

NOAA Atlas NESDIS 22



WORLD OCEAN DATABASE 1998 VOLUME 5: Temporal Distribution of Ocean Station Data Temperature Profiles

Washington, D.C.
June 1998

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service

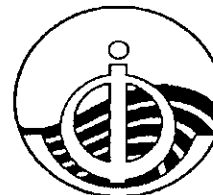
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WORLD OCEAN DATABASE 1998 Volume 5: Temporal Distribution of Ocean Station Data Temperature Profiles



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Silver Spring, MD
June 1998

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PREFACE

The oceanographic databases described by this atlas series greatly expands on the *World Ocean Atlas 1994* (WOA94) database. Previous oceanographic databases including the NODC/WDC-A profile archives, and products derived from these databases, have proven to be of great utility to the international oceanographic, climate research, and operational environmental forecasting communities. In particular, the objectively analyzed fields of temperature and salinity derived from these databases have been used in a variety of ways. These include use as boundary and/or initial conditions in numerical ocean circulation models, for verification of numerical simulations of the ocean, as a form of "sea truth" for satellite measurements such as altimetric observations of sea surface height, and for planning oceanographic expeditions. The databases, and products based on these databases, are critical for support of international assessment programs such as the Intergovernmental Program on Climate Change (IPCC) of the United Nations.

We have expanded these earlier databases to include variables such as chlorophyll and plankton because:

- 1) there is a need for such databases to study the role of biogeochemical cycles in determining how the earth's climate system works, particularly the vulnerability of ocean ecosystems to climate change (IPCC, 1996);
- 2) the analysis of remotely sensed estimates of chlorophyll (SeaWiFS, ADEOS missions) requires knowledge of *in situ* variables such as chlorophyll and plankton;
- 3) our belief that the most comprehensive set of oceanographic databases should be available as a matter of course to the international research community.

It is well known that the amount of carbon dioxide in the earth's atmosphere will most likely double during the next century compared to CO₂ levels that occurred at the beginning of the Industrial Revolution. Regardless of one's scientific and/or political view of a possible "enhanced greenhouse warming" due to the increase of carbon dioxide, it is necessary that the international scientific community have access to the most complete historical oceanographic databases possible in order to study this problem, as well as other scientific and environmental problems. The science community should have access to the most complete oceanographic databases possible to fulfill its obligations.

The production of oceanographic databases is a major undertaking. Such work benefits from the input of many individuals and organizations. We have tried to structure the data sets in such a way as to encourage feedback from experts around the world who have knowledge that can improve the data and metadata contents of the database. It is only with such feedback that high quality global ocean databases can be prepared. Just as with scientific theories and numerical models of the ocean and atmosphere, the development of global ocean databases is not carried out in one giant step, but proceeds in an incremental fashion.

In the acknowledgment section of this publication we have expressed our view that creation of global ocean databases is only possible through the cooperation of scientists, data managers, and scientific administrators throughout the international community. I would also like to thank my colleagues and the staff of the Ocean Climate Laboratory of NODC for their dedication to the project leading to publication of this atlas series. Their integrity and thoroughness have made this database possible. It is my belief that the development and management of national and international oceanographic data archives is best performed by scientists who are actively working with the historical data.

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Silver Spring, MD
June 1998

IPCC, 1996: Impacts, Adaptations and Mitigation of Climate Change: Scientific Technical Analyses. Cambridge University Press, 872 pp.

Acknowledgments

This work was made possible by a grant from the NOAA Climate and Global Change Program which enabled the establishment of a research group at the National Oceanographic Data Center. The purpose of this group is to prepare research quality oceanographic databases, as well as to compute objective analyses of, and diagnostic studies based on, these databases.

The data made available as part of this atlas include the oceanographic data archives maintained by NODC/WDC-A as well as data acquired as a result of the NODC Oceanographic Data Archaeology and Rescue (NODAR) project and the IODE/IOC Global Oceanographic Data Archaeology and Rescue (GODAR) project. At NODC/WDC-A, "data archaeology and rescue" projects are supported with funding from the NOAA Environmental Science Data and Information Management (ESDIM) Program and NOAA Climate and Global Change Program. The majority of funding for these efforts is now provided by the ESDIM program. Support for some of the regional IOC/GODAR meetings was provided by the MAST program of the European Union (Levitus *et al.*, 1998).

We would like to acknowledge the scientists, technicians, and programmers who have submitted data to national and regional data centers as well as the managers and staff at the various data centers. Our database now allows for the storage of additional metadata including information about Principal Investigators to recognize their efforts as well as to provide information that may be useful in determining the quality of data.

The OCL expresses thanks to those who provided comments and helped develop an improved *World Ocean Database 1998* product. In particular, Dr. Steve Worley of NCAR, Dr. Harry Dooley of ICES, Dr. Norm Hall (NODC) for testing the CD-ROMs prior to distribution. John E. O'Reilly (NMFS/NOAA) contributed the program for converting from OCL ASCII format to IDL, Dr. Harry Dooley contributed the conversion program from OCL ASCII format to the ICES/OceanPC format. Any errors are the responsibility of the Ocean Climate Laboratory.

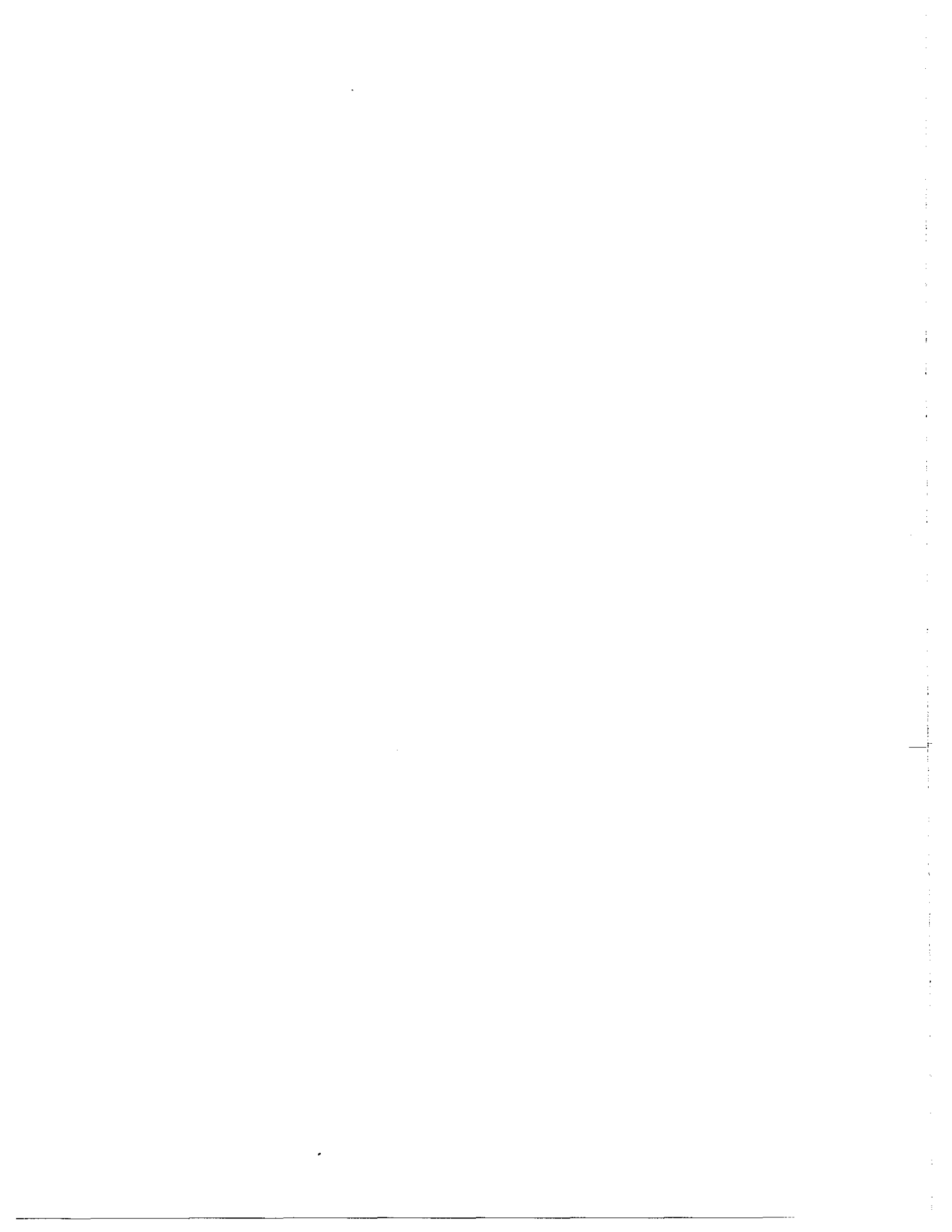
Ron Moffatt and Ervin Godfrey Trammell of the NODC International Data Exchange Team helped locate data in the WDC-A archives for digitization. The OCL would also like to acknowledge the help received over the last several years from colleagues in other NODC divisions. Francis Mitchell helped with all the code lists and accessions, Melanie Hamilton supplied GTSP data, J.D. Hardy researched and documented the correct status of many plankton names, Sheri Phillips helped Olga Baranova design our CD-ROM graphics, Mike Simmons, Carla Bazemore, and Maggie Dunklee wrote the NODC P3 format description presented in the documentation of WOD98.

Recent declassification of substantial amounts of naval oceanographic data by the Russian Naval Ocean Research Center, the United Kingdom Hydrographic Office, and the Argentine Navy is acknowledged. The Intergovernmental Oceanographic Commission has requested such declassification efforts in recent years.

We appreciate the efforts of David Adamec, Jim Carton, and Gennady Chepurin in reviewing the manuscript version of this publication.

References

Levitus, S., M. Conkright, T.P. Boyer, R. Gelfeld, D. Johnson, I. Smolyar, C. Stephens, G. Trammell, R. Moffatt, T. O'Brien, L. Stathoplos, 1998: Results of the IOC Global Oceanographic Data Archaeology and Rescue (GODAR) project. NOAA NESDIS Technical Report.



World Ocean Database 1998, Volume 5: Temporal Distribution of Ocean Station Data (OSD) Temperature Profiles

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ABSTRACT

This atlas describes a collection of scientifically quality controlled Ocean Station Data (OSD) temperature profiles. Yearly distributions for individual years of all OSD temperature profiles in the database are presented to provide information on the state of ocean OSD profile observations.

1. INTRODUCTION

Ocean Station Data (OSD) has historically referred to measurements made from a stationary research ship using reversing thermometers to measure temperature and making measurements of other variables such as salinity, oxygen, nutrients, chlorophyll, *etc.* on seawater samples gathered using special bottles. The two most commonly used bottles are the Nansen and Niskin bottles. Data that are in the OSD files are frequently referred to as "bottle data" and the entire collection of data from these file may be alternatively referred to as the "Bottle Data File". WOD98 includes measurements of temperature, salinity, oxygen, nitrite, nitrate, phosphate, silicate, pH, alkalinity, chlorophyll and plankton.

2. OCEAN STATION DATA (OSD) TEMPERATURE PROFILE DISTRIBUTIONS

Figure 1 shows the number of OSD temperature profiles contained in WOD98 for the world ocean as a function of year. Figures 2 and 3 show the time series for the southern and northern hemispheres respectively. Figure 4 shows the distribution of OSD temperature profiles contained in WOD98 for the world ocean. There are a total of 1,313,281 OSD temperature profiles for the entire World Ocean with 150,268 profiles (11.4%) measured in the southern hemisphere and 1,163,013 profiles (88.6%) measured in the northern hemisphere. Table 1 provides the number of OSD temperature profiles included in WOD98 as a function of year. Tables 2 and 3 show the numbers for the southern and northern hemispheres respectively. The geographic distribution of OSD temperature profiles for individual years for 1900-1996 are shown in Appendix A, Figures

A1-A97. Most profiles have been made in the northern hemisphere, but the southern hemisphere coverage has been increased due to international data archaeology and rescue efforts and the World Ocean Database project (Levitus *et al.* 1994, 1998).

3. BIBLIOGRAPHY

Levitus, S., R. Gelfeld, T. Boyer, and D. Johnson, 1994: *Results of the NODC and IOC Data Archaeology and Rescue projects. Key to Oceanographic Records Documentation No. 19*, National Oceanographic Data Center, Washington, D.C., 67 pp.

Levitus, S., M. Conkright, T.P. Boyer, R. Gelfeld, D. Johnson, I. Smolyar, C. Stephens, G. Trammell, R. Moffatt, T. O'Brien, L. Stathoplos, 1998: Results of the IOC Global Oceanographic Data Archaeology and Rescue (GODAR) project. NOAA NESDIS Technical Report.

Table 1 The number of OSD temperature profiles* in WOD98 as a function of year for the world ocean. The total number of profiles = 1,313,281

YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE
1900	353	1925	3197	1949	11002	1973	35113
1901	269	1926	4029	1950	12971	1974	28428
1902	601	1927	3477	1951	17243	1975	24736
1903	1003	1928	4197	1952	16199	1976	27197
1904	1198	1929	4518	1953	15207	1977	27296
1905	1346	1930	4387	1954	14671	1978	27609
1906	1478	1931	4455	1955	16025	1979	30895
1907	1173	1932	5129	1956	16711	1980	29159
1908	1107	1933	7300	1957	20300	1981	29580
1909	1330	1934	9254	1958	22047	1982	27077
1910	1174	1935	10790	1959	18912	1983	26945
1911	2114	1936	7940	1960	21479	1984	30771
1912	1435	1937	11041	1961	24193	1985	29216
1913	1750	1938	11622	1962	23617	1986	22959
1914	1525	1939	14066	1963	33994	1987	21222
1915	392	1940	8806	1964	30100	1988	19941
1916	135	1941	7635	1965	40069	1989	22880
1917	107	1942	5072	1966	33135	1990	19489
1918	200	1943	4979	1967	38523	1991	6743
1919	568	1944	4173	1968	36579	1992	6374
1920	1463	1945	1848	1969	40105	1993	5356
1921	1834	1946	3549	1970	32380	1994	3354
1922	2473	1947	4736	1971	40976	1995	580
1923	3113	1948	8686	1972	47223	1996	207
1924	3466						

* Does not include ship-of-opportunity "surface only" data profiles

Table 2 The number of OSD temperature profiles* in WOD98 as a function of year for the southern hemisphere. The total number of profiles = 150,268

YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE
1906	21	1929	471	1952	706	1974	3755
1907	0	1930	524	1953	659	1975	4043
1908	0	1931	373	1954	726	1976	4552
1909	0	1932	373	1955	1084	1977	4570
1910	0	1933	183	1956	1370	1978	4528
1911	107	1934	211	1957	2294	1979	5633
1912	27	1935	110	1958	2367	1980	4327
1913	43	1936	339	1959	2221	1981	4943
1914	7	1937	281	1960	2750	1982	4833
1915	0	1938	439	1961	3568	1983	4654
1916	0	1939	220	1962	4403	1984	3549
1917	0	1940	121	1963	5343	1985	3255
1918	0	1941	313	1964	4842	1986	3331
1919	0	1942	166	1965	4940	1987	2849
1920	20	1943	68	1966	4301	1988	3141
1921	1	1944	400	1967	4955	1989	2861
1922	0	1945	60	1968	5885	1990	1210
1923	0	1946	102	1969	5162	1991	293
1924	1	1947	136	1970	4157	1992	231
1925	100	1948	300	1971	4878	1993	32
1926	334	1949	225	1972	4535	1994	1
1927	196	1950	760	1973	4458	1995	2
1928	282	1951	757				

* Does not include ship-of-opportunity "surface only" data profiles

Table 3 The number of OSD temperature profiles* in WOD98 as a function of year for the northern hemisphere. The total number of profiles = 1,163,013

YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE
1900	353	1925	3097	1949	10777	1973	30655
1901	269	1926	3695	1950	12211	1974	24673
1902	601	1927	3281	1951	16486	1975	20693
1903	1003	1928	3915	1952	15493	1976	22645
1904	1198	1929	4047	1953	14548	1977	22726
1905	1346	1930	3863	1954	13945	1978	23081
1906	1457	1931	4082	1955	14941	1979	25262
1907	1173	1932	4756	1956	15341	1980	24832
1908	1107	1933	7117	1957	18006	1981	24637
1909	1330	1934	9043	1958	19680	1982	22244
1910	1174	1935	10680	1959	16691	1983	22291
1911	2007	1936	7601	1960	18729	1984	27222
1912	1408	1937	10760	1961	20625	1985	25961
1913	1707	1938	11183	1962	19214	1986	19628
1914	1518	1939	13846	1963	28651	1987	18373
1915	392	1940	8685	1964	25258	1988	16800
1916	135	1941	7322	1965	35129	1989	20019
1917	107	1942	4906	1966	28834	1990	18279
1918	200	1943	4911	1967	33568	1991	6450
1919	568	1944	3773	1968	30694	1992	6143
1920	1443	1945	1788	1969	34943	1993	5324
1921	1833	1946	3447	1970	28223	1994	3353
1922	2473	1947	4600	1971	36098	1995	578
1923	3113	1948	8386	1972	42688	1996	207
1924	3465						

* Does not include ship-of-opportunity "surface only" data profiles.

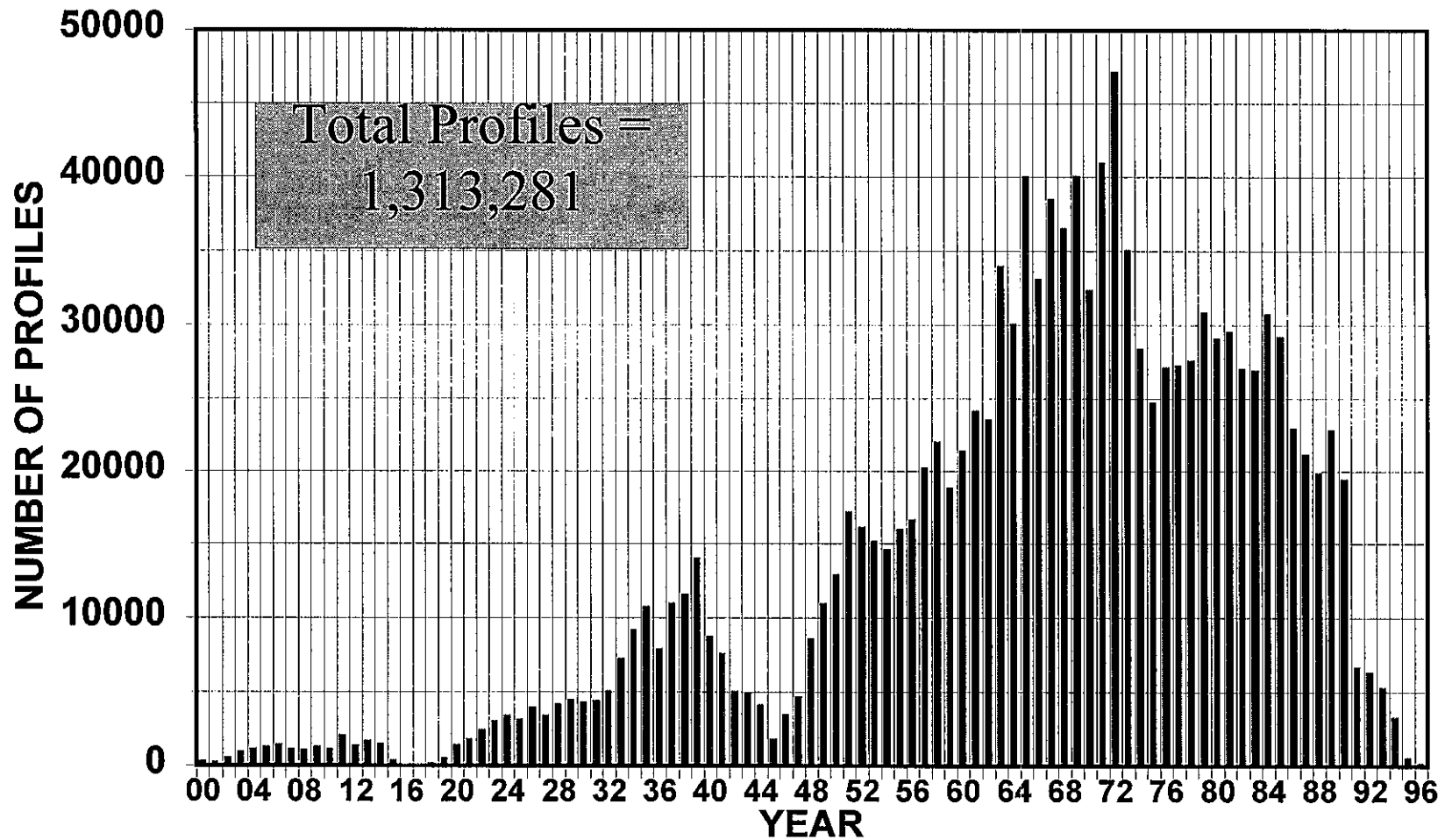


Fig. 1 Time series of Ocean Station Data (OSD) temperature profiles in WOD98 for the world ocean as a function of year

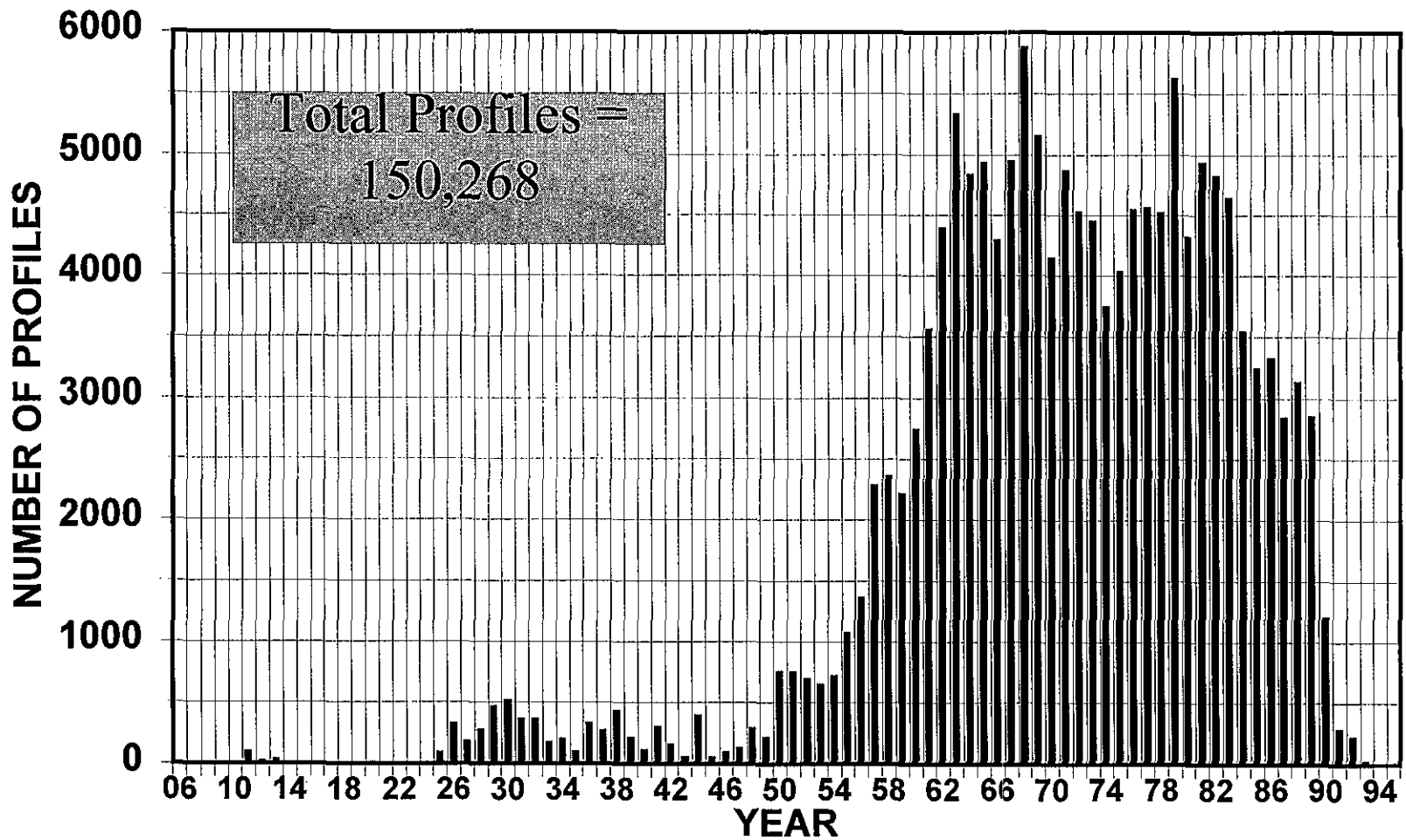


Fig. 2 Time series of Ocean Station Data (OSD) temperature profiles in WOD98 for the southern hemisphere as a function of year

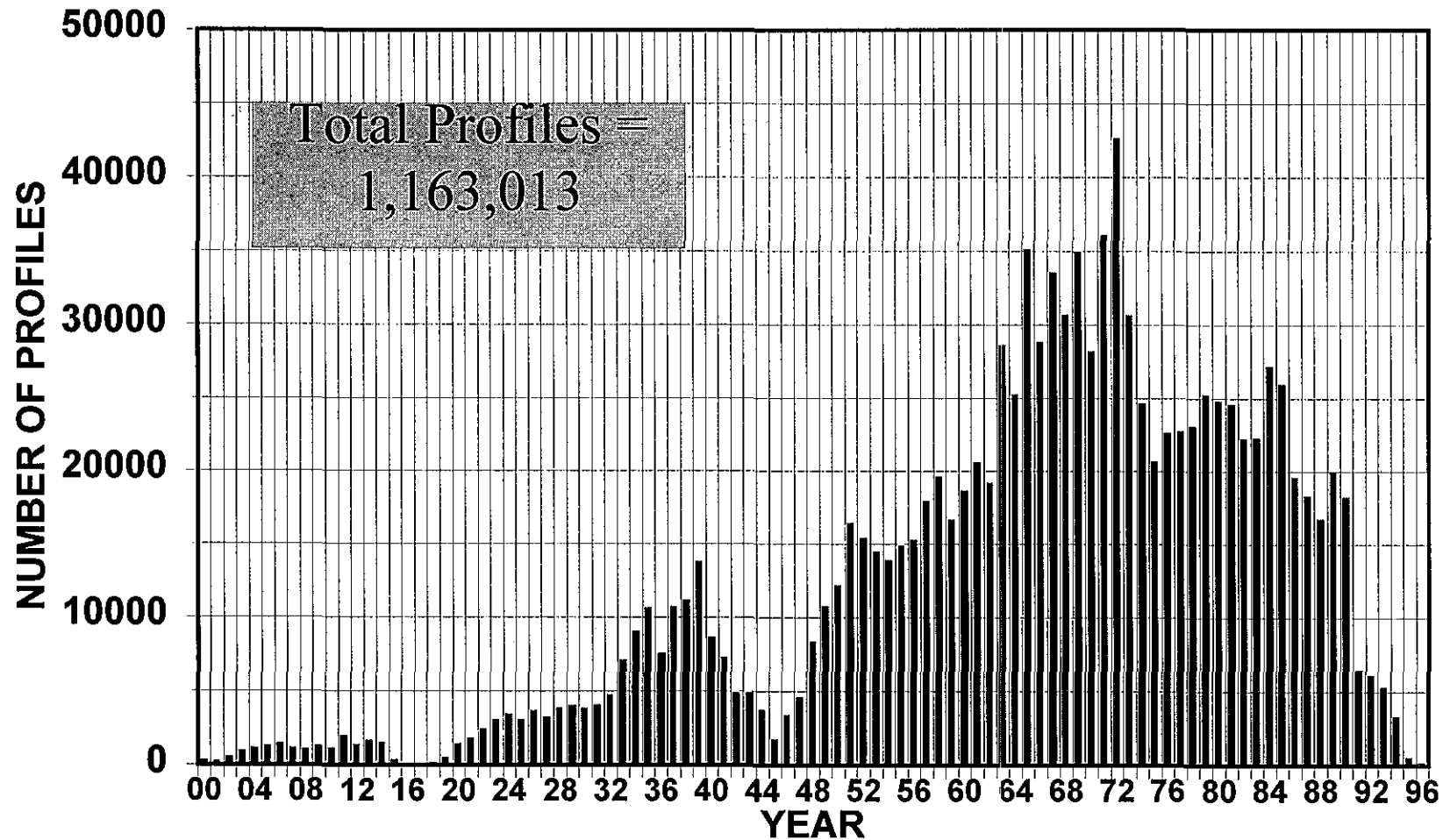


Fig. 3 Time series of Ocean Station Data (OSD) temperature profiles in WOD98 for the northern hemisphere as a function of year

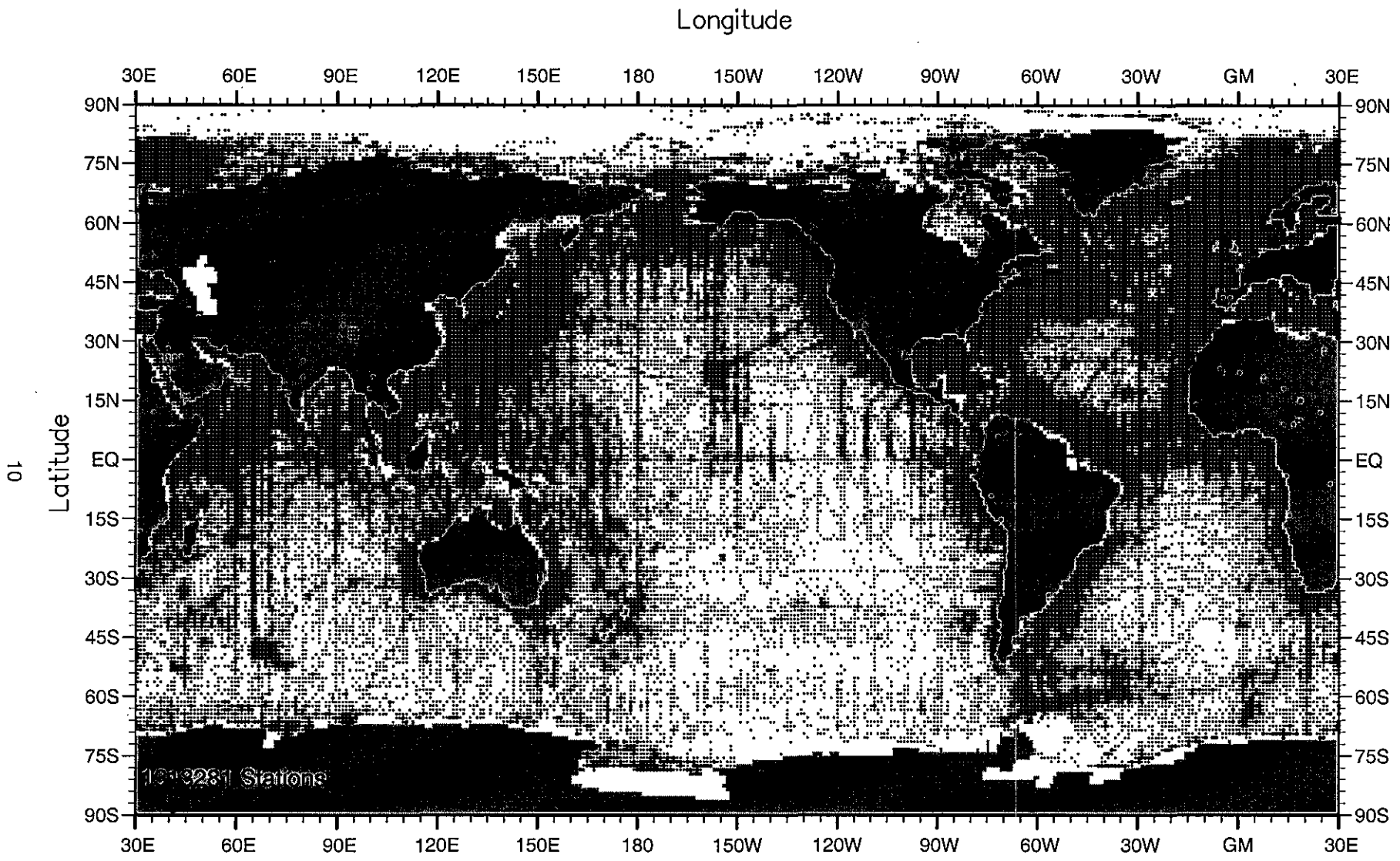


Fig. 4 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98

4. APPENDIX A: DISTRIBUTIONS FOR INDIVIDUAL YEARS OF ALL OCEAN STATION DATA (OSD) TEMPERATURE PROFILES IN WOD98

This appendix contains yearly distributions of all OSD temperature profiles contained in WOD98. These maps provide some history of the observational progress of the field of oceanography. They also serve as indicators of whether or not a particular data set from a scientist or institution is part of the NODC/WDC-A archive. The exchange of information provided by the publication of such maps has provided us with valuable information about deficiencies in the database. The locations of all WOD98 OSD temperature profiles are plotted including stations that may be erroneously located over land. However, WOD98 contains some stations from various lakes so care should be exercised in the use of these stations and the determination as to whether they represent errors in locations.

For all figures in Appendix A, a small dot indicates a one-degree square containing from one to four stations and a large dot indicates five or more stations.

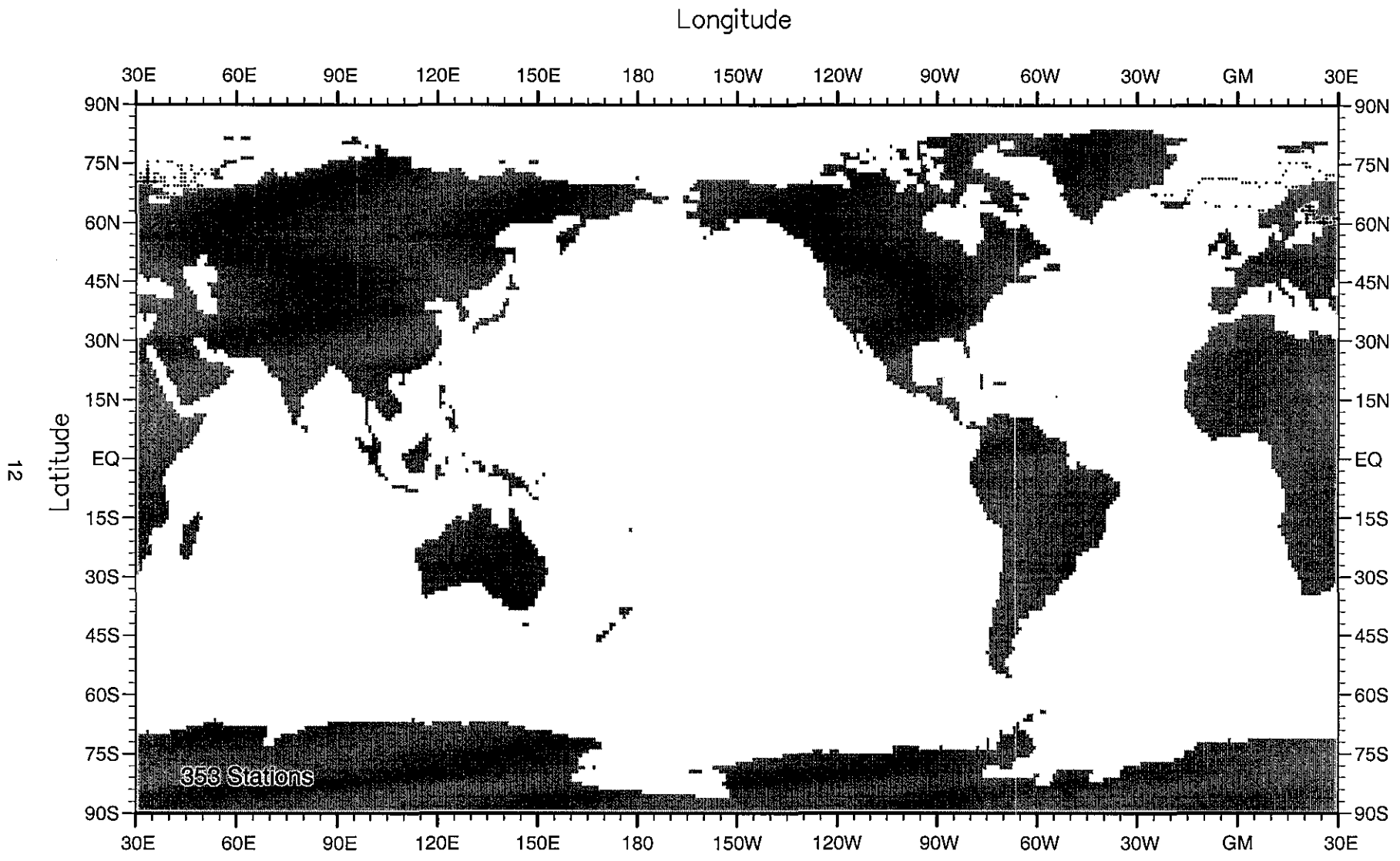


Fig. A1 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1900

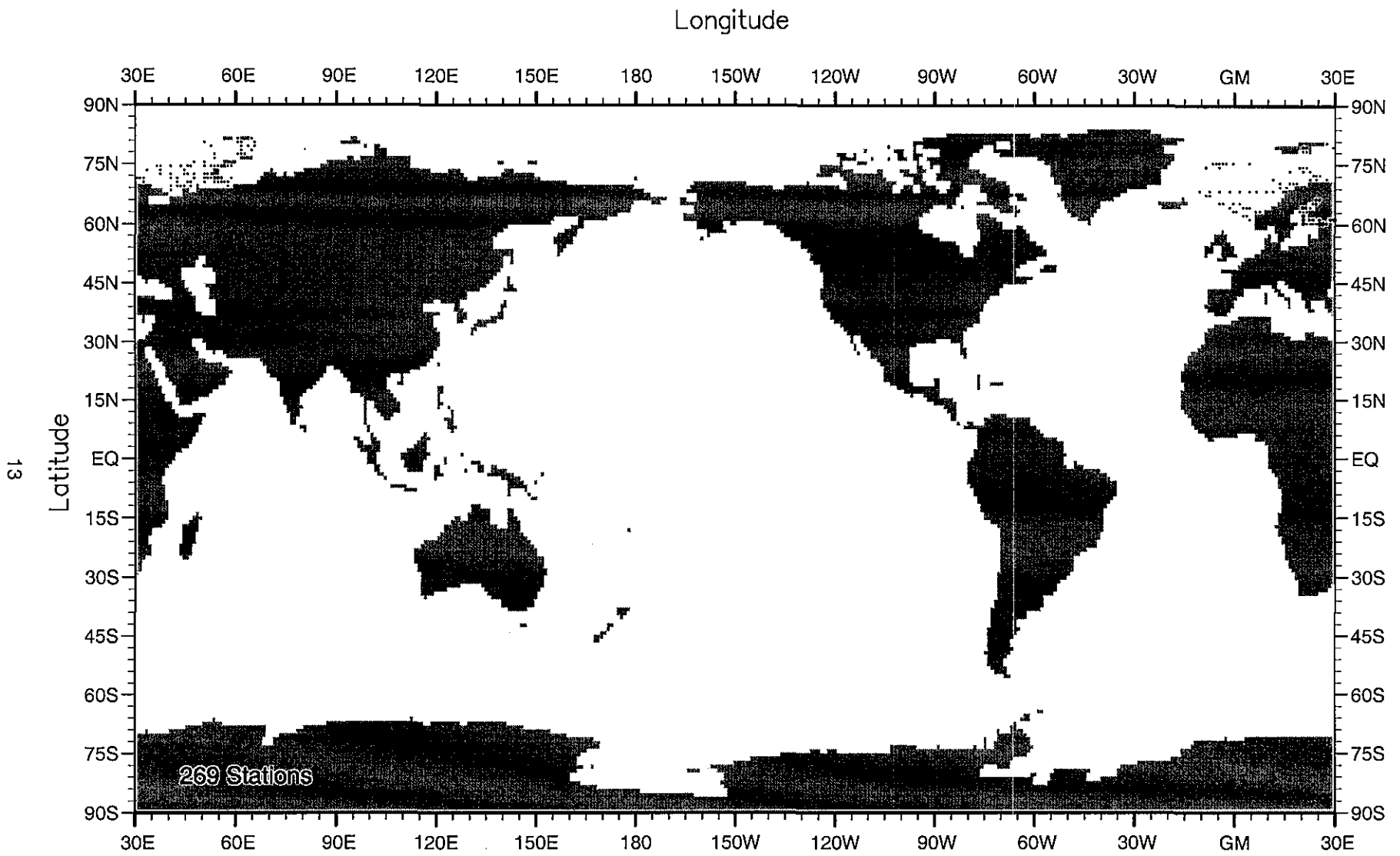


Fig. A2 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1901

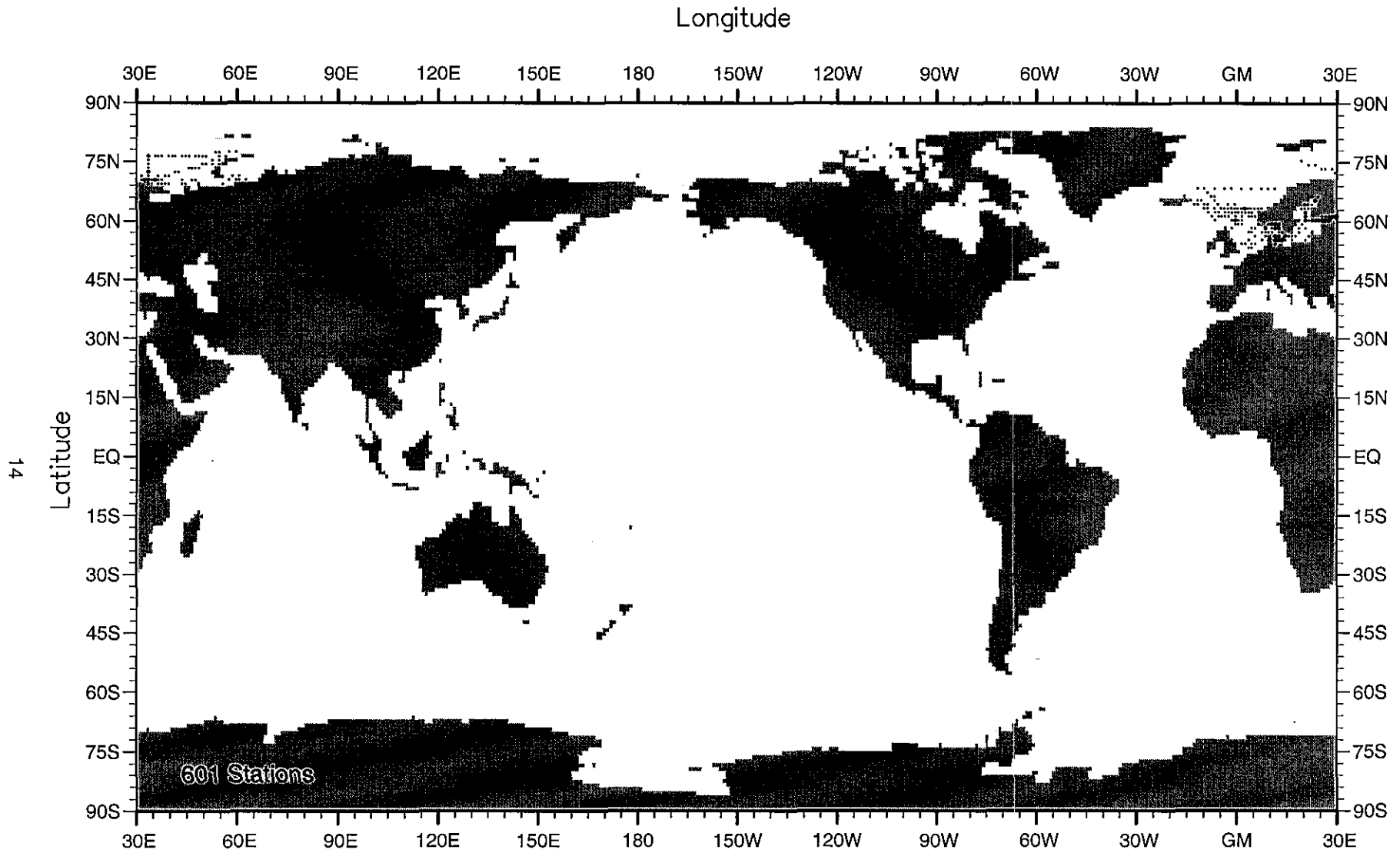


Fig. A3 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1902

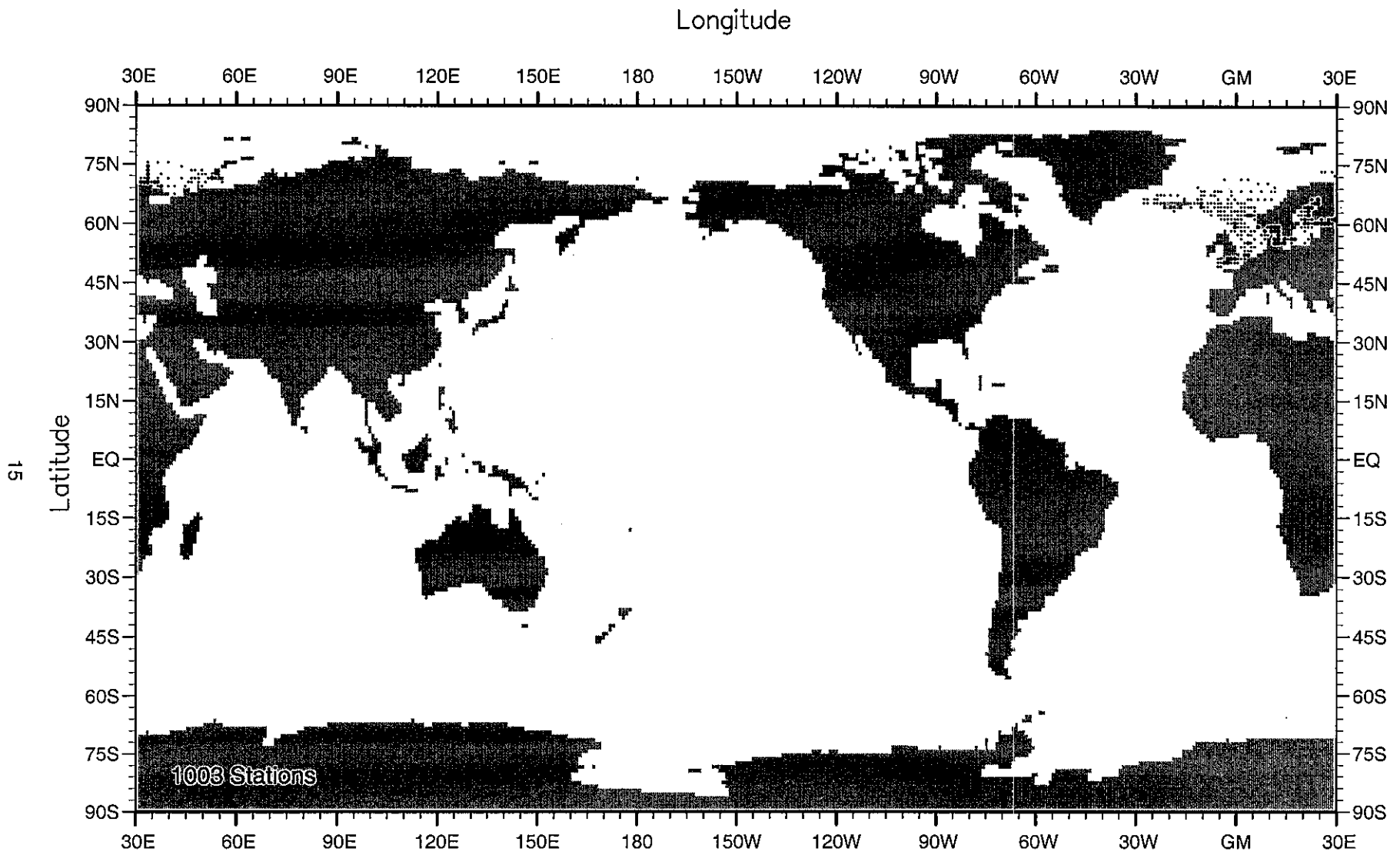


Fig. A4 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1903

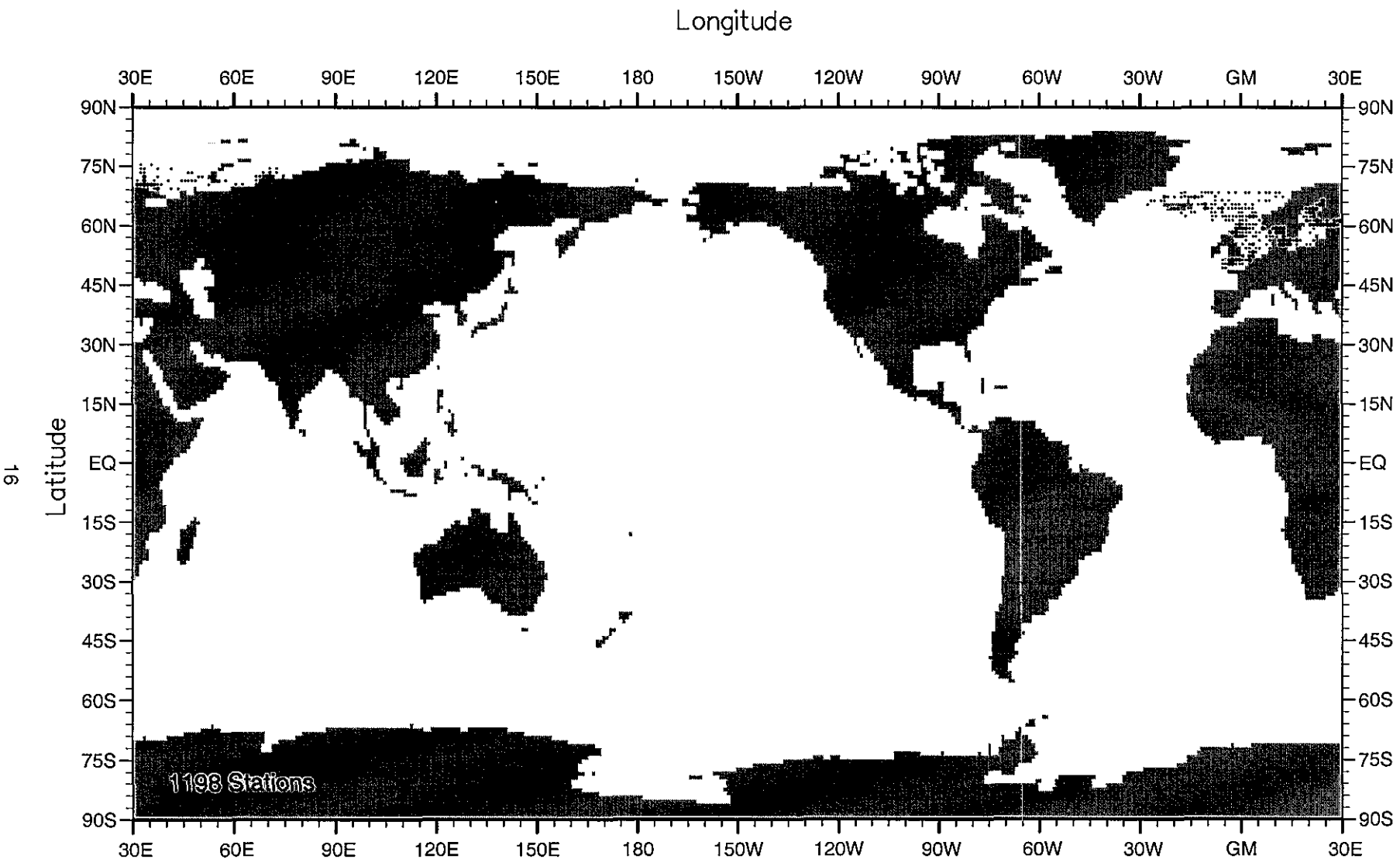


Fig. A5 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1994

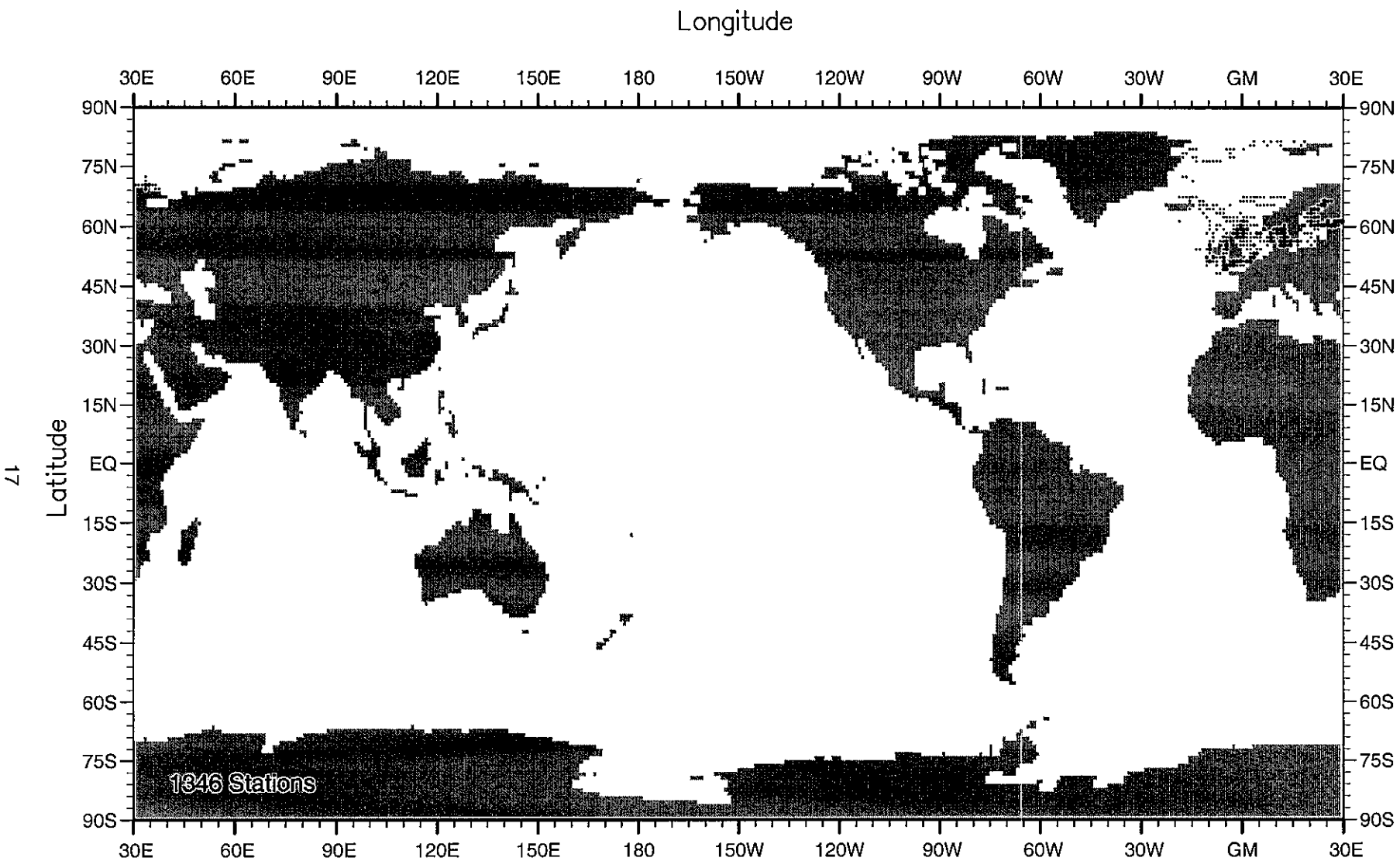


Fig. A6 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1905

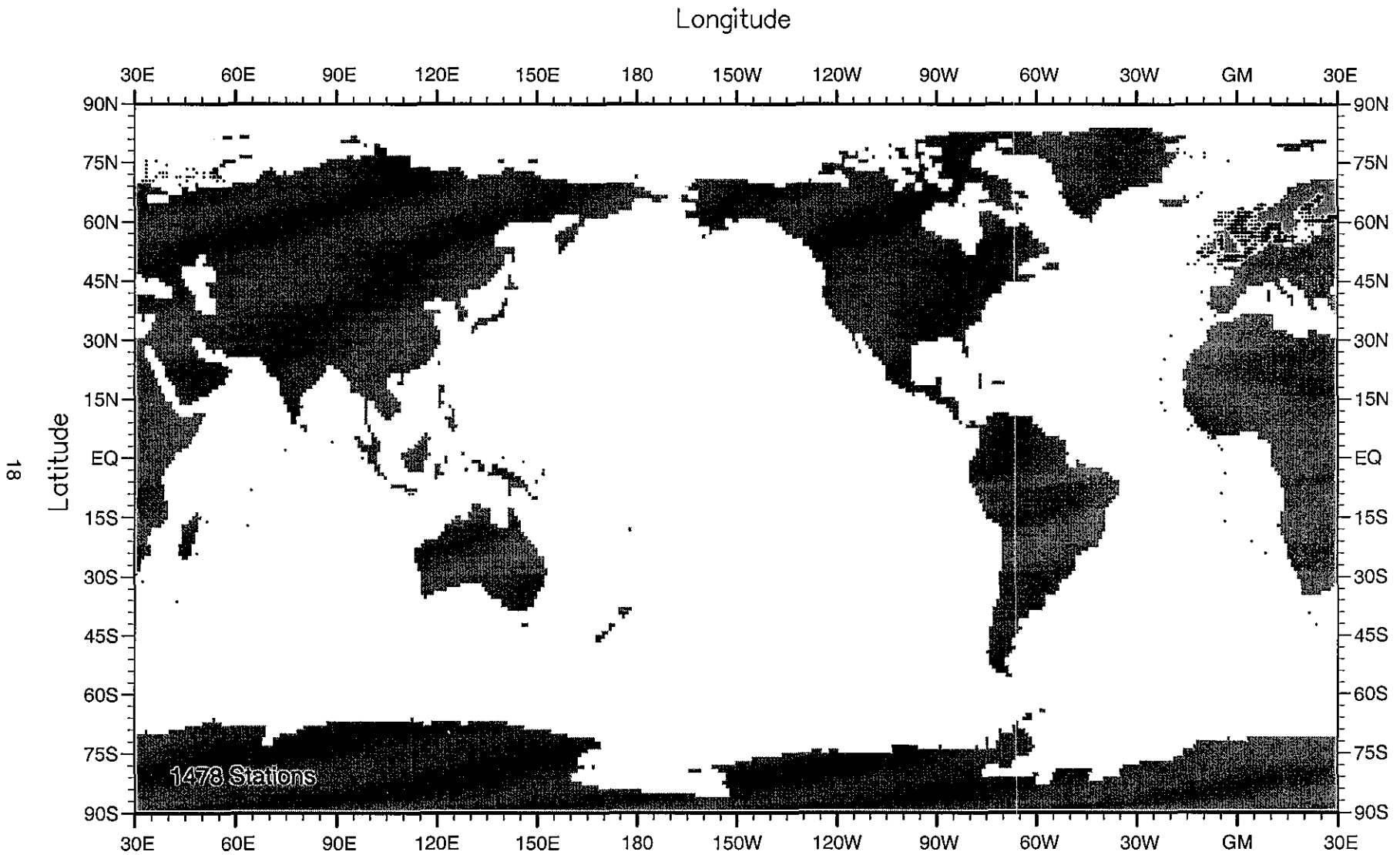


Fig. A7 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1906

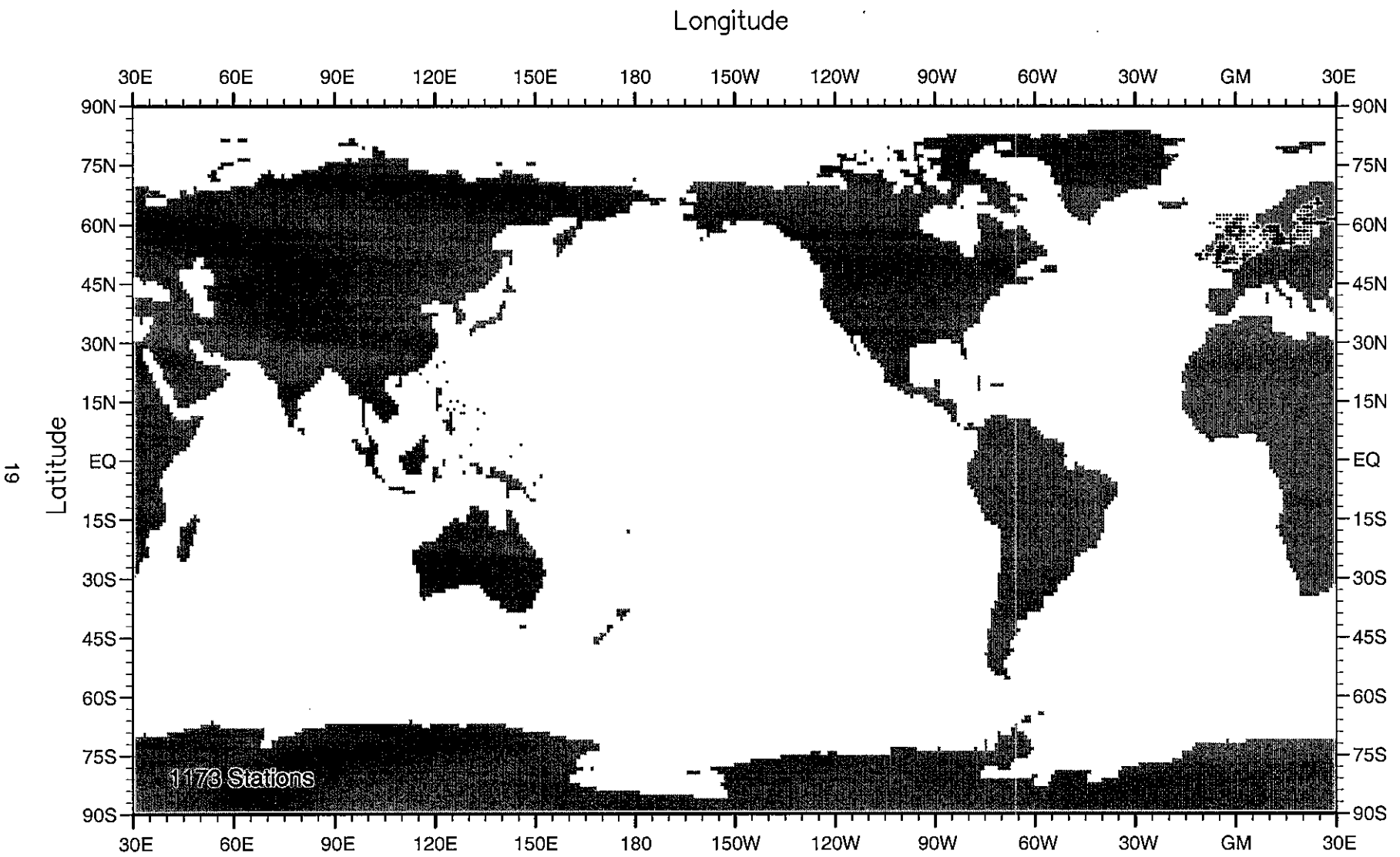


Fig. A8 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1907

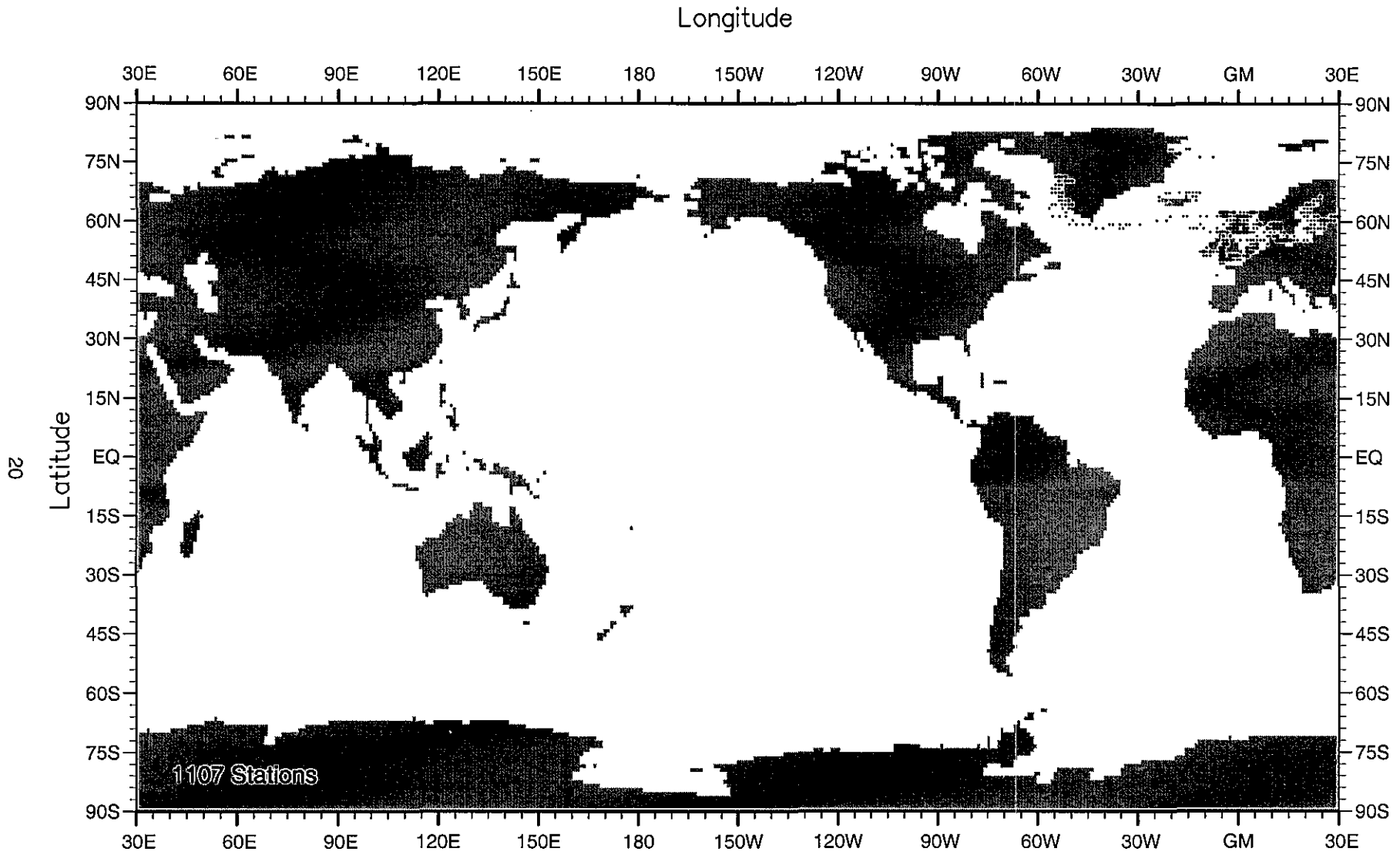


Fig. A9 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1908

Longitude

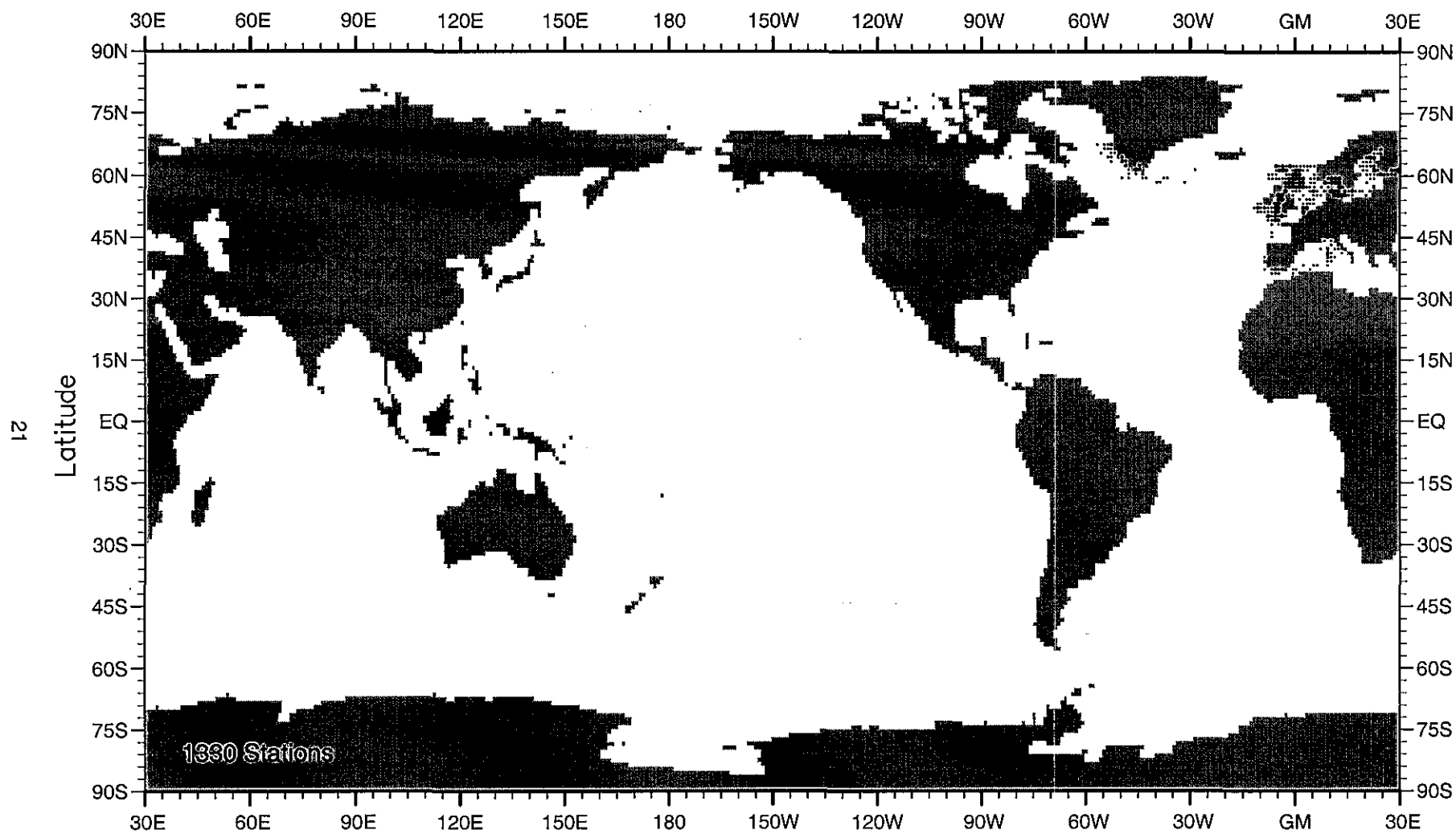


Fig. A10 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1909

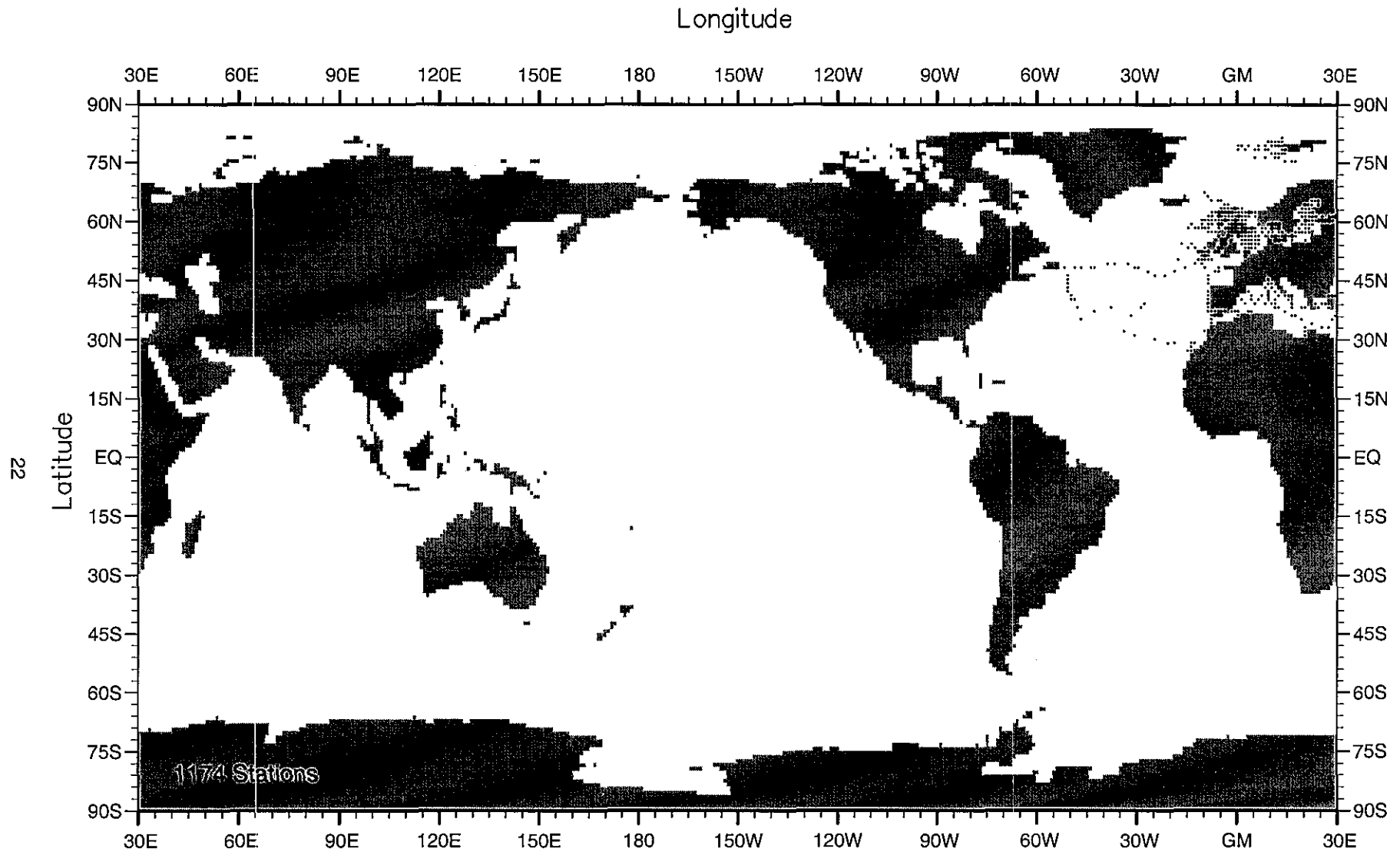


Fig. A11 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1910

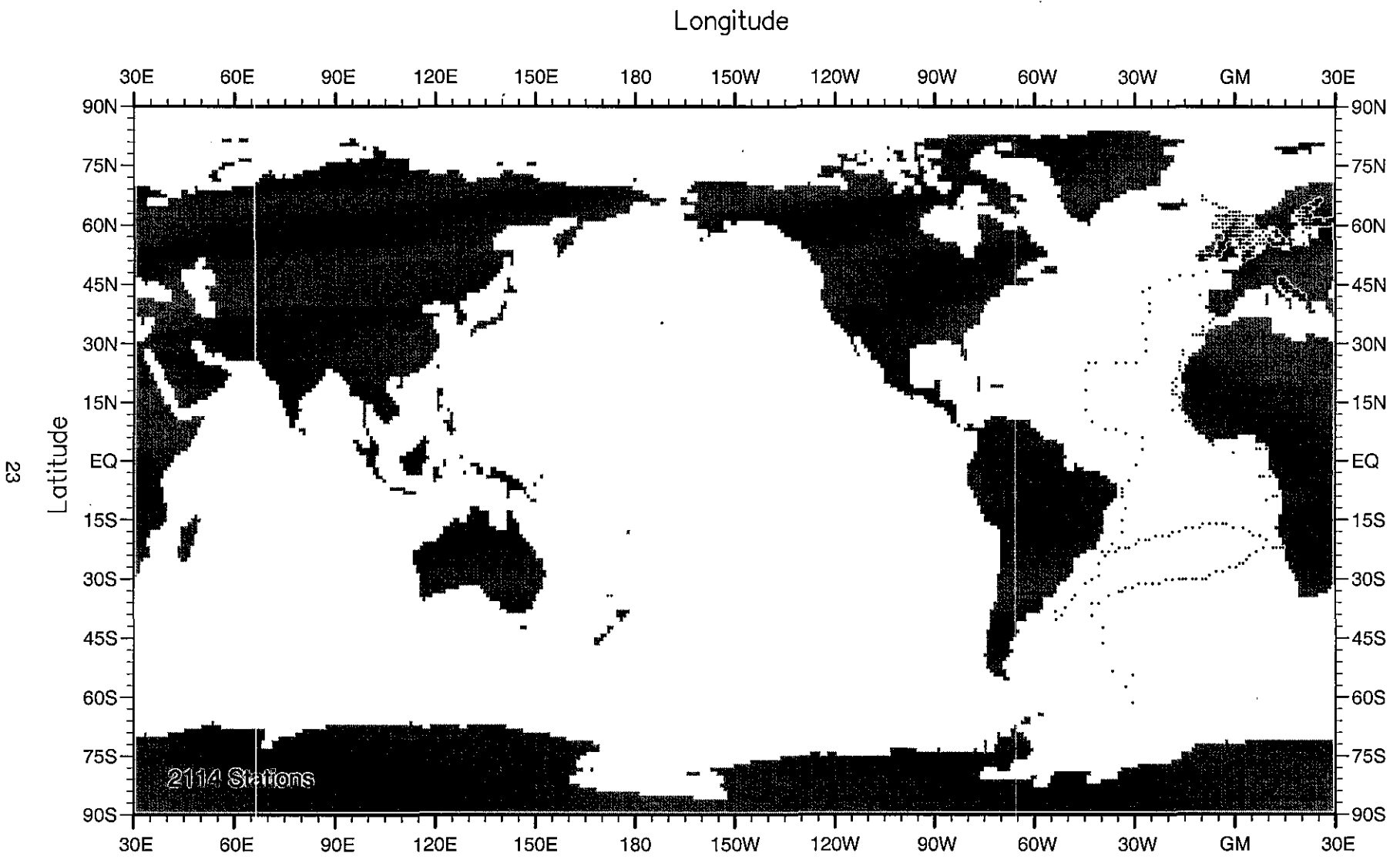


Fig. A12 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1911

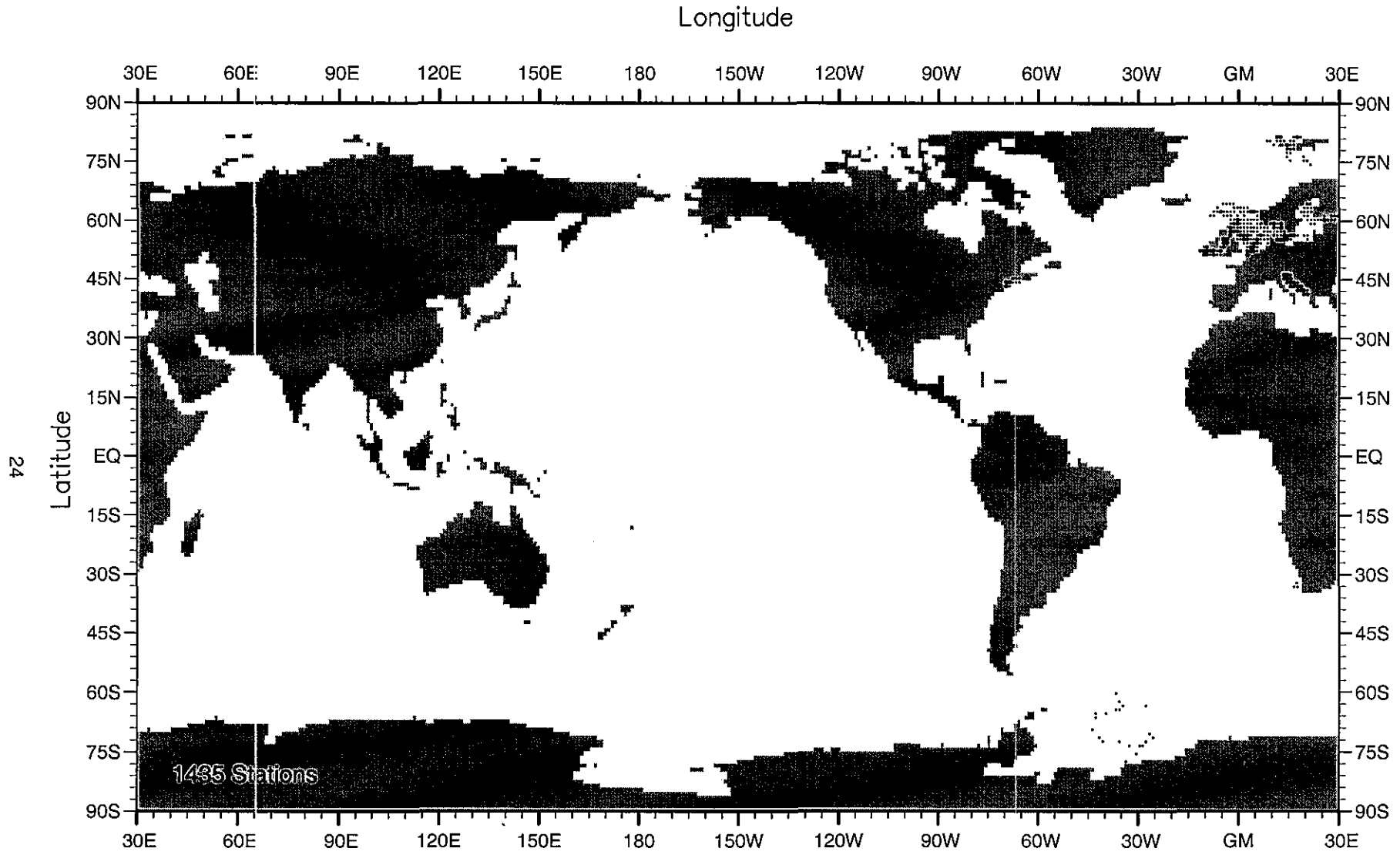


Fig. A13 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1912

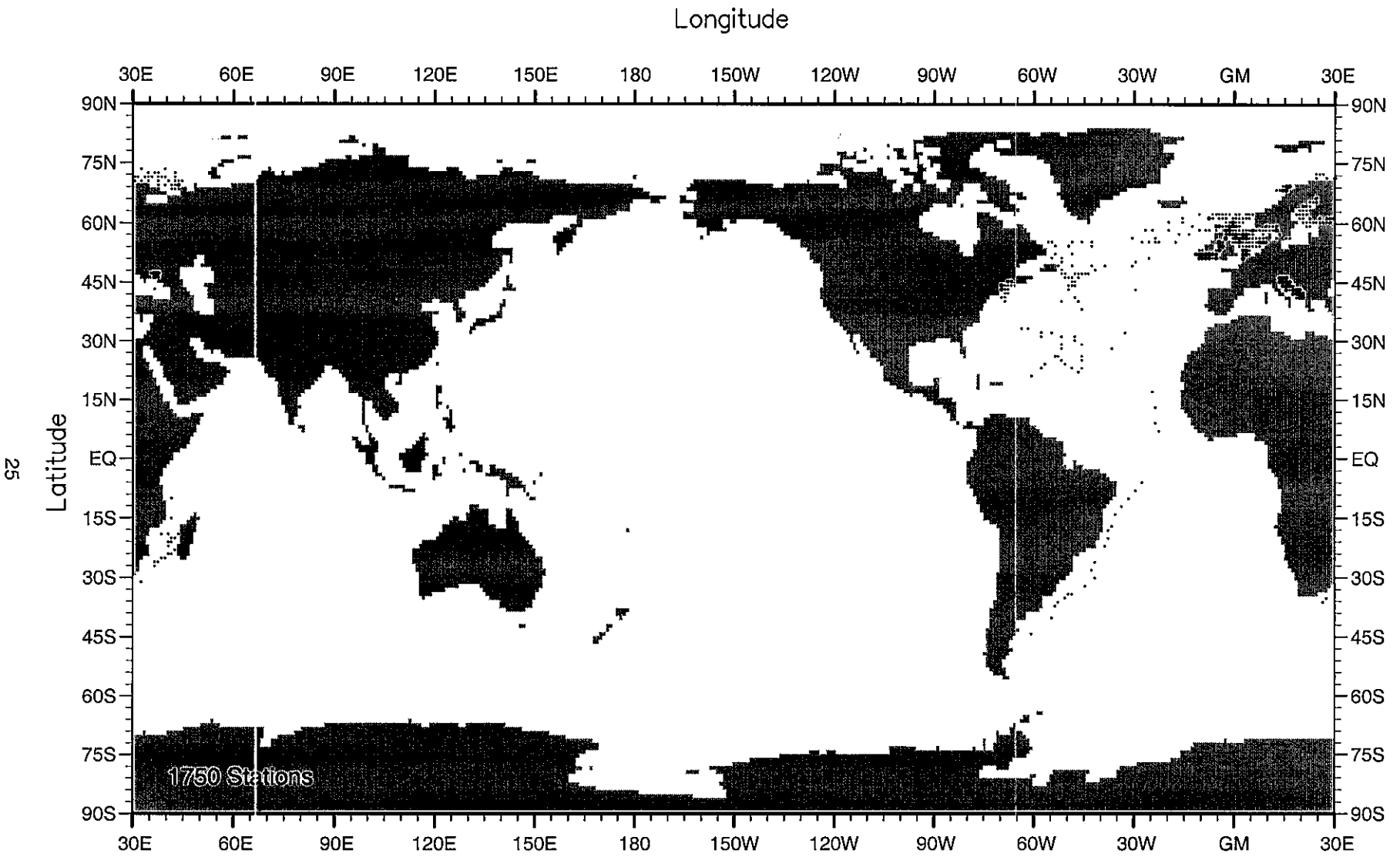


Fig. A14 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1913

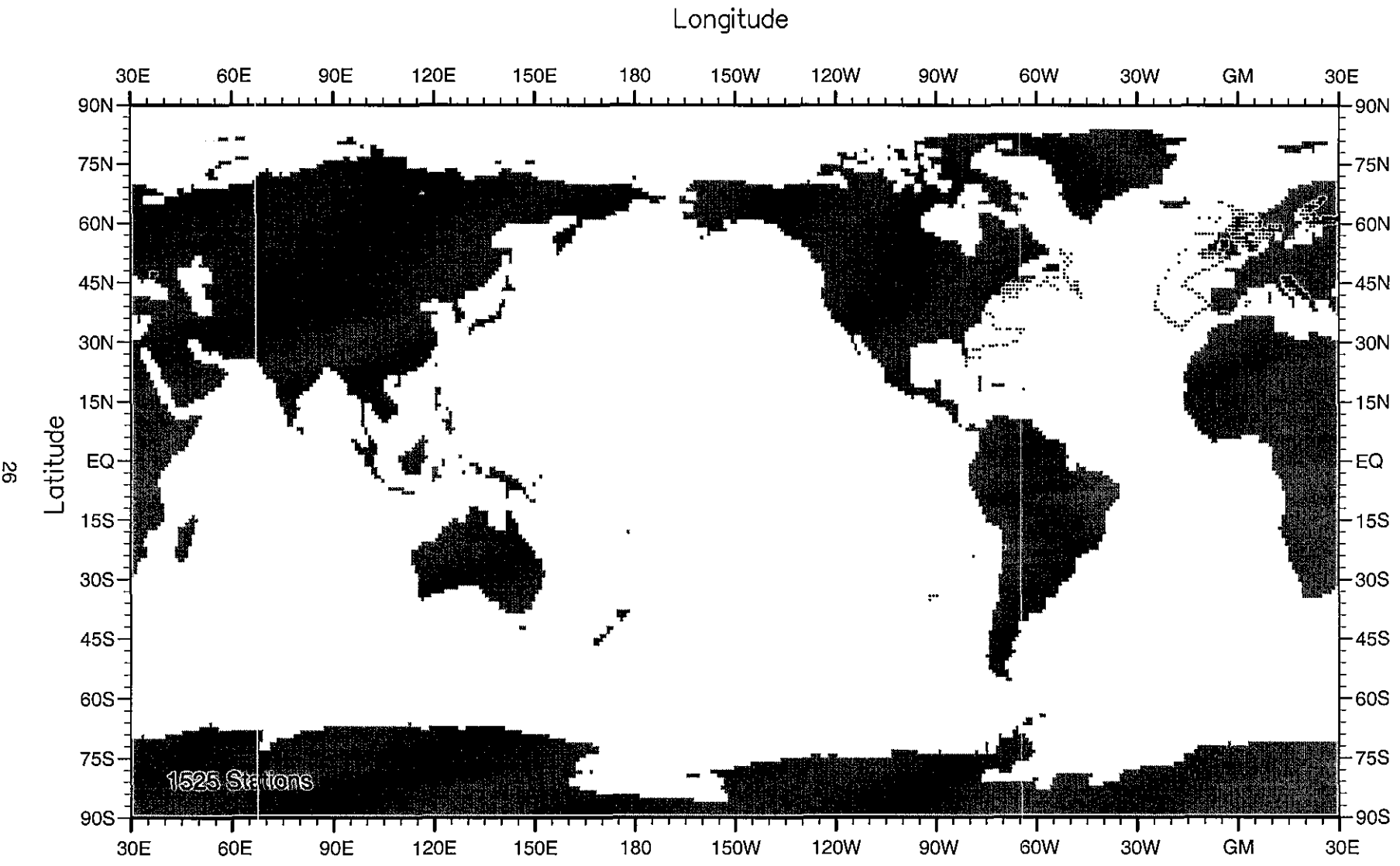


Fig. A15 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1914

Longitude

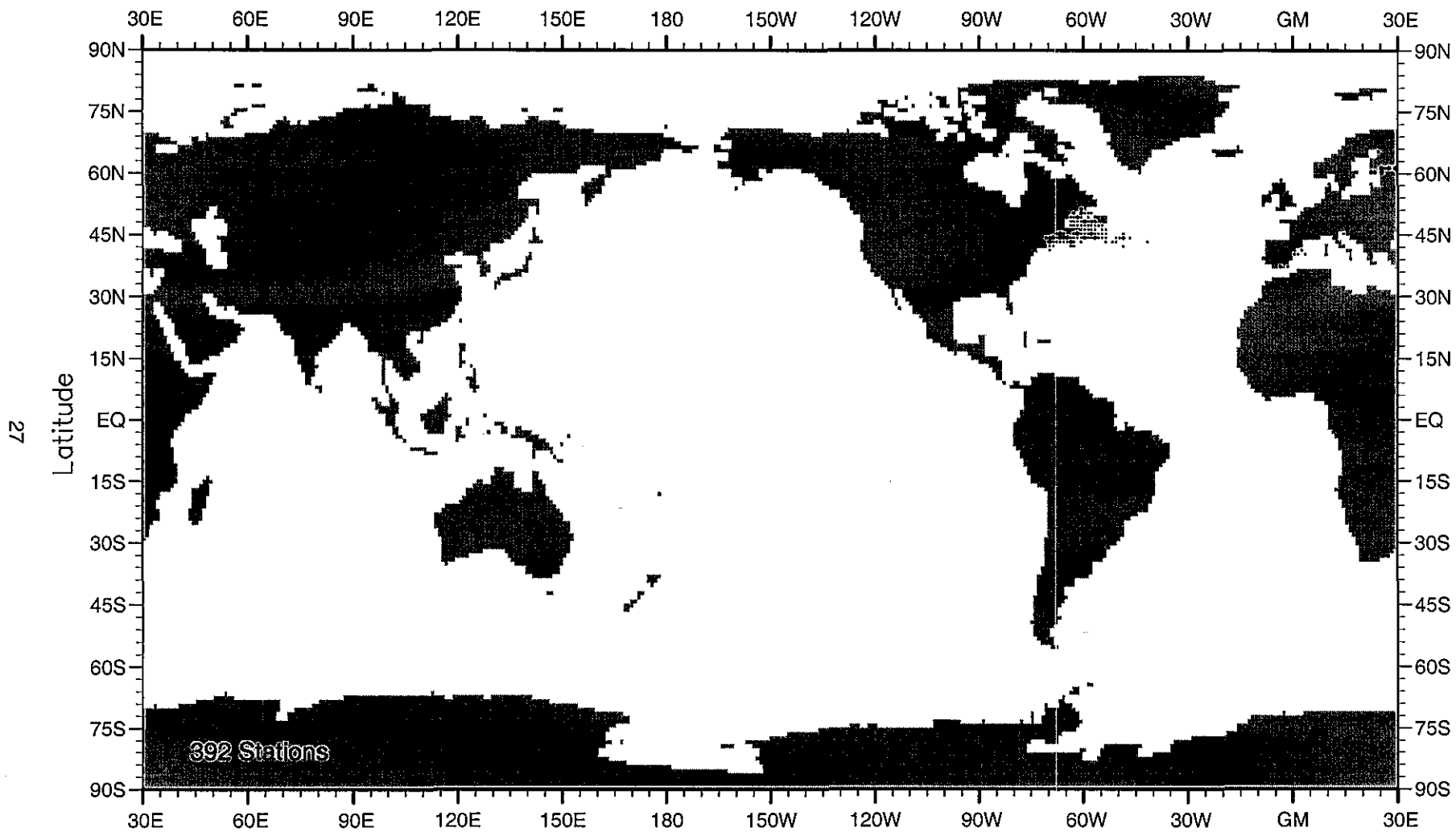


Fig. A16 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1915

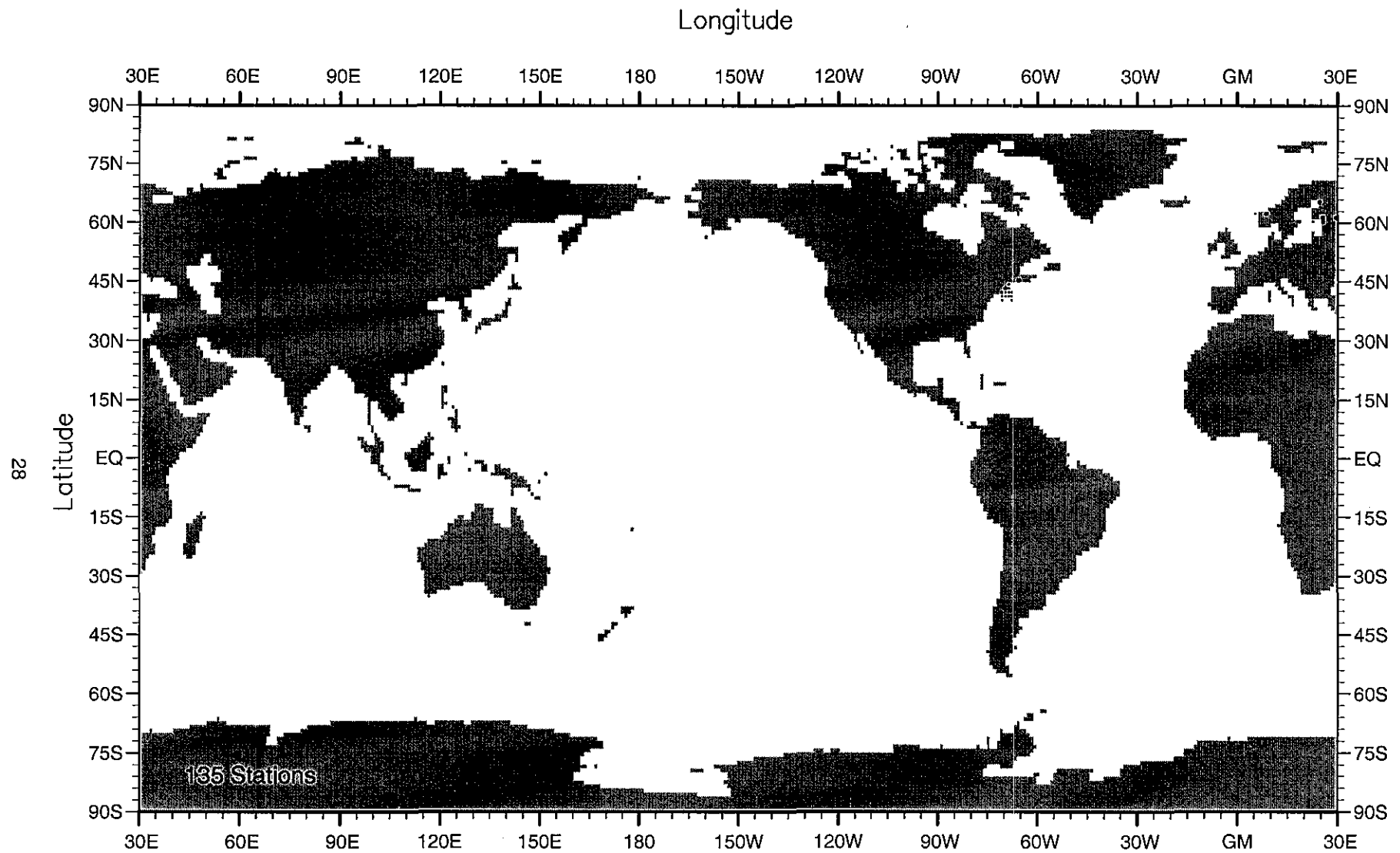


Fig. A17 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1916

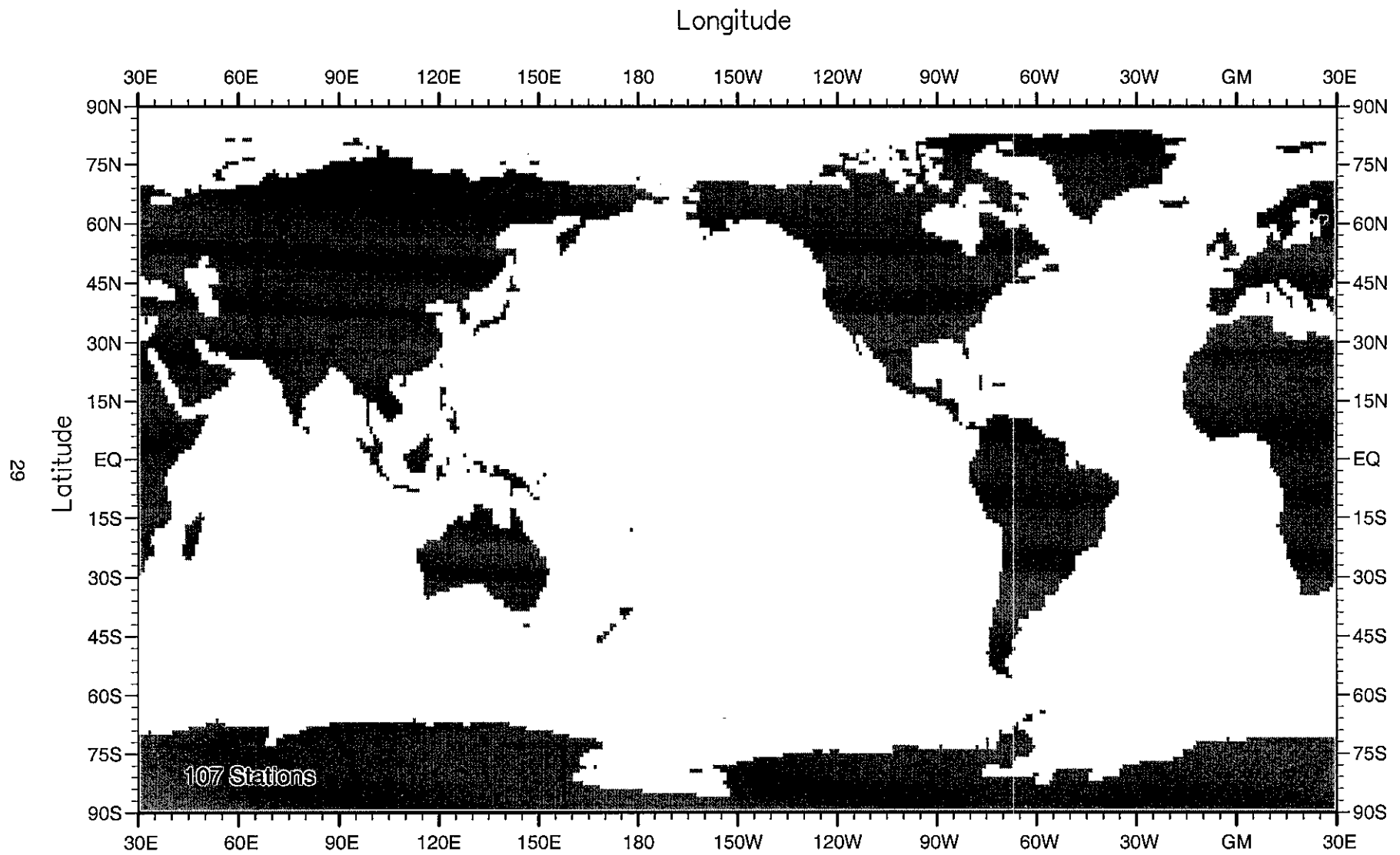


Fig. A18 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1917

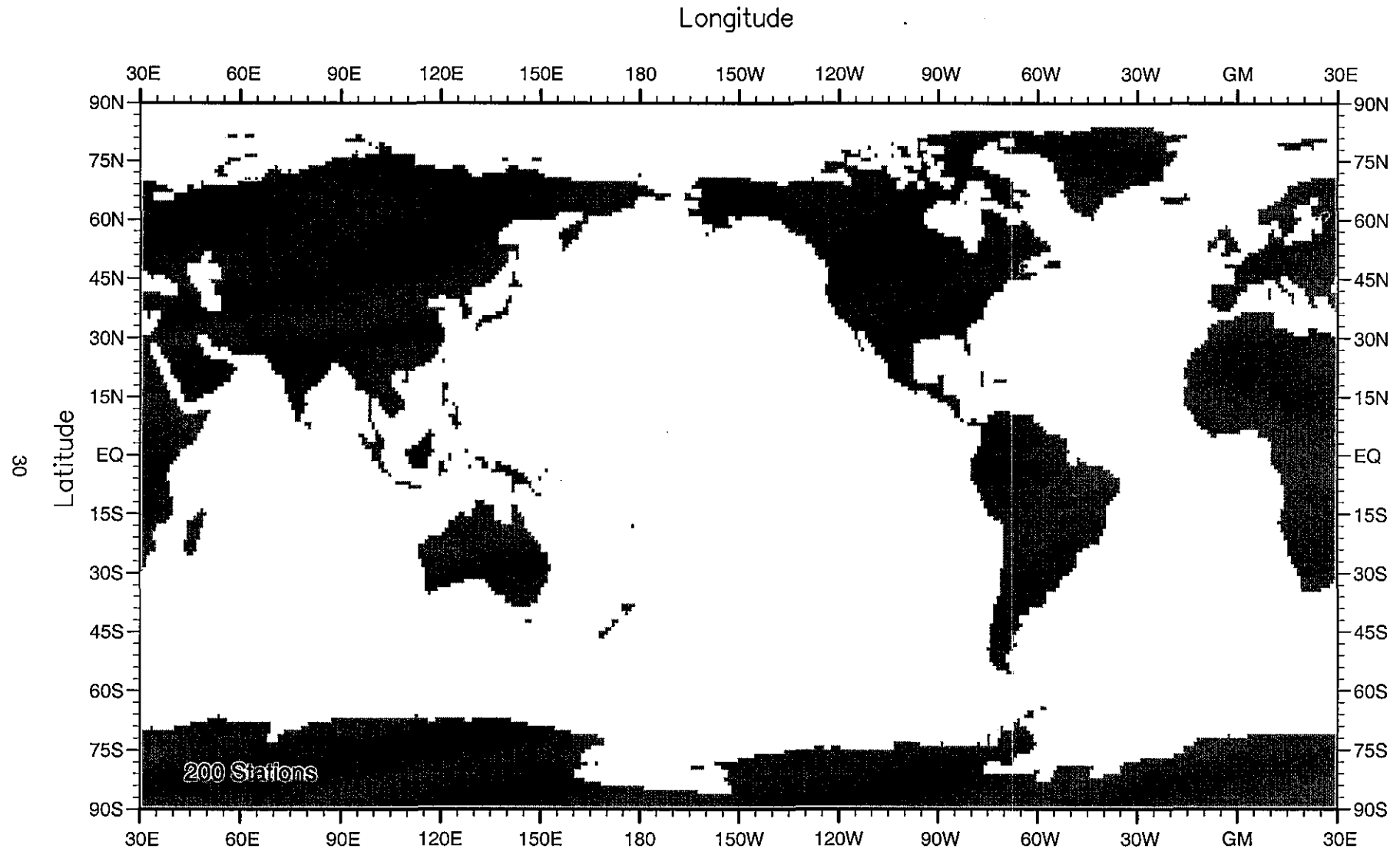


Fig. A19 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1918

Longitude

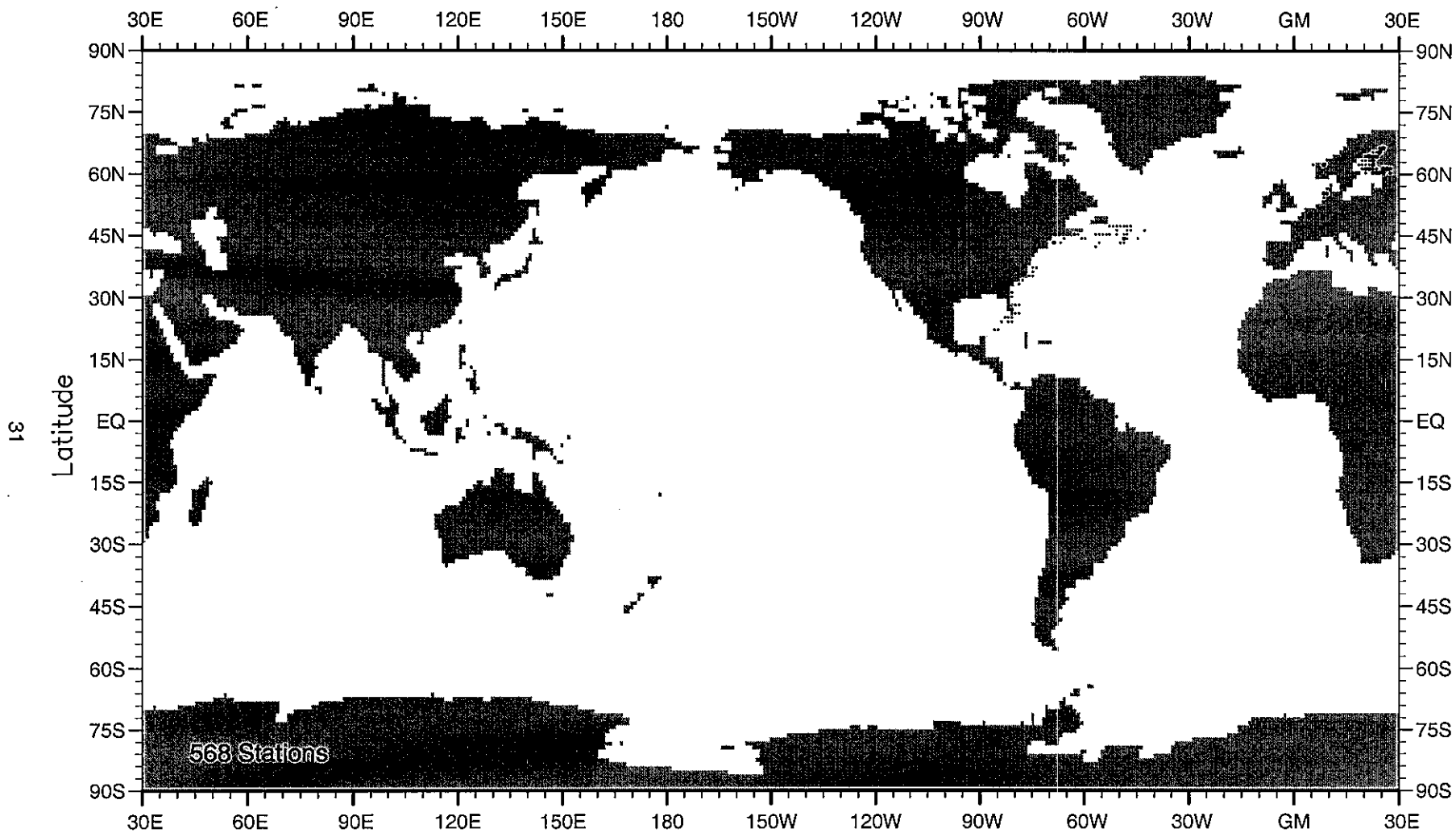


Fig. A20 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1919

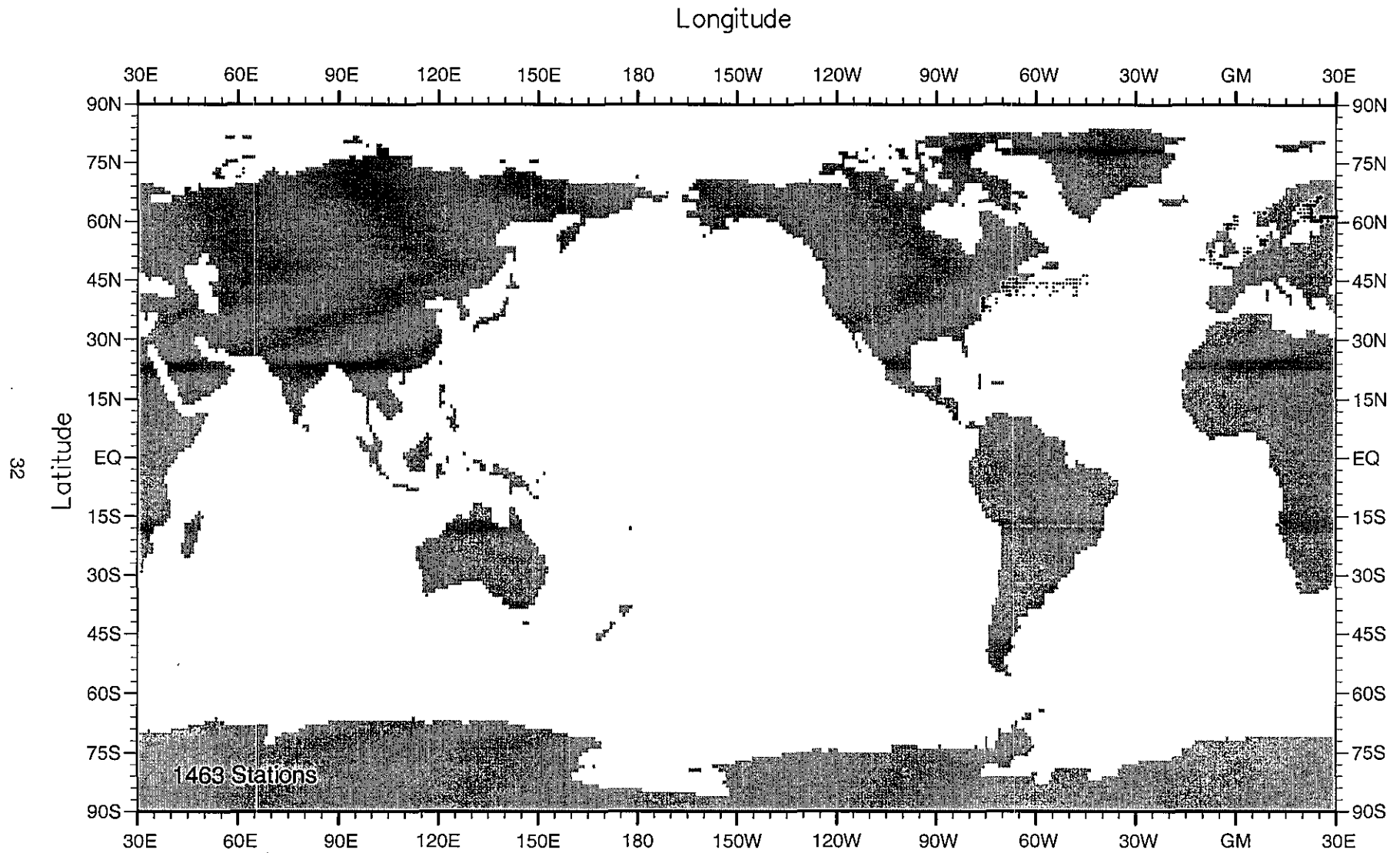


Fig. A21 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1920

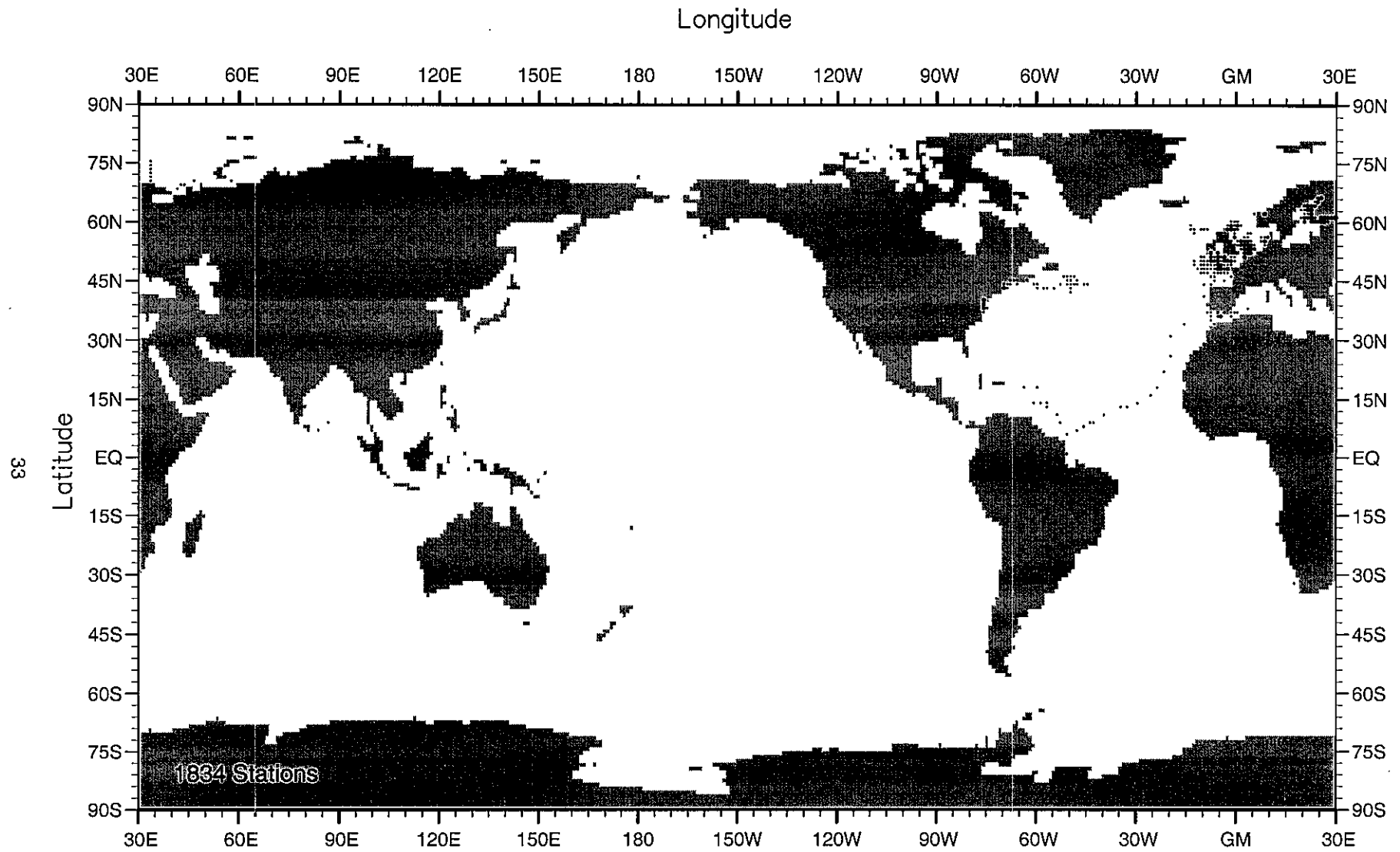


Fig. A22 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1921

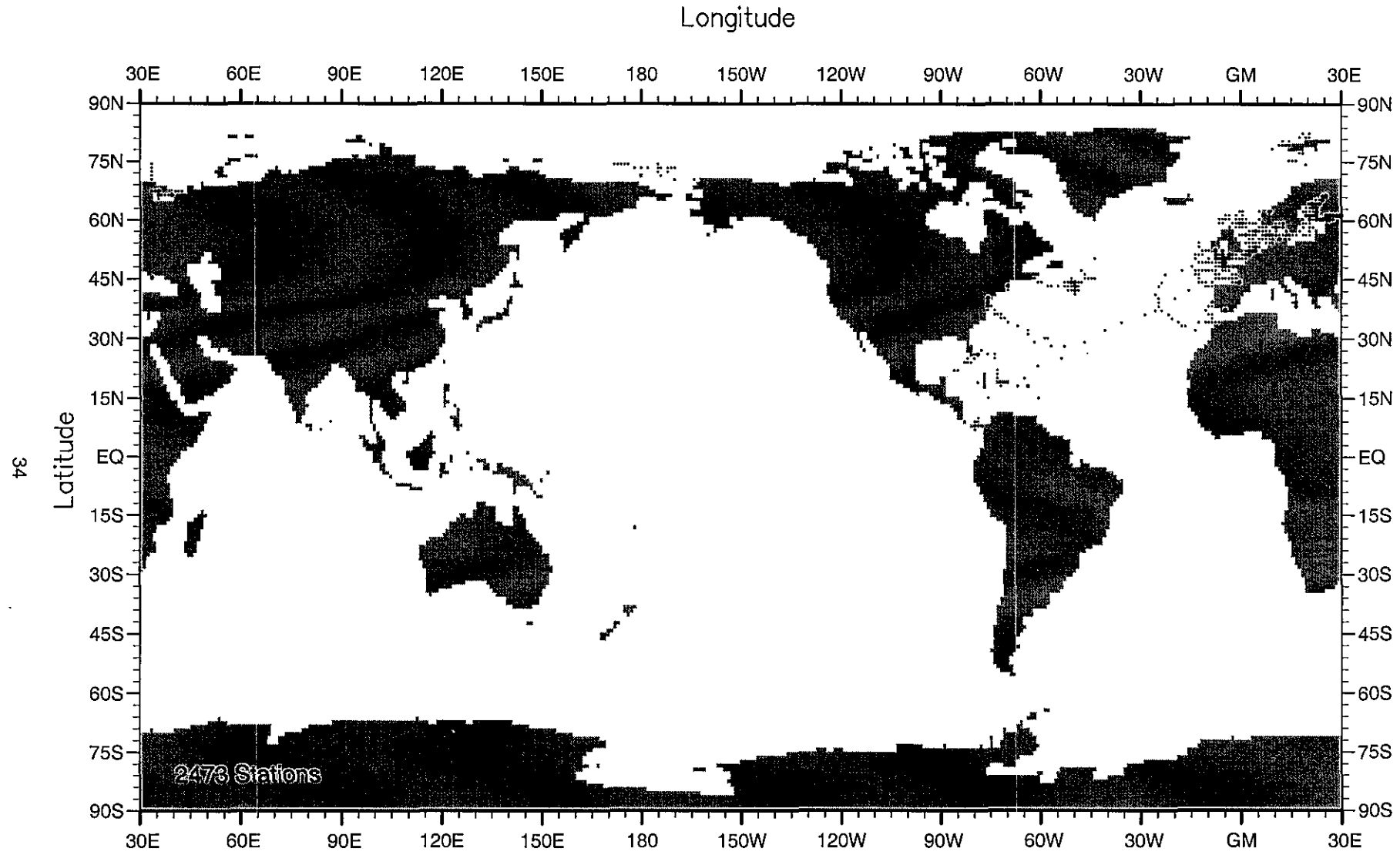


Fig. A23 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1922

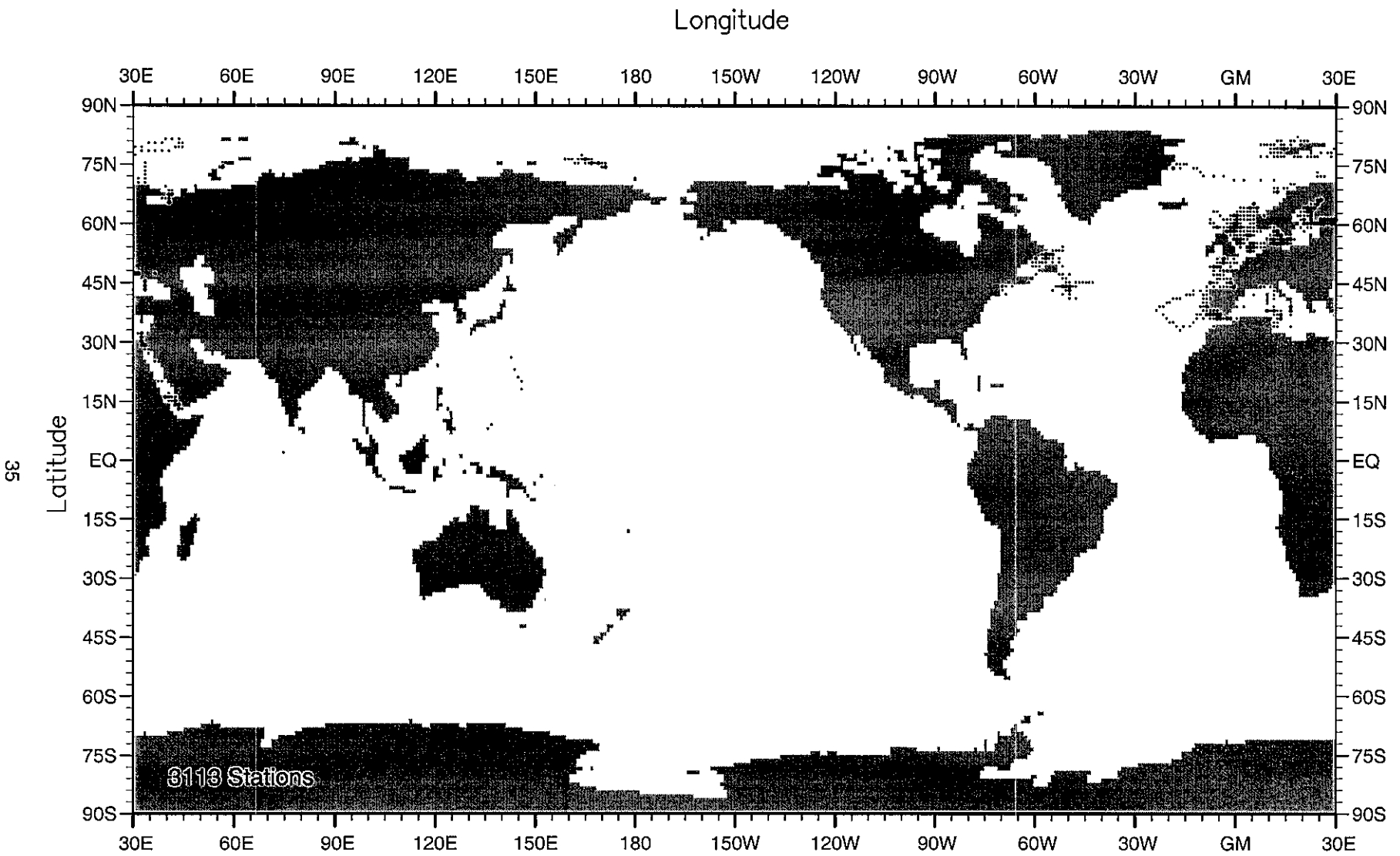


Fig. A24 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1923

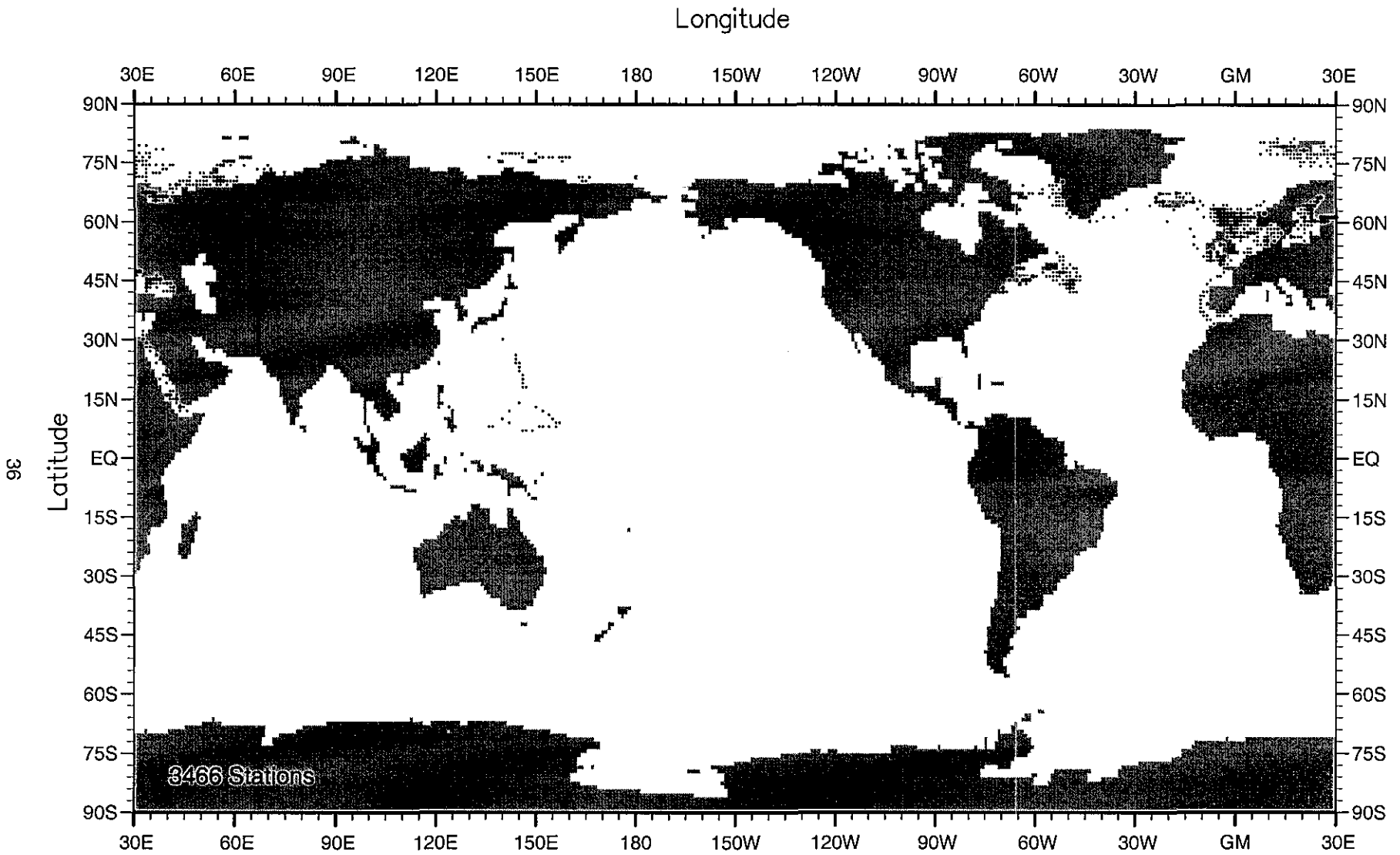


Fig. A25 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1924

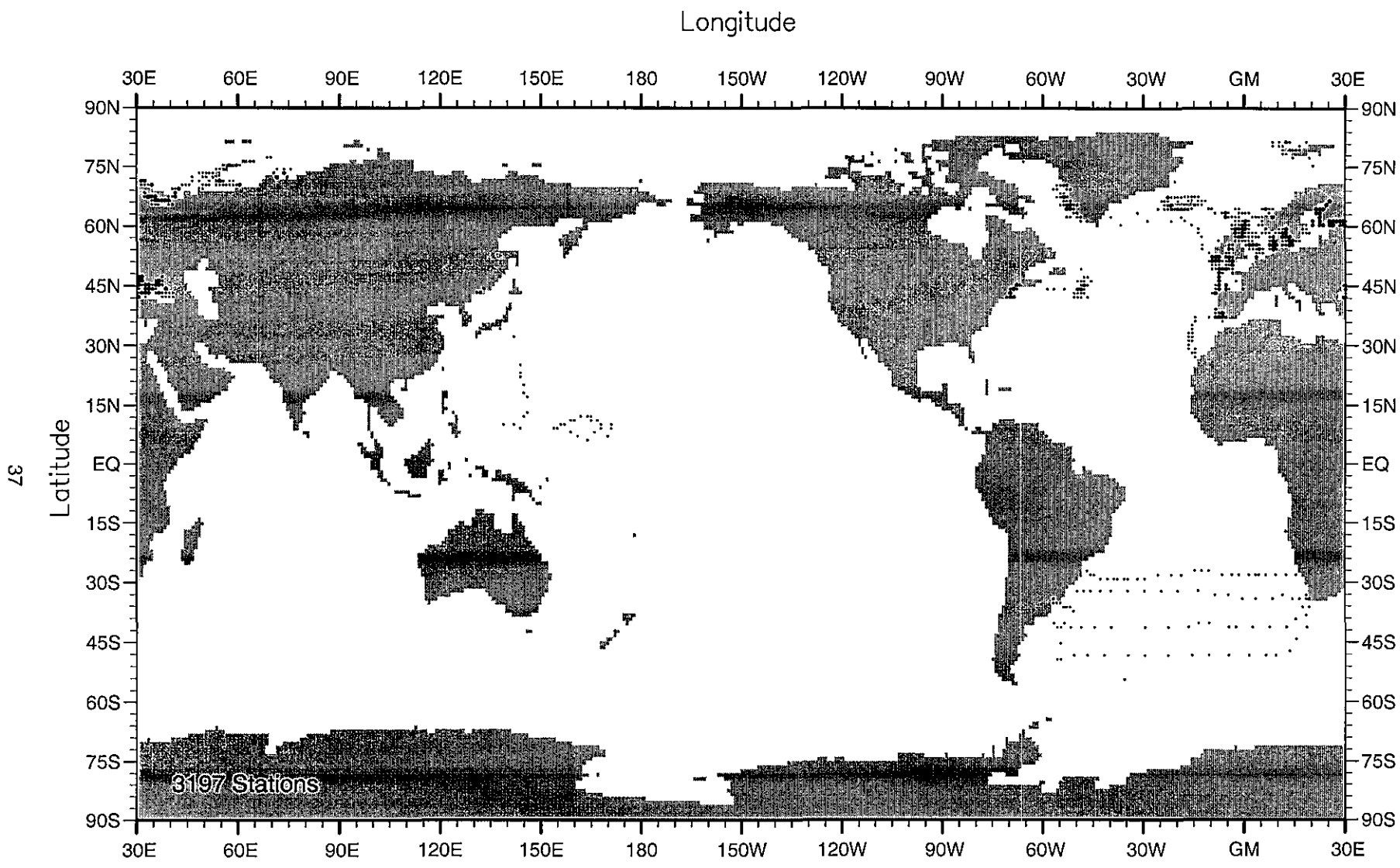


Fig. A26 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1925

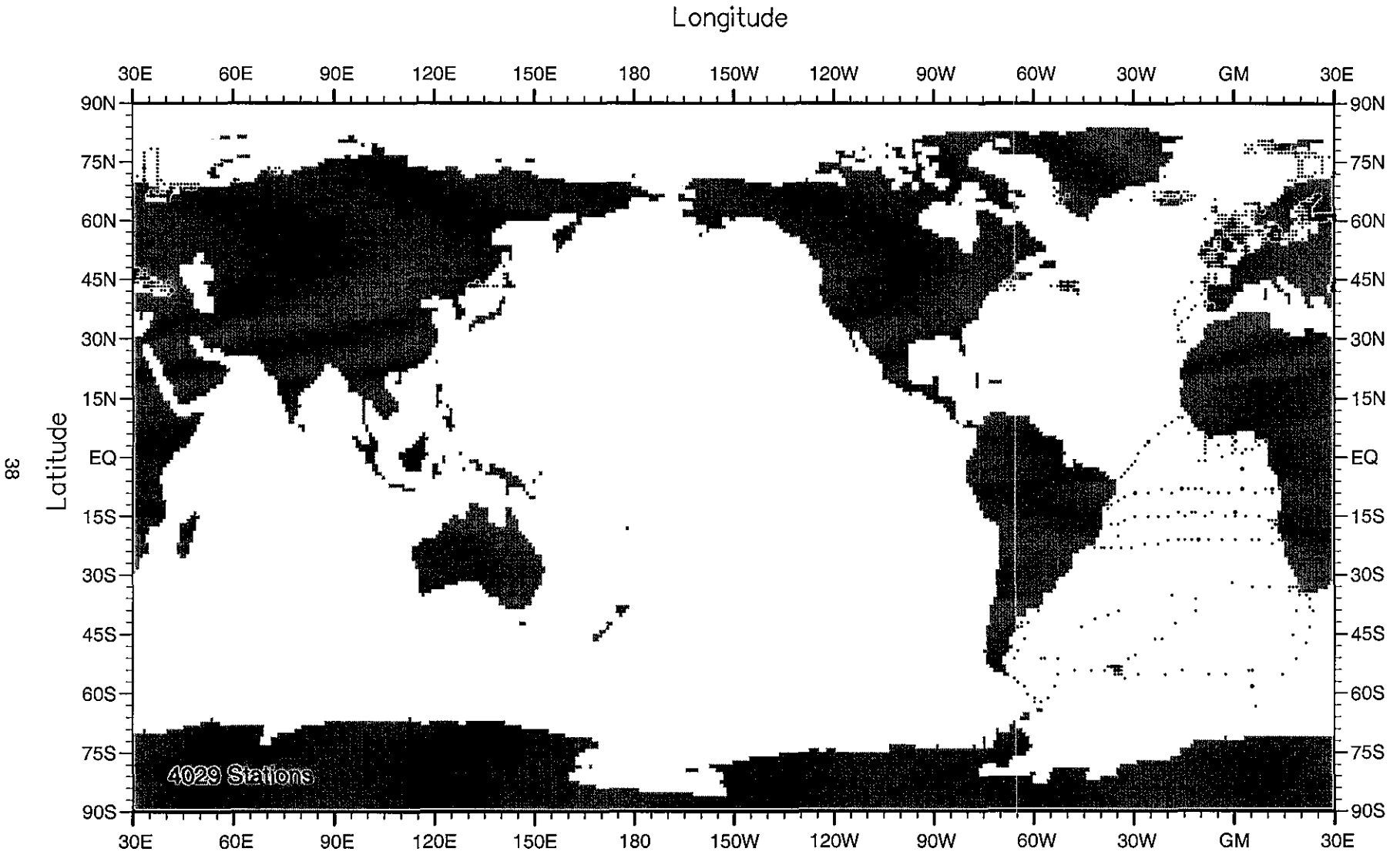


Fig. A27 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1926

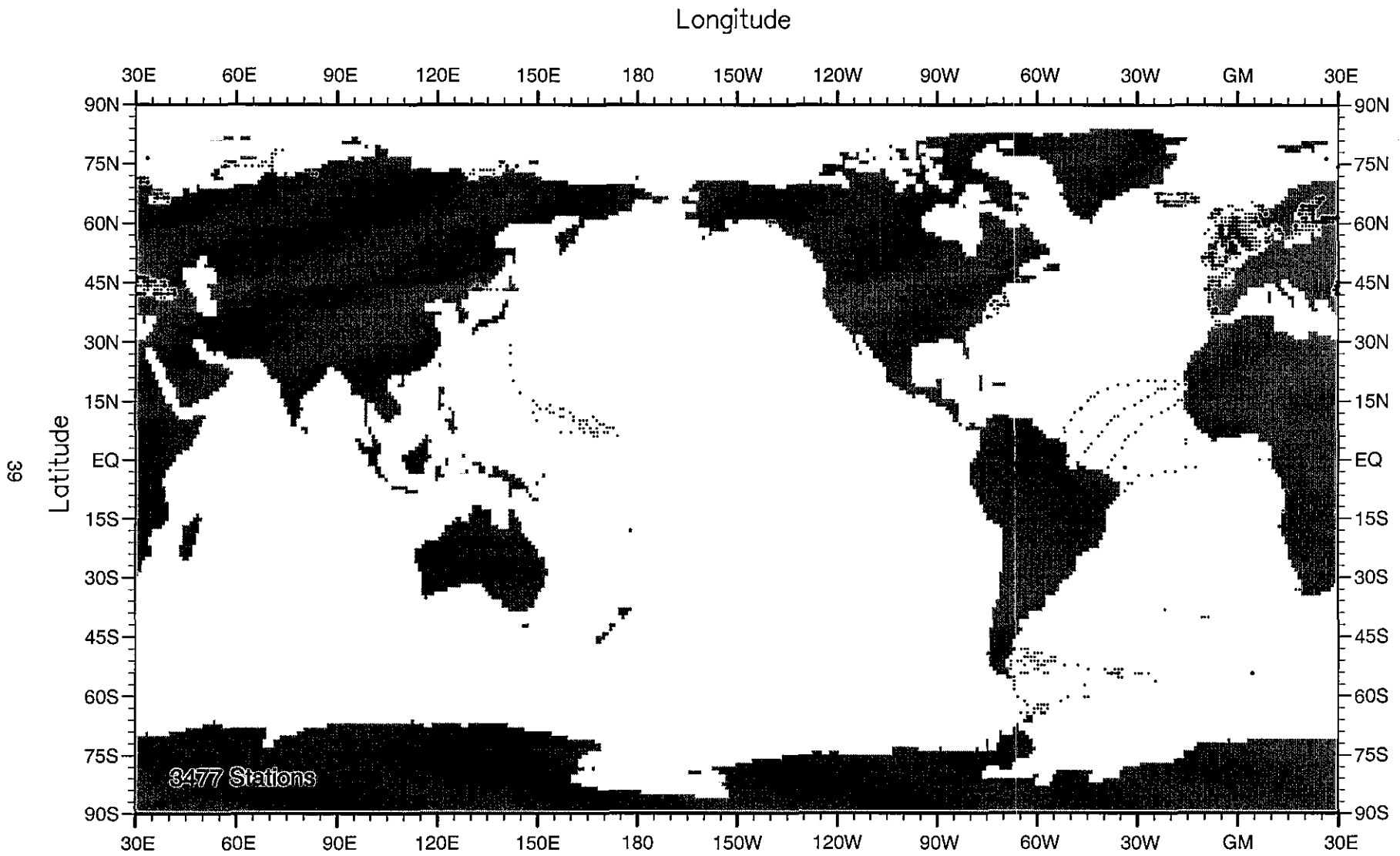


Fig. A28 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1927

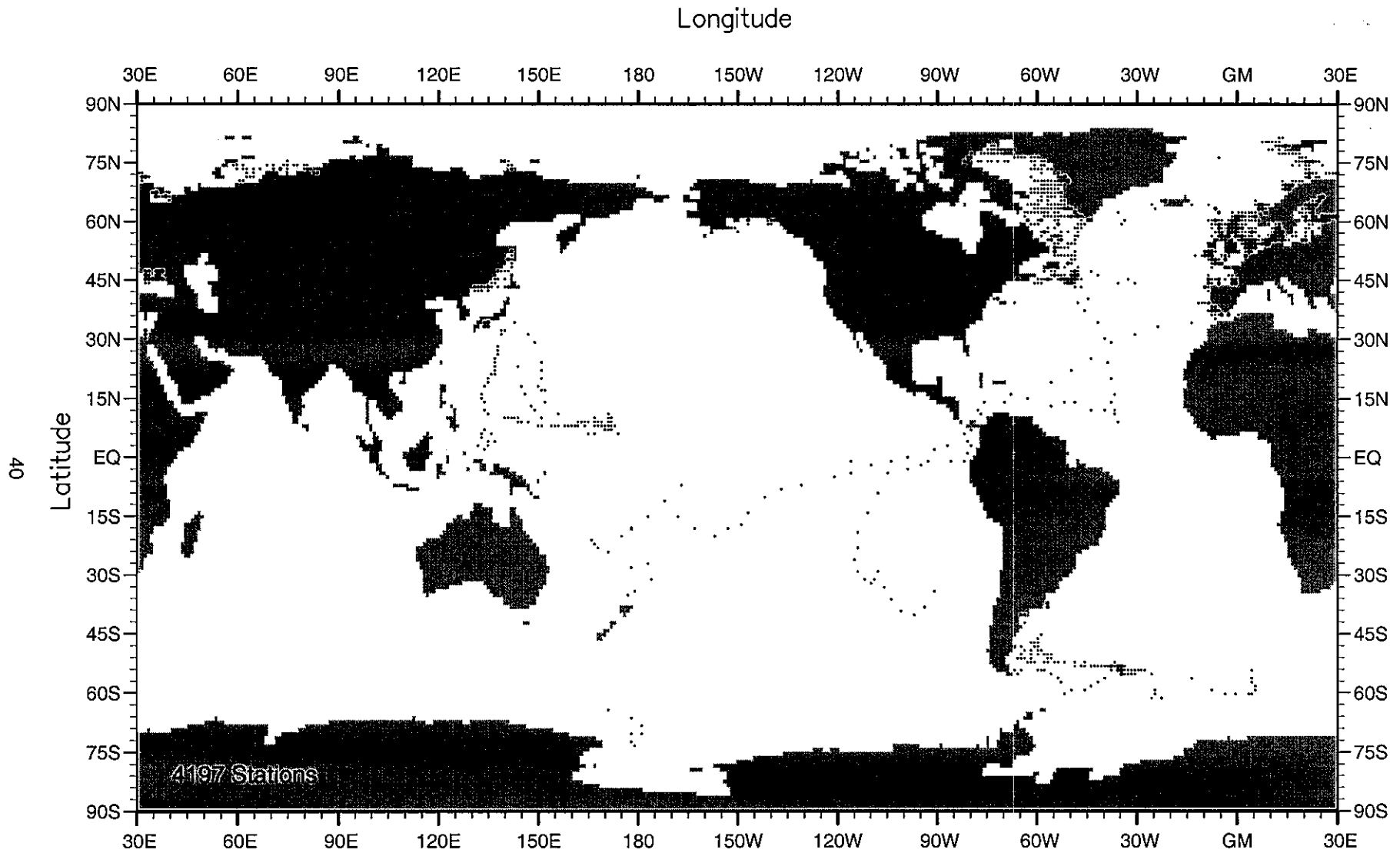


Fig. A29 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1928

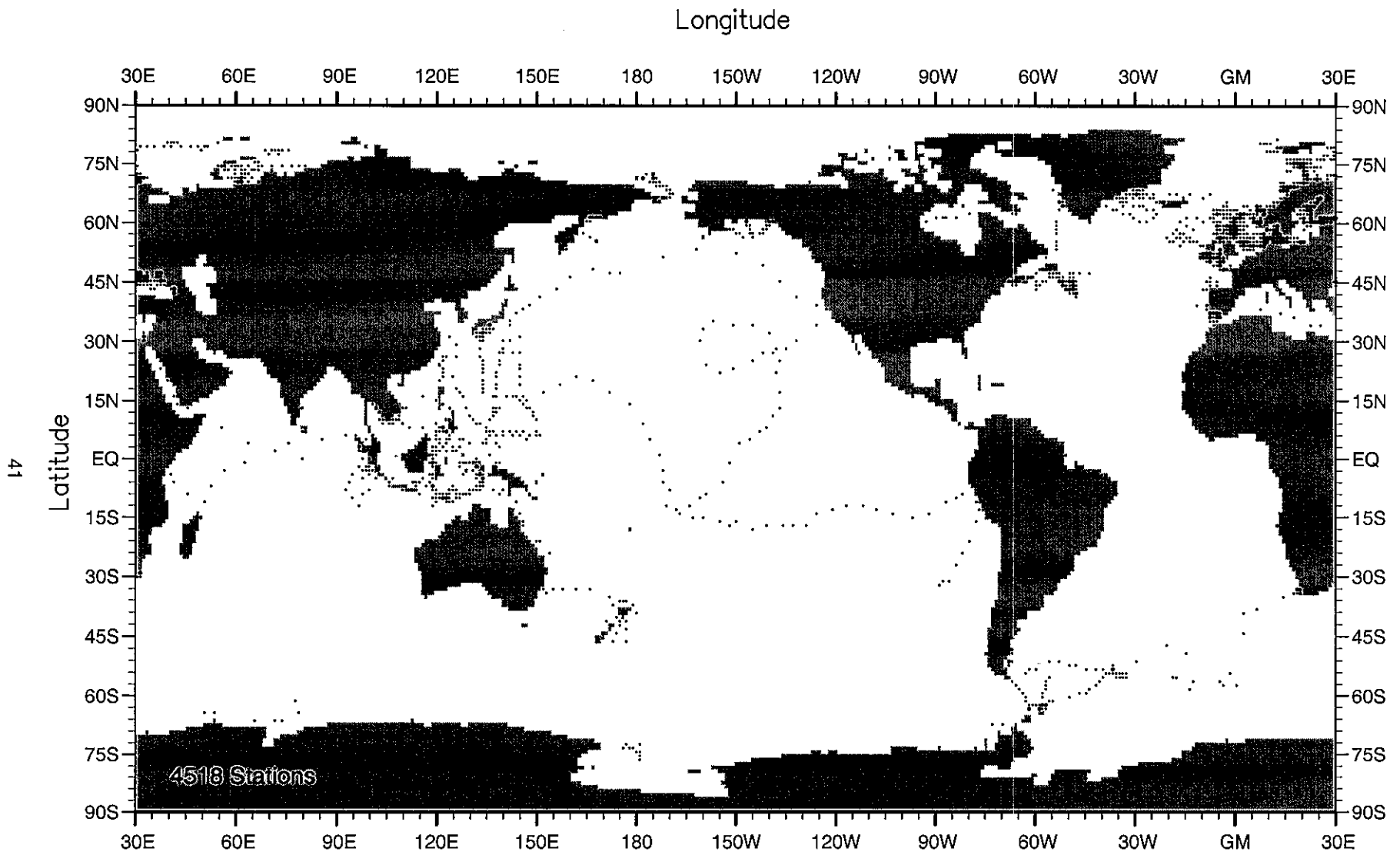


Fig. A30 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1929

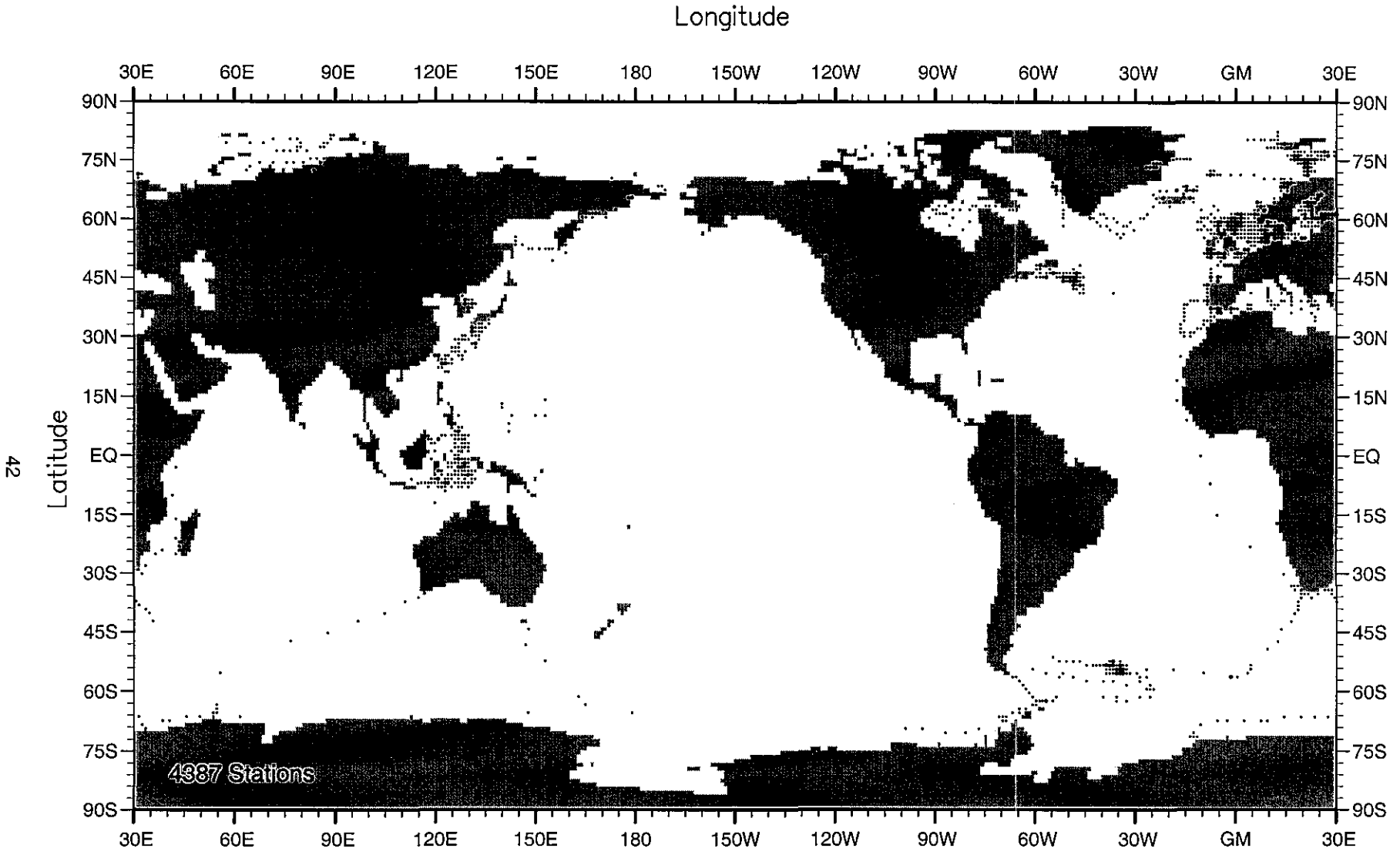


Fig. A31 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1930

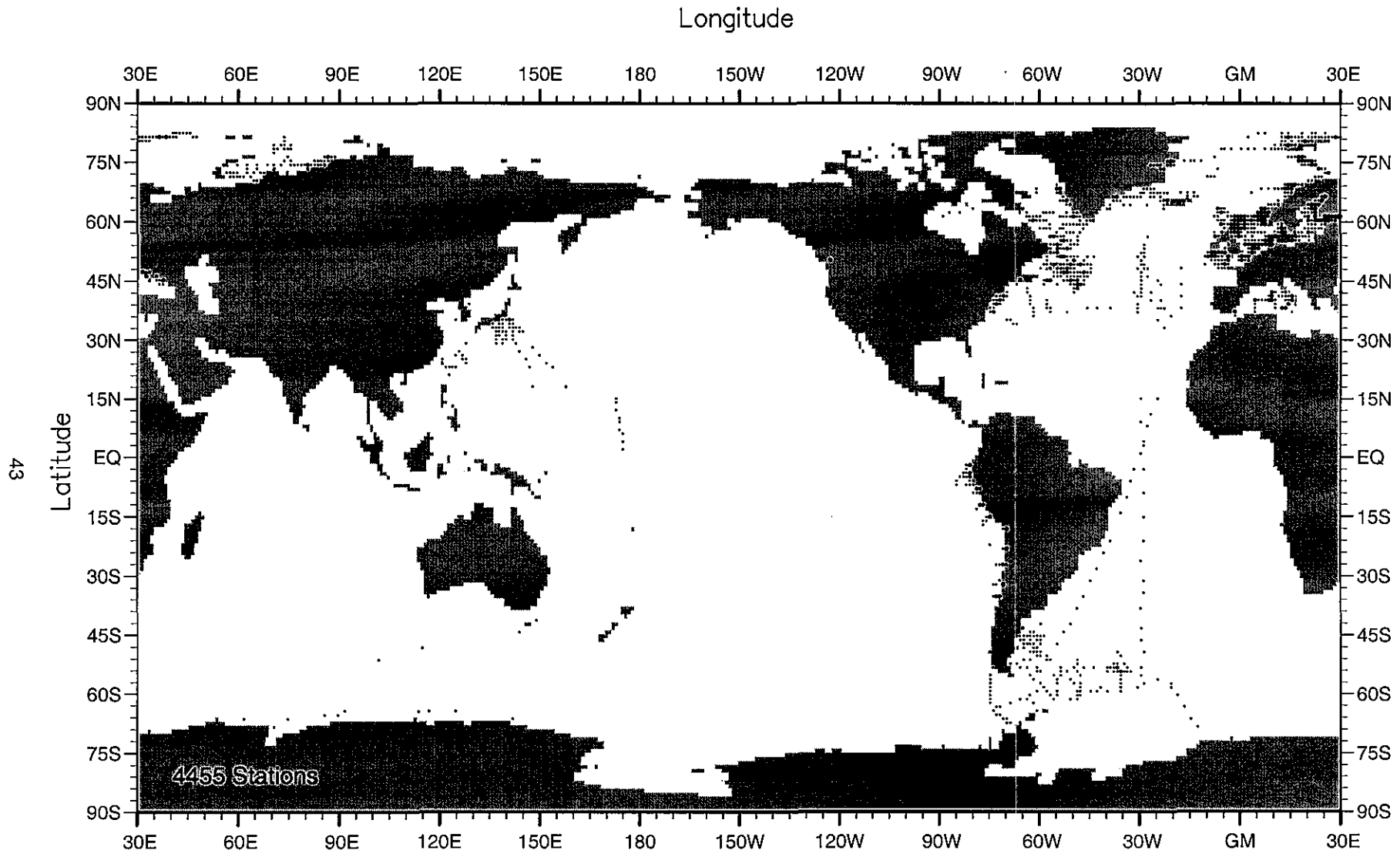


Fig. A32 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1931

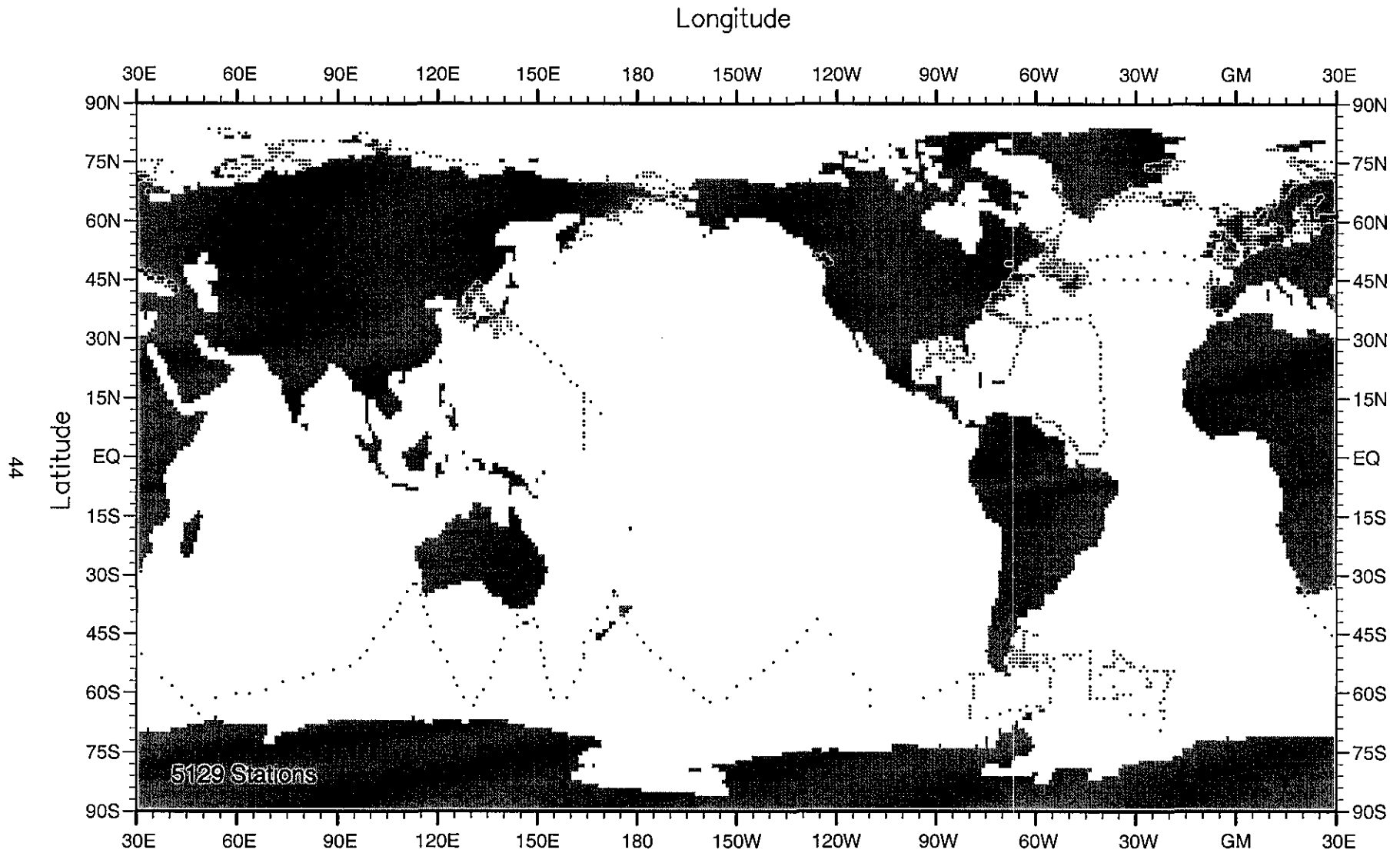


Fig. A33 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1932

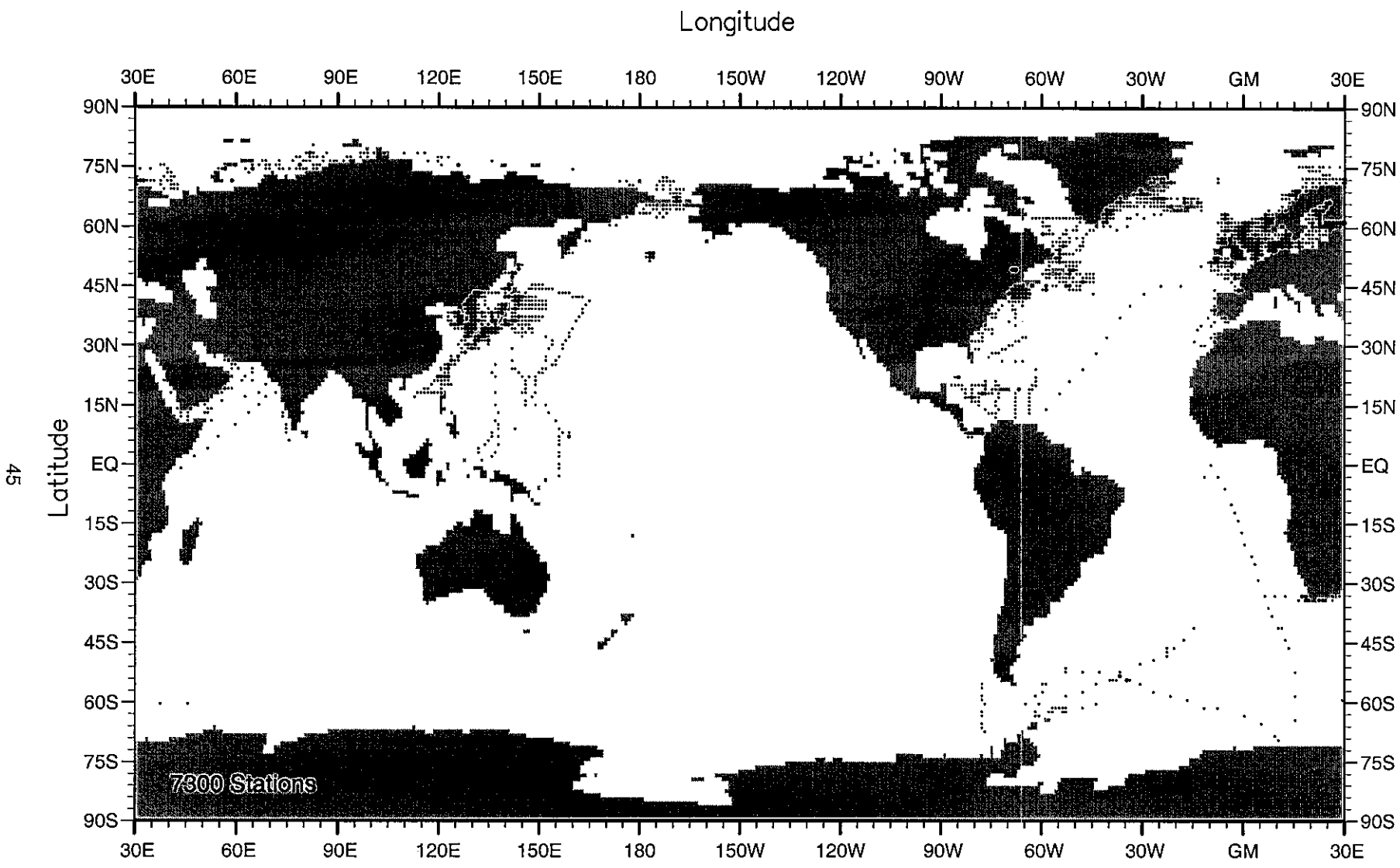


Fig. A34 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1933

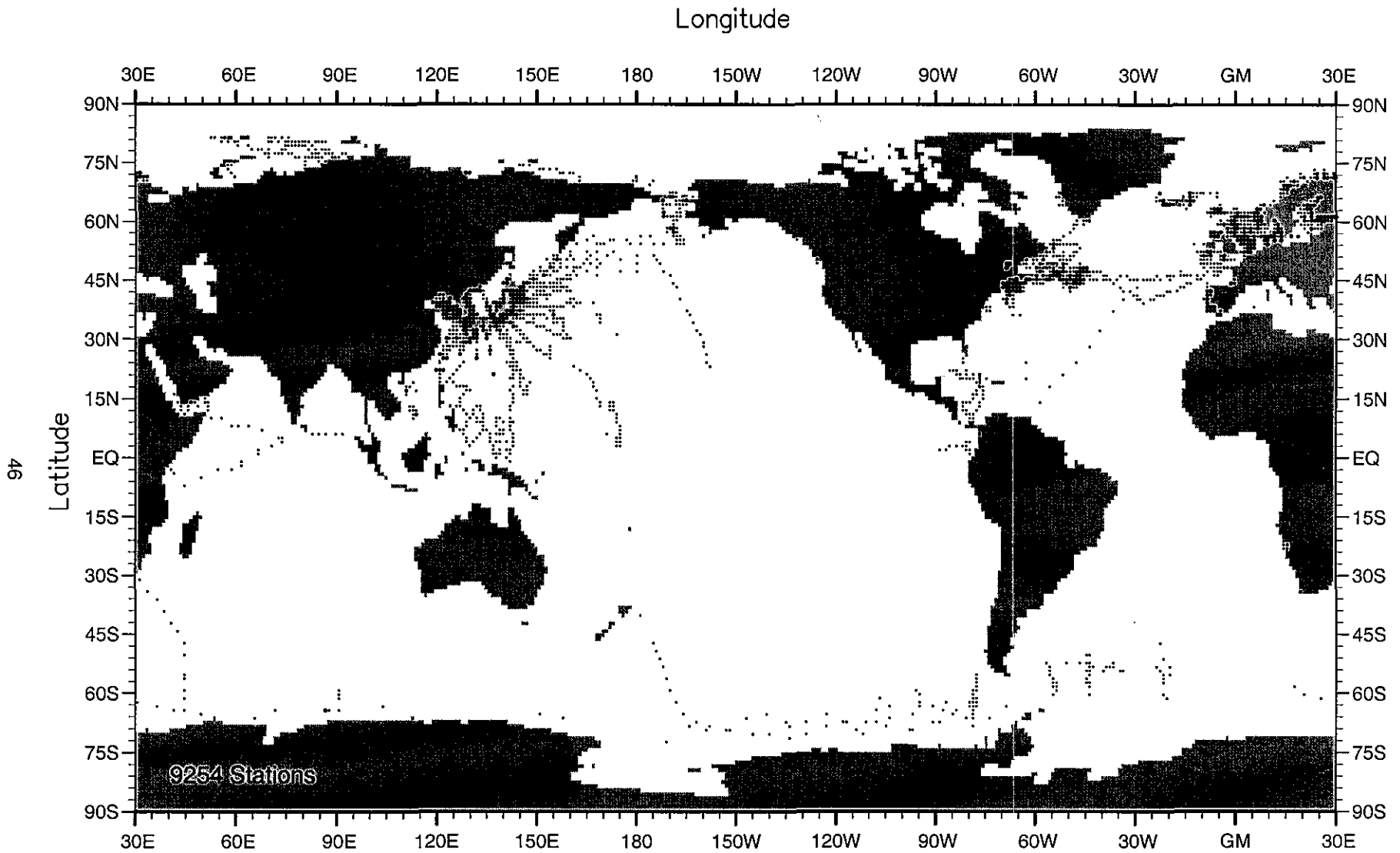


Fig. A35 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1934

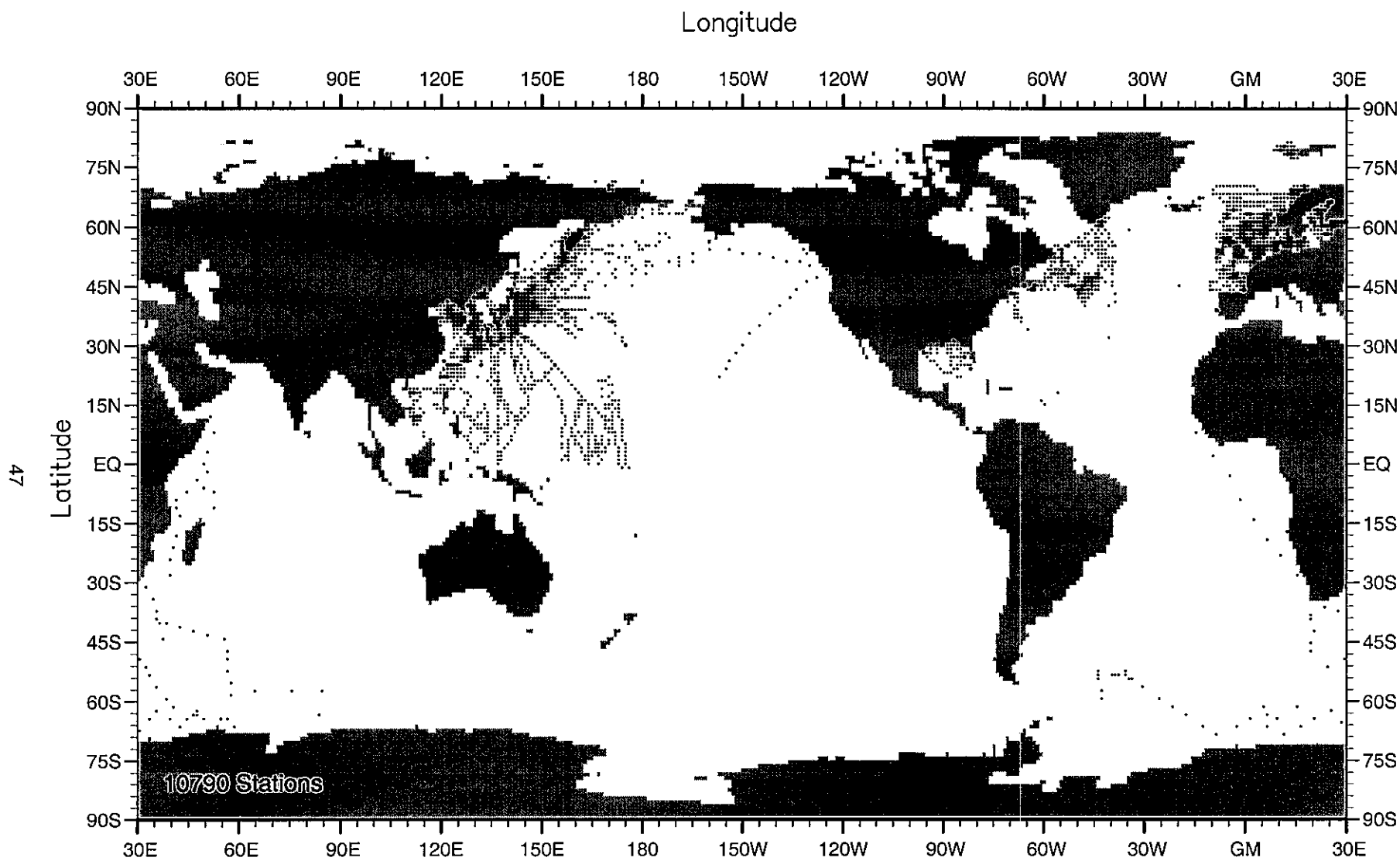


Fig. A36 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1935

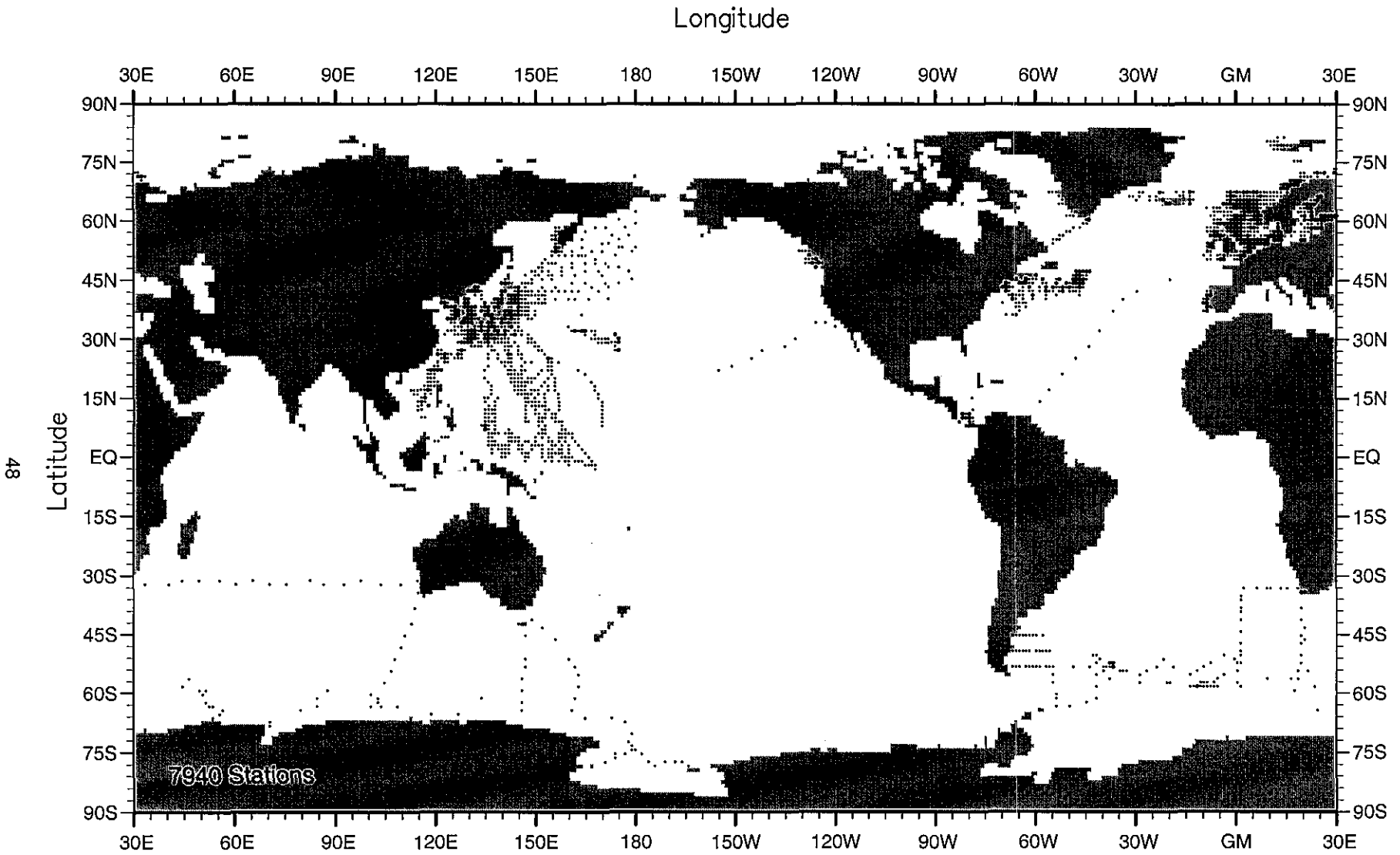


Fig. A37 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1936

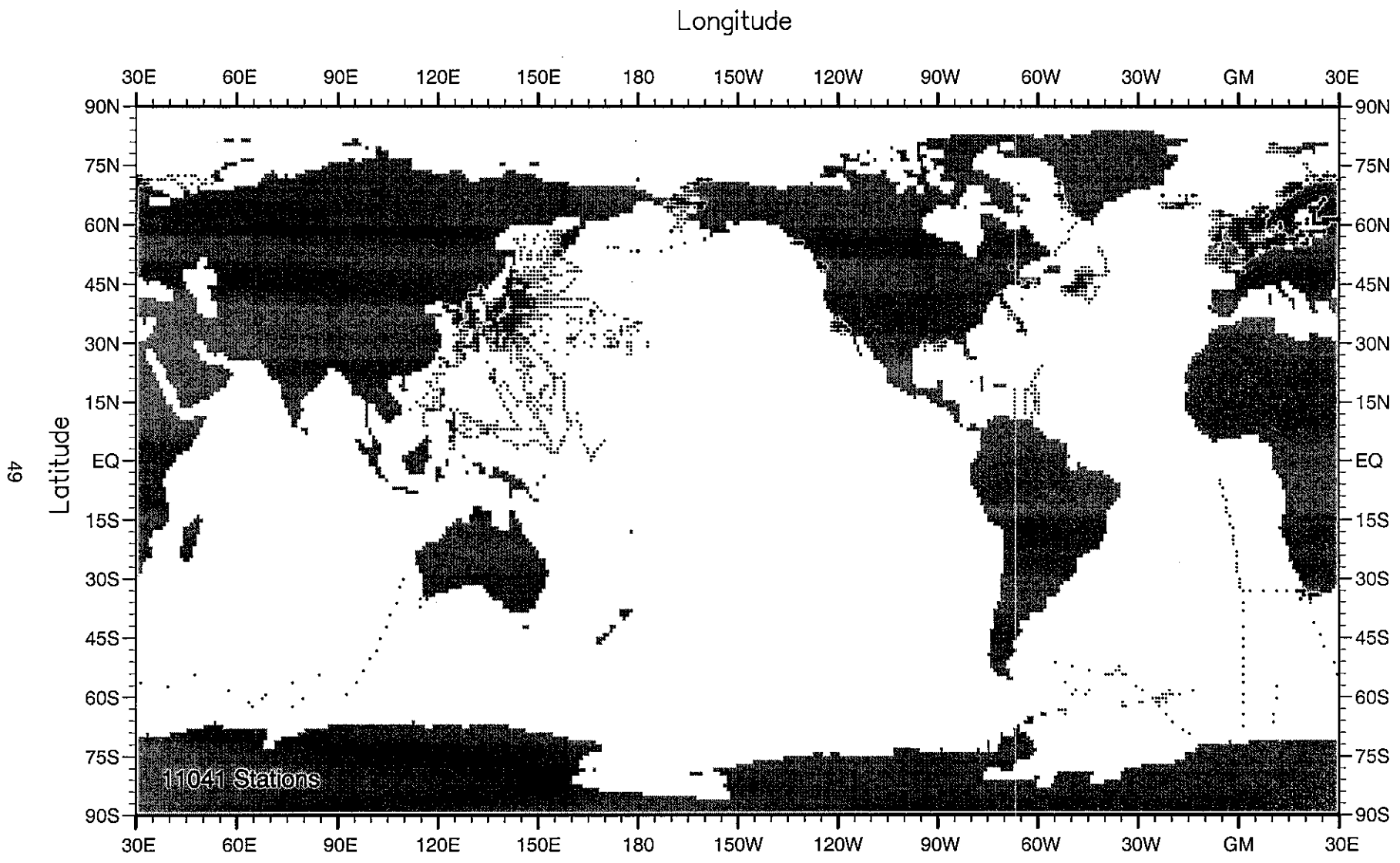


Fig. A38 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1937

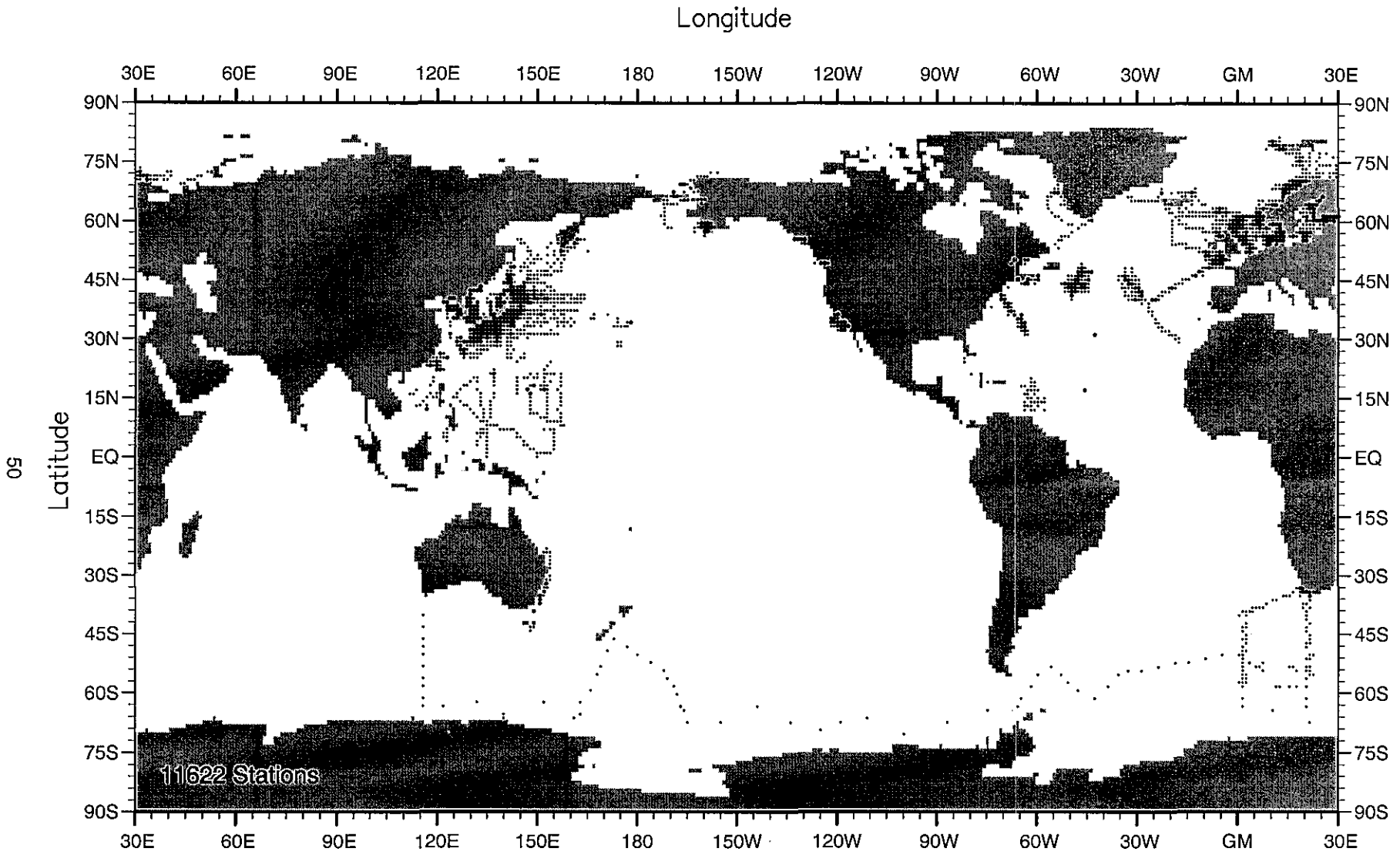


Fig. A39 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1938

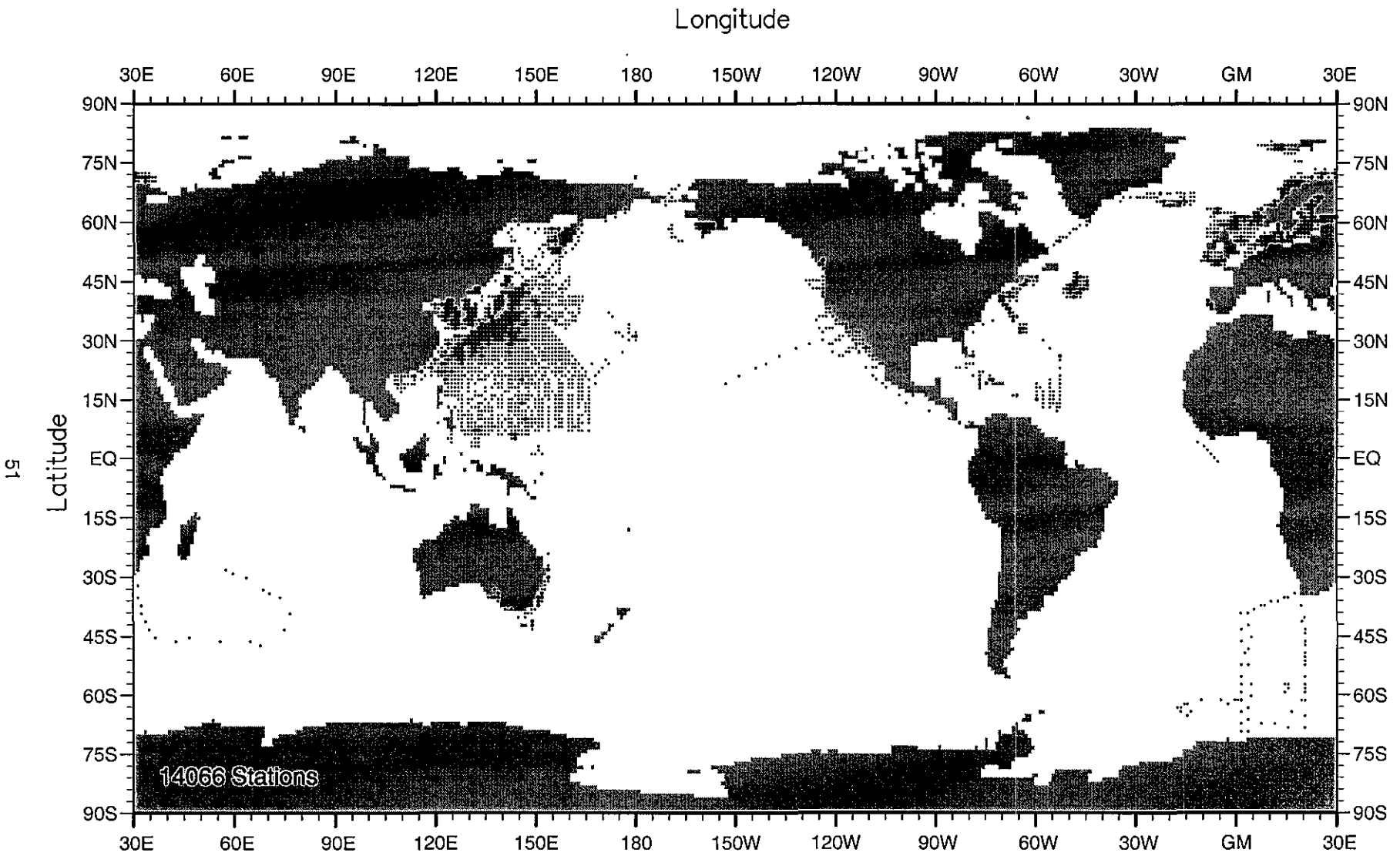


Fig. A40 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1939

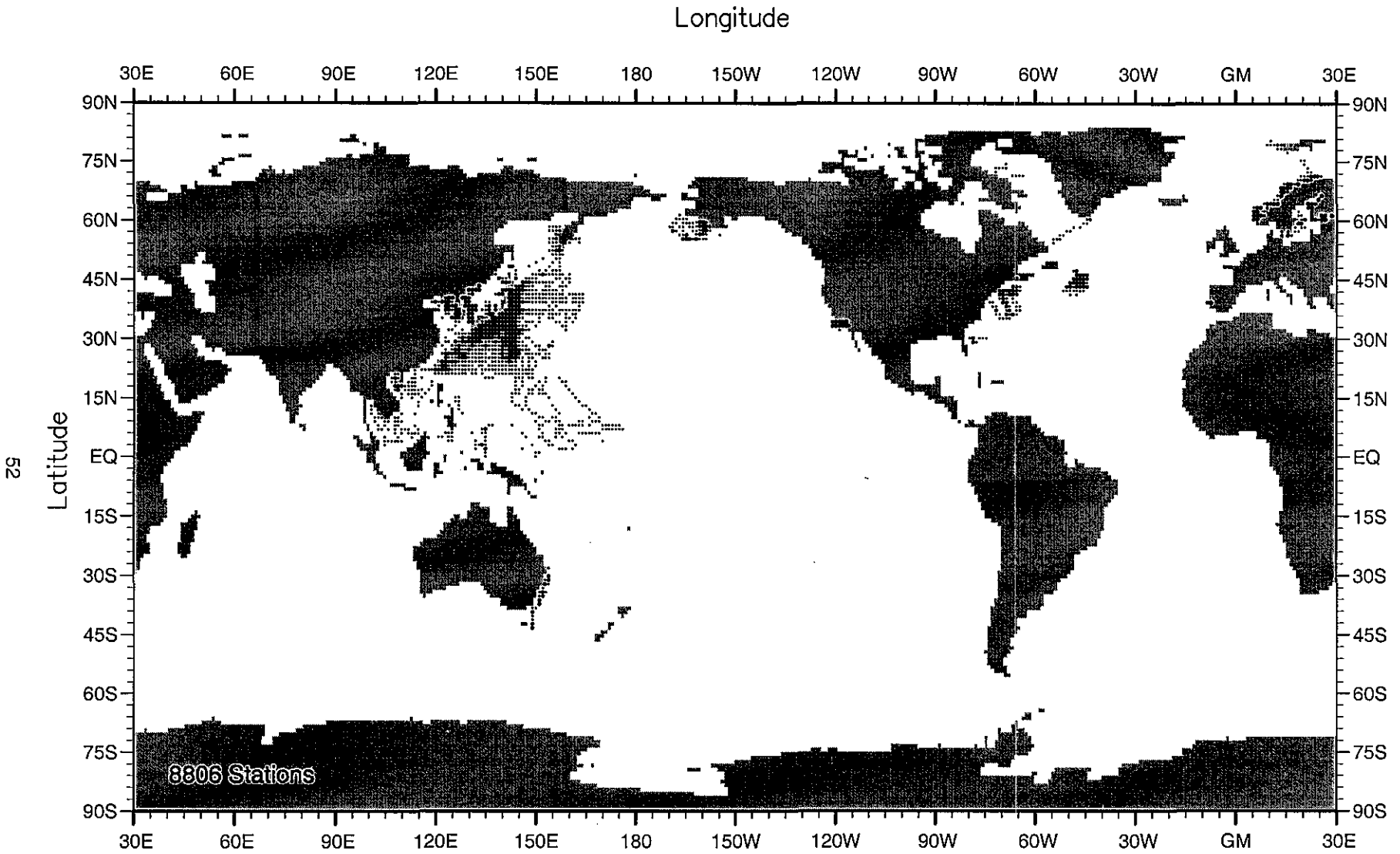


Fig. A41 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1940

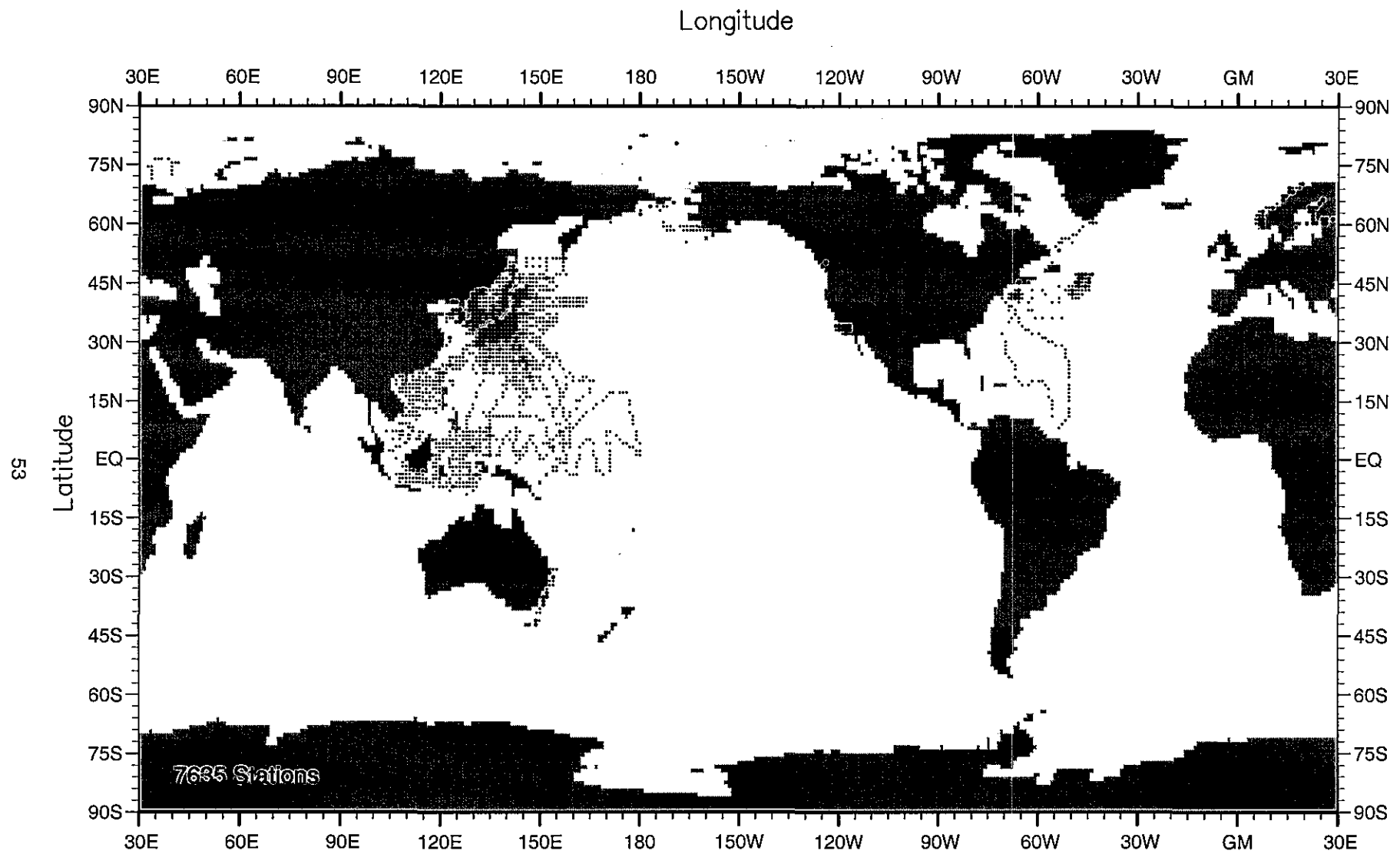


Fig. A42 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1941

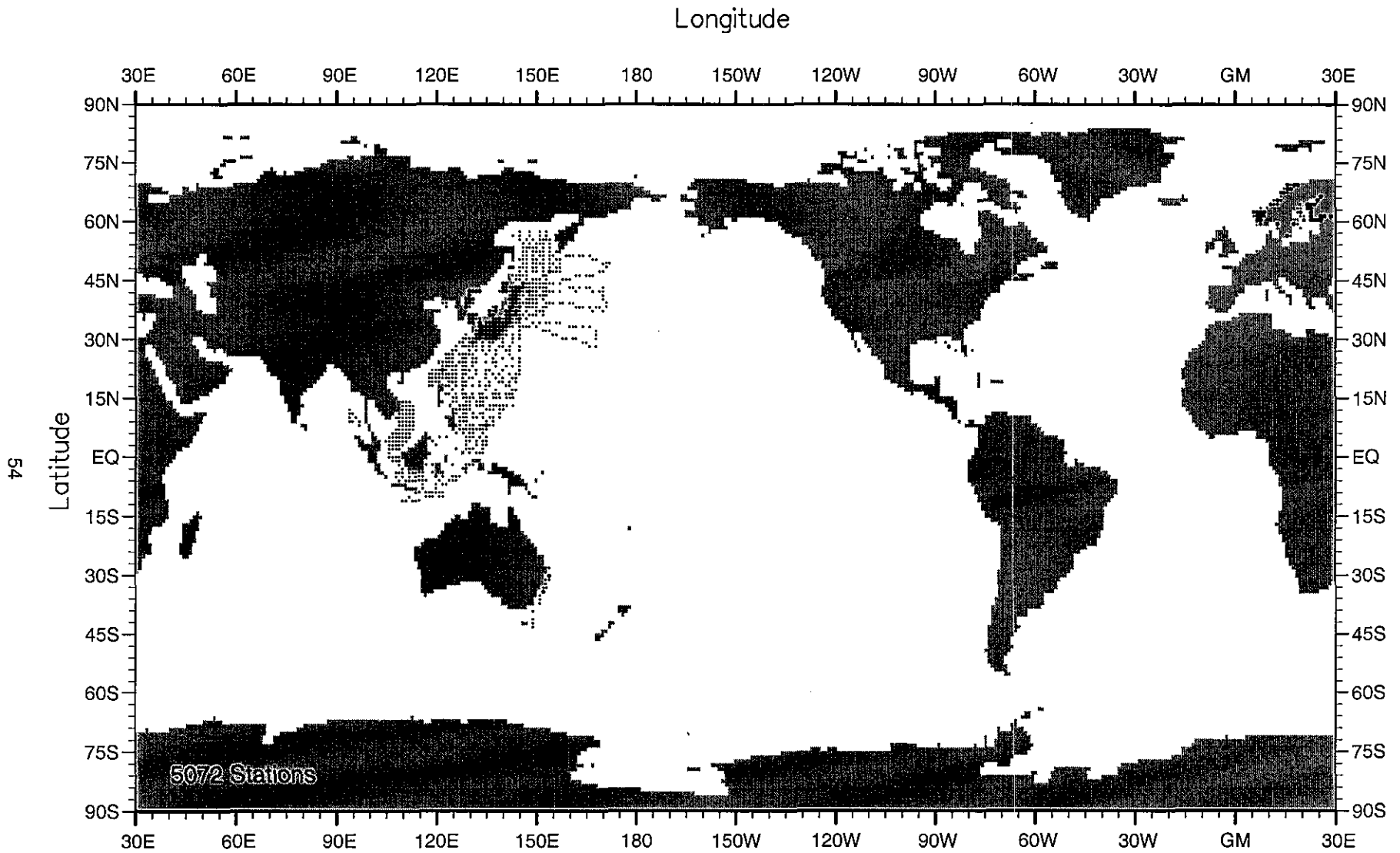


Fig. A43 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1942

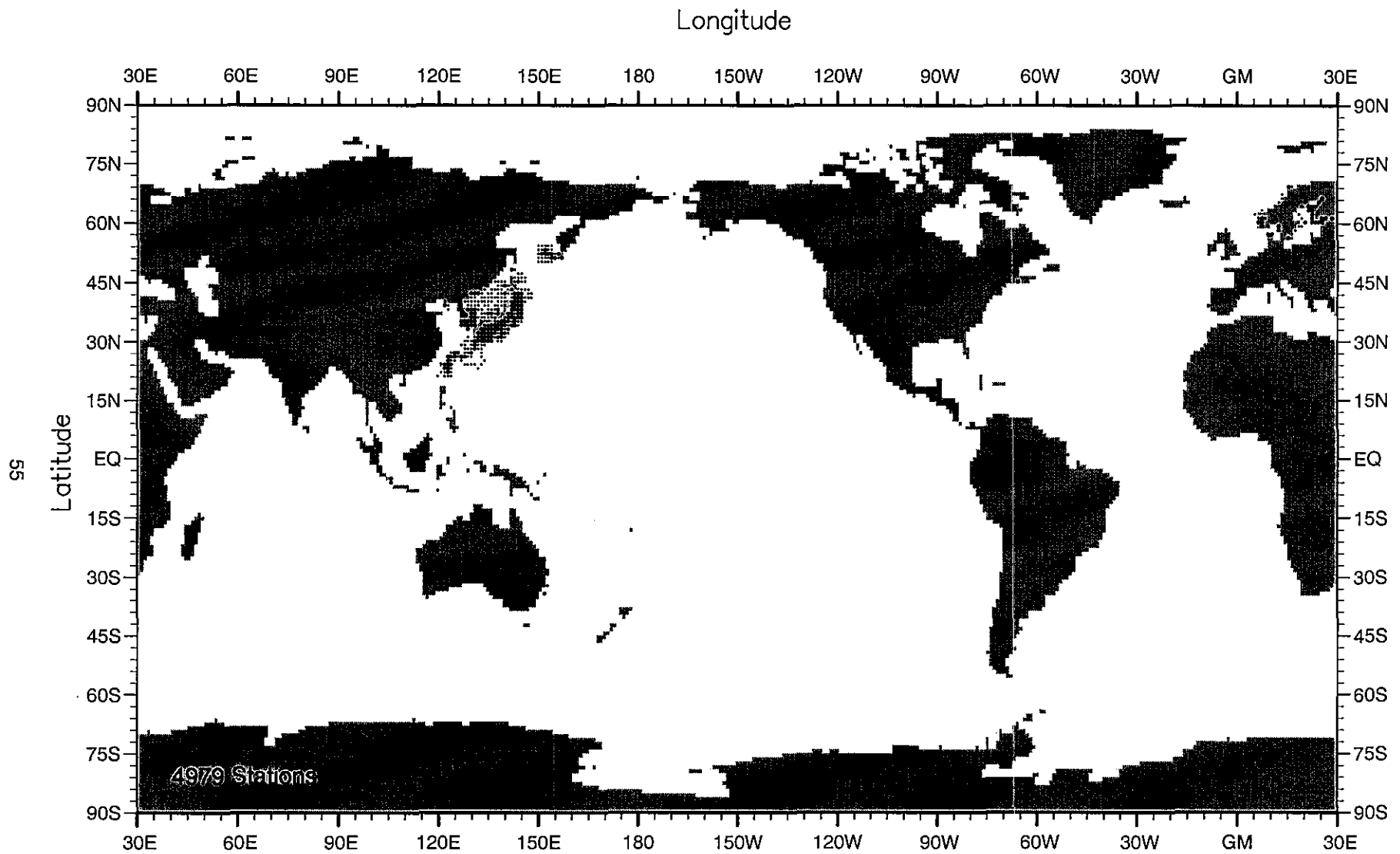


Fig. A44 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1943

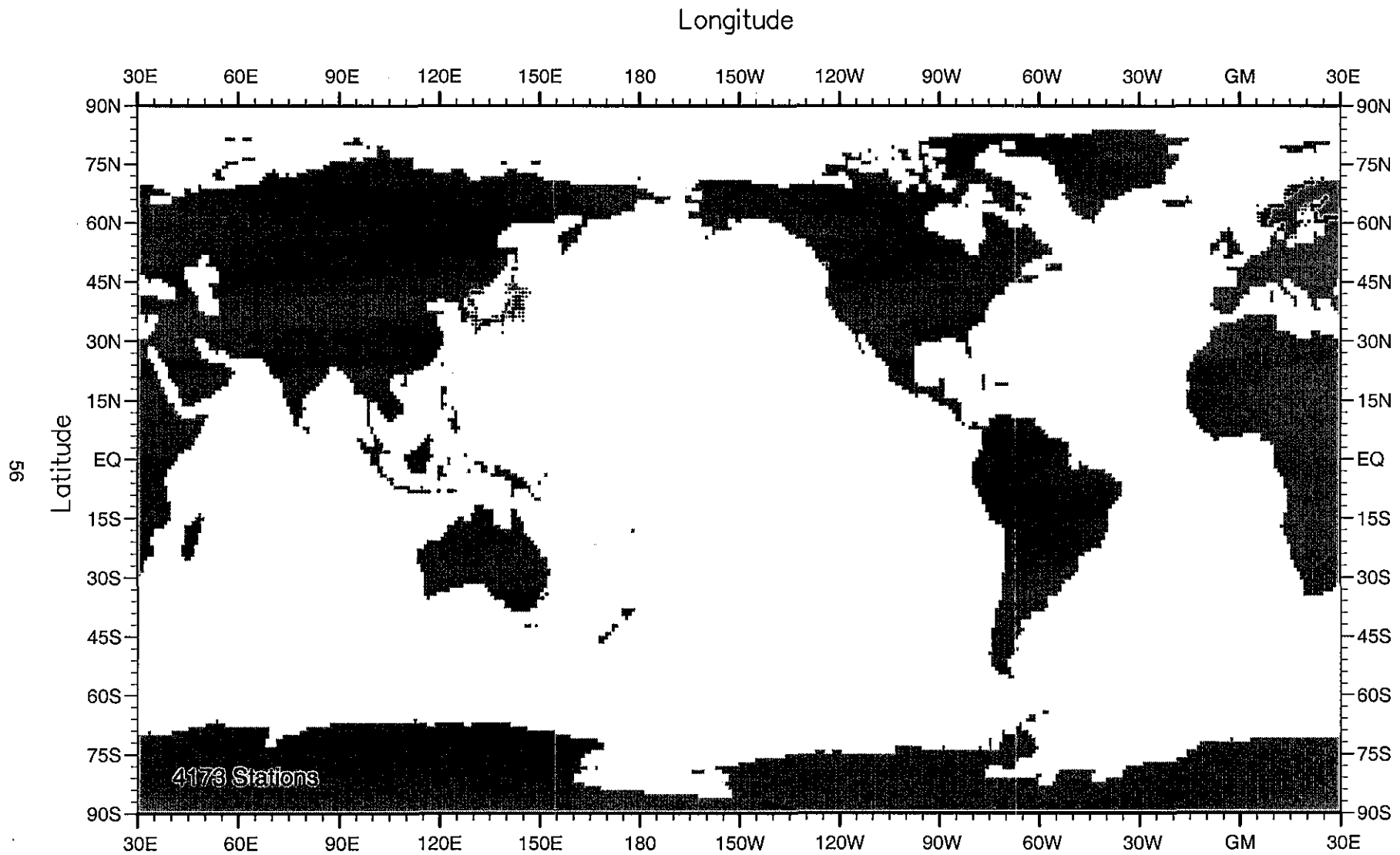


Fig. A45 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1944

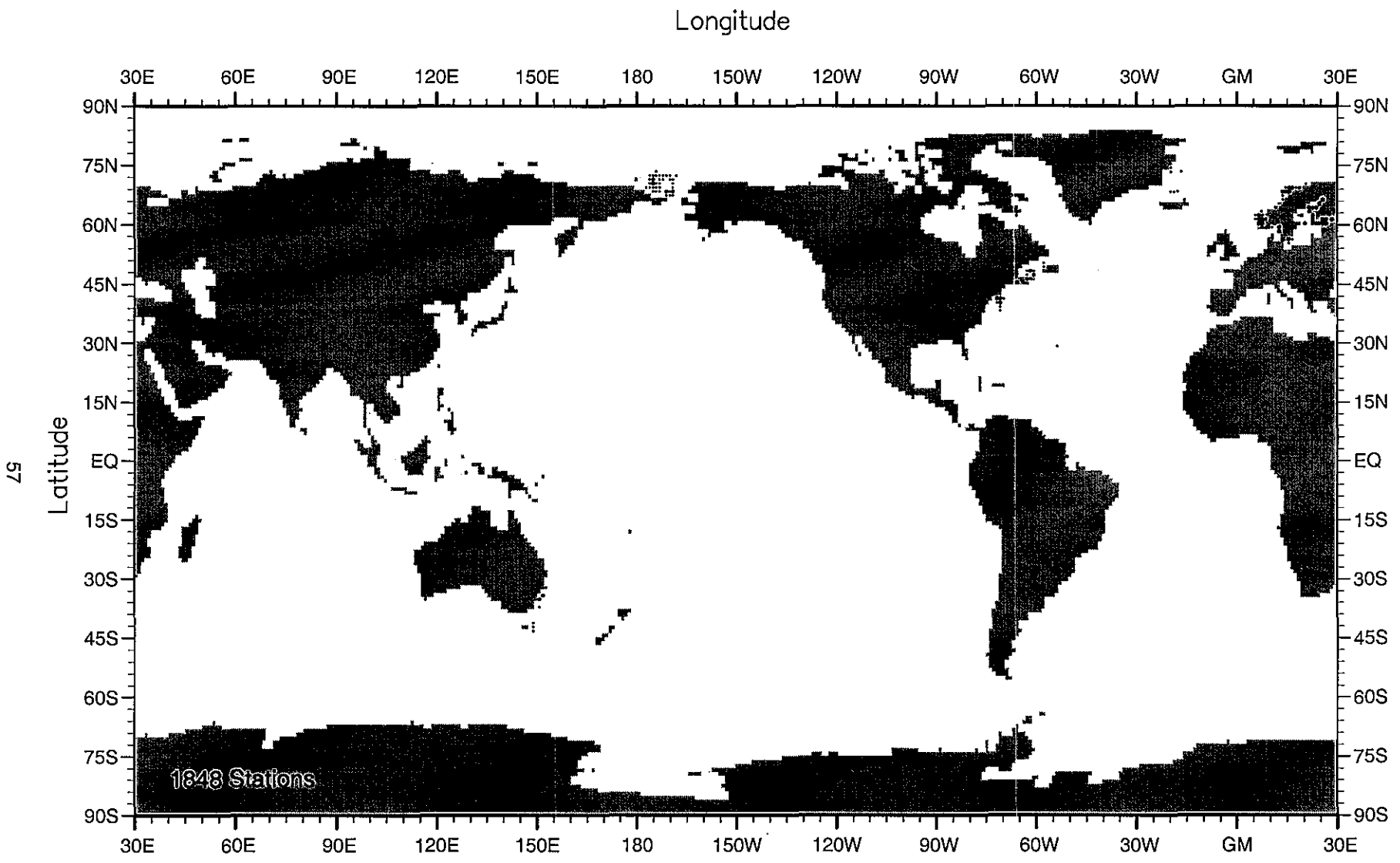


Fig. A46 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1945

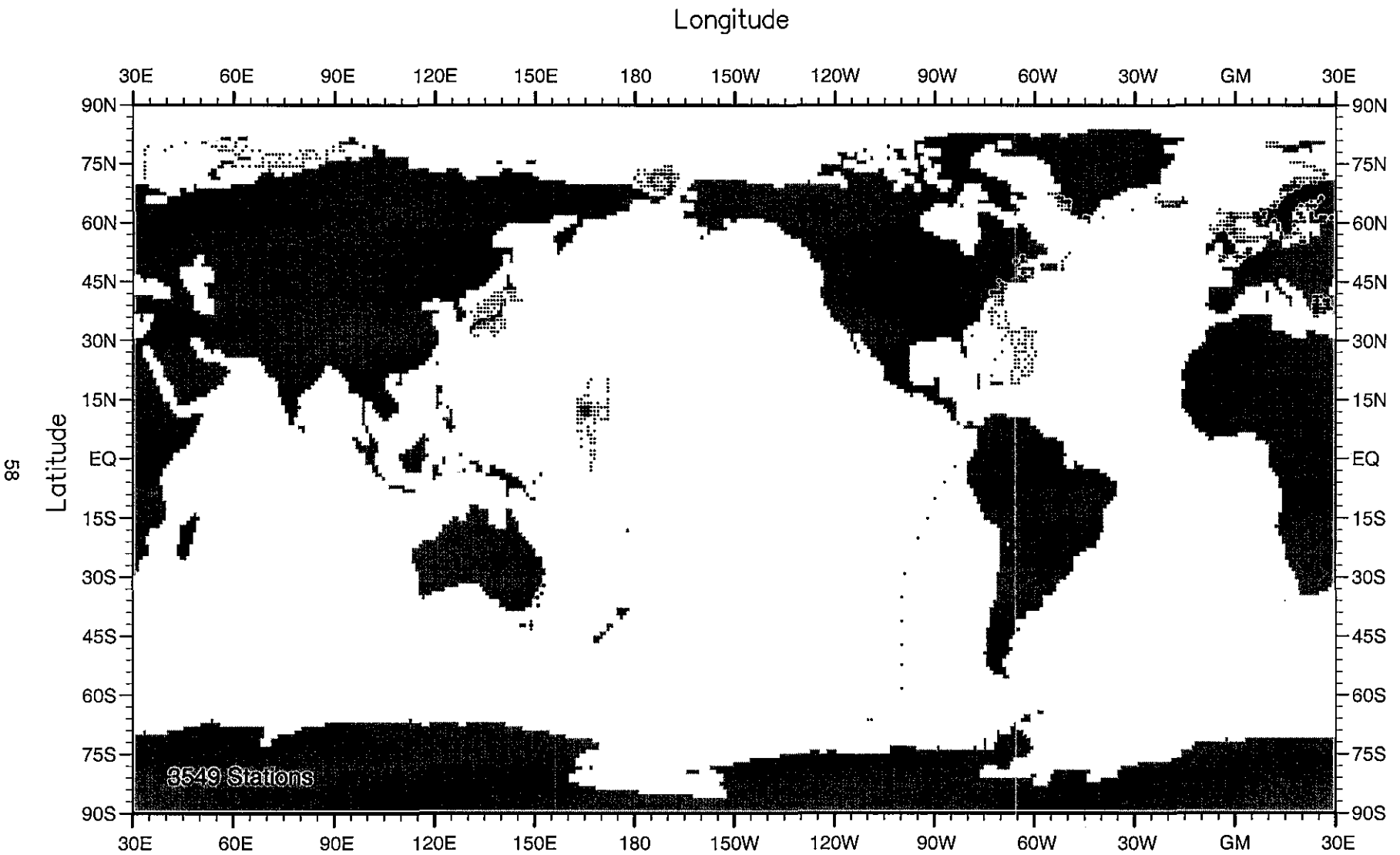


Fig. A47 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1946

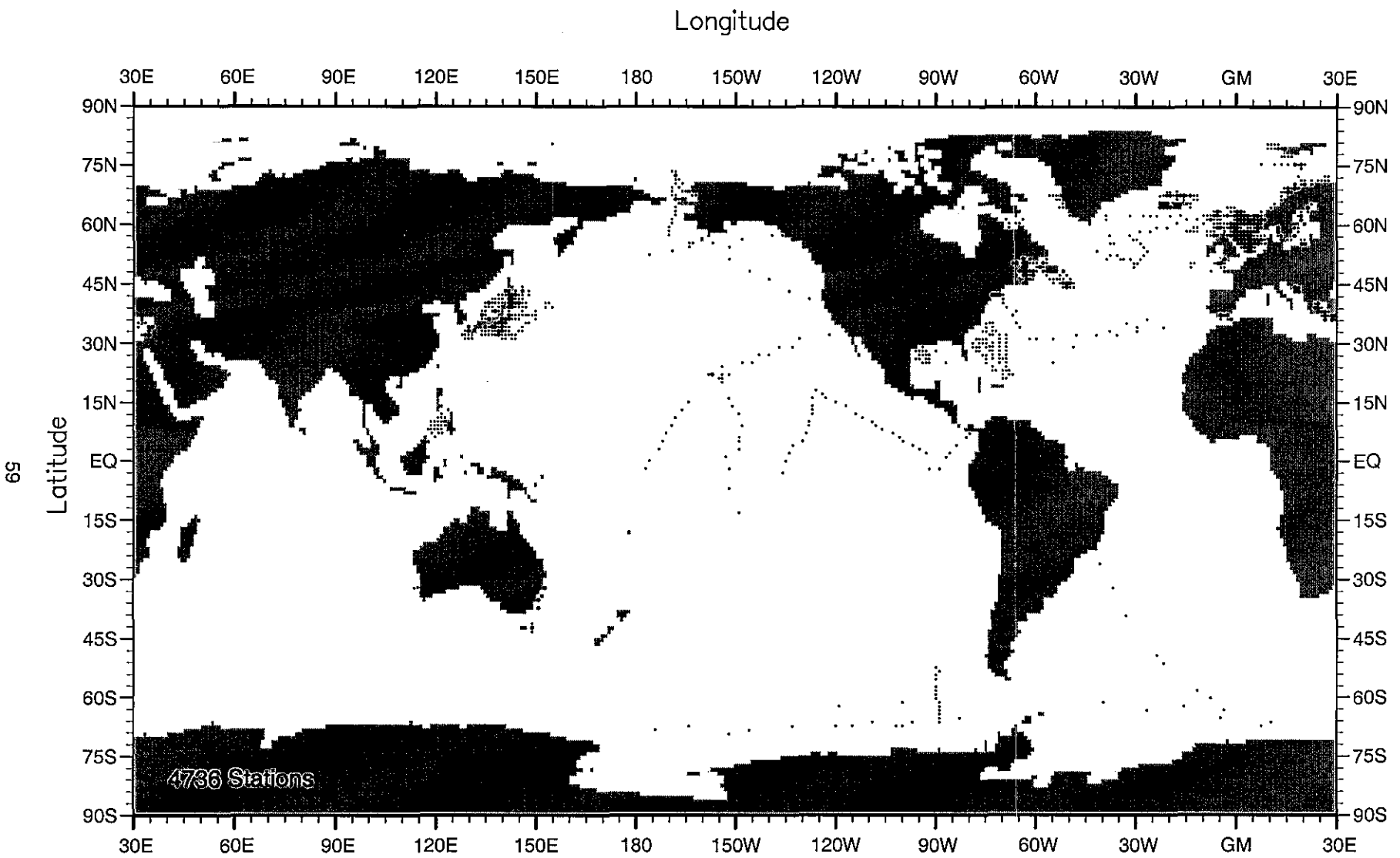


Fig. A48 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1947

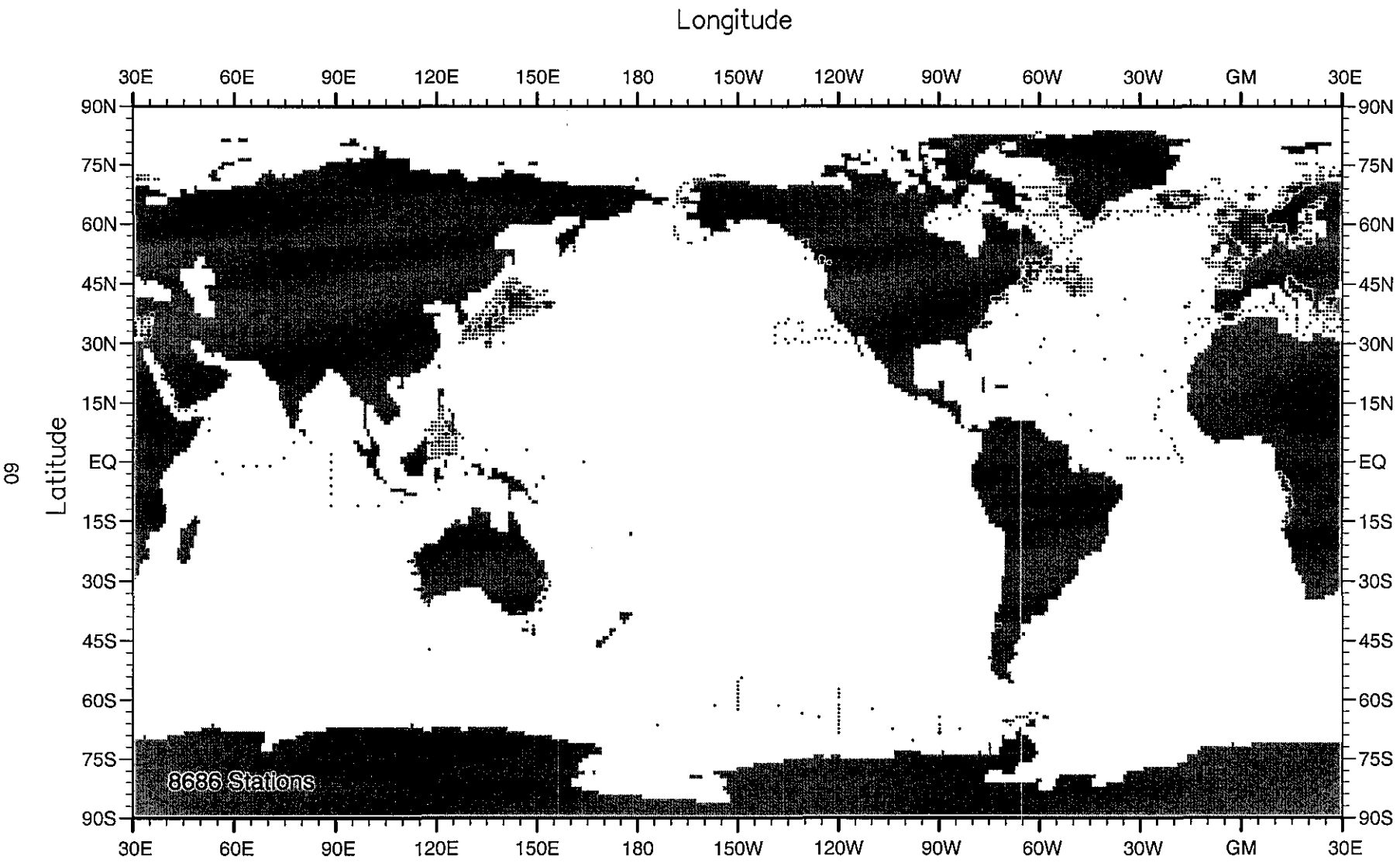


Fig. A49 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1948

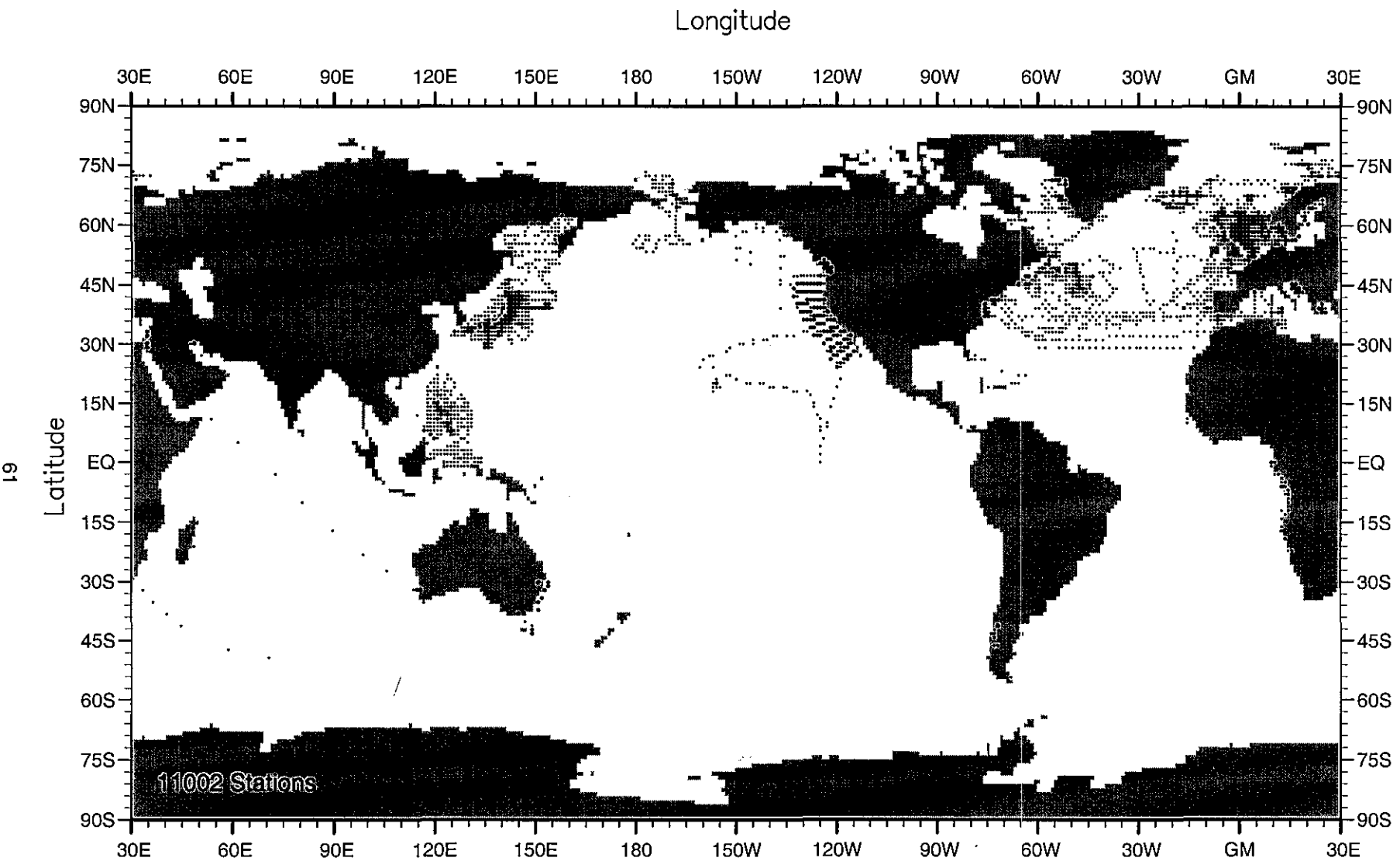


Fig. A50 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1949

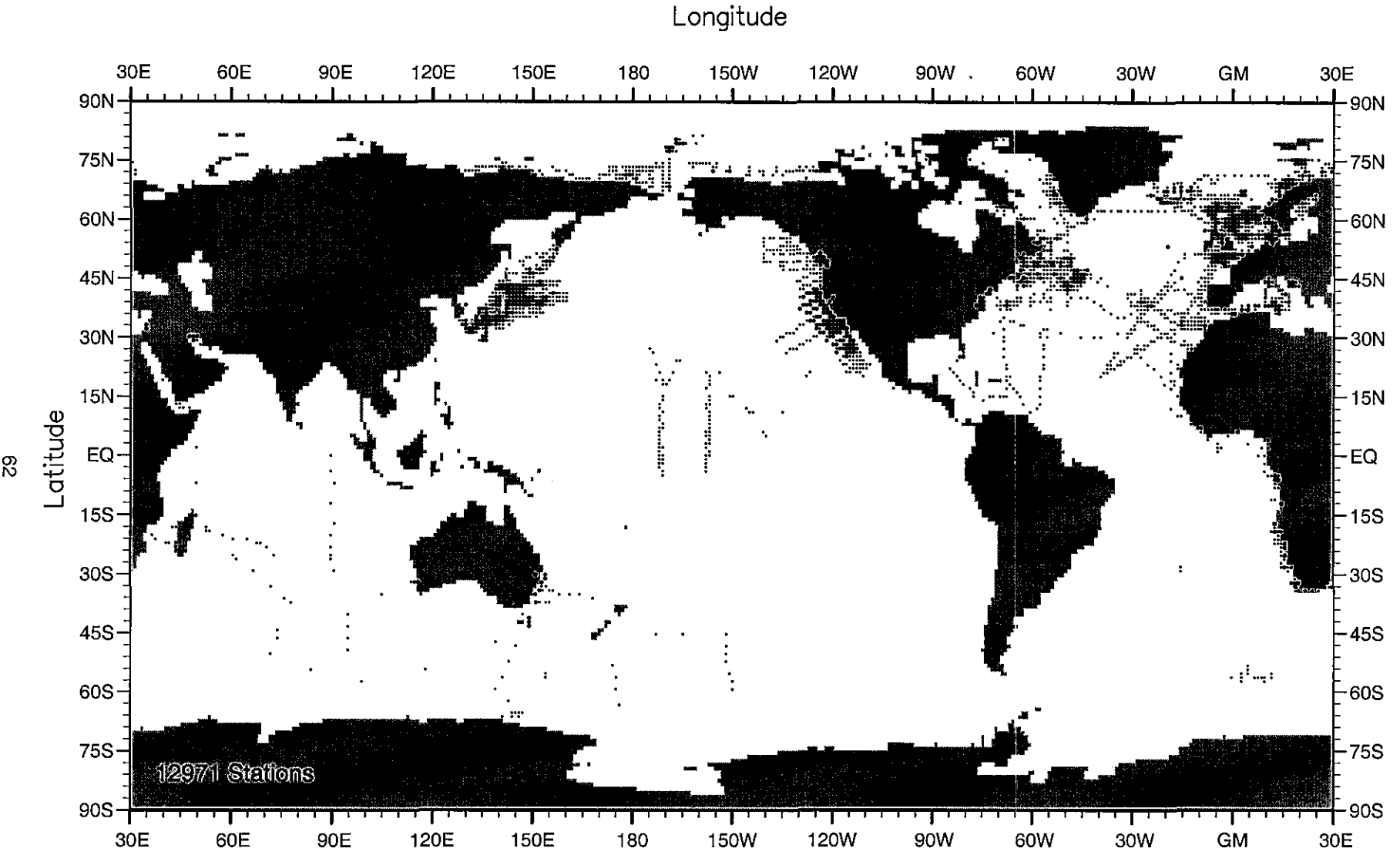


Fig. A51 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1950

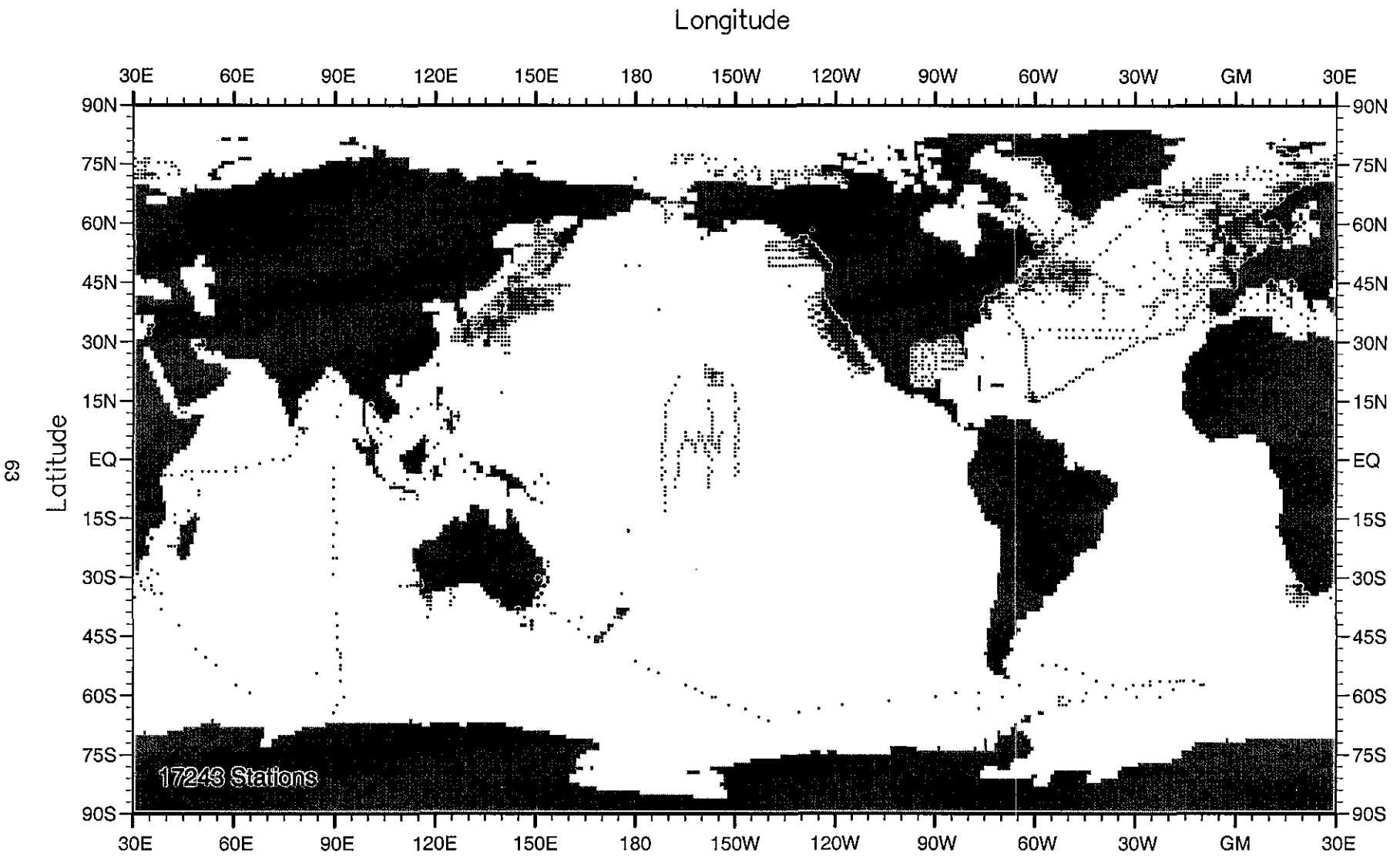


Fig. A52 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1951

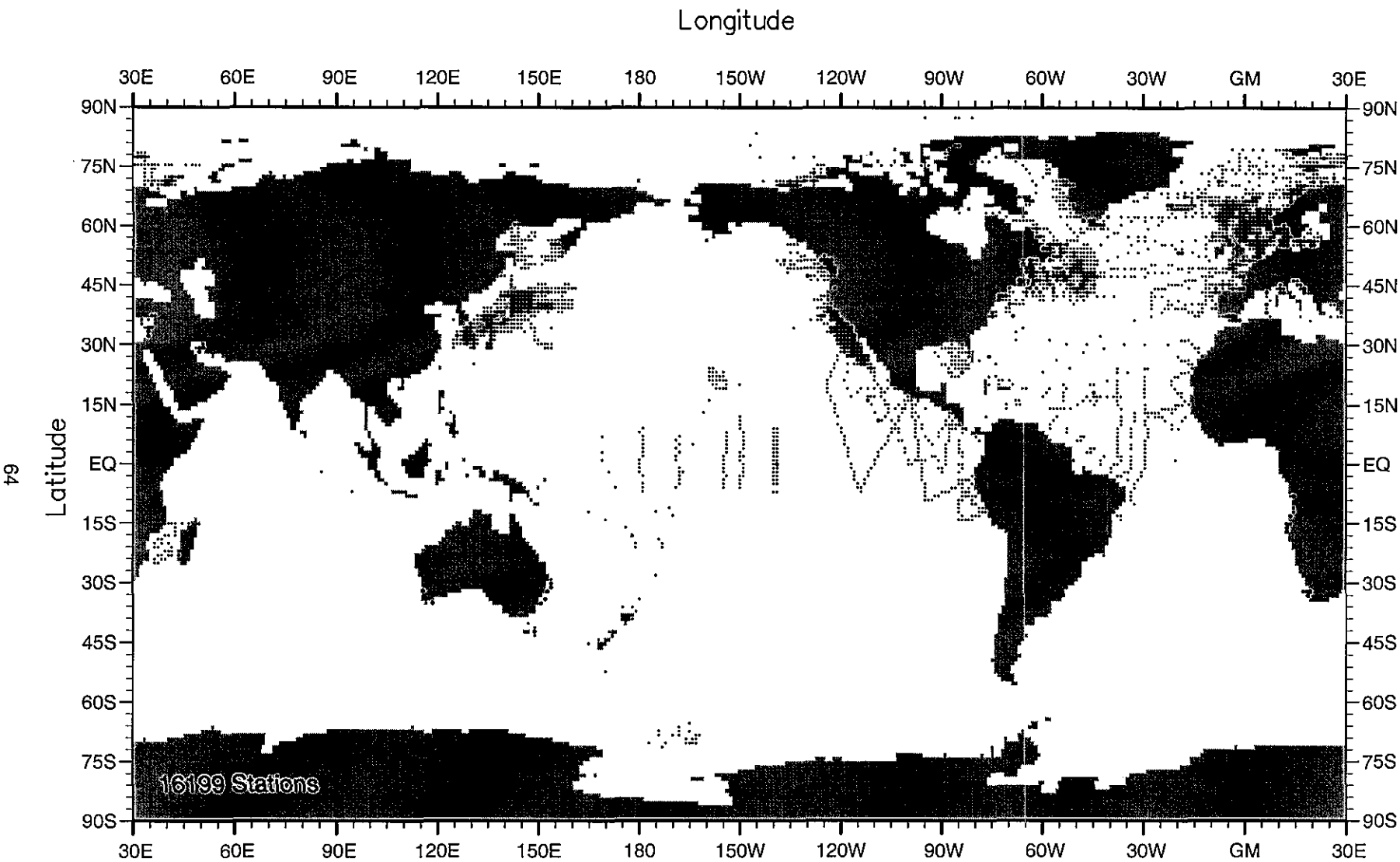


Fig. A53 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1952

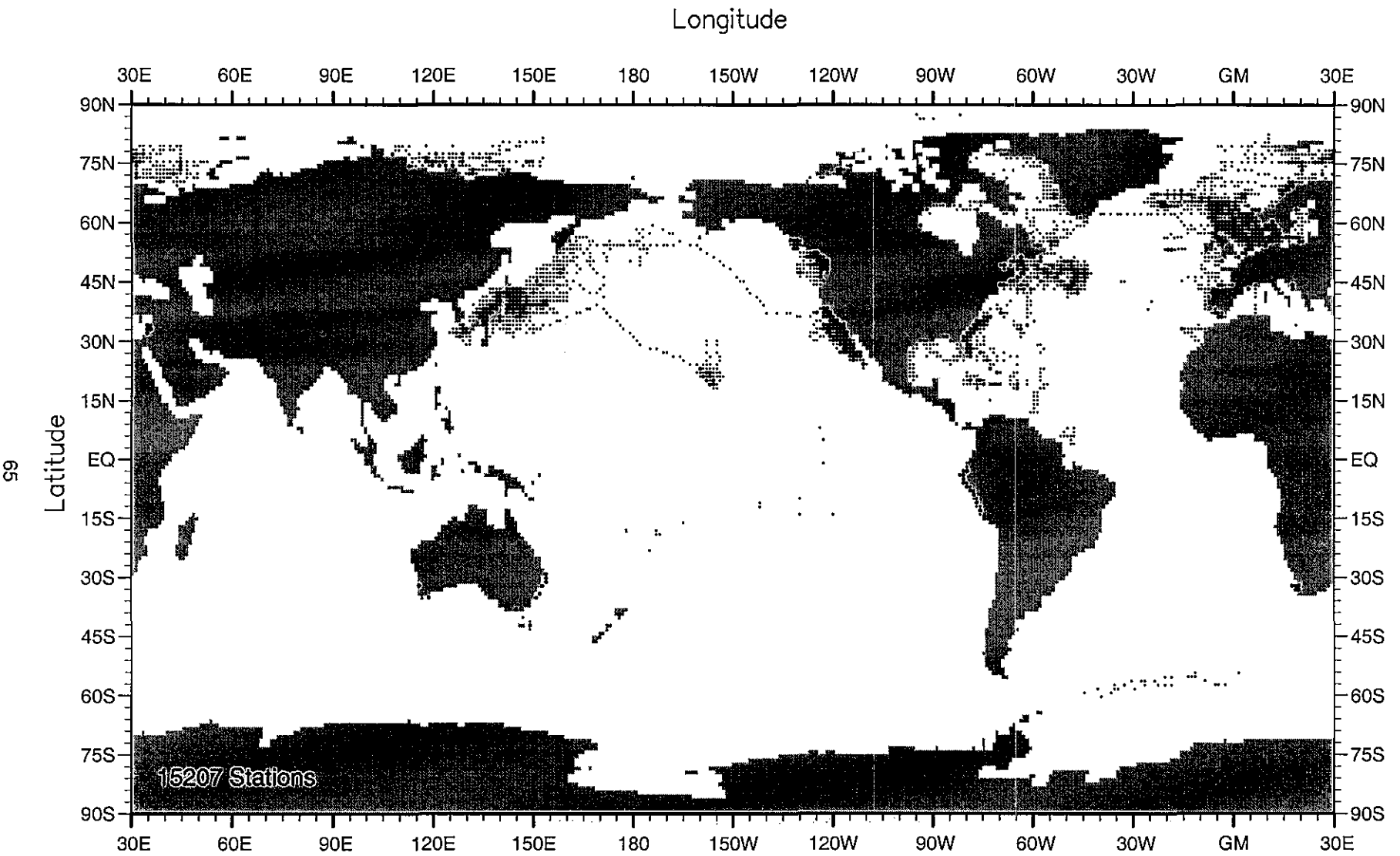


Fig. A54 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1953

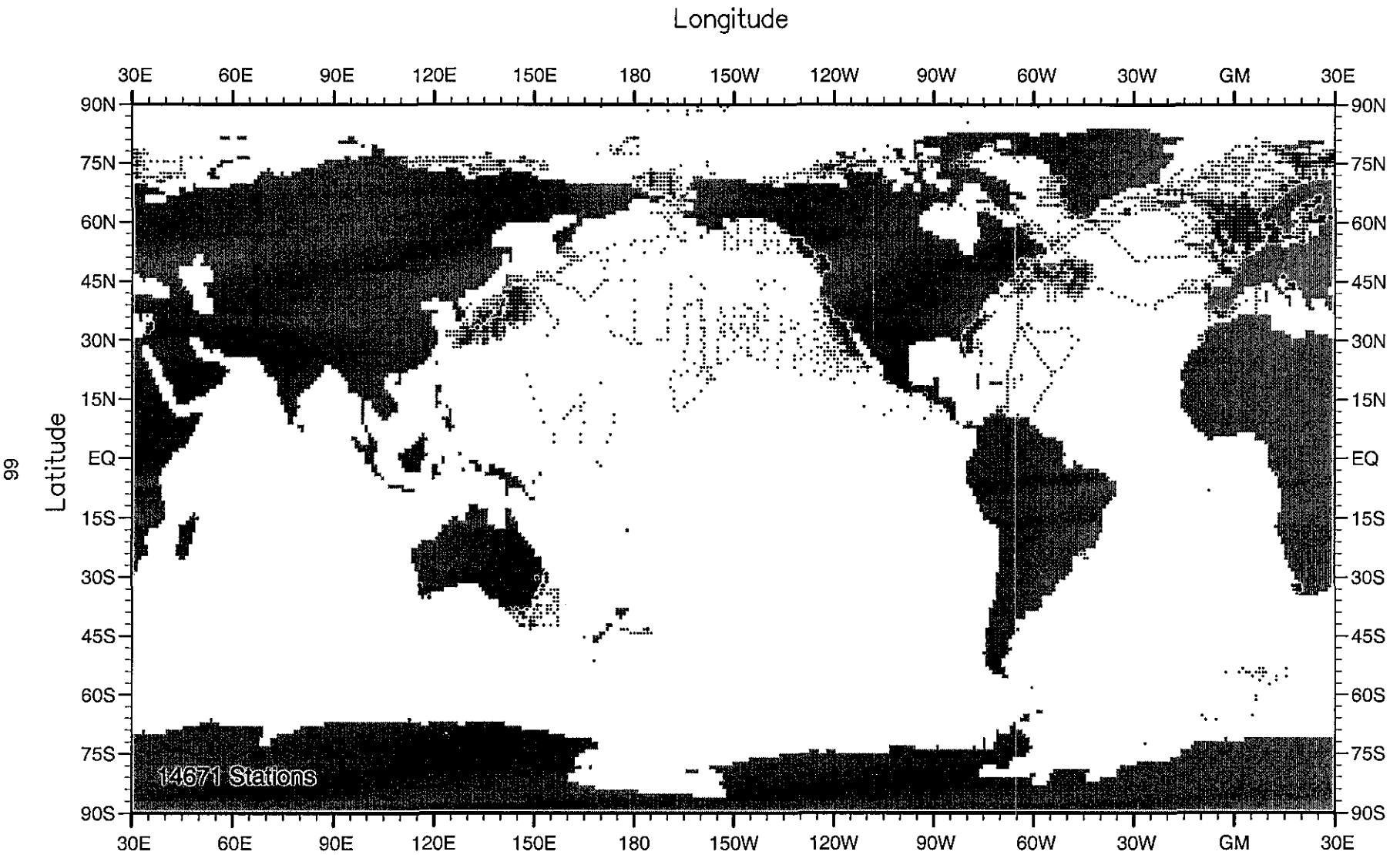


Fig. A55 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1954

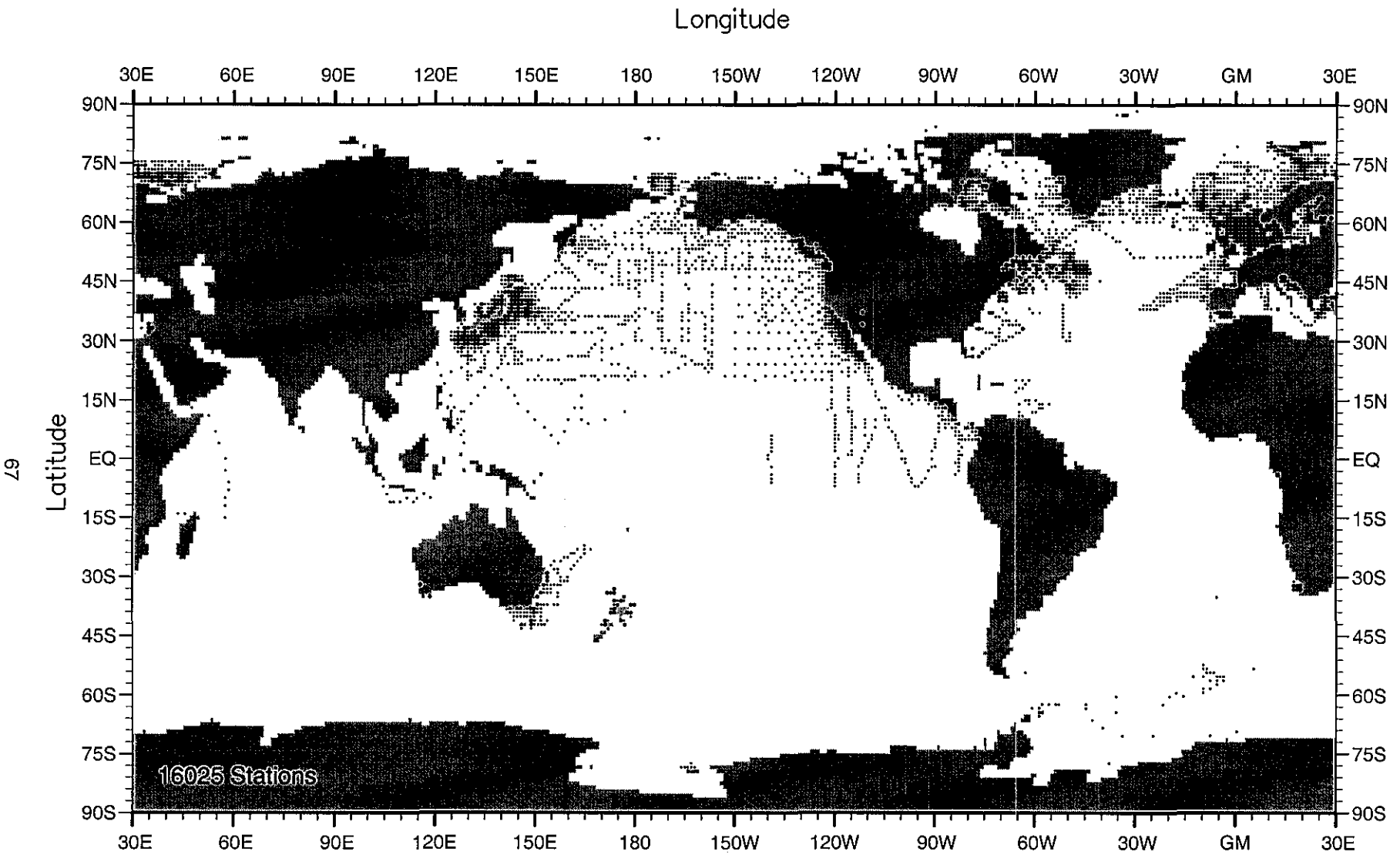


Fig. A56 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1955

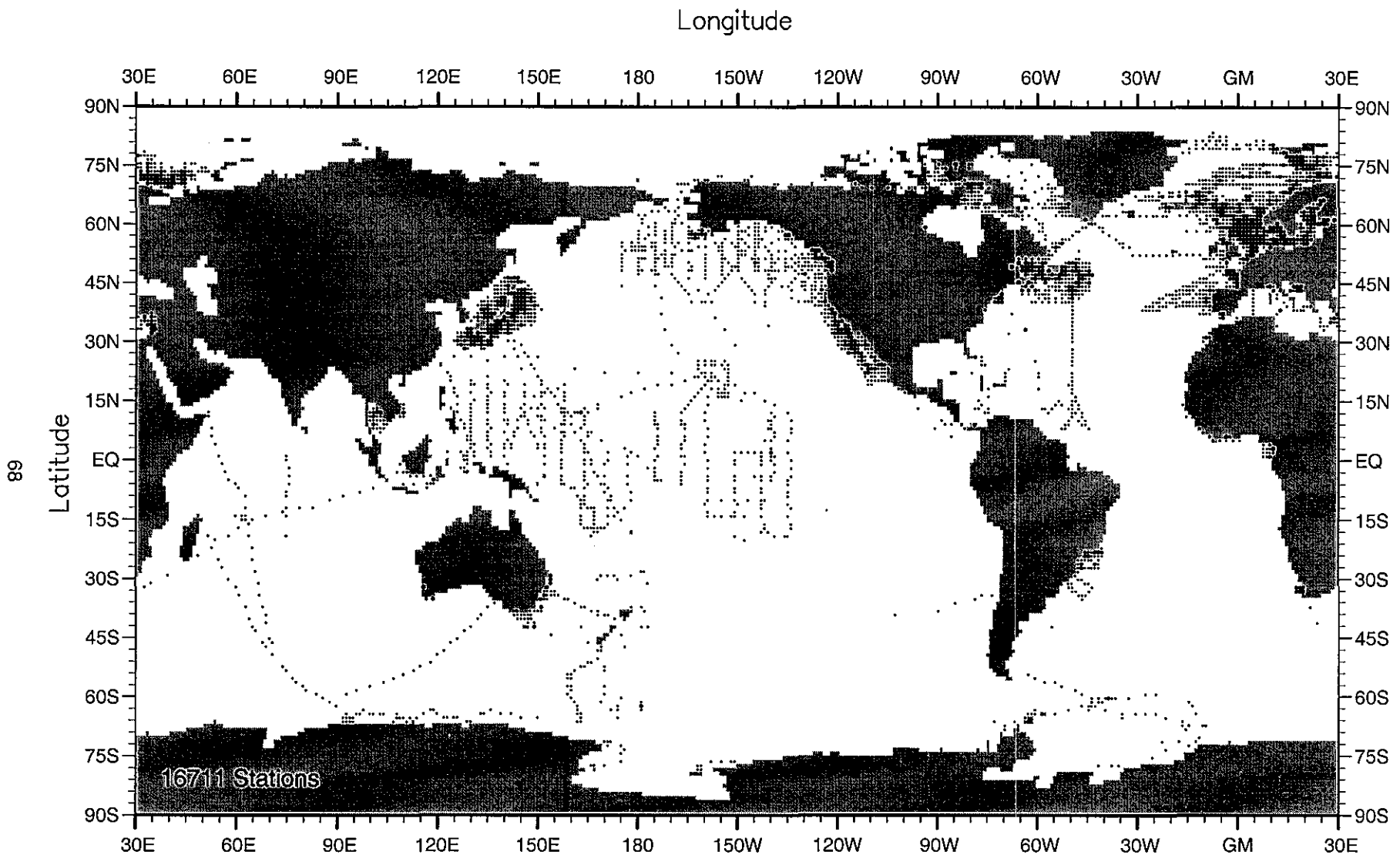


Fig. A57 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1956

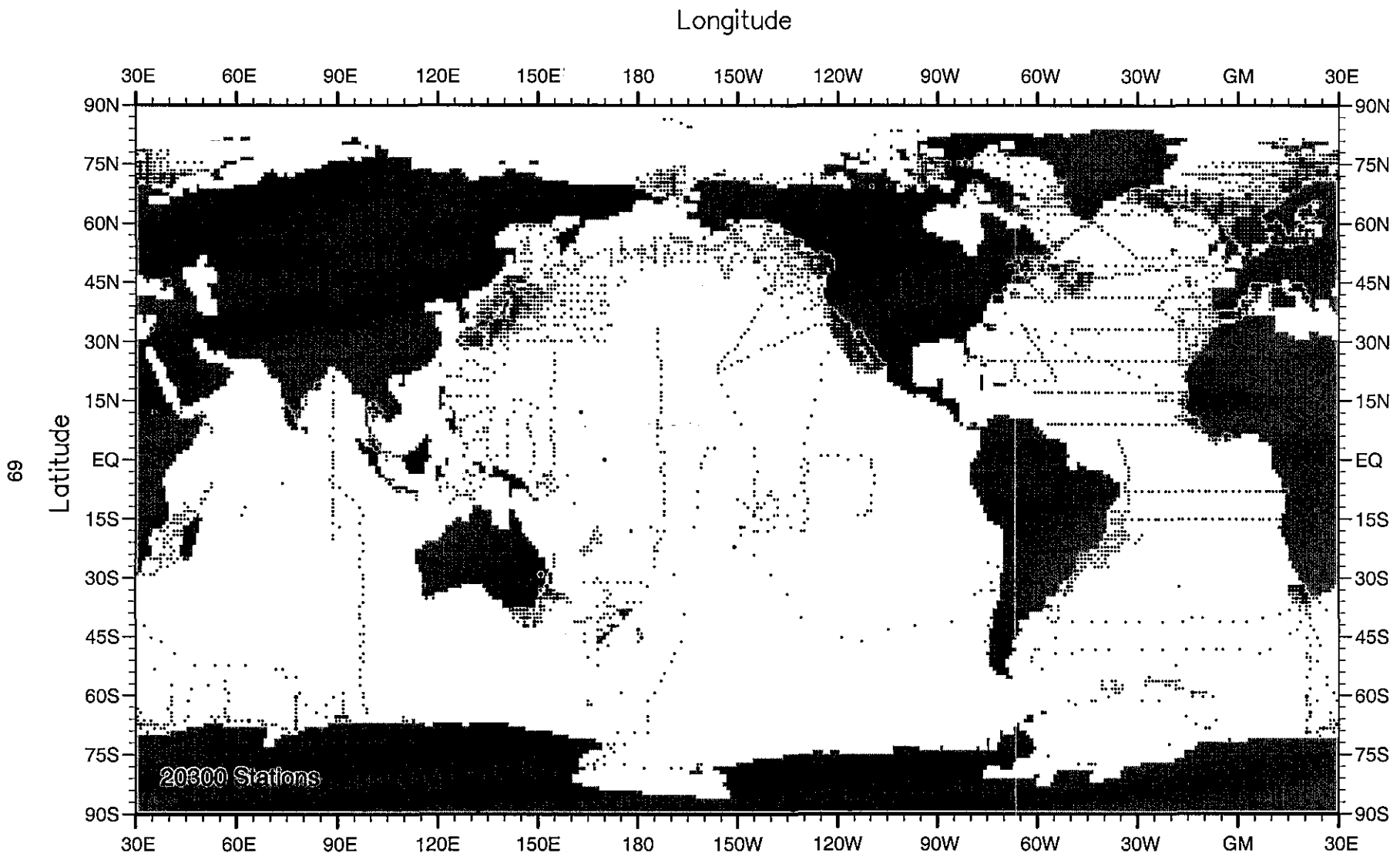


Fig. A58 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1957

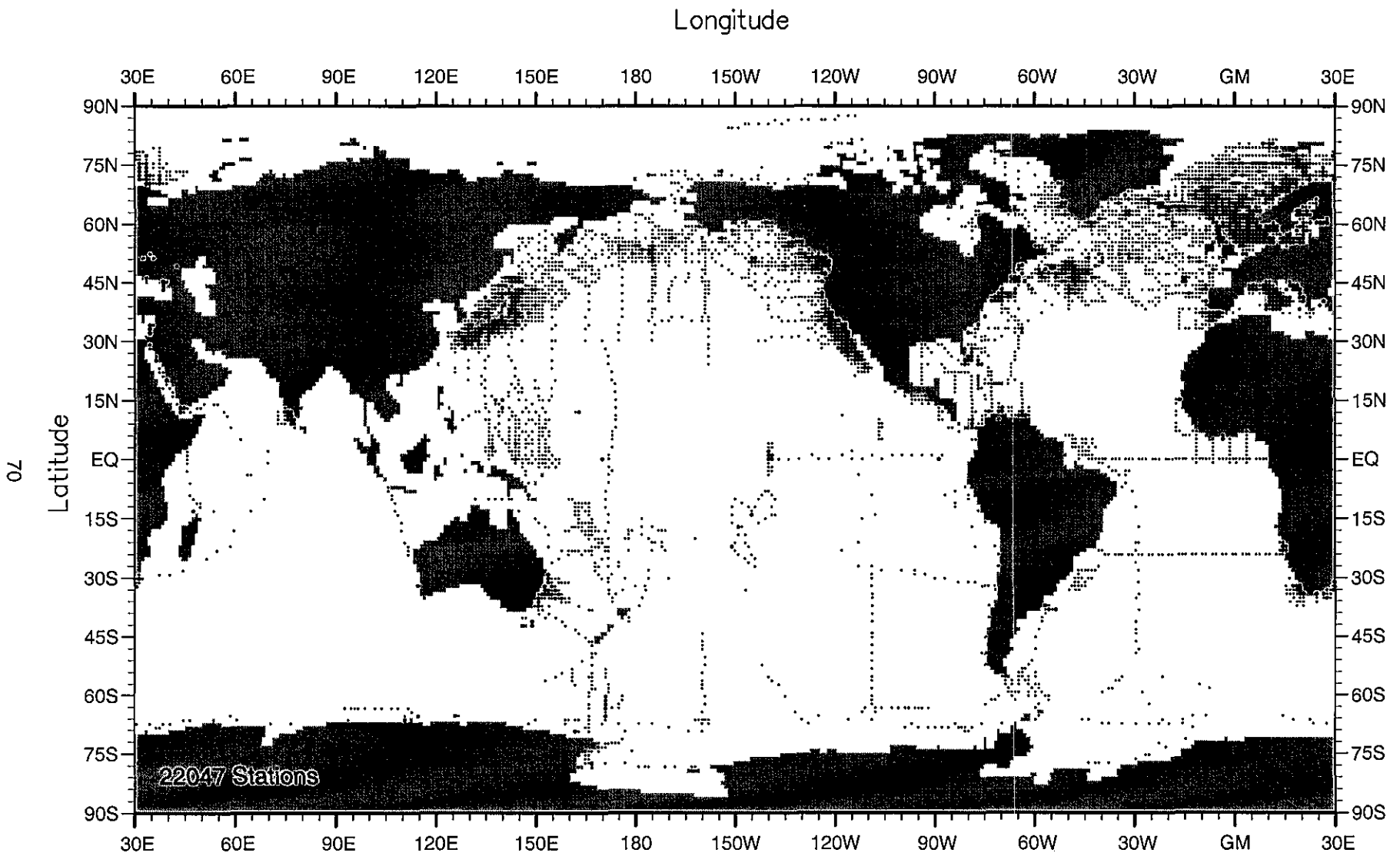


Fig. A59 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1958

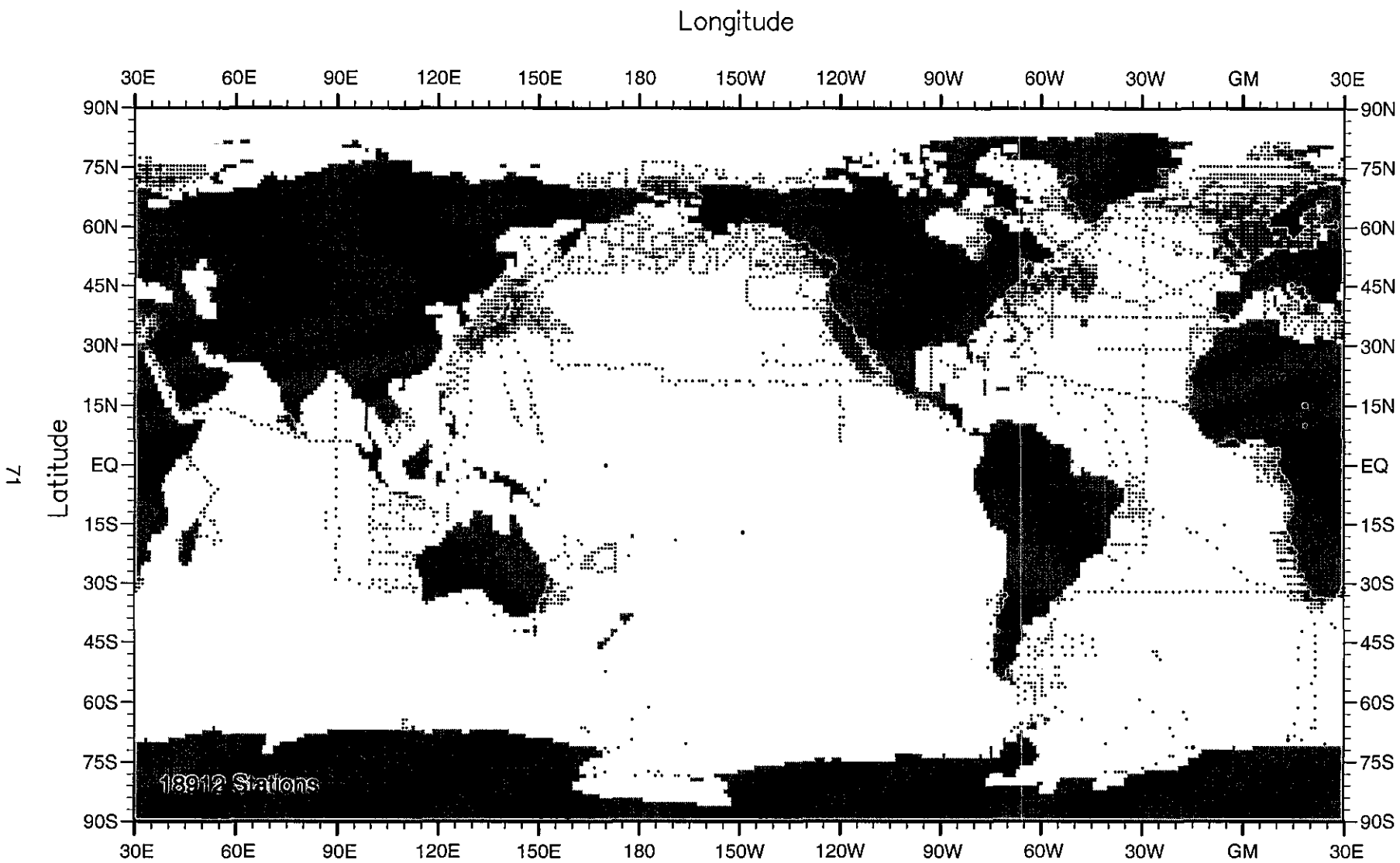


Fig. A60 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1959

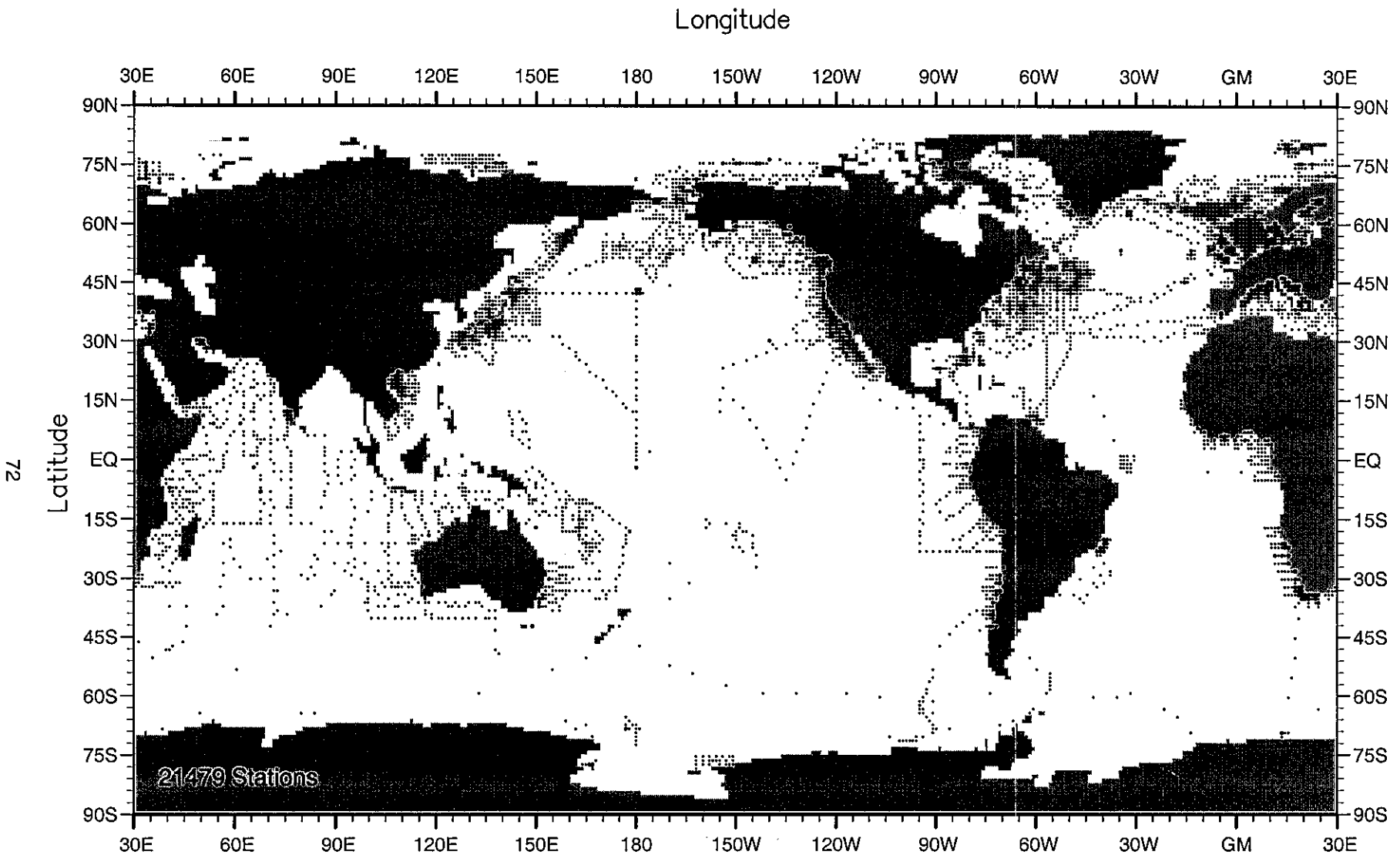


Fig. A61 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1960

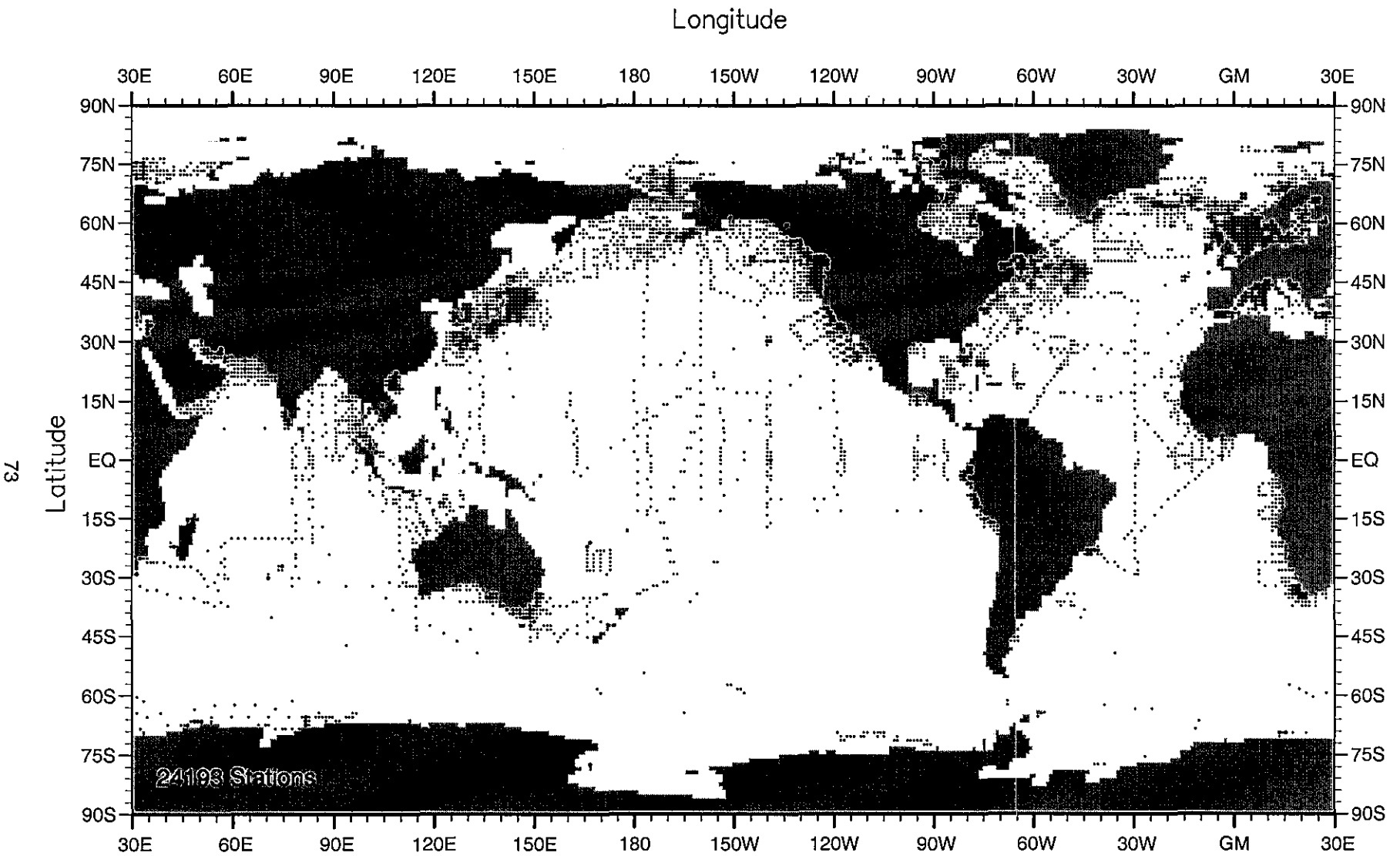


Fig. A62 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1961

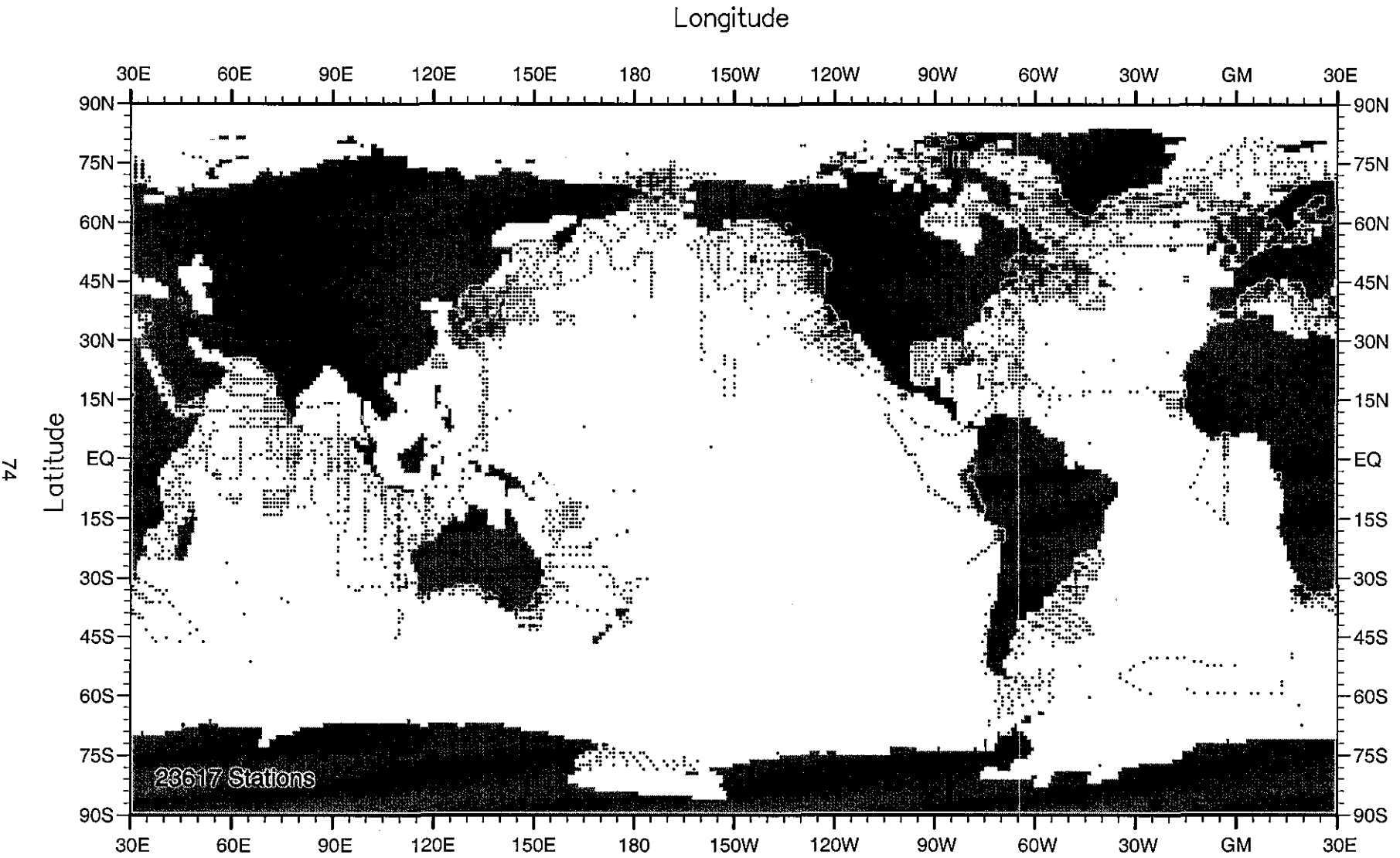


Fig. A63 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1962

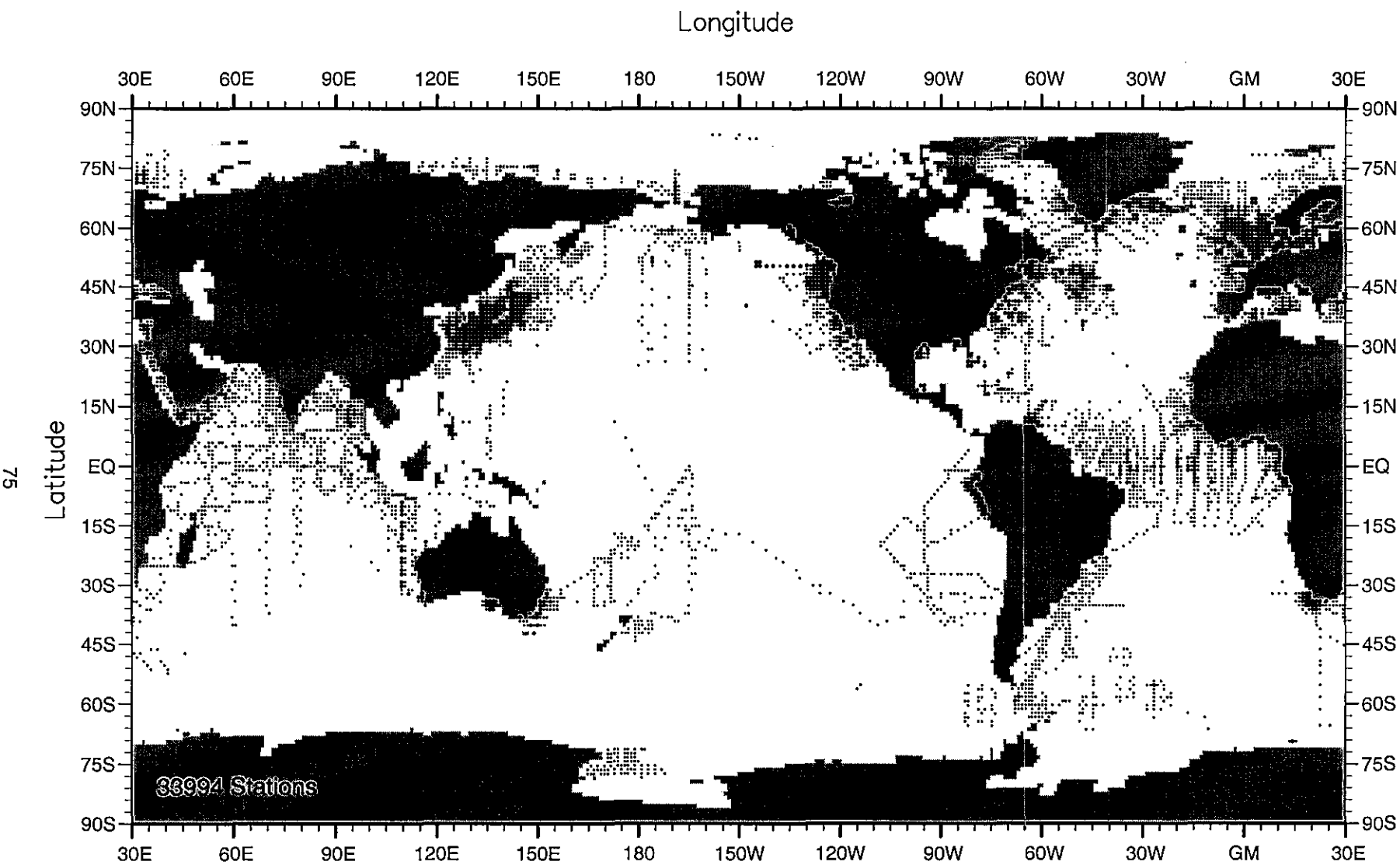


Fig. A64 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1963

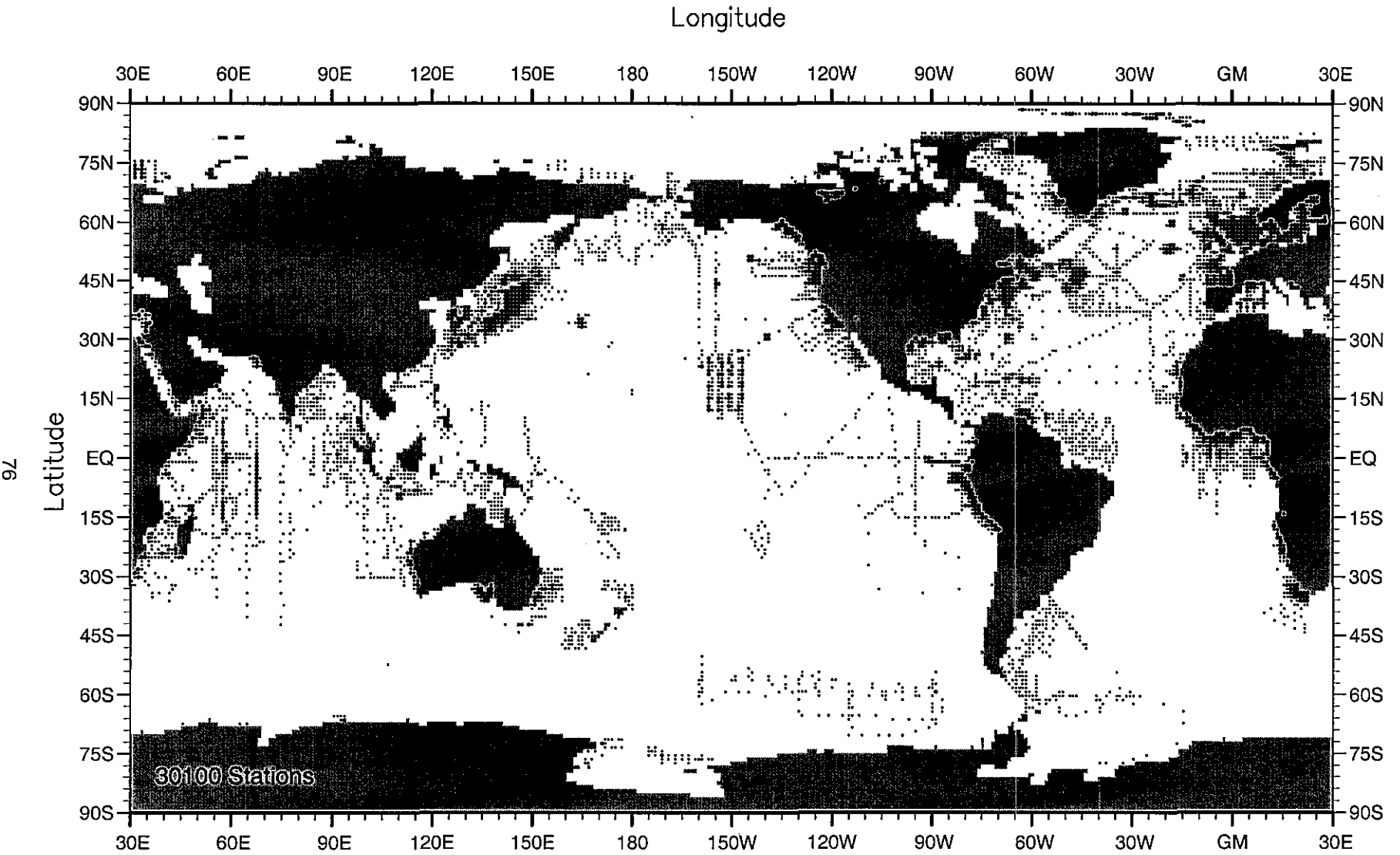


Fig. A65 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1964

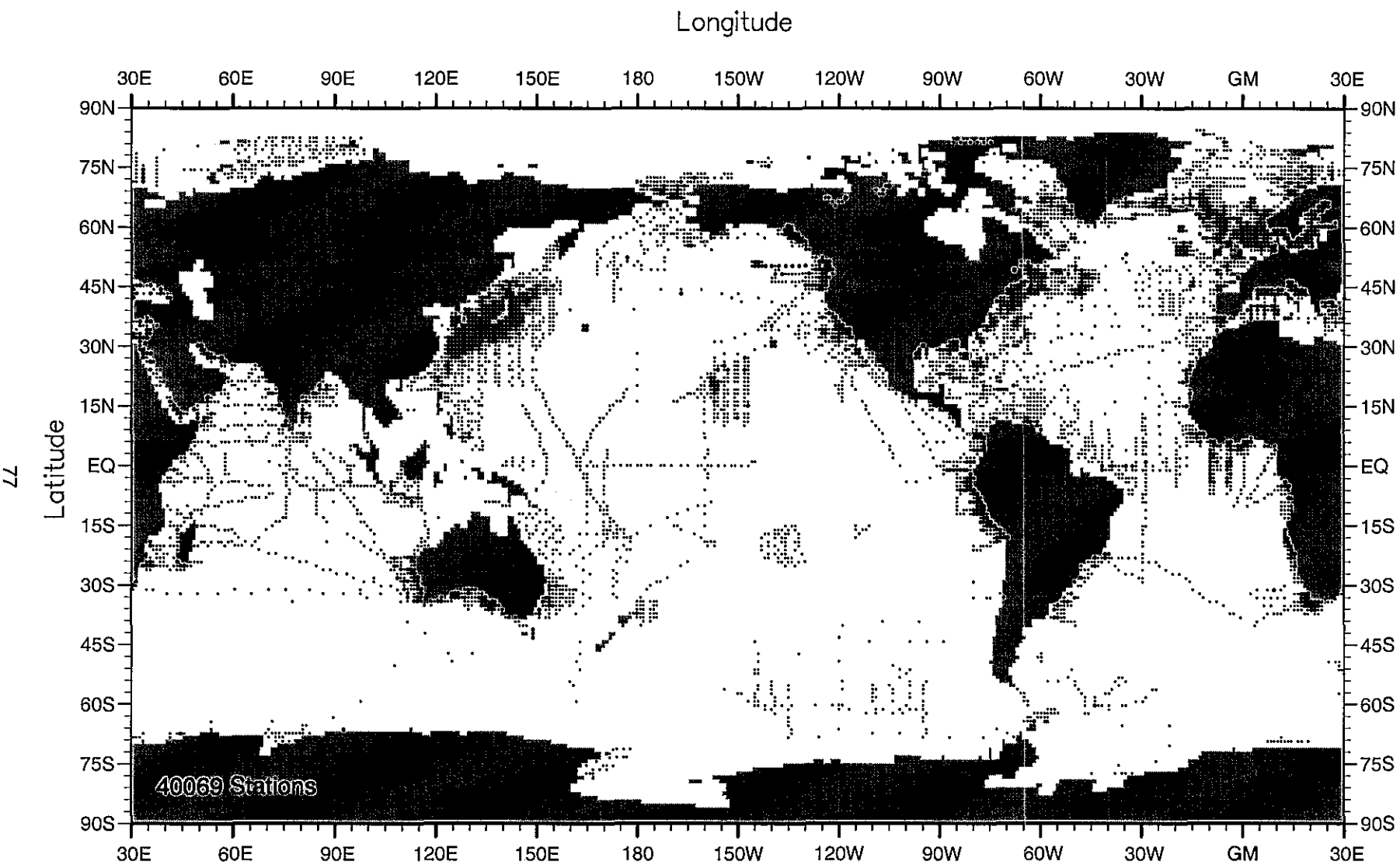


Fig. A66 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1965

Longitude

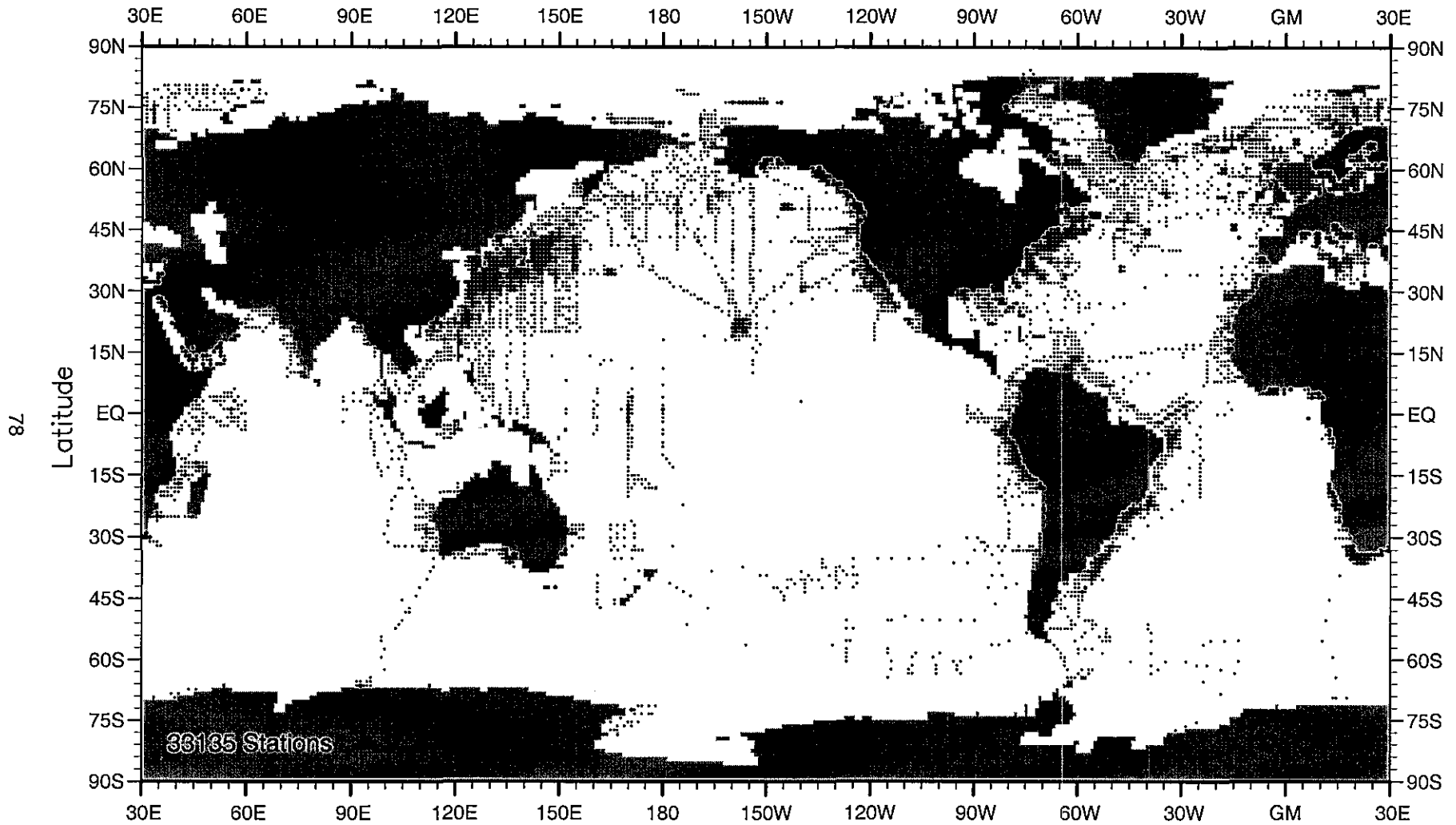


Fig. A67 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1966

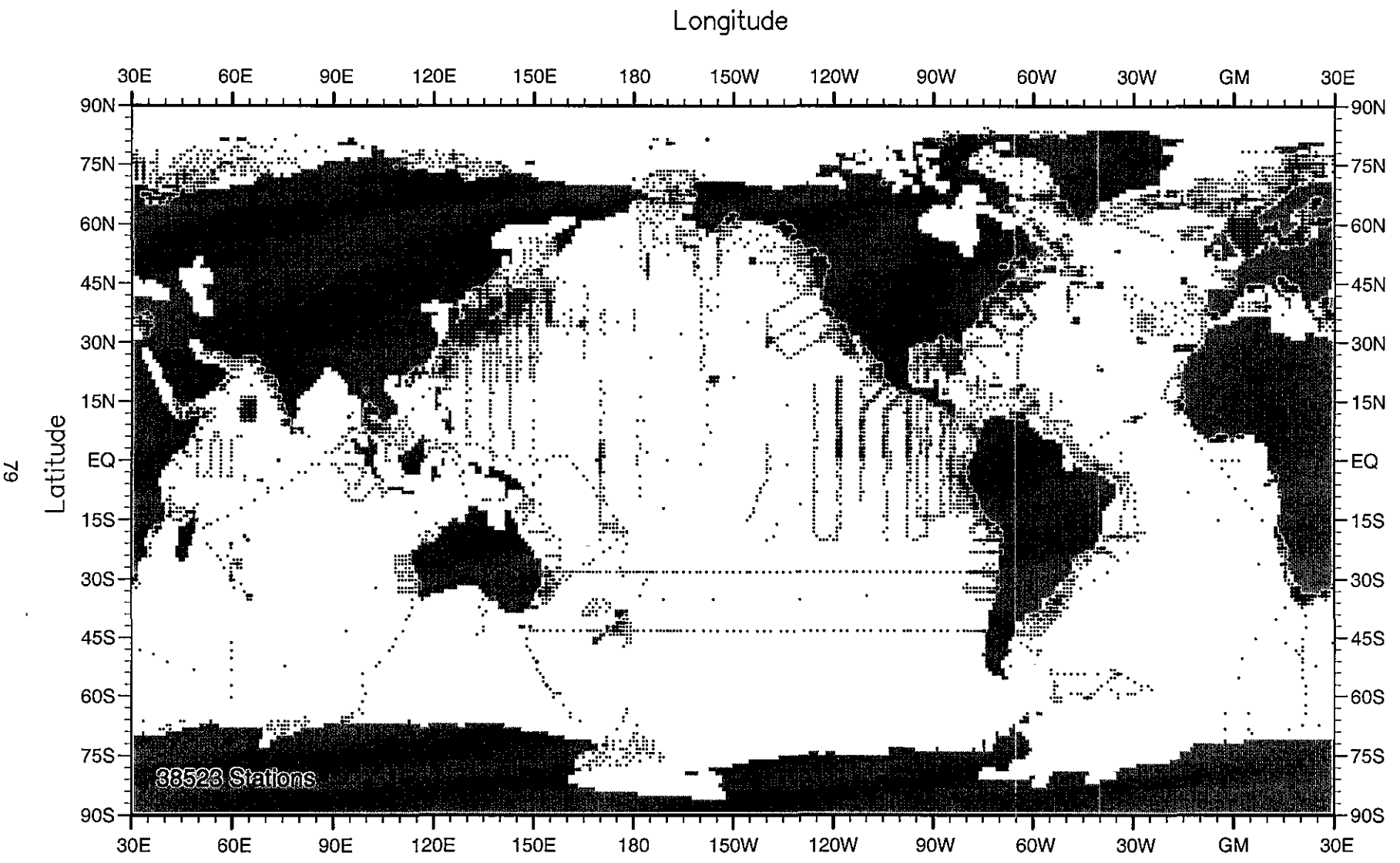


Fig. A68 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1967

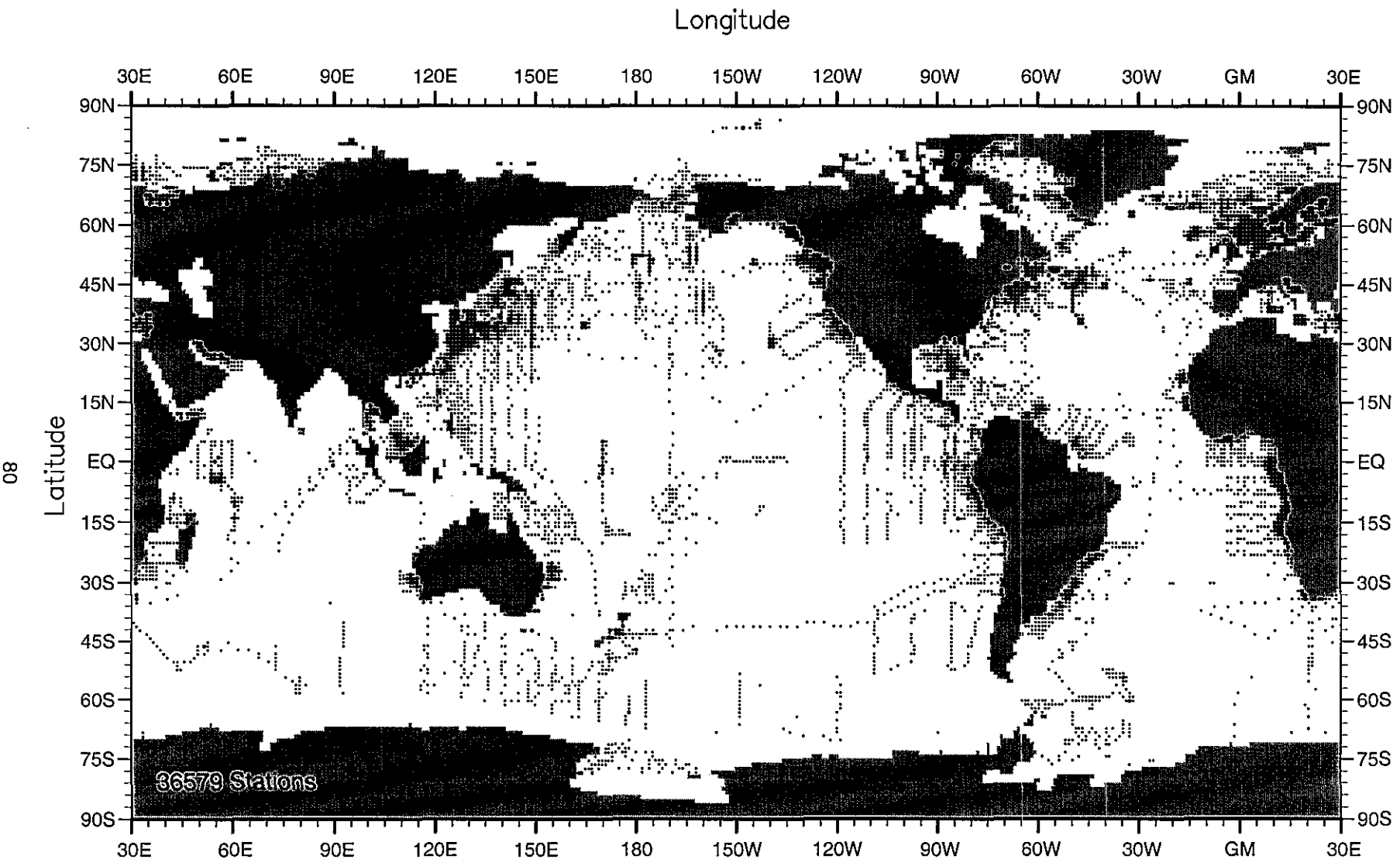


Fig. A69 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1968

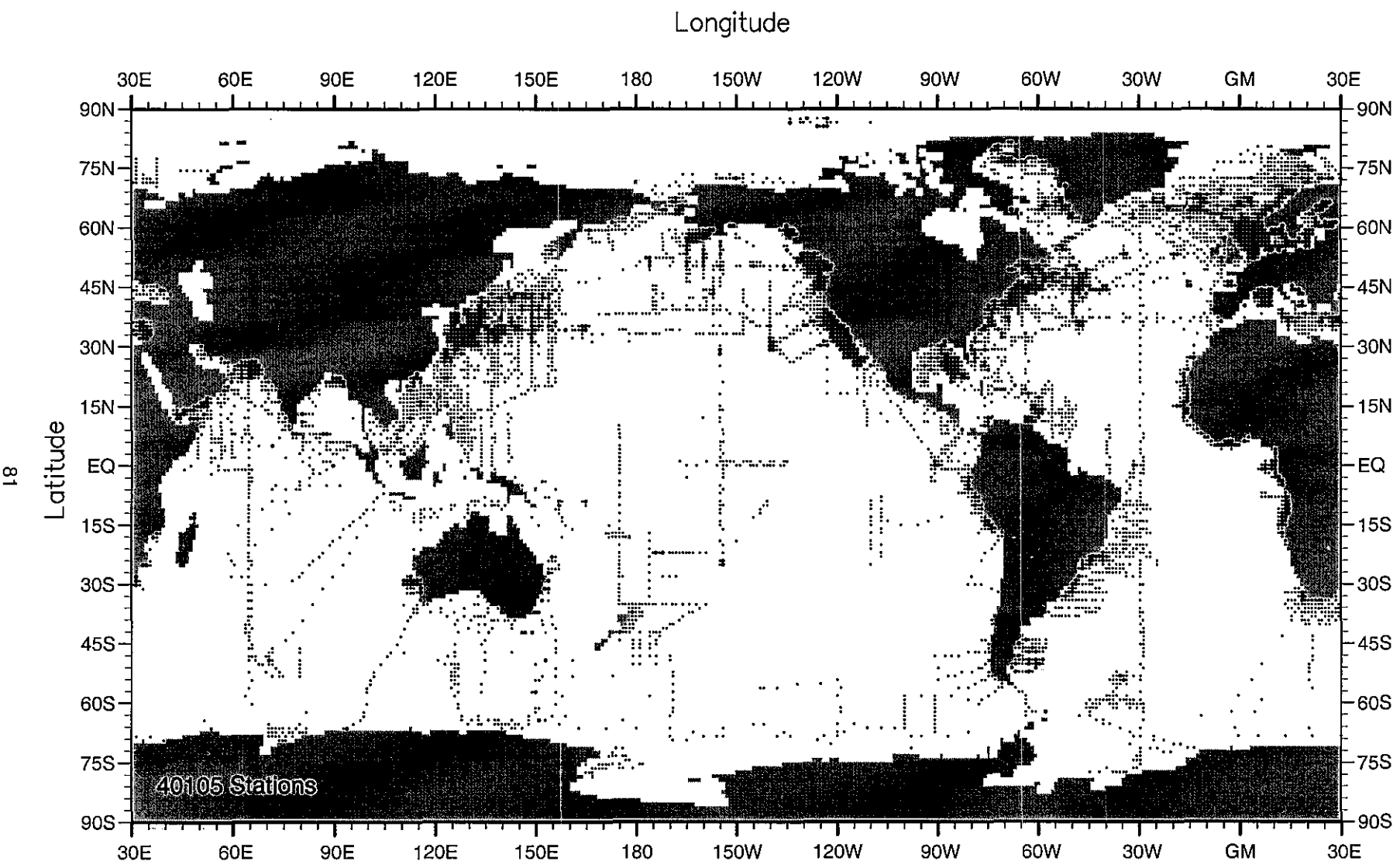


Fig. A70 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1969

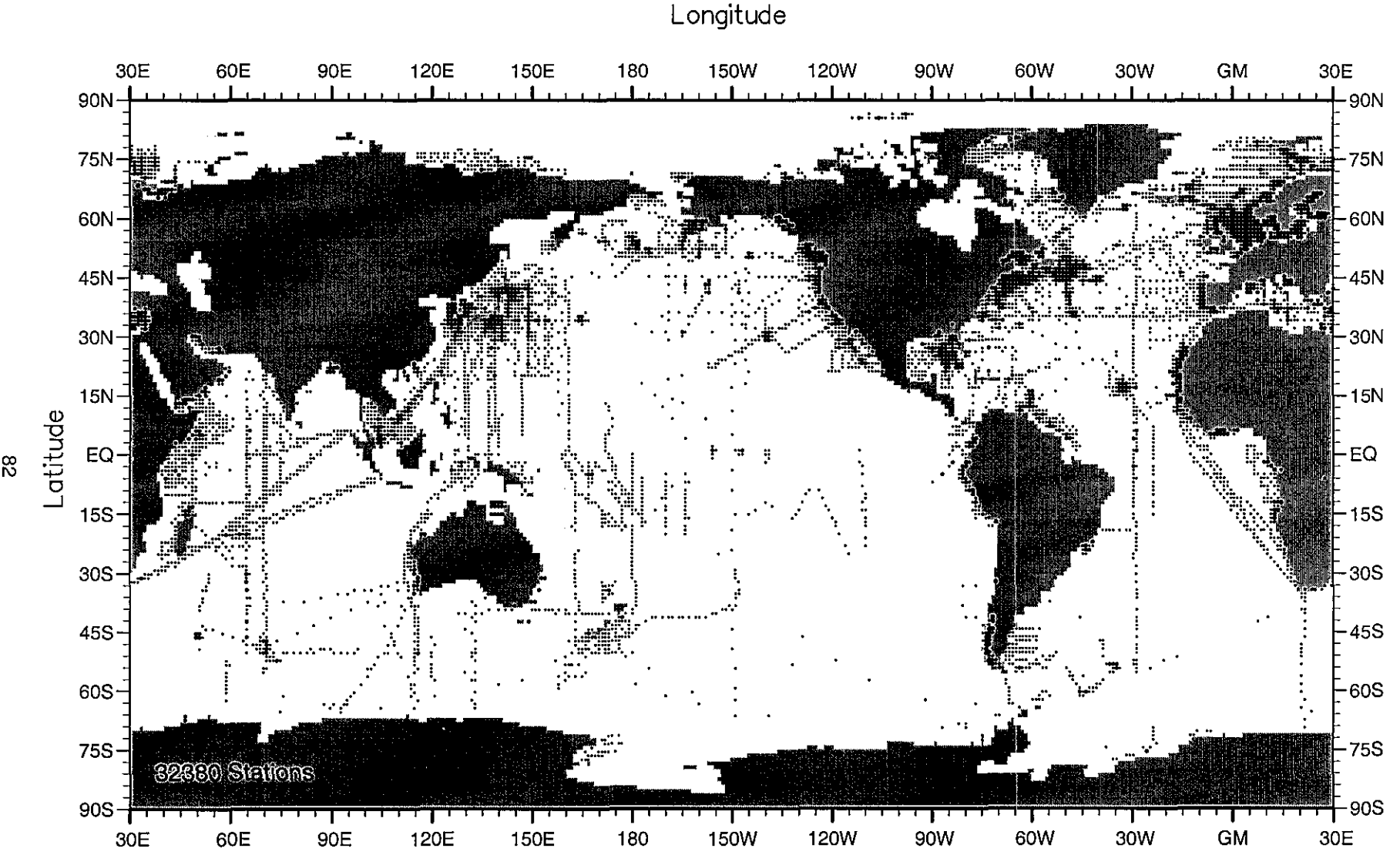


Fig. A71 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1970

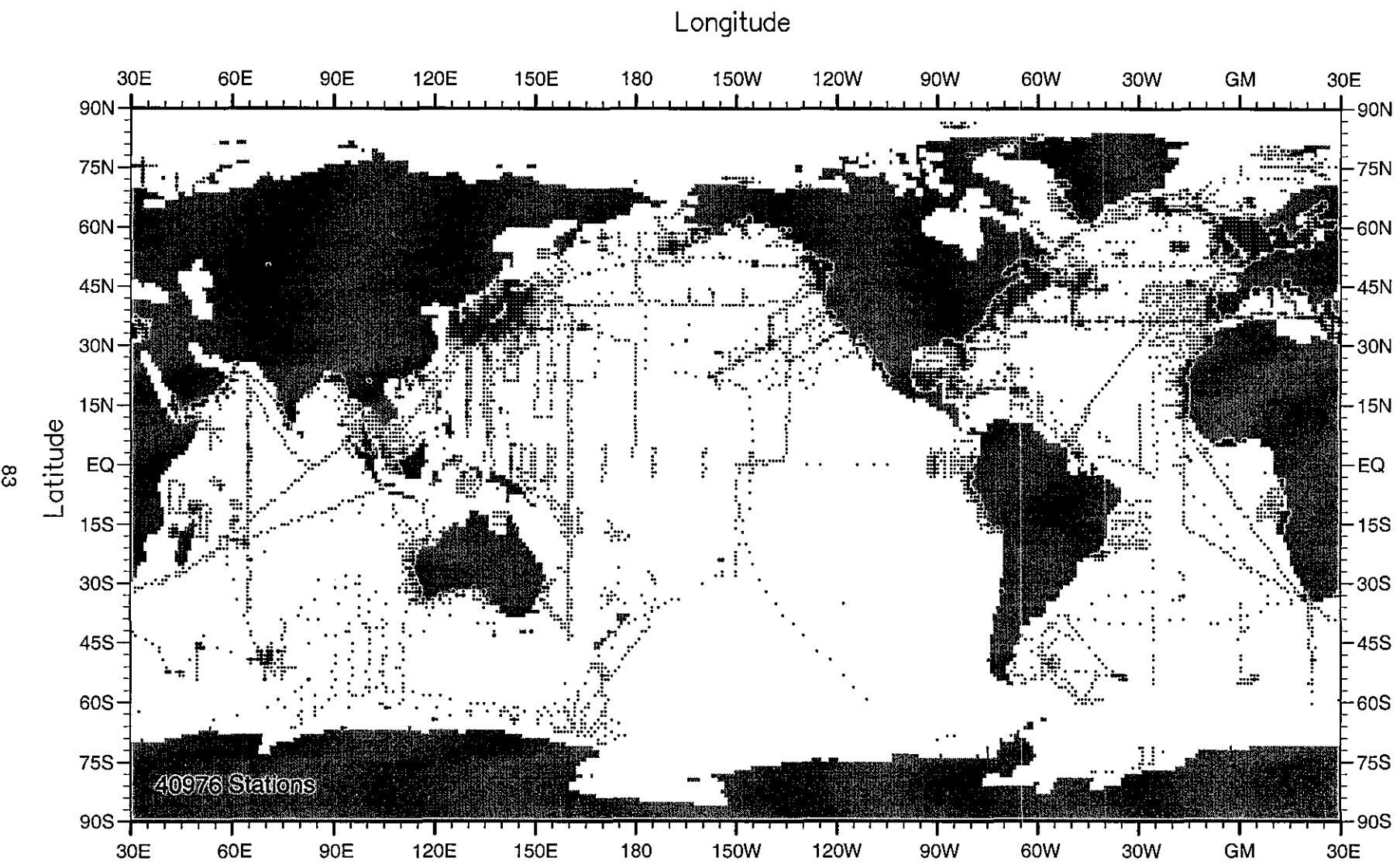


Fig. A72 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1971

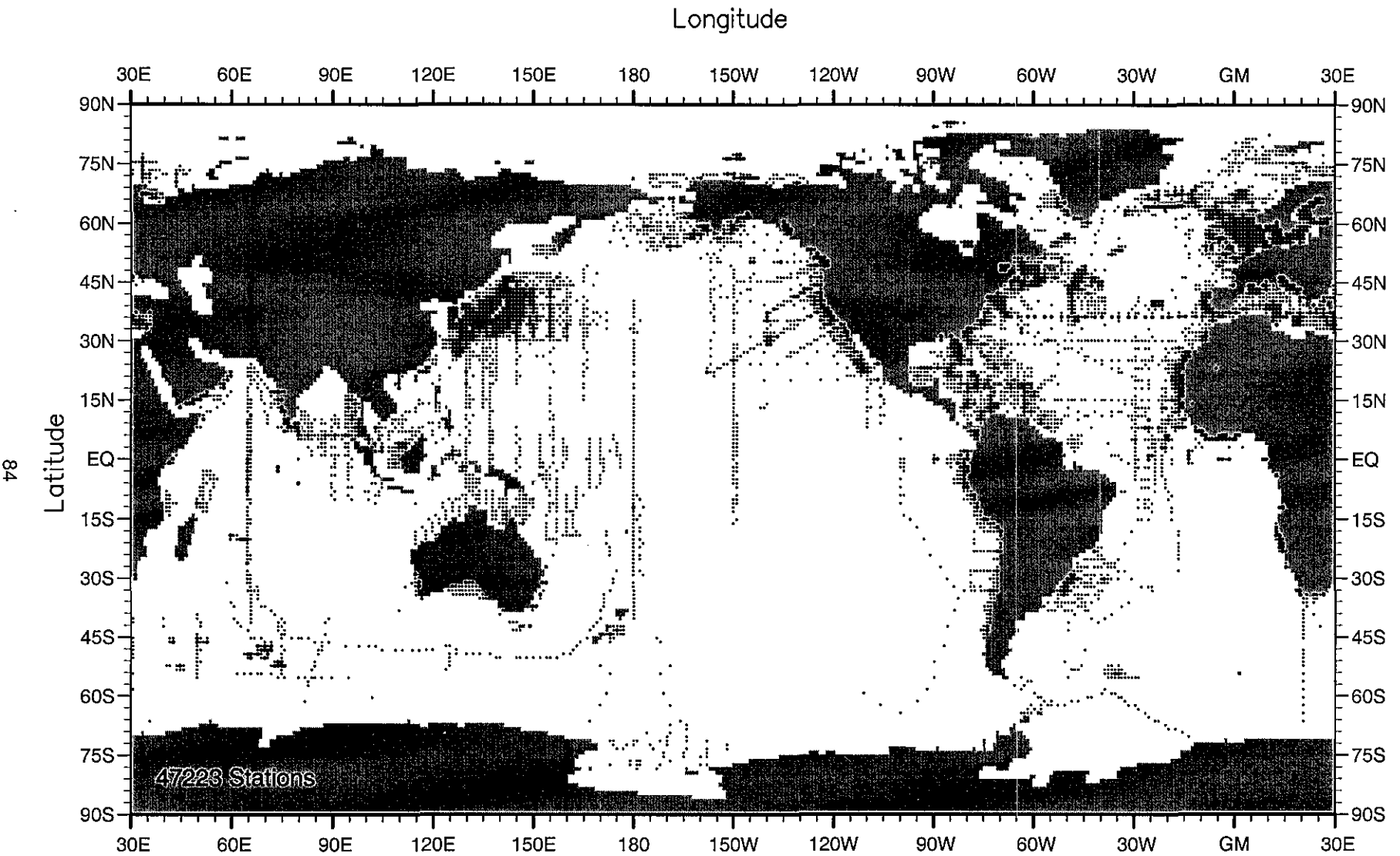


Fig. A73 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1972

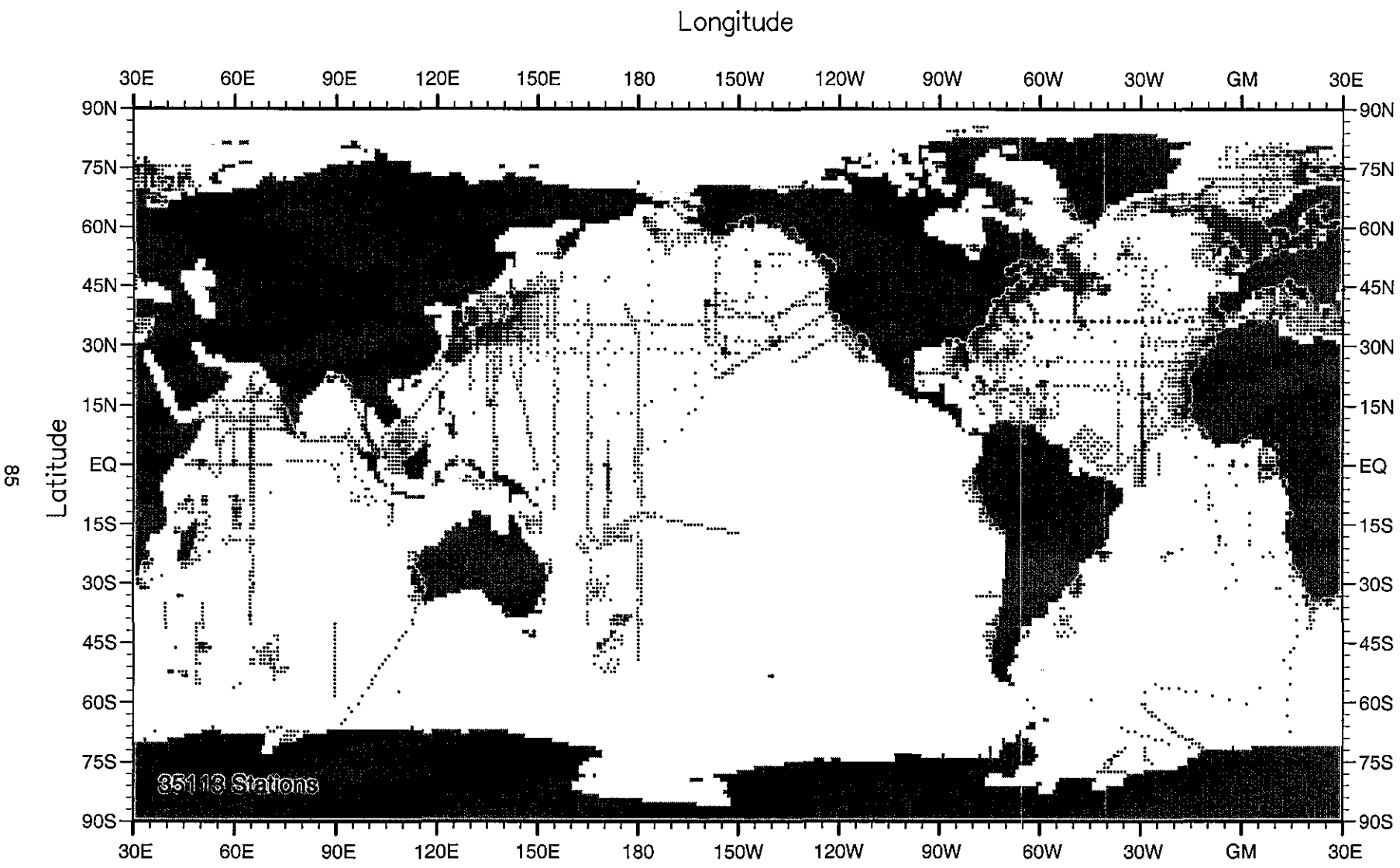


Fig. A74 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1973

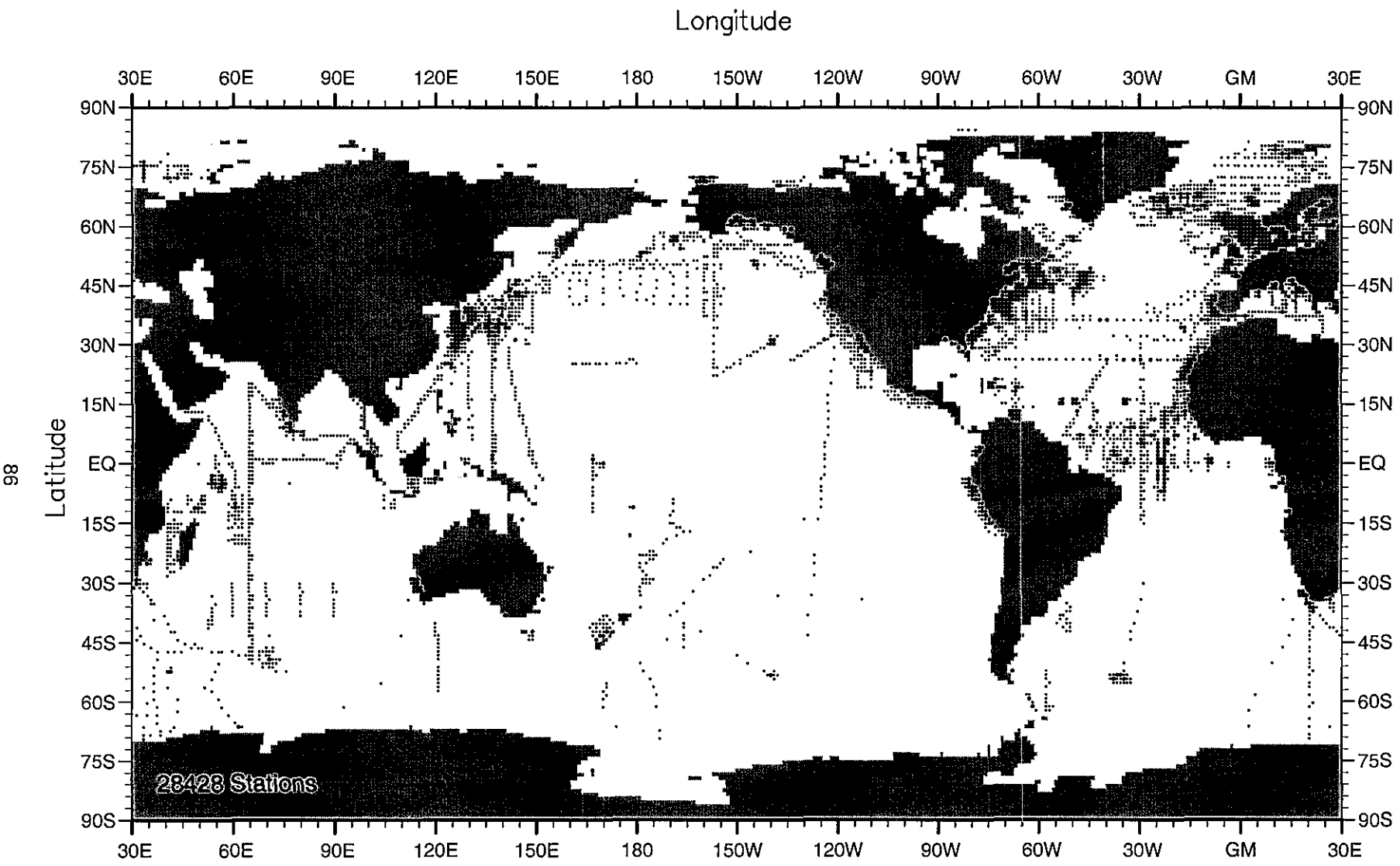


Fig. A75 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1974

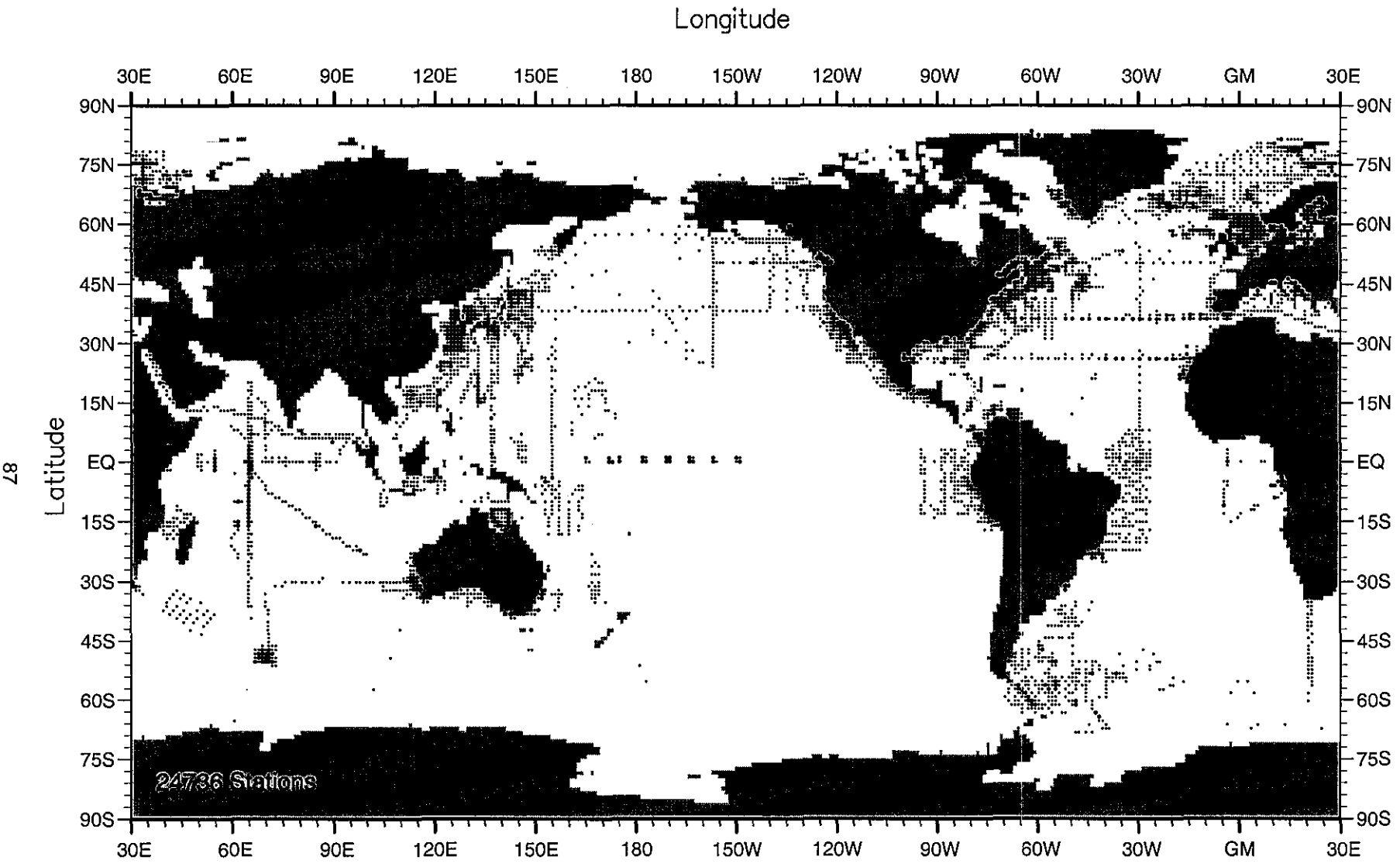


Fig. A76 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1975

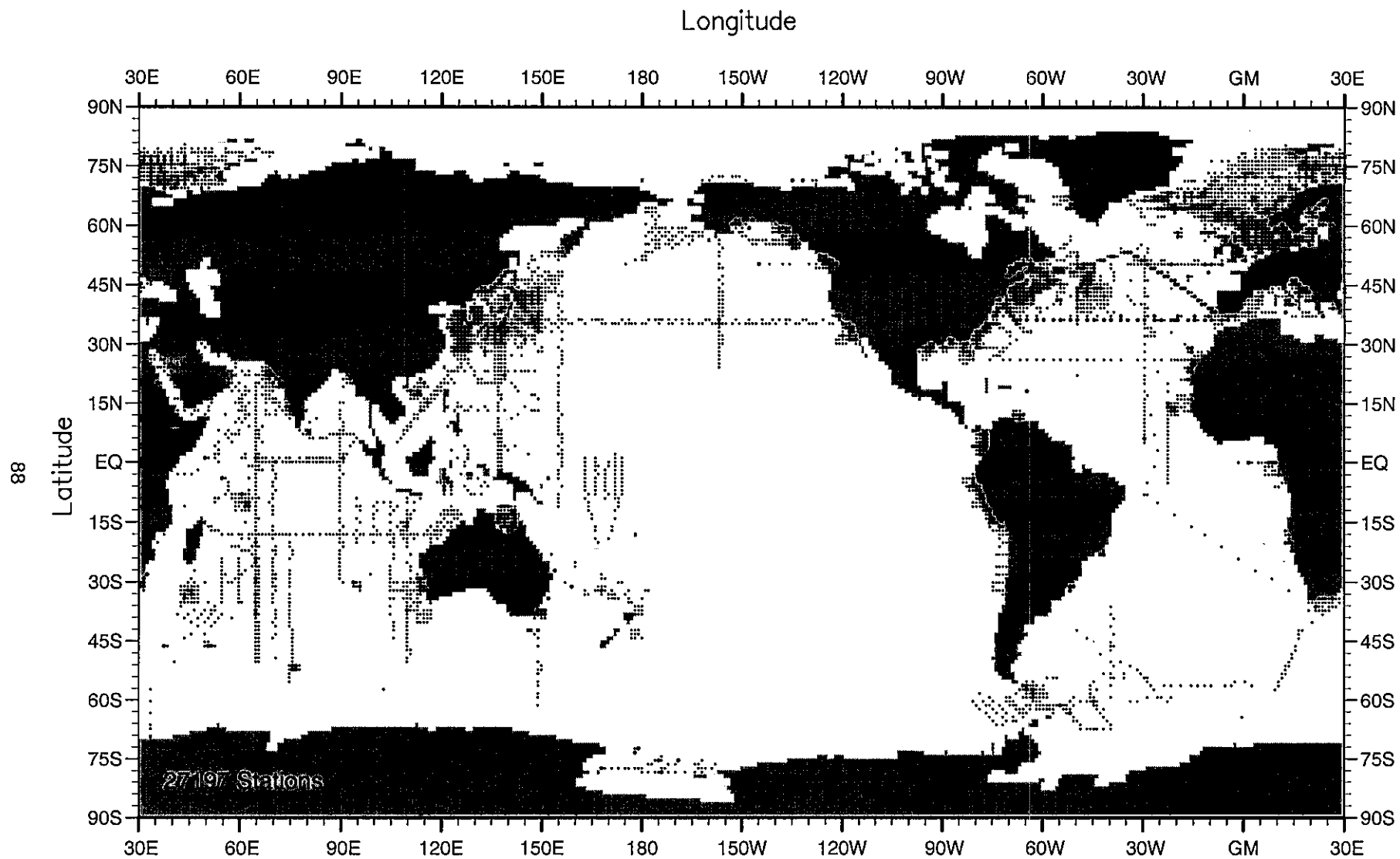


Fig. A77 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1976

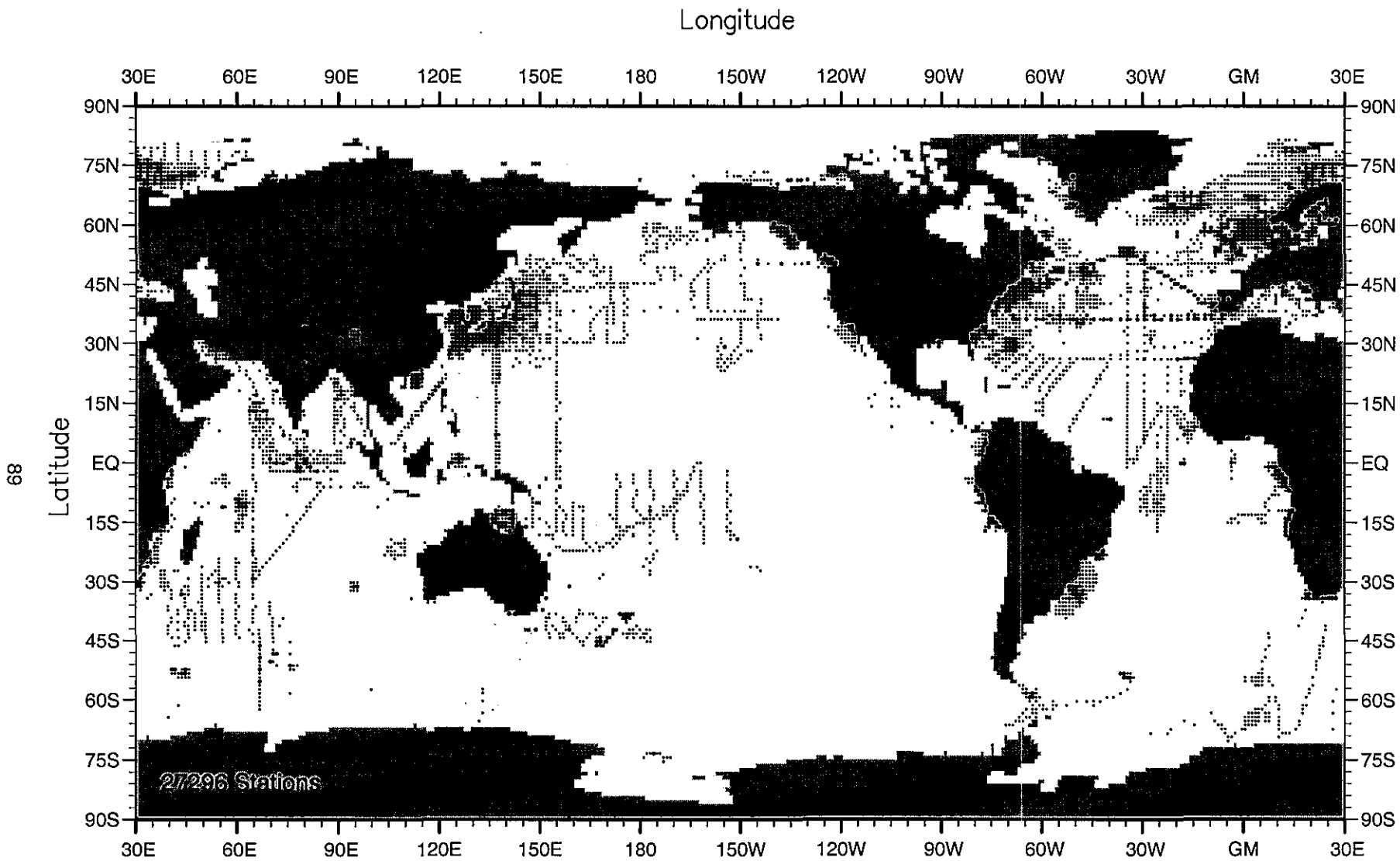


Fig. A78 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1977

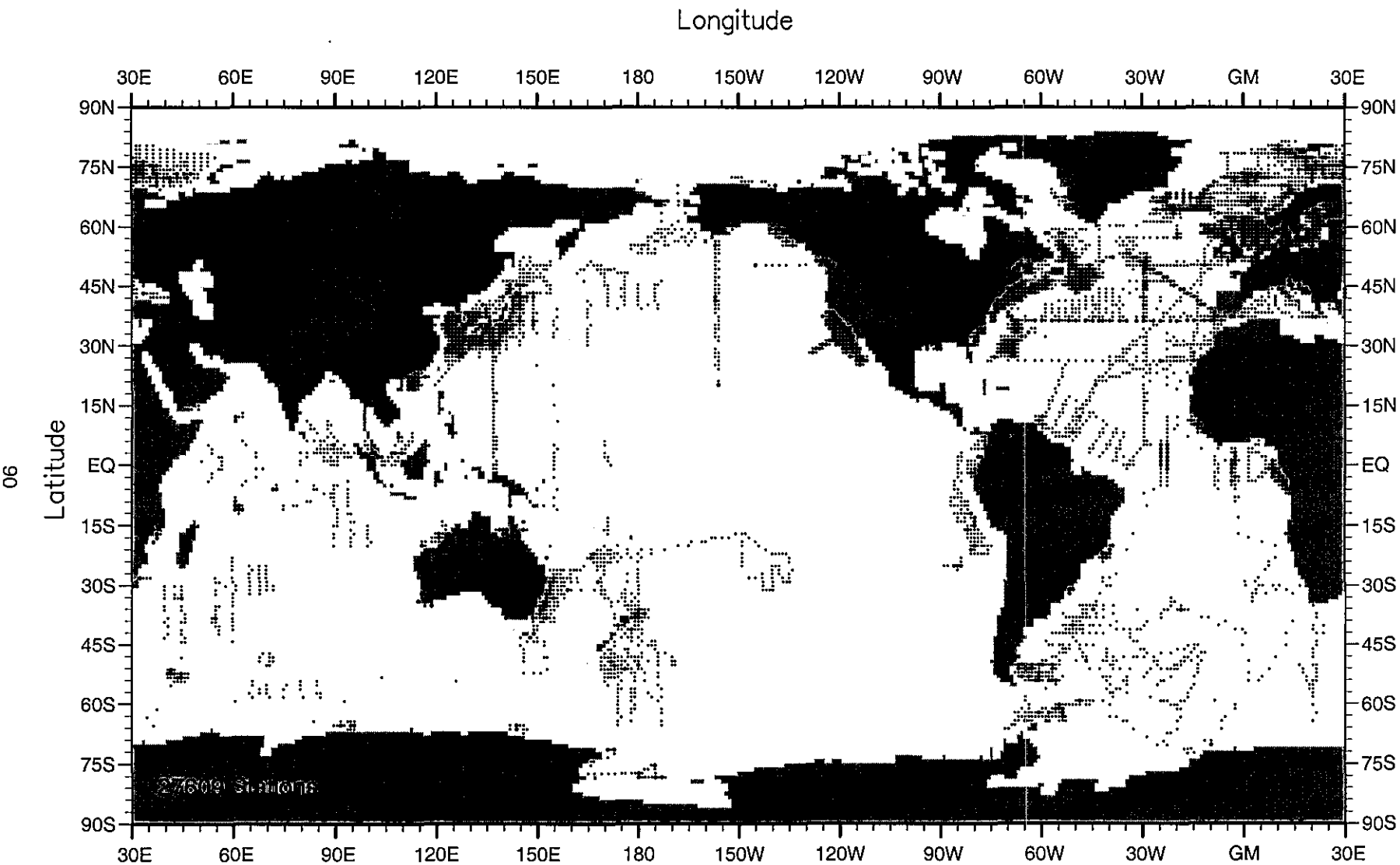


Fig. A79 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1978

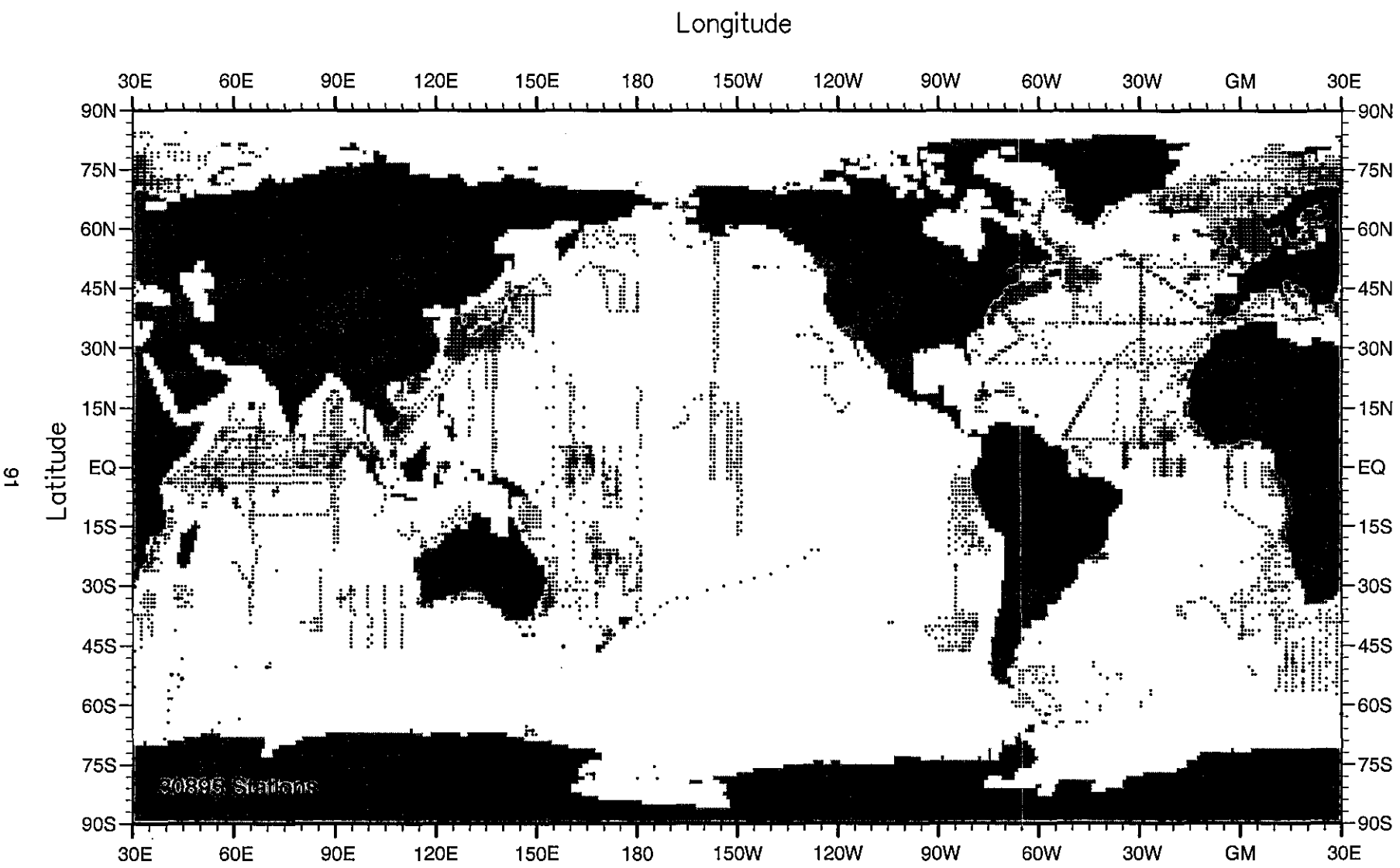


Fig. A80 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1979

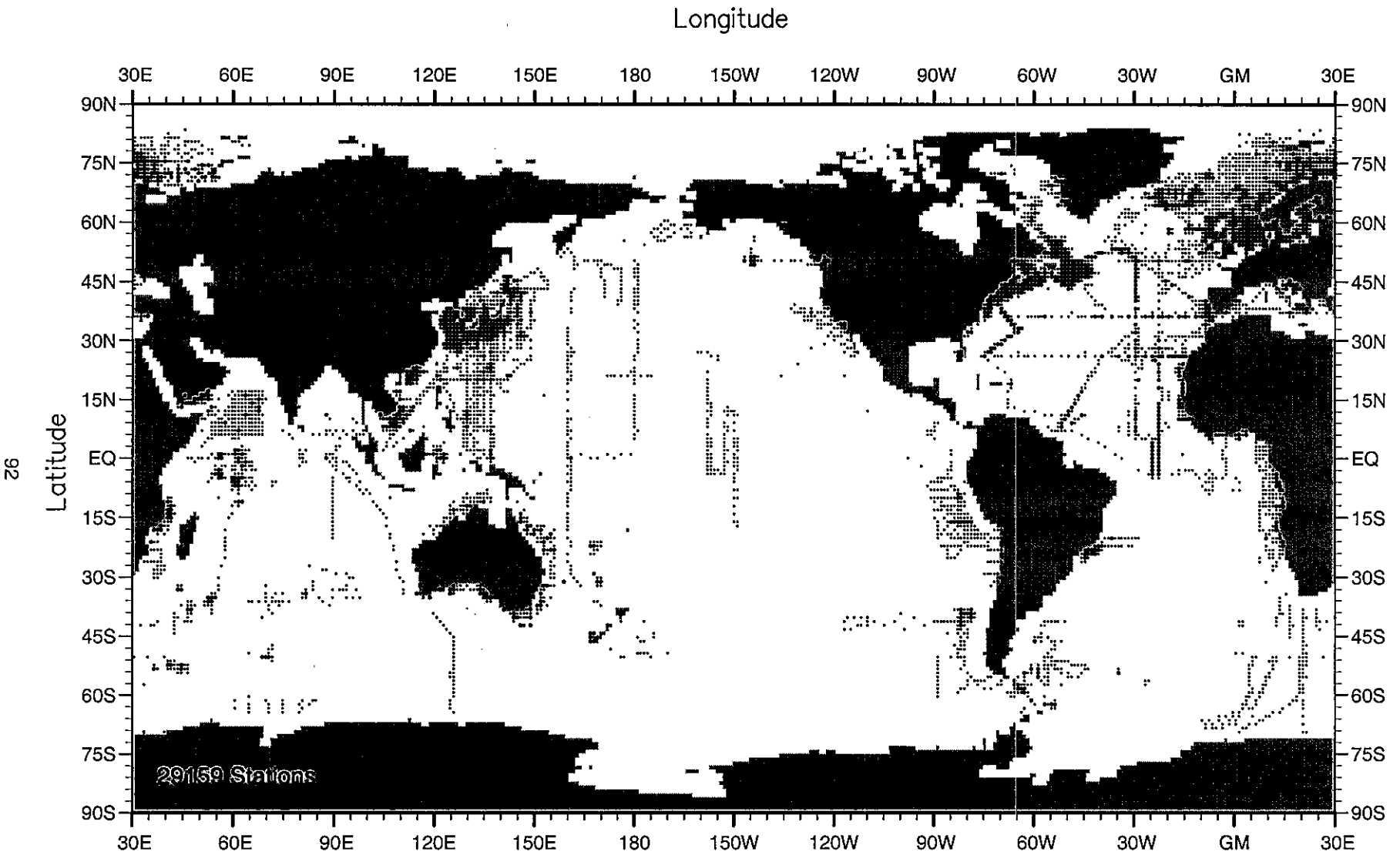


Fig. A81 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1980

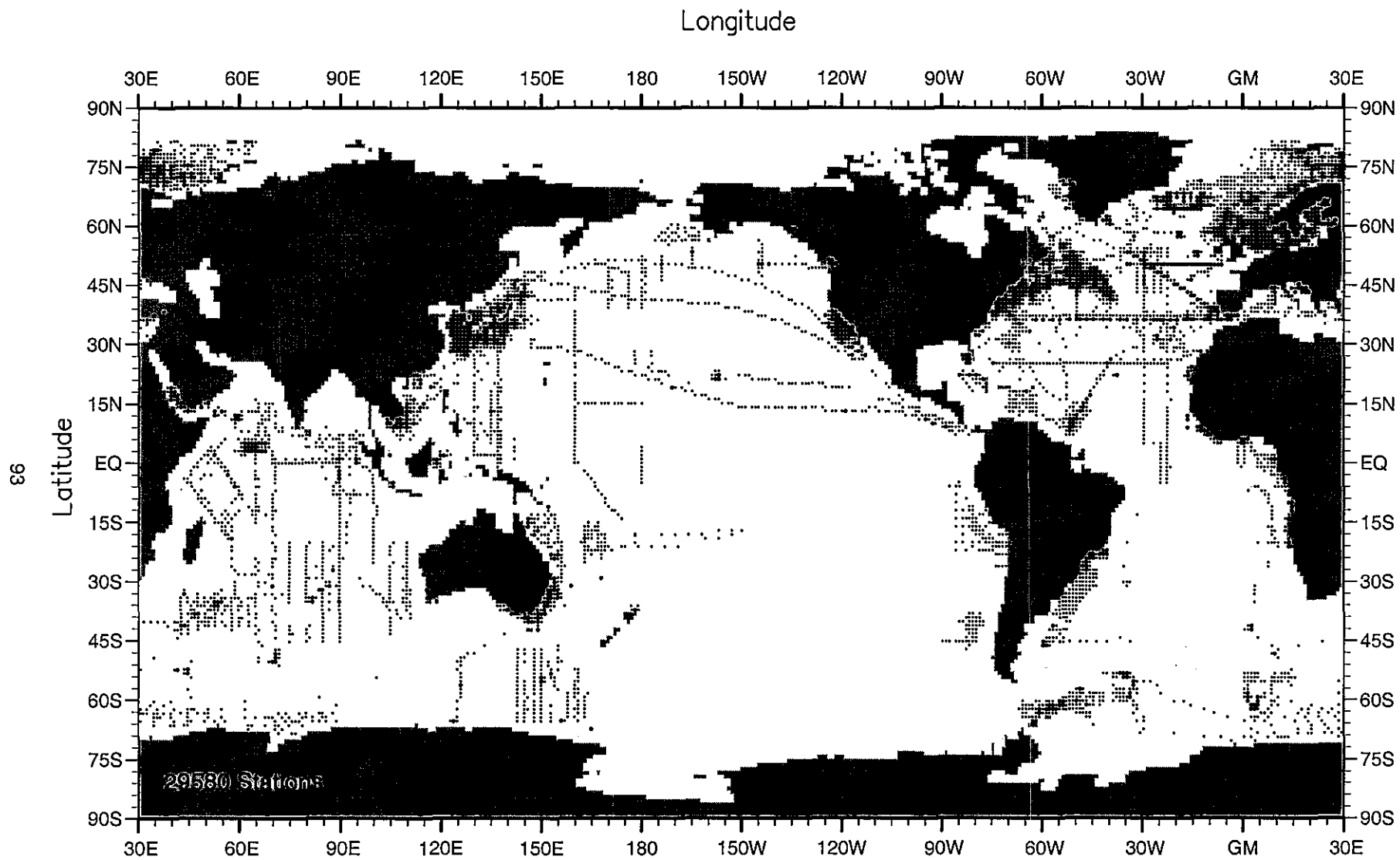


Fig. A82 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1981

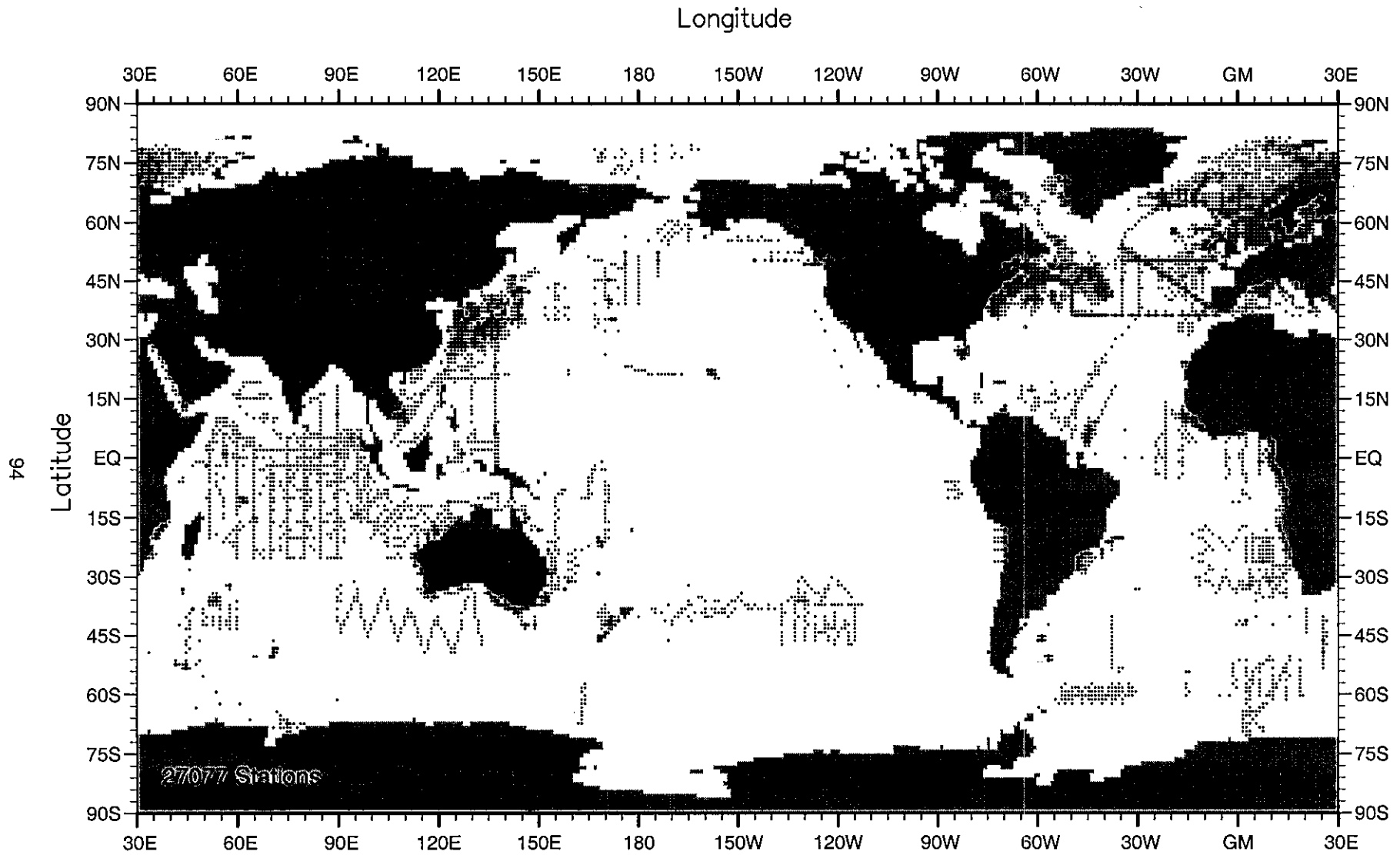


Fig. A83 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1982

Longitude

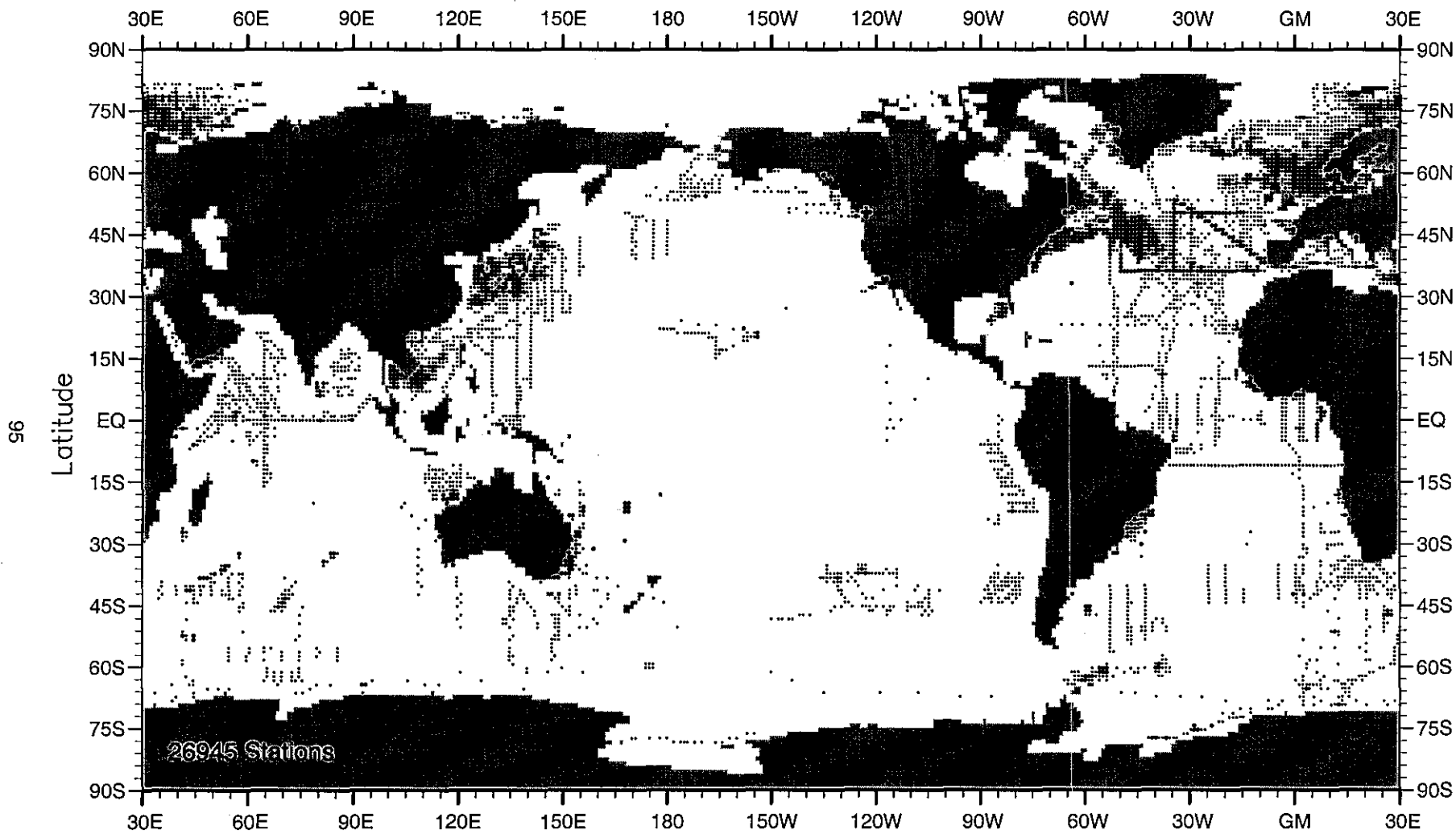


Fig. A84 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1983

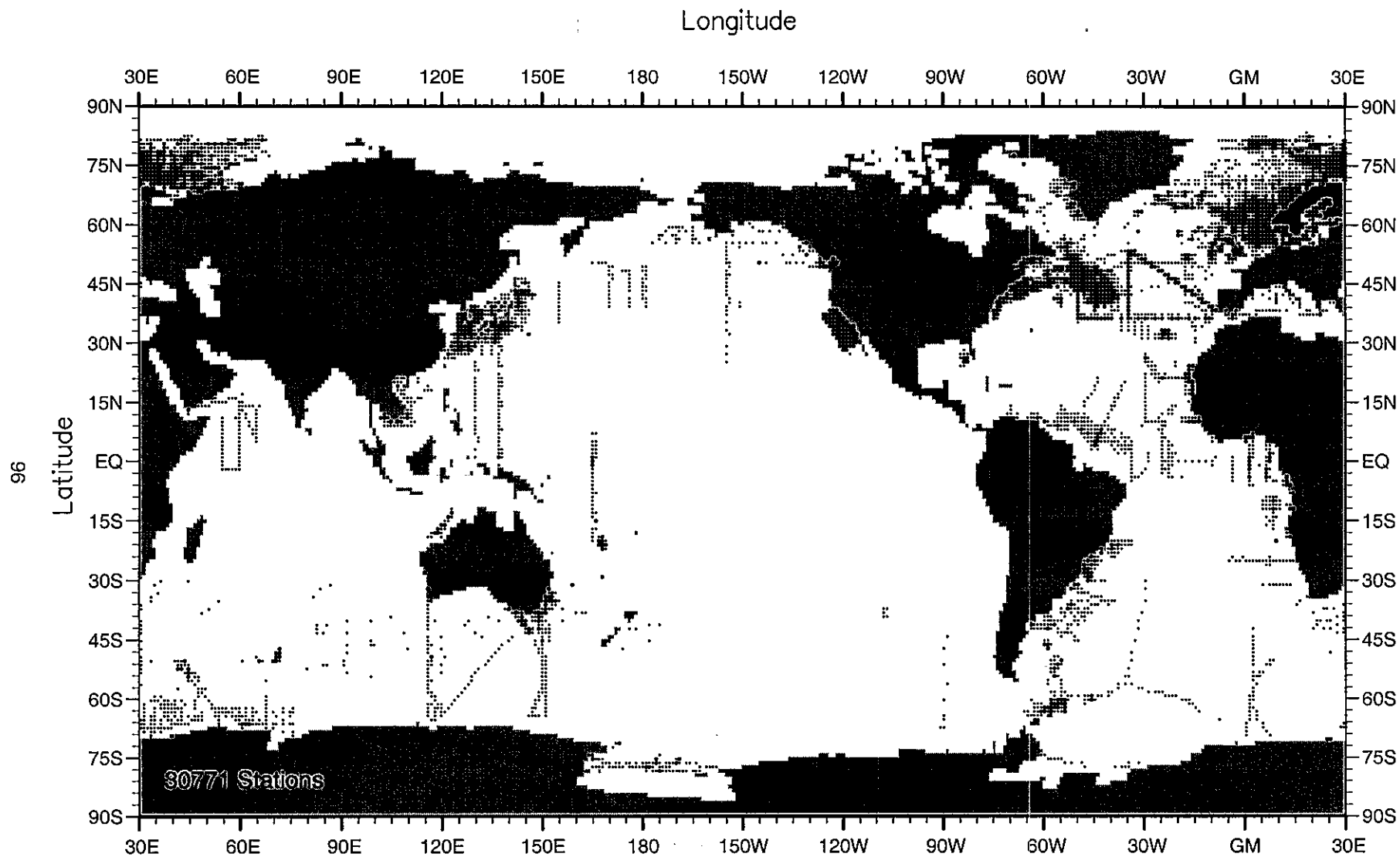


Fig. A85 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1984

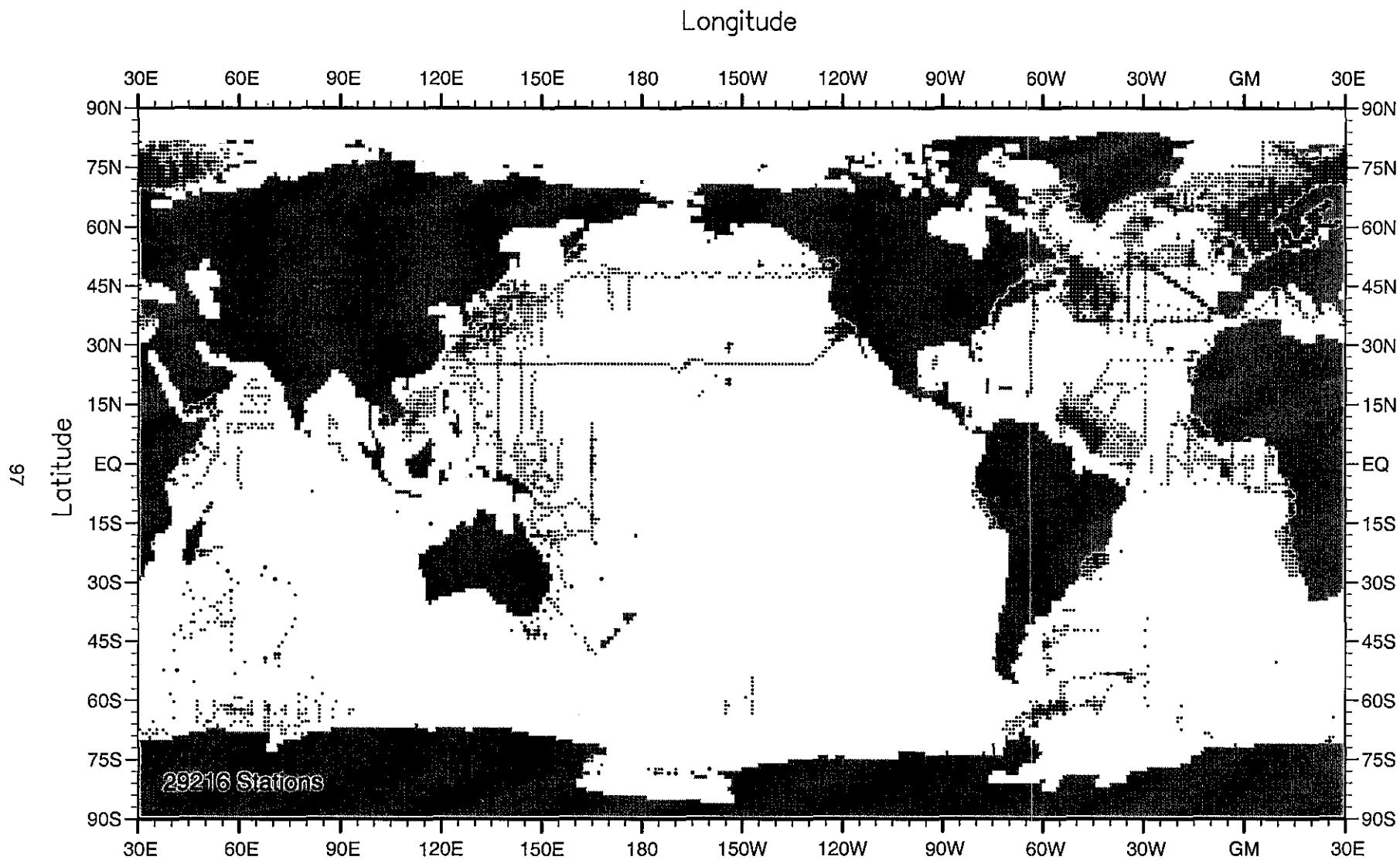


Fig. A86 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1985

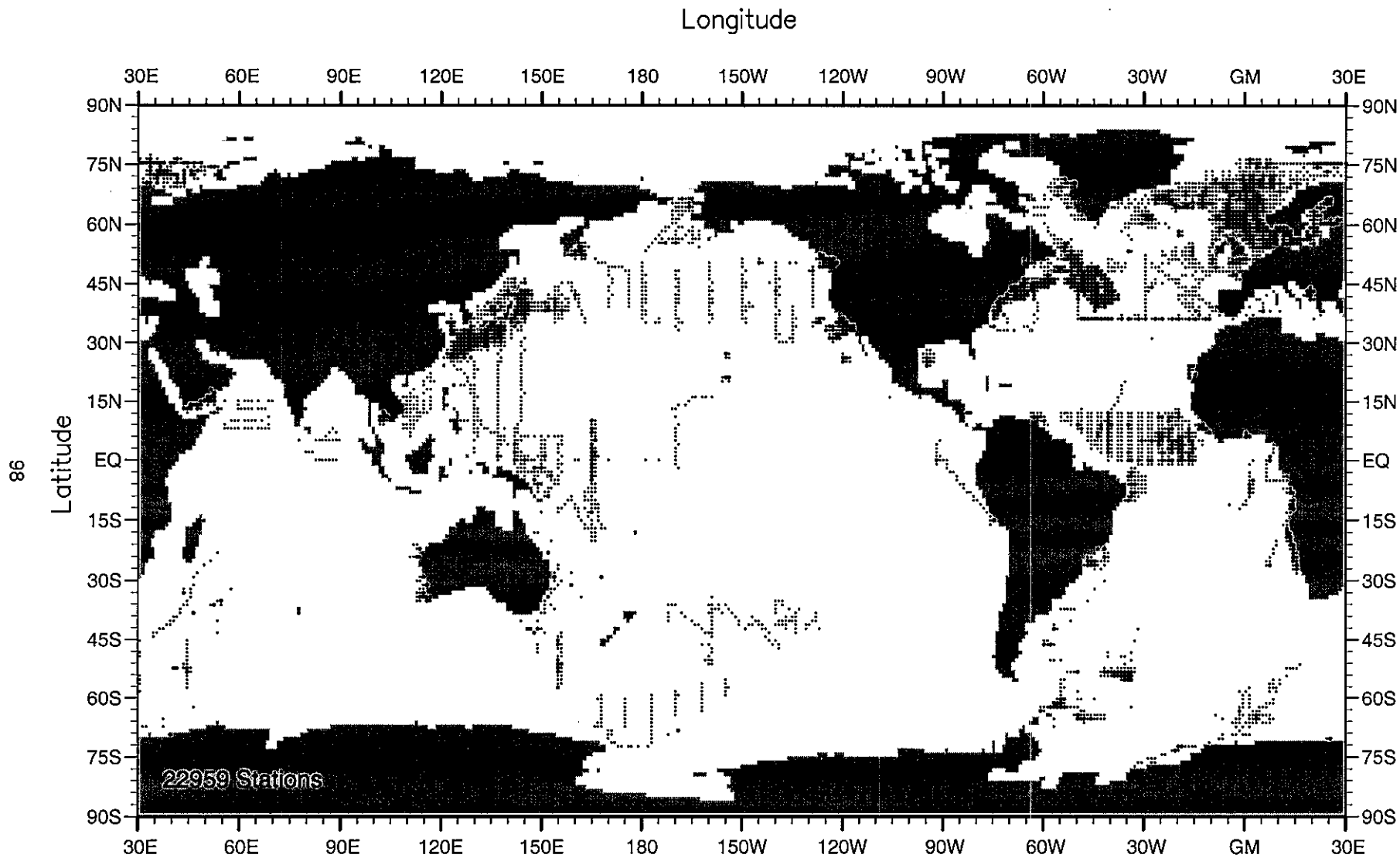


Fig. A87 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1986

Longitude

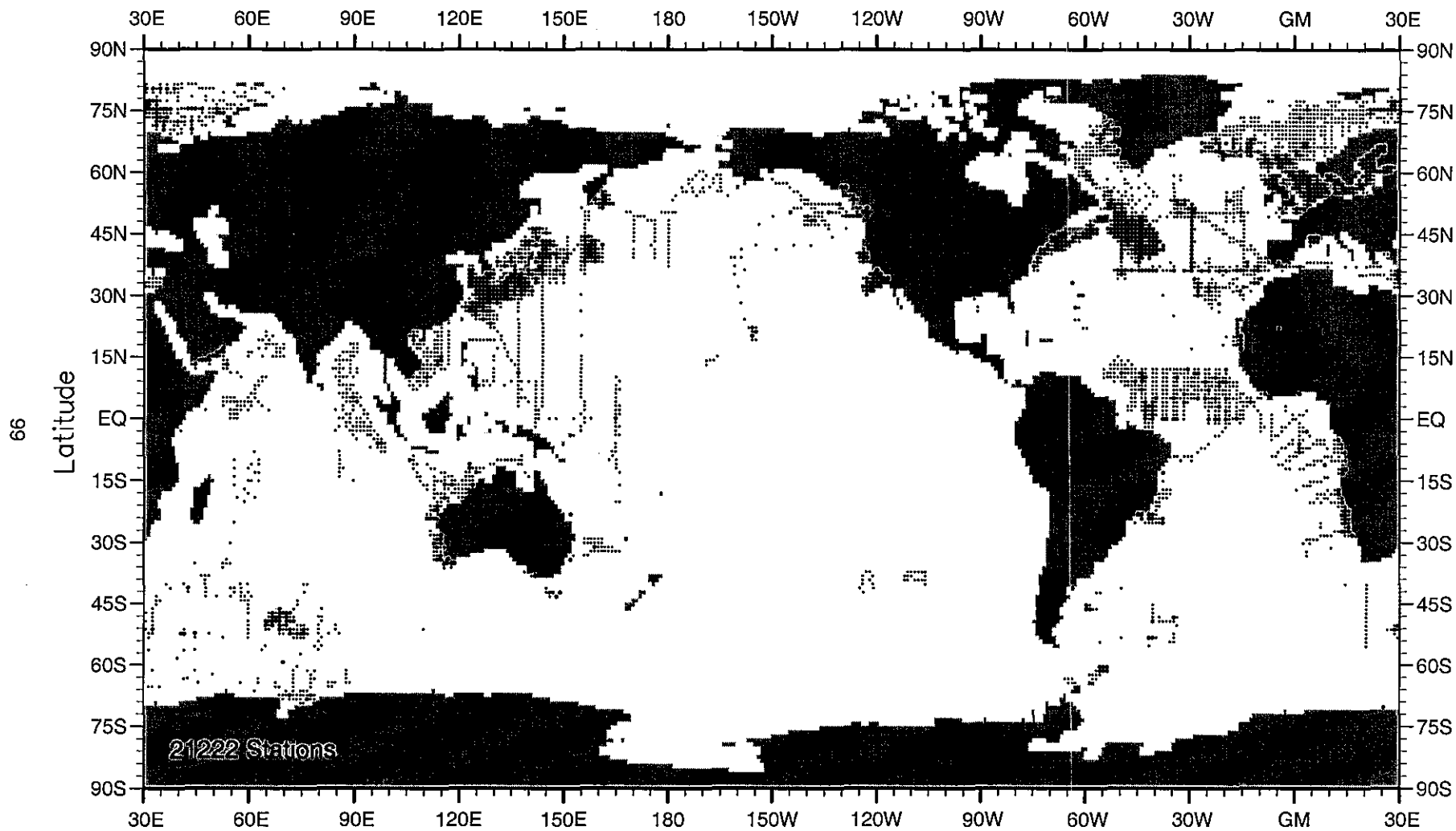


Fig. A88 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1987

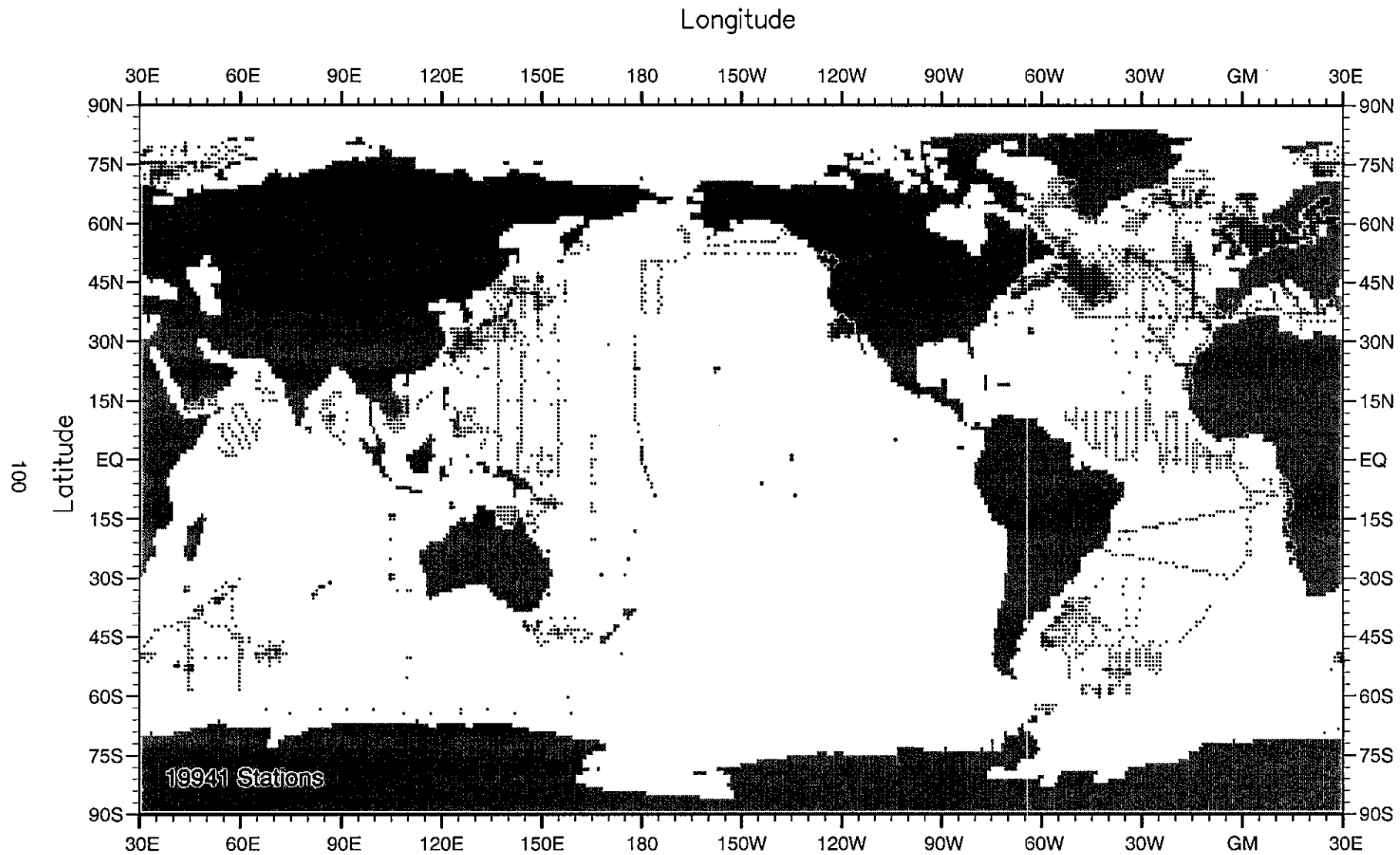


Fig. A89 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1988

Longitude

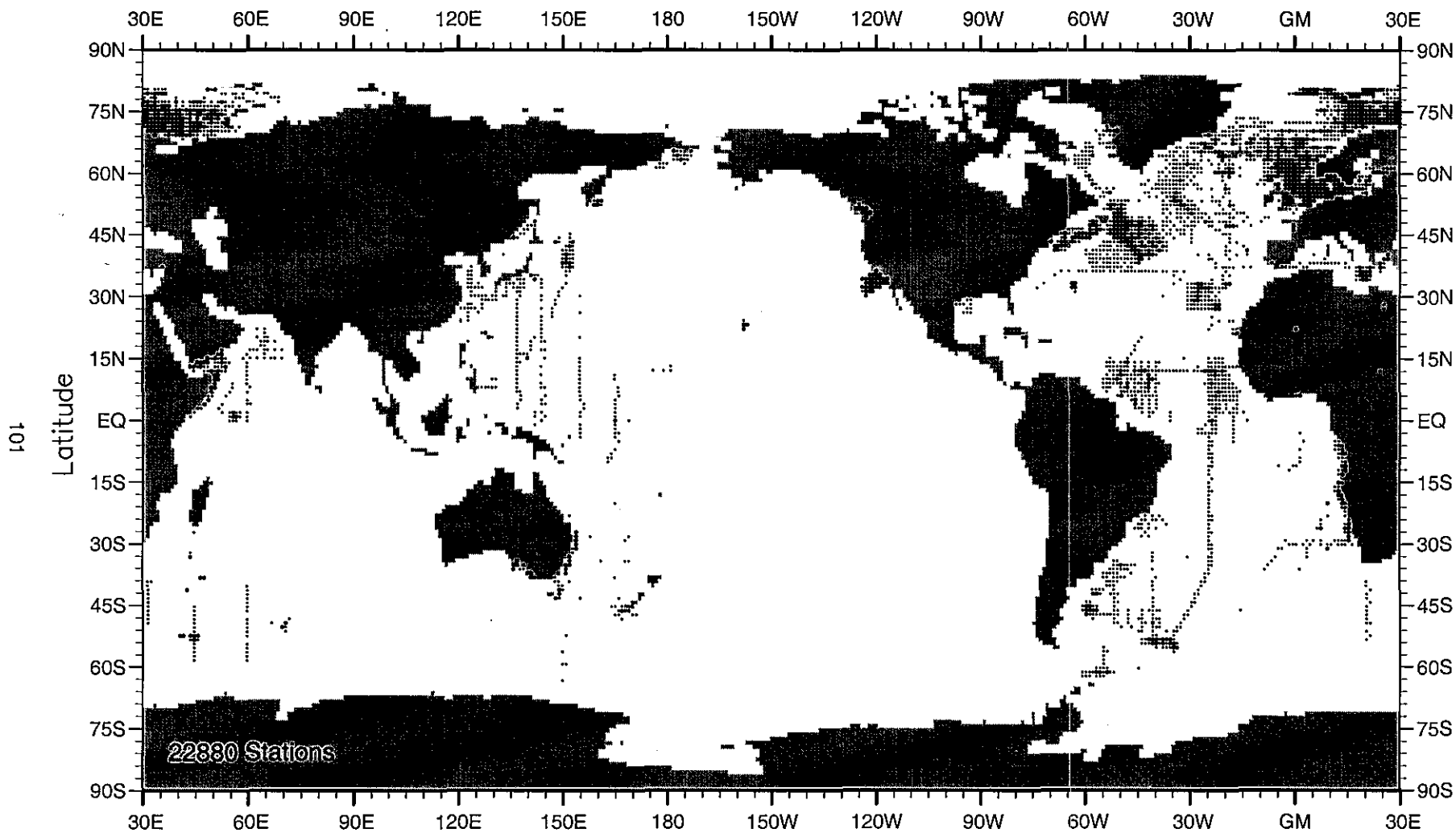


Fig. A90 . Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1989

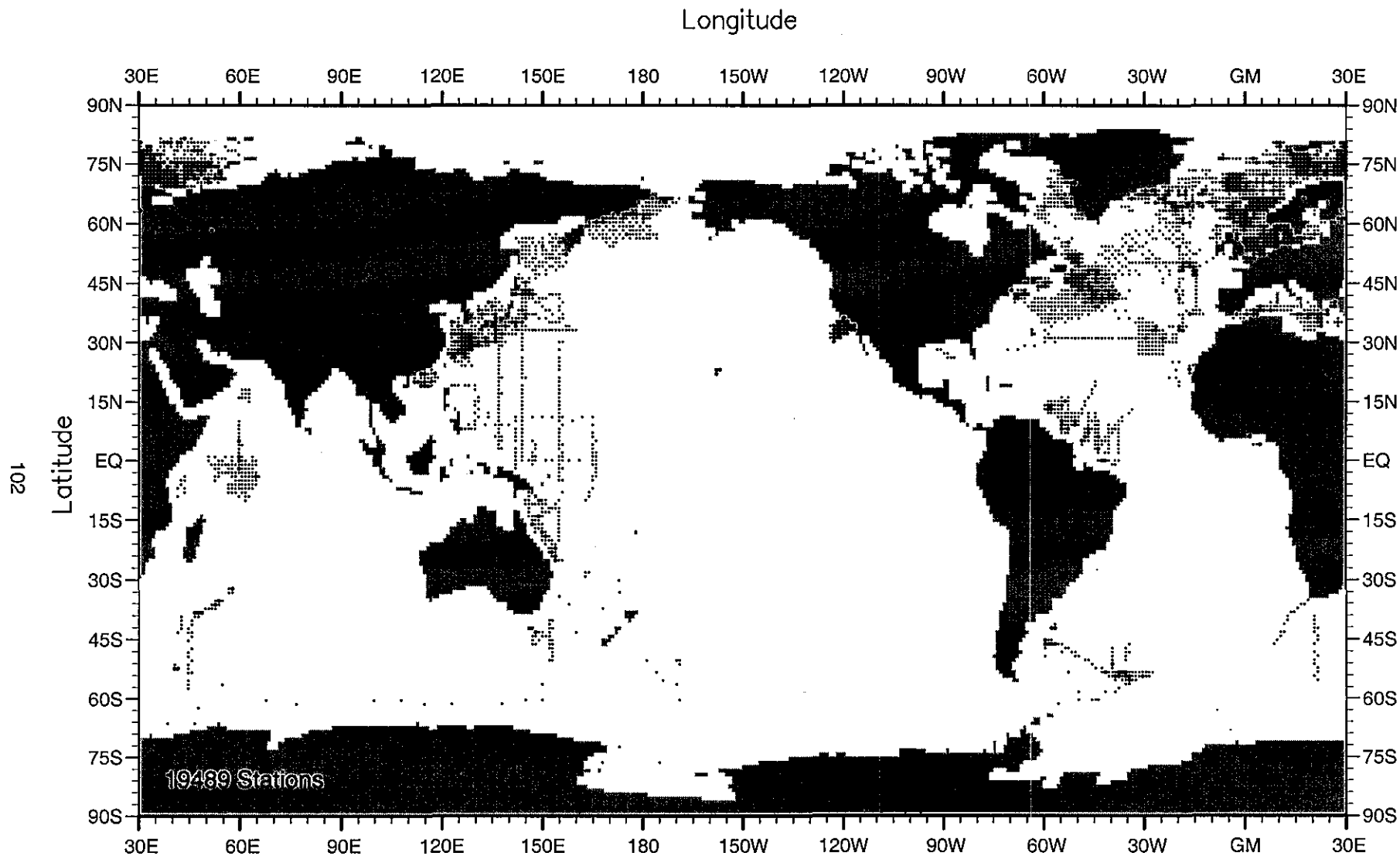


Fig. A91 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1990

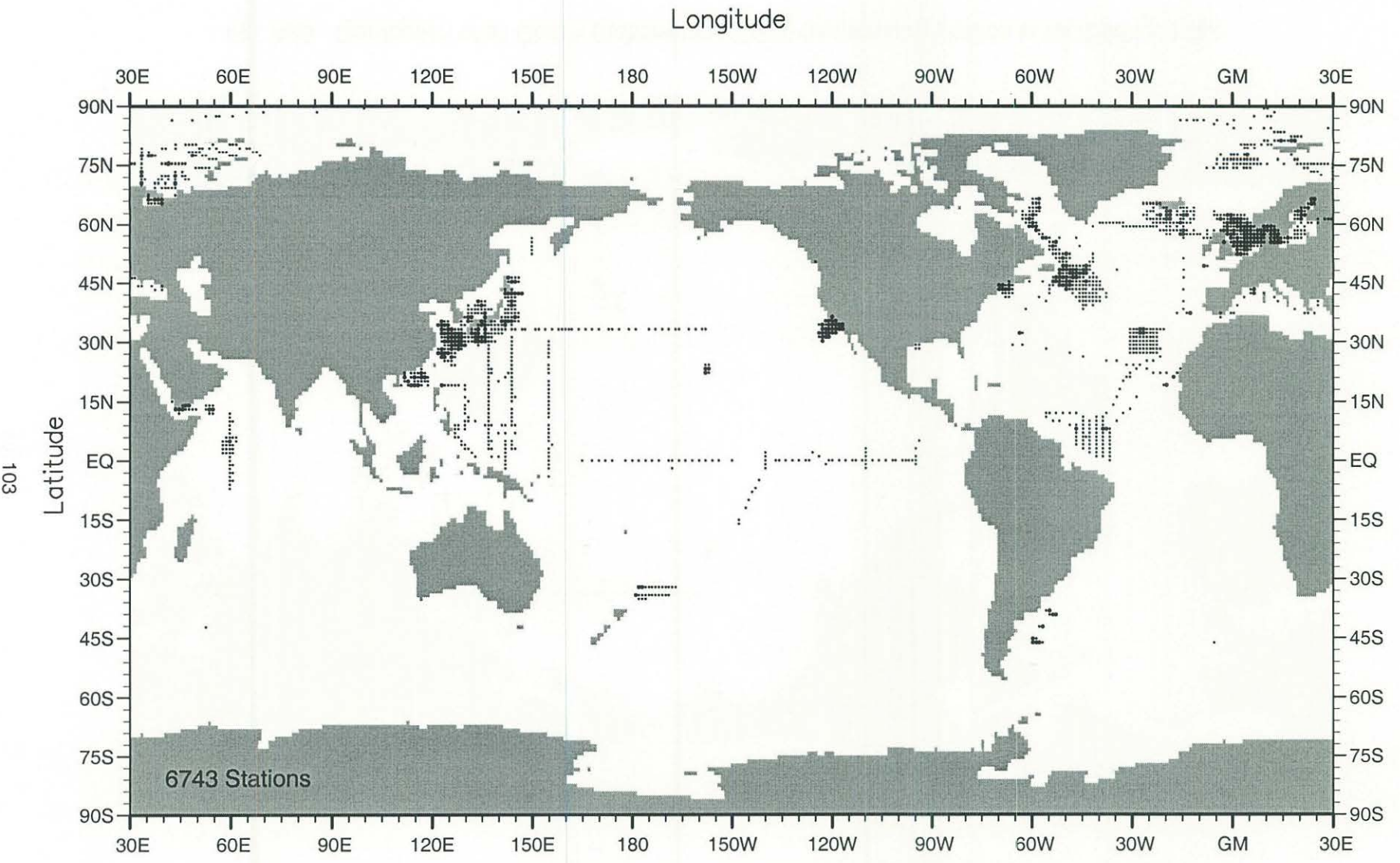


Fig. A92 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1991

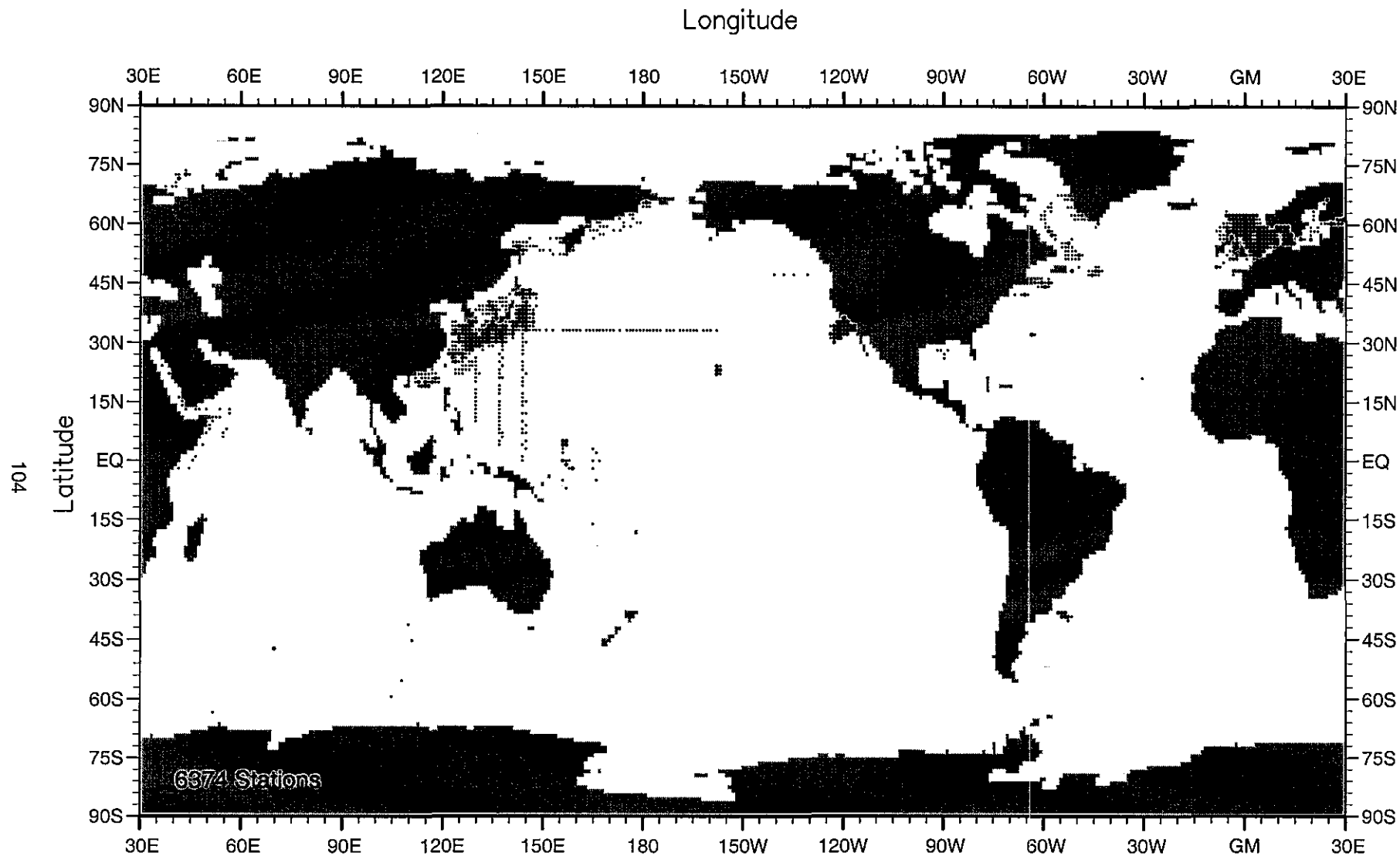


Fig. A93 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1992

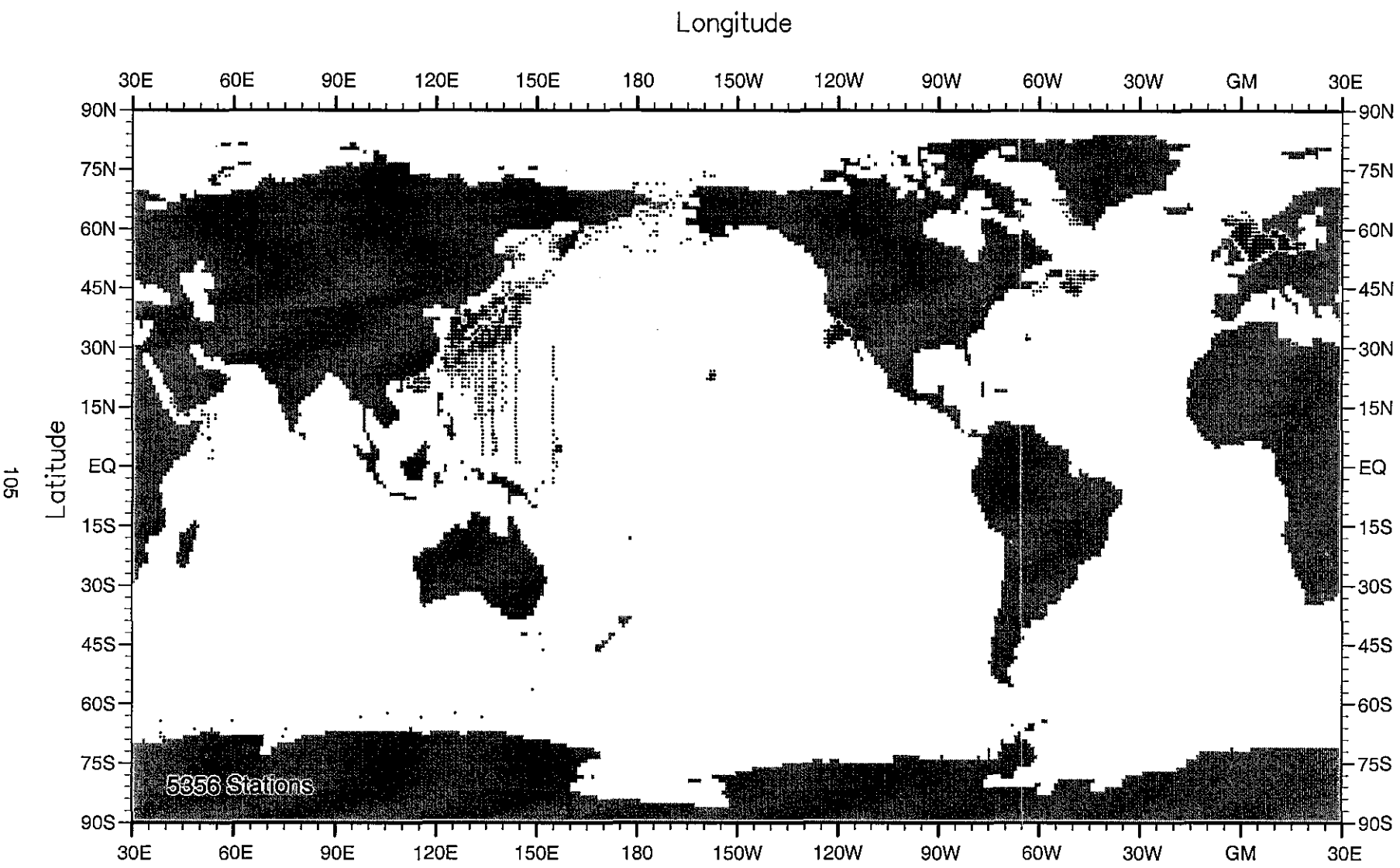


Fig. A94 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1993

Longitude

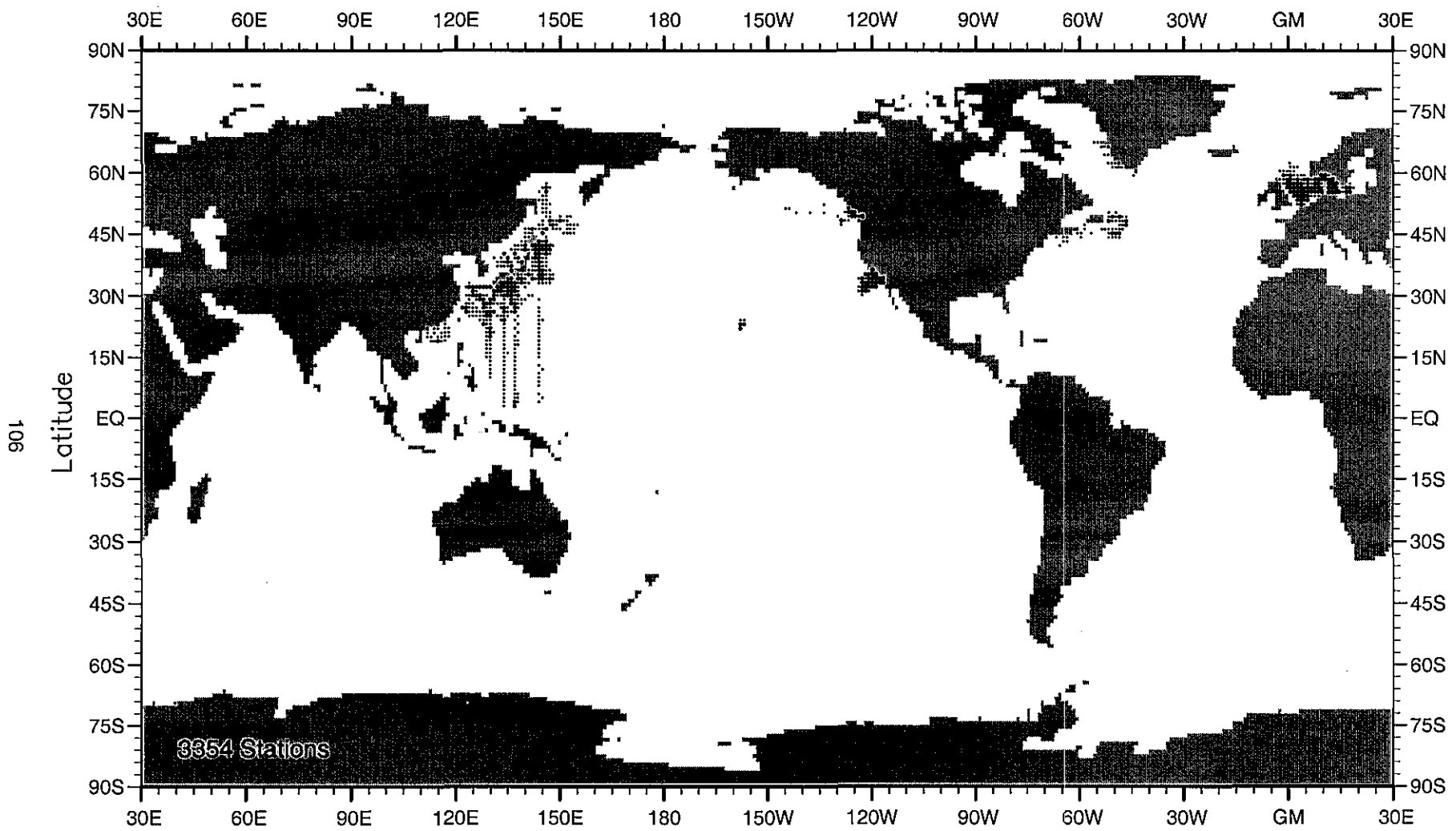


Fig. A95 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1994

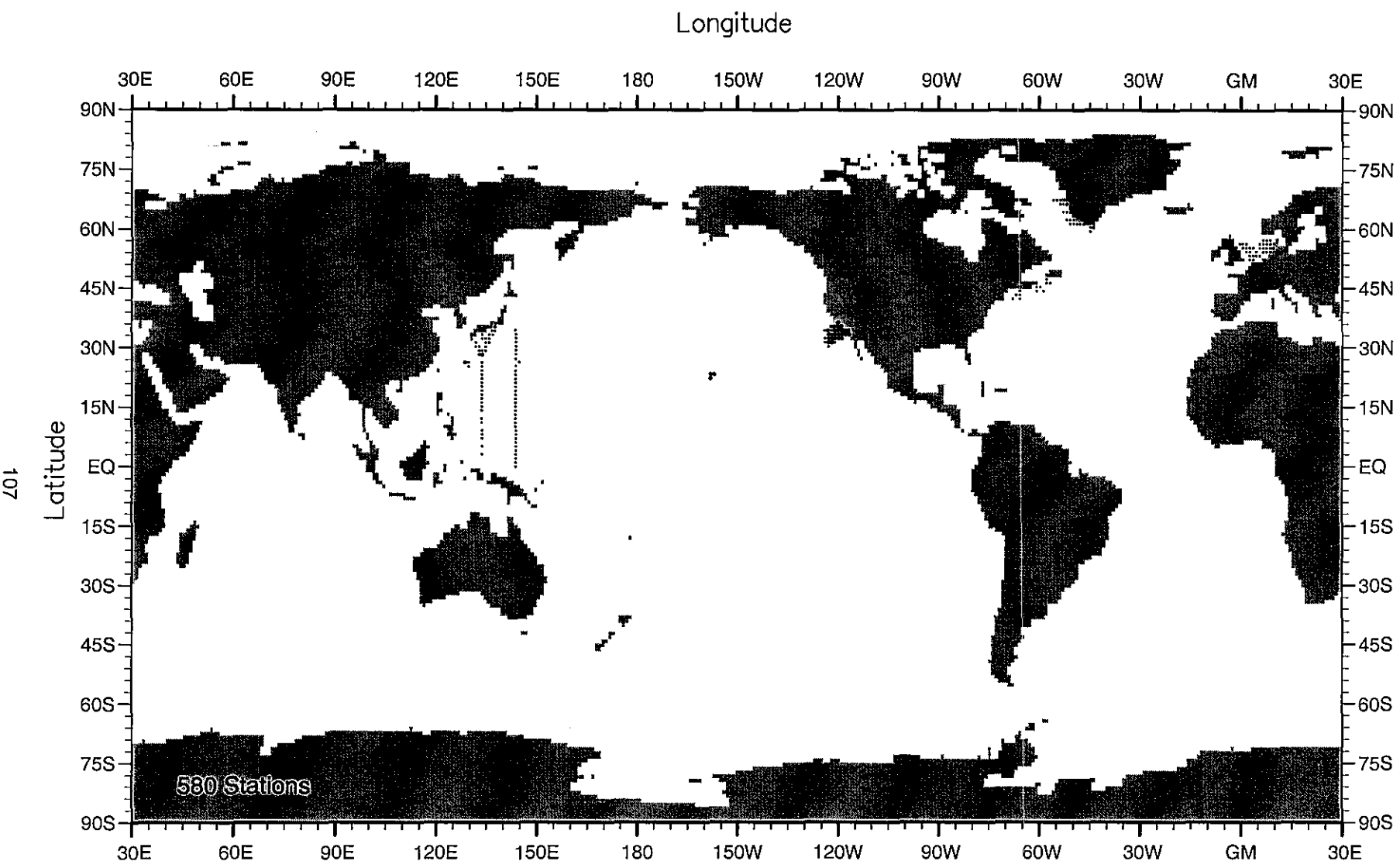


Fig. A96 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1995

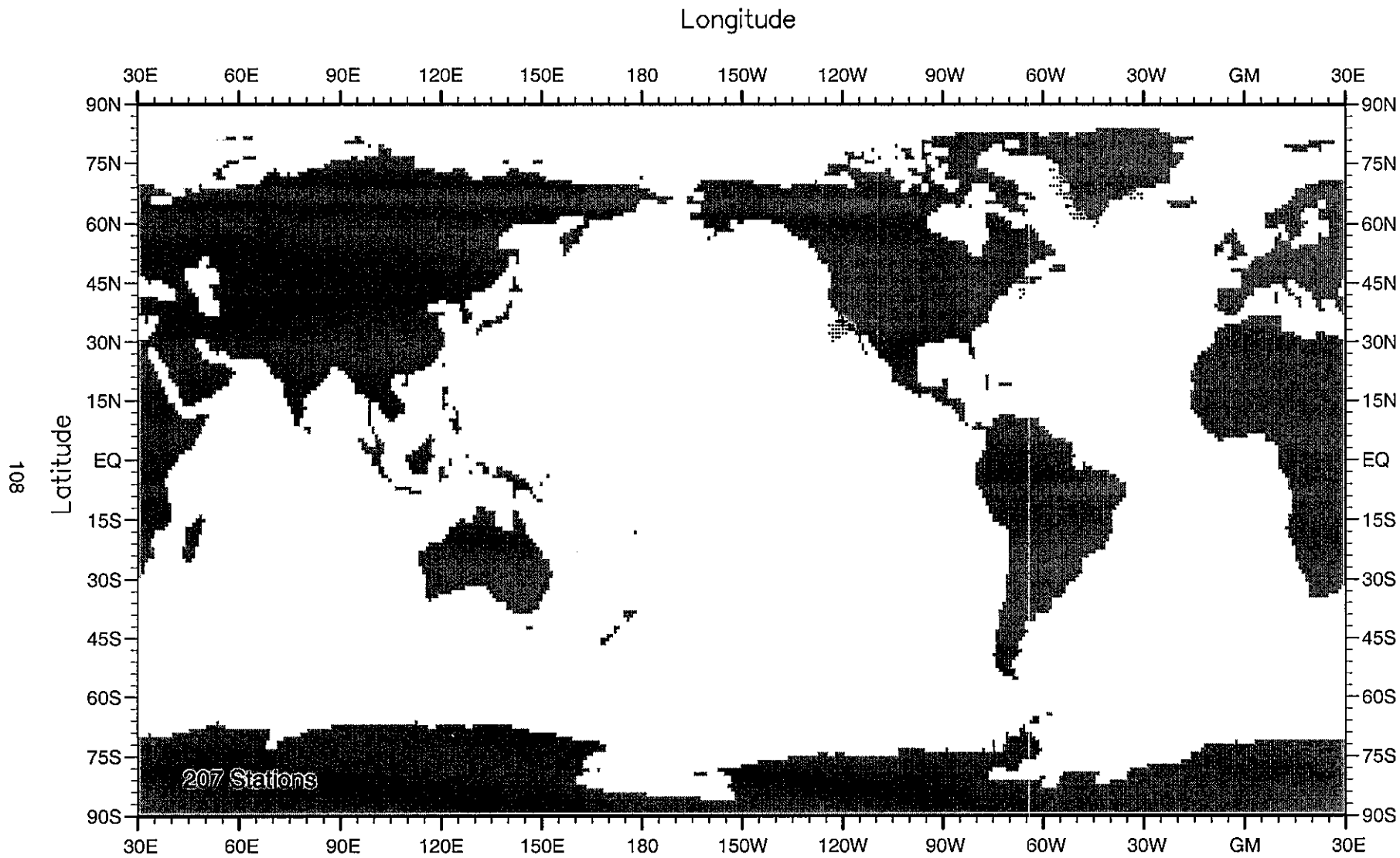


Fig. A97 Distribution of all Ocean Station Data (OSD) temperature profiles in WOD98 for 1996