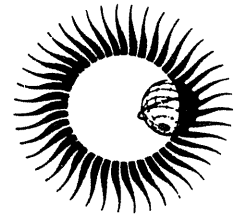
REPORT UAG-101

WORLD DATA CENTER A
for
Solar-Terrestrial Physics

ATLAS OF STACKPLOTS
derived from
SOLAR SYNOPTIC CHARTS

Evolution of Large-Scale Magnetic Fields
and Coronal Holes from Hα Synoptic Charts: 1966-1987



October 1991

NATIONAL GEOPHYSICAL DATA CENTER

WORLD DATA CENTER A

National Academy of Sciences
2101 Constitution Avenue, NW
Washington, DC 20418 USA

World Data Center A consists of the Coordination Office and the following eight Subcenters:

COORDINATION OFFICE
World Data Center A
National Academy of Sciences
2101 Constitution Avenue, NW
Washington, DC 20418 USA
[Telephone: (202) 334-3368]

GLACIOLOGY (Snow and Ice)
World Data Center A: Glaciology (Snow and Ice)
Cooperative Inst. for Research in Environmental Sciences
University of Colorado
Boulder, Colorado 80309 USA
Telephone: (303) 492-5171

MARINE GEOLOGY AND GEOPHYSICS (Gravity, Magnetics, Bathymetry, Seismic Profiles, Marine Sediment, and Rock Analyses):
World Data Center A for Marine Geology and Geophysics
NOAA, E/GC3
325 Broadway
Boulder, Colorado 80303-3328 USA
Telephone: (303) 497-6487

METEOROLOGY (and Nuclear Radiation)
World Data Center A: Meteorology
National Climatic Data Center
NOAA, E/CC
Federal Building
Asheville, North Carolina 28801 USA
Telephone: (704) 259-0682

OCEANOGRAPHY
World Data Center A: Oceanography
National Oceanographic Data Center
NOAA, E/OC
1825 Connecticut Avenue, NW
Universal Building, Room 406
Washington, DC 20235 USA
Telephone: (202) 673-5594

ROCKETS AND SATELLITES
World Data Center A: Rockets and Satellites
NASA/Goddard Space Flight Center
Code 630.2
Greenbelt, Maryland 20771 USA
Telephone: (301) 286-7354

ROTATION OF THE EARTH
World Data Center A: Rotation of the Earth
U.S. Naval Observatory
Washington, DC 20392-5100 USA
Telephone: (202) 653-1529 or 1527

SEISMOLOGY
World Data Center A: Seismology
U.S. Geological Survey
Branch of Global Seismology and Geomagnetism
Box 25046, Mail Stop 967
Denver Federal Center
Denver, Colorado 80225 USA
Telephone: (303) 236-1500

SOLAR-TERRESTRIAL PHYSICS (Solar and Interplanetary Phenomena, Ionospheric Phenomena, Flare-Associated Events, Geomagnetic Variations, Aurora, Cosmic Rays, Airglow):
World Data Center A for Solar-Terrestrial Physics
NOAA, E/GC2
325 Broadway
Boulder, Colorado 80303-3328 USA
Telephone: (303) 497-6324

SOLID-EARTH GEOPHYSICS (Seismicity, Earthquake Strong Motion, Tsunamis, Gravimetry, Earth Tides, Recent Movements of the Earth's Crust, Magnetic Measurements, Paleomagnetism and Archeomagnetism, Volcanology, Geothermics):
World Data Center A for Solid-Earth Geophysics
NOAA, E/GC1
325 Broadway
Boulder, Colorado 80303-3328 USA
Telephone: (303) 497-6521

World Data Centers conduct international exchange of geophysical observations in accordance with the principles set forth by the International Council of Scientific Unions. WDC-A is established in the United States under the auspices of the National Academy of Sciences. Communications regarding data interchange matters in general and World Data Center A as a whole should be addressed to World Data Center A, Coordination Office (see address above). Inquiries and communications concerning data in specific disciplines should be addressed to the appropriate subcenter listed above.

ATLAS OF STACKPLOTS
derived from
SOLAR SYNOPTIC CHARTS
Evolution of Large-Scale Magnetic Fields
and Coronal Holes from Hα Synoptic Charts: 1966-1987

by

P.S. McIntosh
NOAA Space Environment Laboratory
Boulder, CO 80303 USA
and
E.C. Willock and R.J. Thompson
IPS Radio and Space Services
West Chatswood, NSW 2057, Australia

October 1991

Published by
World Data Center A for Solar-Terrestrial Physics
National Geophysical Data Center
325 Broadway, Boulder, CO 80303 USA

TABLE OF CONTENTS

EXPLANATION *Page*

1. Introduction iii

2. Solar Synoptic Charts and Stackplots v
   2.1 Properties of H_α Synoptic Charts and Stackplots v
   2.2 Applications of H_α Synoptic Charts and Stackplots vi

3. Structure of this Atlas viii
   3.1 The Stackplots viii
   3.2 Index Tables to the Stackplots viii
   3.3 Measurement, Interpretation and Location Tools ix

4. Availability of Data ix

5. Acknowledgements x

6. References x

INDEXING AND GRAPHICAL MATERIAL

Table 1 The Synoptic Map Data xii

Table 2 Index of Stackplots by Page Number xv

Table 3 Index of Stackplots by Time xx

Figure 1 Sample Synoptic Chart and Digital Map xxi

Figure 2 Locator Grids xxii

Figure 3 Synodic Rotation Rate Overlay for 10° Slices xxiii

Figure 4 Synodic Rotation Rate Overlay for Active North and South Slices xxiv

Figure 5 Synodic Rotation Rate Overlay for Equatorial Slices xxv

Figure 6 Synodic Rotation Rate Overlay for Large-Scale Stackplots xxvi

Figure 7 Cross-Reference to the 10° and Global Stackplots xxvii

Key to Stackplot Symbols xxviii

Section Index to Stackplots xxix

THE STACKPLOTS

10° Slice Stackplots ..... 1 - 84

Active North Latitude (N01° - N50°) ..... 85 - 114

Equatorial Latitude (S25° - N25°) ..... 115 - 144

Active South Latitude (S01° - S50°) ..... 145 - 174

Large-Scale Stackplots for 10° Slices
for all Carrington Rotations ..... 175 - 188

Global Stackplot Combining 10° Slices
for all Latitude Bands and for all Carrington Rotations ..... Foldout (inside back cover)

ATLAS OF STACKPLOTS

derived from

SOLAR SYNOPTIC CHARTS

Evolution of Large-Scale Magnetic Fields and Coronal Holes
from $H\alpha$ Synoptic Charts: 1966 - 1987.

P. S. McIntosh,[1] *E. C. Willock,*[2] *R. J. Thompson*[2]

[1] NOAA Space Environment Laboratory
325 Broadway
Boulder Co 80303
USA

[2] IPS Radio and Space Services
PO Box 5606
West Chatswood NSW 2057
Australia

Abstract

Long-lived patterns of solar magnetic-field polarity and coronal holes are revealed in a collection of stackplots - vertical time series of segments of solar synoptic charts. The plots, based upon a 21-year collection of $H\alpha$ synoptic charts compiled at the Space Environment Laboratory (SEL) of the National Oceanic and Atmospheric Administration, portray the long-term, large-scale evolution of solar magnetic features from late in 1966 through to the end of 1987. This interval includes two complete sunspot cycles (most of cycles 20 and 21, and the start of cycle 22). Coronal hole data are available from the x-ray images obtained by Skylab (1973-74) and from HeI λ10830 observations for 1975-1987.

Several types of stackplot are included in this collection. These include a series of plots displaying 10° zones of solar latitude, stepped from 70°N through the solar equator to 70°S. Three further series of stackplots show a wider band of latitude (1°N-50°N, 25°S-25°N, 1°S-50°S). Two types of large-scale plots are also included, both being formed from the 10° latitude zones. The first combines data from each 10° zone for the entire interval of time. The second, a fold-out page, combines the data from all zones to provide an overview of the entire 21-year database.

The stackplots are extensively cross-referenced by date, rotation number, and latitude range to allow researchers easy access to periods of special interest. The plots are also accompanied by overlays and grids to measure rotation rates of drifting patterns.

Applications for these data include: studies of variable rates of rotation for magnetic field and coronal hole patterns; inference of the general circulation of the solar atmosphere; definition of the solar cycle from large-scale parameters, independent of sunspots; improved studies of the reversal of polar magnetic fields; and meridional motions of large-scale features.

1. Introduction

$H\alpha$ synoptic charts were first developed by McIntosh [1972a, 1972b, 1972c] as an outgrowth of efforts to infer solar magnetic fields from images obtained by solar flare patrols established to support solar-terrestrial prediction services. Charts have been regularly compiled and used for this purpose by the Space Environment Laboratory (SEL) of the National Oceanic and Atmospheric Administration

(NOAA) in Boulder, Colorado. Preliminary versions began appearing monthly in *Solar-Geophysical Data* in 1973, and, shortly thereafter, in the NOAA weekly *Preliminary Report and Forecast of Solar-Geophysical Data*. More complete charts were published as an atlas for the period of solar cycle 20 (1964-1974) by McIntosh, [1979]. A complete description of the inference techniques, methods of compilation, and an evaluation of the $H\alpha$ synoptic charts' reliability and utility can be found in that atlas.

$H\alpha$ synoptic charts contain a wealth of information including the locations of filaments, filament channels, large sunspots, plage, coronal holes, and large-scale magnetic polarity. While the charts have proved valuable for research and forecasting [Roelof and Krimigis, 1973; McIntosh et al., 1976; McIntosh 1981; McIntosh and Wilson, 1985], the main limitation to their application has been the problems of handling large amounts of data in the printed form. An important development was made in 1989 when the collection was put into digital form by McIntosh and his co-workers at Space Environment Laboratory and by Suess at the NASA Marshall Space Flight Center. The digital versions of the charts do not include the full range of data available in the original charts but they contain the key elements: the large-scale magnetic field structure (positive or negative polarity) and the locations of coronal holes (also positive or negative polarity).

Figures 1(a) and 1(b) show a typical example of a printed synoptic chart from *Solar Geophysical Data* and the corresponding digital map. In the digital map, the location of features (positive/negative magnetic polarity, positive/negative coronal holes) has been indicated by various shades of grey, chosen to accentuate the visibility of different features when grouped into larger plots.

The characteristic of a single map for each solar rotation makes the maps especially valuable for studying the large-scale and long-term evolution of solar features such as magnetic fields and coronal holes. For such studies, it is particularly useful to combine corresponding latitude slices of maps into longer time sequences called "stackplots."

The stackplots presented in this report have been produced from the digital charts using versatile computer software established at IPS Radio and Space Services in Sydney, Australia. This system allows the data to be easily handled by computer and a wide variety of displays to be generated [Thompson, Willock and McIntosh, 1991].

The stackplots portray the evolution of large-scale solar features over a period of 21 years. The plots cover 360° of solar longitude, or one rotation as defined by the rate determined from Carrington's sunspot observations [McIntosh, 1979], a range of solar latitude from 70°N to 70°S, and a variety of latitude slices and styles of display. In each stackplot, time is shown vertically as consecutive slices are arranged down the page. Black, white, and three shades of grey distinguish regions of positive or negative polarity coronal holes from positive and negative polarity large-scale magnetic field. The plots are similar to those created from Mount Wilson magnetograms by Bumba and Howard [1969].

The stackplots include data extending from September 1966 through to December 1987 [Carrington Rotation (CR) 1512 to 1796], but with an interruption in magnetic-field data in the interval of August 1974-December 1978 (CR1617-1676). The entire data set includes nearly all of solar cycles 20 and 21, plus the early portion of cycle 22. The collection of stackplots affords one of the most complete and detailed views of large-scale magnetic-field patterns through a 22-year solar magnetic cycle. It is the only database that includes the complete history of coronal hole data placed in context with solar magnetic fields.

2. Solar Synoptic Charts and Stackplots

2.1 Properties of $H\alpha$ Synoptic Charts and Stackplots

$H\alpha$ synoptic charts display the entire solar globe in cylindrical, heliographic coordinates, showing patterns of neutral lines (lines of magnetic polarity inversion) mapped from filaments and from a variety of chromospheric structures whose forms and presence are governed by magnetic fields [McIntosh, 1972a, 1979]. Superposed on these patterns are the coronal holes observed with x-ray images (1973-74) and inferred from HeI λ10830 spectroheliograms (1975-1987).

Most of the data on the charts come from solar images obtained in the λ6563 line of neutral hydrogen ($H\alpha$), that reveal a wealth of fine structure formed by the influence of magnetic fields on the solar chromosphere and low corona. The $H\alpha$ structures which form into interconnecting systems associated with lines of polarity reversal are: filaments, filament channels, fibril patterns surrounding active regions, plage corridors, and arch-filament systems. The positions of neutral lines are inferred from daily solar images, accumulating information on the complete patterns of neutral lines as structures form and disappear in, and above, the solar surface.

Photographic images are required to infer the neutral lines because: (1) full-disk images are necessary for derivation of absolute solar coordinates, and (2) photographic images still surpass electronic imagery in resolution when recording the full solar disk. Spatial resolution of at least 2 arcseconds, or 1 part in 1000 per solar diameter, is necessary for recognition of fibril patterns and for detection of narrow plage corridors. These features can indicate the location of important segments of neutral lines.

The inference of lines of polarity inversion from structures formed in magnetic fields can be a most valuable alternative to data derived by magnetographs, whose signal can be distorted by numerous physical and line-of-sight difficulties. In addition, the numerous patrol observatories operating in a global network provided $H\alpha$ data with few interruptions, whereas magnetographs operated intermittently and at low resolution through the early part of the data interval, and even today do not form a complete synoptic patrol. The $H\alpha$-inferred data, therefore, are complementary to the more objective, but less complete, magnetograph data.

An important aspect of the synoptic chart format is that it incorporates information about evolving features into a single chart for each rotation of the Sun. During the passage of a feature across the solar disk over a 13-15 day period, daily maps of a feature refine the determination of its coordinates, and confirm the existence of the more subtle portions of inferred neutral lines. The integration of data from all daily observations of a given solar location allows the interconnection of neutral lines not revealed by any single solar image. Some neutral lines extend uninterrupted around the entire solar globe. Others form into large cells that may reflect the scale of giant convective elements beneath the solar surface [Bumba and Howard, 1965; McIntosh, 1972b].

The outlines of coronal holes were scaled from daily spectroheliograms in HeI λ 10830, provided by the Kitt Peak station of the National Solar Observatory in Tucson, Arizona. Only the data prior to August 1979 (CR1685) were mapped from coronal hole boundaries determined by Kitt Peak observers. All others were scaled independently by McIntosh, using a series of daily images to discern coronal holes from other complex aspects of the images by watching the bright coronal hole areas rotate across the solar disk. The variability of image quality and the intrinsic variability of the coronal holes required that the scaling use consistency among the daily images, and some continuity from earlier solar rotations.

The rotation-averaged nature of the charts has limitations for their use in studies of the short-term evolution of features. However, for studying the longer-term evolution of the Sun, this convenient format has advantages; evident when segments of many charts are combined to form stackplots.

Segmentation of the charts into stackplots with narrow zones of latitude is a valuable method of isolating the differential rotation of the Sun. This differential rotation causes long-lived features at one latitude to move relative to those at an adjacent latitude, resulting in complicated interactions among large-scale patterns, including large-scale shear. Presentation of a series of narrow latitude zones on a single page compresses time so that the presence of long-lived patterns is distinguished from short-term changes that may relate to active regions. Displays of such narrow zones were used effectively by Bumba and Howard [1969] to discover "rows and streams" in large-scale magnetic fields recorded at the Mount Wilson Observatory, and to them we give credit for the inspiration to construct stackplots [McIntosh, 1981; McIntosh and Wilson, 1985; Webb et al., 1984].

When stackplots such as those in this atlas are examined it is evident that the average slope of long-lived patterns generally varies in a regular way as a function of latitude. Since the frame of reference is the Carrington system of solar longitudes, a vertical pattern in a stackplot represents a pattern rotating at the Carrington synodic rate of 27.2753 days; positive slopes indicate apparent rotation rates slower than the Carrington rate. These usually occur poleward of 20° latitude. Negative slopes indicate rotation rates faster than the Carrington rate and these usually occur at latitudes less than 20°. The progressive change in mean slope with latitude, seen in the large-scale stackplots on pages 175-188, is a graphic illustration of differential solar rotation.

The stackplots, especially the large-scale plots on pages 175-188, illustrate in graphic fashion that some features are both long-lived and can drift relative to the system of heliographic longitudes. Indeed, some patterns exhibit a constant rate of drift over time scales of years. It is also apparent from the stackplots that the large-scale features move relative to one another, with dramatic examples of convergence and divergence among them.

2.2 Applications of $H\alpha$ Synoptic Charts and Stackplots

The earliest $H\alpha$ synoptic charts were used in studies of solar energetic particles [Roelof and Krimigis, 1973], examining the solar source longitudes for particle streams. The use of transient filaments and patterns of weak unipolar regions revealed interconnecting magnetic neutral lines not recorded on other charts. These additional boundaries led to correlations between solar magnetic-field boundaries and changes in energetic particle data. The interpretation was that coronal structures determined by the surface magnetic fields controlled the escape of particles into interplanetary space and, in some cases, accounted for transport of particles within the solar corona from the expected site of acceleration (e.g. solar flare) to a site of open fields and access to the interplanetary medium.

Comparisons between $H\alpha$ synoptic charts and x-ray solar images obtained in space from the AS&E Skylab/ATM x-ray telescope revealed a close fit of coronal arches, filament cavities, and coronal hole boundaries with the patterns of chromospheric neutral lines [McIntosh et al, 1976]. Such a close correspondence between surface neutral lines and the array of 3-dimensional coronal structures corroborates the correlations between interplanetary data (particles, solar wind, magnetic fields) and the large-scale solar magnetic fields [Ness and Wilcox, 1964; Severny et al., 1970; Roelof, 1974]. Indeed, the correlation between interplanetary fields and the $H\alpha$ synoptic charts was determined to be higher than the correlation with the measured magnetic fields [McIntosh and Roelof, 1972]. This improved correlation may be a product of the better determination of polarity boundaries in areas of weak fields, where filament-like structures give a more distinct signal than the patterns revealed by line-of-sight magnetograms.

The co-existence within the same latitude zone of long-lived patterns with differing rates of rotation -- seen in the stackplots in this report as patterns that cross one another -- is similar to the interplanetary

magnetic field (IMF) patterns displayed in the stackplots published by Svalgaard and Wilcox [1975]. Their study inferred IMF sectors from geomagnetic indices for five solar cycles, and revealed co-existing long-lived patterns with differing rates of rotation. The data in this atlas, therefore, may provide additional understanding of the source of structure to the IMF.

The phenomenon of magnetic polarity reversal at the solar poles is basic to any model of the solar cycle. The $H\alpha$ synoptic charts, with their inclusion of the HeI λ10830 coronal holes, were utilized in a thorough review of the polarity reversal process during three solar cycles [Webb et al, 1984]. The poleward movement of the polar crown ring of filaments is an integral part of the polar reversal phenomenon, and the polar crown latitudes are especially clear on the $H\alpha$ synoptic charts [McIntosh and Wilson, 1985].

The appearance of large-scale magnetic field patterns at the beginning of solar cycles, before many sunspots have formed, suggests that the patterns are formed from magnetic fields that emerge independent of sunspots [McIntosh, 1981; McIntosh and Wilson, 1985; Wilson and McIntosh, 1991]. Furthermore, the persistence of well-organized patterns at sunspot latitudes during the height of the sunspot maximum implies that the frequent eruption of strong magnetic fields in the form of sunspots and active regions appears to be determined to some degree by pre-existing large-scale patterns. McIntosh [1979, 1981] noted the tendency for strong regions to emerge on existing large-scale boundaries, and within existing active regions more often than would occur in a random eruption of flux. The phenomenon of "active longitudes" and their relationship to the long-lived interplanetary sector boundaries [Bumba and Obridko, 1969; Dittmar, 1975] also imply non-random flux eruption and its control by large-scale processes.

Quantitative analyses of these variations, from this new database, may provide critical input to improved models of the solar cycle. These data may become the source of a detailed description of the general circulation of the solar atmosphere. Inasmuch as patterns of magnetic fields are observed to move differently from the measured motions of the surface plasma [Stenflo, 1989], the circulation derived from large-scale patterns may refer to motions of the source of magnetic flux, perhaps located some distance beneath the solar surface.

The fold-out chart inside the back cover of this atlas, a global plot combining the 10° stackplots for the entire data period and for all latitudes, is an improved and extended version of a figure constructed by Stepanyan [1982] from most of these same $H\alpha$ synoptic charts. Stepanyan's diagram was constructed without benefit of computers, and the direction of solar longitude was reversed when data were plotted for the southern solar hemisphere. That reversal had the effect of introducing a symmetry in the appearance of the combined data, with chevron-like patterns sweeping away from the solar equator in both hemispheres. The fold-out displays global symmetry in a different, but equivalent way, and reveals very large patterns not apparent in the Stepanyan version. These patterns arise from both the correlation between adjacent latitudes and the apparent poleward drift of long-lived patterns. The production of the stackplots by computer, together with a careful integration of them, gives improved precision in the alignment between adjacent latitudes, enhancing perception of these grand patterns. The complexity of information is such that proper interpretation of these data will require more study than has been accomplished at the time of this writing.

The absence of magnetic-field patterns in the center of the fold-out and the large-scale stackplots reflects a period when the compilation of $H\alpha$ synoptic charts was incomplete. The importance of phenomena at the time of sunspot minimum creates a need for improvement of these data in the near future.

3. Structure of this Atlas

The atlas consists of stackplots of a variety of types, together with tools to provide easy access to, and effective use of, the data. The data and these tools are described in this section.

3.1 The Stackplots

Five series of stackplots and a fold-out chart have been selected for inclusion in this atlas. These are:

i. ***Narrow-slice stackplots over a wide range of latitude*** for CR1501 to 1800, printed 50 rotations per page. Each 10° slice begins with the slice 61°-70°N, and moves south until the slice 61°-70°S is reached (pages 1-84).

ii. ***Wide-slice stackplots in the latitude range 1°-50°N ("Active North latitudes")***, spanning CR1501 to 1800. These are printed 10 rotations per page (pages 85-114).

iii. ***Wide-slice stackplots in the latitude range 25°S-25°N ("Equatorial latitudes")***, spanning CR1501 to 1800. These are printed 10 rotations per page (pages 115-144).

iv. ***Wide-slice stackplots in the latitude range 1°-50°S ("Active South latitudes")***, spanning CR1501 to 1800. These are printed 10 rotations per page (pages 145-174).

v. ***A large-scale stackplot for each of the 10° latitude zones for the entire range of data (CR1501-1800).*** Five identical plots have been placed side-by-side, each stepped up one row with each addition to the left. This improves the visibility of features that drift beyond the edge of a single 360°-range of solar longitude (pages 175-188).

vi. ***A global fold-out chart combining the 10° stackplots*** for the entire data period for all latitude slices (inside back cover).

3.2 Index Tables to the Stackplots

A number of tables and figures have been included to assist in the interpretation and use of the stackplot atlas. These are:

i. ***A list of the digital synoptic maps*** used in generating the stackplots (Table 1), giving the starting date of each Carrington rotation and the type of data available for that rotation. A map containing the full data set is indicated as "Magnetic Field/Coronal Hole;" "Coronal Hole Only" and "Magnetic Field Only" indicate partial data; while "No Data" indicates that no map is available for that rotation.

ii. ***A page index of the stackplots*** (Table 2) in the atlas. Information in this table includes the type of slice (10°, North, Equatorial, or South), the latitude range covered, the range of Carrington rotations, and the corresponding date range.

iii. ***An index of stackplots according to Carrington rotation and date*** (Table 3). Stackplots are divided according to the type of slice.

iv. ***A cross-reference of the 10° stackplots according to Carrington rotation and date*** (Figure 7). This reference has a similar format to that of the global fold-out and is particularly suited to the location of features using this fold-out.

The large-scale stackplots on pages 175-188 also provide quick location of interesting features, which can then be traced through the index tables listed above.

3.3 Measurement, Interpretation and Location Tools

The following tools are provided to identify the positions of features, to interpret data type, or to measure rotation rates. Of these, three are located on the stackplot pages and two are included as figures.

i. ***Interpretation Key:*** A grey-scale key is provided on each stackplot page to assist in interpretation of the feature polarity. A description of this key is located on page xxiii.

ii. ***Edge Slider:*** A "slider bar" is located on each page and can be used as a rapid-access "thumb index" to quickly locate the desired slice thickness and latitude zone.

iii. ***Map Type-Tags:*** The maps may contain inferred magnetic or coronal hole information. One or both data sets may be absent. Map "type-tag" symbols located on the inner edge of the stackplot give a visual indication of the type of data available for each map. A description of the symbols is given on page xxv. A listing of data is contained in Table 1.

Two sets of tools are incorporated (Figures 2 to 5) for measurement of stackplot features. The first set can be used to measure position, the second set to measure rotation rates. These can be reproduced on transparency film and overlaid on the stackplot to make the desired measurement.

i. ***Locator Grids:*** Two locator grids - one spatial, the other temporal - are provided. Figure 2(a) is a grid of 10° latitude and longitude lines that can be used as an overlay to measure the location of a feature. The Carrington latitude and longitude of the desired location can be read directly from the grid.

   The grid of latitudes and days shown in Figure 2(b) can be used to locate a positional feature in time with respect to the Carrington rotation start date found in Table 1. Values read from the top scale of Figure 2(b) should be added to the start date of the Carrington rotation to obtain the date of central meridian passage of the feature. Values from the lower scale should be subtracted from the start date of the next Carrington rotation.

ii. ***Synodic Rotation Rate Overlays:*** Overlays (Figures 3-6) are provided for the 10°, the Active Latitude, Equatorial, and Large-Scale stackplots. These allow quick determination of the synodic rate of rotation for patterns.

4. Availability of Data

A magnetic tape containing the series of digital synoptic maps is available. Enquiries regarding this tape should be directed to :

National Geophysical Data Center
Solar-Terrestrial Physics Division (E/GC2)
325 Broadway
Boulder Colorado 80303
USA

Telephone : (303) 497-6346
Facsimile : (303) 497-6513
E-Mail (SPAN) : 9555::EKIHN

5. Acknowledgements

The $H\alpha$ synoptic charts were digitized and displayed as computer bitmaps with software developed at SEL by Michael Pearson, Randy Smith, and Vern Raben, extending software first written by Bill Retallack. The conversion of the bitmap archive to digital arrays was accomplished by Dr. Steve Suess of NASA Marshall Space Flight Center, freeing these data for transport to other computer systems and allowing computer analysis. At IPS Radio and Space Services, Craig Bevins, Colin Yuile, and Joe Van provided the computer system support so necessary for successful implementation of the programs used to process and display the digital synoptic maps. Sean Anthonisz assembled the prototypes of page layouts and global plots. The assistance of all of these people is gratefully acknowledged.

6. References

[1] Bumba, V., and Howard, R.: 1969, "Solar Activity and Recurrences in Magnetic Field Distribution," *Solar Phys.*, **7**, 28-38.

[2] Bumba, V., and Obridko, V. N.: 1969, "Bartel's Active Longitudes, Sector Boundaries and Flare Activity," *Solar Phys.*, **6**, 104-110.

[3] Dittmar, P. H.: 1975, "The Relationship between Solar Flares and Solar Sector Boundaries," *Solar Phys.*, **41**, 227-231.

[4] McIntosh, P. S.: 1972a, "Inference of Solar Magnetic Polarities from H-alpha Observations," in *Solar Activity Observations and Predictions* , P. S. McIntosh and M. Dryer, eds., The MIT Press, 65-92.

[5] McIntosh, P. S.: 1972b, "Large-scale Solar Magnetic Fields and H-alpha Patterns," in *Solar Wind*, D. S. Colburn, C. D. Sonett, and J. M. Wilcox, eds., NASA SP-308, 136-140.

[6] McIntosh, P. S.: 1972c, "Solar Magnetic Fields Derived from Hydrogen-Alpha Filtergrams," *Rev. Geophys. Space Phys.*, **10**, 837-846.

[7] McIntosh, P. S.: 1979, "Annotated Atlas of H-alpha Synoptic Charts for Solar Cycle 20 (1964-1974)," Upper Atmosphere Geophysics Report 70, NOAA World Data Center A for Solar-Terrestrial Physics, Boulder, Colorado, 327 pages.

[8] McIntosh, P. S.: 1981, "The Structure and Evolution of Sunspots: Observations," in L. E. Cram and J. H. Thomas (eds.), The Physics of Sunspots, Sacramento Peak Observatory Summer Workshop, 7-41.

[9] McIntosh, P. S., Krieger, A. S., Nolte, J. T. and Vaiana, G.: 1976, "Association of X-ray Arches with Chromospheric Neutral Lines," *Solar Phys.*, **49**, 57-77.

[10] McIntosh, P. S. and Roelof, E. C.: 1972, "H-alpha Structure: An Improved Correlation between the Solar and Interplanetary Magnetic Field," *EOS Trans. AGU*, **53**, 1113.

[11] McIntosh, P. S. and Wilson, P. R.: 1985, "A New Model for Flux Emergence and the Origin of Sunspot and Large-Scale Fields," *Solar Phys.*, **97**, 59.

[12] Ness, N. F. and Wilcox, J. M.: 1964, "Solar Origin of the Interplanetary Magnetic Field," *Phys. Rev. Letters*, **13**, 461.

[13] *Preliminary Report and Forecast of Solar Geophysical Data*, NOAA Space Environment Laboratory, Space Environment Services Center, Boulder, Colorado, USA.

[14] Roelof, E. C. and Krimigis, S. M.: 1973, "Analysis and Synthesis of Coronal and Interplanetary Energetic Particle, Plasma and Magnetic Fields Observations over Three Solar Rotations," *J. Geophys. Res.*, **78**, 5375-5410.

[15] Severny, A., Wilcox, J. M., Scherrer, P. H., and Colburn, D. S.: 1970, "Comparison of the Mean Photospheric Magnetic Field and the Interplanetary Magnetic Field," *Solar Phys.*, **15**, 3-14.

[16] *NOAA Solar-Geophysical Data*, World Data Center-A for Solar-Terrestrial Physics, NOAA Boulder, Colorado, USA.

[17] Stenflo, J. O.: 1989, "Differential Rotation of the Sun's Magnetic Field Pattern," *Astron. Astrophys.*, **210**, 403-409.

[18] Stepanyan, N. N.: 1982, "Background Magnetic Fields on the Sun in 1964-1978," *Izv. Krym. Astrofiz. Obs.*, **65**, 43-58.

[19] Svalgaard, L. and Wilcox, J. M: 1975, "Long Term Evolution of Solar Sector Structure," *Solar Phys.*, **41**, 461-475.

[20] Thompson, R. J., Willock, E. C. and McIntosh, P. S.: 1991, "Display and Analysis of Solar Synoptic Maps at IPS," Technical Report TR-91-02, IPS Radio and Space Services, Australia.

[21] Webb, D. F., Davis, J. M. and McIntosh, P. S.: 1984, "Observations of the Reappearance of Polar Coronal Holes and the Reversal of the Polar Magnetic Field," *Solar Phys.*, **92**, 109-132.

[22] Wilson, P. R. and McIntosh, P. S.: 1991, "Reversal of the Solar Polar Magnetic Field : II Simulation of the Large-Scale Field," *Solar Phys.*, accepted.

Table 1 - The Synoptic Map Data

C.R.	Starting Date	Type of Data	C.R.	Starting Date	Type of Data
1501	1965, Nov 15.8	No Data	1551	1969, Aug 10.5	Magnetic Field Only
1502	1965, Dec 13.1	No Data	1552	1969, Sep 6.8	Magnetic Field Only
1503	1966, Jan 9.4	No Data	1553	1969, Oct 4.0	Magnetic Field Only
1504	1966, Feb 5.7	No Data	1554	1969, Oct 31.3	Magnetic Field Only
1505	1966, Mar 5.1	No Data	1555	1969, Nov 27.6	Magnetic Field Only
1506	1966, Apr 1.4	No Data	1556	1969, Dec 25.0	Magnetic Field Only
1507	1966, Apr 28.6	No Data	1557	1970, Jan 21.3	Magnetic Field Only
1508	1966, May 25.9	No Data	1558	1970, Feb 17.6	Magnetic Field Only
1509	1966, Jun 22.1	No Data	1559	1970, Mar 17.0	Magnetic Field Only
1510	1966, Jul 19.3	No Data	1560	1970, Apr 13.3	Magnetic Field Only
1511	1966, Aug 15.5	No Data	1561	1970, May 10.5	Magnetic Field Only
1512	1966, Sep 11.8	Magnetic Field Only	1562	1970, Jun 6.7	Magnetic Field Only
1513	1966, Oct 9.0	Magnetic Field Only	1563	1970, Jul 3.9	Magnetic Field Only
1514	1966, Nov 5.3	Magnetic Field Only	1564	1970, Jul 31.1	Magnetic Field Only
1515	1966, Dec 2.6	Magnetic Field Only	1565	1970, Aug 27.3	Magnetic Field Only
1516	1966, Dec 30.0	Magnetic Field Only	1566	1970, Sep 23.6	Magnetic Field Only
1517	1967, Jan 26.3	Magnetic Field Only	1567	1970, Oct 20.9	Magnetic Field Only
1518	1967, Feb 22.6	Magnetic Field Only	1568	1970, Nov 17.2	Magnetic Field Only
1519	1967, Mar 22.0	Magnetic Field Only	1569	1970, Dec 14.5	Magnetic Field Only
1520	1967, Apr 18.2	Magnetic Field Only	1570	1971, Jan 10.8	Magnetic Field Only
1521	1967, May 15.5	Magnetic Field Only	1571	1971, Feb 7.2	Magnetic Field Only
1522	1967, Jun 11.7	Magnetic Field Only	1572	1971, Mar 6.5	Magnetic Field Only
1523	1967, Jul 8.9	Magnetic Field Only	1573	1971, Apr 2.8	Magnetic Field Only
1524	1967, Aug 5.1	Magnetic Field Only	1574	1971, Apr 30.1	Magnetic Field Only
1525	1967, Sep 1.3	Magnetic Field Only	1575	1971, May 27.3	Magnetic Field Only
1526	1967, Sep 28.6	Magnetic Field Only	1576	1971, Jun 23.5	Magnetic Field Only
1527	1967, Oct 25.9	Magnetic Field Only	1577	1971, Jul 20.7	Magnetic Field Only
1528	1967, Nov 22.2	Magnetic Field Only	1578	1971, Aug 16.9	Magnetic Field Only
1529	1967, Dec 19.5	Magnetic Field Only	1579	1971, Sep 13.2	Magnetic Field Only
1530	1968, Jan 15.8	Magnetic Field Only	1580	1971, Oct 10.5	Magnetic Field Only
1531	1968, Feb 12.2	Magnetic Field Only	1581	1971, Nov 6.8	Magnetic Field Only
1532	1968, Mar 10.5	Magnetic Field Only	1582	1971, Dec 4.1	Magnetic Field Only
1533	1968, Apr 6.8	Magnetic Field Only	1583	1971, Dec 31.4	Magnetic Field Only
1534	1968, May 4.1	Magnetic Field Only	1584	1972, Jan 27.7	Magnetic Field Only
1535	1968, May 31.3	Magnetic Field Only	1585	1972, Feb 24.1	Magnetic Field Only
1536	1968, Jun 27.5	Magnetic Field Only	1586	1972, Mar 22.4	Magnetic Field Only
1537	1968, Jul 24.7	Magnetic Field Only	1587	1972, Apr 18.7	Magnetic Field Only
1538	1968, Aug 20.9	Magnetic Field Only	1588	1972, May 15.9	Magnetic Field Only
1539	1968, Sep 17.2	Magnetic Field Only	1589	1972, Jun 12.1	Magnetic Field Only
1540	1968, Oct 14.5	Magnetic Field Only	1590	1972, Jul 9.3	Magnetic Field Only
1541	1968, Nov 10.8	Magnetic Field Only	1591	1972, Aug 5.5	Magnetic Field Only
1542	1968, Dec 8.1	Magnetic Field Only	1592	1972, Sep 1.8	Magnetic Field Only
1543	1969, Jan 4.4	Magnetic Field Only	1593	1972, Sep 29.0	Magnetic Field Only
1544	1969, Jan 31.7	Magnetic Field Only	1594	1972, Oct 26.3	Magnetic Field Only
1545	1969, Feb 28.1	Magnetic Field Only	1595	1972, Nov 22.6	Magnetic Field Only
1546	1969, Mar 27.4	Magnetic Field Only	1596	1972, Dec 20.0	Magnetic Field Only
1547	1969, Apr 23.7	Magnetic Field Only	1597	1973, Jan 16.3	Magnetic Field Only
1548	1969, May 20.9	Magnetic Field Only	1598	1973, Feb 12.6	Magnetic Field Only
1549	1969, Jun 17.1	Magnetic Field Only	1599	1973, Mar 12.0	Magnetic Field Only
1550	1969, Jul 14.3	Magnetic Field Only	1600	1973, Apr 8.3	Magnetic Field Only

Table 1 - The Synoptic Map Data (Continued)

C.R.	Starting Date	Type of Data
1601	1973, May 5.5	Magnetic Field/Coronal Hole
1602	1973, Jun 1.7	Magnetic Field/Coronal Hole
1603	1973, Jun 28.9	Magnetic Field/Coronal Hole
1604	1973, Jul 26.1	Magnetic Field/Coronal Hole
1605	1973, Aug 22.4	Magnetic Field/Coronal Hole
1606	1973, Sep 18.6	Magnetic Field/Coronal Hole
1607	1973, Oct 15.9	Magnetic Field/Coronal Hole
1608	1973, Nov 12.2	Magnetic Field/Coronal Hole
1609	1973, Dec 9.5	Magnetic Field/Coronal Hole
1610	1974, Jan 5.8	Magnetic Field/Coronal Hole
1611	1974, Feb 2.2	Magnetic Field/Coronal Hole
1612	1974, Mar 1.5	Magnetic Field Only
1613	1974, Mar 28.8	Magnetic Field Only
1614	1974, Apr 25.1	Magnetic Field Only
1615	1974, May 22.3	Magnetic Field Only
1616	1974, Jun 18.5	Magnetic Field Only
1617	1974, Jul 15.7	No Data
1618	1974, Aug 11.9	No Data
1619	1974, Sep 8.2	No Data
1620	1974, Oct 5.5	No Data
1621	1974, Nov 1.8	No Data
1622	1974, Nov 29.1	No Data
1623	1974, Dec 26.4	No Data
1624	1975, Jan 22.7	No Data
1625	1975, Feb 19.1	No Data
1626	1975, Mar 18.4	No Data
1627	1975, Apr 14.7	No Data
1628	1975, May 11.9	No Data
1629	1975, Jun 8.1	Coronal Hole Only
1630	1975, Jul 5.3	Coronal Hole Only
1631	1975, Aug 1.5	Coronal Hole Only
1632	1975, Aug 28.8	No Data
1633	1975, Sep 25.0	No Data
1634	1975, Oct 22.3	Coronal Hole Only
1635	1975, Nov 18.6	Coronal Hole Only
1636	1975, Dec 15.9	Coronal Hole Only
1637	1976, Jan 12.3	Coronal Hole Only
1638	1976, Feb 8.6	No Data
1639	1976, Mar 7.0	Coronal Hole Only
1640	1976, Apr 3.3	No Data
1641	1976, Apr 30.5	No Data
1642	1976, May 27.8	Coronal Hole Only
1643	1976, Jun 24.0	No Data
1644	1976, Jul 21.1	No Data
1645	1976, Aug 17.4	Coronal Hole Only
1646	1976, Sep 13.6	Coronal Hole Only
1647	1976, Oct 10.9	Coronal Hole Only
1648	1976, Nov 7.2	No Data
1649	1976, Dec 4.5	Coronal Hole Only
1650	1976, Dec 31.8	Coronal Hole Only
1651	1977, Jan 28.2	Coronal Hole Only
1652	1977, Feb 24.5	Coronal Hole Only
1653	1977, Mar 23.8	Coronal Hole Only
1654	1977, Apr 20.1	Coronal Hole Only
1655	1977, May 17.4	Coronal Hole Only
1656	1977, Jun 13.6	Coronal Hole Only
1657	1977, Jul 10.8	Coronal Hole Only
1658	1977, Aug 7.0	Coronal Hole Only
1659	1977, Sep 3.2	Coronal Hole Only
1660	1977, Sep 30.5	Coronal Hole Only
1661	1977, Oct 27.8	Coronal Hole Only
1662	1977, Nov 24.1	Coronal Hole Only
1663	1977, Dec 21.4	Coronal Hole Only
1664	1978, Jan 17.7	Coronal Hole Only
1665	1978, Feb 14.1	Coronal Hole Only
1666	1978, Mar 13.4	Coronal Hole Only
1667	1978, Apr 9.7	Coronal Hole Only
1668	1978, May 6.9	Coronal Hole Only
1669	1978, Jun 3.2	Coronal Hole Only
1670	1978, Jun 30.4	Coronal Hole Only
1671	1978, Jul 27.6	Coronal Hole Only
1672	1978, Aug 23.8	Coronal Hole Only
1673	1978, Sep 20.1	Coronal Hole Only
1674	1978, Oct 17.3	Coronal Hole Only
1675	1978, Nov 13.6	Coronal Hole Only
1676	1978, Dec 10.9	Coronal Hole Only
1677	1979, Jan 7.3	Magnetic Field/Coronal Hole
1678	1979, Feb 3.6	Magnetic Field/Coronal Hole
1679	1979, Mar 3.0	Magnetic Field/Coronal Hole
1680	1979, Mar 30.3	Magnetic Field/Coronal Hole
1681	1979, Apr 26.5	Magnetic Field/Coronal Hole
1682	1979, May 23.8	Magnetic Field/Coronal Hole
1683	1979, Jun 20.0	Magnetic Field/Coronal Hole
1684	1979, Jul 17.2	Magnetic Field/Coronal Hole
1685	1979, Aug 13.4	Magnetic Field/Coronal Hole
1686	1979, Sep 9.6	Magnetic Field/Coronal Hole
1687	1979, Oct 6.9	Magnetic Field/Coronal Hole
1688	1979, Nov 3.2	Magnetic Field/Coronal Hole
1689	1979, Nov 30.5	Magnetic Field/Coronal Hole
1690	1979, Dec 27.8	Magnetic Field/Coronal Hole
1691	1980, Jan 24.2	Magnetic Field/Coronal Hole
1692	1980, Feb 20.5	Magnetic Field/Coronal Hole
1693	1980, Mar 18.8	Magnetic Field/Coronal Hole
1694	1980, Apr 15.1	Magnetic Field/Coronal Hole
1695	1980, May 12.4	Magnetic Field/Coronal Hole
1696	1980, Jun 8.6	Magnetic Field/Coronal Hole
1697	1980, Jul 5.8	Magnetic Field/Coronal Hole
1698	1980, Aug 2.0	Magnetic Field/Coronal Hole
1699	1980, Aug 29.2	Magnetic Field/Coronal Hole
1700	1980, Sep 25.5	Magnetic Field/Coronal Hole

Table 1 - The Synoptic Map Data (Continued)

C.R.	Starting Date	Type of Data
1701	1980, Oct 22.8	Magnetic Field/Coronal Hole
1702	1980, Nov 19.1	Magnetic Field/Coronal Hole
1703	1980, Dec 16.4	Magnetic Field/Coronal Hole
1704	1981, Jan 12.7	Magnetic Field/Coronal Hole
1705	1981, Feb 9.1	Magnetic Field/Coronal Hole
1706	1981, Mar 8.4	Magnetic Field/Coronal Hole
1707	1981, Apr 4.7	Magnetic Field/Coronal Hole
1708	1981, May 2.0	Magnetic Field/Coronal Hole
1709	1981, May 29.2	Magnetic Field/Coronal Hole
1710	1981, Jun 25.4	Magnetic Field/Coronal Hole
1711	1981, Jul 22.6	Magnetic Field/Coronal Hole
1712	1981, Aug 18.8	Magnetic Field/Coronal Hole
1713	1981, Sep 15.1	Magnetic Field/Coronal Hole
1714	1981, Oct 12.4	Magnetic Field/Coronal Hole
1715	1981, Nov 8.6	Magnetic Field/Coronal Hole
1716	1981, Dec 6.0	Magnetic Field/Coronal Hole
1717	1982, Jan 2.3	Magnetic Field/Coronal Hole
1718	1982, Jan 29.6	Magnetic Field/Coronal Hole
1719	1982, Feb 26.0	Magnetic Field/Coronal Hole
1720	1982, Mar 25.3	Magnetic Field/Coronal Hole
1721	1982, Apr 21.6	Magnetic Field/Coronal Hole
1722	1982, May 18.8	Magnetic Field/Coronal Hole
1723	1982, Jun 15.0	Magnetic Field/Coronal Hole
1724	1982, Jul 12.2	Magnetic Field/Coronal Hole
1725	1982, Aug 8.4	Magnetic Field/Coronal Hole
1726	1982, Sep 4.7	Magnetic Field/Coronal Hole
1727	1982, Oct 1.9	Magnetic Field/Coronal Hole
1728	1982, Oct 29.2	Magnetic Field/Coronal Hole
1729	1982, Nov 25.5	Magnetic Field/Coronal Hole
1730	1982, Dec 22.8	Magnetic Field/Coronal Hole
1731	1983, Jan 19.2	Magnetic Field/Coronal Hole
1732	1983, Feb 15.5	Magnetic Field/Coronal Hole
1733	1983, Mar 14.8	Magnetic Field/Coronal Hole
1734	1983, Apr 11.1	Magnetic Field/Coronal Hole
1735	1983, May 8.4	Magnetic Field/Coronal Hole
1736	1983, Jun 4.6	Magnetic Field/Coronal Hole
1737	1983, Jul 1.8	Magnetic Field/Coronal Hole
1738	1983, Jul 29.0	Magnetic Field/Coronal Hole
1739	1983, Aug 25.2	Magnetic Field/Coronal Hole
1740	1983, Sep 21.5	Magnetic Field/Coronal Hole
1741	1983, Oct 18.8	Magnetic Field/Coronal Hole
1742	1983, Nov 15.1	Magnetic Field/Coronal Hole
1743	1983, Dec 12.4	Magnetic Field/Coronal Hole
1744	1984, Jan 8.7	Magnetic Field/Coronal Hole
1745	1984, Feb 5.1	Magnetic Field/Coronal Hole
1746	1984, Mar 3.4	Magnetic Field/Coronal Hole
1747	1984, Mar 30.7	Magnetic Field/Coronal Hole
1748	1984, Apr 27.0	Magnetic Field/Coronal Hole
1749	1984, May 24.2	Magnetic Field/Coronal Hole
1750	1984, Jun 20.4	Magnetic Field/Coronal Hole
1751	1984, Jul 17.6	Magnetic Field/Coronal Hole
1752	1984, Aug 13.8	Magnetic Field/Coronal Hole
1753	1984, Sep 10.1	Magnetic Field/Coronal Hole
1754	1984, Oct 7.3	Magnetic Field/Coronal Hole
1755	1984, Nov 3.7	Magnetic Field/Coronal Hole
1756	1984, Nov 31.0	Magnetic Field/Coronal Hole
1757	1984, Dec 28.3	Magnetic Field/Coronal Hole
1758	1985, Jan 24.6	Magnetic Field/Coronal Hole
1759	1985, Feb 21.0	Magnetic Field/Coronal Hole
1760	1985, Mar 20.3	Magnetic Field/Coronal Hole
1761	1985, Apr 16.6	Magnetic Field/Coronal Hole
1762	1985, May 13.8	Magnetic Field/Coronal Hole
1763	1985, Jun 10.0	Magnetic Field/Coronal Hole
1764	1985, Jul 7.2	Magnetic Field/Coronal Hole
1765	1985, Aug 3.4	Magnetic Field/Coronal Hole
1766	1985, Aug 30.7	Magnetic Field/Coronal Hole
1767	1985, Sep 26.9	Magnetic Field/Coronal Hole
1768	1985, Oct 24.2	Magnetic Field/Coronal Hole
1769	1985, Nov 20.5	Magnetic Field/Coronal Hole
1770	1985, Dec 17.8	Magnetic Field/Coronal Hole
1771	1986, Jan 14.2	Magnetic Field/Coronal Hole
1772	1986, Feb 10.5	Magnetic Field/Coronal Hole
1773	1986, Mar 9.9	Magnetic Field/Coronal Hole
1774	1986, Apr 6.2	Magnetic Field/Coronal Hole
1775	1986, May 3.4	Magnetic Field/Coronal Hole
1776	1986, May 30.6	Magnetic Field/Coronal Hole
1777	1986, Jun 26.8	Magnetic Field/Coronal Hole
1778	1986, Jul 24.0	Magnetic Field/Coronal Hole
1779	1986, Aug 20.3	Magnetic Field/Coronal Hole
1780	1986, Sep 16.5	Magnetic Field/Coronal Hole
1781	1986, Oct 13.8	Magnetic Field/Coronal Hole
1782	1986, Nov 10.1	Magnetic Field/Coronal Hole
1783	1986, Dec 7.4	Magnetic Field/Coronal Hole
1784	1987, Jan 3.7	Magnetic Field/Coronal Hole
1785	1987, Jan 31.1	Magnetic Field/Coronal Hole
1786	1987, Feb 27.4	Magnetic Field/Coronal Hole
1787	1987, Mar 26.7	Magnetic Field/Coronal Hole
1788	1987, Apr 23.0	Magnetic Field/Coronal Hole
1789	1987, May 20.2	Magnetic Field/Coronal Hole
1790	1987, Jun 16.4	Magnetic Field/Coronal Hole
1791	1987, Jul 13.6	Magnetic Field/Coronal Hole
1792	1987, Aug 9.9	Magnetic Field/Coronal Hole
1793	1987, Sep 6.1	Magnetic Field/Coronal Hole
1794	1987, Oct 3.4	Magnetic Field/Coronal Hole
1795	1987, Oct 30.6	Magnetic Field/Coronal Hole
1796	1987, Nov 27.0	Magnetic Field/Coronal Hole
1797	1987, Dec 24.3	No Data
1798	1988, Jan 20.6	No Data
1799	1988, Feb 17.0	No Data
1800	1988, Mar 15.3	No Data

Table 2 - Index of Stackplots by Page Number

Page	Type	Latitude	CR Range	Date Range
1	10°	61° N - 70° N	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
2	10°	61° N - 70° N	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
3	10°	61° N - 70° N	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
4	10°	61° N - 70° N	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
5	10°	61° N - 70° N	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
6	10°	61° N - 70° N	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
7	10°	51° N - 60° N	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
8	10°	51° N - 60° N	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
9	10°	51° N - 60° N	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
10	10°	51° N - 60° N	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
11	10°	51° N - 60° N	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
12	10°	51° N - 60° N	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
13	10°	41° N - 50° N	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
14	10°	41° N - 50° N	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
15	10°	41° N - 50° N	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
16	10°	41° N - 50° N	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
17	10°	41° N - 50° N	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
18	10°	41° N - 50° N	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
19	10°	31° N - 40° N	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
20	10°	31° N - 40° N	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
21	10°	31° N - 40° N	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
22	10°	31° N - 40° N	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
23	10°	31° N - 40° N	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
24	10°	31° N - 40° N	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
25	10°	21° N - 30° N	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
26	10°	21° N - 30° N	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
27	10°	21° N - 30° N	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
28	10°	21° N - 30° N	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
29	10°	21° N - 30° N	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
30	10°	21° N - 30° N	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
31	10°	11° N - 20° N	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
32	10°	11° N - 20° N	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
33	10°	11° N - 20° N	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
34	10°	11° N - 20° N	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
35	10°	11° N - 20° N	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
36	10°	11° N - 20° N	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
37	10°	1° N - 10° N	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
38	10°	1° N - 10° N	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
39	10°	1° N - 10° N	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
40	10°	1° N - 10° N	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
41	10°	1° N - 10° N	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
42	10°	1° N - 10° N	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
43	10°	1° S - 10° S	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
44	10°	1° S - 10° S	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5

Table 2 - Index of Stackplots by Page Number (Continued)

Page	Type	Latitude	CR Range	Date Range
45	10°	1° S - 10° S	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
46	10°	1° S - 10° S	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
47	10°	1° S - 10° S	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
48	10°	1° S - 10° S	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
49	10°	11° S - 20° S	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
50	10°	11° S - 20° S	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
51	10°	11° S - 20° S	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
52	10°	11° S - 20° S	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
53	10°	11° S - 20° S	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
54	10°	11° S - 20° S	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
55	10°	21° S - 30° S	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
56	10°	21° S - 30° S	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
57	10°	21° S - 30° S	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
58	10°	21° S - 30° S	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
59	10°	21° S - 30° S	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
60	10°	21° S - 30° S	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
61	10°	31° S - 40° S	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
62	10°	31° S - 40° S	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
63	10°	31° S - 40° S	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
64	10°	31° S - 40° S	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
65	10°	31° S - 40° S	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
66	10°	31° S - 40° S	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
67	10°	41° S - 50° S	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
68	10°	41° S - 50° S	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
69	10°	41° S - 50° S	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
70	10°	41° S - 50° S	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
71	10°	41° S - 50° S	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
72	10°	41° S - 50° S	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
73	10°	51° S - 60° S	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
74	10°	51° S - 60° S	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
75	10°	51° S - 60° S	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
76	10°	51° S - 60° S	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
77	10°	51° S - 60° S	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
78	10°	51° S - 60° S	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
79	10°	61° S - 70° S	1501 - 1550	1965, Nov 15.8 - 1969, Aug 10.5
80	10°	61° S - 70° S	1551 - 1600	1969, Aug 10.5 - 1973, May 5.5
81	10°	61° S - 70° S	1601 - 1650	1973, May 5.5 - 1977, Jan 28.2
82	10°	61° S - 70° S	1651 - 1700	1977, Jan 28.2 - 1980, Oct 22.8
83	10°	61° S - 70° S	1701 - 1750	1980, Oct 22.8 - 1984, Jul 17.6
84	10°	61° S - 70° S	1751 - 1800	1984, Jul 17.6 - 1988, Apr 11.6
85	North	1° N - 50° N	1501 - 1510	1965, Nov 15.8 - 1966, Aug 15.5
86	North	1° N - 50° N	1511 - 1520	1966, Aug 15.5 - 1967, May 15.5
87	North	1° N - 50° N	1521 - 1530	1967, May 15.5 - 1968, Feb 12.2
88	North	1° N - 50° N	1531 - 1540	1968, Feb 12.2 - 1968, Nov 10.8

Table 2 - Index of Stackplots by Page Number (Continued)

Page	Type	Latitude	CR Range	Date Range
89	North	1° N - 50° N	1541 - 1550	1968, Nov 10.8 - 1969, Aug 10.5
90	North	1° N - 50° N	1551 - 1560	1969, Aug 10.5 - 1970, May 10.5
91	North	1° N - 50° N	1561 - 1570	1970, May 10.5 - 1971, Feb 7.2
92	North	1° N - 50° N	1571 - 1580	1971, Feb 7.2 - 1971, Nov 6.8
93	North	1° N - 50° N	1581 - 1590	1971, Nov 6.8 - 1972, Aug 5.5
94	North	1° N - 50° N	1591 - 1600	1972, Aug 5.5 - 1973, May 5.5
95	North	1° N - 50° N	1601 - 1610	1973, May 5.5 - 1974, Feb 2.2
96	North	1° N - 50° N	1611 - 1620	1974, Feb 2.2 - 1974, Nov 1.8
97	North	1° N - 50° N	1621 - 1630	1974, Nov 1.8 - 1975, Aug 1.5
98	North	1° N - 50° N	1631 - 1640	1975, Aug 1.5 - 1976, Apr 30.5
99	North	1° N - 50° N	1641 - 1650	1976, Apr 30.5 - 1977, Jan 28.2
100	North	1° N - 50° N	1651 - 1660	1977, Jan 28.2 - 1977, Oct 27.8
101	North	1° N - 50° N	1661 - 1670	1977, Oct 27.8 - 1978, Jul 27.6
102	North	1° N - 50° N	1671 - 1680	1978, Jul 27.6 - 1979, Apr 26.5
103	North	1° N - 50° N	1681 - 1690	1979, Apr 26.5 - 1980, Jan 24.2
104	North	1° N - 50° N	1691 - 1700	1980, Jan 24.2 - 1980, Oct 22.8
105	North	1° N - 50° N	1701 - 1710	1980, Oct 22.8 - 1981, Jul 22.6
106	North	1° N - 50° N	1711 - 1720	1981, Jul 22.6 - 1982, Apr 21.6
107	North	1° N - 50° N	1721 - 1730	1982, Apr 21.6 - 1983, Jan 19.2
108	North	1° N - 50° N	1731 - 1740	1983, Jan 19.2 - 1983, Oct 18.8
109	North	1° N - 50° N	1741 - 1750	1983, Oct 18.8 - 1984, Jul 17.6
110	North	1° N - 50° N	1751 - 1760	1984, Jul 17.6 - 1985, Apr 16.6
111	North	1° N - 50° N	1761 - 1770	1985, Apr 16.6 - 1986, Jan 14.2
112	North	1° N - 50° N	1771 - 1780	1986, Jan 14.2 - 1986, Oct 13.8
113	North	1° N - 50° N	1781 - 1790	1986, Oct 13.8 - 1987, Jul 13.6
114	North	1° N - 50° N	1791 - 1800	1987, Jul 13.6 - 1988, Apr 11.6
115	Equat.	25° S - 25° N	1501 - 1510	1965, Nov 15.8 - 1966, Aug 15.5
116	Equat.	25° S - 25° N	1511 - 1520	1966, Aug 15.5 - 1967, May 15.5
117	Equat.	25° S - 25° N	1521 - 1530	1967, May 15.5 - 1968, Feb 12.2
118	Equat.	25° S - 25° N	1531 - 1540	1968, Feb 12.2 - 1968, Nov 10.8
119	Equat.	25° S - 25° N	1541 - 1550	1968, Nov 10.8 - 1969, Aug 10.5
120	Equat.	25° S - 25° N	1551 - 1560	1969, Aug 10.5 - 1970, May 10.5
121	Equat.	25° S - 25° N	1561 - 1570	1970, May 10.5 - 1971, Feb 7.2
122	Equat.	25° S - 25° N	1571 - 1580	1971, Feb 7.2 - 1971, Nov 6.8
123	Equat.	25° S - 25° N	1581 - 1590	1971, Nov 6.8 - 1972, Aug 5.5
124	Equat.	25° S - 25° N	1591 - 1600	1972, Aug 5.5 - 1973, May 5.5
125	Equat.	25° S - 25° N	1601 - 1610	1973, May 5.5 - 1974, Feb 2.2
126	Equat.	25° S - 25° N	1611 - 1620	1974, Feb 2.2 - 1974, Nov 1.8
127	Equat.	25° S - 25° N	1621 - 1630	1974, Nov 1.8 - 1975, Aug 1.5
128	Equat.	25° S - 25° N	1631 - 1640	1975, Aug 1.5 - 1976, Apr 30.5
129	Equat.	25° S - 25° N	1641 - 1650	1976, Apr 30.5 - 1977, Jan 28.2
130	Equat.	25° S - 25° N	1651 - 1660	1977, Jan 28.2 - 1977, Oct 27.8
131	Equat.	25° S - 25° N	1661 - 1670	1977, Oct 27.8 - 1978, Jul 27.6
132	Equat.	25° S - 25° N	1671 - 1680	1978, Jul 27.6 - 1979, Apr 26.5

Table 2 - Index of Stackplots by Page Number (Continued)

Page	Type	Latitude	CR Range	Date Range
133	Equat.	25° S - 25° N	1681 - 1690	1979, Apr 26.5 - 1980, Jan 24.2
134	Equat.	25° S - 25° N	1691 - 1700	1980, Jan 24.2 - 1980, Oct 22.8
135	Equat.	25° S - 25° N	1701 - 1710	1980, Oct 22.8 - 1981, Jul 22.6
136	Equat.	25° S - 25° N	1711 - 1720	1981, Jul 22.6 - 1982, Apr 21.6
137	Equat.	25° S - 25° N	1721 - 1730	1982, Apr 21.6 - 1983, Jan 19.2
138	Equat.	25° S - 25° N	1731 - 1740	1983, Jan 19.2 - 1983, Oct 18.8
139	Equat.	25° S - 25° N	1741 - 1750	1983, Oct 18.8 - 1984, Jul 17.6
140	Equat.	25° S - 25° N	1751 - 1760	1984, Jul 17.6 - 1985, Apr 16.6
141	Equat.	25° S - 25° N	1761 - 1770	1985, Apr 16.6 - 1986, Jan 14.2
142	Equat.	25° S - 25° N	1771 - 1780	1986, Jan 14.2 - 1986, Oct 13.8
143	Equat.	25° S - 25° N	1781 - 1790	1986, Oct 13.8 - 1987, Jul 13.6
144	Equat.	25° S - 25° N	1791 - 1800	1987, Jul 13.6 - 1988, Apr 11.6
145	South	1° S - 50° S	1501 - 1510	1965, Nov 15.8 - 1966, Aug 15.5
146	South	1° S - 50° S	1511 - 1520	1966, Aug 15.5 - 1967, May 15.5
147	South	1° S - 50° S	1521 - 1530	1967, May 15.5 - 1968, Feb 12.2
148	South	1° S - 50° S	1531 - 1540	1968, Feb 12.2 - 1968, Nov 10.8
149	South	1° S - 50° S	1541 - 1550	1968, Nov 10.8 - 1969, Aug 10.5
150	South	1° S - 50° S	1551 - 1560	1969, Aug 10.5 - 1970, May 10.5
151	South	1° S - 50° S	1561 - 1570	1970, May 10.5 - 1971, Feb 7.2
152	South	1° S - 50° S	1571 - 1580	1971, Feb 7.2 - 1971, Nov 6.8
153	South	1° S - 50° S	1581 - 1590	1971, Nov 6.8 - 1972, Aug 5.5
154	South	1° S - 50° S	1591 - 1600	1972, Aug 5.5 - 1973, May 5.5
155	South	1° S - 50° S	1601 - 1610	1973, May 5.5 - 1974, Feb 2.2
156	South	1° S - 50° S	1611 - 1620	1974, Feb 2.2 - 1974, Nov 1.8
157	South	1° S - 50° S	1621 - 1630	1974, Nov 1.8 - 1975, Aug 1.5
158	South	1° S - 50° S	1631 - 1640	1975, Aug 1.5 - 1976, Apr 30.5
159	South	1° S - 50° S	1641 - 1650	1976, Apr 30.5 - 1977, Jan 28.2
160	South	1° S - 50° S	1651 - 1660	1977, Jan 28.2 - 1977, Oct 27.8
161	South	1° S - 50° S	1661 - 1670	1977, Oct 27.8 - 1978, Jul 27.6
162	South	1° S - 50° S	1671 - 1680	1978, Jul 27.6 - 1979, Apr 26.5
163	South	1° S - 50° S	1681 - 1690	1979, Apr 26.5 - 1980, Jan 24.2
164	South	1° S - 50° S	1691 - 1700	1980, Jan 24.2 - 1980, Oct 22.8
165	South	1° S - 50° S	1701 - 1710	1980, Oct 22.8 - 1981, Jul 22.6
166	South	1° S - 50° S	1711 - 1720	1981, Jul 22.6 - 1982, Apr 21.6
167	South	1° S - 50° S	1721 - 1730	1982, Apr 21.6 - 1983, Jan 19.2
168	South	1° S - 50° S	1731 - 1740	1983, Jan 19.2 - 1983, Oct 18.8
169	South	1° S - 50° S	1741 - 1750	1983, Oct 18.8 - 1984, Jul 17.6
170	South	1° S - 50° S	1751 - 1760	1984, Jul 17.6 - 1985, Apr 16.6
171	South	1° S - 50° S	1761 - 1770	1985, Apr 16.6 - 1986, Jan 14.2
172	South	1° S - 50° S	1771 - 1780	1986, Jan 14.2 - 1986, Oct 13.8
173	South	1° S - 50° S	1781 - 1790	1986, Oct 13.8 - 1987, Jul 13.6
174	South	1° S - 50° S	1791 - 1800	1987, Jul 13.6 - 1988, Apr 11.6

Table 2 - Index of Stackplots by Page Number (Continued)

Page	Type	Latitude	CR Range	Date Range
175	Large-Scale	61° N - 70° N	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
176	Large-Scale	51° N - 60° N	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
177	Large-Scale	41° N - 50° N	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
178	Large-Scale	31° N - 40° N	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
179	Large-Scale	21° N - 30° N	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
180	Large-Scale	11° N - 20° N	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
181	Large-Scale	1° N - 10° N	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
182	Large-Scale	1° S - 10° S	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
183	Large-Scale	11° S - 20° S	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
184	Large-Scale	21° S - 30° S	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
185	Large-Scale	31° S - 40° S	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
186	Large-Scale	41° S - 50° S	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
187	Large-Scale	51° S - 60° S	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3
188	Large-Scale	61° S - 70° S	1501 - 1800	1965, Nov 15.8 - 1988, Mar 15.3

Table 3a - Index of 10° Stackplots by Time

CR Range	Date Range	Pages [70°N to 70°S in 10° intervals]
1501 - 1550	1965, Nov 16 - 1969, Aug 11	1 7 13 19 25 31 37 43 49 55 61 67 73 79
1551 - 1600	1969, Aug 11 - 1973, May 6	2 8 14 20 26 32 38 44 50 56 62 68 74 80
1601 - 1650	1973, May 6 - 1977, Jan 28	3 9 15 21 27 33 39 45 51 57 63 69 75 81
1651 - 1700	1977, Jan 28 - 1980, Oct 23	4 10 16 22 28 34 40 46 52 58 64 70 76 82
1701 - 1750	1980, Oct 23 - 1984, Jul 18	5 11 17 23 29 35 41 47 53 59 65 71 77 83
1751 - 1800	1984, Jul 18 - 1988, Apr 12	6 12 18 24 30 36 42 48 54 60 66 72 78 84

Table 3b - Index of 50° Stackplots by Time

CR Range	Date Range	Pages		
		North	Equat.	South
1501 - 1510	1965, Nov 16 - 1966, Aug 16	85	115	145
1511 - 1520	1966, Aug 16 - 1967, May 15	86	116	146
1521 - 1530	1967, May 15 - 1968, Feb 12	87	117	147
1531 - 1540	1968, Feb 12 - 1968, Nov 11	88	118	148
1541 - 1550	1968, Nov 11 - 1969, Aug 11	89	119	149
1551 - 1560	1969, Aug 11 - 1970, May 10	90	120	150
1561 - 1570	1970, May 10 - 1971, Feb 7	91	121	151
1571 - 1580	1971, Feb 7 - 1971, Nov 7	92	122	152
1581 - 1590	1971, Nov 7 - 1972, Aug 6	93	123	153
1591 - 1600	1972, Aug 6 - 1973, May 6	94	124	154
1601 - 1610	1973, May 6 - 1974, Feb 2	95	125	155
1611 - 1620	1974, Feb 2 - 1974, Nov 2	96	126	156
1621 - 1630	1974, Nov 2 - 1975, Aug 2	97	127	157
1631 - 1640	1975, Aug 2 - 1976, Apr 31	98	128	158
1641 - 1650	1976, Apr 31 - 1977, Jan 28	99	129	159
1651 - 1660	1977, Jan 28 - 1977, Oct 28	100	130	160
1661 - 1670	1977, Oct 28 - 1978, Jul 28	101	131	161
1671 - 1680	1978, Jul 28 - 1979, Apr 27	102	132	162
1681 - 1690	1979, Apr 27 - 1980, Jan 24	103	133	163
1691 - 1700	1980, Jan 24 - 1980, Oct 23	104	134	164
1701 - 1710	1980, Oct 23 - 1981, Jul 23	105	135	165
1711 - 1720	1981, Jul 23 - 1982, Apr 22	106	136	166
1721 - 1730	1982, Apr 22 - 1983, Jan 19	107	137	167
1731 - 1740	1983, Jan 19 - 1983, Oct 19	108	138	168
1741 - 1750	1983, Oct 19 - 1984, Jul 18	109	139	169
1751 - 1760	1984, Jul 18 - 1985, Apr 17	110	140	170
1761 - 1770	1985, Apr 17 - 1986, Jan 14	111	141	171
1771 - 1780	1986, Jan 14 - 1986, Oct 14	112	142	172
1781 - 1790	1986, Oct 14 - 1987, Jul 14	113	143	173
1791 - 1800	1987, Jul 14 - 1988, Apr 12	114	144	174

Sample Synoptic Chart and Digital Map

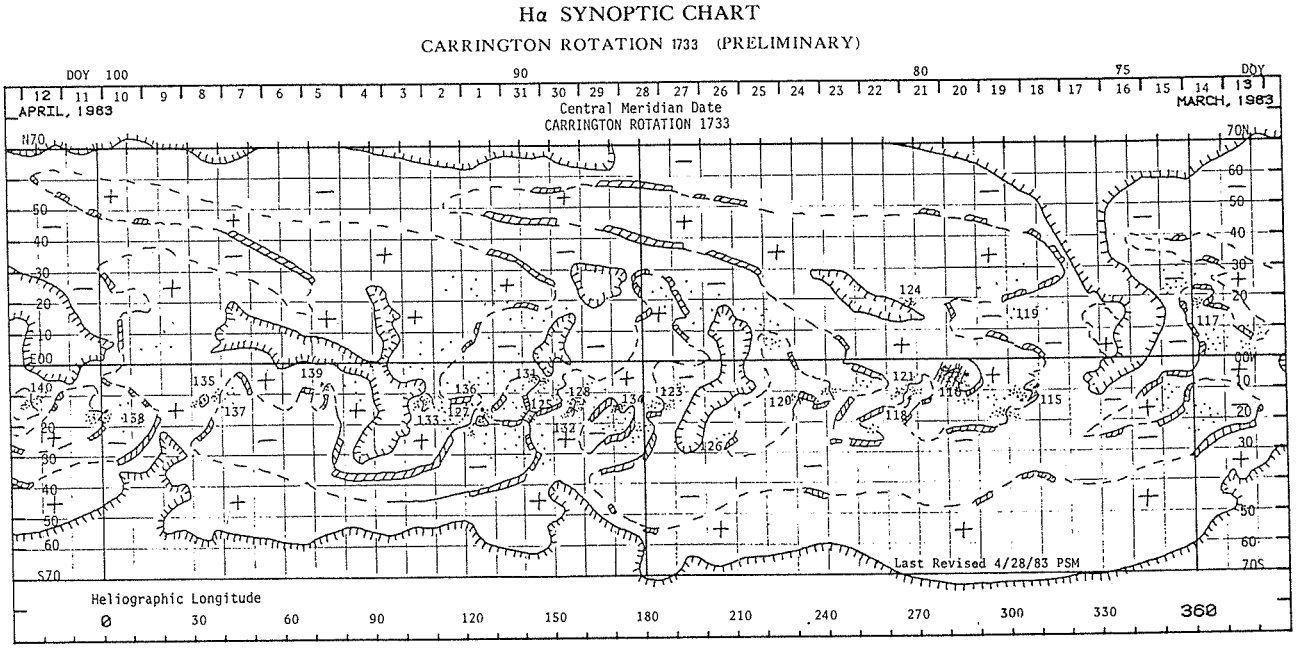


Figure 1(a): A typical H-alpha solar synoptic chart (Carrington Rotation 1733, March 1983) as published in Solar-Geophysical Data, showing the locations of large-scale magnetic field polarity; coronal holes; filaments and sunspot regions.

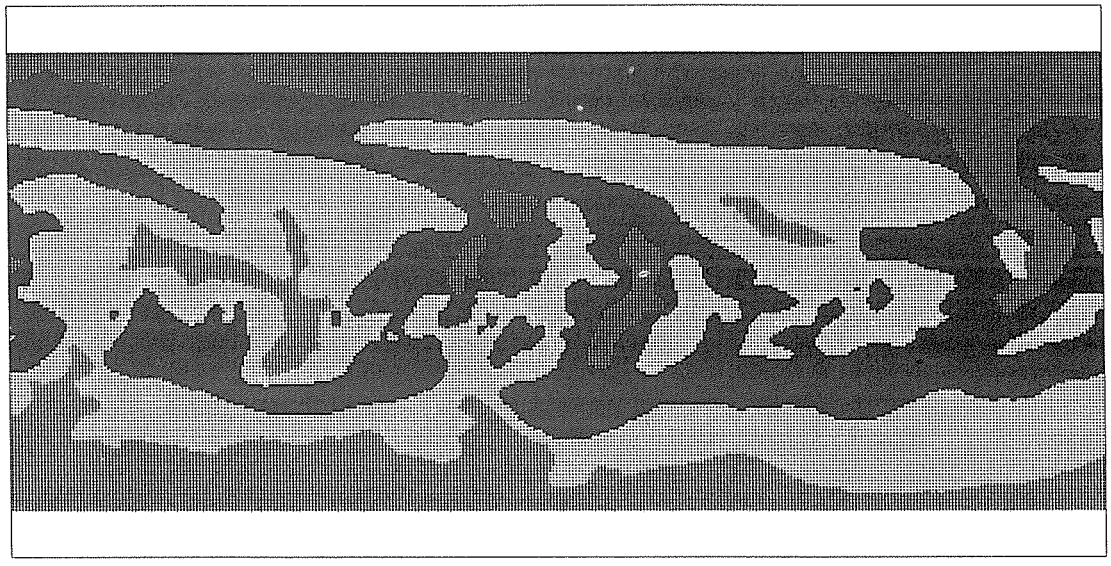


Figure 1(b): A digital solar synoptic map for the same Carrington Rotation as in Figure 1(a). The four types of region - negative and positive magnetic field; negative and positive coronal hole - are shown as differently shaded areas (see page xxv for Key).

LOCATOR GRIDS

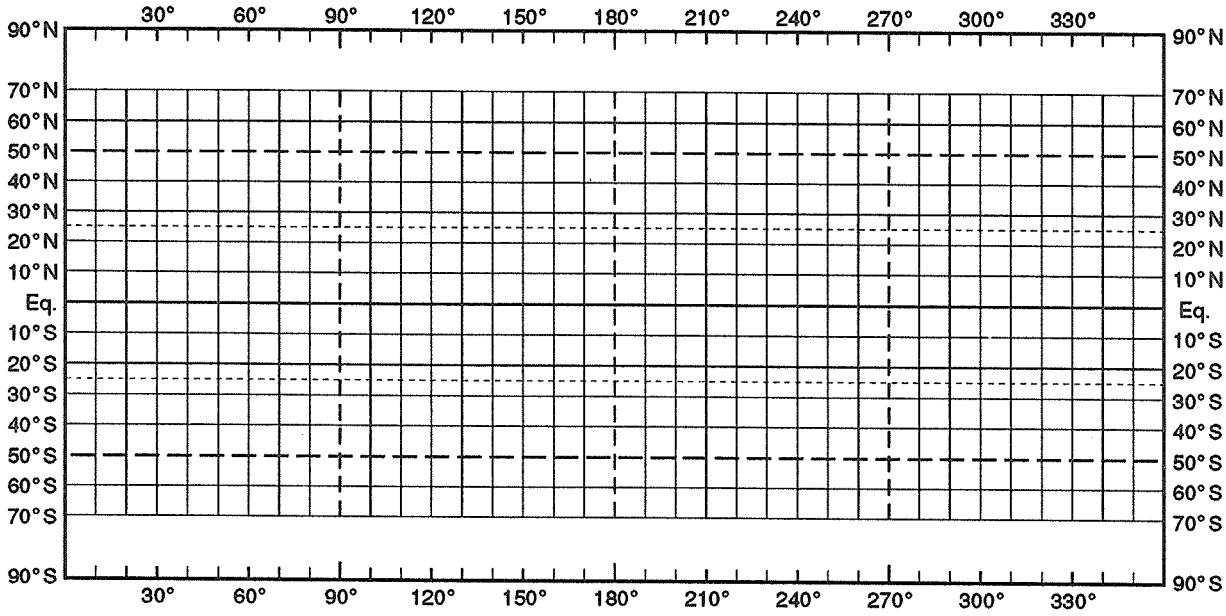


Figure 2(a): Locator Overlay Grid - Carrington Latitude and Longitude.

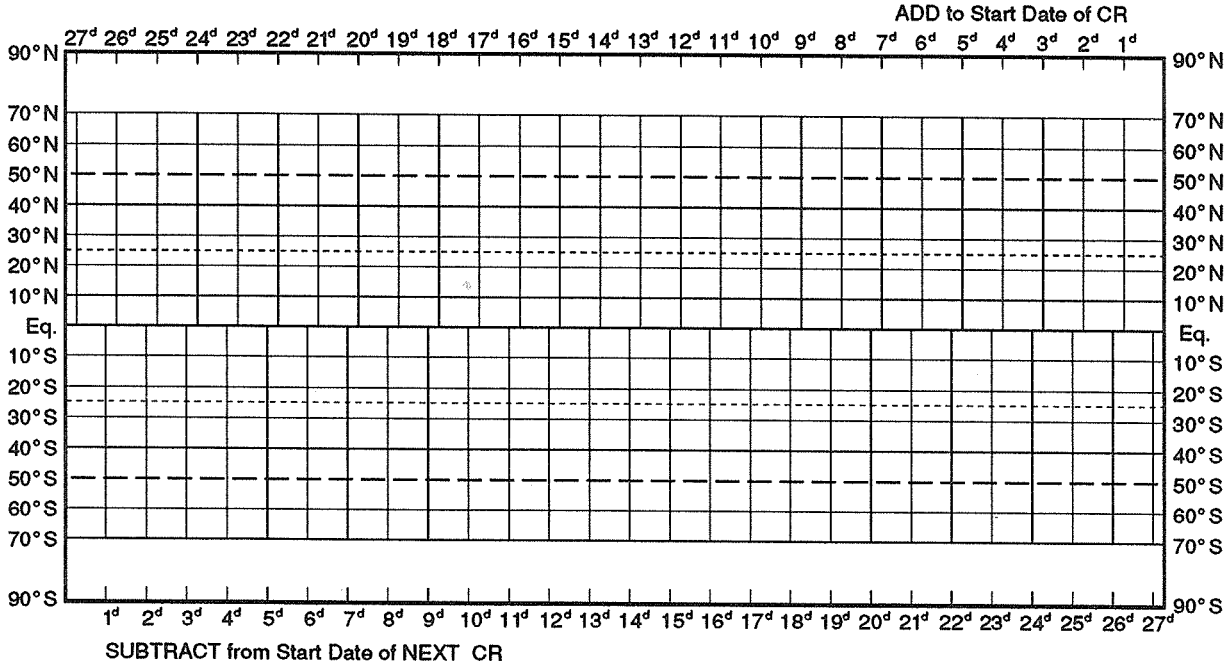


Figure 2(b): Locator Overlay Grid - Date of Central Meridian Passage.

Figure 2: Spatial and Temporal Locator Grids for Stackplots.

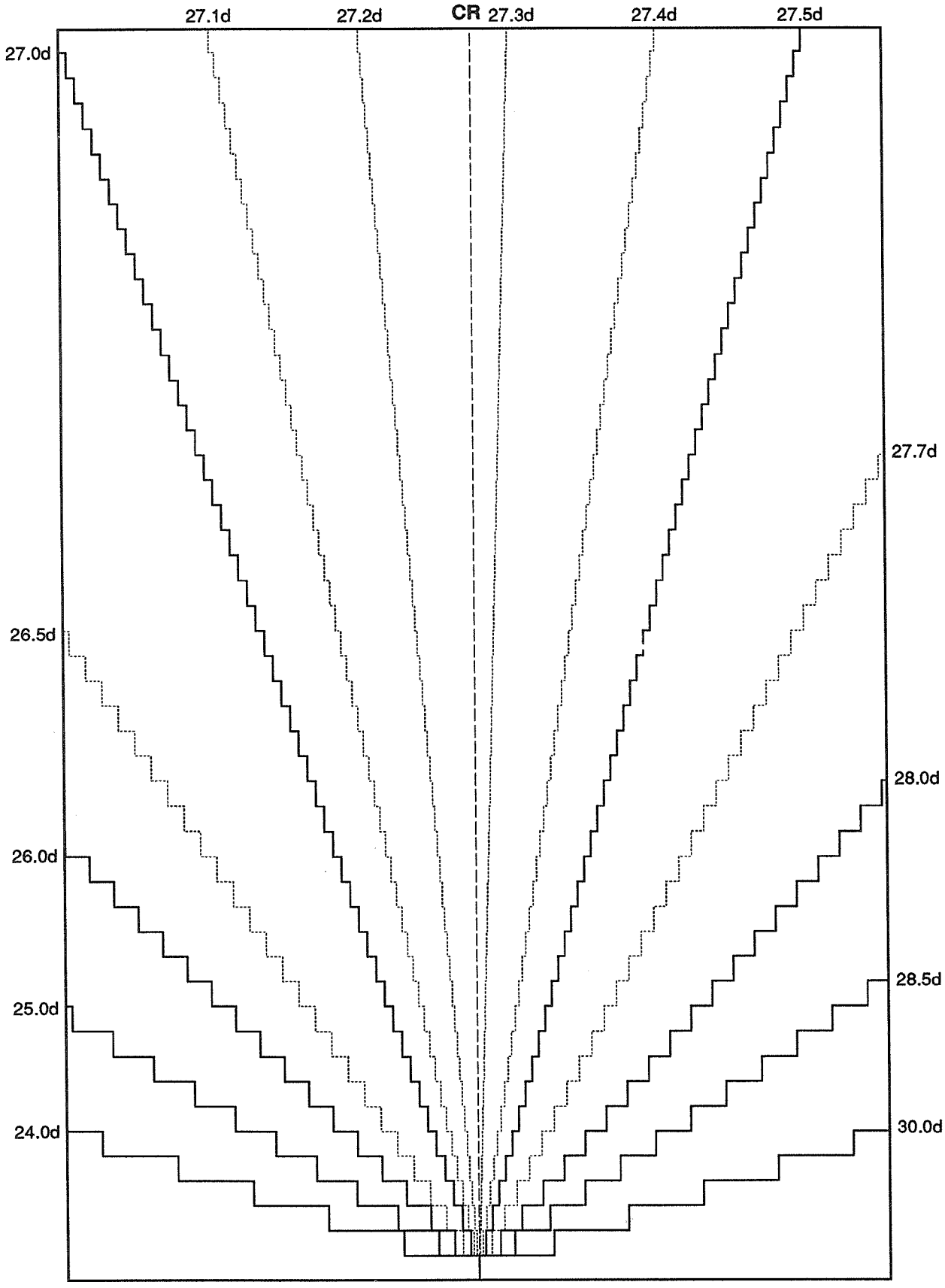


Figure 3: Synodic Rotation Rate Overlay for 10 Degree Stackplots
(Rotation rates are in days. CR is Carrington rate 27.2753 days.)

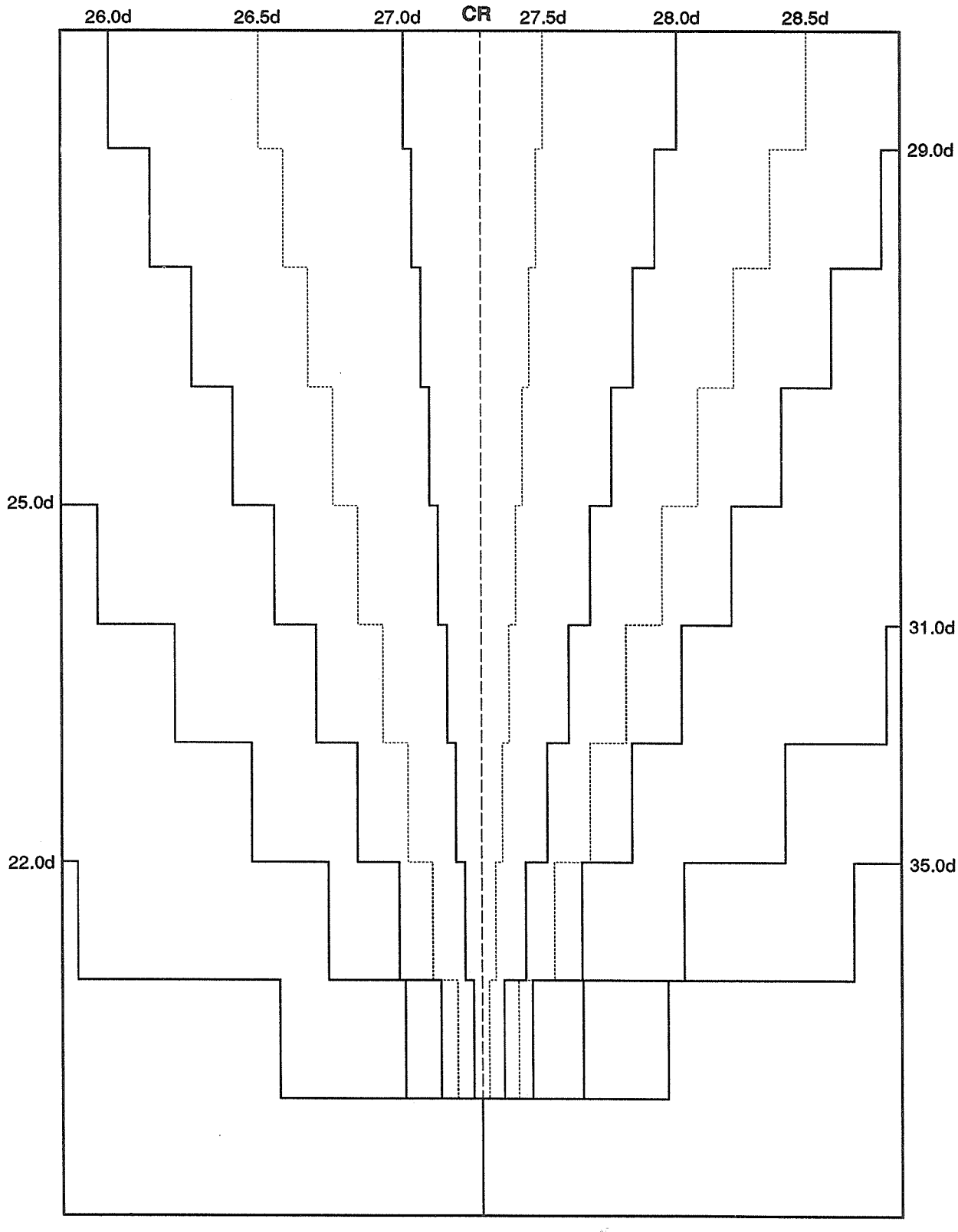


Figure 4: Synodic Rotation Rate Overlay for Active North and South Stackplots
(Rotation rates are in days. CR is Carrington rate 27.2753 days.)

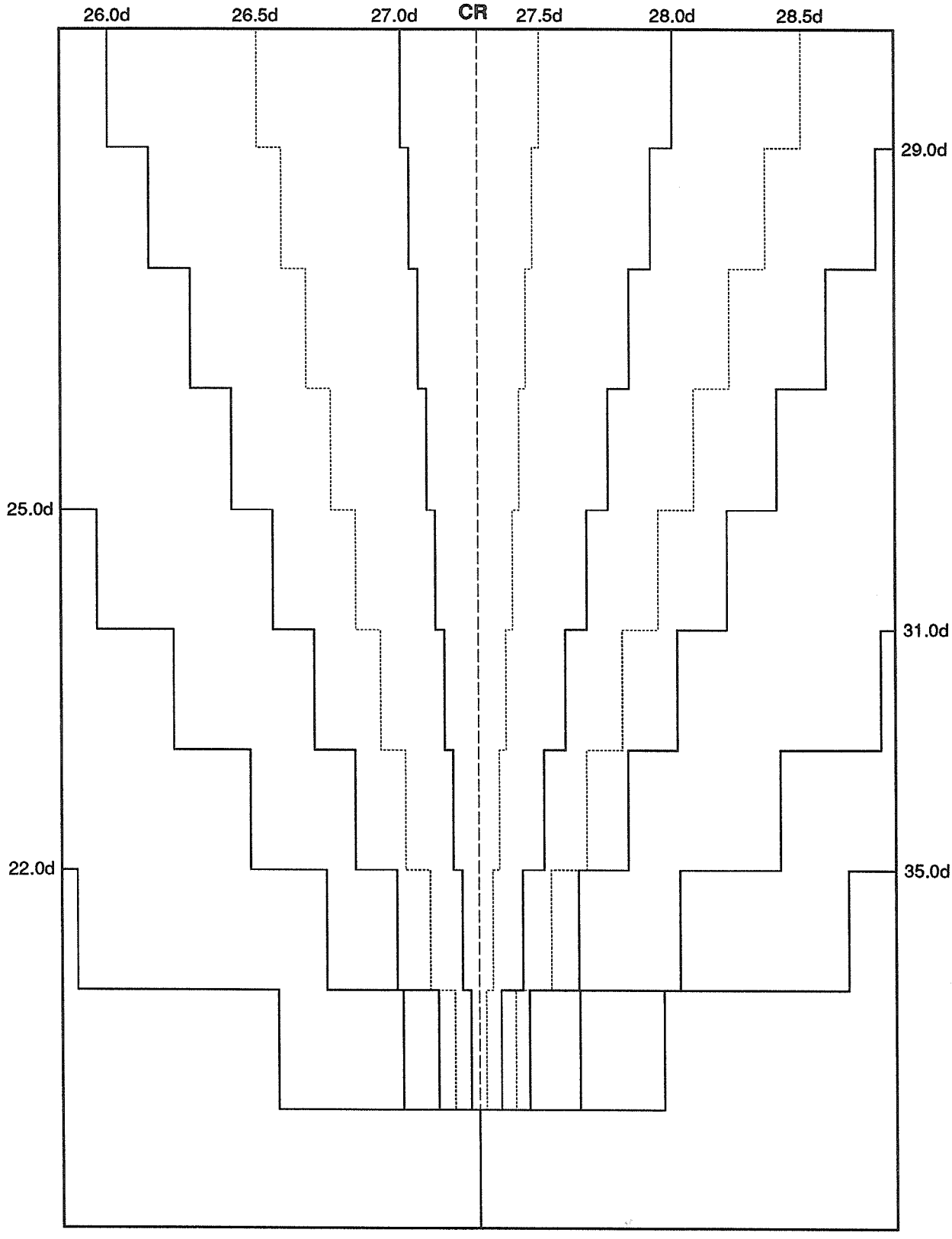


Figure 5: Synodic Rotation Rate Overlay for the Equatorial Stackplots
(Rotation rates are in days. CR is Carrington rate 27.2753 days.)

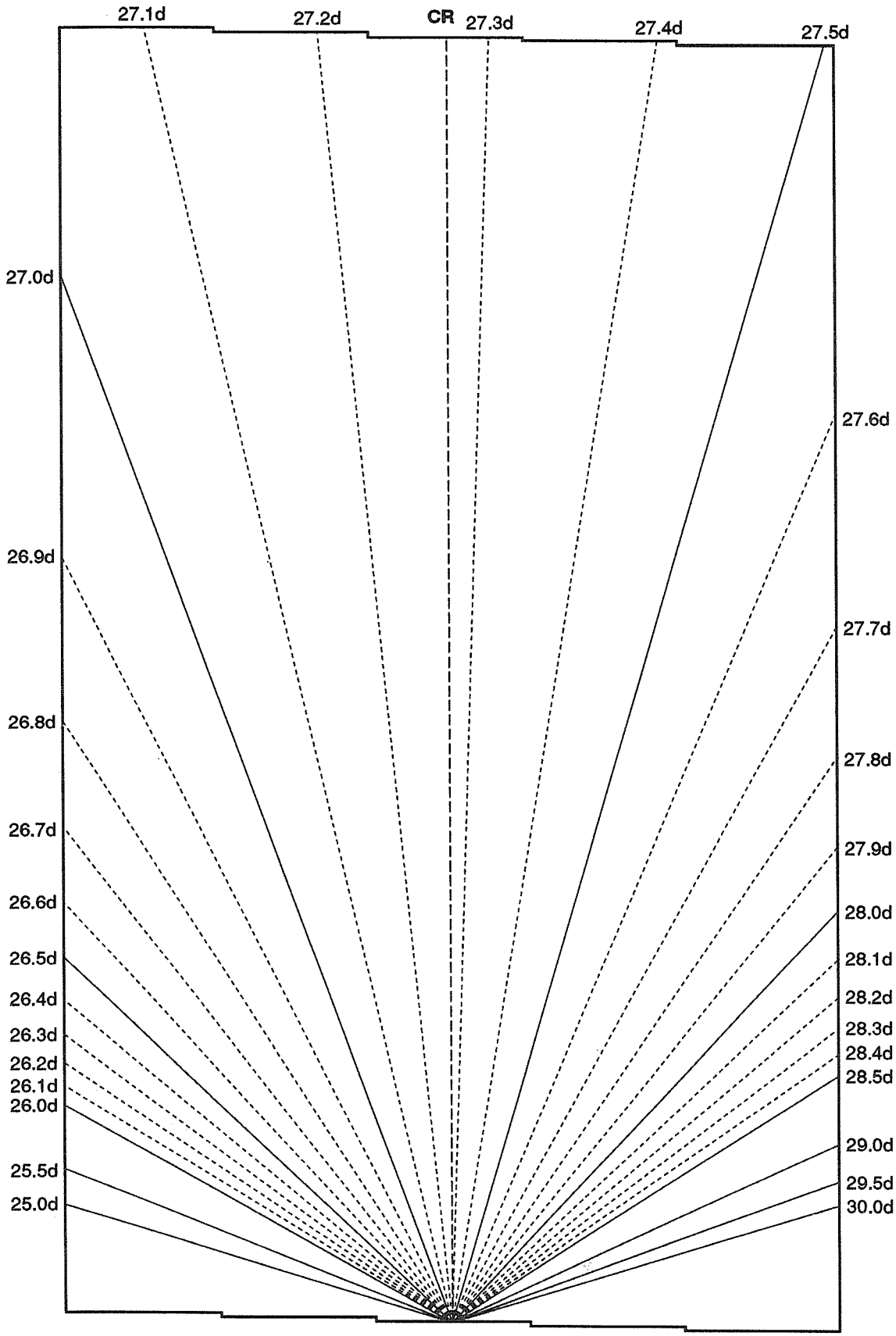


Figure 6: Synodic Rotation Rate Overlay for Large-Scale Stackplots
(Rotation rates are in days. CR is Carrington rate 27.2753 days.)

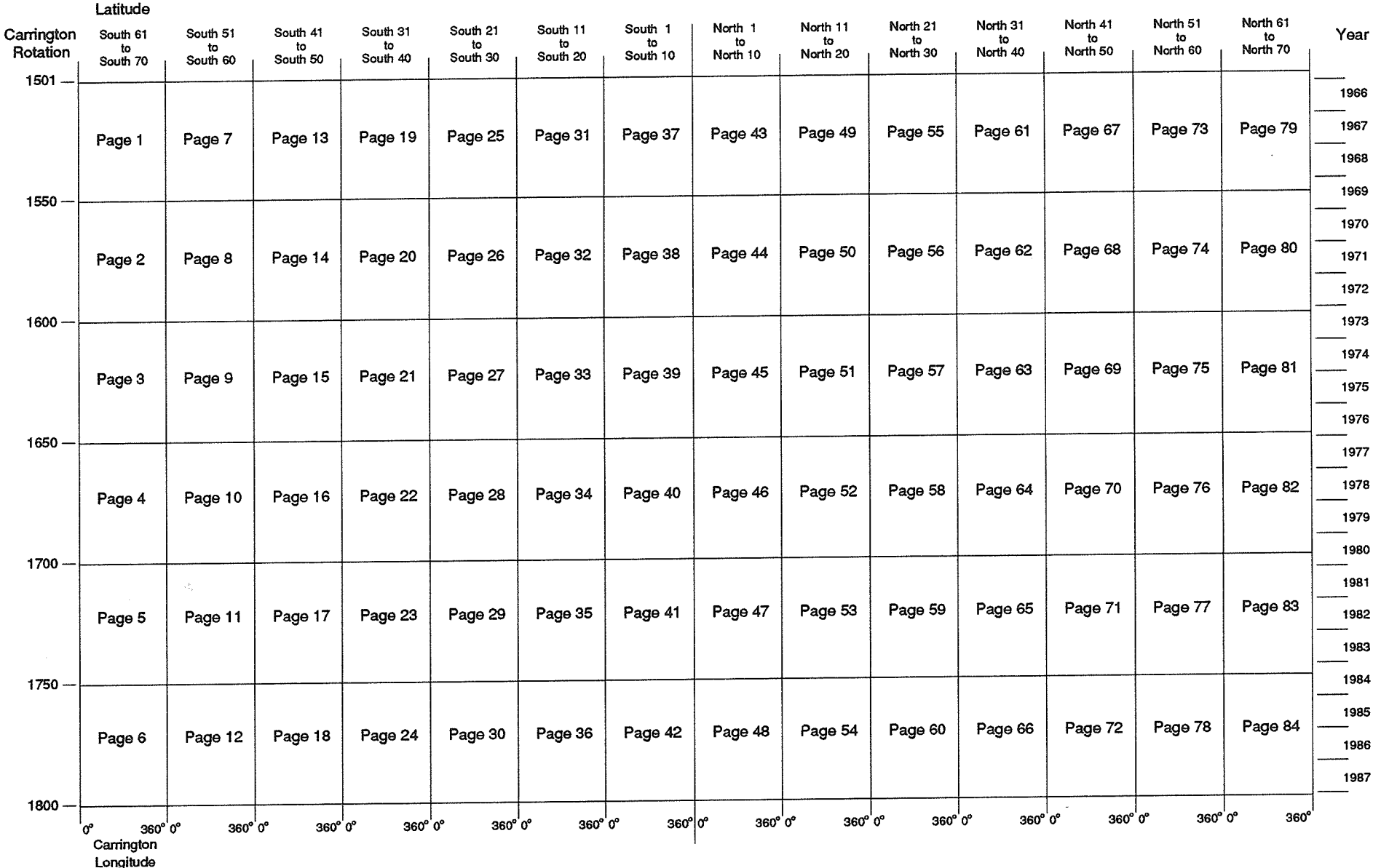


Figure 7: Year, Rotation Number and Latitude, Page Cross-Reference for 10 Degree Stackplots and the Global Synoptic Stackplot

KEY TO STACKPLOT SYMBOLS

Map Data - Availability Symbols



Magnetic Field Information Only

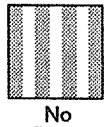


Coronal Hole Information Only

Absence of a symbol means either full data or no data

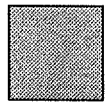
Shading of Regions Within Stackplots

Key



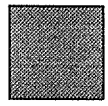
No Data

No Data Available



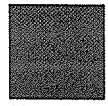
Pos. Pol. Mag. Fld

Region of Positive Polarity Magnetic Field



Pos. Pol. Cor. Hole

Positive Polarity Coronal Hole



Neg. Pol. Cor. Hole

Negative Polarity Coronal Hole



Neg. Pol. Mag. Fld

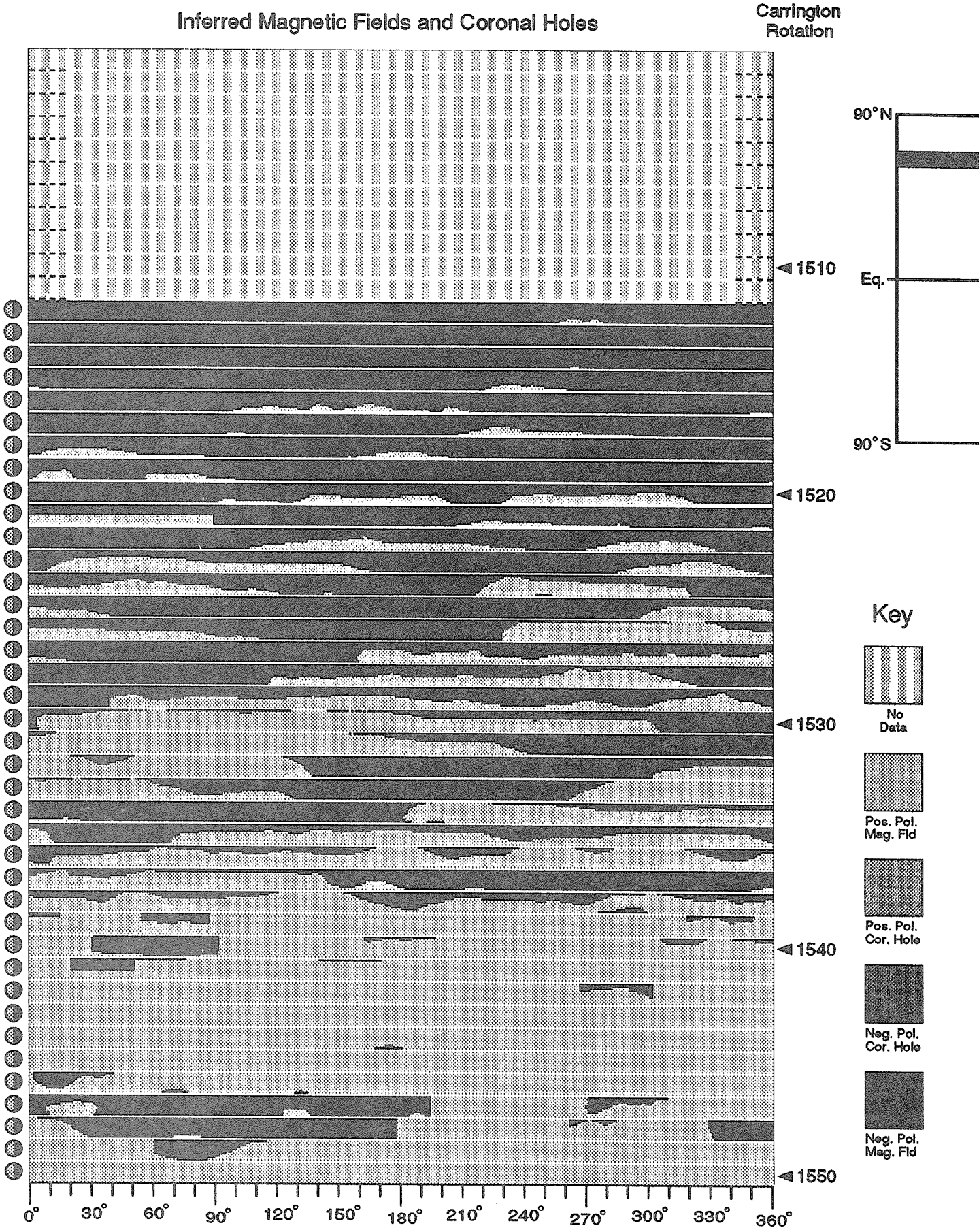
Region of Negative Polarity Magnetic Field

Note: Blank regions (i.e. white spaces) on maps containing "Coronal Hole Only" information indicate the absence of a coronal hole.

THE STACKPLOTS

Type of Stackplot	Pages
10° Slice Stackplots	1 - 84
Active North Latitude (N01° - N50°)	85 - 114
Equatorial Latitude (S25° - N25°)	115 - 144
Active South Latitude (S01° - S50°)	145 - 174
Large-Scale Stackplots for 10° Slices for all Carrington Rotations	175 - 188
Global Stackplot Combining 10° slices for all Latitude Bands and for all Rotations	Foldout Inside Back Cover

Inferred Magnetic Fields and Coronal Holes

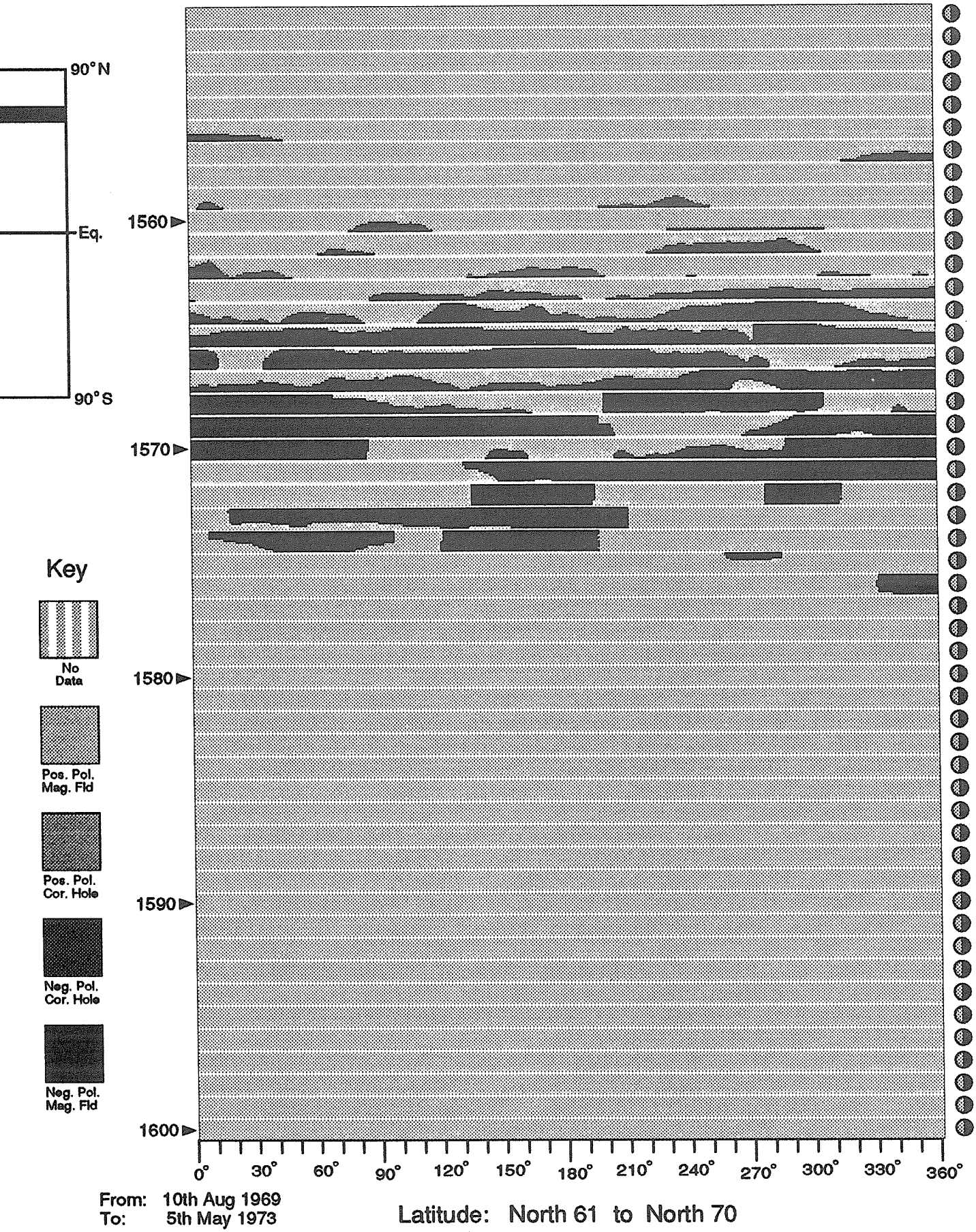


Latitude: North 61 to North 70

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



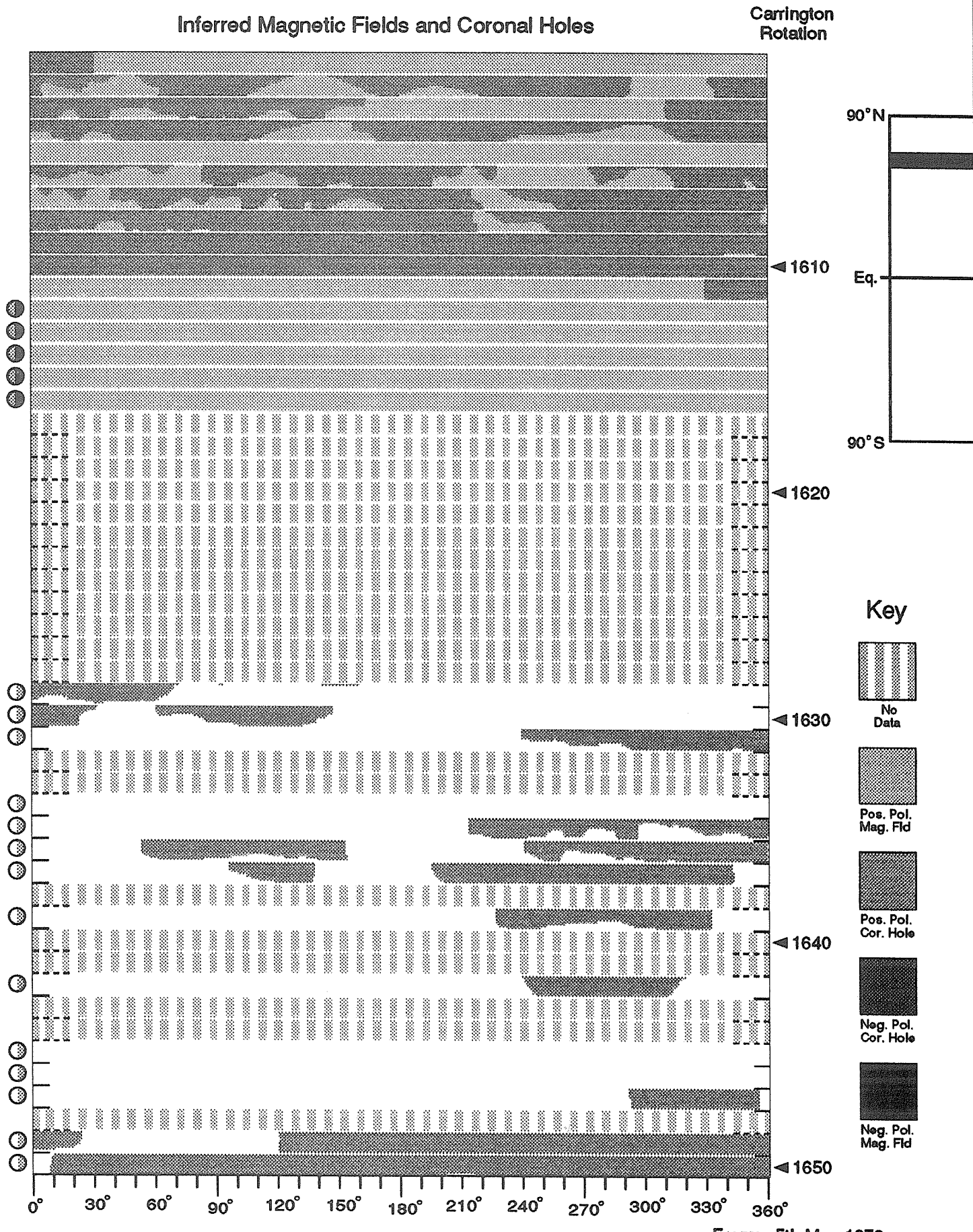
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 10th Aug 1969
To: 5th May 1973

Latitude: North 61 to North 70

Inferred Magnetic Fields and Coronal Holes

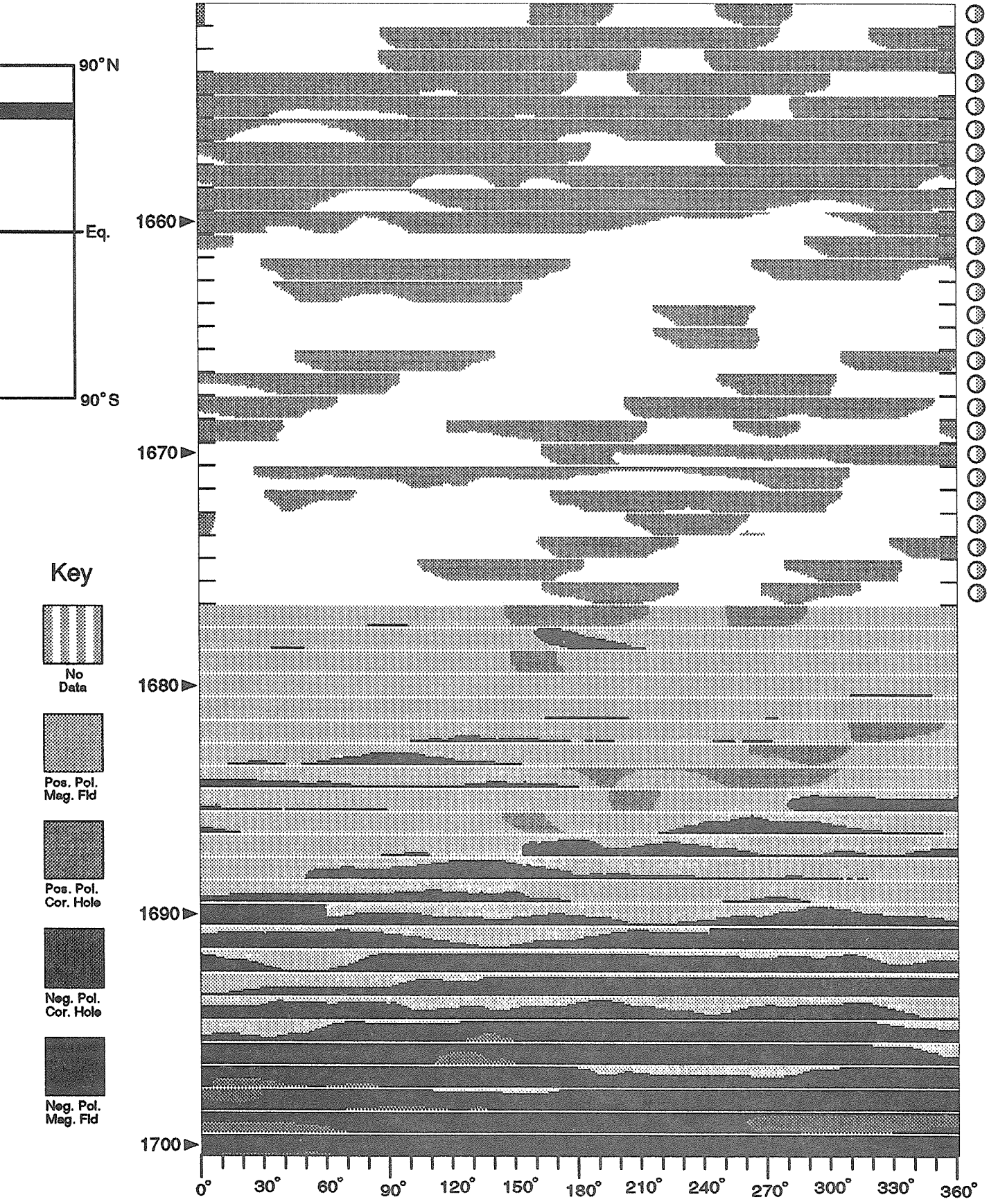


Latitude: North 61 to North 70

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes

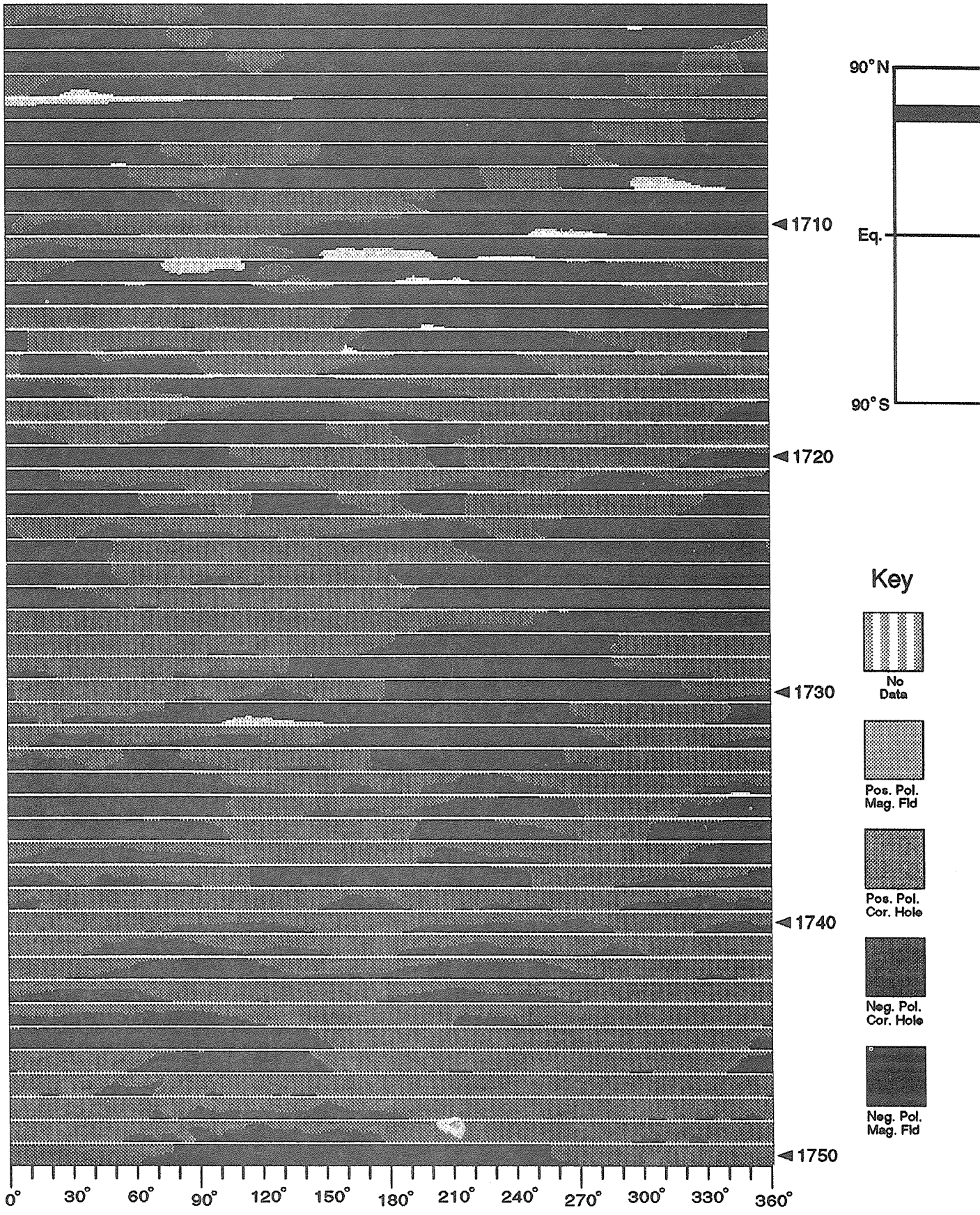


From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: North 61 to North 70

Inferred Magnetic Fields and Coronal Holes

Carrington Rotation

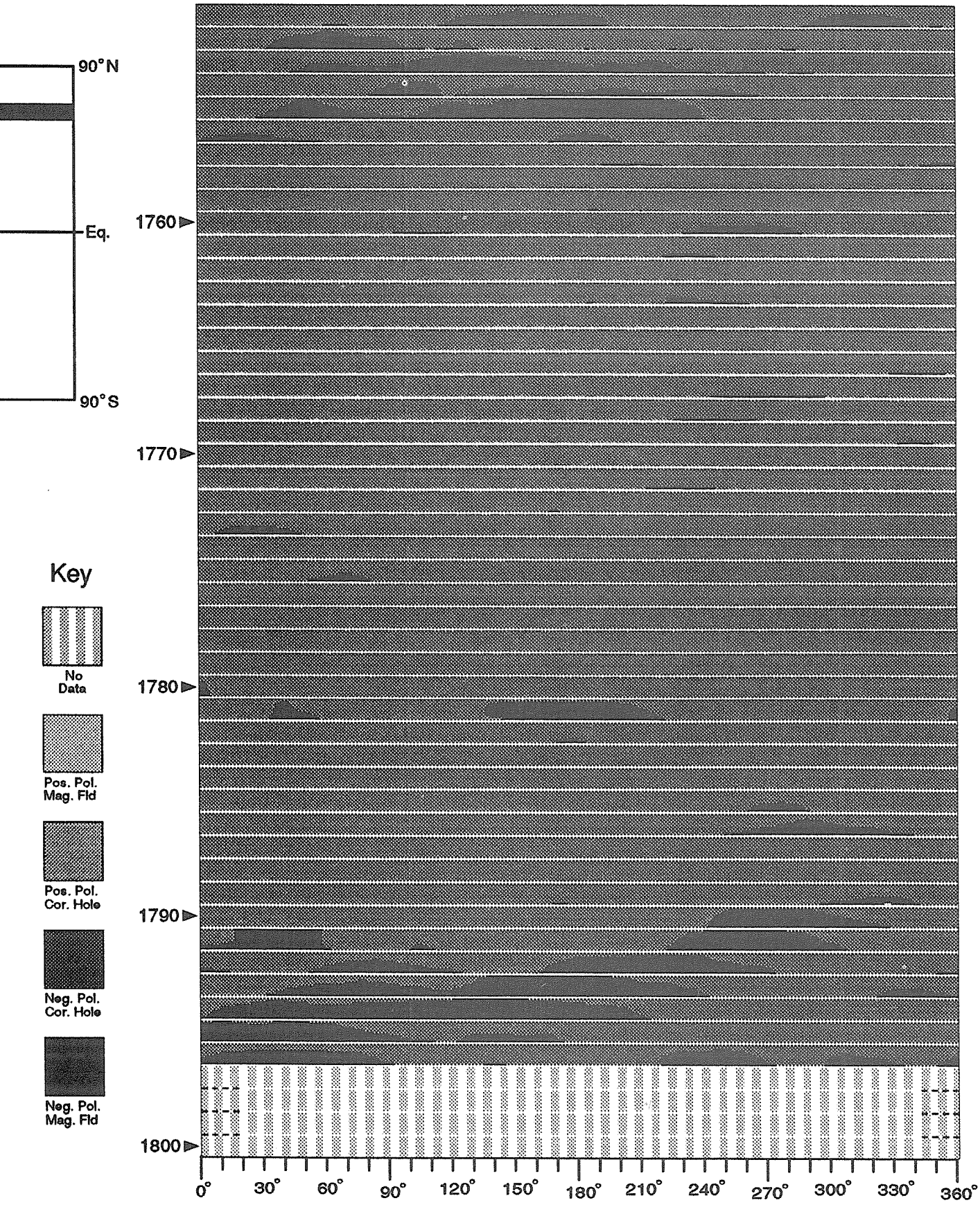


Latitude: North 61 to North 70

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

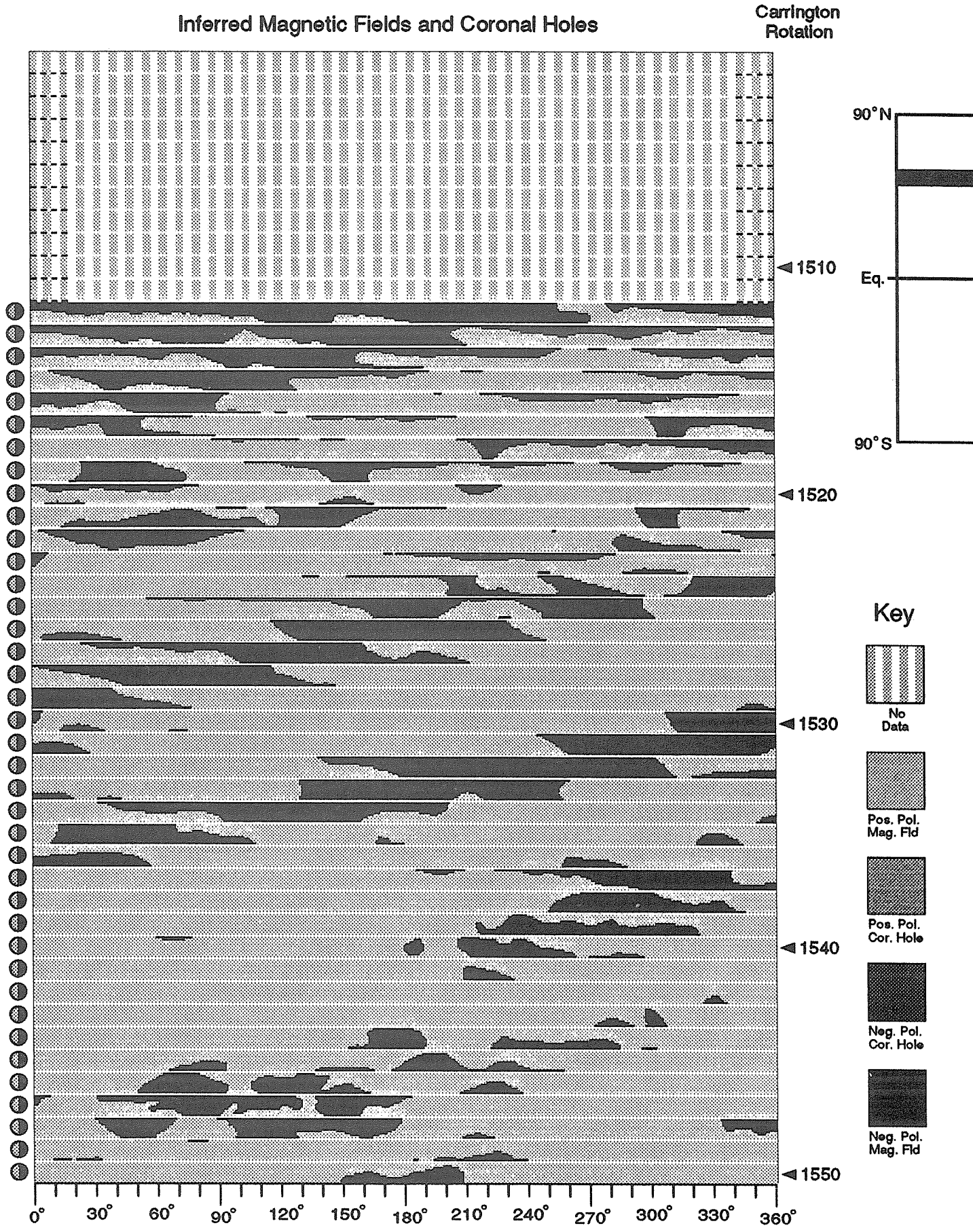
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 11th Apr 1988

Latitude: North 61 to North 70

Inferred Magnetic Fields and Coronal Holes

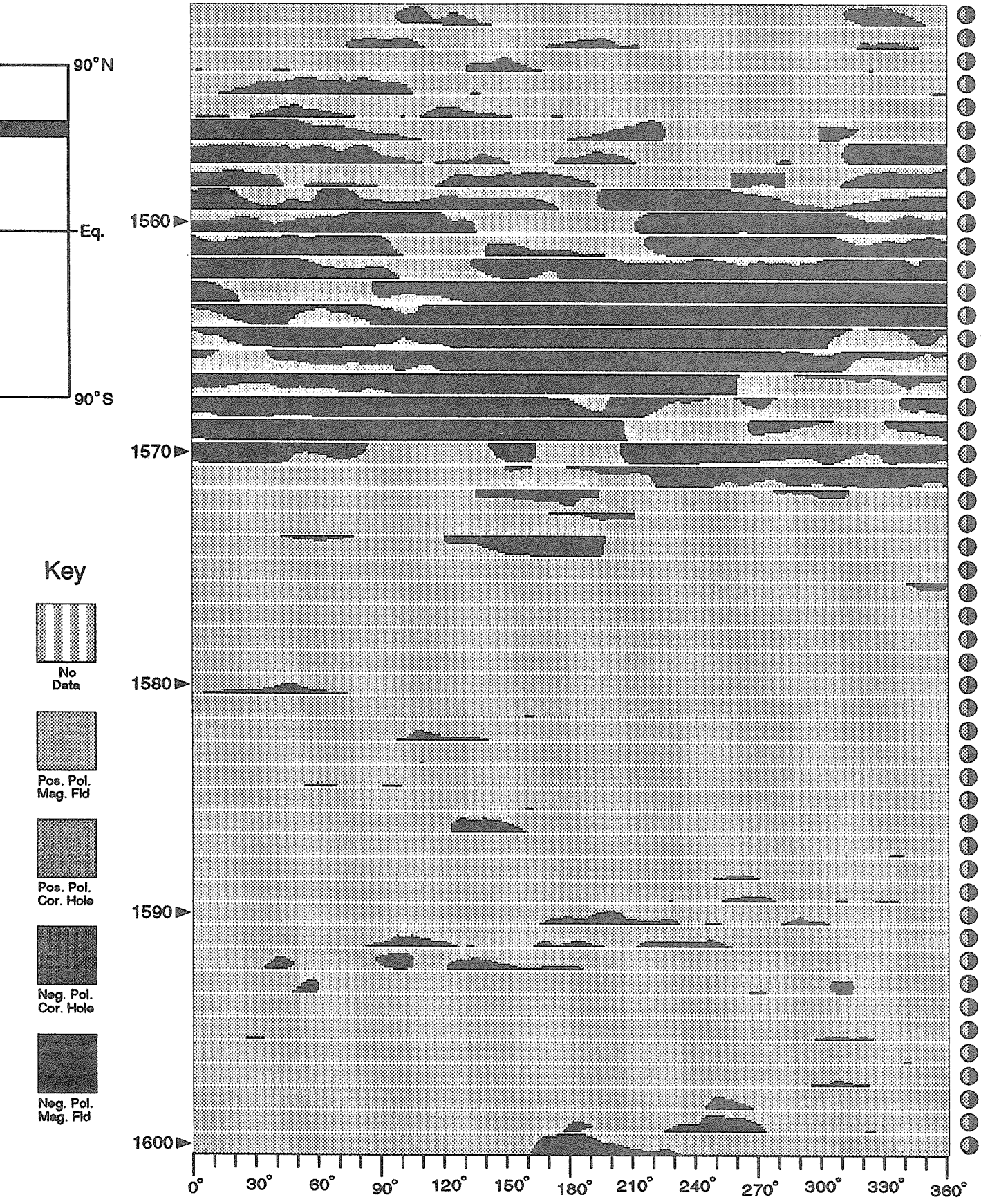


Latitude: North 51 to North 60

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



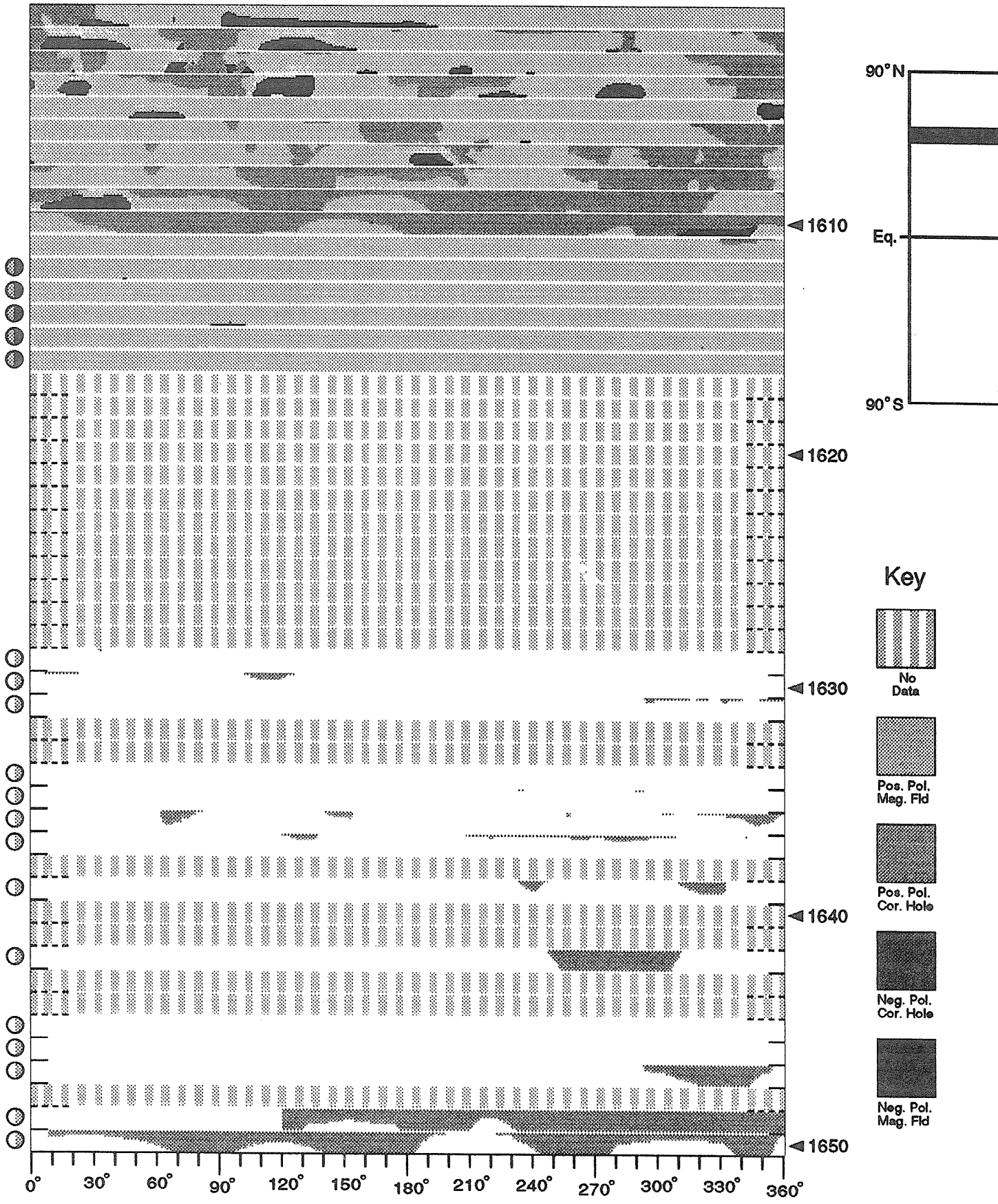
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 10th Aug 1969
To: 5th May 1973

Latitude: North 51 to North 60

Inferred Magnetic Fields and Coronal Holes

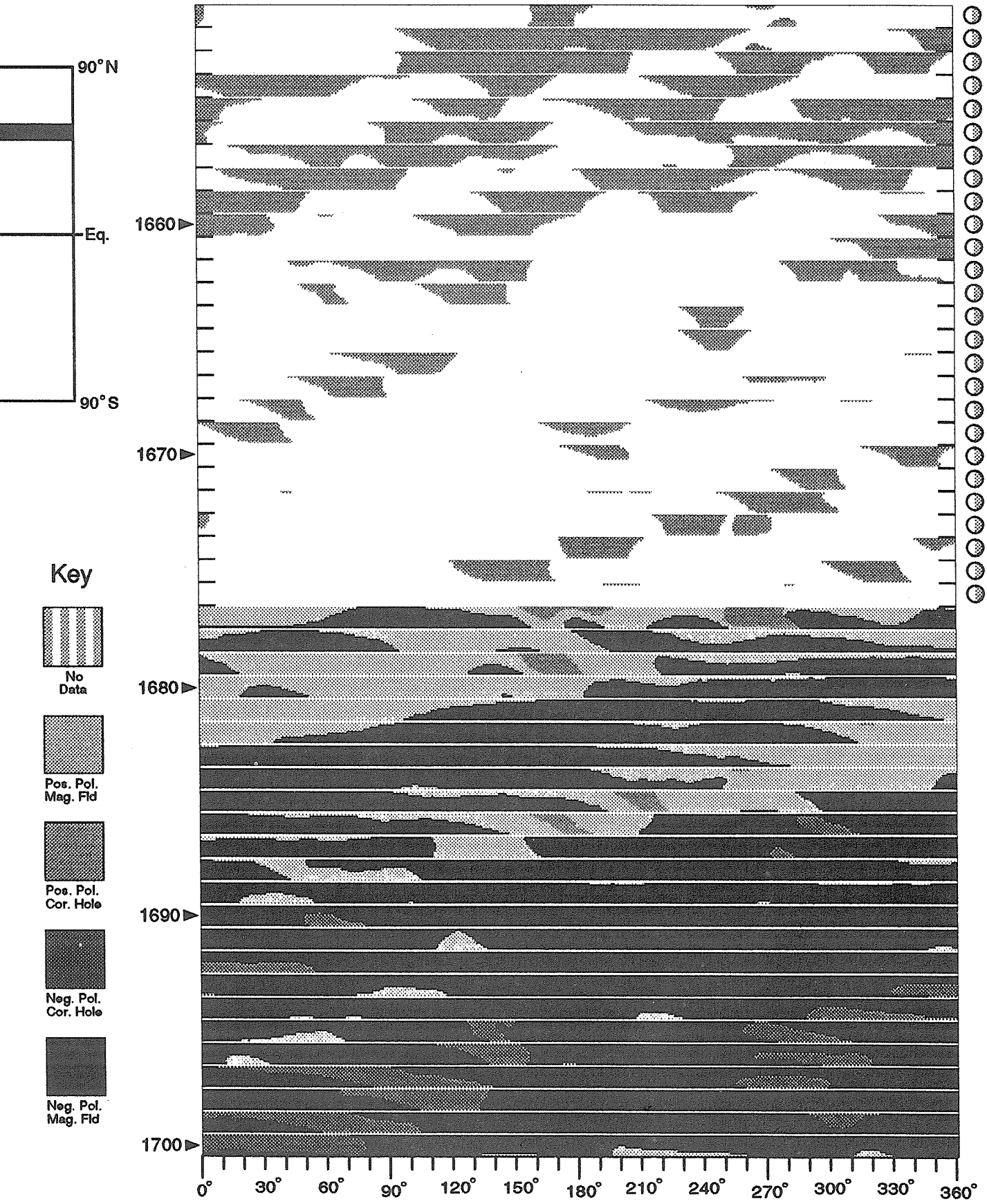


Latitude: North 51 to North 60

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

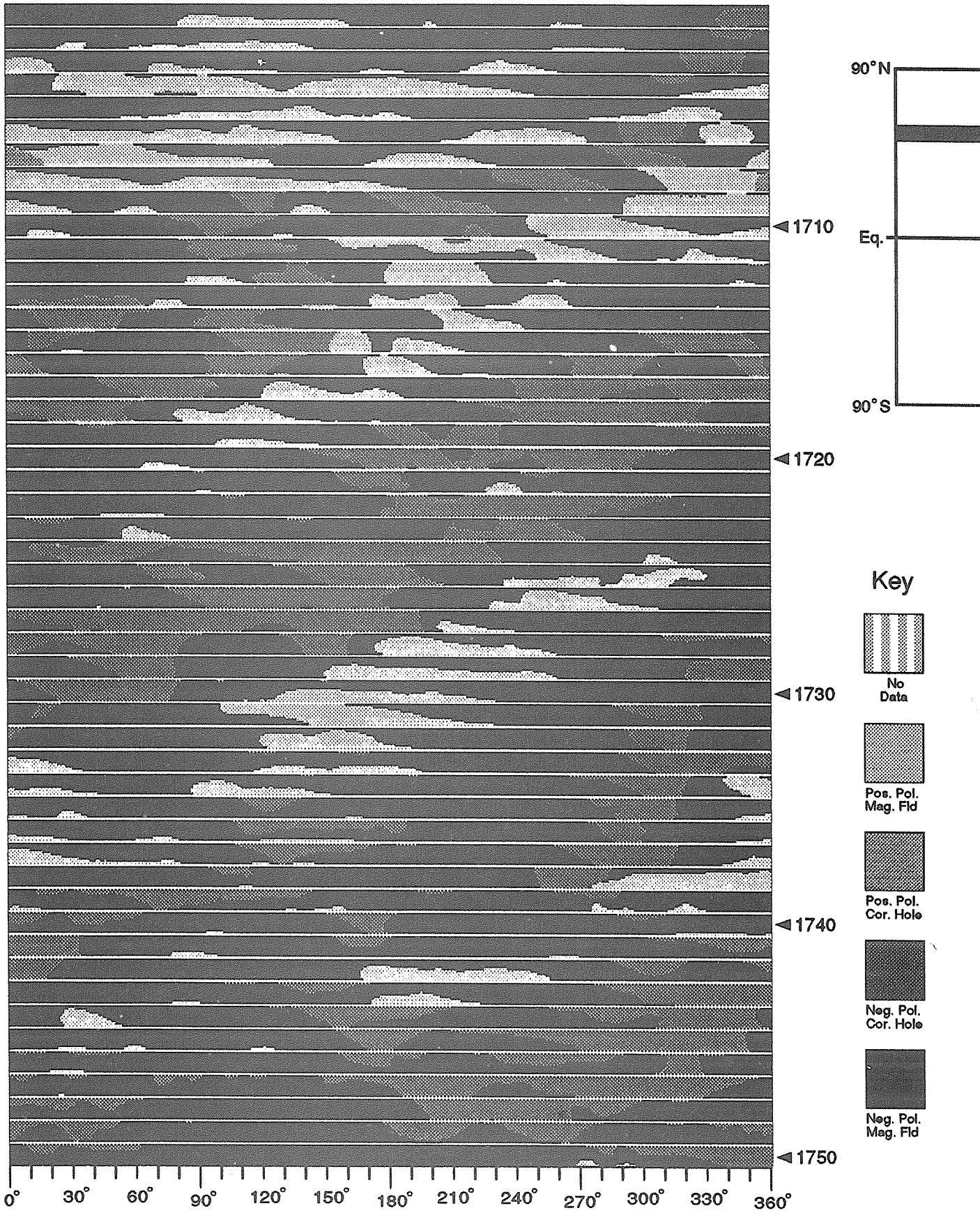
Inferred Magnetic Fields and Coronal Holes



From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: North 51 to North 60

Inferred Magnetic Fields and Coronal Holes

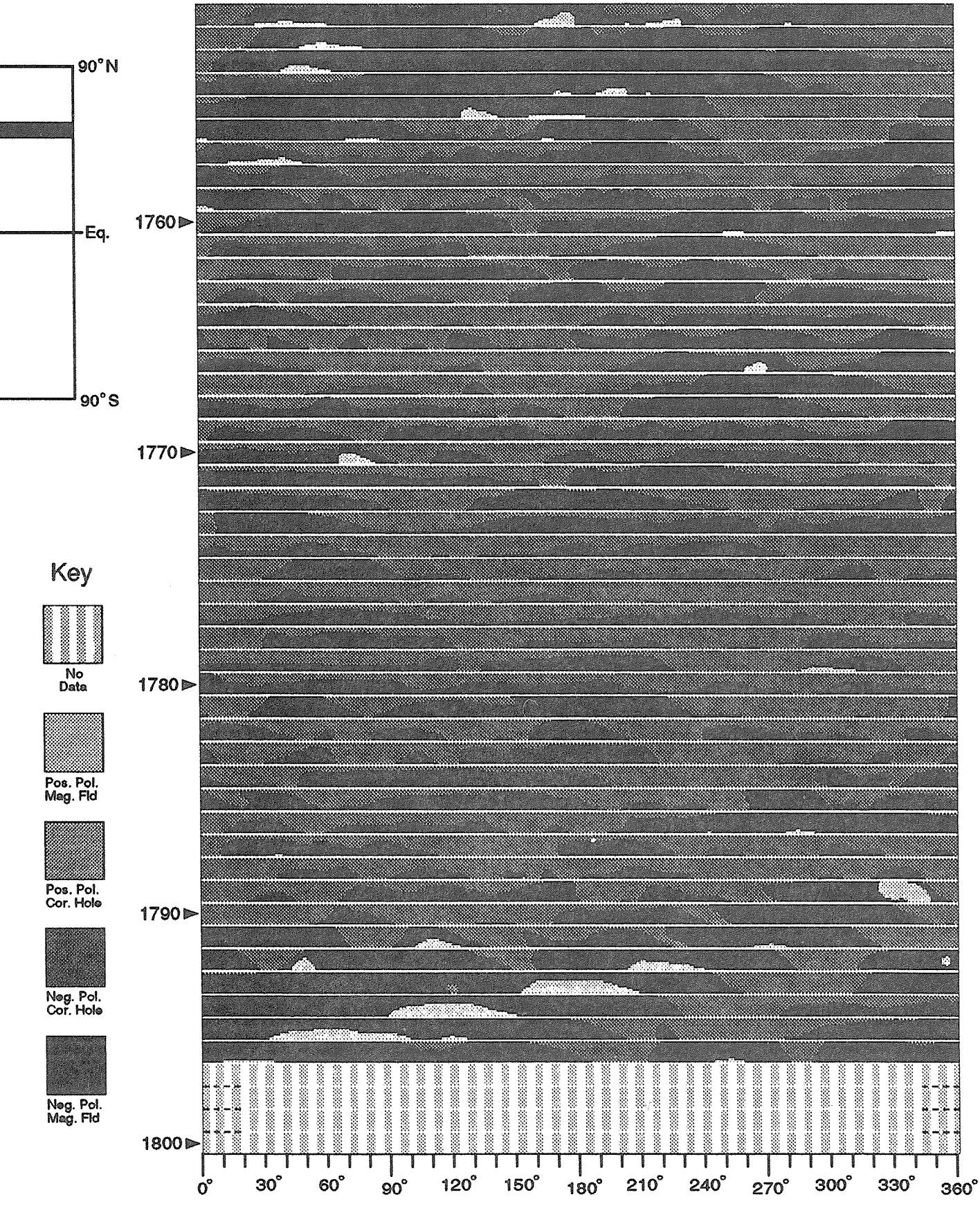


Latitude: North 51 to North 60

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

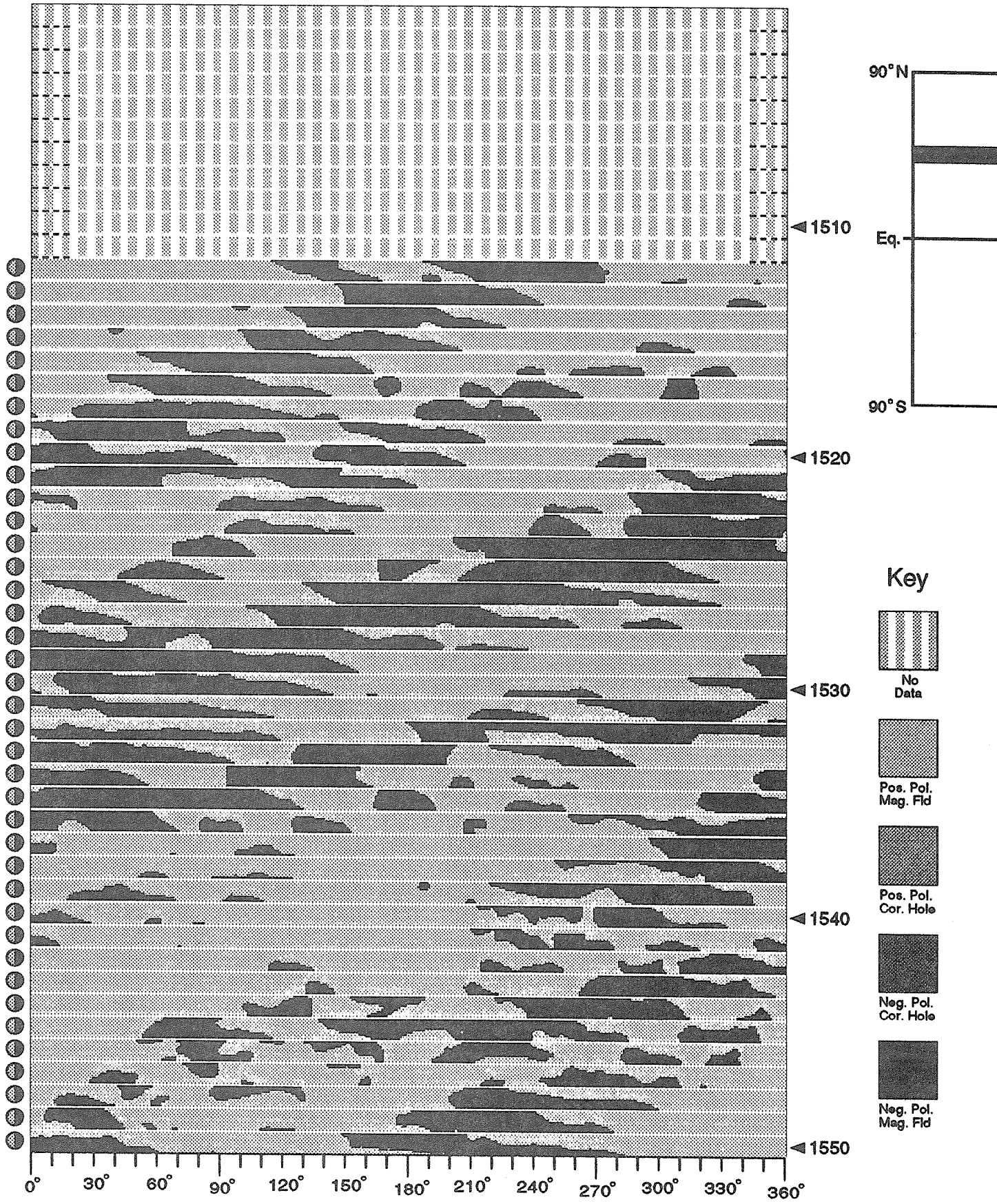
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 11th Apr 1988

Latitude: North 51 to North 60

Inferred Magnetic Fields and Coronal Holes

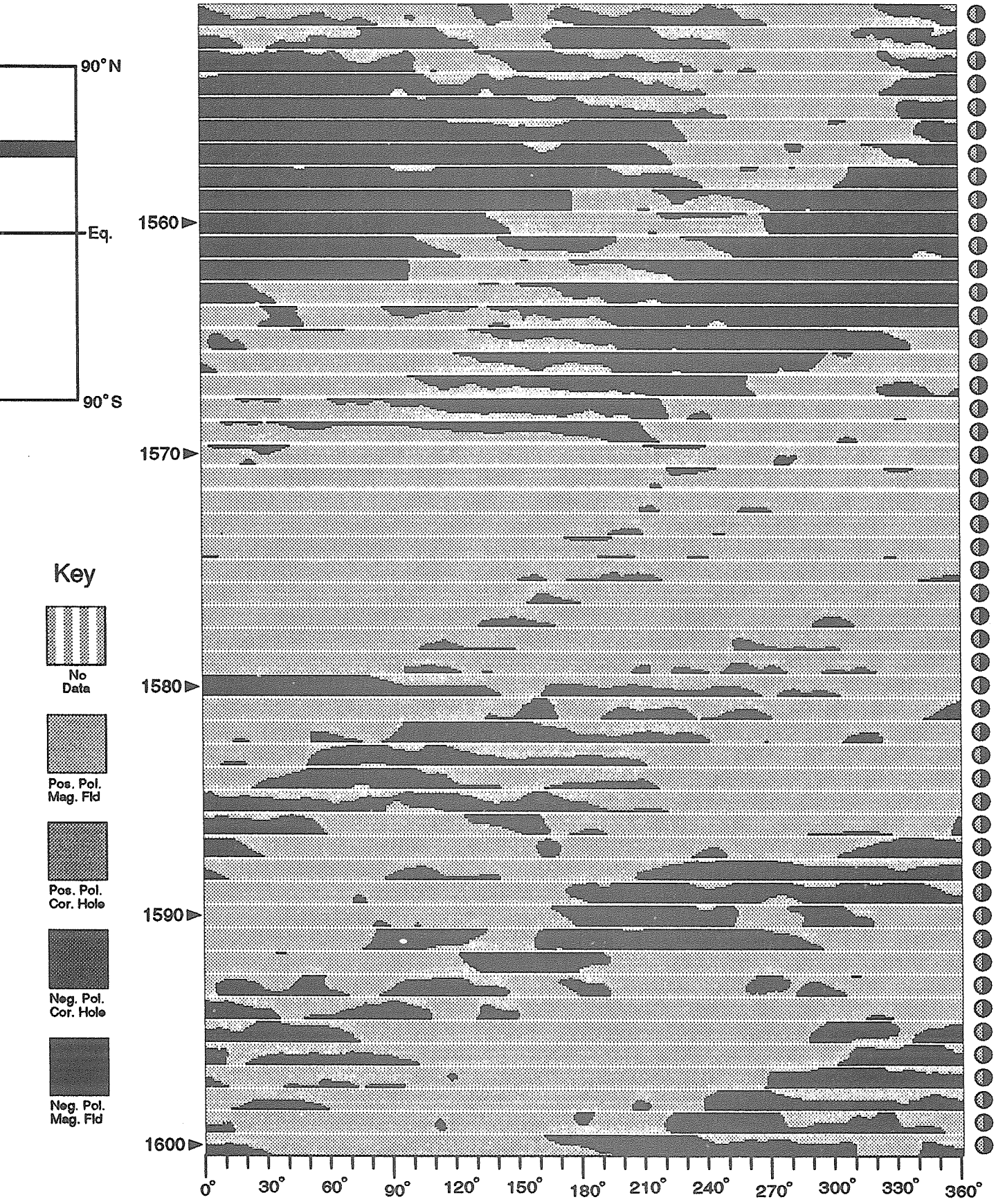


Latitude: North 41 to North 50

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

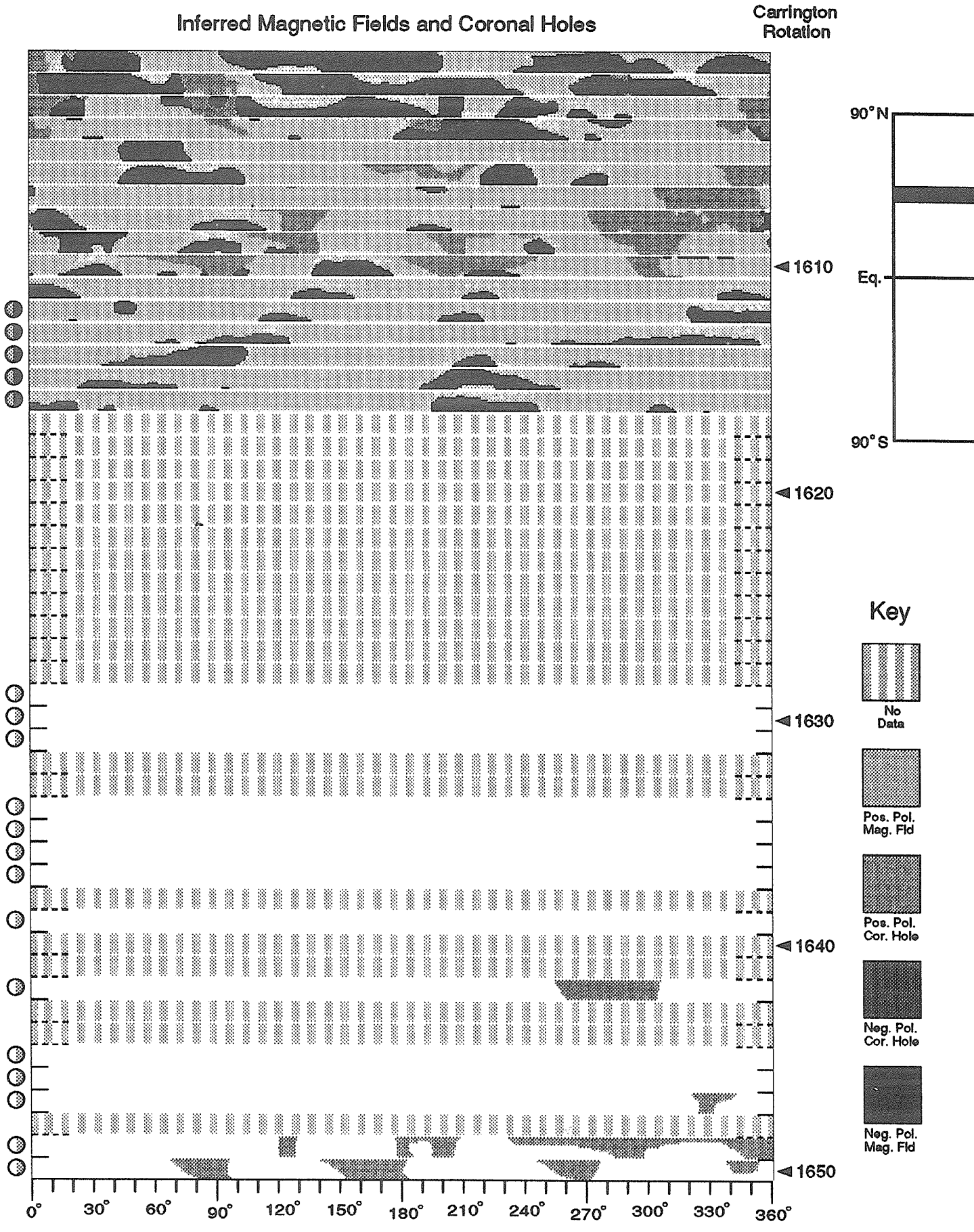
Inferred Magnetic Fields and Coronal Holes



From: 10th Aug 1969
To: 5th May 1973

Latitude: North 41 to North 50

Inferred Magnetic Fields and Coronal Holes

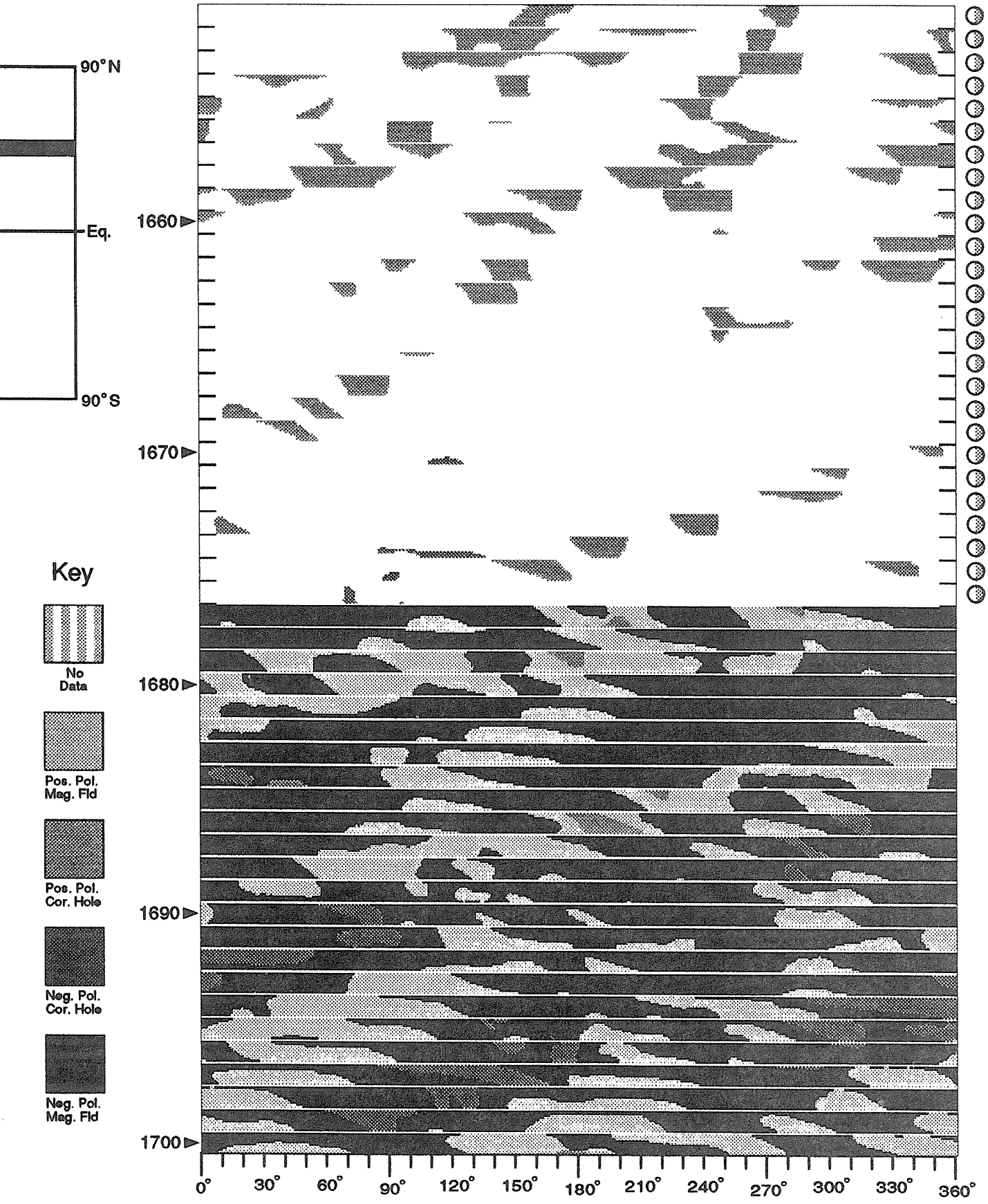


Latitude: North 41 to North 50

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

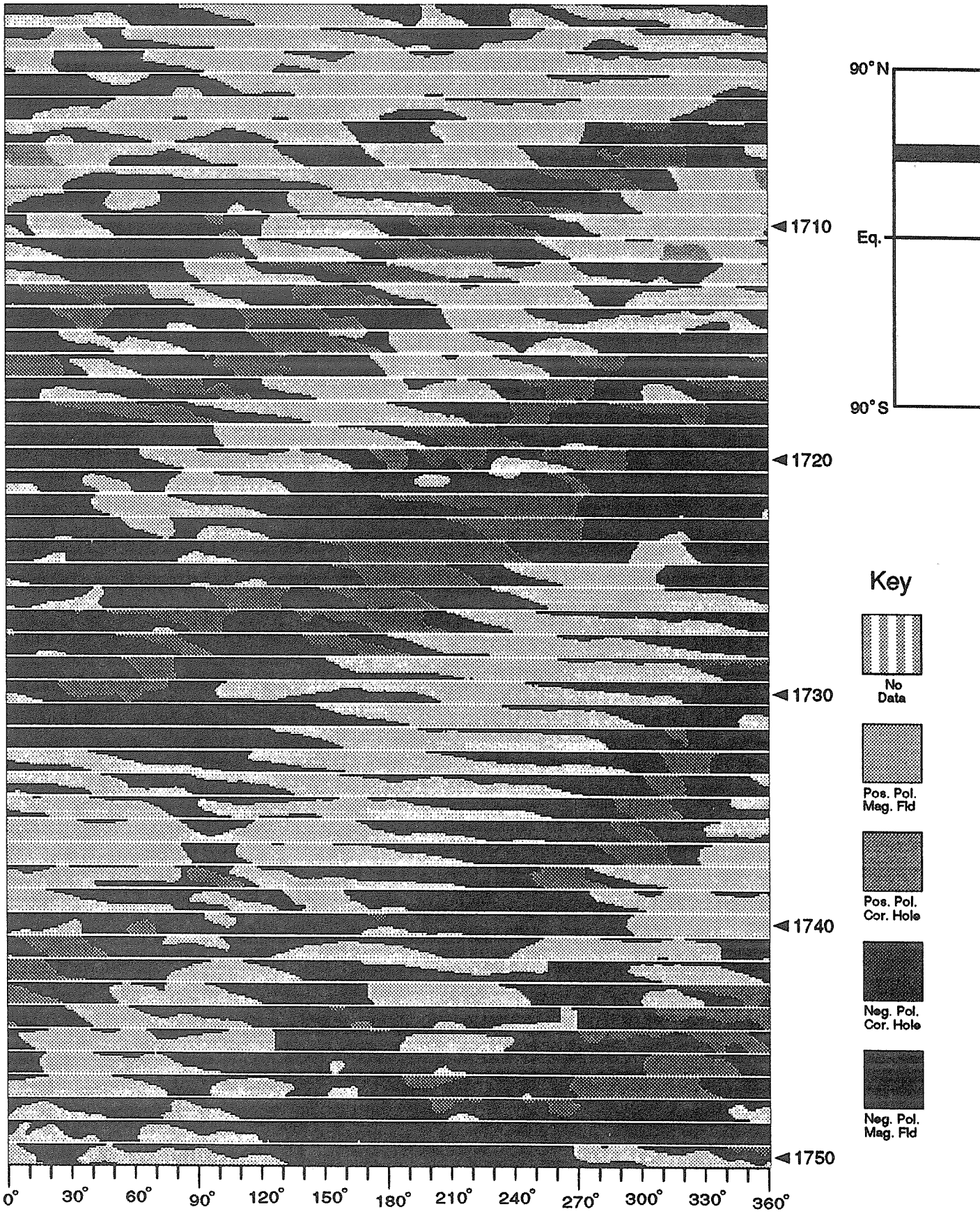
Inferred Magnetic Fields and Coronal Holes



From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: North 41 to North 50

Inferred Magnetic Fields and Coronal Holes

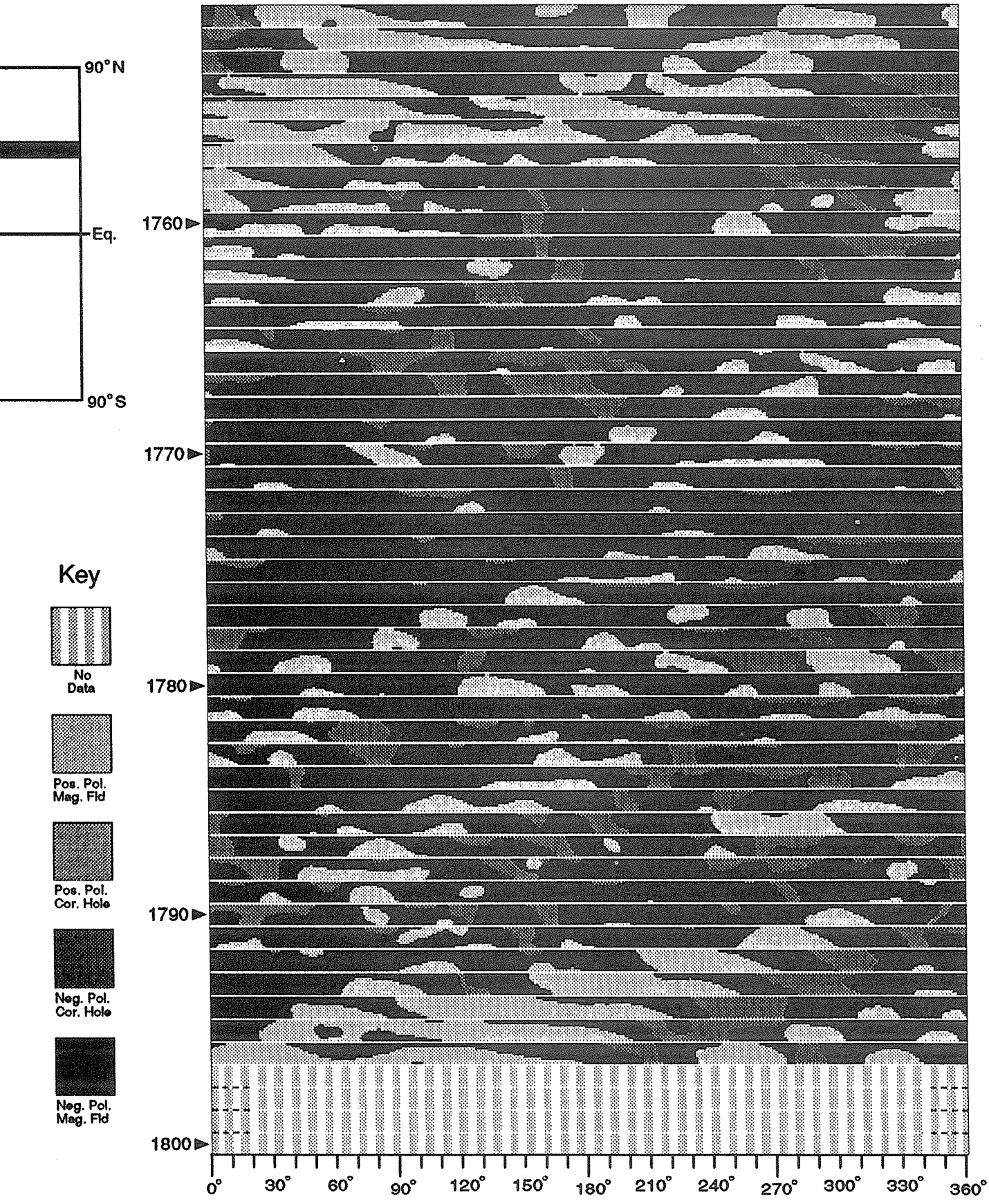


Latitude: North 41 to North 50

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

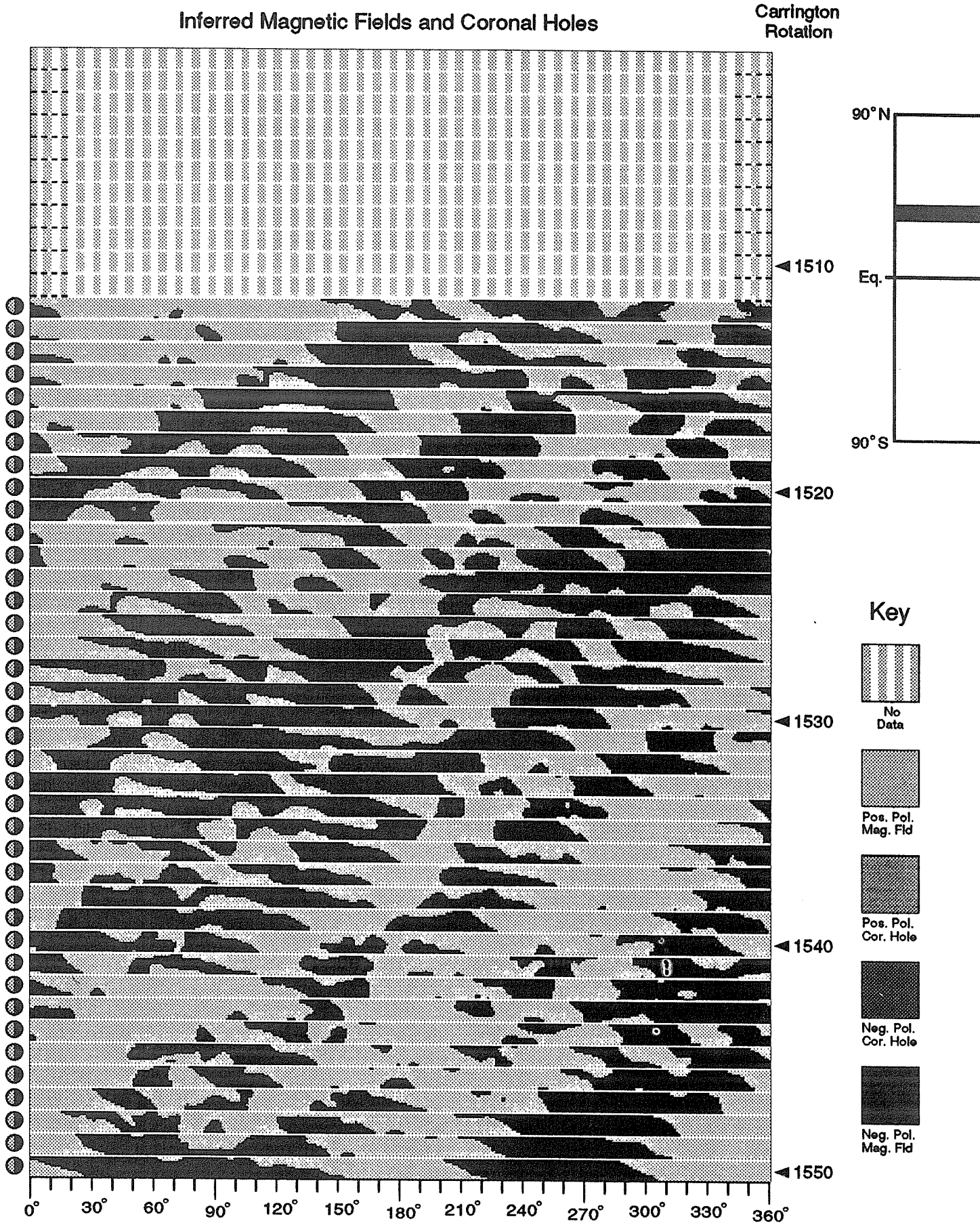
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 11th Apr 1988

Latitude: North 41 to North 50

Inferred Magnetic Fields and Coronal Holes

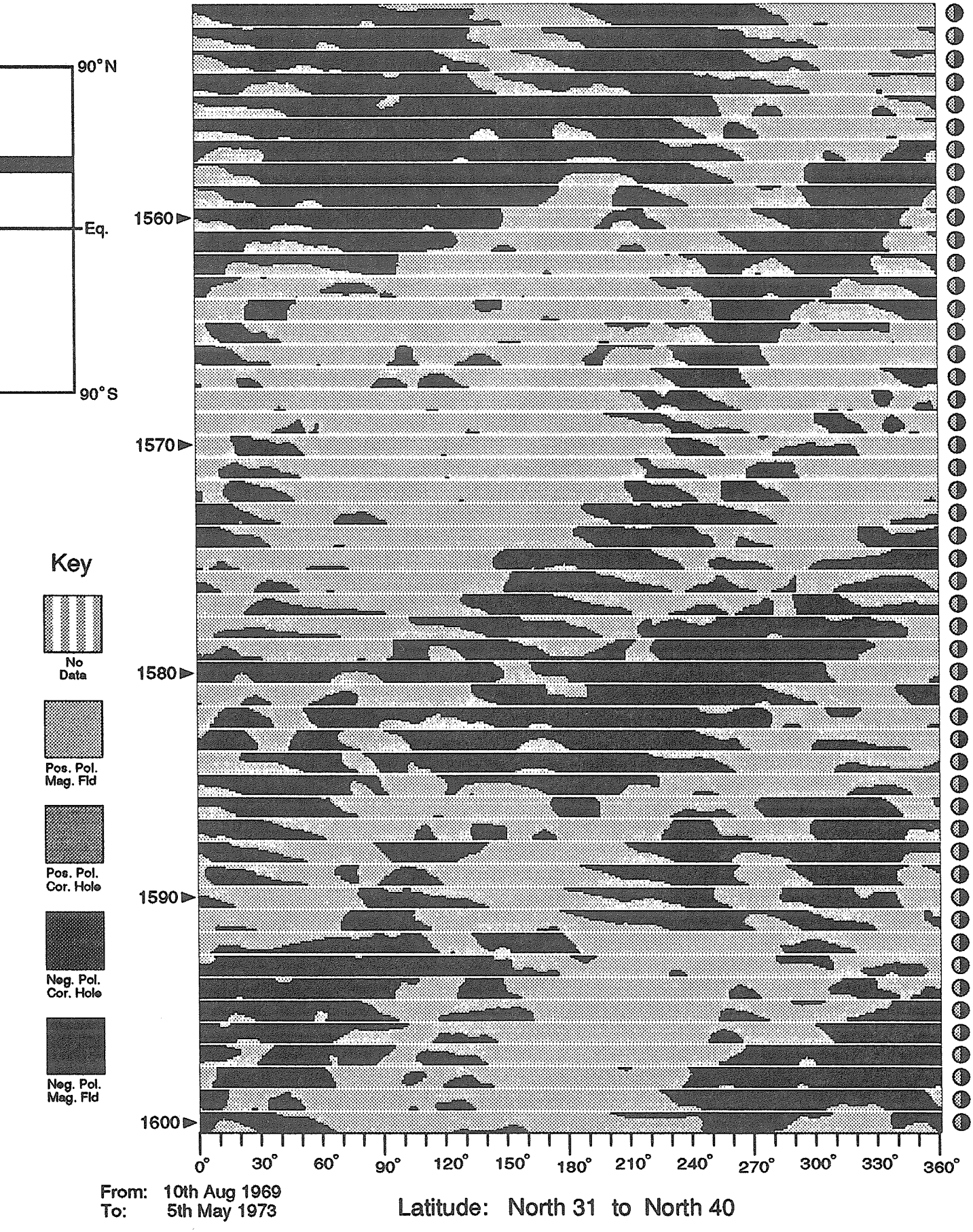


Latitude: North 31 to North 40

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes

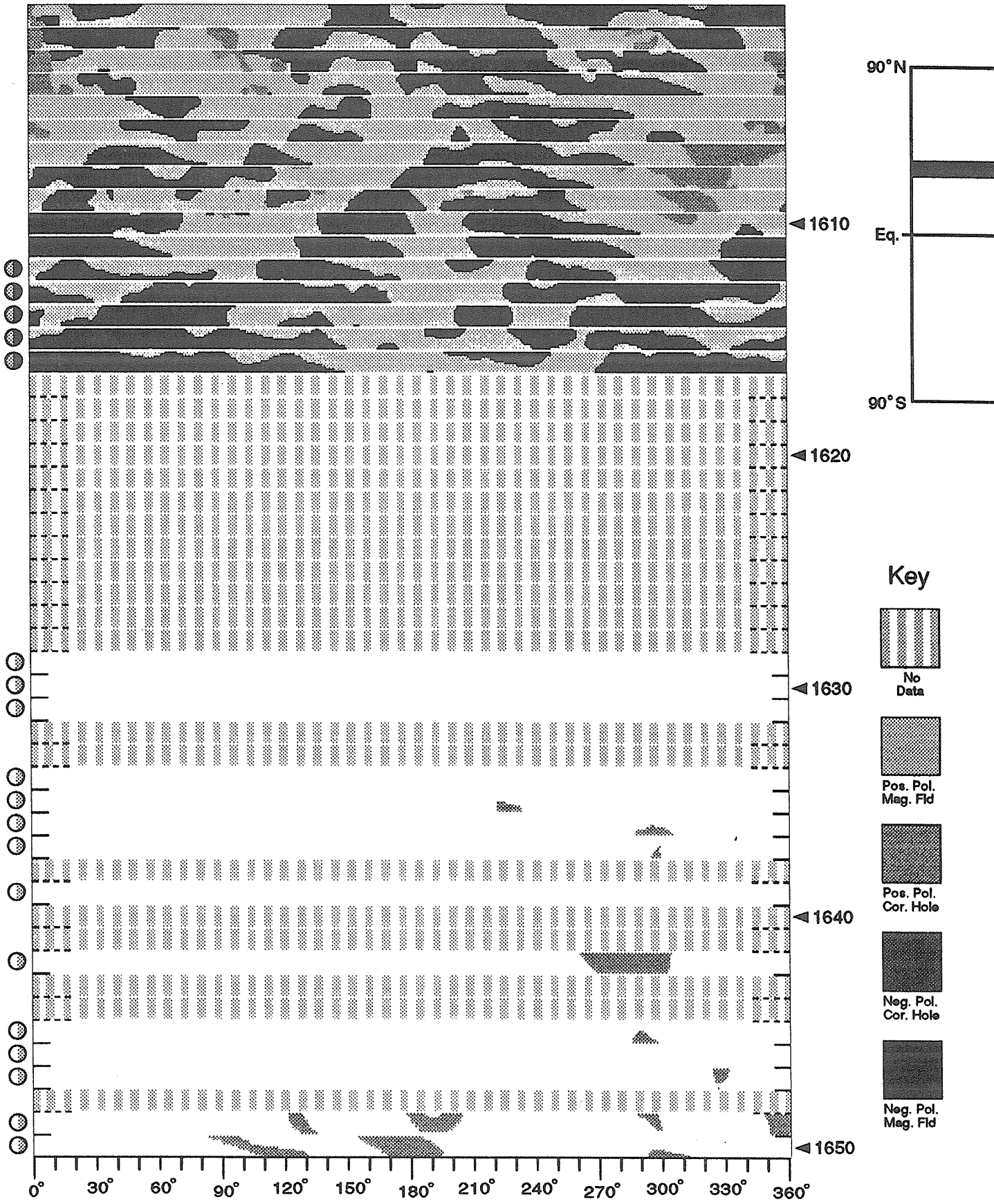


From: 10th Aug 1969
To: 5th May 1973

Latitude: North 31 to North 40

Inferred Magnetic Fields and Coronal Holes

Carrington Rotation

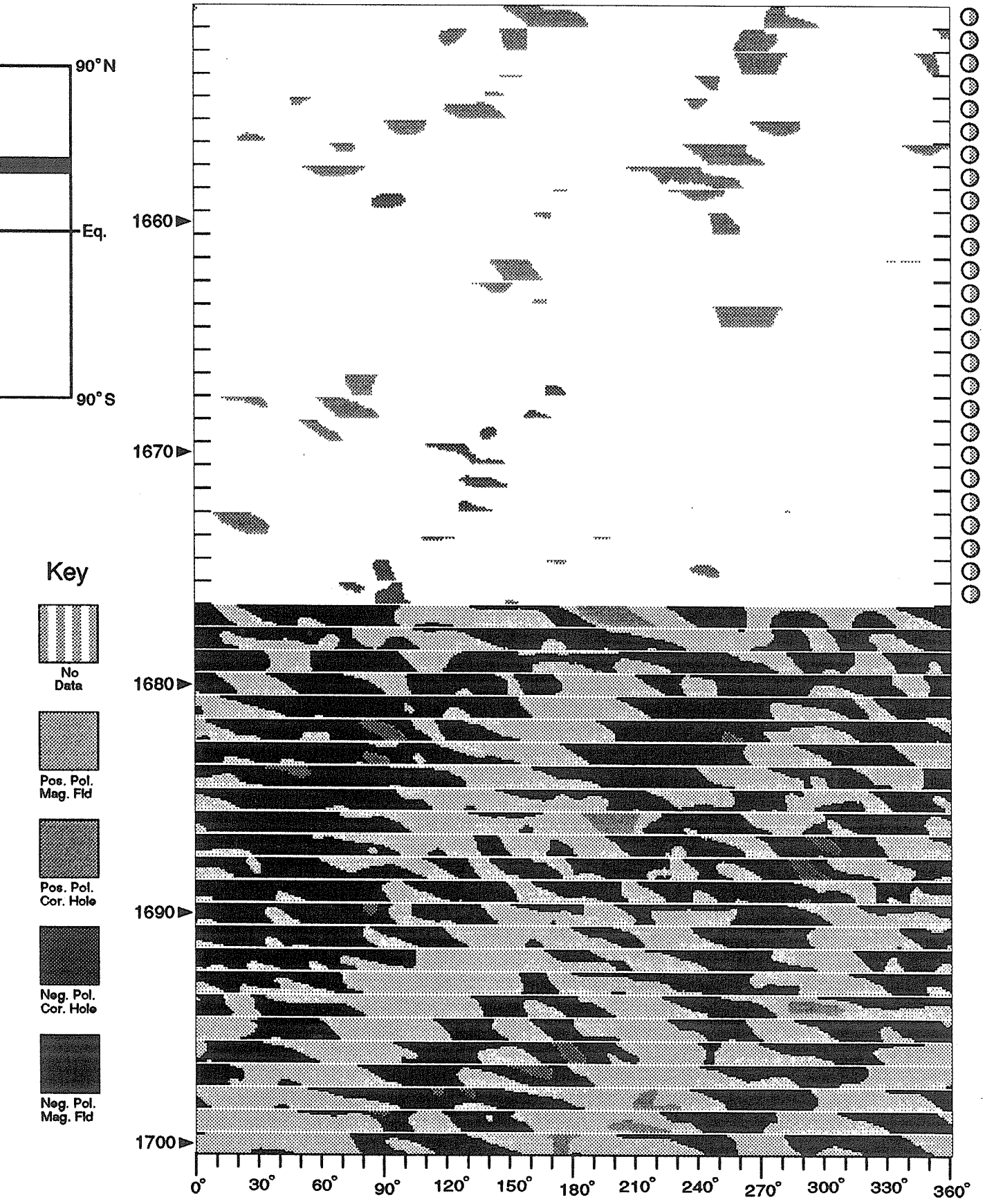


Latitude: North 31 to North 40

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

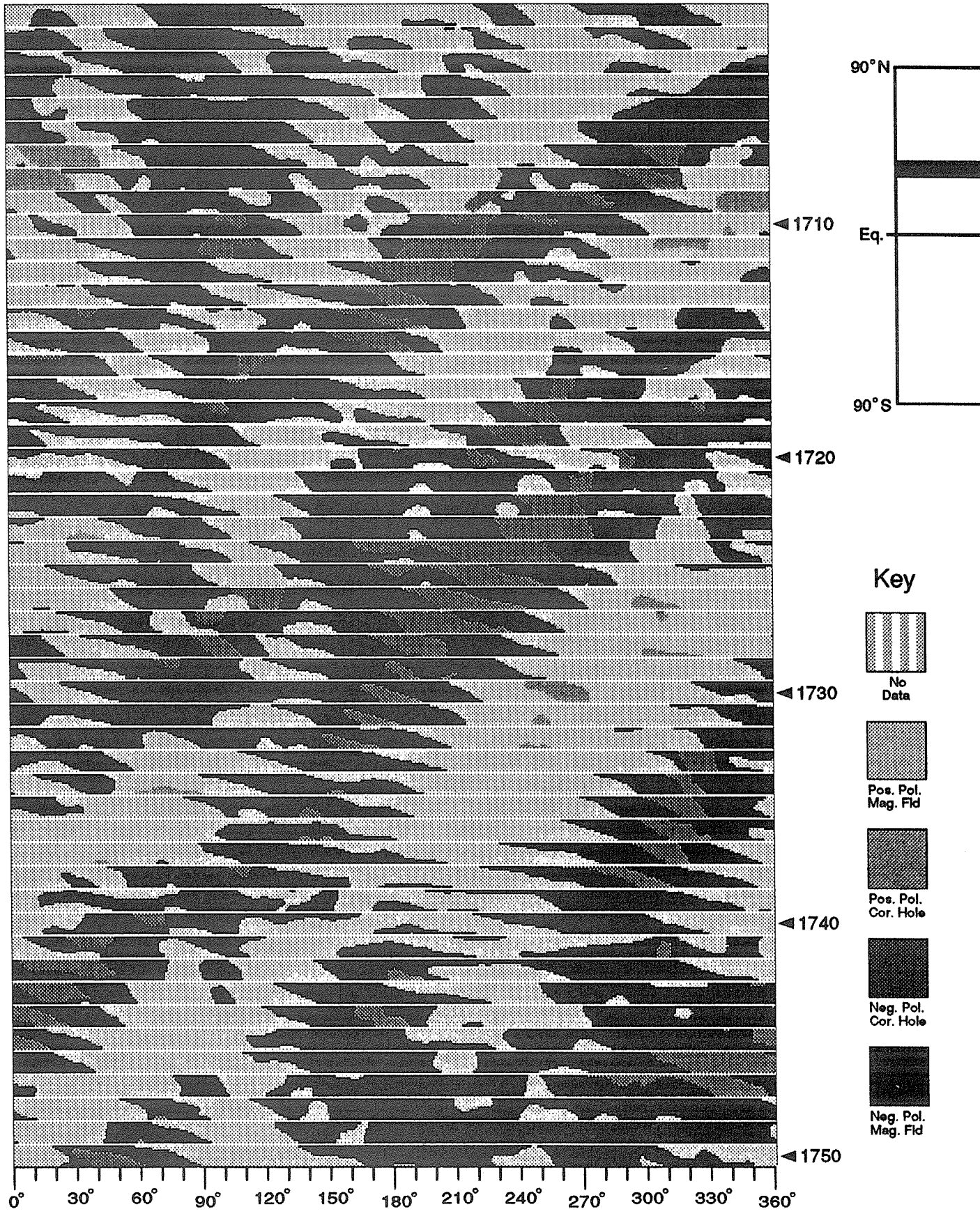
Inferred Magnetic Fields and Coronal Holes



From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: North 31 to North 40

Inferred Magnetic Fields and Coronal Holes

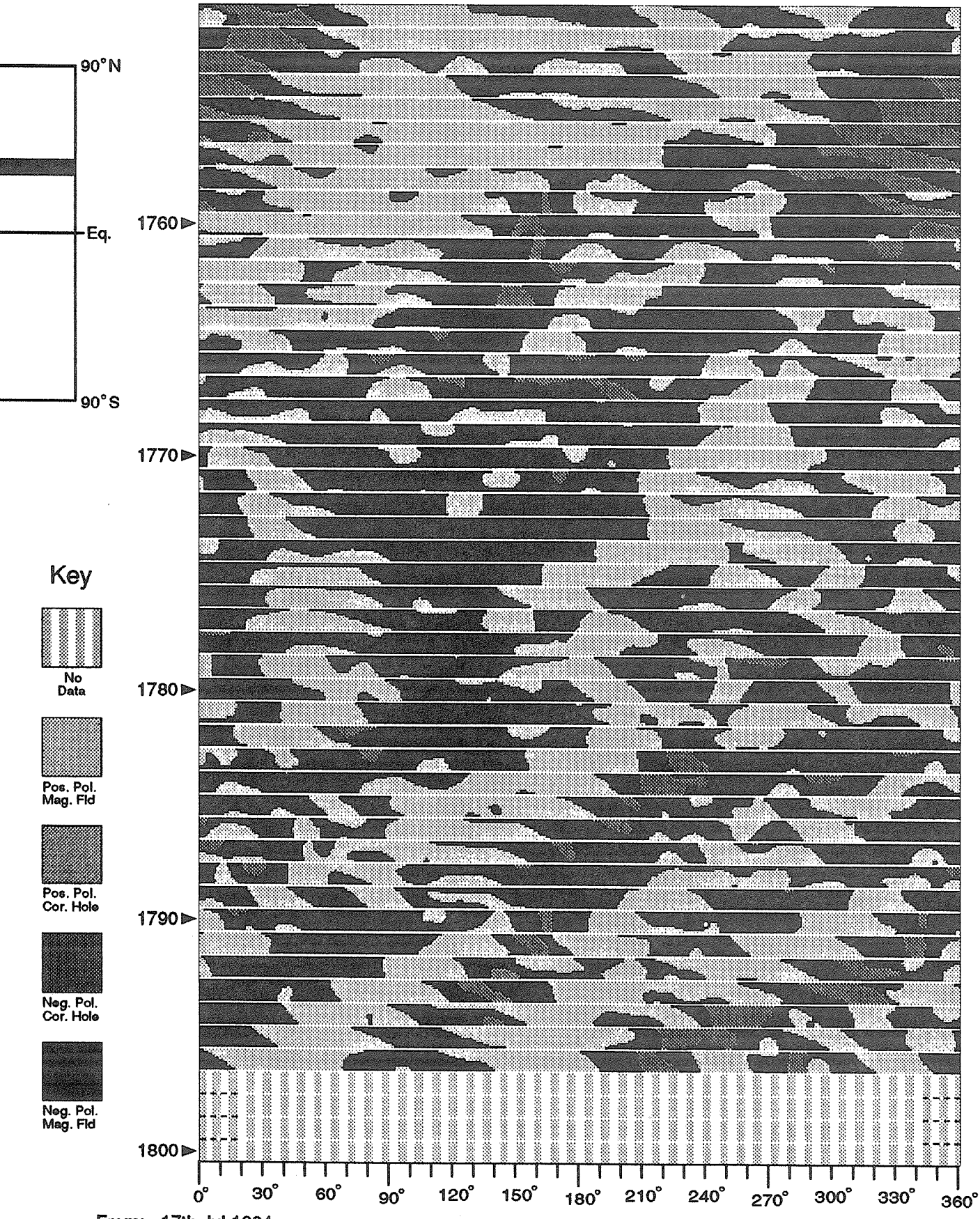


Latitude: North 31 to North 40

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



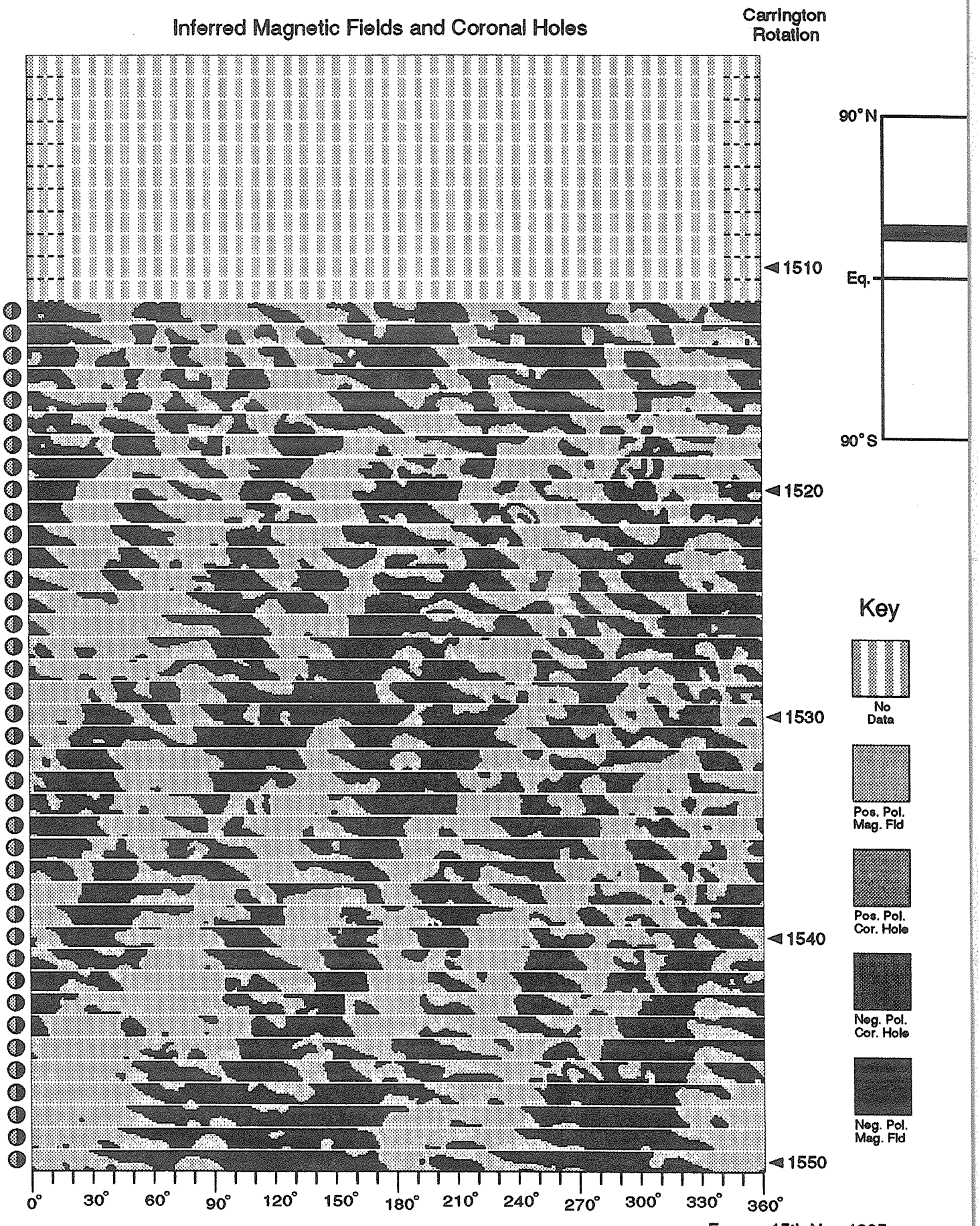
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 17th Jul 1984
To: 11th Apr 1988

Latitude: North 31 to North 40

Inferred Magnetic Fields and Coronal Holes

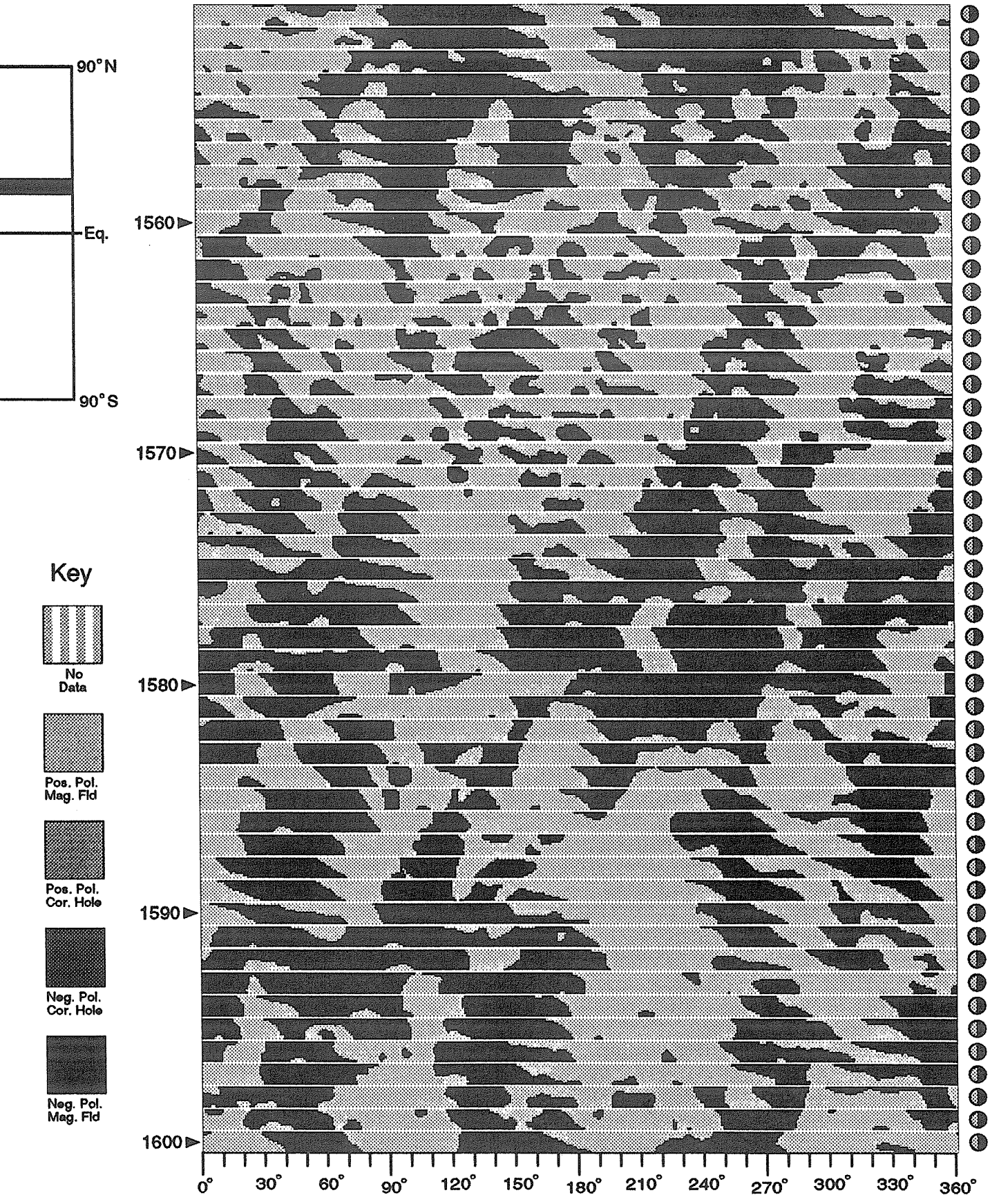


Latitude: North 21 to North 30

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



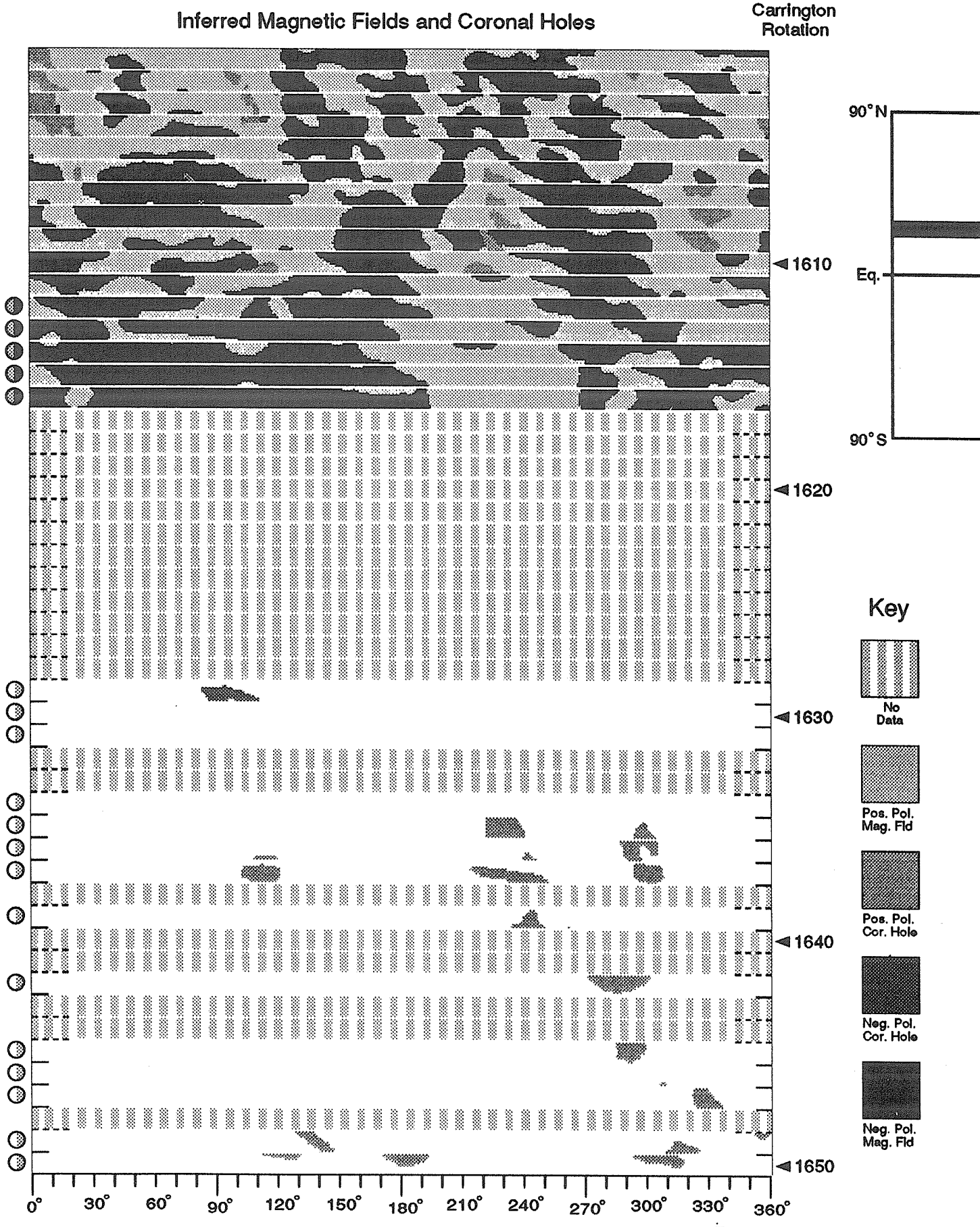
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 10th Aug 1969
To: 5th May 1973

Latitude: North 21 to North 30

Inferred Magnetic Fields and Coronal Holes

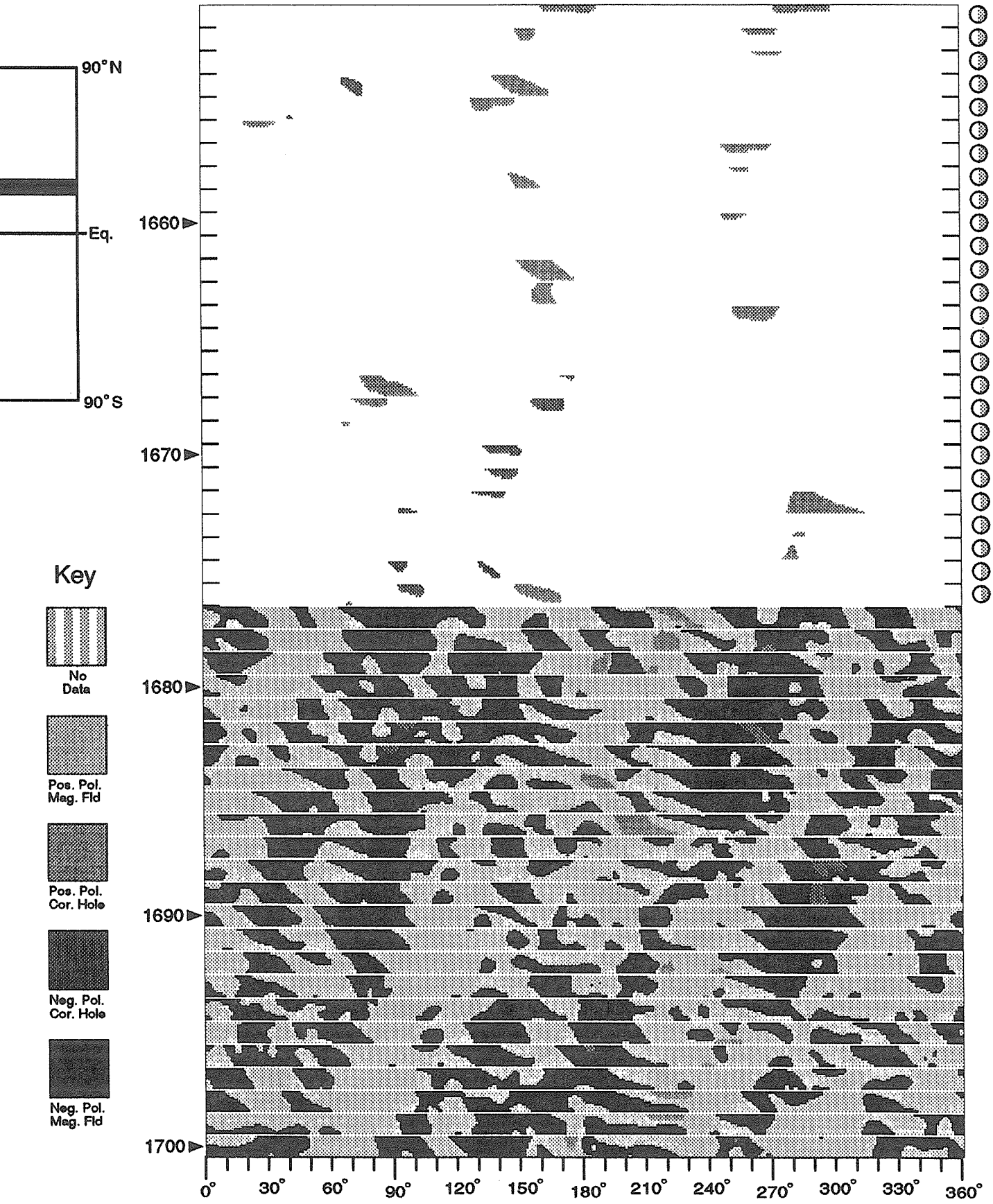


Latitude: North 21 to North 30

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

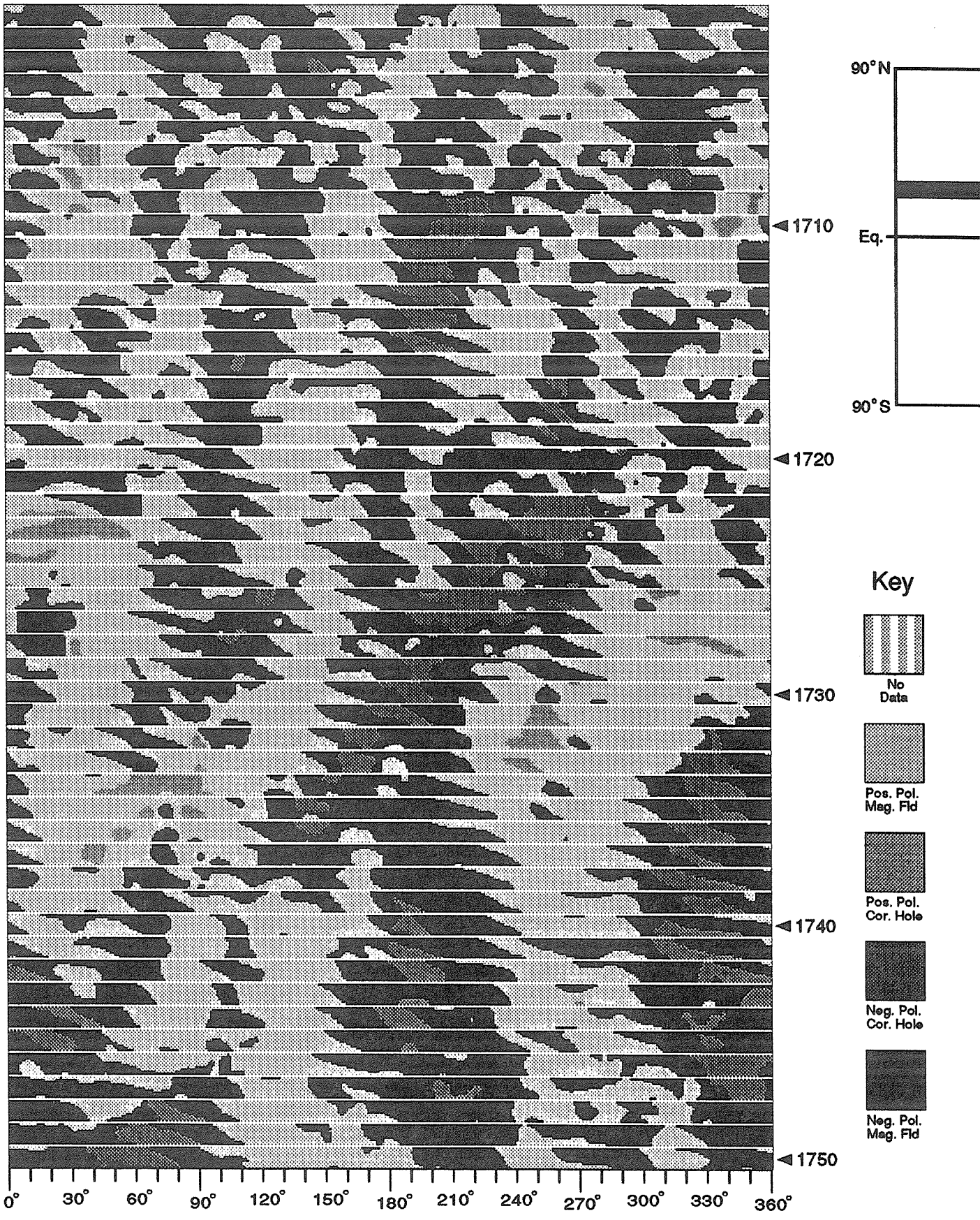
Inferred Magnetic Fields and Coronal Holes



From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: North 21 to North 30

Inferred Magnetic Fields and Coronal Holes

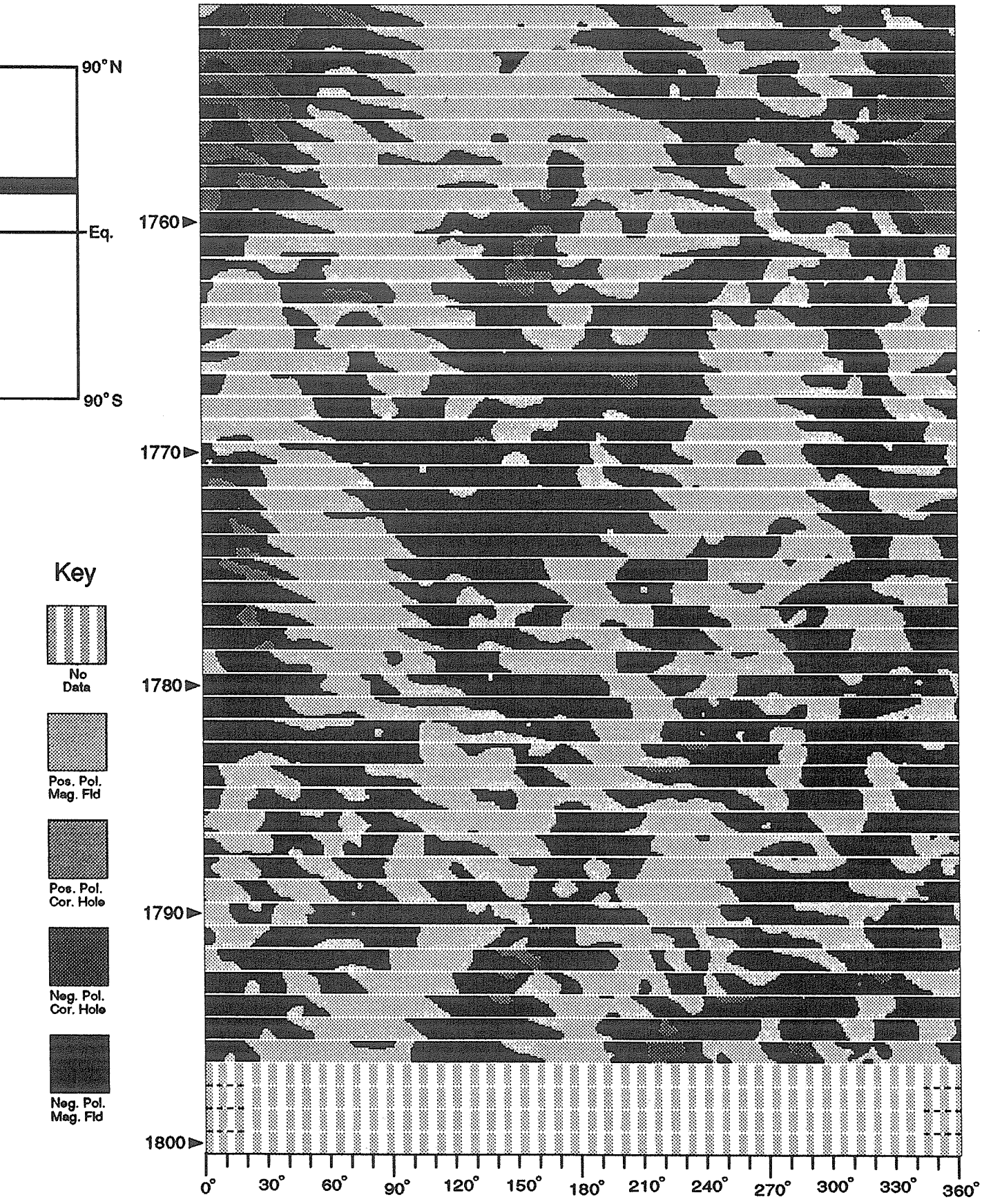


Latitude: North 21 to North 30

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

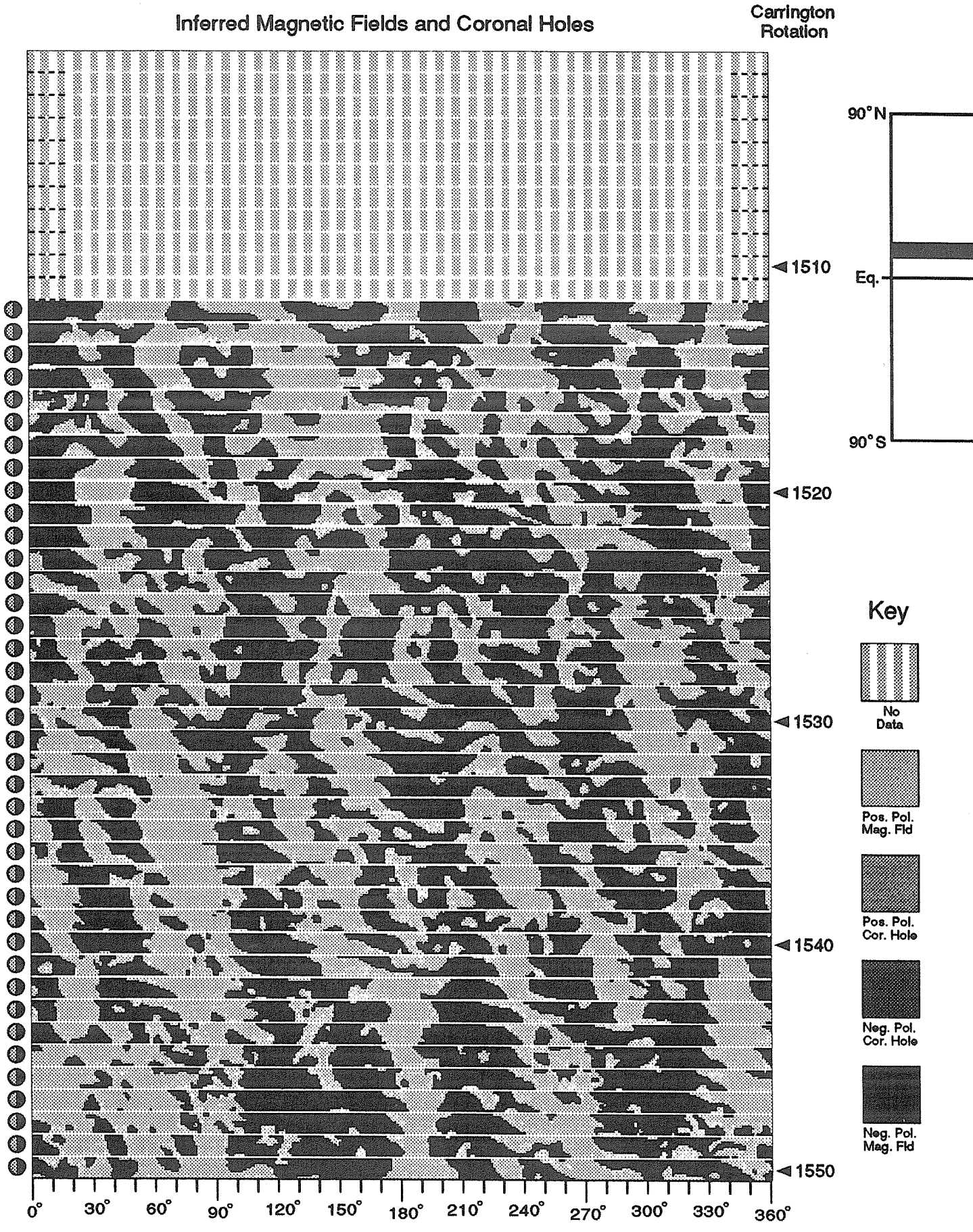
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 11th Apr 1988

Latitude: North 21 to North 30

Inferred Magnetic Fields and Coronal Holes

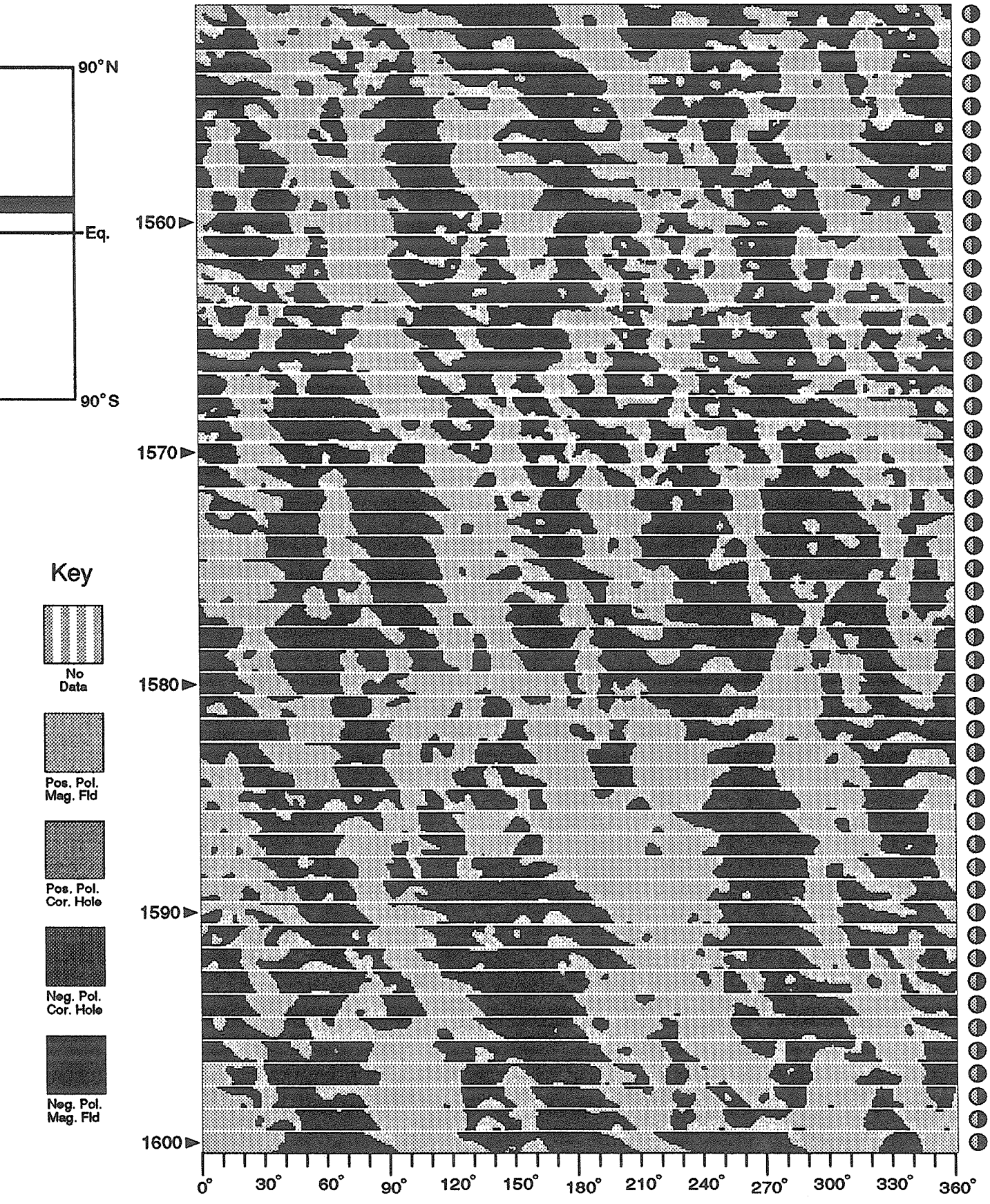


Latitude: North 11 to North 20

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



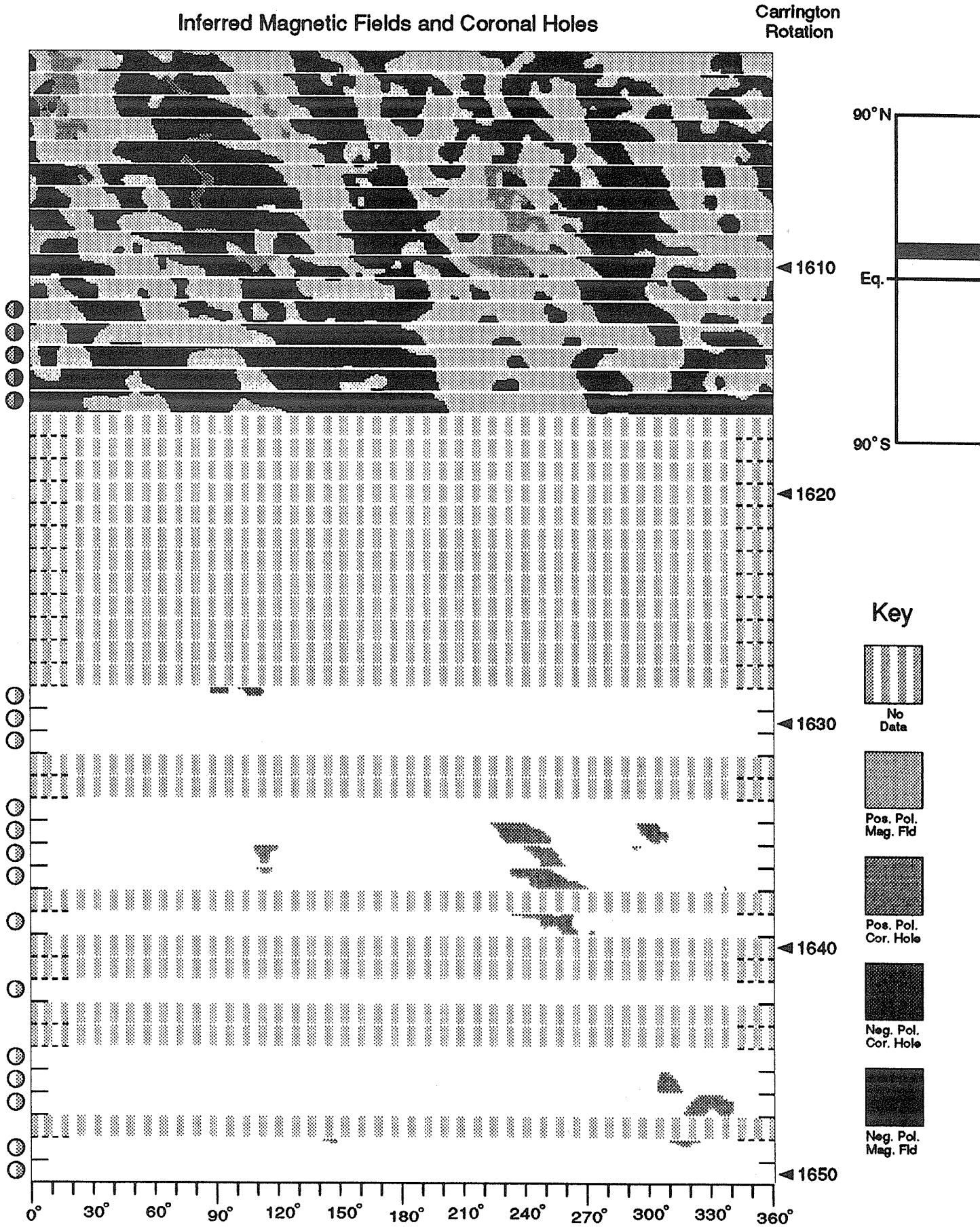
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 10th Aug 1969
To: 5th May 1973

Latitude: North 11 to North 20

Inferred Magnetic Fields and Coronal Holes

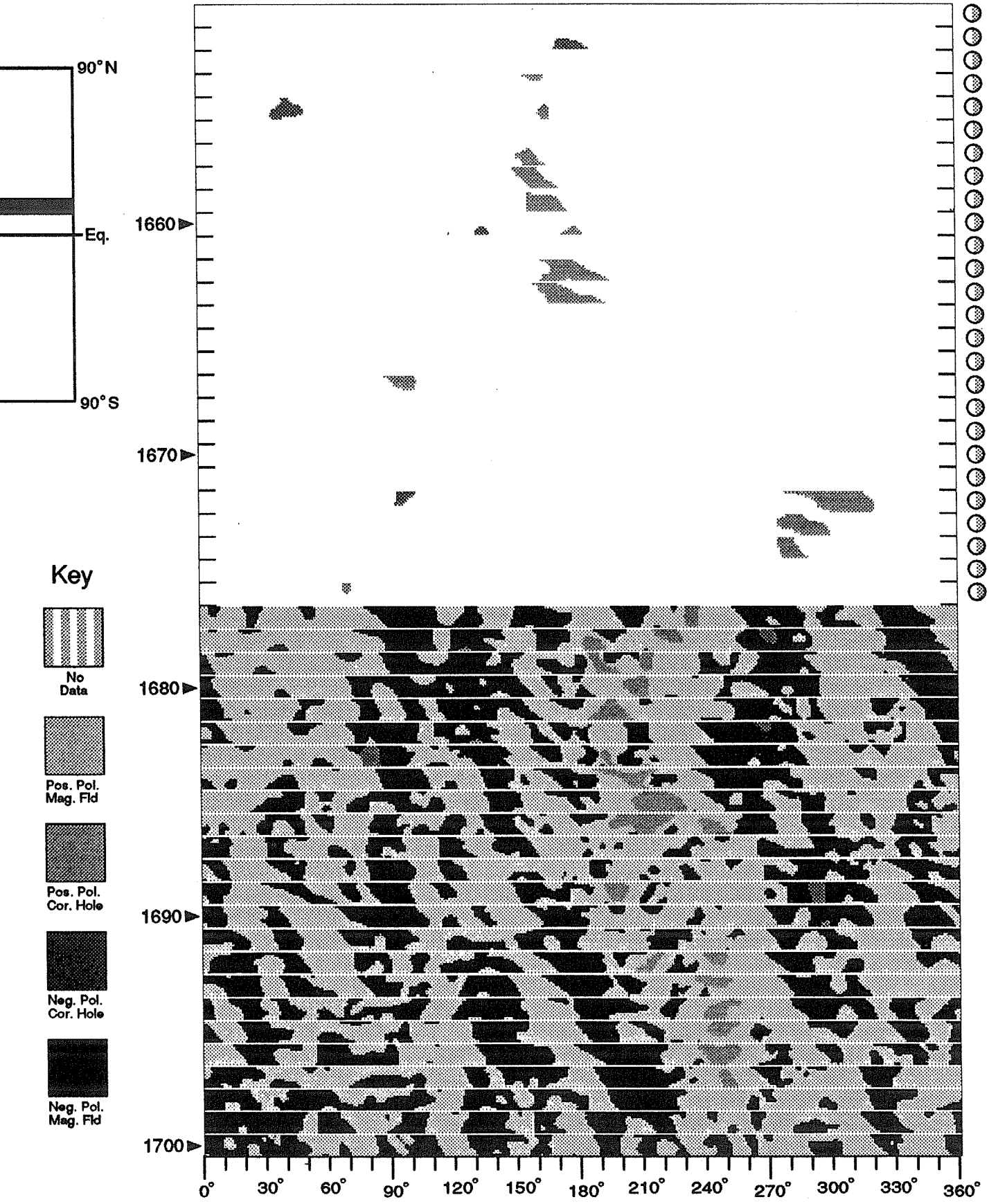


Latitude: North 11 to North 20

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

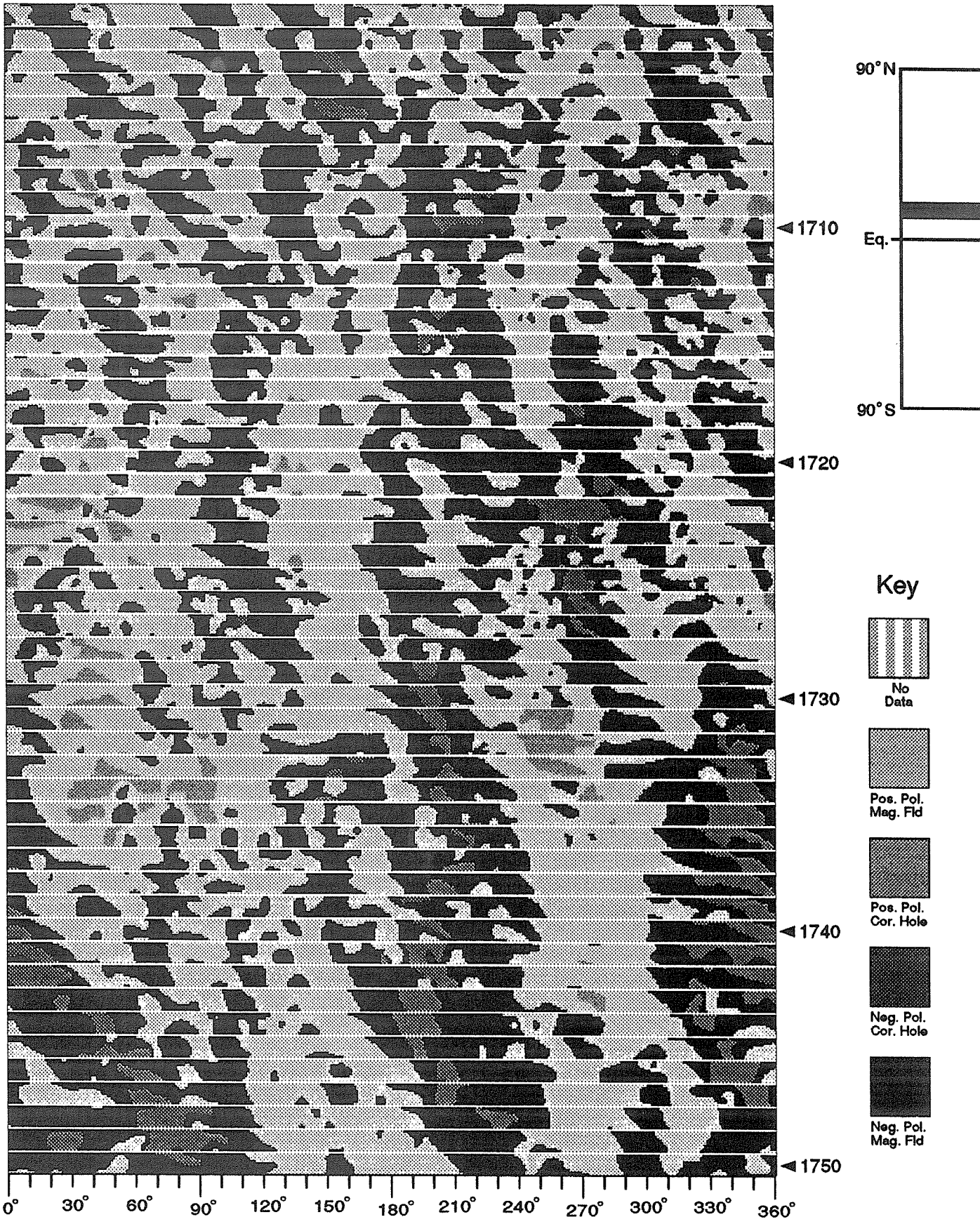
Inferred Magnetic Fields and Coronal Holes



From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: North 11 to North 20

Inferred Magnetic Fields and Coronal Holes

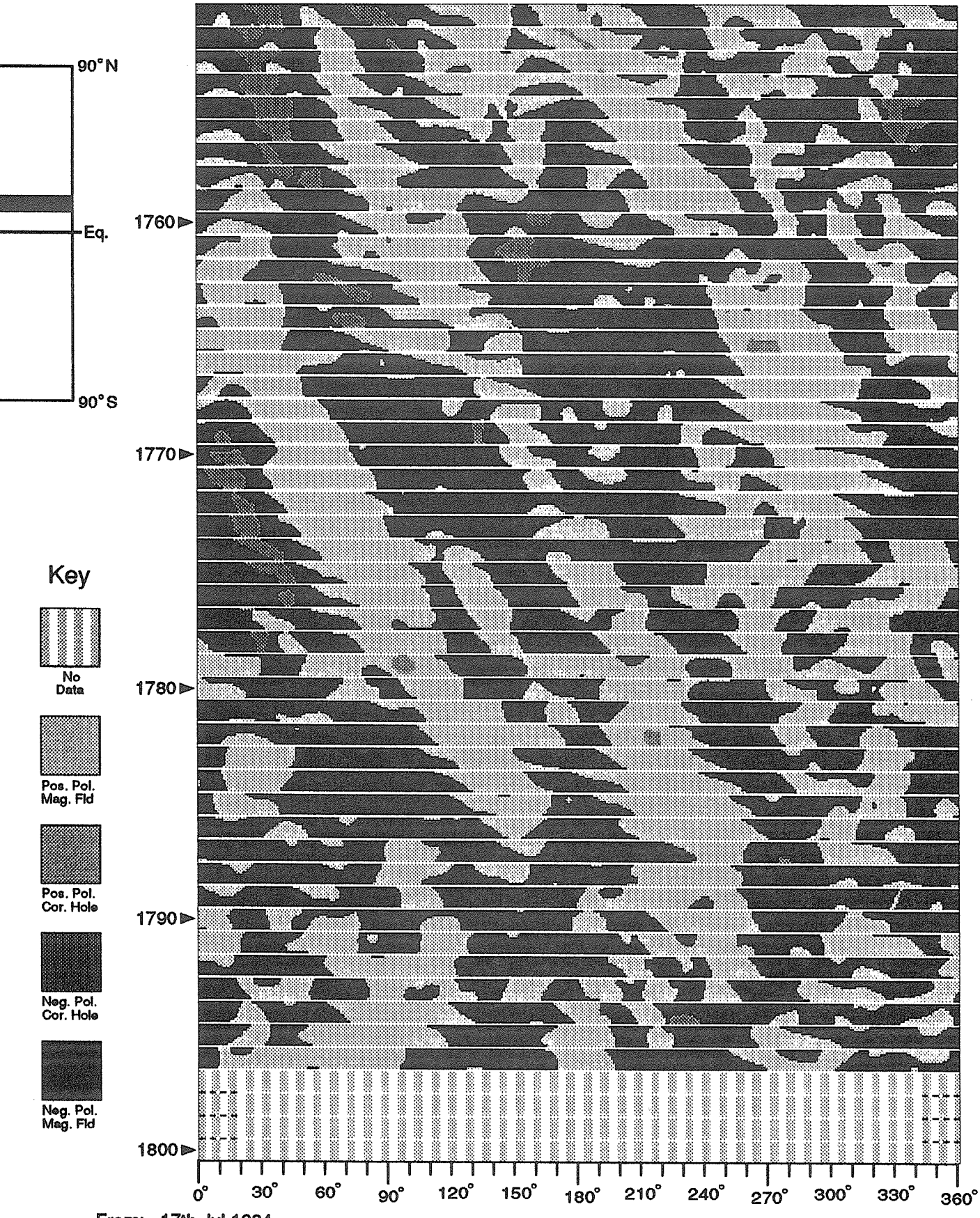


Latitude: North 11 to North 20

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



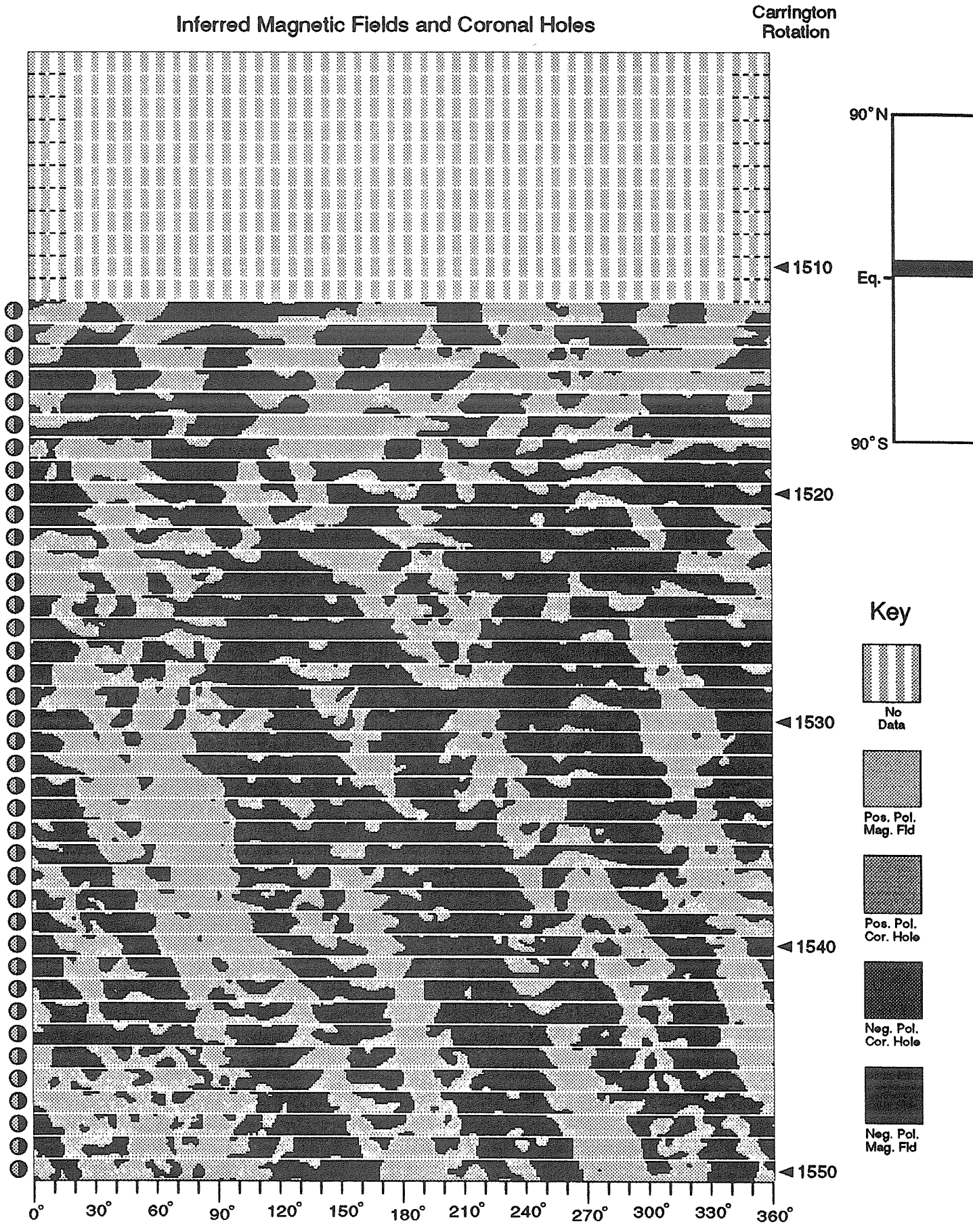
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 17th Jul 1984
To: 11th Apr 1988

Latitude: North 11 to North 20

Inferred Magnetic Fields and Coronal Holes

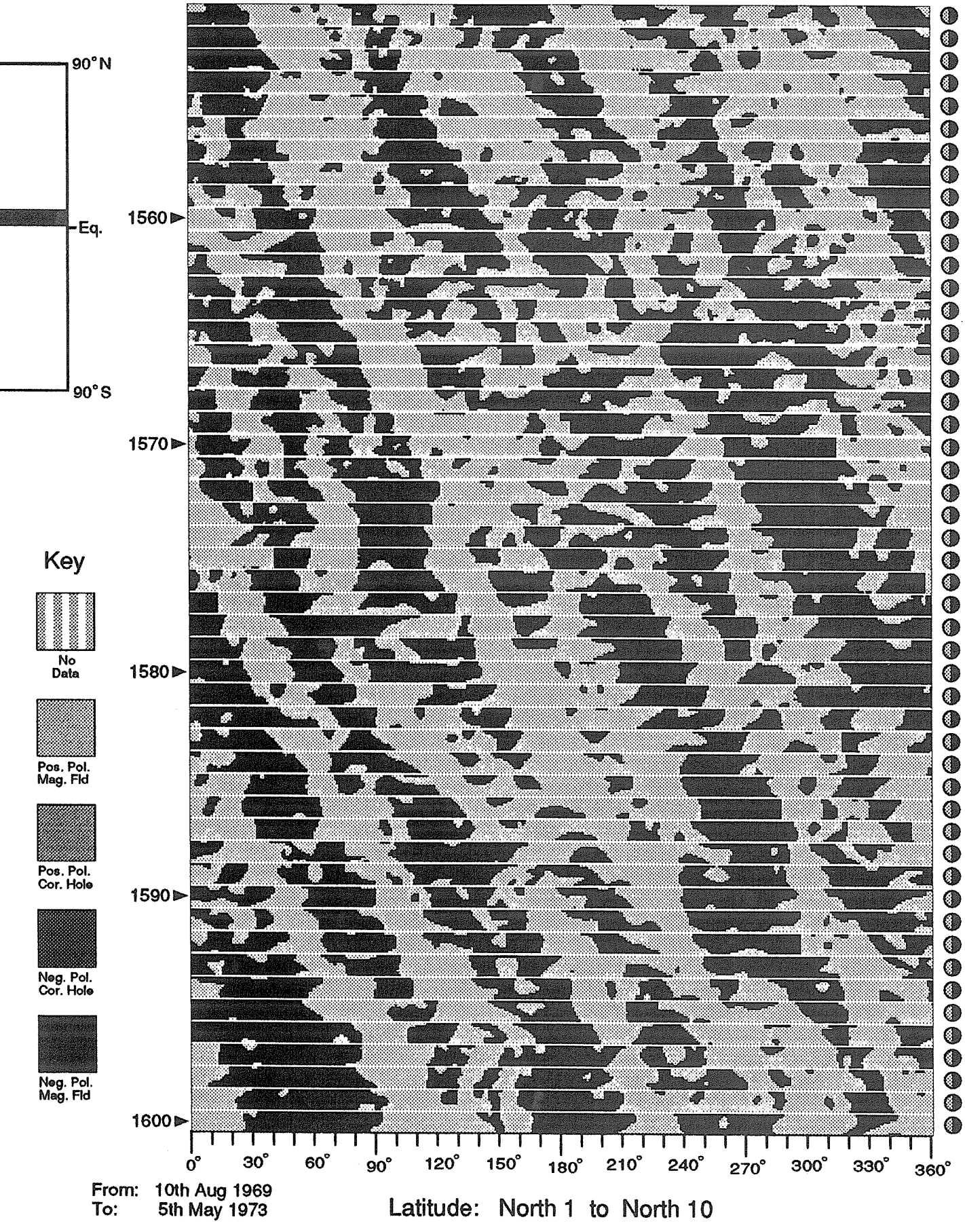


Latitude: North 1 to North 10

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

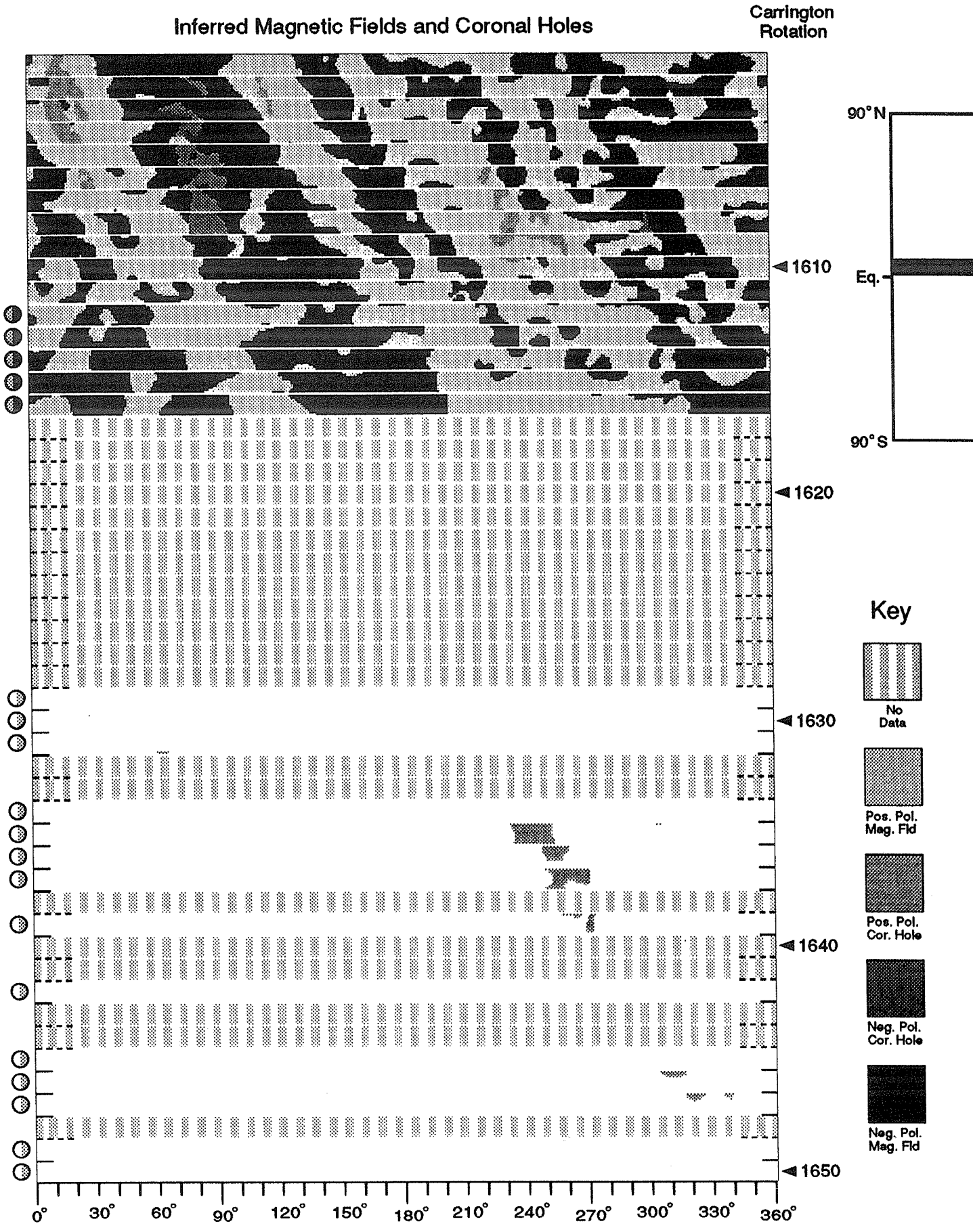
Inferred Magnetic Fields and Coronal Holes



From: 10th Aug 1969
To: 5th May 1973

Latitude: North 1 to North 10

Inferred Magnetic Fields and Coronal Holes

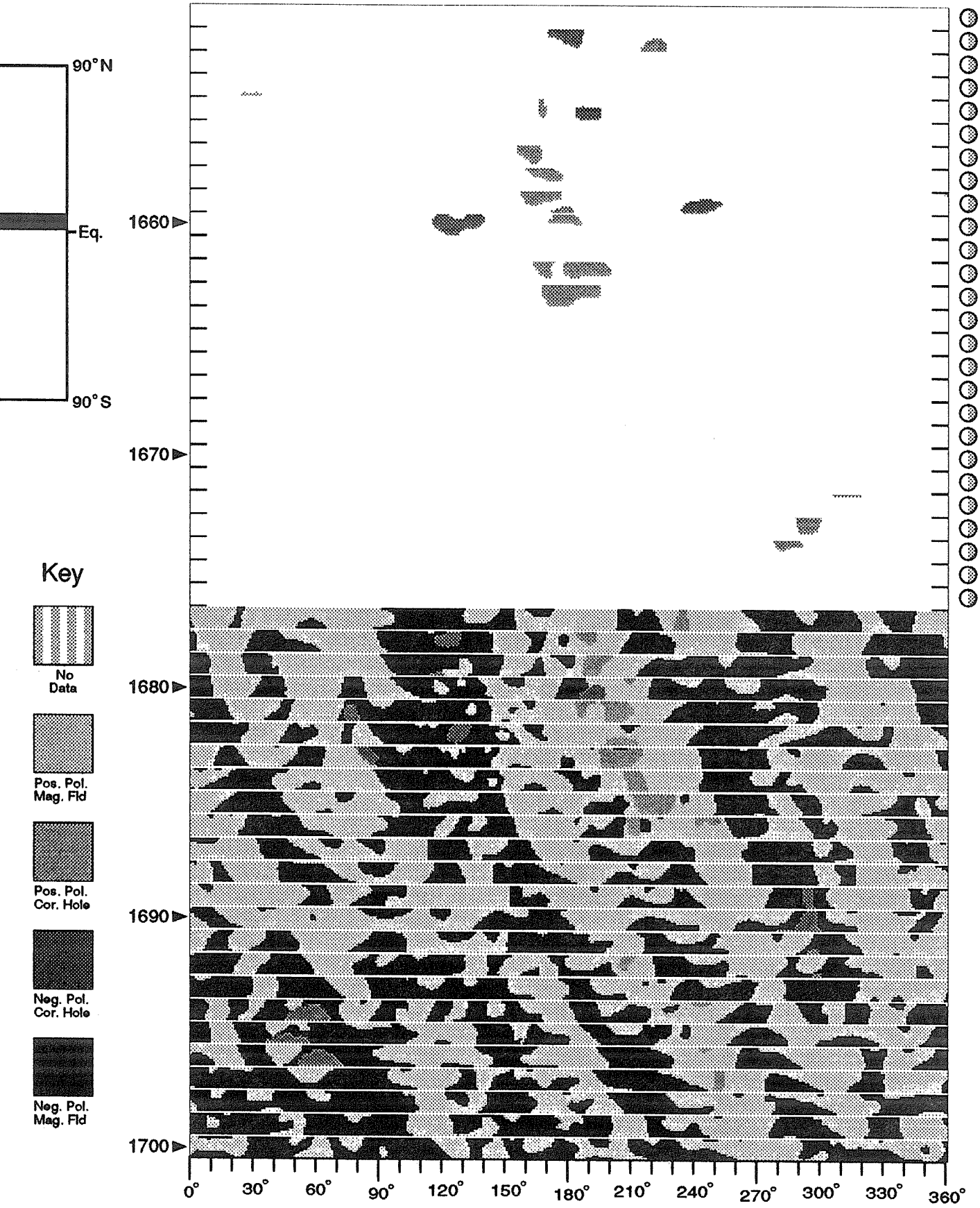


Latitude: North 1 to North 10

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

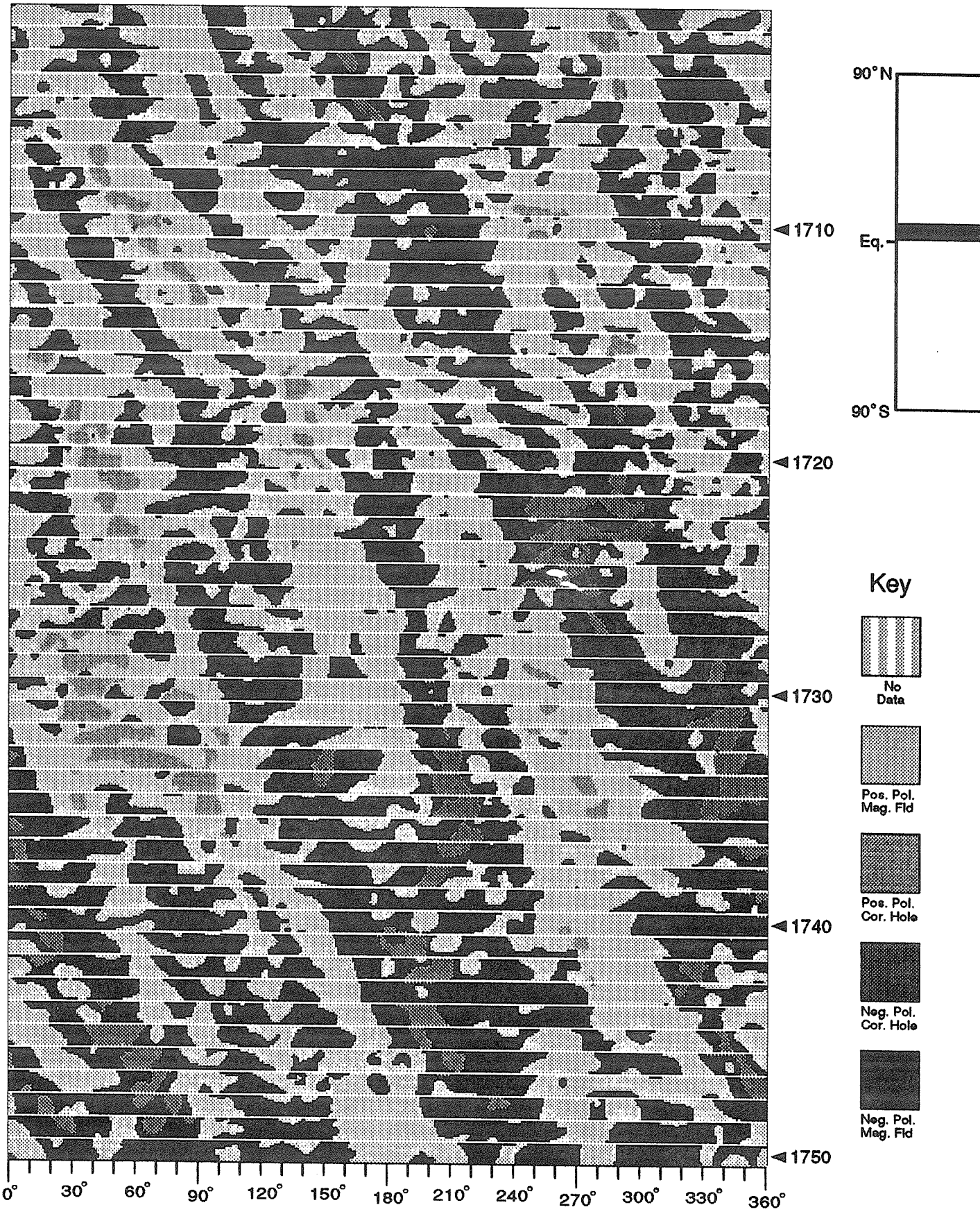
Inferred Magnetic Fields and Coronal Holes



From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: North 1 to North 10

Inferred Magnetic Fields and Coronal Holes

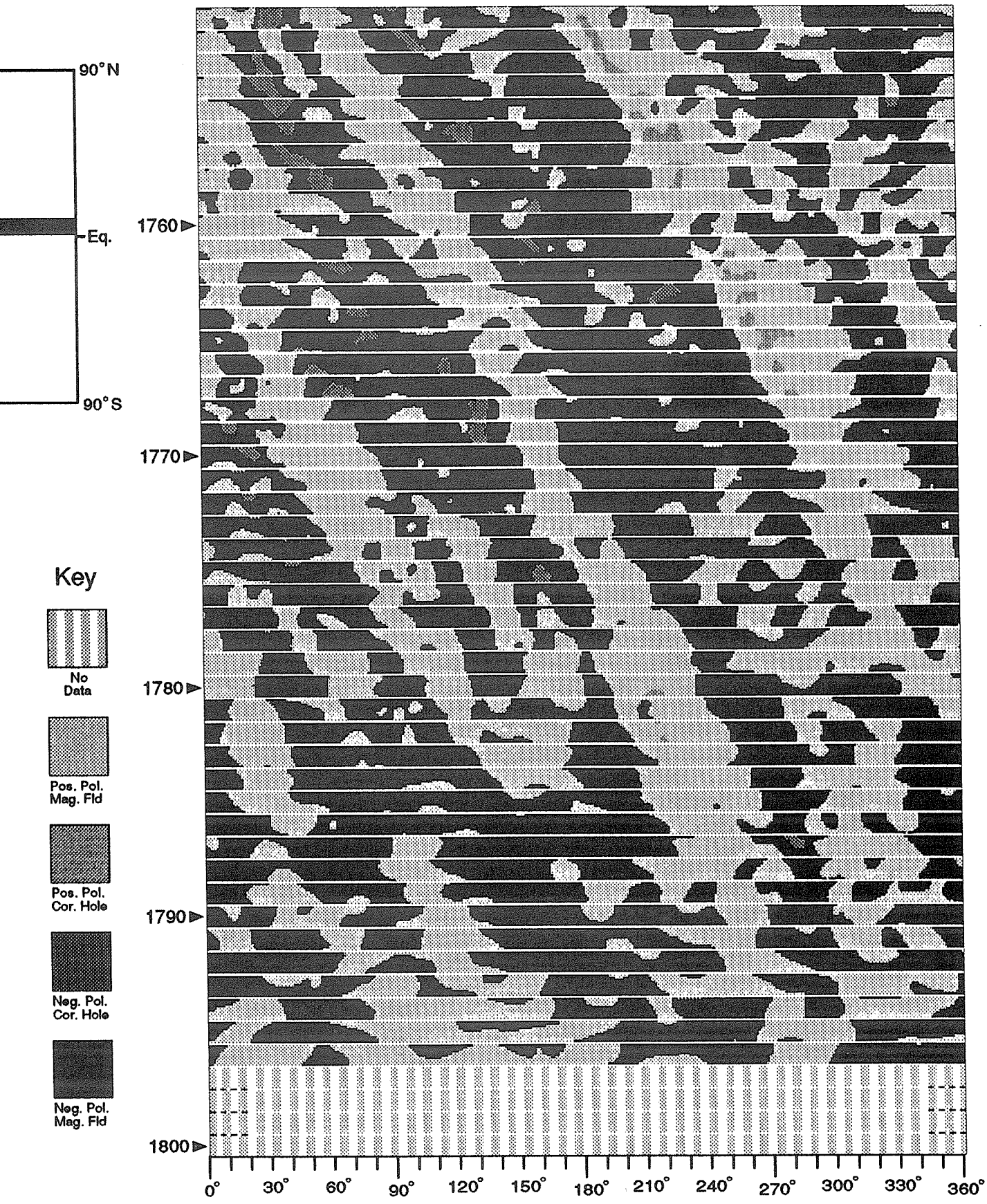


Latitude: North 1 to North 10

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

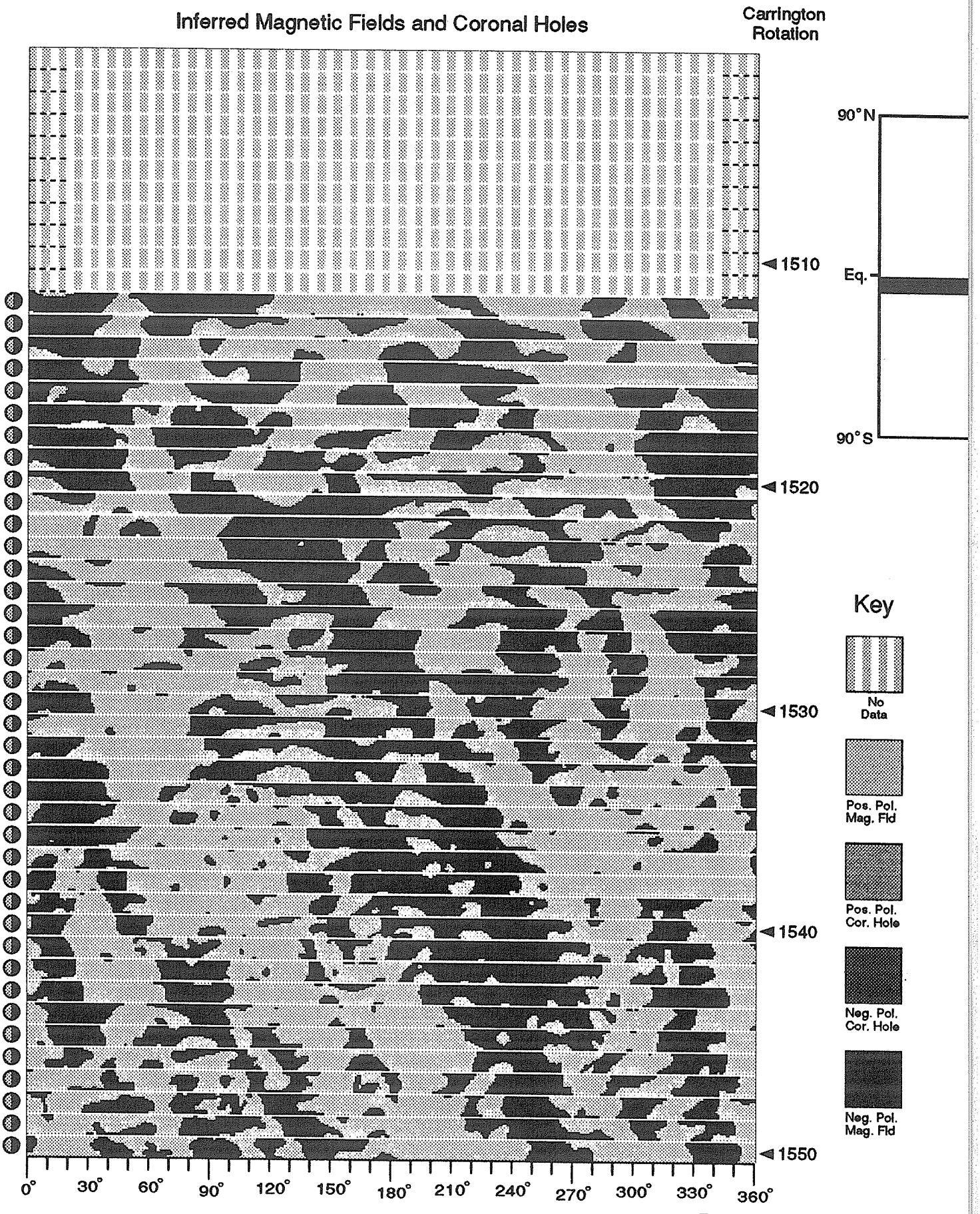
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 11th Apr 1988

Latitude: North 1 to North 10

Inferred Magnetic Fields and Coronal Holes

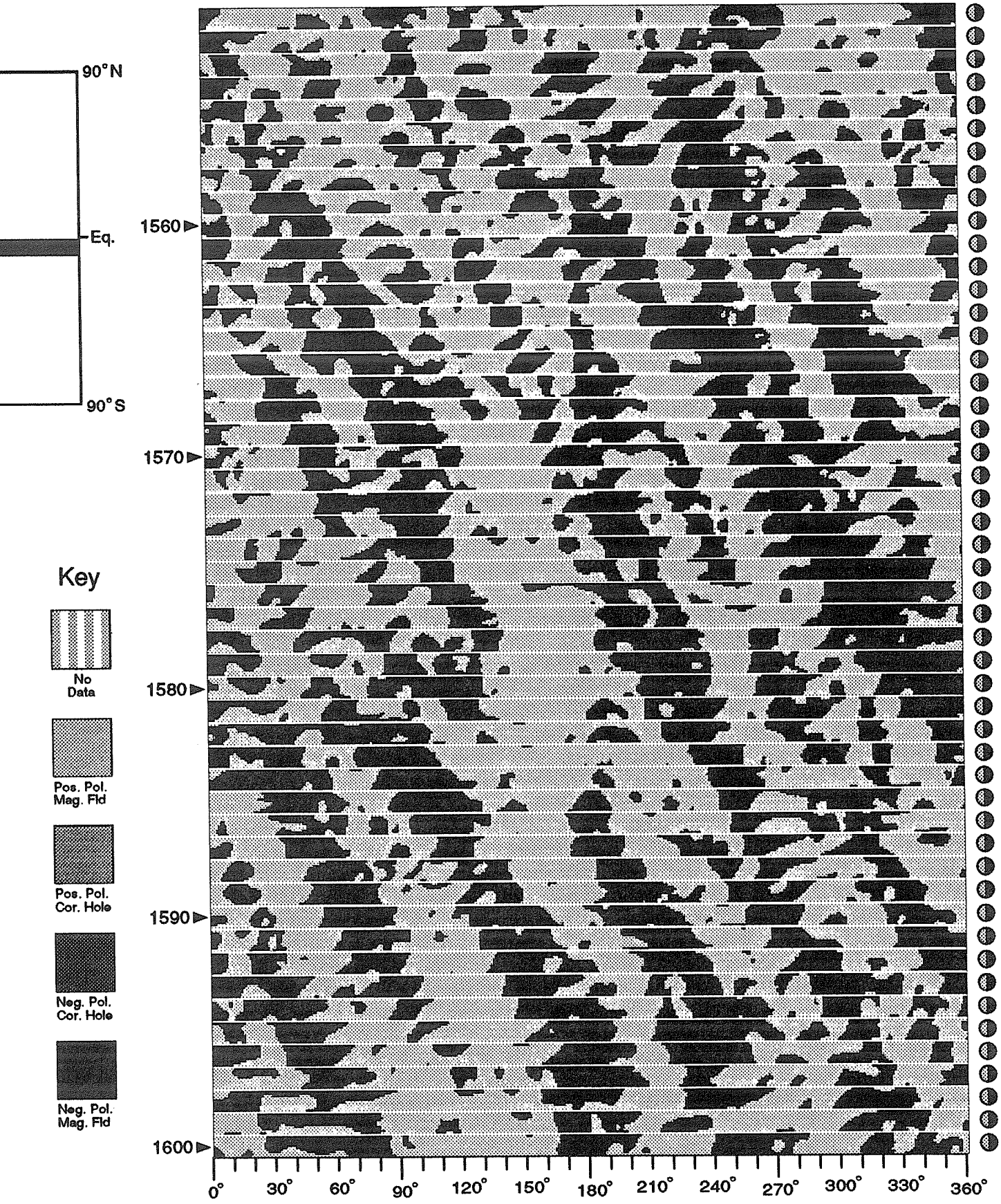


Latitude: South 1 to South 10

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

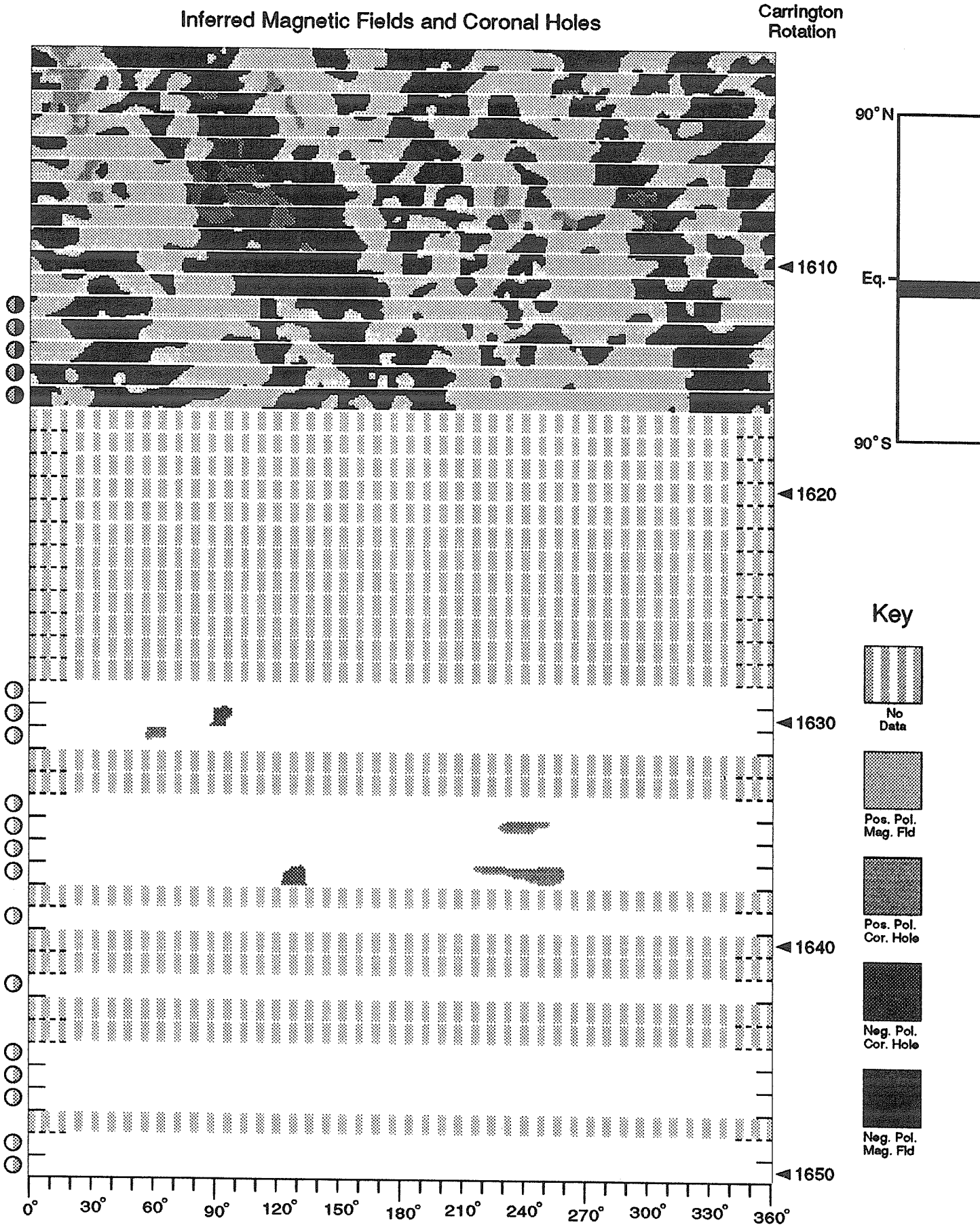
Inferred Magnetic Fields and Coronal Holes



From: 10th Aug 1969
To: 5th May 1973

Latitude: South 1 to South 10

Inferred Magnetic Fields and Coronal Holes

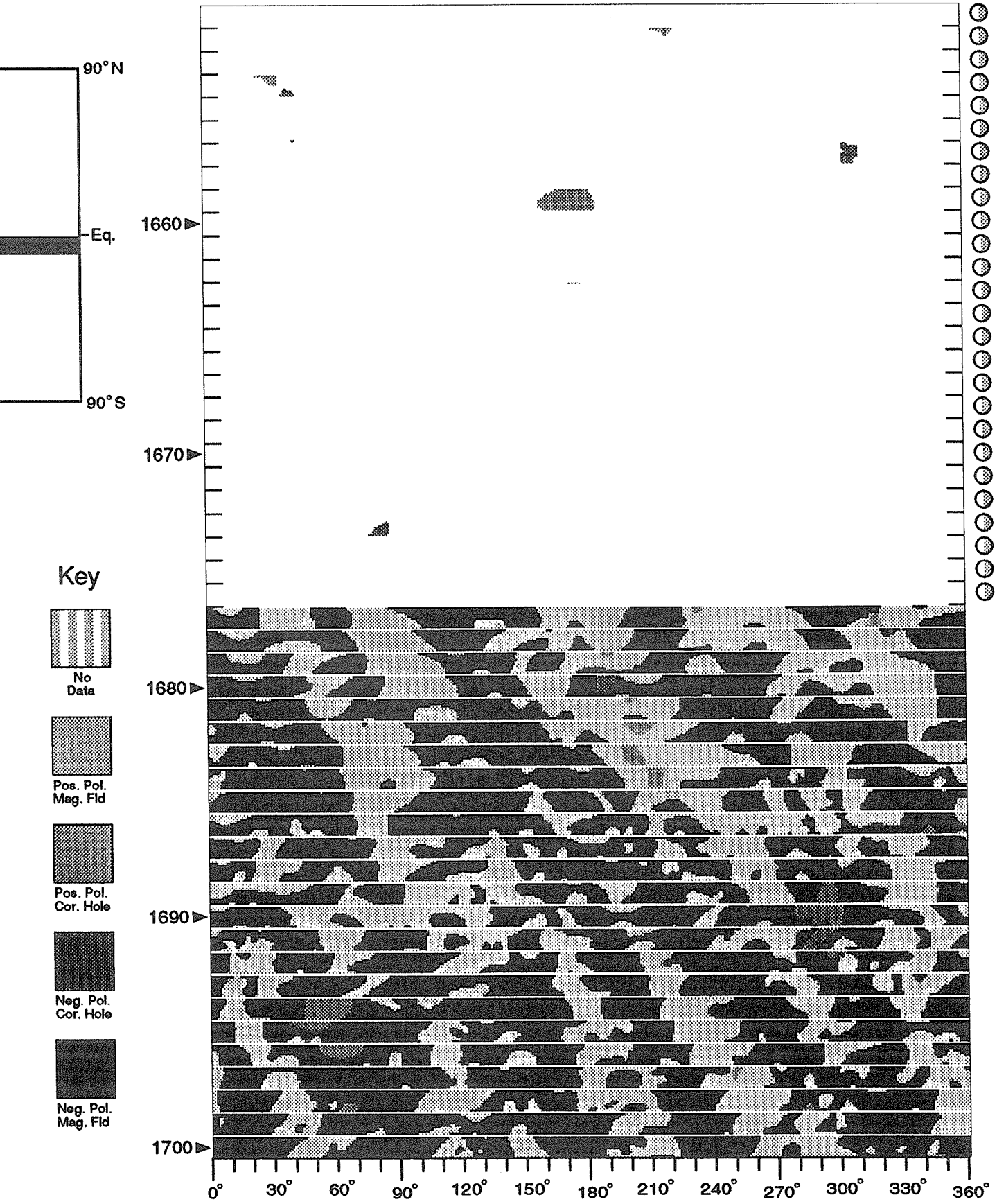


Latitude: South 1 to South 10

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

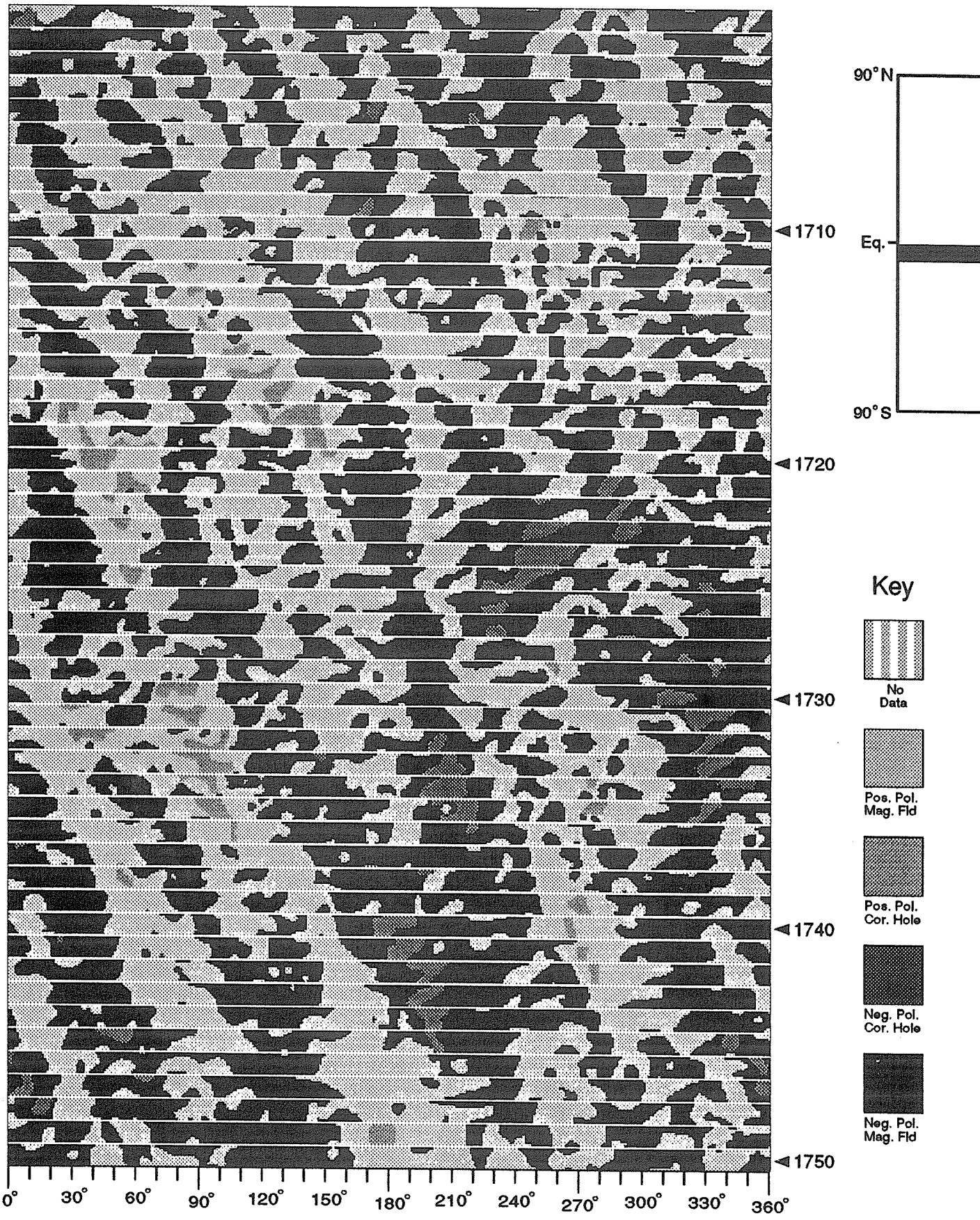
Inferred Magnetic Fields and Coronal Holes



From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: South 1 to South 10

Inferred Magnetic Fields and Coronal Holes

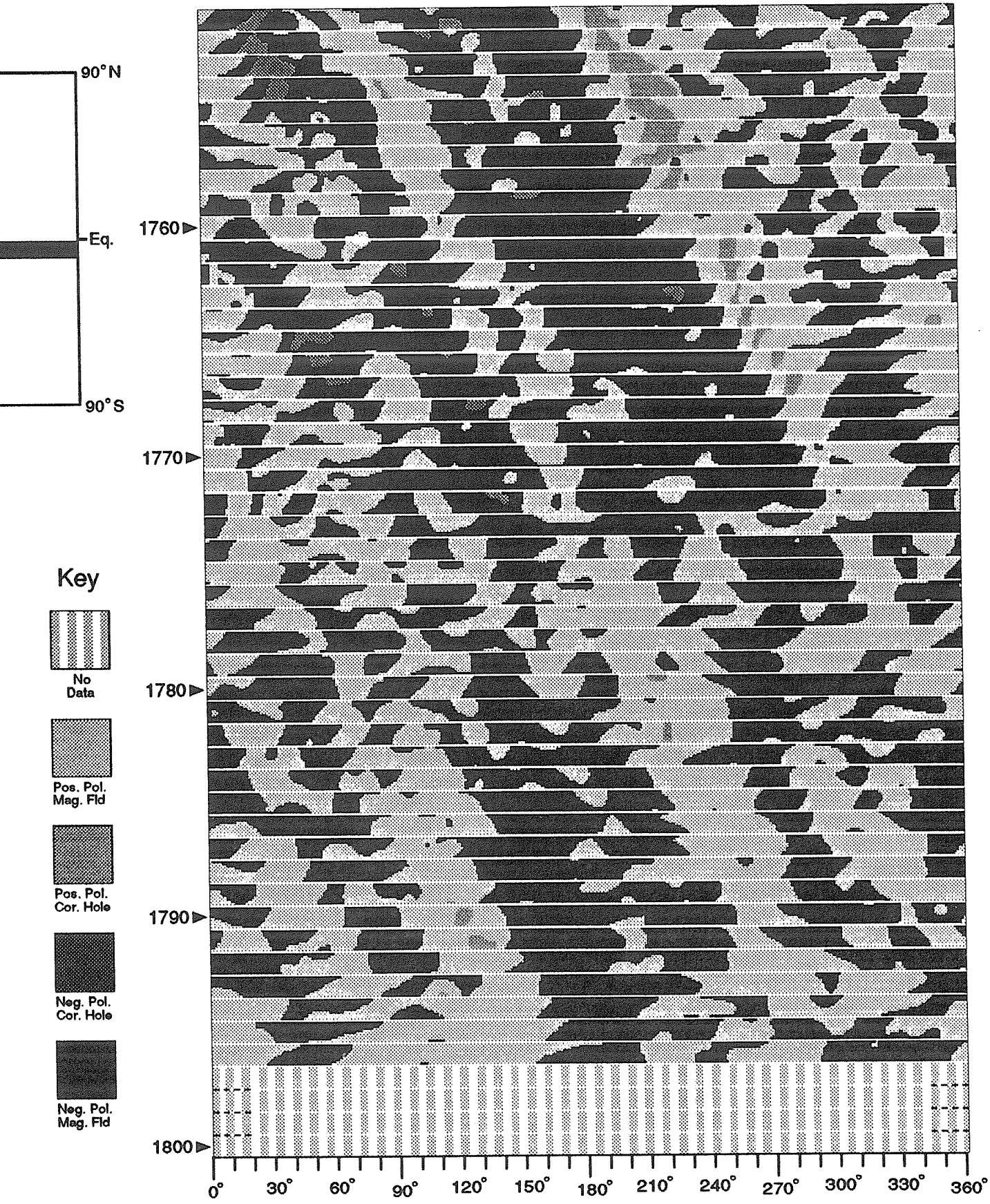


Latitude: South 1 to South 10

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

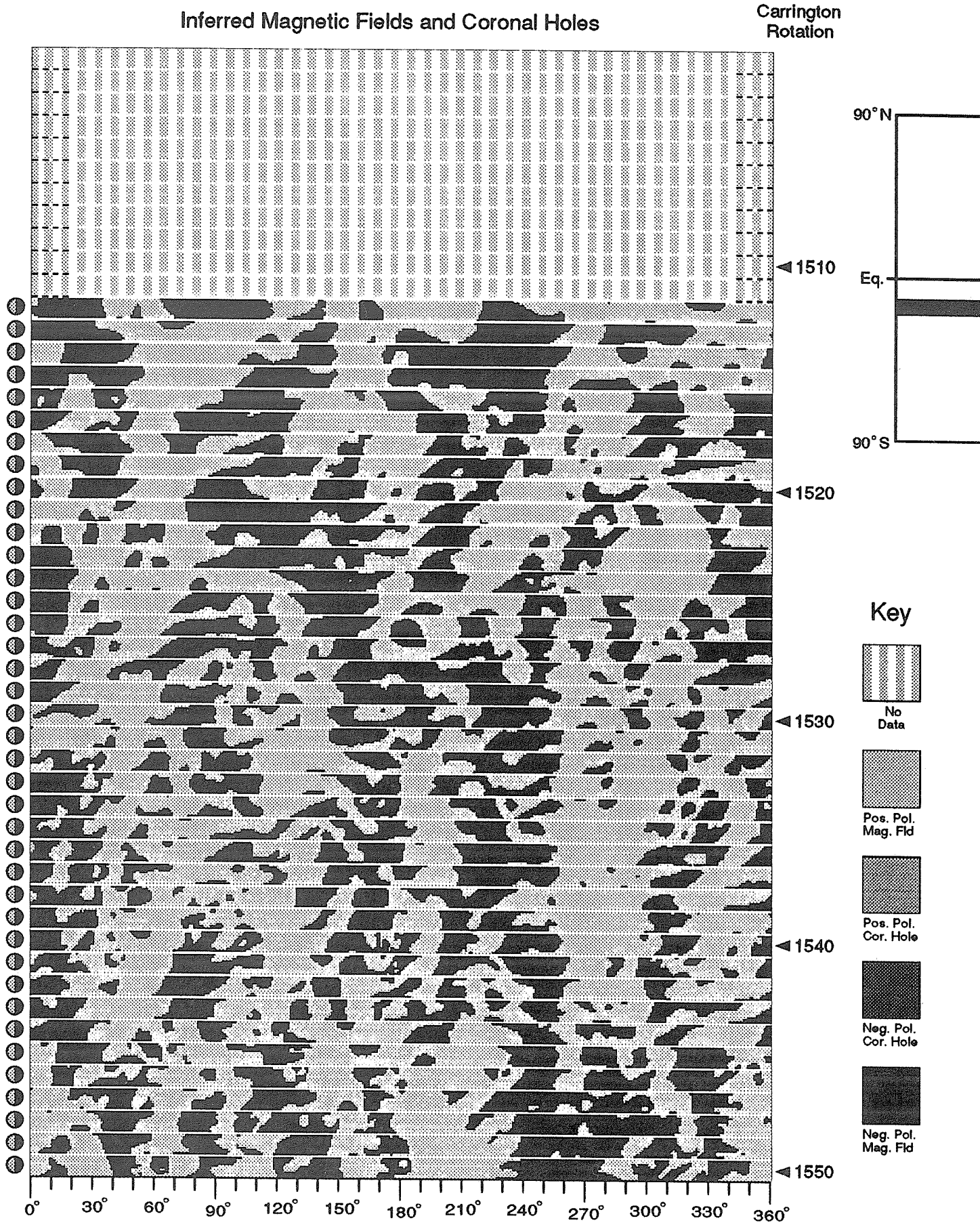
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 11th Apr 1988

Latitude: South 1 to South 10

Inferred Magnetic Fields and Coronal Holes

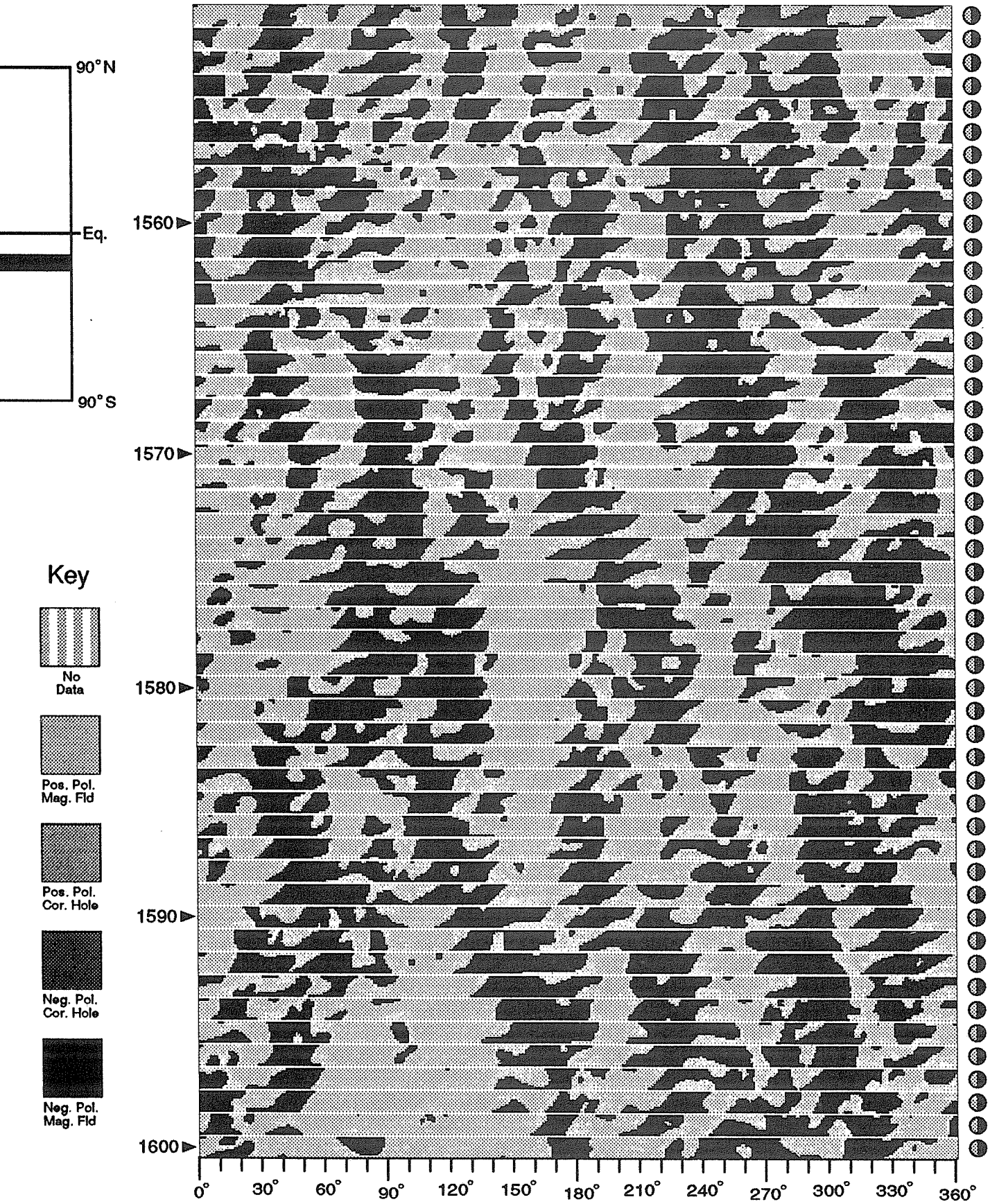


Latitude: South 11 to South 20

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



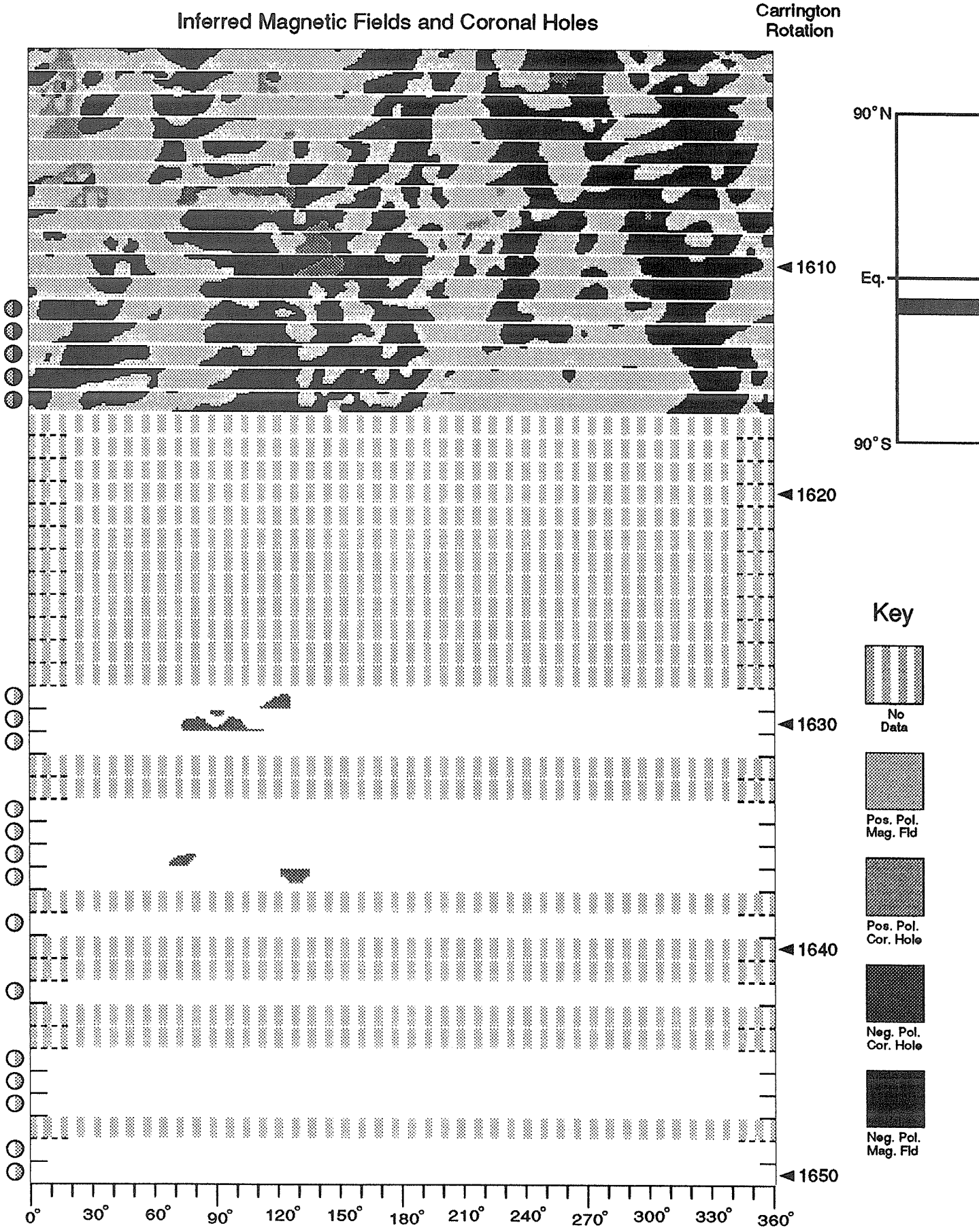
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 10th Aug 1969
To: 5th May 1973

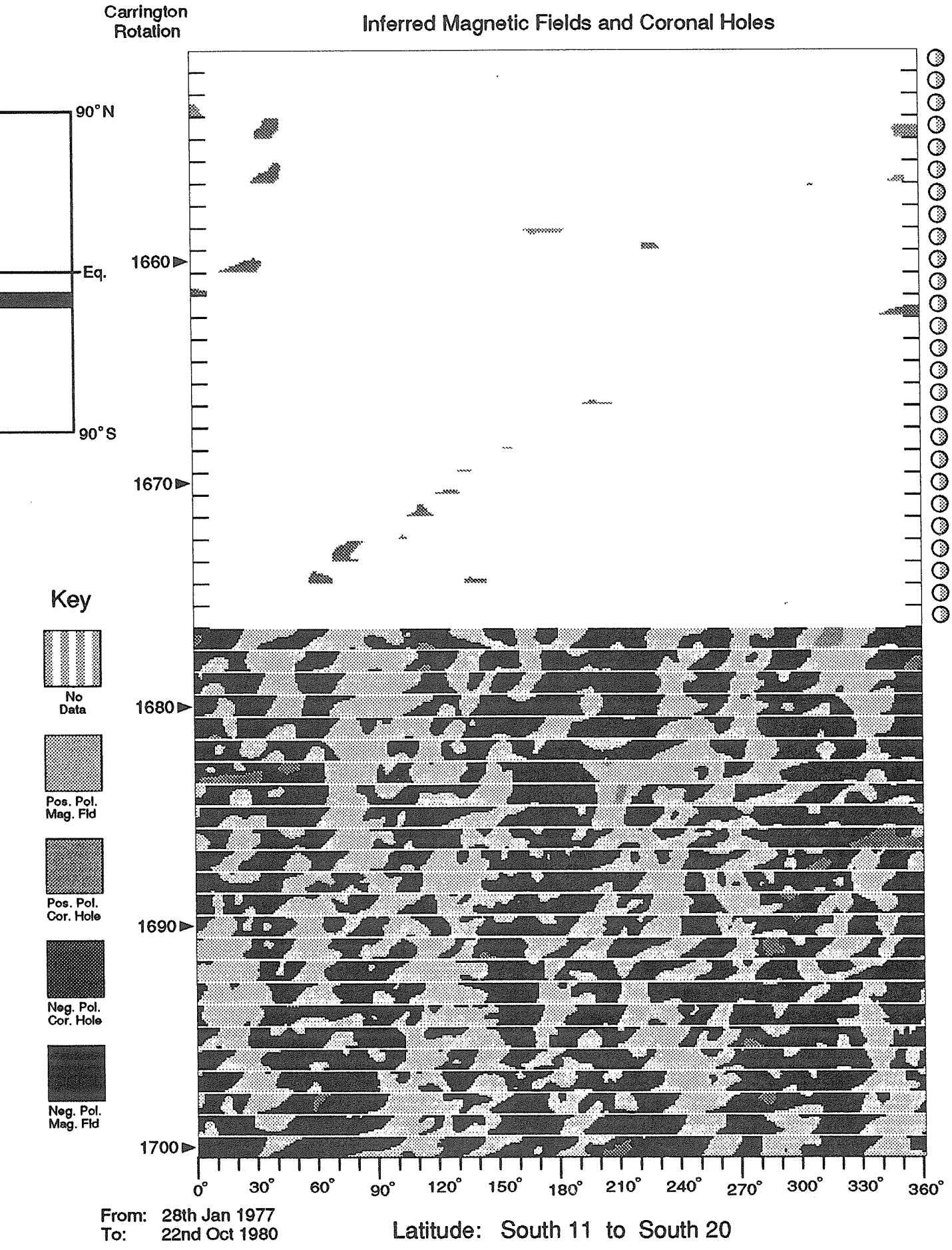
Latitude: South 11 to South 20

Inferred Magnetic Fields and Coronal Holes

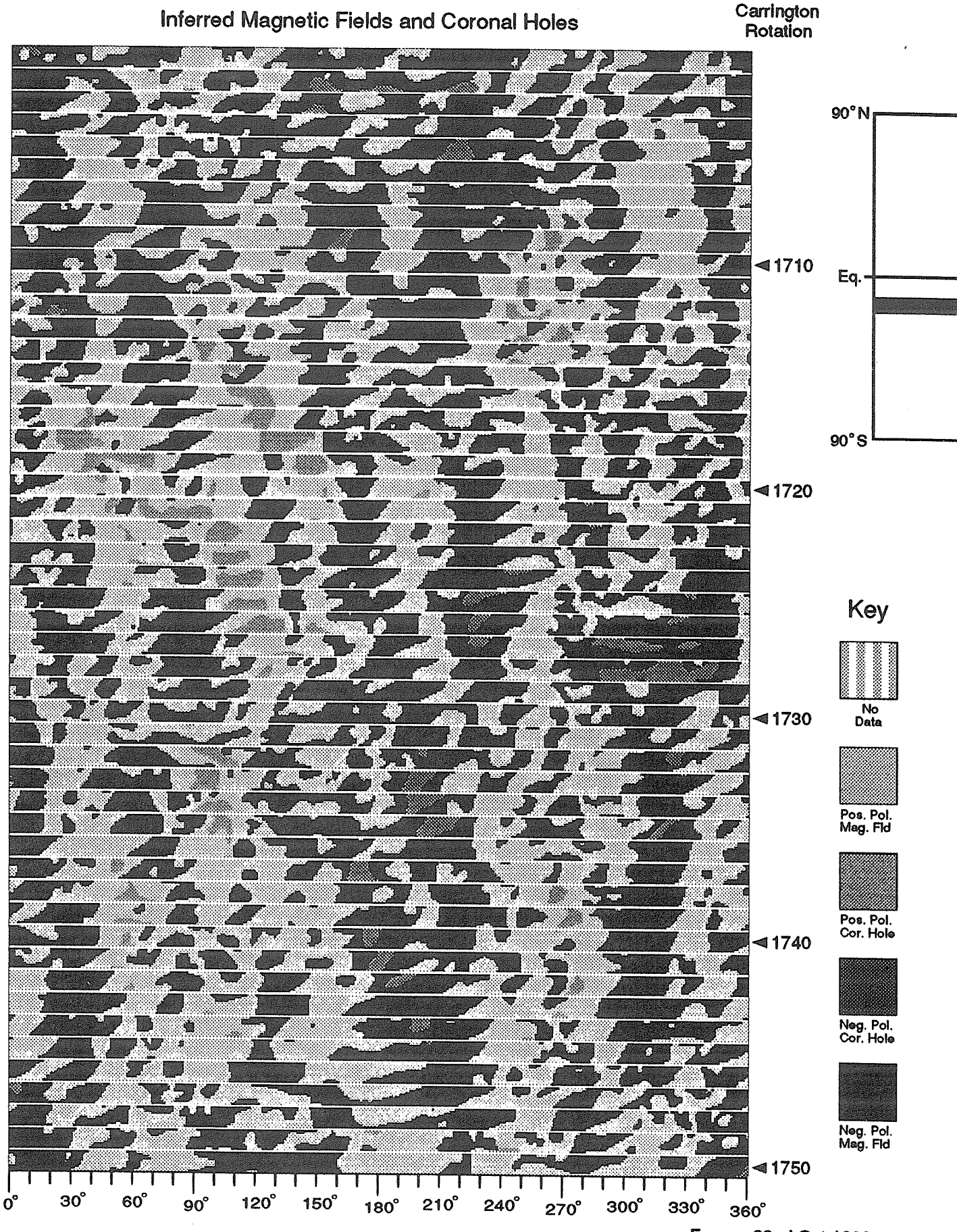


Latitude: South 11 to South 20

From: 5th May 1973
To: 28th Jan 1977


Carrington Rotation
Inferred Magnetic Fields and Coronal Holes
90°N
Eq.
90°S
1660
1670
1680
1690
1700
Key
No Data
Pos. Pol. Mag. Fld
Pos. Pol. Cor. Hole
Neg. Pol. Cor. Hole
Neg. Pol. Mag. Fld
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
From: 28th Jan 1977
To: 22nd Oct 1980
Latitude: South 11 to South 20

Inferred Magnetic Fields and Coronal Holes

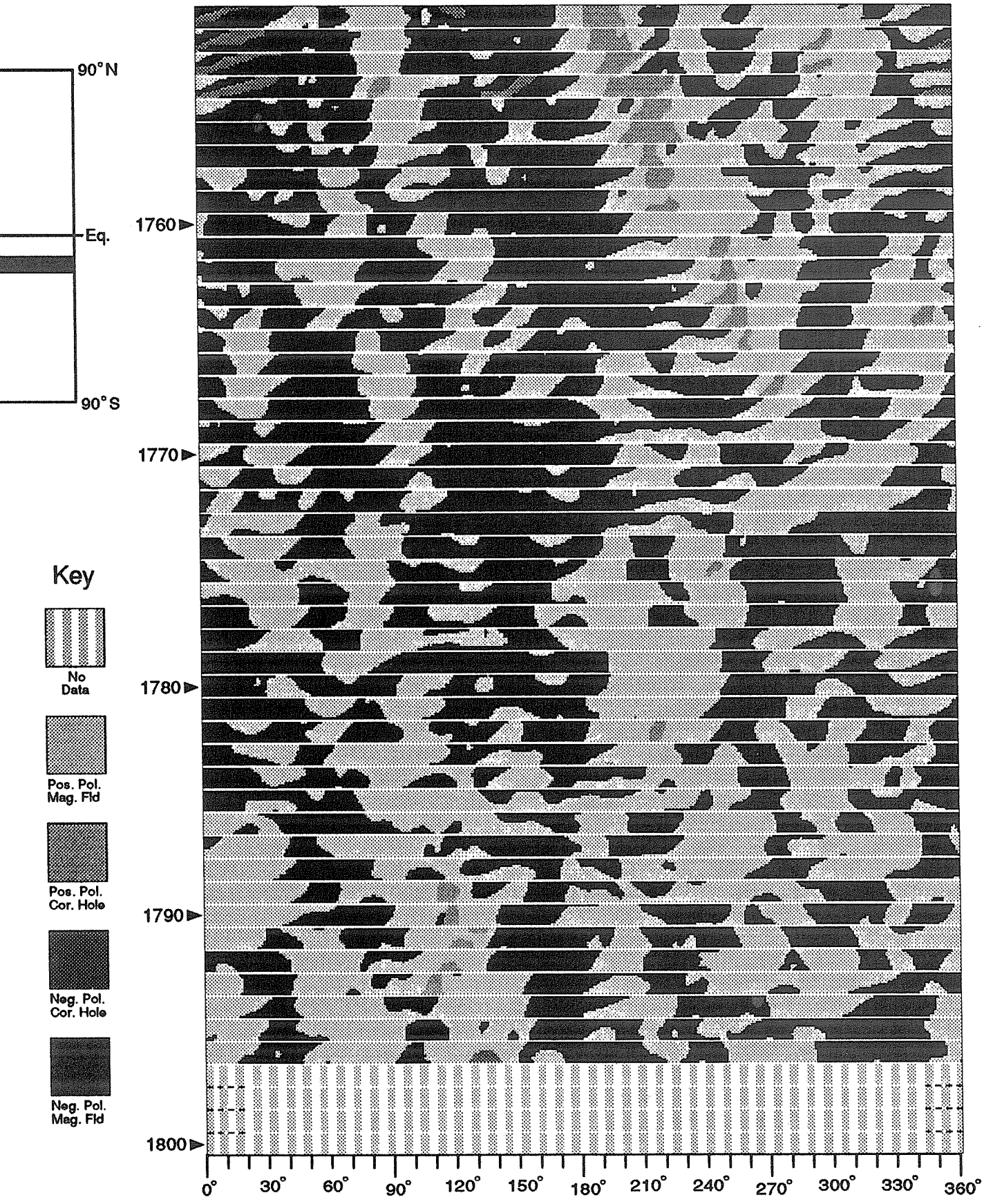


Latitude: South 11 to South 20

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

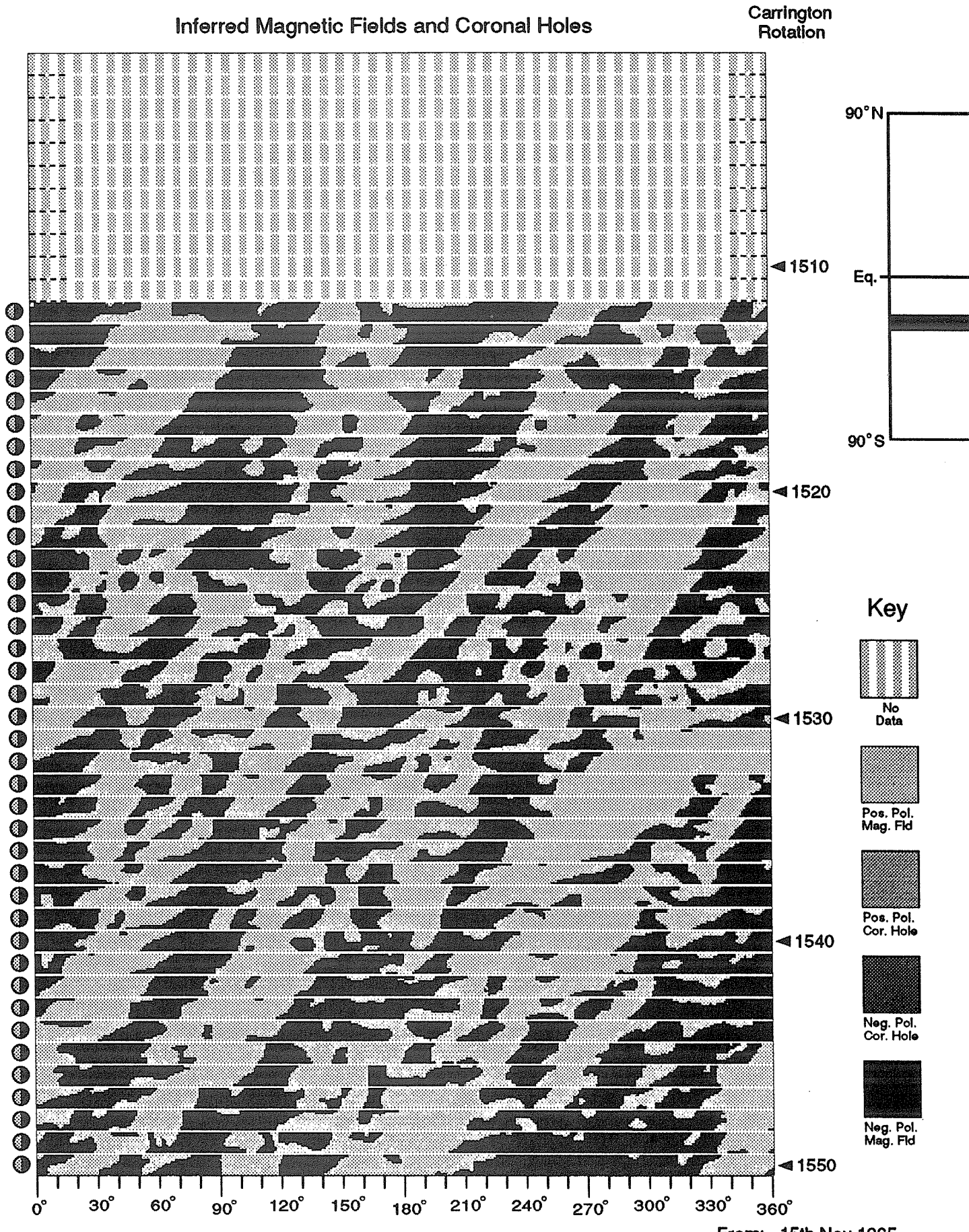
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 11th Apr 1988

Latitude: South 11 to South 20

Inferred Magnetic Fields and Coronal Holes

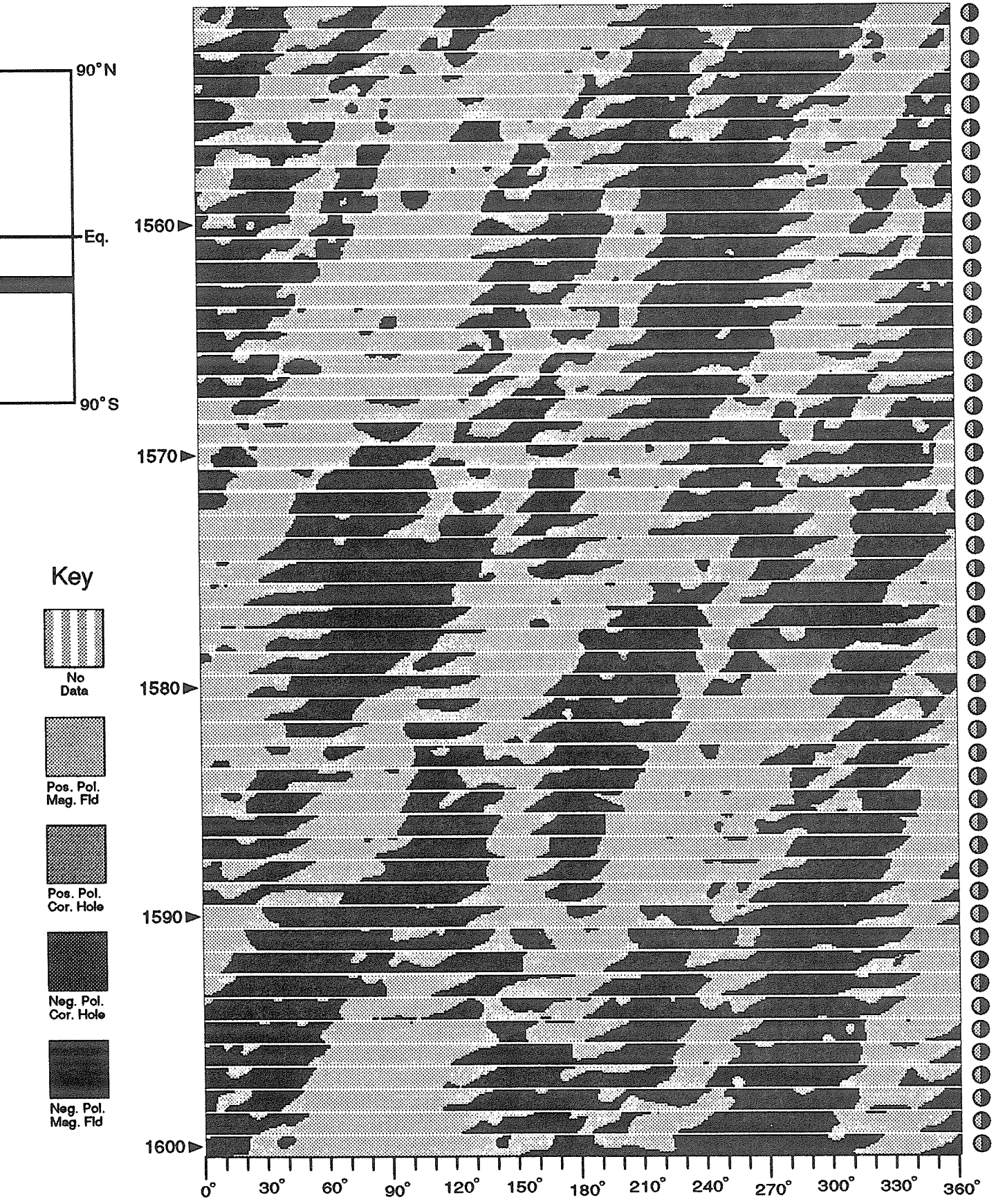


Latitude: South 21 to South 30

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



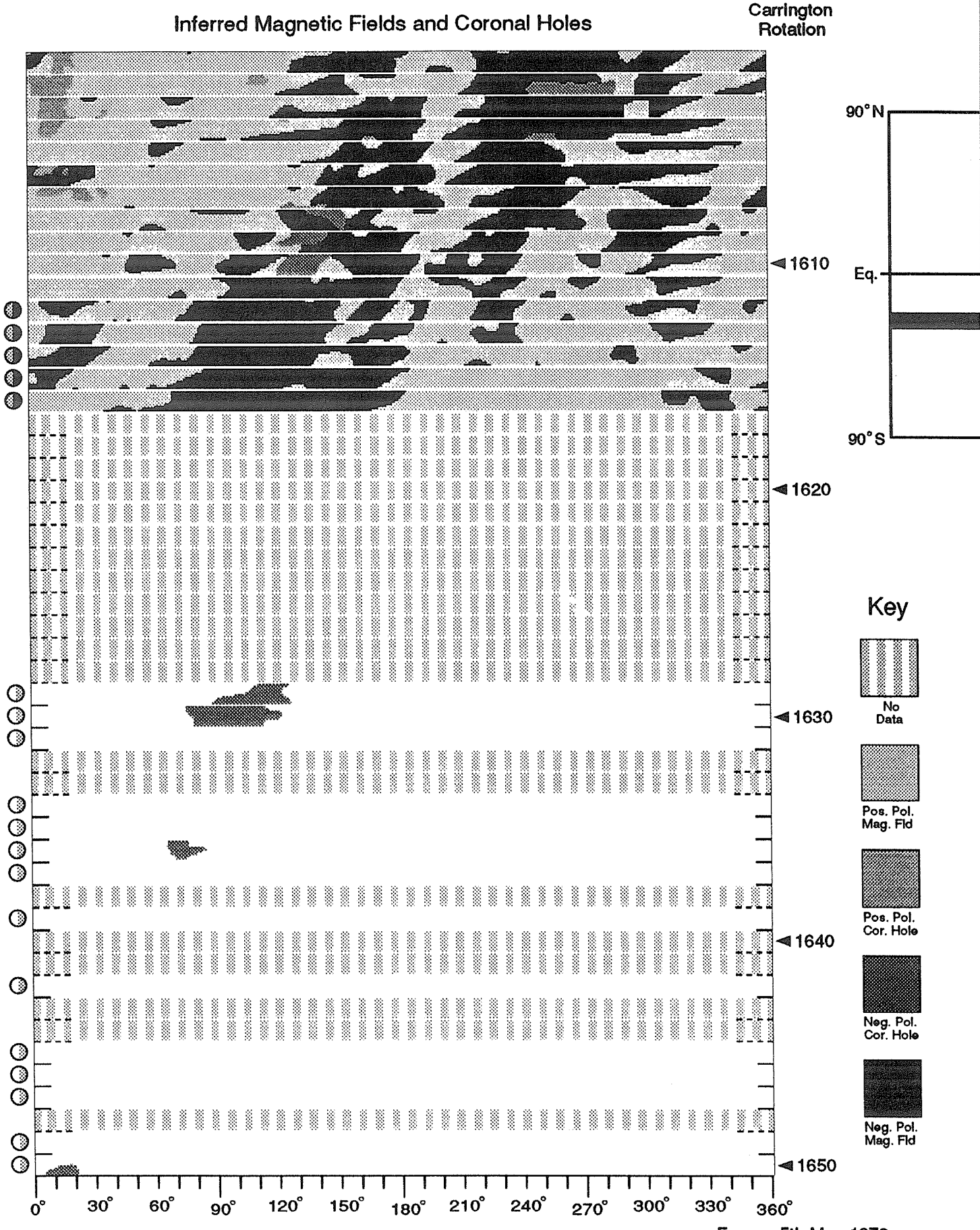
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 10th Aug 1969
To: 5th May 1973

Latitude: South 21 to South 30

Inferred Magnetic Fields and Coronal Holes

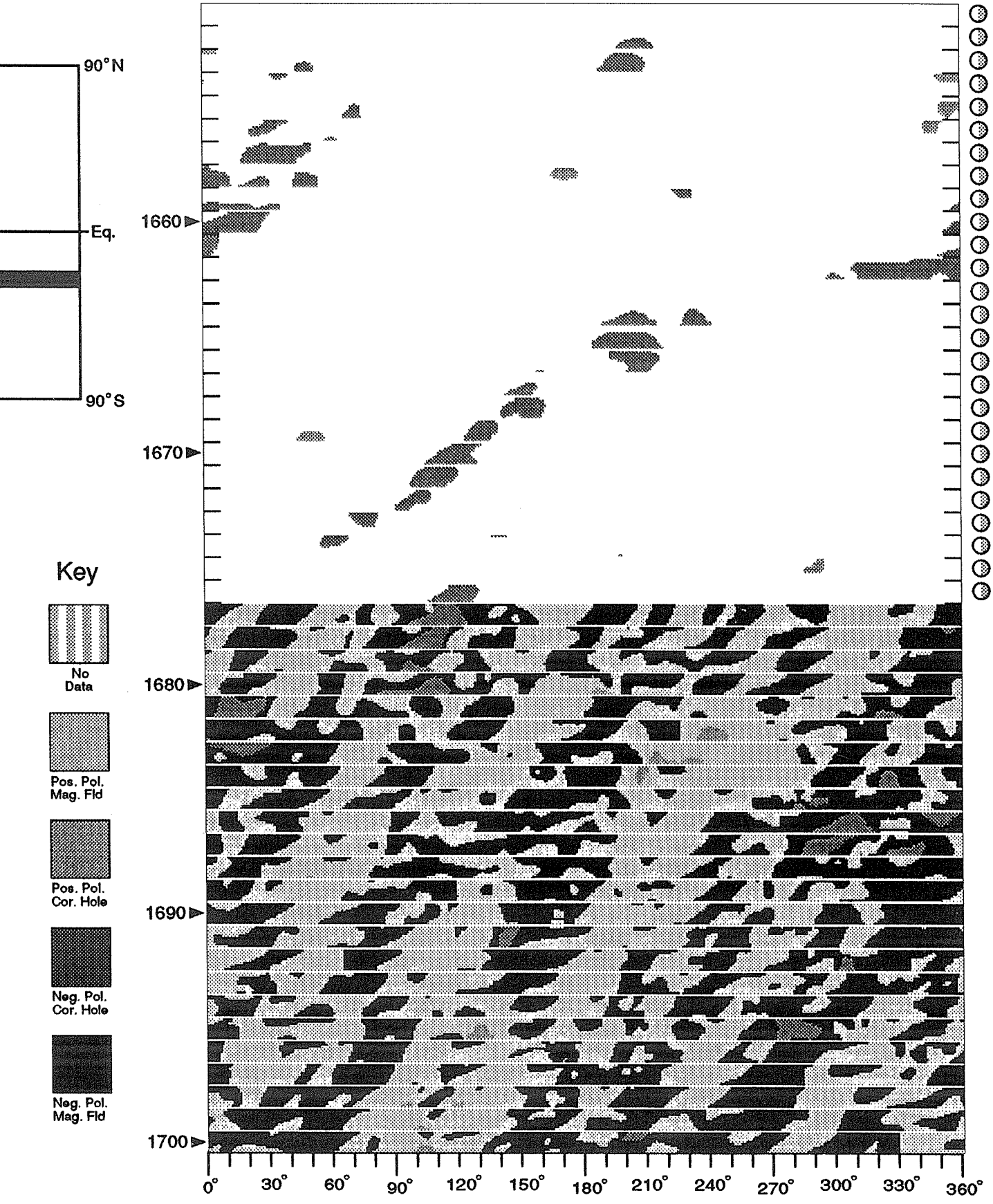


Latitude: South 21 to South 30

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



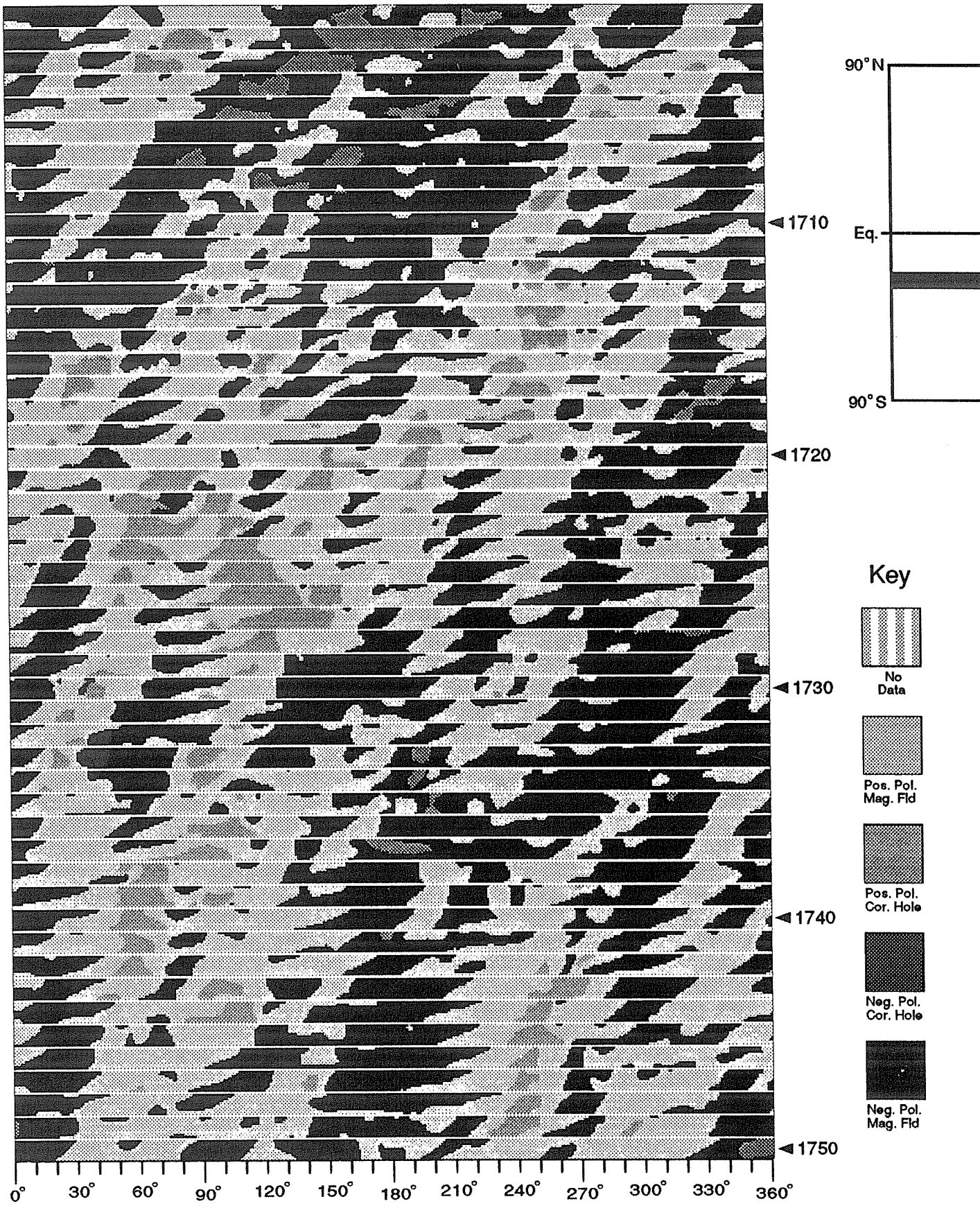
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: South 21 to South 30

Inferred Magnetic Fields and Coronal Holes

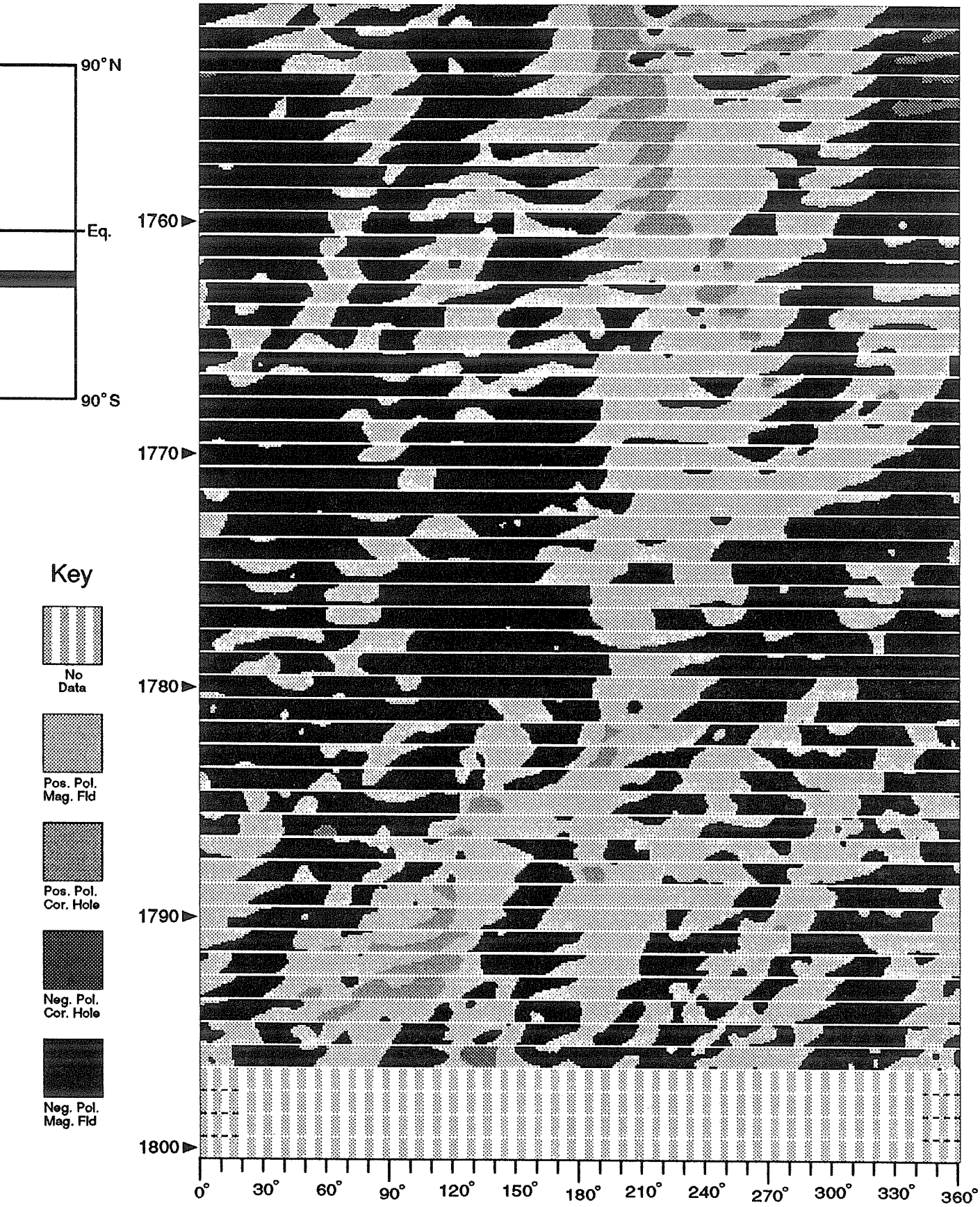


Latitude: South 21 to South 30

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

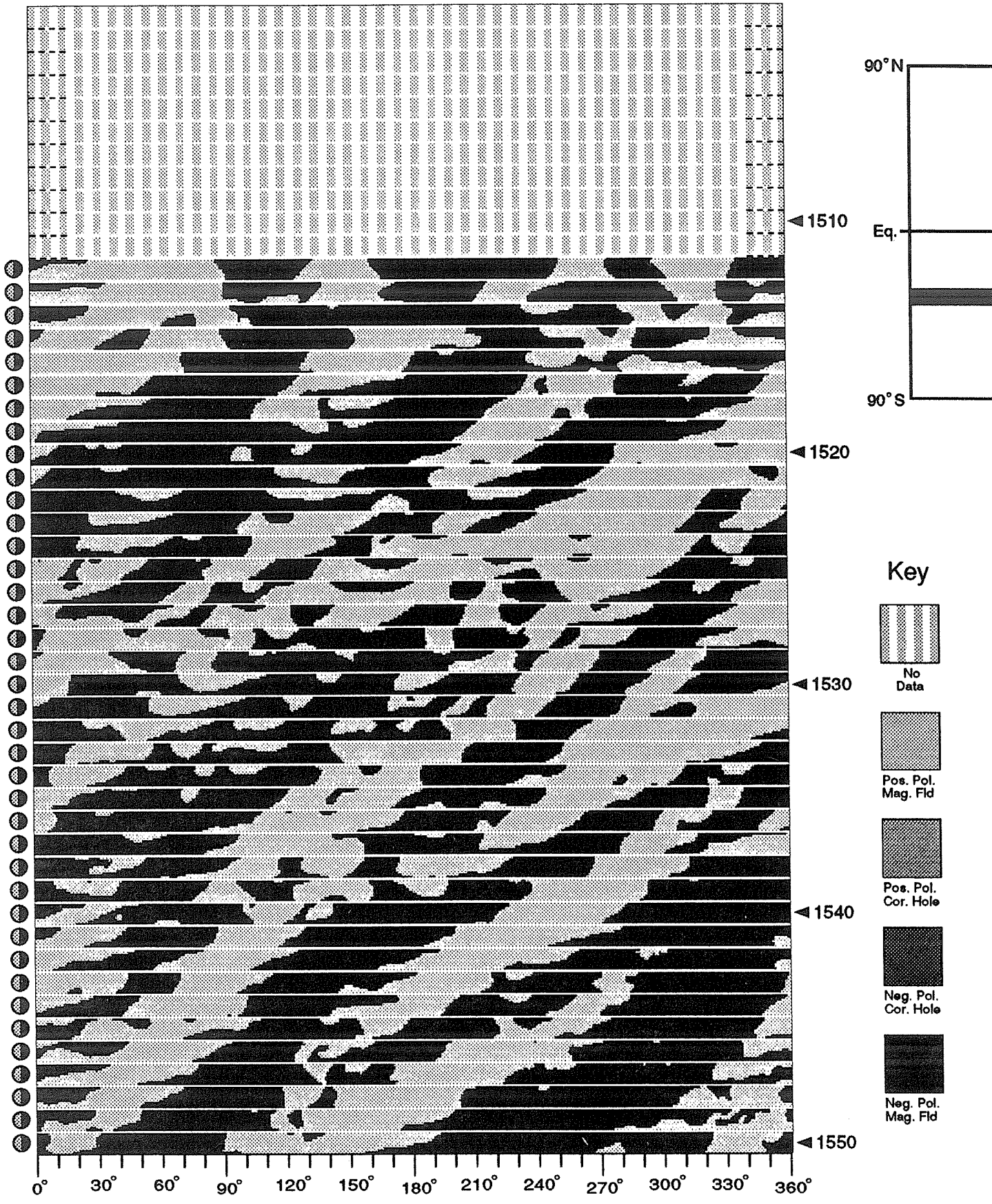
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 11th Apr 1988

Latitude: South 21 to South 30

Inferred Magnetic Fields and Coronal Holes

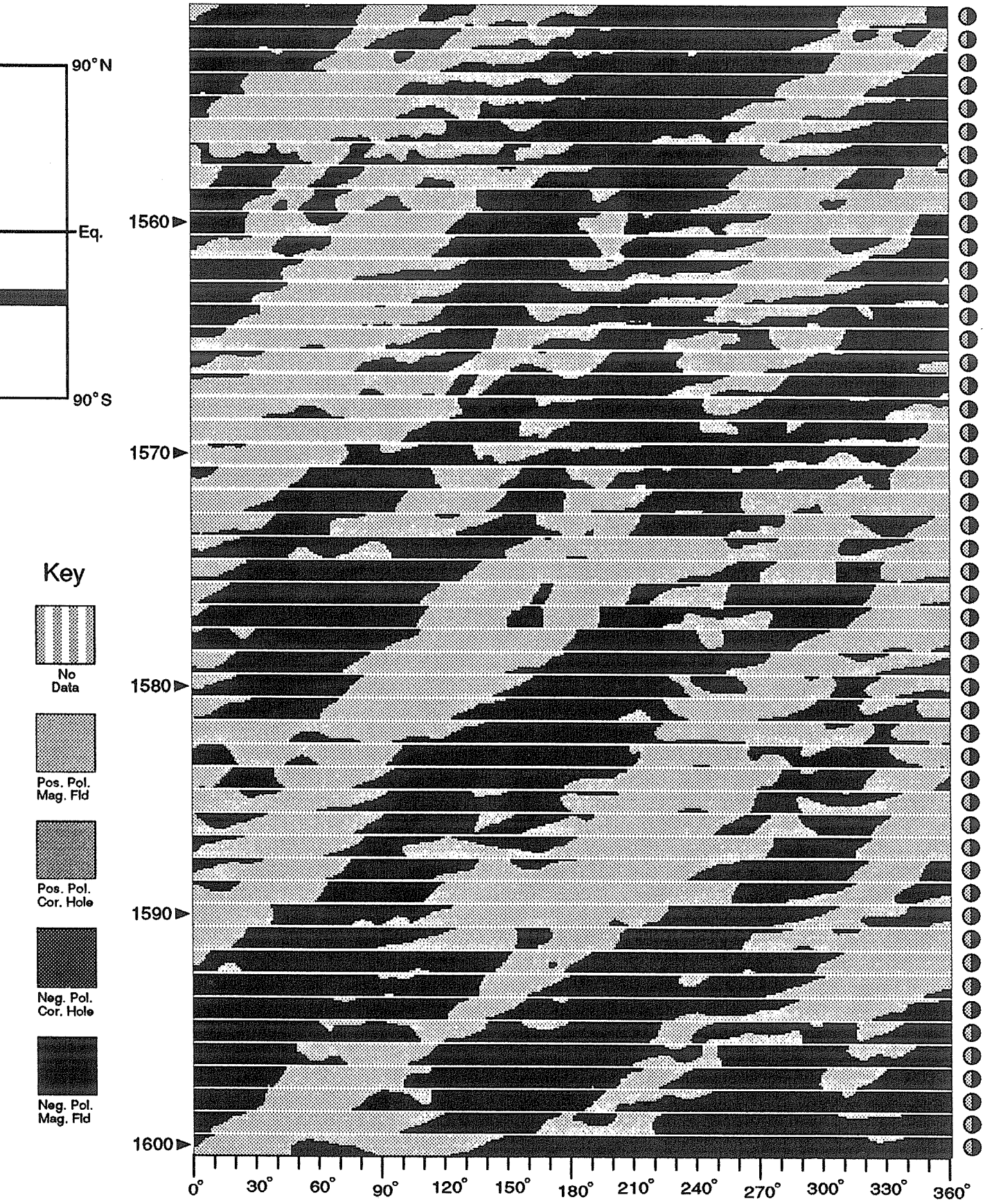


Latitude: South 31 to South 40

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



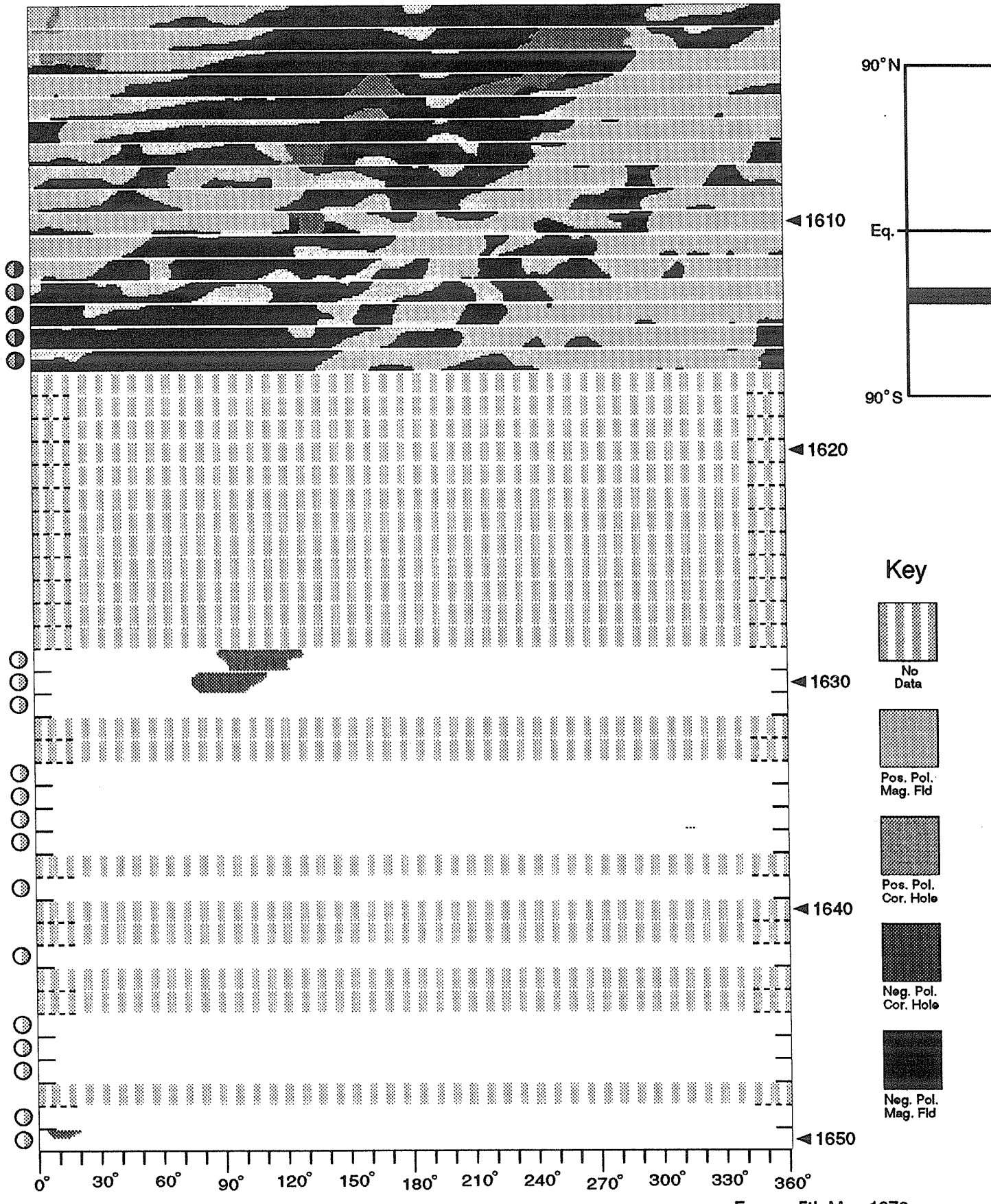
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 10th Aug 1969
To: 5th May 1973

Latitude: South 31 to South 40

Inferred Magnetic Fields and Coronal Holes

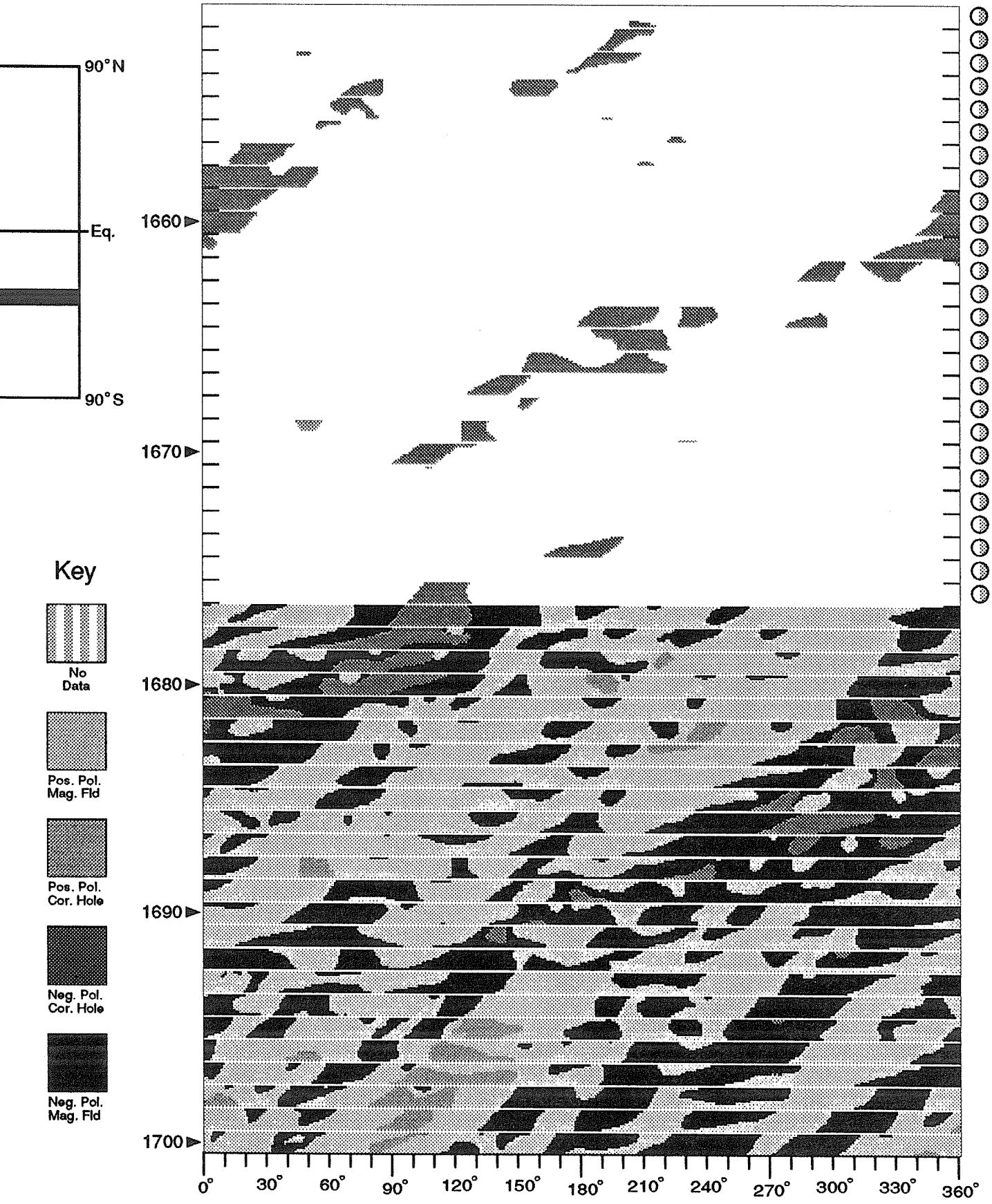


Latitude: South 31 to South 40

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



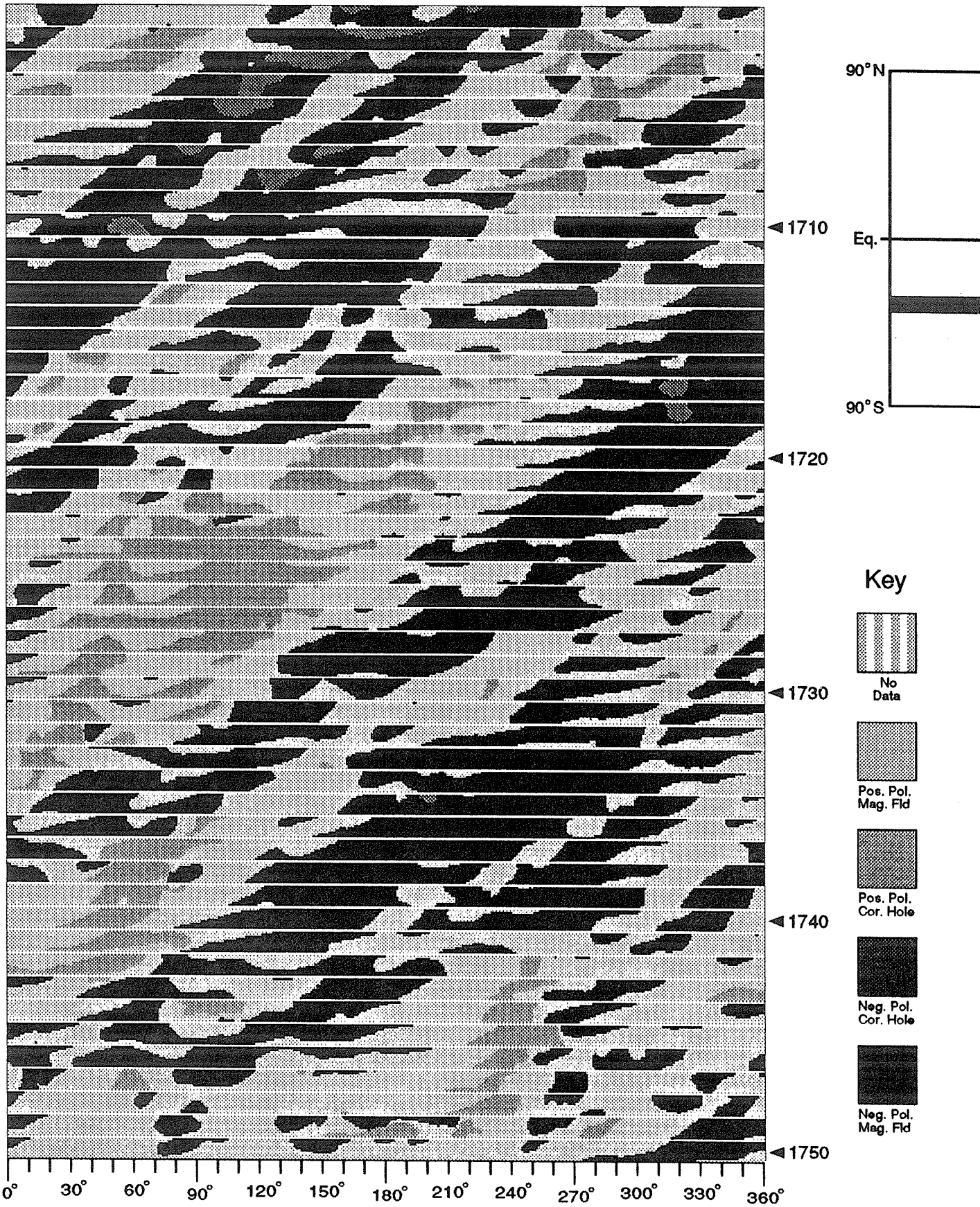
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: South 31 to South 40

Inferred Magnetic Fields and Coronal Holes

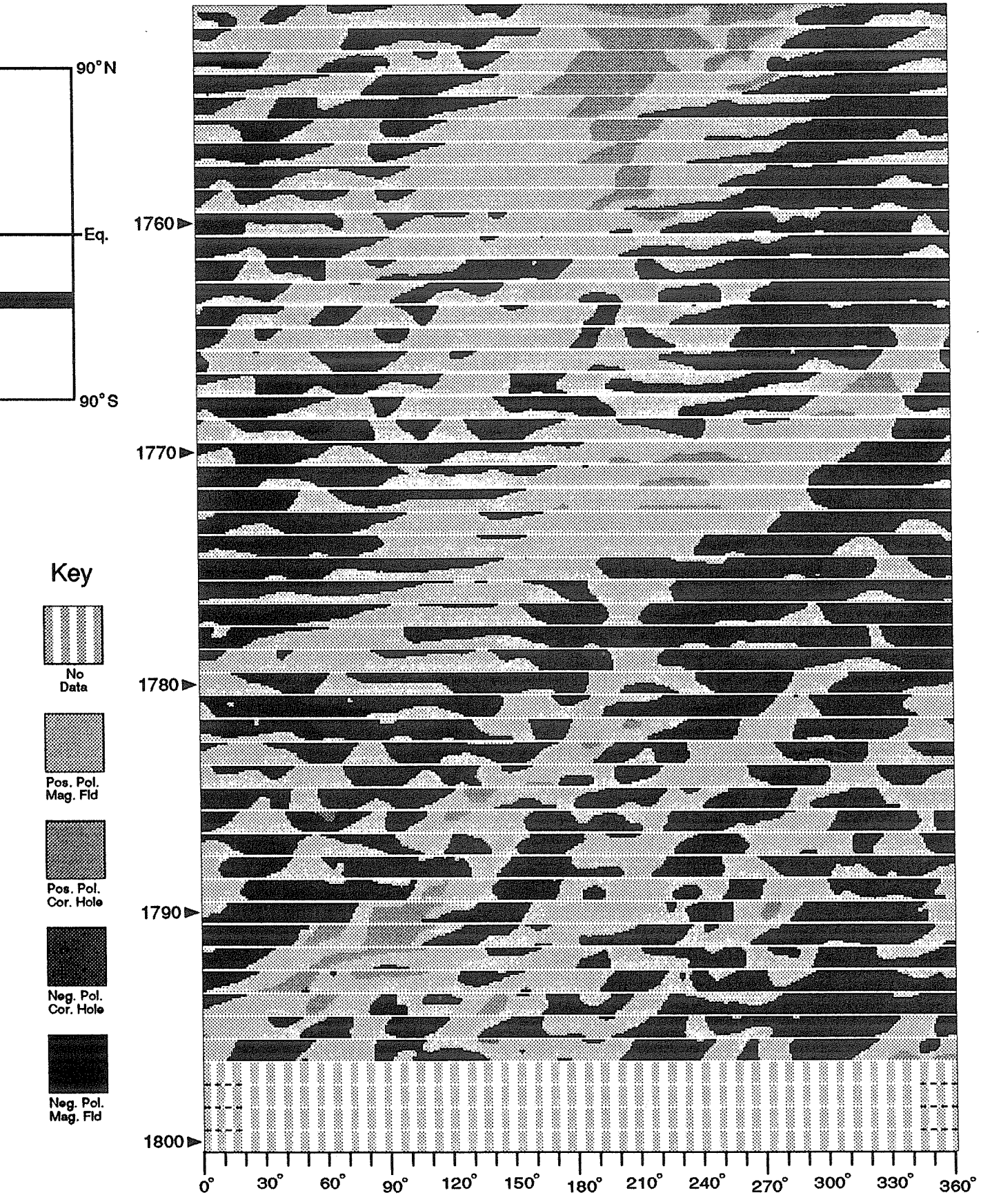


Latitude: South 31 to South 40

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

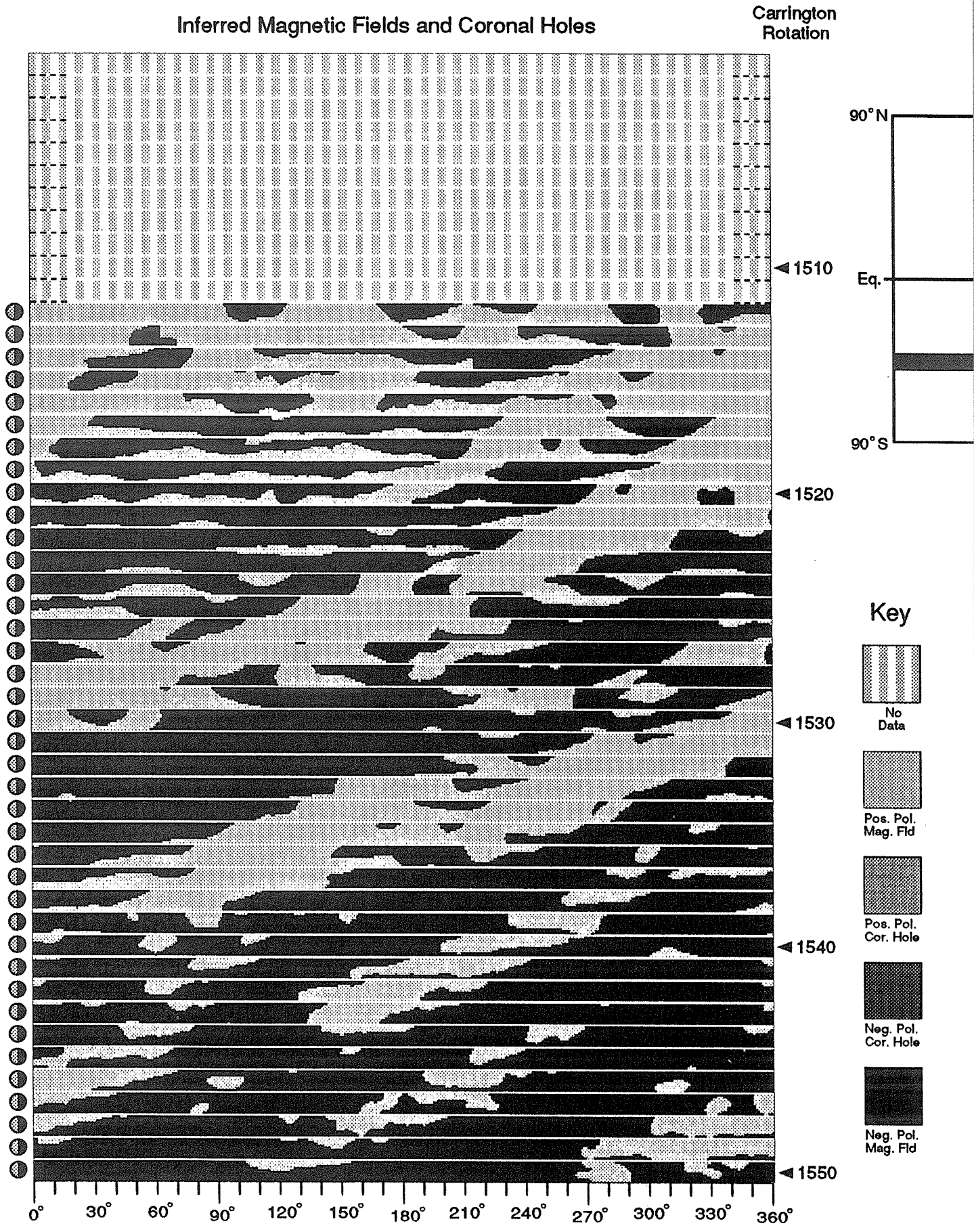
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 11th Apr 1988

Latitude: South 31 to South 40

Inferred Magnetic Fields and Coronal Holes

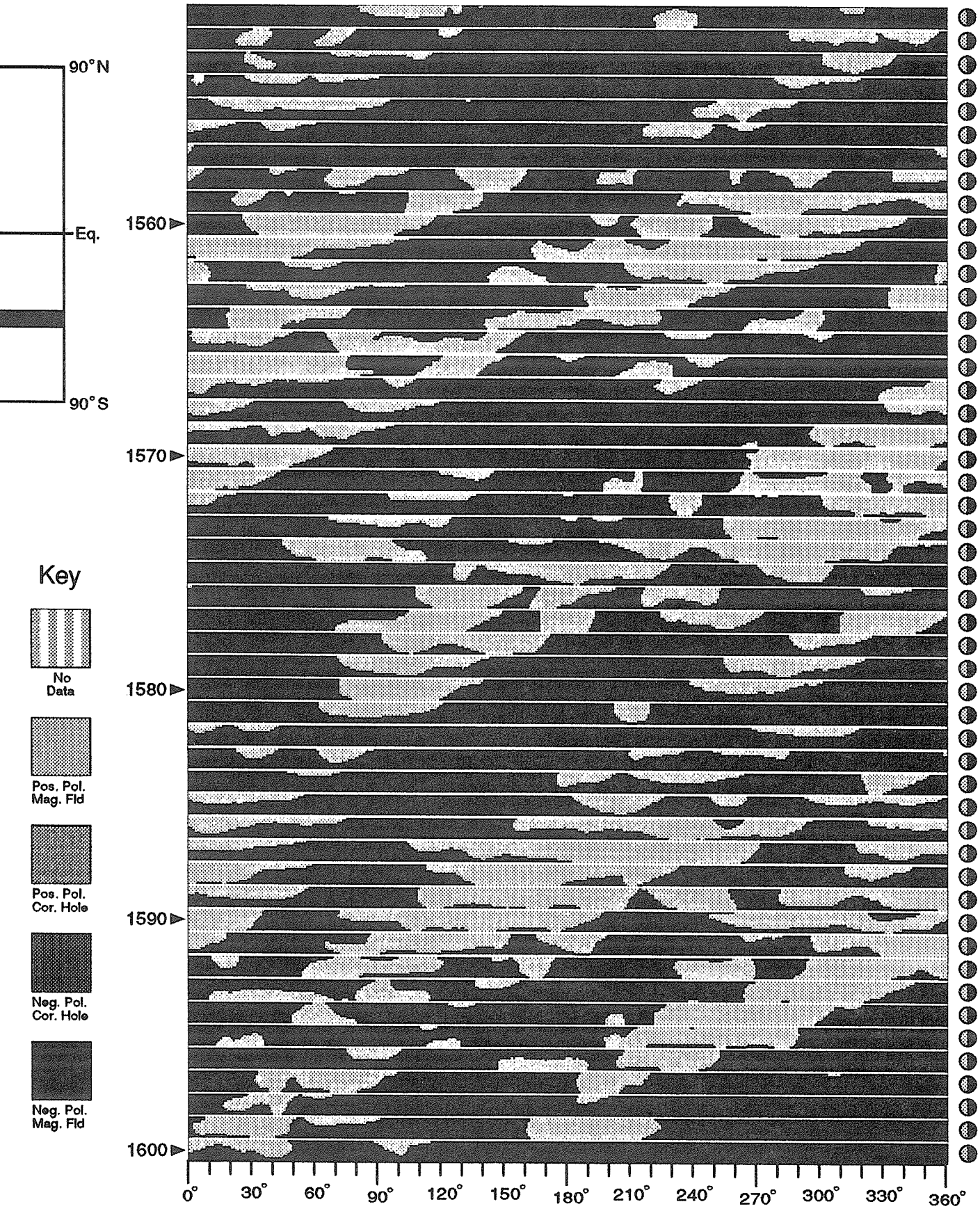


Latitude: South 41 to South 50

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



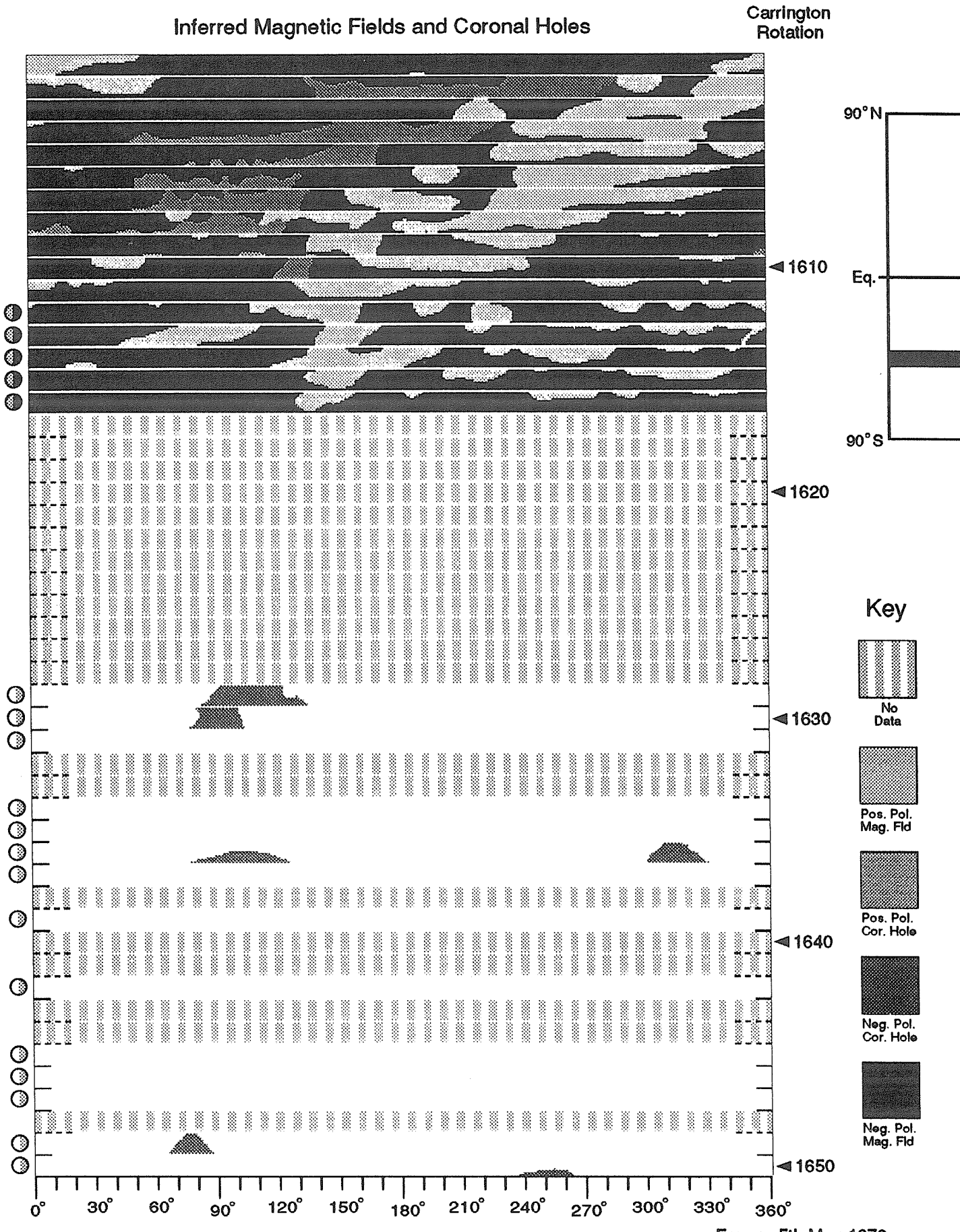
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 10th Aug 1969
To: 5th May 1973

Latitude: South 41 to South 50

Inferred Magnetic Fields and Coronal Holes

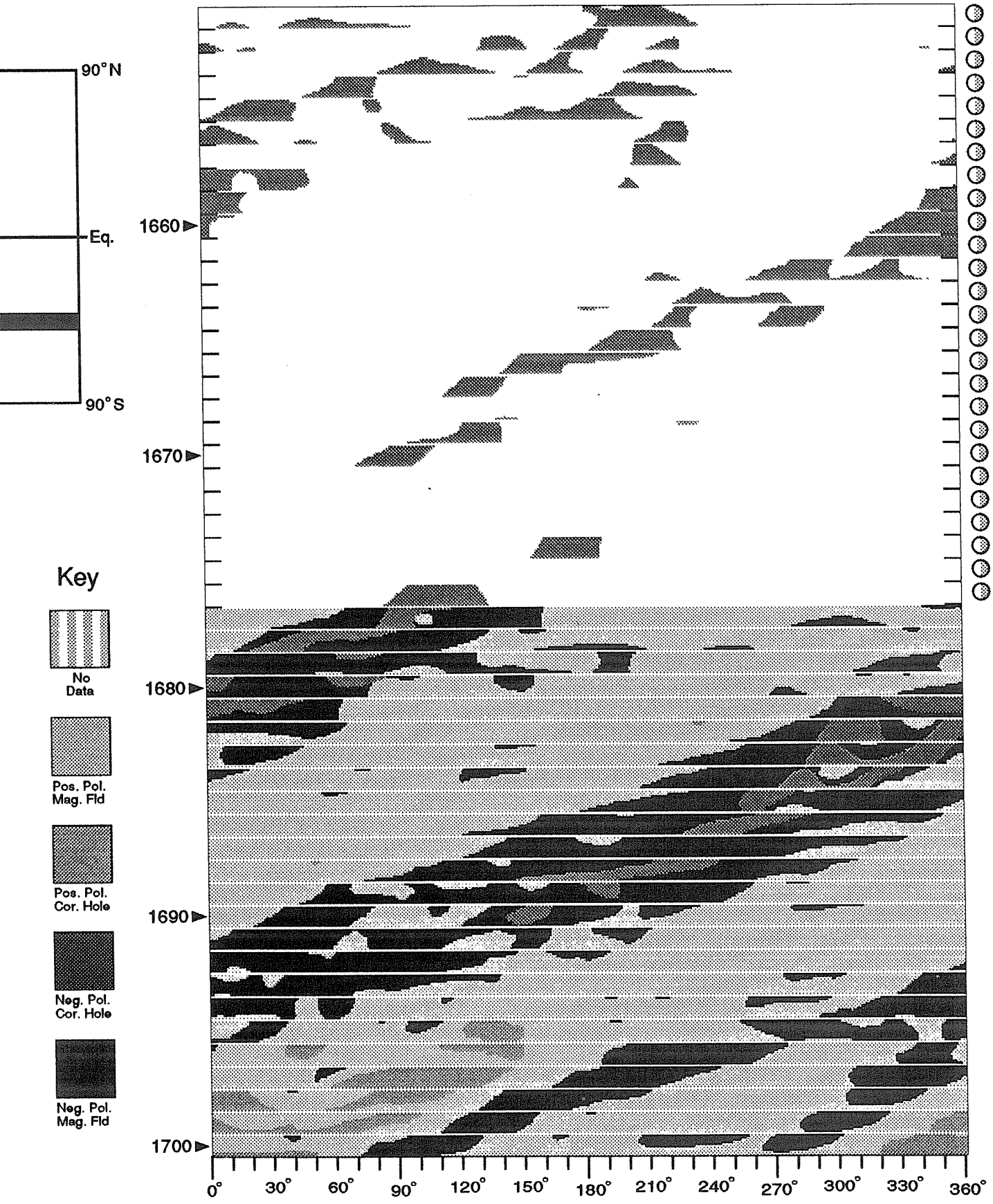


Latitude: South 41 to South 50

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

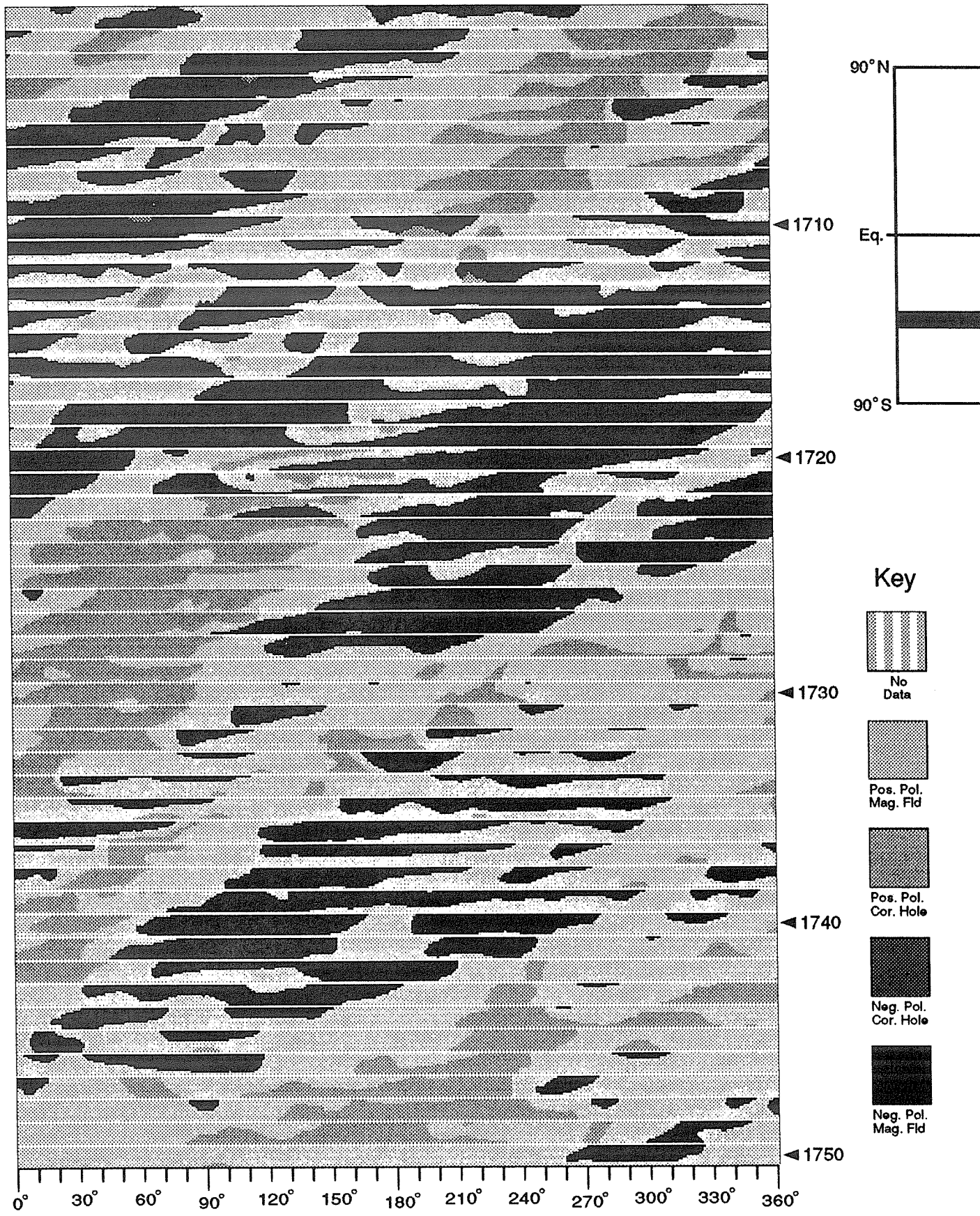
Inferred Magnetic Fields and Coronal Holes



From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: South 41 to South 50

Inferred Magnetic Fields and Coronal Holes

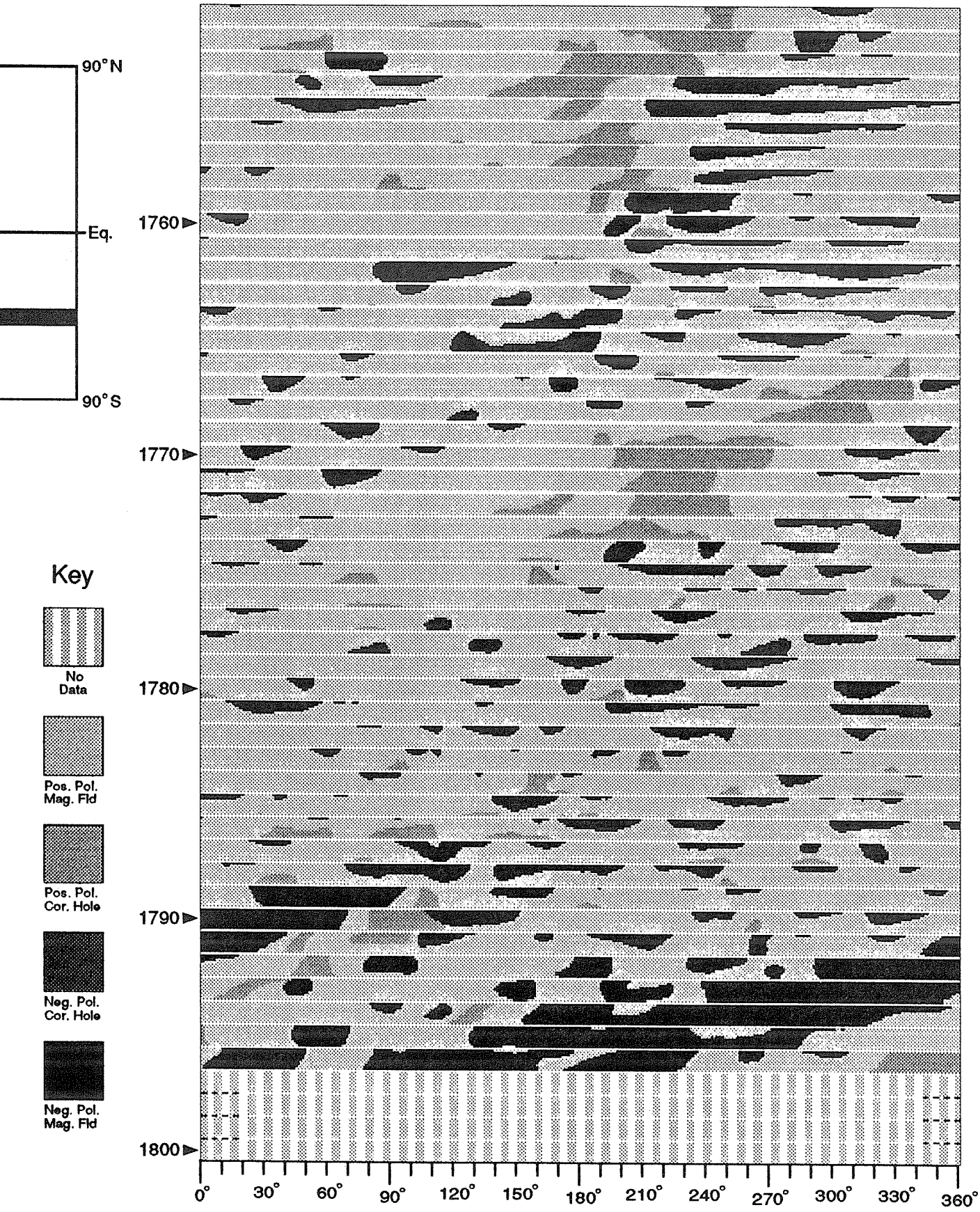


Latitude: South 41 to South 50

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

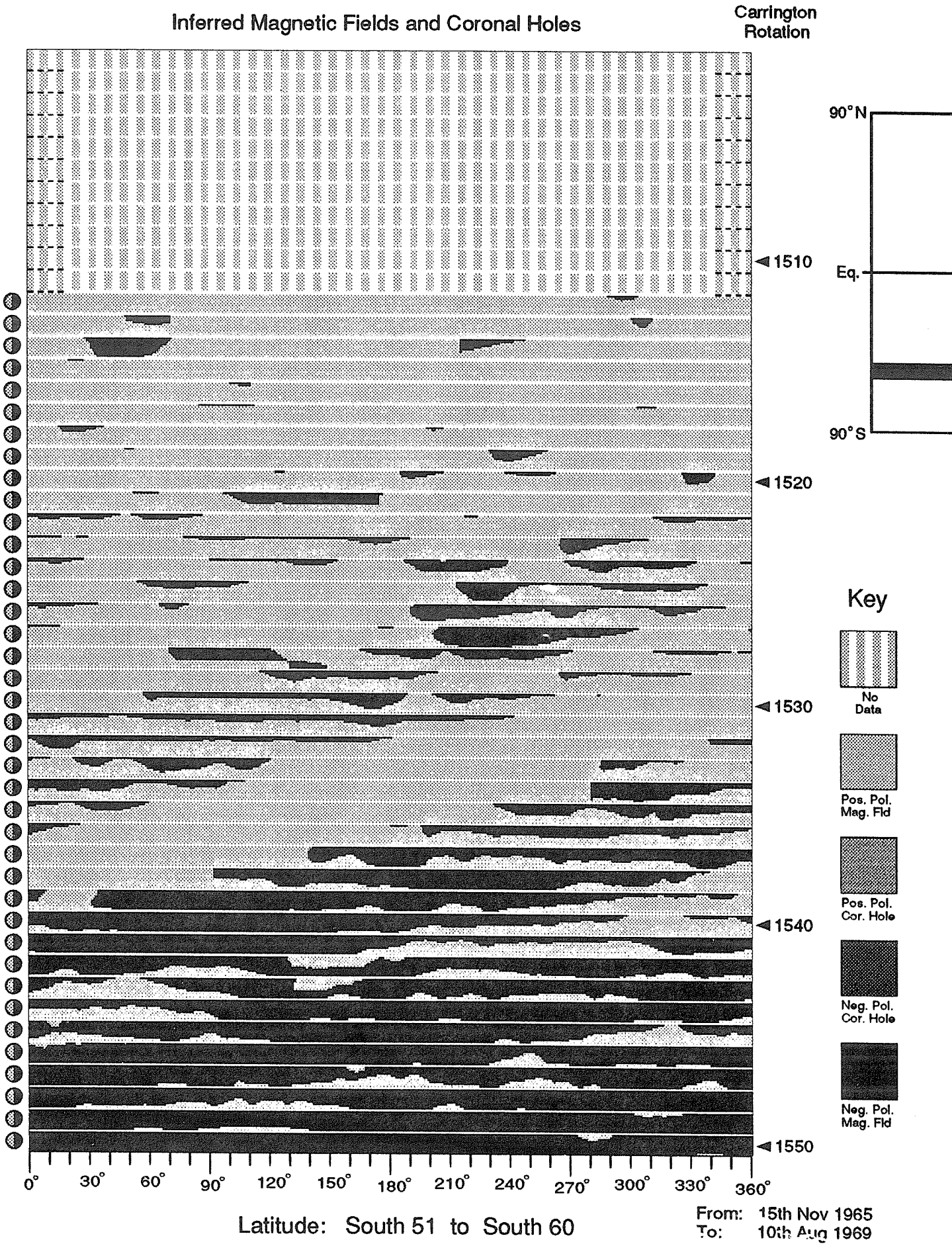
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 11th Apr 1988

Latitude: South 41 to South 50

Inferred Magnetic Fields and Coronal Holes

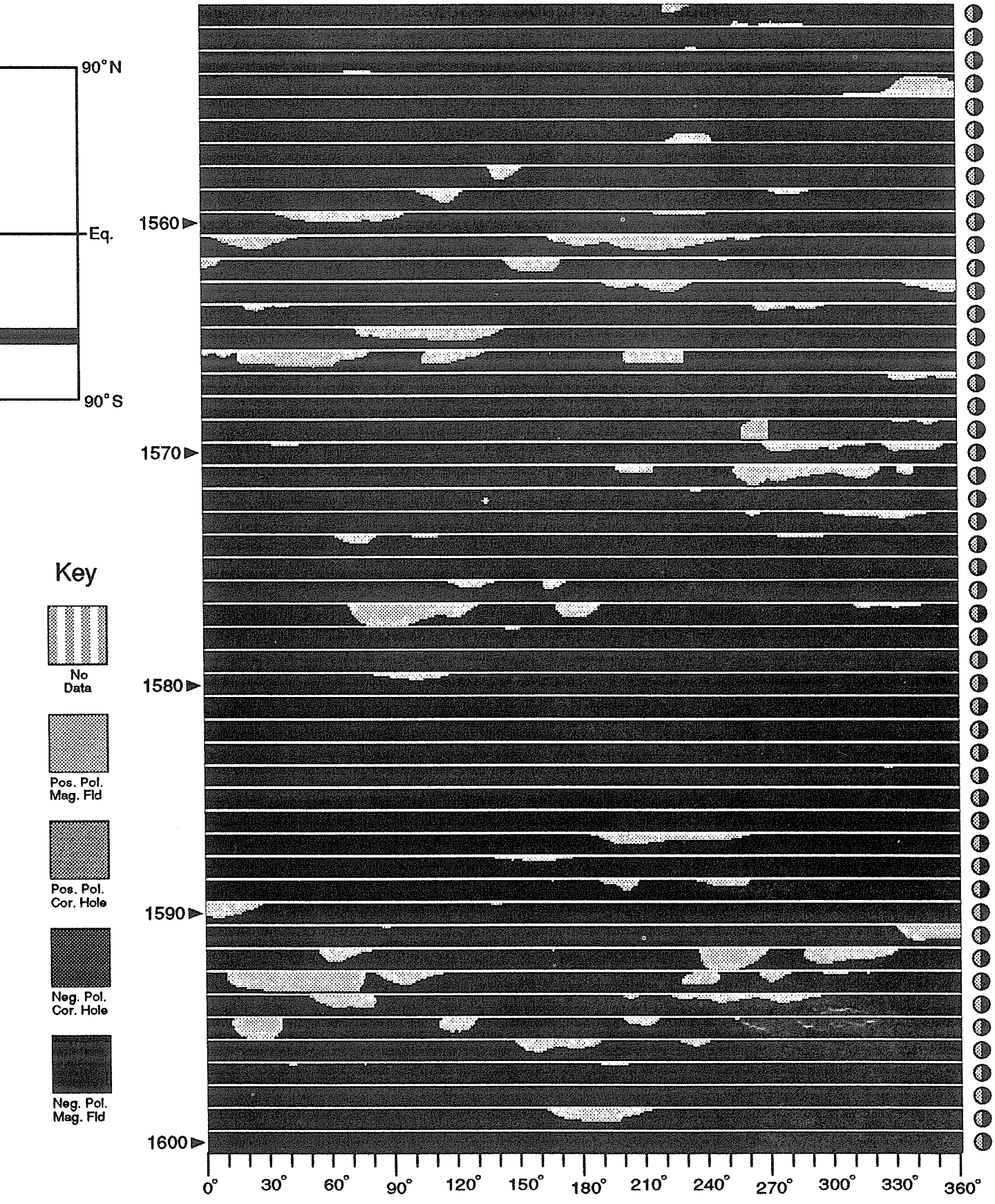


Latitude: South 51 to South 60

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



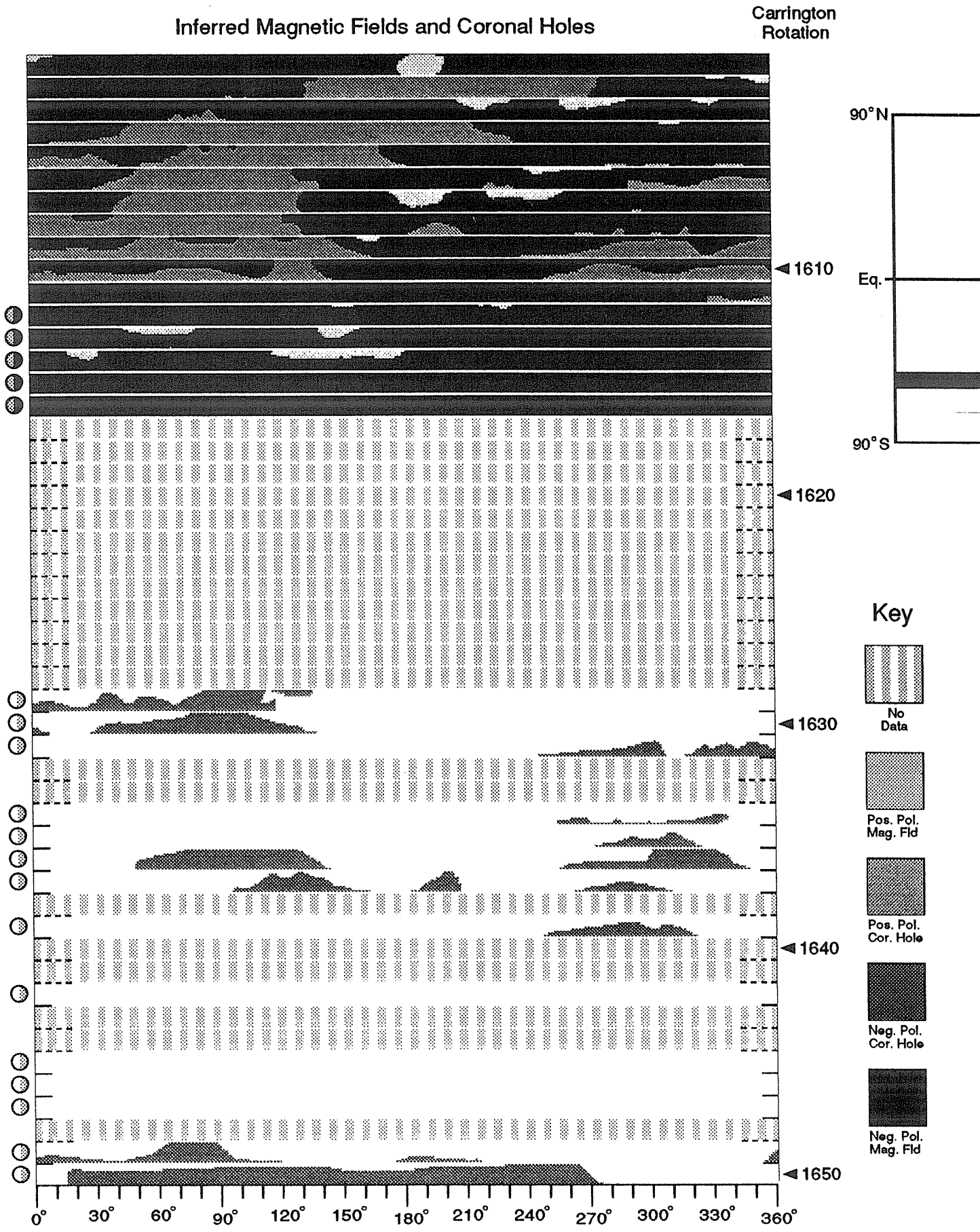
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 10th Aug 1969
To: 5th May 1973

Latitude: South 51 to South 60

Inferred Magnetic Fields and Coronal Holes

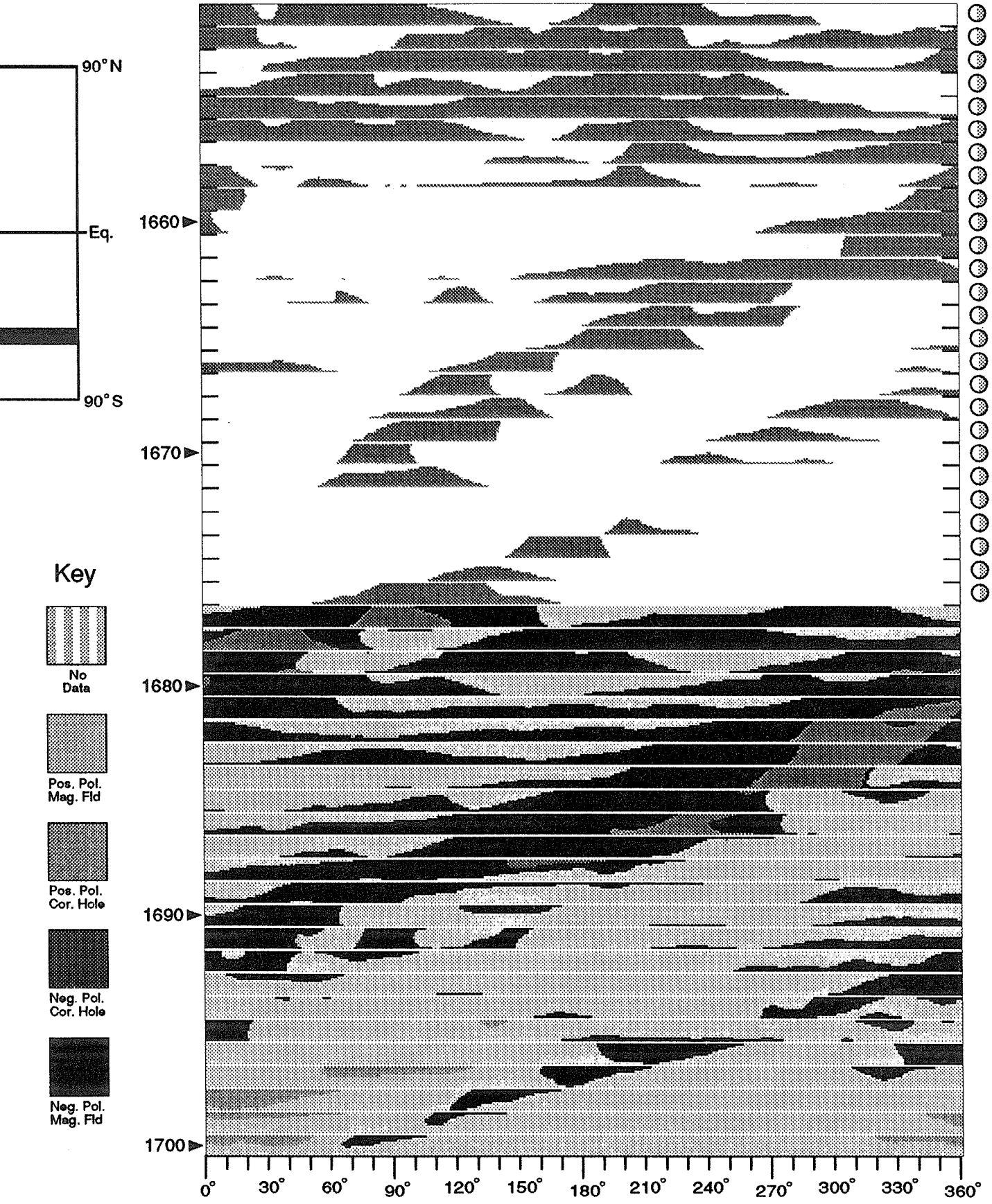


Latitude: South 51 to South 60

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

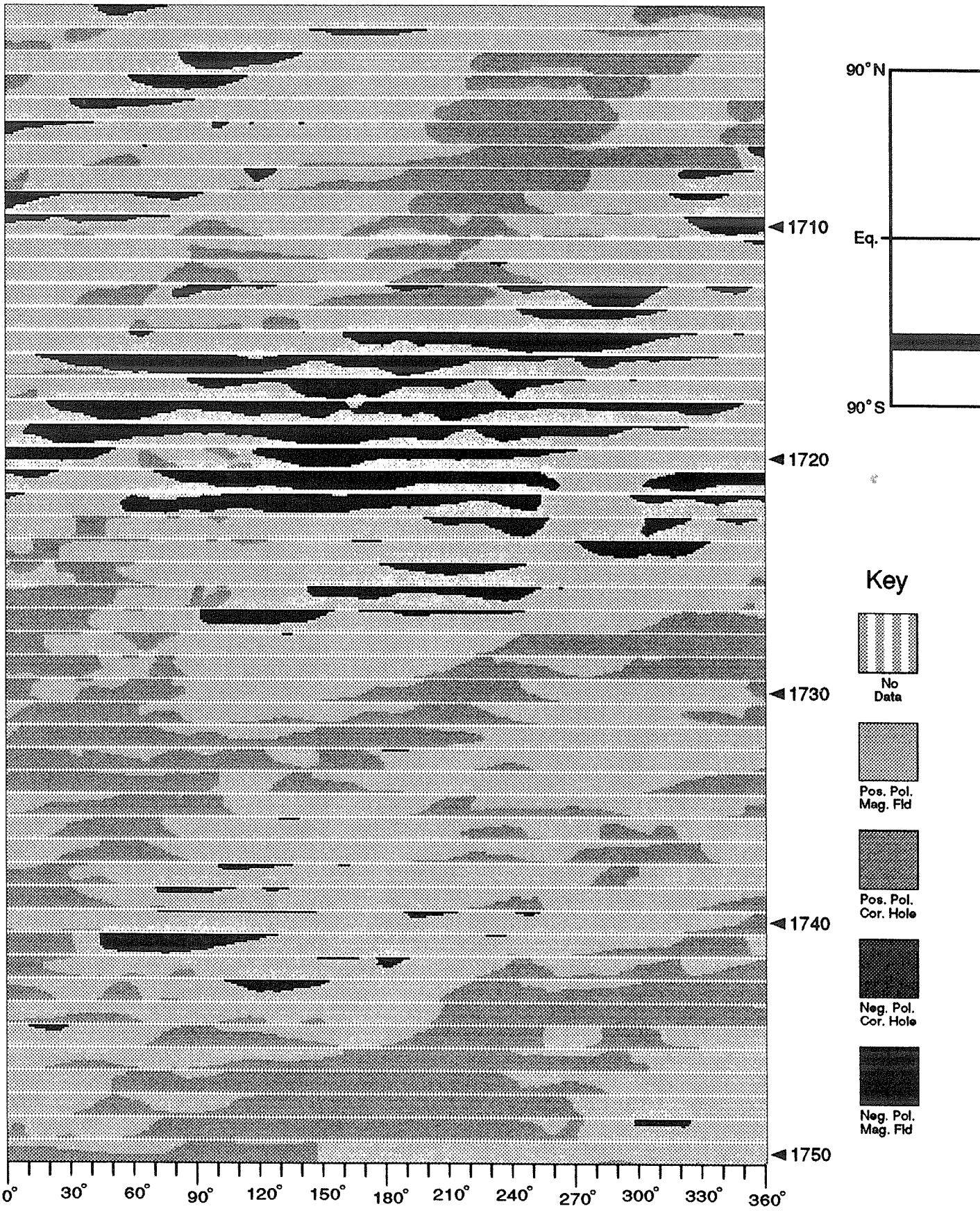
Inferred Magnetic Fields and Coronal Holes



From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: South 51 to South 60

Inferred Magnetic Fields and Coronal Holes

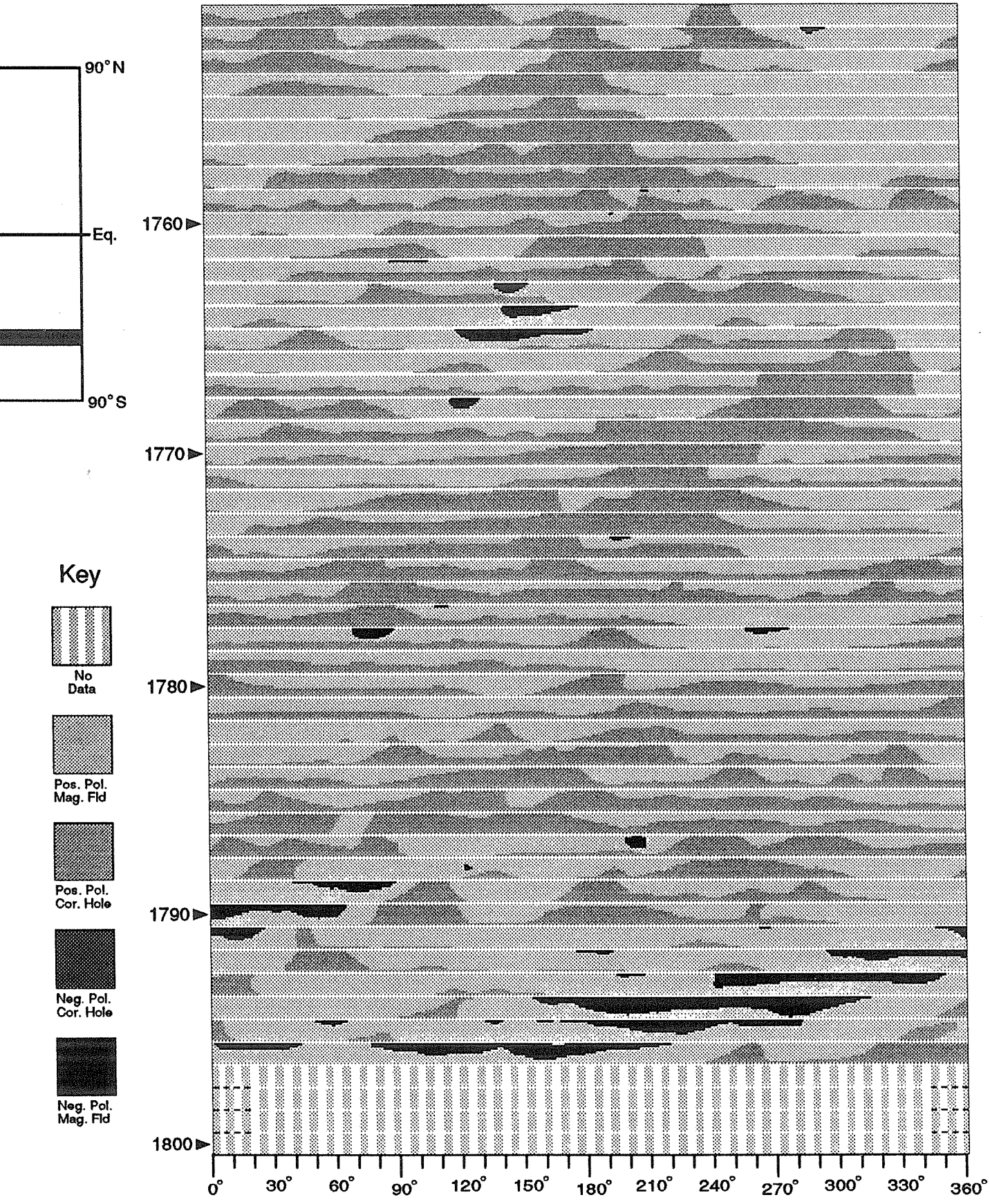


Latitude: South 51 to South 60

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

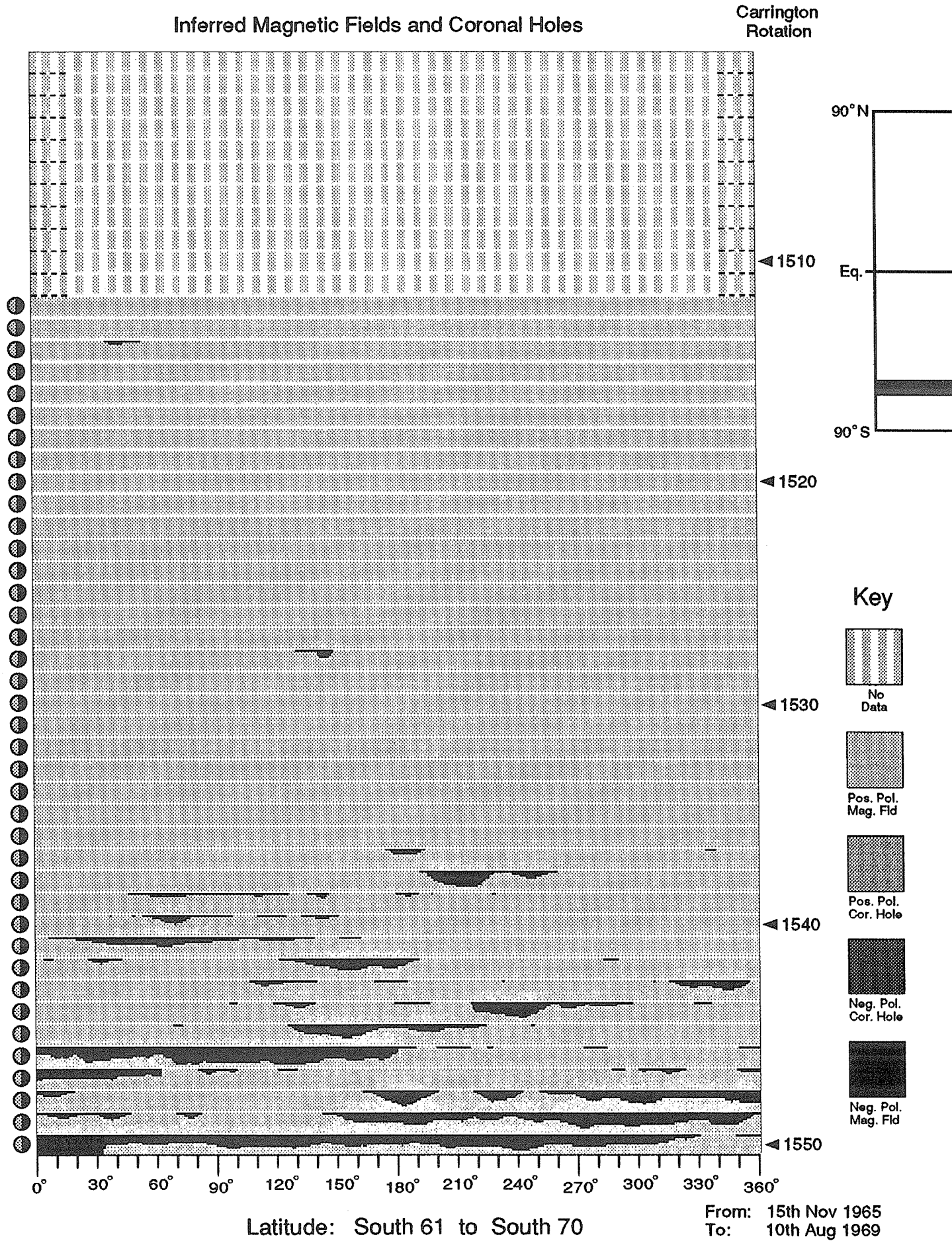
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 11th Apr 1988

Latitude: South 51 to South 60

Inferred Magnetic Fields and Coronal Holes

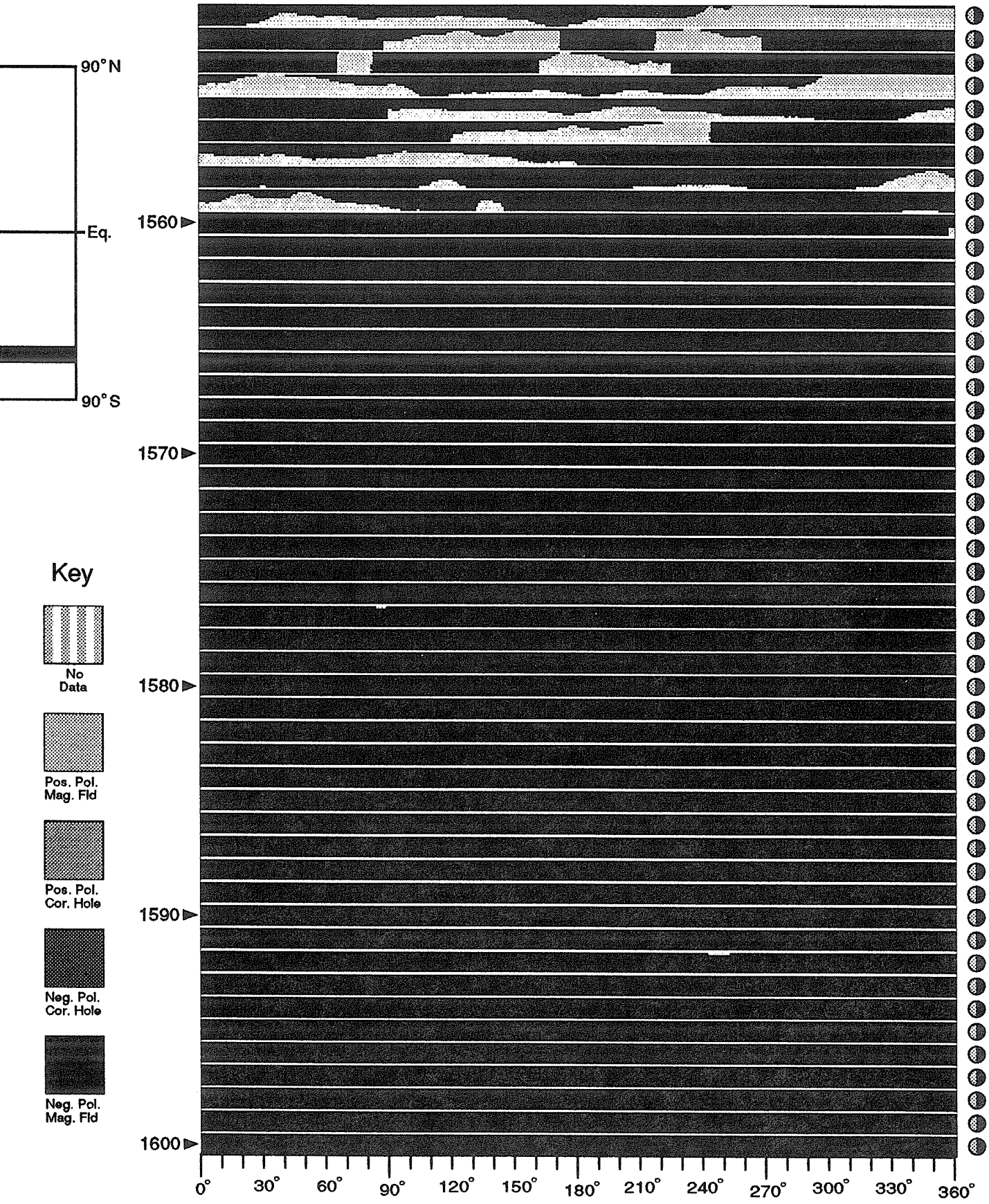


Latitude: South 61 to South 70

From: 15th Nov 1965
To: 10th Aug 1969

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



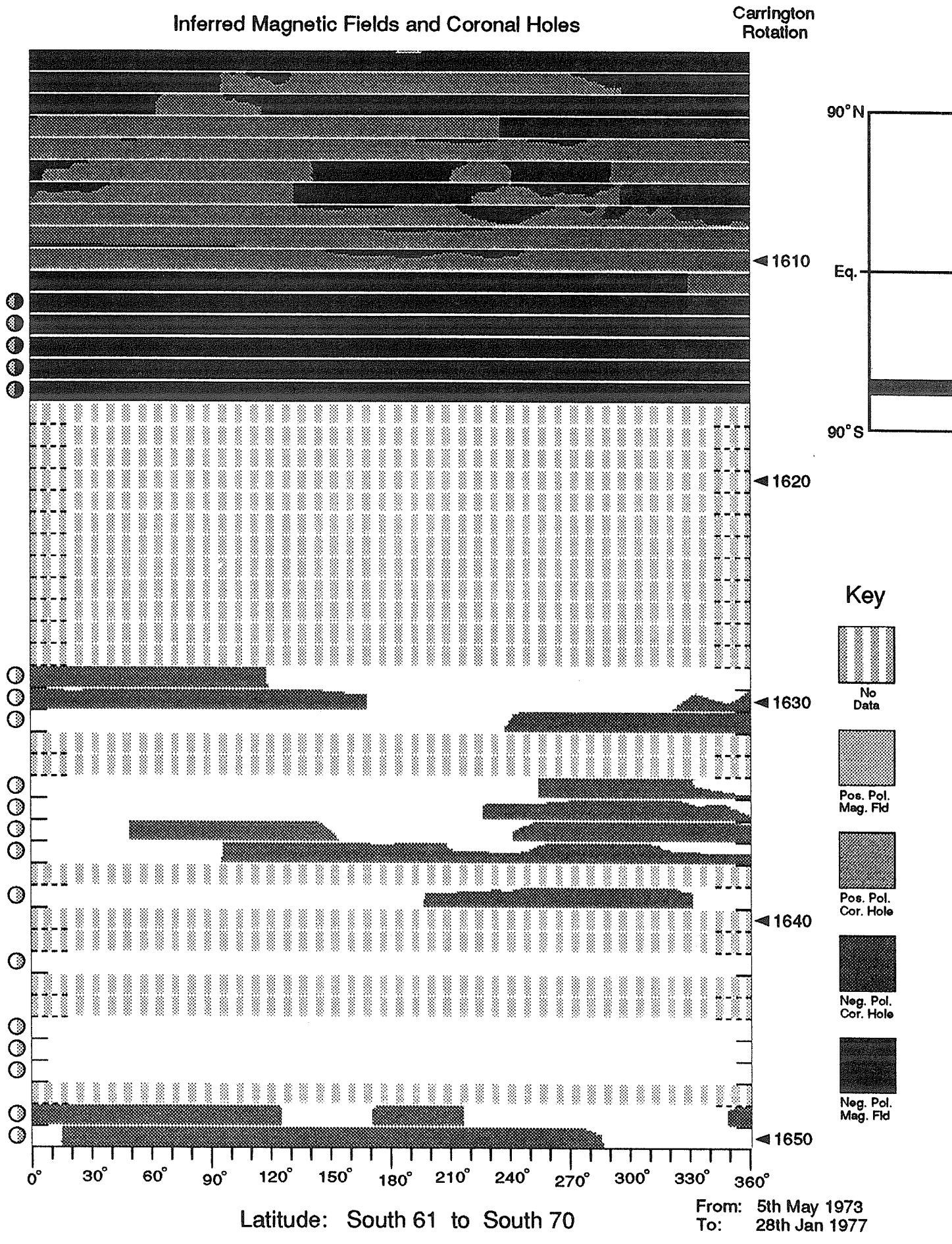
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 10th Aug 1969
To: 5th May 1973

Latitude: South 61 to South 70

Inferred Magnetic Fields and Coronal Holes

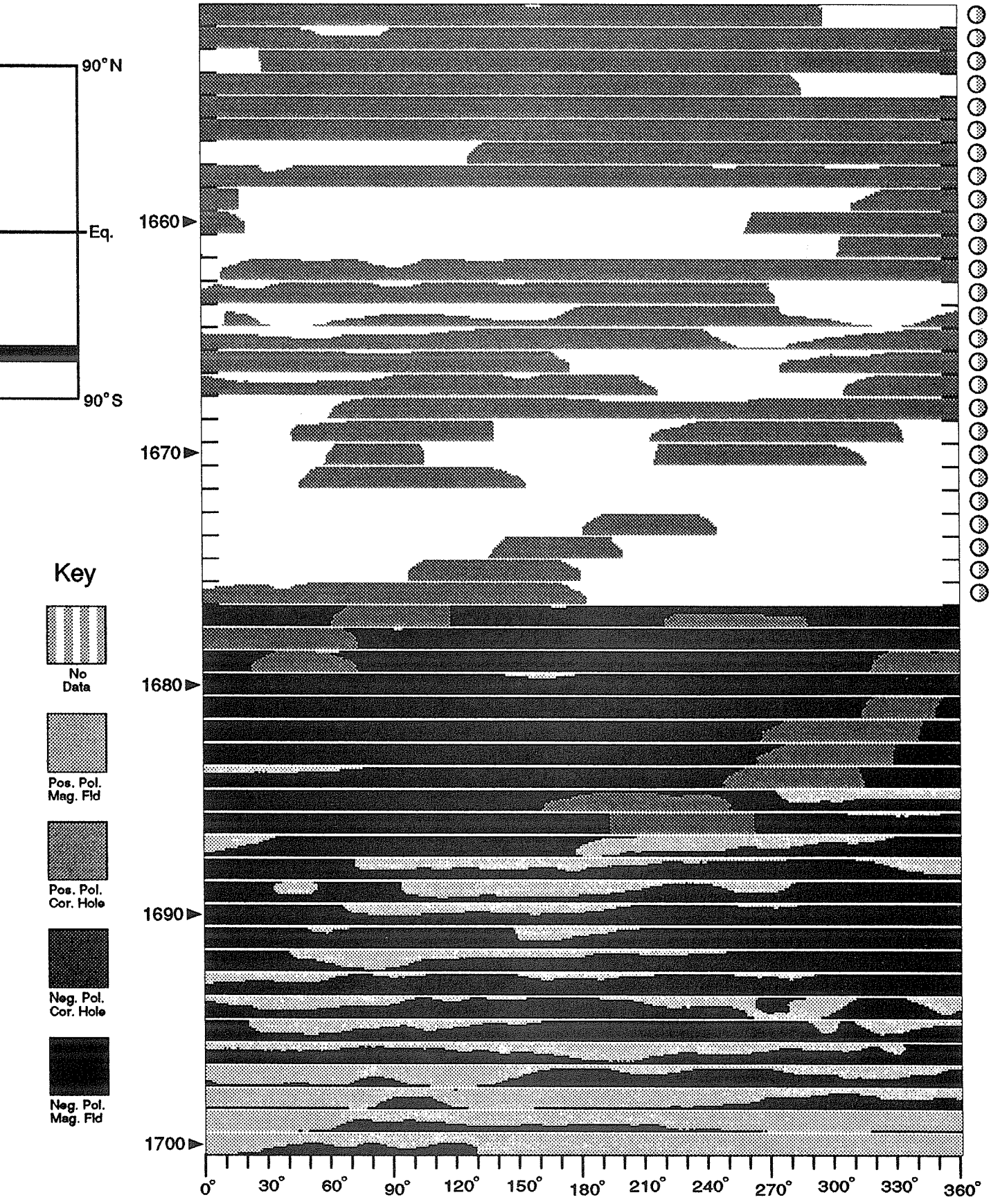


Latitude: South 61 to South 70

From: 5th May 1973
To: 28th Jan 1977

Carrington Rotation

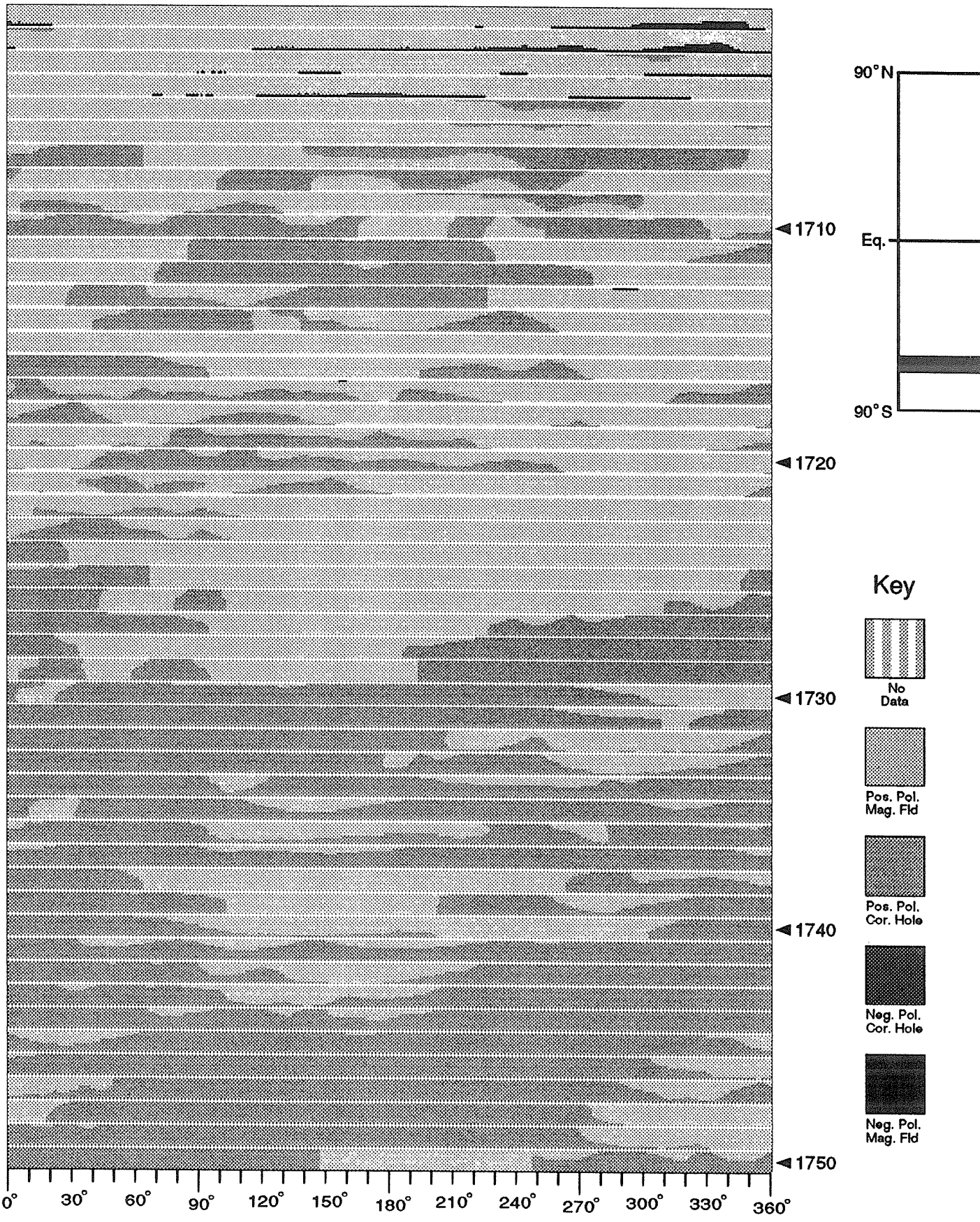
Inferred Magnetic Fields and Coronal Holes



From: 28th Jan 1977
To: 22nd Oct 1980

Latitude: South 61 to South 70

Inferred Magnetic Fields and Coronal Holes

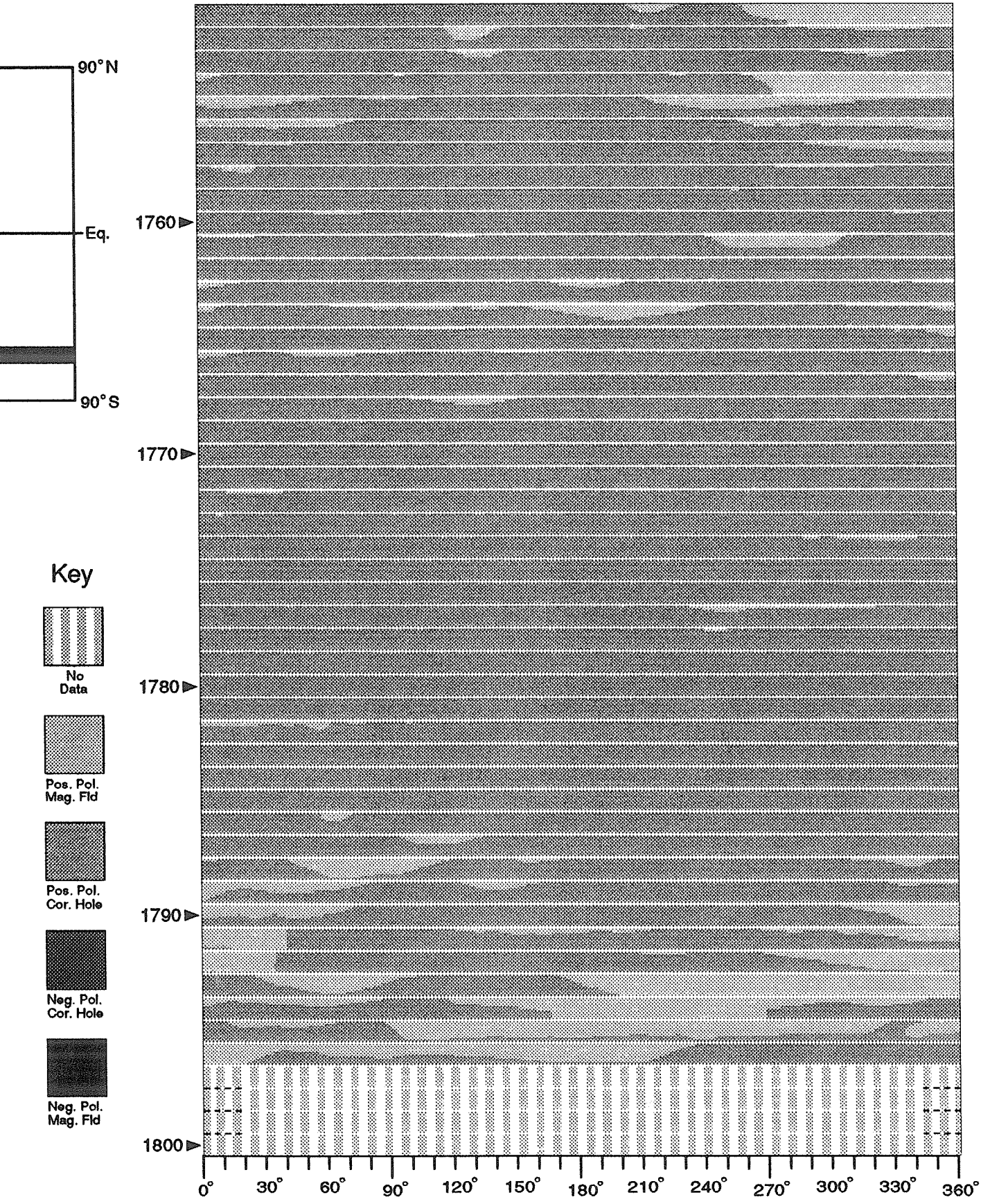


Latitude: South 61 to South 70

From: 22nd Oct 1980
To: 17th Jul 1984

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



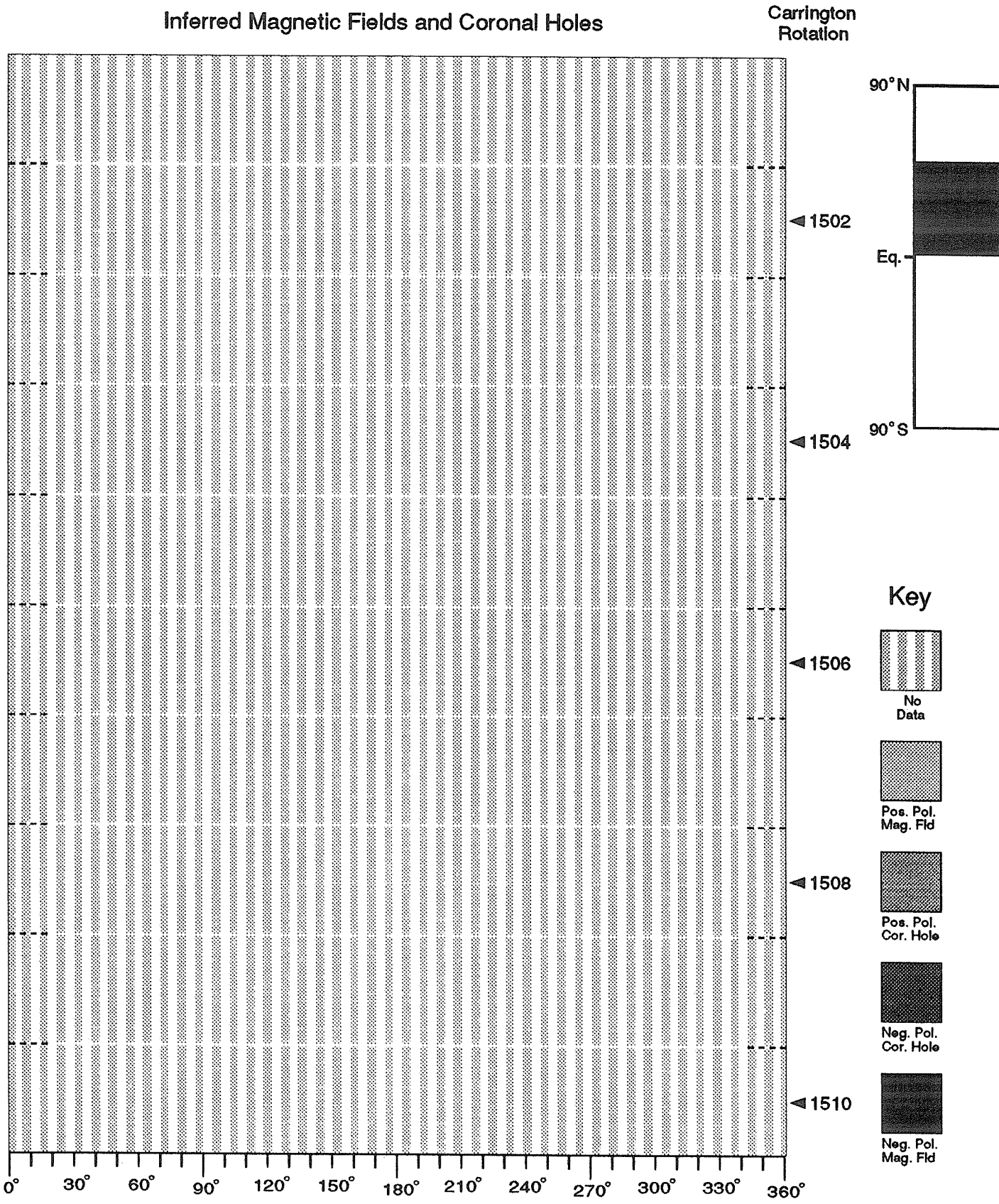
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 17th Jul 1984
To: 11th Apr 1988

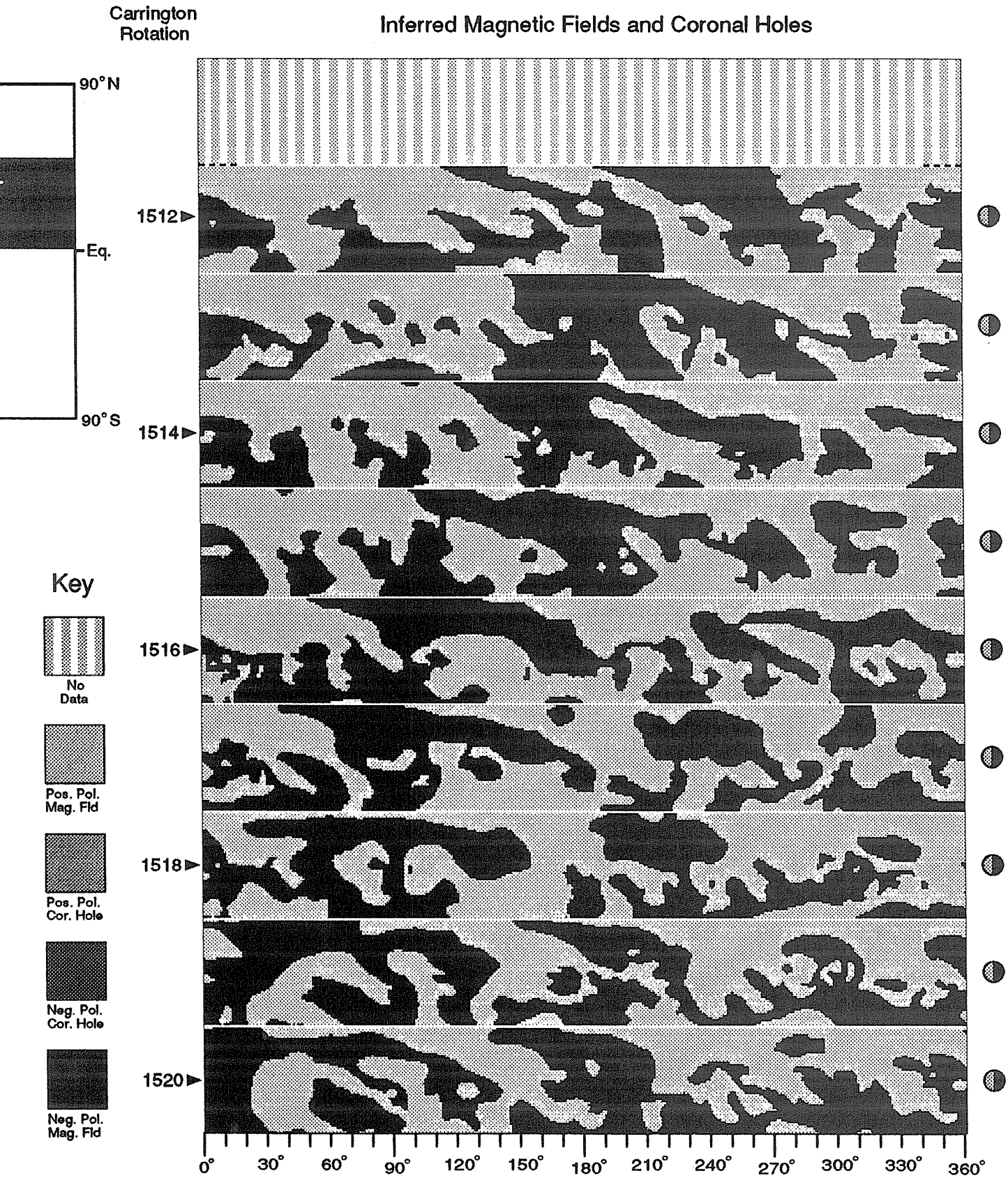
Latitude: South 61 to South 70

Inferred Magnetic Fields and Coronal Holes



Latitude: North 1 to North 50

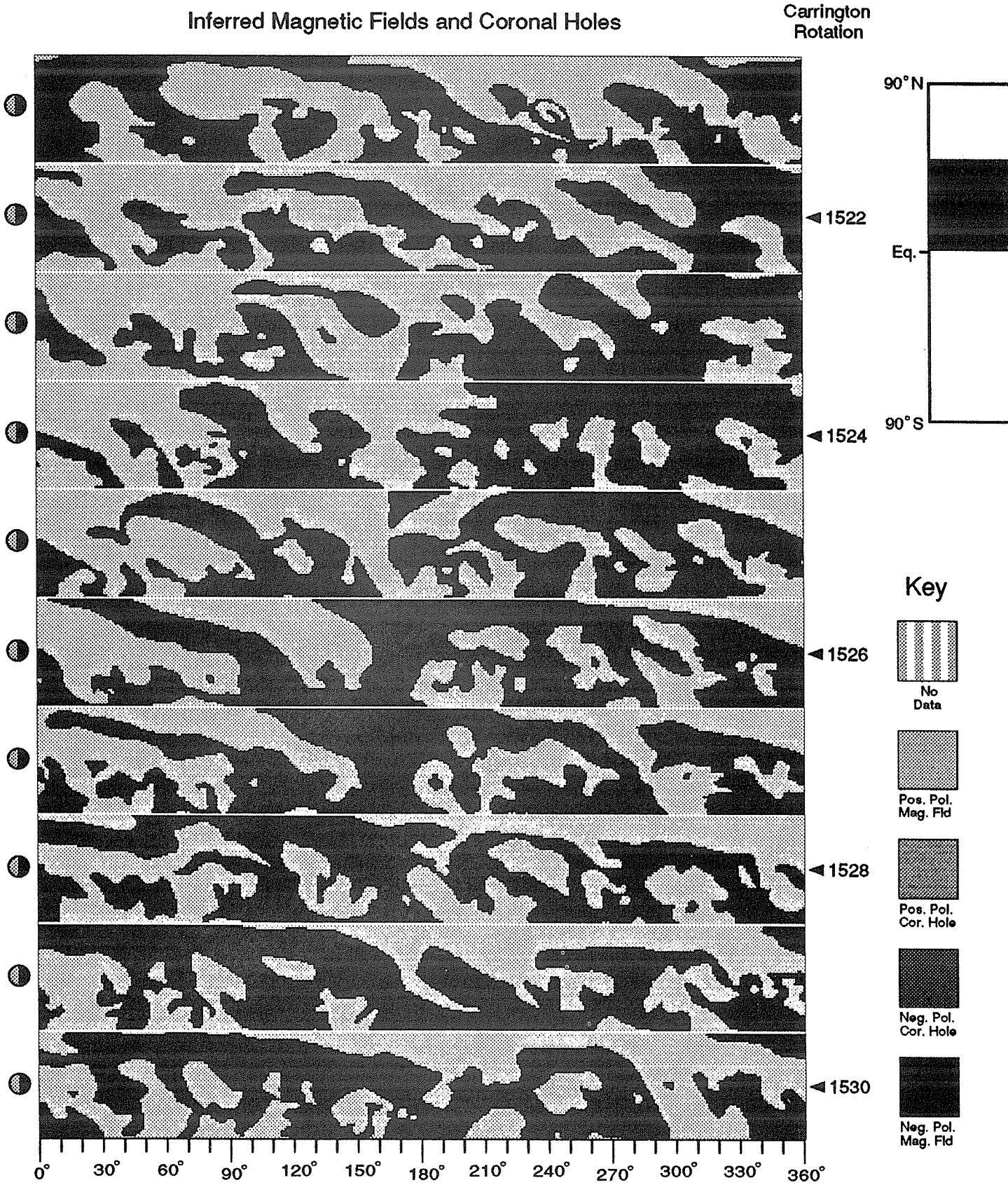
From: 15th Nov 1965
To: 15th Aug 1966



From: 15th Aug 1966
To: 15th May 1967

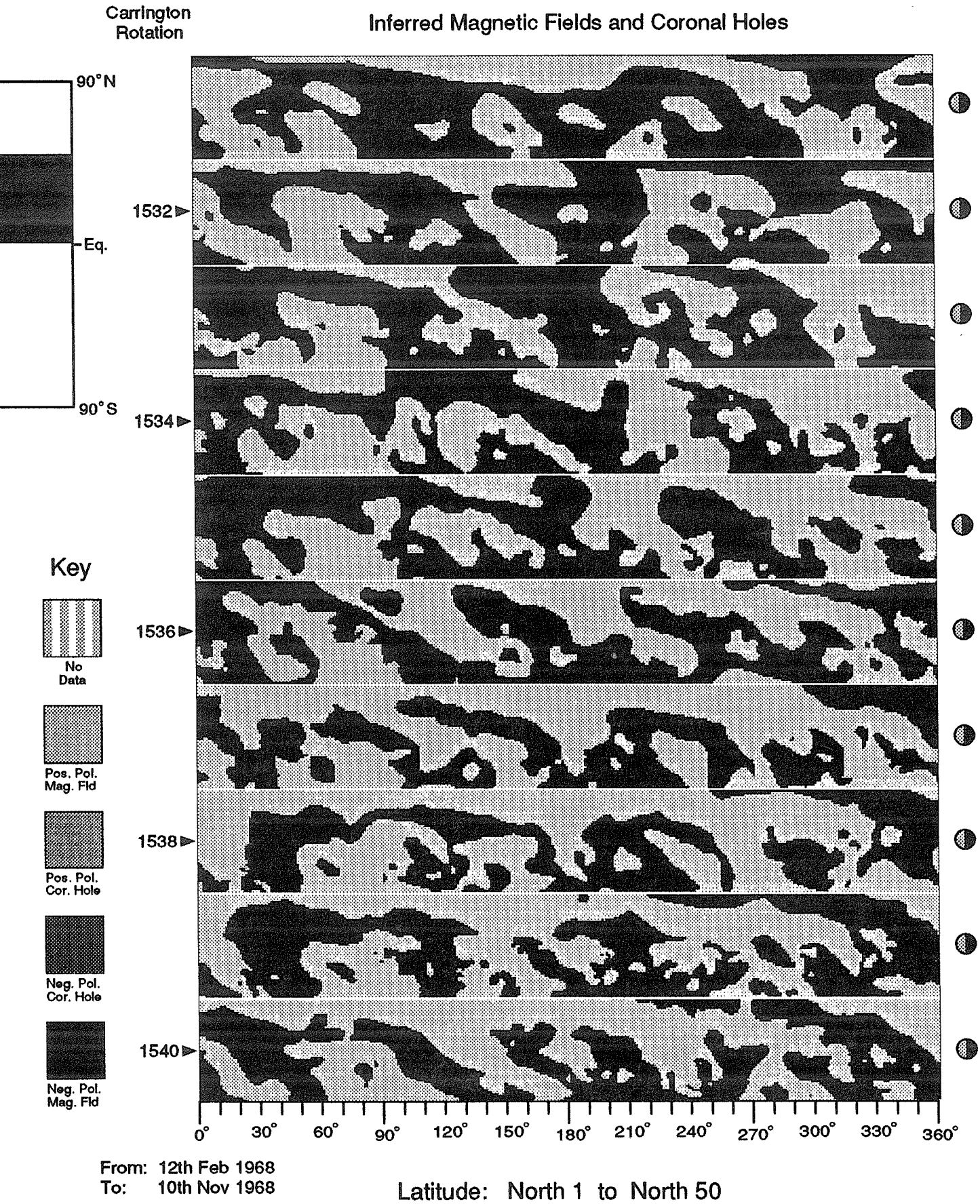
Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

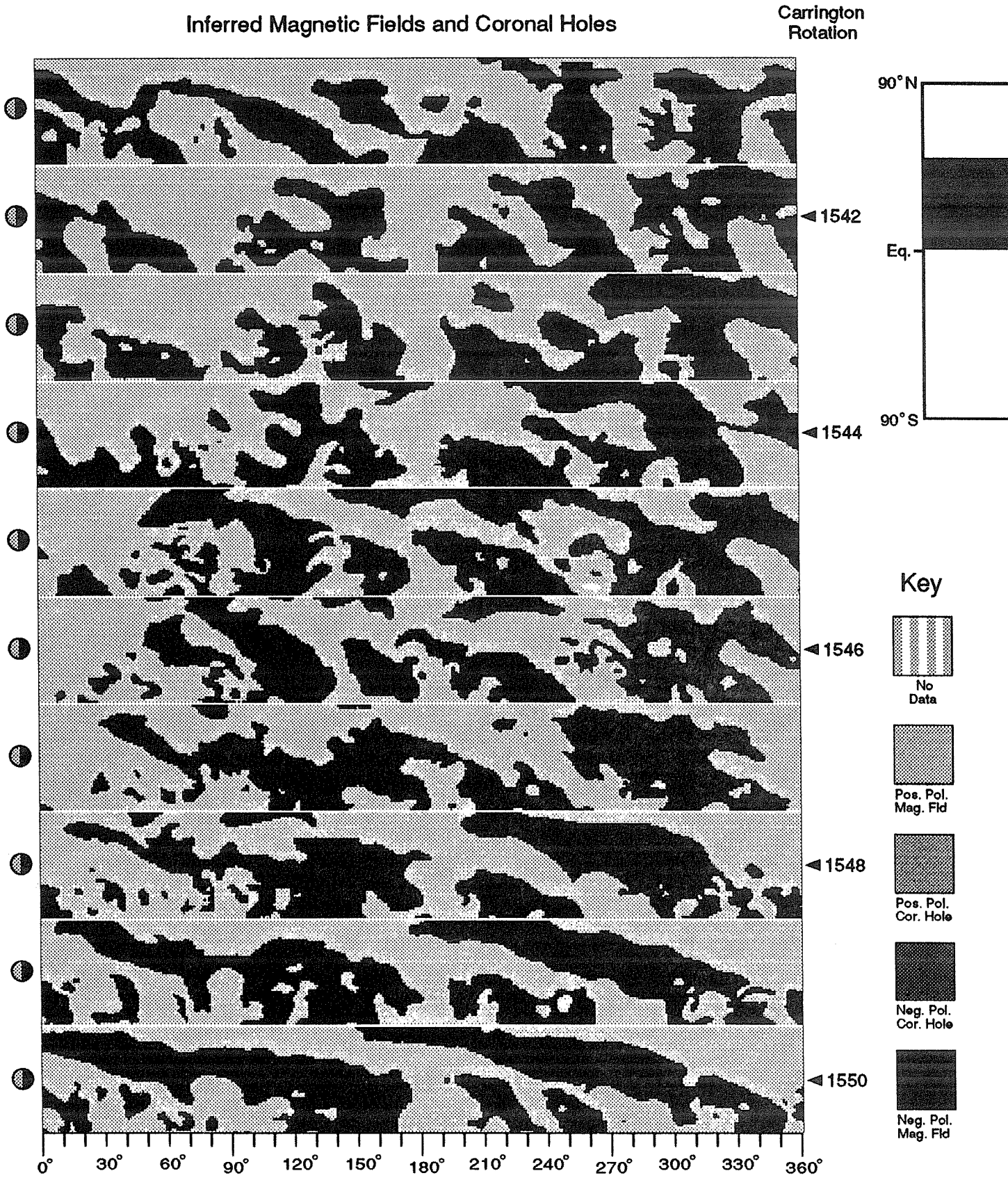


From: 15th May 1967
To: 12th Feb 1968

Latitude: North 1 to North 50


Carrington Rotation
Inferred Magnetic Fields and Coronal Holes
90°N
Eq.
90°S
1532
1534
1536
1538
1540
Key
No Data
Pos. Pol. Mag. Fld
Pos. Pol. Cor. Hole
Neg. Pol. Cor. Hole
Neg. Pol. Mag. Fld
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
From: 12th Feb 1968
To: 10th Nov 1968
Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

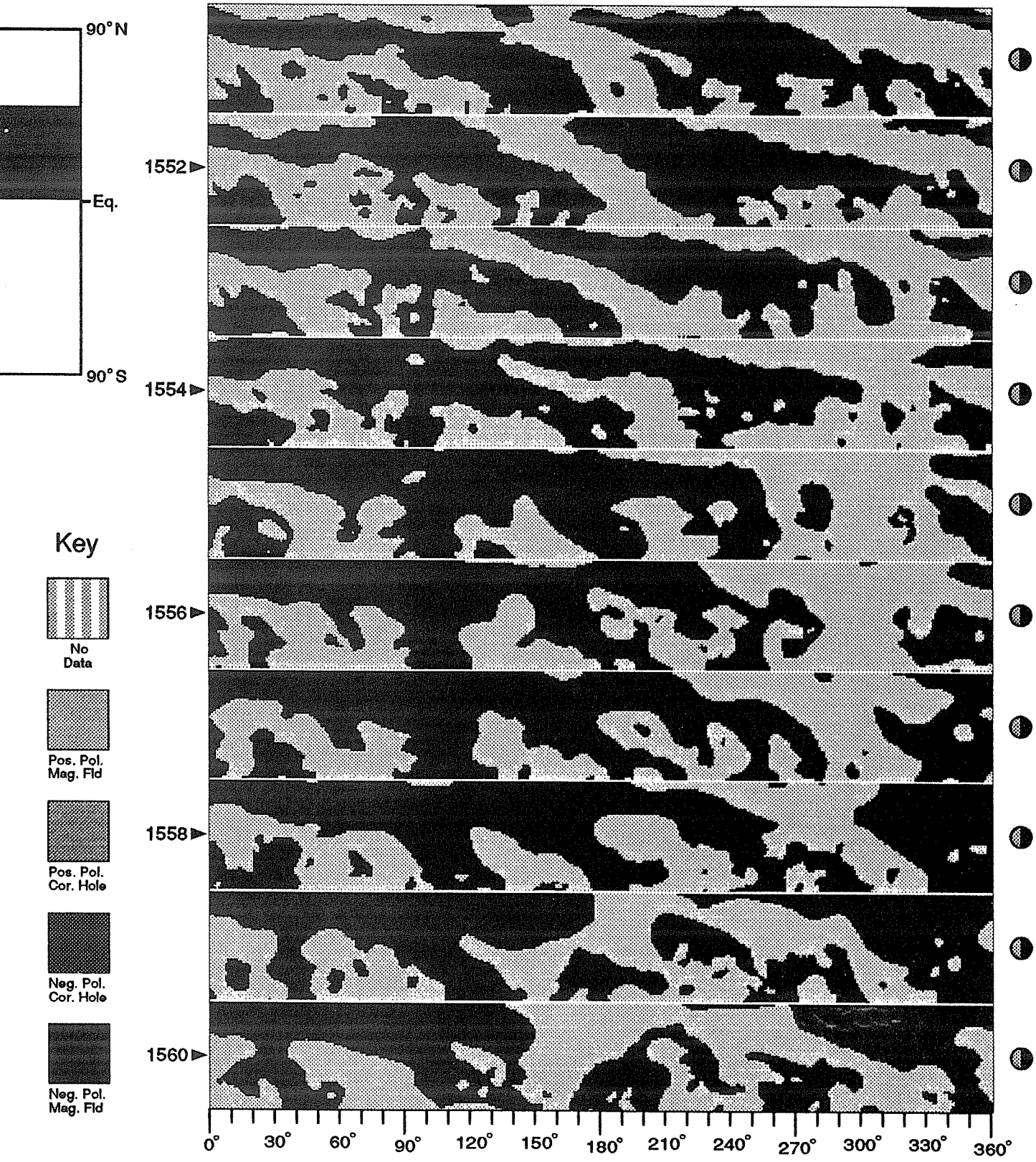


From: 10th Nov 1968
To: 10th Aug 1969

Latitude: North 1 to North 50

Carrington Rotation

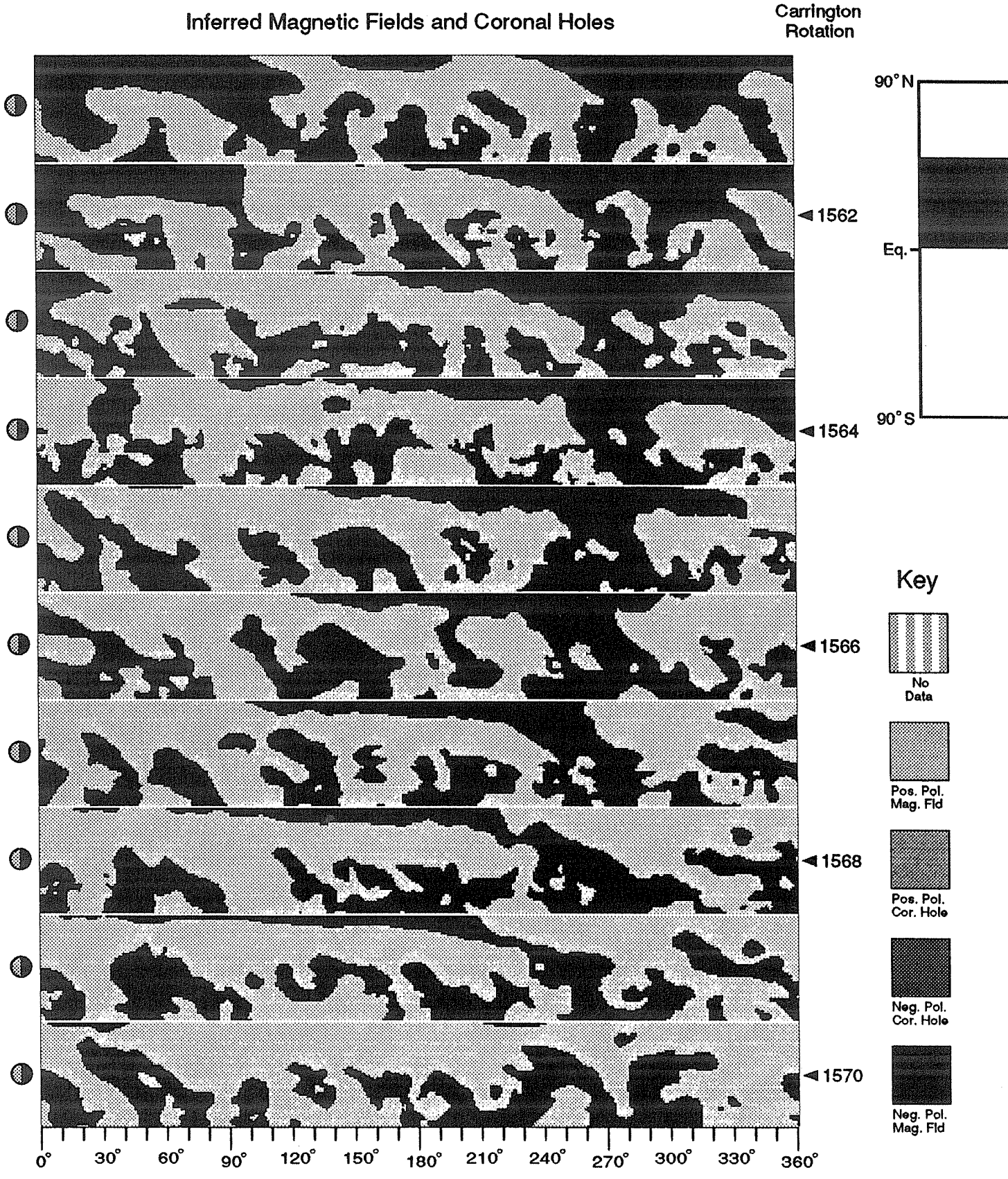
Inferred Magnetic Fields and Coronal Holes



From: 10th Aug 1969
To: 10th May 1970

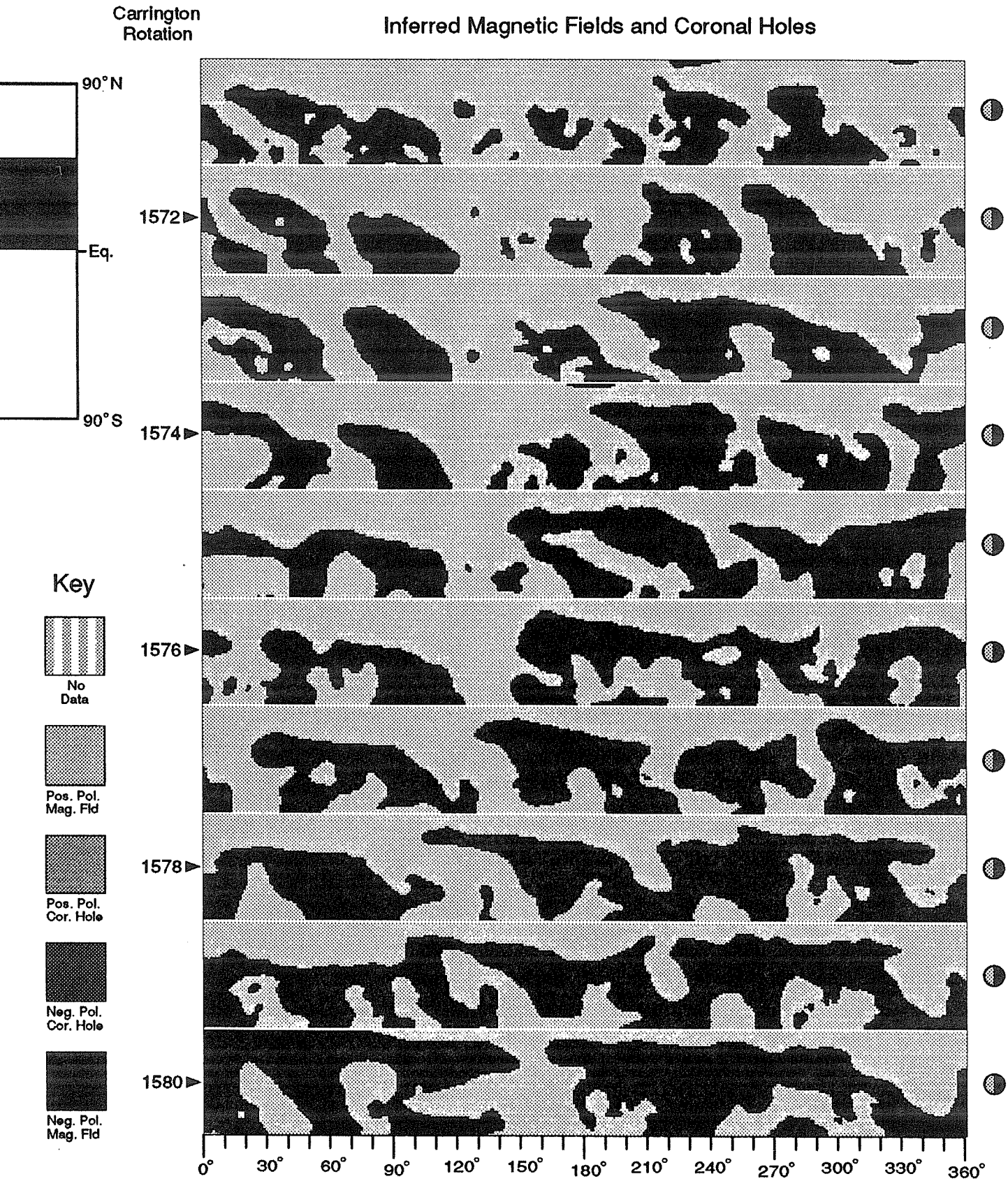
Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes



From: 10th May 1970
To: 7th Feb 1971

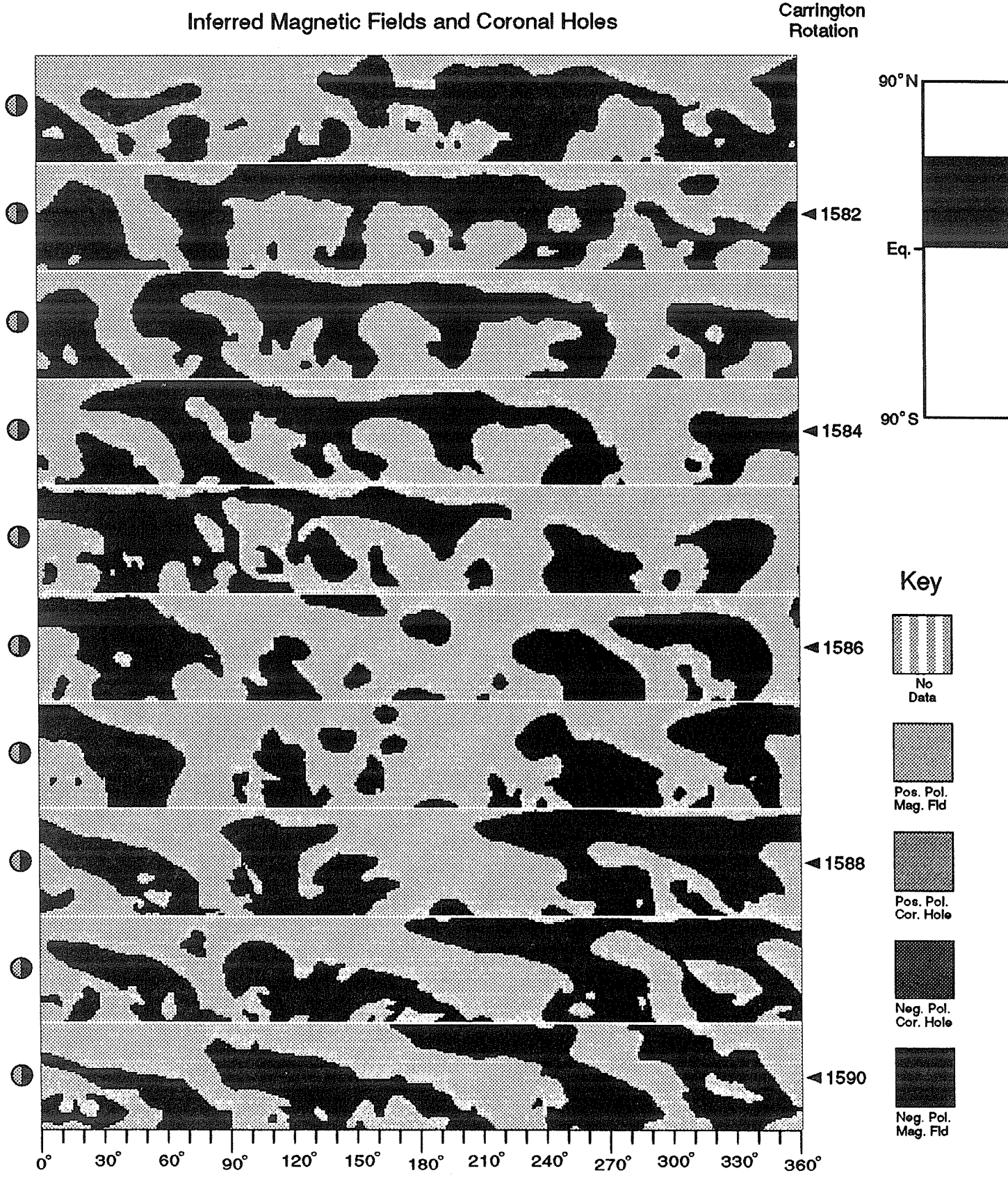
Latitude: North 1 to North 50



From: 7th Feb 1971
To: 6th Nov 1971

Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

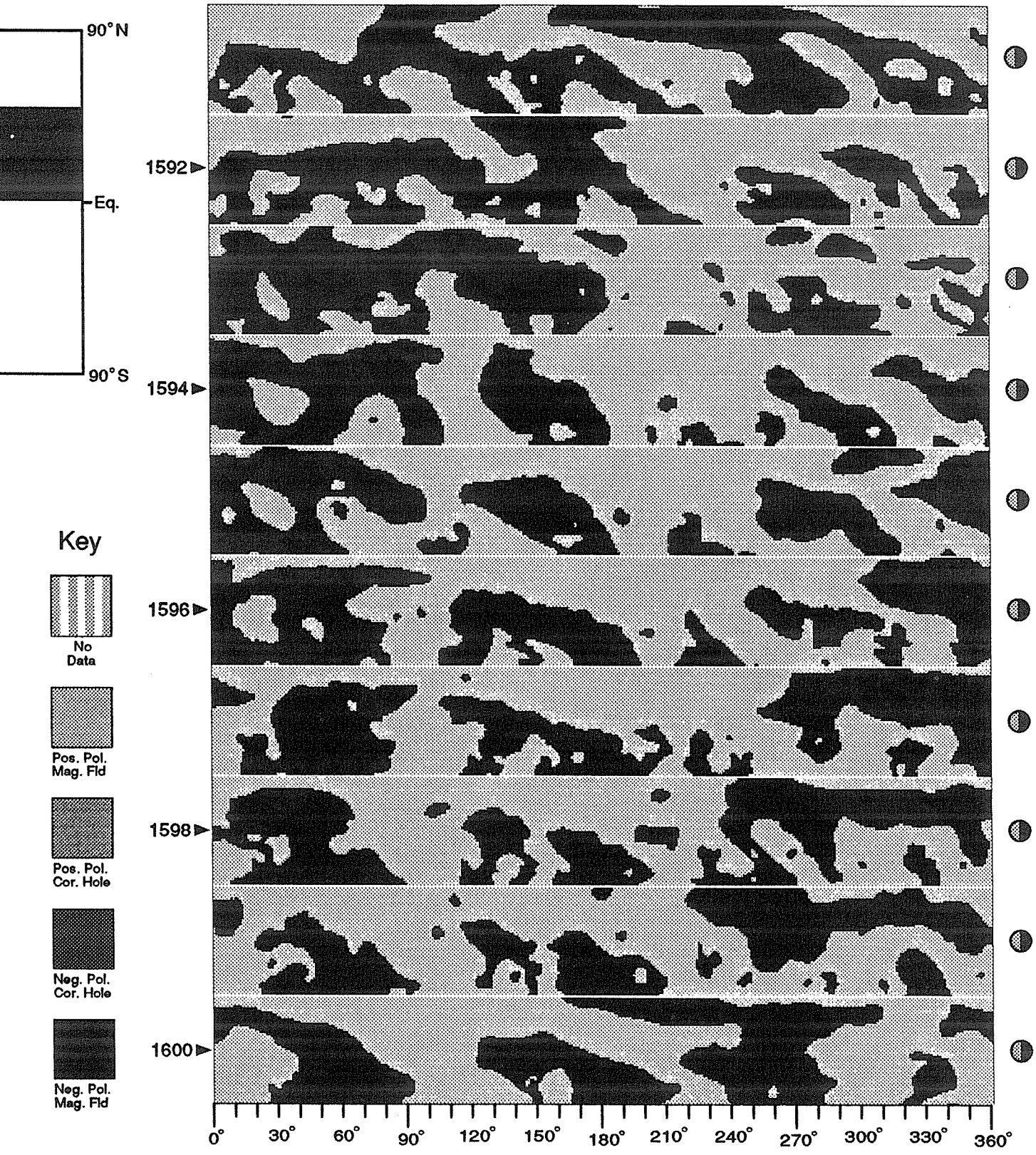


Latitude: North 1 to North 50

From: 6th Nov 1971
To: 5th Aug 1972

Carrington Rotation

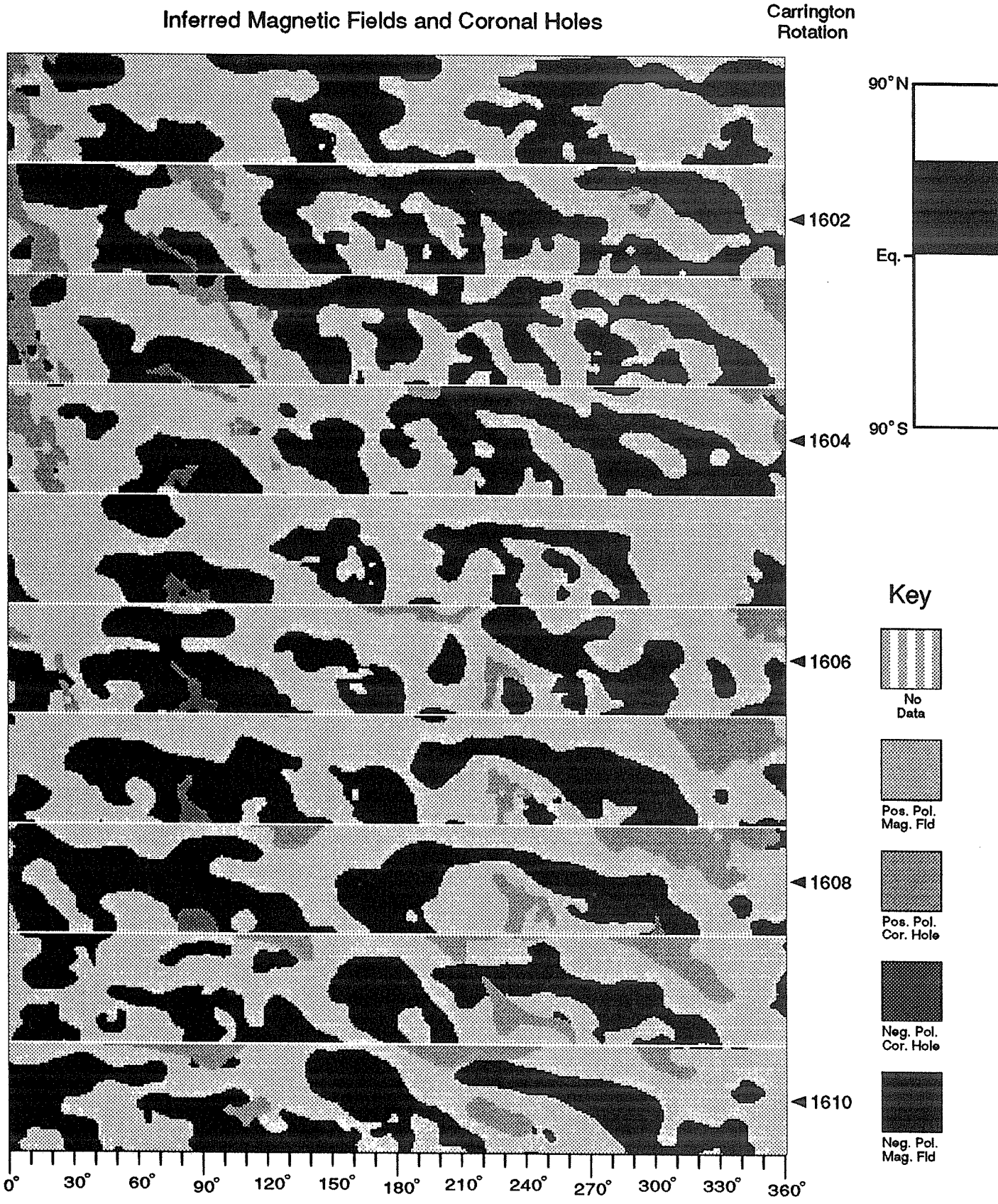
Inferred Magnetic Fields and Coronal Holes



From: 5th Aug 1972
To: 5th May 1973

Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

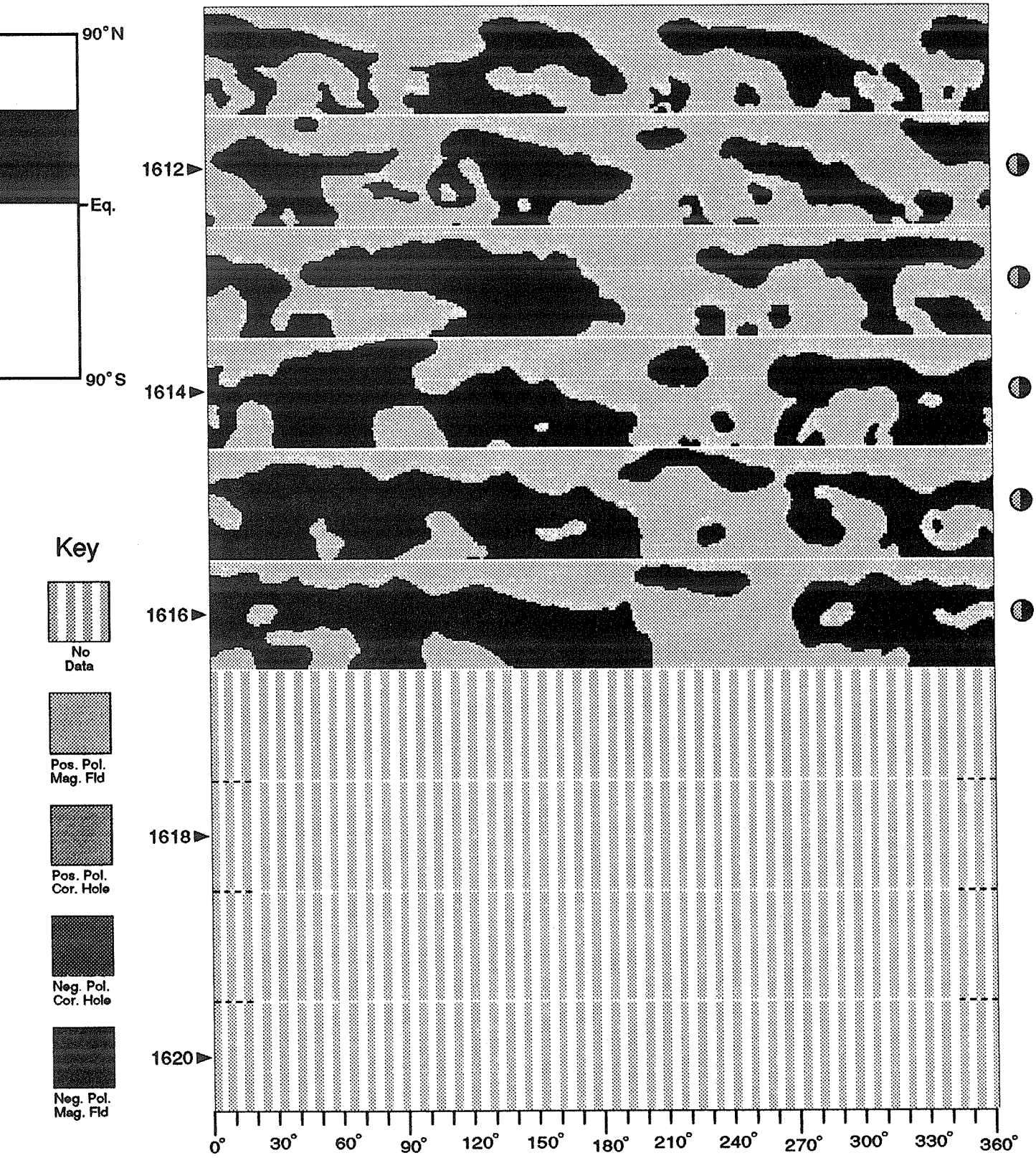


Latitude: North 1 to North 50

From: 5th May 1973
To: 2nd Feb 1974

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



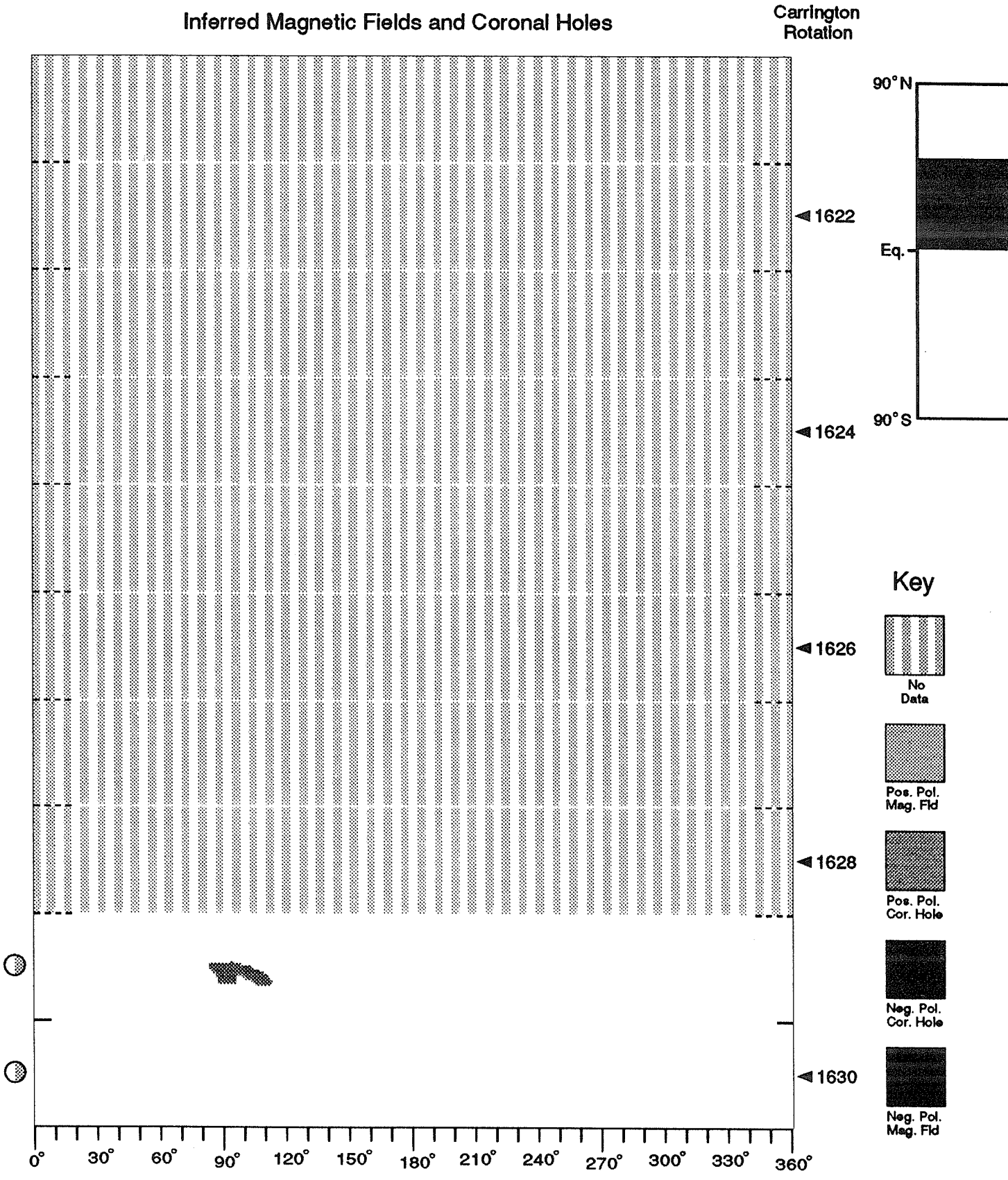
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 2nd Feb 1974
To: 1st Nov 1974

Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

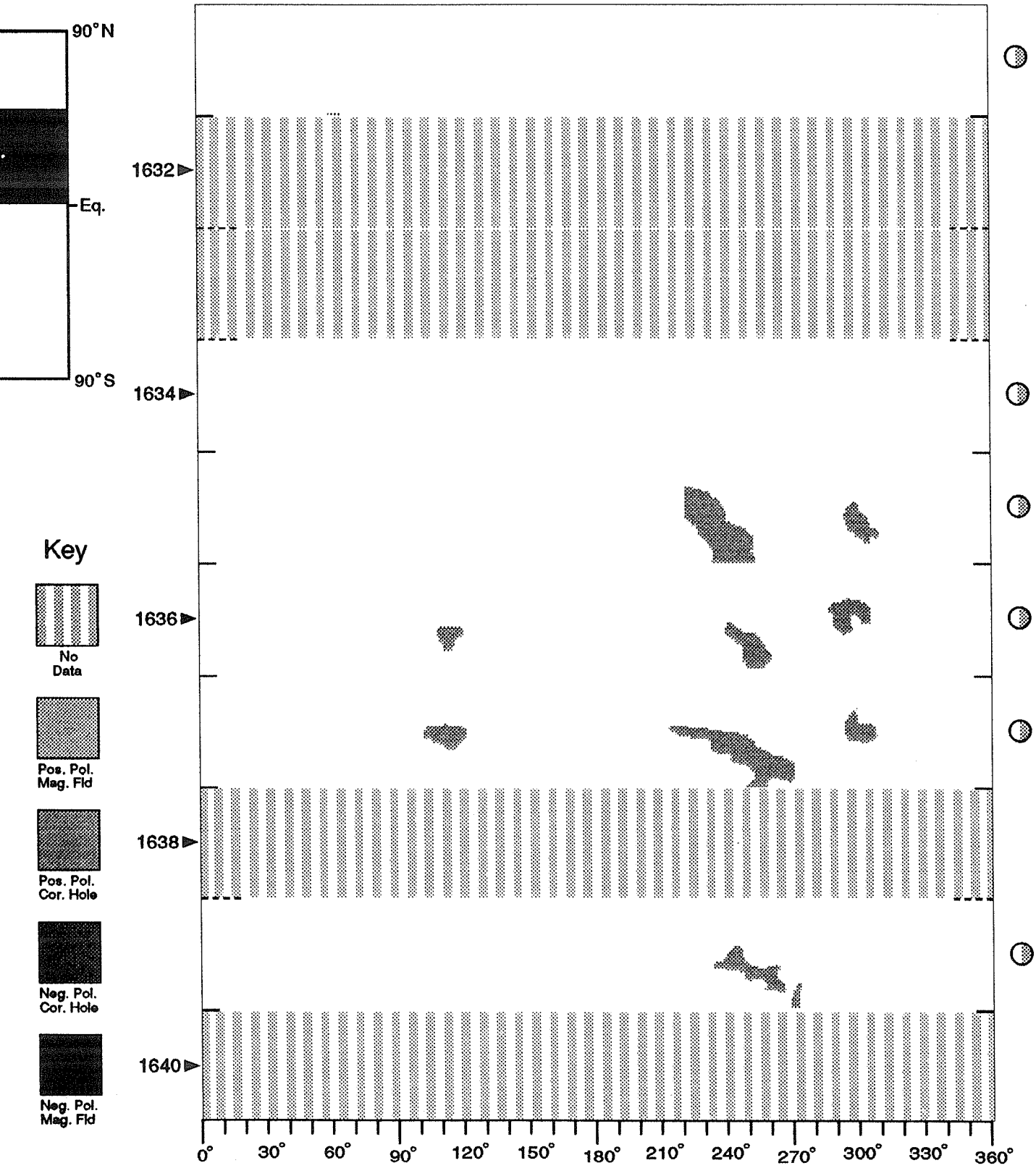


From: 1st Nov 1974
To: 1st Aug 1975

Latitude: North 1 to North 50

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes

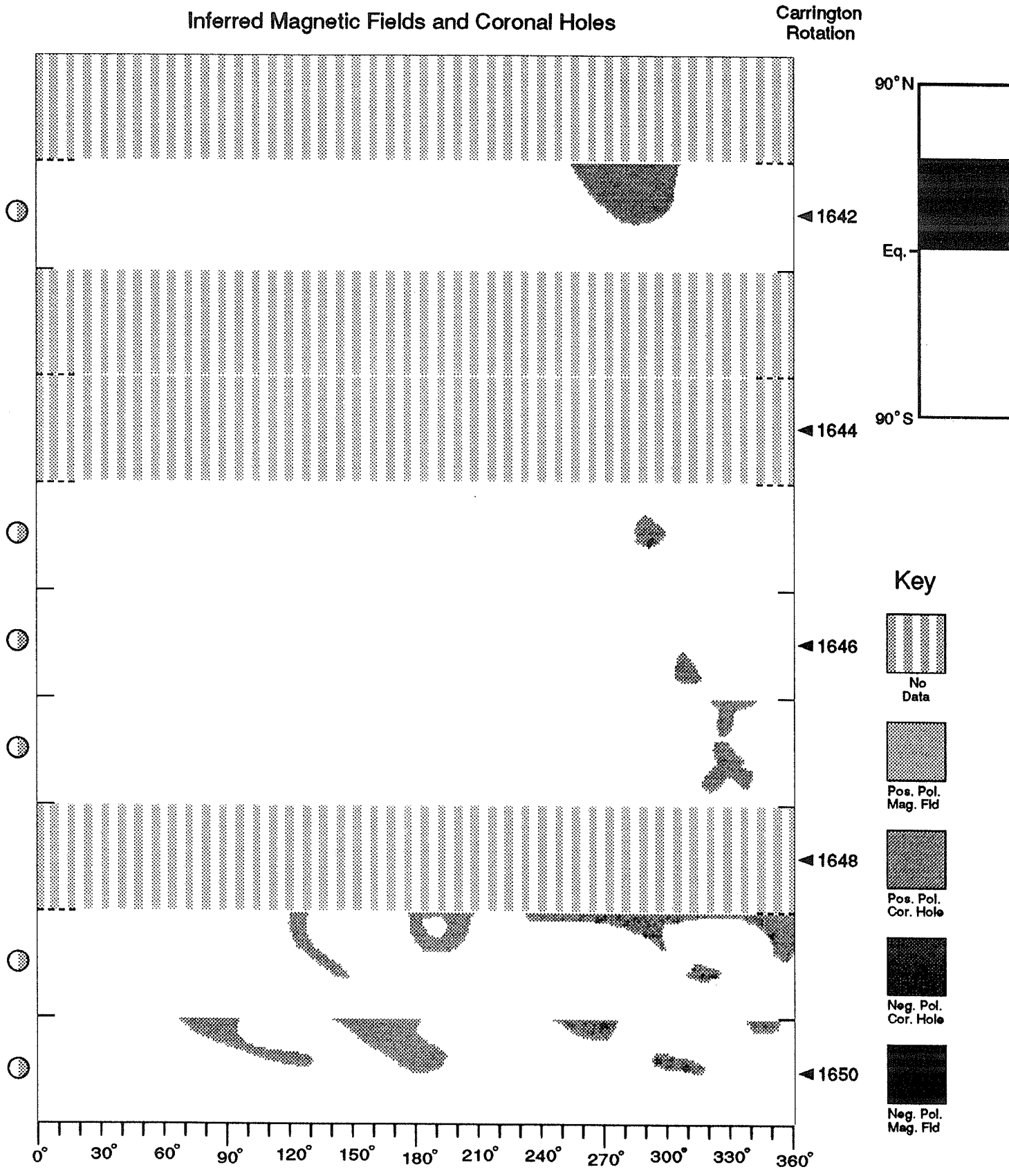


Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 1st Aug 1975
To: 30th Apr 1976

Latitude: North 1 to North 50

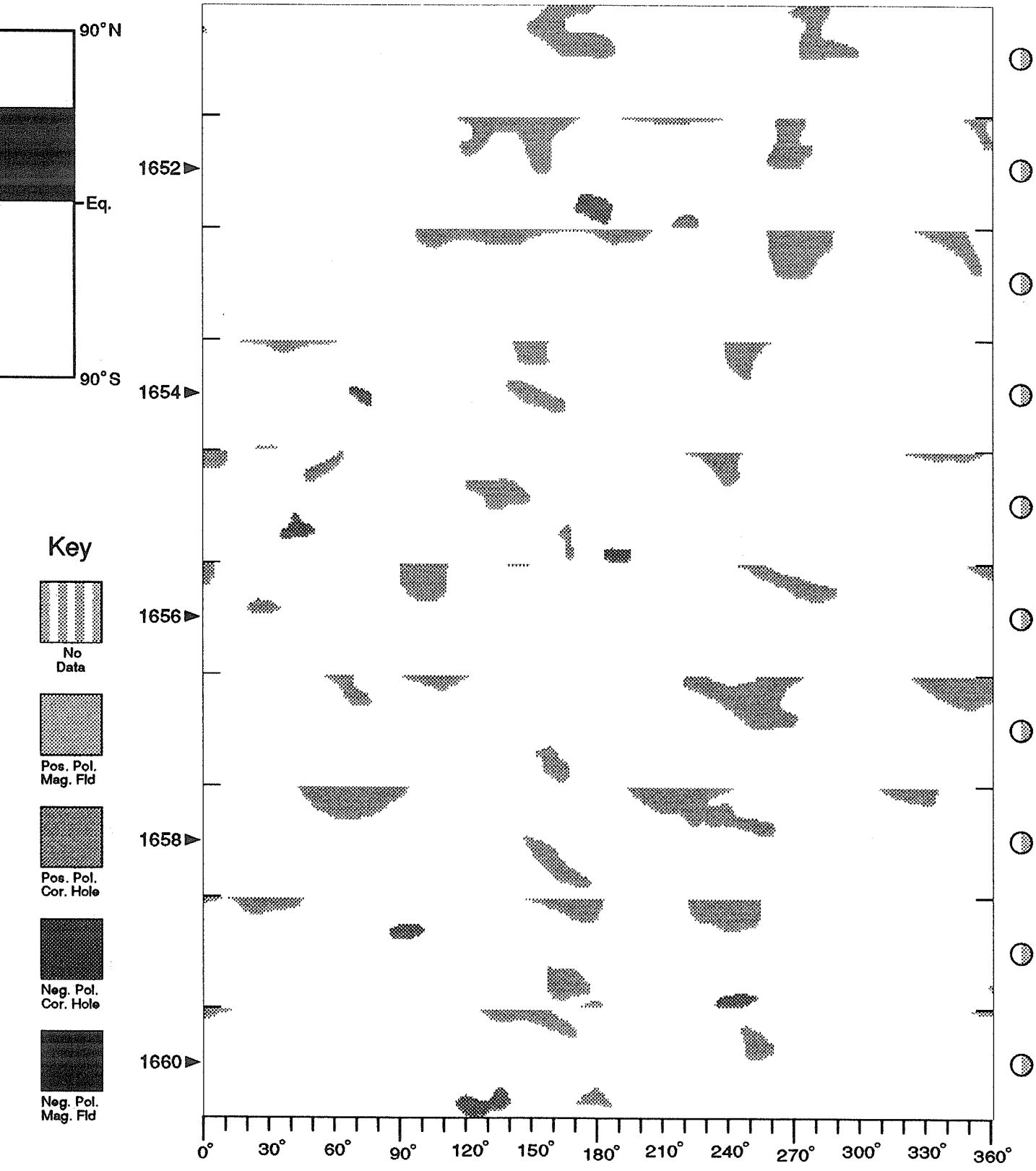


Latitude: North 1 to North 50

From: 30th Apr 1976
To: 28th Jan 1977

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



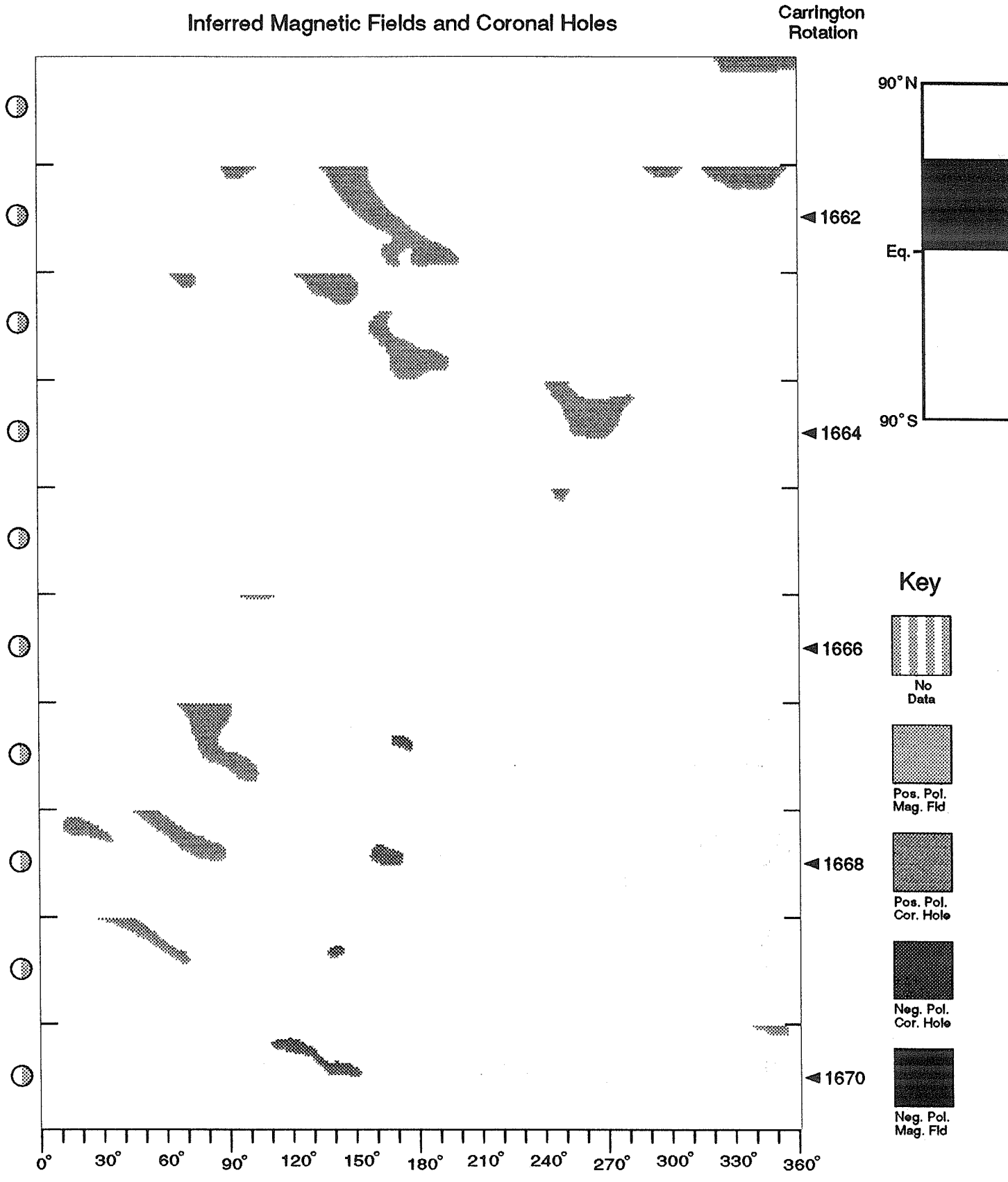
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 28th Jan 1977
To: 27th Oct 1977

Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

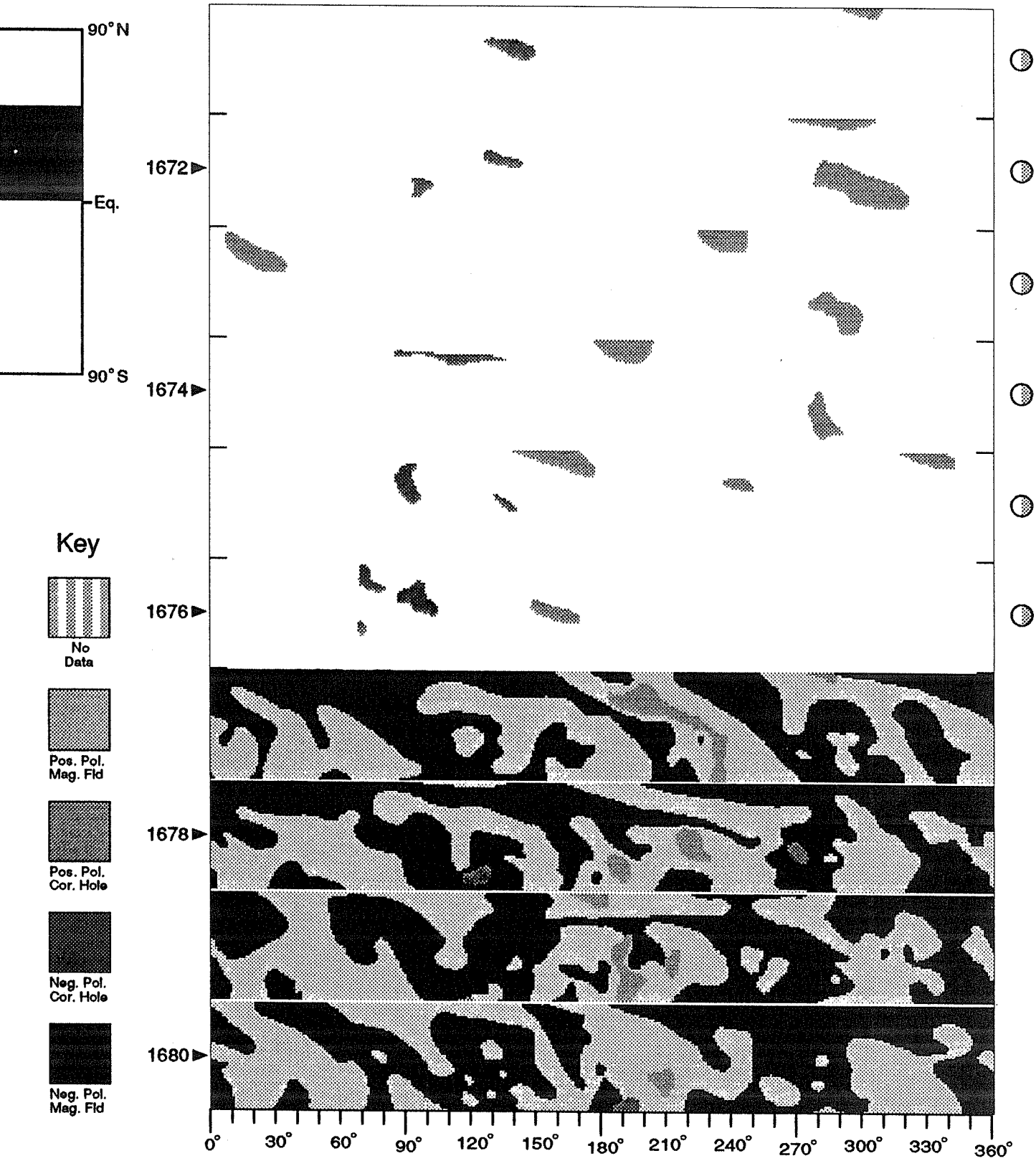


From: 27th Oct 1977
To: 27th Jul 1978

Latitude: North 1 to North 50

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



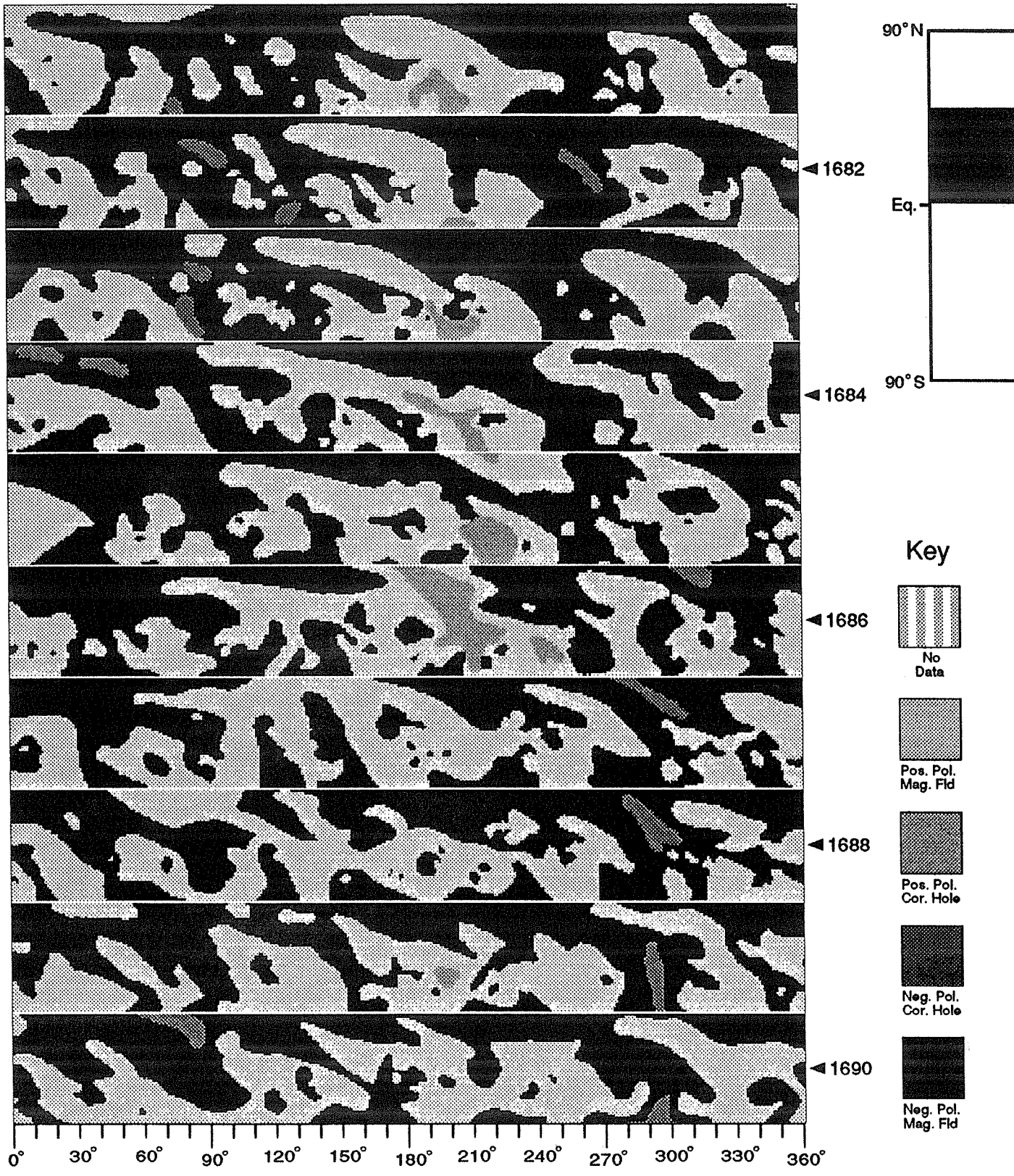
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 27th Jul 1978
To: 26th Apr 1979

Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

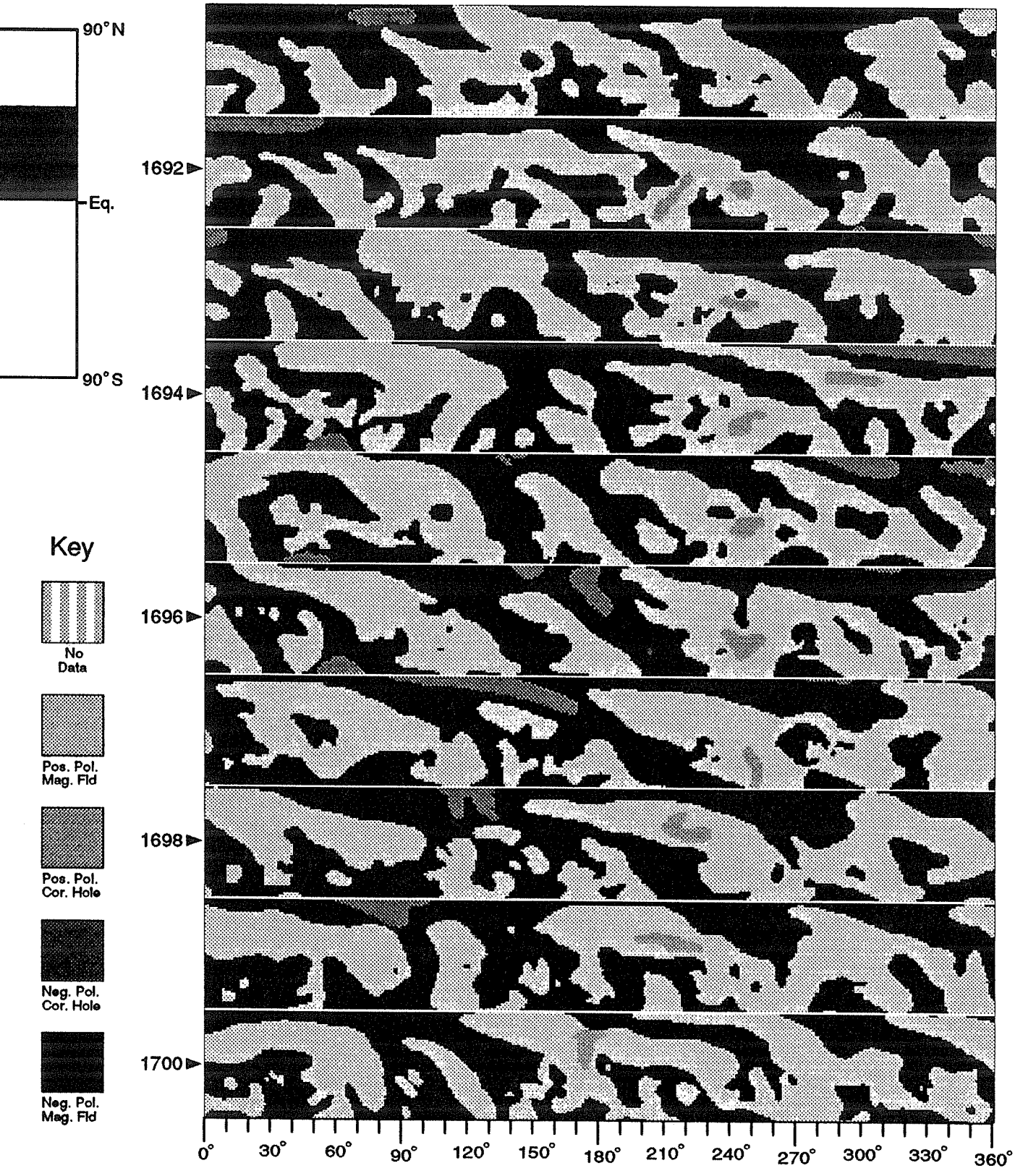


Latitude: North 1 to North 50

From: 26th Apr 1979
To: 24th Jan 1980

Carrington Rotation

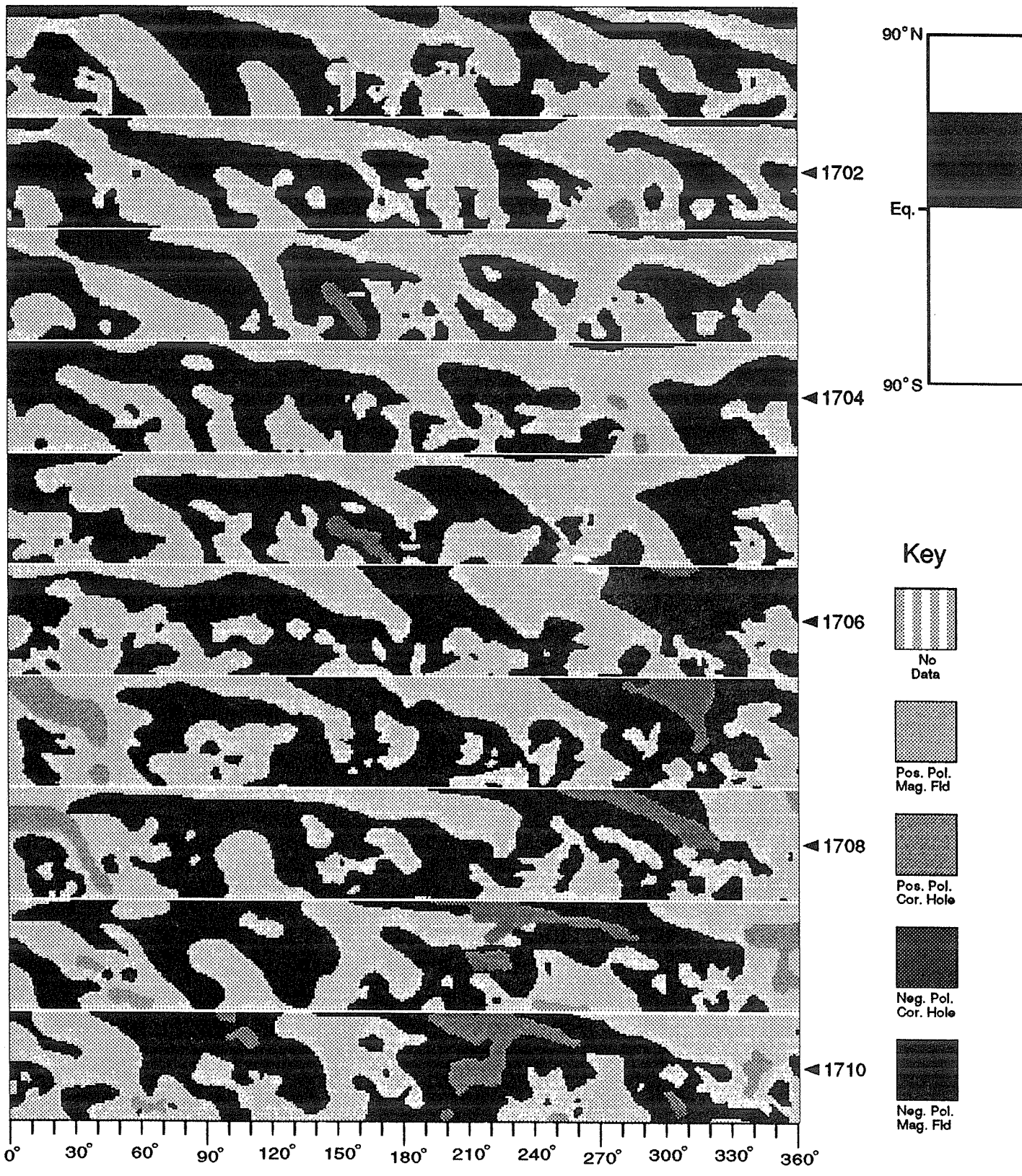
Inferred Magnetic Fields and Coronal Holes



From: 24th Jan 1980
To: 22nd Oct 1980

Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

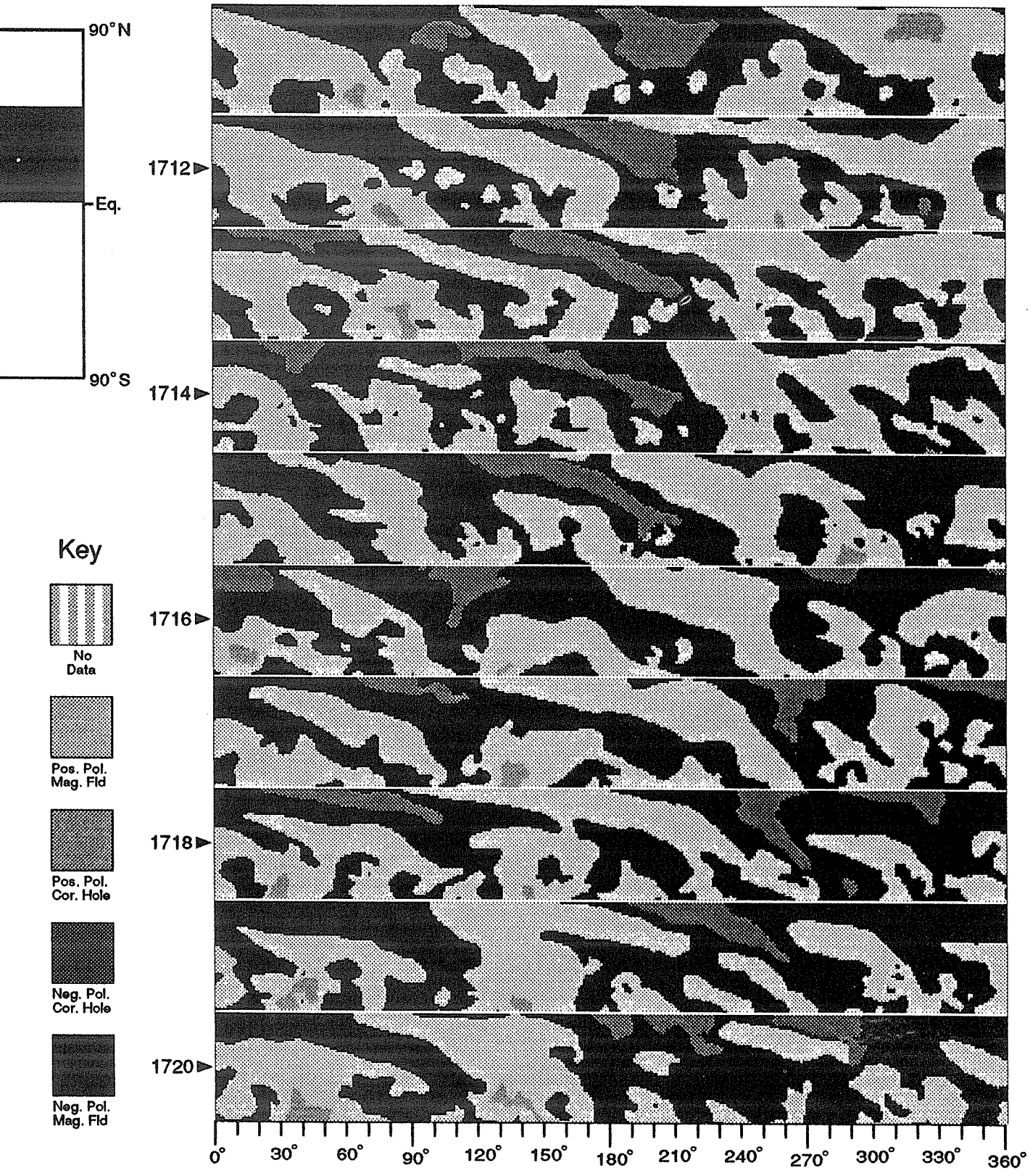


Latitude: North 1 to North 50

From: 22nd Oct 1980
To: 22nd Jul 1981

Carrington Rotation

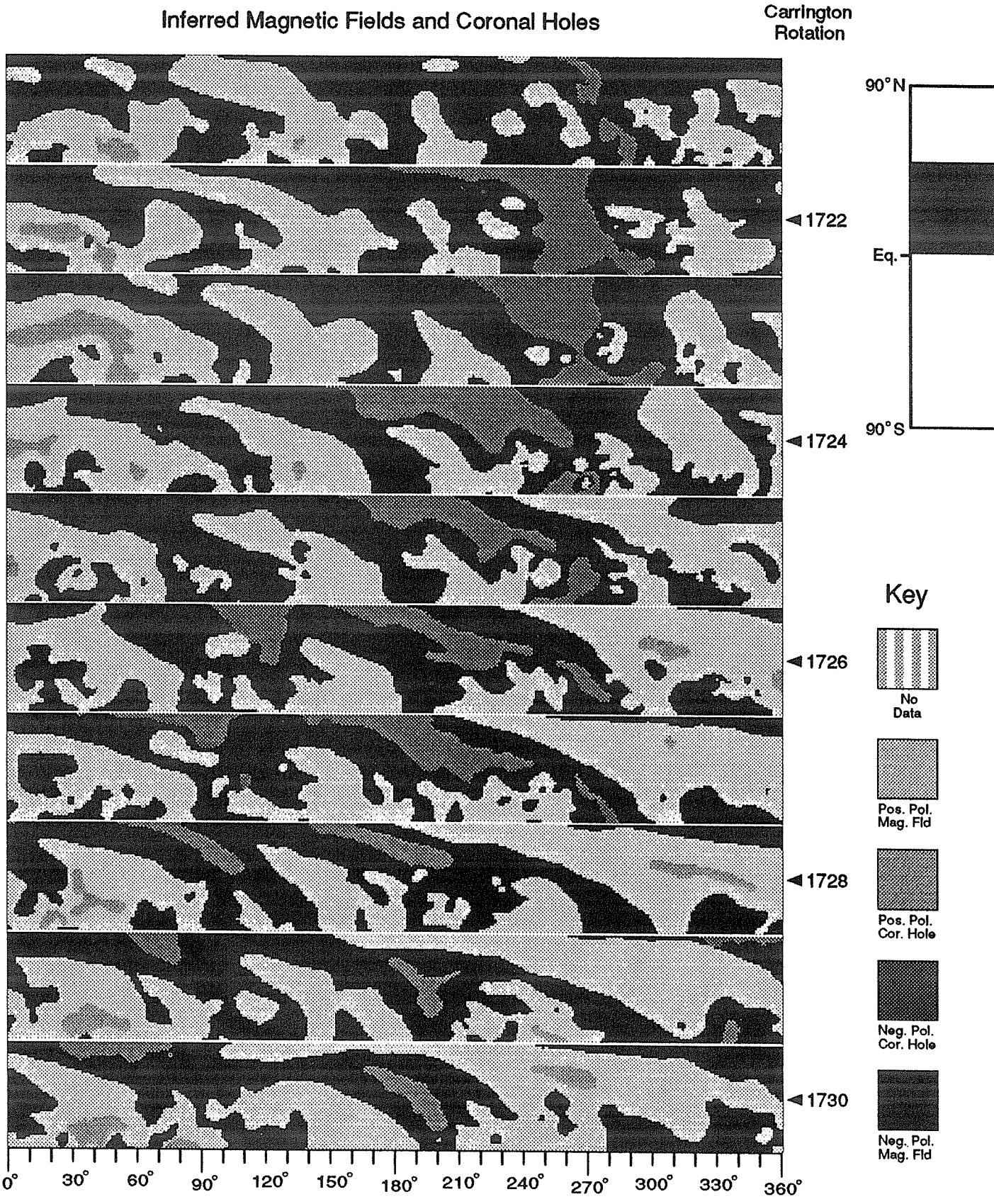
Inferred Magnetic Fields and Coronal Holes



From: 22nd Jul 1981
To: 21st Apr 1982

Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

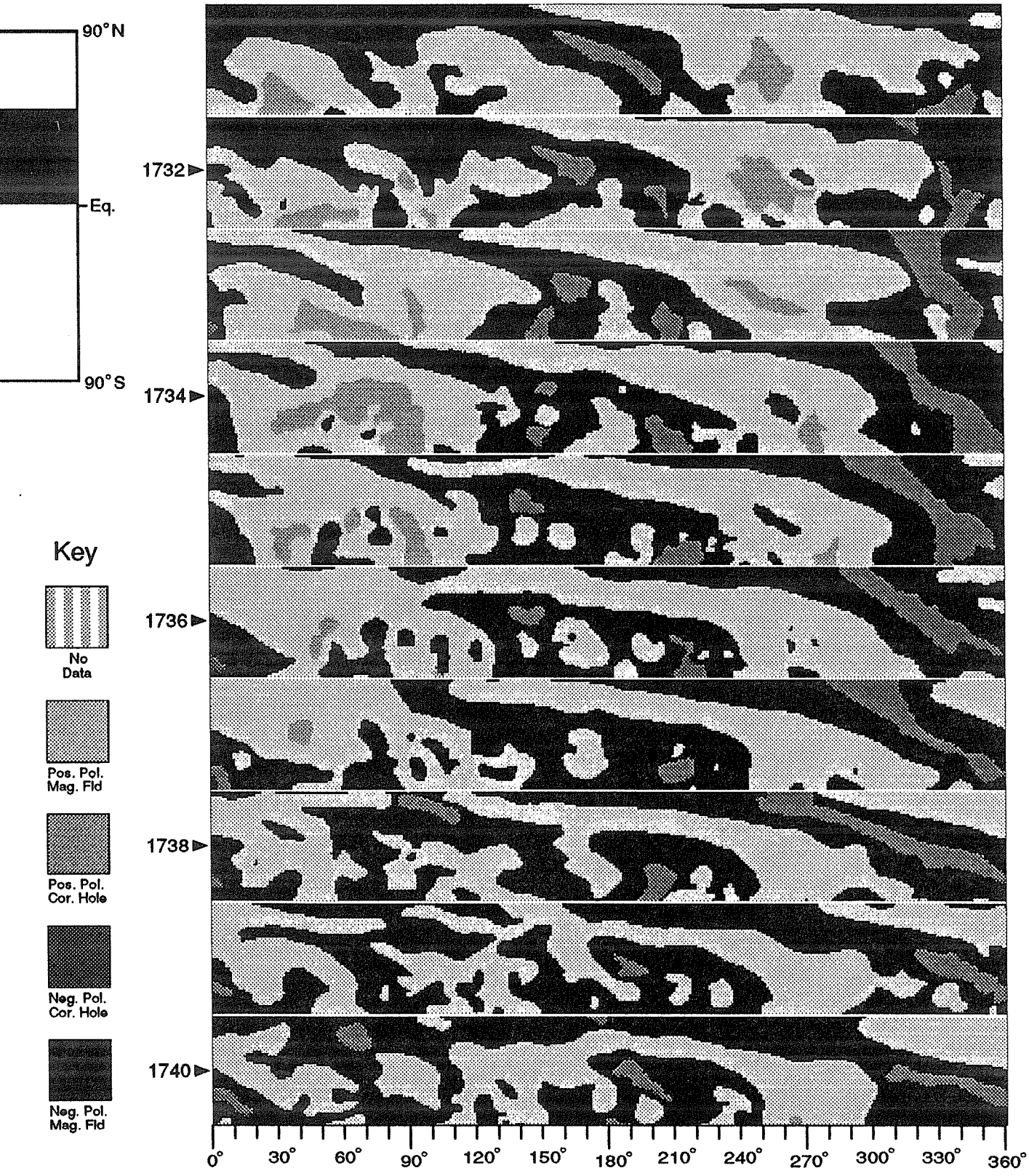


Latitude: North 1 to North 50

From: 21st Apr 1982
To: 19th Jan 1983

Carrington Rotation

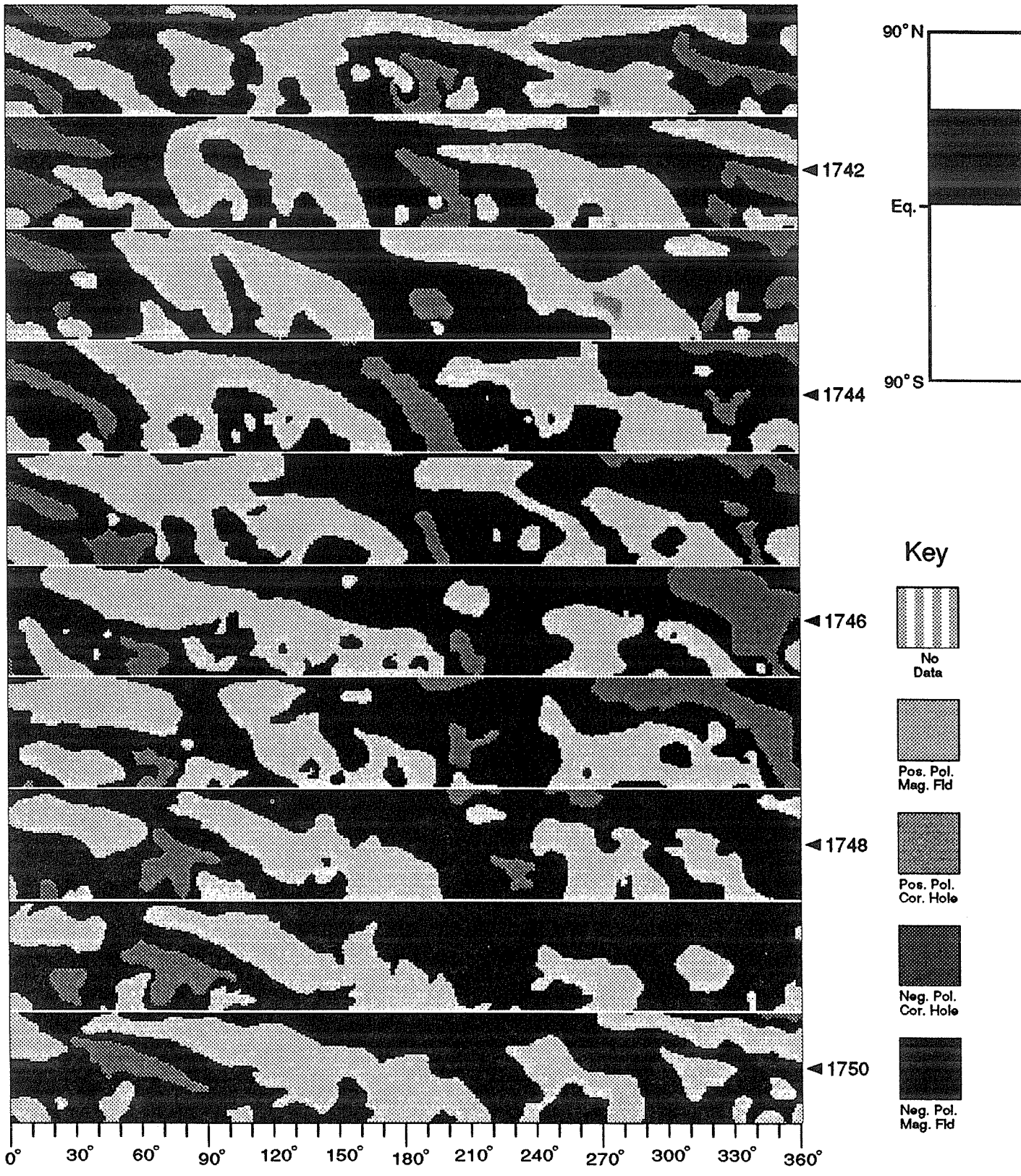
Inferred Magnetic Fields and Coronal Holes



From: 19th Jan 1983
To: 18th Oct 1983

Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

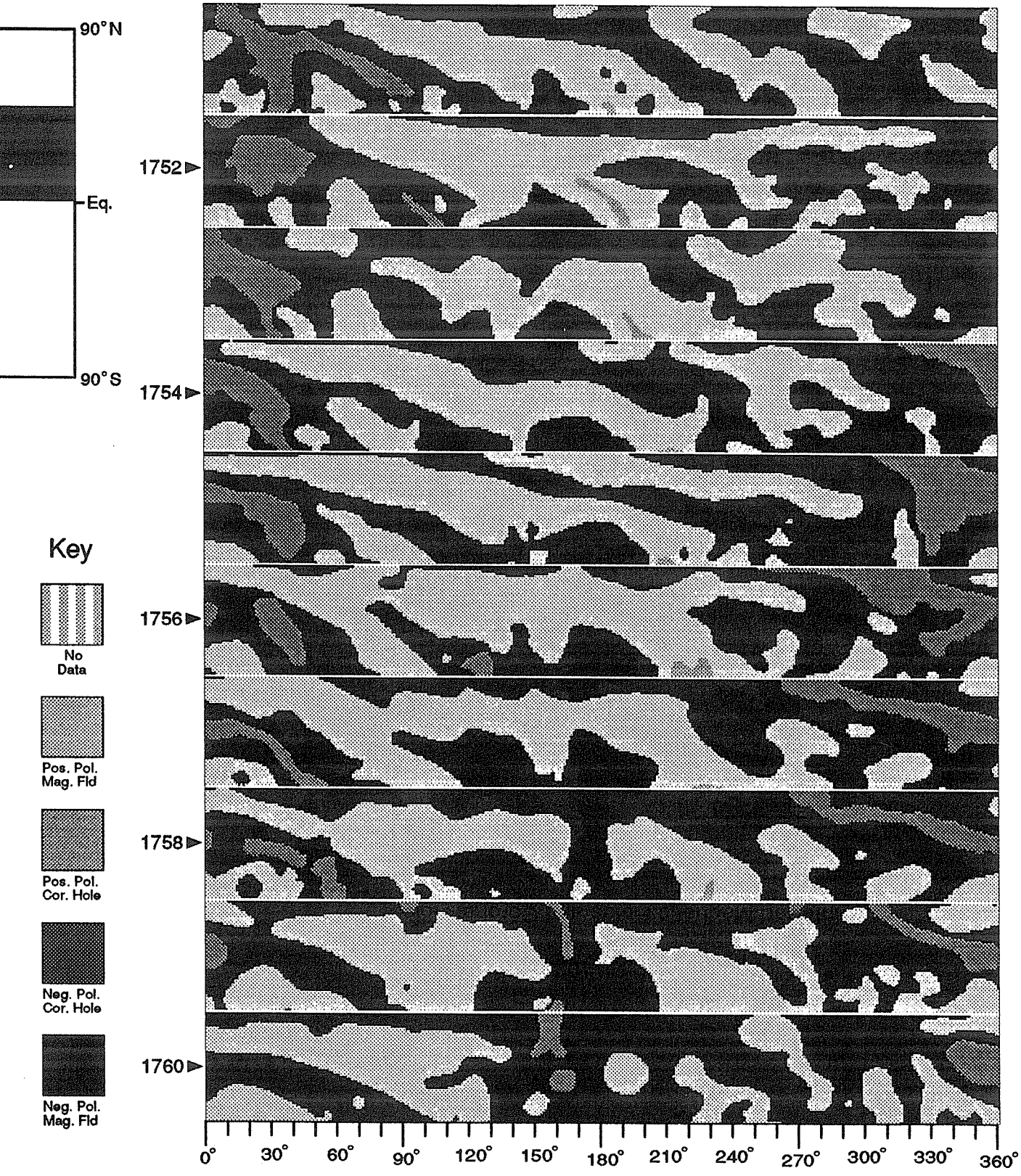


From: 18th Oct 1983
To: 17th Jul 1984

Latitude: North 1 to North 50

Carrington Rotation

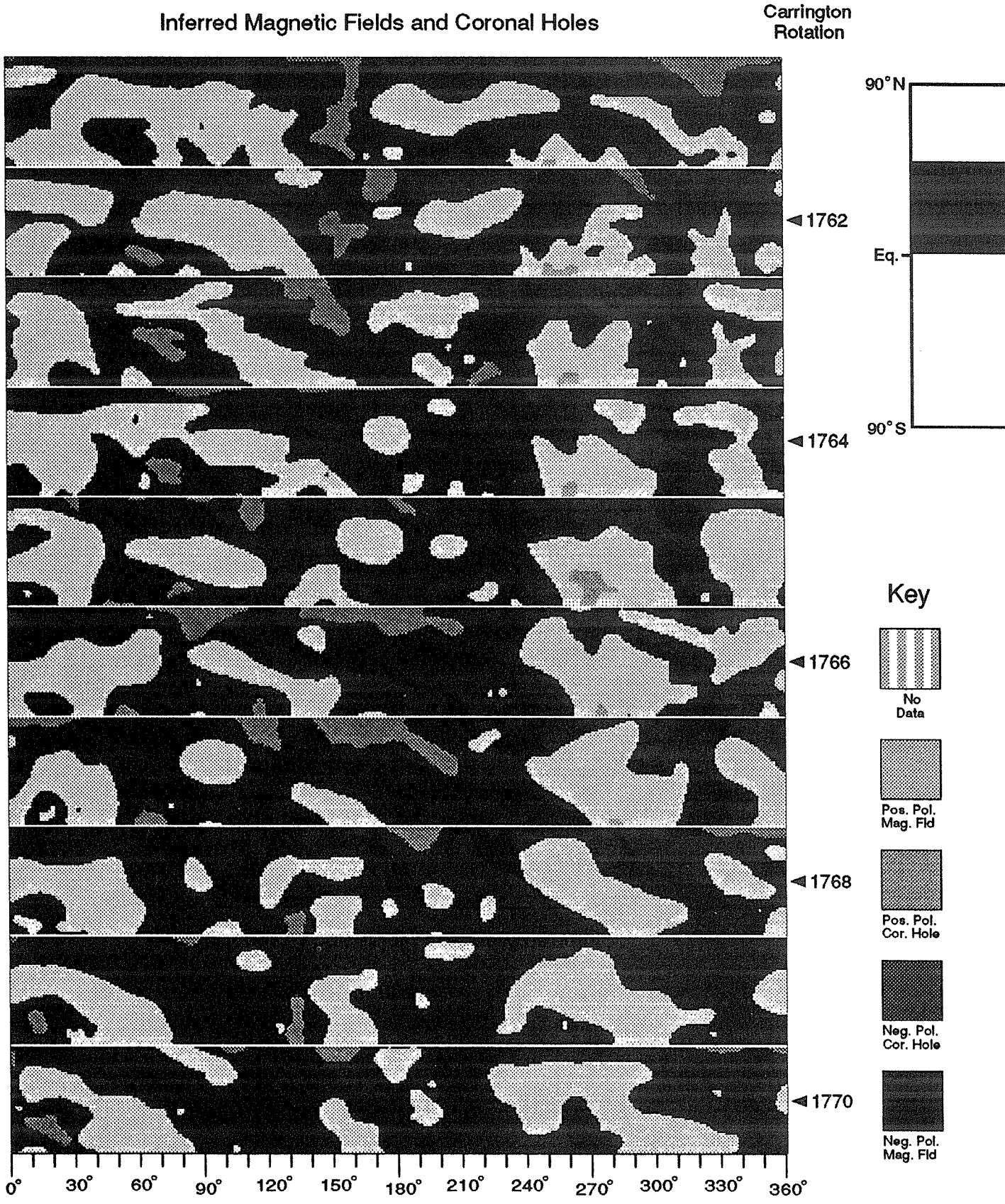
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 16th Apr 1985

Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

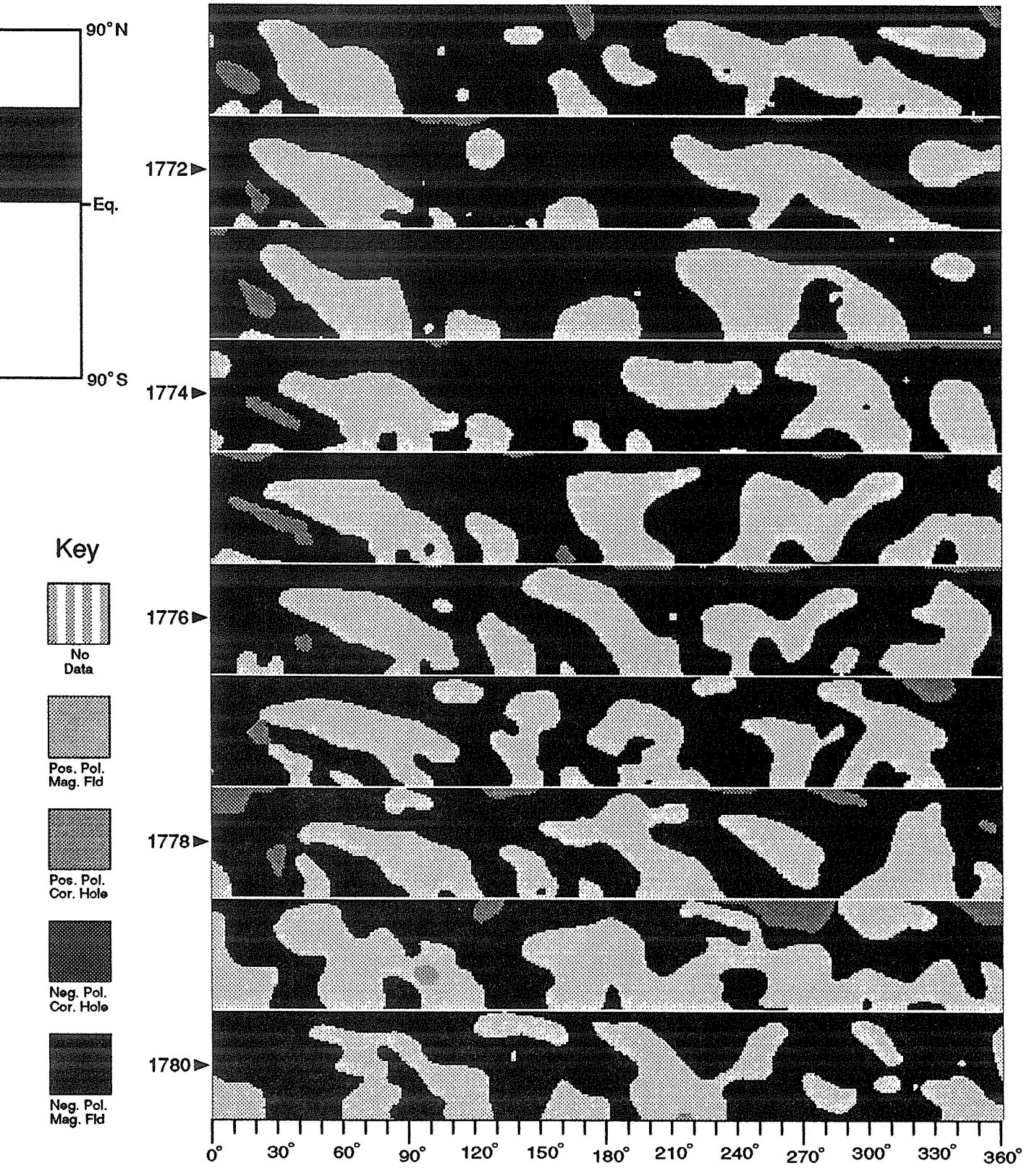


From: 16th Apr 1985
To: 14th Jan 1986

Latitude: North 1 to North 50

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



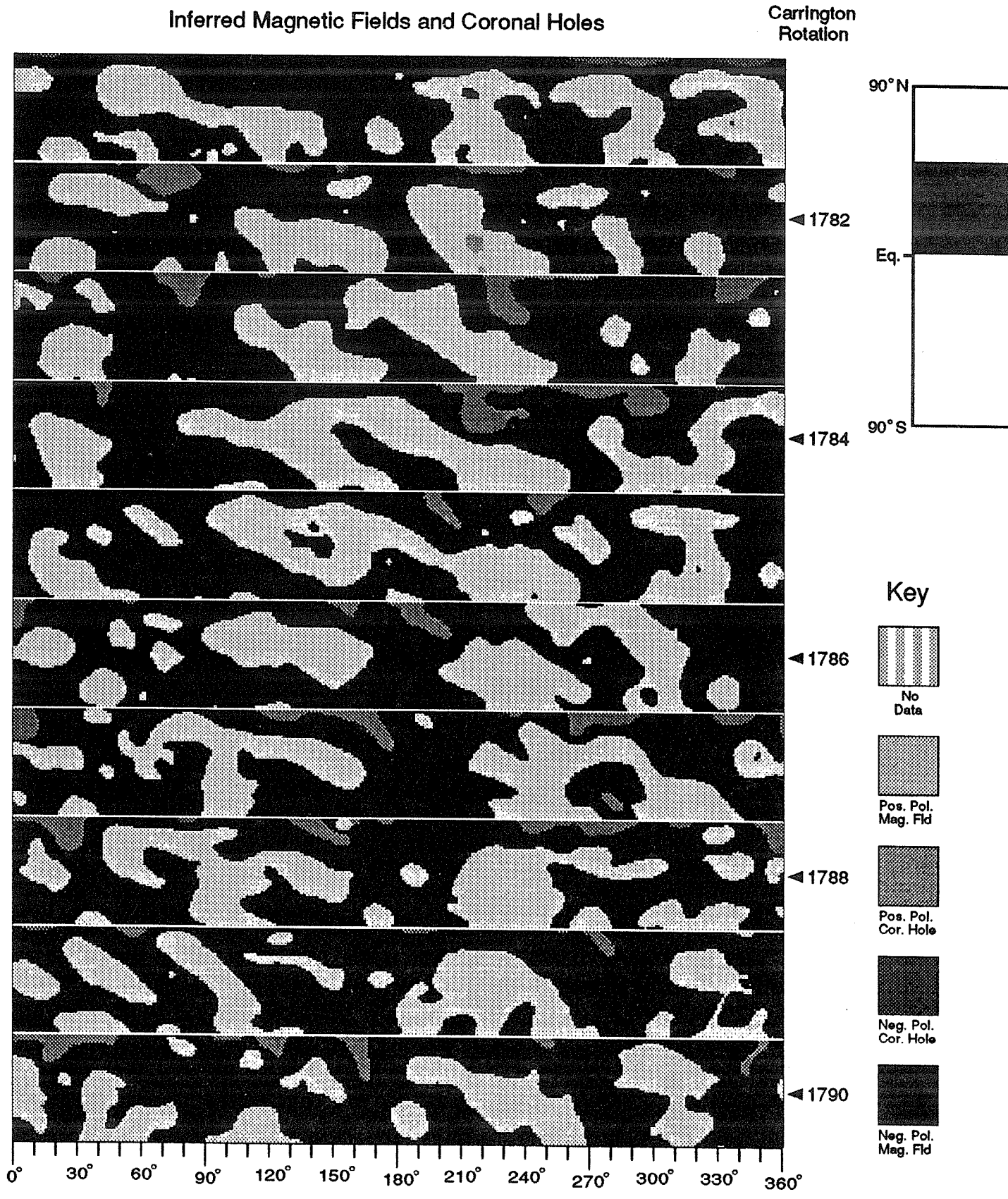
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 14th Jan 1986
To: 13th Oct 1986

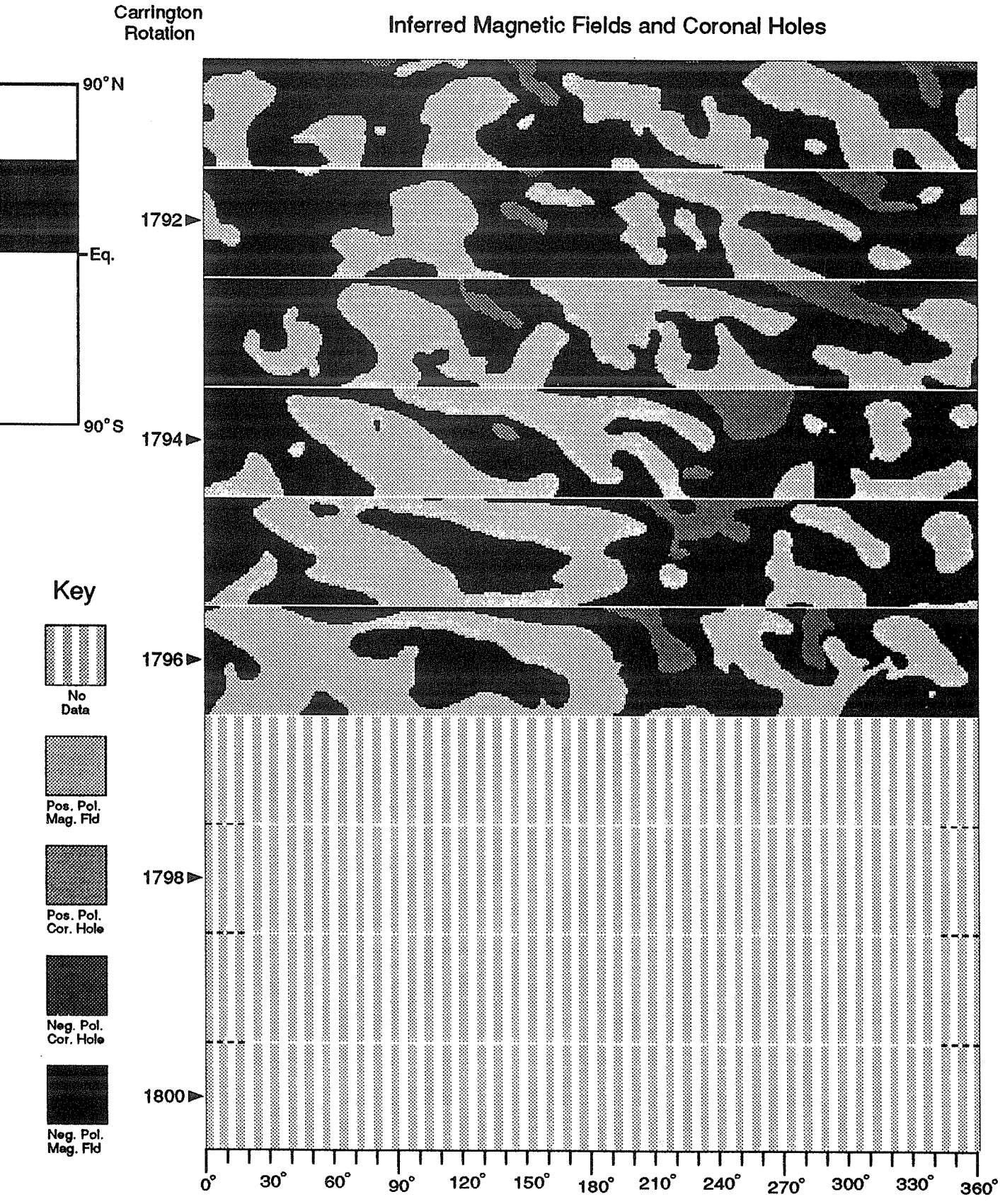
Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

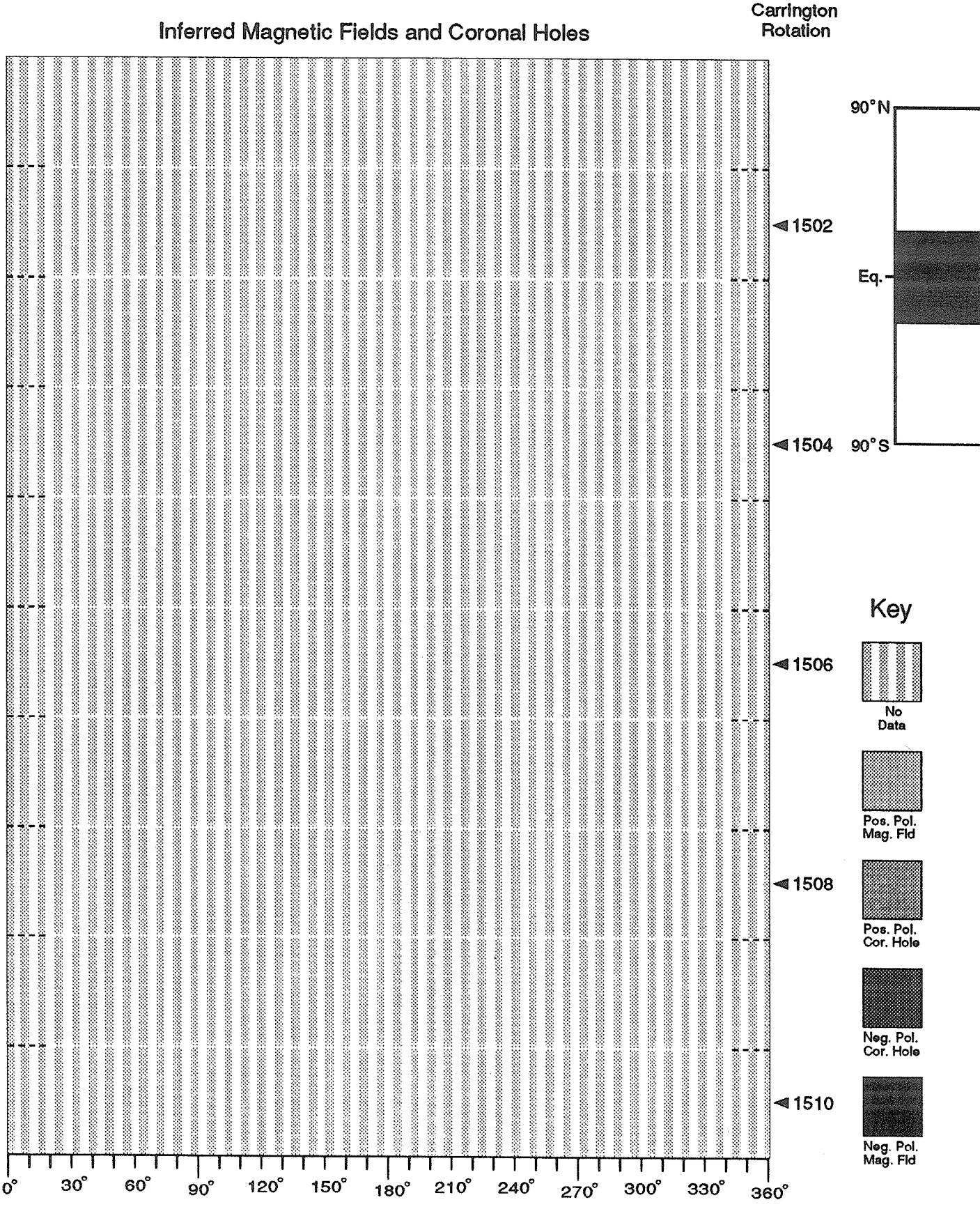


Latitude: North 1 to North 50

From: 13th Oct 1986
To: 13th Jul 1987


Carrington Rotation
Inferred Magnetic Fields and Coronal Holes
90°N
Eq.
90°S
1792
1794
1796
1798
1800
Key
No Data
Pos. Pol. Mag. Fld
Pos. Pol. Cor. Hole
Neg. Pol. Cor. Hole
Neg. Pol. Mag. Fld
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
From: 13th Jul 1987
To: 11th Apr 1988
Latitude: North 1 to North 50

Inferred Magnetic Fields and Coronal Holes

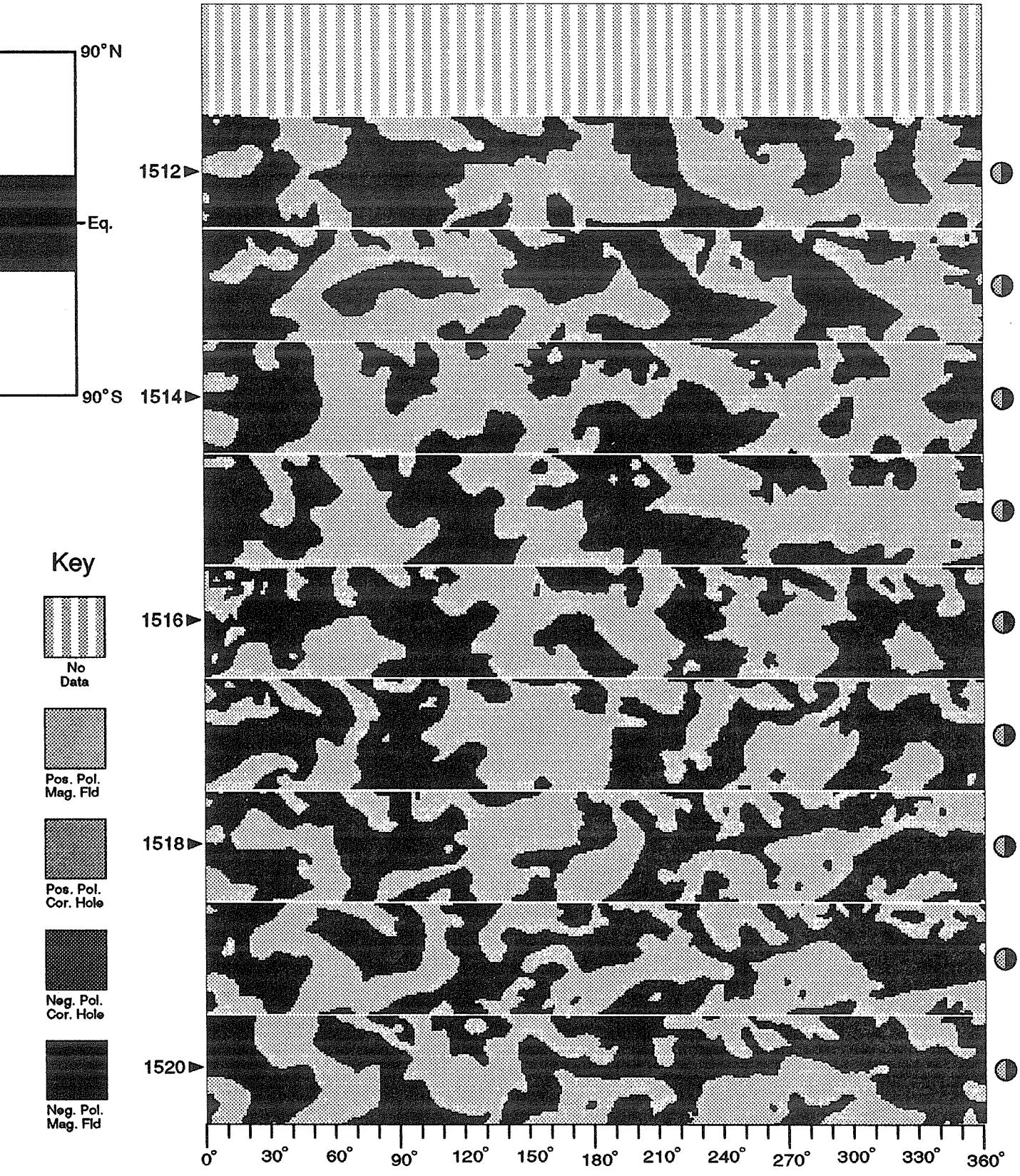


Latitude: South 25 to North 25

From: 15th Nov 1965
To: 15th Aug 1966

Carrington Rotation

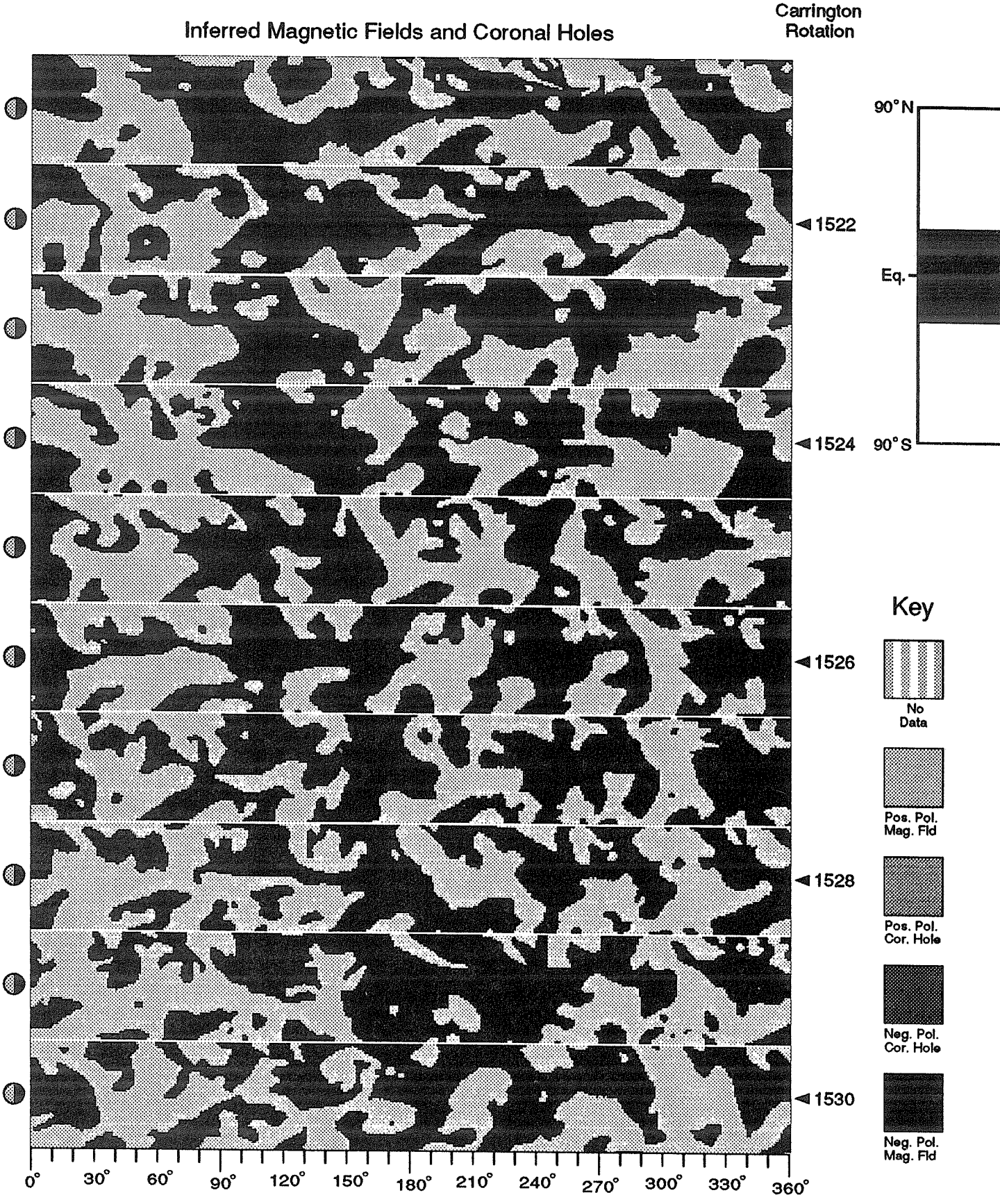
Inferred Magnetic Fields and Coronal Holes



From: 15th Aug 1966
To: 15th May 1967

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

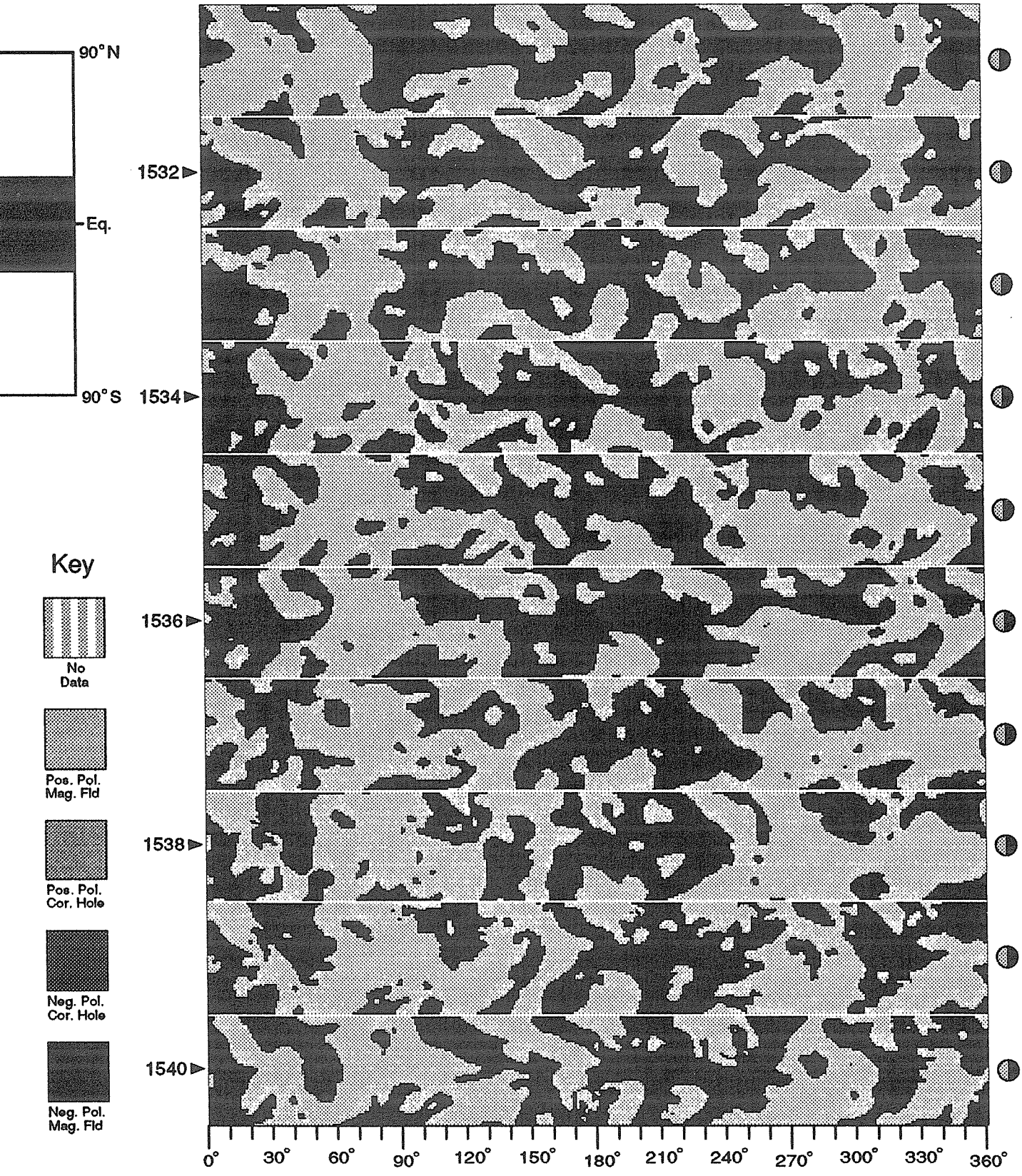


Latitude: South 25 to North 25

From: 15th May 1967
To: 12th Feb 1968

Carrington Rotation

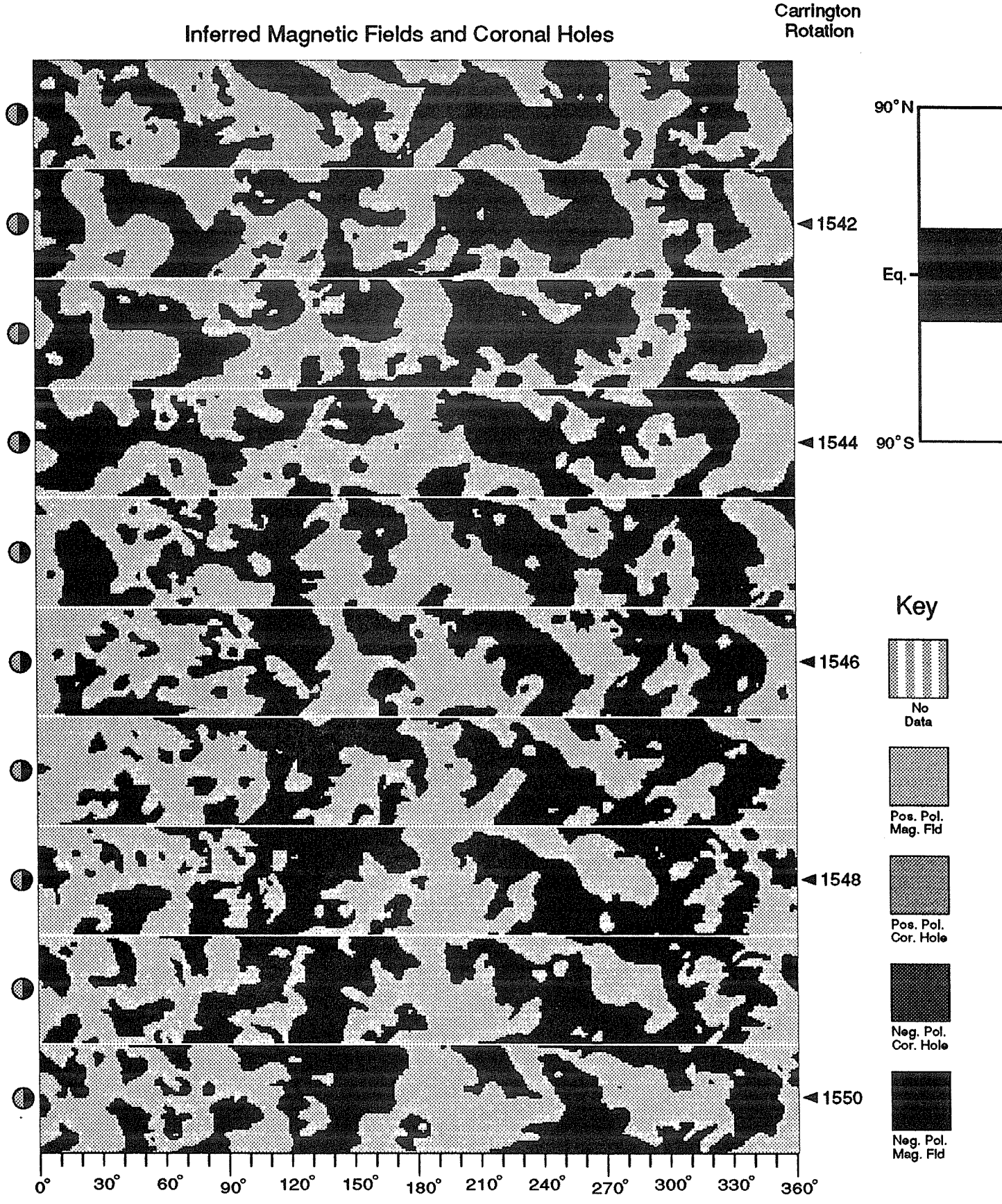
Inferred Magnetic Fields and Coronal Holes



From: 12th Feb 1968
To: 10th Nov 1968

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

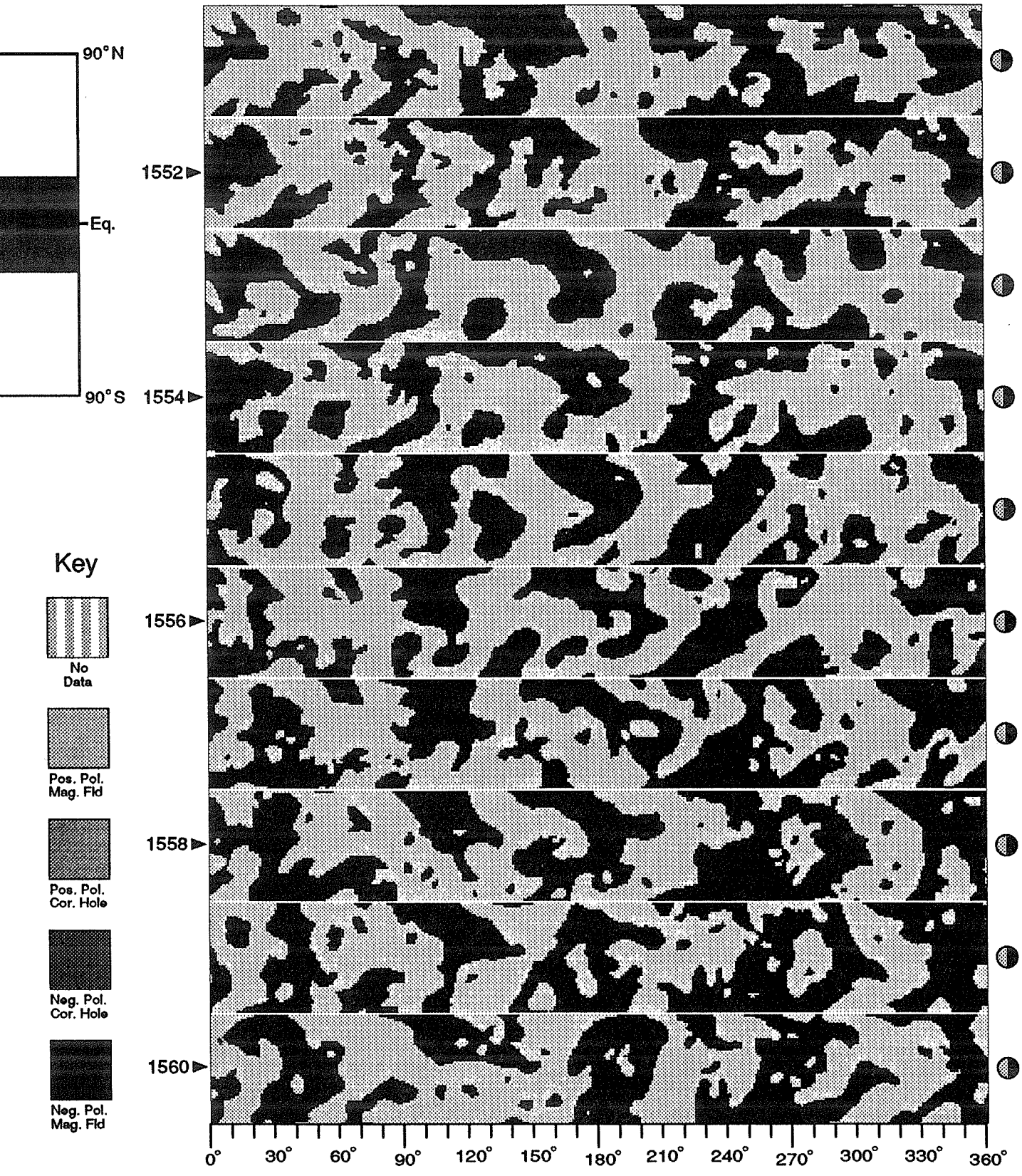


Latitude: South 25 to North 25

From: 10th Nov 1968
To: 10th Aug 1969

Carrington Rotation

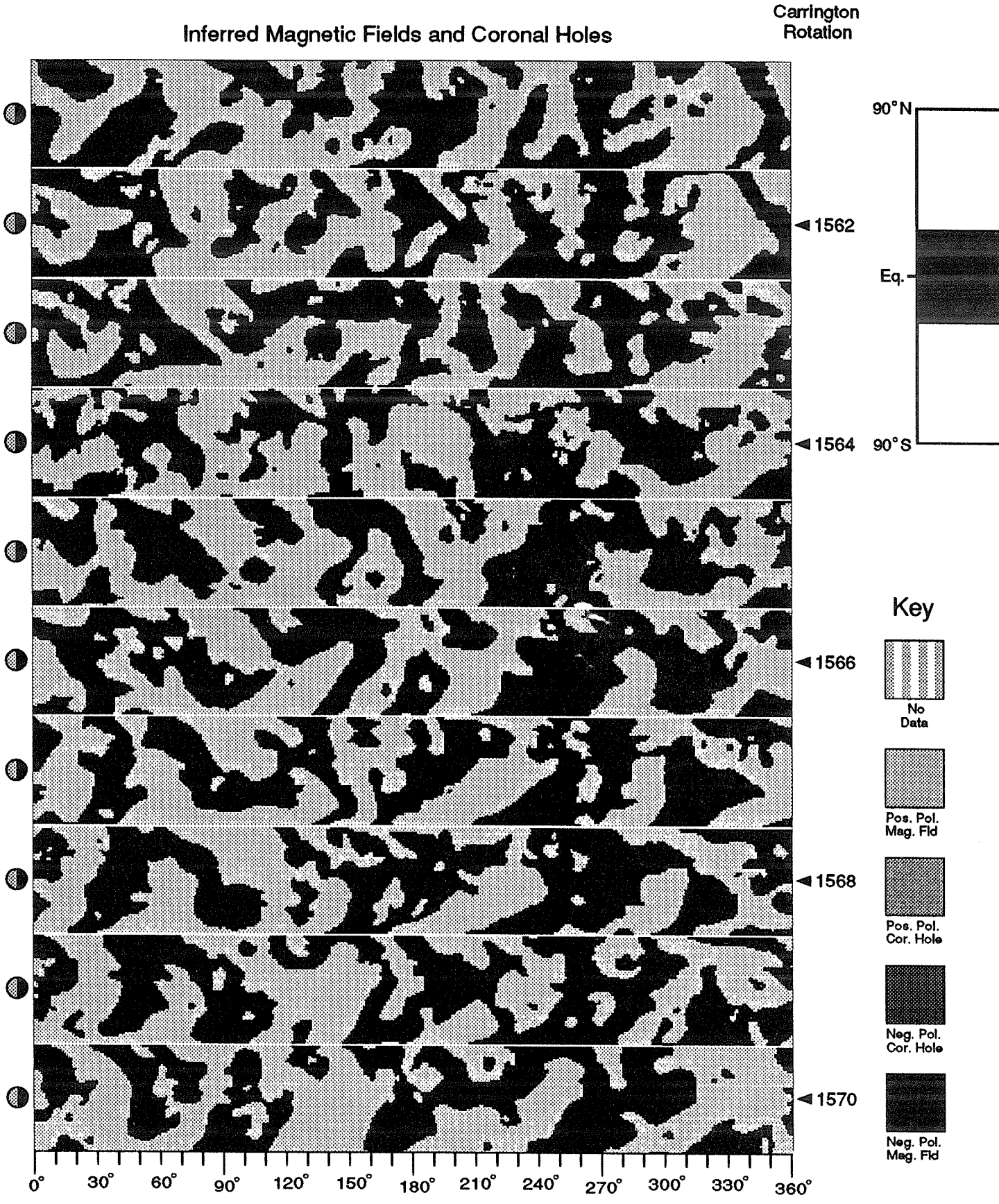
Inferred Magnetic Fields and Coronal Holes



From: 10th Aug 1969
To: 10th May 1970

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

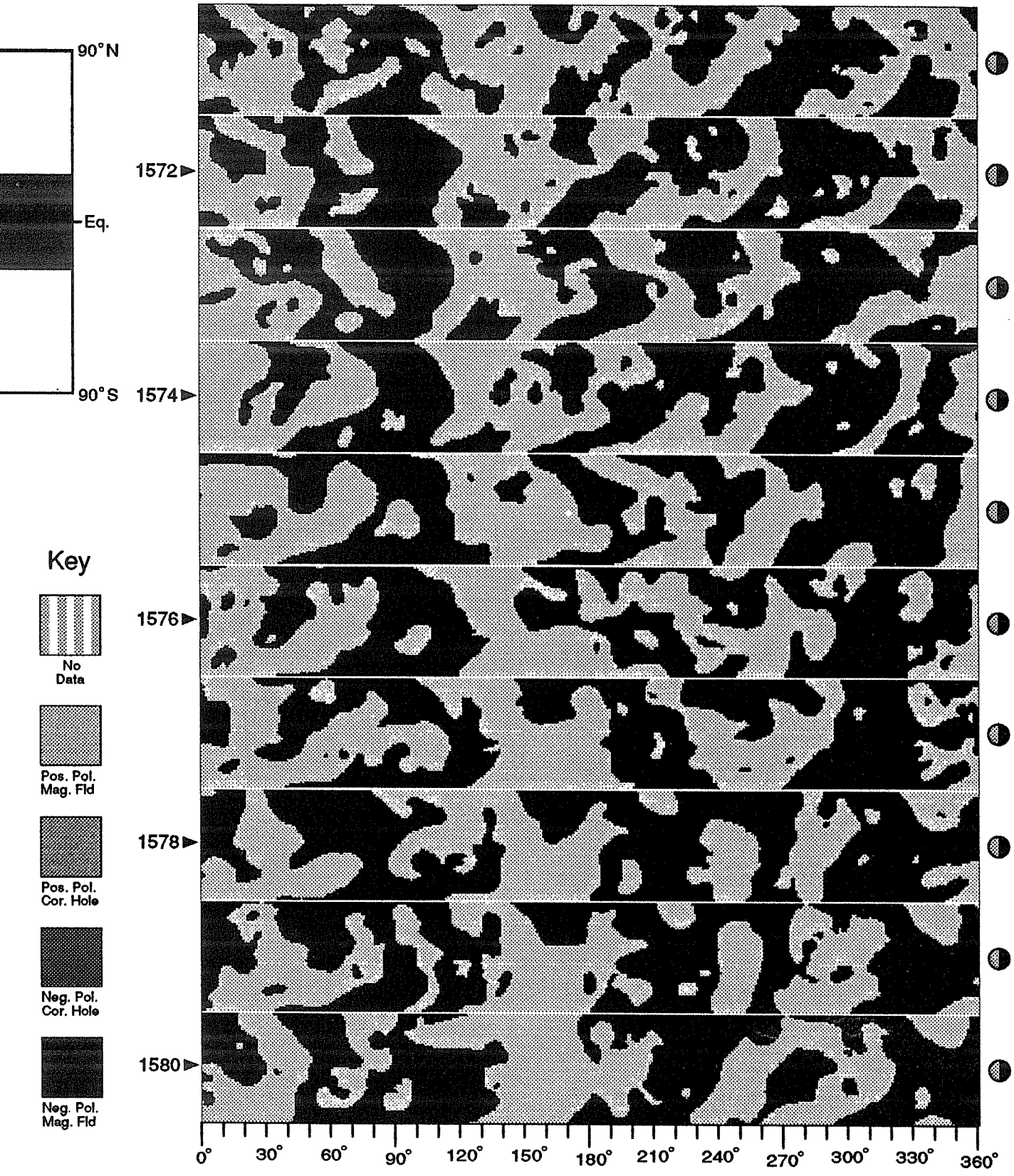


Latitude: South 25 to North 25

From: 10th May 1970
To: 7th Feb 1971

Carrington Rotation

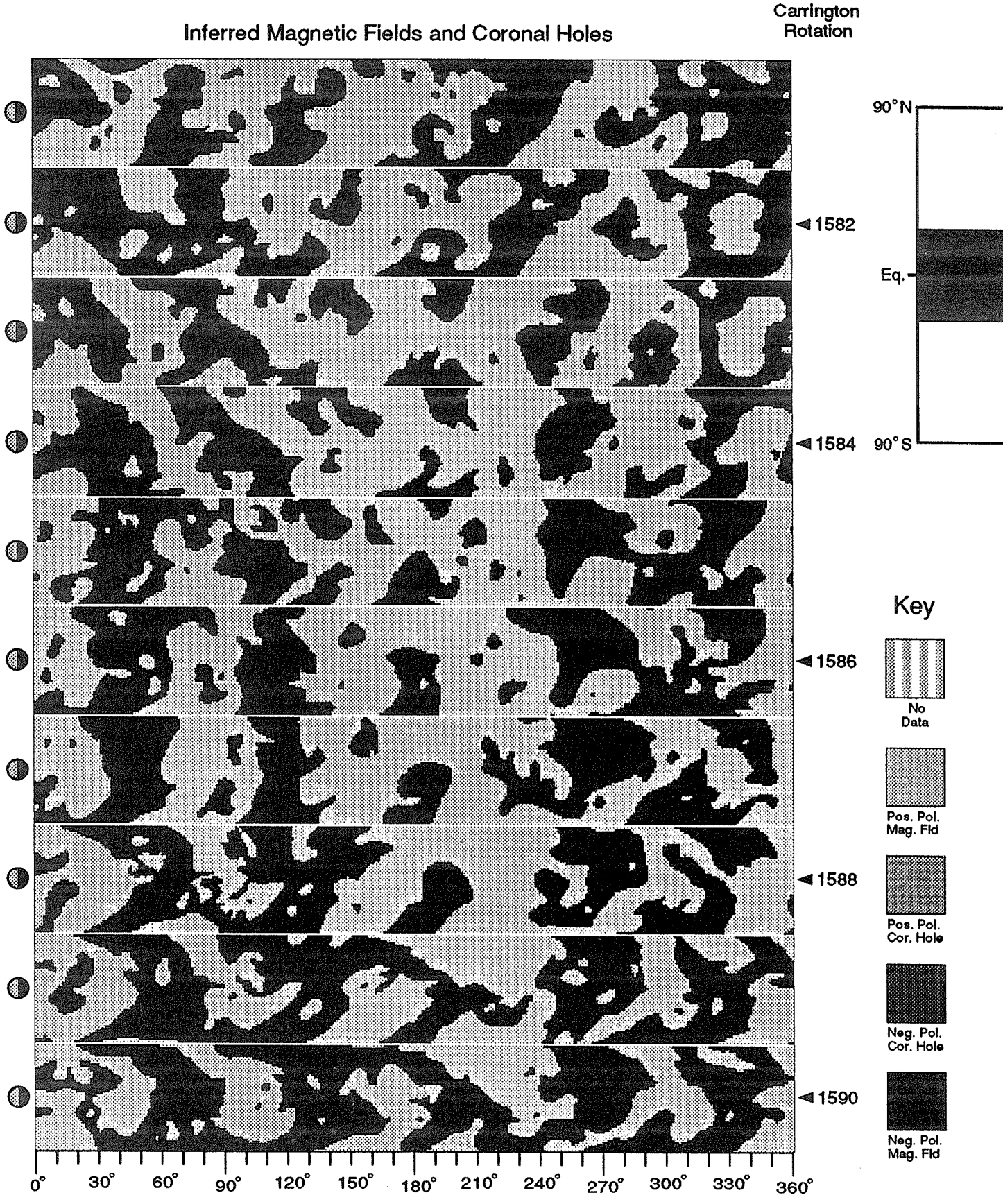
Inferred Magnetic Fields and Coronal Holes



From: 7th Feb 1971
To: 6th Nov 1971

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

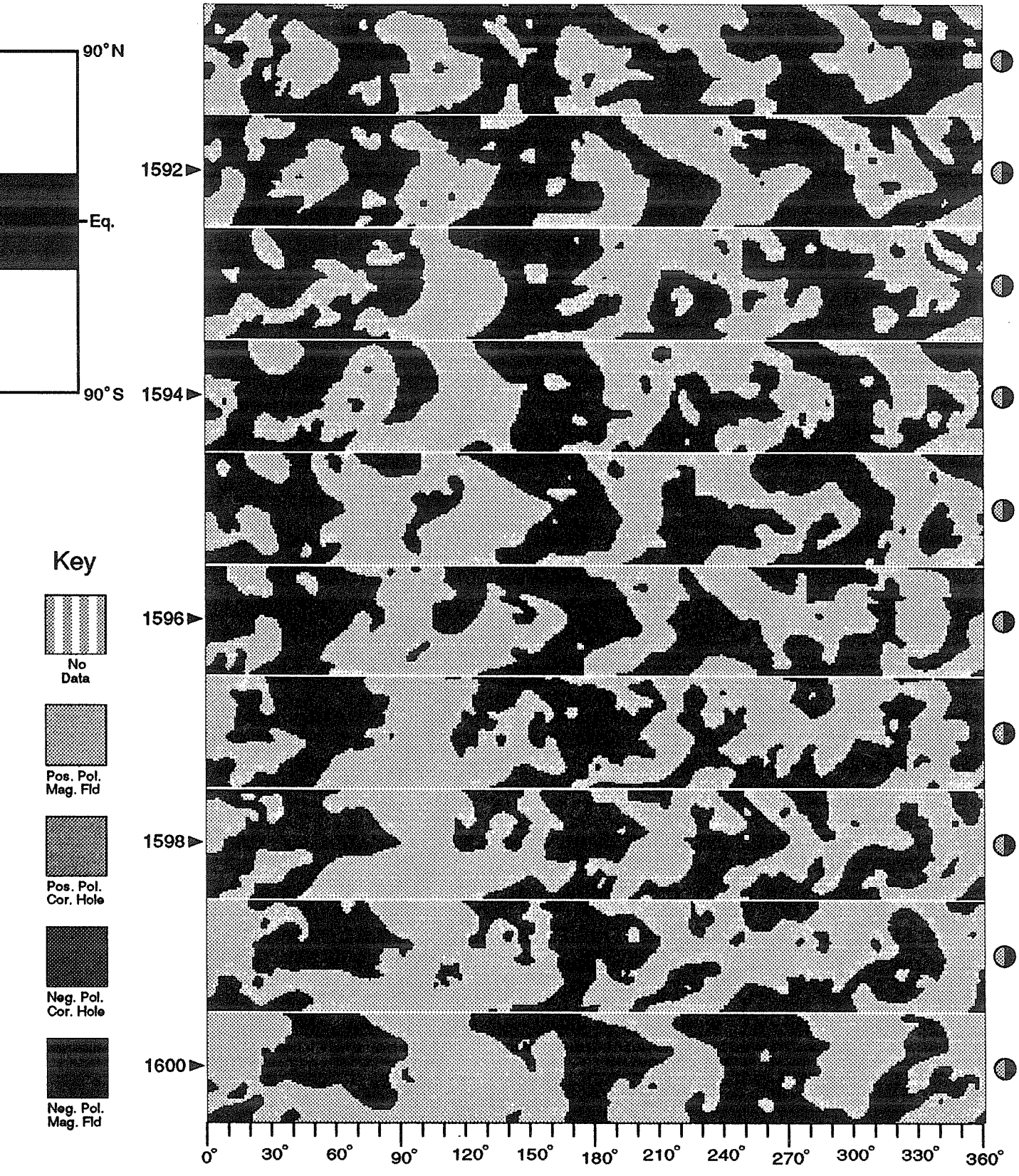


Latitude: South 25 to North 25

From: 6th Nov 1971
To: 5th Aug 1972

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes

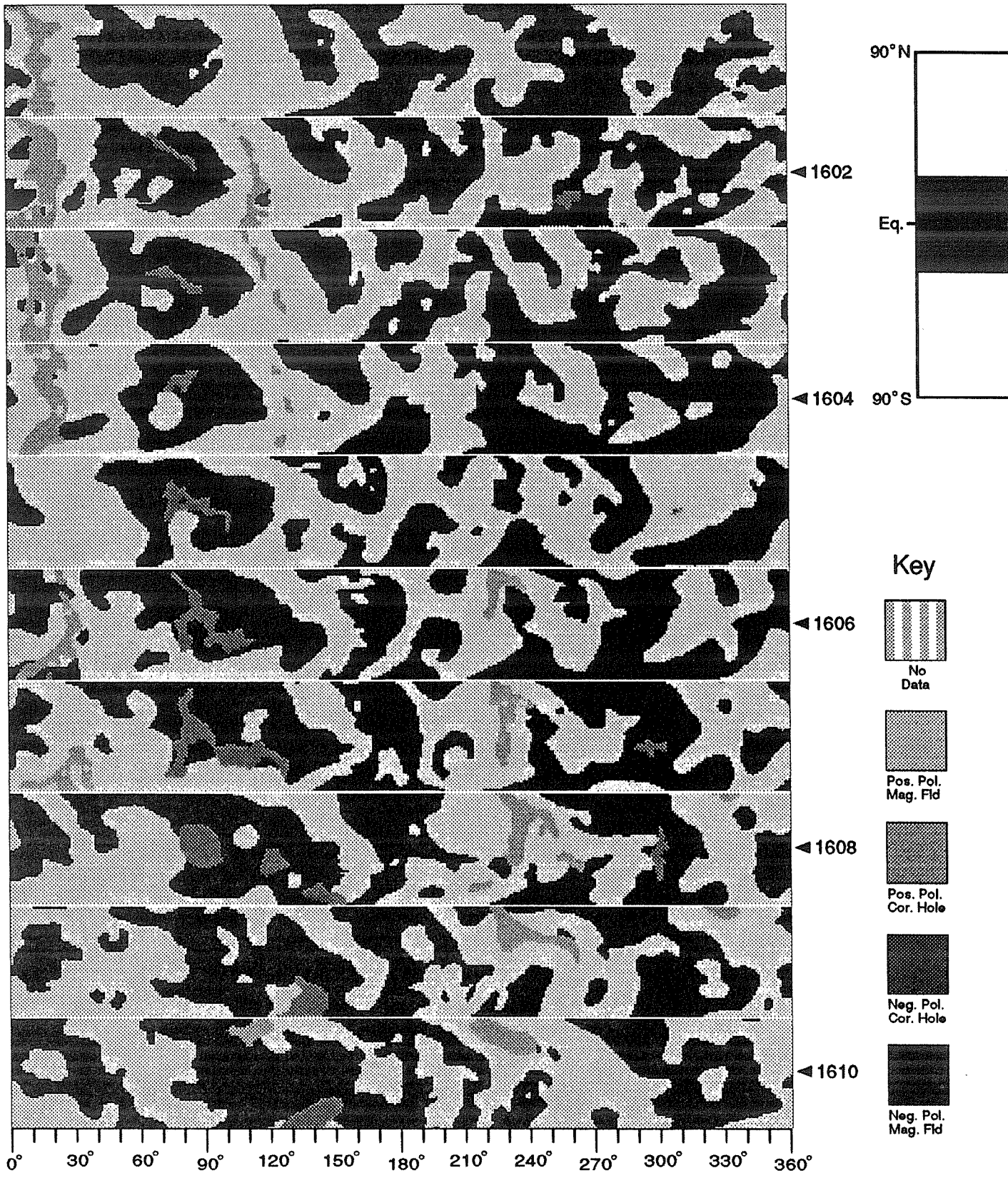


From: 5th Aug 1972
To: 5th May 1973

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

Carrington Rotation

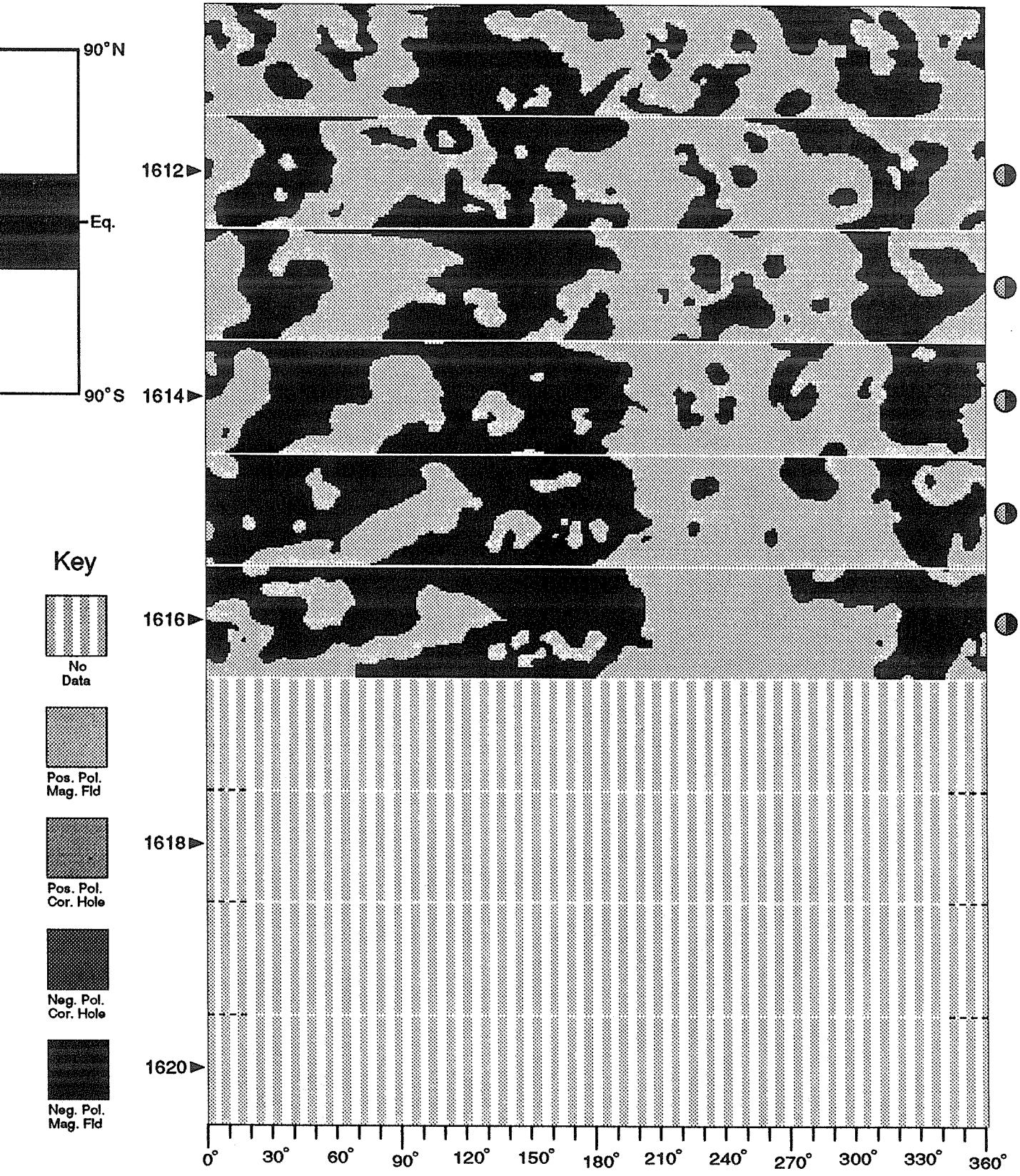


Latitude: South 25 to North 25

From: 5th May 1973
To: 2nd Feb 1974

Carrington Rotation

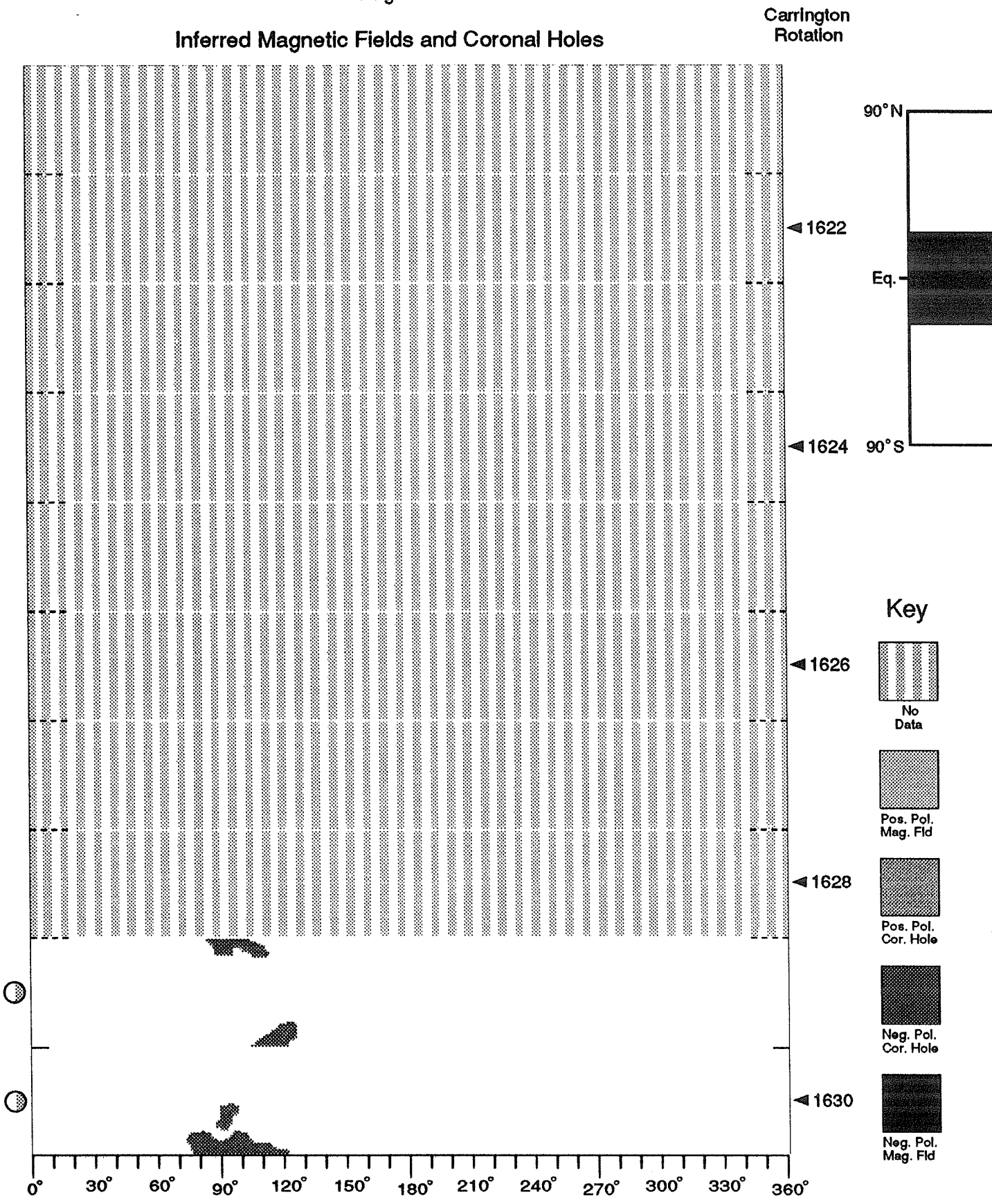
Inferred Magnetic Fields and Coronal Holes



From: 2nd Feb 1974
To: 1st Nov 1974

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

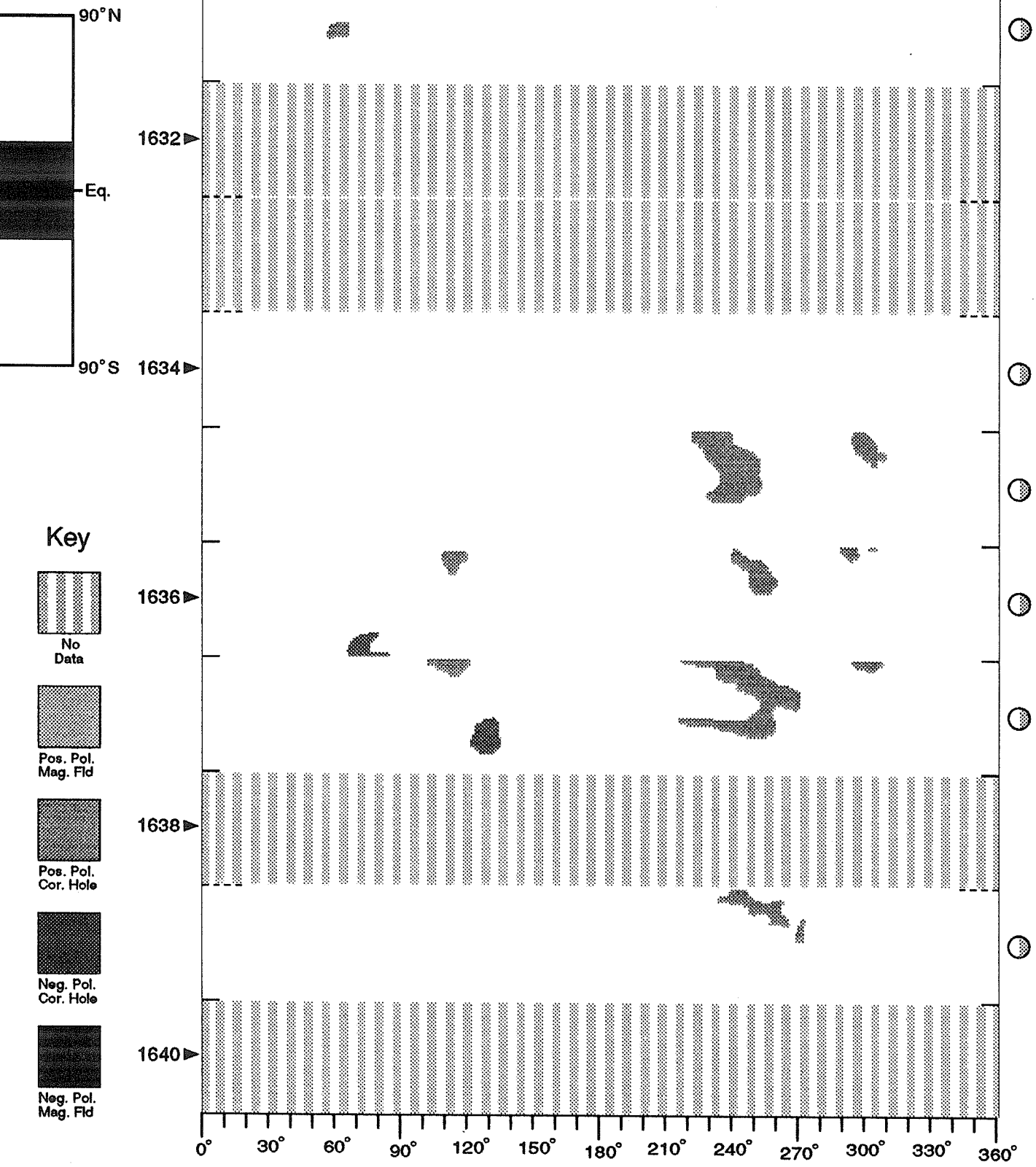


Latitude: South 25 to North 25

From: 1st Nov 1974
To: 1st Aug 1975

Carrington Rotation

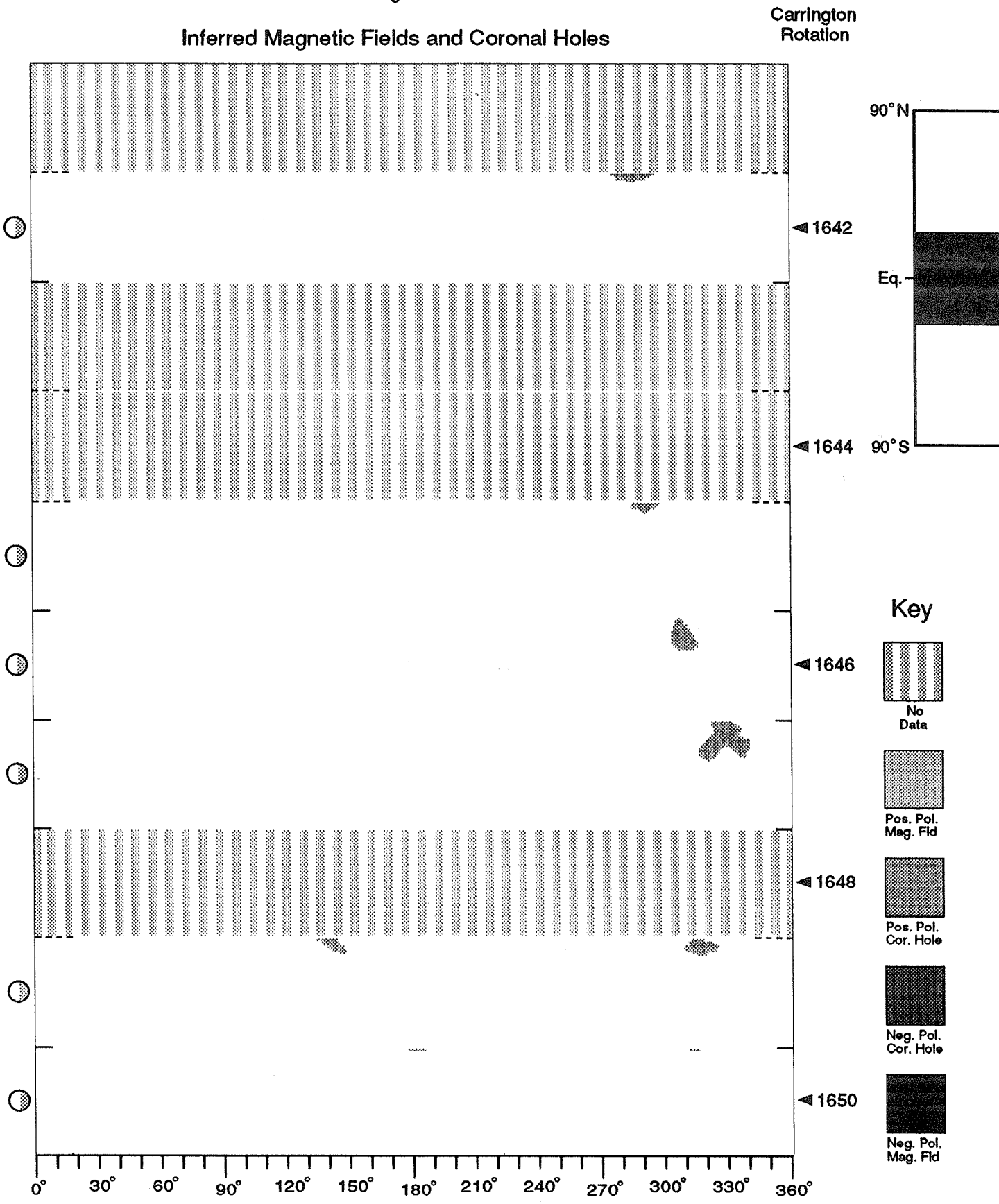
Inferred Magnetic Fields and Coronal Holes



From: 1st Aug 1975
To: 30th Apr 1976

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

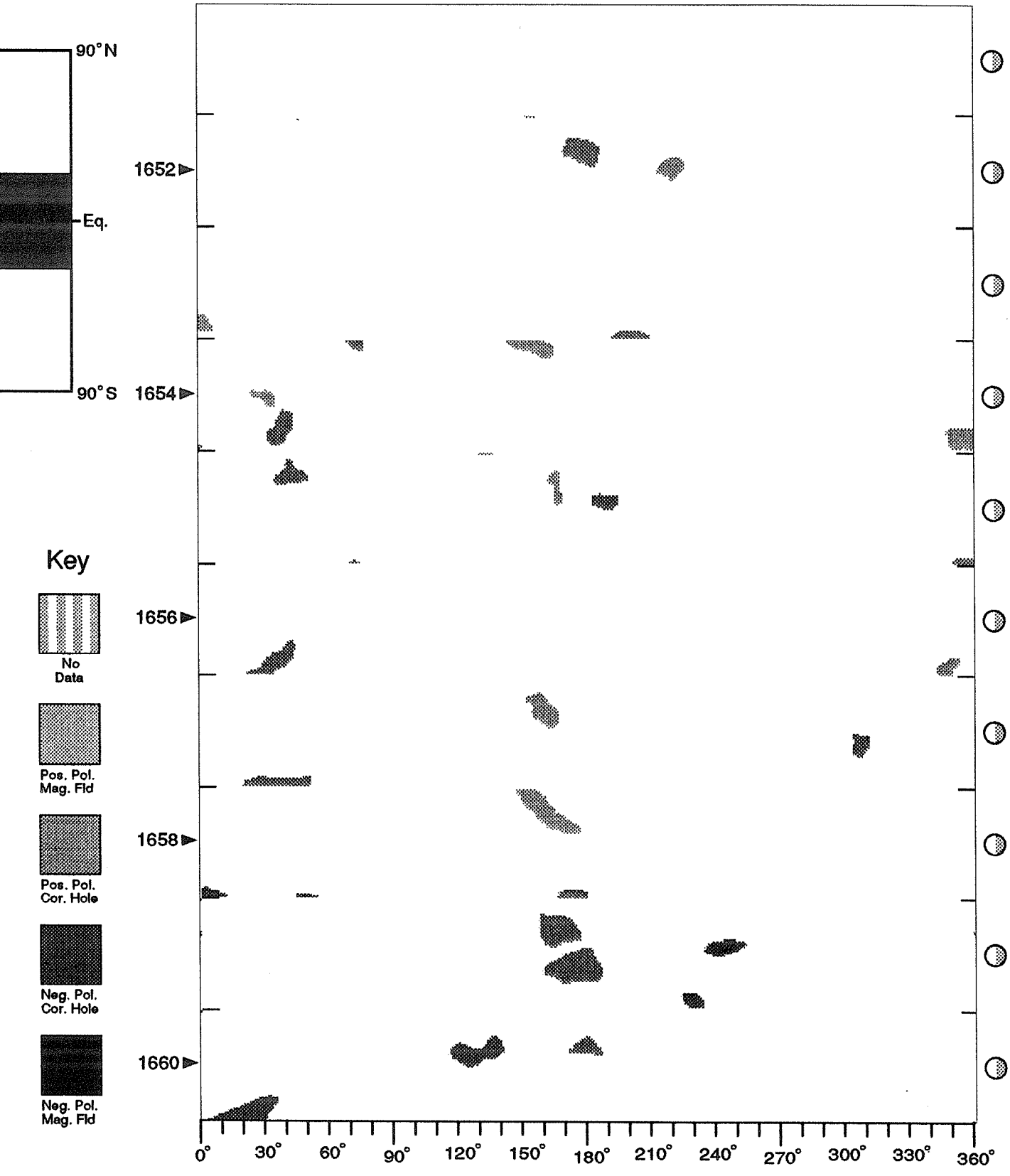


Latitude: South 25 to North 25

From: 30th Apr 1976
To: 28th Jan 1977

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



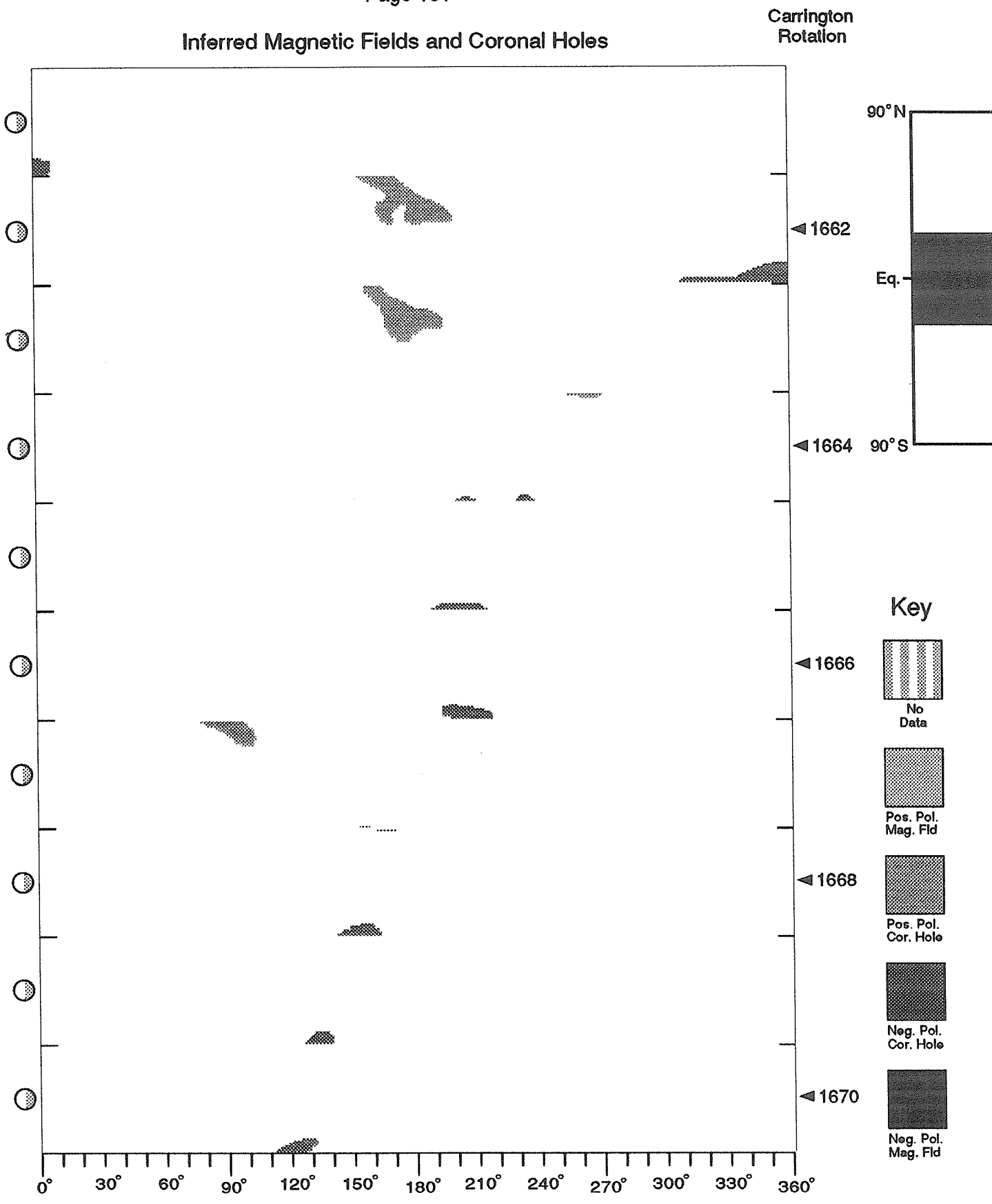
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 28th Jan 1977
To: 27th Oct 1977

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

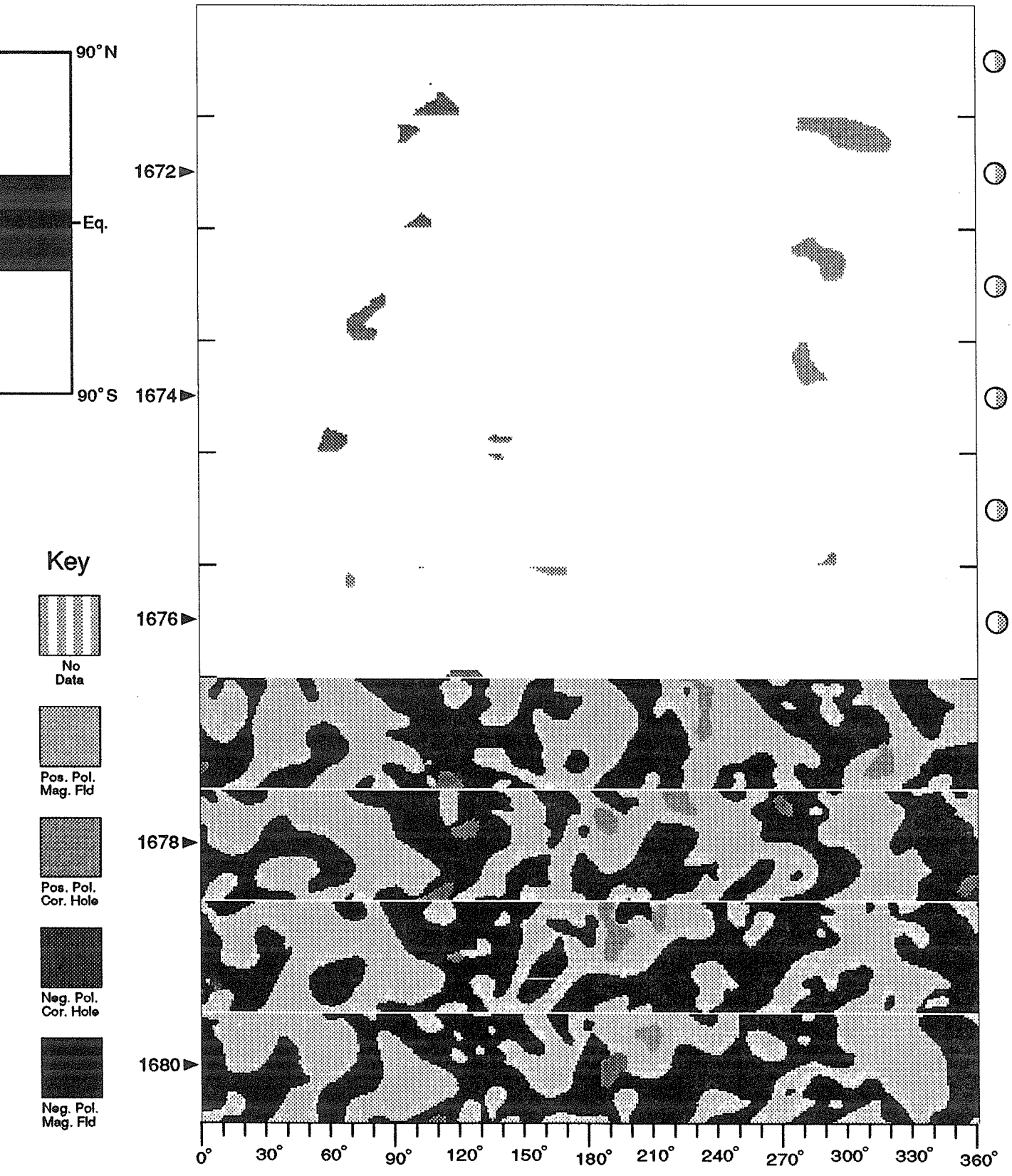


Latitude: South 25 to North 25

From: 27th Oct 1977
To: 27th Jul 1978

Carrington Rotation

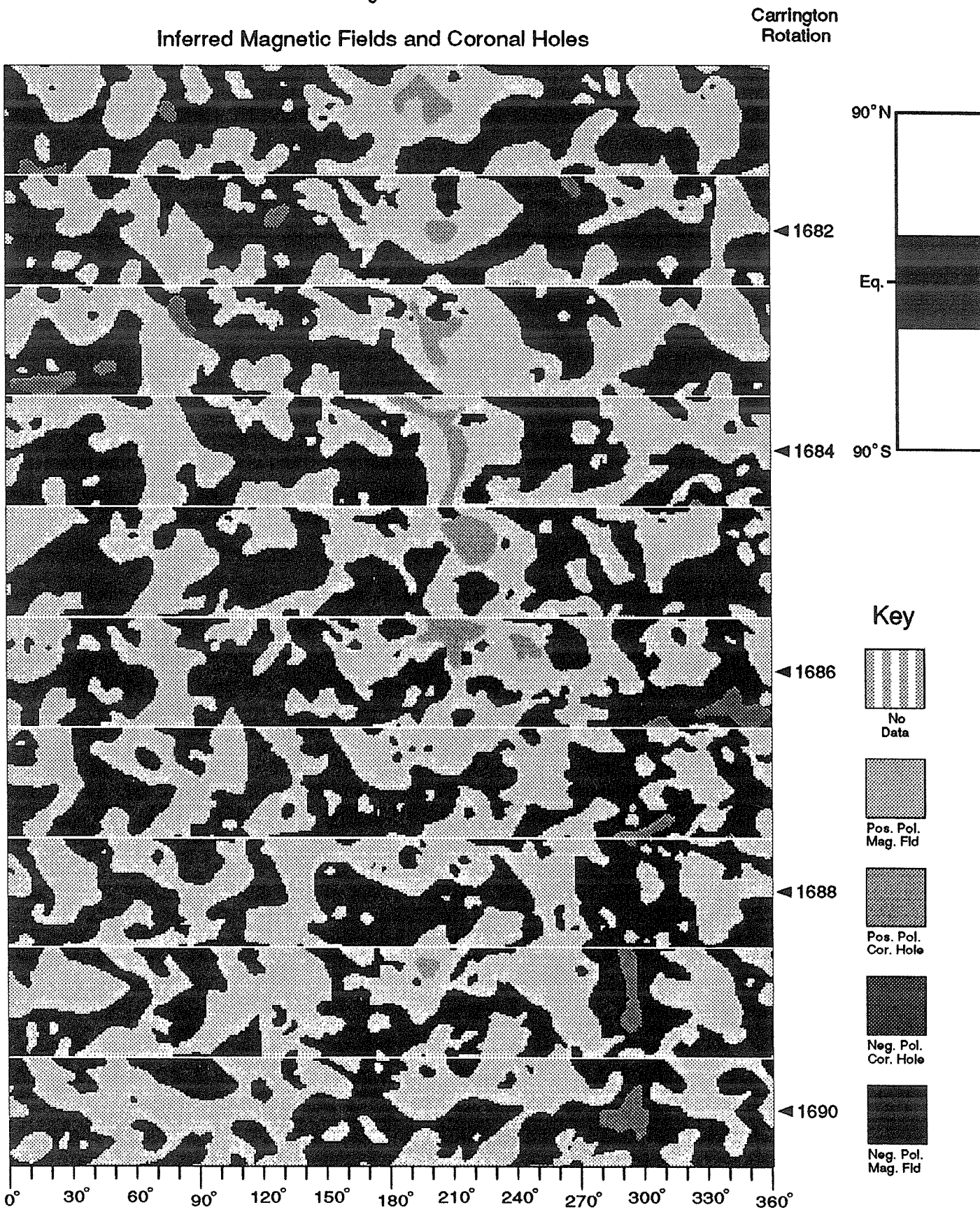
Inferred Magnetic Fields and Coronal Holes



From: 27th Jul 1978
To: 26th Apr 1979

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

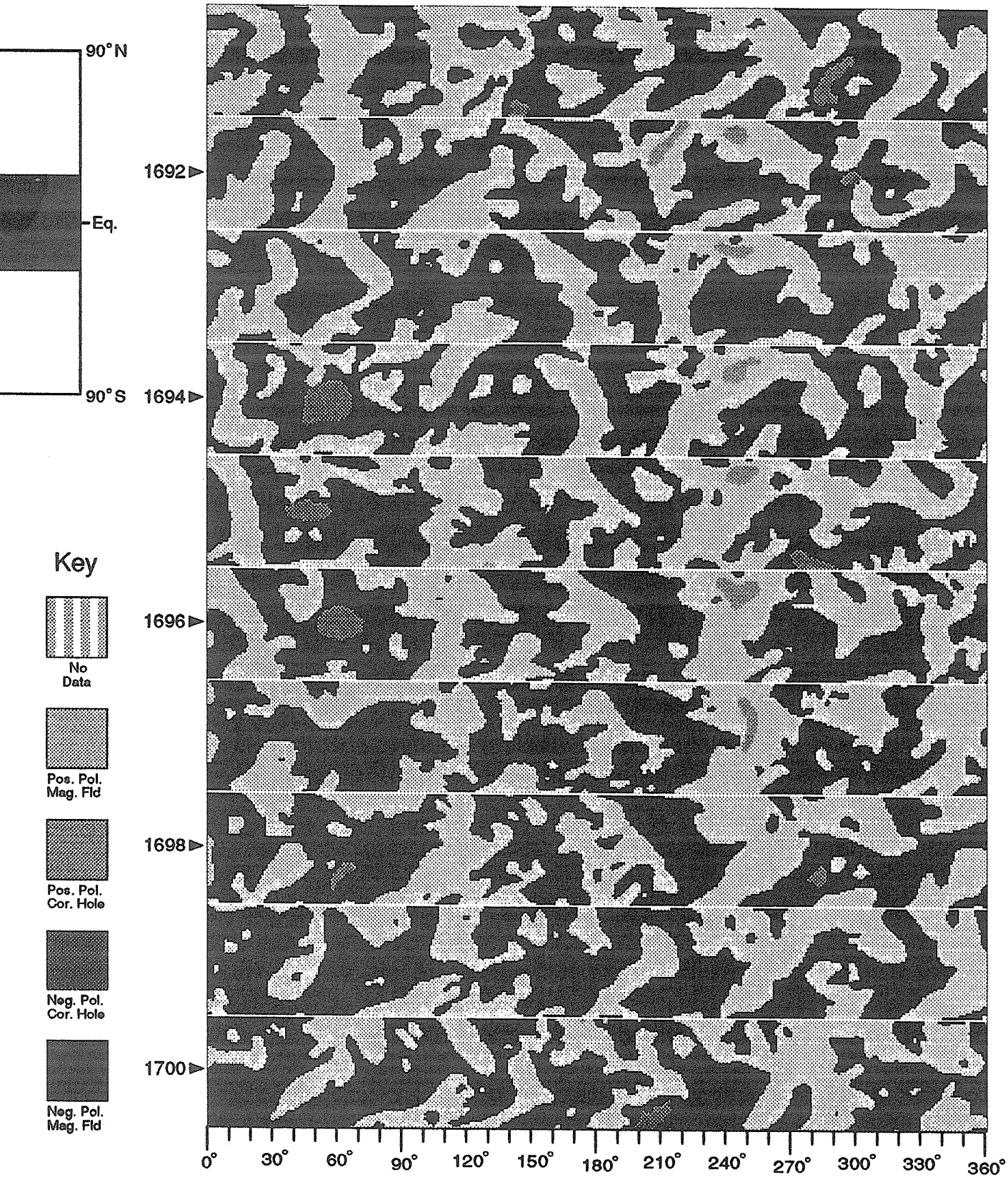


Latitude: South 25 to North 25

From: 26th Apr 1979
To: 24th Jan 1980

Carrington Rotation

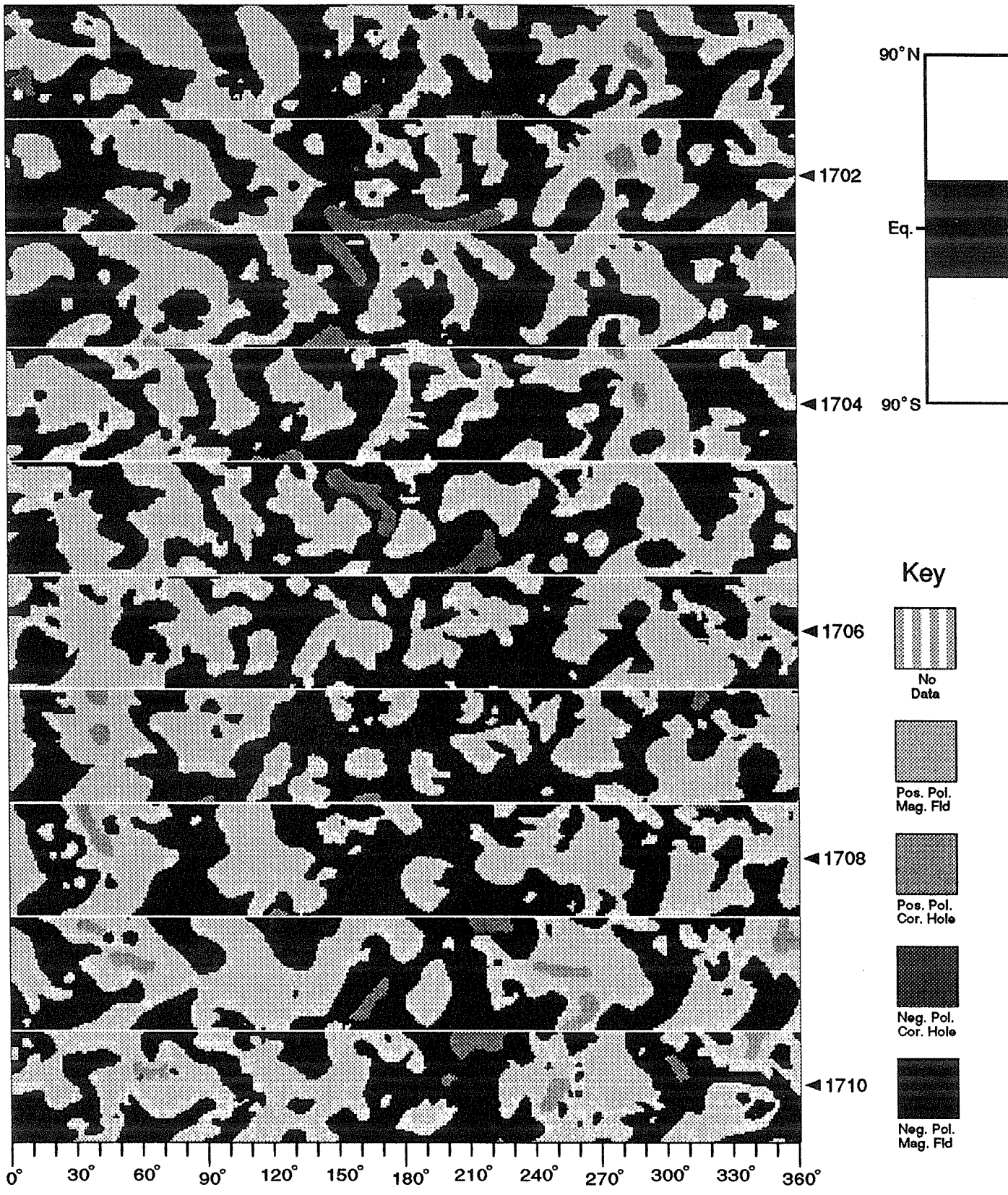
Inferred Magnetic Fields and Coronal Holes



From: 24th Jan 1980
To: 22nd Oct 1980

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

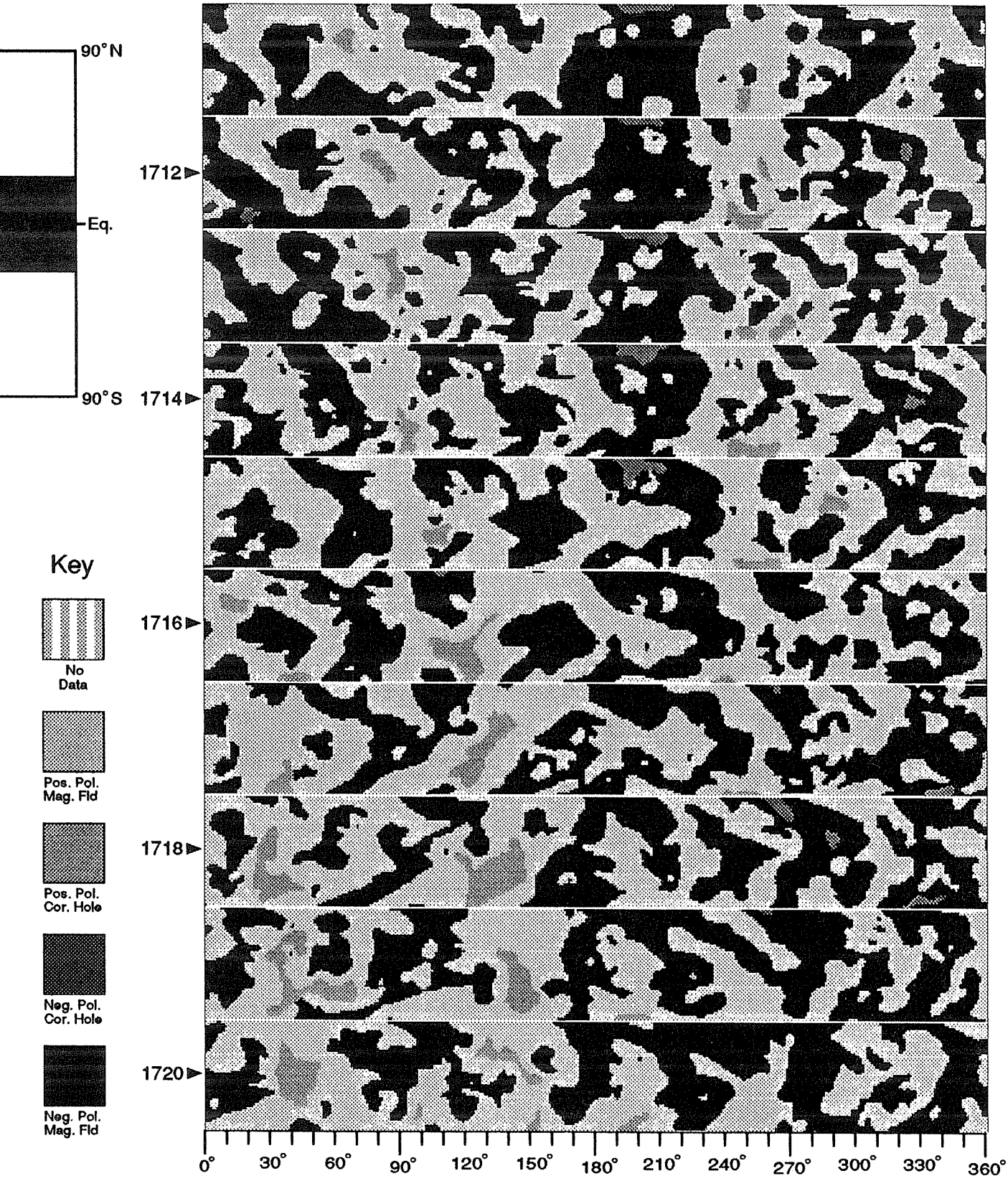


Latitude: South 25 to North 25

From: 22nd Oct 1980
To: 22nd Jul 1981

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes

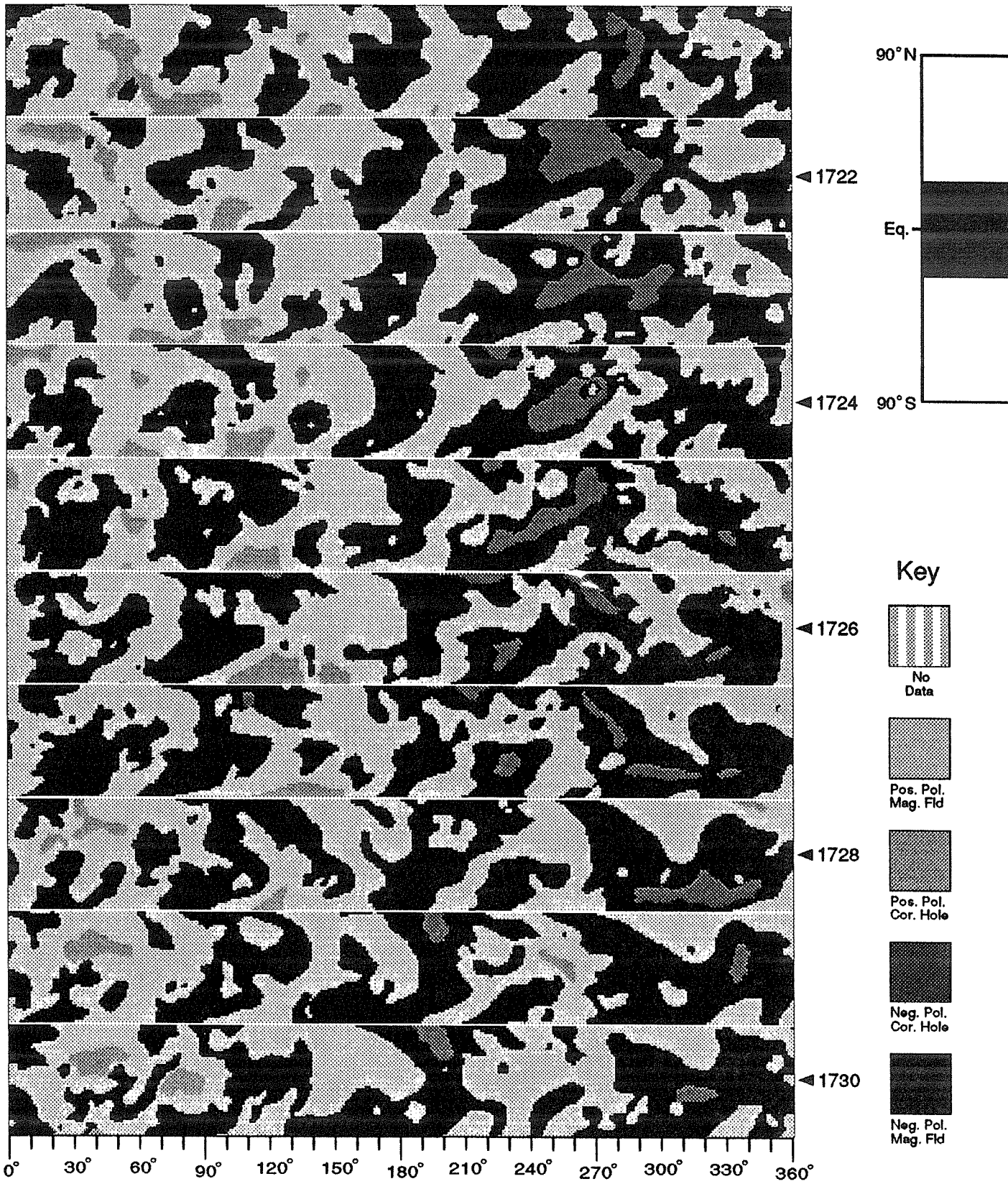


From: 22nd Jul 1981
To: 21st Apr 1982

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

Carrington Rotation

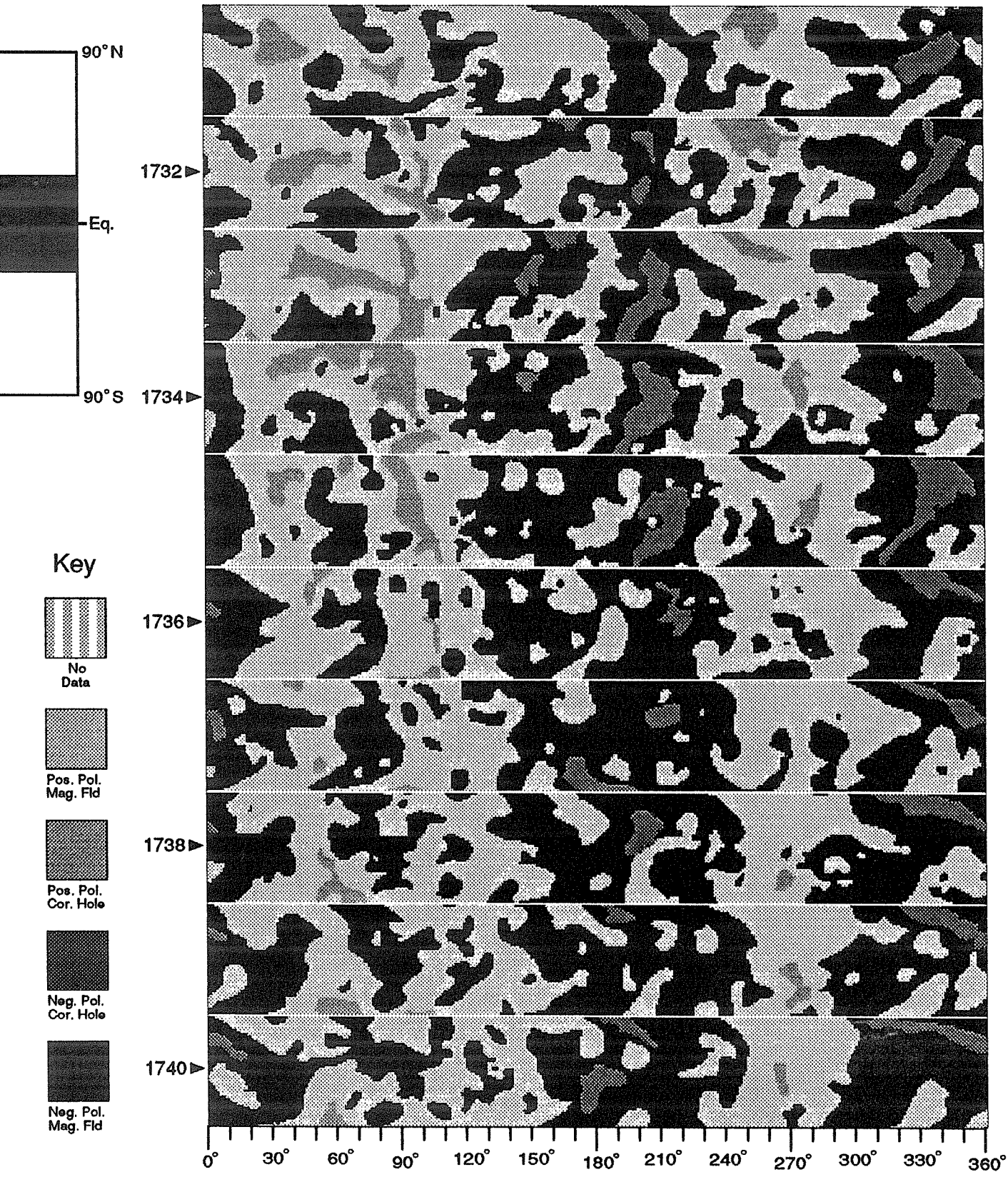


Latitude: South 25 to North 25

From: 21st Apr 1982
To: 19th Jan 1983

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes

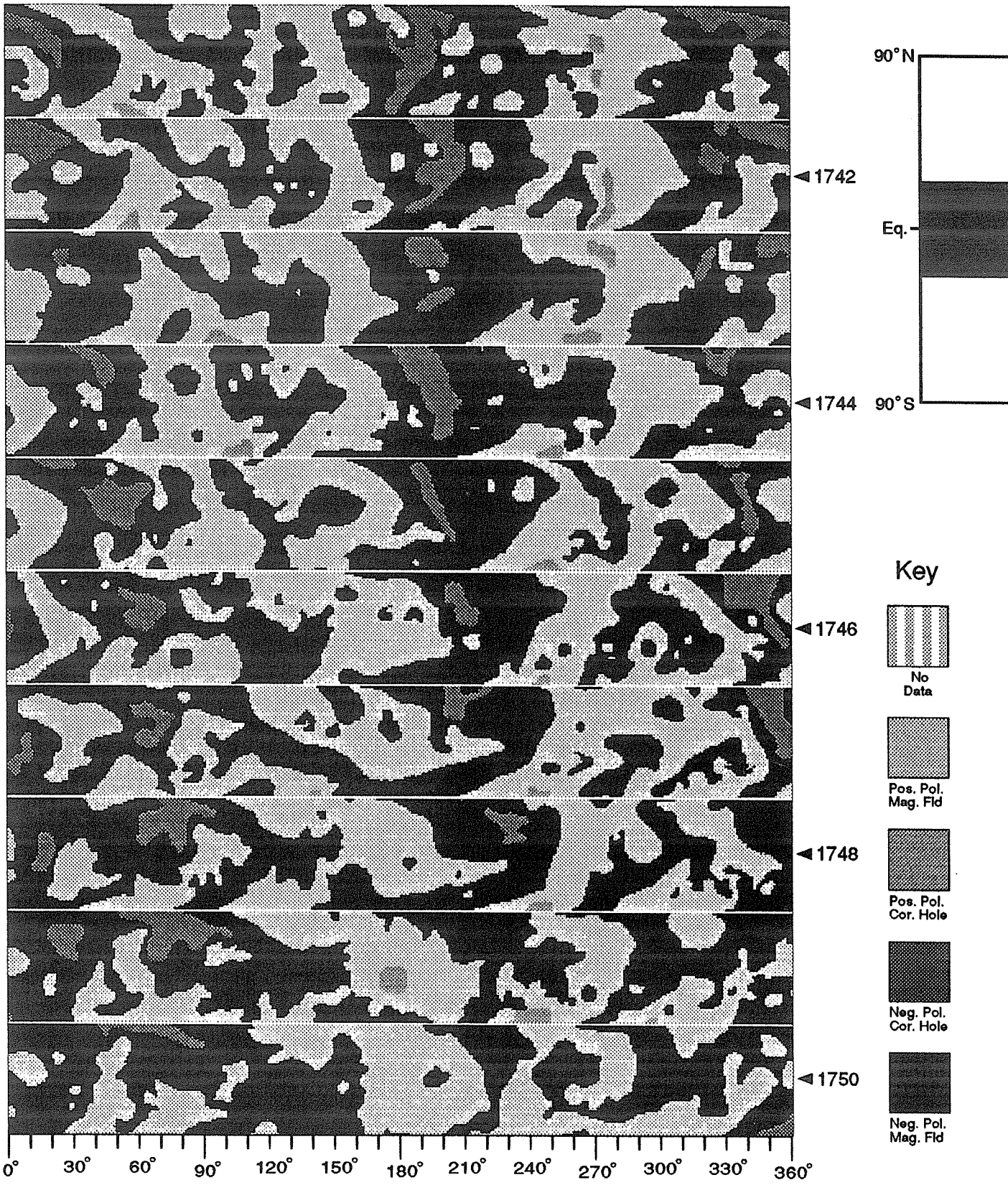


From: 19th Jan 1983
To: 18th Oct 1983

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

Carrington Rotation

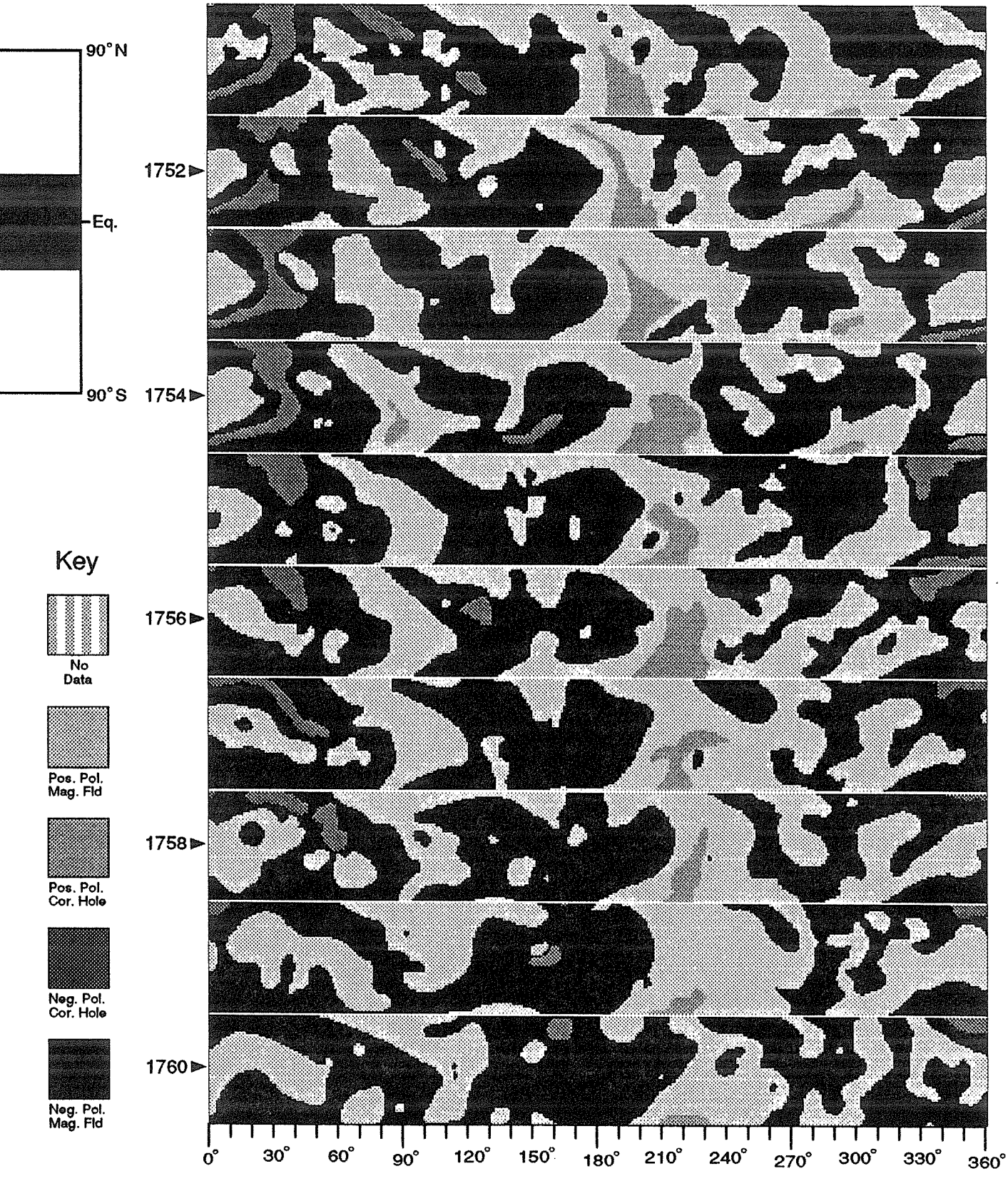


Latitude: South 25 to North 25

From: 18th Oct 1983
To: 17th Jul 1984

Carrington Rotation

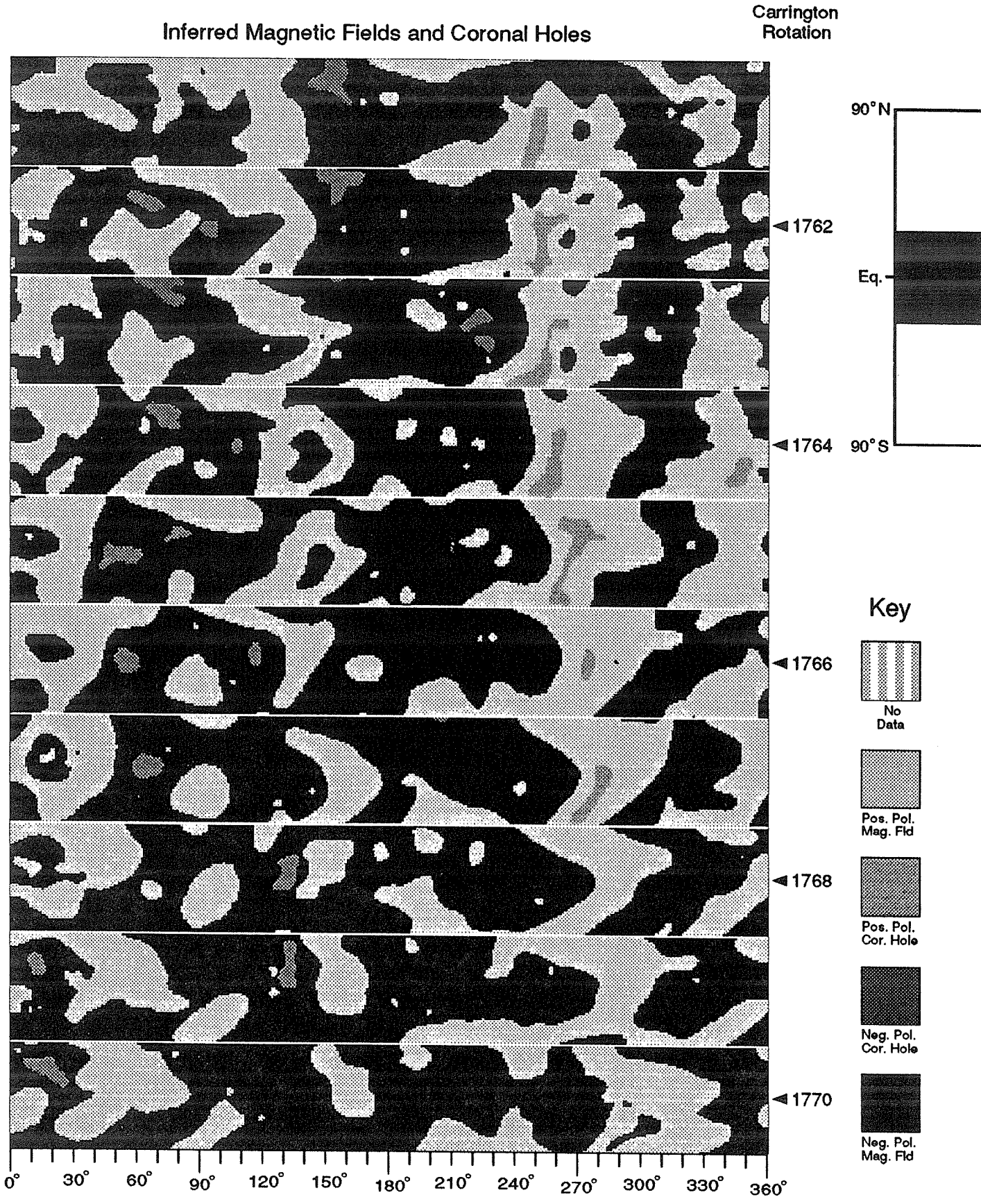
Inferred Magnetic Fields and Coronal Holes



From: 17th Jul 1984
To: 16th Apr 1985

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

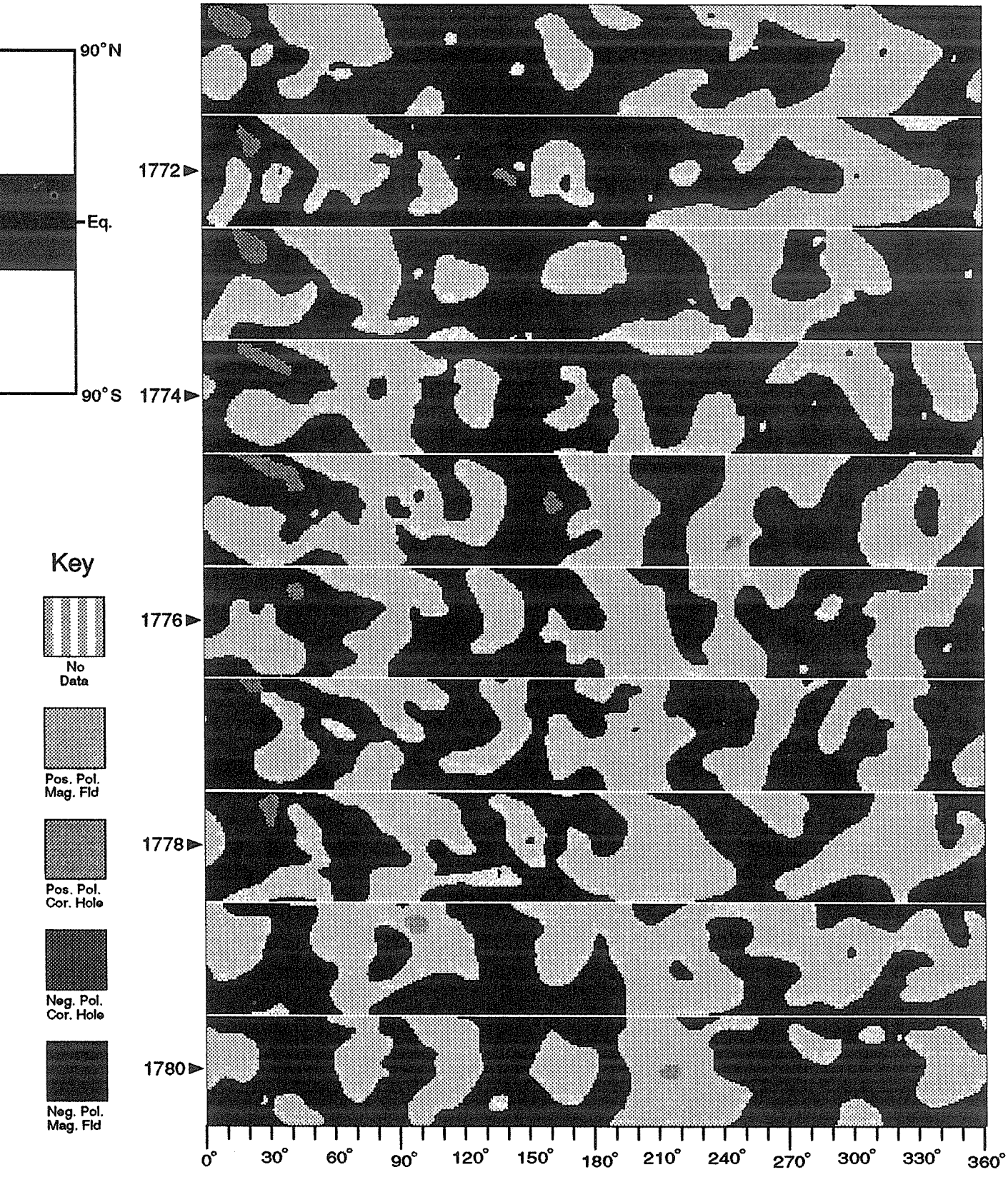


Latitude: South 25 to North 25

From: 16th Apr 1985
To: 14th Jan 1986

Carrington Rotation

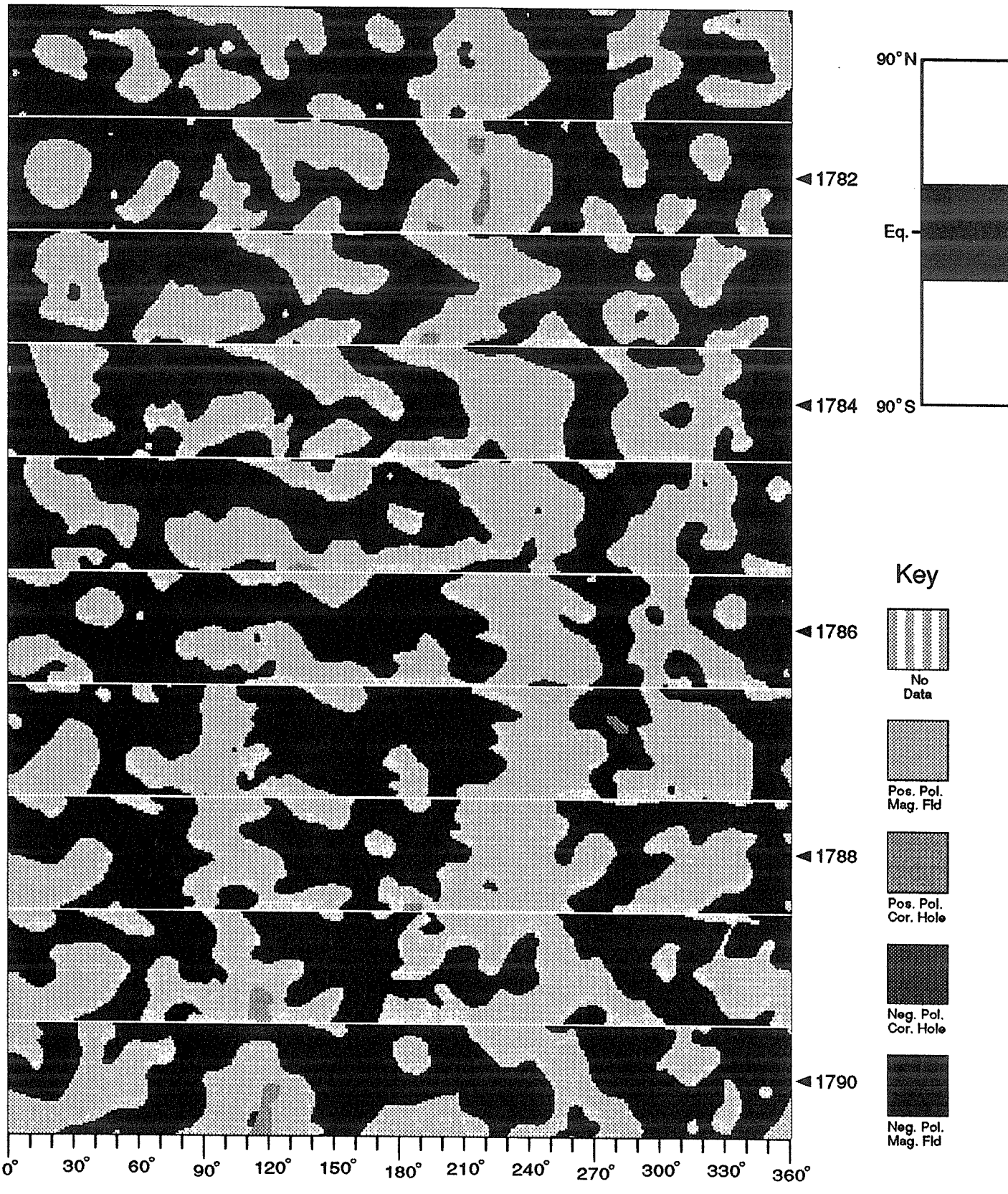
Inferred Magnetic Fields and Coronal Holes



From: 14th Jan 1986
To: 13th Oct 1986

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

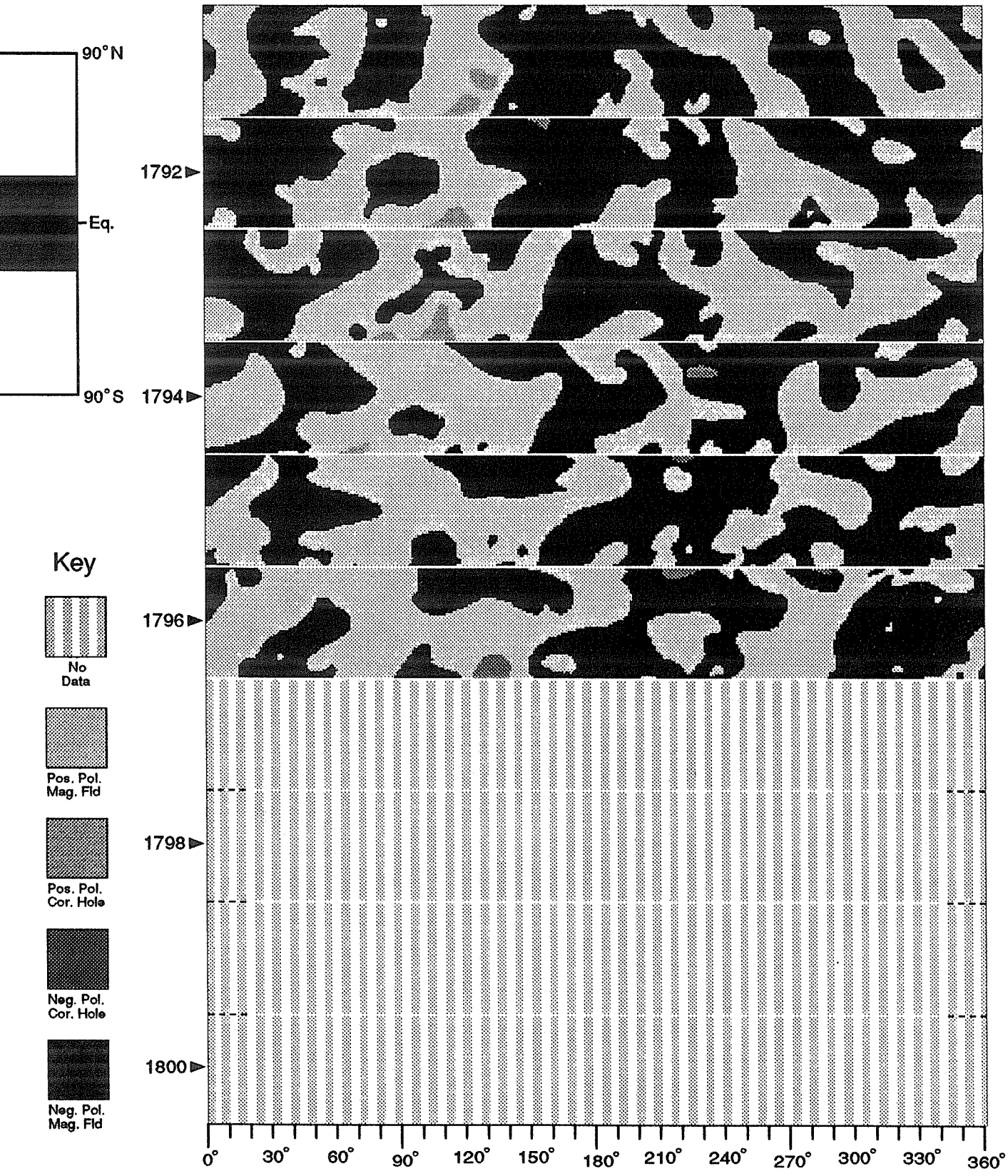


Latitude: South 25 to North 25

From: 13th Oct 1986
To: 13th Jul 1987

Carrington Rotation

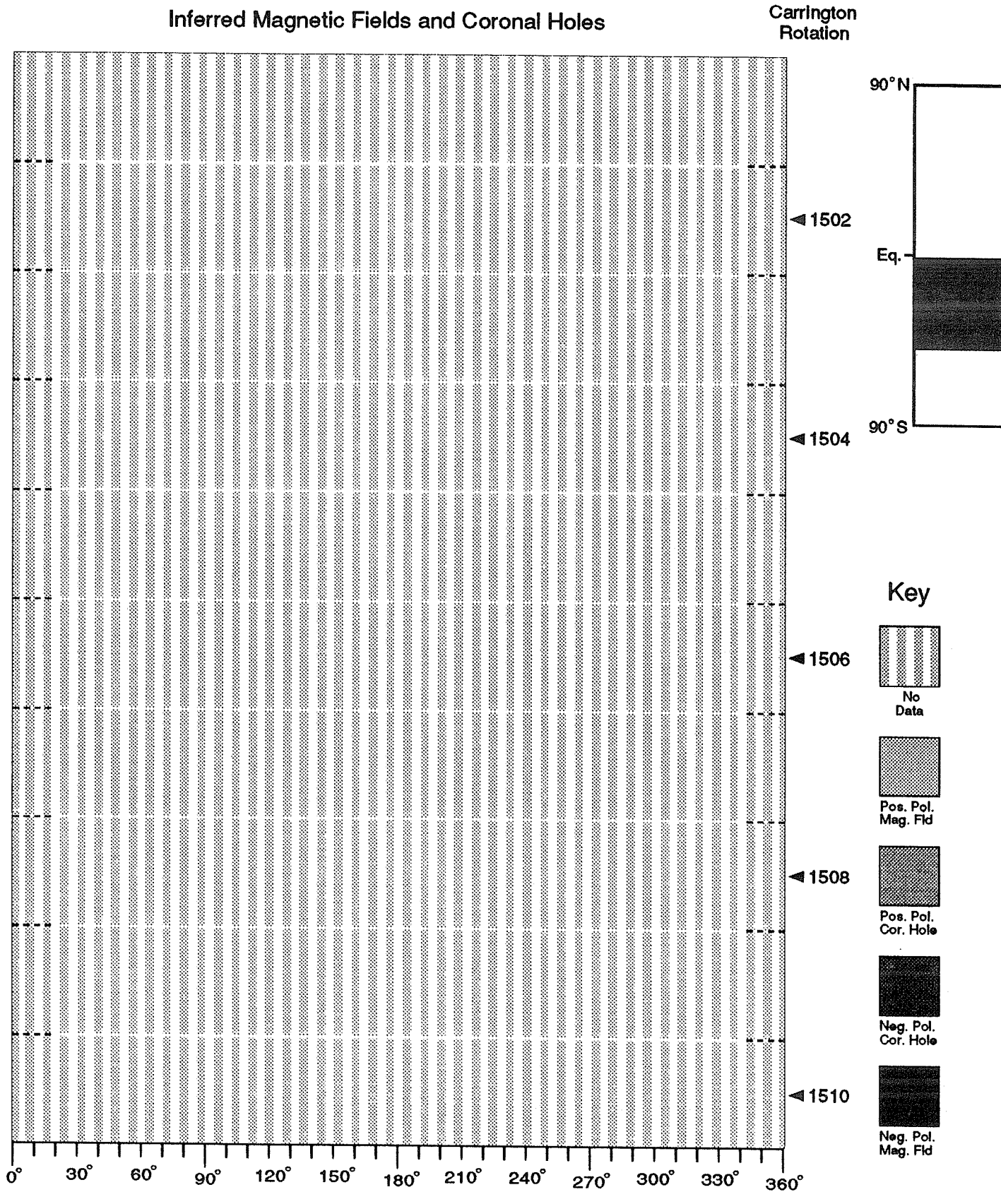
Inferred Magnetic Fields and Coronal Holes



From: 13th Jul 1987
To: 11th Apr 1988

Latitude: South 25 to North 25

Inferred Magnetic Fields and Coronal Holes

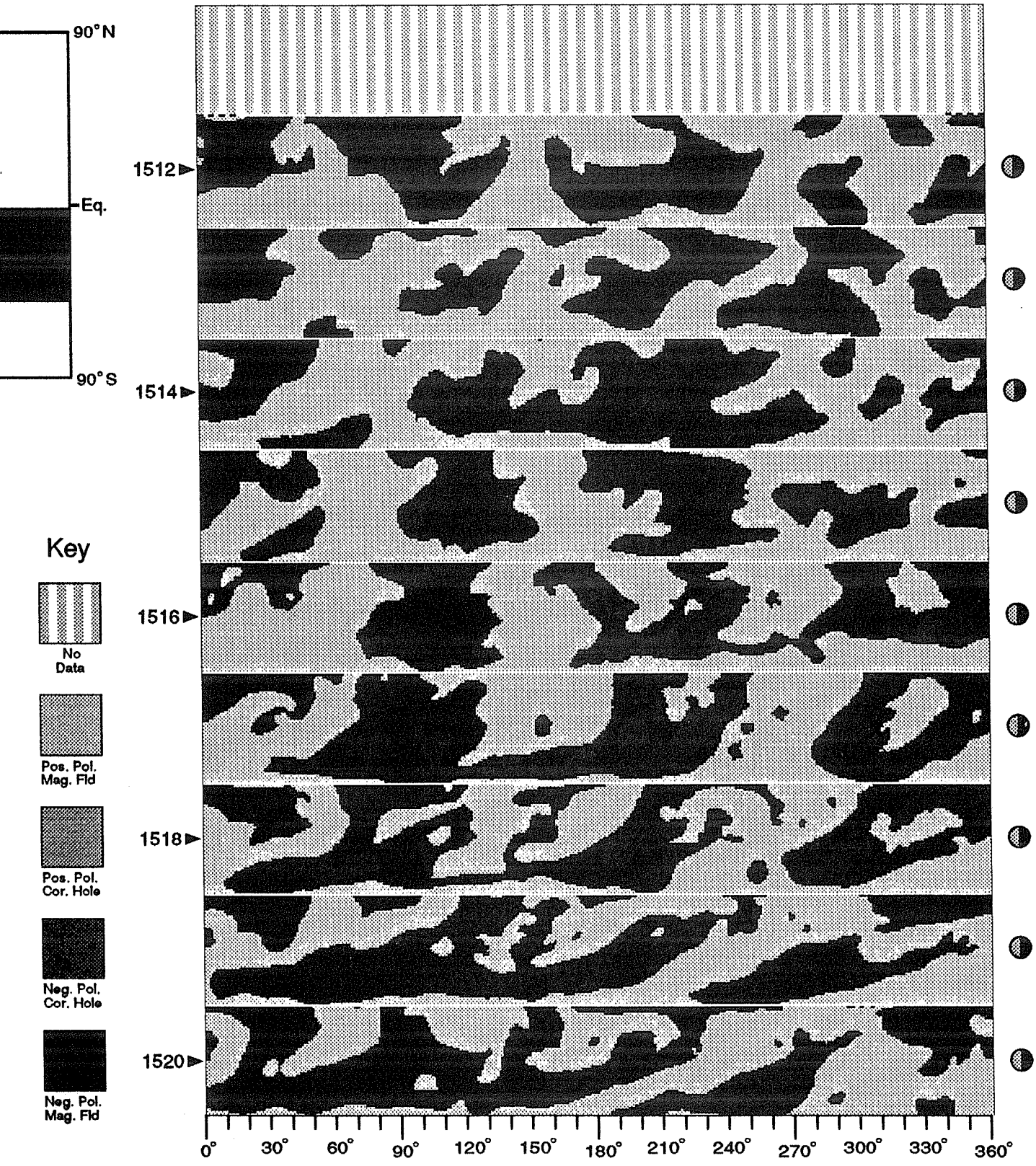


Latitude: South 1 to South 50

From: 15th Nov 1965
To: 15th Aug 1966

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



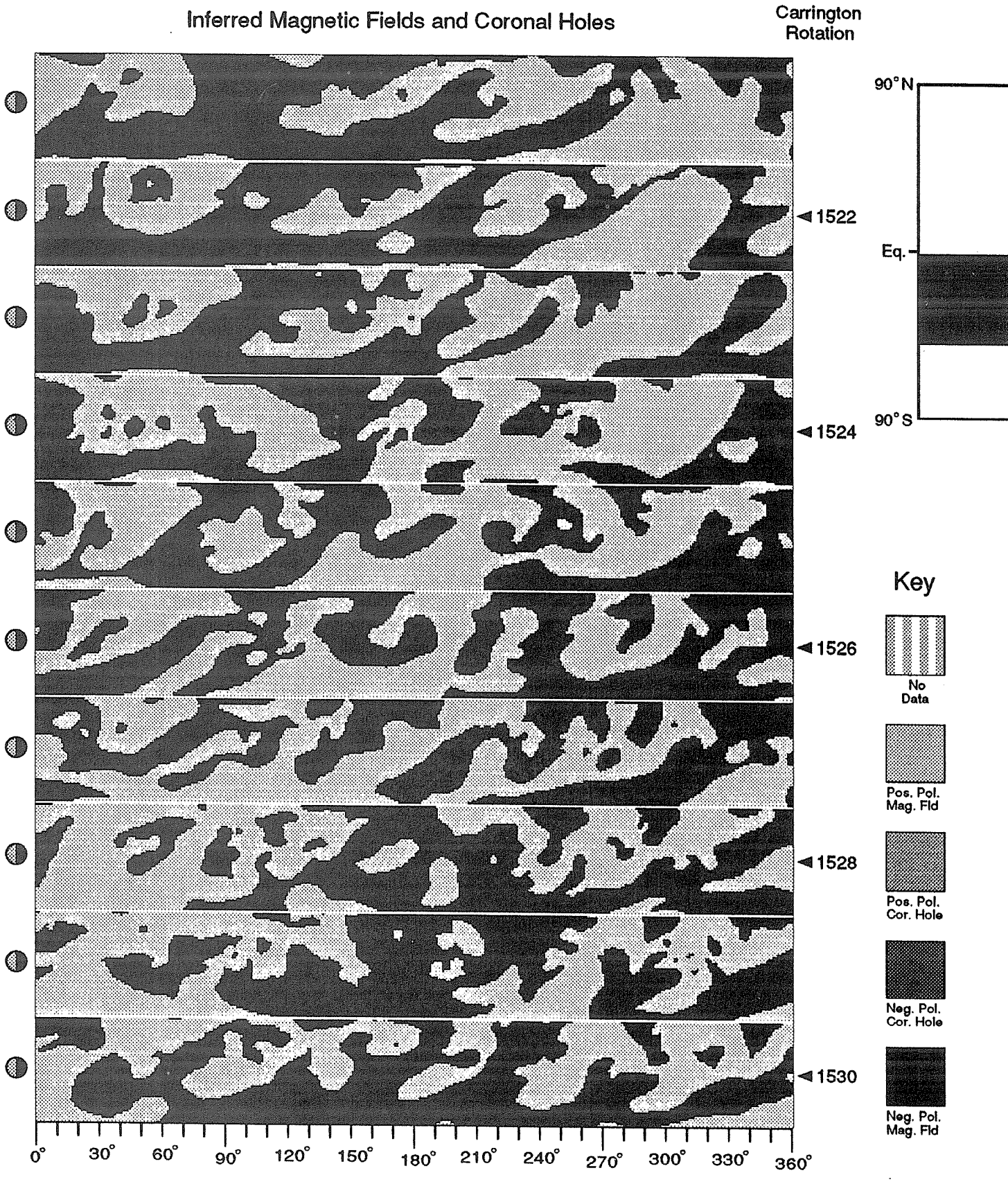
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 15th Aug 1966
To: 15th May 1967

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

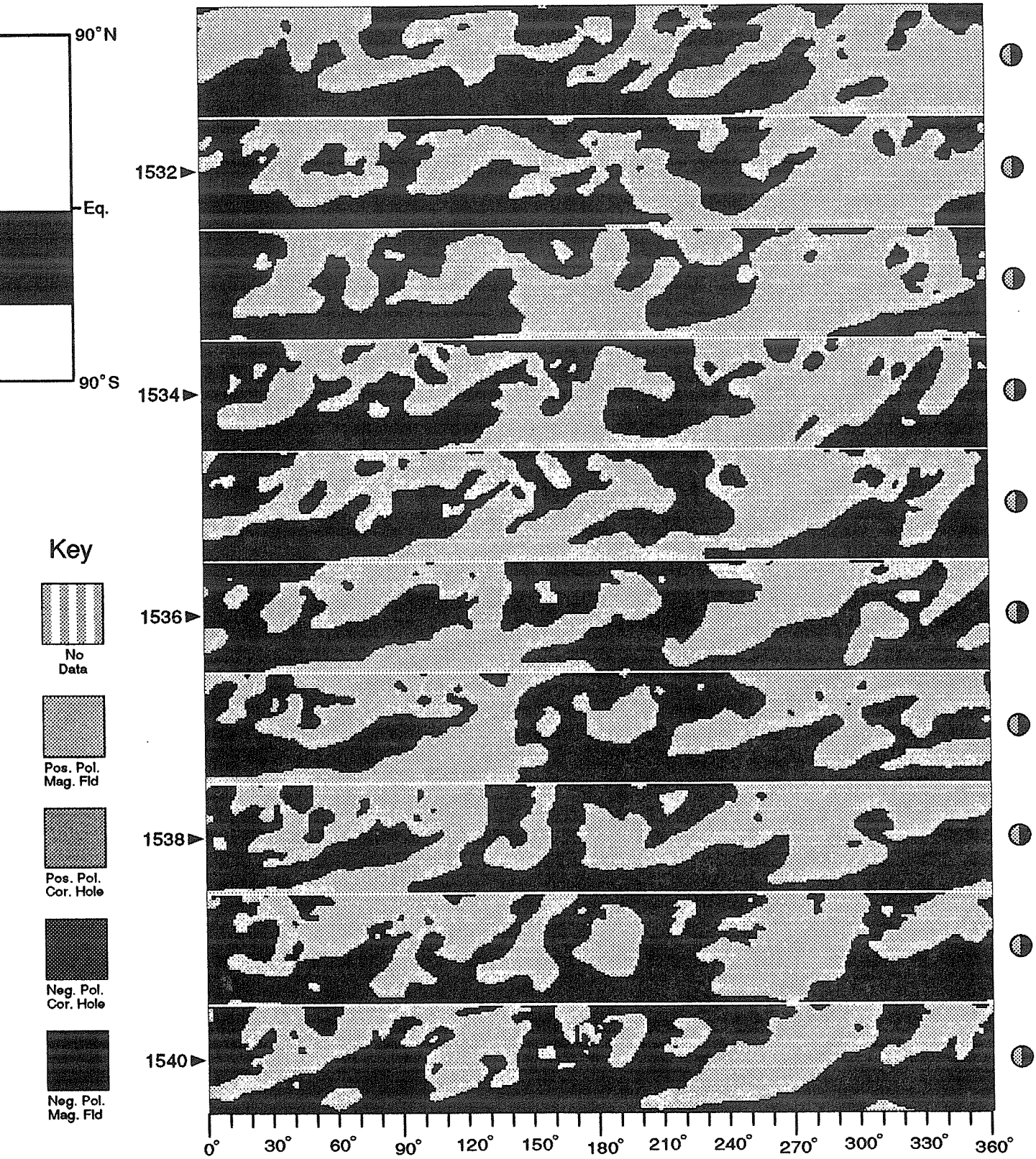


Latitude: South 1 to South 50

From: 15th May 1967
To: 12th Feb 1968

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes

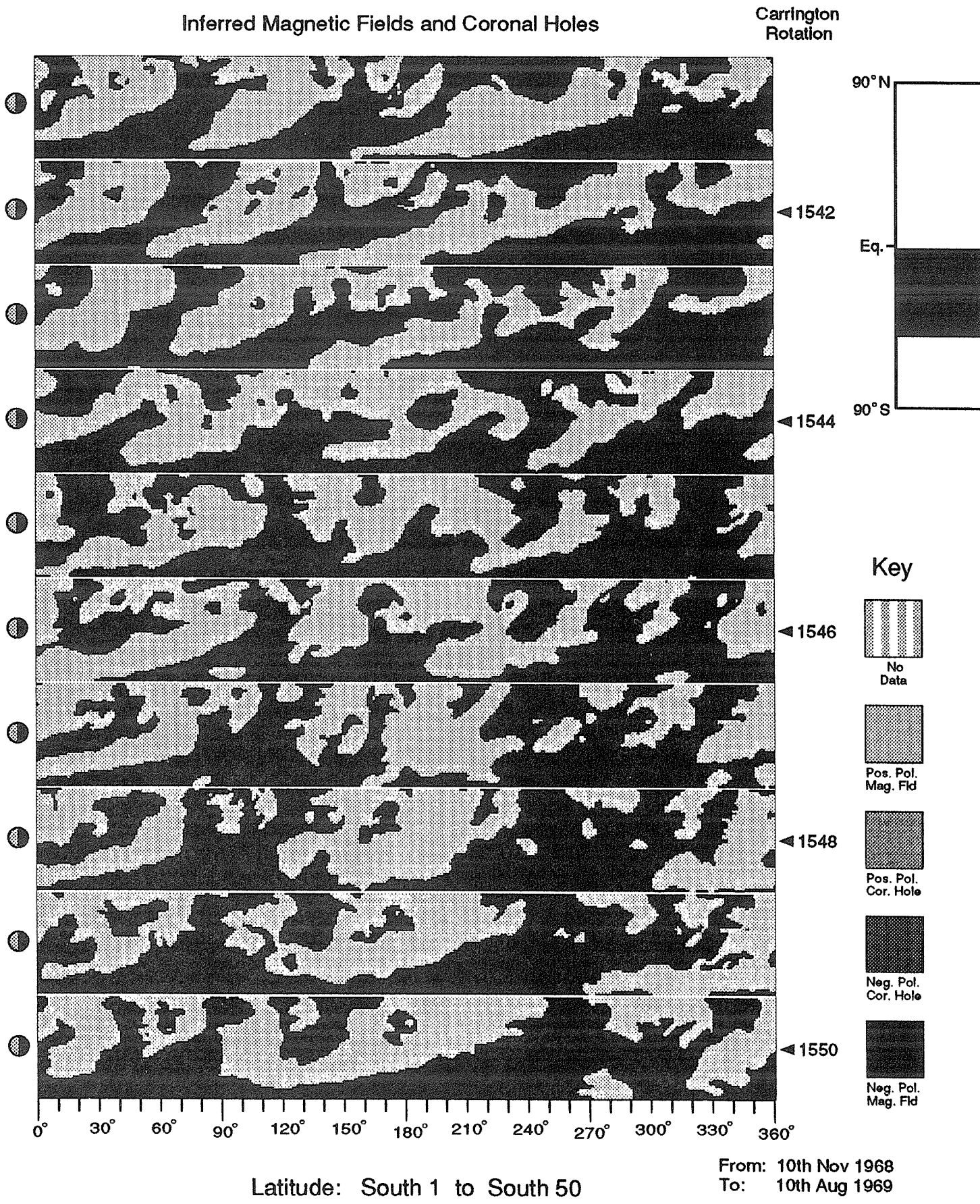


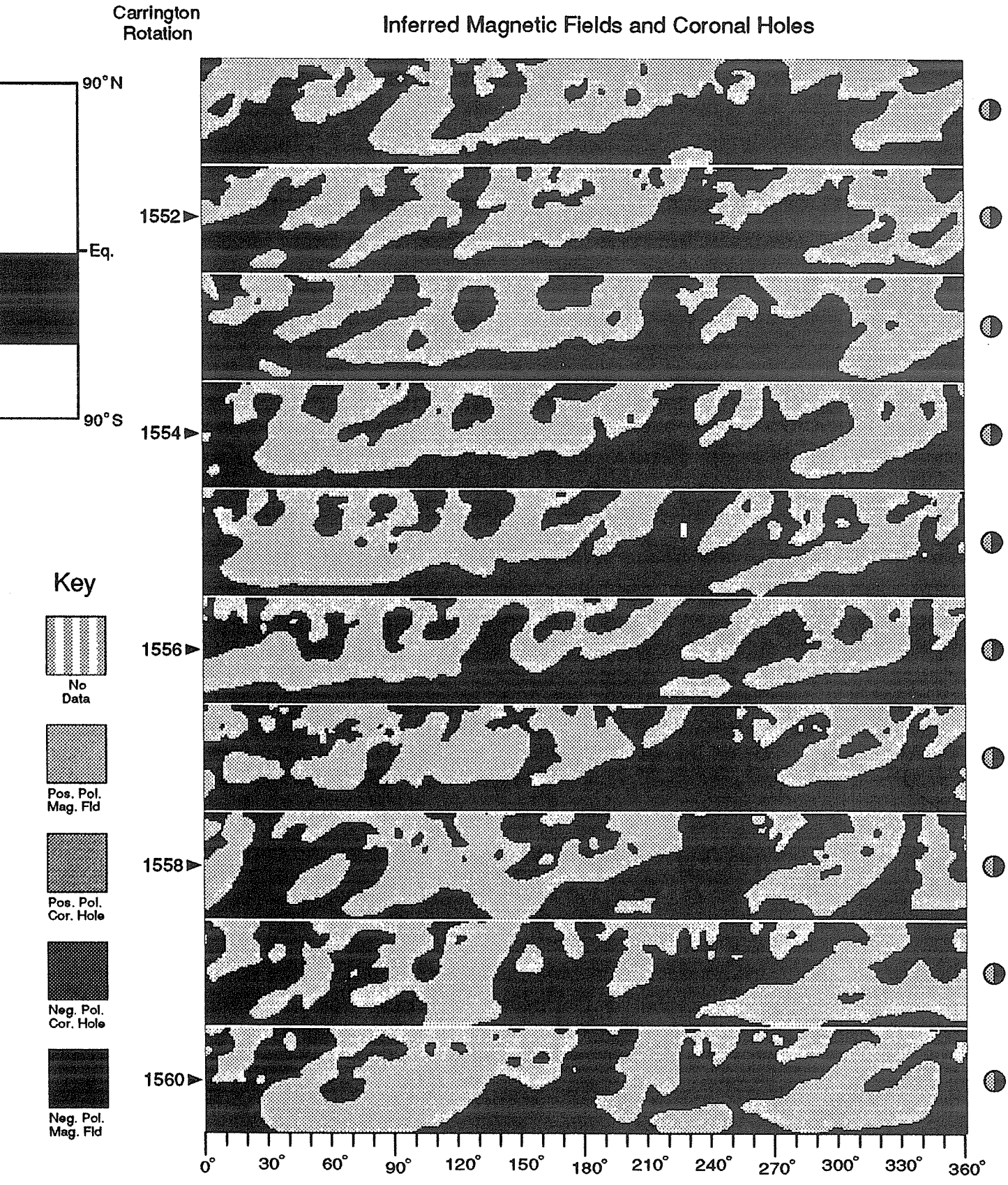
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 12th Feb 1968
To: 10th Nov 1968

Latitude: South 1 to South 50

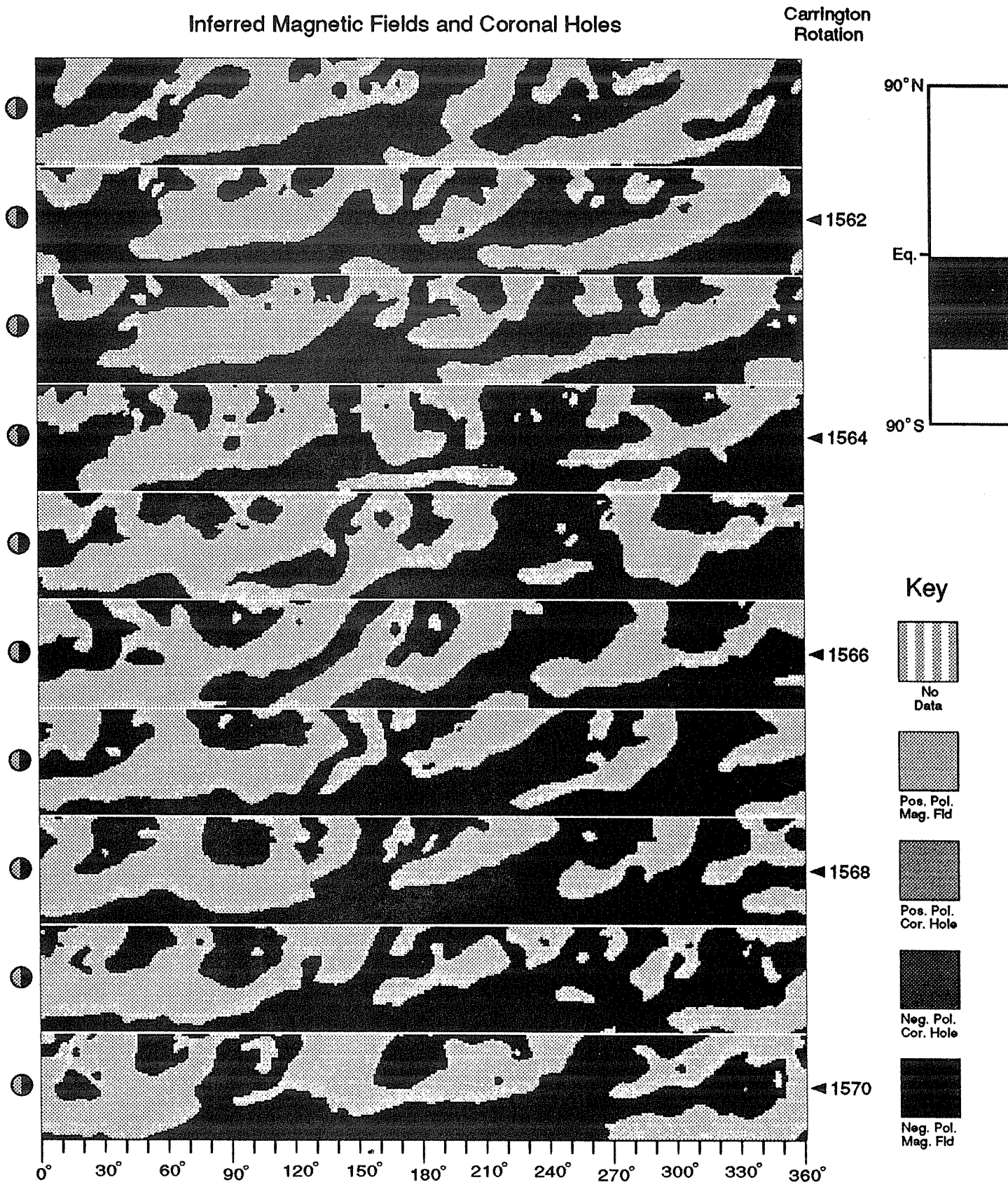

Inferred Magnetic Fields and Coronal Holes
Carrington Rotation
90° N
Eq.
90° S
1542
1544
1546
1548
1550
Key
No Data
Pos. Pol. Mag. Fld
Pos. Pol. Cor. Hole
Neg. Pol. Cor. Hole
Neg. Pol. Mag. Fld
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
360°
Latitude: South 1 to South 50
From: 10th Nov 1968
To: 10th Aug 1969



From: 10th Aug 1969
To: 10th May 1970

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

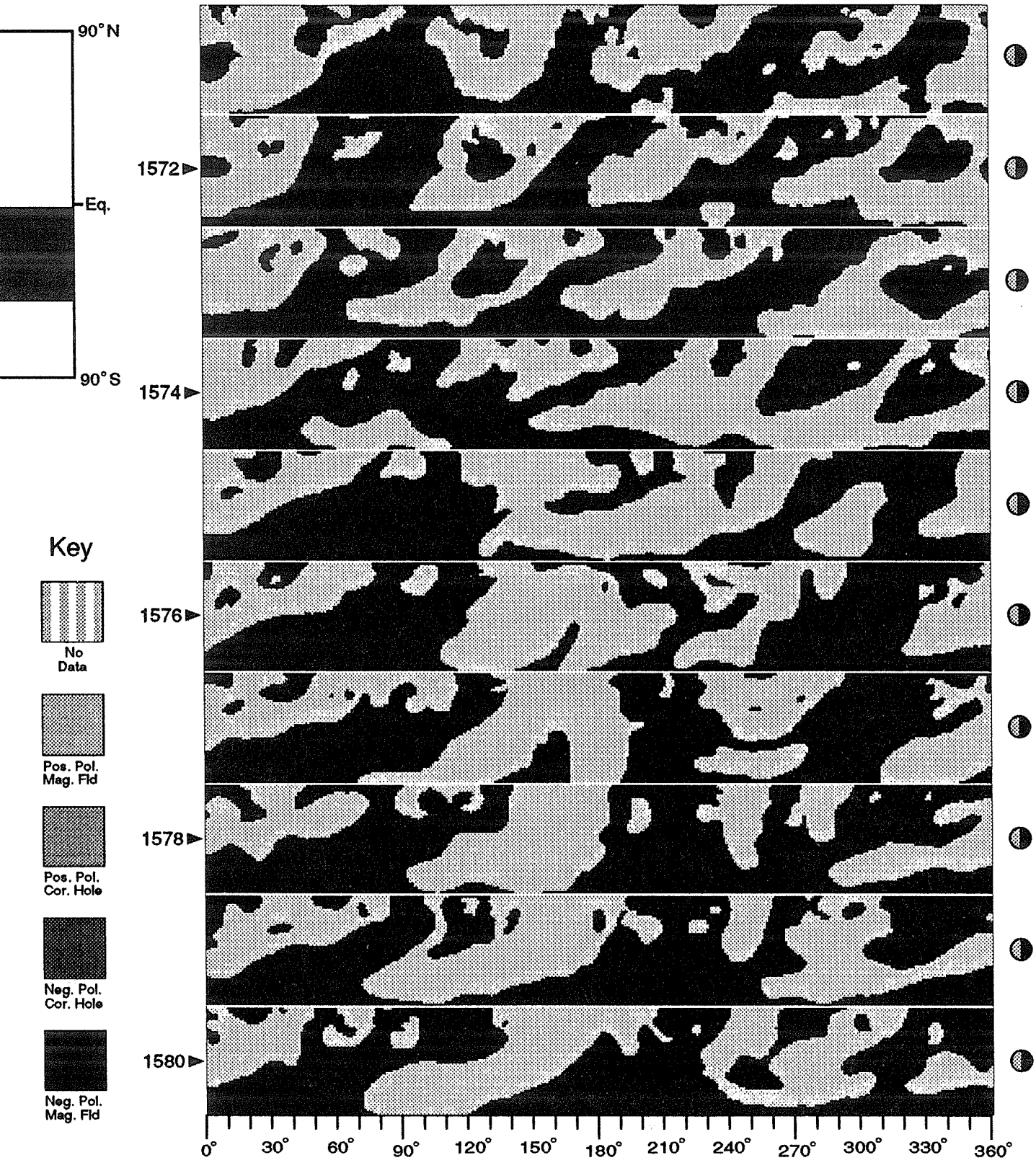


From: 10th May 1970
To: 7th Feb 1971

Latitude: South 1 to South 50

Carrington Rotation

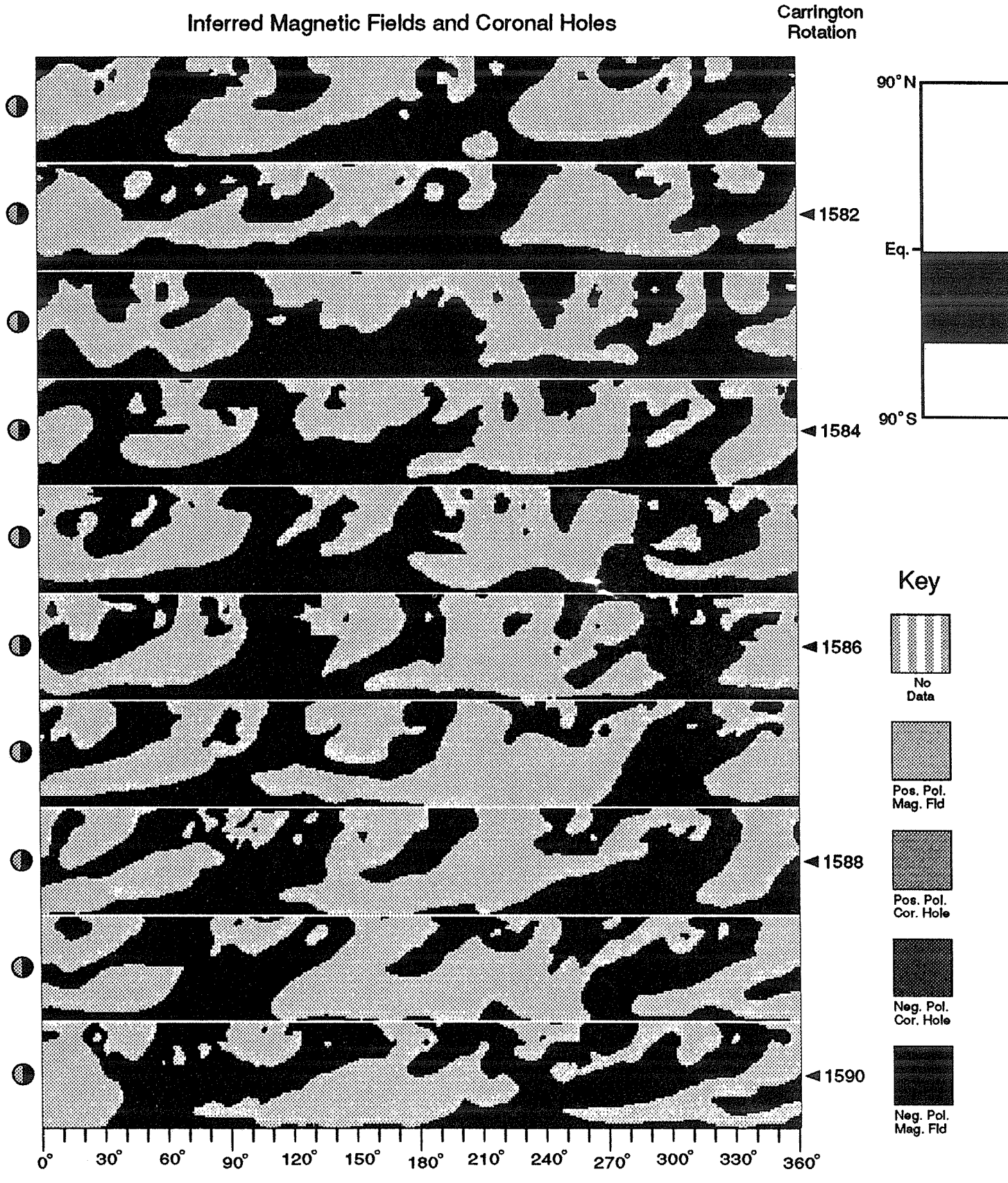
Inferred Magnetic Fields and Coronal Holes



From: 7th Feb 1971
To: 6th Nov 1971

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

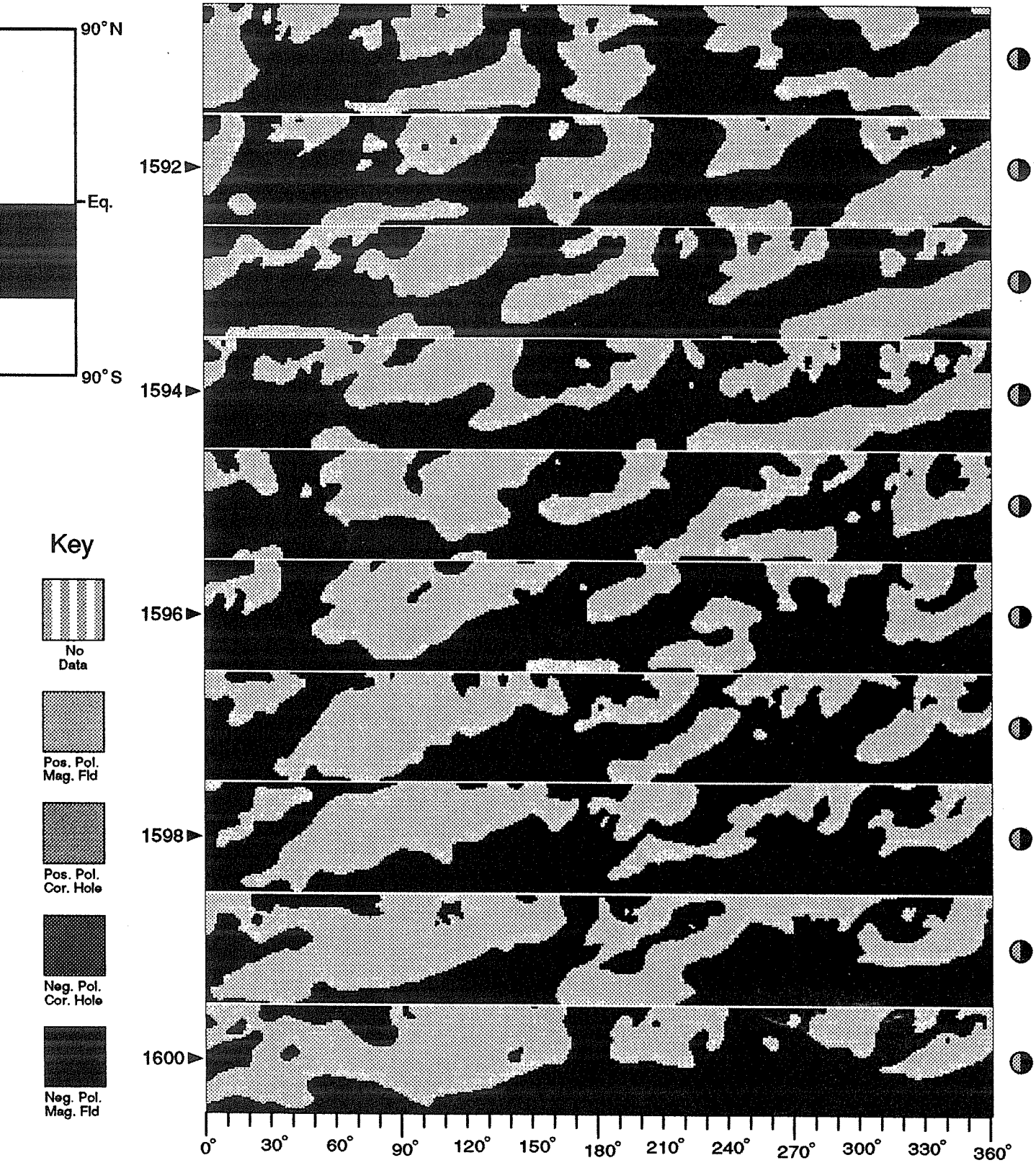


From: 6th Nov 1971
To: 5th Aug 1972

Latitude: South 1 to South 50

Carrington Rotation

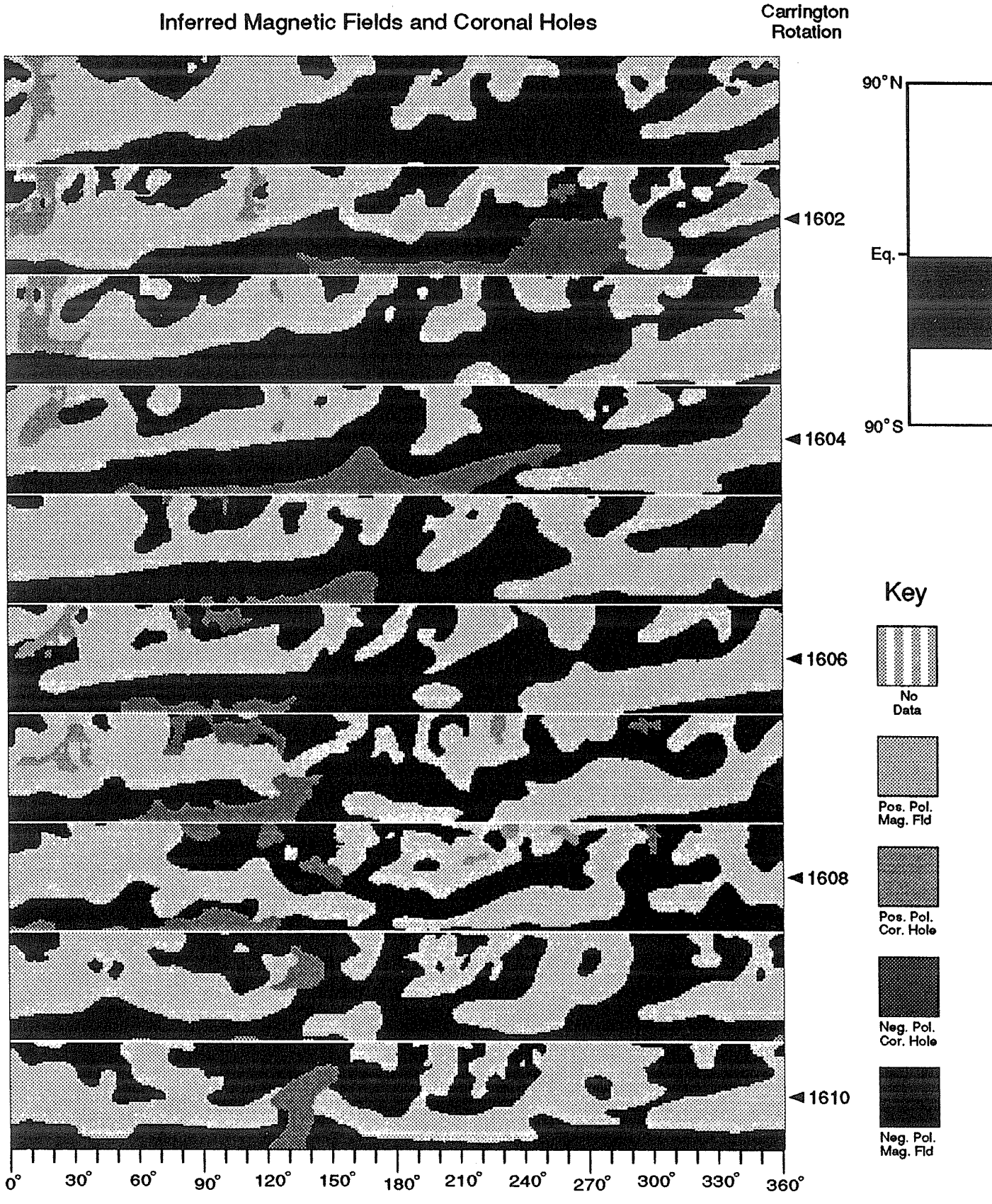
Inferred Magnetic Fields and Coronal Holes



From: 5th Aug 1972
To: 5th May 1973

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

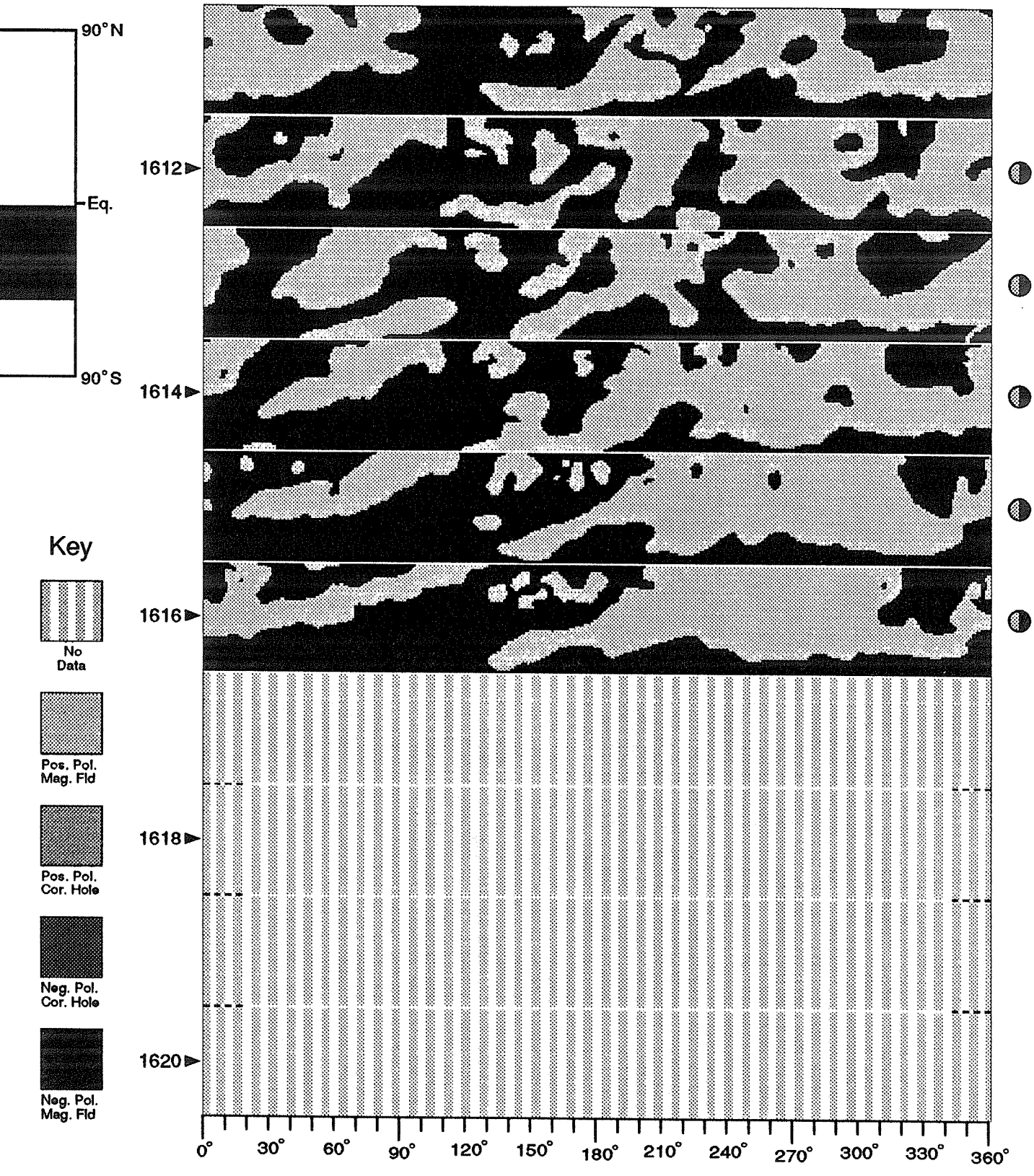


Latitude: South 1 to South 50

From: 5th May 1973
To: 2nd Feb 1974

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



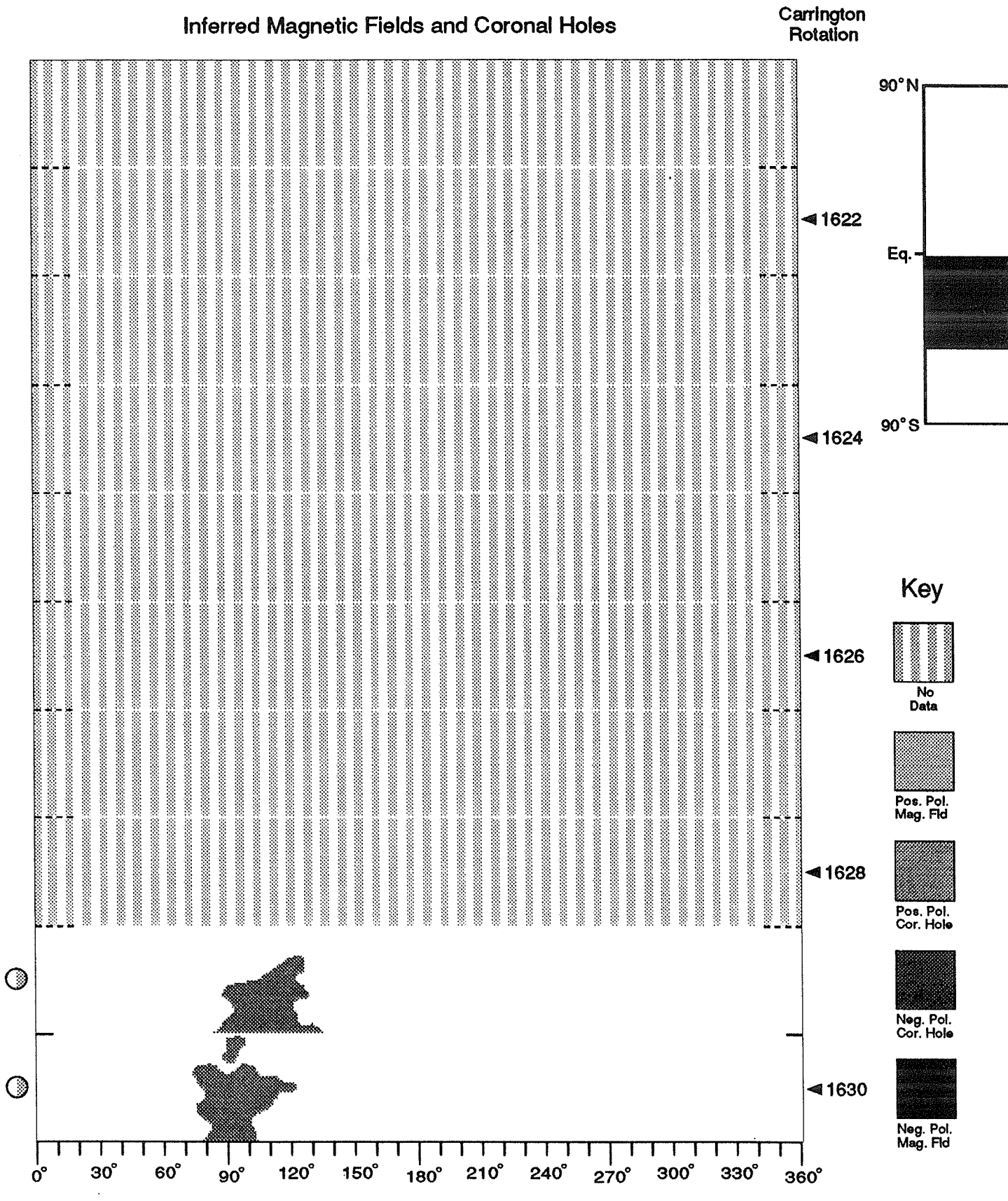
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 2nd Feb 1974
To: 1st Nov 1974

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

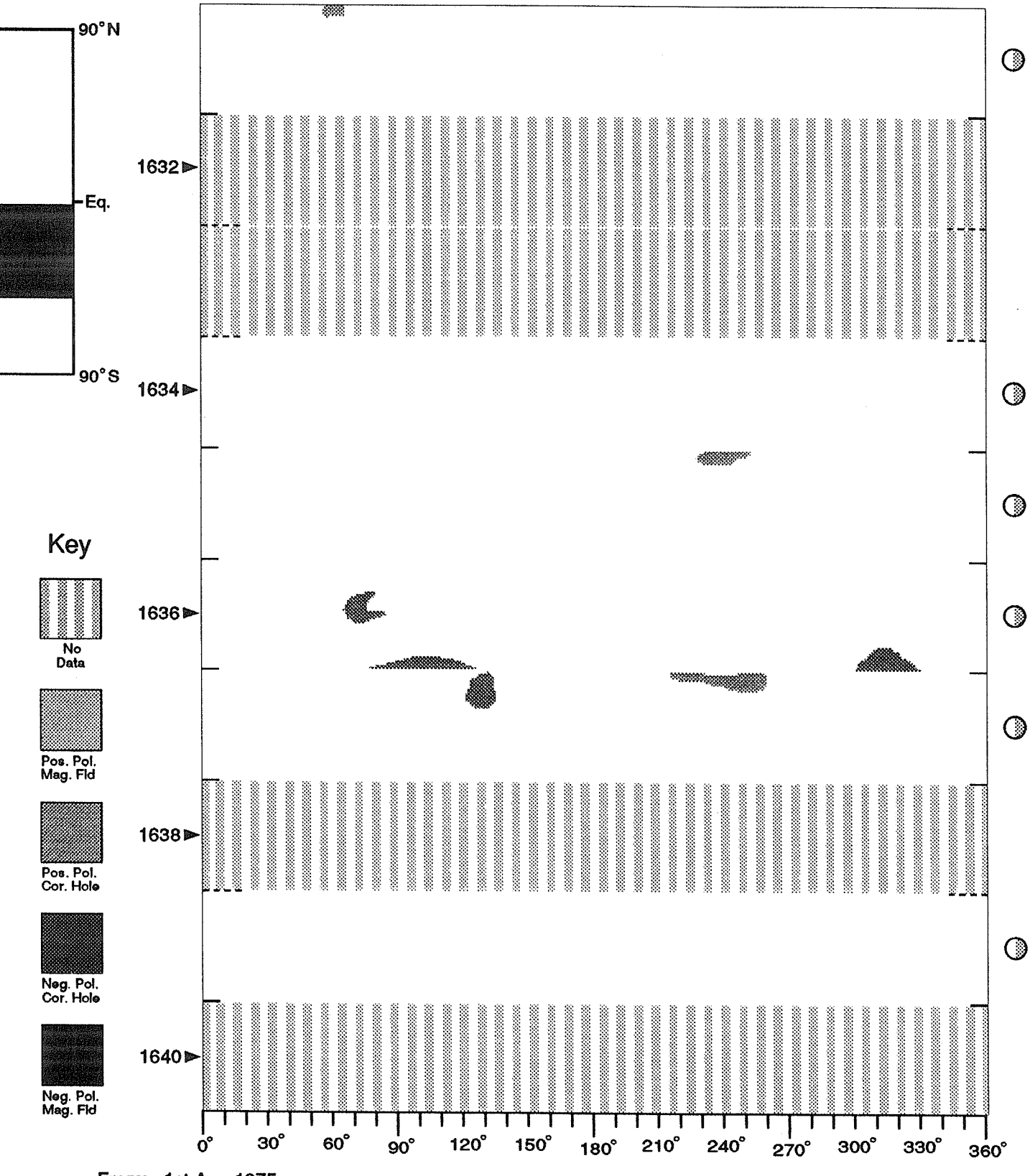


From: 1st Nov 1974
To: 1st Aug 1975

Latitude: South 1 to South 50

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



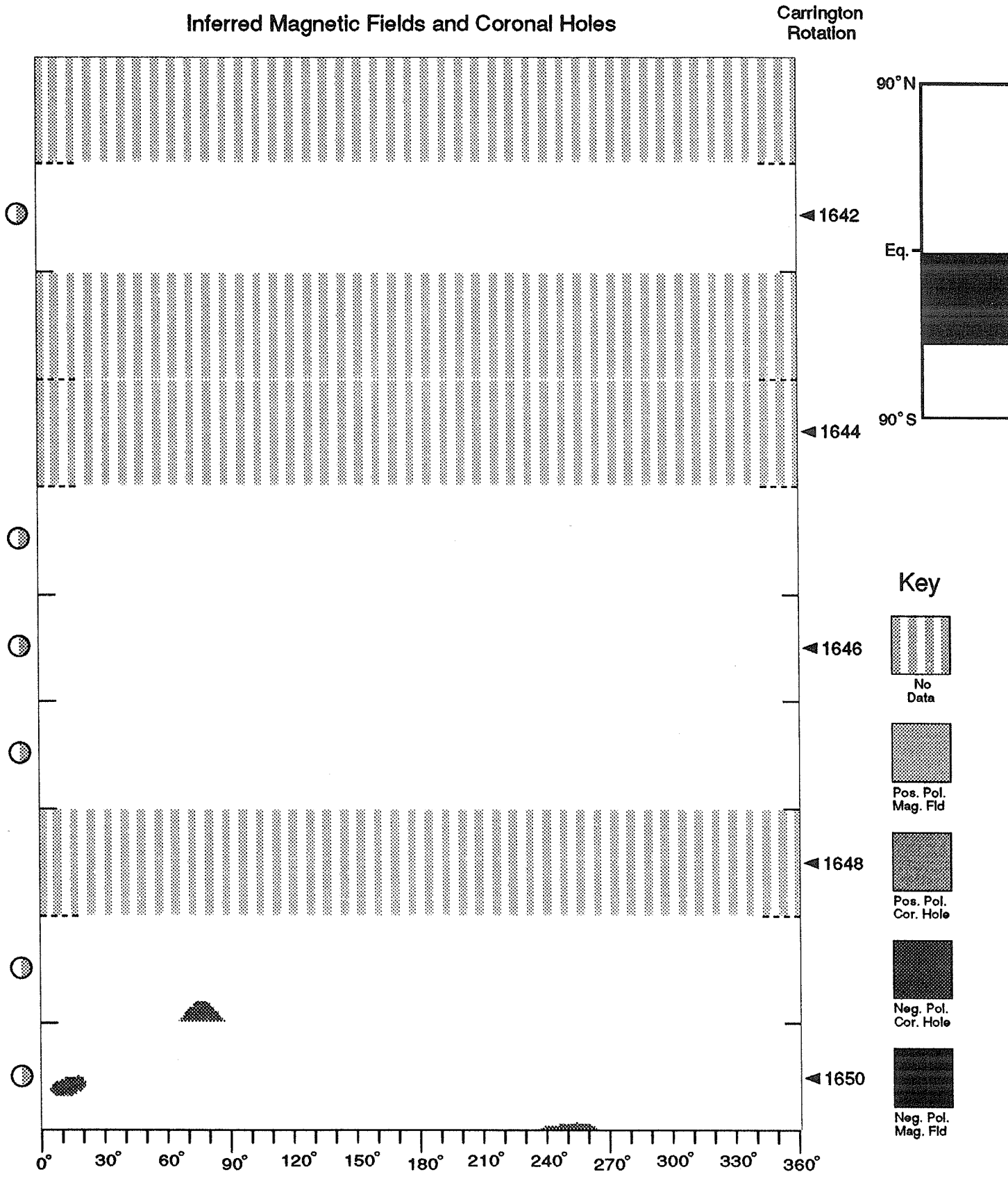
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 1st Aug 1975
To: 30th Apr 1976

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

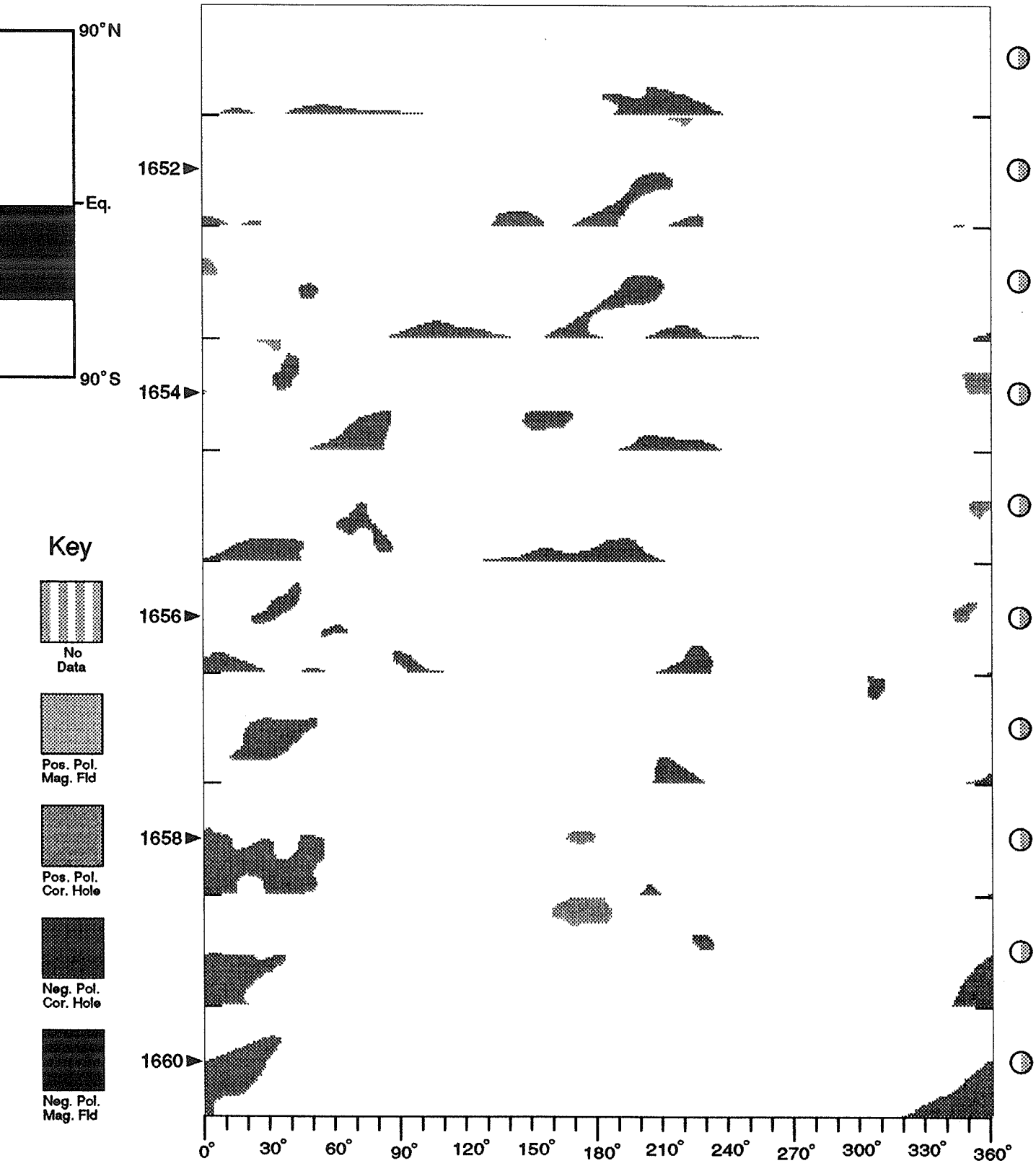


From: 30th Apr 1976
To: 28th Jan 1977

Latitude: South 1 to South 50

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



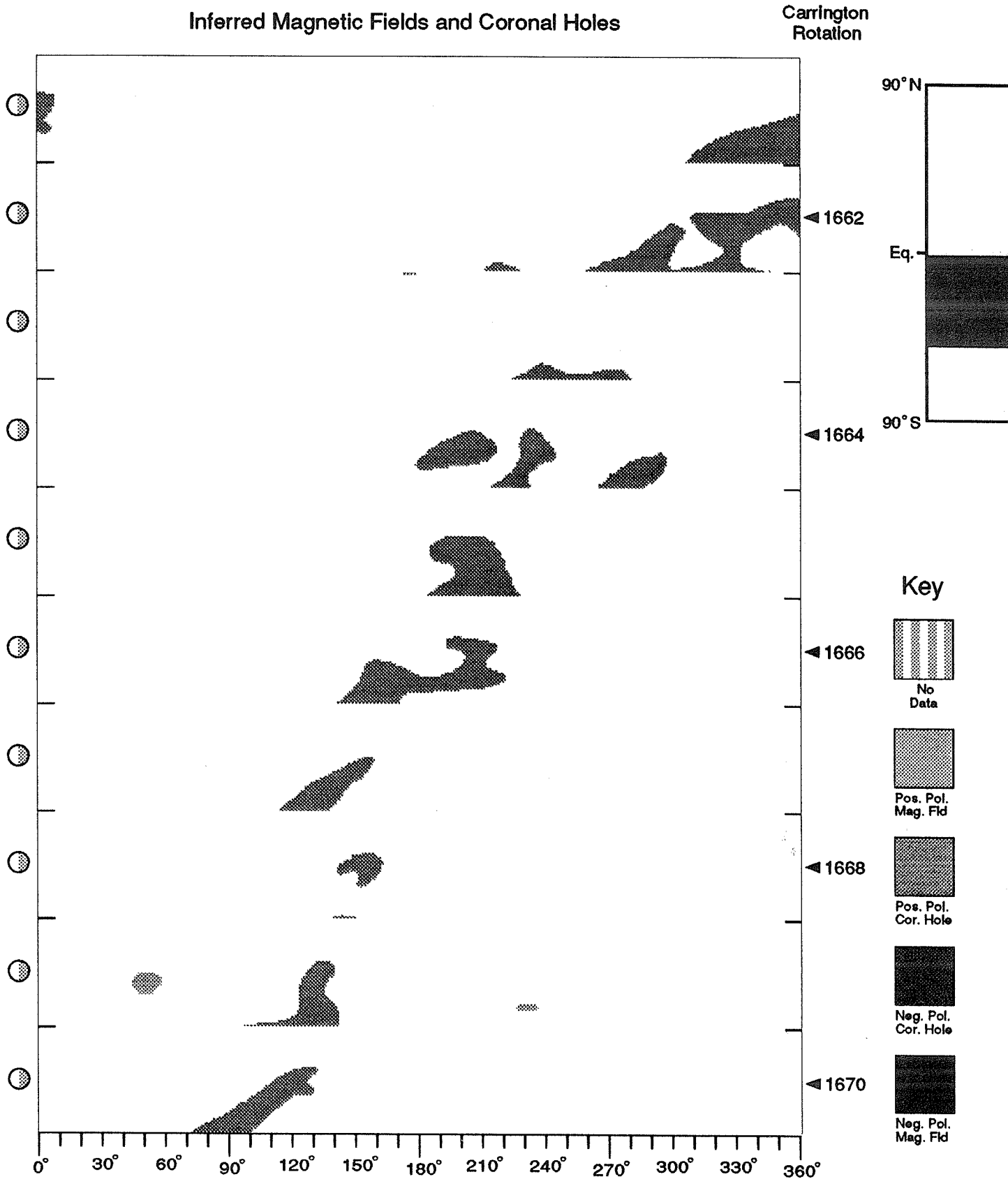
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 28th Jan 1977
To: 27th Oct 1977

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

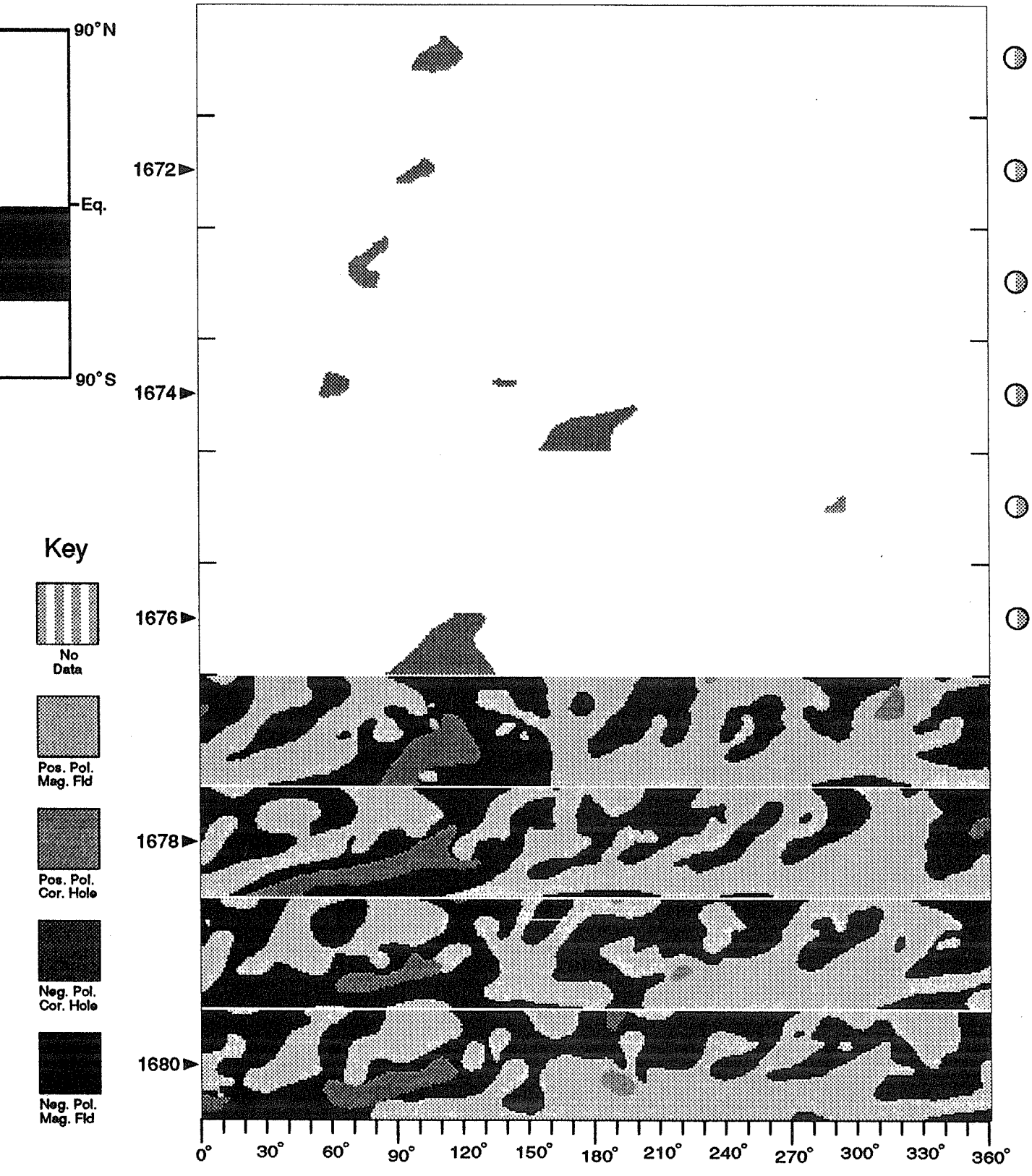


Latitude: South 1 to South 50

From: 27th Oct 1977
To: 27th Jul 1978

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



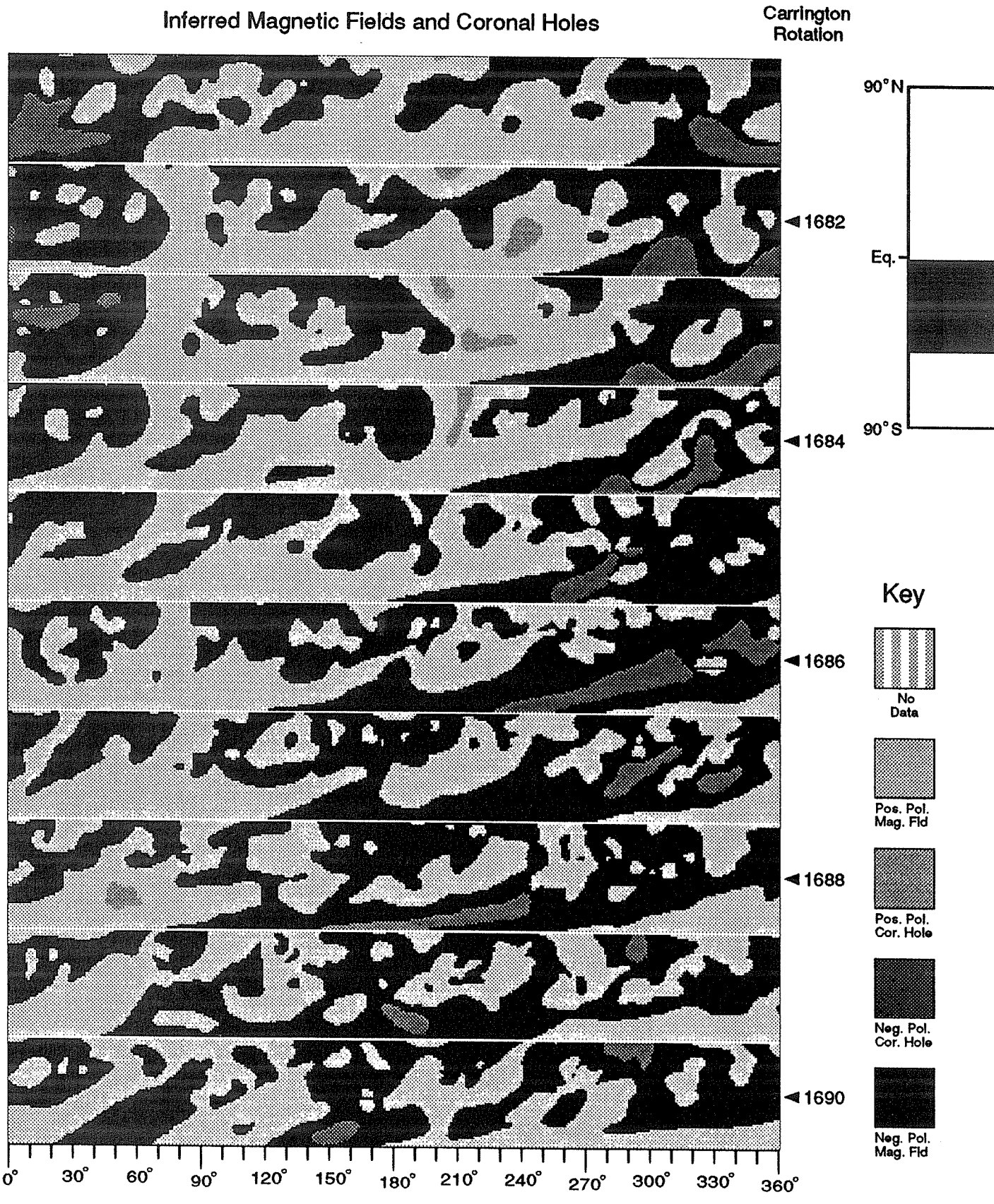
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 27th Jul 1978
To: 26th Apr 1979

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

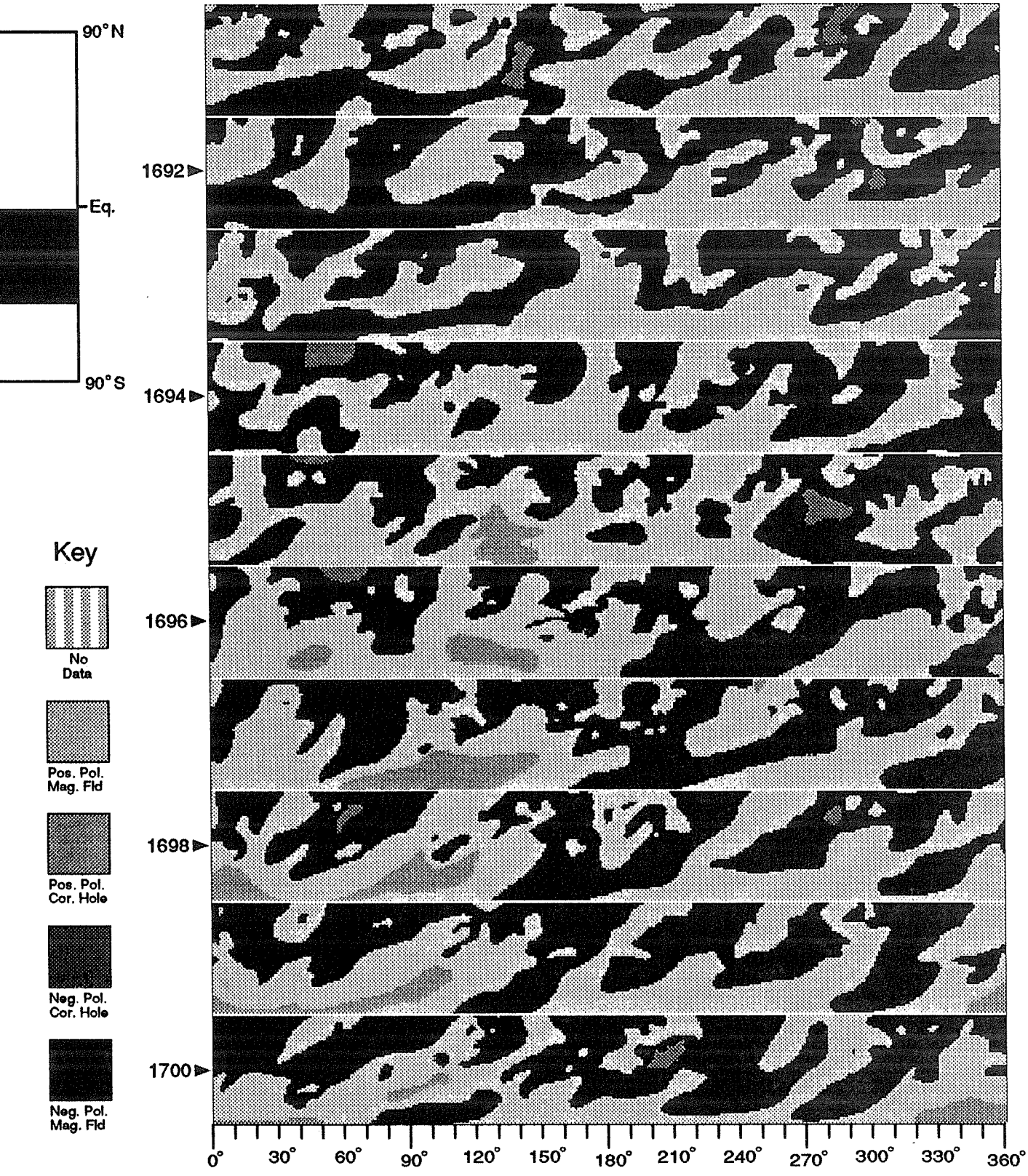


Latitude: South 1 to South 50

From: 26th Apr 1979
To: 24th Jan 1980

Carrington Rotation

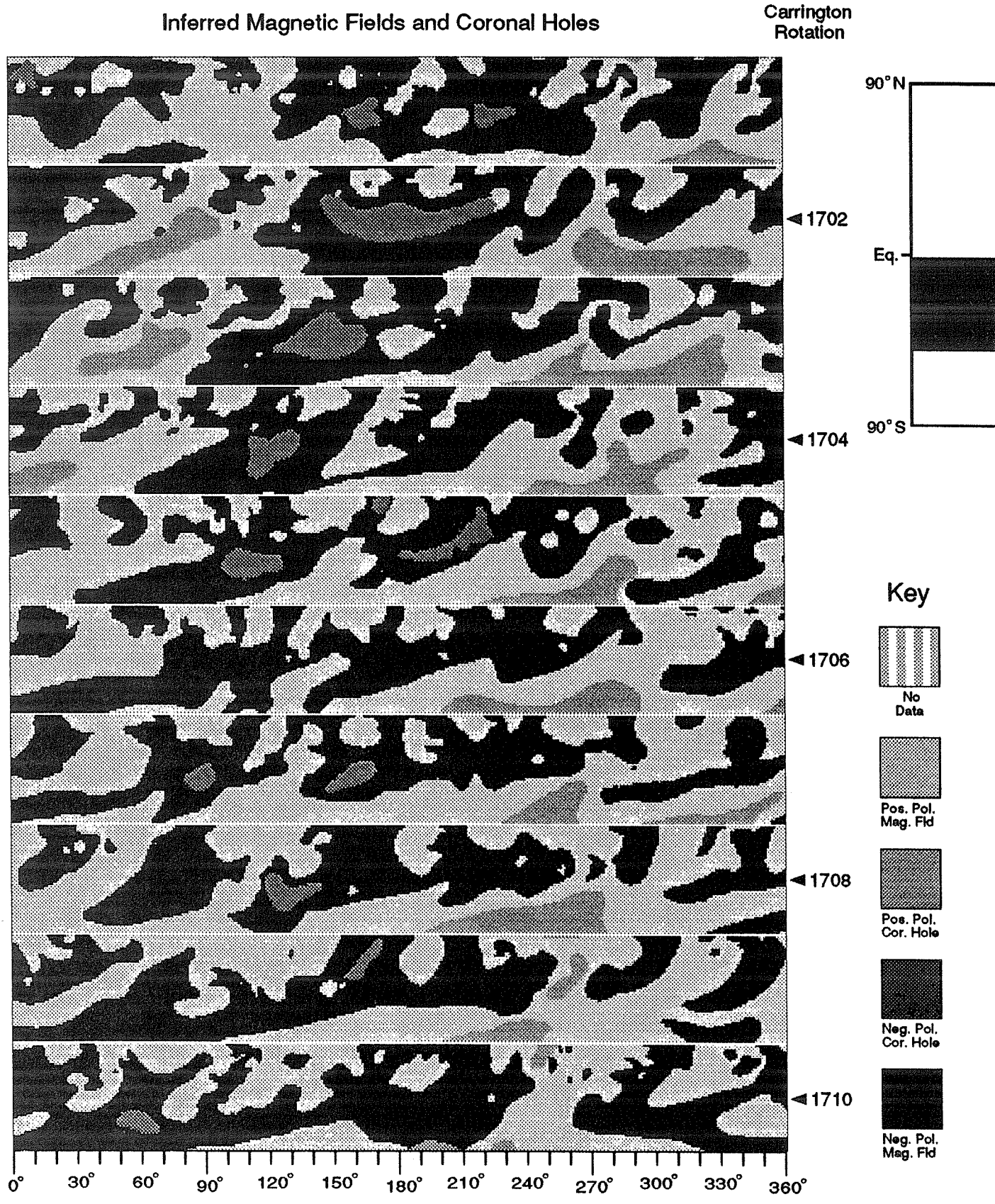
Inferred Magnetic Fields and Coronal Holes



From: 24th Jan 1980
To: 22nd Oct 1980

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

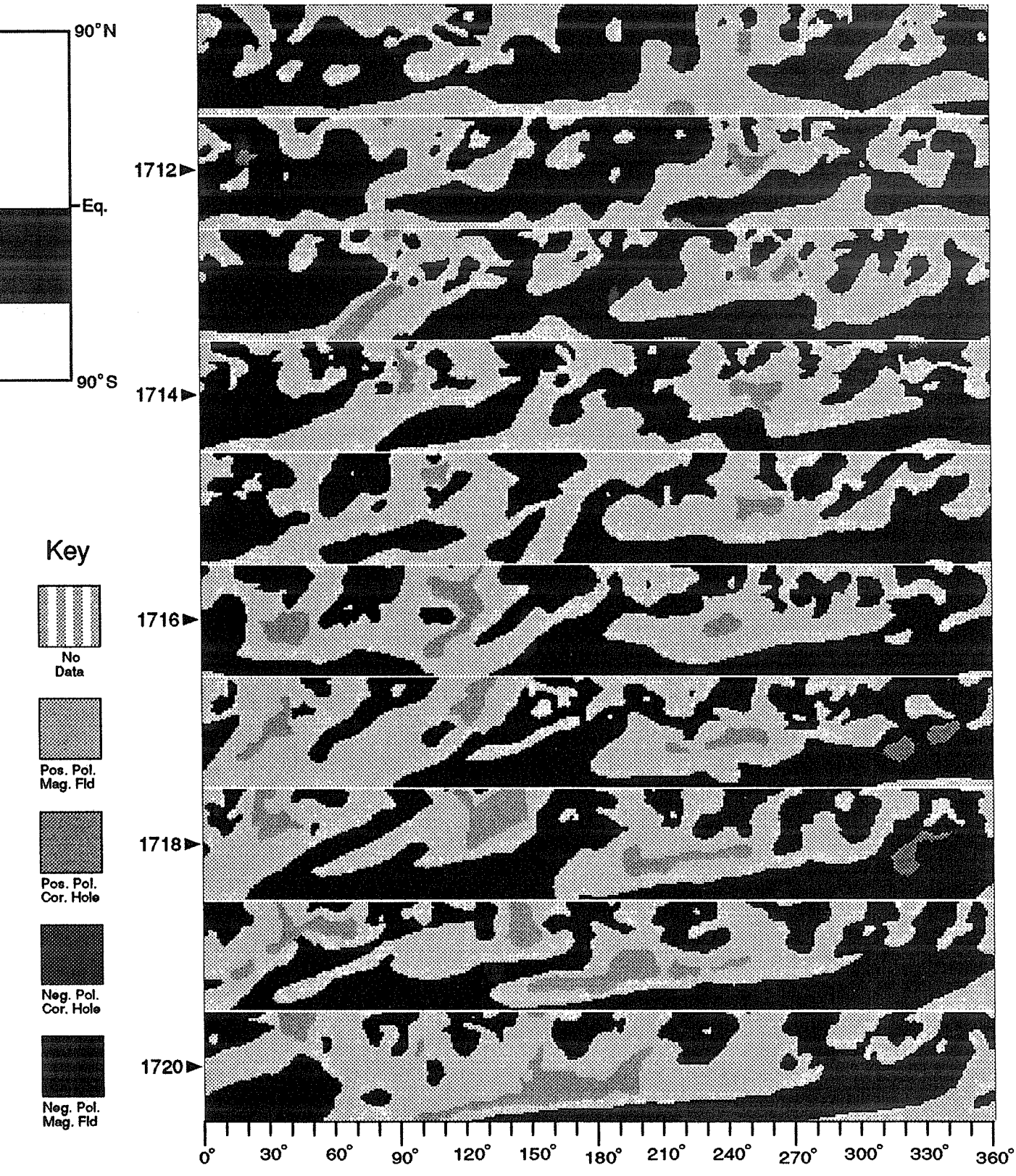


From: 22nd Oct 1980
To: 22nd Jul 1981

Latitude: South 1 to South 50

Carrington Rotation

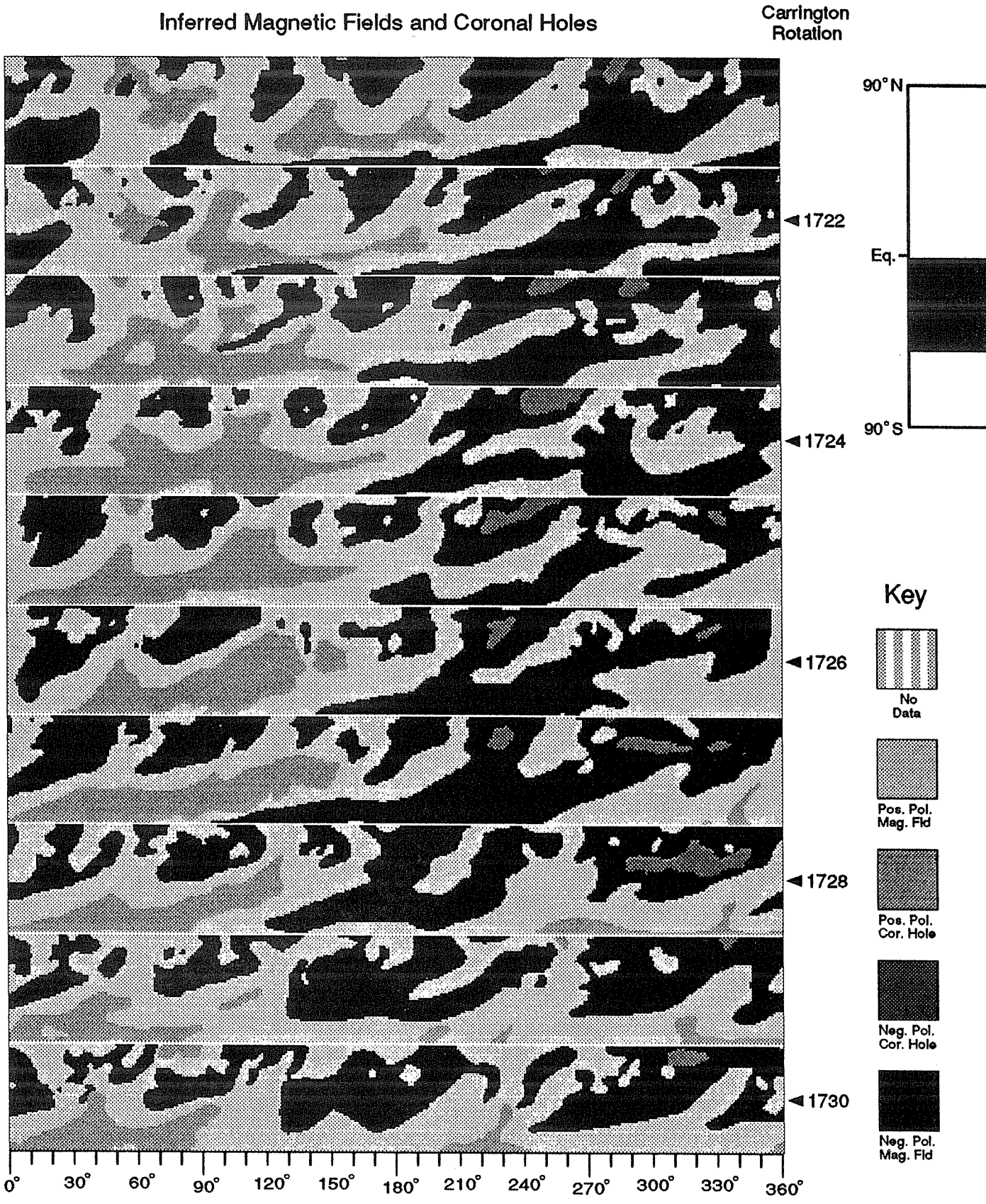
Inferred Magnetic Fields and Coronal Holes



From: 22nd Jul 1981
To: 21st Apr 1982

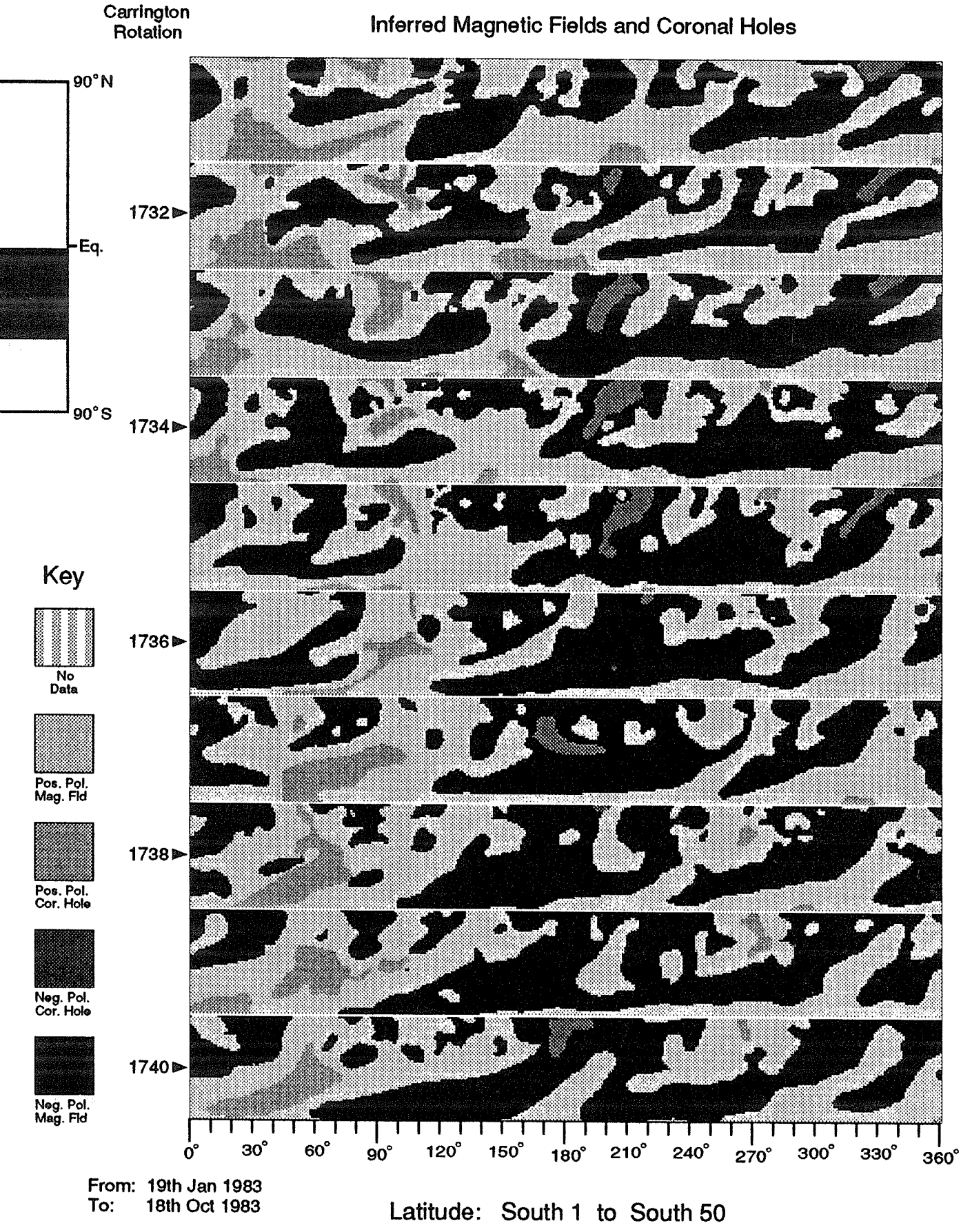
Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes



Latitude: South 1 to South 50

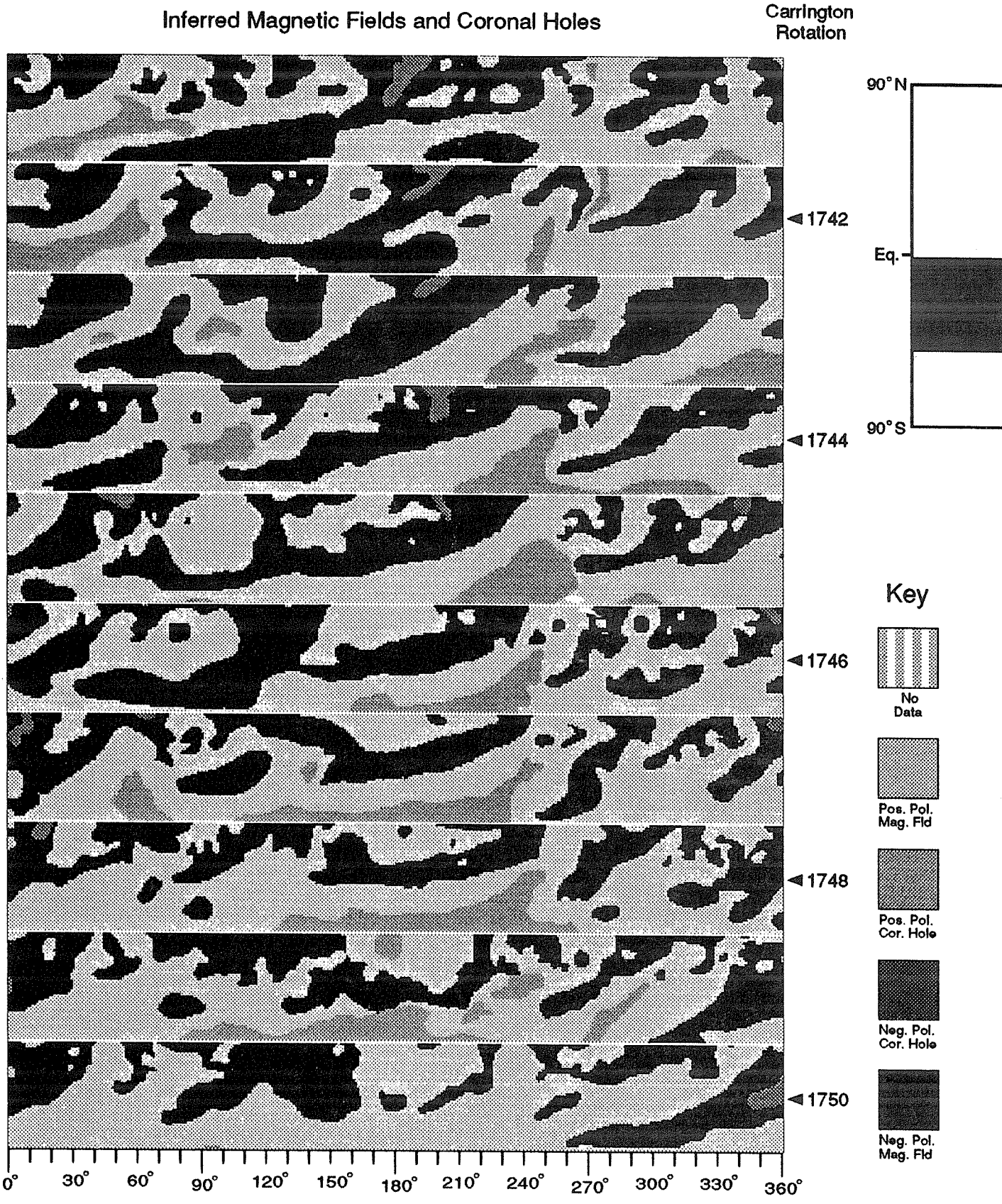
From: 21st Apr 1982
To: 19th Jan 1983



From: 19th Jan 1983
To: 18th Oct 1983

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

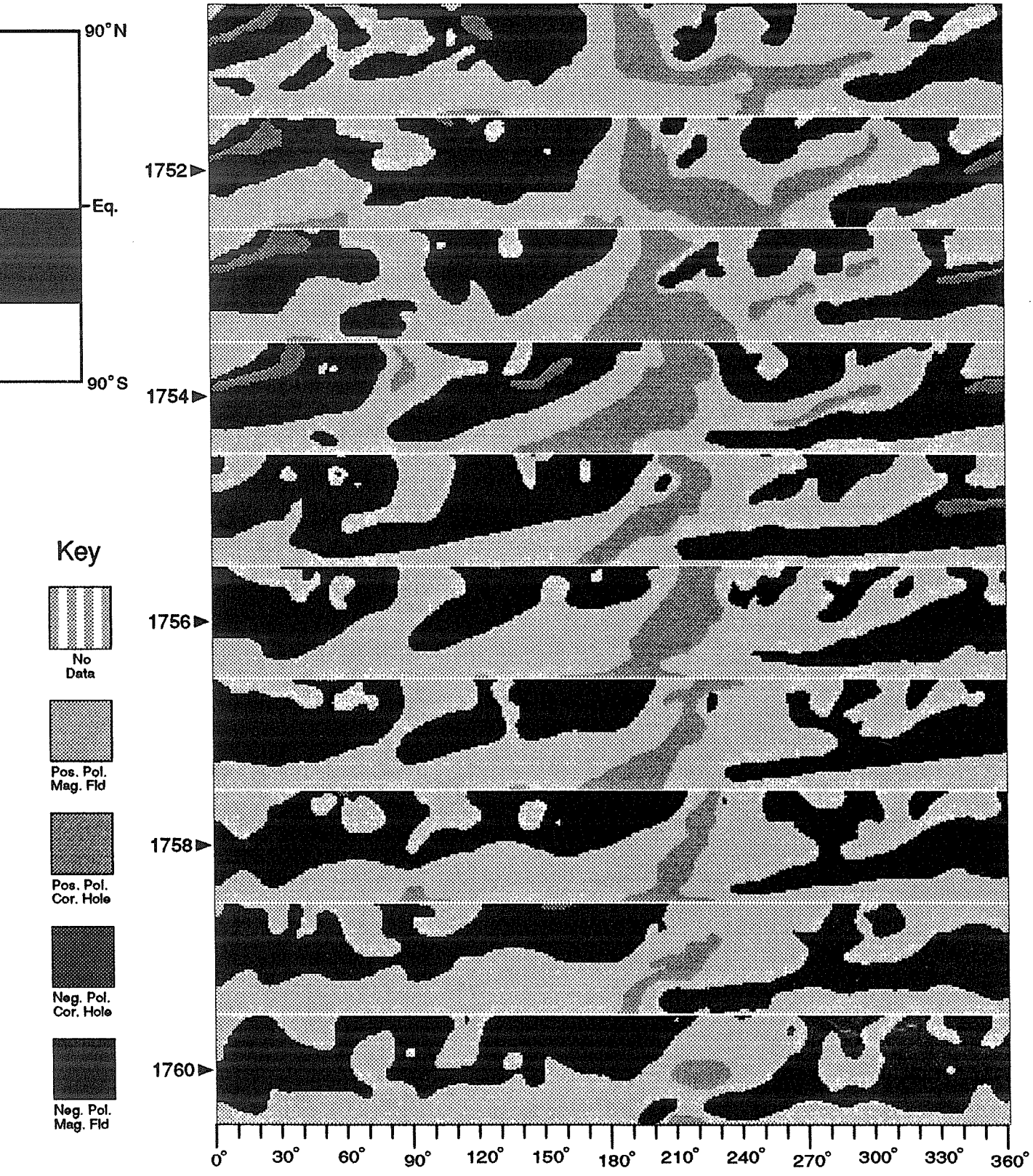


Latitude: South 1 to South 50

From: 18th Oct 1983
To: 17th Jul 1984

Carrington Rotation

Inferred Magnetic Fields and Coronal Holes



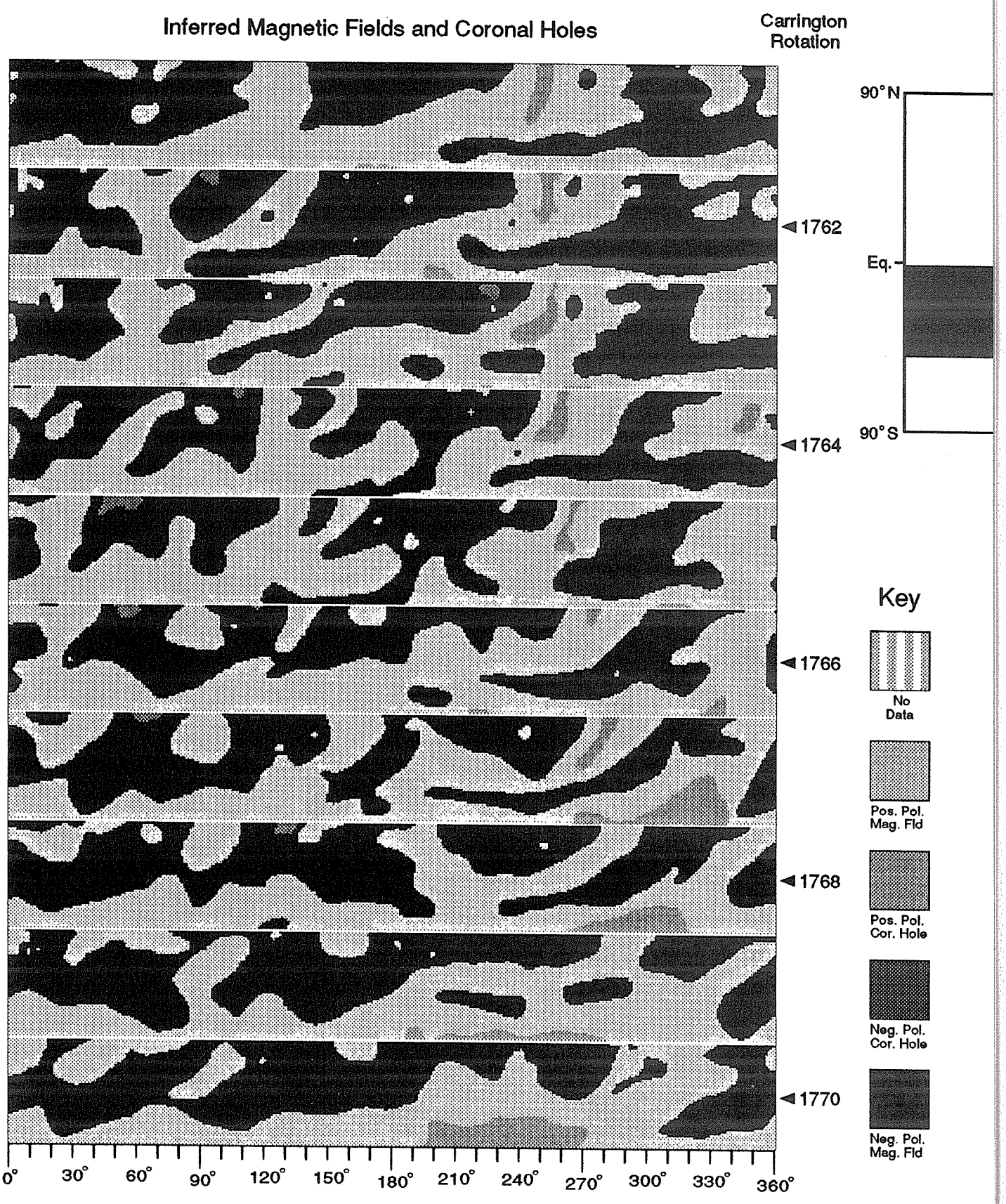
Key

- No Data
- Pos. Pol. Mag. Fld
- Pos. Pol. Cor. Hole
- Neg. Pol. Cor. Hole
- Neg. Pol. Mag. Fld

From: 17th Jul 1984
To: 16th Apr 1985

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

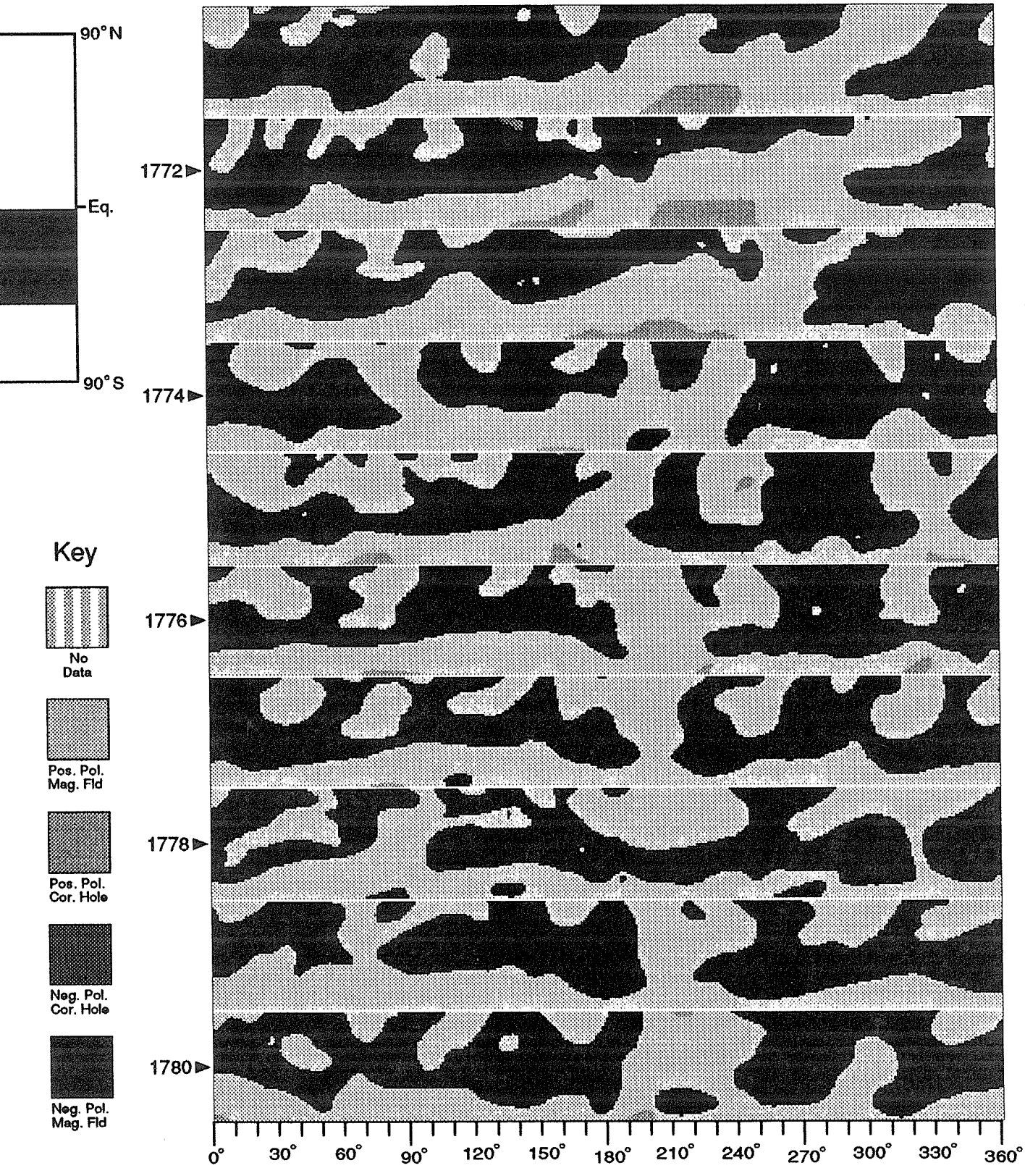


Latitude: South 1 to South 50

From: 16th Apr 1985
To: 14th Jan 1986

Carrington Rotation

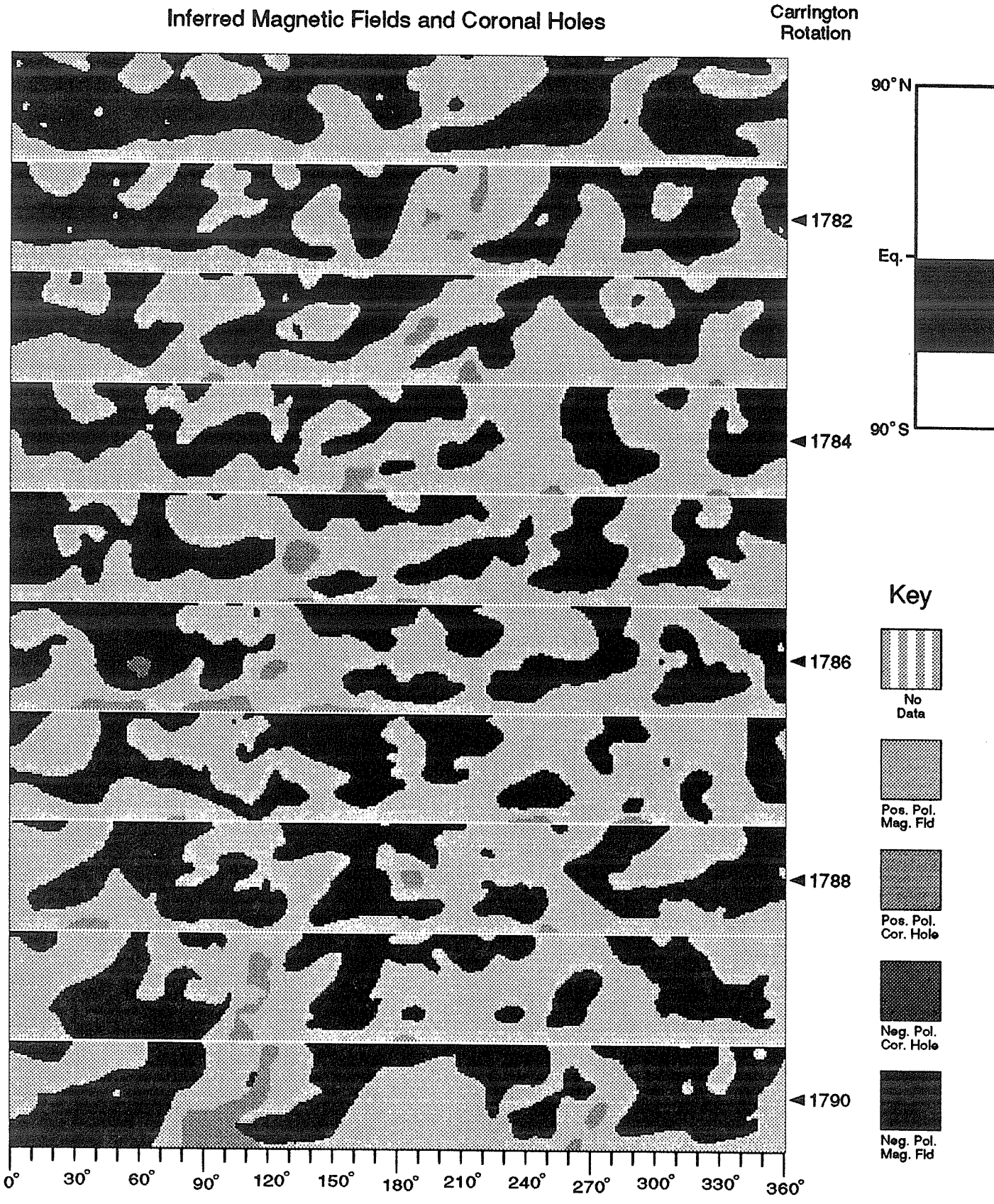
Inferred Magnetic Fields and Coronal Holes



From: 14th Jan 1986
To: 13th Oct 1986

Latitude: South 1 to South 50

Inferred Magnetic Fields and Coronal Holes

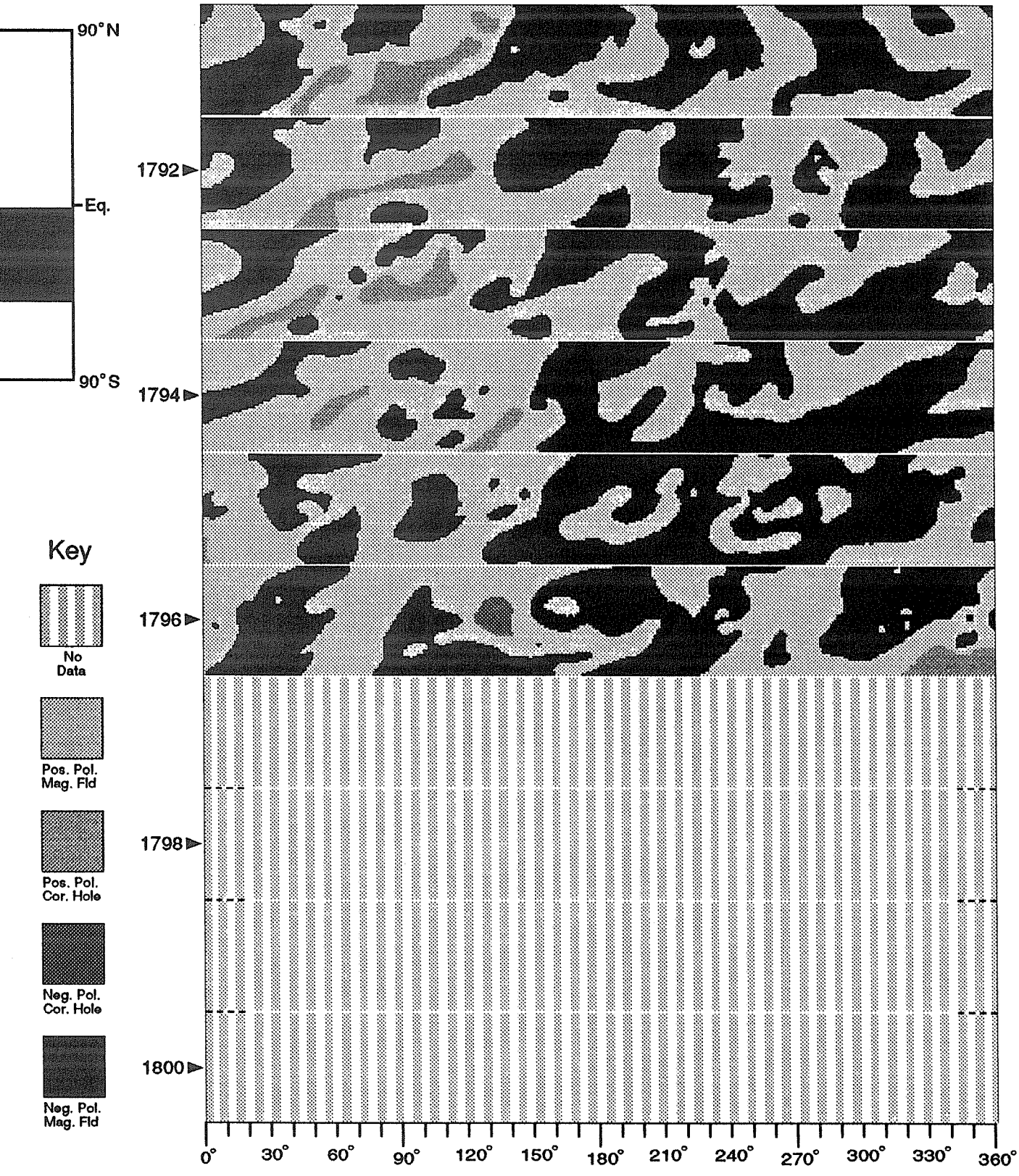


Latitude: South 1 to South 50

From: 13th Oct 1986
To: 13th Jul 1987

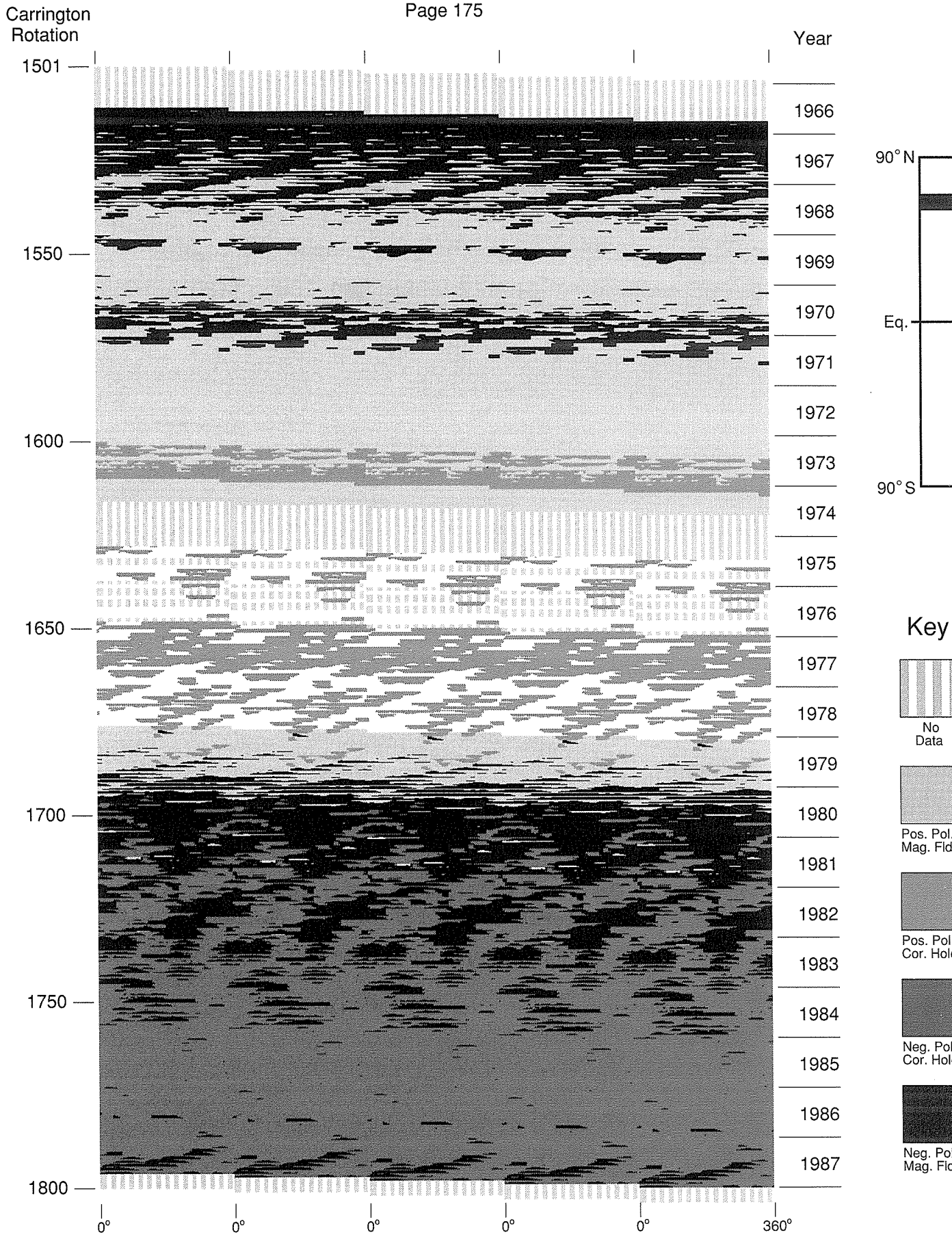
Carrington Rotation

Inferred Magnetic Fields and Coronal Holes

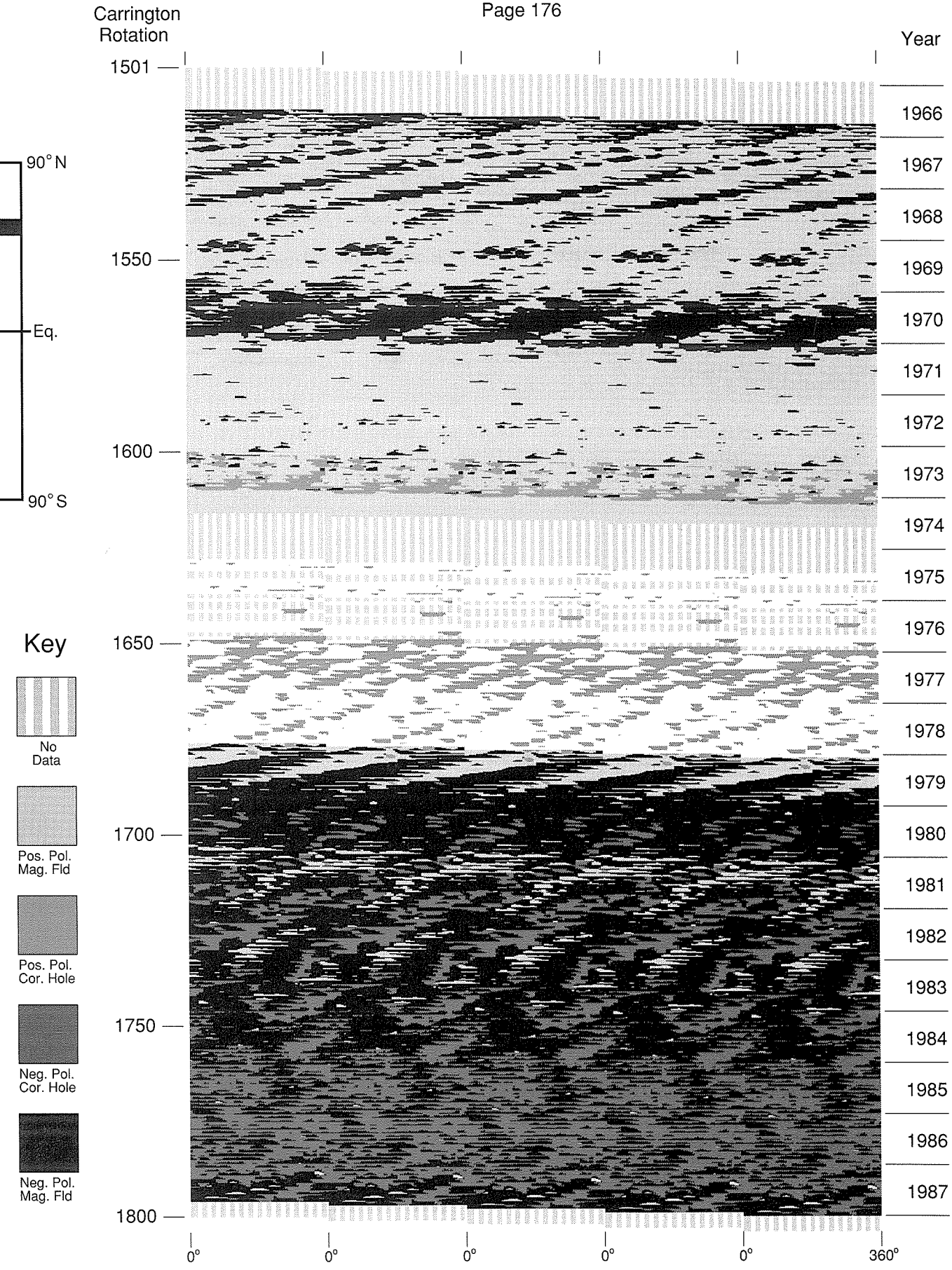


From: 13th Jul 1987
To: 11th Apr 1988

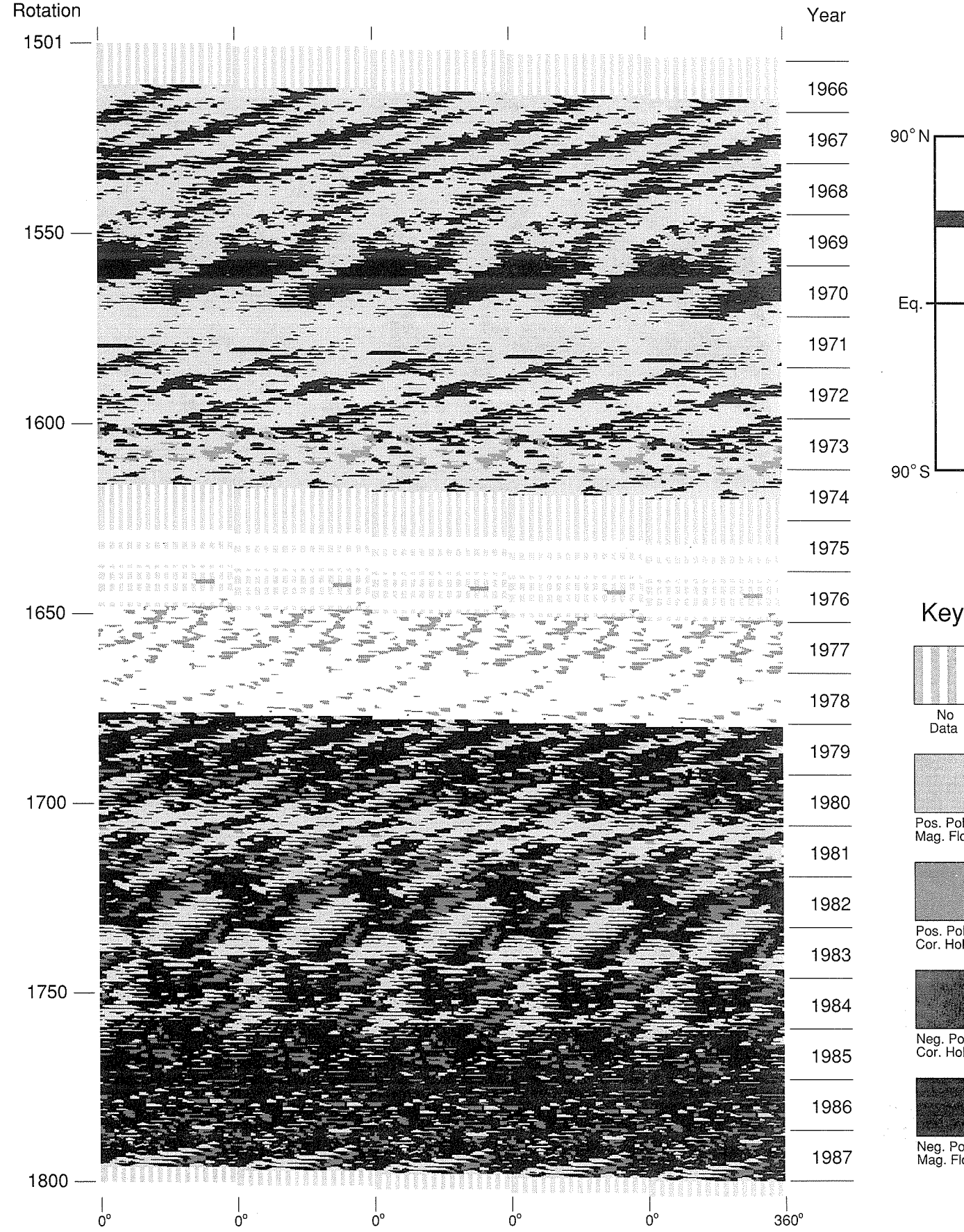
Latitude: South 1 to South 50



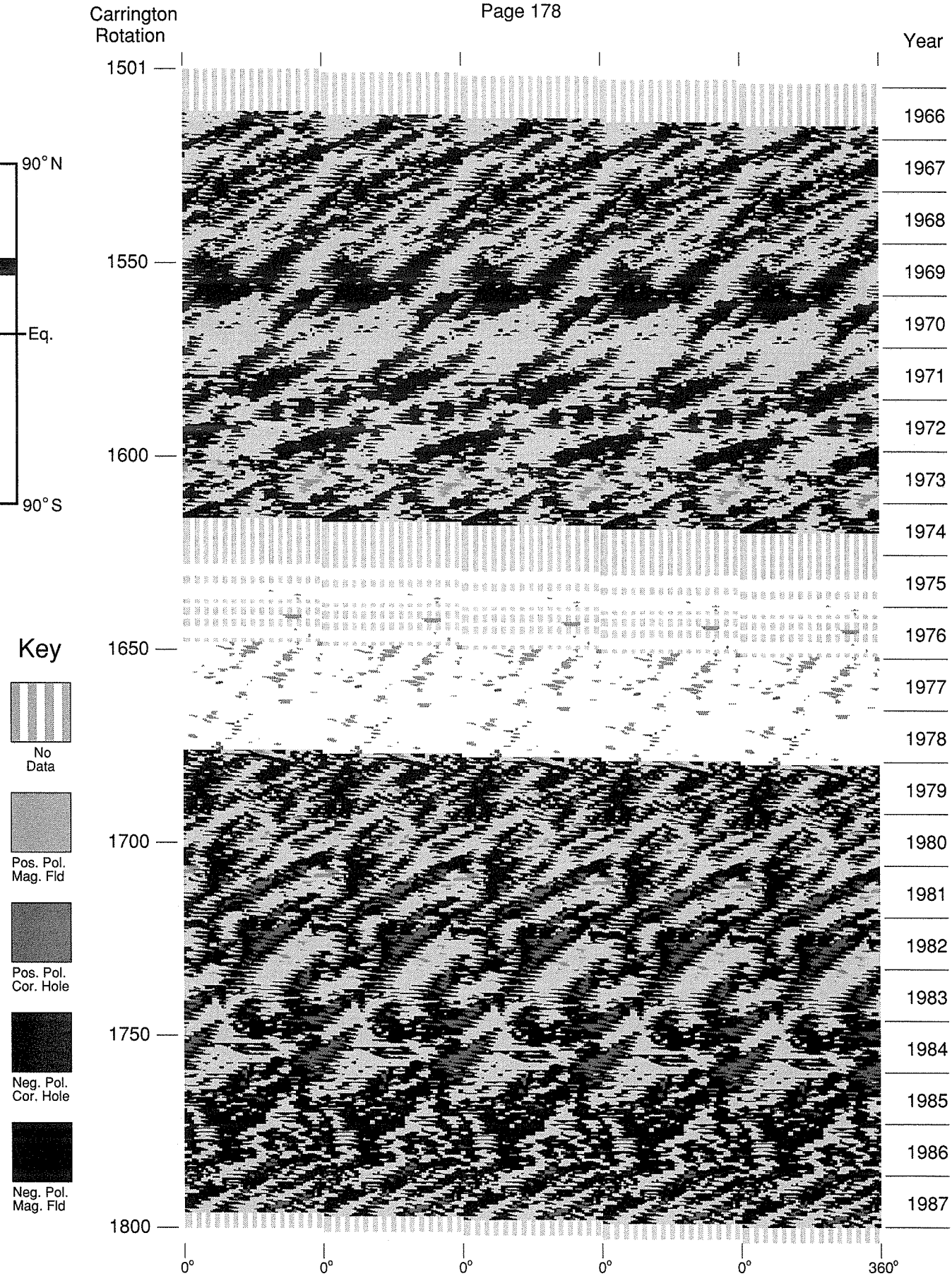
Large-Scale Stackplot(s): North 61 to North 70



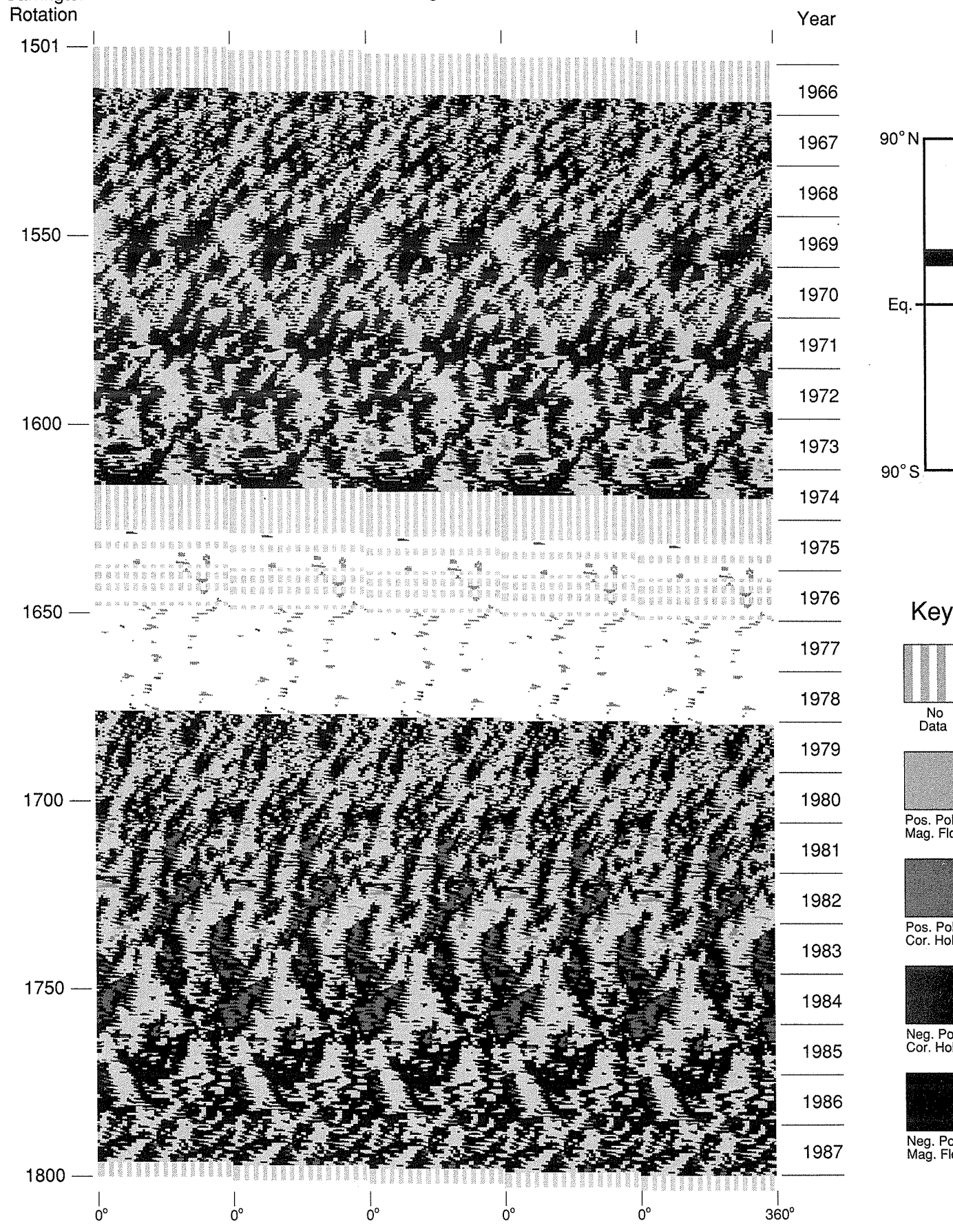
Large-Scale Stackplot(s): North 51 to North 60



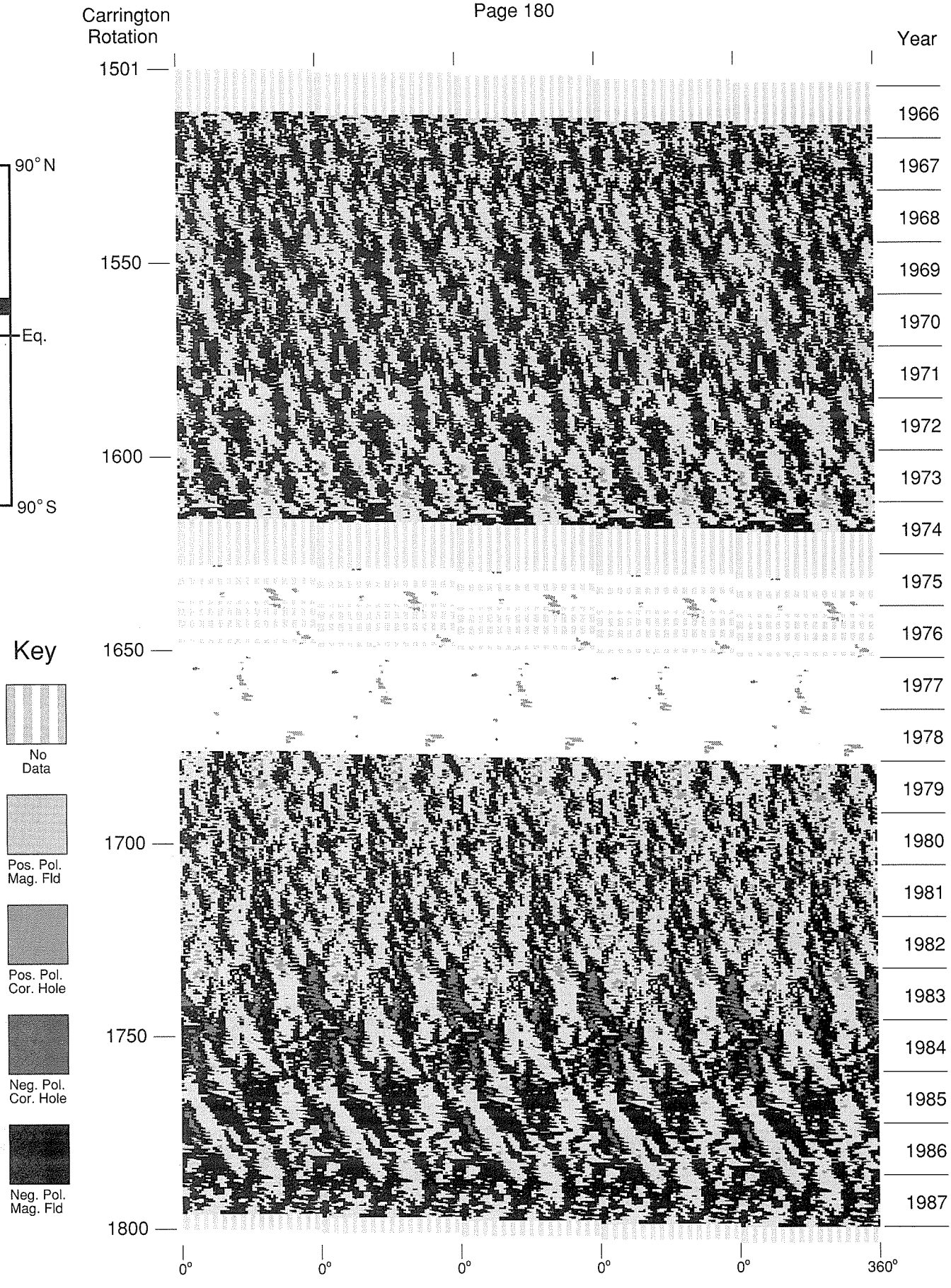
Large-Scale Stackplot(s): North 41 to North 50



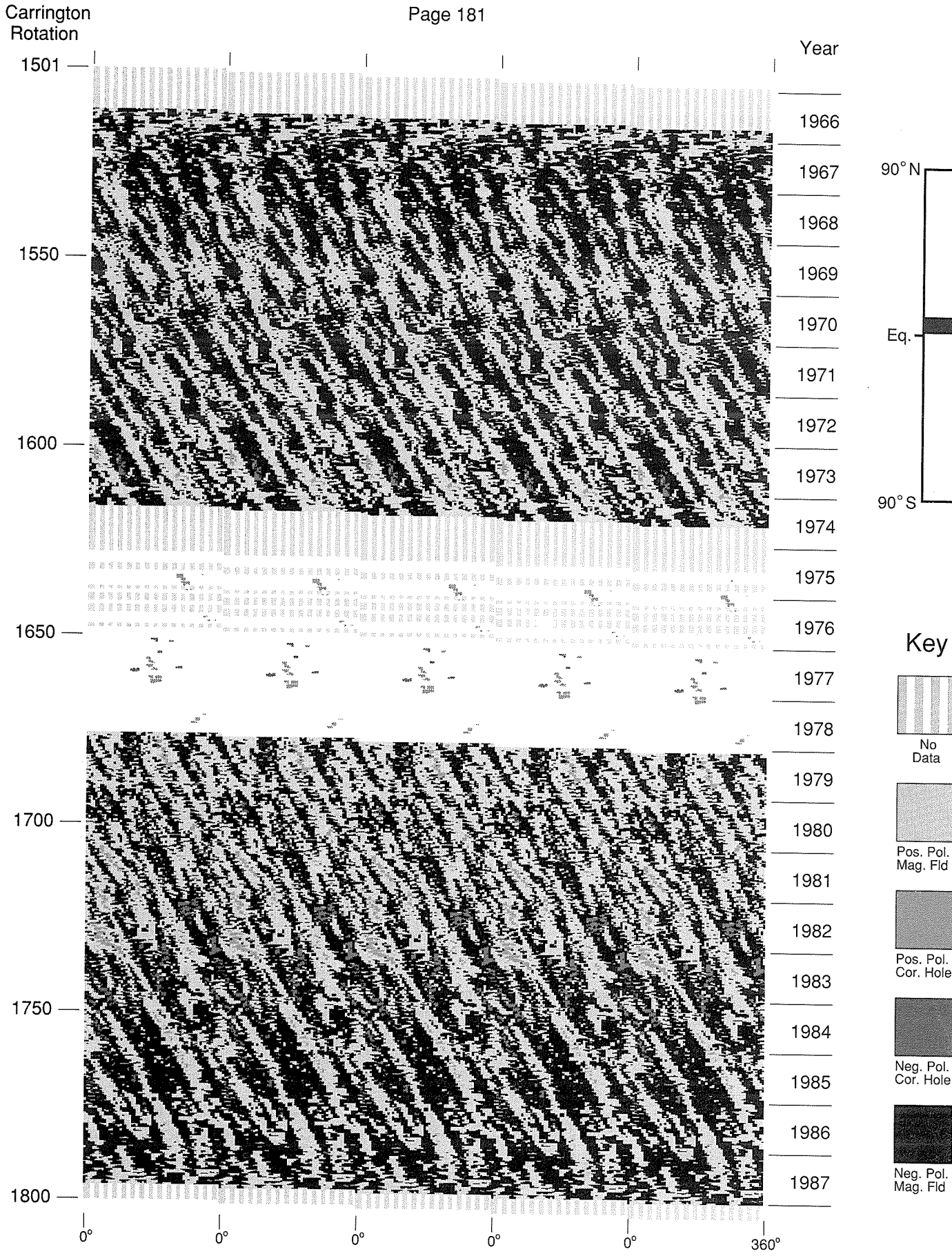
Large-Scale Stackplot(s): North 31 to North 40



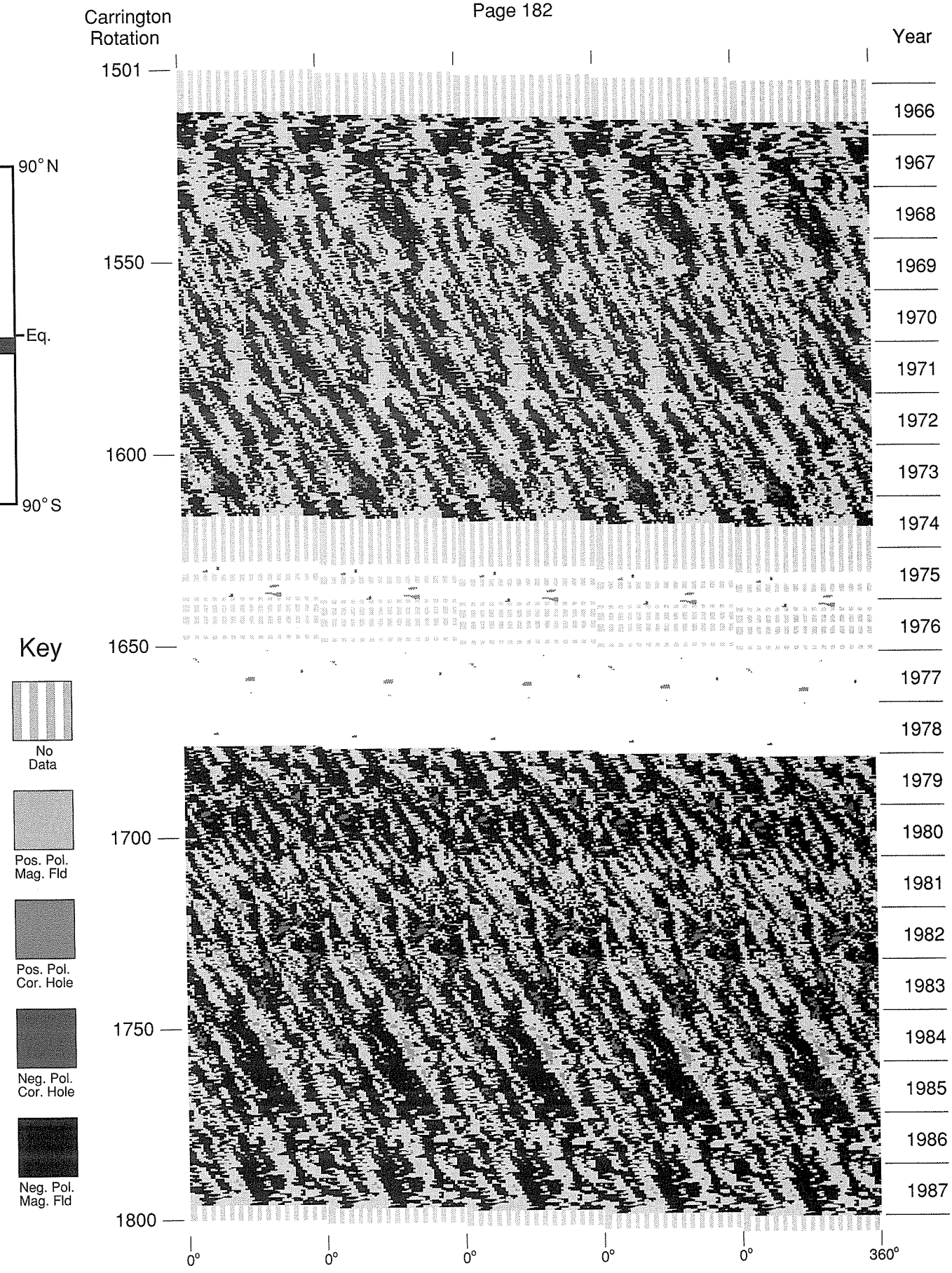
Large-Scale Stackplot(s): North 21 to North 30



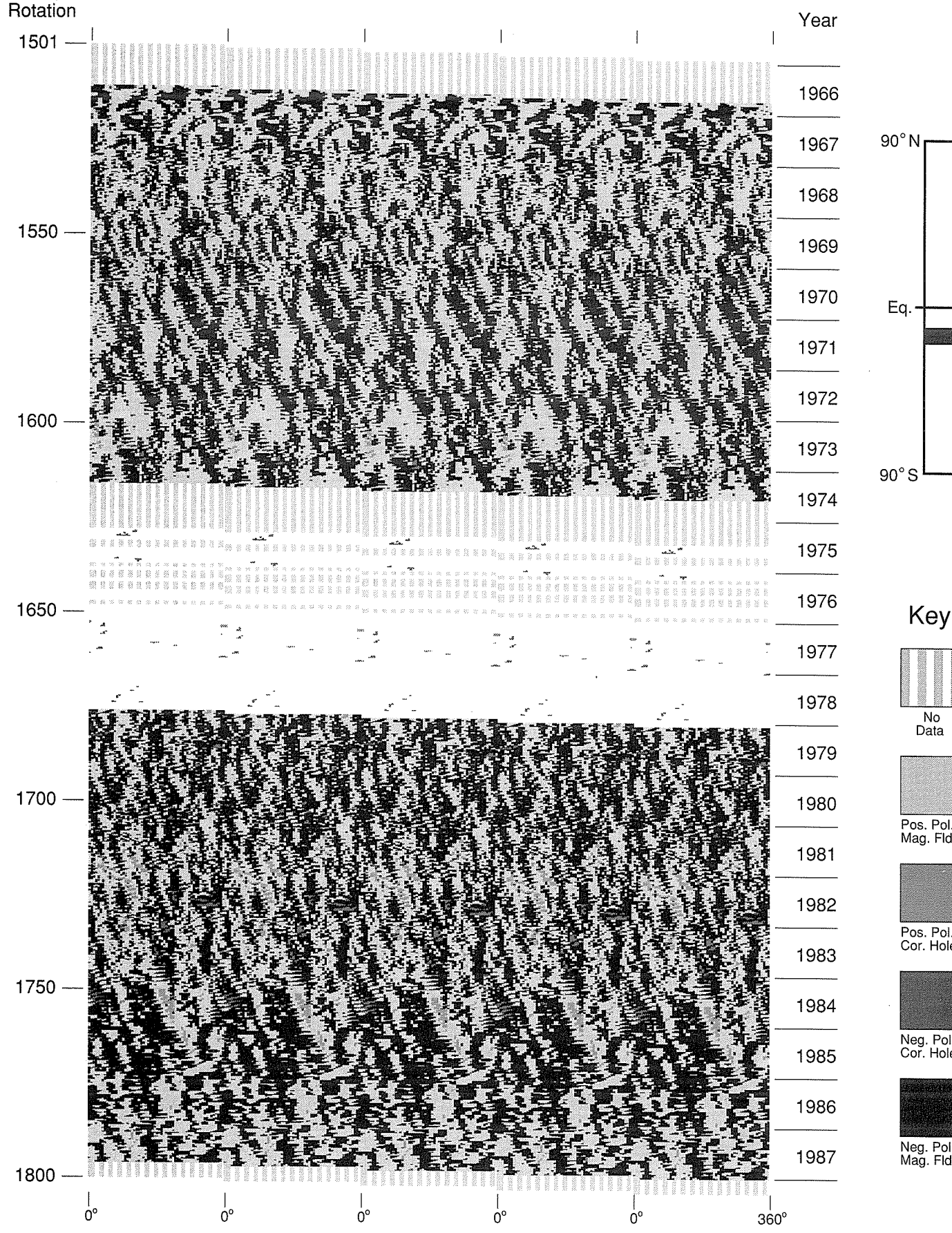
Large-Scale Stackplot(s): North 11 to North 20



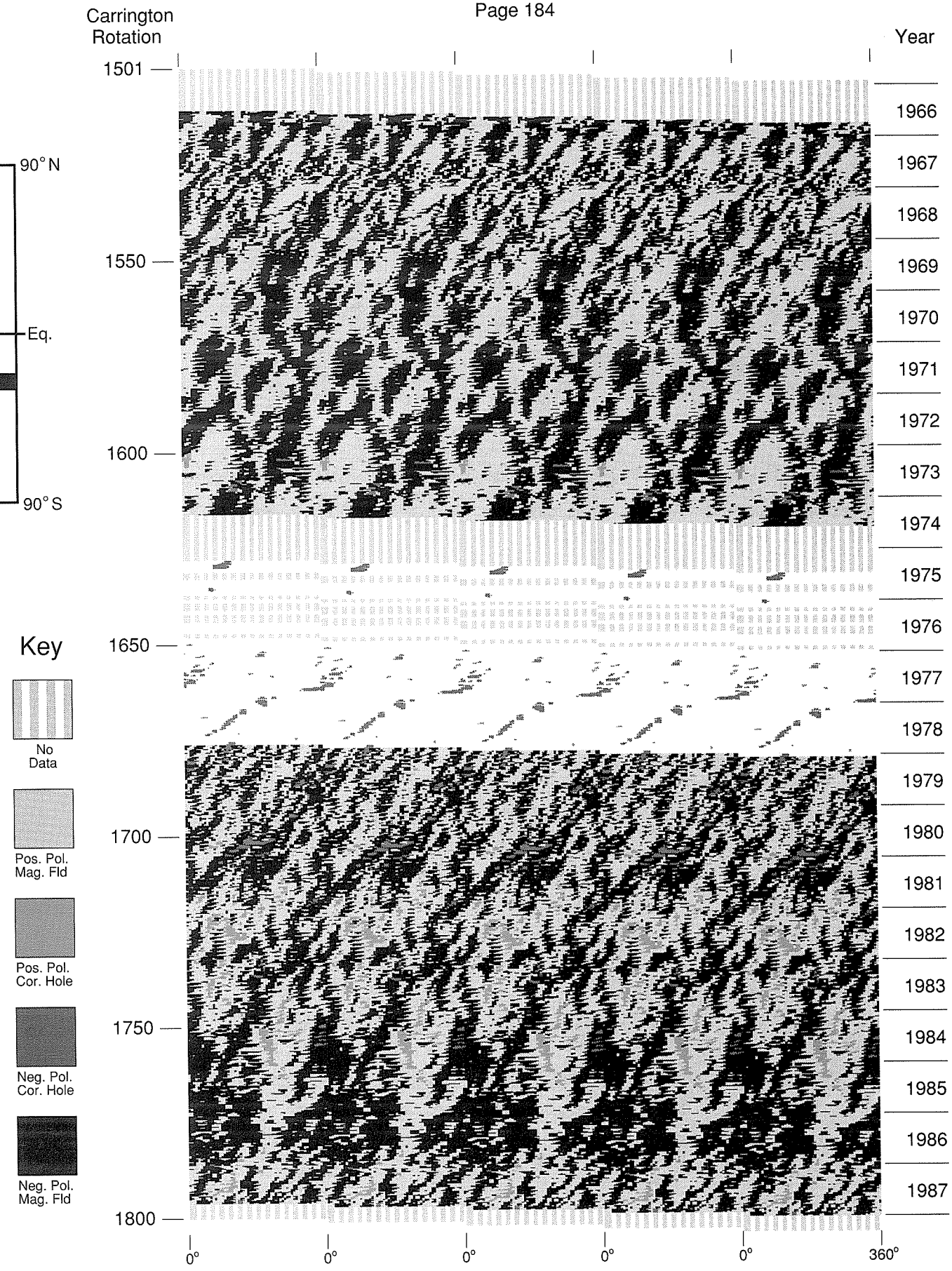
Large-Scale Stackplot(s): North 1 to North 10



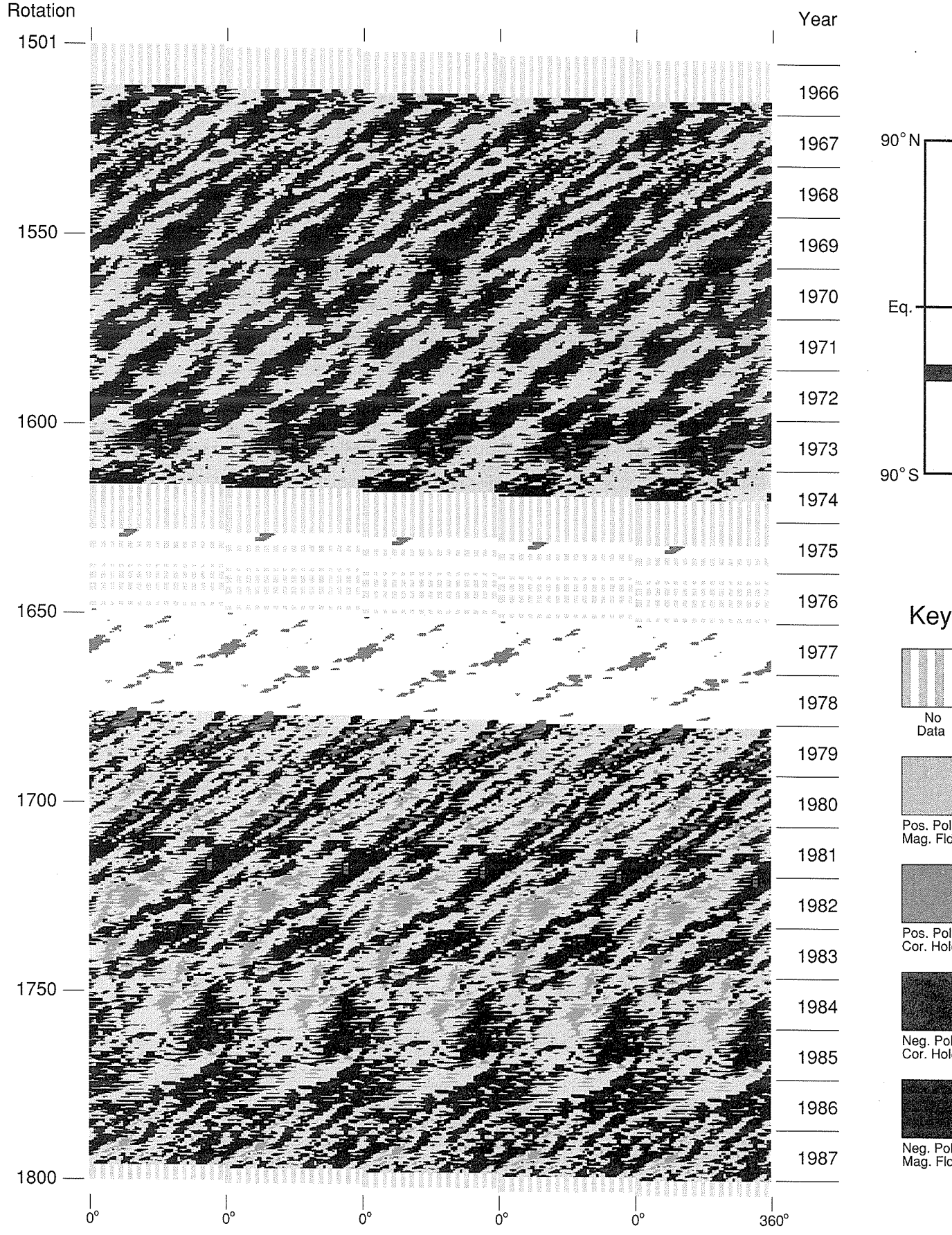
Large-Scale Stackplot(s): South 1 to South 10



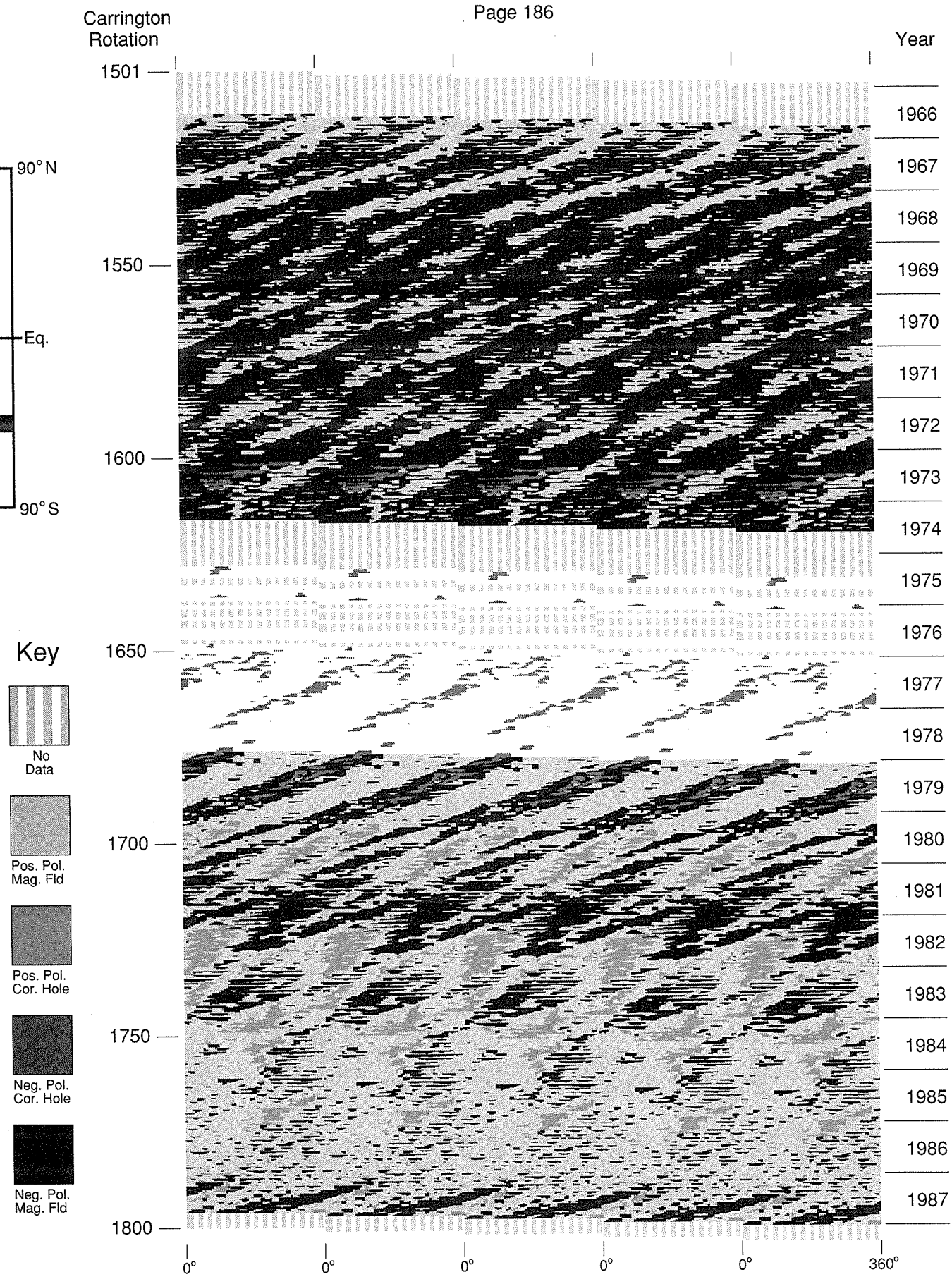
Large-Scale Stackplot(s): South 11 to South 20



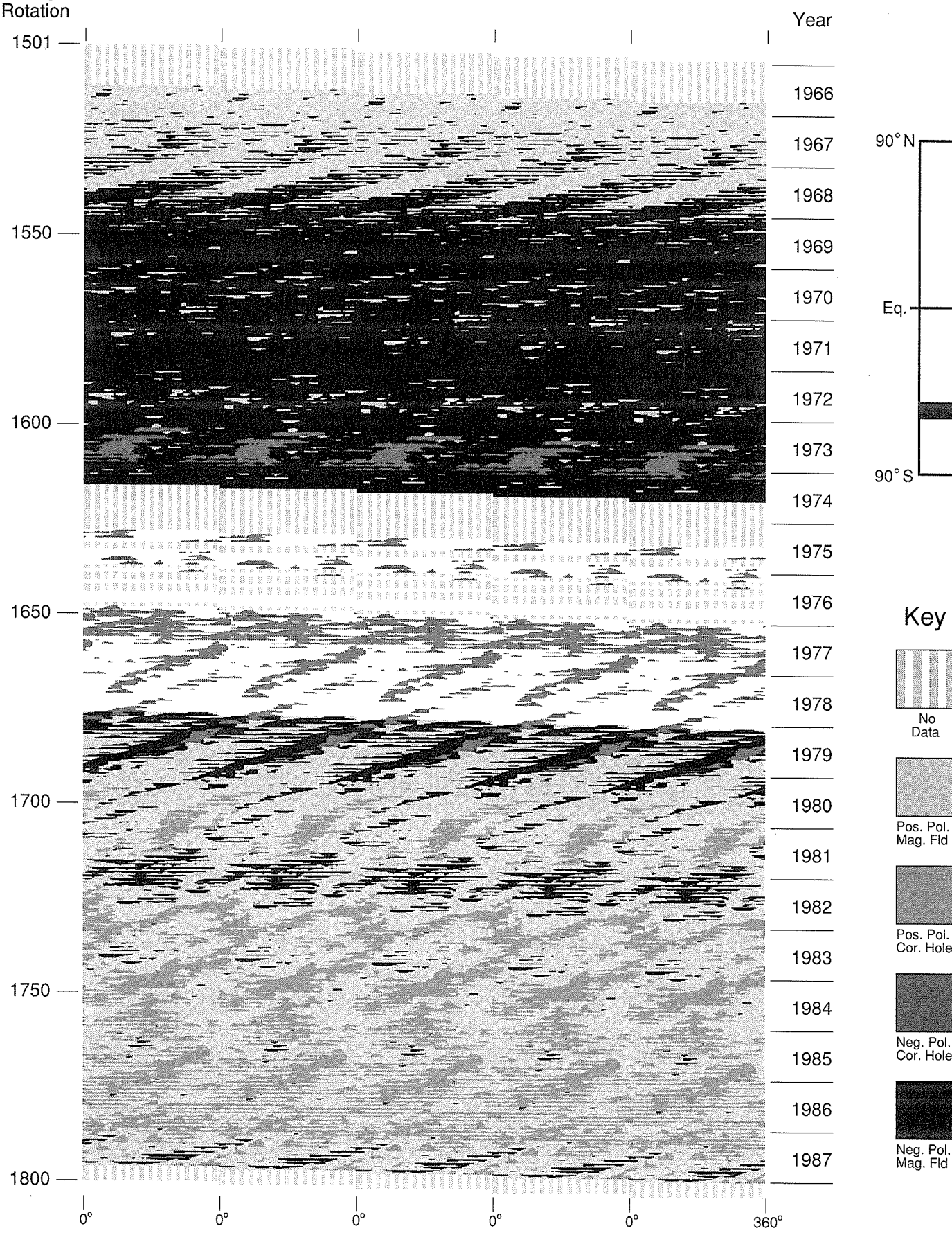
Large-Scale Stackplot(s): South 21 to South 30



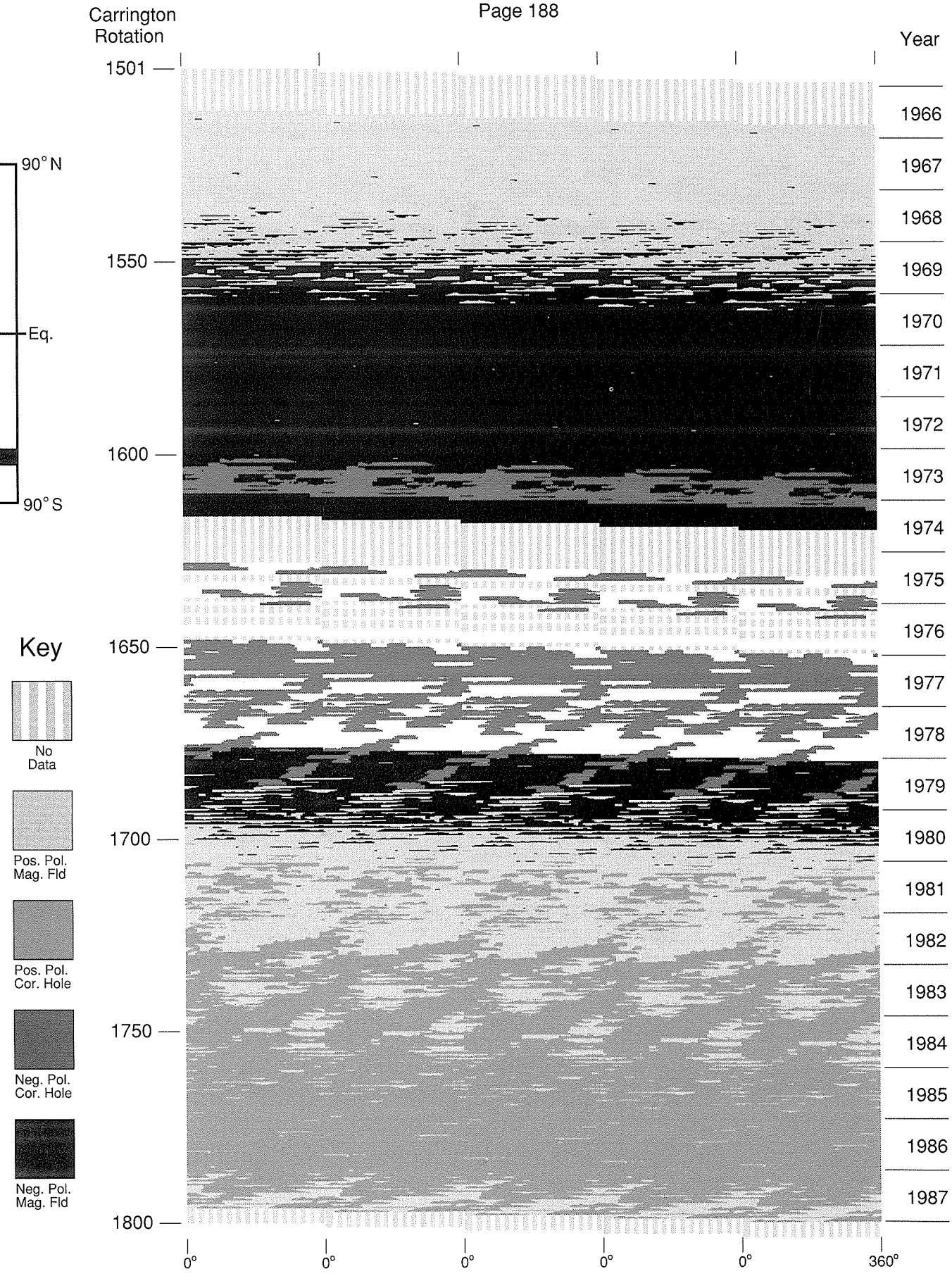
Large-Scale Stackplot(s): South 31 to South 40



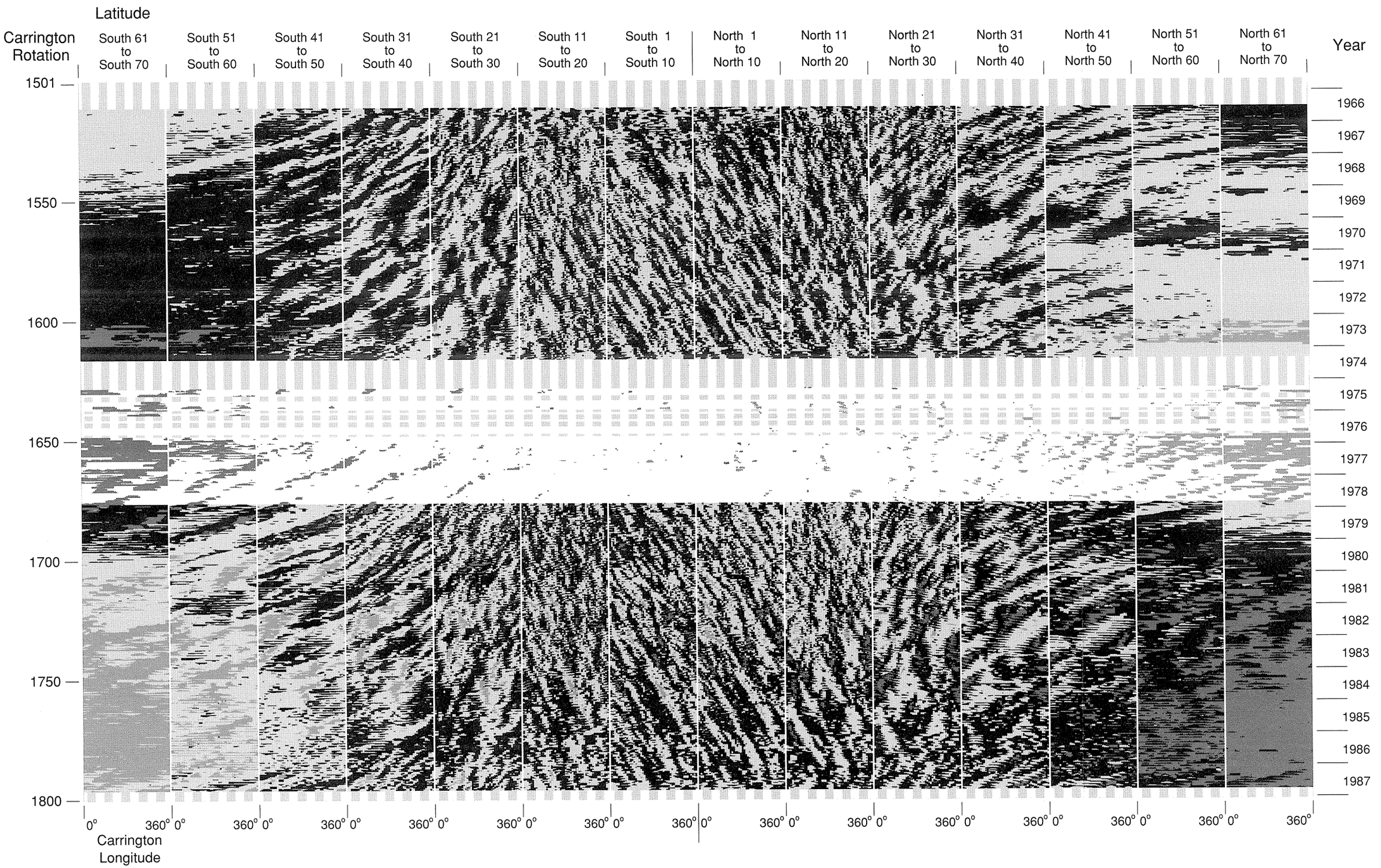
Large-Scale Stackplot(s): South 41 to South 50



Large-Scale Stackplot(s): South 51 to South 60



Large-Scale Stackplot(s): South 61 to South 70



Global Solar Synoptic Stackplot

10 Degree Slices from 70° South to 70° North for 300 Carrington Rotations

UAG SERIES OF REPORTS

Fewer than four UAG Reports are published at irregular intervals each year. Copies of these publications may be purchased through the NATIONAL GEOPHYSICAL DATA CENTER, Solar-Terrestrial Physics Division (E/GC2) 325 Broadway, Boulder, Colorado 80303, USA. Please note that some reports are available on microfiche only at $4.00 a copy and that a $10.00 handling charge will be added. In this case orders must include check or money order payable in U.S. currency to Commerce, NOAA/NGDC.

UAG- 1 IQSY NIGHT AIRGLOW DATA, by L.L. Smith, F.E. Roach, and J.M. McKennan, ESSA Aeronomy Laboratory, Boulder, CO, July 1968, 305 pp.

UAG- 2 A REEVALUATION OF SOLAR FLARES, 1964-1966, by Helen W. Dodson and E. Ruth Hedeman, McMath-Hulbert Observatory, University of Michigan, Pontaic, MI, August 1968, 28 pp.

UAG- 3 OBSERVATIONS OF JUPITER'S SPORADIC RADIO EMISSION IN THE RANGE 7.6-41 MHZ, 6 JULY 1966 THROUGH 8 SEPTEMBER 1968, by James W. Warwick and George A. Dulk, University of Colorado, Boulder, CO, October 1968, 35 pp.

UAG- 4 ABBREVIATED CALENDAR RECORD 1966-1967, by J. Virginia Lincoln, Hope I. Leighton and Dorothy K. Kropp, ESSA [now NOAA], Aeronomy and Space Data Center, Boulder, CO, January 1969, 170 pp.

UAG- 5 DATA ON SOLAR EVENT OF MAY 23, 1967, AND ITS GEOPHYSICAL EFFECTS, compiled by J. Virginia Lincoln, World Data Center A, Upper Atmosphere Geophysics, ESSA [now NOAA], Boulder, CO, February 1969, 120 pp.

UAG- 6 INTERNATIONAL GEOPHYSICAL CALENDARS 1957-1969, by A.H. Shapley and J. Virginia Lincoln, ESSA Research Laboratories [now NOAA], Boulder, CO, March 1969, 25 pp.

UAG- 7 OBSERVATIONS OF THE SOLAR ELECTRON CORONA: FEBRUARY 1964 - JANUARY 1968, by Richard T. Hansen, High Altitude Observatory, NCAR, Boulder, CO, and Kamuela, HI, October 1969, 12 pp.

UAG- 8 DATA ON SOLAR-GEOPHYSICAL ACTIVITY OCTOBER 24 - NOVEMBER 6, 1968, Parts 1 and 2, compiled by J. Virginia Lincoln, World Data Center A, Upper Atmosphere Geophysics, ESSA [now NOAA], Boulder, CO, March 1970, 312 pp, (includes Parts 1 and 2).

UAG- 9 DATA ON COSMIC RAY EVENT OF NOVEMBER 18, 1968, AND ASSOCIATED PHENOMENA, compiled by J. Virginia Lincoln, World Data Center A, Upper Atmosphere Geophysics, ESSA [now NOAA], Boulder, CO, April 1970, 109 pp.

UAG-10 ATLAS OF IONOGRAMS, edited by A.H. Shapley, ESSA Research Laboratories [now NOAA], Boulder, CO, May 1970, 243 pp.

UAG-11 [Superseded by UAG-30]

UAG-12 SOLAR-GEOPHYSICAL ACTIVITY ASSOCIATED WITH THE MAJOR GEOMAGNETIC STORM OF MARCH 8, 1970, Parts 1, 2 and 3, compiled by J. Virginia Lincoln and Dale B. Bucknam, World Data Center A, Upper Atmosphere Geophysics, ESSA [now NOAA], Boulder, CO, April 1971, 466 pp, (includes 3 parts).

UAG-13 DATA ON THE SOLAR PROTON EVENT OF NOVEMBER 2, 1969, THROUGH THE GEOMAGNETIC STORM OF NOVEMBER 8-10, 1969, compiled by Dale B. Bucknam and J. Virginia Lincoln, World Data Center A, Upper Atmosphere Geophysics, ESSA [now NOAA], Boulder, CO, May 1971, 76 pp.

UAG-14 AN EXPERIMENTAL, COMPREHENSIVE FLARE INDEX AND ITS DERIVATION FOR 'MAJOR' FLARES, 1955-1969, by Helen W. Dodson and E. Ruth Hedeman, McMath-Hulbert Observatory, University of Michigan, Pontiac, MI, July 1971, 25 pp.

UAG-15 [Superseded by UAG-30]

UAG-16 TEMPORAL DEVELOPMENT OF THE GEOPHYSICAL DISTRIBUTION OF AURORAL ABSORPTION FOR 30 SUBSTORM EVENTS IN EACH OF IQSY (1964-65) AND IASY (1960), by F.T. Berkey, University of Alaska, Fairbanks, AK; V.M. Driatskiy, Arctic and Antarctic Research Institute, Leningrad, USSR; K. Henriksen, Auroral Observatory, Tromso, Norway; D.H. Jelly, Communications Research Center, Ottawa, Canada; T.I. Shchuka, Arctic and Antarctic Research Institute, Leningrad, USSR; A. Theander, Kiruna Geophysical Observatory, Kiruna, Sweden; and J. Yliniemi, University of Oulu, Oulu, Finland, September 1971, 131 pp, $4.00 (microfiche only).

UAG-17 IONOSPHERIC DRIFT VELOCITY MEASUREMENTS AT JICAMARCA, PERU (JULY 1967 - MARCH 1970), by Ben B. Balsley, NOAA Aeronomy Laboratory, Boulder, CO, and Ronald F. Woodman, Jicamarca Radar Observatory, Instituto Geofisico del Peru, Lima, Peru, October 1971, 45 pp, $4.00 (microfiche only).

UAG-18 A STUDY OF POLAR CAP AND AURORAL ZONE MAGNETIC VARIATIONS, by K. Kawasaki and S.-I. Akasofu, University of Alaska, Fairbanks, AK, June 1972, 21 pp.

UAG-19 REEVALUATION OF SOLAR FLARES 1967, by Helen W. Dodson and E. Ruth Hedeman, McMath-Hulbert Observatory, University of Michigan, Pontiac, MI, and Marta Rovira de Miceli, San Miguel Observatory, Argentina, June 1972, 15 pp.

UAG-20 [Superseded by UAG-30]

UAG-21 PRELIMINARY COMPILATION OF DATA FOR RETROSPECTIVE WORLD INTERVAL JULY 26 - AUGUST 14, 1972, by J. Virginia Lincoln and Hope I. Leighton, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, November 1972, 128 pp.

UAG-22 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES (AE) FOR 1970, by Joe Haskell Allen, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, November 1972, 146 pp.

UAG-23 U.R.S.I. HANDBOOK OF IONOGRAM INTERPRETATION AND REDUCTION, Second Edition, November 1972, edited by W.R. Piggott, Radio and Space Research Station, Slough, UK, and K. Rawer, Arbeitsgruppe fur Physikalische Weltraumforschung, Freiburg, GFR, November 1972, 324 pp.

UAG-23A U.R.S.I. HANDBOOK OF IONOGRAM INTERPRETATION AND REDUCTION, Second Edition, Revision of Chapters 1-4, edited by W.R. Piggott, Radio and Space Research Station, Slough, UK, and K. Rawer, Arbeitsgruppe fur Physikalische Weltraumforschung, Freiburg, GFR, November 1972, 135 pp.

UAG-24 DATA ON SOLAR-GEOPHYSICAL ACTIVITY ASSOCIATED WITH THE MAJOR GROUND LEVEL COSMIC RAY EVENTS OF 24 JANUARY AND 1 SEPTEMBER 1971, Parts 1 and 2, compiled by Helen E. Coffey and J. Virginia Lincoln, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, December 1972, 462 pp, (includes Parts 1 and 2).

UAG-25 OBSERVATIONS OF JUPITER'S SPORADIC RADIO EMISSION IN THE RANGE 7.6-41 MHZ, 9 SEPTEMBER 1968 THROUGH 9 DECEMBER 1971, by James W. Warwick, George A. Dulk and David G. Swann, University of Colorado, Boulder, CO, February 1973, 35 pp.

UAG-26 DATA COMPILATION FOR THE MAGNETOSPHERICALLY QUIET PERIODS FEBRUARY 19-23 AND NOVEMBER 29 - DECEMBER 3, 1970, compiled by Helen E. Coffey and J. Virginia Lincoln, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, May 1973, 129 pp.

UAG-27 HIGH SPEED STREAMS IN THE SOLAR WIND, by D.S. Intriligator, University of Southern California, Los Angeles, CA, June 1973, 16 pp.

UAG-28 COLLECTED DATA REPORTS ON AUGUST 1972 SOLAR-TERRESTRIAL EVENTS, Parts 1, 2 and 3, edited by Helen E. Coffey, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, July 1973, 932 pp.

UAG-29 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1968, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, October 1973, 148 pp.

UAG-30 CATALOGUE OF DATA ON SOLAR-TERRESTRIAL PHYSICS, prepared by NOAA Environmental Data Service, Boulder, CO, October 1973, 317 pp. Supersedes catalogs UAG-11, 15 and 20.

UAG-31 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1969, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, February 1974, 142 pp.

UAG-32 SYNOPTIC RADIO MAPS OF THE SUN AT 3.3 MM FOR THE YEARS 1967-1969, by Earle B. Mayfield, Kennon P. White III, and Fred I. Shimabukuro, Aerospace Corp., El Segundo, CA, April 1974, 26 pp.

UAG-33 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(10) FOR 1967, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, May 1974, 142 pp.

UAG-34 ABSORPTION DATA FOR THE IGY/IGC AND IQSY, compiled and edited by A.H. Shapley, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO; W.R. Piggott, Appleton Laboratory, Slough, UK; and K. Rawer, Arbeitsgruppe fur Physikalische Weltraumforschung, Freiburg, GFR, June 1974, 381 pp.

UAG-35 [Superseded by UAG-92]

UAG-36 AN ATLAS OF EXTREME ULTRAVIOLET FLASHES OF SOLAR FLARES OBSERVED VIA SUDDEN FREQUENCY DEVIATIONS DURING THE ATM-SKYLAB MISSIONS, by R.F. Donnelly and E.L. Berger, NOAA Space Environment Laboratory; Lt. J.D. Busman, NOAA Commissioned Corps; B. Henson, NASA Marshall Space Flight Center; T.B. Jones, University of Leicester, UK; G.M. Lerfald, NOAA Wave Propagation Laboratory; K. Najita, University of Hawaii; W.M. Retallack, NOAA Space Environment Laboratory and W.J. Wagner, Sacramento Peak Observatory, October 1974, 95 pp.

UAG-37 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(10) FOR 1966, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, December 1974, 142 pp.

UAG-38 MASTER STATION LIST FOR SOLAR-TERRESTRIAL PHYSICS DATA AT WDC-A FOR SOLAR-TERRESTRIAL PHYSICS, by R.W. Buhmann, World Data Center A for Solar-Terrestrial Physics, Boulder, CO; Juan D. Roederer, University of Denver, Denver, CO; and M.A. Shea and D.F. Smart, Air Force Cambridge Research Laboratories, Hanscom AFB, MA, December 1974, 110 pp.

UAG-39 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1971, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, February 1975, 144 pp.

UAG-40 H-ALPHA SYNOPTIC CHARTS OF SOLAR ACTIVITY FOR THE PERIOD OF SKYLAB OBSERVATIONS, MAY 1973 - MARCH 1974, by Patrick S. McIntosh, NOAA Space Environment Laboratory, Boulder, CO, February 1975, 32 pp.

UAG-41 H-ALPHA SYNOPTIC CHARTS OF SOLAR ACTIVITY DURING THE FIRST YEAR OF SOLAR CYCLE 20 OCTOBER 1964 - AUGUST 1965, by Patrick S. McIntosh, NOAA Space Environment Laboratory, Boulder, CO, and Jerome T. Nolte, American Science and Engineering, Inc., Cambridge, MA, March 1975, 25 pp.

UAG-42 OBSERVATIONS OF JUPITER'S SPORADIC RADIO EMISSION IN THE RANGE 7.6-80 MHZ, 10 DECEMBER 1971 THROUGH 21 MARCH 1975, by James W. Warwick, George A. Dulk and Anthony C. Riddle, University of Colorado, Boulder, CO, April 1975, 49 pp.

UAG-43 CATALOG OF OBSERVATION TIMES OF GROUND-BASED SKYLAB-COORDINATED SOLAR OBSERVING PROGRAMS, compiled by Helen E. Coffey, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, May 1975, 159 pp.

UAG-44 SYNOPTIC MAPS OF SOLAR 9.1 CM MICROWAVE EMISSION FROM JUNE 1962 TO AUGUST 1973, by Werner Graf and Ronald N. Bracewell, Stanford University, Stanford, CA, May 1975, 183 pp.

UAG-45 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1972, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, May 1975, 144 pp, $4.00 (microfiche only).

UAG-46 INTERPLANETARY MAGNETIC FIELD DATA 1963-1964, by Joseph H. King, National Space Science Data Center, NASA Goddard Space Flight Center, Greenbelt, MD, June 1975, 382 pp.

UAG-47 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1973, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, June 1975, 144 pp, $4.00 (microfiche only).

UAG-48 [Superseded by UAG-48A]

UAG-48A SYNOPTIC OBSERVATIONS OF THE SOLAR CORONA DURING CARRINGTON ROTATIONS 1580-1596 (11 OCTOBER 1971 - 15 JANUARY 1973), [Re-issue of UAG-48 with quality images], by R.A. Howard, M.J. Koomen, D.J. Michels, R. Tousey, C.R. Detwiler, D.E. Roberts, R.T. Seal, and J.D. Whitney, U.S. Naval Research Laboratory, Washington, DC; and R.T. Hansen and S.F. Hansen, C.J. Garcia and E. Yasukawa, High Altitude Observatory, NCAR, Boulder, CO, February 1976, 200 pp. Supersedes UAG-48.

UAG-49 [Superseded by UAG-92]

UAG-50 HIGH-LATITUDE SUPPLEMENT TO THE URSI HANDBOOK ON IONOGRAM INTERPRETATION AND REDUCTION, edited by W.R. Piggott, British Antarctic Survey, c/o Appleton Laboratory, Slough, UK, October 1975, 294 pp.

UAG-51 SYNOPTIC MAPS OF SOLAR CORONAL HOLE BOUNDARIES DERIVED FROM HE II 304A SPECTROHELIOGRAMS FROM THE MANNED SKYLAB MISSIONS, by J.D. Bohlin and D.M. Rubenstein, U.S. Naval Research Laboratory, Washington, DC, November 1975, 30 pp.

UAG-52 EXPERIMENTAL COMPREHENSIVE SOLAR FLARE INDICES FOR CERTAIN FLARES, 1970-1974, by Helen W. Dodson and E. Ruth Hedeman, McMath-Hulbert Observatory, University of Michigan, Pontiac, MI, November 1975, 27 pp.

UAG-53 DESCRIPTION AND CATALOG OF IONOSPHERIC F-REGION DATA, JICAMARCA RADIO OBSERVATORY (NOVEMBER 1966 - APRIL 1969), by W.L. Clark and T.E. Van Zandt, NOAA Aeronomy Laboratory, Boulder, CO, and J.P. McClure, University of Texas at Dallas, Dallas, TX, April 1976, 10 pp.

UAG-54 [Superseded by UAG-85]

UAG-55 EQUIVALENT IONOSPHERIC CURRENT REPRESENTATIONS BY A NEW METHOD, ILLUSTRATED FOR 8-9 NOVEMBER 1969 MAGNETIC DISTURBANCES, by Y. Kamide, Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO; H.W. Kroehl, Data Studies Division, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO; M. Kanamitsu, Advanced Study Program, National Center for Atmospheric Research, Boulder, CO; Joe Haskell Allen, Data Studies Division, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO; and S.-I. Akasofu, Geophysical Institute, University of Alaska, Fairbanks, AK, April 1976, 91 pp, $4.00 (microfiche only).

UAG-56 ISO-INTENSITY CONTOURS OF GROUND MAGNETIC H PERTURBATIONS FOR THE DECEMBER 16-18, 1971, GEOMAGNETIC STORM, Y. Kamide, Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO, April 1976, 37 pp.

UAG-57 MANUAL ON IONOSPHERIC ABSORPTION MEASUREMENTS, edited by K. Rawer, Institut fur Physikalische Weltraumforschung, Freiburg, GFR, June 1976, 302 pp.

UAG-58 ATS-6 RADIO BEACON ELECTRON CONTENT MEASUREMENTS AT BOULDER, JULY 1974 - MAY 1975, by R.B. Fritz, NOAA Space Environment Laboratory, Boulder, CO, September 1976, 61 pp.

UAG-59 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1974, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, December 1976, 144 pp.

UAG-60 GEOMAGNETIC DATA FOR JANUARY 1976 [AE(7) INDICES AND STACKED MAGNETOGRAMS], by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center. Boulder, CO, July 1977, 57 pp.

UAG-61 COLLECTED DATA REPORTS FOR STIP INTERVAL II 20 MARCH - 5 MAY 1976, edited by Helen E. Coffey and John A. McKinnon, World Data Center A for Solar-Terrestrial Physics, Boulder, CO, August 1977, 313 pp.

UAG-62 GEOMAGNETIC DATA FOR FEBRUARY 1976 [AE(7) INDICES AND STACKED MAGNETOGRAMS], by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, September 1977, 55 pp.

UAG-63 GEOMAGNETIC DATA FOR MARCH 1976 [AE(7) INDICES AND STACKED MAGNETOGRAMS], by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, September 1977, 57 pp.

UAG-64 GEOMAGNETIC DATA FOR APRIL 1976 [AE(8) INDICES AND STACKED MAGNETOGRAMS], by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, February 1978, 55 pp.

UAG-65 THE INFORMATION EXPLOSION AND ITS CONSEQUENCES FOR DATA ACQUISITION, DOCUMENTATION, PROCESSING, by G.K. Hartmann, Max-Planck-Institut fur Aeronomie, Lindau, GFR, May 1978, 36 pp.

UAG-66 SYNOPTIC RADIO MAPS OF THE SUN AT 3.3 MM 1970-1973, by Earle B. Mayfield and Fred I. Shimabukuro, Aerospace Corp., El Segundo, CA, May 1978, 30 pp.

UAG-67 IONOSPHERIC D-REGION PROFILE DATA BASE, A COLLECTION OF COMPUTER-ACCESSIBLE EXPERIMENTAL PROFILES OF THE D AND LOWER E REGIONS, by L.F. McNamara, Ionospheric Prediction Service, Sydney, Australia, August 1978, 30 pp, $4.00 (microfiche only).

UAG-68 A COMPARATIVE STUDY OF METHODS OF ELECTRON DENSITY PROFILE ANALYSIS, by L.F. McNamara, Ionospheric Prediction Service, Sydney, Australia, August 1978, 30 pp, $4.00 (microfiche only).

UAG-69 SELECTED DISTURBED D-REGION ELECTRON DENSITY PROFILES. THEIR RELATION TO THE UNDISTURBED D REGION, by L.F. McNamara, Ionospheric Prediction Service, Sydney, Australia, October 1978, 50 pp, $4.00 (microfice only).

UAG-70 ANNOTATED ATLAS OF H-ALPHA SYNOPTIC CHARTS FOR SOLAR CYCLE 20 (1964-1974) CARRINGTON SOLAR ROTATIONS 1487-1616, by Patrick S. McIntosh, NOAA Space Environment Laboratory, Boulder, CO, February 1979, 327 pp.

UAG-71 MAGNETIC POTENTIAL PLOTS OVER THE NORTHERN HEMISPHERE FOR 26-28 MARCH 1976, A.D. Richmond, NOAA Space Environment Laboratory, Boulder, CO; H.W. Kroehl, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO; M.A. Henning, Lockheed Missiles and Space Co., Aurora, CO; and Y. Kamide, Kyoto Sangyo University, Kyoto, Japan, April 1979, 118 pp.

UAG-72 ENERGY RELEASE IN SOLAR FLARES, PROCEEDINGS OF THE WORKSHOP ON ENERGY RELEASE IN FLARES, 26 FEBRUARY - 1 MARCH 1979, CAMBRIDGE, MASSACHUSETTS, U.S.A., edited by David M. Rust, American Science and Engineering, Inc., Cambridge, MA; and A. Gordon Emslie, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, July 1979, 68 pp, $4.00 (microfiche only).

UAG-73 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11-12) FOR JANUARY - JUNE 1975, by Joe Haskell Allen, Carl C. Abston, J.E. Salazar and J.A. McKinnon, National Geophysical and Solar-Terrestrial Data Center, NOAA, Boulder, CO, August 1979, 114 pp, $4.00 (microfiche only).

UAG-74 ATS-6 RADIO BEACON ELECTRON CONTENT MEASUREMENTS AT OOTACAMUND, INDIA, OCTOBER - JULY 1976, by S.D. Bouwer, K. Davies, R.F. Donnelly, R.N. Grubb, J.E. Jones and J.H. Taylor, NOAA Space Environment Laboratory, Boulder, CO; and R.G. Rastogi, M.R. Deshpande, H. Chandra and G. Sethia, Physical Research Laboratory, Ahmedabad, India, March 1980, 58 pp.

UAG-75 THE ALASKA IMS MERIDIAN CHAIN: MAGNETIC VARIATIONS FOR 9 MARCH - 27 APRIL 1978, by H.W. Kroehl and G.P. Kosinski, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO; S.-I. Akasofu, G.J. Romick, C.E. Campbell and G.K. Corrick, University of Alaska, Fairbanks, AK; and C.E. Hornback and A.M. Gray, NOAA Space Environment Laboratory, Boulder, CO, June 1980, 107 pp.

UAG-76 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(12) FOR JULY - DECEMBER 1975, by Joe Haskell Allen, Carl C. Abston, J.E. Salazar and J.A. McKinnon, National Geophysical and Solar-Terrestrial Data Center, NOAA, Boulder, CO, August 1980, 116 pp.

UAG-77 SYNOPTIC SOLAR MAGNETIC FIELD MAPS FOR THE INTERVAL INCLUDING CARRINGTON ROTATIONS 1601-1680, MAY5, 1973 - APRIL 26, 1979, by J. Harvey, B. Gillespie, P. Miedaner and C. Slaughter, Kitt Peak National Observatory, Tucson, AZ, August 1980, 66 pp.

UAG-78 THE EQUATORIAL LATITUDE OF AURORAL ACTIVITY DURING 1972-1977, by N.R. Sheeley, Jr. and R.A. Howard, E.O. Hulbert Center for Space Research, U.S. Naval Research Laboratory, Washington, DC and B.S. Dandekar, Air Force Geophysics Laboratory, Hanscom AFB, MA, October 1980, 61 pp.

UAG-79 SOLAR OBSERVATIONS DURING SKYLAB, APRIL 1973 - FEBRUARY 1974, I. CORONAL X-RAY STRUCTURE, II. SOLAR FLARE ACTIVITY, by J.M. Hanson, University of Michigan, Ann Arbor, MI; and E.C. Roelof and and R.E. Gold, The Johns Hopkins University, Laurel, MD, December 1980, 43 pp.

UAG-80 EXPERIMENTAL COMPREHENSIVE SOLAR FLARE INDICES FOR 'MAJOR' AND CERTAIN LESSER FLARES, 1975-1979, compiled by Helen W. Dodson and E. Ruth Hedeman, The Johns Hopkins University, Laurel, MD, July 1981, 33 pp.

UAG-81 EVOLUTIONARY CHARTS OF SOLAR ACTIVITY (CALCIUM PLAGES) AS FUNCTIONS OF HELIOGRAPHIC LONGITUDE AND TIME, 1964-1979, by E. Ruth Hedeman, Helen W. Dodson and Edmond C. Roelof, The Johns Hopkins University, Laurel, MD, August 1981, 103 pp.

UAG-82 INTERNATIONAL REFERENCE IONOSPHERE - IRI 79, edited by J. Virginia Lincoln and Raymond O. Conkright, National Geophysical and Solar-Terrestrial Data Center, NOAA, Boulder, CO, November 1981, 243 pp.

UAG-83 SOLAR-GEOPHYSICAL ACTIVITY REPORTS FOR SEPTEMBER 7-24, 1977 AND NOVEMBER 22, 1977, Parts 1 and 2, compiled by John A. McKinnon and J. Virginia Lincoln, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, February 1982, 553 pp.

UAG-84 CATALOG OF AURORAL RADIO ABSORPTION DURING 1976-1979 AT ABISKO, SWEDEN, by J.K. Hargreaves, C.M. Taylor and J.M. Penman, Environmental Sciences Department, University of Lancaster, Lancaster, UK, July 1982, 69 pp.

UAG-85 [Superseded by UAG-91]

UAG-86 [Superseded by UAG-92]

UAG-87 CHANGES IN THE GLOBAL ELECTRIC FIELDS AND CURRENTS FOR MARCH 17-19, 1978, FROM SIX IMS MERIDIAN CHAINS OF MAGNETOMETERS, by Y. Kamide, Kyoto Sangyo University, Kyoto, Japan; H.W. Kroehl, National Geophysical Data Center, NOAA, Boulder, CO; and A.D. Richmond, NOAA Space Environment Laboratory, Boulder, CO, November 1982, 102 pp.

UAG-88 NUMERICAL MODELING OF IONOSPHERIC PARAMETERS FROM GLOBAL IMS MAGNETOMETER DATA FOR THE CDAW-6 INTERVALS, by Y. Kamide, Kyoto Sangyo University, Kyoto, Japan; H.W. Kroehl, National Geophysical Data Center, NOAA, Boulder, CO; and B.A. Hausman, National Geophysical Data Center, NOAA, Boulder, CO, November 1983, 197 pp.

UAG-89 ATMOSPHERIC HANDBOOK: ATMOSPHERIC DATA TABLES AVAILABLE ON COMPUTER TAPE, by V.E. Derr, NOAA Environmental Research Laboratories, Boulder, CO, July 1984, 56 pp.

UAG-90 EXPERIENCE WITH PROPOSED IMPROVEMENTS OF THE INTERNATIONAL REFERENCE IONOSPHERE (IRI): CONTRIBUTED PAPERS, MAINLY FROM THE URSI-COSPAR WORKSHOP HELD IN BUDAPEST IN 1980, edited by K. Rawer, University of Freiburg, Federal Republic of Germany, and C.M. Minnis, International Union of Radio Science (URSI), Brussels, Belgium, May 1984, 233 pp.

UAG-91 COMBINED CATALOG OF IONOSPHERE VERTICAL SOUNDINGS DATA, compiled by Raymond O. Conkright and Marcus O. Ertle, National Geophysical Data Center, NOAA, Boulder, CO, December 1984, 174 pp.

UAG-92 INTERNATIONAL CATALOG OF GEOMAGNETIC DATA, compiled by C.C. Abston, National Geophysical Data Center, NOAA, Boulder, CO; N.E. Papitashvili, Academy of Sciences of the USSR, World Data Center B2, Moscow, USSR; and V.O. Papitashvili, IZMIRAN, Moscow Region, USSR, August 1985, 291 pp. Supersedes UAG-35, 49, and 86.

UAG-93 IONOGRAM ANALYSIS WITH THE GENERALIZED PROGRAM POLAN, by J.E. Titheridge, University of Auckland, New Zealand, December 1985, 194 pp.

UAG-94 THE SOLAR MAGNETIC FIELD--1976 THROUGH 1985: AN ATLAS OF PHOTOSPHERIC MAGNETIC FIELD OBSERVATIONS AND COMPUTED CORONAL MAGNETIC FIELDS FROM THE JOHN M. WILCOX SOLAR OBSERVATORY AT STANFORD, by J. Todd Hoeksema and Philip H. Scherrer, Center for Space Science and Astrophysics, Stanford University, Stanford, CA, January 1986, 370 pp.

UAG-95 SUNSPOT NUMBERS: 1610-1985, (based on THE SUNSPOT-ACTIVITY IN THE YEARS 1610-1960, by Prof. M. Waldmeier, Copyright 1961, Swiss Federal Observatory, Zurich, Switzerland), revised by John A. McKinnon, National Geophysical Data Center, NOAA, Boulder, CO, January 1987, 112 pp.

UAG-96 SOLAR-GEOPHYSICAL ACTIVITY REPORTS FOR STIP INTERVAL XV, 12-21 February 1984 Ground Level Event, AND STIP INTERVAL XVI, 20 April - 4 May 1984 Forbush Decrease, compiled by Helen E. Coffey and Joe H. Allen, National Geophysical Data Center, NOAA, Boulder, CO, July 1987, 418 pp.

UAG-97 NUMERICAL MODELING OF POLAR IONOSPHERIC ELECTRODYNAMICS FOR JULY 23-24, 1983, UTILIZING IONOSPHERIC CONDUCTANCES DEDUCED FROM DMSP X-RAY IMAGES, by B.-H. Ahn, Kyungpook National University, Taegu, Korea; E. Friis-Christensen, Division of Geophysics, Danish Meteorological Institute, Copenhagen, Denmark; D.J. Gorney, Space Sciences Laboratory, The Aerospace Corporation, Los Angeles, CA; Y. Kamide, Kyoto Sangyo University, Kyoto, Japan; and H.W. Kroehl, National Geophysical Data Center, NOAA, Boulder, CO, April 1988, 133 pp.

UAG-98 TYPE II SOLAR RADIO BURSTS RECORDED AT WEISSENAU 1966-1987, by H.W. Urbarz, Astronomical Institute of Tubingen University, Weissenau Station, 7980 Rasthalde, Ravensburg, GFR, February 1990, 86 pp.

UAG-99 PROCEEDINGS OF THE WORKSHOP ON GEOPHYSICAL INFORMATICS, MOSCOW, AUGUST 14-18, 1988, edited by J.H. Allen, National Geophysical Data Center, NOAA, Boulder, CO; and V.A. Nechitailenko, Soviet Geophysical Committee, Academy of Sciences of the USSR, Moscow, USSR, January 1991, 304 pp.

UAG-100 CATALOGUE OF SOLAR FILAMENT DISAPPEARANCES 1964-1980, by C.S. Wright, Electronics Research Laboratory, Defence Science and Technology Organisation, Salisbury, South Australia 5108, Australia, February 1991, 62 pp.

UAG-101 ATLAS OF STACKPLOTS DERIVED FROM SOLAR SYNOPTIC CHARTS, Evolution of Large-Scale Magnetic Fields and Coronal Holes from H-alpha Synoptic Charts: 1966-1987, by P.S. McIntosh, NOAA Space Environment Laboratory, Boulder, CO; and E.C. Willock and R.J. Thompson, IPS Radio and Space Services, West Chatswood, New South Wales 2057, Australia, October 1991, 188 pp.

☆U.S. GOVERNMENT PRINTING OFFICE: 1991-573-002/41003