NOAA Atlas NESDIS 18

WORLD OCEAN DATABASE 1998
VOLUME 1: INTRODUCTION

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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VOLUME 1: INTRODUCTION

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1998 International Year of the Ocean

National Oceanographic Data Center
USER SERVICES

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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 CO_2 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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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 GTSPP 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. Declassification of data by the U.S. Navy on a regular basis is appreciated. The Intergovernmental Oceanographic Commission has requested such declassification efforts in recent years.

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

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World Ocean Database 1998, Volume 1: Introduction

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ABSTRACT

This atlas describes a collection of scientifically quality controlled ocean profile and plankton data that includes measurements of temperature, salinity, oxygen, phosphate, nitrite, nitrate, silicate, chlorophyll, alkalinity, and pH. A discussion of data sources is provided. Yearly distributions and seasonal data distributions for individual years of all profiles in the database are presented to provide information on the state of ocean profile observations.

1. INTRODUCTION

The *World Ocean Atlas 1994* (WOA94) represented the first major product of the National Oceanographic Data Center (NODC) Ocean Climate Laboratory (OCL). WOA94 included vertical profiles of six variables including temperature, salinity, oxygen, phosphate, nitrate, and silicate as well as objective analyses of these variables at standard depth levels (Conkright *et al.*, 1994a; Levitus *et al.*, 1994a,b; Levitus and Boyer, 1994a,b). As part of our continuing efforts to compile, scientifically quality control, and distribute oceanographic databases, we have now updated our databases to include additional data for these six variables as well as additional variables such as chlorophyll, nitrite, pH, alkalinity and plankton as well as high resolution CTD (conductivity-temperature-depth) and high resolution XBT (expendable bathythermograph) profiles. This new database is called *World Ocean Database 1998* (WOD98). Products derived from this database, such as objective analyses of the variables that comprise WOD98, will be made available as a separate atlas and CD-ROM series entitled *World Ocean Atlas 1998* (WOA98). As with our previous work, users can obtain the latest information on WOD98 (*e.g.* Errata sheet, Frequently Asked Questions,..) via the NODC Home Page, **http:/www.nodc.noaa.gov/** (click on *Ocean Climate Laboratory*, then click on WOD98). The purpose of the WOD98 atlas series is to show the historical distributions of profiles made using the various instrument types included in WOD98 as well as some specific variables that comprise WOD98. This is accomplished through the display of data distribution plots for individual years and for individual seasons in these years. This provides users with basic information about the data in the historical ocean profile archives of NODC/WDC-A.

This first WOD98 atlas volume gives general information about WOD98 data and presents yearly and year-season data distribution maps for 1941-present for all data profiles merged together (Station Data, CTD, XBT, MBT, TAO buoys). In succeeding volumes of this atlas series (Levitus *et al.*, 1998a; Antonov *et al.*, 1998; Boyer *et al.*, 1998a,b; Conkright *et al.*, 1998b,c; O'Brien *et al.*, 1998) yearly, and in some cases seasonal profile distributions for each year are presented for each instrument type. Such data distribution plots are also invaluable as a first step of quality control. We have previously published similar maps and various individuals have informed us of location errors of some profiles.

1.1a Goals for *World Ocean Database 1998* (WOD98)

Our goal in developing and distributing WOD98 is to make available without restriction, the most complete set of digital historical ocean profile data and plankton measurements possible along with appropriate metadata and quality control flags set for:

i) each individual observed level measurement,
ii) "data" values at standard depth levels resulting from vertical interpolation,
iii) data or metadata representing an entire cruise.

As with earlier versions of NODC/WDC-A databases, we expect the data contained in WOD98 will find use in many different areas of oceanography, meteorology, and climatology. Whether studying the role of the ocean as part of the earth's climate system, conducting fisheries research, or managing marine resources, scientists and managers depend on observations of the marine environment in order to fulfill their mission. Oceanography is an observational science. Because of the importance of understanding climate variability as well as in attempting to forecast both natural, as well as possible anthropogenic climate variations, it is necessary to study the role of the ocean as part of the earth's climate system (IPCC (1996); WCRP (1995)).

It is important to note that WOD98 is a product based on data submitted to NODC/WDC-A by individual scientists and scientific teams as well as institutional, national, and regional data centers. A major contribution of NODC/WDC-A to the field of oceanography has been to provide centralized databases where all data and metadata are in the same format. This has allowed investigators such as Wyrtki (1971) and Levitus (1982) to construct atlases that have proven to be of utility to the scientific research and in some instances the operational forecasting communities.

1.1b Data and instrument (probe) types in WOD98

WOD98 consists of profile data from several oceanographic instrument (probe) types. We present a brief description of some of the major instrument types and/or systems that are (or were) used to make measurements which are included in WOD98. NODC instrument codes are presented by Conkright *et al.* (1998a) and are also available via the NODC Home Page.

A description of various oceanographic instruments may be found in the recent publication by Emery and Thomson (1997). Detailed descriptions of instruments and measurement techniques can be found in the scientific literature, some of these sources are given in the bibliography of this atlas.

i) Ocean Station Data

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 Nisken 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. The NODC Ocean Profile Database contains data for additional variables such as dissolved organic carbon.

ii) Conductivity-Temperature-Depth

Conductivity-Temperature-Depth (CTD) instruments measure temperature and conductivity as a function of pressure (depth) at relatively high (often referred to as "continuous") vertical resolution. Salinity is computed from the conductivity measurement. CTD data may be submitted to NODC/WDC-A at sub-meter vertical resolution. These data are now archived at this resolution whereas in the past, electronic storage limitations resulted in only selected levels being stored. An earlier version of the CTD instrument was the STD (salinity-temperature-depth) which computed salinity from a conductivity sensor as the instrument was moving though the water column. Because of instrument problems that led to erroneous data values (spikes), this method was replaced by the CTD method for which conductivity measurements are recorded from the instrument and then salinity computed with appropriate calibration information. Dissolved oxygen content can now be measured "continuously" with sensors placed on CTD instruments. New sensors are being developed to make "continuous" measurements of other variables. We refer to CTD "stations" or "casts" to recognize that more than one variable is being measured when a CTD instrument is deployed.

iii) Mechanical Bathythermograph

Mechanical Bathythermograph (MBT) instruments were developed in their modern form around 1938 (Spilhaus, 1938). The instrument provides estimates of temperature as a function of depth in the upper ocean. Earlier versions of the instrument were limited to making measurements in the upper 140 m of the water column. The last U.S. version of this instrument reached a maximum depth of 295 m. A temperature profile as a function of depth is traced on a smoked glass slide which is digitized. Pressure is determined from a pressure sensitive tube known as a Bourdon tube. One advantage of the MBT compared to lowering a reversing thermometer is that it could be dropped from a moving ship and then winched aboard ship again. The accuracy of the MBT instrument is generally acknowledged to be about 0.5 °F (0.3 °C) (see references by Levitus *et al.*, 1998a). The Digital Bathythermograph (DBT) instrument is a version of the MBT that reports data electronically rather than mechanically and may reach depths deeper than 295 m.. DBT profiles are included in the MBT files.

iv) Expendable Bathythermograph

The Expendable Bathythermograph (XBT) was deployed beginning in 1966 and has replaced the MBT in many measurement programs. There are different models of XBT instruments which have different maximum depth penetration and/or other different characteristics. The T-4, T-6, and T-7 probes reach maximum depths of 450, 750, and 750 m respectively. The T-7 probe differs from the T-6 probe in that it can be dropped from a faster moving ship and still maintain certain accuracy standards. The T-5 probe reaches a maximum depth of about 1800 m.

The depth of a temperature measurement from an XBT instrument is determined using the time elapsed between when the probe enters the water and the time each temperature measurement is made. A vendor supplied drop-rate equation is utilized. However, the vendor supplied drop-rate equation for T-4, T-6, and T-7 probes was found to have a systematic error and a new equation has been developed by the international research community (Hanawa *et al.*, 1995; UNESCO, 1994). The recommended practice regarding exchange and archiving of XBT profiles is that XBT profile data be exchanged or sent to data centers without correction for the systematic depth error, until an "international mechanism is established to implement the general use of the new equation" (UNESCO, 1994). This policy is to avoid double corrections.

v) NOAA Tropical Atmosphere-Ocean (TAO) buoy temperature profiles

Upper ocean temperature profiles from NOAA Tropical Atmosphere-Ocean (TAO) buoys located in the tropical Pacific have been included in WOD98 as part of the XBT file. These are profiles that were transmitted over the Global Telecommunication System (GTS) and entered into the Global Temperature-Salinity Profile Program (GTSPP) database maintained at NODC/WDC-A. For a description of the TAO buoy network we refer to the work by Hayes (1991) and McPhaden (1993, 1995).

1.1c Economic justification for maintaining archives of historical oceanographic data: the value of stewardship

Oceanography is an observational science and it is not possible to replace historical data that have been lost. From this point of view, historical measurements of the ocean are priceless. However, in order to provide input to a "cost-benefit" analysis of the activities of oceanographic data centers and specialized data rescue projects, we can estimate the costs incurred if we wanted to resurvey the world ocean today, in the same manner as represented by the WOD98 Ocean Station Data (OSD) profile archive.

The computation we describe was first performed in 1982 by Mr. Rene Cuzon du Rest, of NODC. We use an average operating cost of $16,000. per day for a medium-sized U.S. research ship (NSF personal communication) with a capability to make two "deep" casts per day or 10 "shallow" casts per day. We define a "deep" cast as extending to a depth of more than 1000 m and a "shallow" cast as extending to less than 1000 m. This is an arbitrary definition but we are only trying to provide a coarse estimate of replacement costs for this database. Using this definition, WOD98 contains 1,348,084 shallow casts so that the cost of the ship time to perform these measurements is approximately $2.1 billion. In addition WOD98 contains 216,049 profiles deeper than 1000 m depth, so the cost in ship time to make these "deep" measurements is approximately $1.7 billion. Thus, the total replacement cost of the OSD archive is about $3.8 billion, a figure based only on ship-time operating costs, not salaries for scientists or any other costs.

1.1d Data fusion

It is not uncommon in oceanography that measurements of different variables made from the same sea water samples, are often maintained as separate databases by different principal investigators. In fact, data from the same oceanographic cast may be located at different institutions in different countries. From its inception, NODC recognized the importance of building oceanographic databases in which as much data from each station and each cruise as possible are placed into standard formats, accompanied by appropriate metadata that make the data useful to future generations of scientists. It was the existence of such databases that allowed the *International Indian Ocean Expedition Atlas* (Wyrtki, 1971) and *Climatological Atlas of the World Ocean* (Levitus, 1982) to be produced without the time-consuming, laborious task of gathering data from many different sources. Part of the development of WOD98 has been to expand this data fusion activity by increasing the number of variables that NODC/WDC-A makes available as part of standardized databases.

1.1e Distribution media

WOD98 is primarily being distributed on CD-ROMs with all data compressed in DOS format. Based on requests by users of our earlier products, the OCL developed a new ASCII format to make the most efficient use of space on storage media used to transfer data to users. To further minimize storage space requirements, the data have been compressed with the GZIP utility (Conkright *et al.*, 1998a). The greater size of WOD98 compared to WOA94 is in part due to the inclusion of high resolution CTD and XBT profiles, as well the addition of metadata and data not included in WOA94. Even with compression, there are a total of four CD-ROMs containing all profile data in WOD98 at observed levels and one CD-ROM containing all profile data in WOD98 at standard levels. Without compression, the number of CD-ROMs required to distribute the WOD98 database would total about sixteen.

1.1f Application software interfaces

We have included software conversion routines so that users of software packages, databases, and programming languages such as MATLAB, IDL, PC-Surfer, ICES format, NODC P3 format, C, and FORTRAN can access the data. An effort is in progress to develop a JAVA based interface for viewing data from the WOD98 CD-ROMs. In response to user requests, we have defined the WOD98 format to be as "self defining" as possible so as to eliminate, or at least minimize, the need for any structural changes to the format when new data types are added. We do not envision any substantial changes to our present data format. We will use the Internet to make available additional convertors, Graphical User Interfaces (GUI), and other software tools that become available.

Users can request WOD98 data from NODC in the NODC "P3" format (comma separated values) which is a more amenable format for transfer of data to spreadsheets and databases, but which has the disadvantage of requiring much more storage space.

2. COMPARISON OF WOD98 WITH PREVIOUS GLOBAL OCEAN PROFILE DATABASES

Table 1 shows the amount of temperature data available from different instrument (probe) types that were used in earlier global oceanographic temperature analyses. During the past five years, the archives of historical oceanographic data have grown due to special data management and data observation projects that we discuss in section 3.1 of this atlas, as well as due to normal submission by scientists and operational ocean monitoring programs. With the distribution of WOD98 there are now approximately 5.3 million temperature profiles and 1.5 million salinity profiles (as well as other profile data and plankton data) available to the international research community in a common format with associated metadata and quality control flags. There has been a net increase of about 750,000 temperature profiles since publication of *World Ocean Atlas 1994.* However, the amount of "new" historical data available is greater than this figure by about 353,000 profiles. This is due to improved "near-duplicate" checking schemes that have been incorporated into our processing system which resulted in the elimination of near-duplicates in the amounts of about 137,000 MBT profiles, 134,000 XBT profiles, 7,400 CTD casts and 77,000 Station Data casts that existed in WOA94. Comparison of the yearly data distribution maps shown in Appendix A of this publication with similar maps shown by Levitus *et al.* (1994b) document that there is now much better data coverage in many years and regions since publication of WOA94. For example, Figs. 1a-c show the distribution of all profile data for 1969 based on: a) the WOA94 database b) the WOD98 and c) the profiles added for 1969 in the compilation of WOD98. There is an obvious increase in the data coverage in space. However, because of the elimination of duplicate stations, the net change of the total number of profiles available between WOA94 and WOD98 is a decrease of 1,389 profiles!

Table 2 shows a comparison of the total number of Ocean Station Data variables at the sea surface with previous databases.

3. DATA SOURCES

The oceanographic data that comprise WOD98 have been acquired through many sources and projects as well as from individual scientists. Some of the international data exchange organizations are described.

The International Council for the Exploration of the Sea (ICES) was established in 1902 and began collecting and distributing oceanographic data. The pioneering and excellent work in international oceanographic data management and exchange of ICES continues under the guidance of Dr. Harry Dooley.

The International Oceanographic Data Exchange (IODE) activities of the Intergovernmental Oceanographic Commission (IOC), have been responsible for the development of a network of National Oceanographic Data Centers in many countries. This network greatly facilitates international ocean data exchange. The IOC was established to support international oceanographic scientific needs including data exchange on an intergovernmental basis (UNESCO, 1979). Additional information about IODE can be found on their Web Page, **www.unesco.org/ioc/iochome.htm**).

The World Data Center System was set up during the International Geophysical Year under the auspices of the International Council of Scientific Unions (ICSU, 1996; Rishbeth, 1991; Ruttenberg and Rishbeth, 1994). Contributions of data from scientists, oceanographic institutions, and countries have been sent to WDC-A for Oceanography since its inception. WDC-B for Oceanography is located in Obninsk, Russia and WDC-D for Oceanography is located in Tianjin, China. Additional information about the World Data Center System can be found on the following Web Page, **www.ngdc.noaa.gov/wdc/wdcmain.html**) hosted by the National Geophysical Data Center located in Boulder, Colorado .

3.1 Project results

3.1a *IOC Global Oceanographic Data Archaeology and Rescue Project*

NODC and several other oceanographic data centers initiated "data archaeology and rescue" projects around 1991. Based on the success of these projects, the Intergovernmental Oceanographic Commission of UNESCO initiated a project in 1993 known as the "Global Oceanographic Data Archaeology and Rescue"(GODAR) project with the goal of "locating and rescuing" oceanographic data that are stored in manuscript and/or digital form, that are at risk of being lost due to media decay. The international scientific and data management communities have strongly supported this project. Results from the first phase of this project were described by Levitus *et al.* (1994a). With the publication and distribution of WOD98, approximately two million temperature profiles have been added to the historical archives of oceanographic data since inception of various national data archaeology and rescue projects and the IOC/GODAR project in 1991, and the NODC/WDC-A

"Global Ocean Database Project" in 1996. The status of these projects to date is described by Levitus *et al.* (1998). A partial list of some data sets added to the NODC/WDC-A Ocean Profile Database (NOPDB) since publication of WOA94 is given in Table 3.

3.1b *NODC/WDC-A Global Ocean Database Project*

During 1995, World Data Center-A for Oceanography initiated a project entitled "*Global Ocean Database*" with support from the NOAA/ESDIM program. This project was instituted because it was recognized that there are substantial oceanographic data in digital form at oceanographic institutes around the world, that while not at risk of being lost due to media degradation or neglect, have not been submitted to the WDC system. WDC-A for Oceanography has begun requesting institutions to transfer their entire ocean profile and plankton archives to WDC-A for Oceanography. After receipt at NODC/WDC-A, the data in these databases are compared to existing data holdings and duplicates and "near duplicates" are eliminated before data are added to the NODC/WDC-A archives. A substantial effort is involved, but the improvements to the archives greatly serves the user community.

The response to WDC-A requests for data has been excellent as partially summarized in Table 4. We emphasize that some of, and in some cases the majority of, the data submitted by these institutions may have already existed in NODC/WDC-A databases. However, we have frequently found that there are large numbers of casts that were thought to be in these databases that were in fact not present. In addition, there were large number of Ocean Station Data casts for which the NODC/WDC databases had temperature and salinity data but not data for other variables (*e.g.*, chlorophyll). These additional data were merged in with the profiles from the existing stations. There were also cases for which the NODC/WDC-A databases had data only at standard or selected levels. We replaced these data profiles with the corresponding observed level profiles.

3.1c *IOC Global Temperature-Salinity Profile Program*

The Global Temperature-Salinity Profile Program (GTSPP) (Searle, 1992) is a project sponsored by the Intergovernmental Oceanographic Commission to develop databases of real-time temperature-salinity profiles. The GTSPP files include data from "fixed platforms" such as the NOAA Tropical Atmosphere-Ocean (TAO) array of buoys (Hayes *et al.*, 1991; McPhaden, 1993, 1995) in the Pacific Ocean and from other buoys. We incorporated XBT and TAO buoy profiles from this database into WOD98 for the period inclusive through 1996.

Users wanting GTSPP data for 1997 and 1998 can acquire the data over the Internet via the NODC website:(**www.nodc.noaa.gov**) or by contacting the NODC user Services group (**services@nodc.noaa.gov**).

Users wanting the complete TAO buoy database comprised of data that have had the benefit of additional PMEL processing and quality control, can find instructions for acquiring these data via the Home Page of the Pacific Marine Environmental Laboratory (**www.pmel.noaa.gov**).

3.1d National, regional and international project data sets

The MAST (Marine Science and Technology Programme) program of the European community has promoted international oceanographic data exchange by emphasizing that MAST funded projects must contribute data to appropriate data centers. Some of these contributions are listed in Table 4.

It has become more common for all data from a particular project to be released on CD-ROM as a project data set. We have incorporated data from these CD-ROMs into the WOD98. Examples include: the British Ocean Flux Study dataset produced by the British Oceanographic Data Center and the North Sea Project Database sponsored by the MAST program of the European Community.

3.1e *World Ocean Circulation Experiment* data

We downloaded the publicly available World Ocean Circulation Experiment (WOCE) CTD and OSD profiles in April 1997. There were 3,250 CTD profiles available at that time. Some WOCE XBT profiles are also part of WOD98.

3.2 ICES contribution

As part of the World Ocean Database project, WDC-A requested that the International Council for the Exploration of the Sea (ICES) data center transfer their archives of publically available data to NODC/WDC-A. Table 5 shows the data transferred to date. While some of these data already existed in the NODC/WDC-A profile databases, many were not there.

3.3 Declassified naval data sets

As a result of the end of the Cold War, the navies of several countries have declassified substantial amounts of oceanographic data that were formerly classified, in some cases at the request of the Intergovernmental Oceanographic Commission. Table 6 shows the amount of data recently declassified and transferred to NODC/WDC-A. It should be recognized that some navies have policies of declassifying substantial amounts of data in real time or with relatively short time delays. For example, the U.S. Navy has contributed approximately 435,000 MBT profiles and the U.S. Coast Guard approximately 217,000 MBT profiles to the NODC/WDC-A databases. Also, the Australian Navy reports profile data in real-time including data from their Exclusive Economic Zone (EEZ).

3.4 Integrated Global Ocean Service - Volunteer Observing Ship programs

Since the pioneering work of Mathew Maury beginning in 1854, there have been programs in existence to gather meteorological and oceanographic data from merchant ships. These ships are sometimes referred to as Voluntary Observing Ships (VOS) and the programs called Ship-of-

Opportunity Programs (SOOP). During the 1970's, the U.S. and France (Scripps Institute of Oceanography and ORSTOM, New Caledonia) began a SOOP program that focused on the deployment of XBT instruments from VOS platforms in the Pacific Ocean (White, 1995). This program expanded to include the Atlantic and Pacific Oceans and is now supported by NOAA Ship-of-Opportunity Program. Several countries are conducting SOOPs or have conducted them. These programs are coordinated internationally by the World Meteorological Organization (WMO) and the Intergovernmental Oceanographic Commission (IOC). A description of the status of many of these programs can be found in the report, IOC (1989). As described in this report, Australia, Canada, Chile, Germany, Japan, United Kingdom, and Russia have conducted such programs in addition to France and the U.S. A more recent summary of the status of the system is given by Joint IOC-WMO Committee for IGOSS (1996).

3.4a NOAA Ship-of-Opportunity Program (SOOP)

The NOAA SOOP program acquires surface meteorological data and XBT profiles from instruments placed on Volunteer Observing Ships participating in the program. The automated system for acquiring and transmitting these data is known as SEAS (Shipboard Environmental Acquisition System). Data are transmitted via satellite and eventually stored at NODC/WDC-A. Approximately 20,000 XBT probes are deployed each year as a result of this effort.

3.4b SURTROPAC

The SURTROPAC program is a French Ship-of-Opportunity Program that uses Volunteer Observing Ships to make measurements of sea surface temperature, salinity, and chlorophyll (Dandonneau, 1992). While these are “surface only data” we have placed them in the Ocean Station Data file of WOD98 because of the great interest by the scientific community in having access to chlorophyll measurements.

4. QUALITY CONTROL FLAGS

Each individual data value and each profile in WOD98 has quality control flags associated with it. A description of these flags and general documentation describing software to read and use the WOD98 database are found in the report by Conkright *et al.* (1998a). Users can choose to accept or ignore these flags. It is clear that there are both Type I and Type II statistical errors (for normal distributions) associated with these flags. There are some data that have been flagged as being erroneous or unrepresentative when in fact they are not. There are some data that have been flagged as being “acceptable” based on our tests which in fact may not be the case. In addition, the sparsity of data, non-normal frequency distributions, and presence of different water masses in close proximity results in incorrect assignment of flags.

The obvious advantage of flagging data is that users can choose to accept or ignore all or part of the flags we assign to data values. The most important flags we set are those that are set based on unusual features produced during objective analyses of the data at standard levels. This is because standard statistical tests may be biased for the reasons described above. Data from small-scale ocean features such as eddies and/or lenses are not representative of the large-scale permanent or semipermanent features we attempt to reproduce with our analyses and will cause unrealistic features such as bull's-eyes to appear. Hence, we flag these data, and other data causing such features, as being unrealistic or as possible errors. It is important to note that an investigator studying the distribution of mesoscale features in the ocean will find data from such features to be the signal he/she is looking for. As noted by Levitus (1982), it is not possible to produce one set of data analyses to serve the requirements of all possible users. A corollary is that it is not possible to produce one set of quality control flags for a database that serve the exact requirements of all investigators. As data are added to a database, investigators must realize that flags set for having violated certain criteria in an earlier version of the database may be reset solely due to the addition of new data which may change the statistics of the region being considered. Even data that have produced unrealistic features may turn out to be realistic when additional data are added to a region of sparse data. Conkright *et al.* (1994b) present the objectively analyzed field of silica at 1000 m depth using all silica data available as part of WOA94 and using only data flagged as being acceptable. The differences are obvious.

5. XBT DROP RATE ERROR

The XBT instrument does not measure pressure or depth directly. The depth of an XBT instrument as it falls through the water column is computed from the elapsed time from when the probe enters the water through use of a drop-rate equation. There are several models of the Sippican Expendable Bathythermograph instrument. The manufacturer's drop rate equation for the T4, T-6, and T-7 models are known to contain a systematic error. The systematic error in calculated depth can be as large as 25-30 m at depths of 750 m. To correct for this error a new drop rate equation has been computed (Hanawa *et al.*, 1995; UNESCO, 1994). By international agreement (UNESCO, 1994), XBT profile depths are supposed to be reported to and archived at data centers using the "old' drop-rate equation. This policy is to avoid possible confusion as to whether the profiles have been converted or not. NODC/WDC-A archives the XBT data as submitted. In fact, some data are submitted using the new drop-rate formula although none of these data are in WOD98. This fact can be demonstrated by using a code in the observed level profile metadata (Conkright *et al.*, 1998a).

The observed level XBT profiles are the same data as submitted by originators. However, in preparing standard level data for WOD98, the NODC/OCL corrected the depths of the originator's XBT profiles using the new drop-rate equation, before interpolating to standard levels.

6. STATISTICS OF INDIVIDUAL INSTRUMENT TYPES

We present a series of figures and tables which document the status of the archives of historical ocean profile through the presentation of summary statistics. More detailed information is presented in the individual volumes of WOD98, each describing the historical distributions of an individual instrument or measurement type (e.g. CTD, MBT, XBT, OSD temperature and salinity, nutrients, chlorophyll, pH, alkalinity and plankton data).

Table 7 shows the number of stations or profiles in WOD98 submitted by individual country for the OSD, CTD, MBT, and XBT files. This table is sorted by NODC country code. Table 8 shows the same information sorted alphabetically by country name. Tables 9-12 give the contribution by each country of OSD, MBT, XBT, and CTD stations or profiles with each table sorted in descending order by percent contribution.

Figs. 2-4 shows the time series of the yearly totals of Ocean Station Data stations for the World Ocean, southern hemisphere oceans, and northern hemisphere oceans respectively. Tables 13-15 give the yearly counts of OSD stations in table form for the World Ocean, southern hemisphere oceans , and northern hemisphere oceans respectively. Fig. 5 shows the distribution of all OSD stations in WOD98.

Figs. 6-8 shows the time series of the yearly totals of Conductivity-Temperature-Depth stations for the World Ocean, southern hemisphere oceans, and northern hemisphere oceans respectively, Tables 16-18 give the yearly counts of CTD stations in table form for the World Ocean, southern hemisphere oceans, and northern hemisphere oceans respectively. Fig. 9 shows the distribution of all CTD stations in WOD98.

Figs. 10-12 shows the time series of the yearly totals of Mechanical Bathythermograph profiles for the World Ocean, southern hemisphere oceans, and northern hemisphere oceans respectively, Tables 19-21 give the yearly counts of MBT profiles for the World Ocean, southern hemisphere oceans, and northern hemisphere oceans respectively. Fig. 13 shows the distribution of all MBT profiles in WOD98.

Figs. 14-16 shows the time series of the yearly totals of Expendable Bathythermograph profiles for the World Ocean, southern hemisphere oceans, and northern hemisphere oceans respectively. Tables 22-24 give the yearly counts of XBT profiles in table form for the World Ocean, southern hemisphere oceans, and northern hemisphere oceans respectively. Fig. 17 shows the distribution of all XBT profiles in WOD98.

Fig. 18 shows the distribution of all stations and profiles in WOD98.

Appendix A is comprised of figures that show the yearly distributions of all ocean stations and profiles merged together (OSD+MBT+XBT+CTD+TAO) for the period 1941-1996. Note that we include MBT profiles for 1941-1996, XBT profiles for 1966-1996, CTD stations for 1967-1996.

Appendix B is comprised of figures that show the seasonal distributions for individual years of all ocean stations and profiles data merged together (OSD+MBT+XBT+CTD+TAO) for the period

1941-1996.

7. OUTLOOK FOR FUTURE ACQUISITIONS OF HISTORICAL OCEAN PROFILE AND PLANKTON DATA AND INTERNATIONAL COOPERATION IN A "GLOBAL OCEAN DATABASE PROJECT"

Substantial amounts of historical ocean data continue to be transferred to NODC/WDC-A for inclusion into databases. The outlook for continuing to be able to increase the amount of such data available to the scientific community is excellent. Based on the positive results of the IOC/GODAR project and the Global Ocean Database Project, we have requested the continued cooperation of the international scientific and data management communities in building the historical ocean data archives. There is a particular need for high resolution CTD data so that we can resolve smaller scale features in the vertical and provide objective analyses of variables at greater vertical resolution than present. Examination of the distribution of high resolution CTD profiles shown in Fig. 6 and by Boyer *et al.* (1998a) documents the lack of such data for global scale analyses. The WOCE CTD surveys will substantially improve this distribution. There is a need for additional historical chlorophyll and plankton data so we can improve understanding of ocean biogeochemical cycles.

Improving the quality of historical data and their associated metadata is a important task. Corrections to possible errors in data and metadata is best done with the expertise of the principal investigators who made the original observations, the data center or group that prepared the data, or be based on historical documents such as cruise and data reports (however, one has to also consider that these documents may contain errors). The continuing response of the international oceanographic community to the GODAR project and the Global Ocean Database Project have been excellent. This response has resulted in global ocean databases that can be used internationally without restriction for the study of many environmental problems.

As the amount of historical oceanographic data continues to increase as a result of international cooperation, the scientific community will be able to make more and more realistic estimates of variability and be able to place confidence intervals on the magnitude of temporal variability of the more frequently sampled variables such as temperature.

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Table 1. Comparison of the number of temperature profiles in the WOD98 database compared to the WOA94 database and the database used in *Climatological Atlas of the World Ocean* (1982).

Data type	Climatological Atlas of the World Ocean (1982)	World Ocean Atlas 1994	World Ocean Database 1998
STATION DATA and LOW RESOLUTION C/STD temperature profiles*	425000	1194407	1373440
HIGH RESOLUTION CTD temperature profiles	na	89000	189555
MBT temperature profiles	775000	1922170	2077200
XBT temperature profiles	290000	1281942	1537203
TAO moored buoy (fixed platform) temperature profiles (these are found in the XBT files)	na	na	69941
FIXED PLATFORM temperature profiles other than the TAO buoys (these are found in the XBT files)	na	na	37774
Total number of temperature profiles	1490000	4487519	5285113
"SURFACE ONLY" TEMPERATURE DATA (these are ship-of-opportunity data found in the SD files			159,794

*The Ocean Station Data file contains some older low resolution STD and CTD data that were placed there before NODC developed a separate CTD file.

Table 2. Comparison of the number of sea surface observations in WOD98 of several Ocean Station Data variables with previous databases.

Variable	CLIMATOLOGICAL ATLAS OF THE WORLD OCEAN	WORLD OCEAN ATLAS	WORLD OCEAN DATABASE 1998
Temperature	425,000	1,194,000	1,439,209
Salinity	399,429	1,034,091	1,343,580
Oxygen	159,016	324,627	480,718
Phosphate	0	171,064	279,011
Silicate	0	80,235	186,226
Nitrite	0	0	120,337
Nitrate	0	61,817	144,523
pH	0	0	103,338
Alkalinity	0	0	6,759
chlorophyll	0	0	131,690

Table 3. Some GODAR contributions since publication of WOA94.

Country	Institution	Station Data	XBT	MBT	CTD
Russia	**Murmansk Marine Biological Institute**	**10000**	**0**	**0**	**0**
Ukraine	**Southern Scientific Research Institute of marine Fisheries and Oceanography (YugNIRO)**	**32480**	**0**	**27175**	**650**
Ukraine	**Marine Hydrophysical Institute**	**550**	**0**	**0**	**1700**
United States	**Scripps Institute of Oceanography**	**0**	**0**	**103548***	**0**
TOTALS		**43030**	**0**	**130723**	**2350**

*** in addition to approximately 74,000 profiles that were part of WOA94**

Table 4. Some contributions of digital data sets to the Global Ocean Database Project from individual countries and institutions. Some of the data in these data sets were already in the NODC/WDC-A archives as noted in the text.

Country or Agency	Institution or Project	Station Data	XBT	MBT	CTD
Australia	CSIRO (Hobart)	26033	0	0	0
Canada	Marine Environmental Data Service	179633	46658	145286	0
Canada	Institute of Ocean Sciences	1339	0	0	19325
Canada	Bedford Institute	0	0	0	25904
France	IFREMER	76375	0	0	0
Japan	Japan Oceanographic Data Center	254846	25223	60764	0
Republic of Korea	Korean Oceanographic Data Center	24079	0	0	0
United Kingdom	British Oceanographic data Center (BOFS)	548	89	0	535
European Community MAST	North Sea Project Database	2483	0	0	3786
TOTALS		565336	71970	206050	49550

Table 5. Contributions of digital data through the ICES Data Center.

Country	Station Data	CTD
Angola*	623	0
Denmark	13140	0
Finland	42661	0
Iceland	8643	0
Netherlands	5554	788
Norway	45538	0
Portugal	4035	0
Spain	2155	0
United Kingdom	87426	0
TOTALS	209,775	788

*** In conjunction with Norway**

Table 6. Recent naval contributions of digital oceanographic cast data.

Country	XBT	MBT	CTD	Station Data
Argentina	1,493	6,351	0	0
Russia	0	138,903	0	33,579
Turkey	0	0	0	864
United Kingdom	108,407	63,187	0	304
TOTALS	109,900	220,012	0	34,747

Table 7 National contributions of OSD, MBT, XBT, CTD casts sorted by NODC Country Code

*NODC Country Code	Country Name	OSD Count	% of Total	MBT Count	% of Total	XBT Count	% of Total	CTD Count	% of Total
1	NOT USED	0	0	0	0	0	0	0	0
2	NOT USED	0	0	0	0	0	0	0	0
3	NOT USED	0	0	0	0	0	0	0	0
4	NOT USED	0	0	0	0	0	0	0	0
5	NOT USED	0	0	0	0	0	0	0	0
6	GERMANY, FED. REP	43472	2.83	7156	0.34	45366	2.76	2650	1.4
7	GERMANY, DEM. REP.	14171	0.93	0	0	66	0	340	0.18
8	ARGENTINA	3307	0.22	13028	0.63	1909	0.12	183	0.1
9	AUSTRALIA	30015	1.97	17817	0.86	71137	4.32	4870	2.56
10	AUSTRIA	11	0	0	0	0	0	0	0
11	BELGIUM	5088	0.33	0	0	0	0	0	0
12	BURMA	0	0	0	0	0	0	0	0
13	BOLIVIA	0	0	0	0	0	0	0	0
14	BRAZIL	9660	0.63	82	0	216	0.01	0	0
15	BULGARIA	0	0	0	0	0	0	0	0
16	NOT USED	0	0	0	0	0	0	0	0
17	CAMEROON	0	0	0	0	0	0	0	0
18	CANADA	113469	7.42	191691	9.23	46186	2.81	51334	27.02
19	SRI LANKA	0	0	0	0	0	0	0	0
20	CHILE	1329	0.09	4158	0.2	2359	0.14	0	0
21	TAIWAN	2851	0.19	0	0	3	0	57	0.03
22	COLOMBIA	973	0.06	746	0.04	32	0	0	0
23	NOT USED	0	0	0	0	0	0	0	0
24	KOREA, REP. OF	28339	1.85	847	0.04	53	0	27	0.01
25	NOT USED	0	0	0	0	0	0	0	0
26	DENMARK	32509	2.13	0	0	5852	0.36	0	0
27	ARAB REP. OF EGYPT	551	0.04	0	0	0	0	0	0
28	ECUADOR	2381	0.16	885	0.04	492	0.03	0	0
29	SPAIN	2981	0.2	195	0.01	2812	0.17	0	0
30	NOT USED	0	0	0	0	0	0	0	0
31	UNITED STATES	264538	17.38	1052121	50.65	659382	40.09	71592	37.69
32	UNITED STATES	8252	0.54	44564	2.15	234483	14.25	26520	13.99
33	UNITED STATES	115	0.01	20435	0.98	3080	0.19	1038	0.55
34	FINLAND	42252	2.76	0	0	0	0	99	0.05
35	FRANCE	46238	3.03	2532	0.12	33430	2.03	11468	6.05
36	GREECE	556	0.04	0	0	0	0	0	0
37	GUATEMALA	0	0	0	0	0	0	0	0
38	HAITI	0	0	0	0	0	0	0	0
39	NOT USED	0	0	0	0	0	0	0	0
40	NOT USED	0	0	0	0	0	0	0	0
41	INDIA	4049	0.26	540	0.03	205	0.01	0	0
42	INDONESIA	4370	0.29	0	0	1178	0.07	88	0.05
43	IRAQ	0	0	0	0	0	0	0	0
44	IRAN	0	0	0	0	0	0	0	0
45	IRELAND	2722	0.18	0	0	0	0	0	0
46	ICELAND	16047	1.05	0	0	4292	0.26	0	0
47	ISRAEL	5584	0.37	0	0	0	0	0	0
48	ITALY	10631	0.7	6169	0.3	339	0.02	618	0.33
49	JAPAN	204053	13.35	228425	11	212555	12.92	444	0.23

*NODC Country Code	Country Name	OSD Count	% of Total	MBT Count	% of Total	XBT Count	% of Total	CTD Count	% of Total
50	JORDAN	0	0	0	0	0	0	0	0
51	JAPAN	0	0	0	0	0	0	0	0
52	LEBANON	0	0	0	0	0	0	0	0
53	LIBYA	0	0	0	0	0	0	0	0
54	LIBERIA	0	0	0	0	23471	1.43	0	0
55	MALAGASY REP.	2666	0.17	405	0.02	62	0	0	0
56	MOROCCO	0	0	0	0	0	0	0	0
57	MEXICO	1283	0.08	0	0	1959	0.12	59	0.03
58	NORWAY	89205	5.84	890	0.04	4124	0.25	2754	1.45
59	NEW CALEDONIA	43198	2.83	0	0	0	0	0	0
60	JAPAN	0	0	0	0	0	0	0	0
61	NEW ZEALAND	1996	0.13	2436	0.12	5404	0.33	102	0.05
62	PAKISTAN	199	0.01	0	0	0	0	0	0
63	NOT USED	0	0	0	0	0	0	0	0
64	NETHERLANDS	14090	0.92	7123	0.34	11046	0.67	1056	0.56
65	PERU	4278	0.28	5212	0.25	714	0.04	0	0
66	PHILIPPINES	236	0.02	0	0	1001	0.06	0	0
67	POLAND	8639	0.57	0	0	1320	0.08	809	0.43
68	PORTUGAL	4440	0.29	2920	0.14	714	0.04	0	0
69	NOT USED	0	0	0	0	0	0	0	0
70	DOMINICAN REP.	9	0	0	0	0	0	0	0
71	NOT USED	0	0	0	0	0	0	0	0
72	ALBANIA	0	0	0	0	0	0	0	0
73	ROMANIA	0	0	0	0	0	0	0	0
74	UNITED KINGDOM	95875	6.31	115940	5.58	155169	9.43	7267	3.83
75	EL SALVADOR	0	0	0	0	0	0	0	0
76	CHINA, PEOPLES REP	5517	0.36	0	0	3349	0.2	1749	0.92
77	SWEDEN	36032	2.36	0	0	4441	0.27	165	0.09
78	SWITZERLAND	0	0	0	0	0	0	0	0
79	SURINAM	0	0	0	0	0	0	0	0
80	SYRIA	0	0	0	0	0	0	0	0
81	NOT USED	0	0	0	0	0	0	0	0
82	NOT USED	0	0	0	0	0	0	0	0
83	NOT USED	0	0	0	0	0	0	0	0
84	NOT USED	0	0	0	0	0	0	0	0
85	NOT USED	0	0	0	0	0	0	0	0
86	THAILAND	2879	0.19	77	0	29	0	0	0
87	TOGO	0	0	0	0	0	0	0	0
88	TUNISIA	389	0.03	0	0	0	0	0	0
89	TURKEY	305	0.02	0	0	0	0	0	0
90	RUSSIA	231591	15.16	344949	16.61	13693	0.83	3192	1.68
91	SOUTH AFRICA	22372	1.46	20	0	2750	0.17	0	0
92	URUGUAY	0	0	0	0	147	0.01	0	0
93	VENEZUELA	3575	0.23	668	0.03	0	0	0	0
94	VIETNAM	0	0	0	0	0	0	0	0
95	CROATIA (YUGOSLAVIA)	9431	0.62	0	0	0	0	0	0
96	NOT USED	0	0	0	0	0	0	0	0
97	NOT USED	0	0	0	0	0	0	0	0
98	NOT USED	0	0	0	0	0	0	0	0
99	UNKNOWN	32318	2.11	3197	0.15	47911	2.91	537	0.28
0	NOT USED	0	0	0	0	0	0	0	0
AG	ANTIGUA	0	0	0	0	4205	0.26	0	0
AL	ALGERIA	0	0	0	0	0	0	0	0

*NODC Country Code	Country Name	OSD Count	% of Total	MBT Count	% of Total	XBT Count	% of Total	CTD Count	% of Total
AN	ANGOLA	621	0.04	0	0	0	0	0	0
BA	BARBADOS	0	0	0	0	225	0.01	0	0
BH	BAHAMAS	0	0	0	0	2079	0.13	0	0
BN	BONAIRE	0	0	0	0	0	0	0	0
CA	CURACAO	0	0	0	0	0	0	0	0
CI	CAYMAN ISLANDS	0	0	0	0	0	0	0	0
CR	COSTA RICA	0	0	0	0	31	0	0	0
CU	CUBA	970	0.06	0	0	0	0	0	0
CV	CAPE VERDE	0	0	0	0	0	0	0	0
CY	CYPRUS	0	0	0	0	1256	0.08	0	0
ES	ESTONIA	0	0	0	0	0	0	0	0
ET	ETHIOPIA	0	0	0	0	0	0	0	0
FJ	FIJI ISLANDS	0	0	0	0	64	0	0	0
GA	GABON	0	0	0	0	0	0	0	0
GH	GHANA	2670	0.17	12	0	0	0	0	0
GM	GAMBIA	0	0	0	0	0	0	0	0
GN	GUINEA-BISSAU	0	0	0	0	0	0	0	0
GR	GRENADA	0	0	0	0	0	0	0	0
GU	GUINEA	0	0	0	0	0	0	0	0
GY	GUYANA	0	0	0	0	0	0	0	0
HO	HONDURAS	0	0	0	0	0	0	0	0
HK	HONG KONG	0	0	0	0	775	0.05	0	0
IC	IVORY COAST	3159	0.21	100	0	14	0	0	0
IN	INTERNATIONAL	0	0	0	0	0	0	0	0
JA	JAMAICA	0	0	0	0	0	0	0	0
KE	KENYA	0	0	0	0	0	0	0	0
KU	KUWAIT	0	0	0	0	865	0.05	0	0
LA	LATVIA	0	0	0	0	0	0	0	0
LT	LITHUANIA	0	0	0	0	0	0	0	0
MA	MAURITIUS	0	0	0	0	52	0	0	0
ML	MALTA	0	0	0	0	301	0.02	0	0
MO	MONACO	0	0	0	0	0	0	0	0
MS	MALAYSIA	154	0.01	0	0	0	0	0	0
MU	MAURITANIA	1217	0.08	0	0	0	0	0	0
MZ	MOZAMBIQUE	0	0	0	0	0	0	0	0
NC	NICARAGUA	0	0	0	0	0	0	0	0
NI	NIGERIA	759	0.05	89	0	0	0	0	0
OM	OMAN	0	0	0	0	0	0	0	0
PA	PANAMA	139	0.01	0	0	19144	1.16	0	0
QA	QUATAR	0	0	0	0	0	0	0	0
RC	CONGO	1845	0.12	1337	0.06	0	0	0	0
RU	RUSSIA	1684	0.11	0	0	0	0	0	0
SA	SAUDI ARABIA	0	0	0	0	166	0.01	0	0
SC	SEYCHELLES	0	0	0	0	0	0	0	0
SE	SENEGAL	1975	0.13	247	0.01	0	0	0	0
SI	SINGAPORE	412	0.03	0	0	8739	0.53	0	0
SL	SIERRA LEONE	0	0	187	0.01	0	0	0	0
SM	SOMALIA	0	0	0	0	0	0	0	0
SO	SOLOMON ISLANDS	0	0	0	0	0	0	0	0
RU	SUDAN	0	0	0	0	0	0	0	0
SV	SAINT VINCENT	0	0	0	0	2920	0.18	0	0
TN	TONGA	0	0	0	0	1165	0.07	0	0
TT	TRINIDAD/TOBAGO	0	0	0	0	1	0	0	0

*NODC Country Code	Country Name	OSD Count	% of Total	MBT Count	% of Total	XBT Count	% of Total	CTD Count	% of Total
UA	U. ARAB EMIRATES	0	0	0	0	0	0	0	0
UR	UKRAINE	0	0	0	0	0	0	0	0
WS	WESTERN SAMOA	0	0	0	0	0	0	0	0
YM	YEMEN	85	0.01	0	0	0	0	0	0
ZA	TANZANIA	0	0	0	0	0	0	0	0
ZZ	MISC. ORGANIZATIONS	0	0	0	0	178	0.01	537	0.28
	TOTAL	1526727		2077200		1644911		189555	
	TOTAL PROFILES								
	COMBINED	5438393							

*The United States, Russia, and Japan have multiple country codes. This is because the NODC Institution Code is limited to two digits and these three countries each have more than 99 institutions that can potentially transfer data to NODC/WDC-A.

There are 897 Mechanical Bathythermograph (MBT) profiles reported for years prior to 1941. Some of these represent profiles with "incorrect" years because they predate the deployment of the MBT in 1937/1938. In addition, there are 163 Expendable Bathythermograph Data (XBT) profiles reported for years prior to 1966. Some of these represent profiles with "incorrect" years because they predate the deployment of the XBT in 1965/1966. The MBT and XBT profiles with the "early" dates are included in this table as well as in the WOD98 CD-ROMs.

Table 8 National contributions of OSD, MBT, XBT, CTD casts sorted alphabetically by country name

*NODC Country Code	Country Name	OSD Count	% of Total	MBT Count	% of Total	XBT Count	% of Total	CTD Count	% of Total
72	ALBANIA	0	0	0	0	0	0	0	0
AL	ALGERIA	0	0	0	0	0	0	0	0
AN	ANGOLA	621	0.04	0	0	0	0	0	0
AG	ANTIGUA	0	0	0	0	4205	0.26	0	0
27	ARAB REP. OF EQYPT	551	0.04	0	0	0	0	0	0
8	ARGENTINA	3307	0.22	13028	0.63	1909	0.12	183	0.1
9	AUSTRALIA	30015	1.97	17817	0.86	71137	4.32	4870	2.56
10	AUSTRIA	11	0	0	0	0	0	0	0
BH	BAHAMAS	0	0	0	0	2079	0.13	0	0
BA	BARBADOS	0	0	0	0	225	0.01	0	0
11	BELGIUM	5088	0.33	0	0	0	0	0	0
13	BOLIVIA	0	0	0	0	0	0	0	0
BN	BONAIRE	0	0	0	0	0	0	0	0
14	BRAZIL	9660	0.63	82	0	216	0.01	0	0
15	BULGARIA	0	0	0	0	0	0	0	0
12	BURMA	0	0	0	0	0	0	0	0
17	CAMEROON	0	0	0	0	0	0	0	0
18	CANADA	113469	7.43	191691	9.23	46186	2.81	51334	27.08
CV	CAPE VERDE	0	0	0	0	0	0	0	0
CI	CAYMAN ISLANDS	0	0	0	0	0	0	0	0
20	CHILE	1329	0.09	4158	0.2	2359	0.14	0	0
76	CHINA, PEOPLES REP	5517	0.36	0	0	3349	0.2	1749	0.92
22	COLOMBIA	973	0.06	746	0.04	32	0	0	0
RC	CONGO	1845	0.12	1337	0.06	0	0	0	0
CR	COSTA RICA	0	0	0	0	31	0	0	0
95	CROATIA (YUGOSLAVIA)	9431	0.62	0	0	0	0	0	0
CU	CUBA	970	0.06	0	0	0	0	0	0
CA	CURACAO	0	0	0	0	0	0	0	0
CY	CYPRUS	0	0	0	0	1256	0.08	0	0
26	DENMARK	32509	2.13	0	0	5852	0.36	0	0
70	DOMINICAN REP.	9	0	0	0	0	0	0	0
28	ECUADOR	2381	0.16	885	0.04	492	0.03	0	0
75	EL SALVADOR	0	0	0	0	0	0	0	0
ES	ESTONIA	0	0	0	0	0	0	0	0
ET	ETHIOPIA	0	0	0	0	0	0	0	0
FJ	FIJI ISLANDS	0	0	0	0	64	0	0	0
34	FINLAND	42252	2.77	0	0	0	0	99	0.05
35	FRANCE	46238	3.03	2532	0.12	33430	2.03	11468	6.05
GA	GABON	0	0	0	0	0	0	0	0
GM	GAMBIA	0	0	0	0	0	0	0	0
7	GERMANY, DEM. REP.	14171	0.93	0	0	66	0	340	0.18
6	GERMANY, FED. REP.	43472	2.83	7156	0.34	45366	2.76	2650	1.4
GH	GHANA	2670	0.17	12	0	0	0	0	0
36	GREECE	556	0.04	0	0	0	0	0	0
GR	GRENADA	0	0	0	0	0	0	0	0
37	GUATEMALA	0	0	0	0	0	0	0	0
GU	GUINEA	0	0	0	0	0	0	0	0
GN	GUINEA-BISSAU	0	0	0	0	0	0	0	0
GY	GUYANA	0	0	0	0	0	0	0	0

*NODC Country Code	Country Name	OSD Count	% of Total	MBT Count	% of Total	XBT Count	% of Total	CTD Count	% of Total
38	HAITI	0	0	0	0	0	0	0	0
HO	HONDURAS	0	0	0	0	0	0	0	0
HK	HONG KONG	0	0	0	0	775	0.05	0	0
46	ICELAND	16047	1.05	0	0	4292	0.26	0	0
41	INDIA	4049	0.27	540	0.03	205	0.01	0	0
42	INDONESIA	4370	0.29	0	0	1178	0.07	88	0.05
IN	INTERNATIONAL	0	0	0	0	0	0	0	0
44	IRAN	0	0	0	0	0	0	0	0
43	IRAQ	0	0	0	0	0	0	0	0
45	IRELAND	2722	0.18	0	0	0	0	0	0
47	ISRAEL	5584	0.37	0	0	0	0	0	0
48	ITALY	10631	0.7	6169	0.3	339	0.02	618	0.33
IC	IVORY COAST	3159	0.21	100	0	14	0	0	0
JA	JAMAICA	0	0	0	0	0	0	0	0
49	JAPAN	204053	13.37	228425	11	212555	12.92	444	0.23
51	JAPAN	0	0	0	0	0	0	0	0
60	JAPAN	0	0	0	0	0	0	0	0
50	JORDAN	0	0	0	0	0	0	0	0
KE	KENYA	0	0	0	0	0	0	0	0
24	KOREA, REP. OF	28339	1.85	847	0.04	53	0	27	0.01
KU	KUWAIT	0	0	0	0	865	0.05	0	0
LA	LATVIA	0	0	0	0	0	0	0	0
52	LEBANON	0	0	0	0	0	0	0	0
54	LIBERIA	0	0	0	0	23471	1.43	0	0
53	LIBYA	0	0	0	0	0	0	0	0
LT	LITHUANIA	0	0	0	0	0	0	0	0
55	MALAGASY REP.	2666	0.17	405	0.02	62	0	0	0
MS	MALAYSIA	154	0.01	0	0	0	0	0	0
ML	MALTA	0	0	0	0	301	0.02	0	0
MU	MAURITANIA	1217	0.08	0	0	0	0	0	0
MA	MAURITIUS	0	0	0	0	52	0	0	0
57	MEXICO	1283	0.08	0	0	1959	0.12	59	0.03
ZZ	MISC. ORGANIZATIONS	0	0	0	0	178	0.01	537	0.28
MO	MONACO	0	0	0	0	0	0	0	0
56	MOROCCO	0	0	0	0	0	0	0	0
MZ	MOZAMBIQUE	0	0	0	0	0	0	0	0
64	NETHERLANDS	14090	0.92	7123	0.34	11046	0.67	1056	0.56
59	NEW CALEDONIA	43198	2.83	0	0	0	0	0	0
61	NEW ZEALAND	1996	0.13	2436	0.12	5404	0.33	102	0.05
NC	NICARAGUA	0	0	0	0	0	0	0	0
NI	NIGERIA	759	0.05	89	0	0	0	0	0
58	NORWAY	89205	5.84	890	0.04	4124	0.25	2754	1.45
OM	OMAN	0	0	0	0	0	0	0	0
62	PAKISTAN	199	0.01	0	0	0	0	0	0
PA	PANAMA	139	0.01	0	0	19144	1.16	0	0
65	PERU	4278	0.28	5212	0.25	714	0.04	0	0
66	PHILIPPINES	236	0.02	0	0	1001	0.06	0	0
67	POLAND	8639	0.57	0	0	1320	0.08	809	0.43
68	PORTUGAL	4440	0.29	2920	0.14	714	0.04	0	0
QA	QUATAR	0	0	0	0	0	0	0	0
73	ROMANIA	0	0	0	0	0	0	0	0
90	RUSSIA	231591	15.17	344949	16.61	13693	0.83	3192	1.68
RU	RUSSIA	1684	0.11	0	0	0	0	0	0
SV	SAINT VINCENT	0	0	0	0	2920	0.18	0	0

*NODC Country Code	Country Name	OSD Count	% of Total	MBT Count	% of Total	XBT Count	% of Total	CTD Count	% of Total
SA	SAUDI ARABIA	0	0	0	0	166	0.01	0	0
SE	SENEGAL	1975	0.13	247	0.01	0	0	0	0
SC	SEYCHELLES	0	0	0	0	0	0	0	0
SL	SIERRA LEONE	0	0	187	0.01	0	0	0	0
SI	SINGAPORE	412	0.03	0	0	8739	0.53	0	0
SO	SOLOMON ISLANDS	0	0	0	0	0	0	0	0
SM	SOMALIA	0	0	0	0	0	0	0	0
91	SOUTH AFRICA	22372	1.47	20	0	2750	0.17	0	0
29	SPAIN	2981	0.2	195	0.01	2812	0.17	0	0
19	SRI LANKA	0	0	0	0	0	0	0	0
SU	SUDAN	0	0	0	0	0	0	0	0
79	SURINAM	0	0	0	0	0	0	0	0
77	SWEDEN	36032	2.36	0	0	4441	0.27	165	0.09
78	SWITZERLAND	0	0	0	0	0	0	0	0
80	SYRIA	0	0	0	0	0	0	0	0
21	TAIWAN	2851	0.19	0	0	3	0	57	0.03
ZA	TANZANIA	0	0	0	0	0	0	0	0
86	THAILAND	2879	0.19	77	0	29	0	0	0
87	TOGO	0	0	0	0	0	0	0	0
TN	TONGA	0	0	0	0	1165	0.07	0	0
TT	TRINIDAD/TOBAGO	0	0	0	0	1	0	0	0
88	TUNISIA	389	0.03	0	0	0	0	0	0
89	TURKEY	305	0.02	0	0	0	0	0	0
UA	U. ARAB EMIRATES	0	0	0	0	0	0	0	0
UR	UKRAINE	0	0	0	0	0	0	0	0
74	UNITED KINGDOM	95875	6.28	115940	5.58	155169	9.43	7267	3.83
31	UNITED STATES	264538	17.33	1052121	50.65	659382	40.09	71592	37.77
32	UNITED STATES	8252	0.54	44564	2.15	234483	14.25	26520	13.99
33	UNITED STATES	115	0.01	20435	0.98	3080	0.19	1038	0.55
99	UNKNOWN	32318	2.12	3197	0.15	47911	2.91	537	0.28
92	URUGUAY	0	0	0	0	147	0.01	0	0
93	VENEZUELA	3575	0.23	668	0.03	0	0	0	0
94	VIETNAM	0	0	0	0	0	0	0	0
WS	WESTERN SAMOA	0	0	0	0	0	0	0	0
YM	YEMEN	85	0.01	0	0	0	0	0	0
	TOTAL	1526727		2077200		1644911		189555	
	TOTAL PROFILES COMBINED	5438393							

*The United States, Russia, and Japan have multiple country codes. This is because the NODC Institution Code is limited to two digits and these three countries each have more than 99 institutions that can potentially transfer data to NODC/WDC-A.

There are 897 Mechanical Bathythermograph (MBT) profiles reported for years prior to 1941. Some of these represent profiles with "incorrect" years because they predate the deployment of the MBT in 1937/1938. In addition, there are 163 Expendable Bathythermograph Data (XBT) profiles reported for years prior to 1966. Some of these represent profiles with "incorrect" years because they predate the deployment of the XBT in 1965/1966. The MBT and XBT profiles with the "early" dates are included in this table as well as in the WOD98 CD-ROMs.

Table 9 National contributions of Oceanographic Station Data (OSD) casts sorted by percent contribution of each country

*NODC Country Code	Country Name	OSD Count	% of Total
31	UNITED STATES	264538	17.33
32	UNITED STATES	8252	0.54
33	UNITED STATES	115	0.01
90	RUSSIA	231591	15.17
RU	RUSSIA	1684	0.11
49	JAPAN	204053	13.37
18	CANADA	113469	7.43
74	UNITED KINGDOM	95875	6.28
58	NORWAY	89205	5.84
35	FRANCE	46238	3.03
59	NEW CALEDONIA	43198	2.83
6	GERMANY, FED. REP.	43472	2.83
34	FINLAND	42252	2.77
77	SWEDEN	36032	2.36
26	DENMARK	32509	2.13
99	UNKNOWN	32318	2.12
9	AUSTRALIA	30015	1.97
24	KOREA, REP. OF	28339	1.85
91	SOUTH AFRICA	22372	1.47
46	ICELAND	16047	1.05
7	GERMANY, DEM. REP.	14171	0.93
64	NETHERLANDS	14090	0.92
48	ITALY	10631	0.7
14	BRAZIL	9660	0.63
95	CROATIA (YUGOSLAVIA)	9431	0.62
67	POLAND	8639	0.57
47	ISRAEL	5584	0.37
76	CHINA, PEOPLES REP	5517	0.36
11	BELGIUM	5088	0.33
68	PORTUGAL	4440	0.29
42	INDONESIA	4370	0.29
65	PERU	4278	0.28
41	INDIA	4049	0.27
93	VENEZUELA	3575	0.23
8	ARGENTINA	3307	0.22
IC	IVORY COAST	3159	0.21
29	SPAIN	2981	0.2
86	THAILAND	2879	0.19
21	TAIWAN	2851	0.19
45	IRELAND	2722	0.18
GH	GHANA	2670	0.17
55	MALAGASY REP.	2666	0.17
28	ECUADOR	2381	0.16
61	NEW ZEALAND	1996	0.13
SE	SENEGAL	1975	0.13
RC	CONGO	1845	0.12
20	CHILE	1329	0.09
57	MEXICO	1283	0.08
MU	MAURITANIA	1217	0.08

*NODC Country Code	Country Name	OSD Count	% of Total
22	COLOMBIA	973	0.06
CU	CUBA	970	0.06
NI	NIGERIA	759	0.05
AN	ANGOLA	621	0.04
36	GREECE	556	0.04
27	ARAB REP. OF EGYPT	551	0.04
SI	SINGAPORE	412	0.03
88	TUNISIA	389	0.03
89	TURKEY	305	0.02
66	PHILIPPINES	236	0.02
62	PAKISTAN	199	0.01
MS	MALAYSIA	154	0.01
PA	PANAMA	139	0.01
YM	YEMEN	85	0.01
10	AUSTRIA	11	0
70	DOMINICAN REP.	9	0
	TOTAL	1526727	

*The United States, Russia, and Japan have multiple country codes. This is because the NODC Institution Code is limited to two digits and these three countries each have more than 99 institutions that can potentially transfer data to NODC/WDC-A.

Table 10 National contributions of Mechanical Bathythermograph (MBT) profiles sorted by percent contribution of each country

*NODC Country Code	Country Name	MBT Count	% of Total
31	UNITED STATES	1052120	50.65
32	UNITED STATES	44564	2.15
33	UNITED STATES	20435	0.98
90	RUSSIA	344949	16.61
49	JAPAN	228425	11
18	CANADA	191691	9.23
74	UNITED KINGDOM	115940	5.58
9	AUSTRALIA	17817	0.86
8	ARGENTINA	13028	0.63
6	GERMANY, FED. REP.	7156	0.34
64	NETHERLANDS	7123	0.34
48	ITALY	6169	0.3
65	PERU	5212	0.25
20	CHILE	4158	0.2
99	UNKNOWN	3197	0.15
68	PORTUGAL	2920	0.14
35	FRANCE	2532	0.12
61	NEW ZEALAND	2436	0.12
RC	CONGO	1337	0.06
58	NORWAY	890	0.04
28	ECUADOR	885	0.04
24	KOREA, REP.OF	847	0.04
22	COLOMBIA	746	0.04
93	VENEZUELA	668	0.03
41	INDIA	540	0.03
55	MALAGASY REP.	405	0.02
SE	SENEGAL	247	0.01
29	SPAIN	195	0.01
SL	SIERRA LEONE	187	0.01
IC	IVORY COAST	100	0
NI	NIGERIA	89	0
14	BRAZIL	82	0
86	THAILAND	77	0
91	SOUTH AFRICA	20	0
GH	GHANA	12	0
	TOTAL	2077200	

*The United States, Russia, and Japan have multiple country codes. This is because the NODC Institution Code is limited to two digits and these three countries each have more than 99 institutions that can potentially transfer data to NODC/WDC-A.
There are 897 profiles reported for years prior to 1941. Some of these represent profiles with "incorrect" years because they predate the deployment of the MBT in 1937/1938.
The MBT profiles with the "early" dates are included in this table as well as in the WOD98 CD-ROMs.

Table 11 National contributions of Expendable Bathythermograph (XBT) profiles sorted by percent contribution of each country

*NODC Country Code	Country Name	XBT Count	% of Total
31	UNITED STATES	659382	40.09
32	UNITED STATES	234483	14.25
33	UNITED STATES	3080	0.19
49	JAPAN	212555	12.92
74	UNITED KINGDOM	155169	9.43
9	AUSTRALIA	71137	4.32
99	UNKNOWN	47911	2.91
18	CANADA	46186	2.81
6	GERMANY, FED. REP.	45366	2.76
35	FRANCE	33430	2.03
54	LIBERIA	23471	1.43
PA	PANAMA	19144	1.16
90	RUSSIA	13693	0.83
64	NETHERLANDS	11046	0.67
SI	SINGAPORE	8739	0.53
26	DENMARK	5852	0.36
61	NEW ZEALAND	5404	0.33
77	SWEDEN	4441	0.27
46	ICELAND	4292	0.26
AG	ANTIGUA	4205	0.26
58	NORWAY	4124	0.25
76	CHINA, PEOPLES REP	3349	0.2
SV	SAINT VINCENT	2920	0.18
29	SPAIN	2812	0.17
91	SOUTH AFRICA	2750	0.17
20	CHILE	2359	0.14
BH	BAHAMAS	2079	0.13
57	MEXICO	1959	0.12
8	ARGENTINA	1909	0.12
67	POLAND	1320	0.08
CY	CYPRUS	1256	0.08
42	INDONESIA	1178	0.07
TN	TONGA	1165	0.07
66	PHILIPPINES	1001	0.06
KU	KUWAIT	865	0.05
HK	HONG KONG	775	0.05
65	PERU	714	0.04
68	PORTUGAL	714	0.04
28	ECUADOR	492	0.03
48	ITALY	339	0.02
ML	MALTA	301	0.02
BA	BARBADOS	225	0.01
14	BRAZIL	216	0.01
41	INDIA	205	0.01
ZZ	MISC. ORGANIZATIONS	178	0.01
SA	SAUDI ARABIA	166	0.01
92	URUGUAY	147	0.01
7	GERMANY, DEM. REP.	66	0
FJ	FIJI ISLANDS	64	0

*NODC Country Code	Country Name	XBT Count	% of Total
55	MALAGASY REP.	62	0
24	KOREA, REP. OF	53	0
MA	MAURITIUS	52	0
22	COLOMBIA	32	0
CR	COSTA RICA	31	0
86	THAILAND	29	0
IC	IVORY COAST	14	0
21	TAIWAN	3	0
TT	TRINIDAD/TOBAGO	1	0
	TOTAL	1644911	

*The United States, Russia, and Japan have multiple country codes. This is because the NODC Institution Code is limited to two digits and these three countries each have more than 99 institutions that can potentially transfer data to NODC/WDC-A.
There are 163 profiles reported for years prior to 1966. Some of these represent profiles with "incorrect" years because they predate the deployment of the XBT in 1965/1966.
The XBT profiles with the "early" dates are included in this table as well as in the WOD98 CD-ROMs.

Table 12 National contributions of Conductivity/Temperature/Depth (CTD) casts sorted by percent contribution of each country

*NODC Country Code	Country Name	CTD Count	% of Total
31	UNITED STATES	71592	37.69
32	UNITED STATES	26520	13.99
33	UNITED STATES	1038	0.55
18	CANADA	51334	27.08
35	FRANCE	11468	6.05
74	UNITED KINGDOM	7267	3.83
9	AUSTRALIA	4870	2.56
90	RUSSIA	3192	1.68
58	NORWAY	2754	1.45
6	GERMANY, FED. REP.	2650	1.4
76	CHINA, PEOPLES REP	1749	0.92
64	NETHERLANDS	1056	0.56
67	POLAND	809	0.43
48	ITALY	618	0.33
99	UNKNOWN	537	0.28
ZZ	MISC. ORGANIZATIONS	537	0.28
49	JAPAN	444	0.23
7	GERMANY, DEM. REP.	340	0.18
8	ARGENTINA	183	0.1
77	SWEDEN	165	0.09
61	NEW ZEALAND	102	0.05
34	FINLAND	99	0.05
42	INDONESIA	88	0.05
57	MEXICO	59	0.03
21	TAIWAN	57	0.03
24	KOREA, REP. OF	27	0.01
	TOTAL	189555	

*The United States, Russia, and Japan have multiple country codes. This is because the NODC Institution Code is limited to two digits and these three countries each have more than 99 institutions that can potentially transfer data to NODC/WDC-A.

Table 13 The number of OSD casts* in WOD98 as a function of year for the World Ocean. The total number of casts = 1,526,727

YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS
1874	5	1905	1346	1936	8006	1967	45048
1875	39	1906	1480	1937	11104	1968	41126
1876	0	1907	1178	1938	11775	1969	45569
1877	0	1908	1109	1939	14105	1970	33614
1878	0	1909	1334	1940	8813	1971	44282
1879	0	1910	1183	1941	7638	1972	51805
1880	0	1911	2116	1942	5078	1973	36956
1881	0	1912	1438	1943	4980	1974	30797
1882	0	1913	1754	1944	4173	1975	27780
1883	0	1914	1560	1945	1848	1976	30113
1884	0	1915	394	1946	3563	1977	29840
1885	0	1916	135	1947	4988	1978	35616
1886	11	1917	108	1948	9777	1979	46162
1887	27	1918	201	1949	11310	1980	39292
1888	118	1919	570	1950	14453	1981	39512
1889	152	1920	1670	1951	19321	1982	38510
1890	0	1921	2074	1952	18345	1983	35528
1891	27	1922	2496	1953	17743	1984	39110
1892	12	1923	3174	1954	17939	1985	36801
1893	65	1924	3489	1955	18429	1986	29850
1894	107	1925	3375	1956	18984	1987	27764
1895	17	1926	4078	1957	22496	1988	24268
1896	26	1927	3501	1958	24900	1989	28943
1897	0	1928	4306	1959	22027	1990	24967
1898	147	1929	4633	1960	24962	1991	9991
1899	280	1930	4513	1961	26880	1992	10040
1900	435	1931	4621	1962	27012	1993	6311
1901	269	1932	5285	1963	38149	1994	4030
1902	601	1933	7344	1964	34681	1995	700
1903	1008	1934	9327	1965	45350	1996	207
1904	1198	1935	10849	1966	38181		

* Includes ship-of-opportunity "surface only" data casts. Does not include casts from cruises for which all casts only contain plankton data. These casts are in the "BIO" file.

Table 14 The number of OSD casts in WOD98 as a function of year for the southern hemisphere. The total number of casts = 211,460

YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS
1874	5	1905	0	1936	375	1966	5299
1875	39	1906	21	1937	323	1967	7371
1876	0	1907	0	1938	490	1968	7477
1877	0	1908	0	1939	243	1969	5483
1878	0	1909	0	1940	121	1970	4187
1879	0	1910	0	1941	313	1971	5193
1880	0	1911	107	1942	166	1972	4985
1881	0	1912	27	1943	68	1973	4762
1882	0	1913	43	1944	400	1974	3991
1883	0	1914	7	1945	60	1975	4352
1884	0	1915	0	1946	113	1976	5062
1885	0	1916	0	1947	371	1977	4961
1886	11	1917	0	1948	950	1978	6299
1887	5	1918	0	1949	405	1979	8460
1888	0	1919	0	1950	761	1980	7951
1889	0	1920	221	1951	760	1981	8236
1890	0	1921	221	1952	706	1982	9837
1891	0	1922	0	1953	659	1983	9469
1892	0	1923	34	1954	727	1984	7294
1893	0	1924	4	1955	1277	1985	7285
1894	0	1925	232	1956	1371	1986	6716
1895	0	1926	334	1957	2303	1987	6538
1896	0	1927	197	1958	2489	1988	4757
1897	0	1928	283	1959	2523	1989	4903
1898	0	1929	473	1960	3703	1990	3126
1899	0	1930	586	1961	4259	1991	1032
1900	82	1931	491	1962	5387	1992	1435
1901	0	1932	404	1963	6582	1993	76
1902	0	1933	208	1964	6262	1994	1
1903	0	1934	217	1965	6358	1995	2
1904	0	1935	143				

Table 15 The number of OSD casts in WOD98 as a function of year for the northern hemisphere. The total number of casts = 1,315,267

YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS
1887	22	1915	394	1943	4912	1970	29427
1888	118	1916	135	1944	3773	1971	39089
1889	152	1917	108	1945	1788	1972	46820
1890	0	1918	201	1946	3450	1973	32194
1891	27	1919	570	1947	4617	1974	26806
1892	12	1920	1449	1948	8827	1975	23428
1893	65	1921	1853	1949	10905	1976	25051
1894	107	1922	2496	1950	13692	1977	24879
1895	17	1923	3140	1951	18561	1978	29317
1896	26	1924	3485	1952	17639	1979	37702
1897	0	1925	3143	1953	17084	1980	31341
1898	147	1926	3744	1954	17212	1981	31276
1899	280	1927	3304	1955	17152	1982	28673
1900	353	1928	4023	1956	17613	1983	26059
1901	269	1929	4160	1957	20193	1984	31816
1902	601	1930	3927	1958	22411	1985	29516
1903	1008	1931	4130	1959	19504	1986	23134
1904	1198	1932	4881	1960	21259	1987	21226
1905	1346	1933	7136	1961	22621	1988	19511
1906	1459	1934	9110	1962	21625	1989	24040
1907	1178	1935	10706	1963	31567	1990	21841
1908	1109	1936	7631	1964	28419	1991	8959
1909	1334	1937	10781	1965	38992	1992	8605
1910	1183	1938	11285	1966	32882	1993	6235
1911	2009	1939	13862	1967	37677	1994	4029
1912	1411	1940	8692	1968	33649	1995	698
1913	1711	1941	7325	1969	40086	1996	207
1914	1553	1942	4912				

Table 16 The number of CTD casts in WOD98 as a function of year for the World Ocean. The total number of casts = 189,555

YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS
1967	1530	1975	5051	1983	8339	1990	7824
1968	730	1976	5443	1984	10031	1991	9172
1969	2460	1977	6693	1985	8753	1992	9466
1970	551	1978	8172	1986	9795	1993	8656
1971	999	1979	7529	1987	12189	1994	4644
1972	3535	1980	5985	1988	9591	1995	3197
1973	5376	1981	8359	1989	10125	1996	1532
1974	6449	1982	7379				

Table 17 The number of CTD casts in WOD98 as a function of year for the southern hemisphere. The total number of casts = 21,074

YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS
1967	607	1974	323	1981	318	1988	818
1968	191	1975	481	1982	472	1989	1864
1969	57	1976	481	1983	1895	1990	1315
1970	0	1977	799	1984	1817	1991	891
1971	61	1978	789	1985	909	1992	1976
1972	57	1979	798	1986	1069	1993	808
1973	176	1980	621	1987	1394	1994	87

Table 18 The number of CTD casts in WOD98 as a function of year for the northern hemisphere. The total number of casts = 168,481

YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS	YEAR	STATIONS
1967	923	1975	4570	1983	6444	1990	6509
1968	539	1976	4962	1984	8214	1991	8281
1969	2403	1977	5894	1985	7844	1992	7490
1970	551	1978	7383	1986	8726	1993	7848
1971	938	1979	6731	1987	10795	1994	4557
1972	3478	1980	5364	1988	8773	1995	3197
1973	5200	1981	8041	1989	8261	1996	1532
1974	6126	1982	6907				

Table 19 The number of MBT profiles* in WOD98 as a function of year for the World Ocean. The total number of profiles = 2,076,303

YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE
1941	9802	1955	42339	1969	49989	1982	18903
1942	6571	1956	45308	1970	40060	1983	20312
1943	16712	1957	56110	1971	35785	1984	33482
1944	36686	1958	64147	1972	34765	1985	26199
1945	40713	1959	59836	1973	25602	1986	28220
1946	23394	1960	65472	1974	29459	1987	25342
1947	28321	1961	71666	1975	22244	1988	21123
1948	29878	1962	79339	1976	28363	1989	11644
1949	34907	1963	84041	1977	25851	1990	11447
1950	48527	1964	81400	1978	25464	1991	4217
1951	49301	1965	86861	1979	32596	1992	893
1952	60418	1966	97440	1980	26276	1993	16
1953	57023	1967	85190	1981	20925	1994	73
1954	51441	1968	64210				

* does not include 897 profiles for the pre-1941 period

Table 20 The number of MBT profiles in WOD98 as a function of year for the southern hemisphere. The total number of profiles = 227,079

YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE
1941	10	1954	1106	1967	14083	1979	5181
1942	1384	1955	2957	1968	10059	1980	5000
1943	2567	1956	4195	1969	5312	1981	3487
1944	3388	1957	8396	1970	4882	1982	3105
1945	1003	1958	10448	1971	5639	1983	4140
1946	913	1959	9092	1972	4480	1984	6811
1947	2159	1960	9832	1973	3269	1985	3707
1948	125	1961	6899	1974	3077	1986	4167
1949	550	1962	9522	1975	1615	1987	3487
1950	310	1963	11489	1976	3992	1988	1879
1951	468	1964	9950	1977	4254	1989	1279
1952	2761	1965	10053	1978	3092	1990	722
1953	878	1966	9905				

Table 21 The number of MBT profiles in WOD98 as a function of year for the northern hemisphere. The total number of profiles = 1,849,224

YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE
1941	9792	1955	39382	1969	44677	1982	15798
1942	5187	1956	41113	1970	35178	1983	16172
1943	14145	1957	47714	1971	30146	1984	26671
1944	33298	1958	53699	1972	30285	1985	22492
1945	39710	1959	50744	1973	22333	1986	24053
1946	22481	1960	55640	1974	26382	1987	21855
1947	26162	1961	64767	1975	20629	1988	19244
1948	29753	1962	69817	1976	24371	1989	10365
1949	34357	1963	72552	1977	21597	1990	10725
1950	48217	1964	71450	1978	22372	1991	4217
1951	48833	1965	76808	1979	27415	1992	893
1952	57657	1966	87535	1980	21276	1993	16
1953	56145	1967	71107	1981	17438	1994	73
1954	50335	1968	54151				

Table 22 The number of XBT profiles* in WOD98 as a function of year for the World Ocean. The total number of profiles = 1,644,748

YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE
1966	1747	1974	54500	1982	53160	1990	69284
1967	9259	1975	53592	1983	53147	1991	60327
1968	26482	1976	47815	1984	53262	1992	66033
1969	33629	1977	54243	1985	66817	1993	73154
1970	44007	1978	52389	1986	72358	1994	65188
1971	57350	1979	51433	1987	69243	1995	81055
1972	52815	1980	52118	1988	59313	1996	64303
1973	54462	1981	50734	1989	41529		

* does not include 163 profiles for the pre-1966 period. Includes data for "fixed" platforms such as the TOGA-TAO array.

Table 23 The number of XBT profiles in WOD98 as a function of year for the southern hemisphere. The total number of profiles = 279,145

YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE
1966	168	1974	5884	1982	9404	1990	13320
1967	644	1975	4306	1983	10225	1991	13799
1968	2136	1976	5983	1984	8760	1992	15795
1969	2033	1977	4883	1985	10234	1993	22594
1970	2561	1978	5861	1986	11413	1994	21190
1971	5163	1979	6911	1987	13062	1995	22675
1972	6548	1980	6744	1988	9890	1996	16187
1973	6426	1981	5740	1989	8606		

Table 24 The number of XBT profiles in WOD98 as a function of year for the northern hemisphere. The total number of profiles = 1,365,603

YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE
1966	1579	1974	48616	1982	43756	1990	55964
1967	8615	1975	49286	1983	42922	1991	46528
1968	24346	1976	41832	1984	44502	1992	50238
1969	31596	1977	49360	1985	56583	1993	50560
1970	41446	1978	46528	1986	60945	1994	43998
1971	52187	1979	44522	1987	56181	1995	58380
1972	46267	1980	45374	1988	49423	1996	48116
1973	48036	1981	44994	1989	32923		

Table 25 The number of all casts (OSD+CTD+XBT+MBT) in WOD98 as a function of year for the World Ocean. The total number of casts = 5,438,393

YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE	YEAR	PROFILE
1874	5	1905	1360	1936	8041	1967	141027
1875	39	1906	1491	1937	11201	1968	132548
1876	0	1907	1188	1938	11894	1969	131647
1877	0	1908	1165	1939	14209	1970	118232
1878	0	1909	1377	1940	8867	1971	138416
1879	0	1910	1229	1941	17440	1972	142920
1880	0	1911	2204	1942	11649	1973	122396
1881	0	1912	1473	1943	21692	1974	121205
1882	0	1913	1802	1944	40859	1975	108667
1883	0	1914	1562	1945	42561	1976	111734
1884	0	1915	395	1946	26957	1977	116627
1885	0	1916	135	1947	33309	1978	121641
1886	11	1917	109	1948	39655	1979	137720
1887	27	1918	201	1949	46217	1980	123671
1888	118	1919	570	1950	62980	1981	119530
1889	152	1920	1670	1951	68622	1982	117952
1890	0	1921	2074	1952	78763	1983	117326
1891	27	1922	2496	1953	74766	1984	135885
1892	12	1923	3175	1954	69380	1985	138570
1893	65	1924	3490	1955	60768	1986	140223
1894	107	1925	3388	1956	64292	1987	134538
1895	17	1926	4082	1957	78606	1988	114295
1896	26	1927	3504	1958	89047	1989	92241
1897	0	1928	4307	1959	81863	1990	113522
1898	147	1929	4637	1960	90438	1991	83707
1899	280	1930	4513	1961	98562	1992	86432
1900	435	1931	4629	1962	106366	1993	88137
1901	269	1932	5300	1963	122253	1994	73935
1902	601	1933	7367	1964	116128	1995	84952
1903	1009	1934	9347	1965	132229	1996	66042
1904	1198	1935	10888	1966	137368		

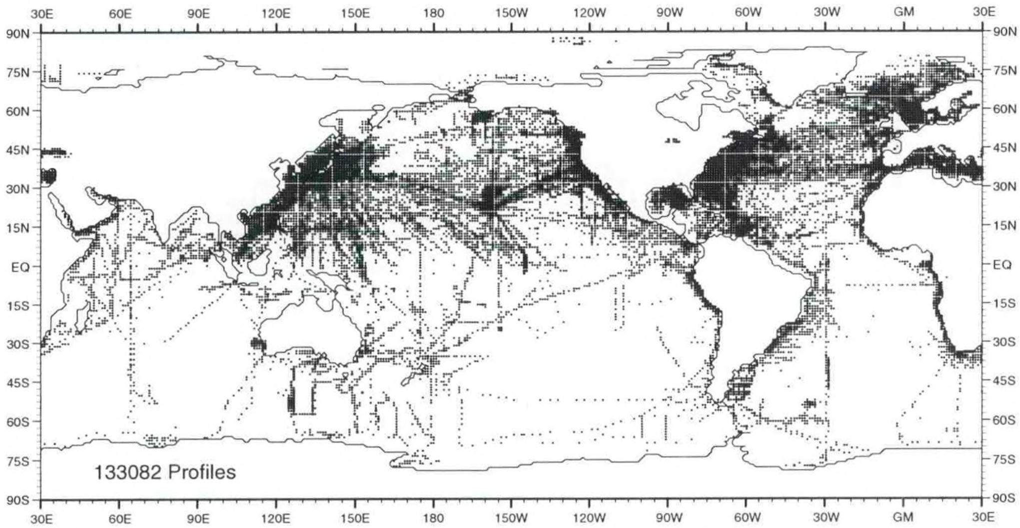
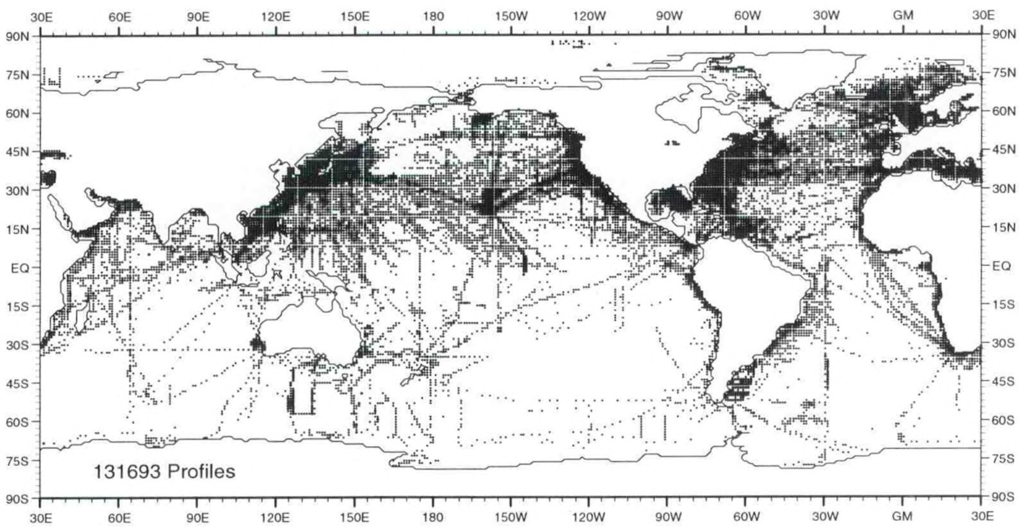
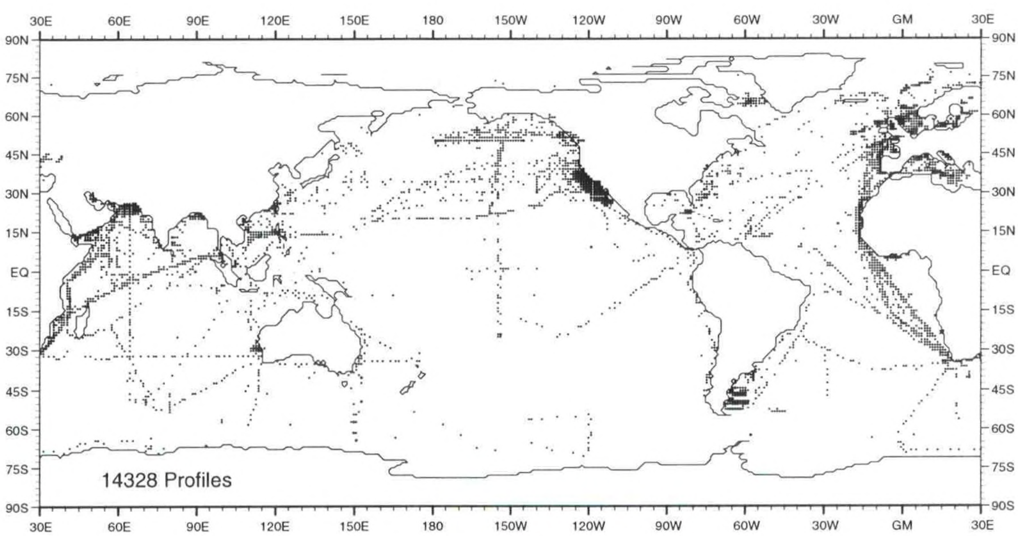


Fig. 1 Distribution of all stations for 1969; a) stations used in WOA94



b) stations used in WOD98



c) additions to WOD98 over WOA94

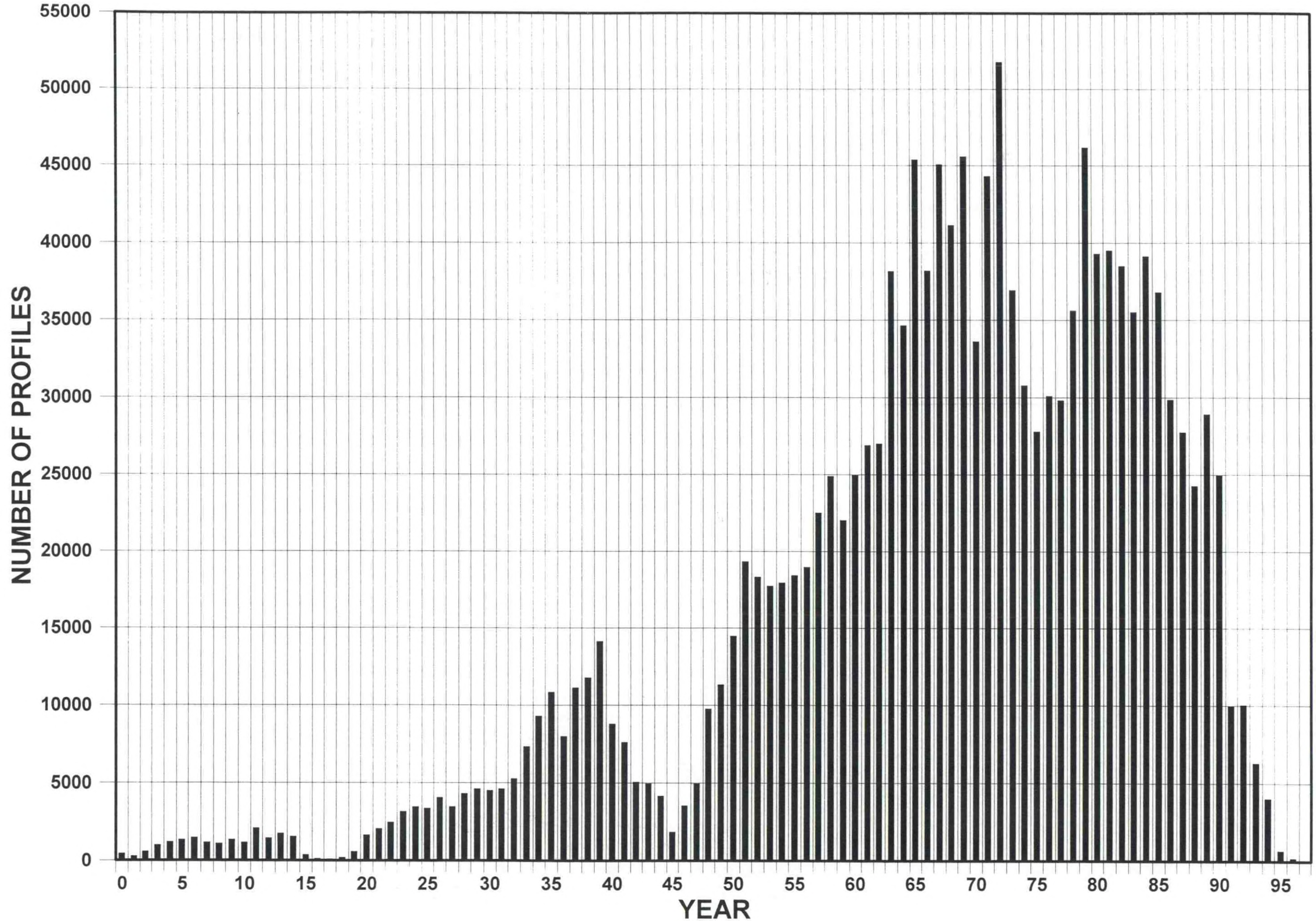


Fig. 2 Time series of Ocean Station Data casts in WOD98 for the world ocean as a function of year

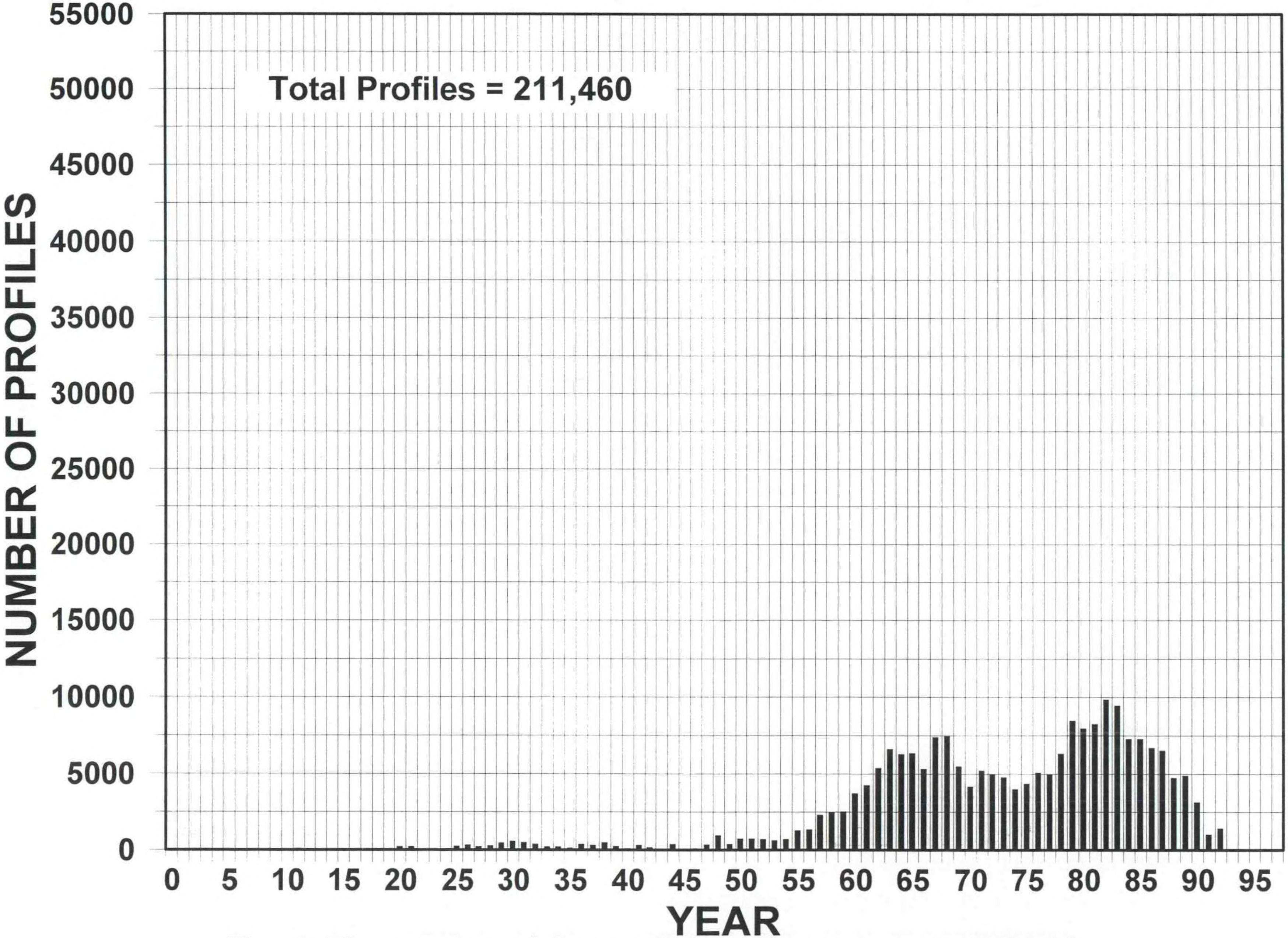


Fig. 3 Time series of Ocean Station Data casts in WOD98 for the southern hemisphere as a function of year

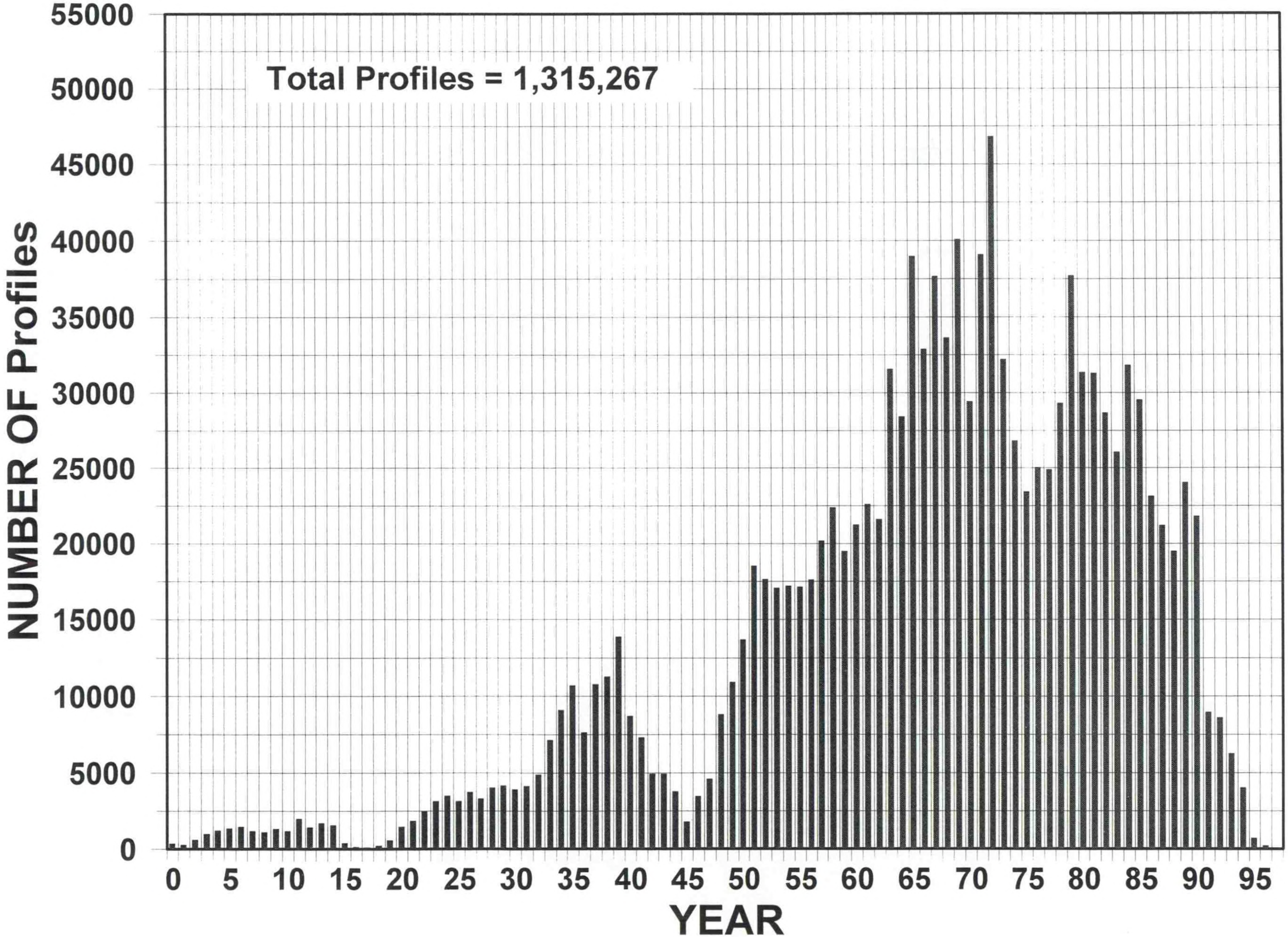


Fig. 4 Time series of Ocean Station Data casts in WOD98 for the northern hemisphere as a function of year

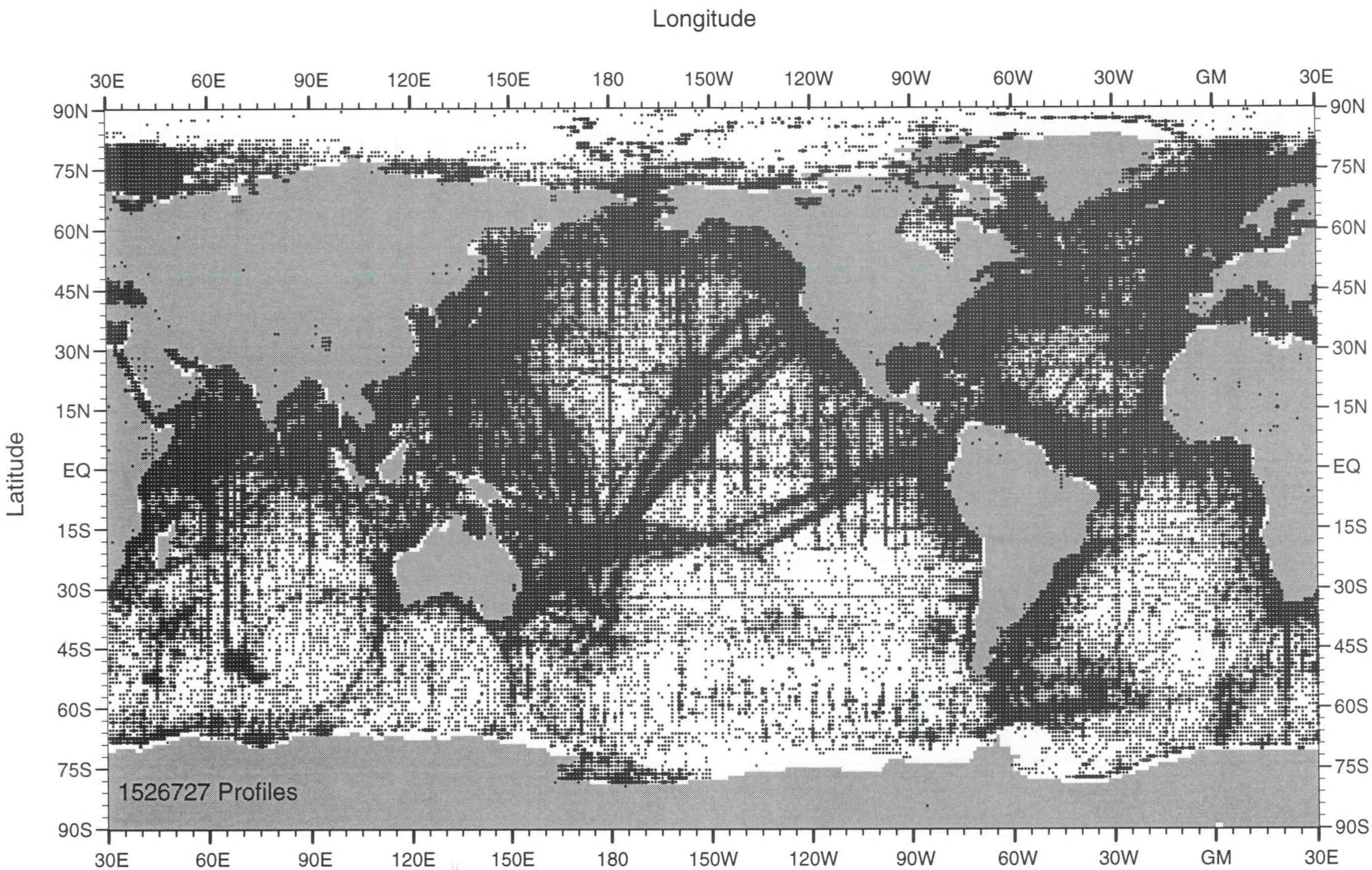


Fig. 5 Distribution of all casts in the Ocean Station Data files of WOD98

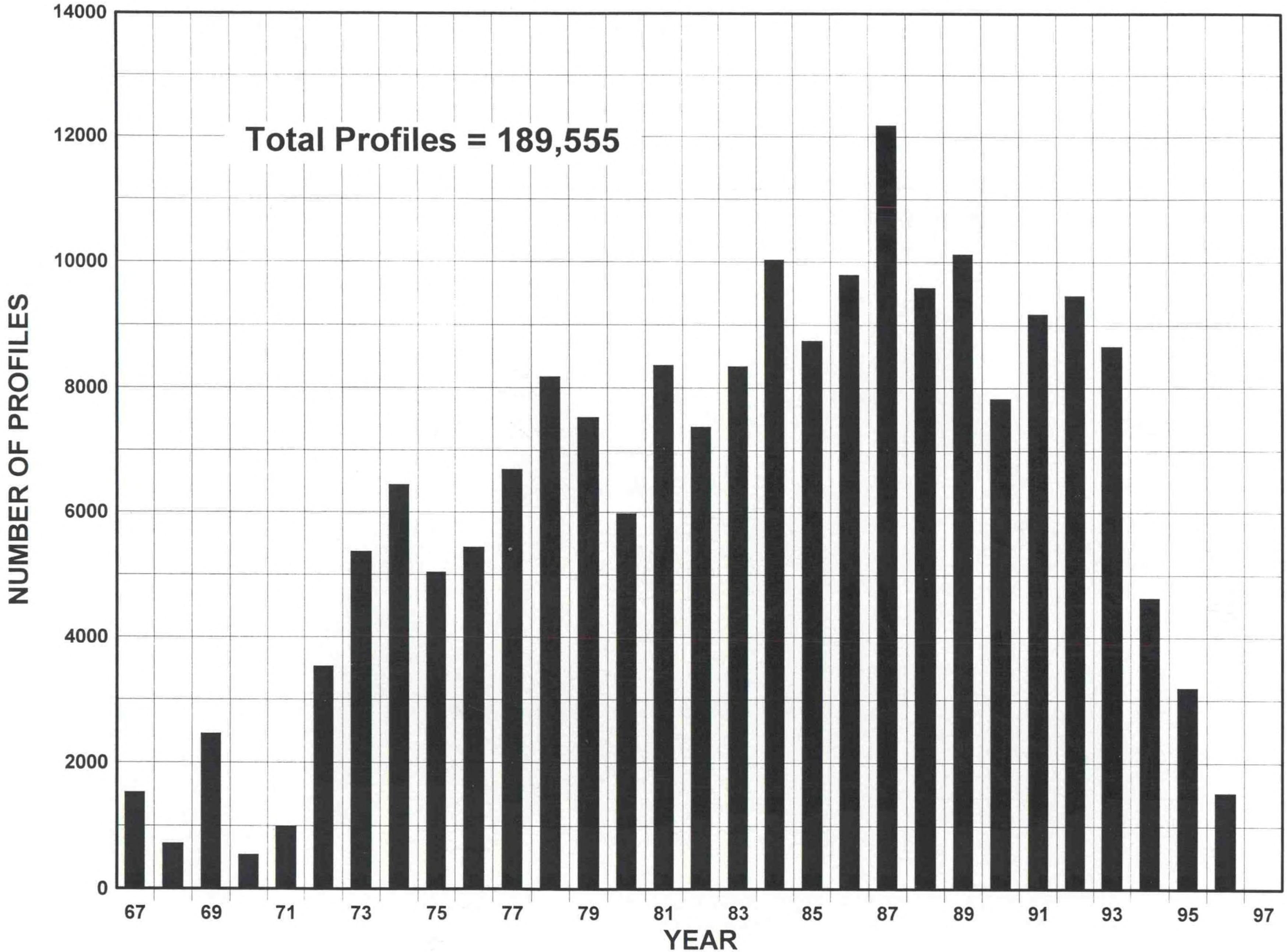


Fig. 6 Time series of CTD casts in WOD98 for the world ocean as a function of year

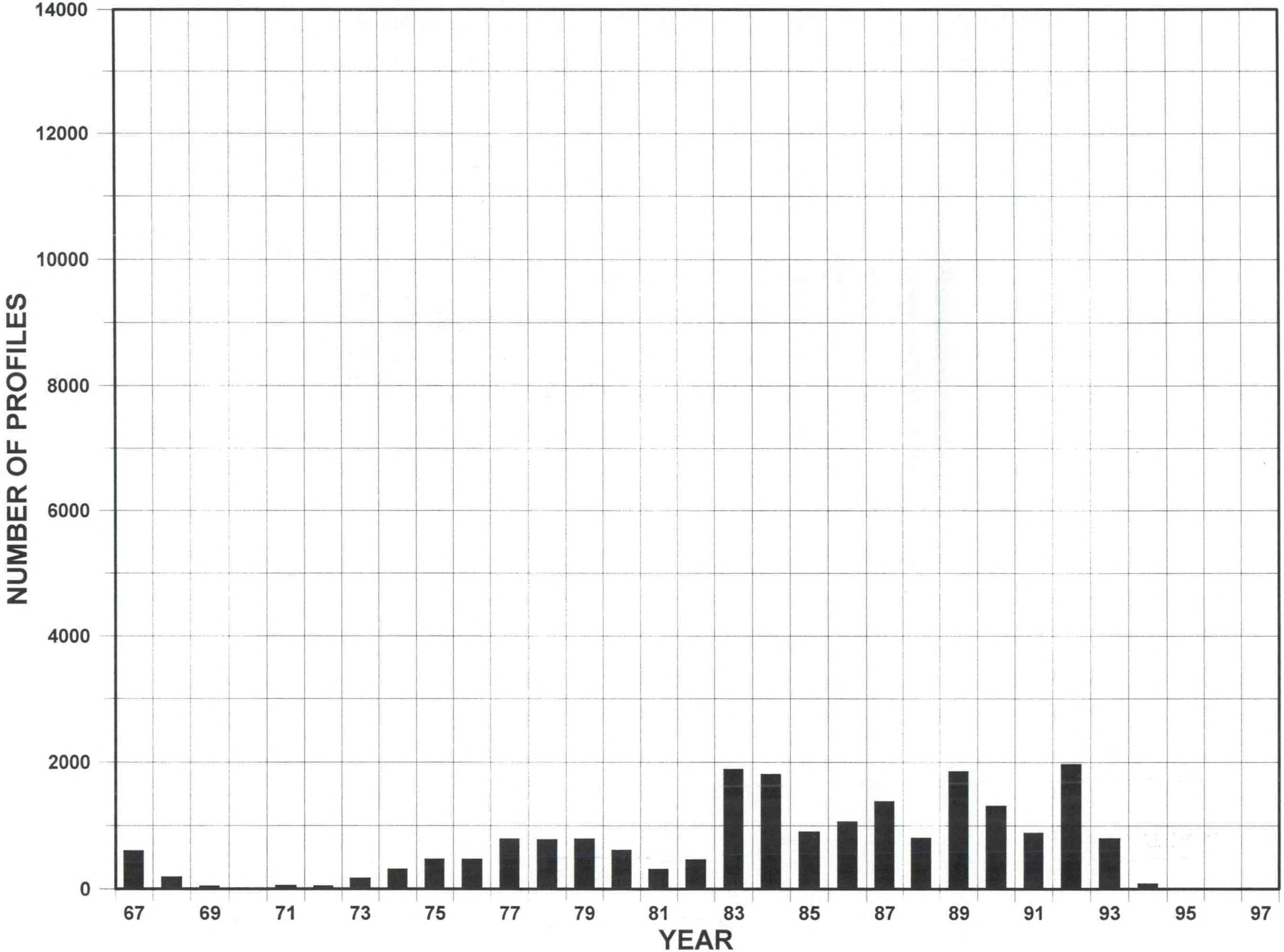


Fig. 7 Time series of CTD casts in WOD98 for the southern hemisphere as a function of year

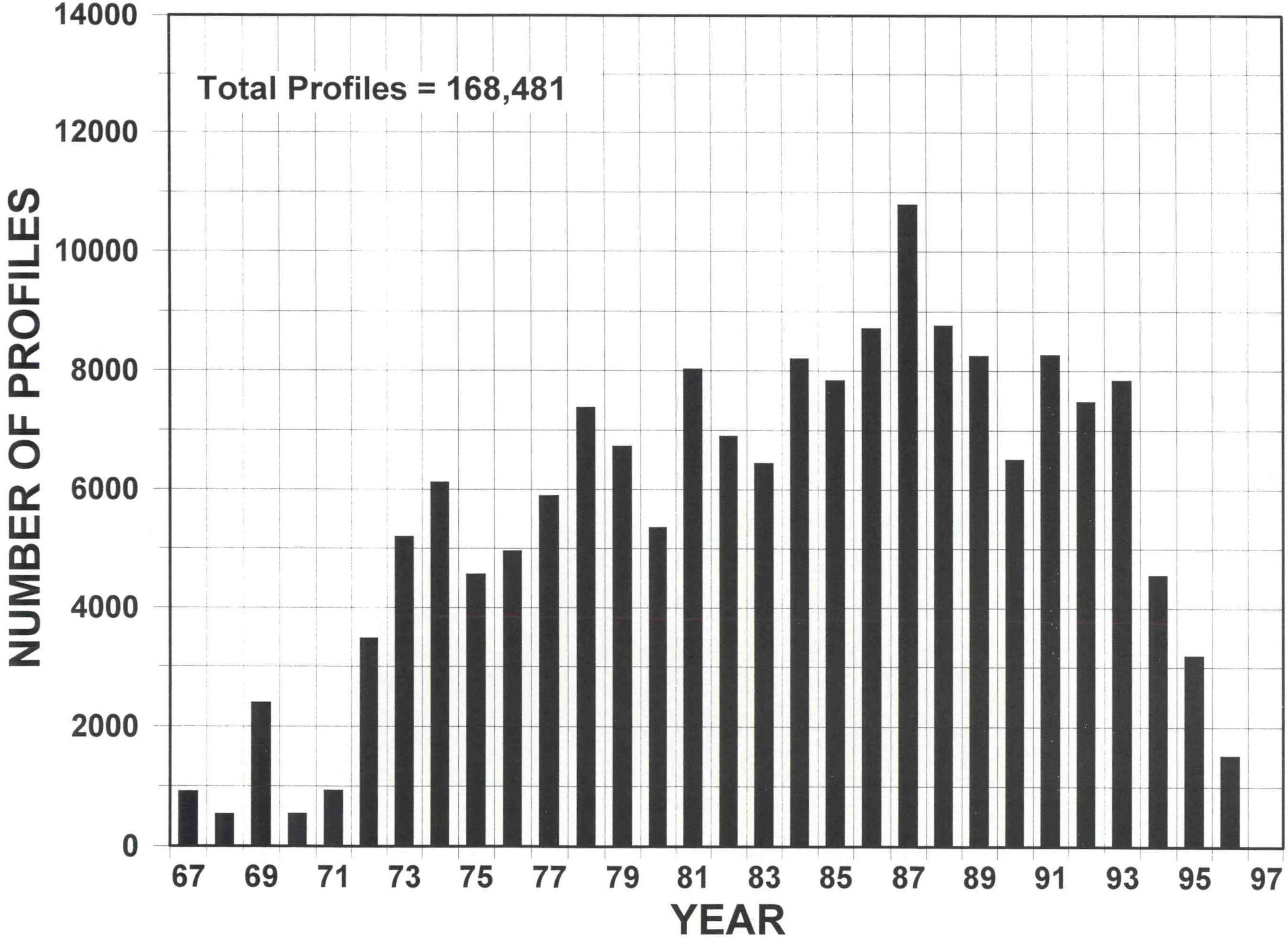


Fig. 8 Time series of CTD casts in WOD98
for the northern hemisphere as a function of year

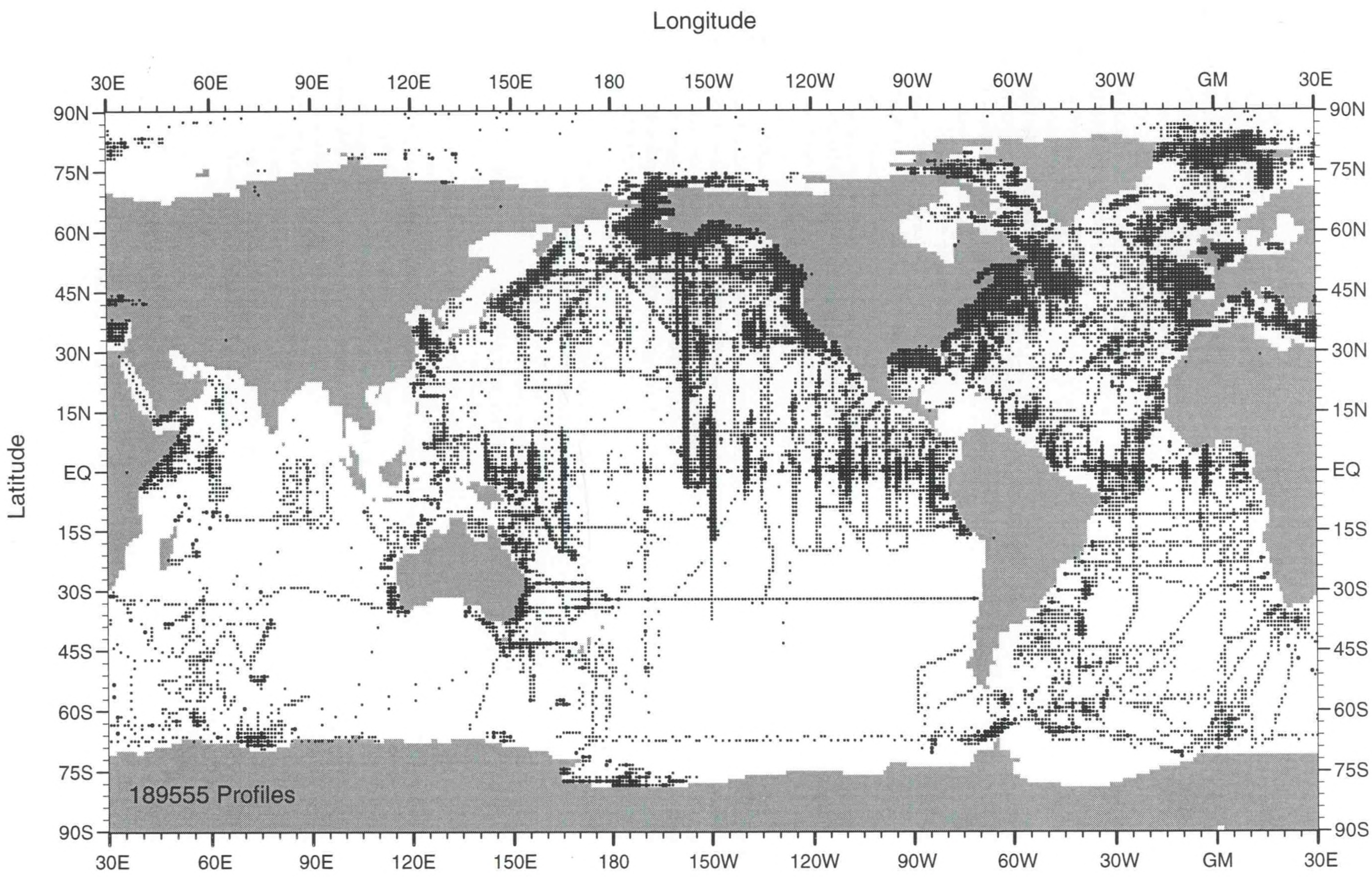


Fig. 9 Distribution of all casts in the CTD files of WOD98

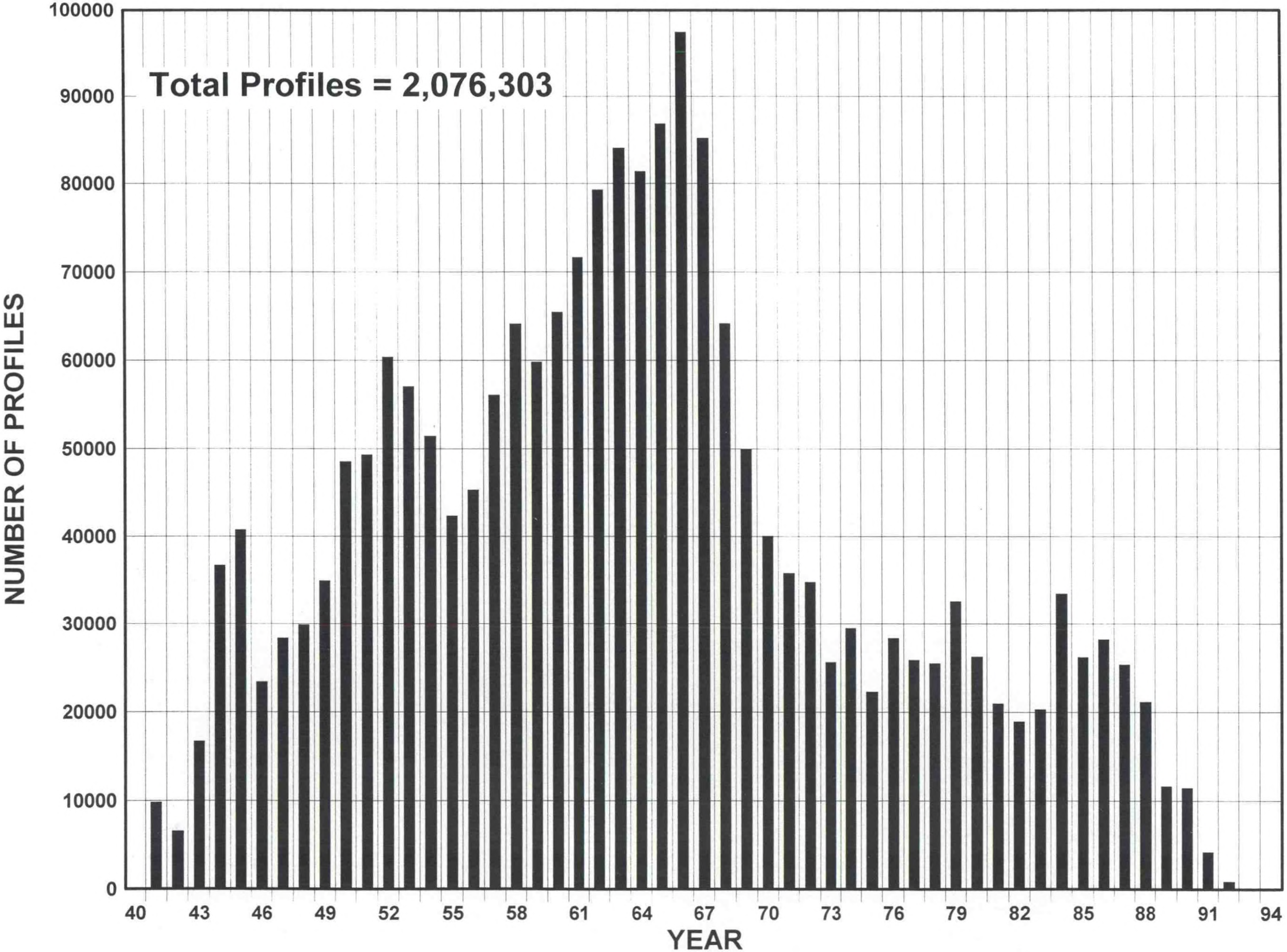


Fig. 10 Time series of MBT Profiles in WOD98 for the world ocean as a function of year

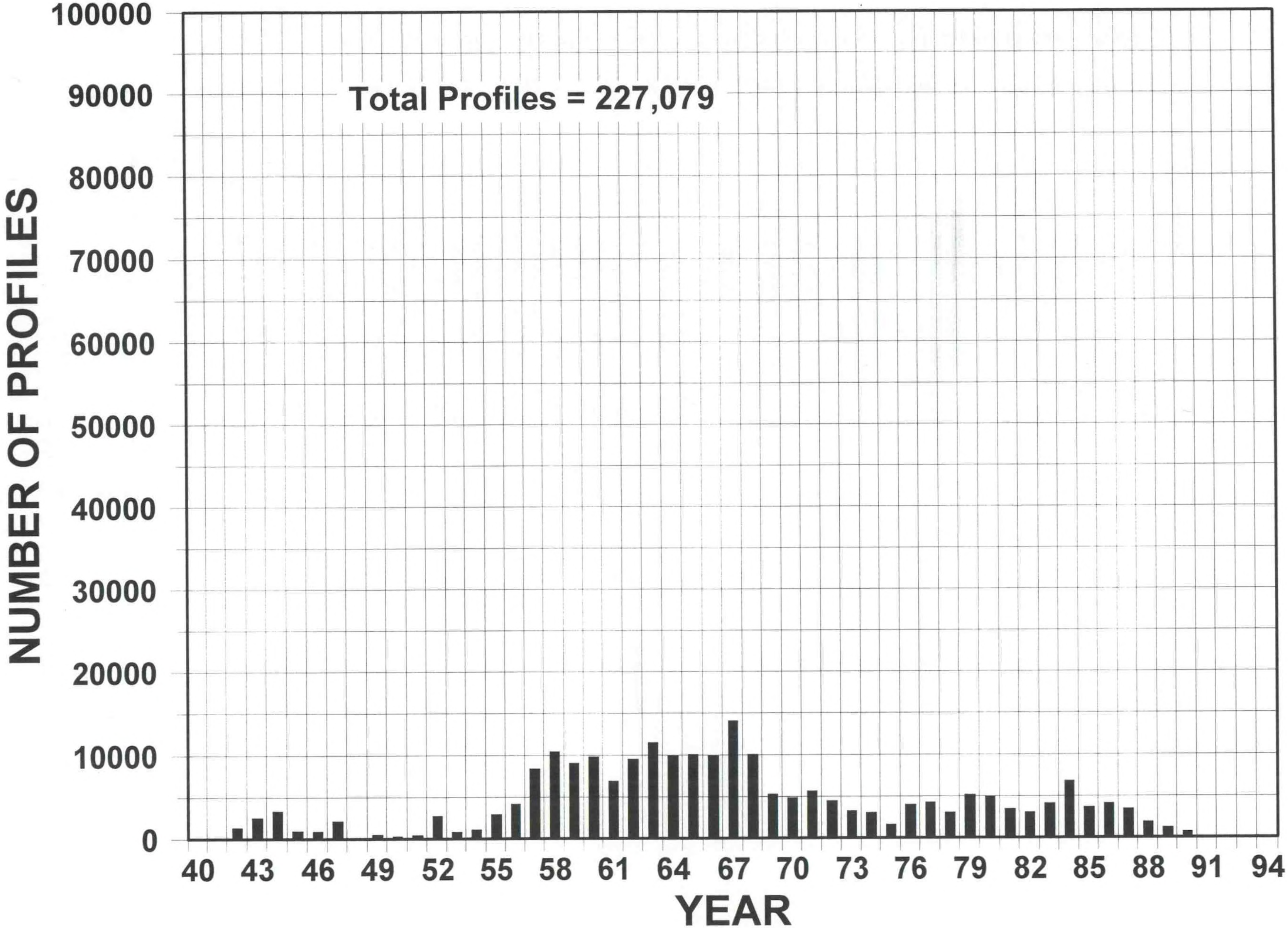


Fig. 11 Time series of MBT Profiles in WOD98
for the southern hemisphere as a function of year

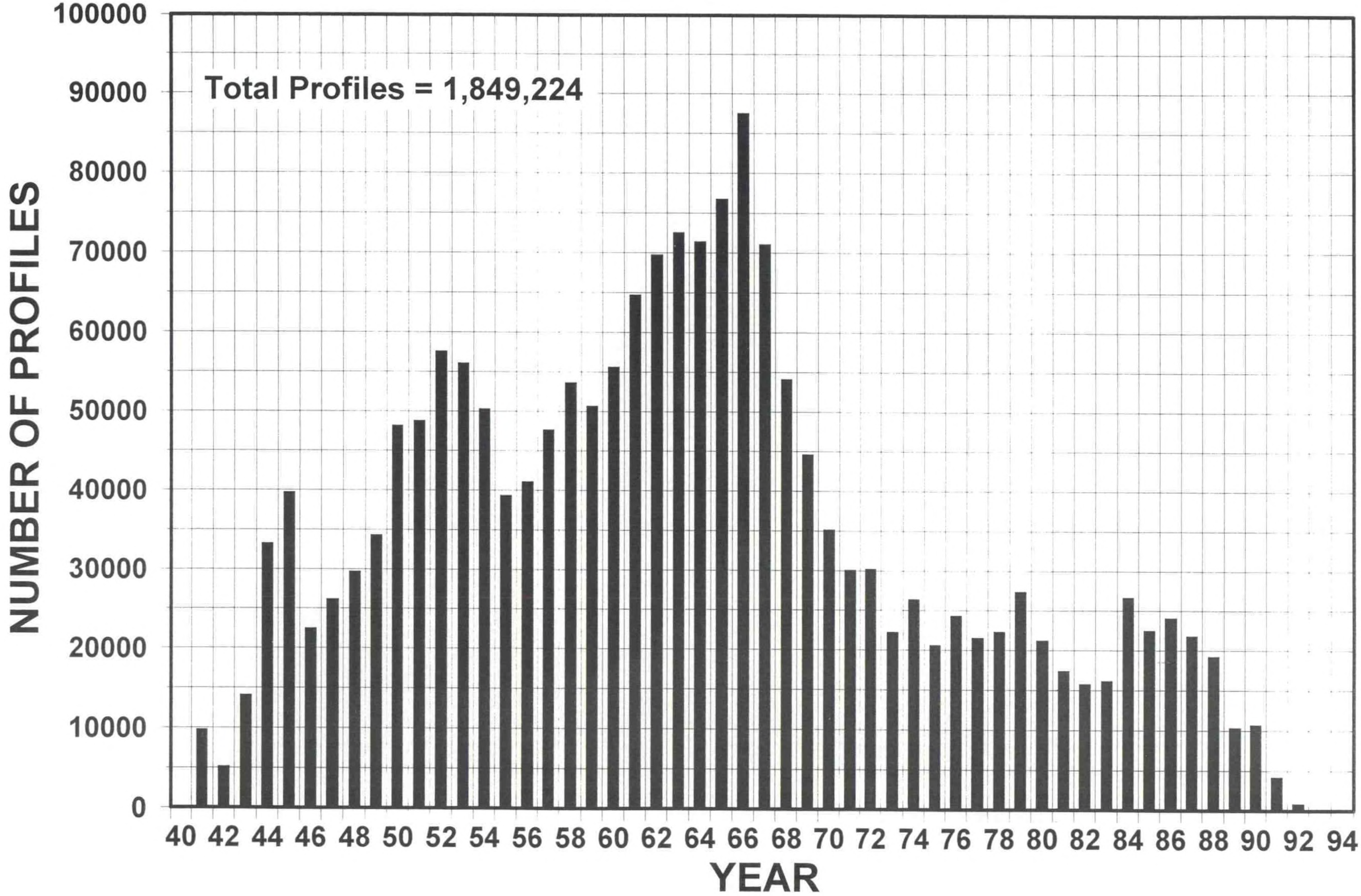


Fig. 12 Time series of MBT Profiles in WOD98 for the northern hemisphere as a function of year

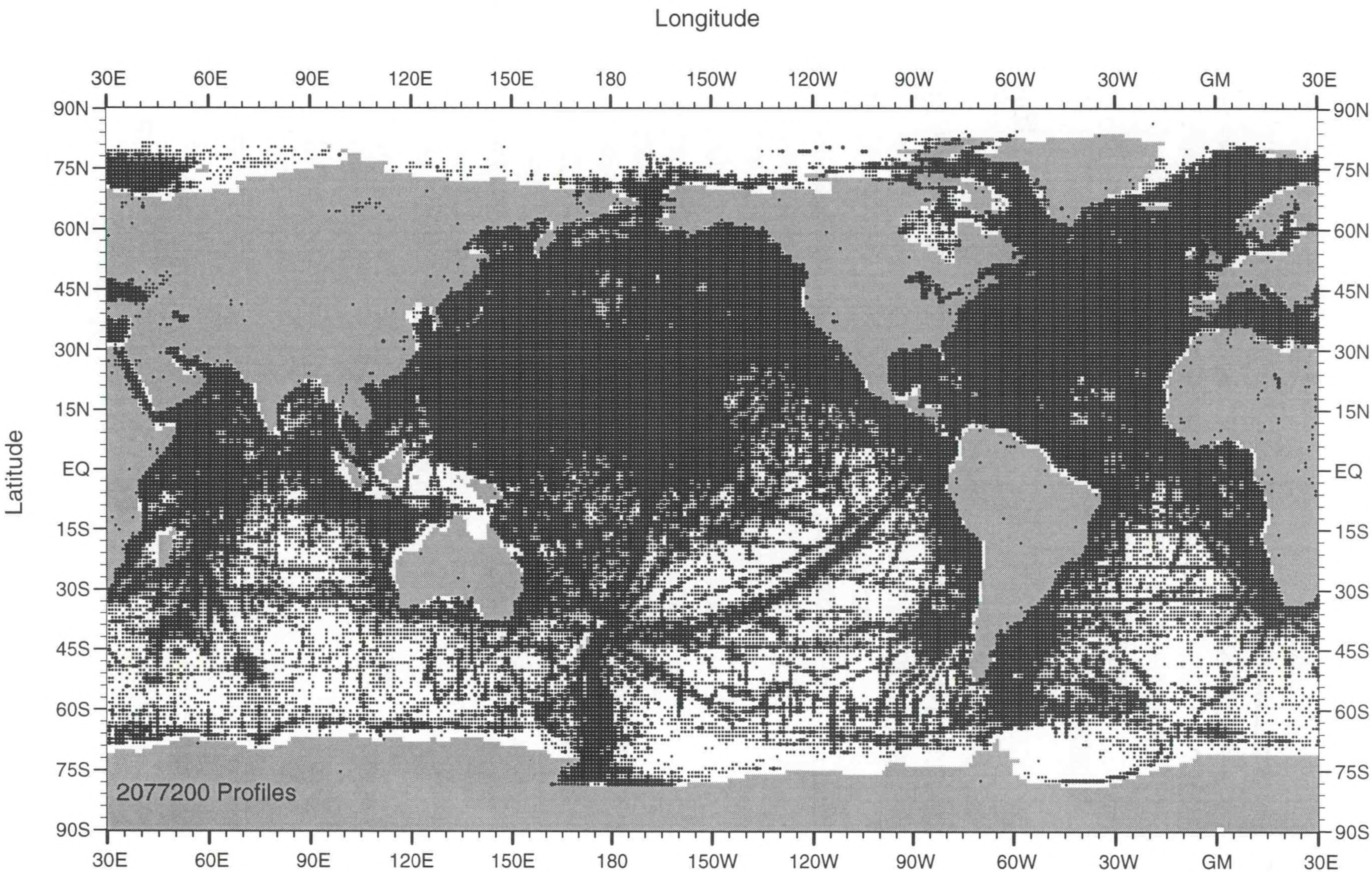


Fig. 13 Distribution of all profiles in the MBT files of WOD98

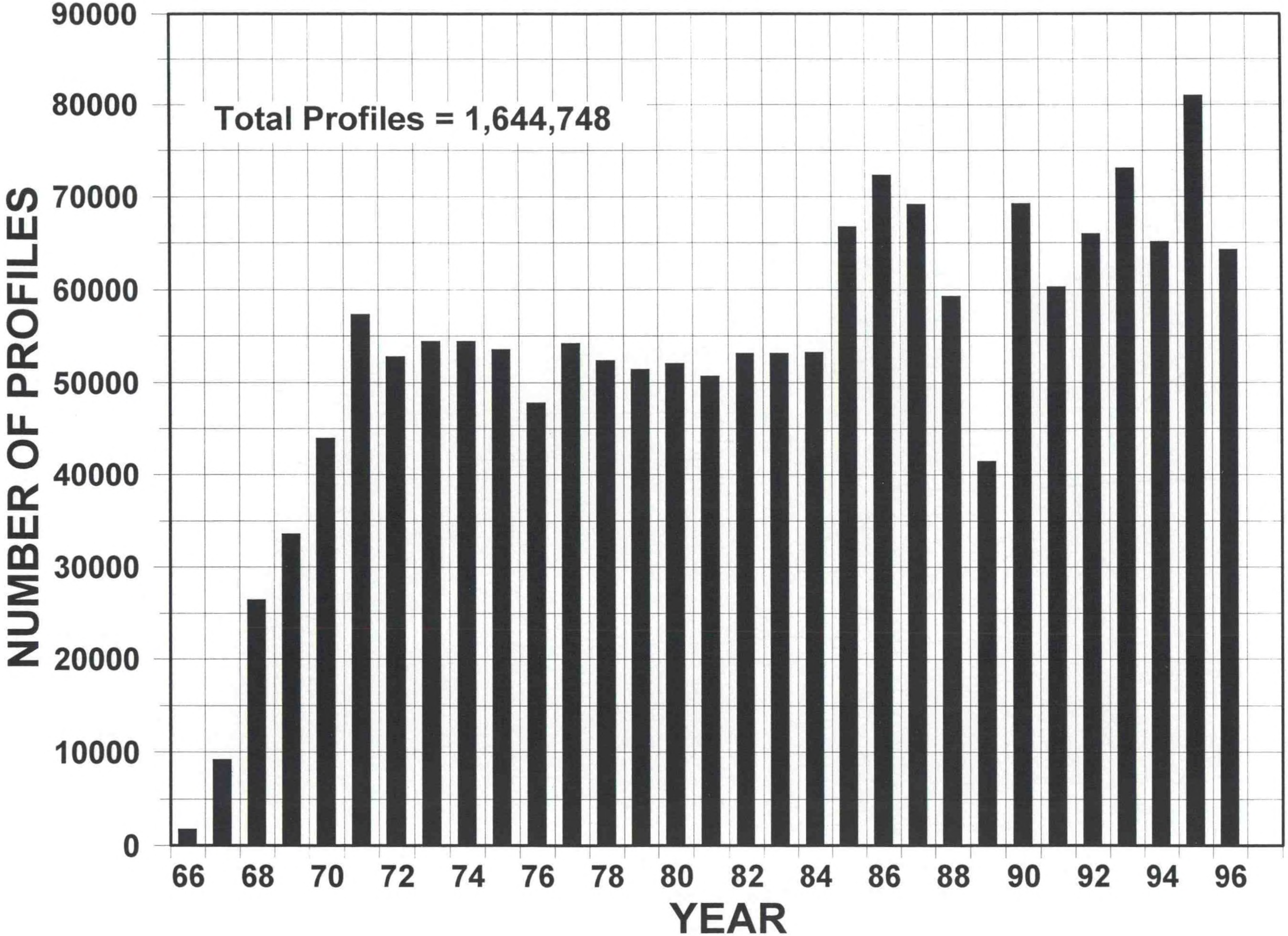


Fig. 14 Time series of XBT Profiles in WOD98 for the world ocean as a function of year

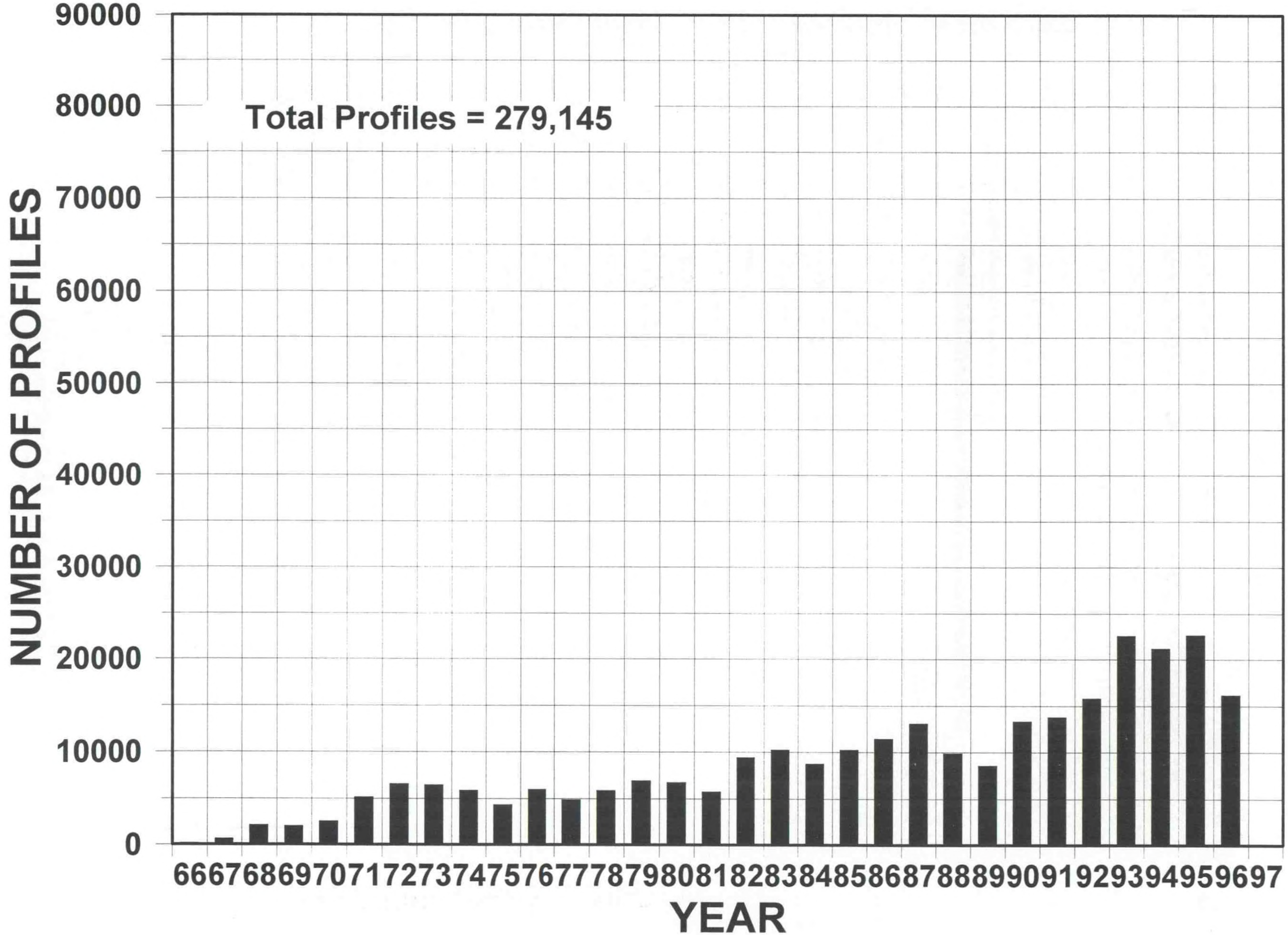


Fig. 15 Time series of XBT Profiles in WOD98
for the southern hemisphere as a function of year

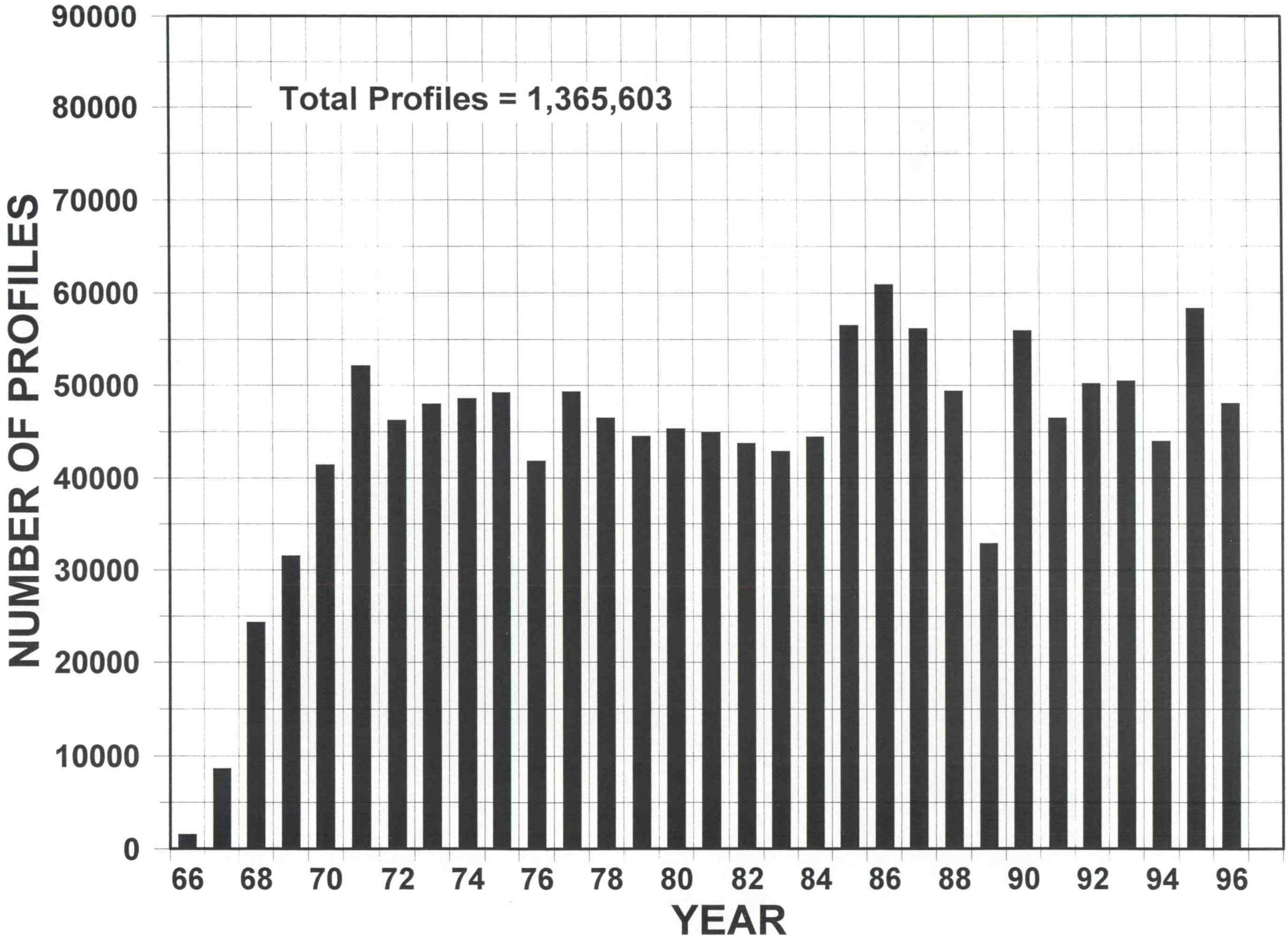


Fig. 16 Time series of XBT Profiles in WOD98 for the northern hemisphere as a function of year

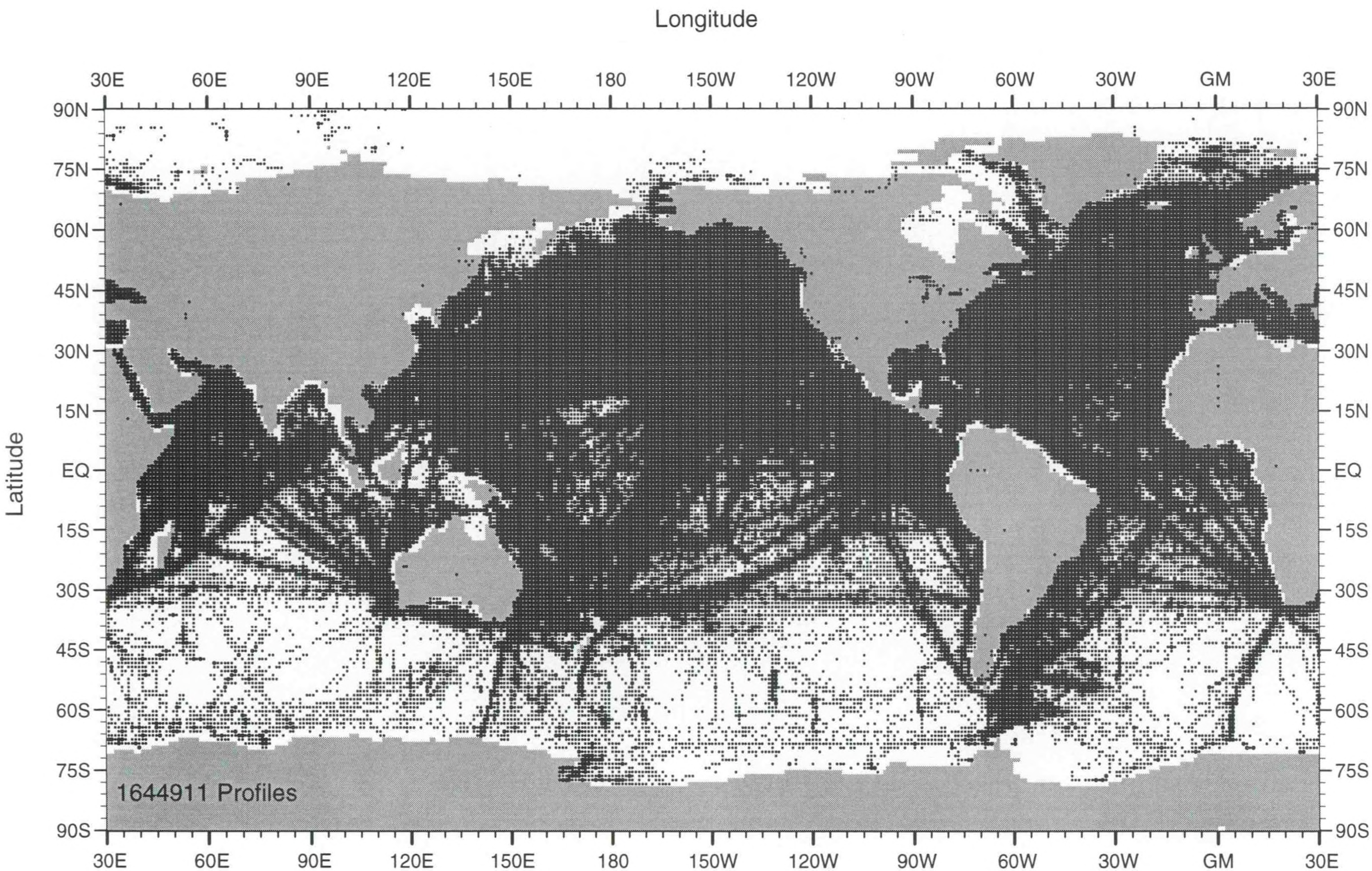


Fig. 17 Distribution of all profiles in the XBT files of WOD98

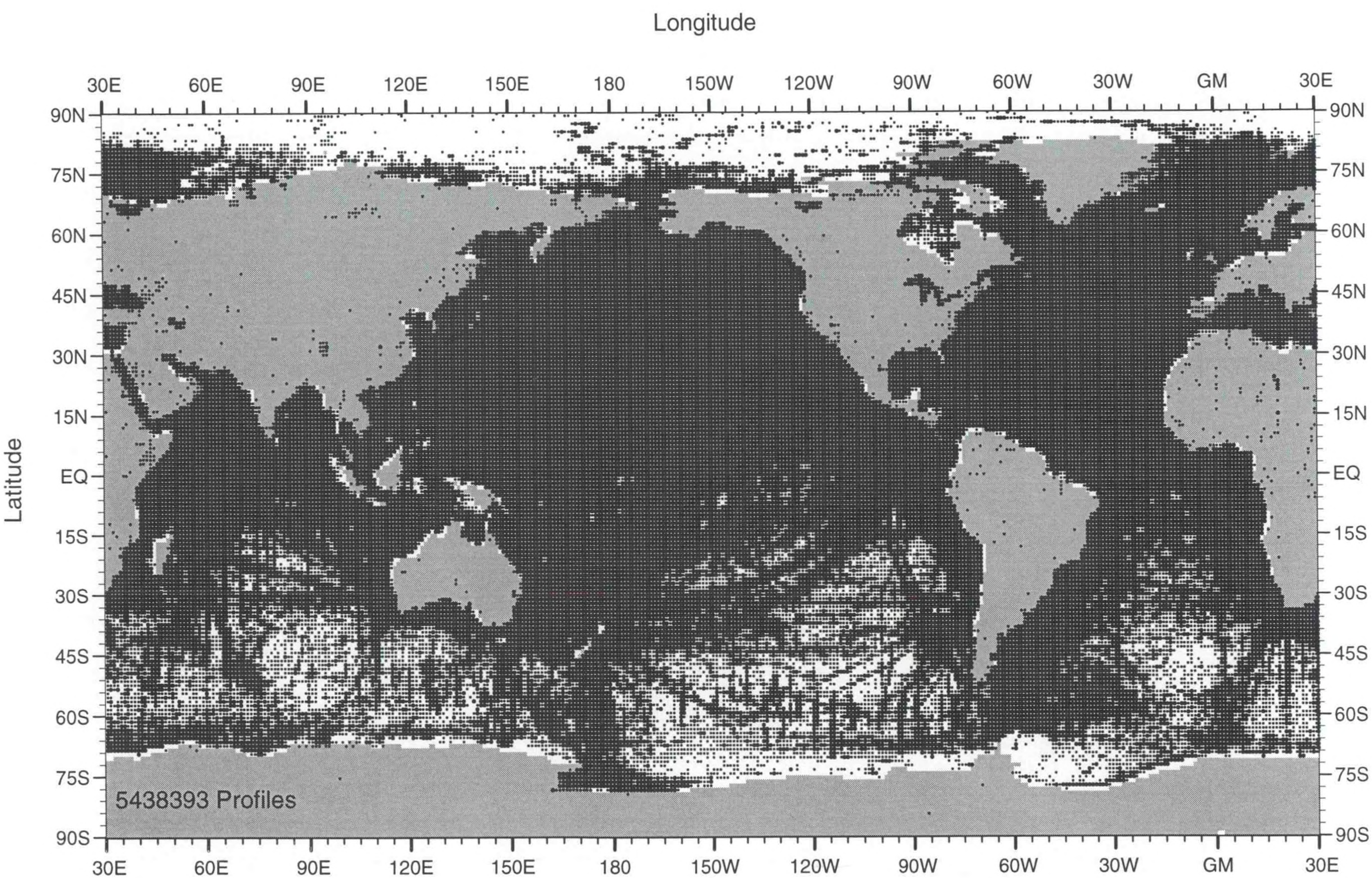


Fig. 18 Distribution of all profiles (OSD+CTD+MBT+XBT+TAO) in WOD98

9. APPENDIX A: YEARLY DISTRIBUTION MAPS OF ALL CASTS IN WOD98

This appendix contains yearly data distributions of all profile data contained in WOD98, surface only data are not plotted. We have combined all data of the OSD, CTD, MBT, and XBT files together for each year. Ocean Station Data data occur during the full period covered by WOD98 which is 1874-present, MBT profiles exist during 1941-present, XBT profiles exist during 1966-present, and CTD exists during 1967-present. 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 profiles are plotted including profiles that may be erroneously located over land. However, WOD98 contains some profiles from various lakes so care should be exercised in the use of these profiles 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 profiles and a large dot indicates five or more profiles.

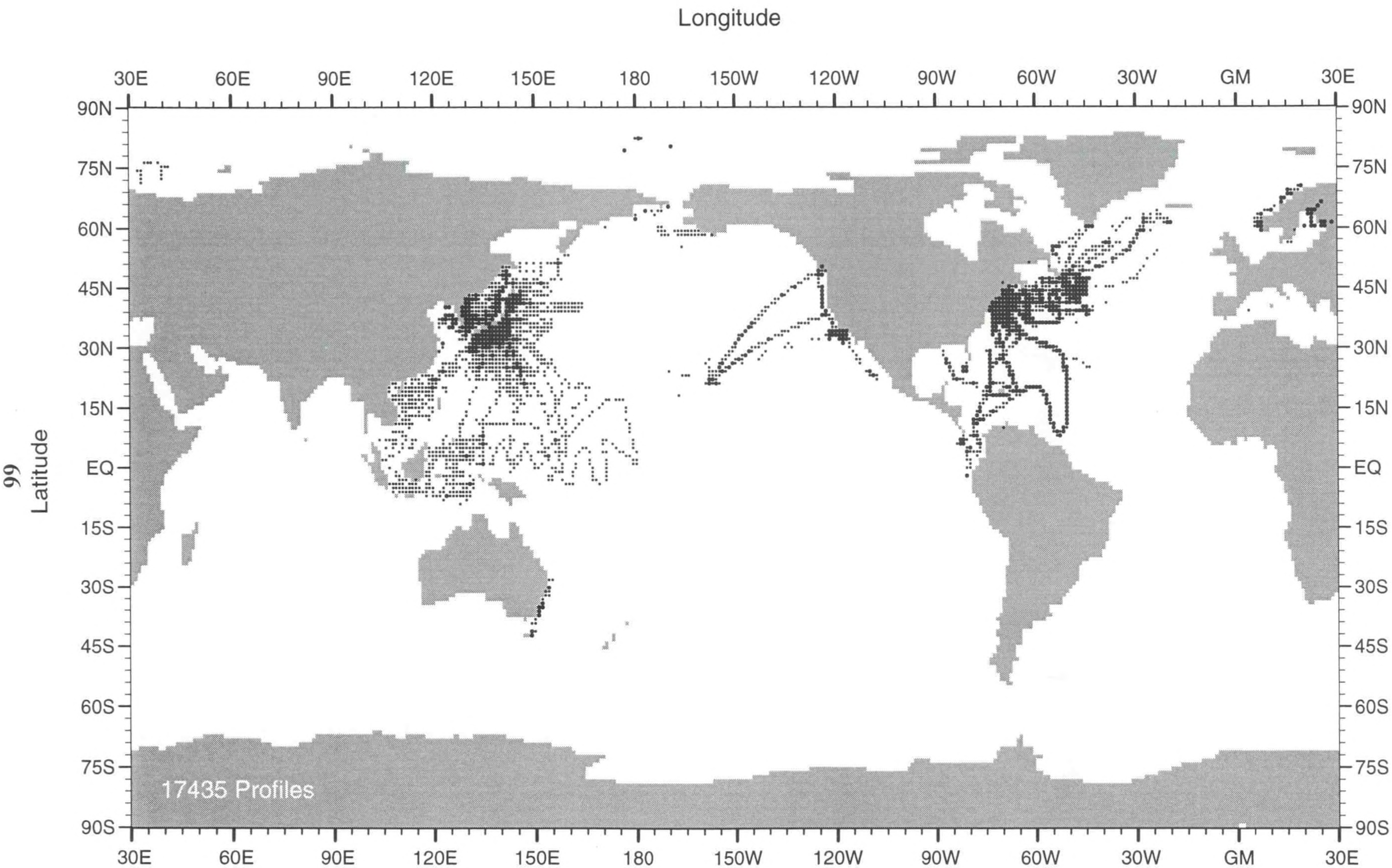


Fig. A1 Distribution of all data profiles (OSD+MBT) in WOD98 for 1941

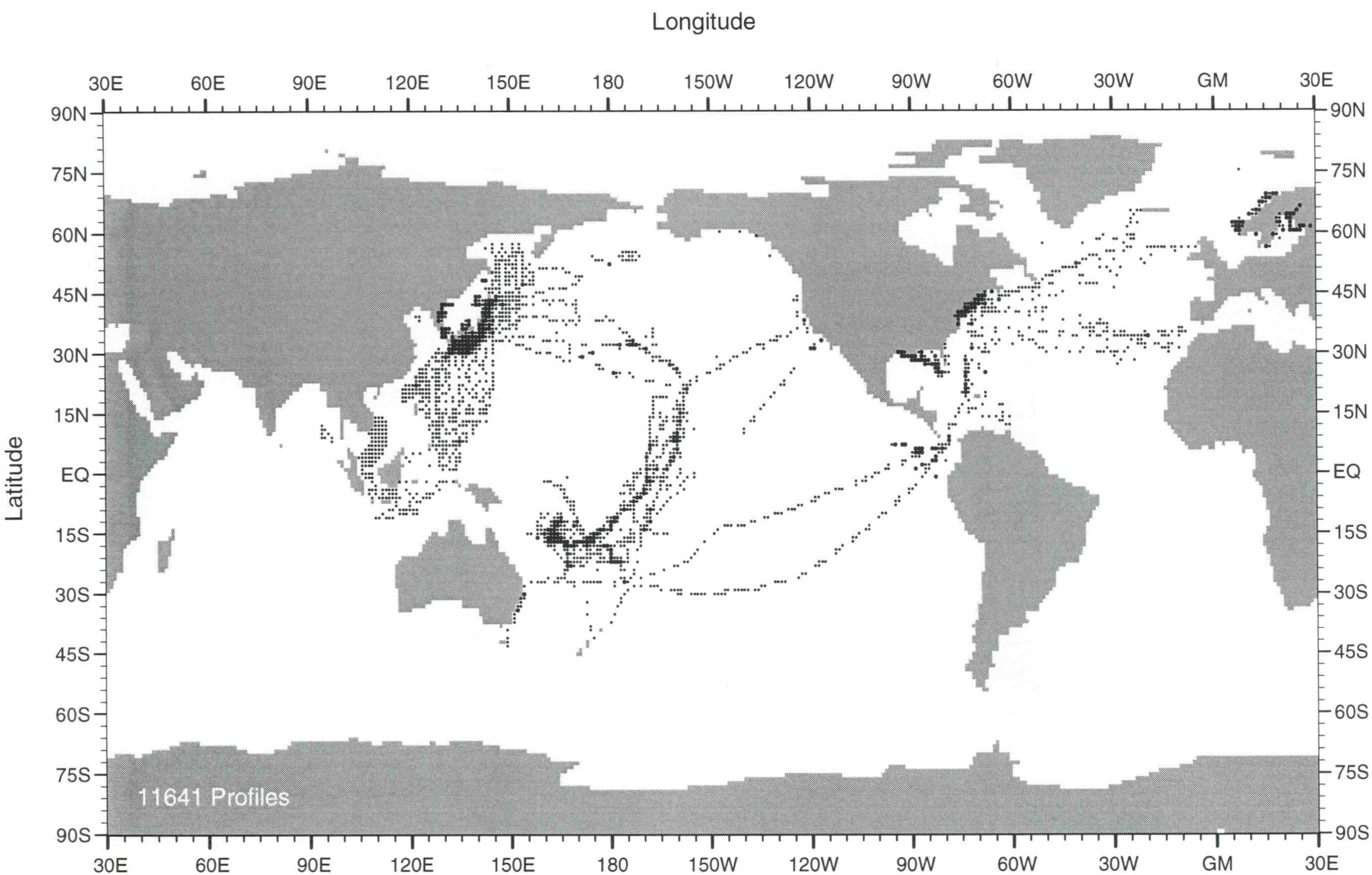


Fig. A2 Distribution of all data profiles (OSD+MBT) in WOD98 for 1942

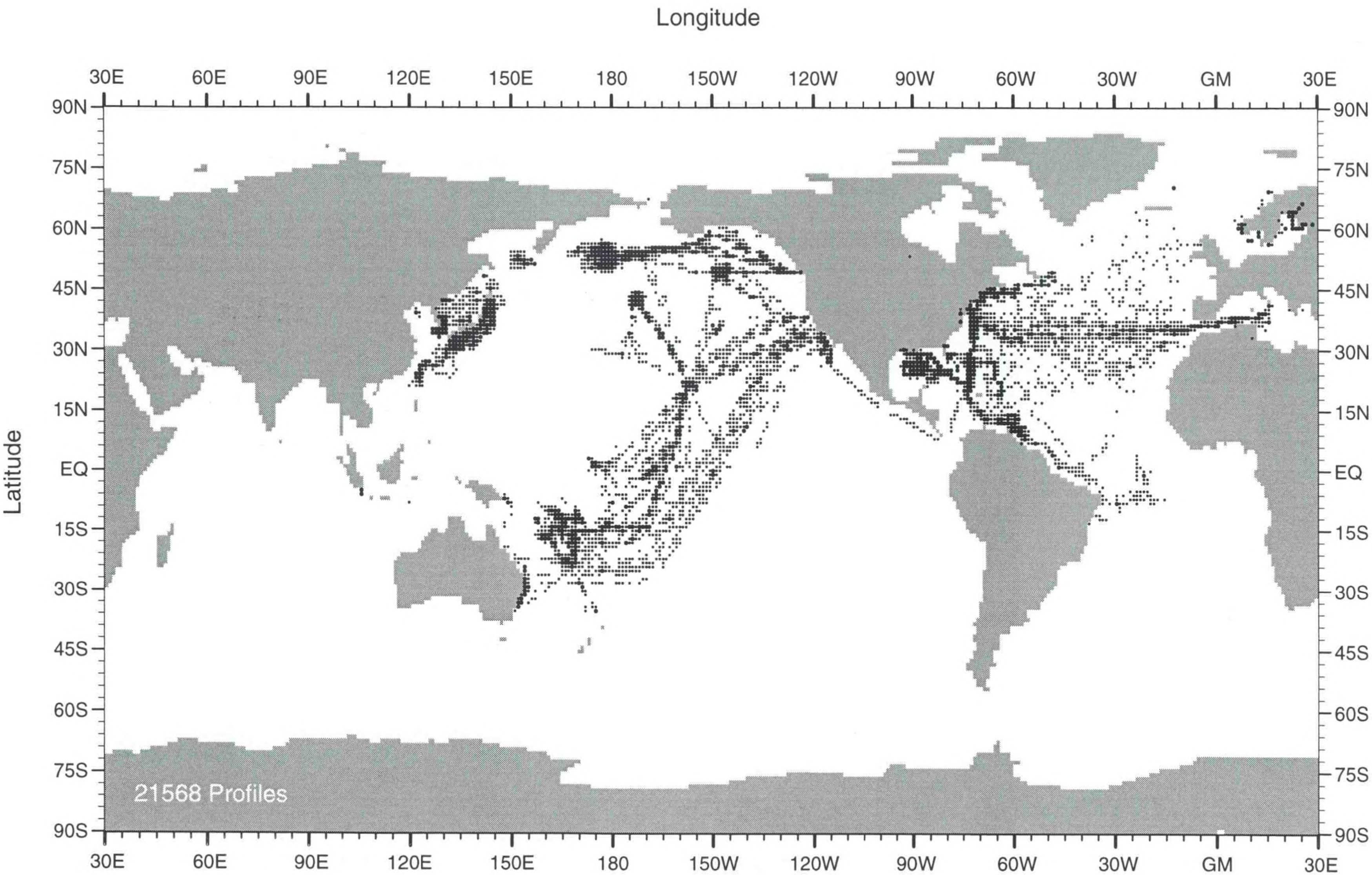


Fig. A3 Distribution of all data profiles (OSD+MBT) in WOD98 for 1943

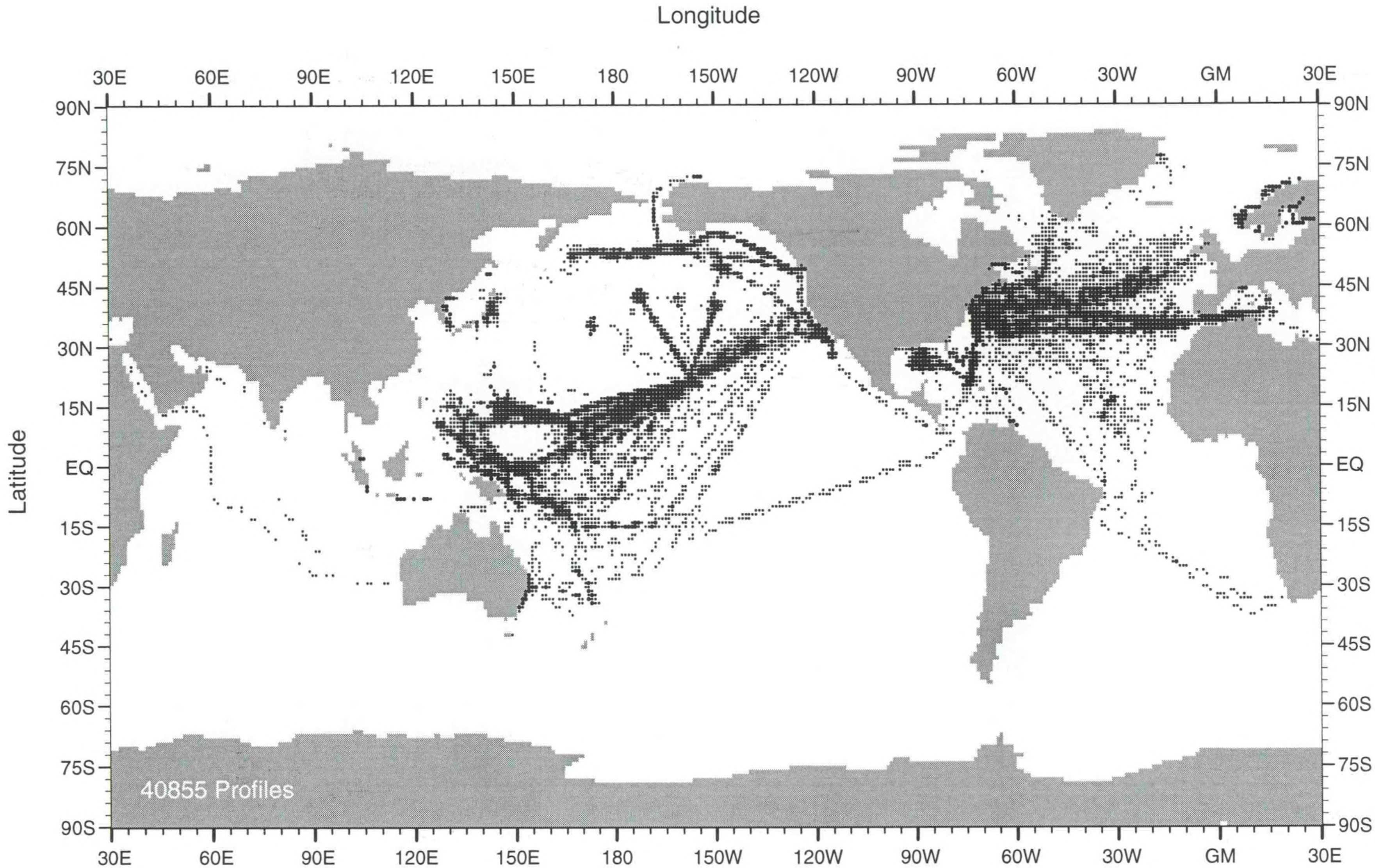


Fig. A4 Distribution of all data profiles (OSD+MBT) in WOD98 for 1944

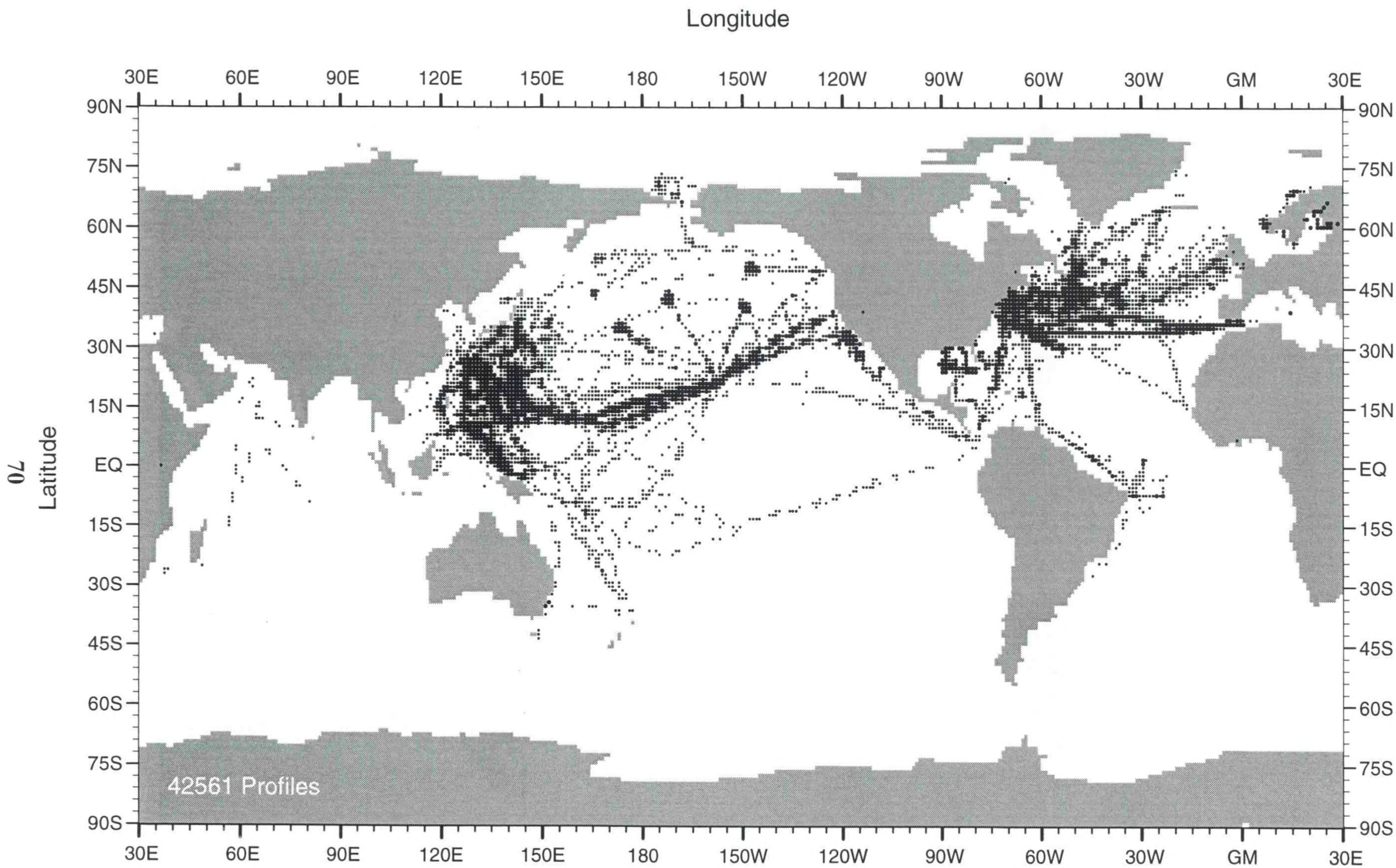


Fig. A5 Distribution of all data profiles (OSD+MBT) in WOD98 for 1945

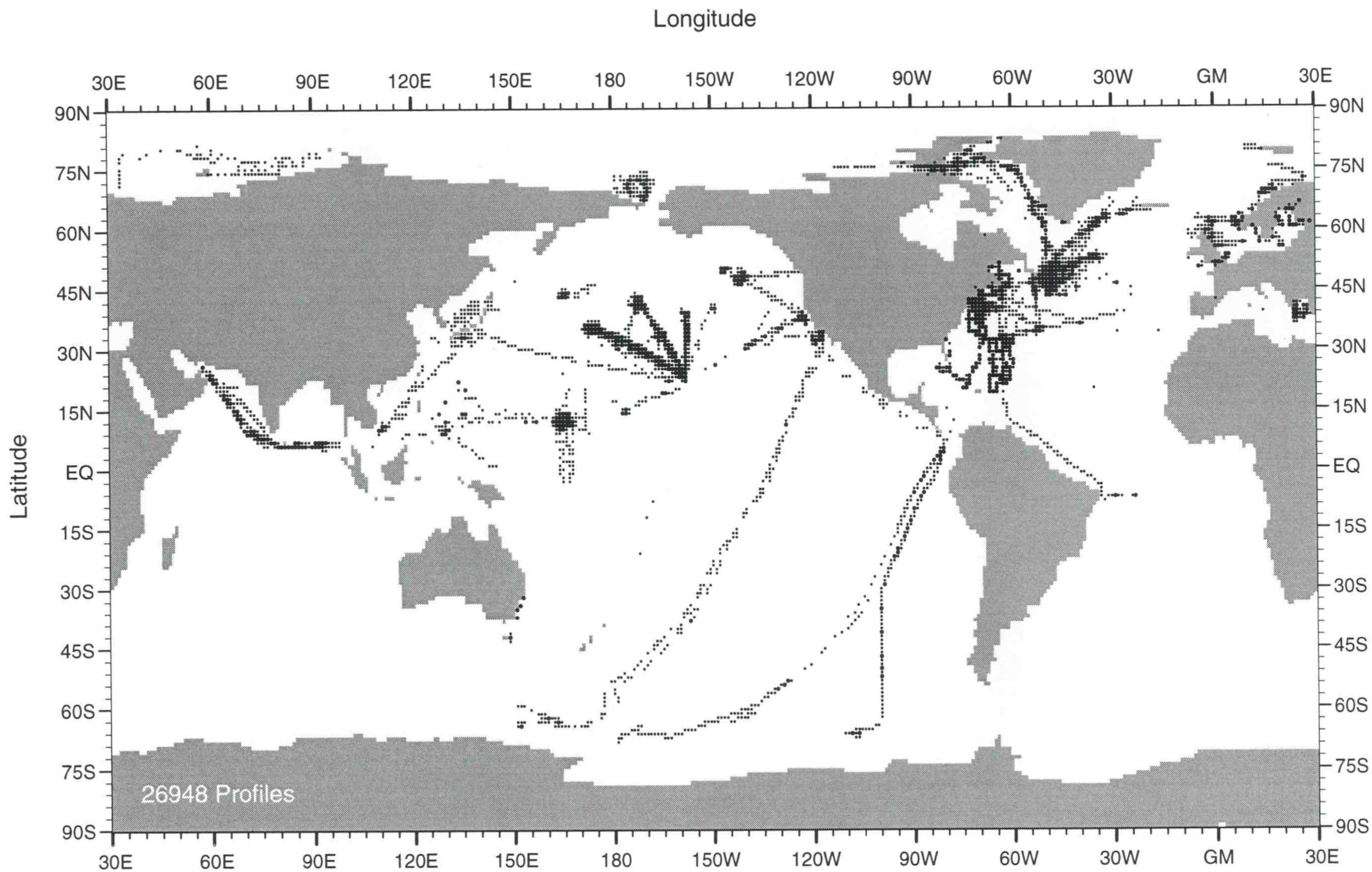


Fig. A6 Distribution of all data profiles (OSD+MBT) in WOD98 for 1946

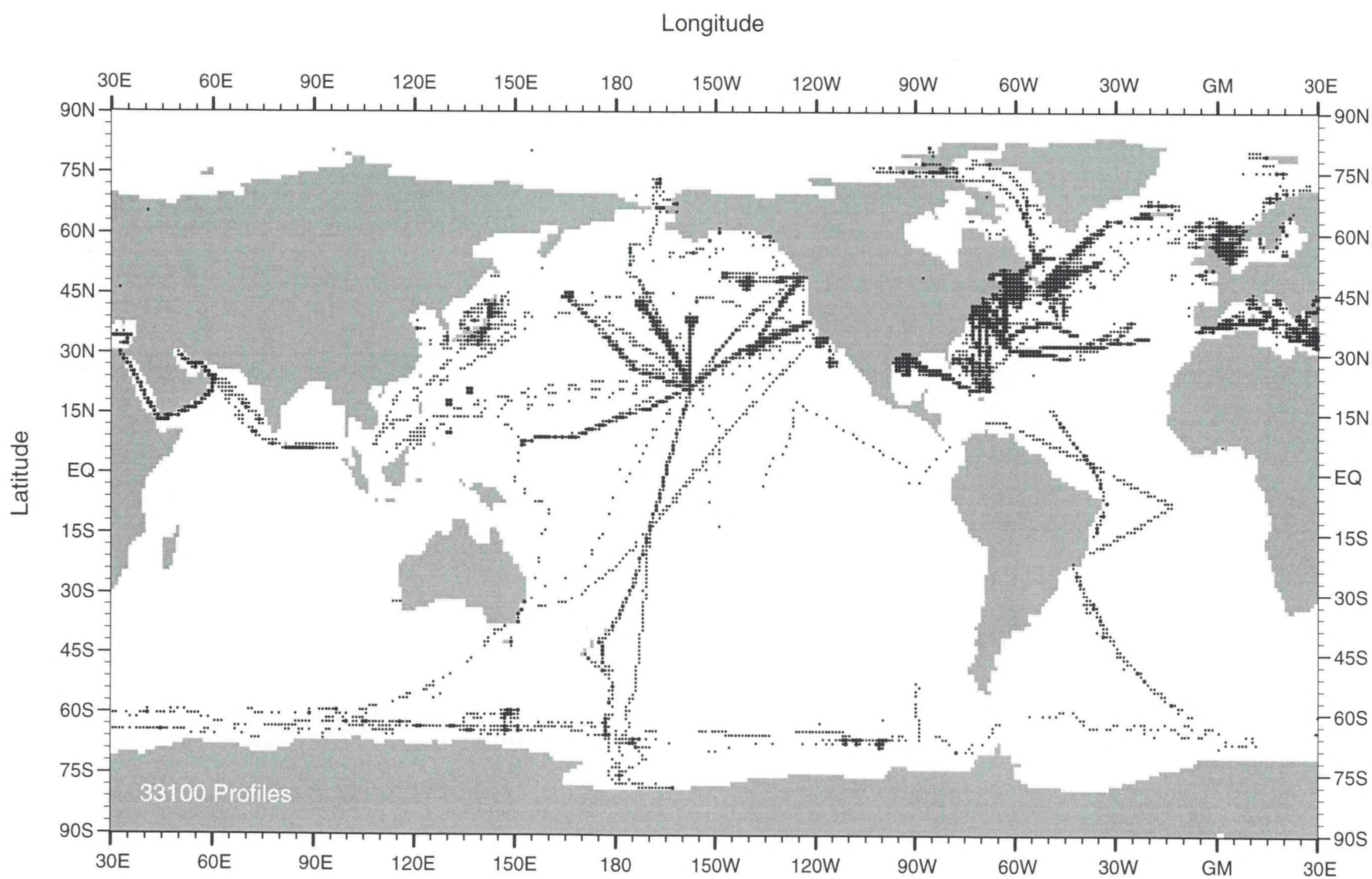


Fig. A7 Distribution of all data profiles (OSD+MBT) in WOD98 for 1947

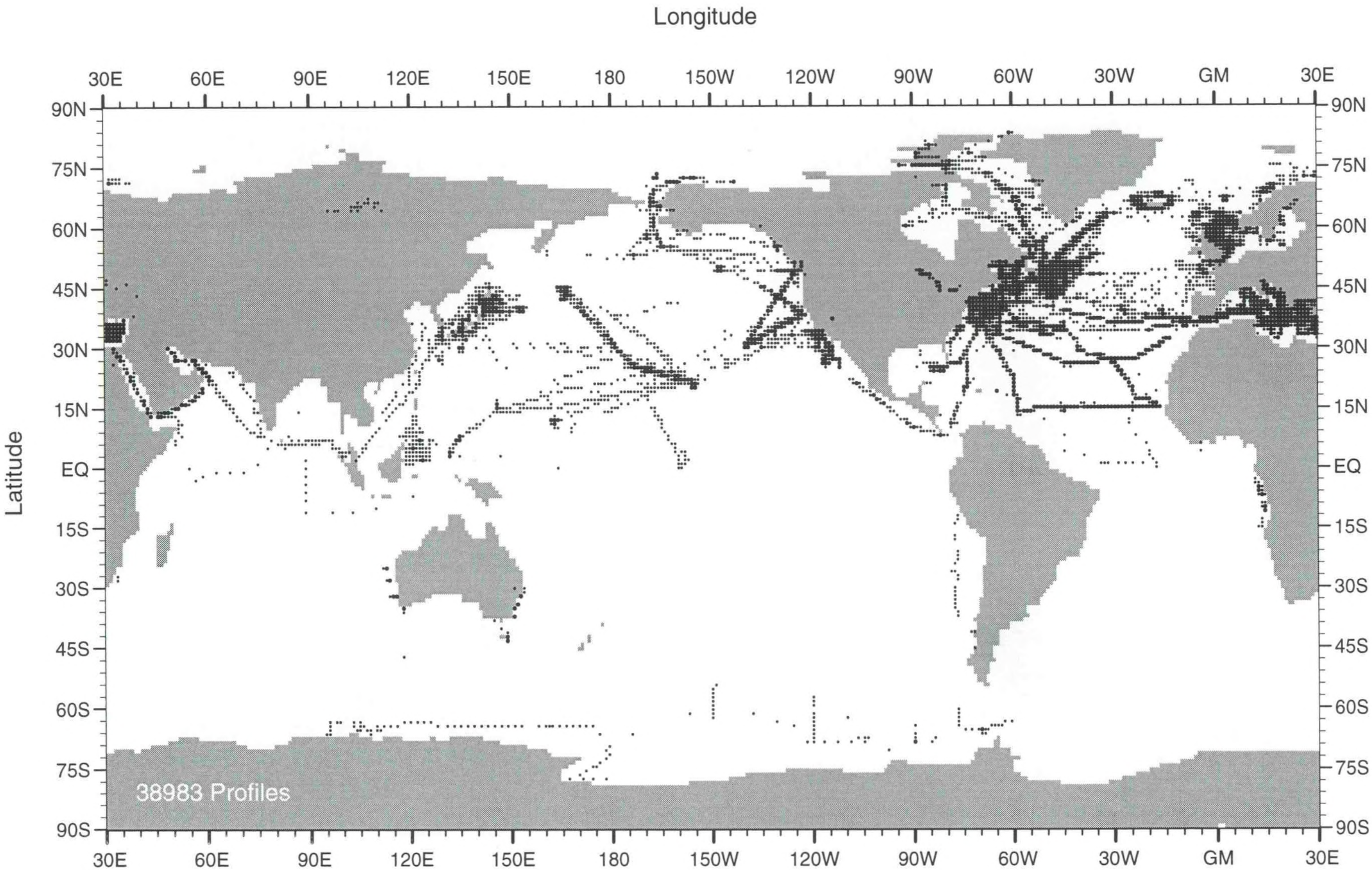


Fig. A8 Distribution of all data profiles (OSD+MBT) in WOD98 for 1948

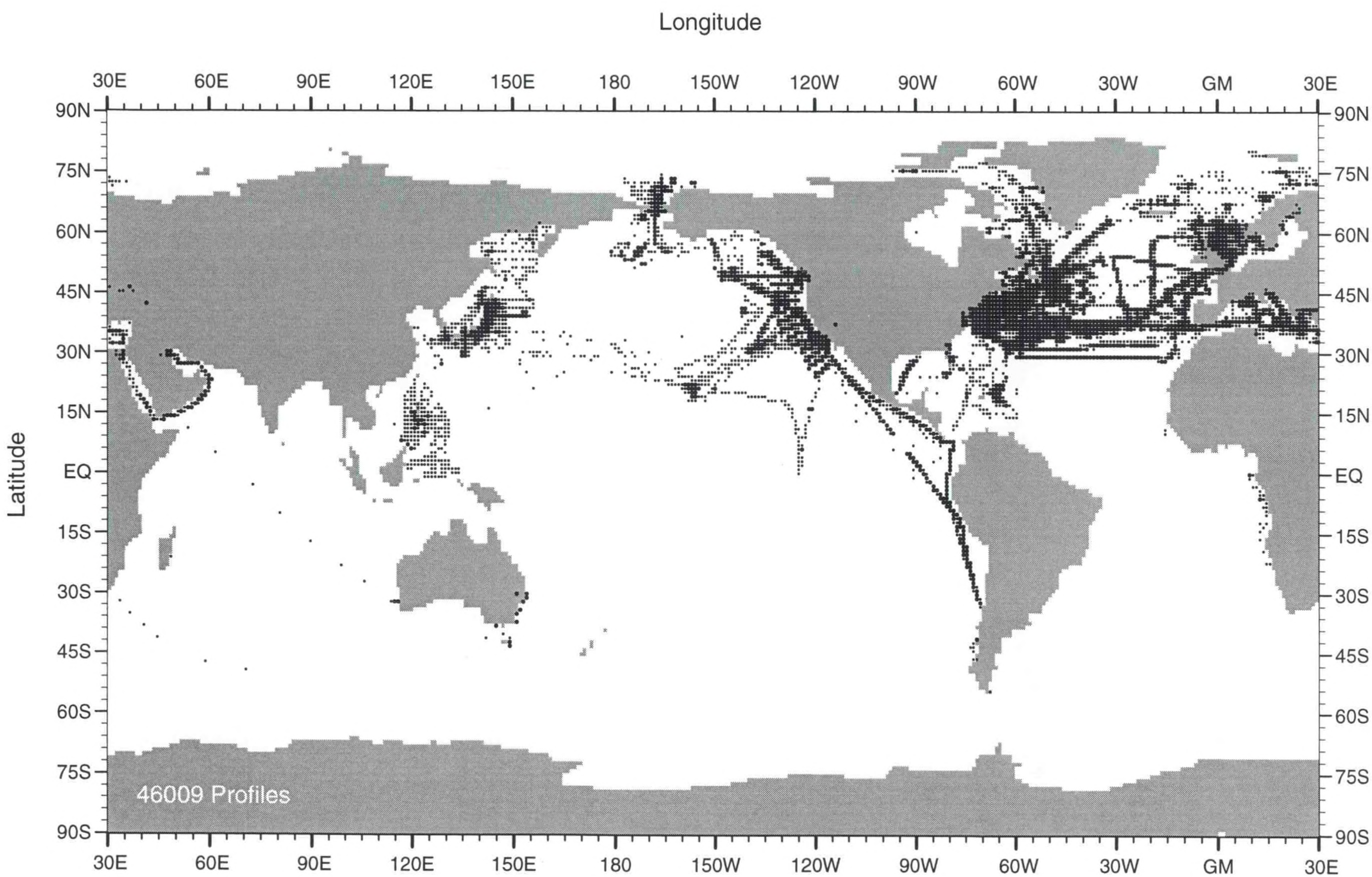


Fig. A9 Distribution of all data profiles (OSD+MBT) in WOD98 for 1949

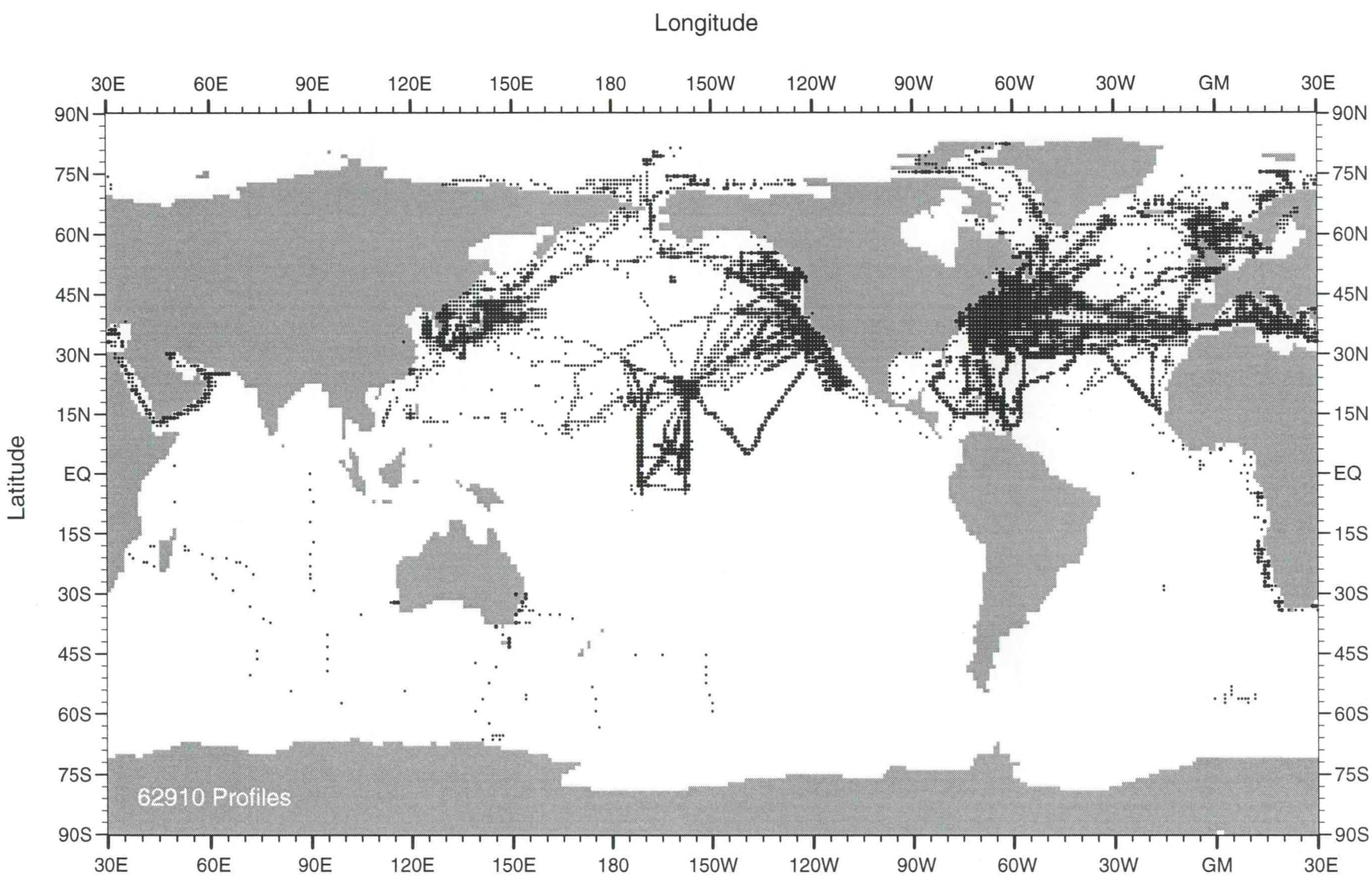


Fig. A10 Distribution of all data profiles (OSD+MBT) in WOD98 for 1950

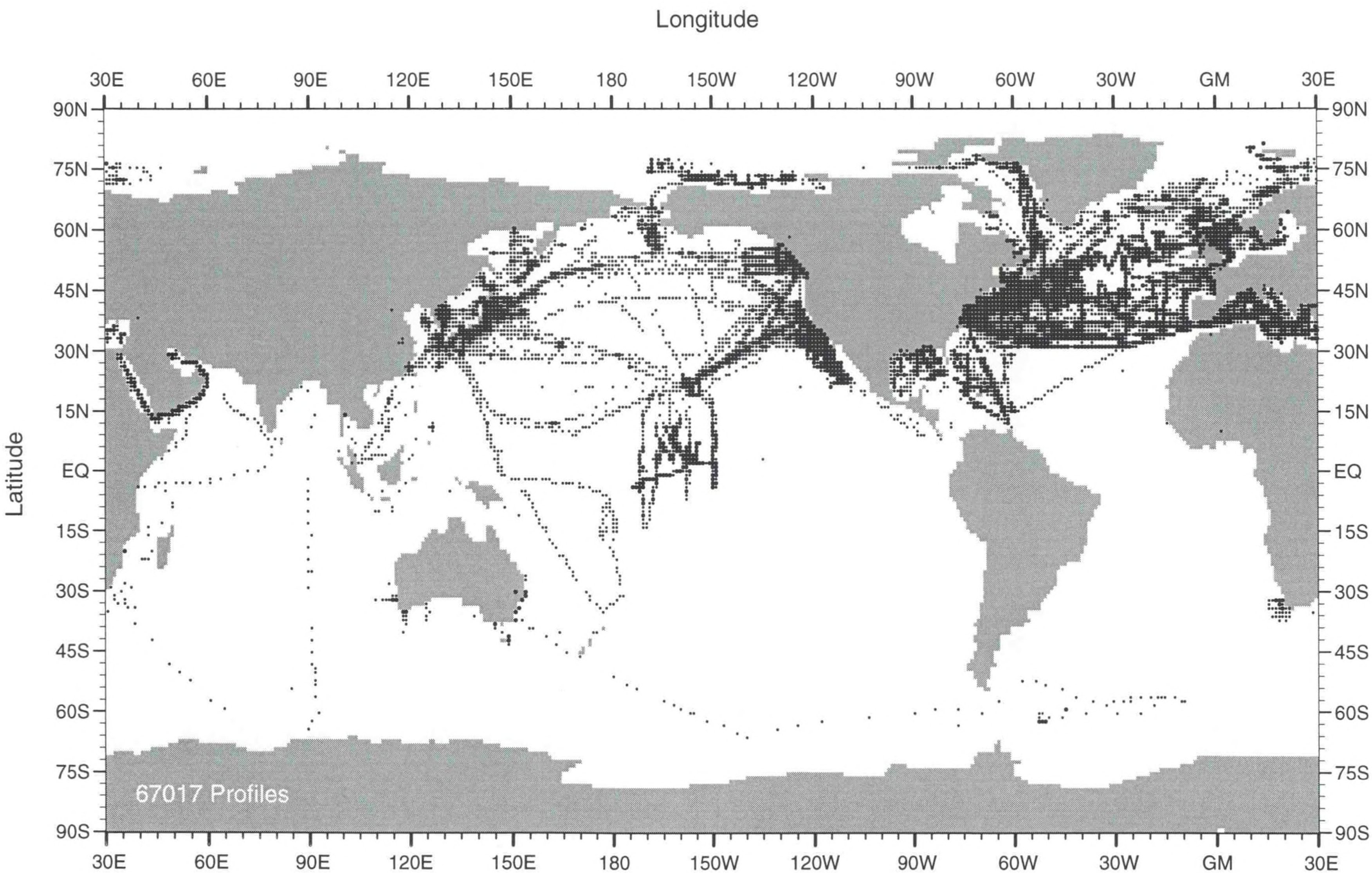


Fig. A11 Distribution of all data profiles (OSD+MBT) in WOD98 for 1951

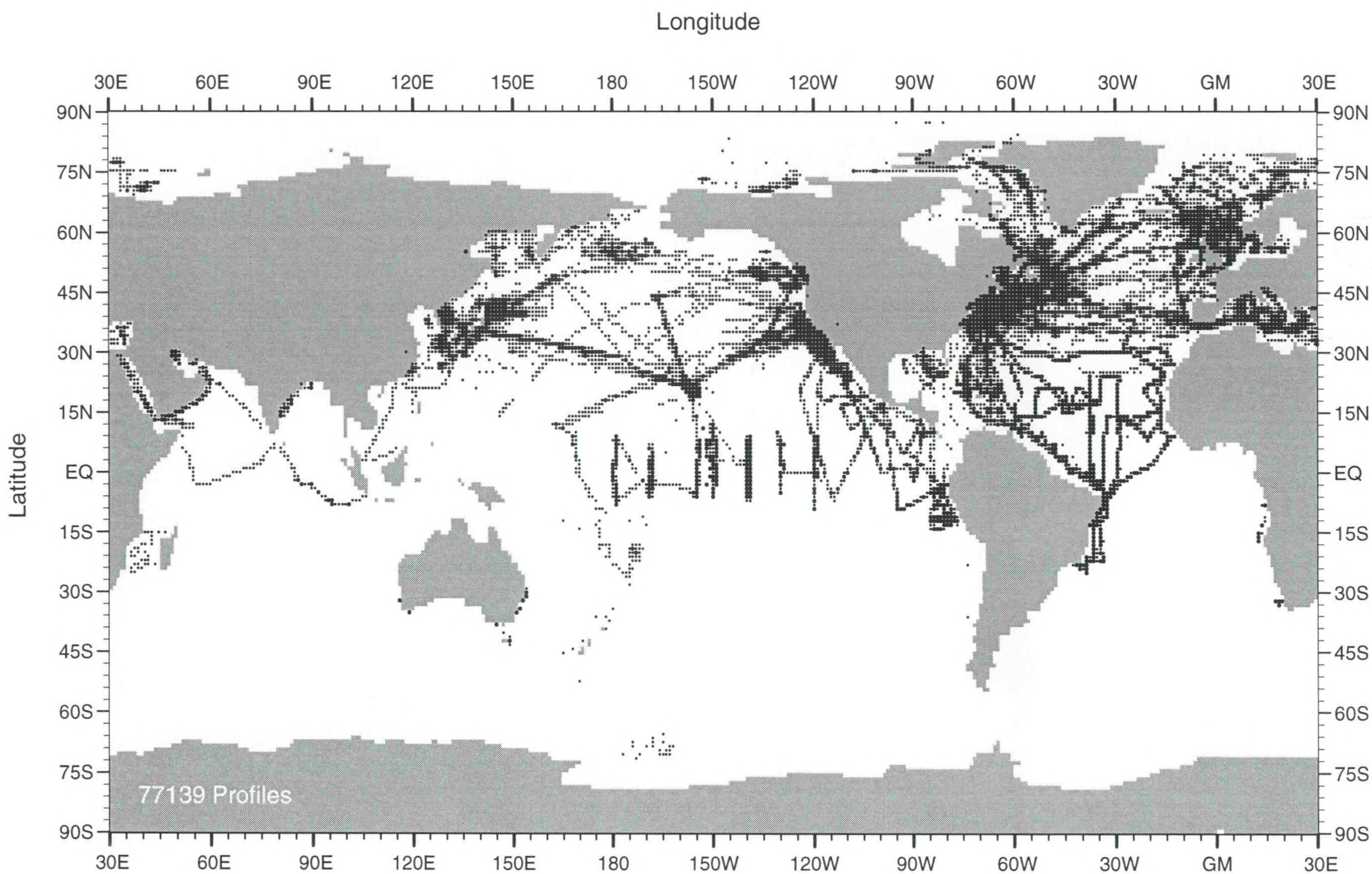


Fig. A12 Distribution of all data profiles (OSD+MBT) in WOD98 for 1952

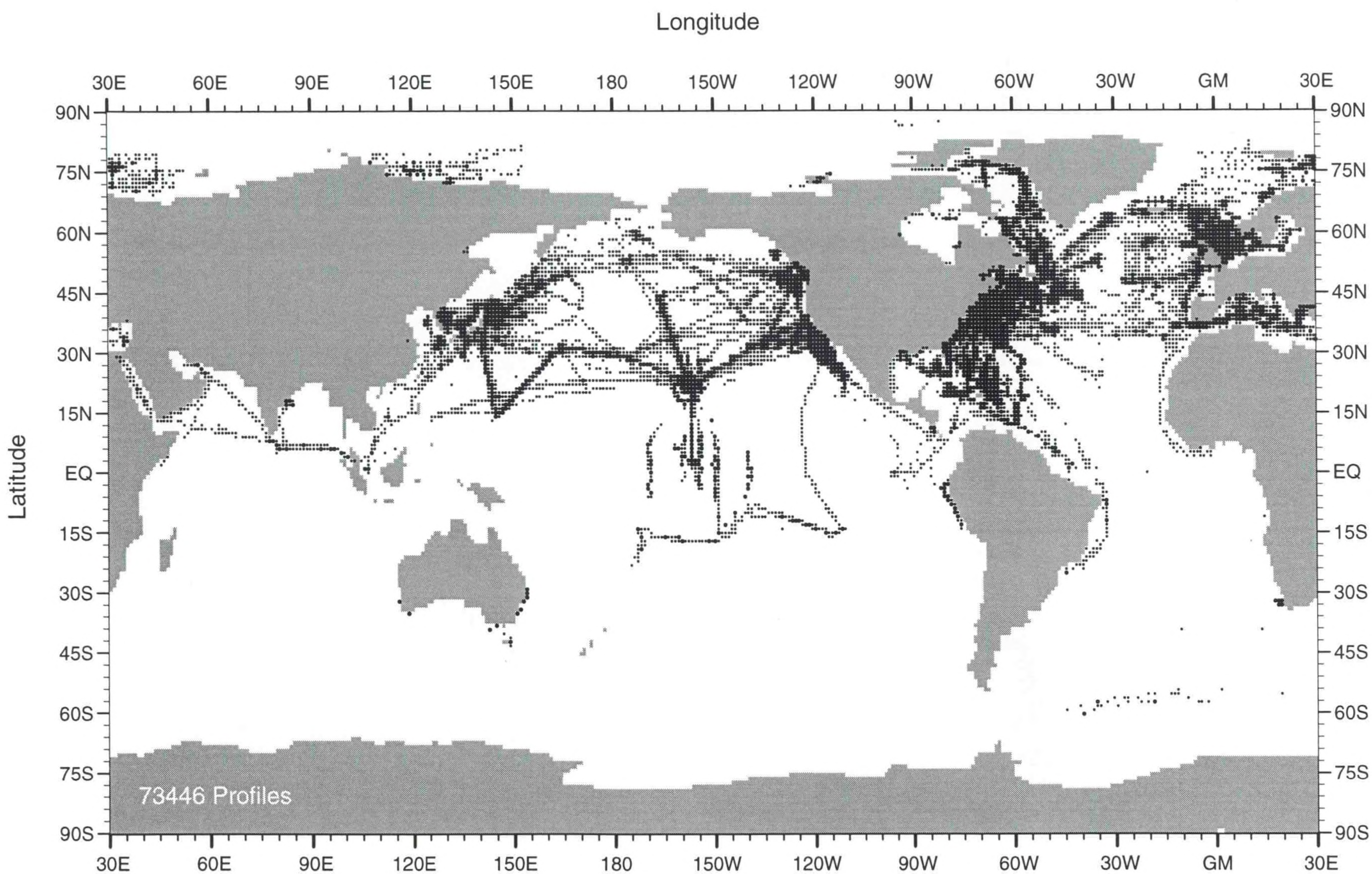


Fig. A13 Distribution of all data profiles (OSD+MBT) in WOD98 for 1953

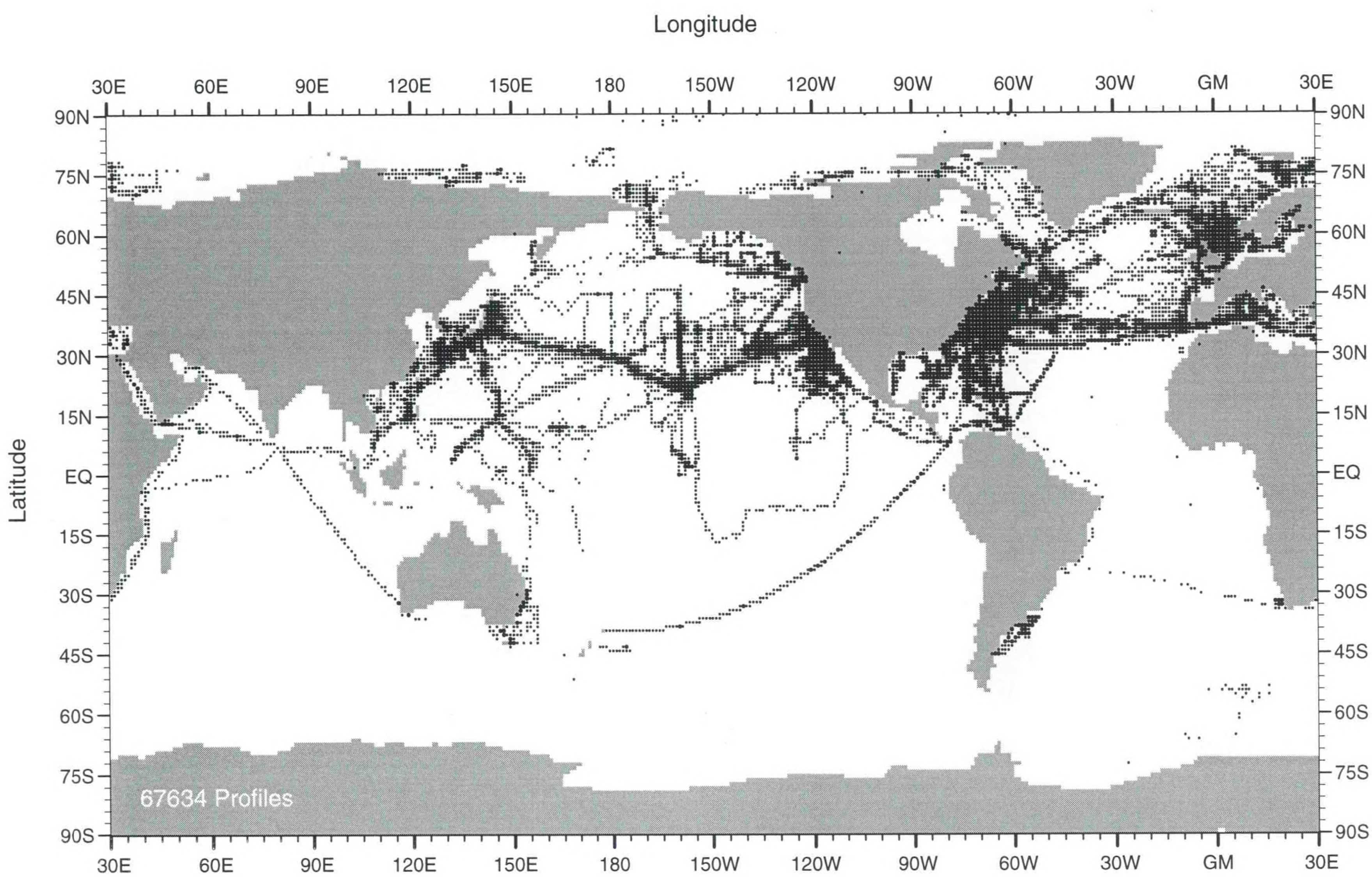


Fig. A14 Distribution of all data profiles (OSD+MBT) in WOD98 for 1954

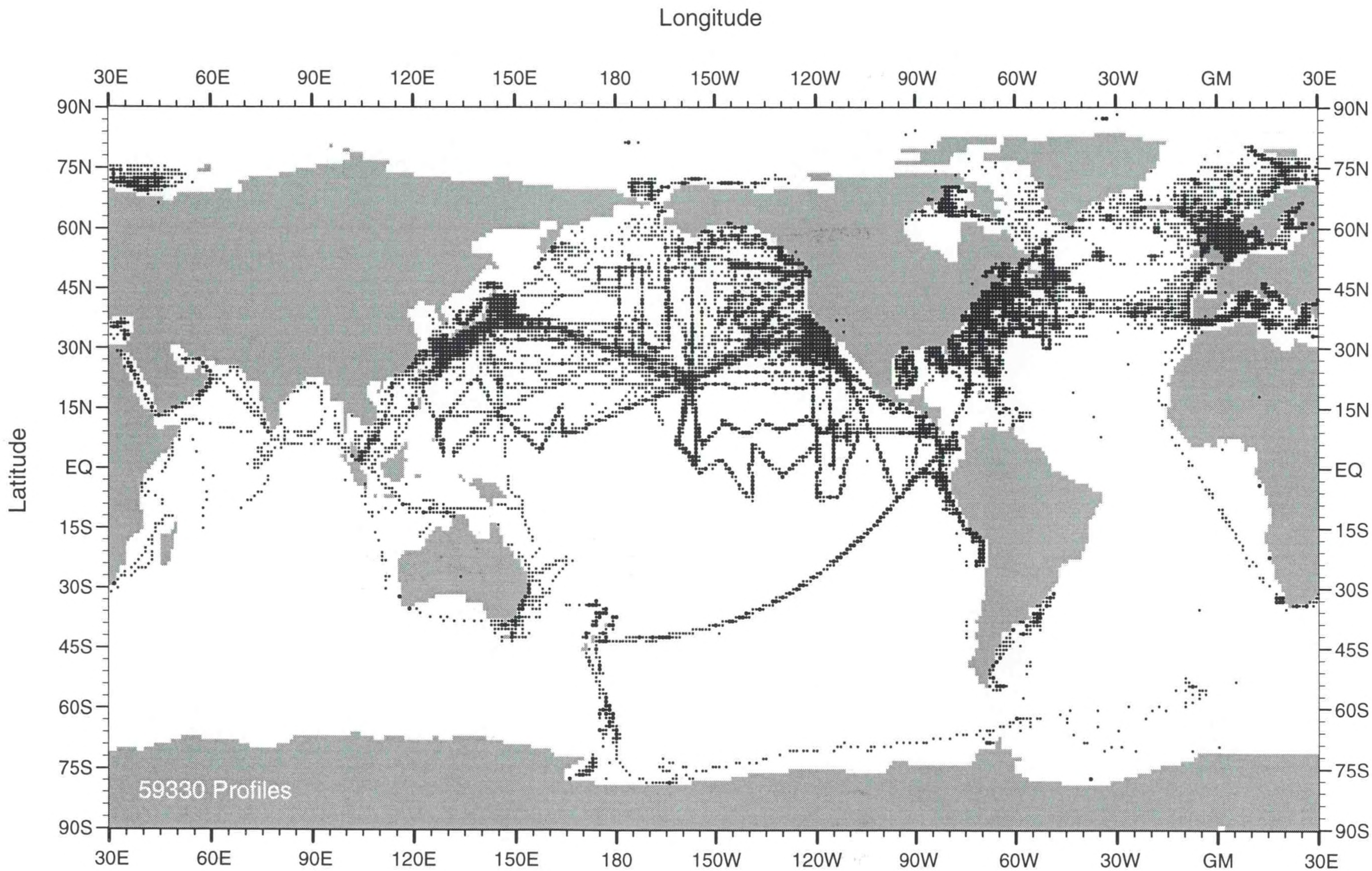


Fig. A15 Distribution of all data profiles (OSD+MBT) in WOD98 for 1955

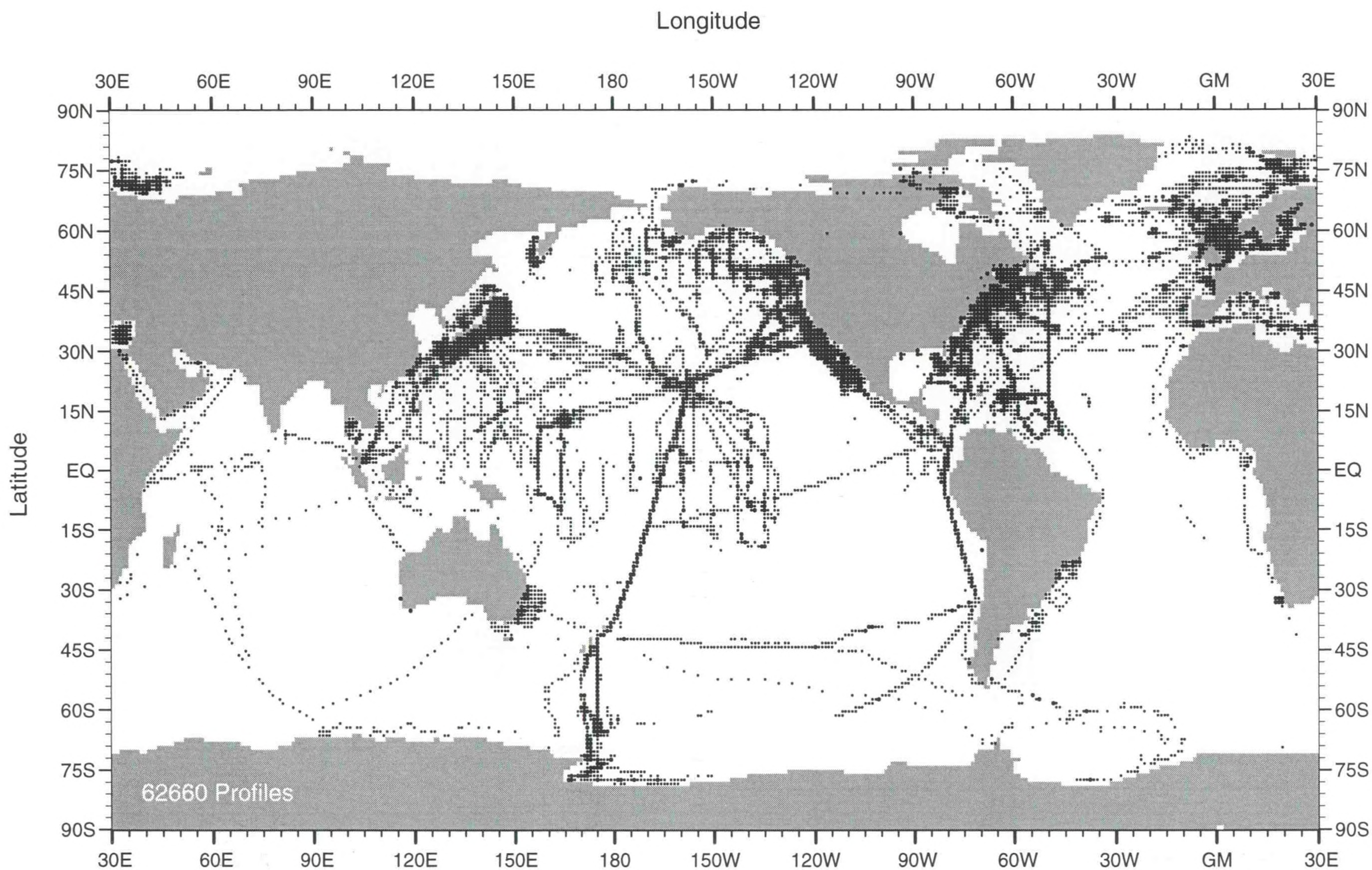


Fig. A16 Distribution of all data profiles (OSD+MBT) in WOD98 for 1956

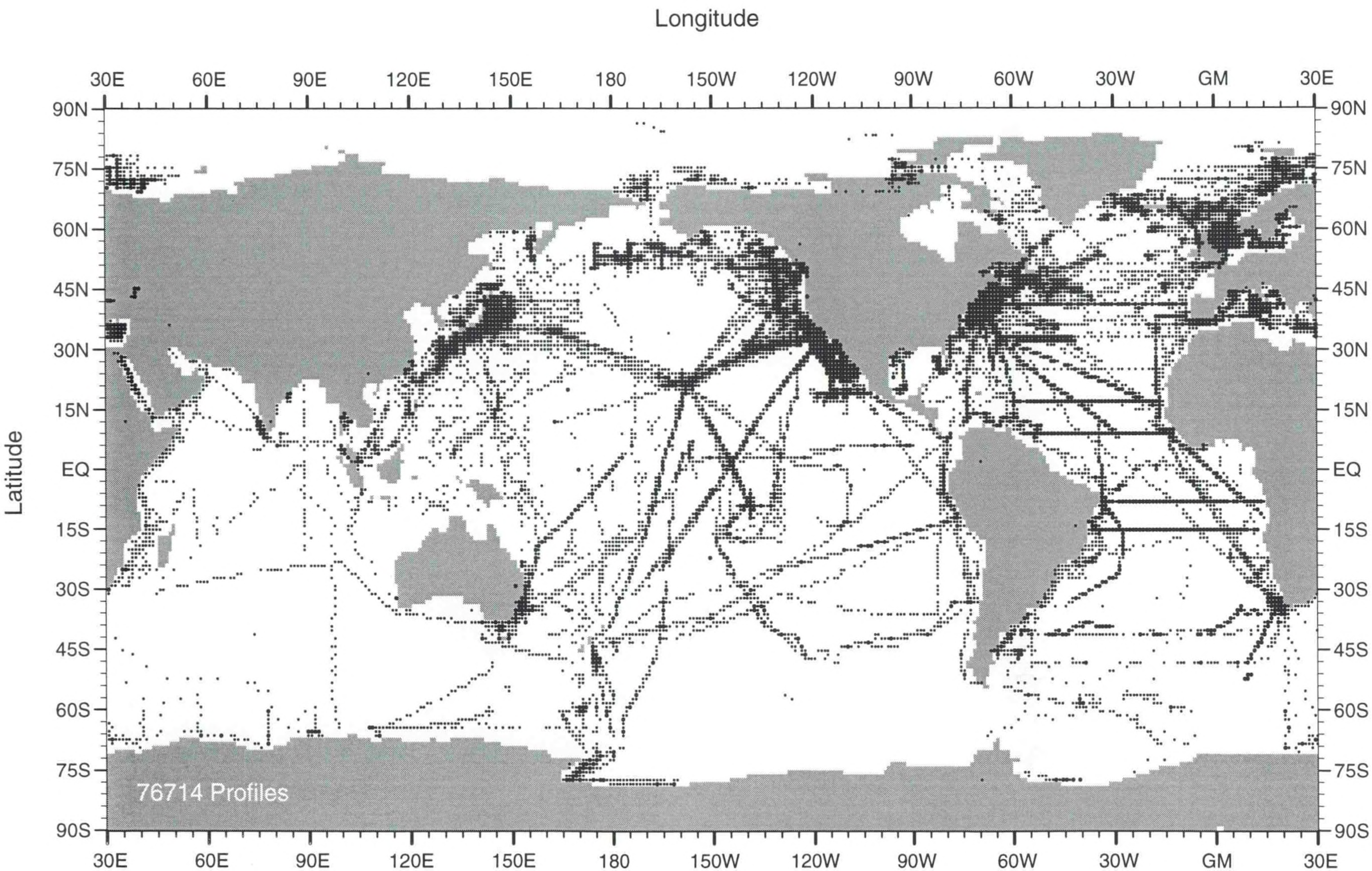


Fig. A17 Distribution of all data profiles (OSD+MBT) in WOD98 for 1957

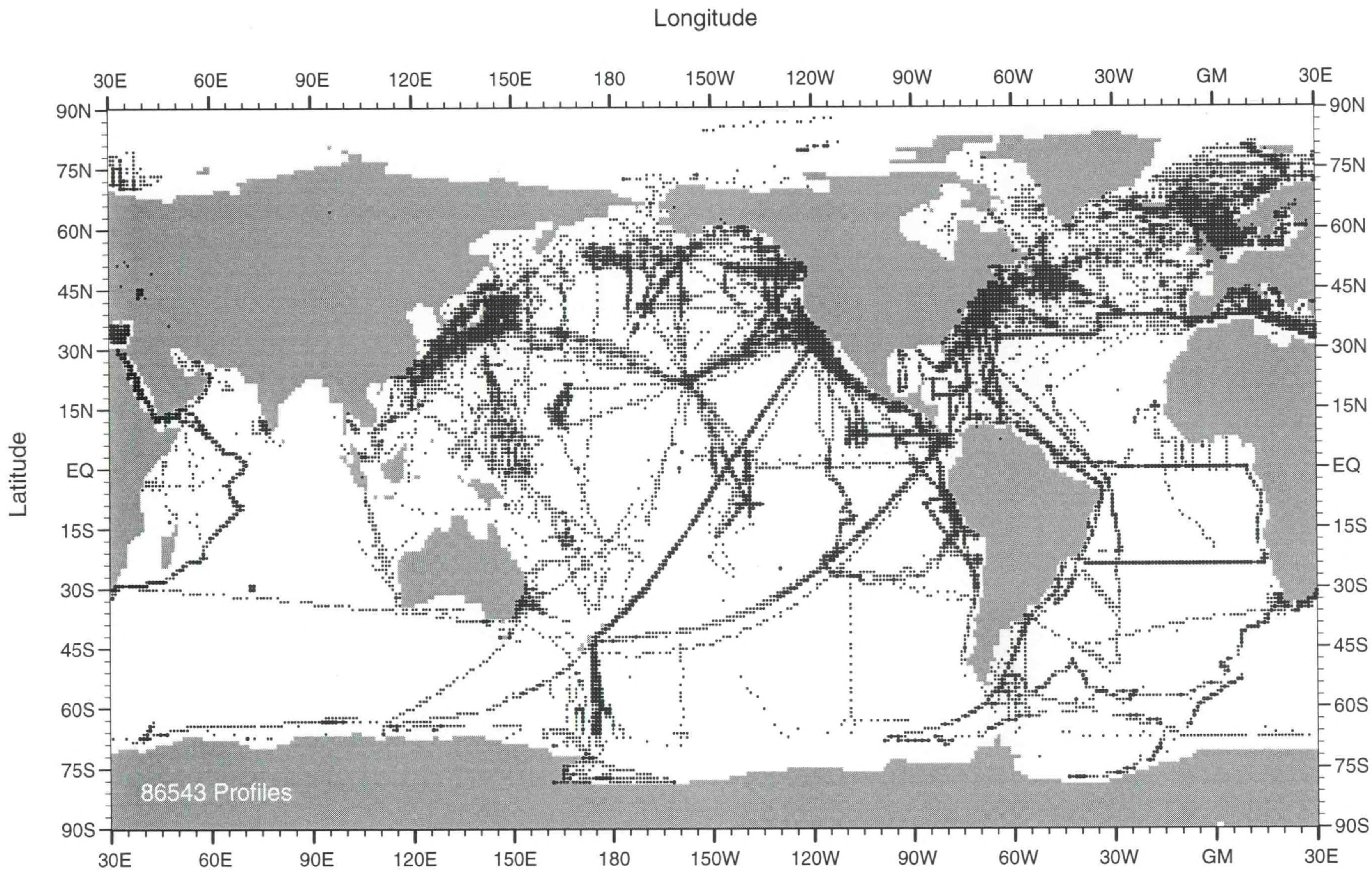


Fig. A18 Distribution of all data profiles (OSD+MBT) in WOD98 for 1958

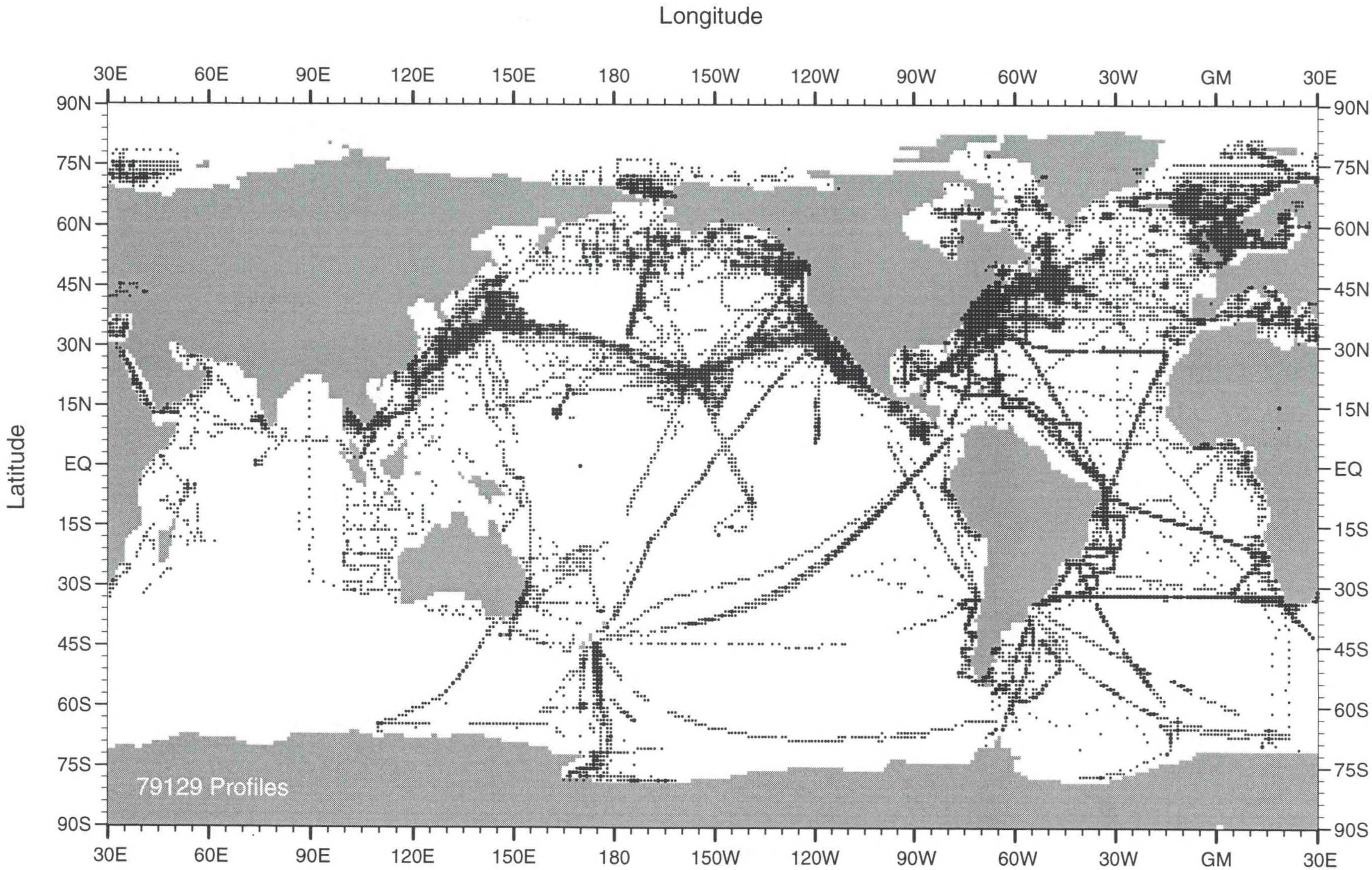


Fig. A19 Distribution of all data profiles (OSD+MBT) in WOD98 for 1959

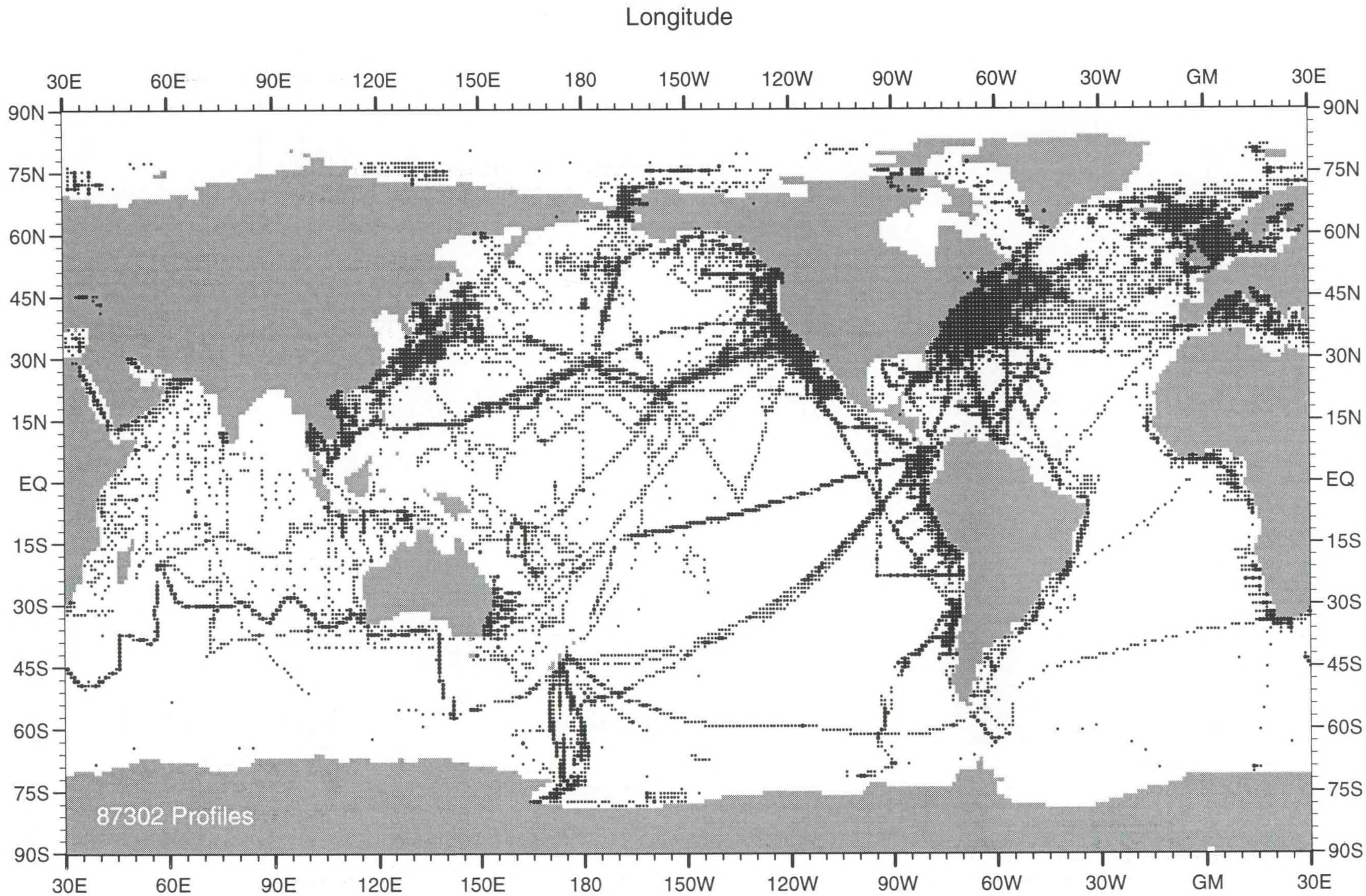


Fig. A20 Distribution of all data profiles (OSD+MBT) in WOD98 for 1960

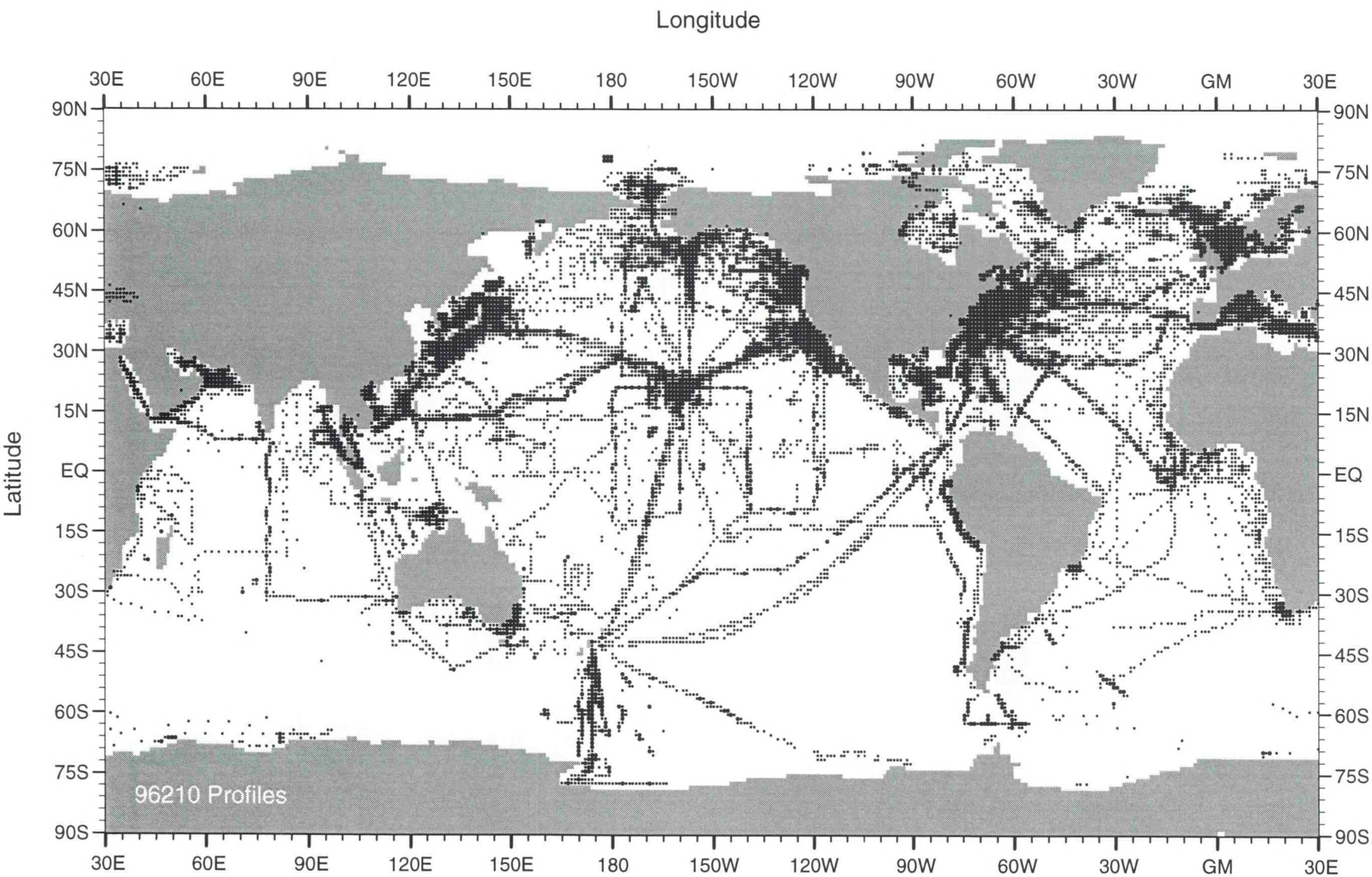


Fig. A21 Distribution of all data profiles (OSD+MBT) in WOD98 for 1961

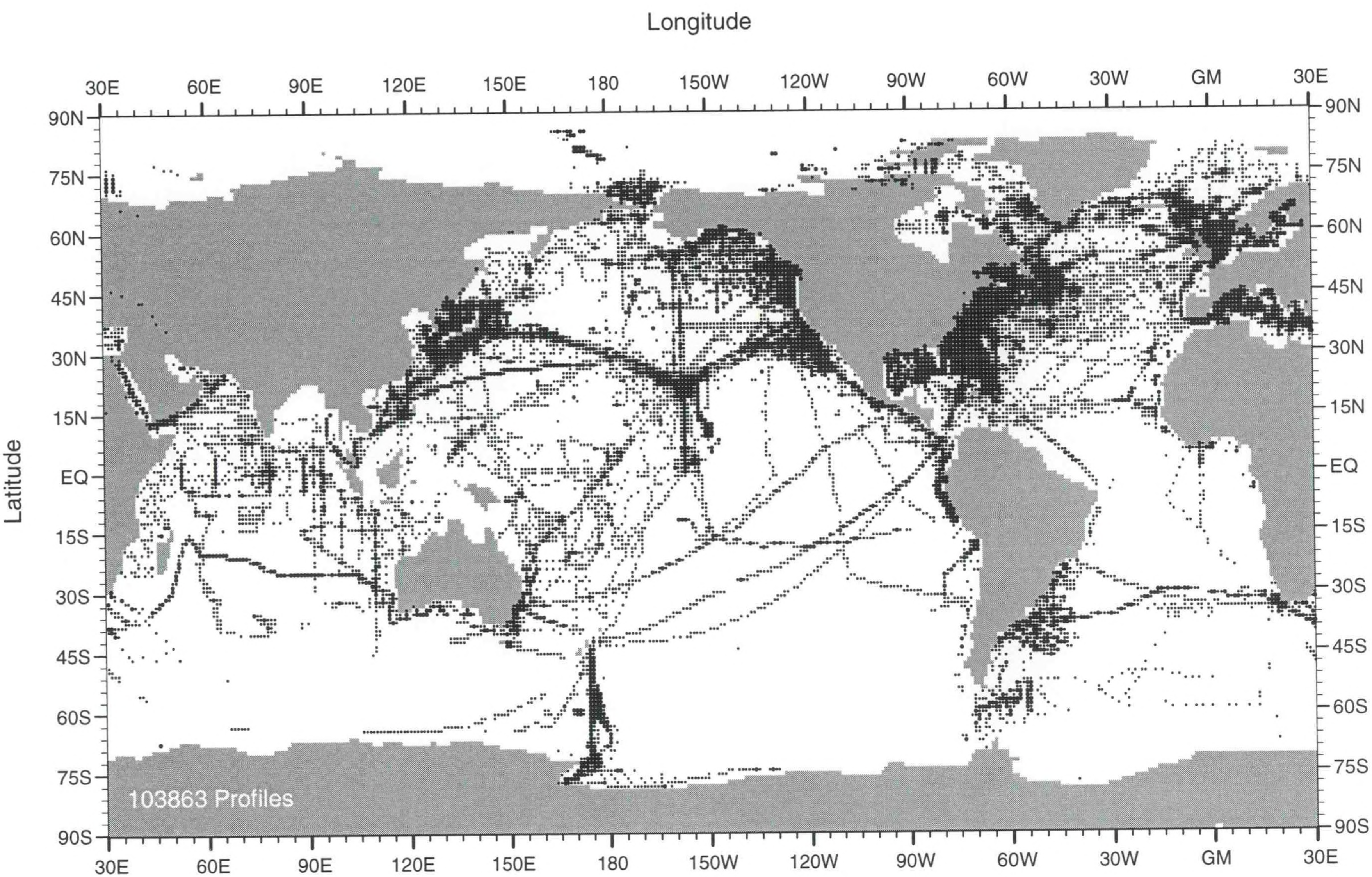


Fig. A22 Distribution of all data profiles (OSD+MBT) in WOD98 for 1962

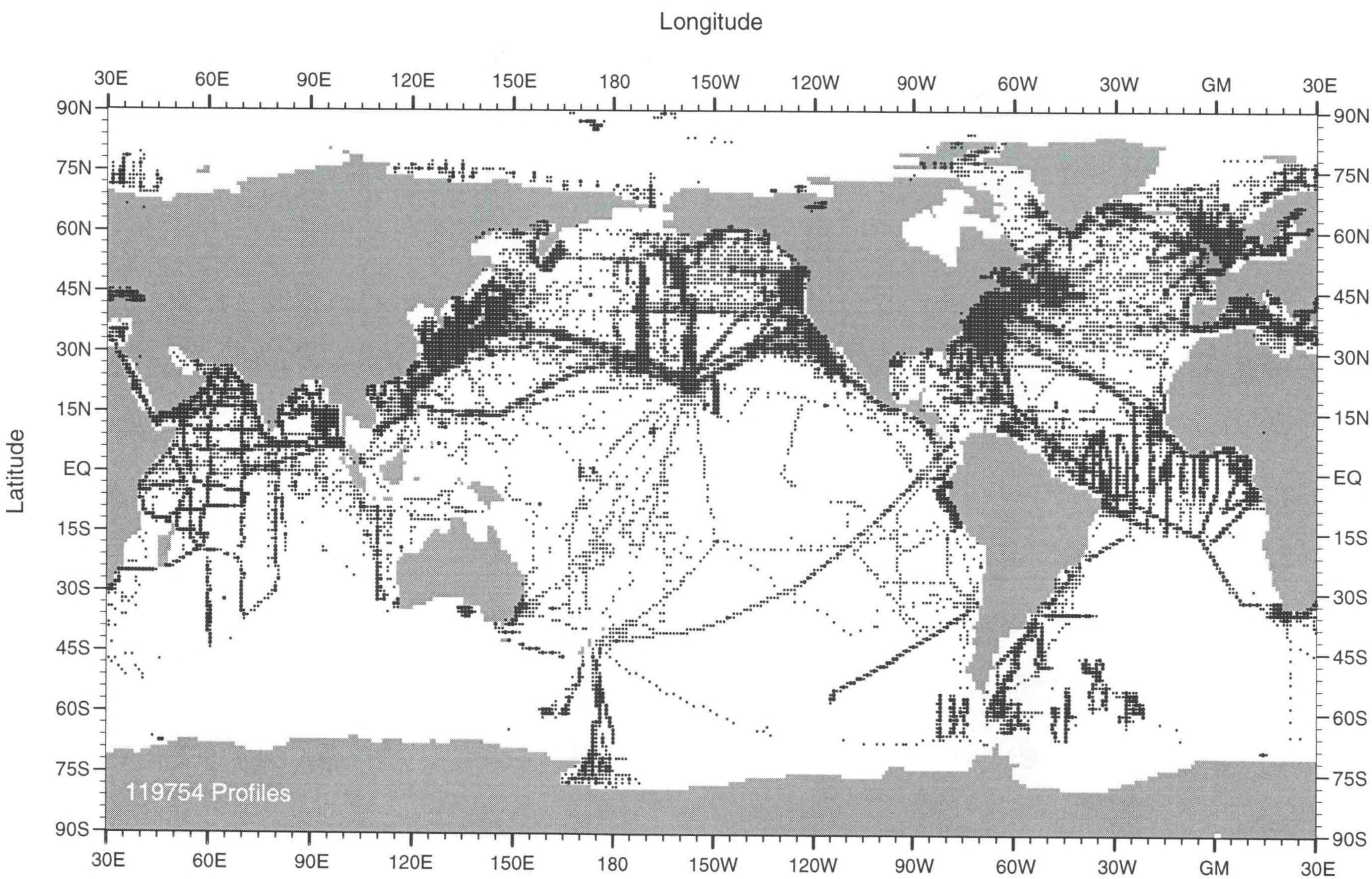


Fig. A23 Distribution of all data profiles (OSD+MBT) in WOD98 for 1963

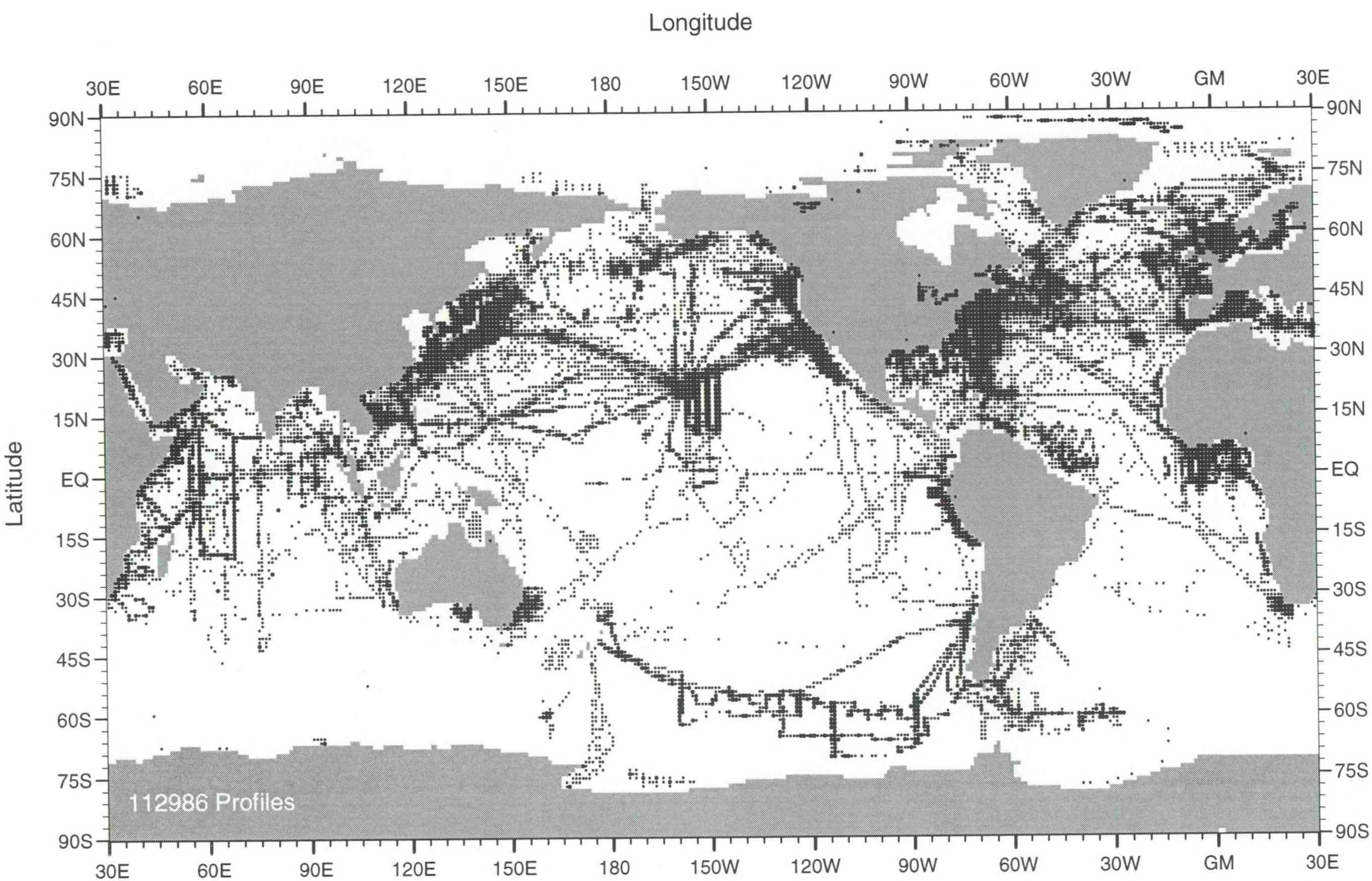


Fig. A24 Distribution of all data profiles (OSD+MBT) in WOD98 for 1964

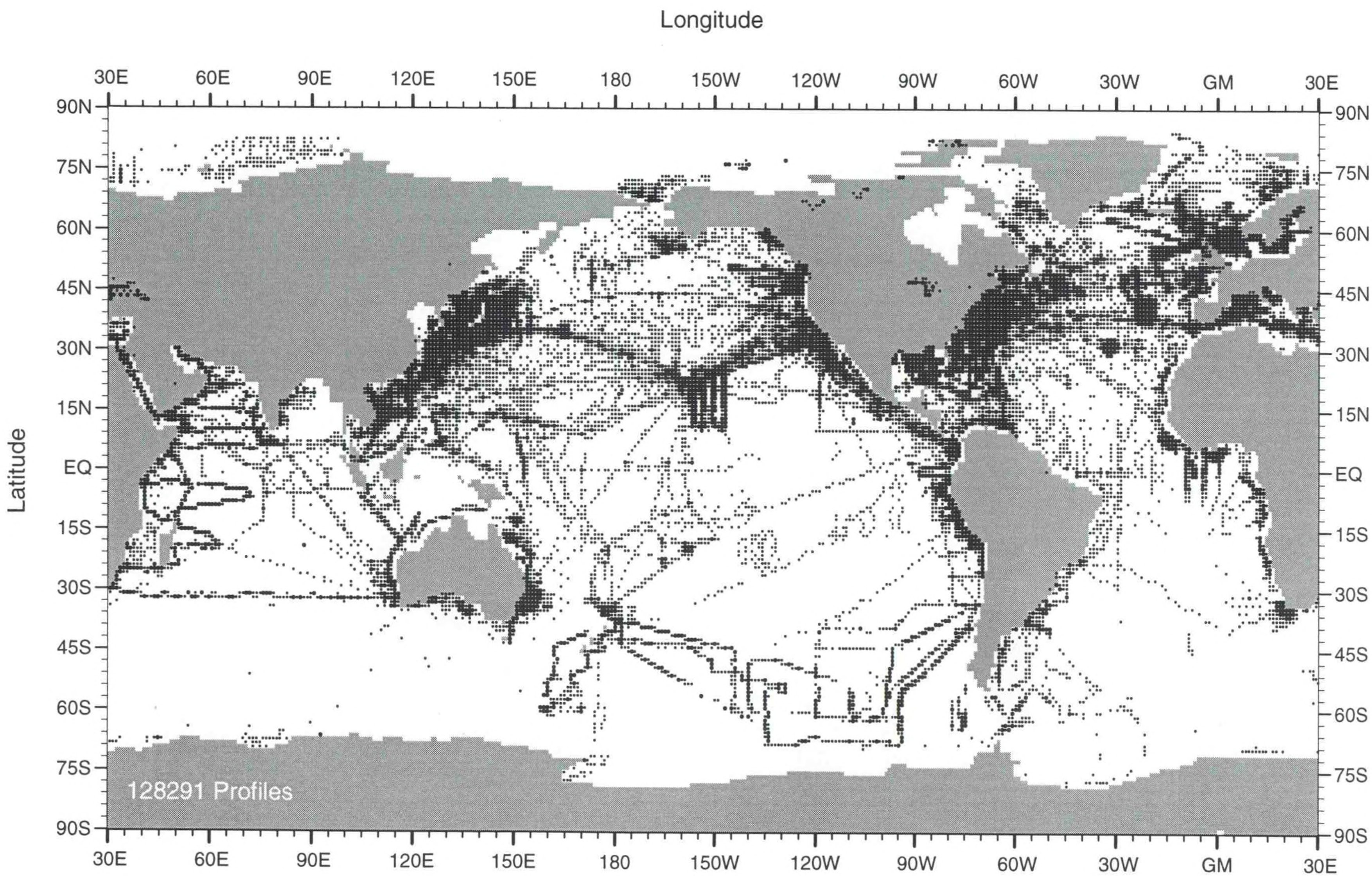


Fig. A25 Distribution of all data profiles (OSD+MBT) in WOD98 for 1965

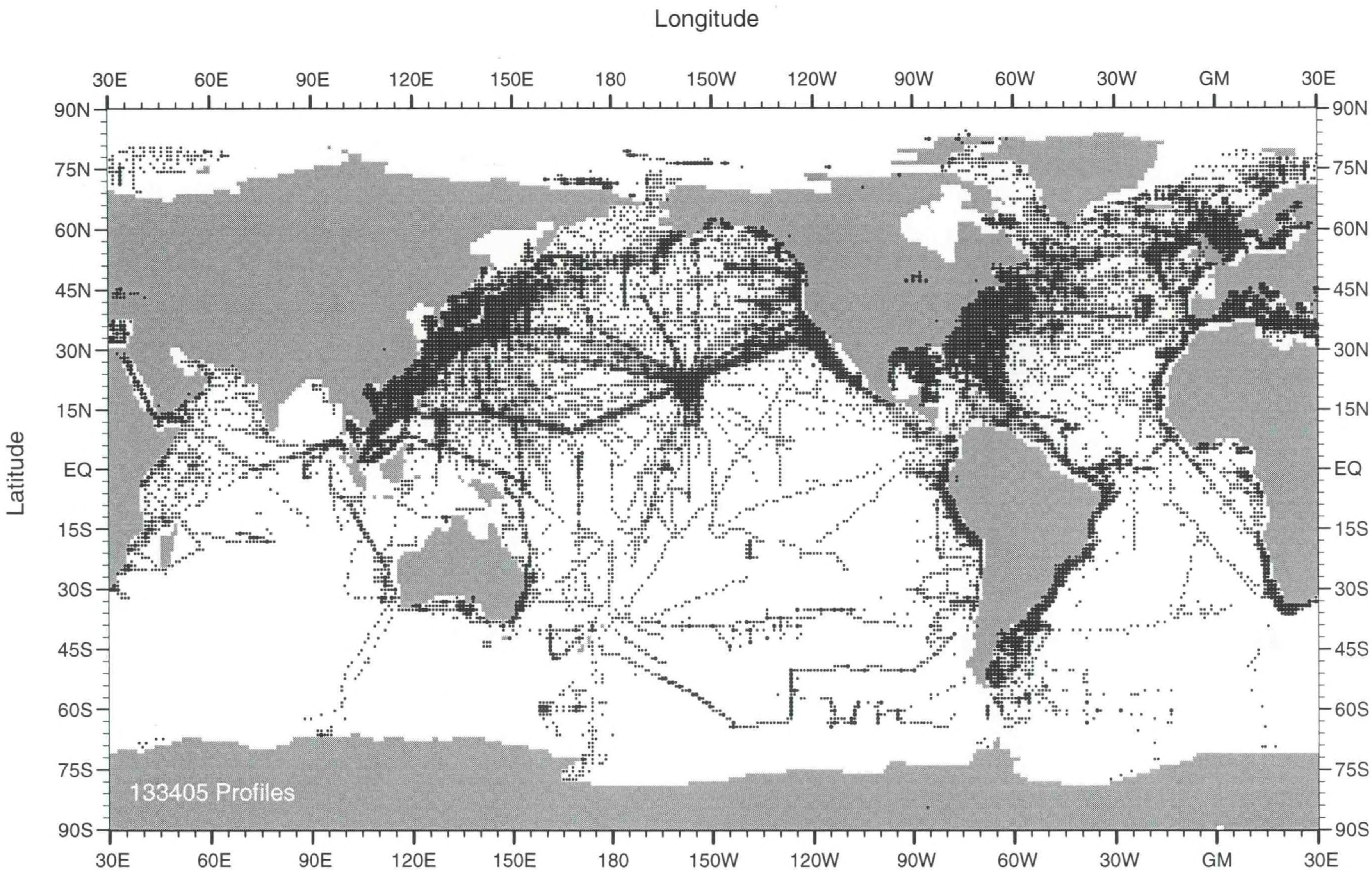


Fig. A26 Distribution of all data profiles (OSD+MBT+XBT) in WOD98 for 1966

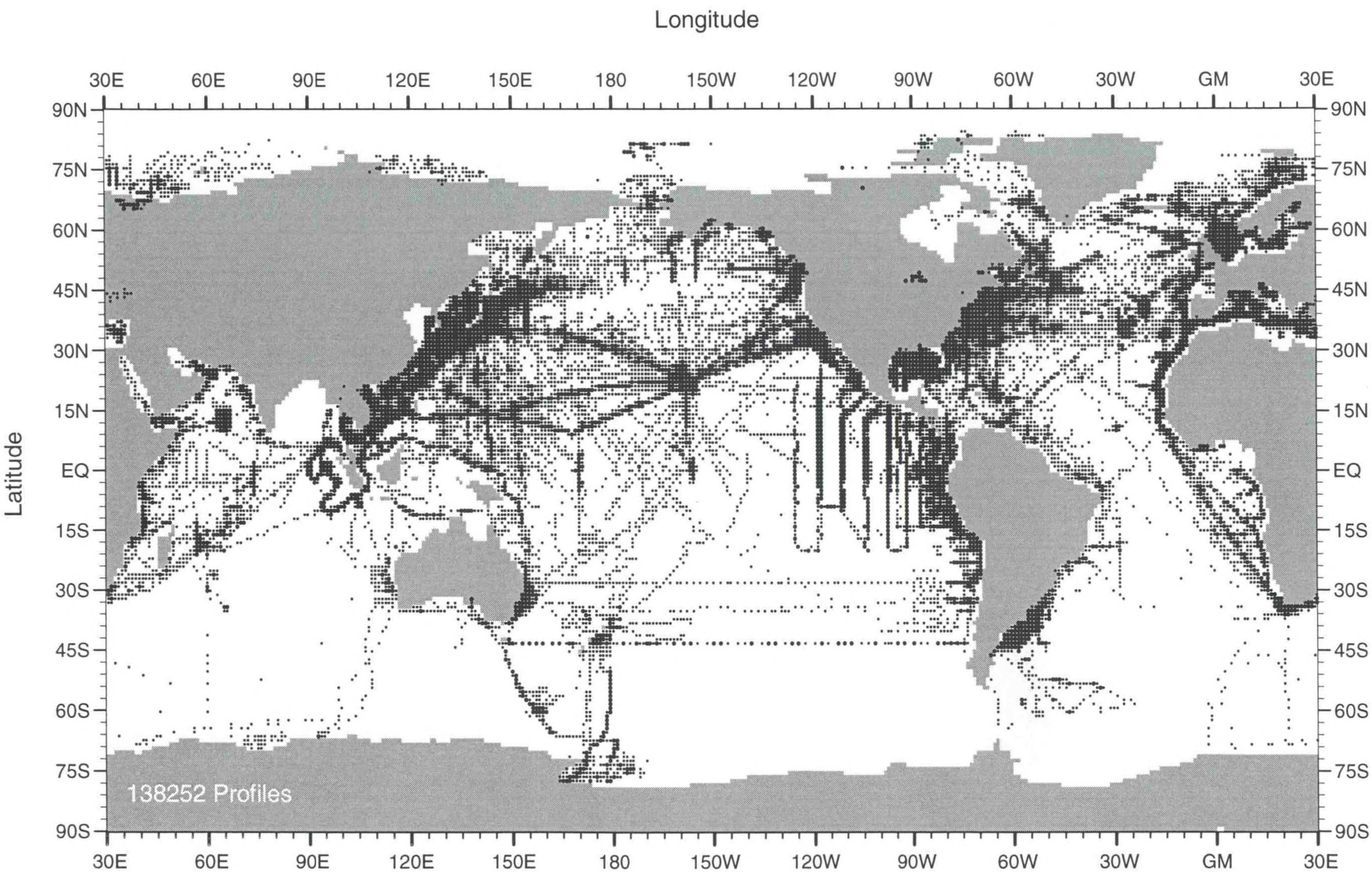


Fig. A27 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1967

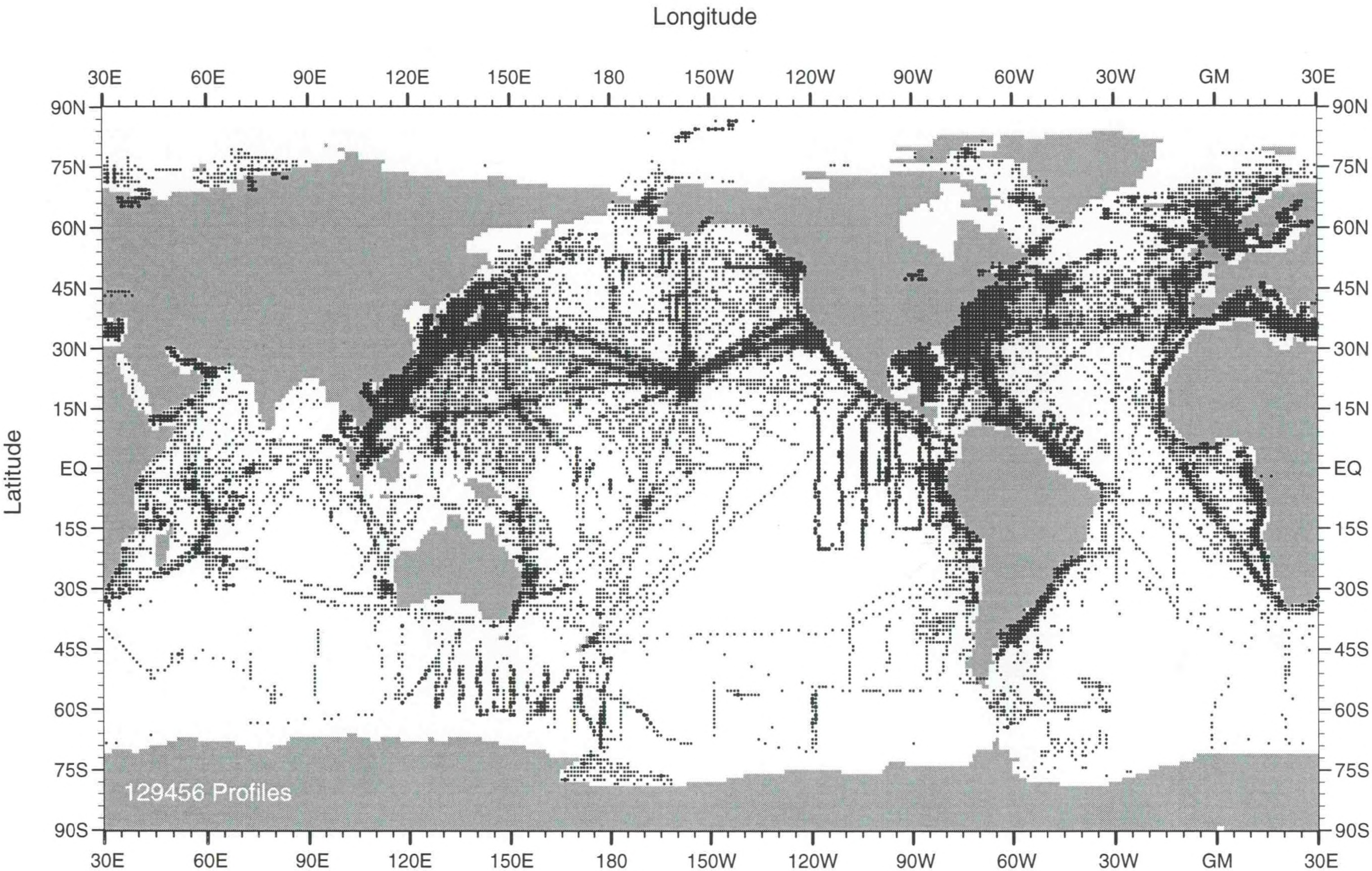


Fig. A28 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1968

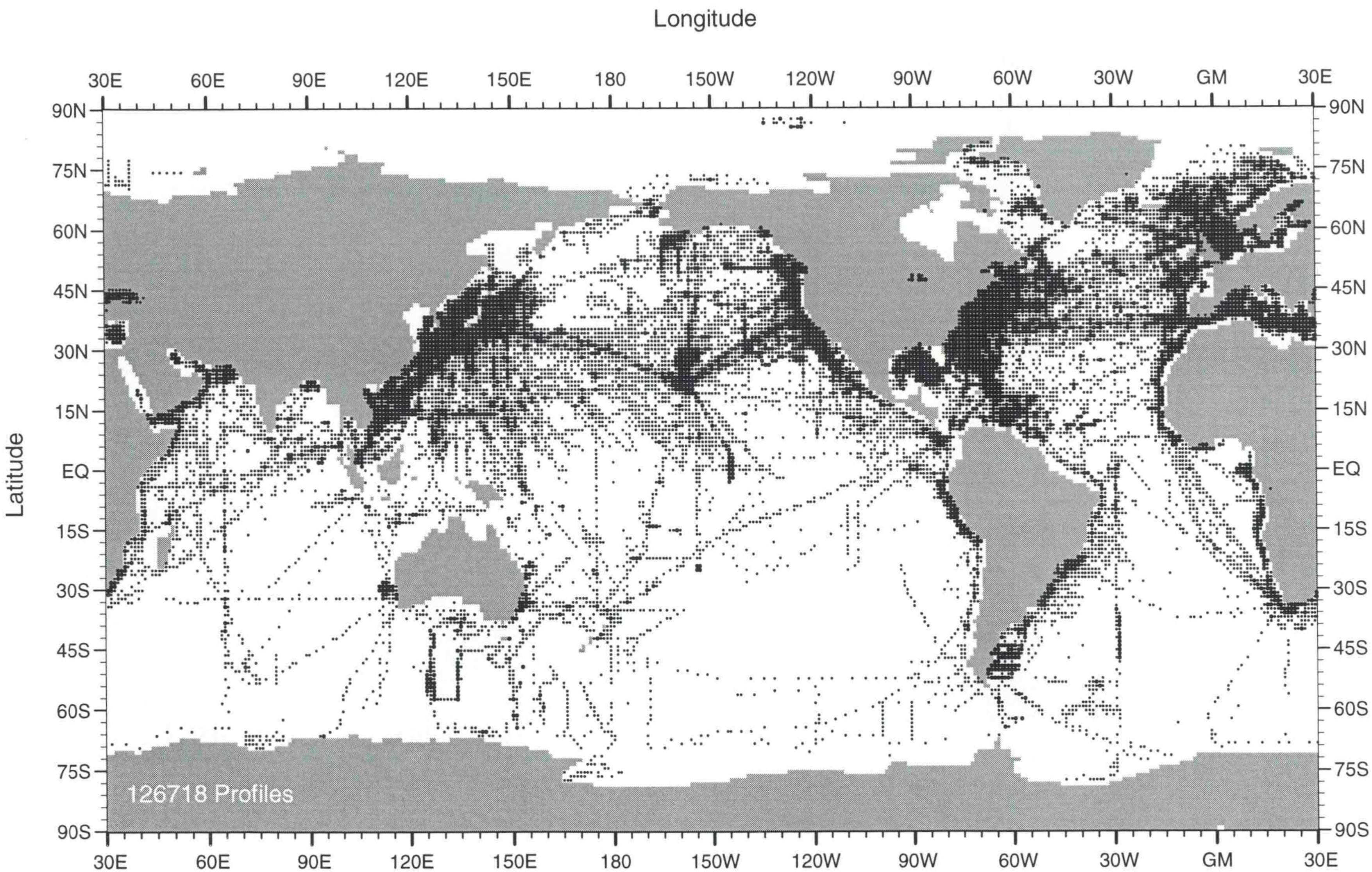


Fig. A29 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1969

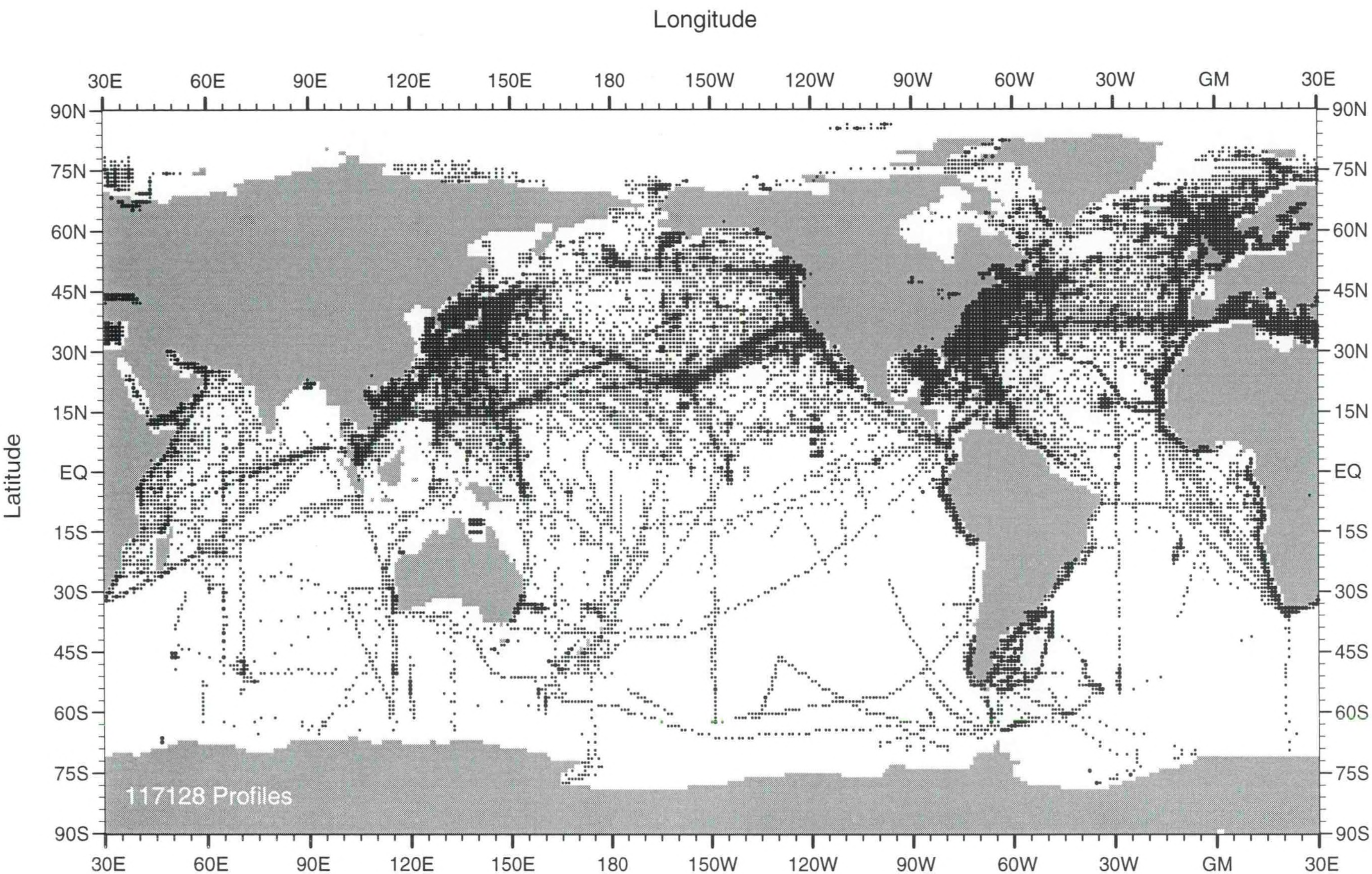


Fig. A30 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1970

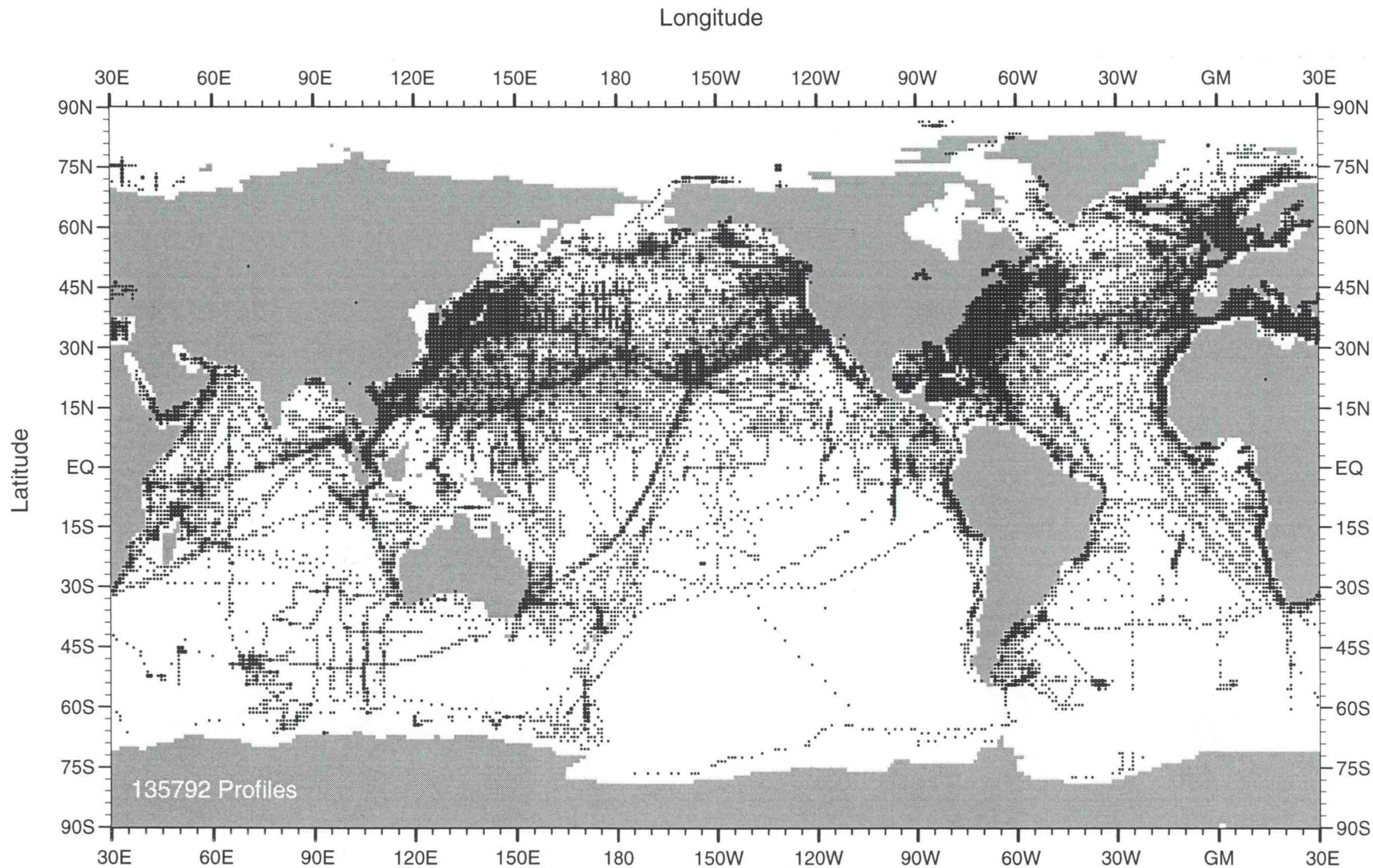


Fig. A31 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1971

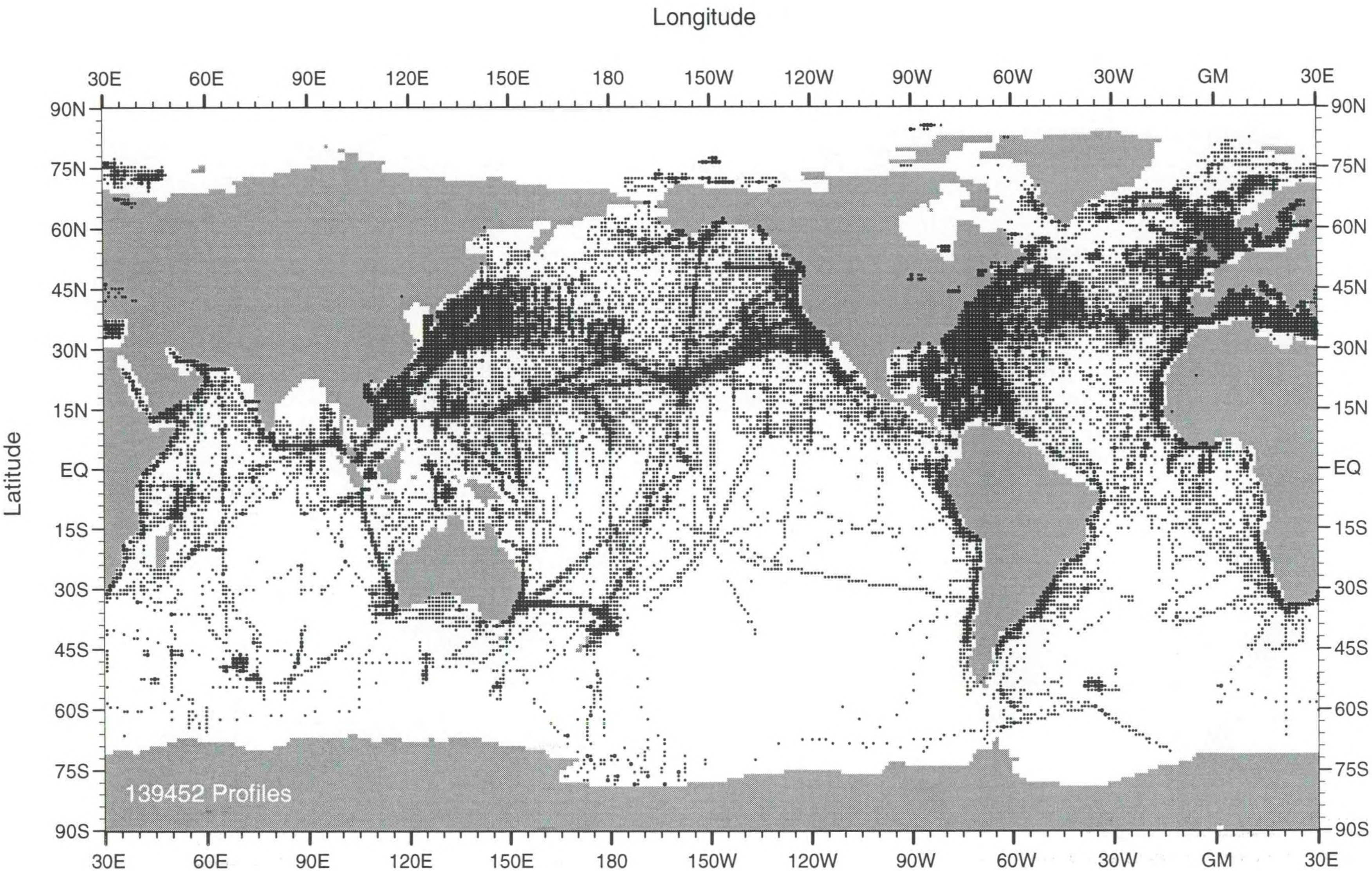


Fig. A32 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1972

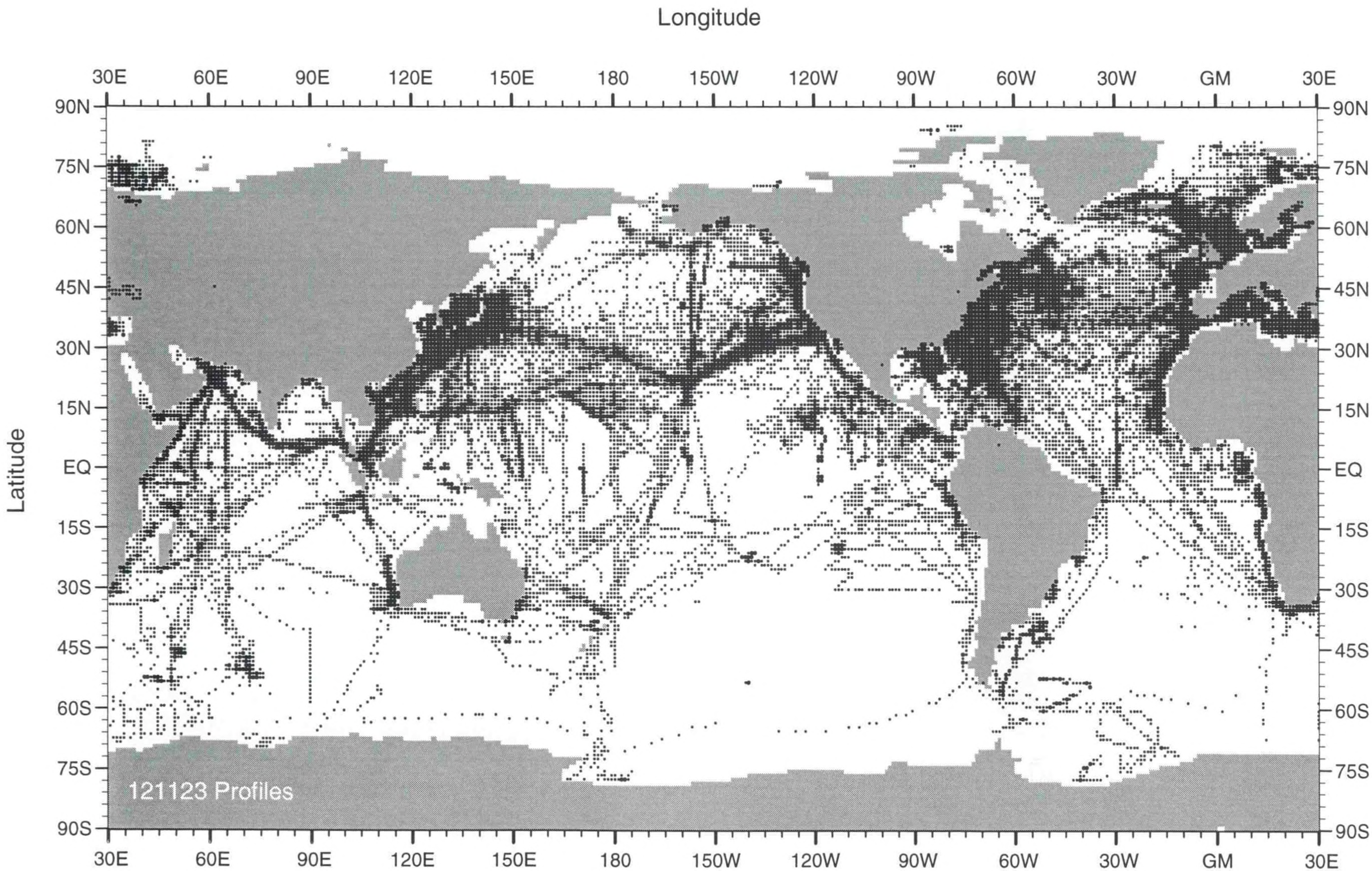


Fig. A33 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1973

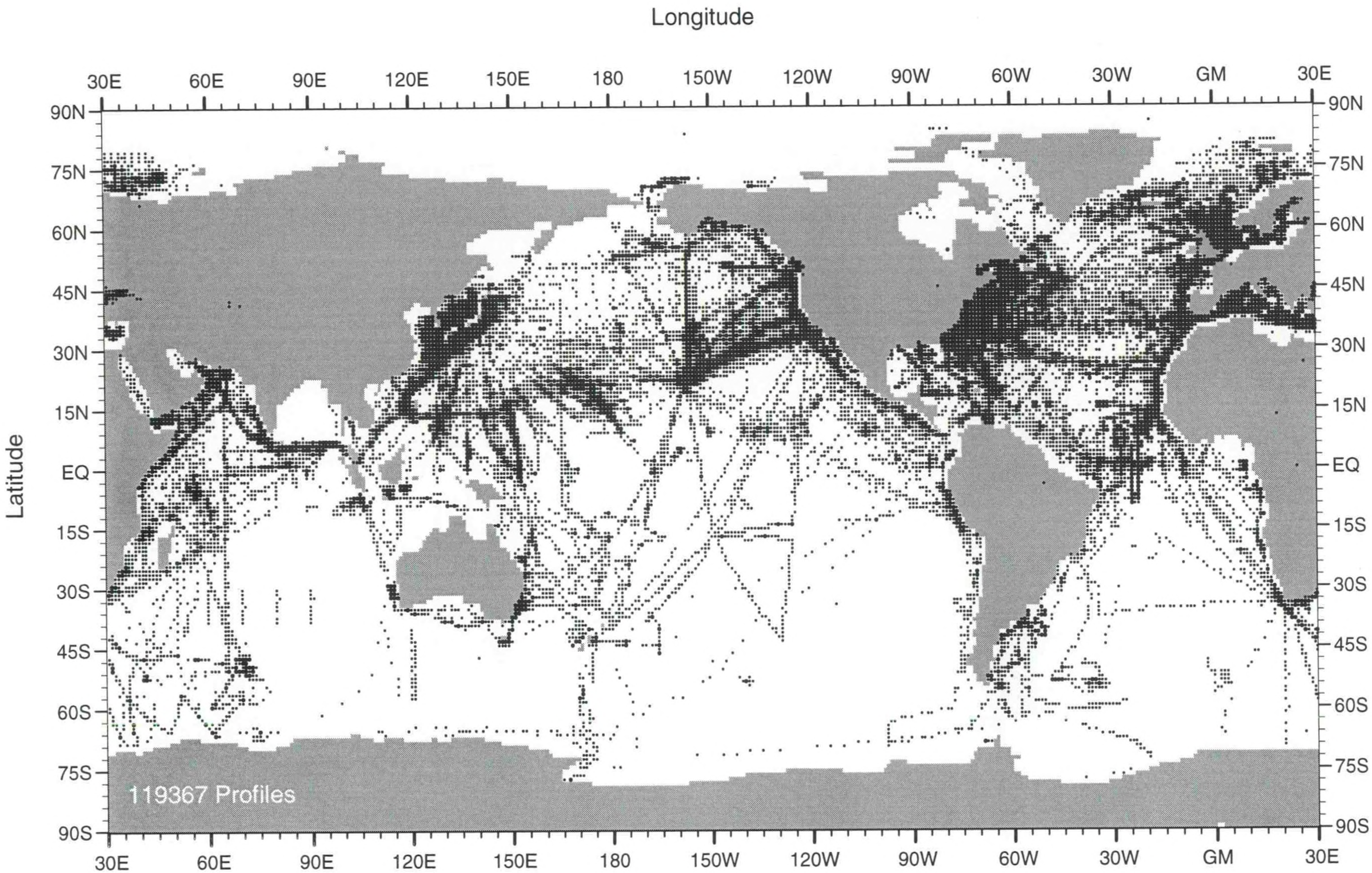


Fig. A34 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1974

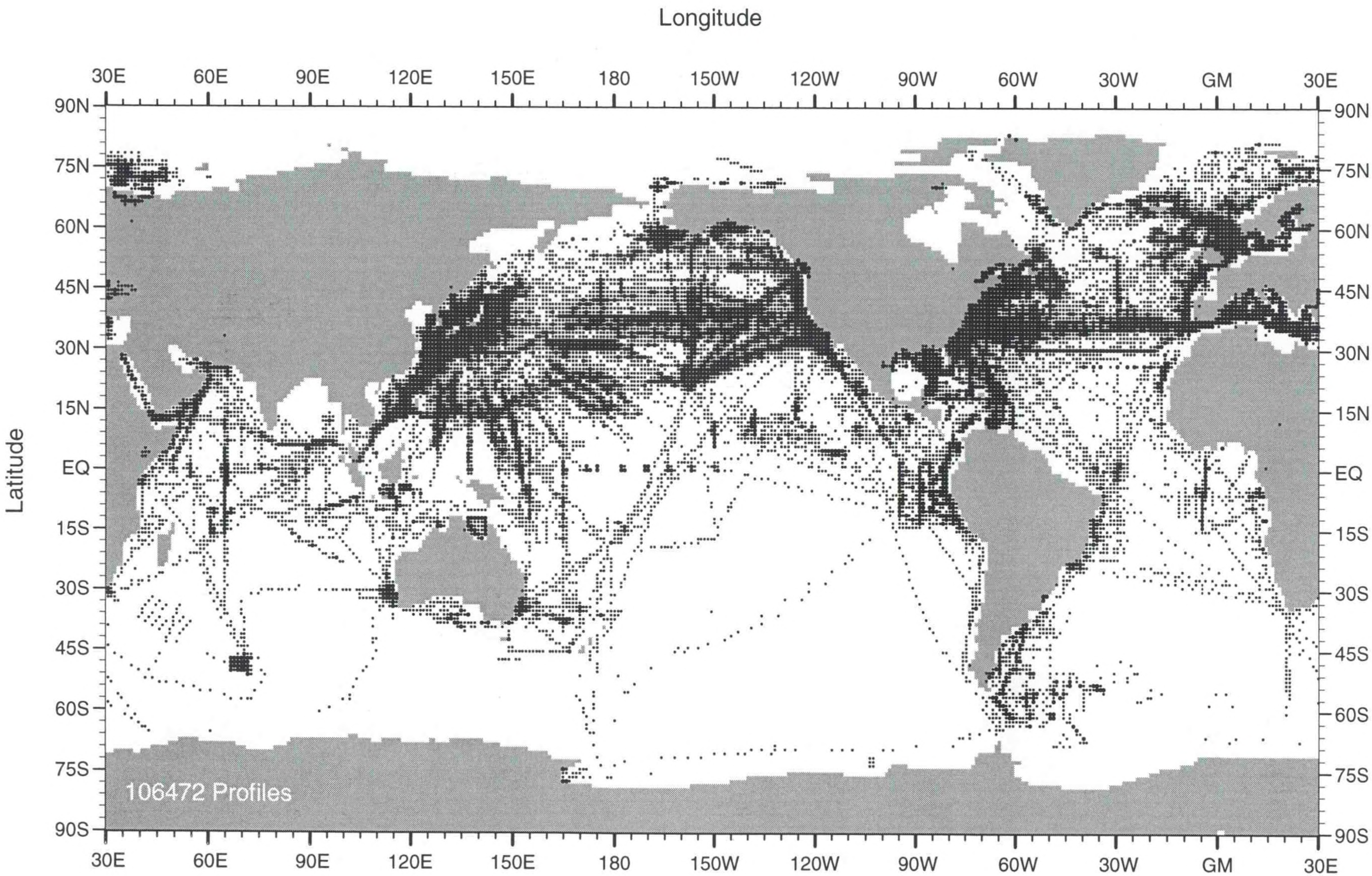


Fig. A35 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1975

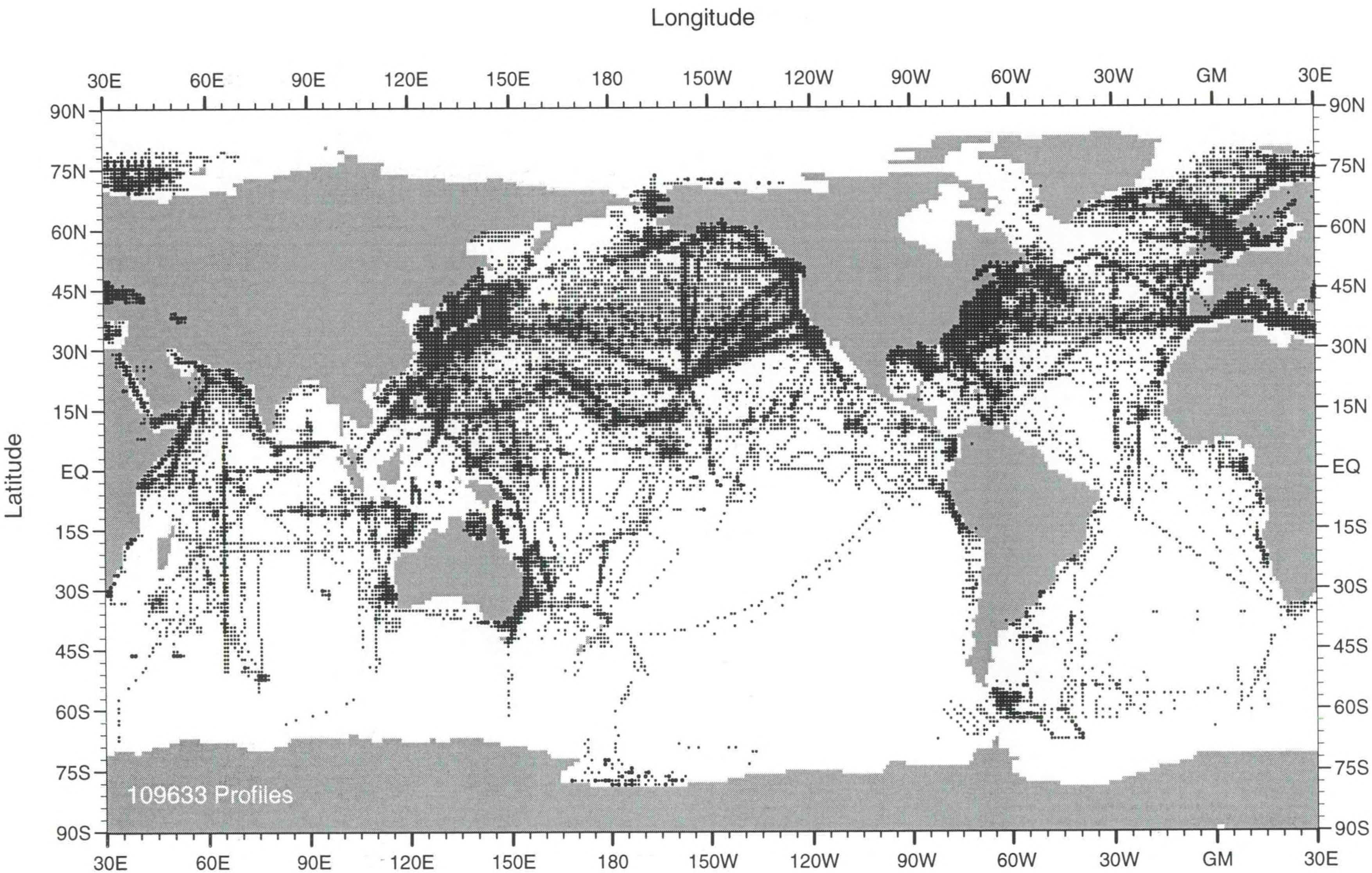


Fig. A36 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1976

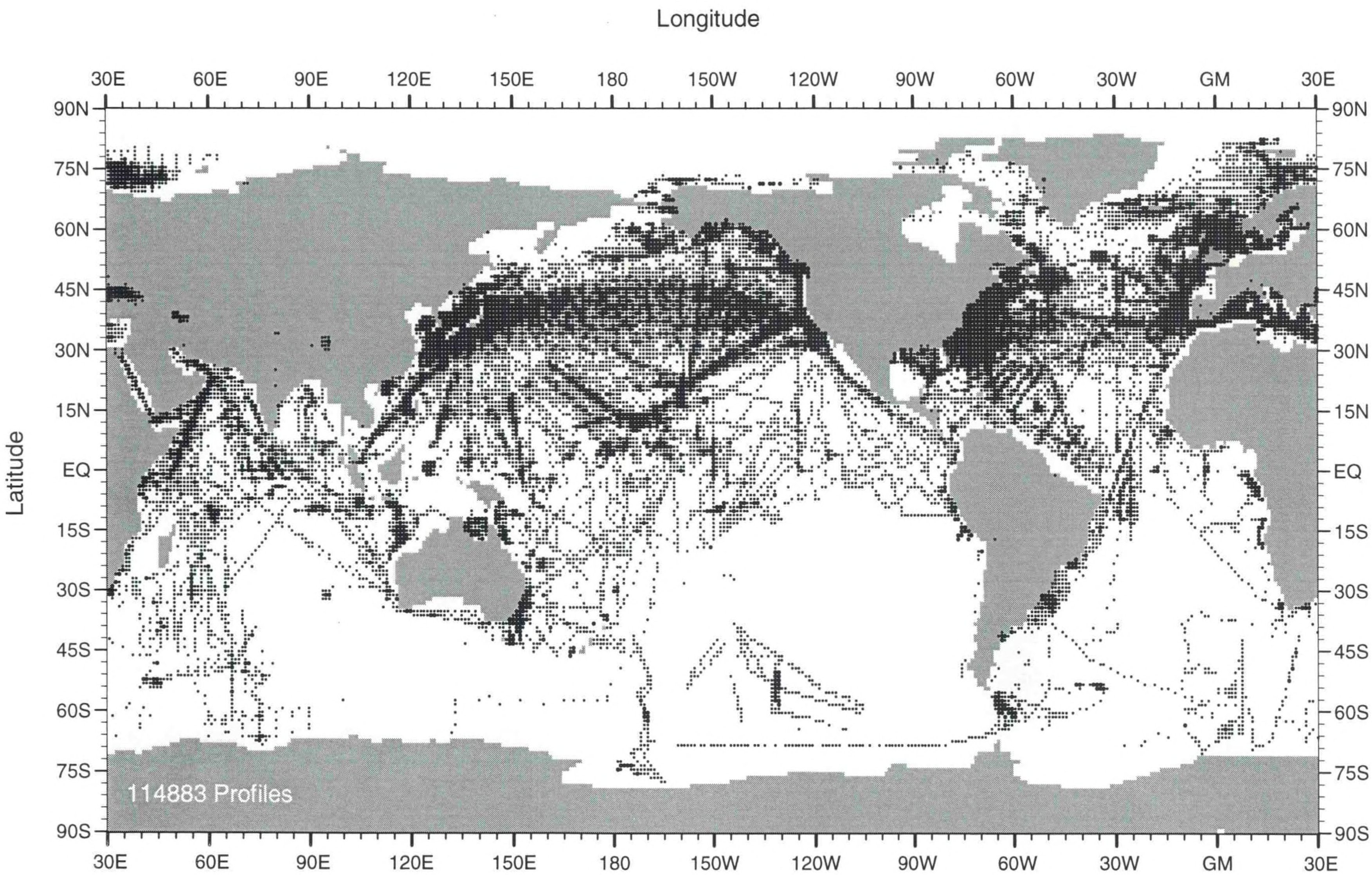


Fig. A37 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1977

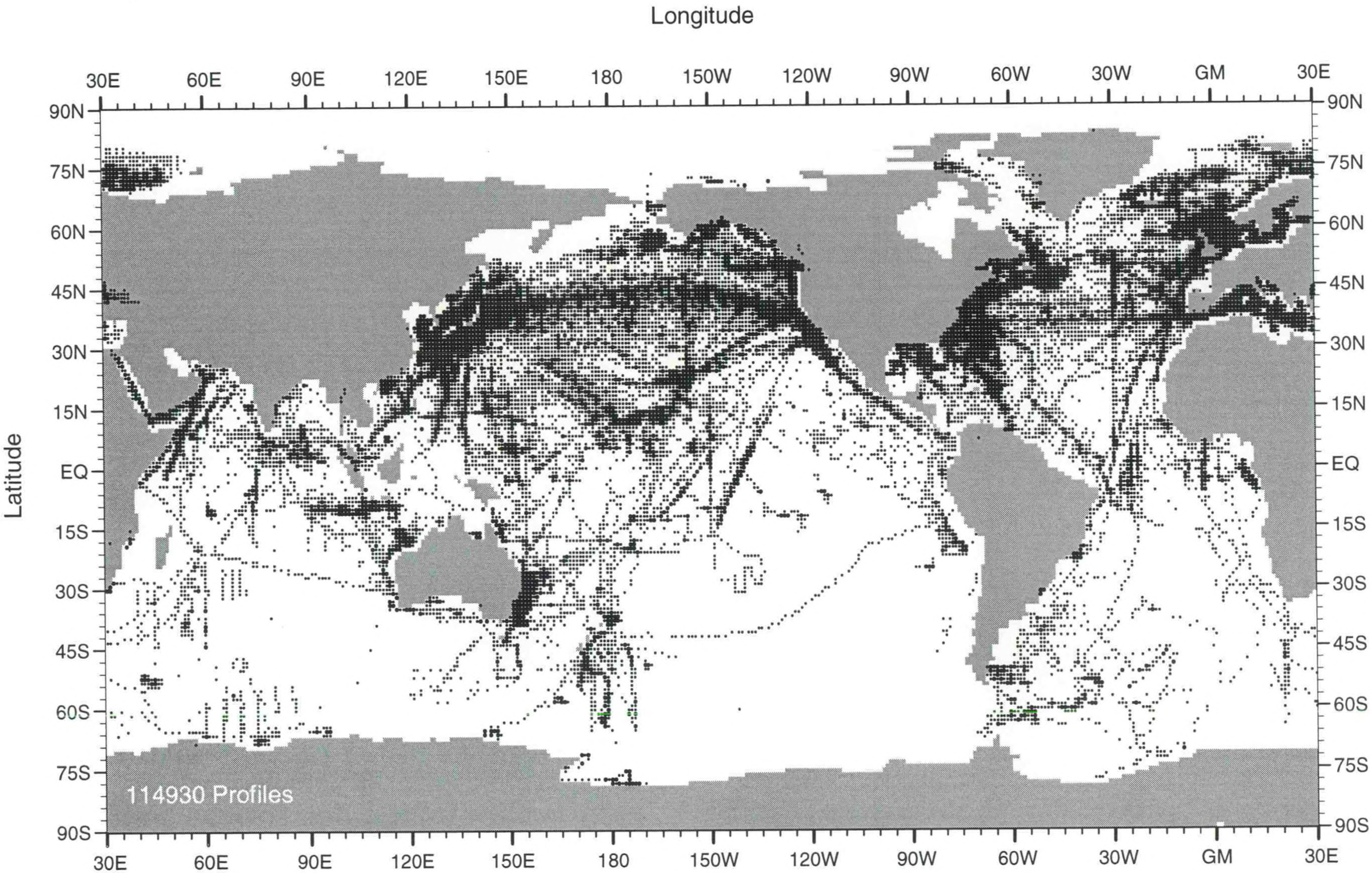


Fig. A38 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1978

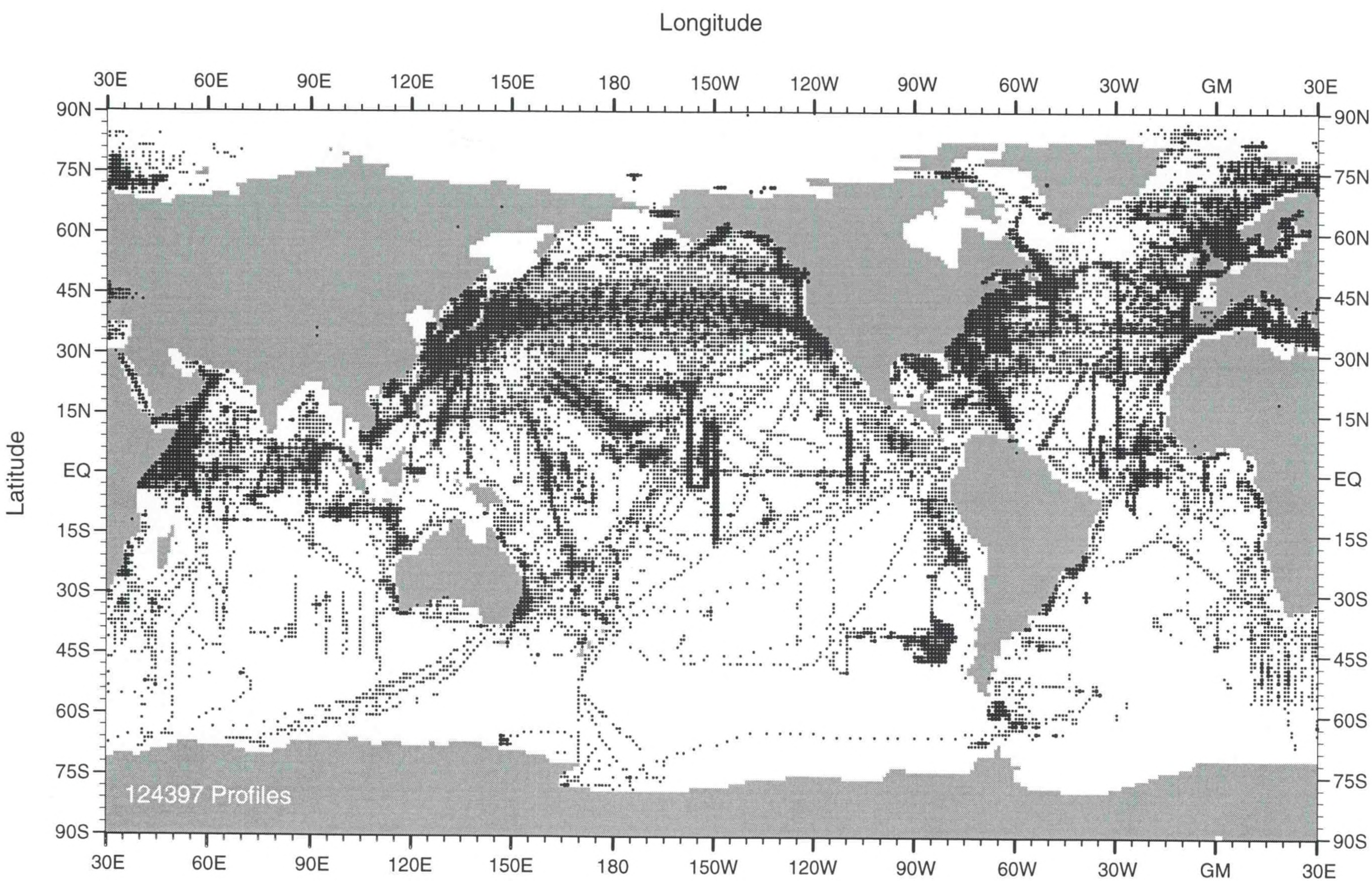


Fig. A39 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1979

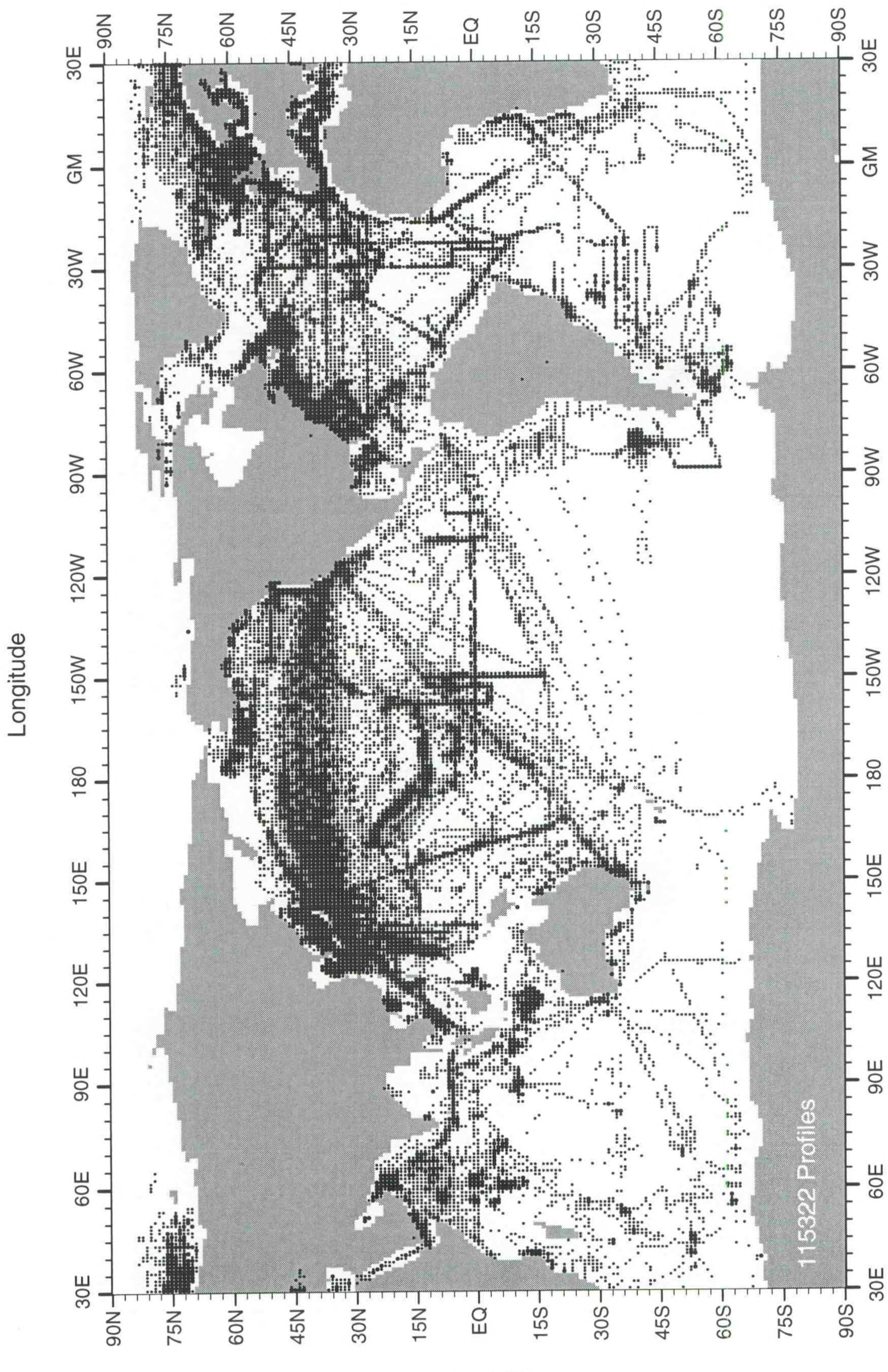


Fig. A40 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1980

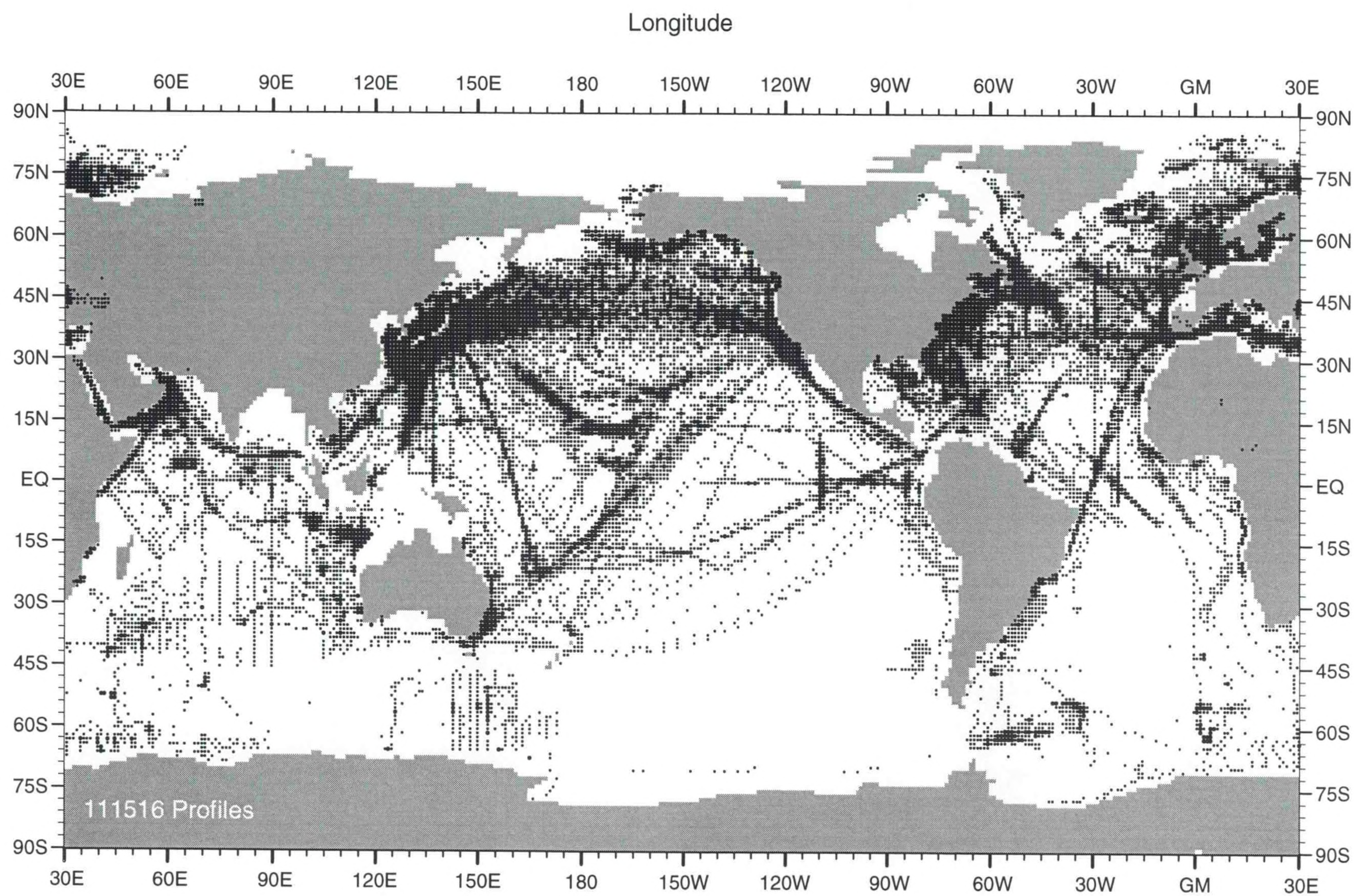


Fig. A41 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1981

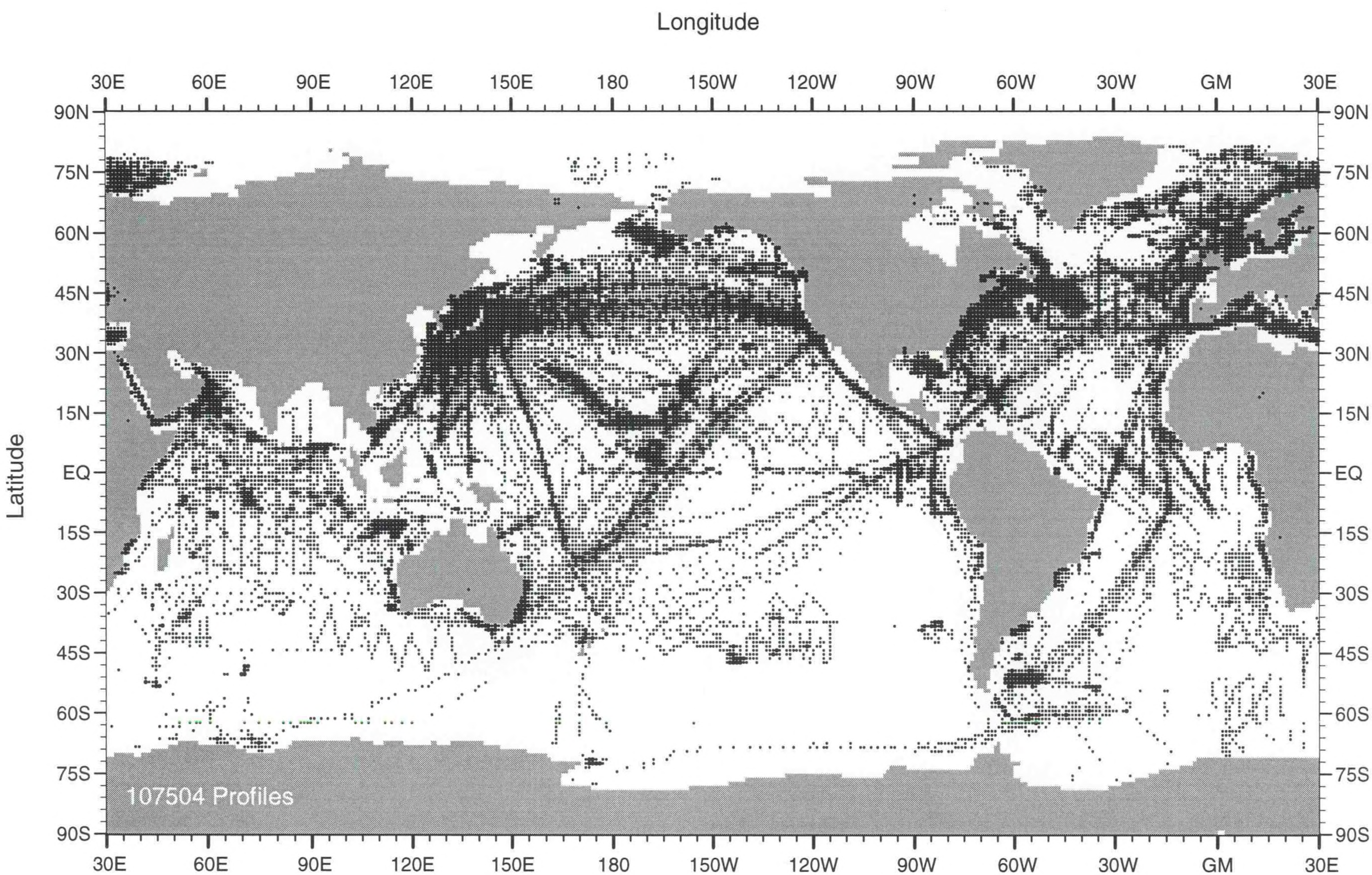


Fig. A42 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1982

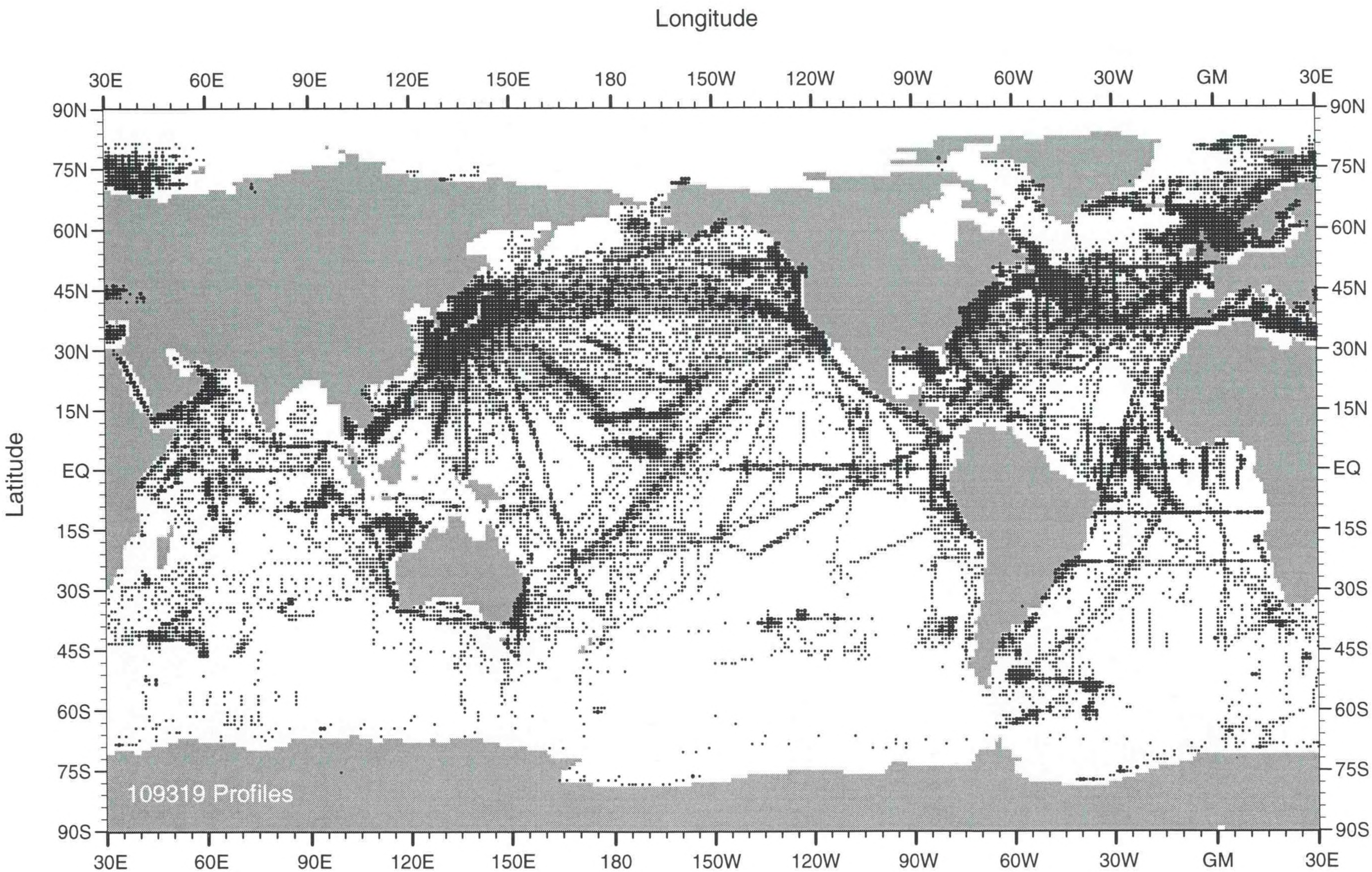


Fig. A43 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1983

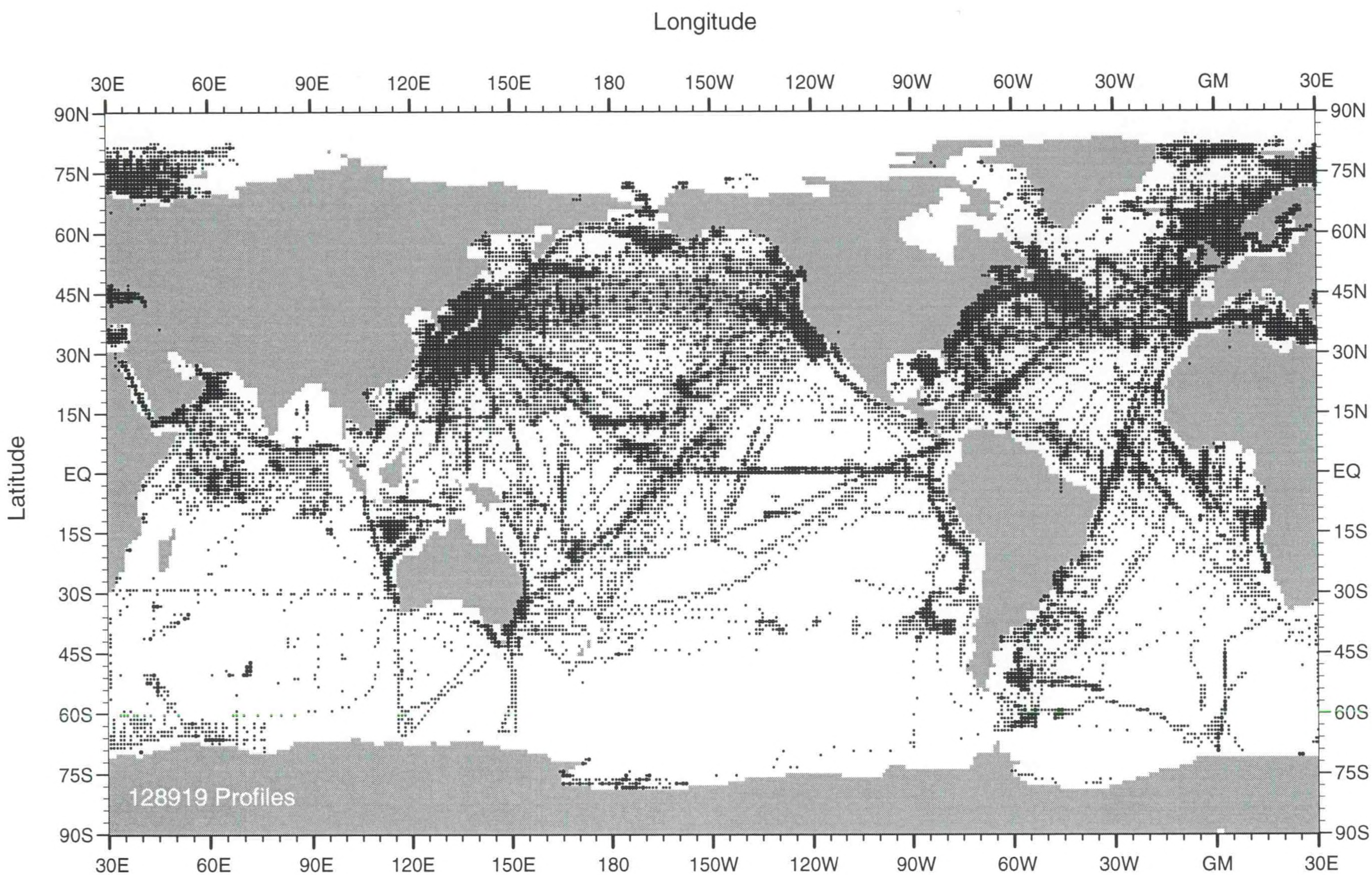


Fig. A44 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1984

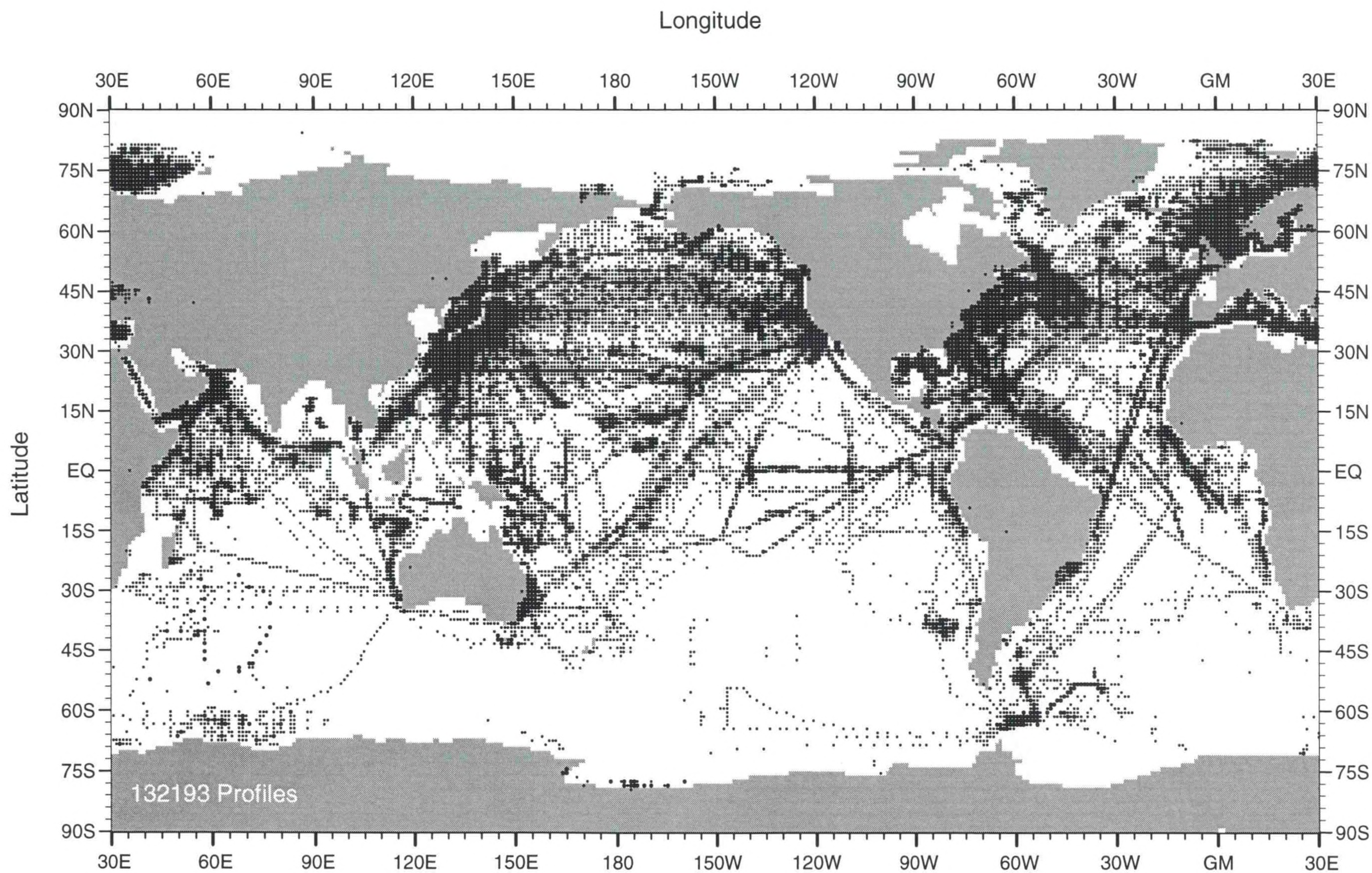


Fig. A45 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1985

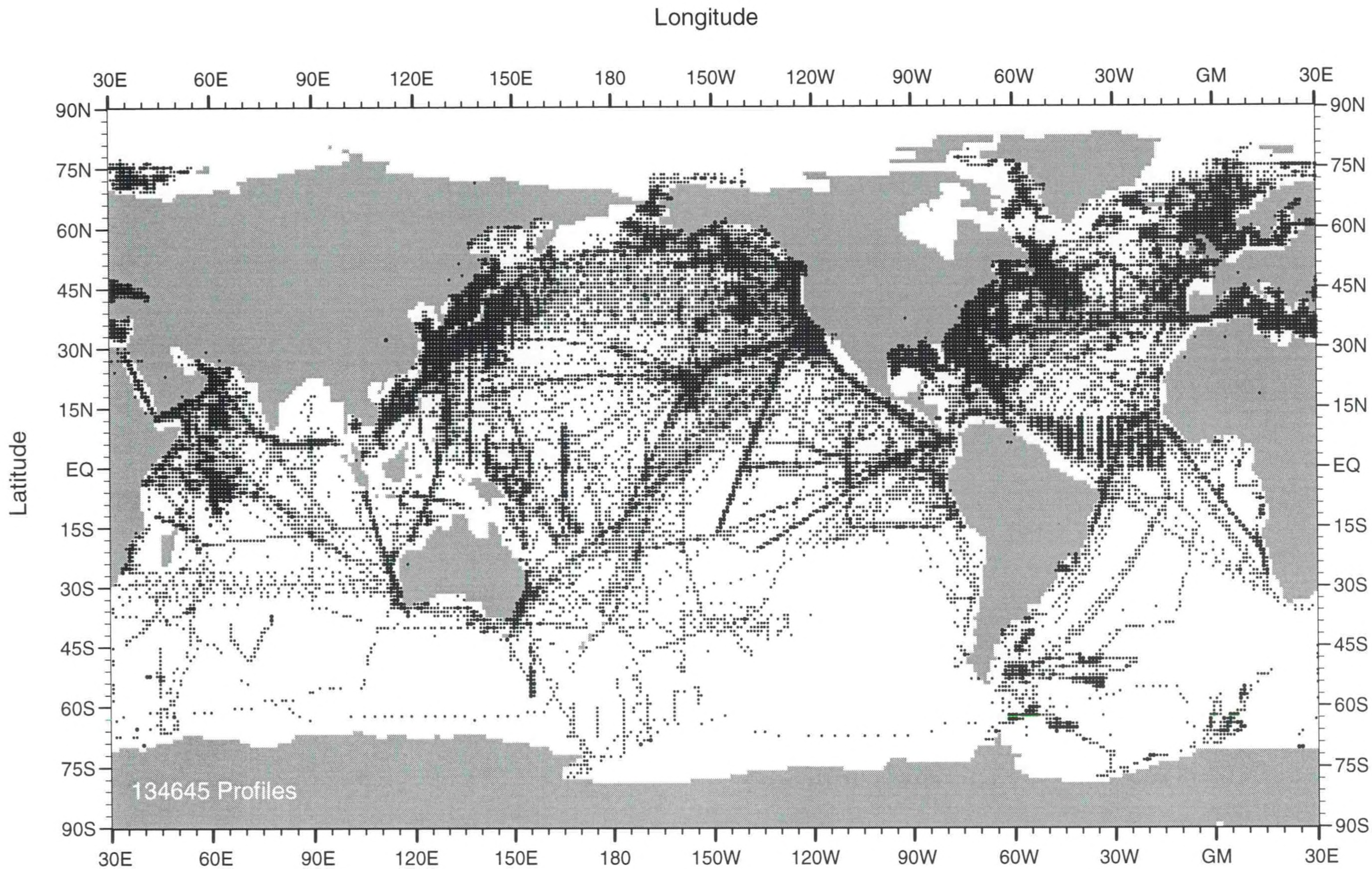


Fig. A46 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1986

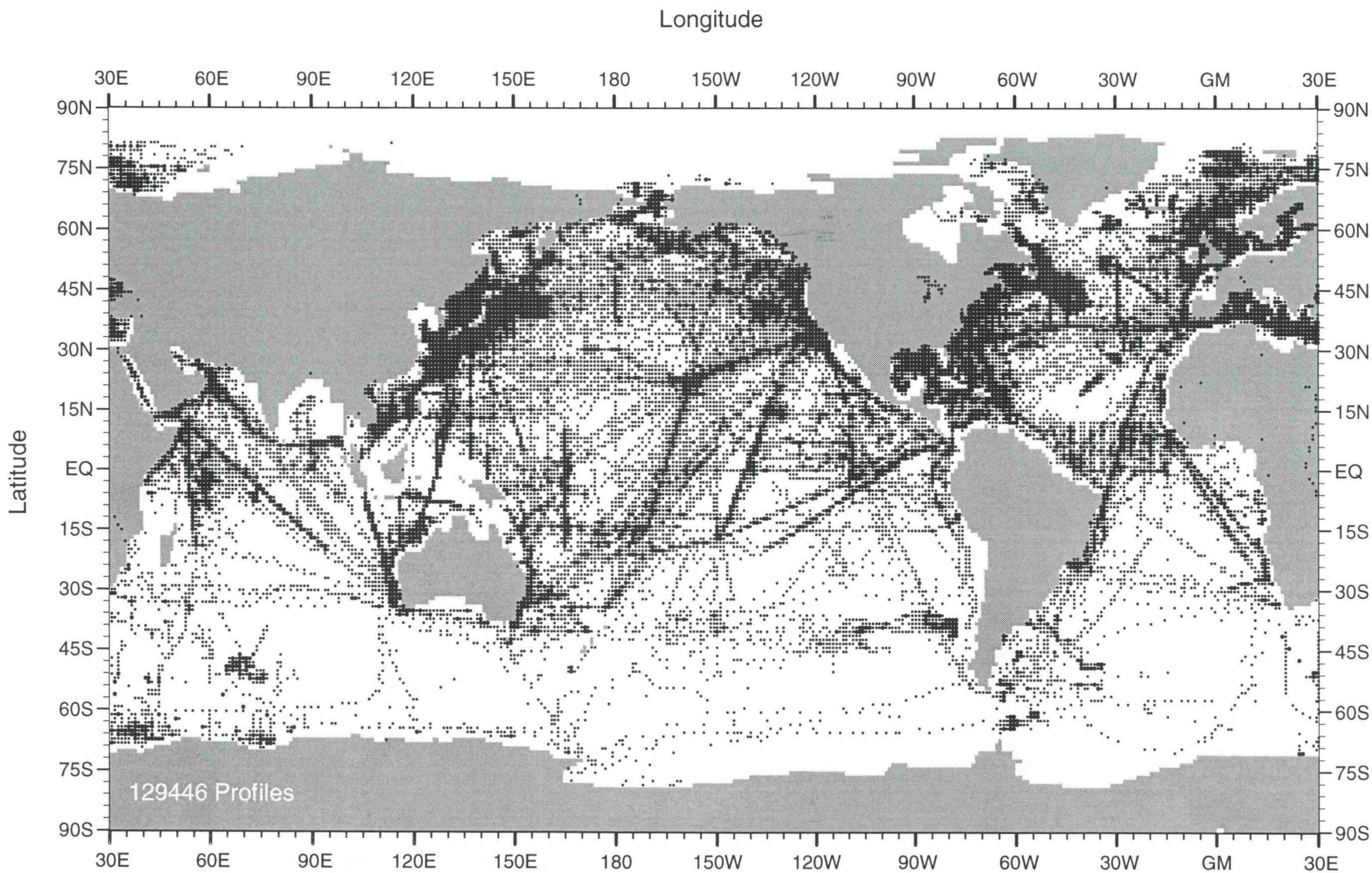


Fig. A47 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1987

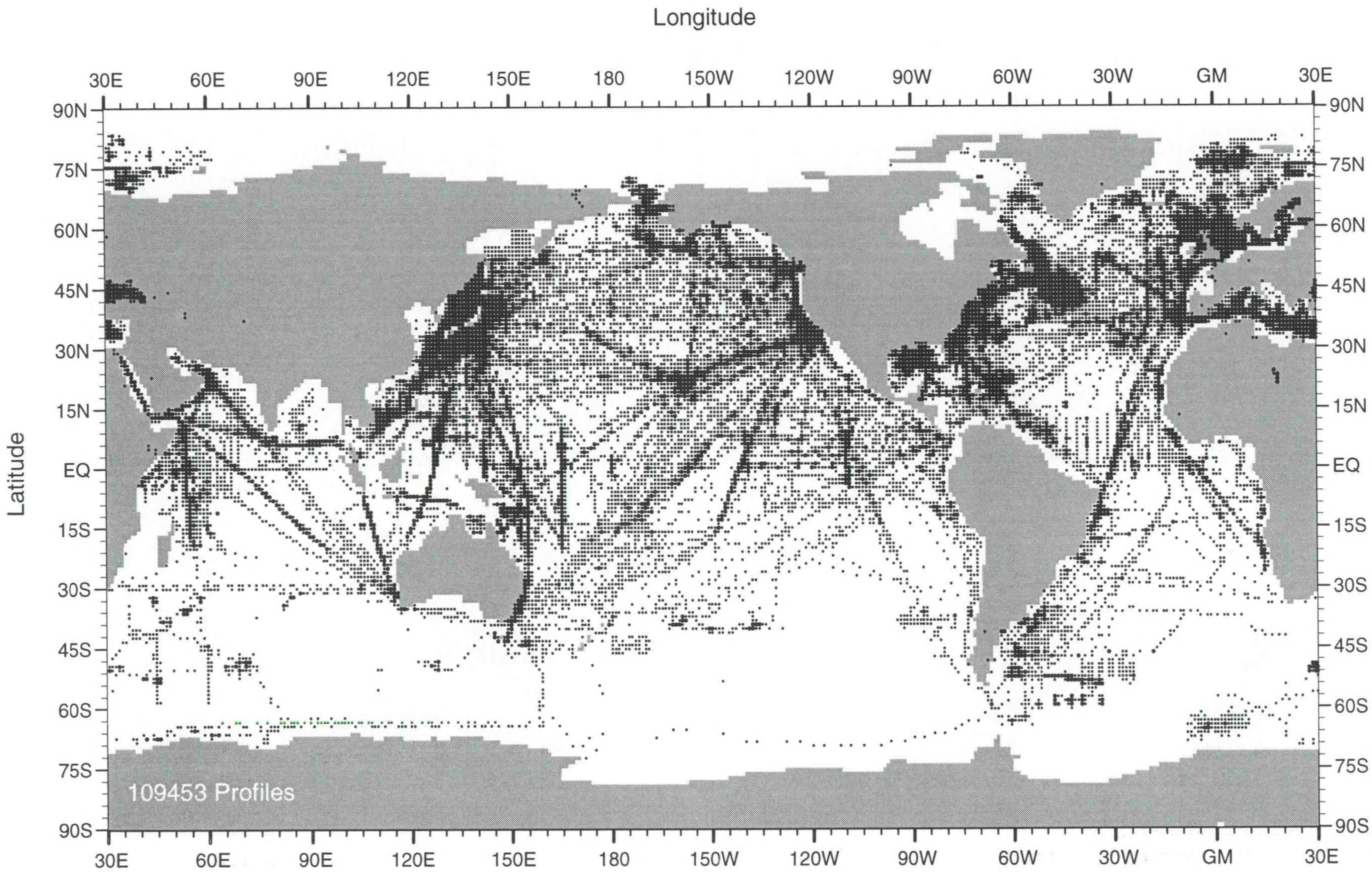


Fig. A48 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1988

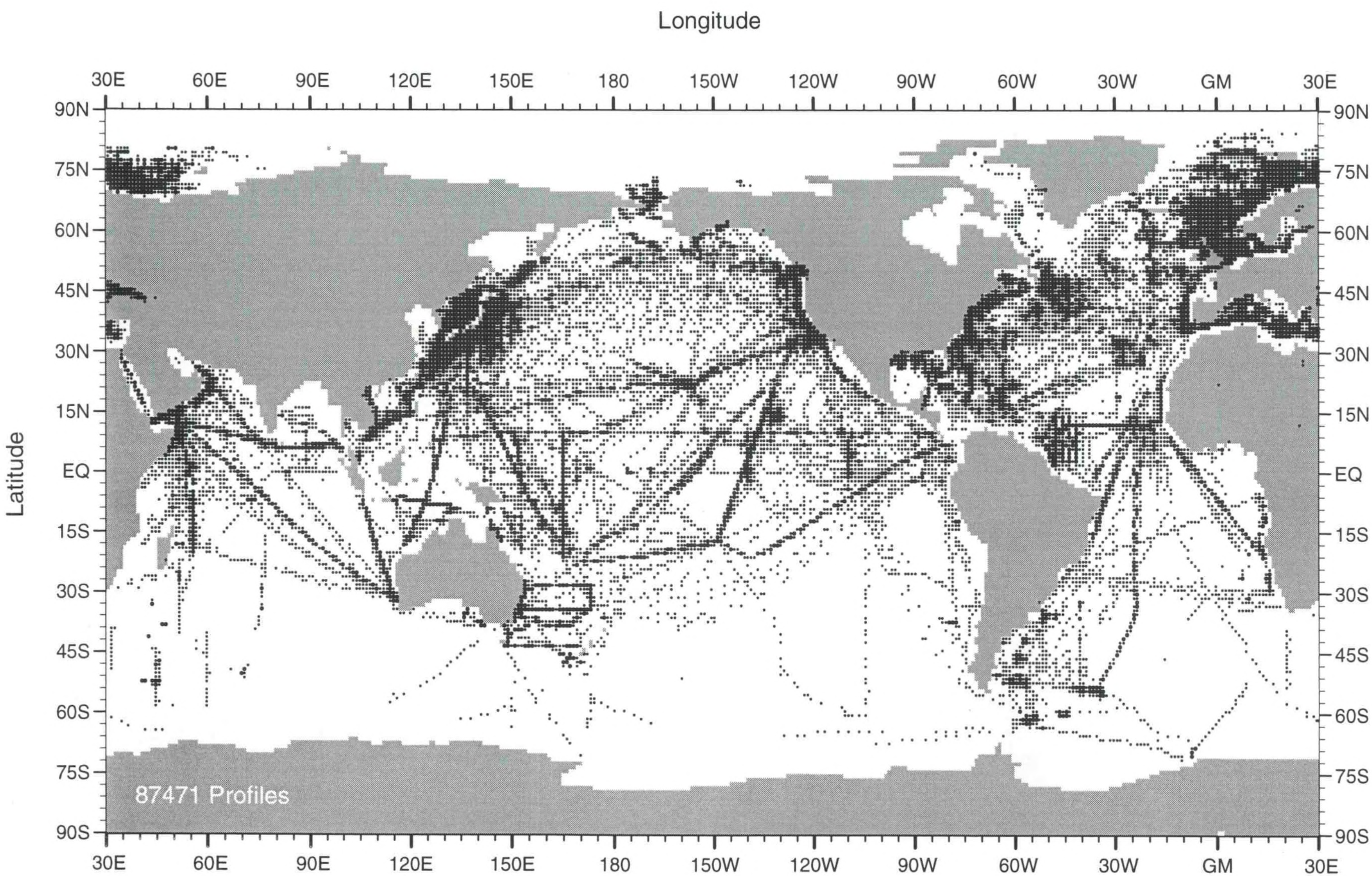


Fig. A49 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for 1989

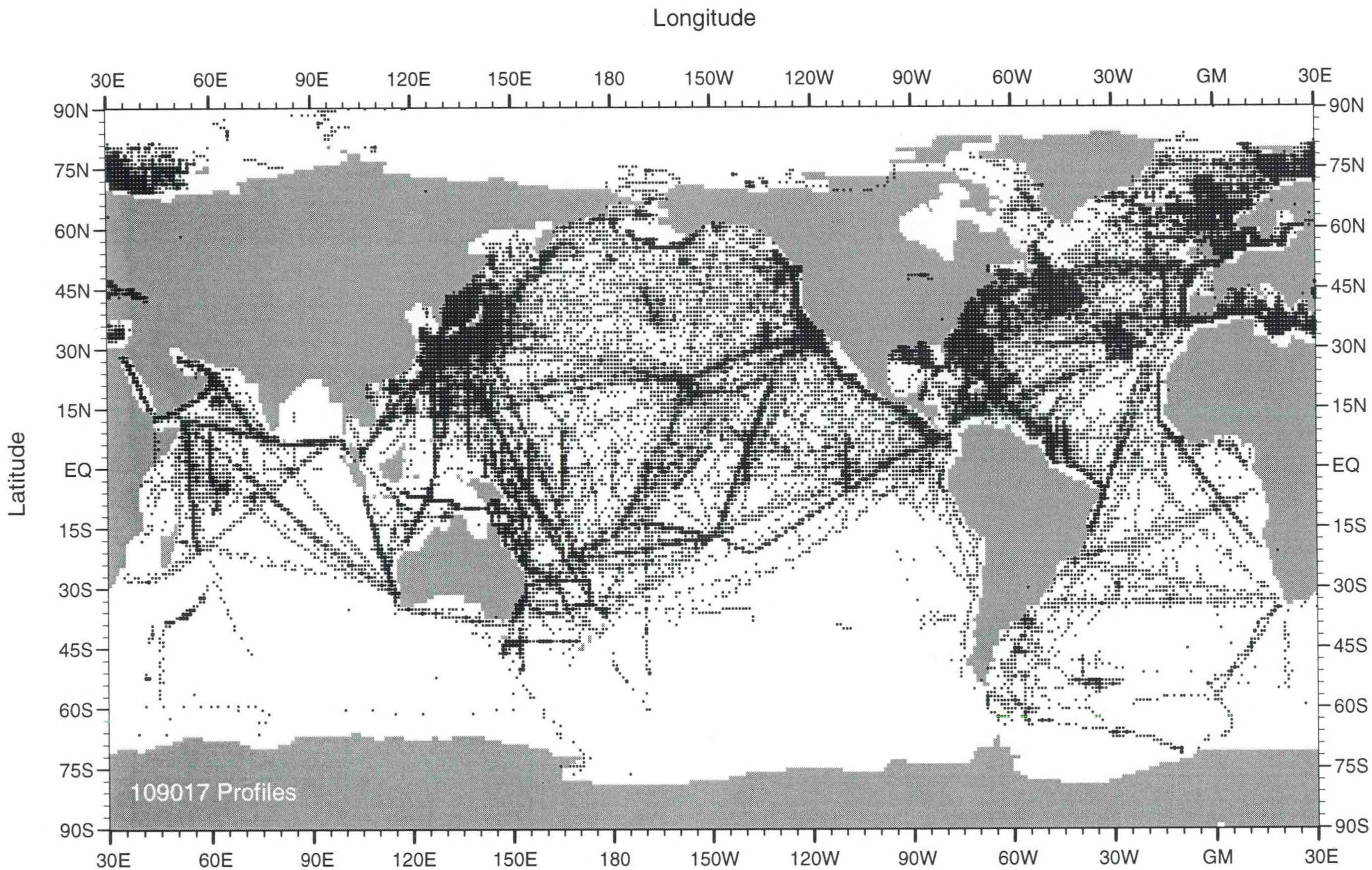


Fig. A50 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for 1990

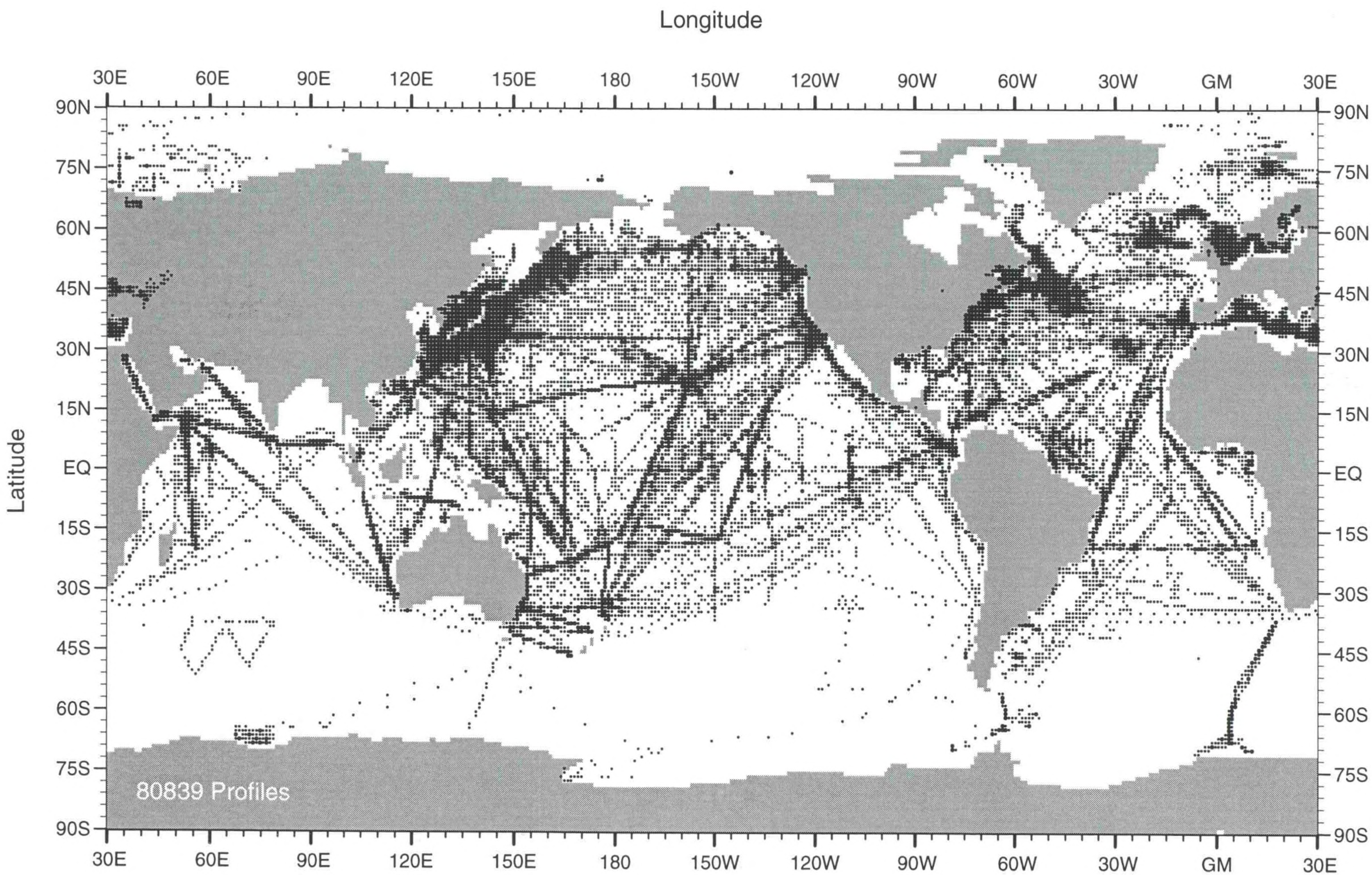


Fig. A51 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for 1991

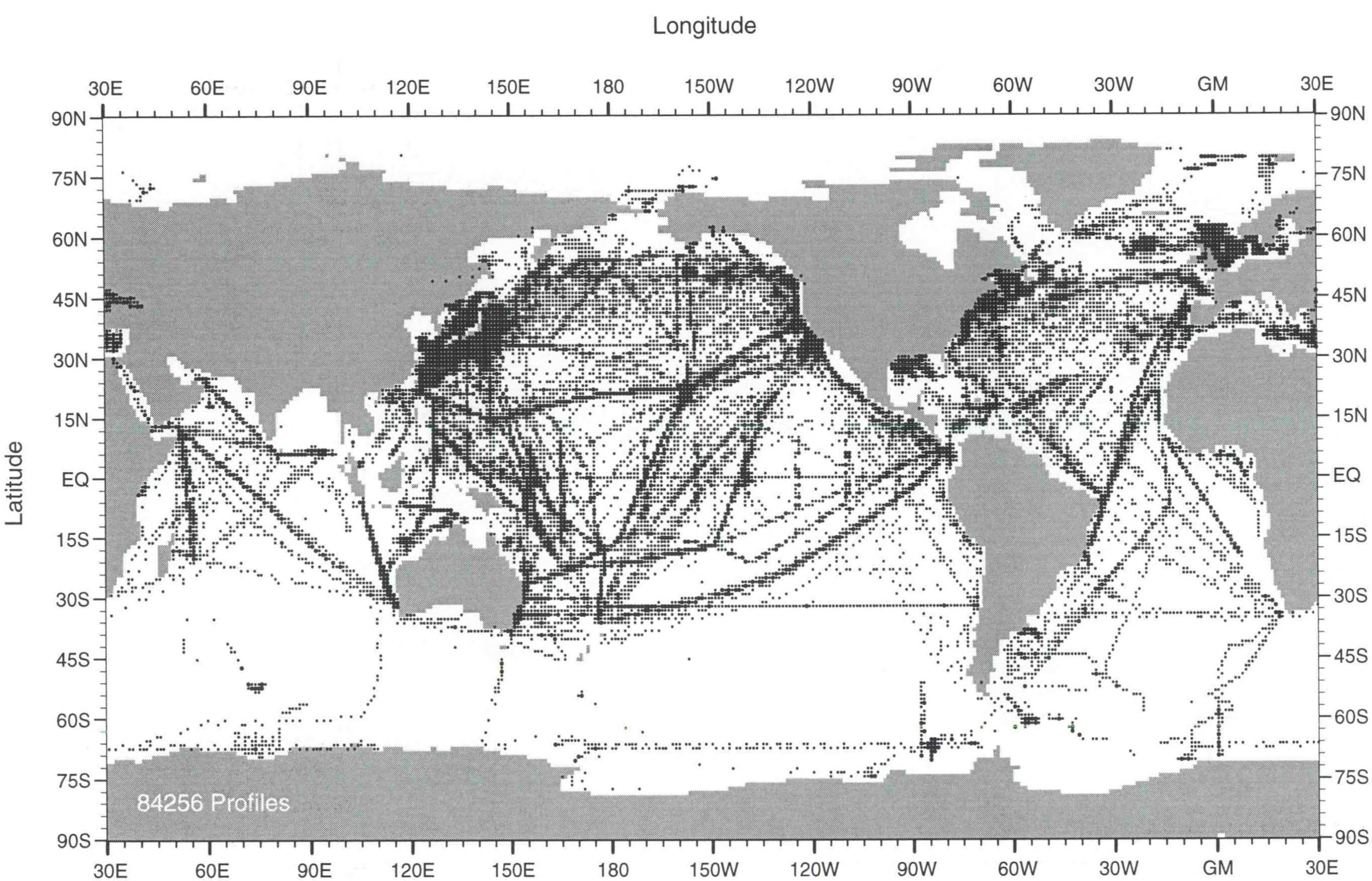


Fig. A52 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for 1992

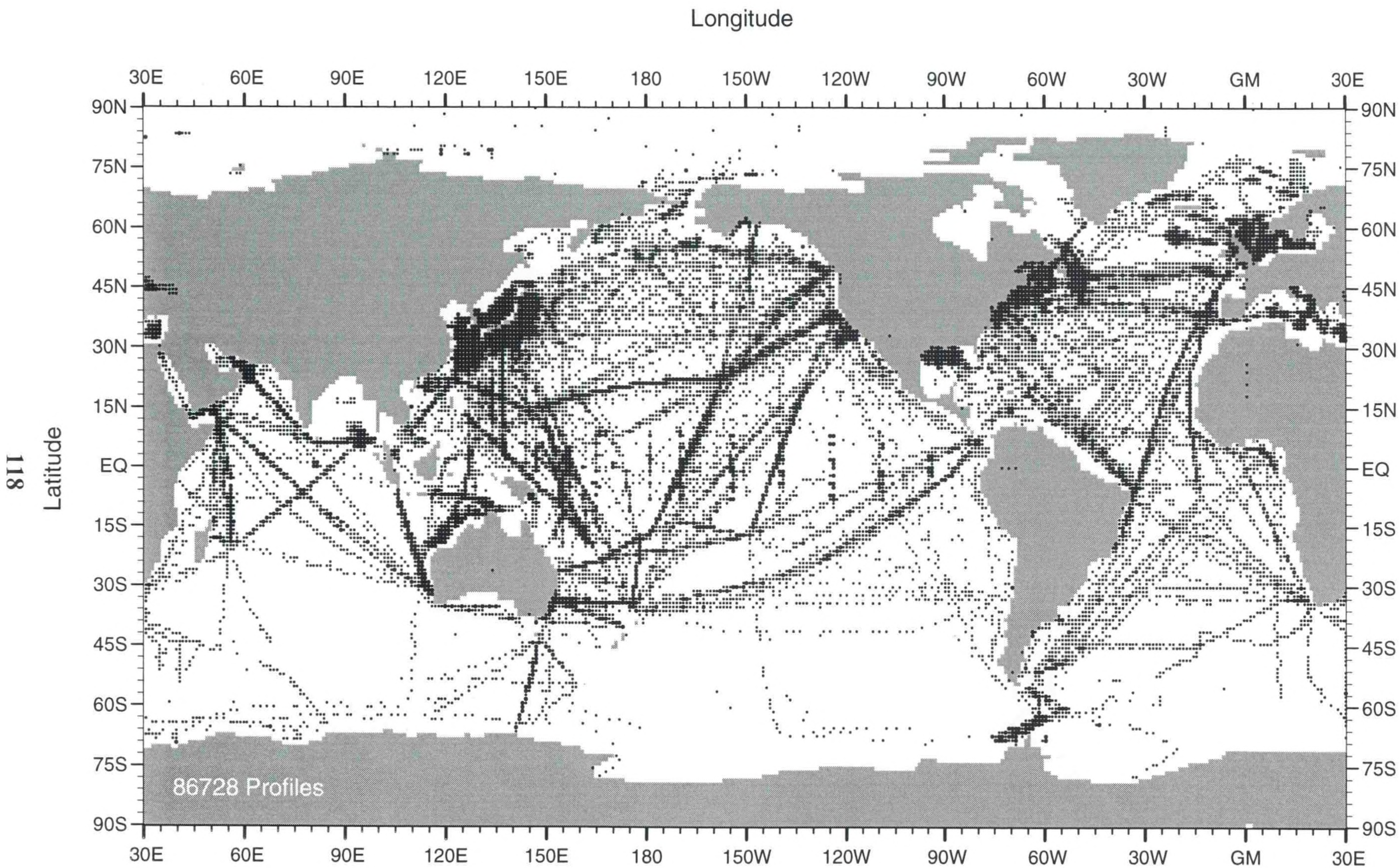


Fig. A53 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for 1993

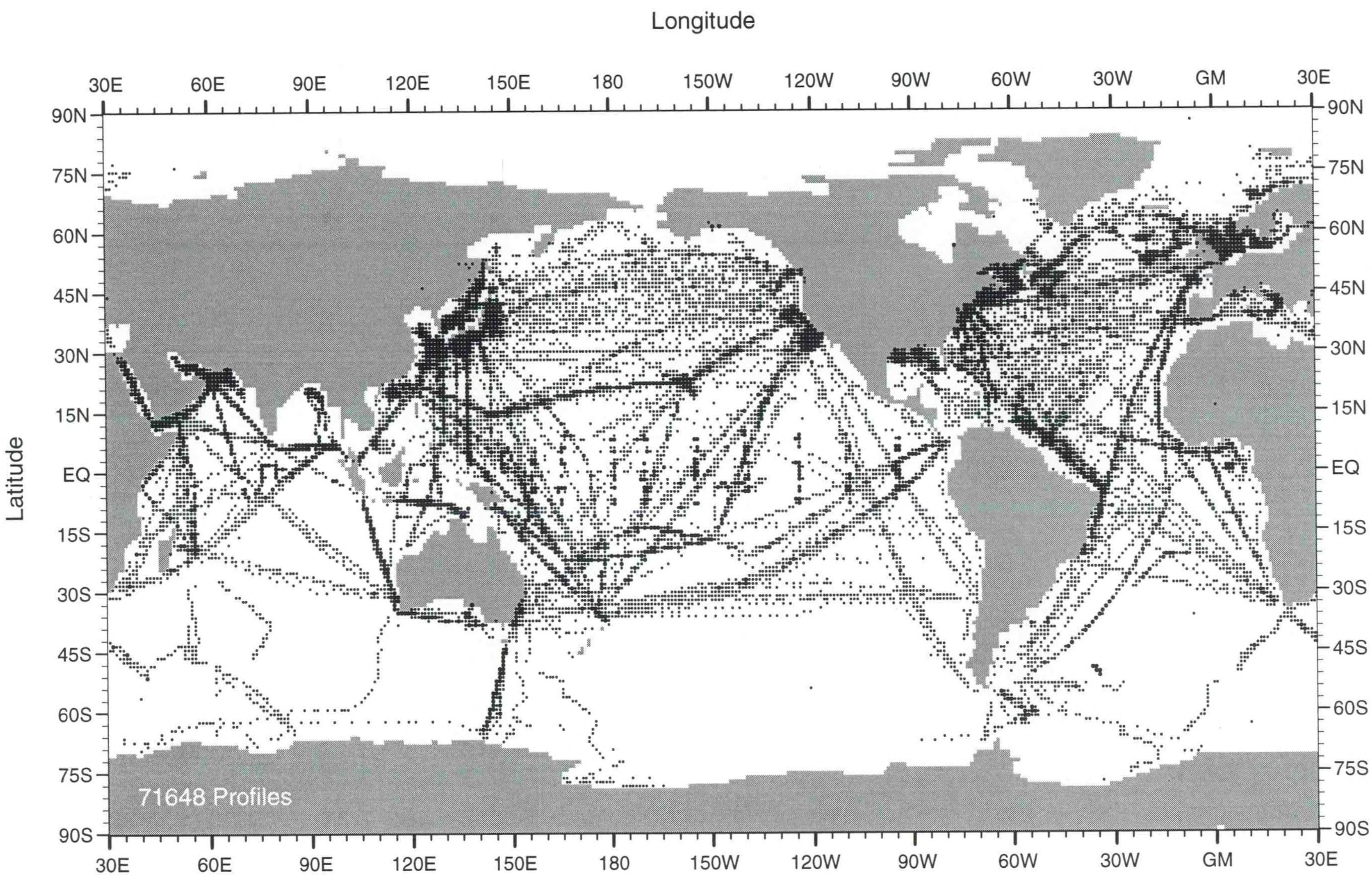


Fig. A54 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for 1994

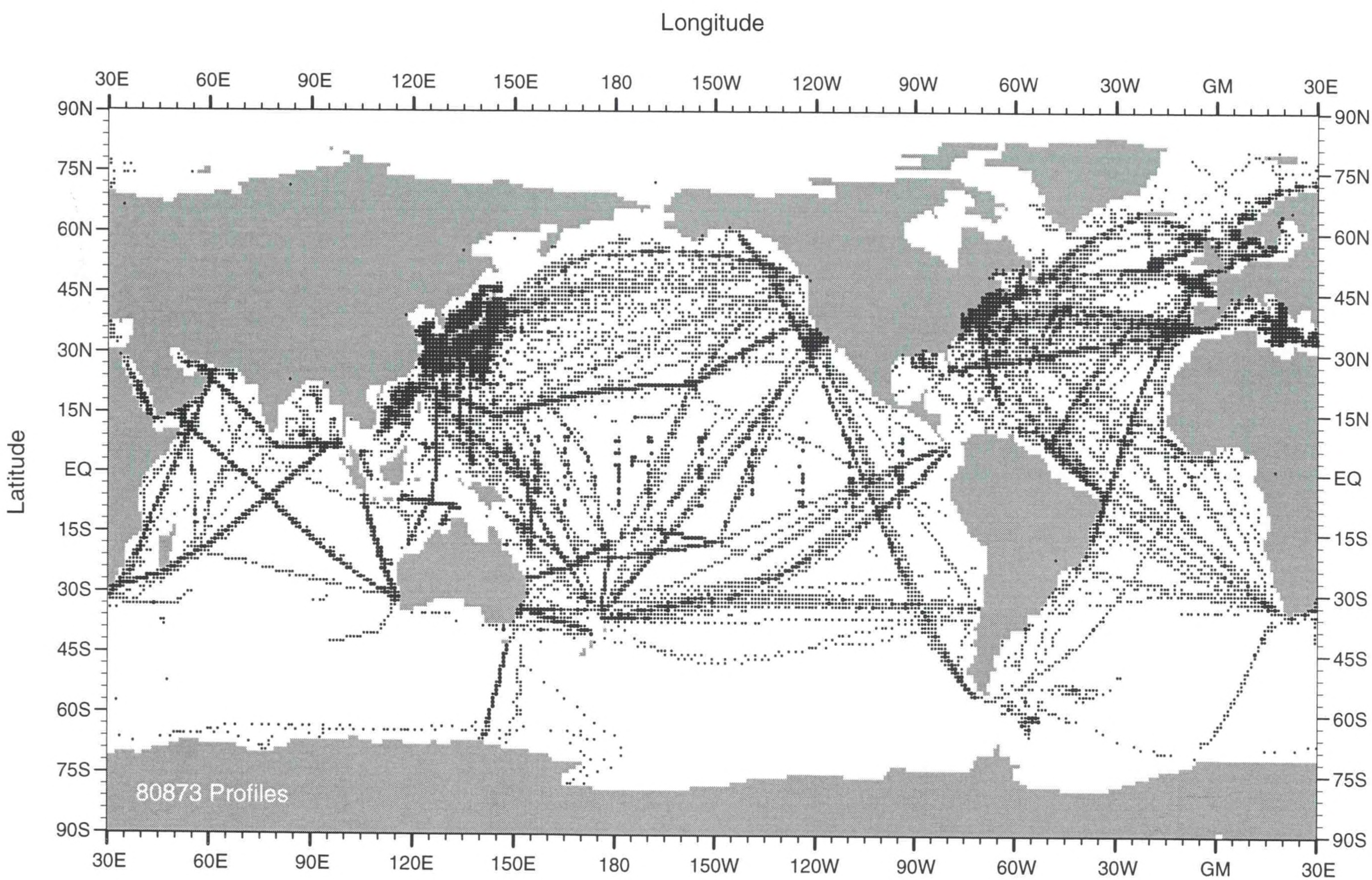


Fig. A55 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for 1995

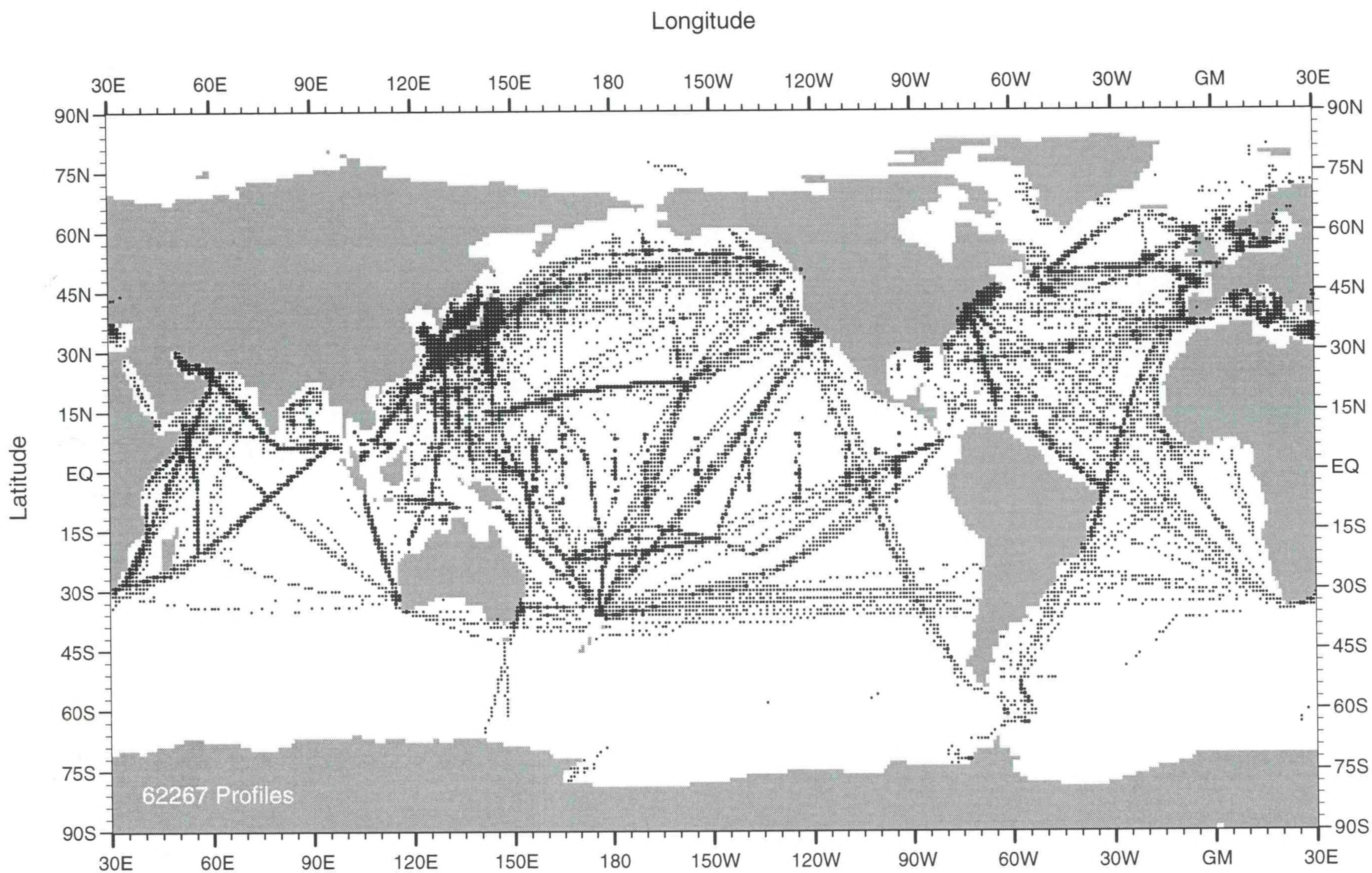


Fig. A56 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for 1996

10. APPENDIX B: SEASONAL DISTRIBUTION MAPS FOR INDIVIDUAL YEARS OF ALL CASTS IN WOD98

Same as in Appendix A but for individual seasons for individual years.

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

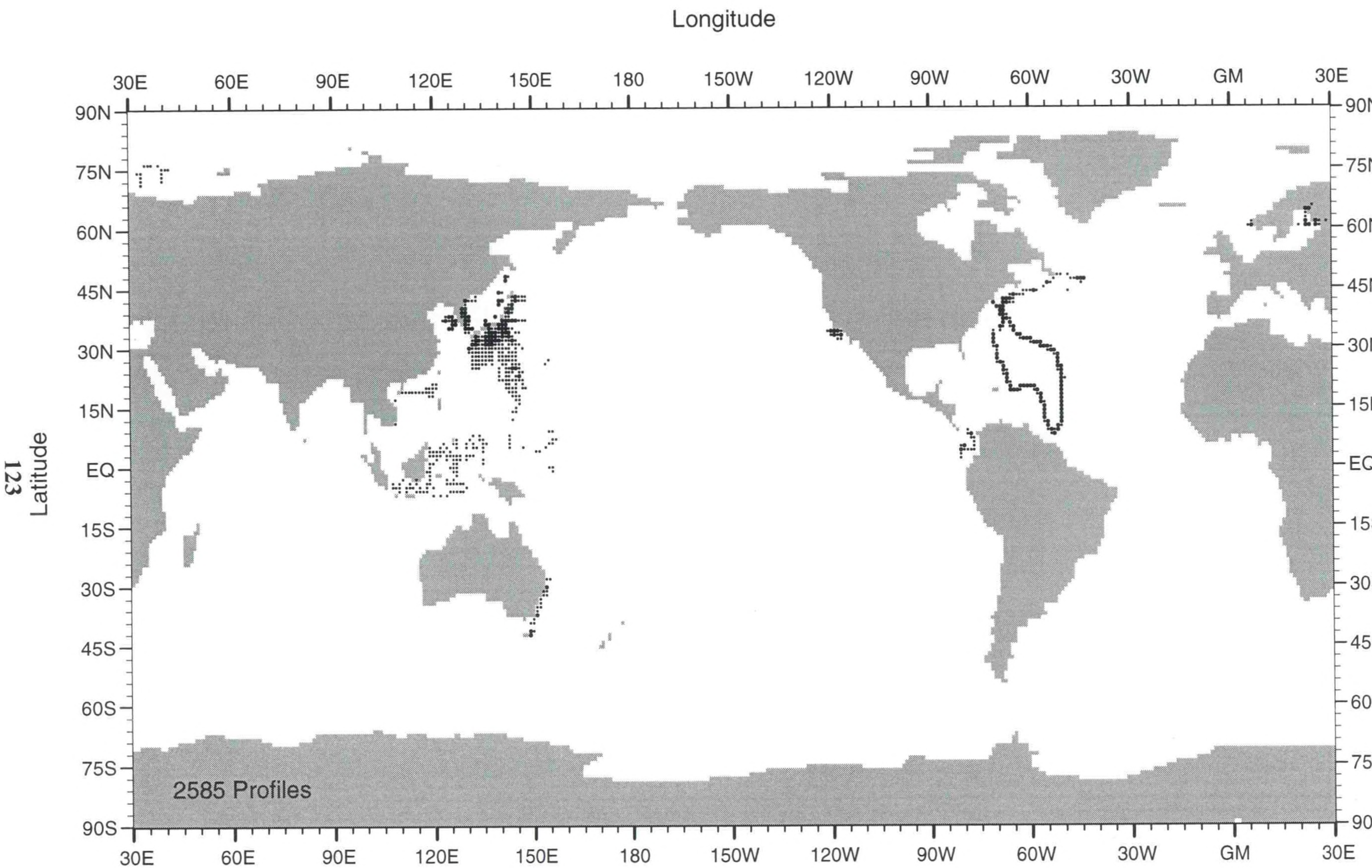


Fig. B1 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1941

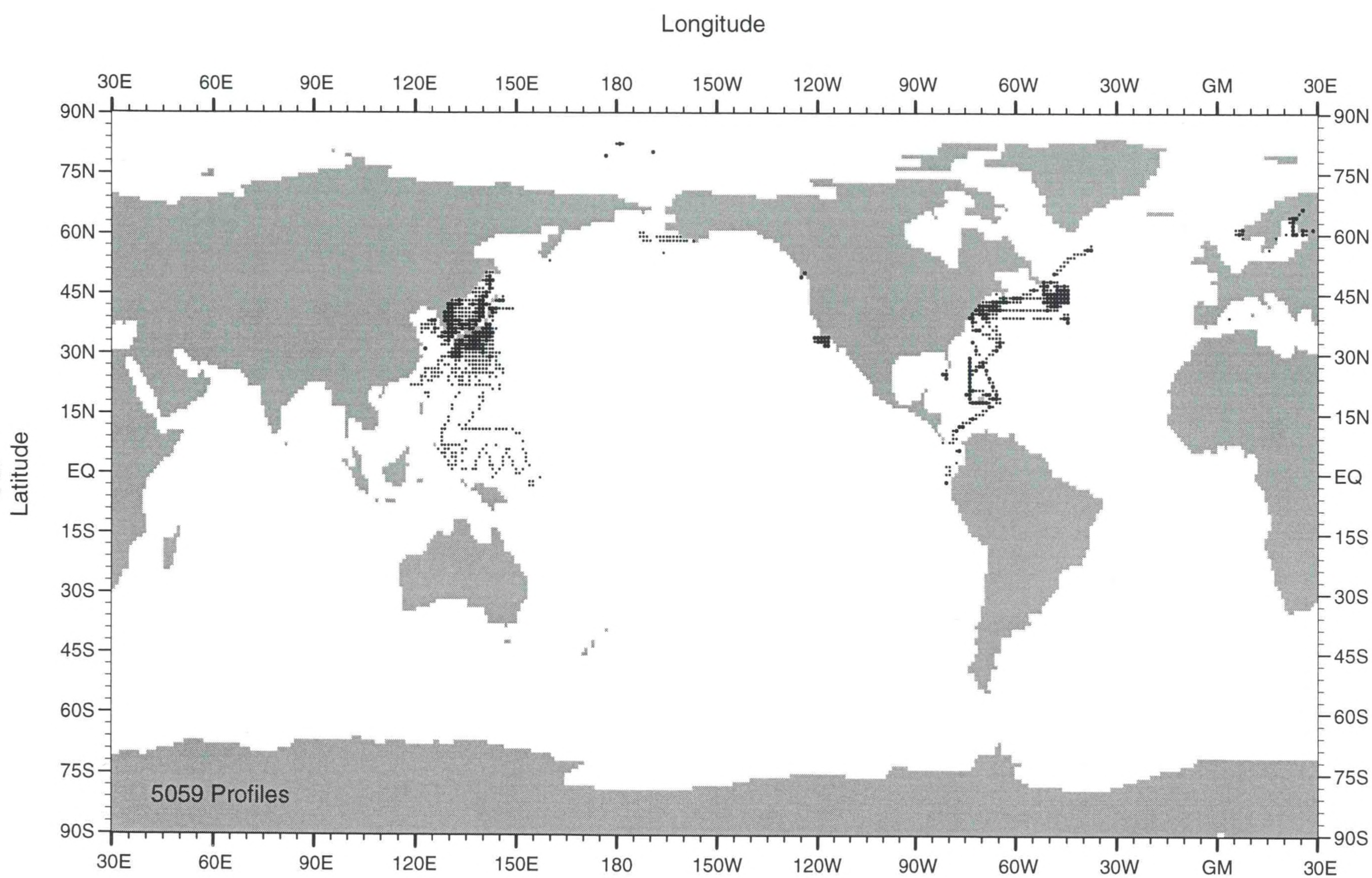


Fig. B2 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1941

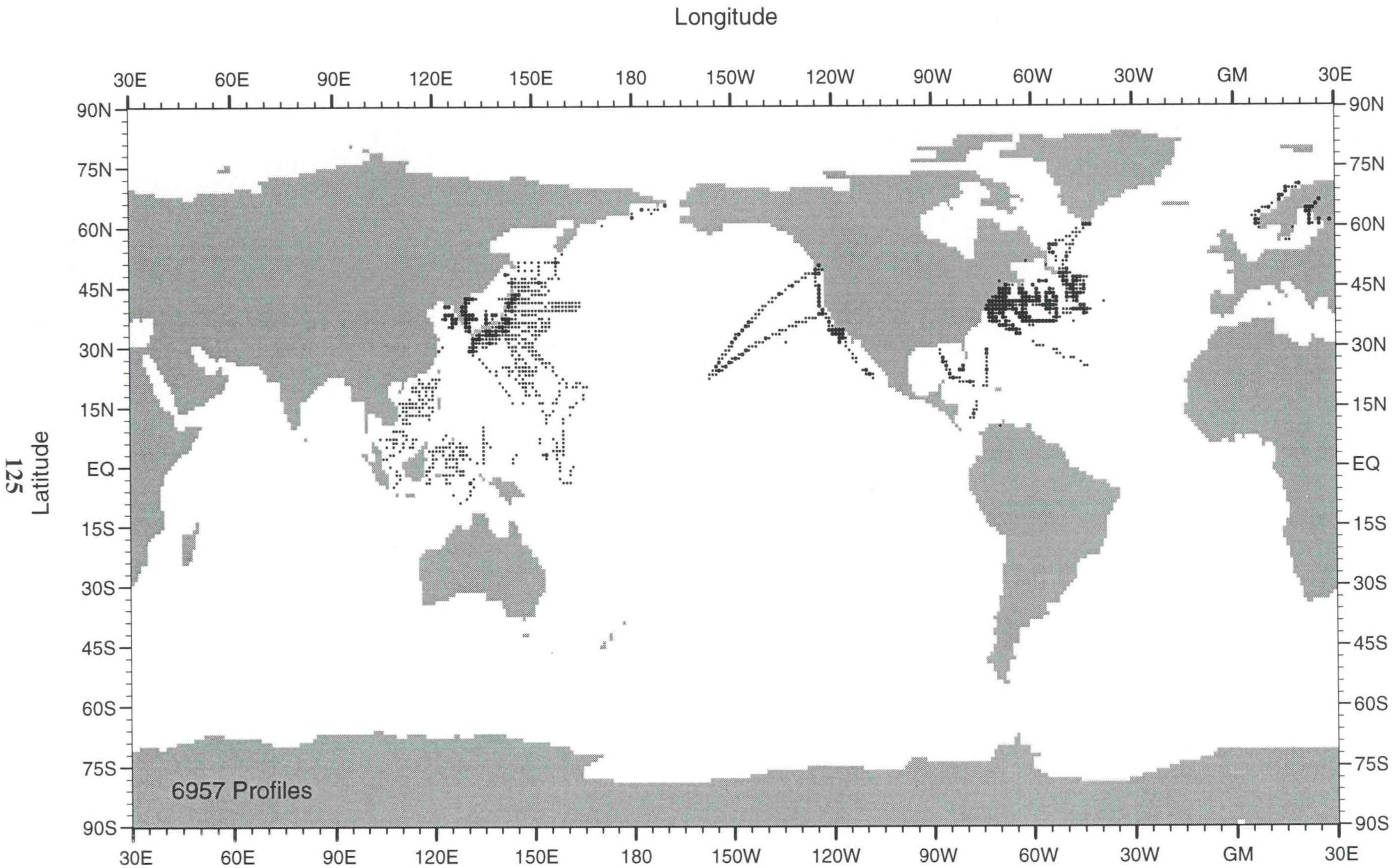


Fig. B3 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1941

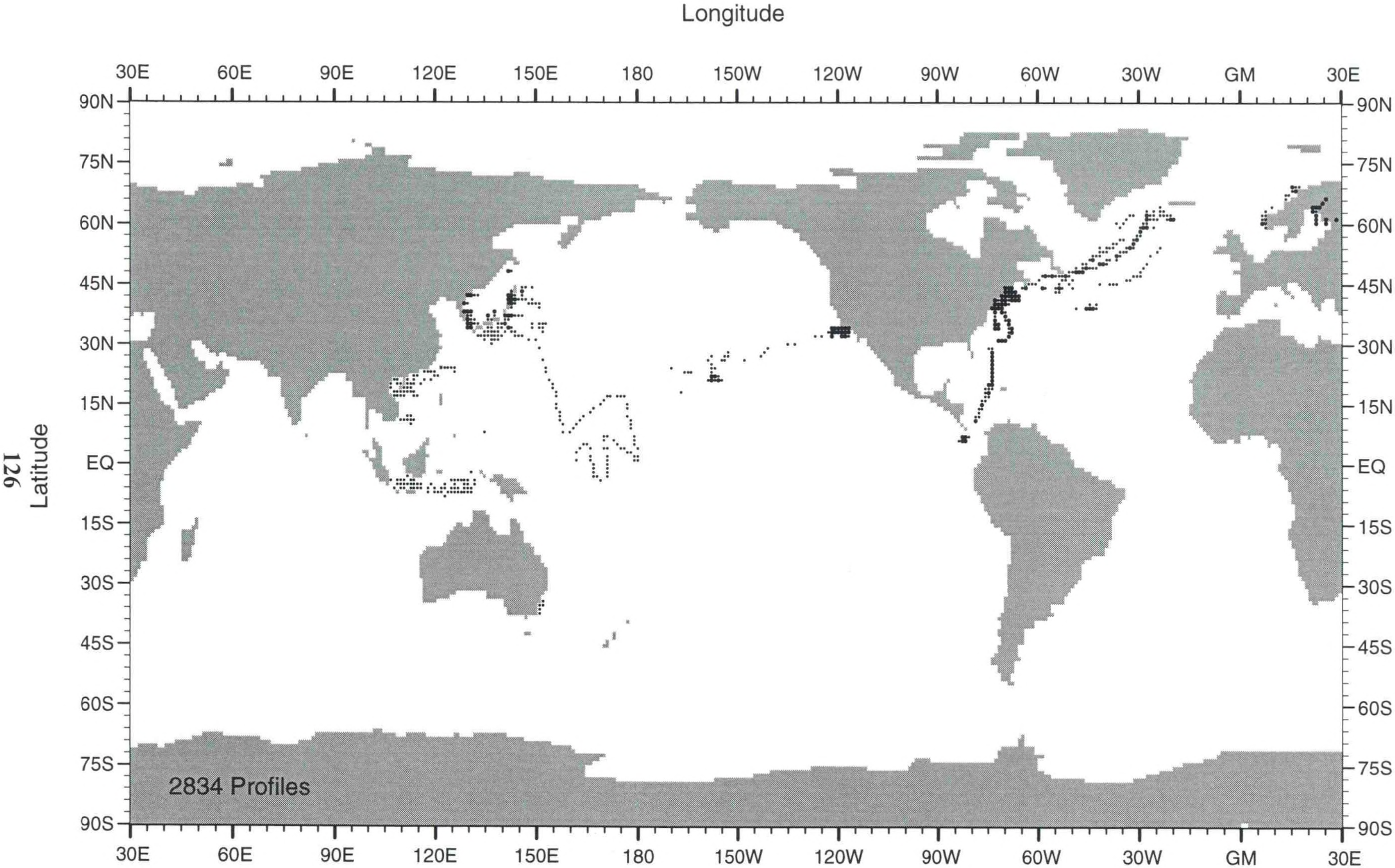


Fig. B4 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1941

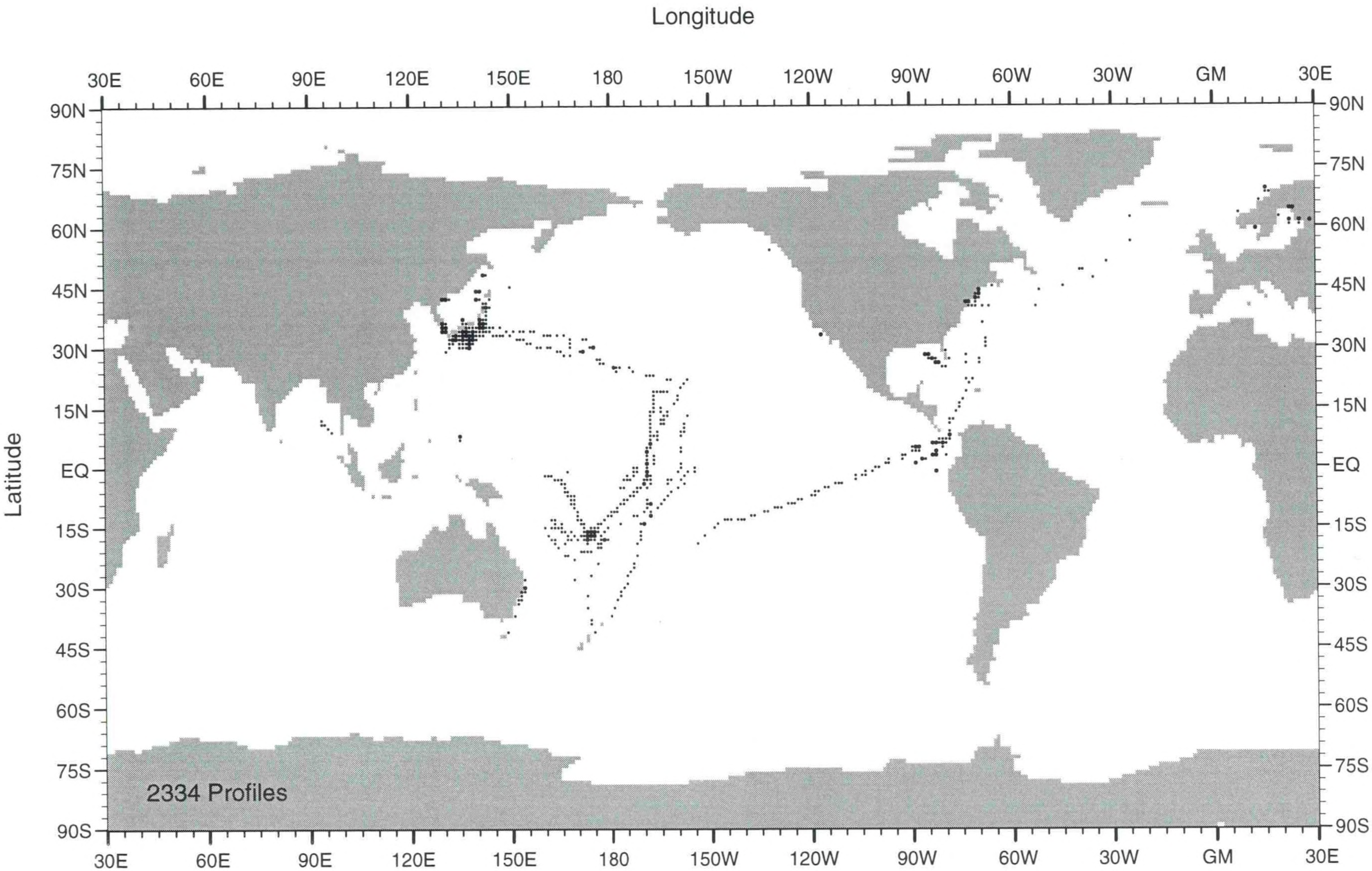


Fig. B5 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1942

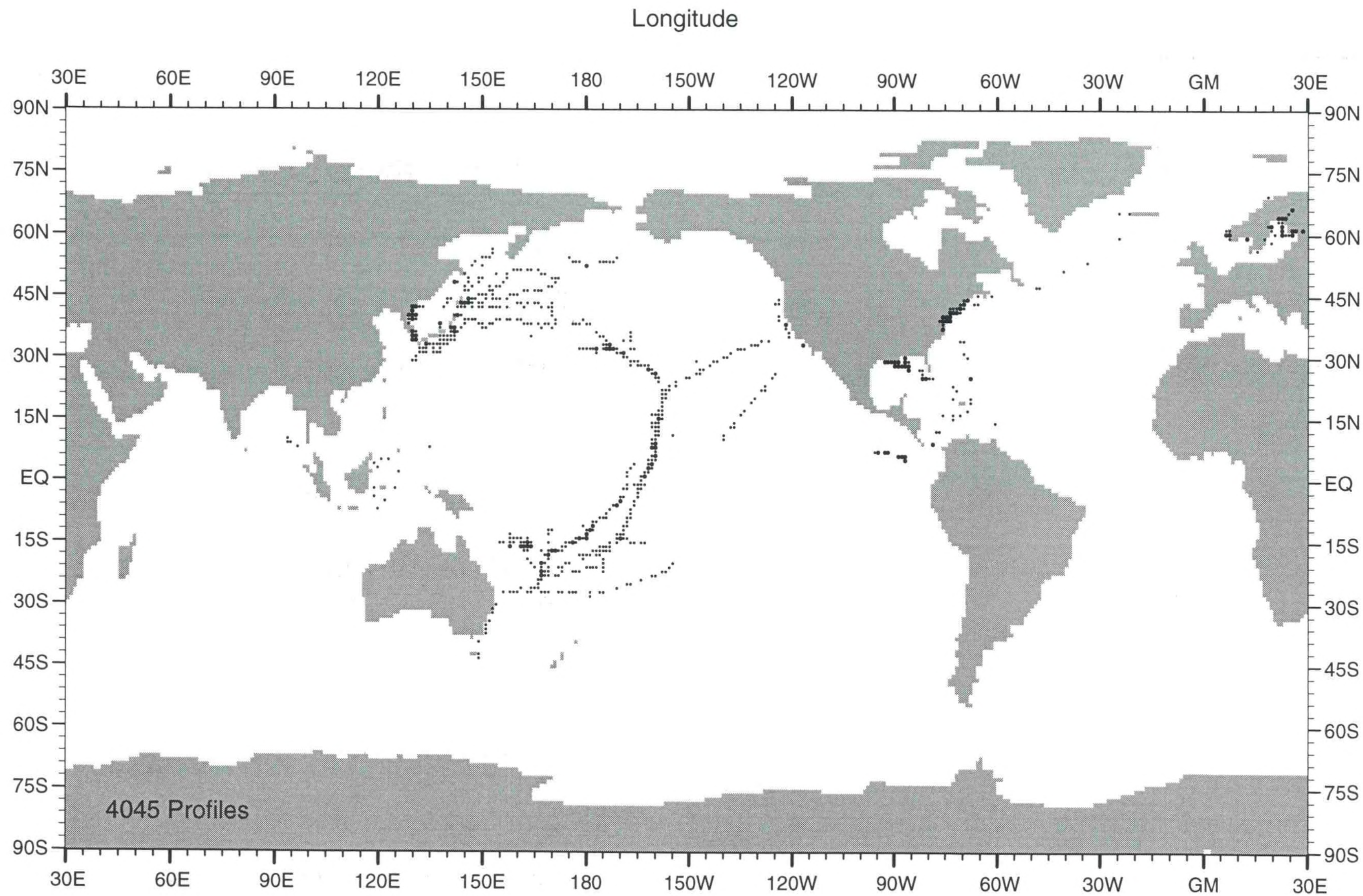


Fig. B6 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1942

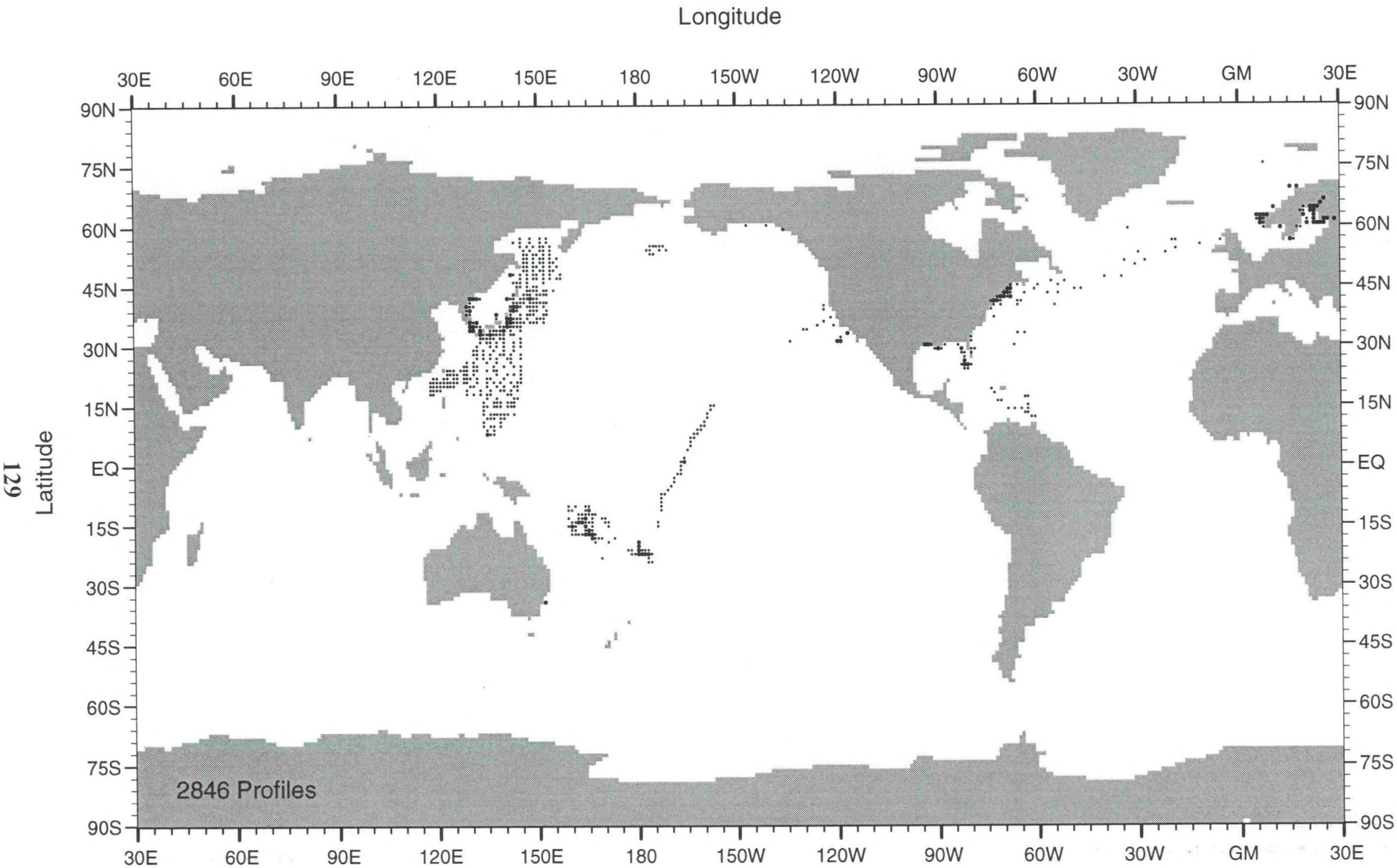


Fig. B7 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1942

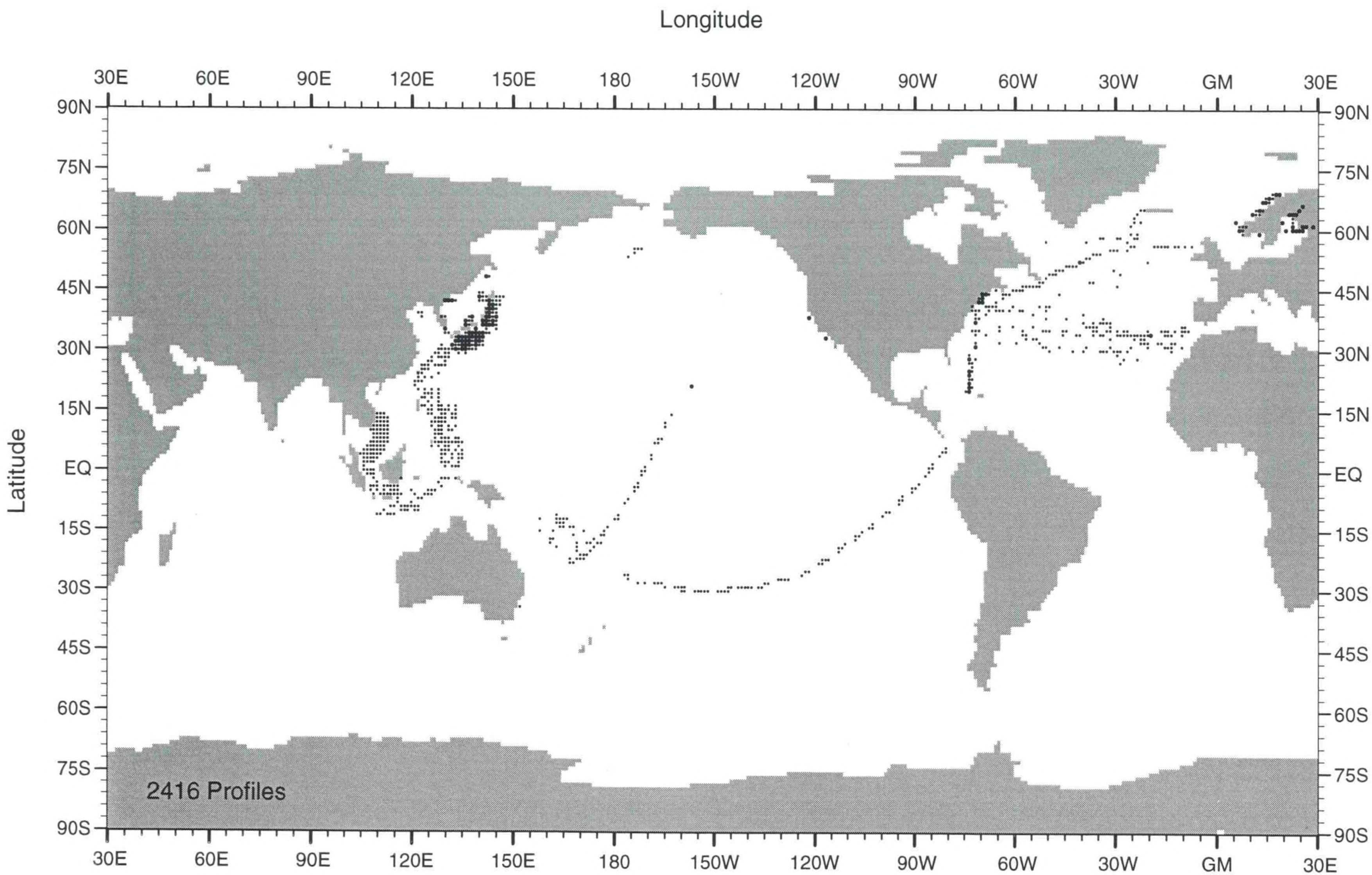


Fig. B8 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1942

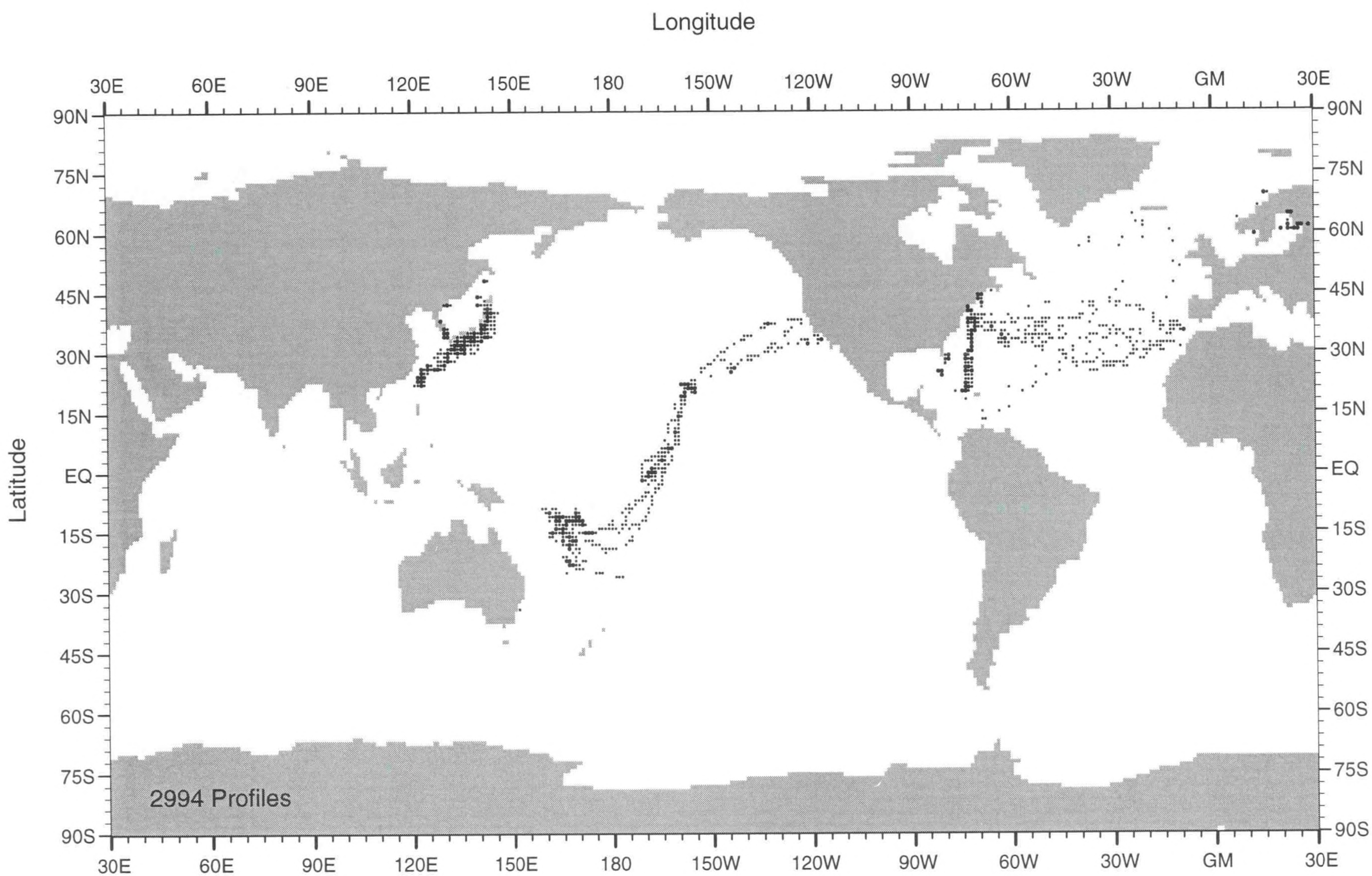


Fig. B9 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1943

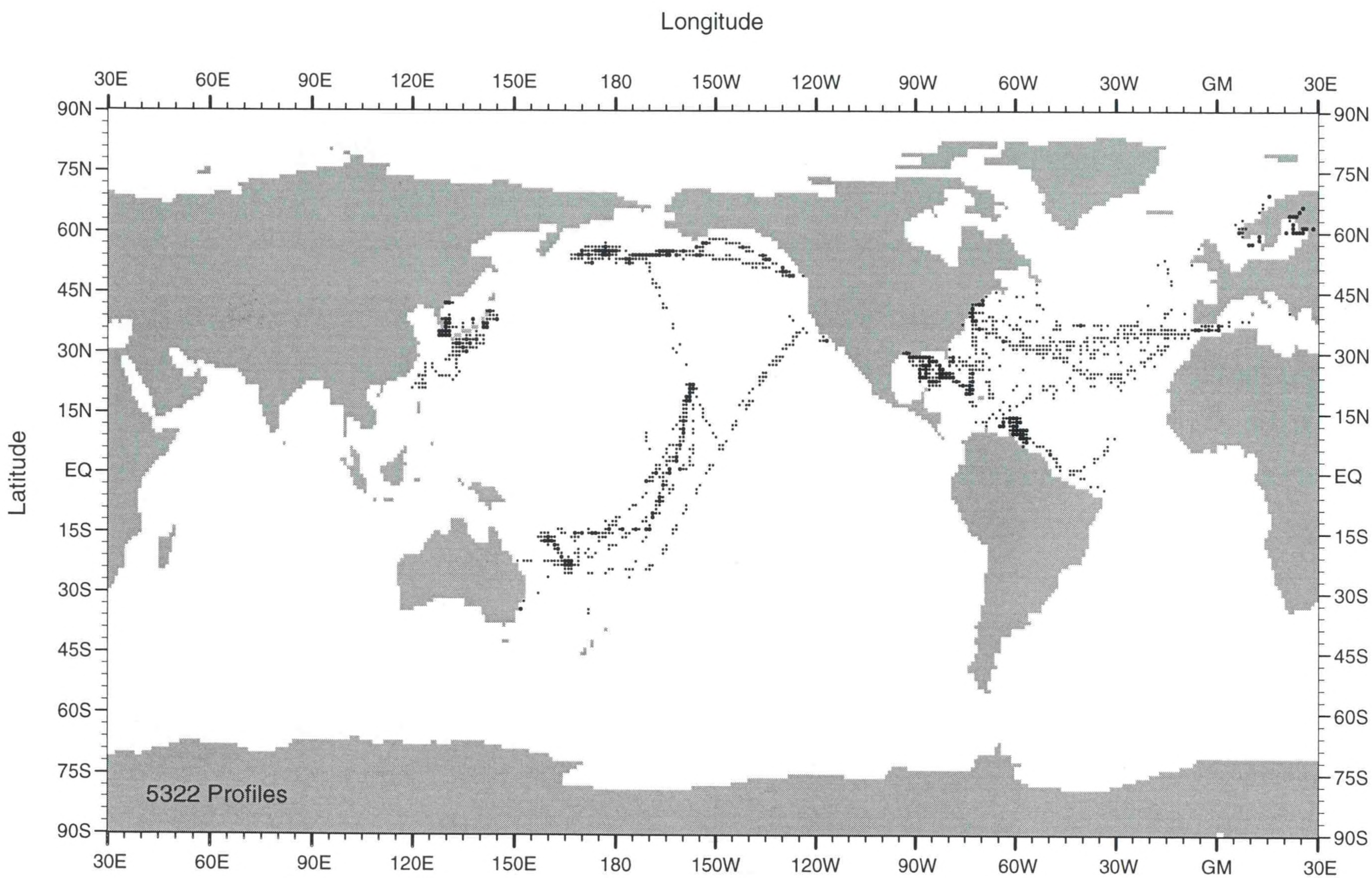


Fig. B10 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1943

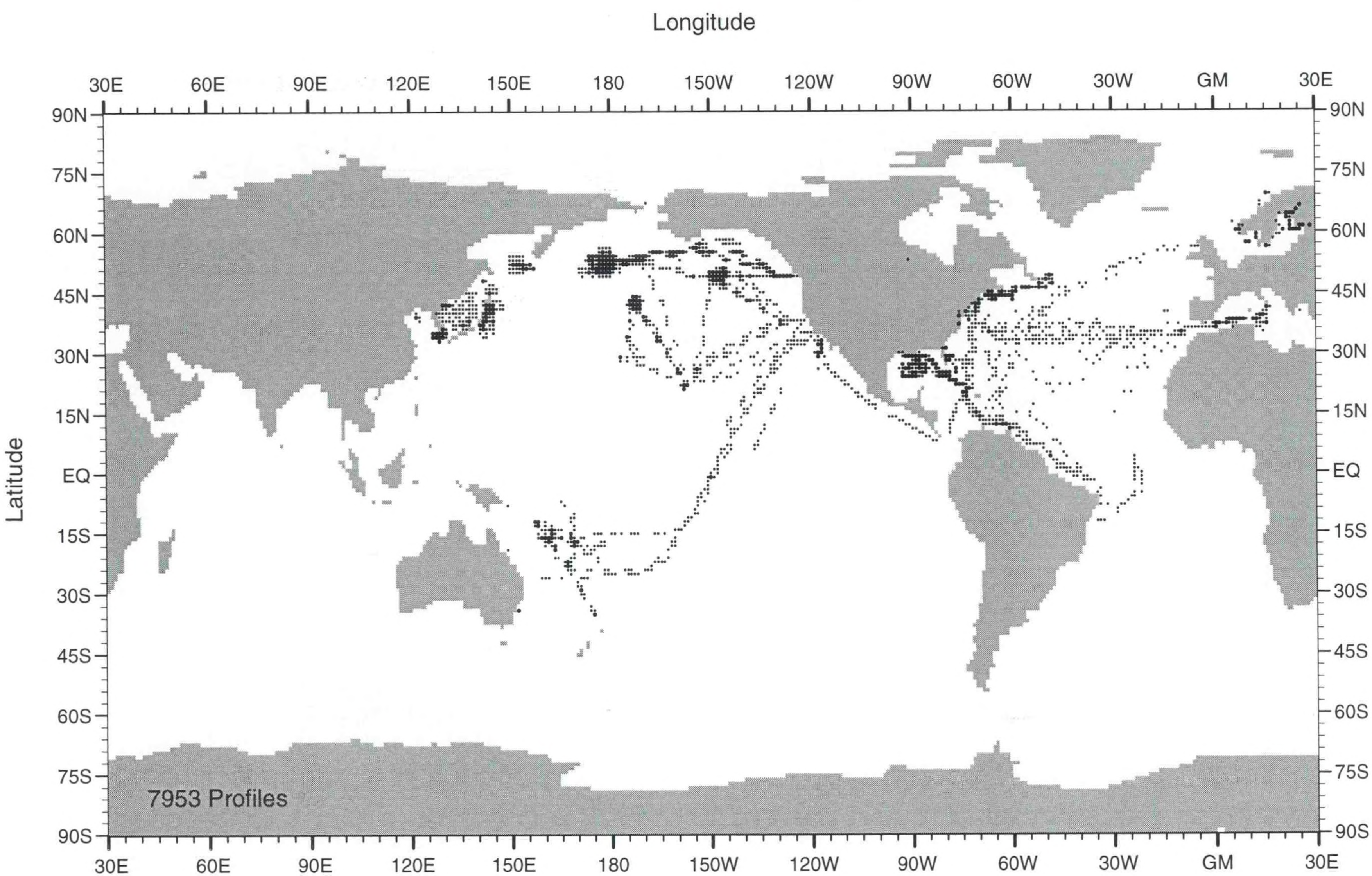


Fig. B11 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1943

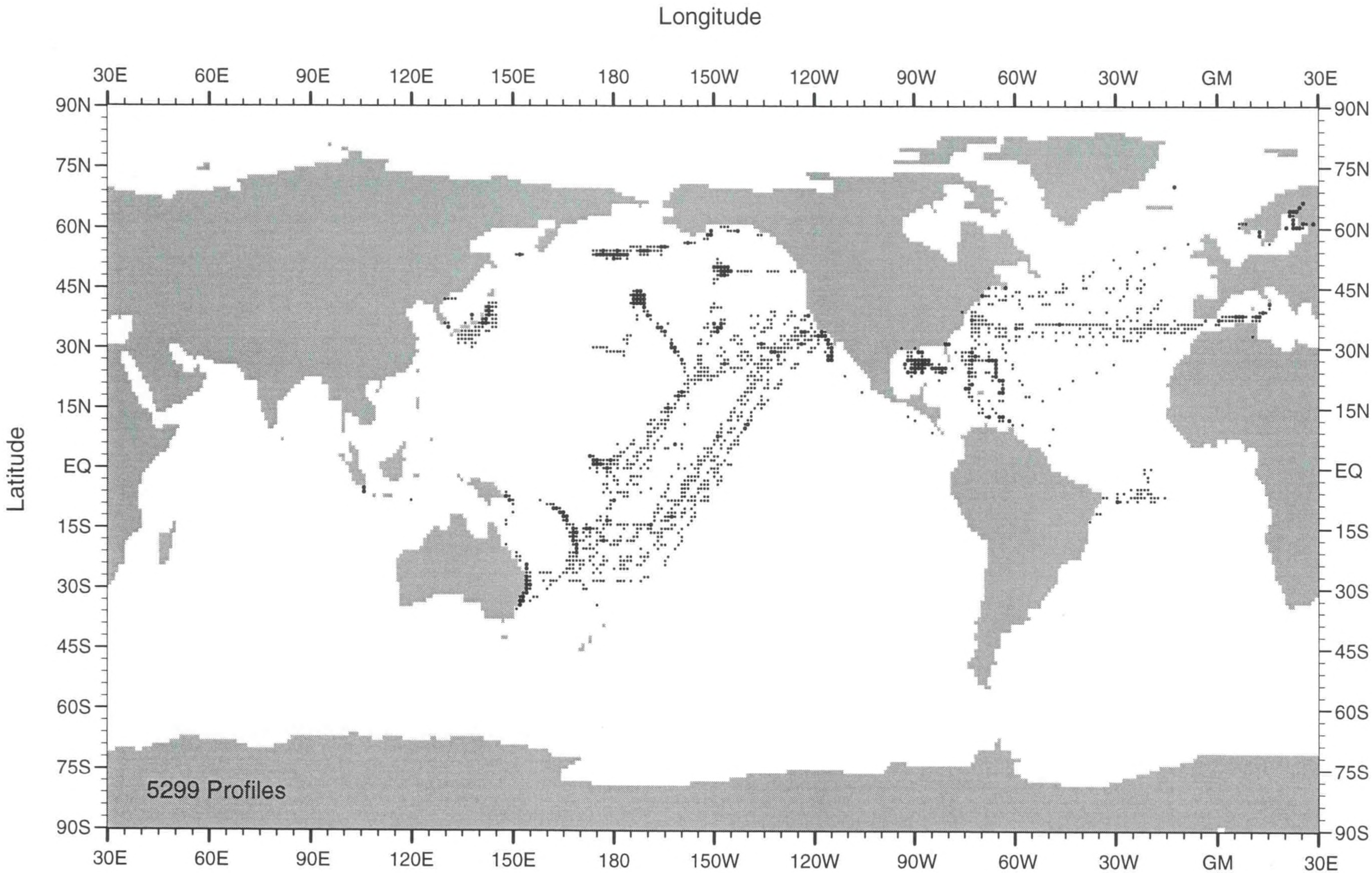


Fig. B12 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1943

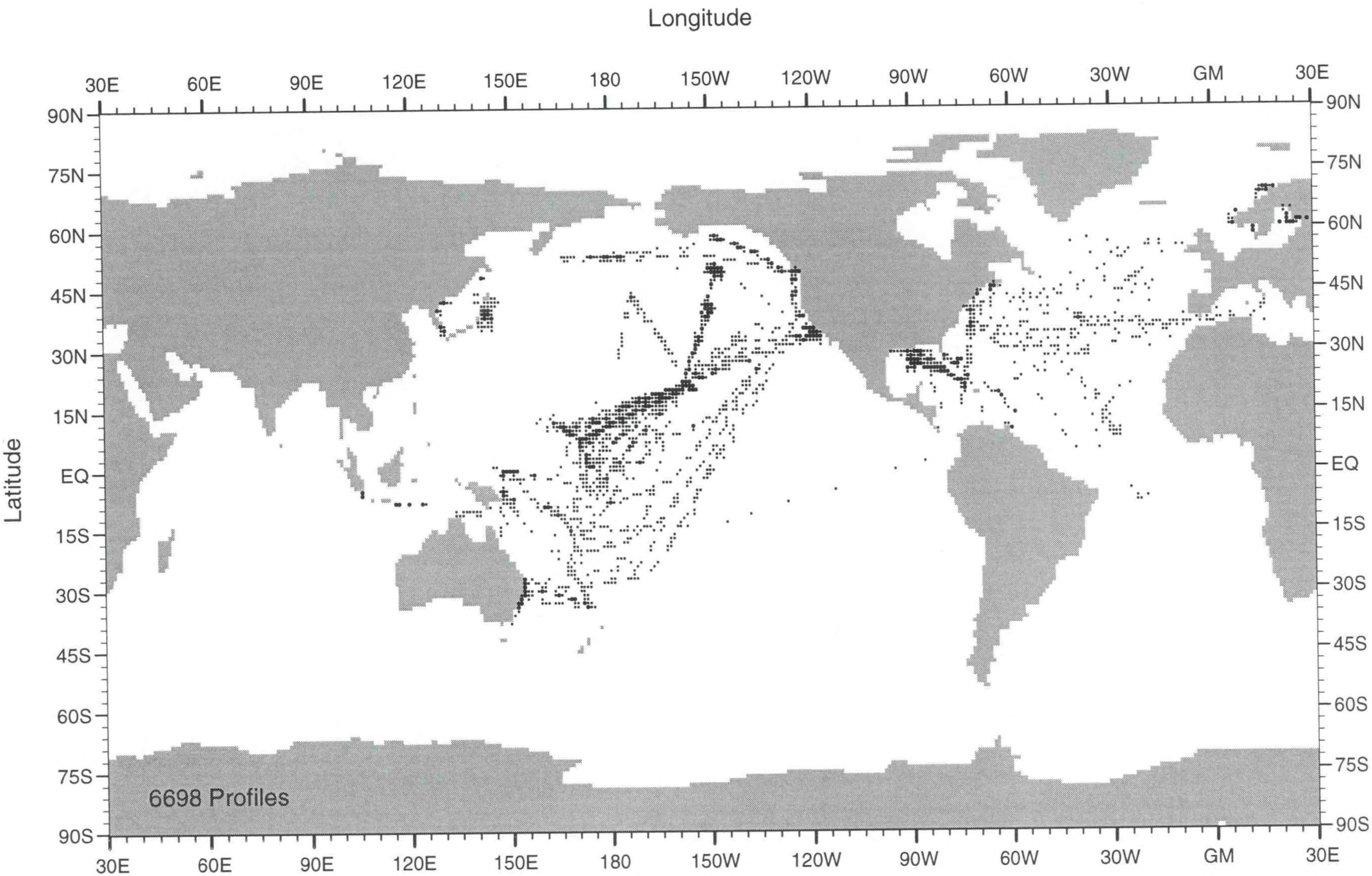


Fig. B13 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1944

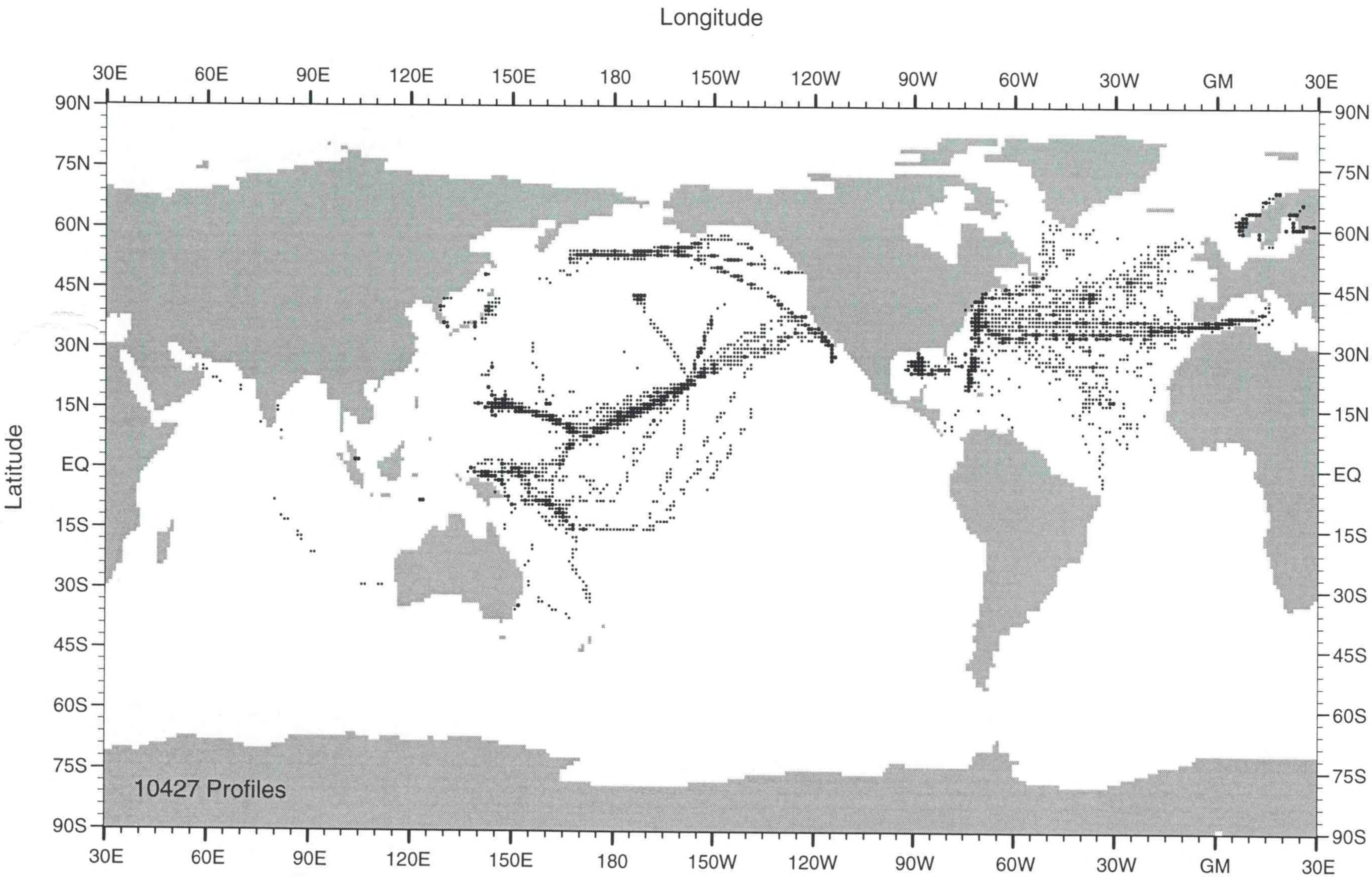


Fig. B14 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1944

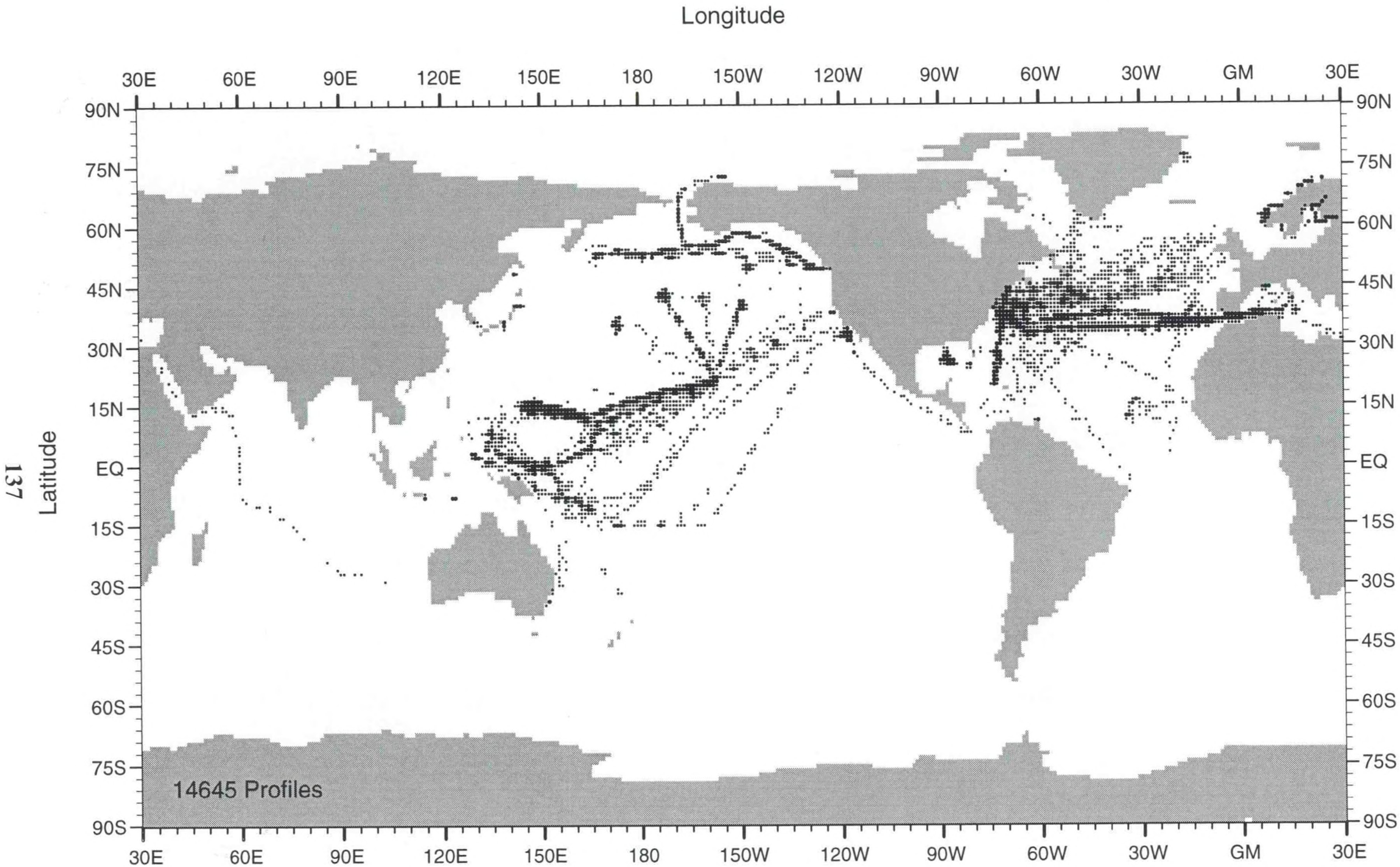


Fig. B15 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1944

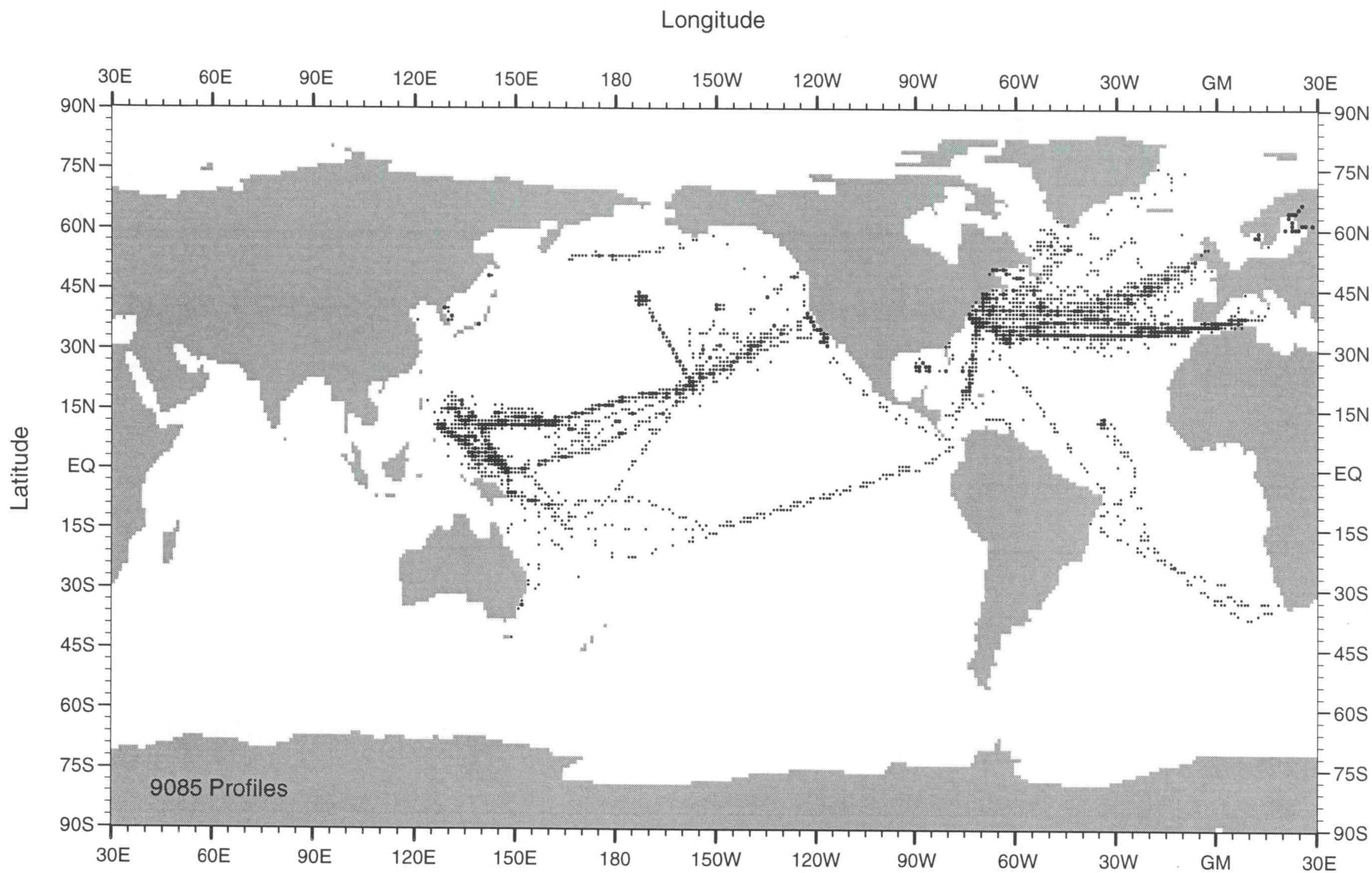


Fig. B16 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1944

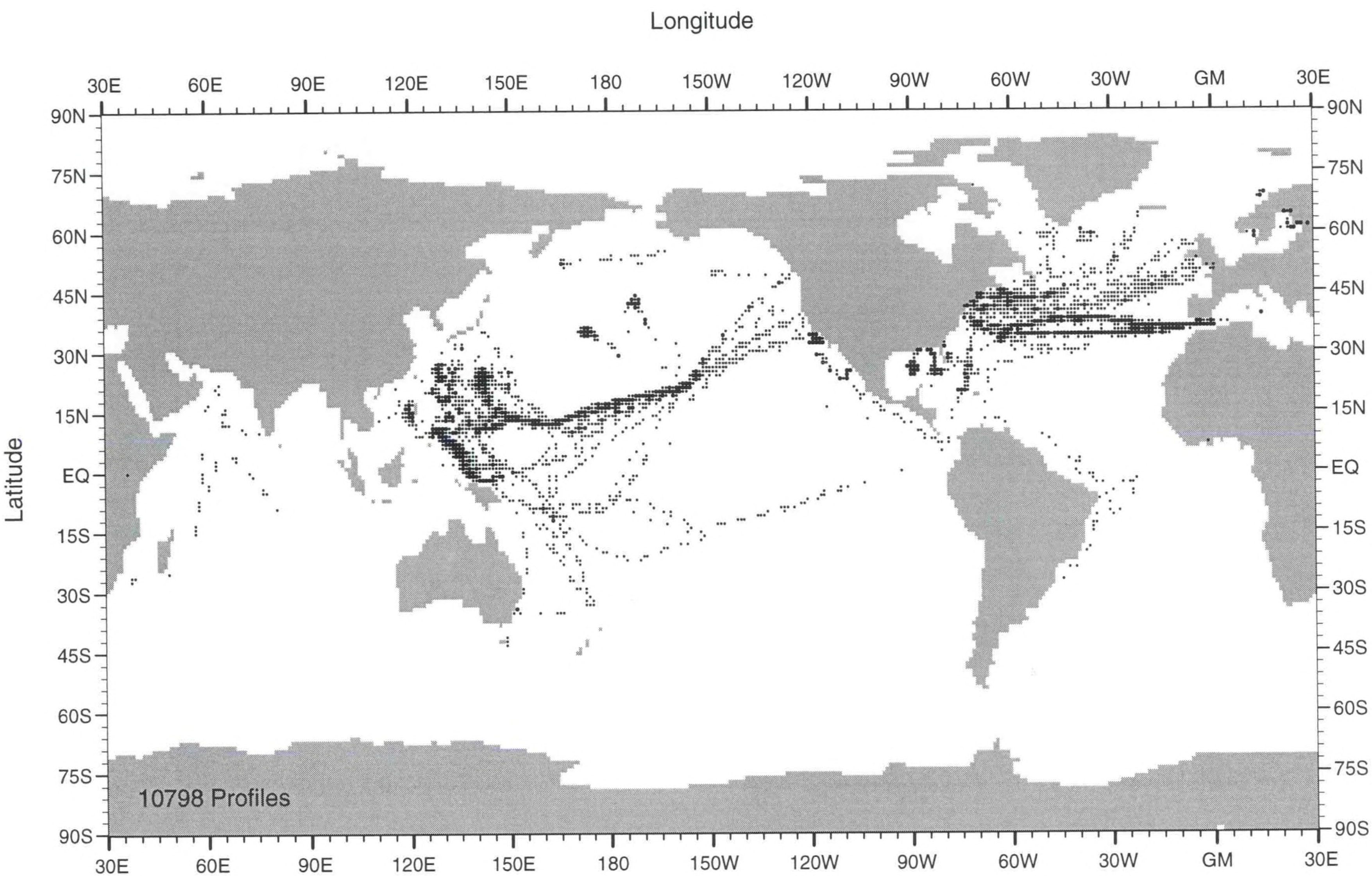


Fig. B17 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1945

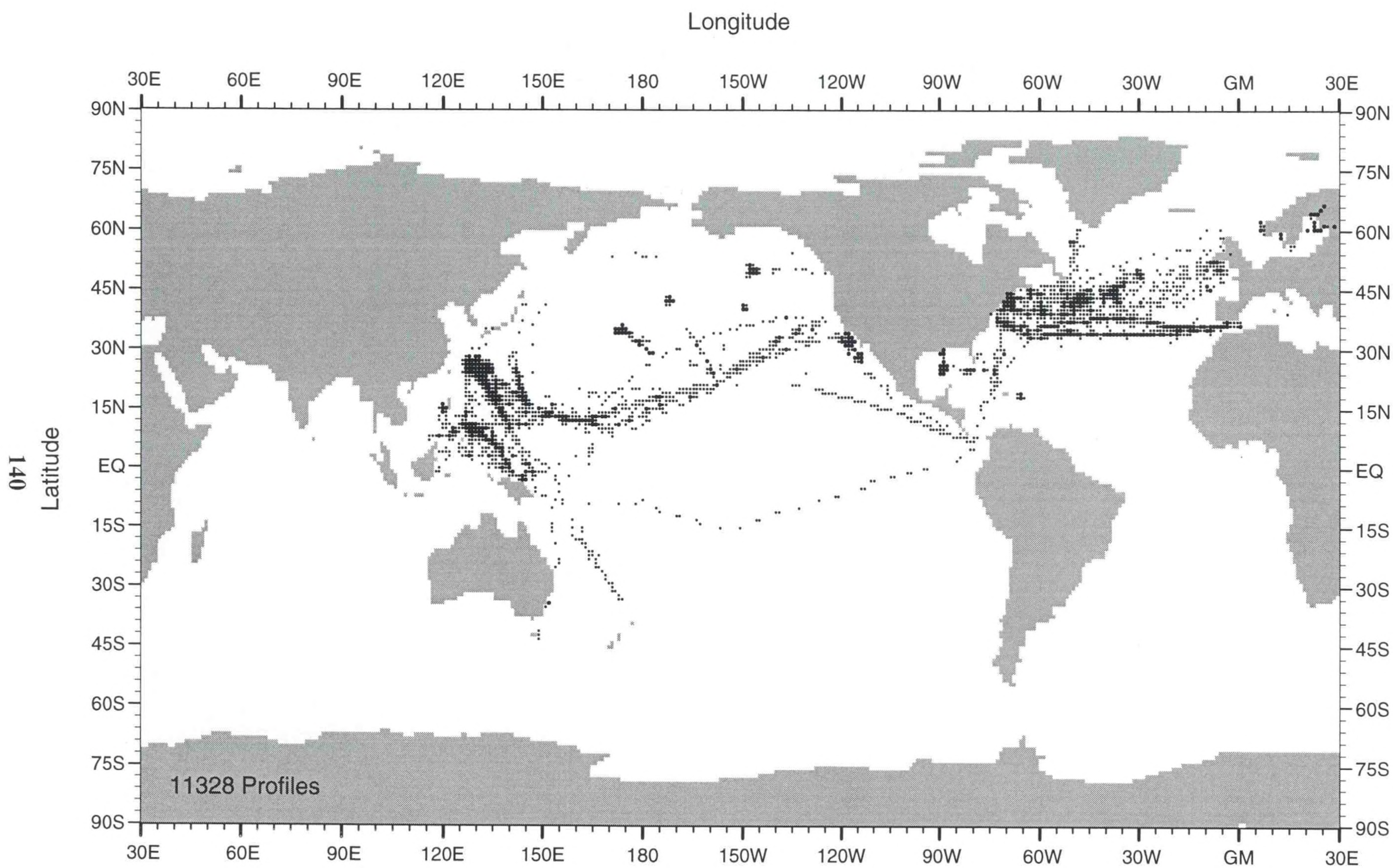


Fig. B18 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1945

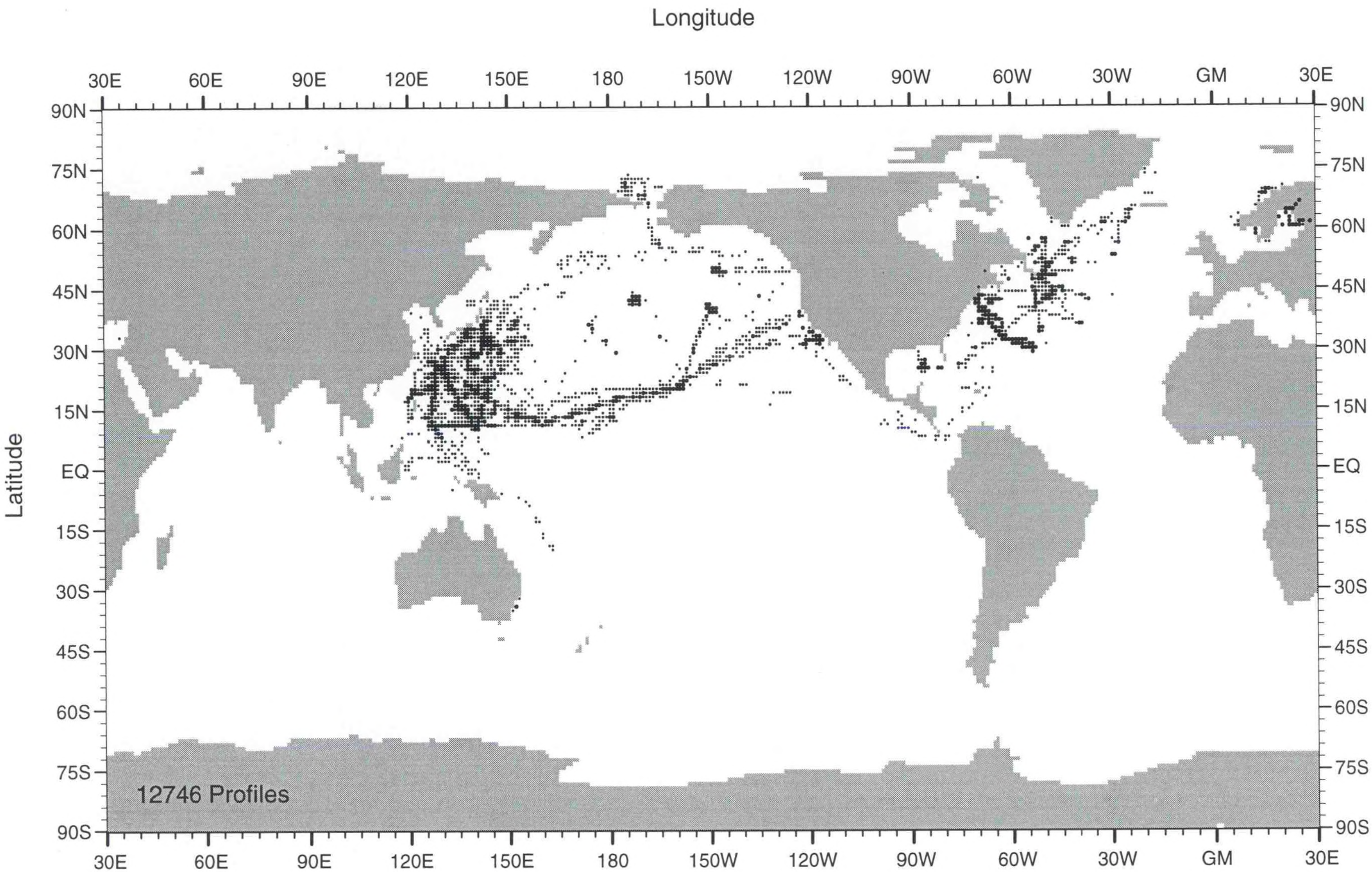


Fig. B19 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1945

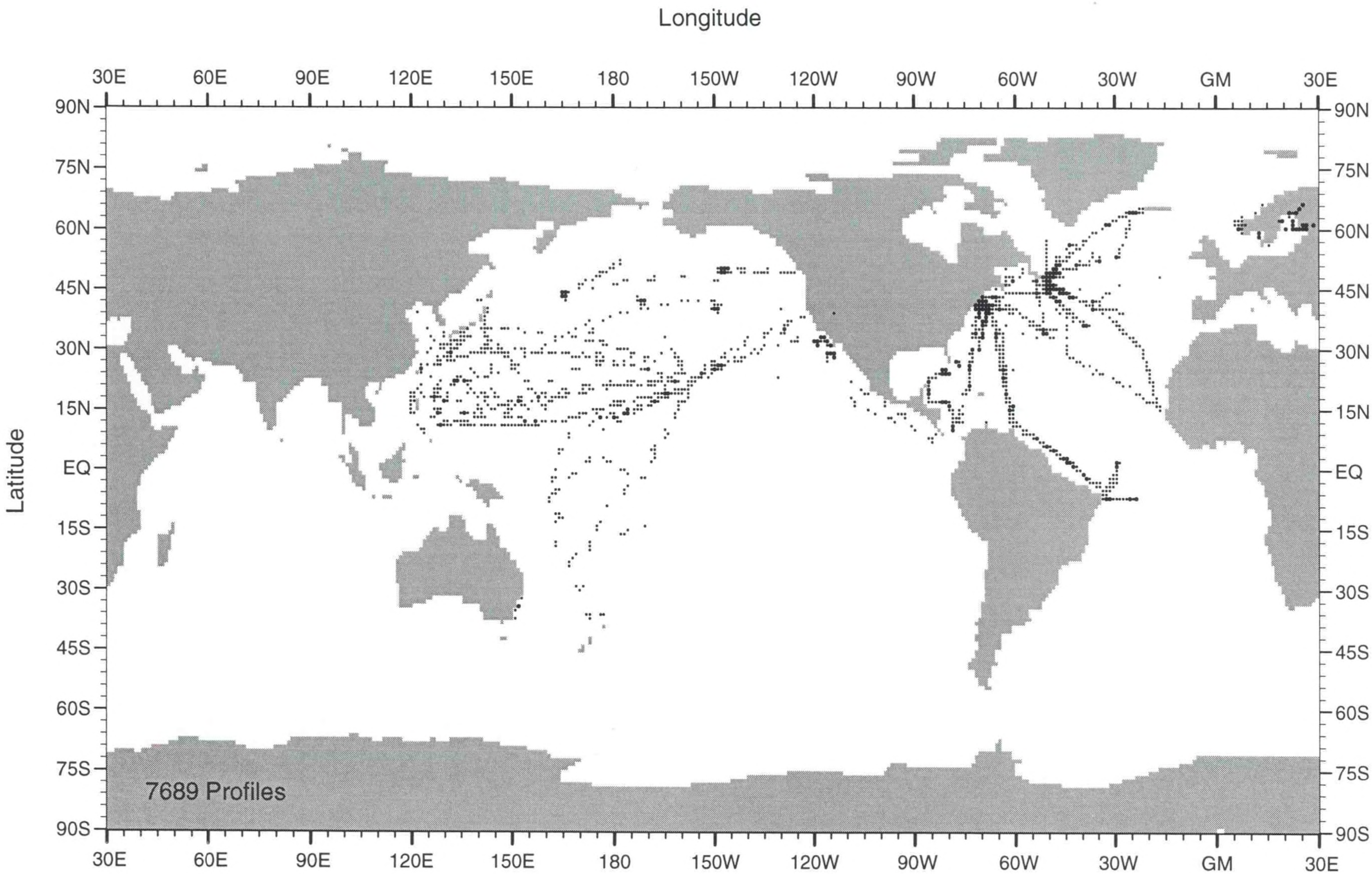


Fig. B20 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1945

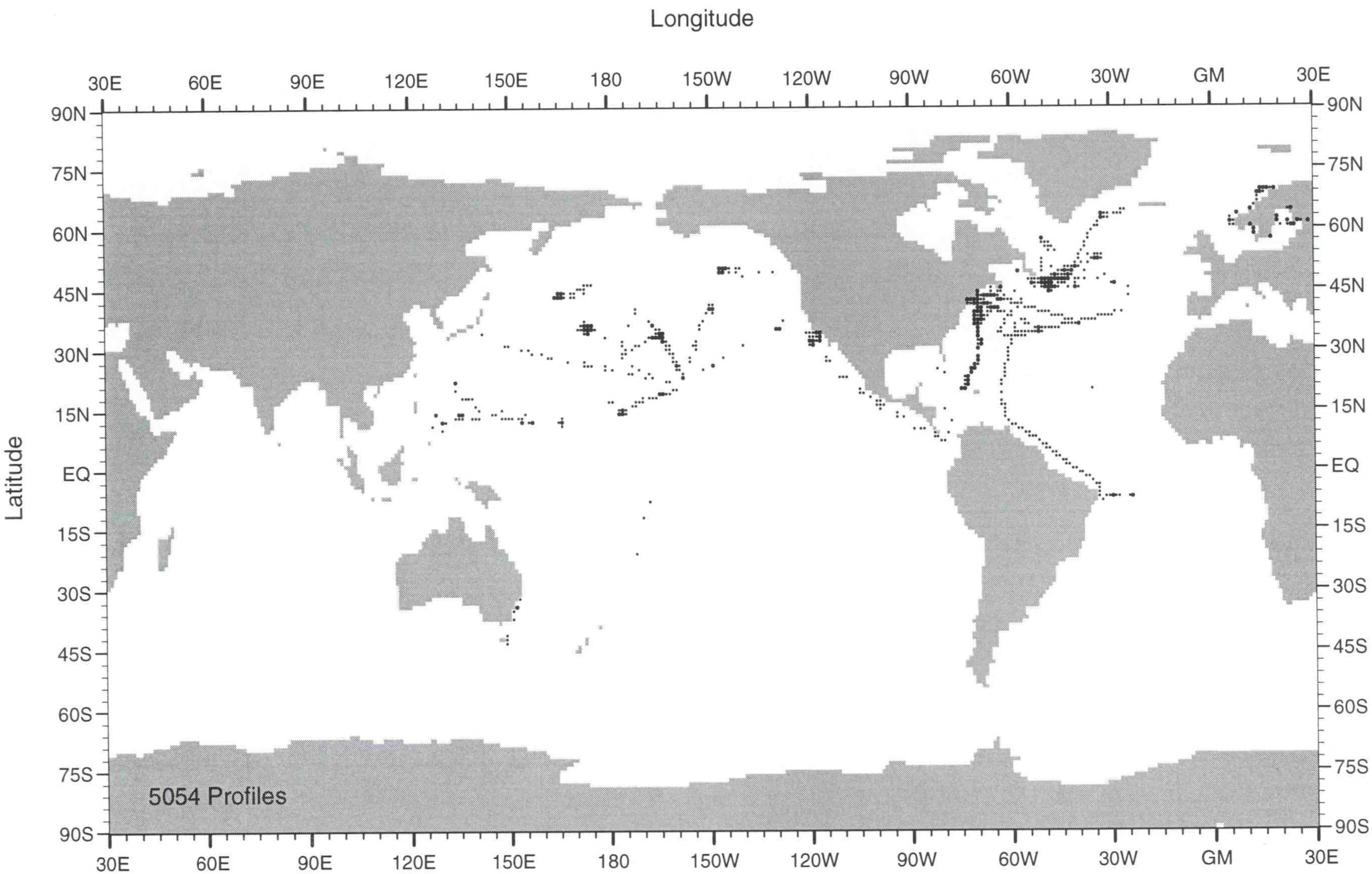


Fig. B21 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1946

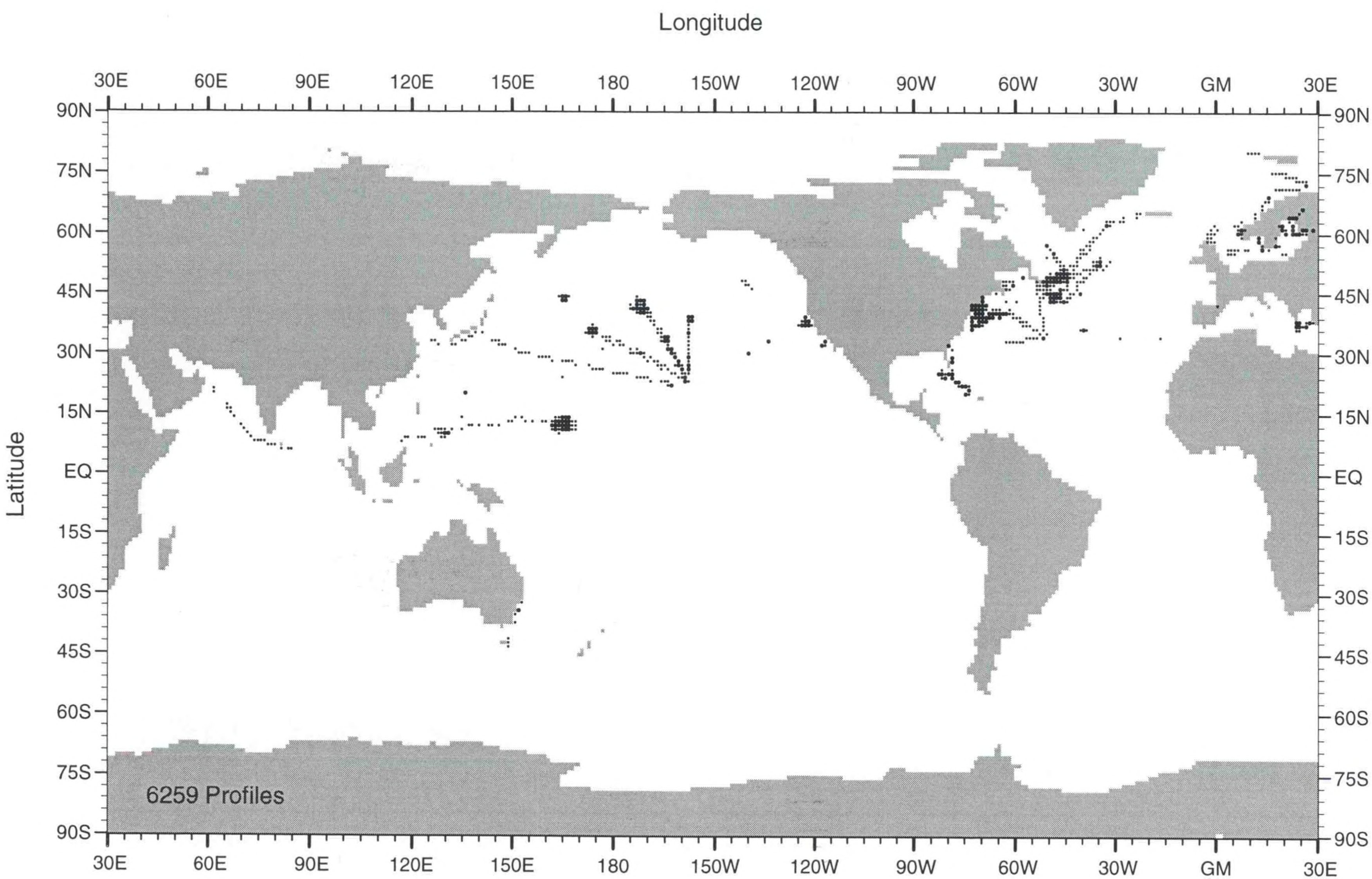


Fig. B22 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1946

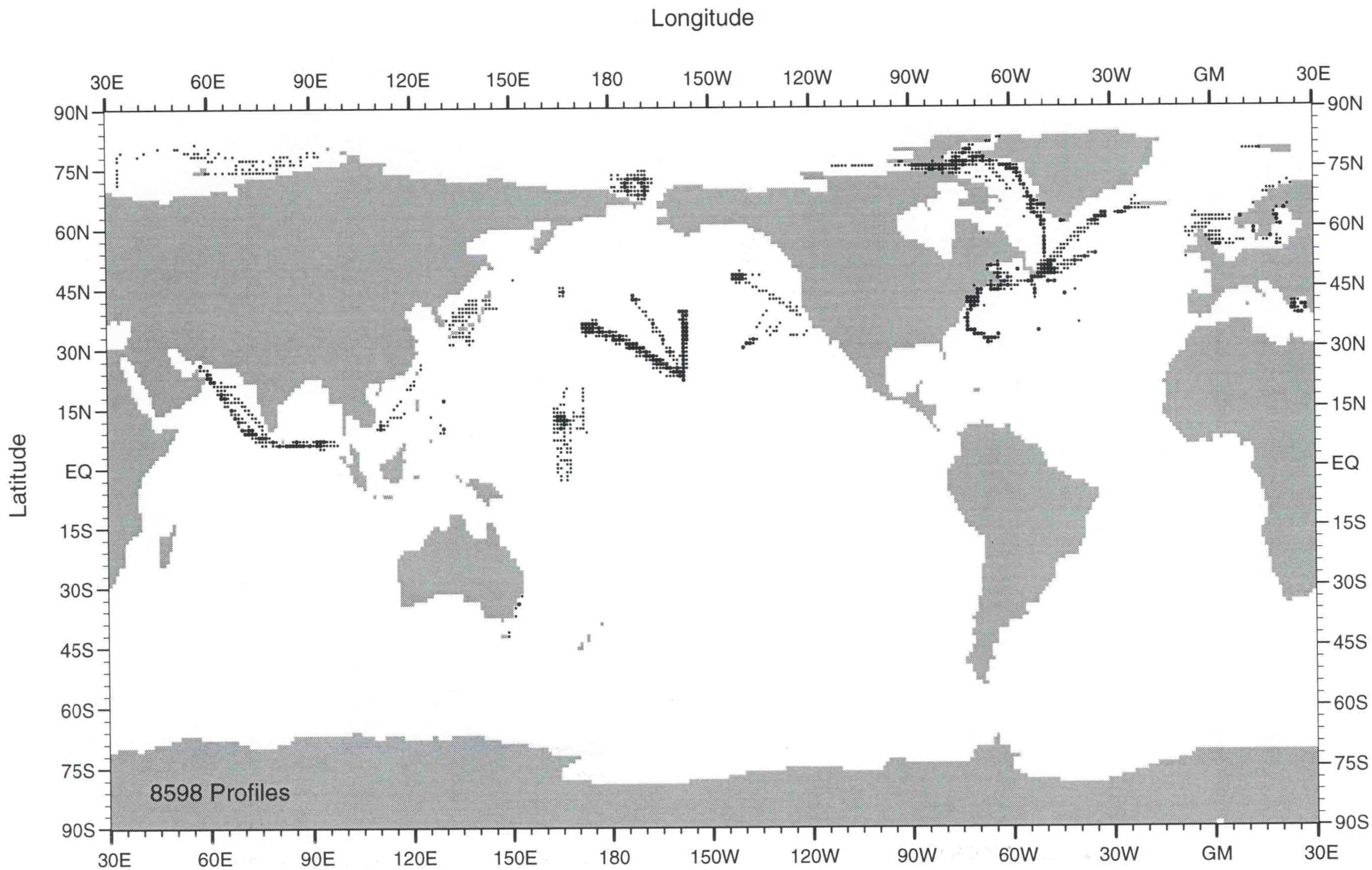


Fig. B23 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1946

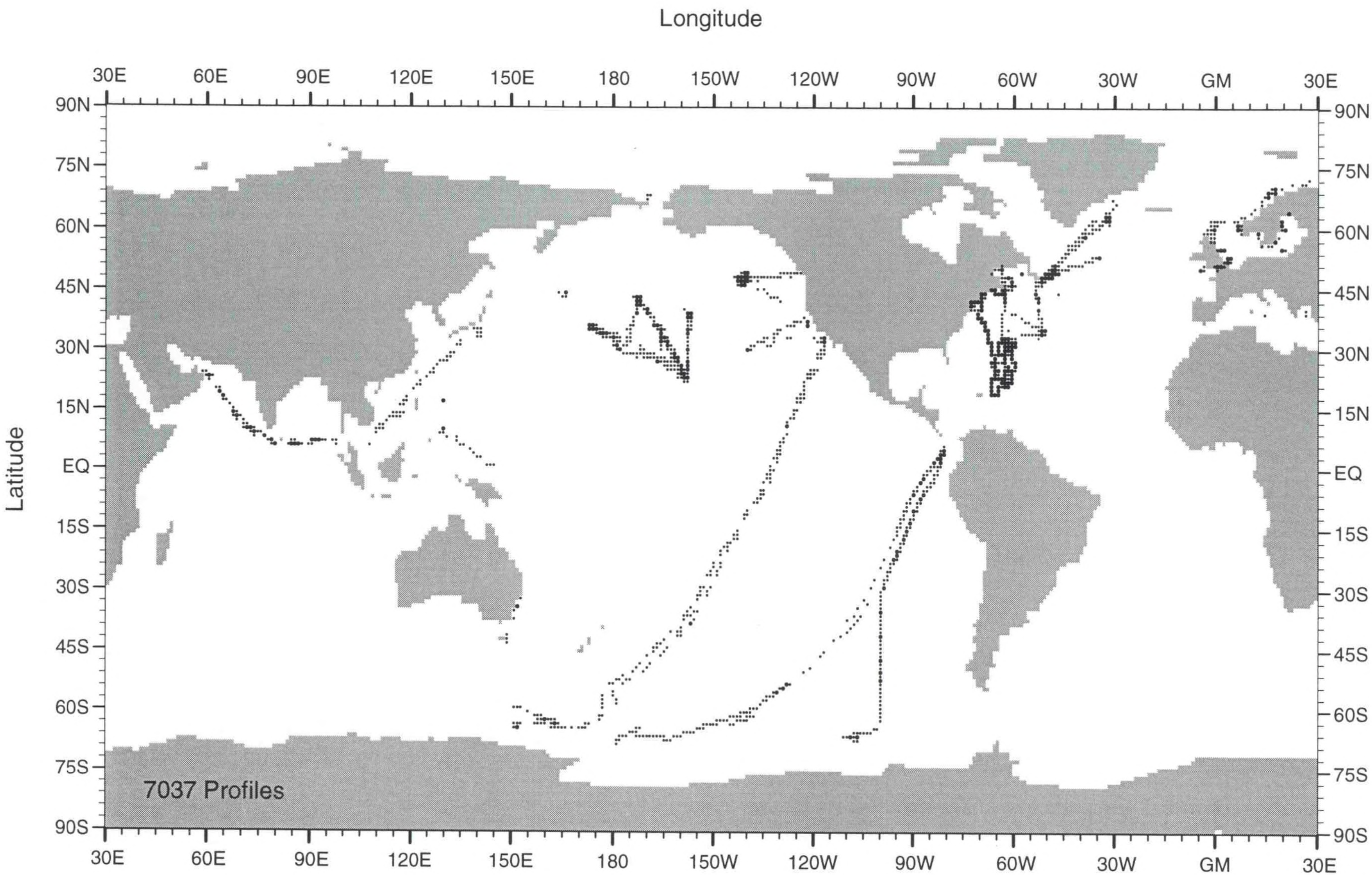


Fig. B24 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1946

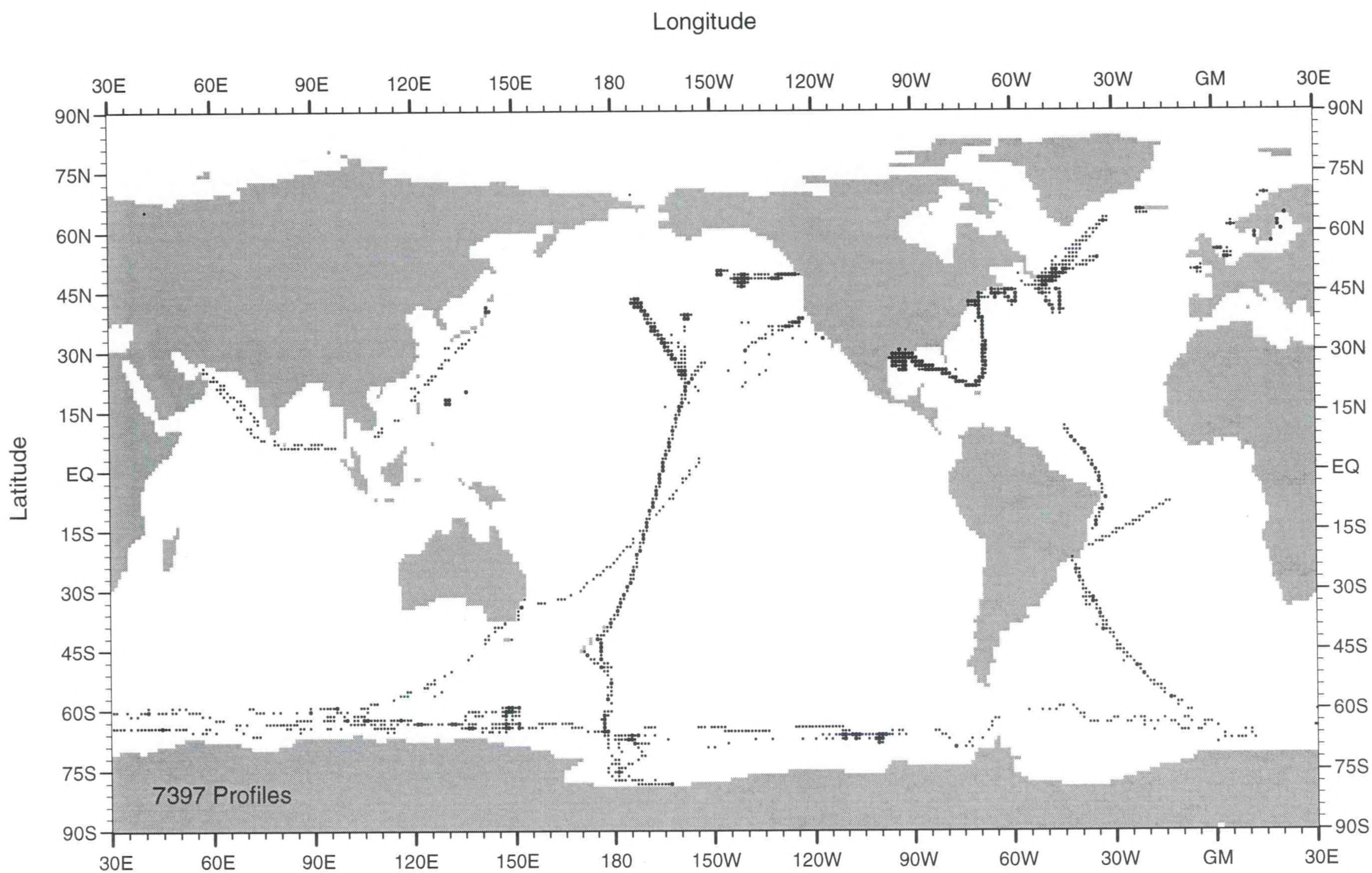


Fig. B25 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1947

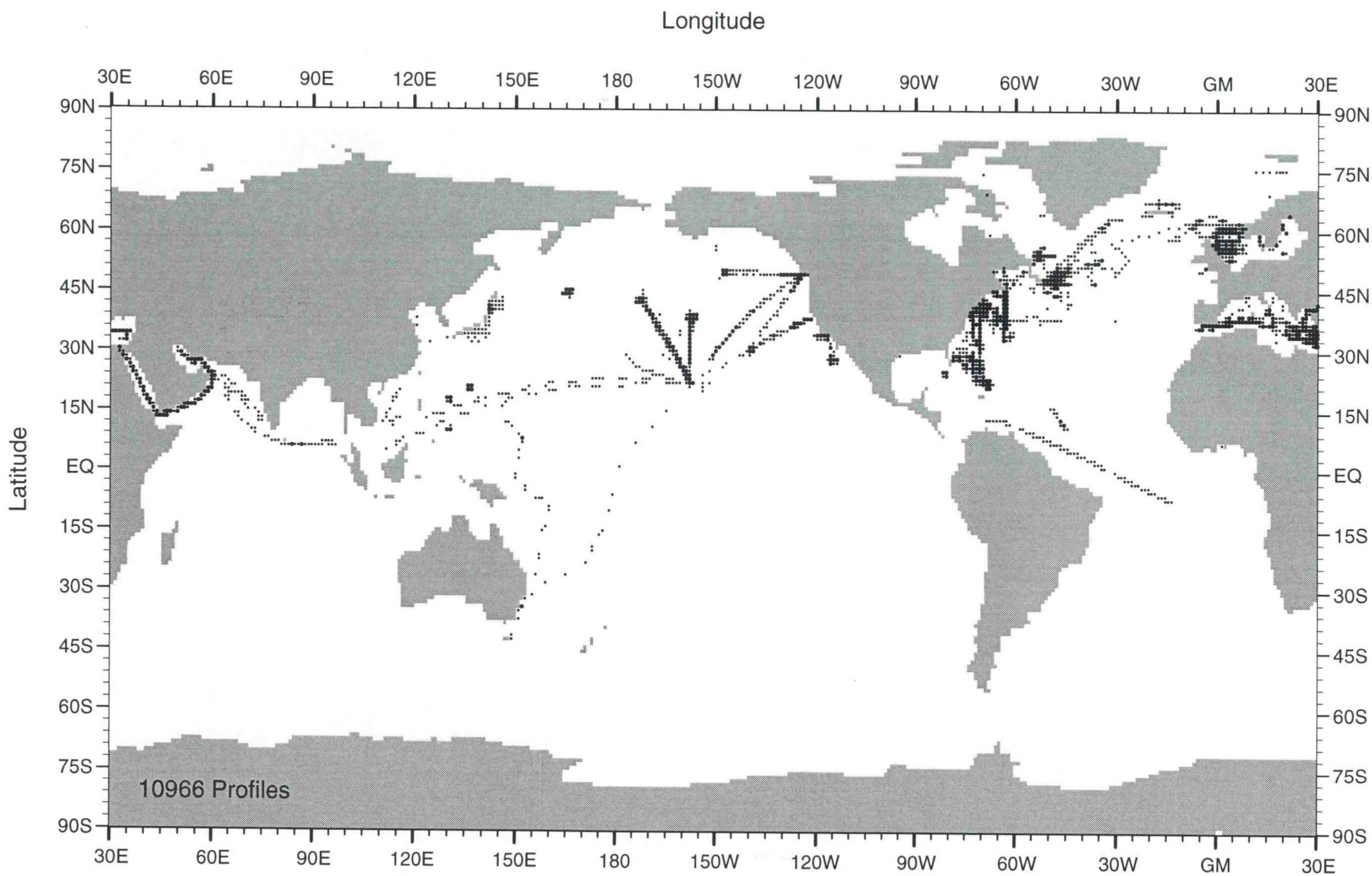


Fig. B26 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1947

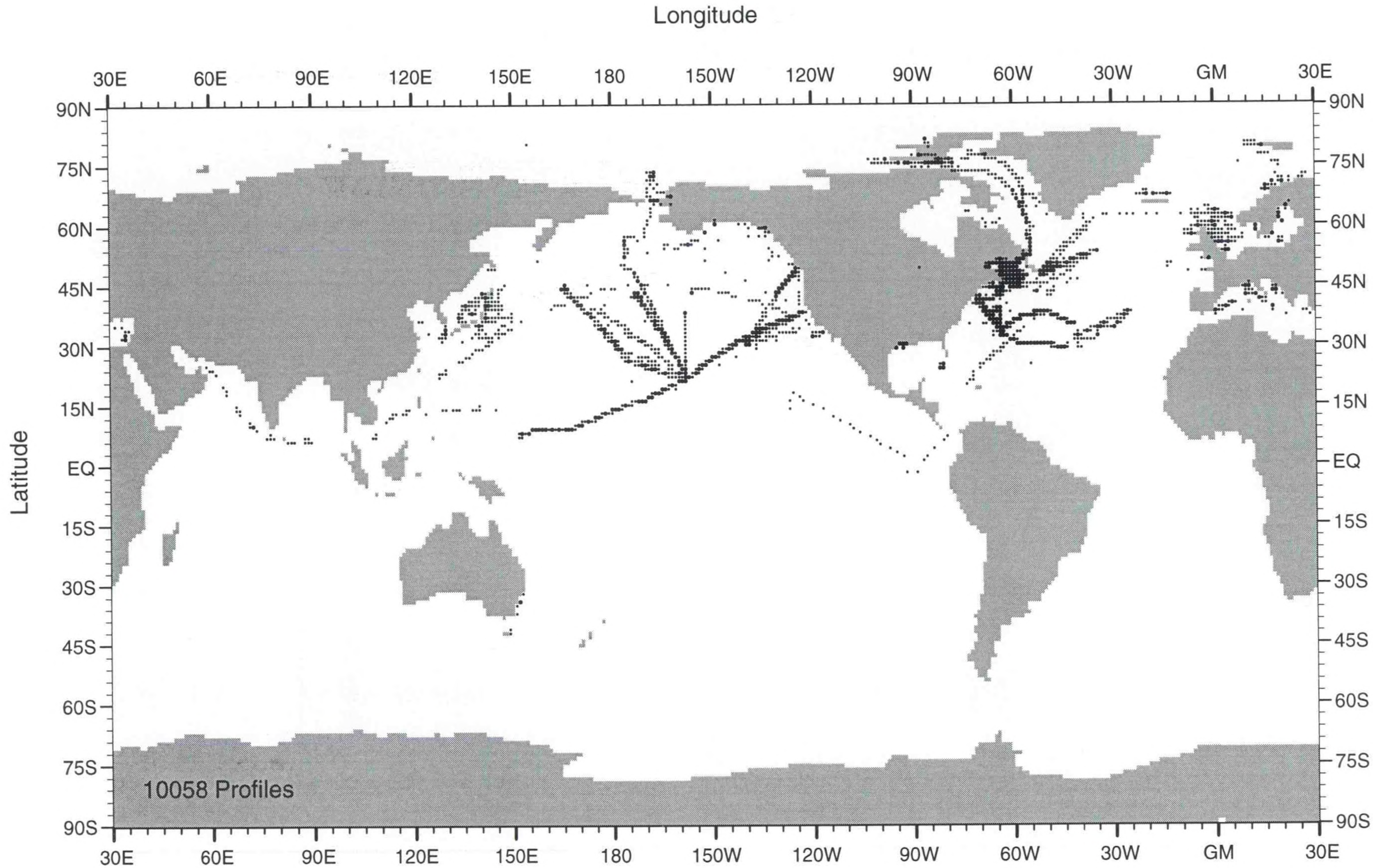


Fig. B27 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1947

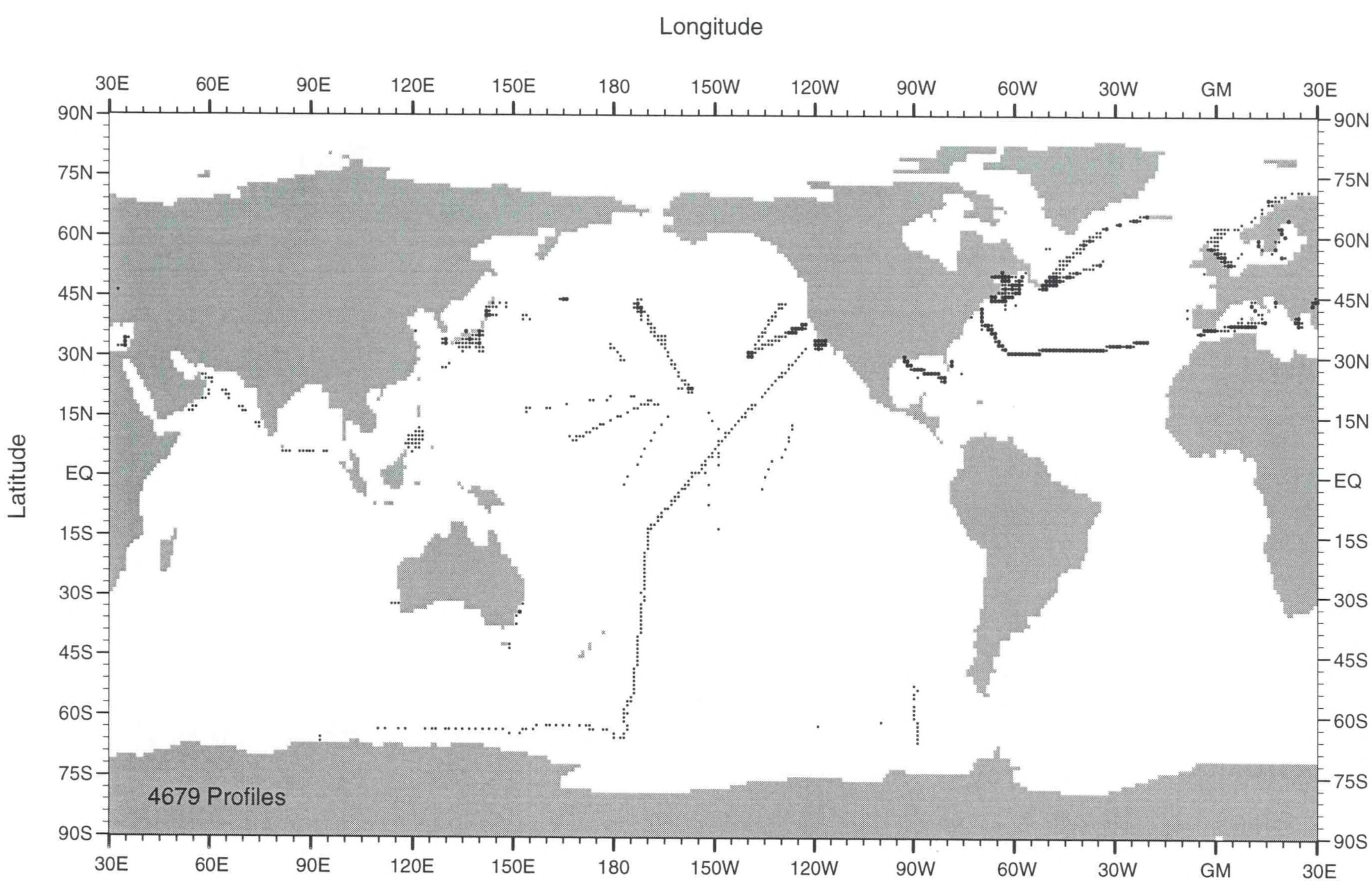


Fig. B28 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1947

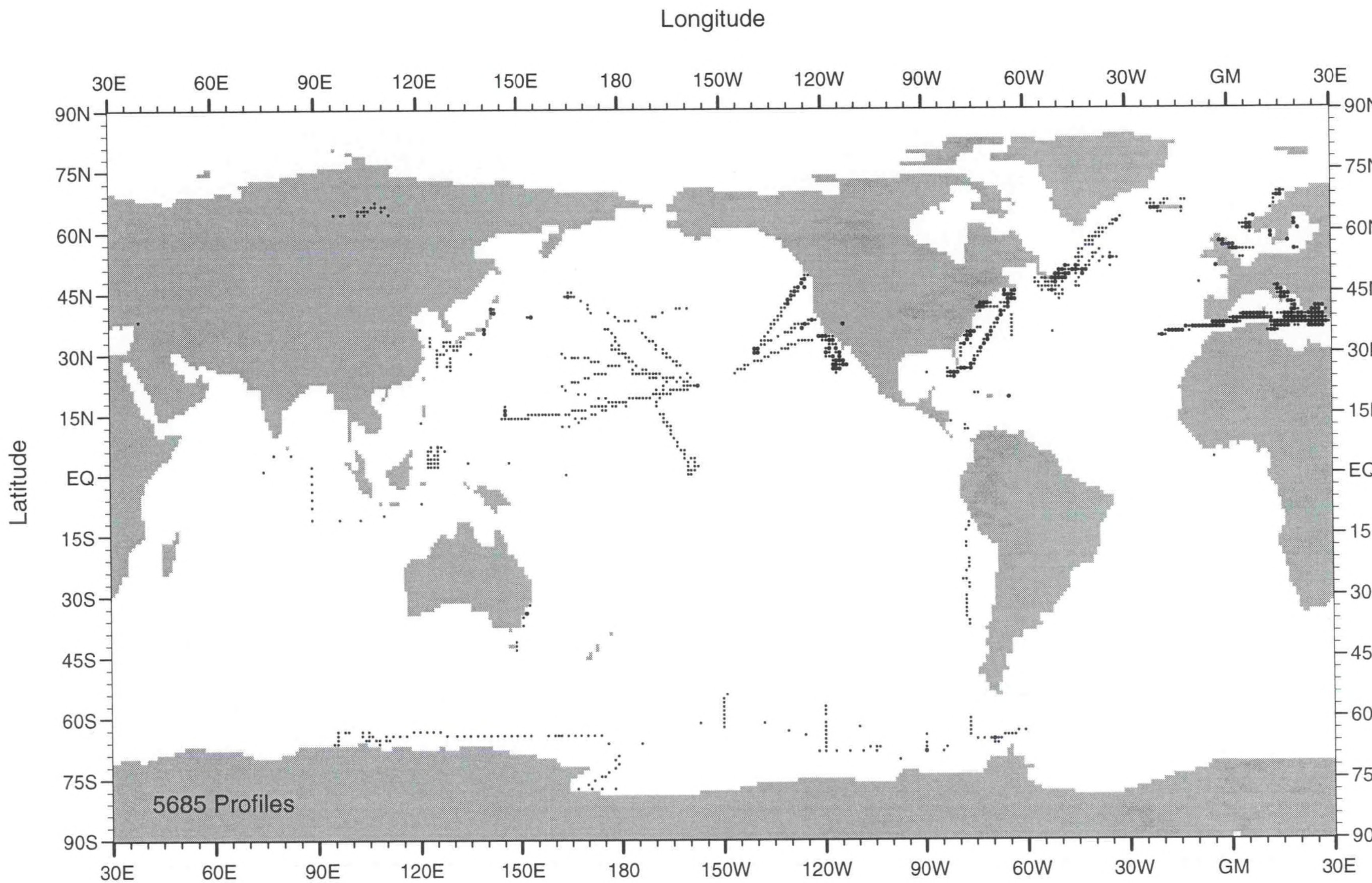


Fig. B29 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1948

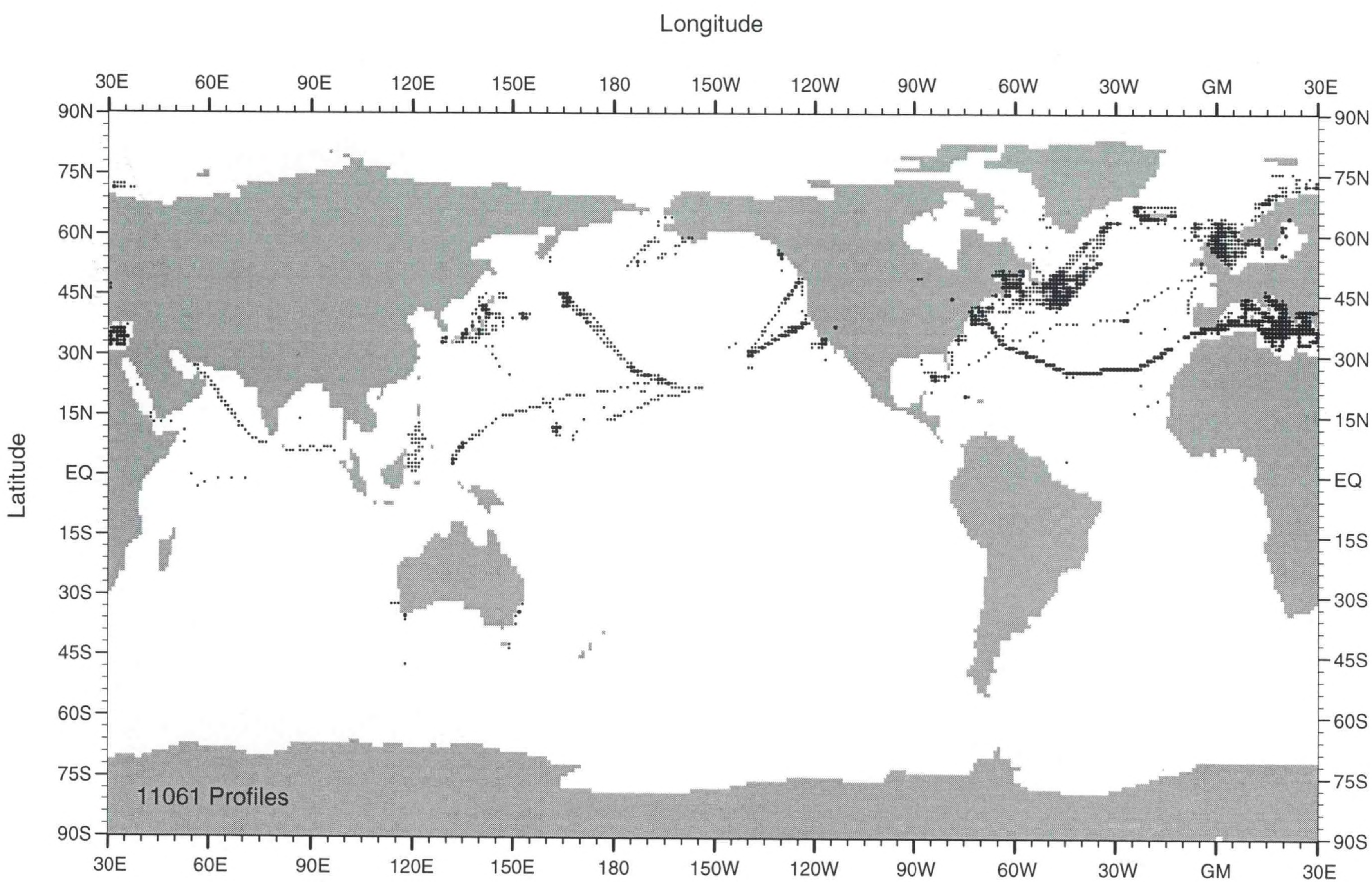


Fig. B30 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1948

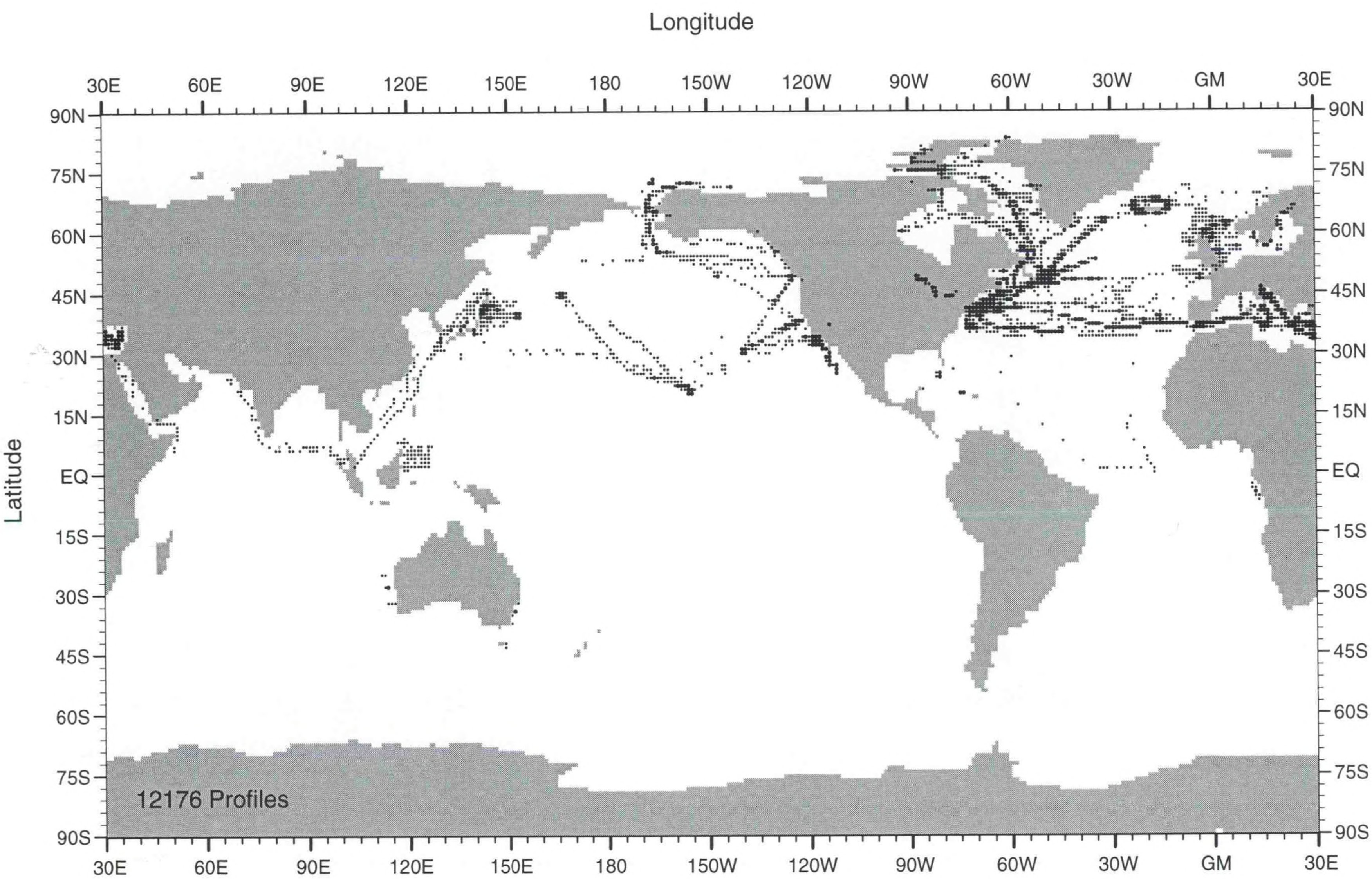


Fig. B31 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1948

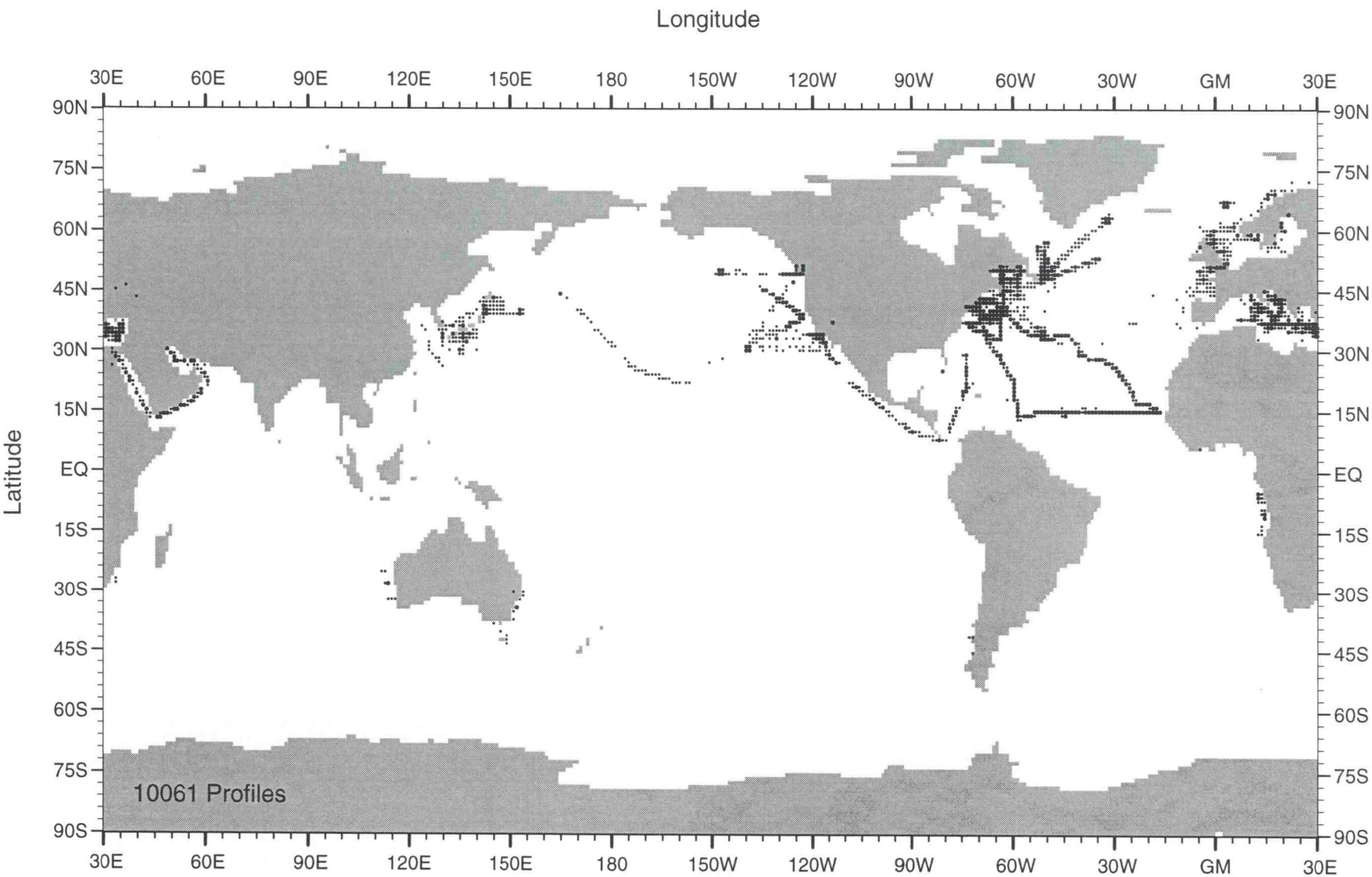


Fig. B32 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1948

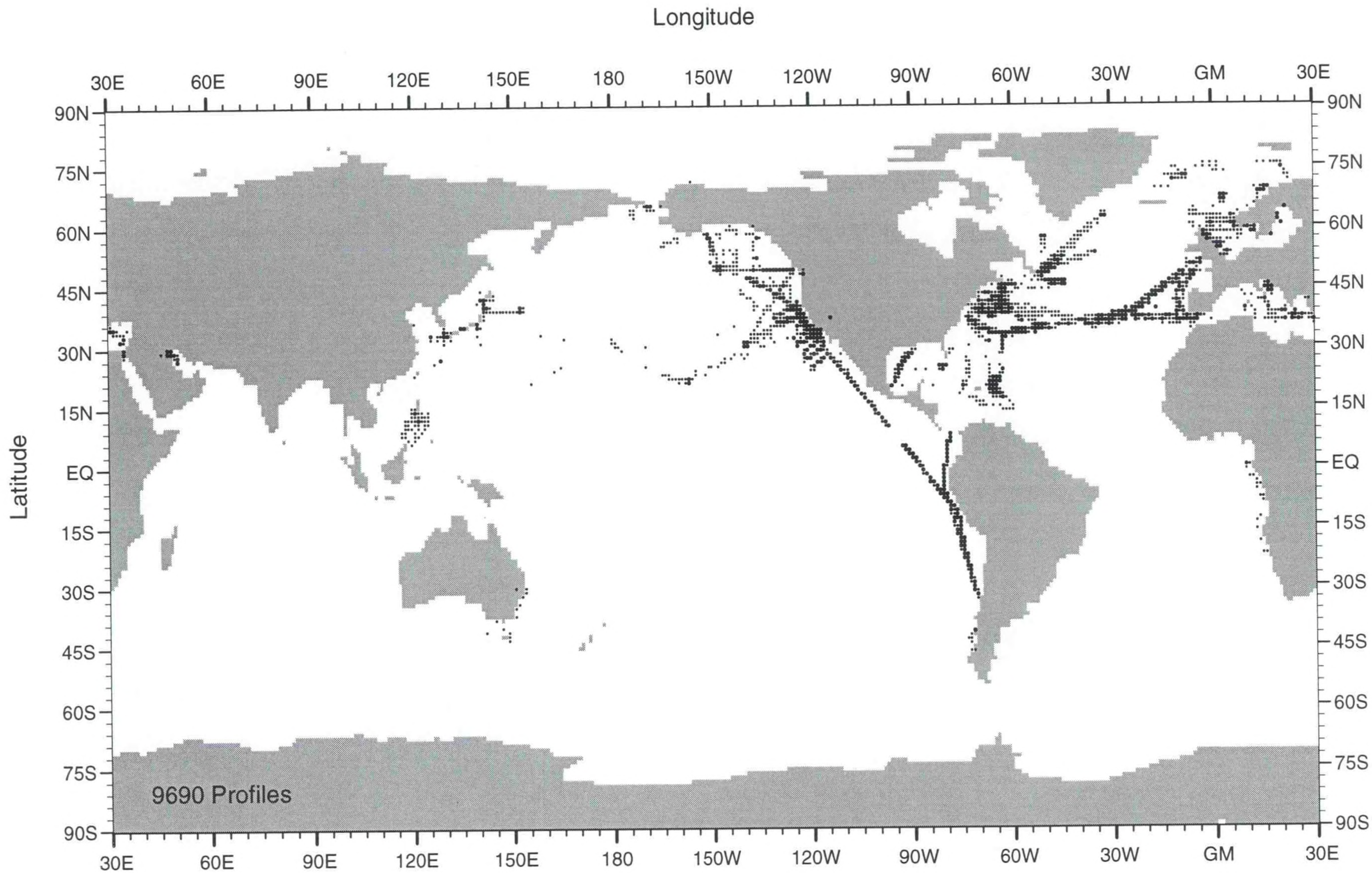


Fig. B33 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1949

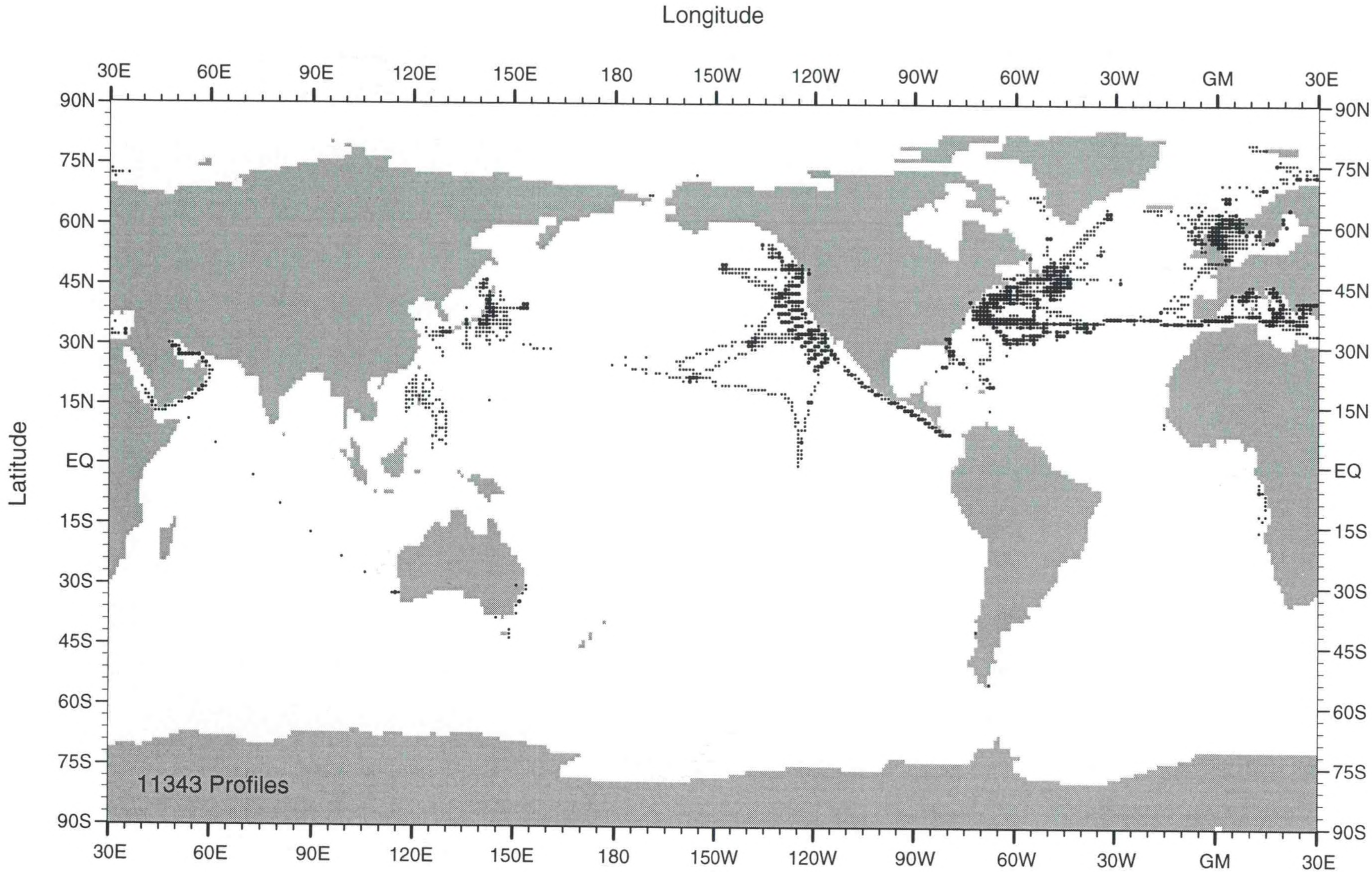


Fig. B34 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1949

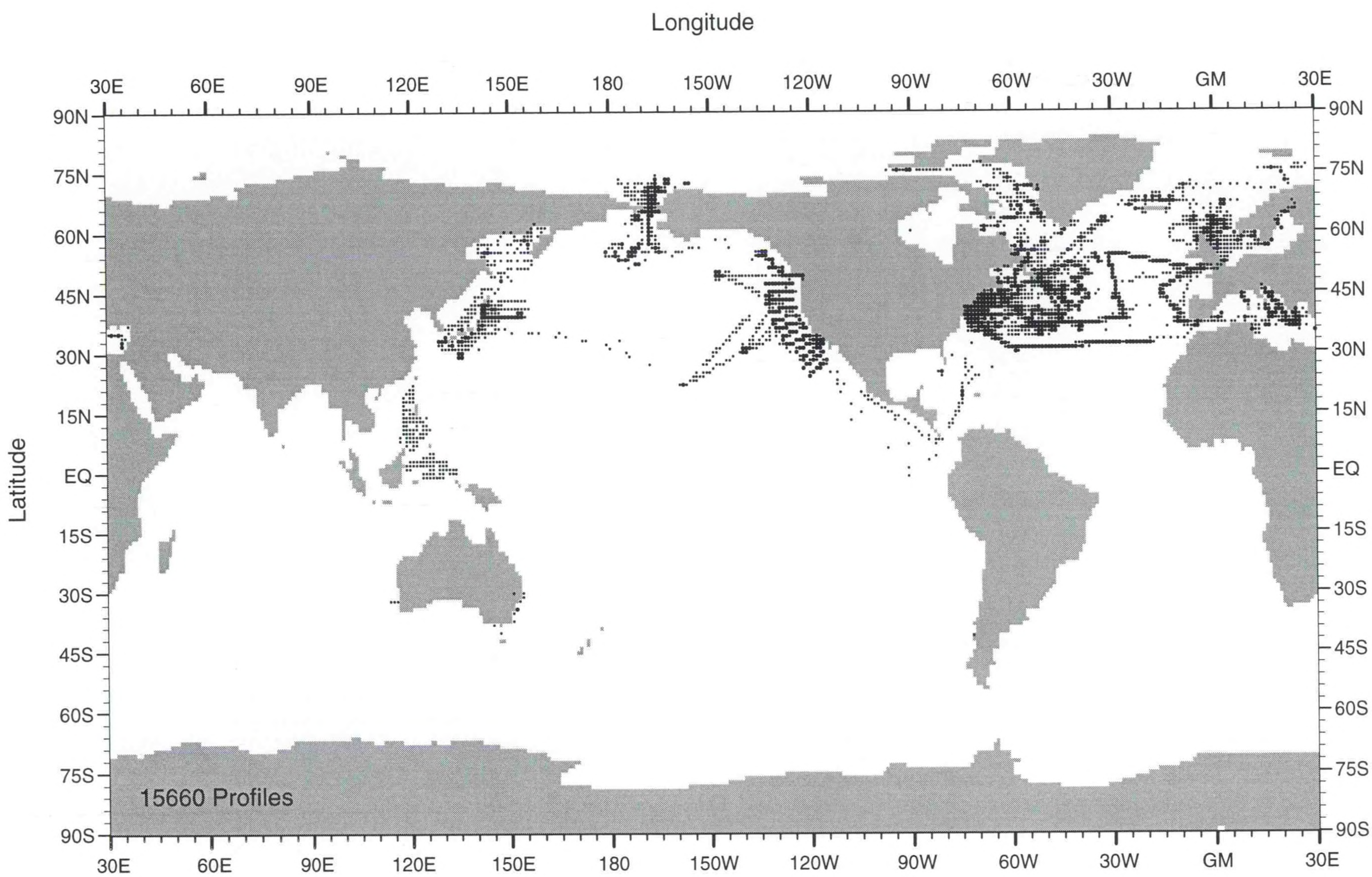


Fig. B35 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1949

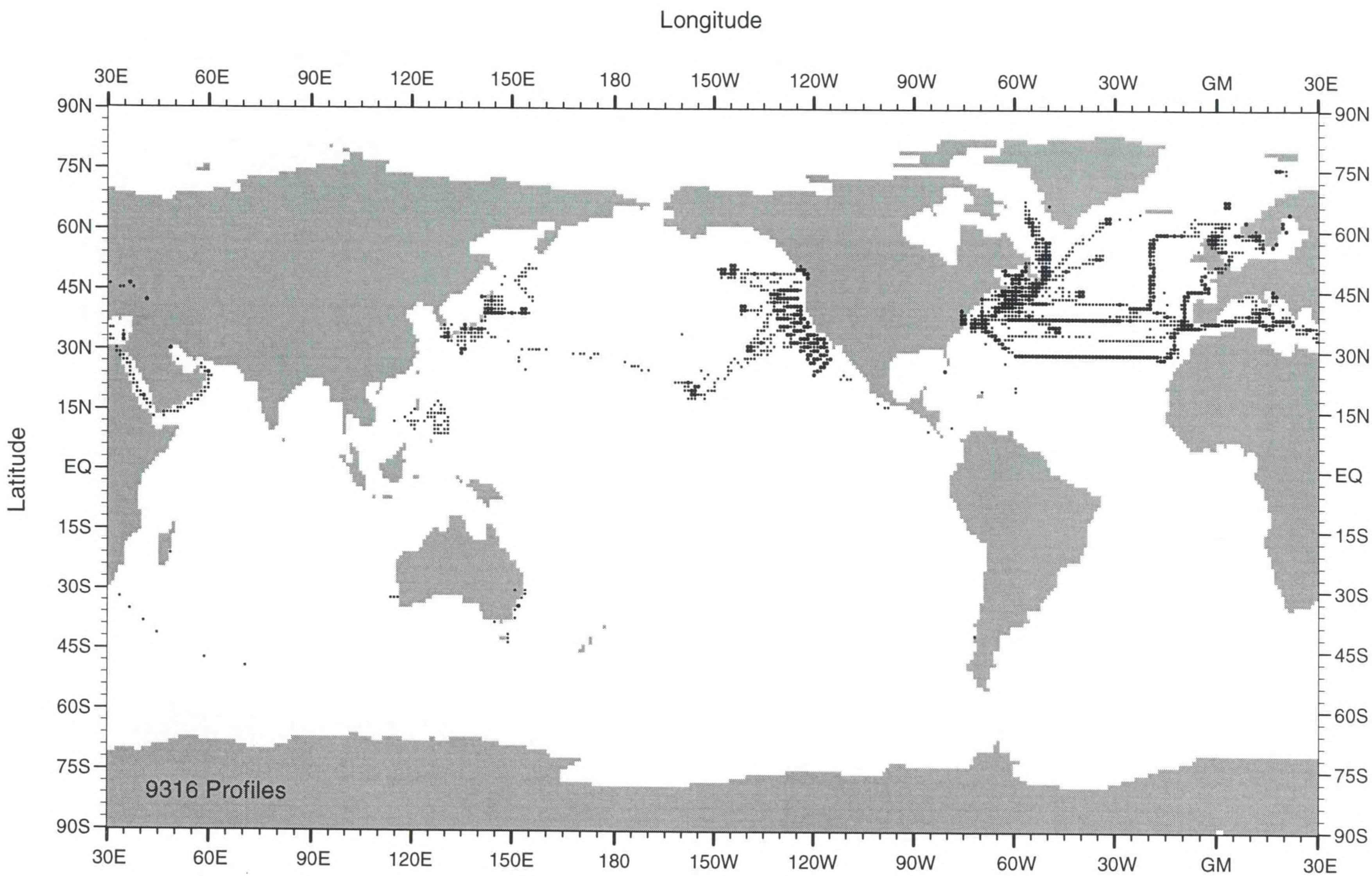


Fig. B36 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1949

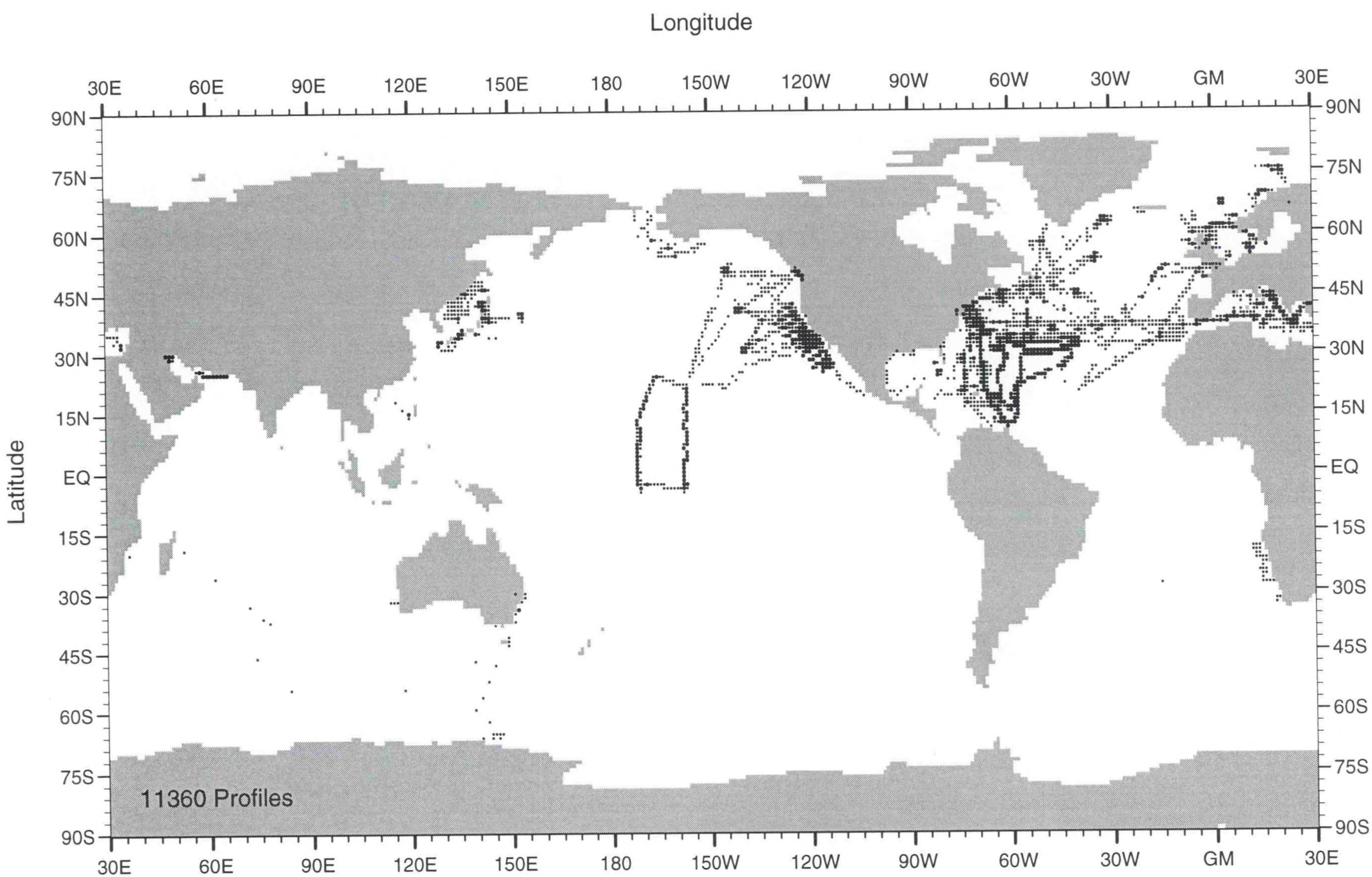


Fig. B37 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1950

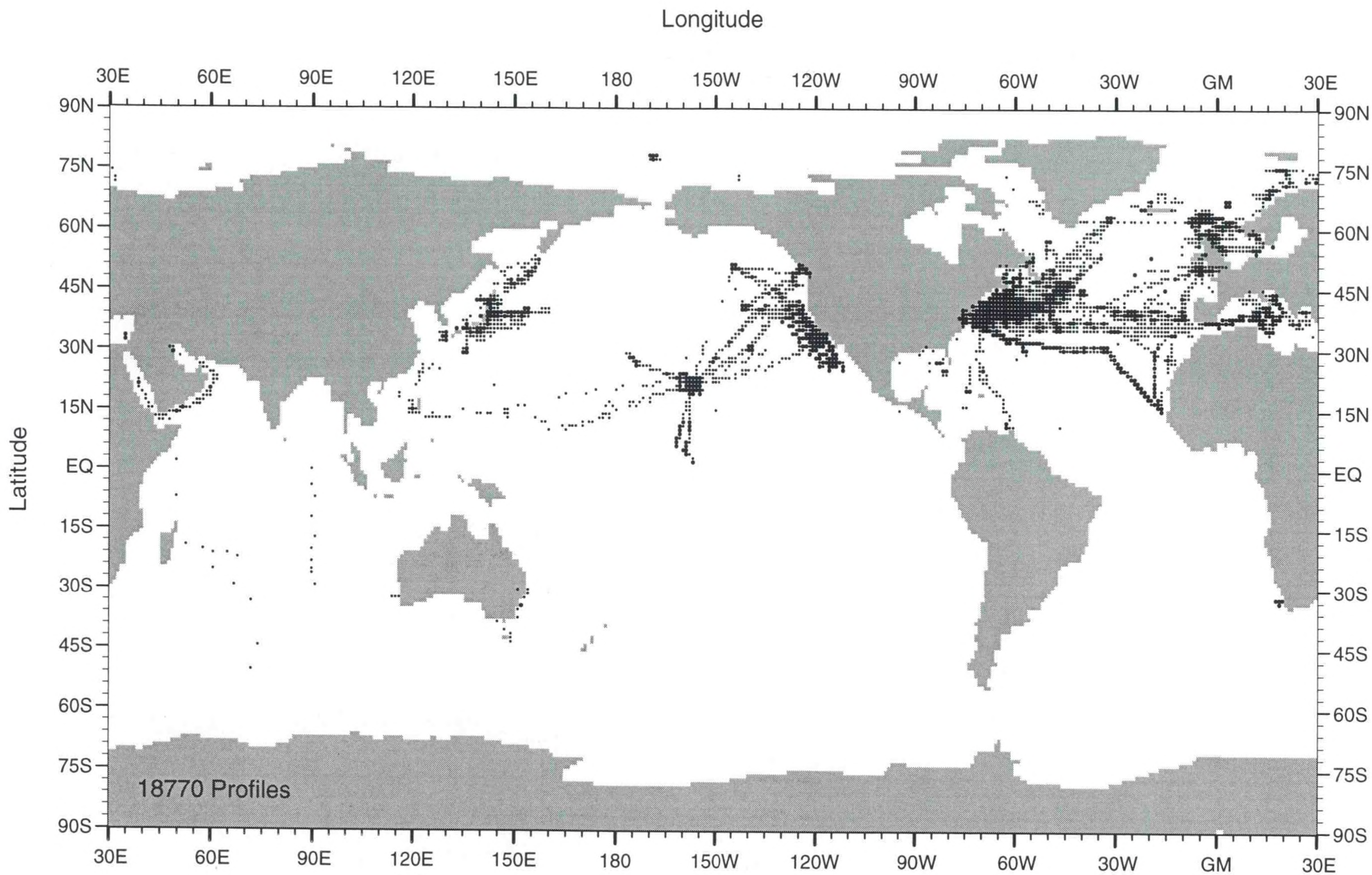


Fig. B38 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1950

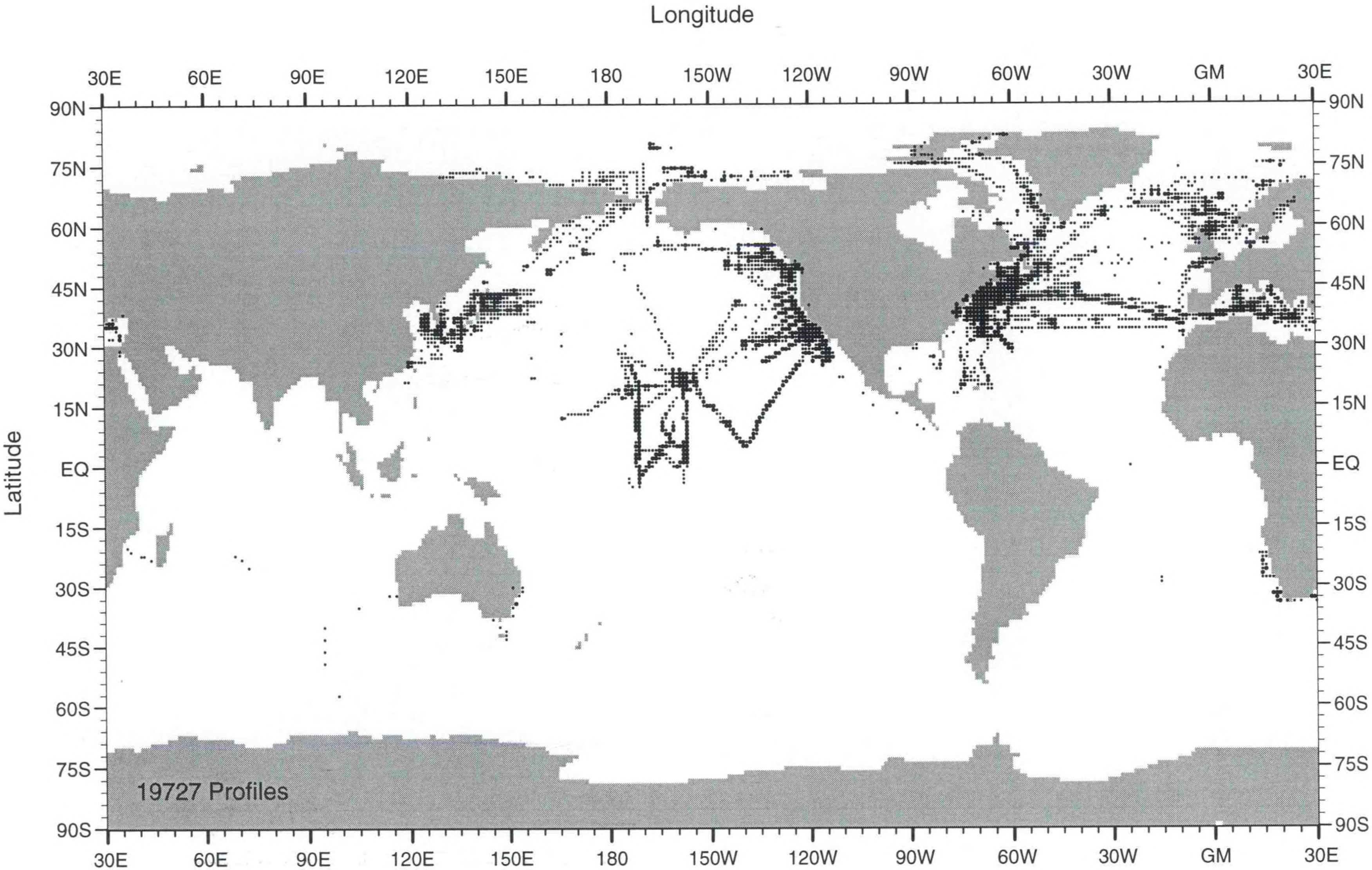


Fig. B39 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1950

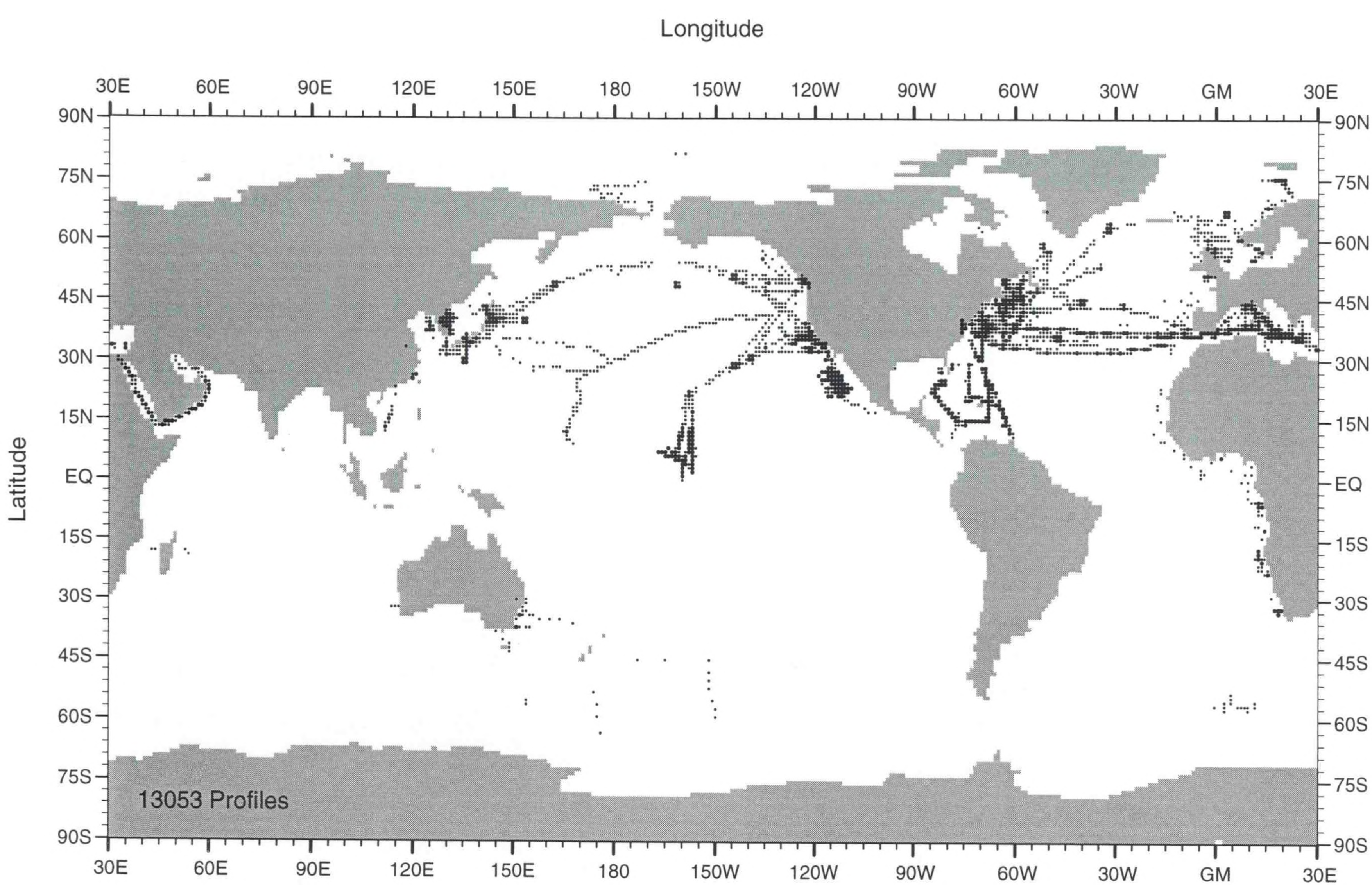


Fig. B40 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1950

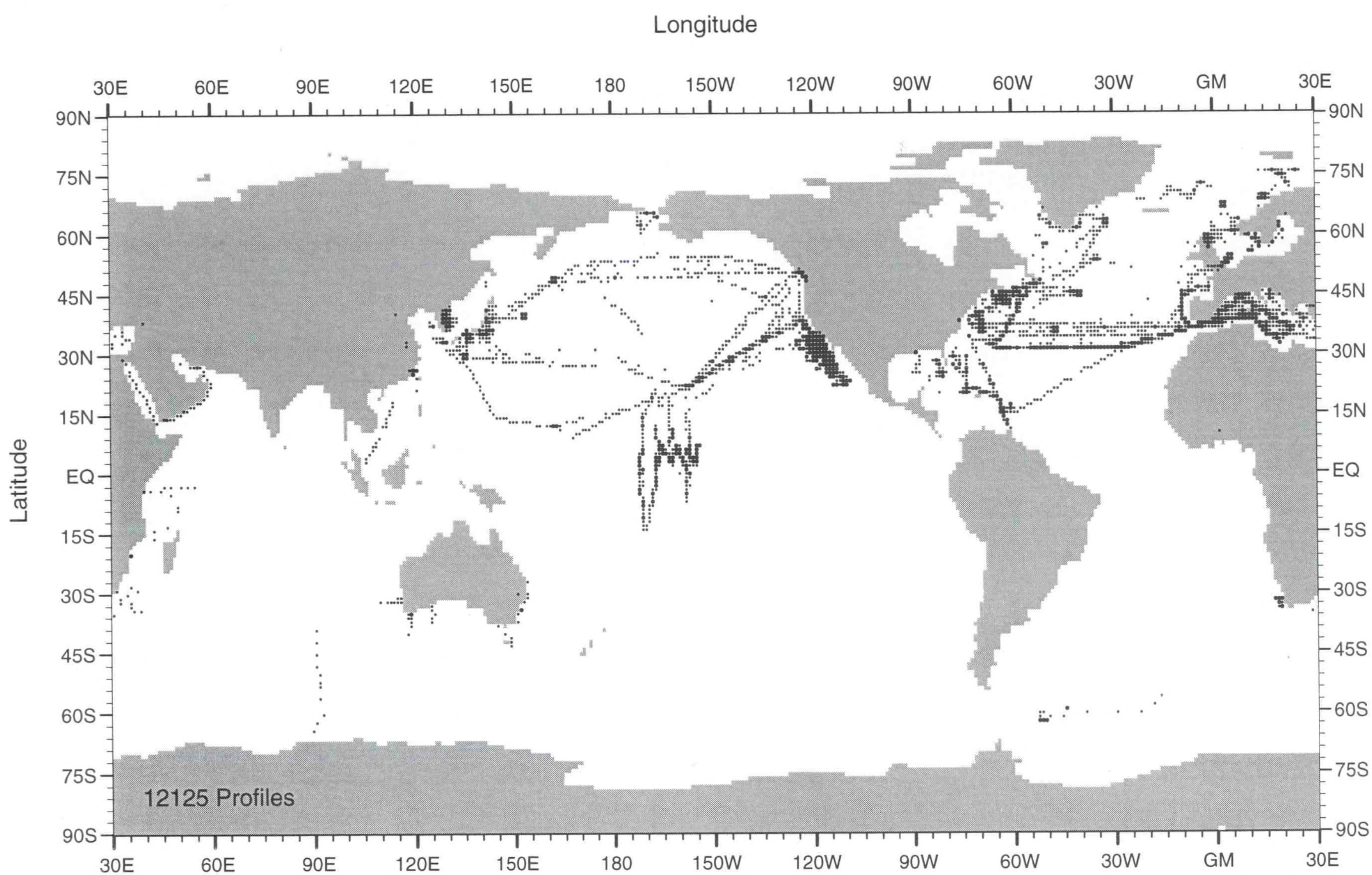


Fig. B41 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1951

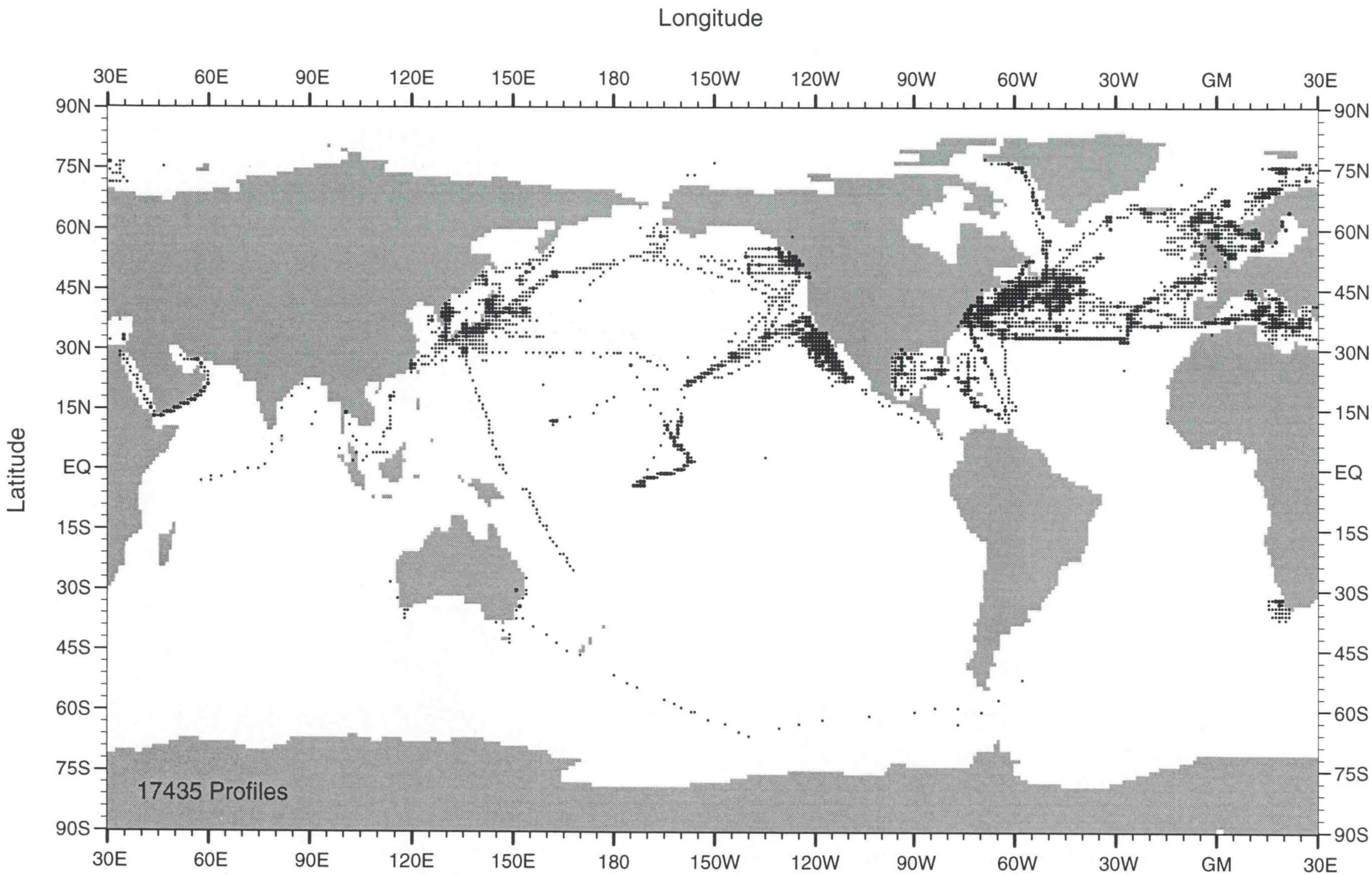


Fig. B42 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1951

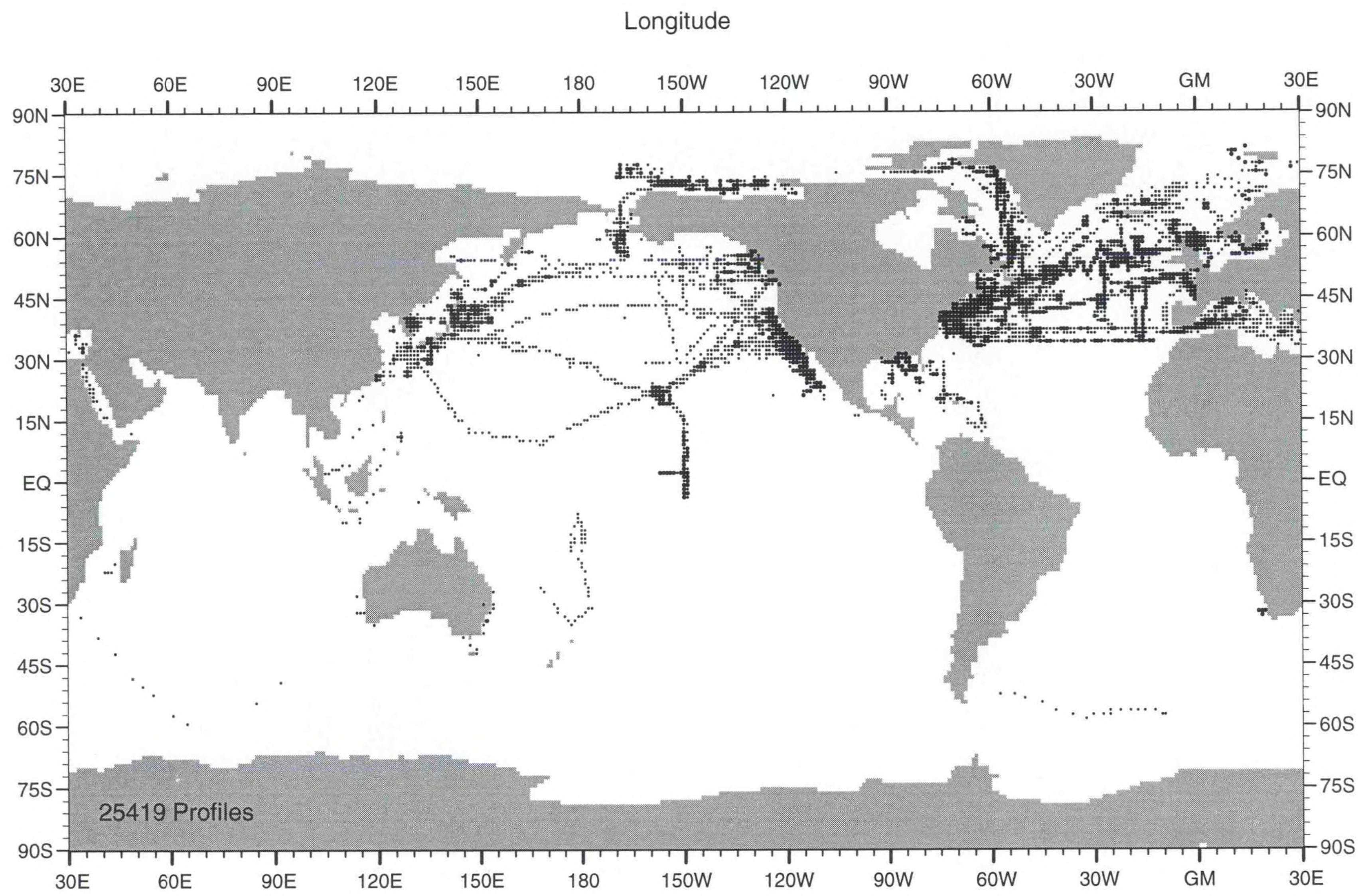


Fig. B43 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1951

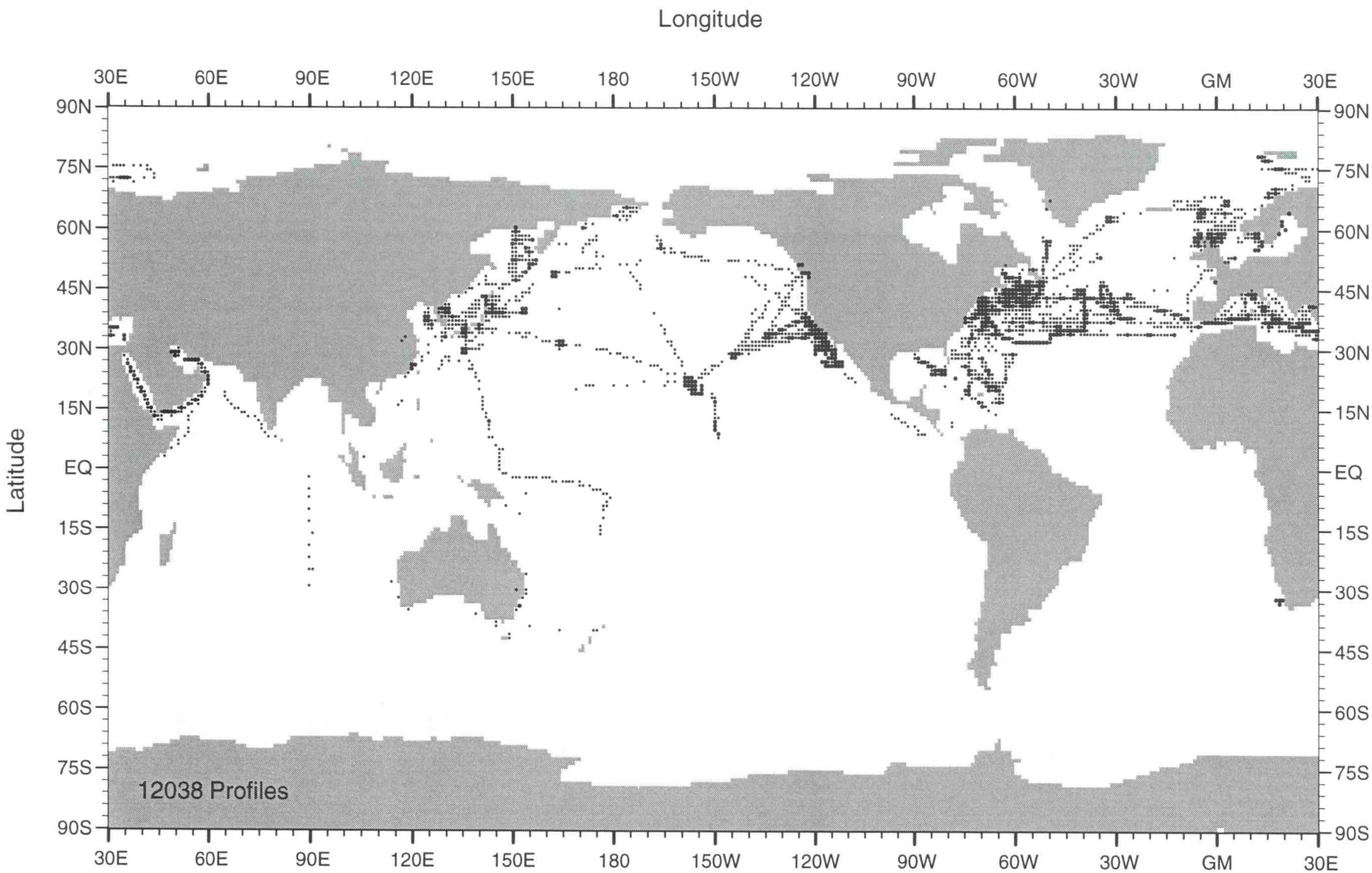


Fig. B44 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1951

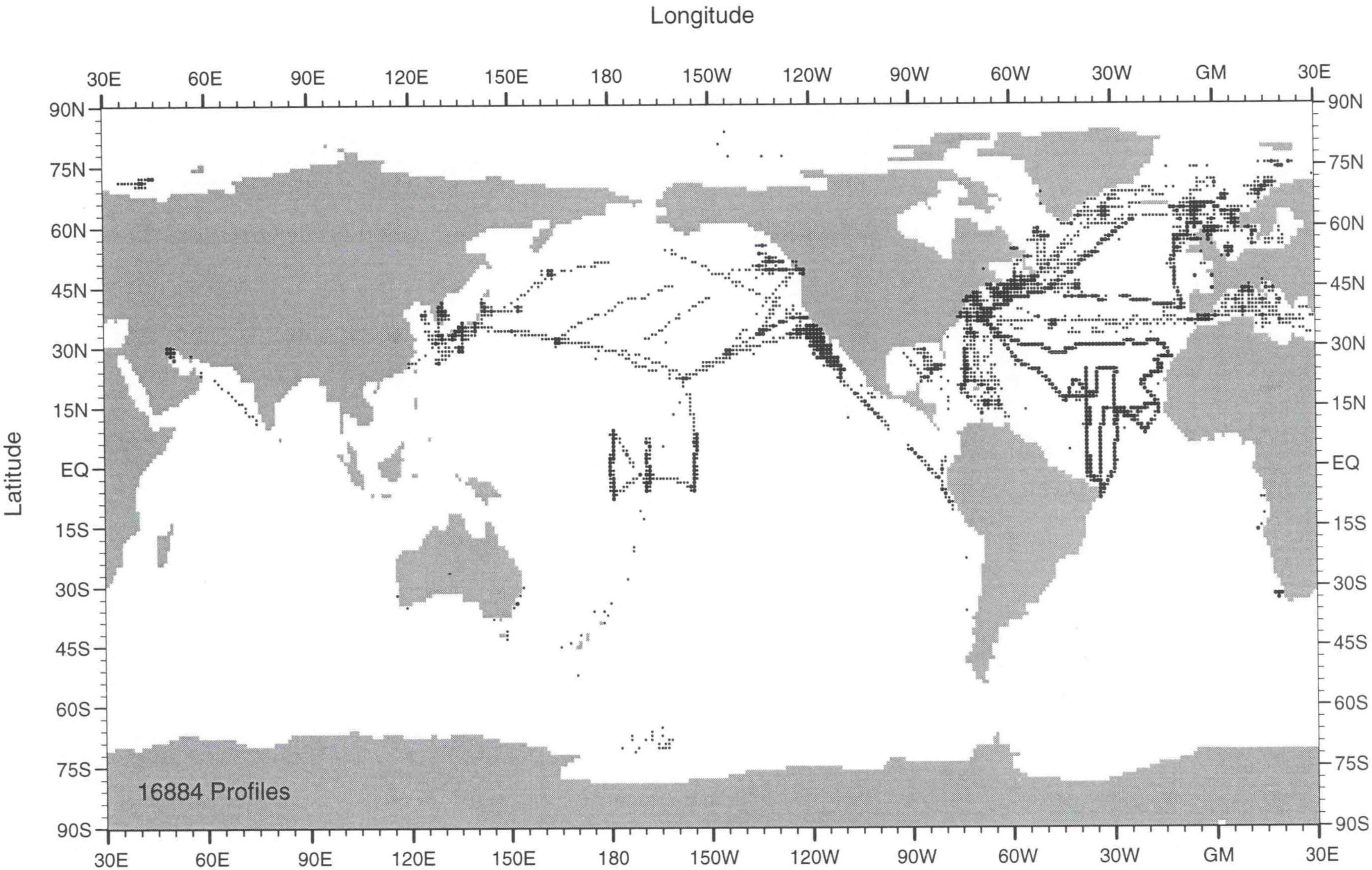


Fig. B45 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1952

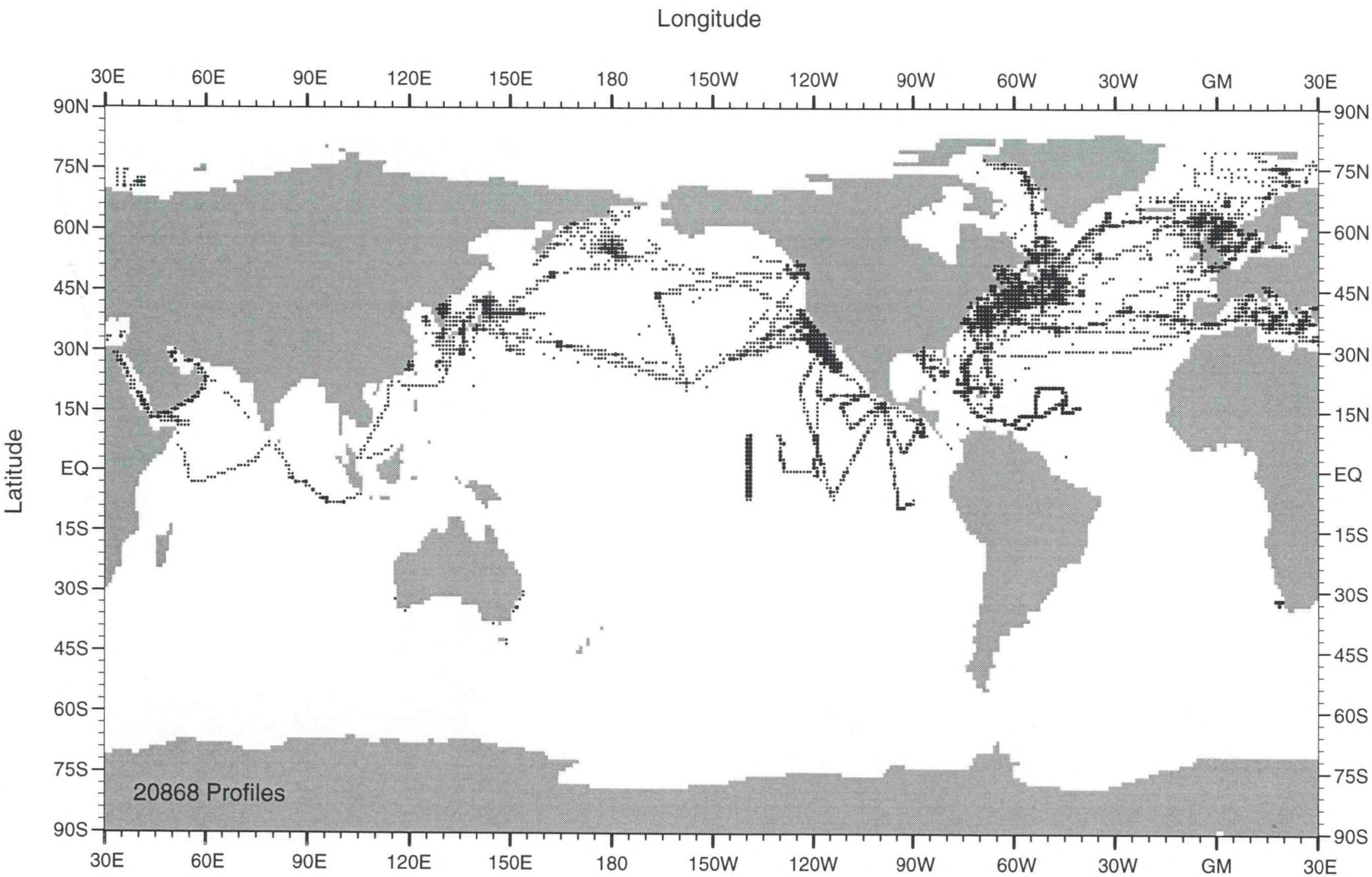


Fig. B46 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1952

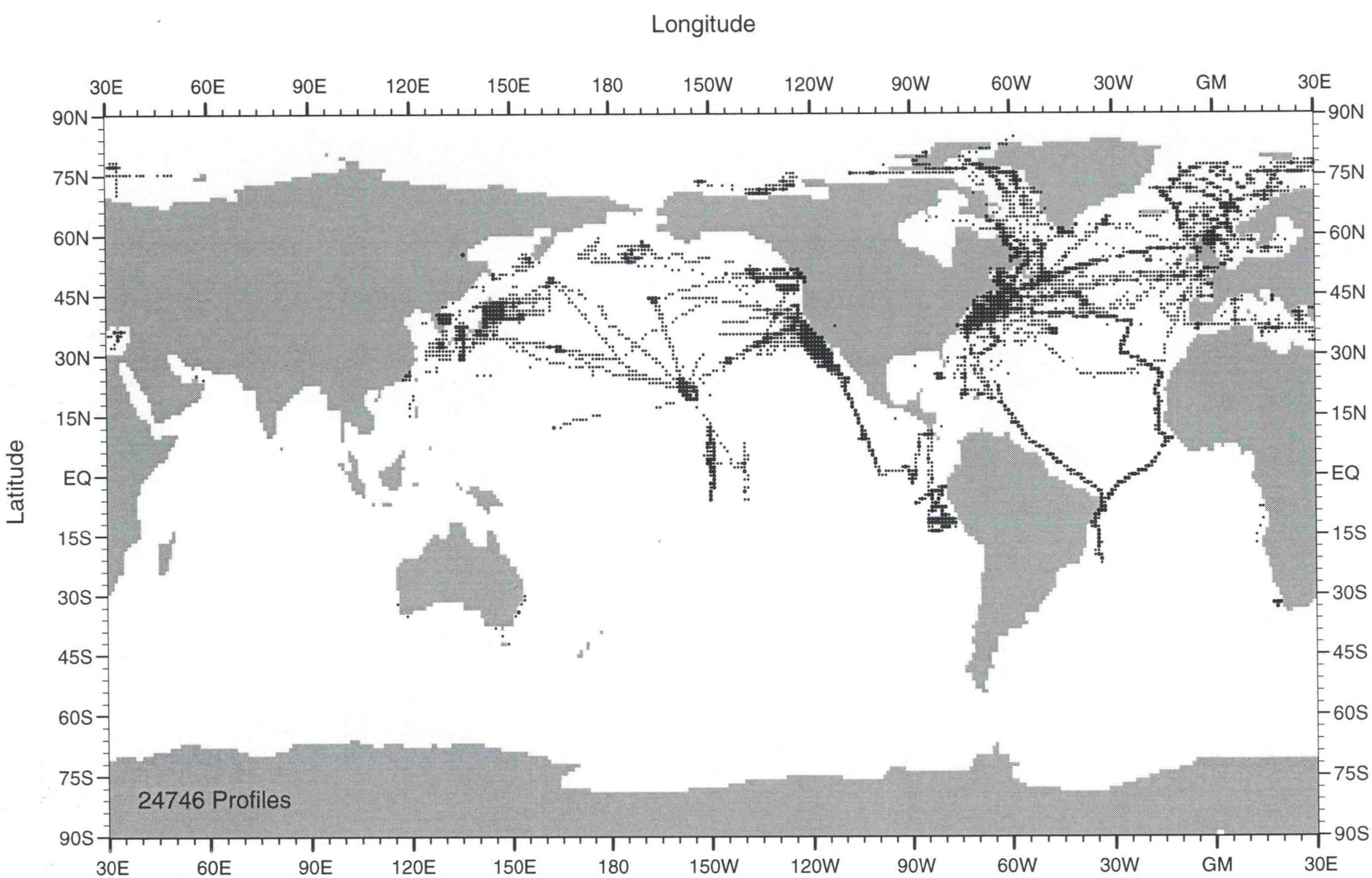


Fig. B47 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1952

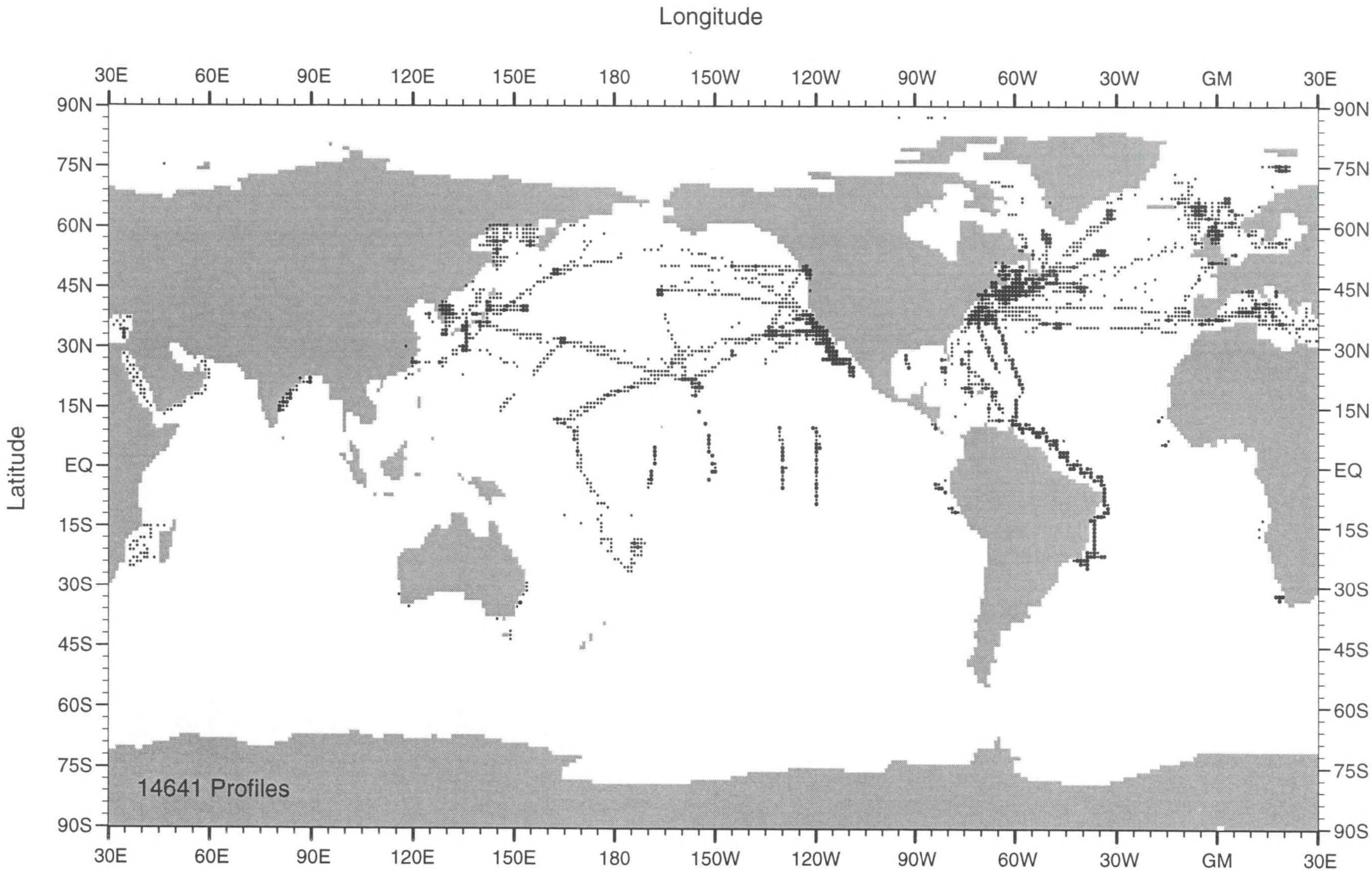


Fig. B48 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1952

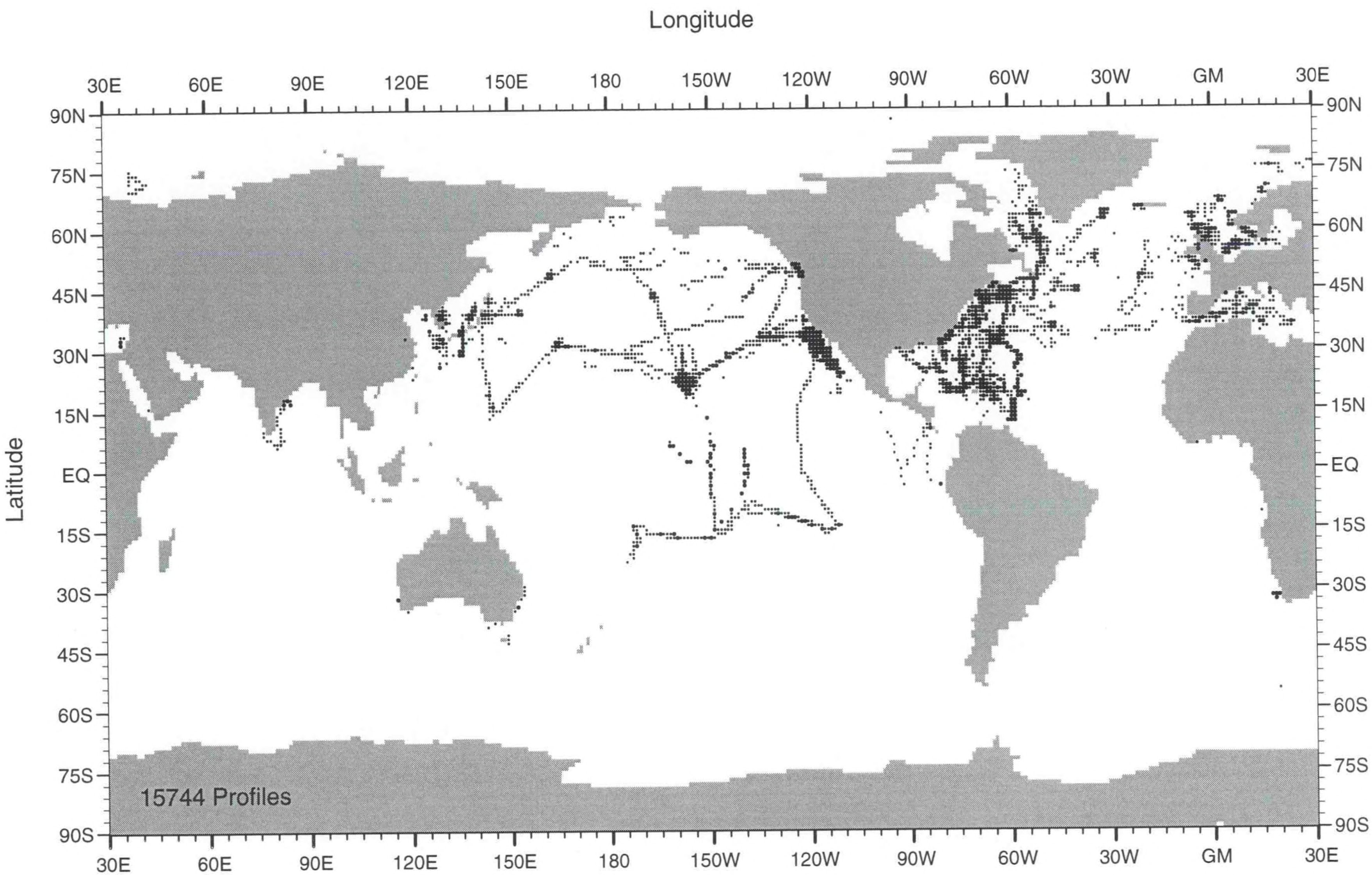


Fig. B49 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1953

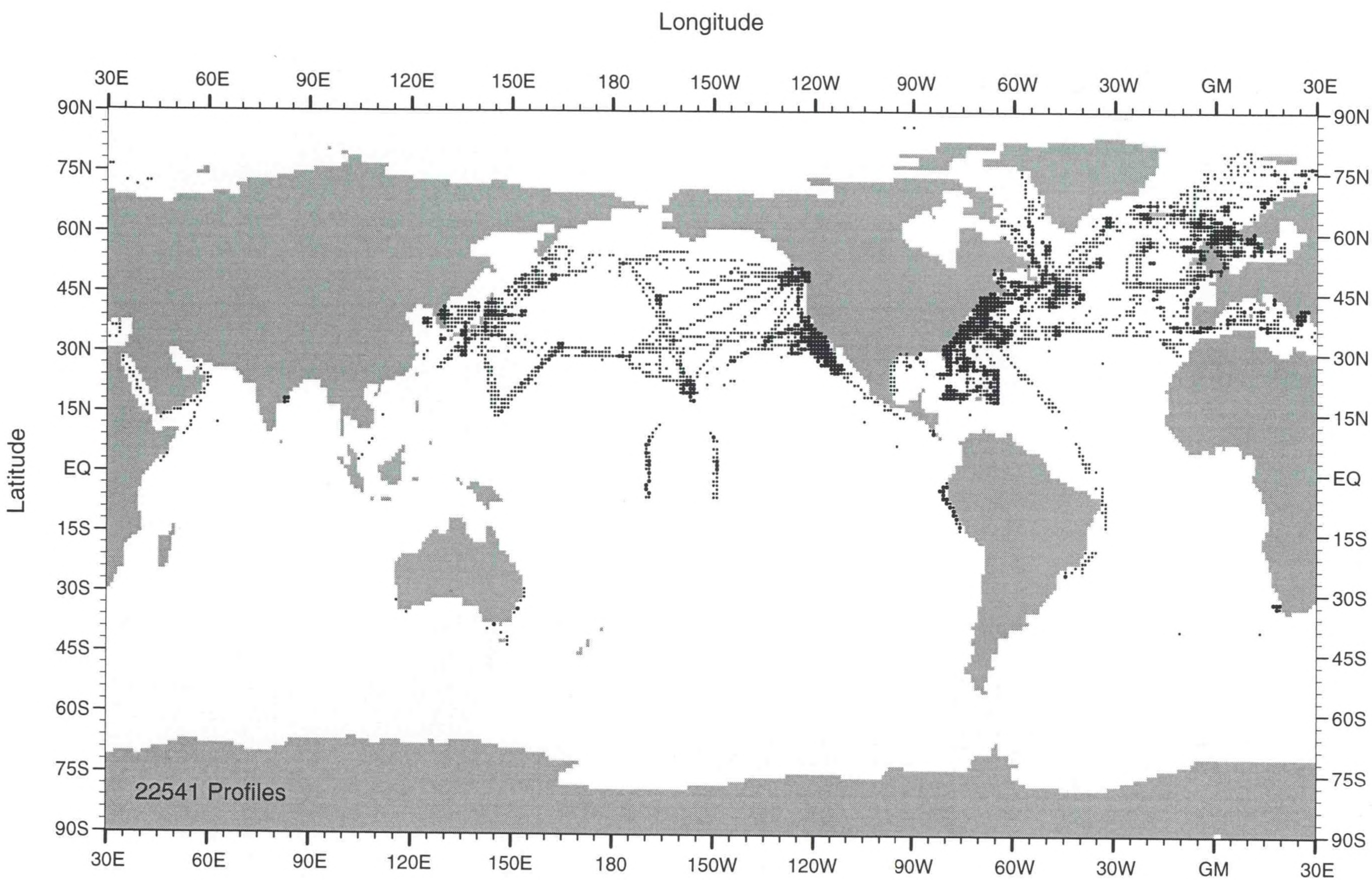


Fig. B50 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1953

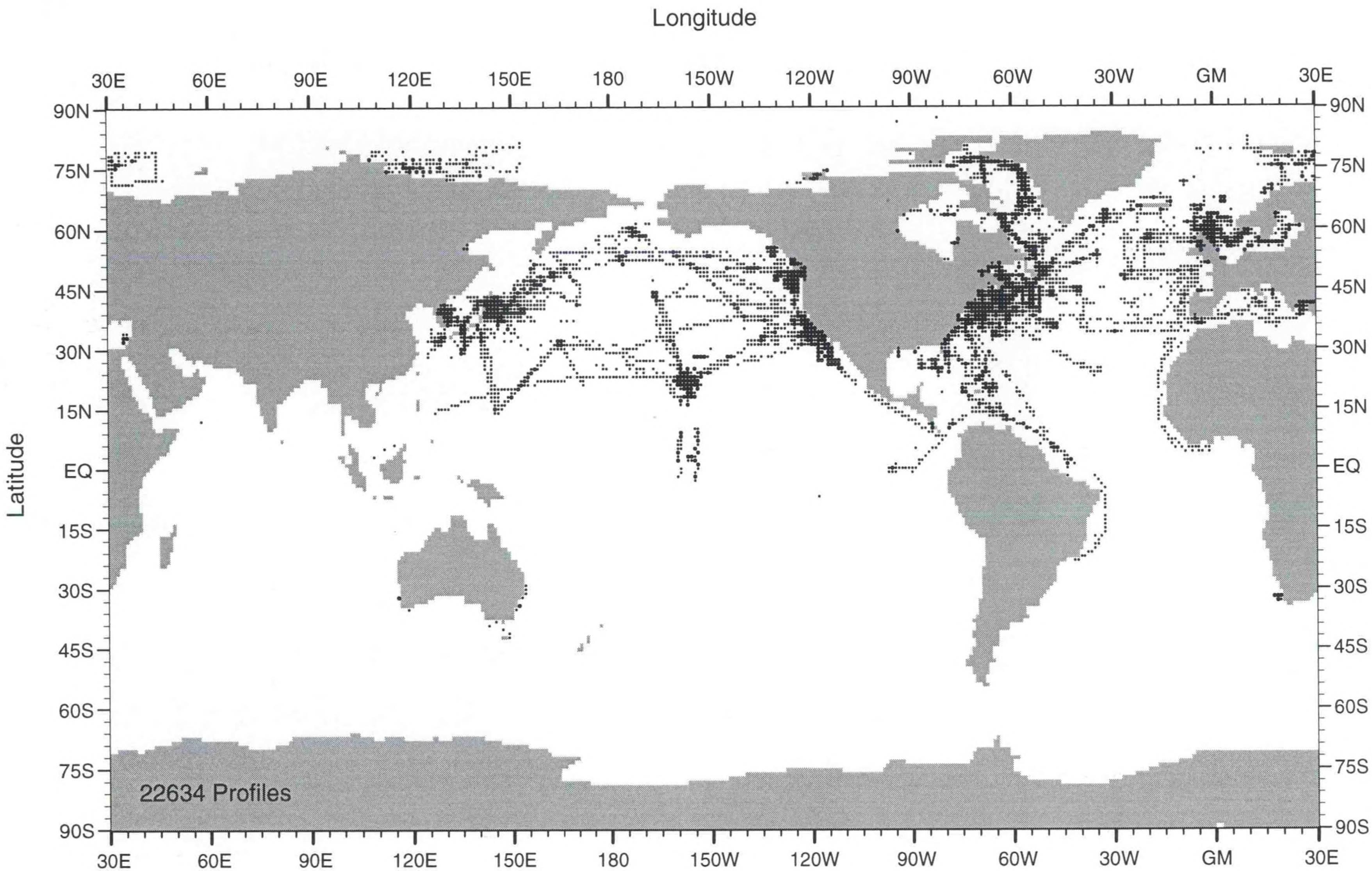


Fig. B51 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1953

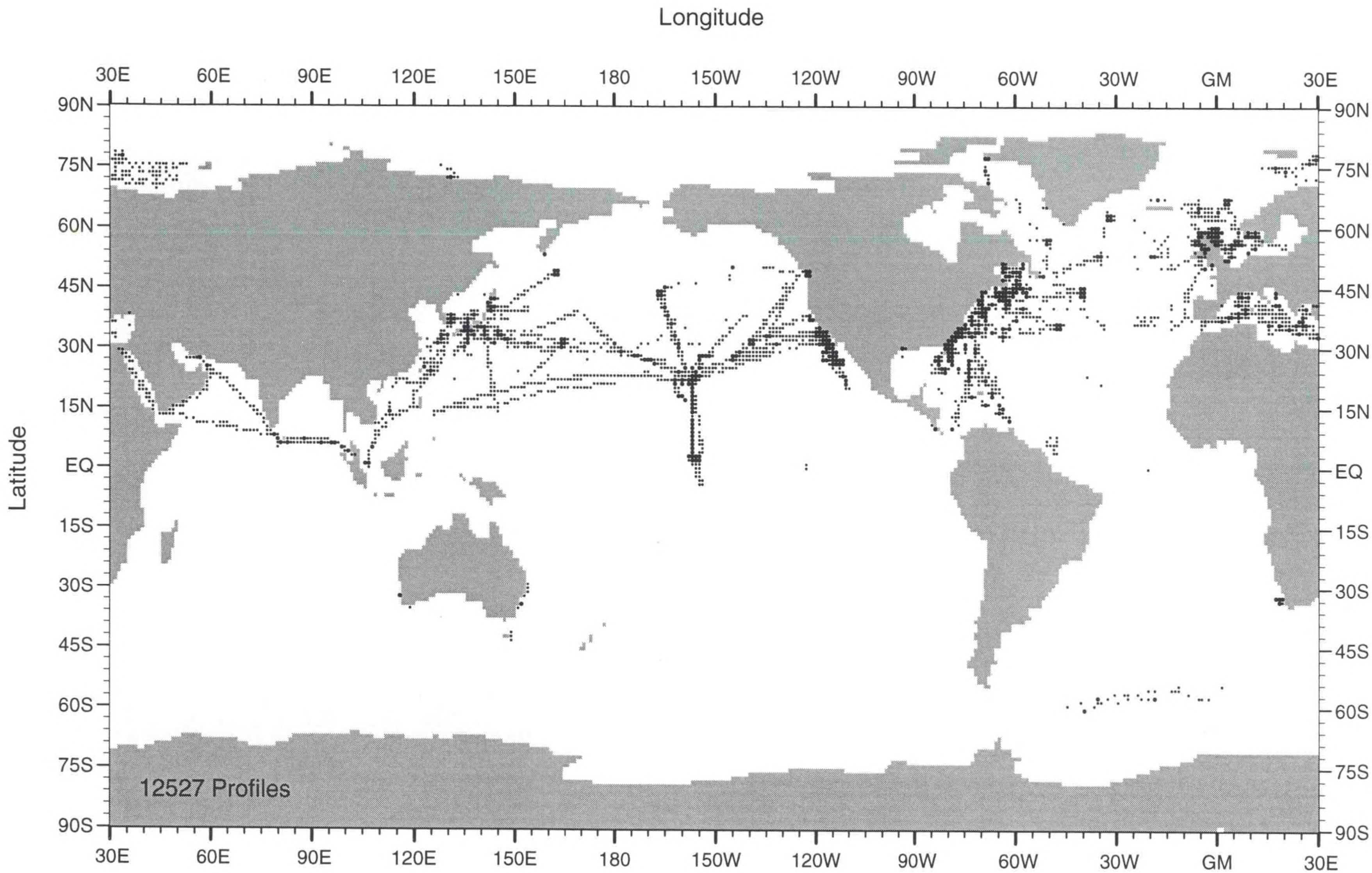


Fig. B52 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1953

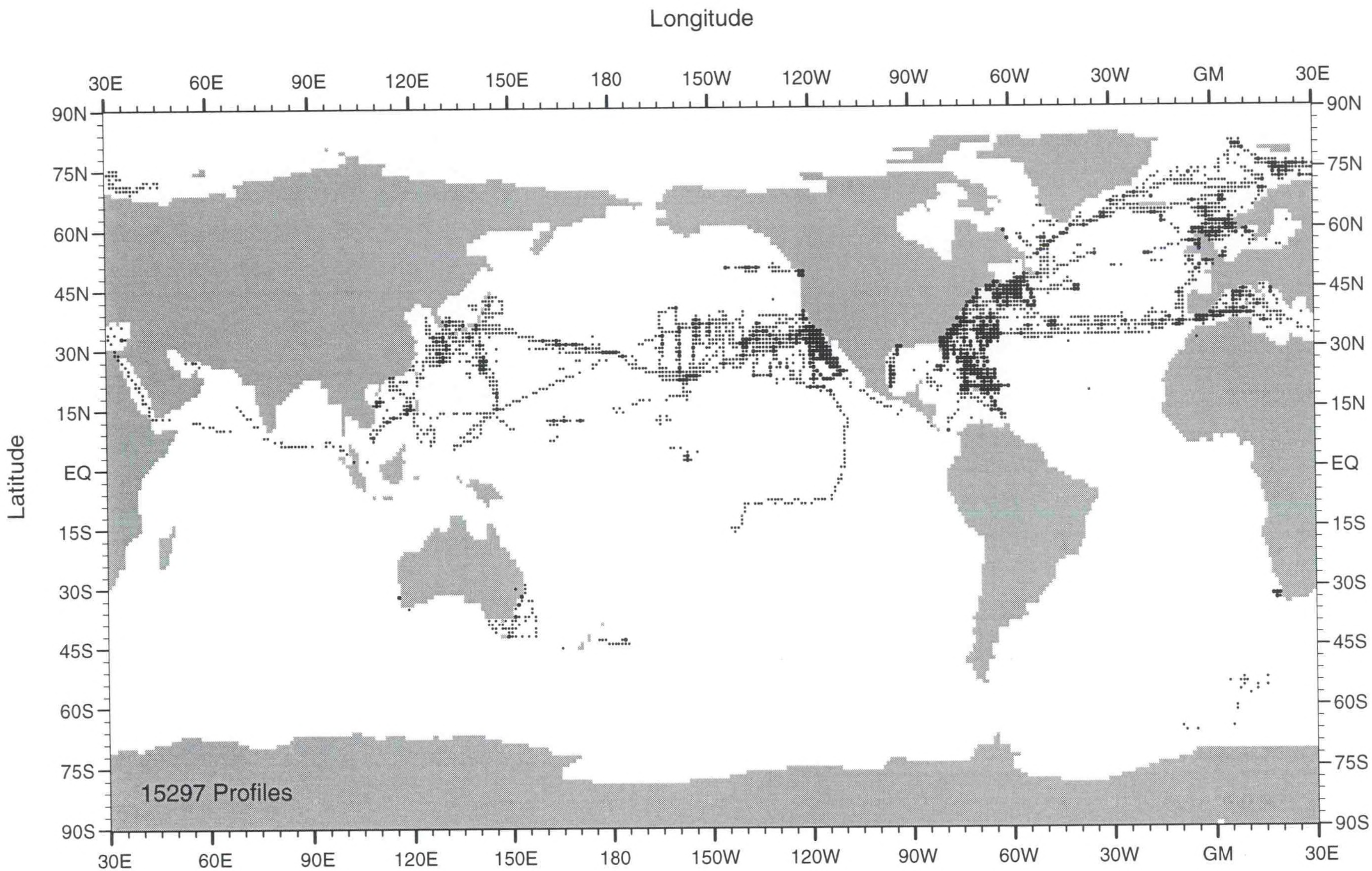


Fig. B53 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1954

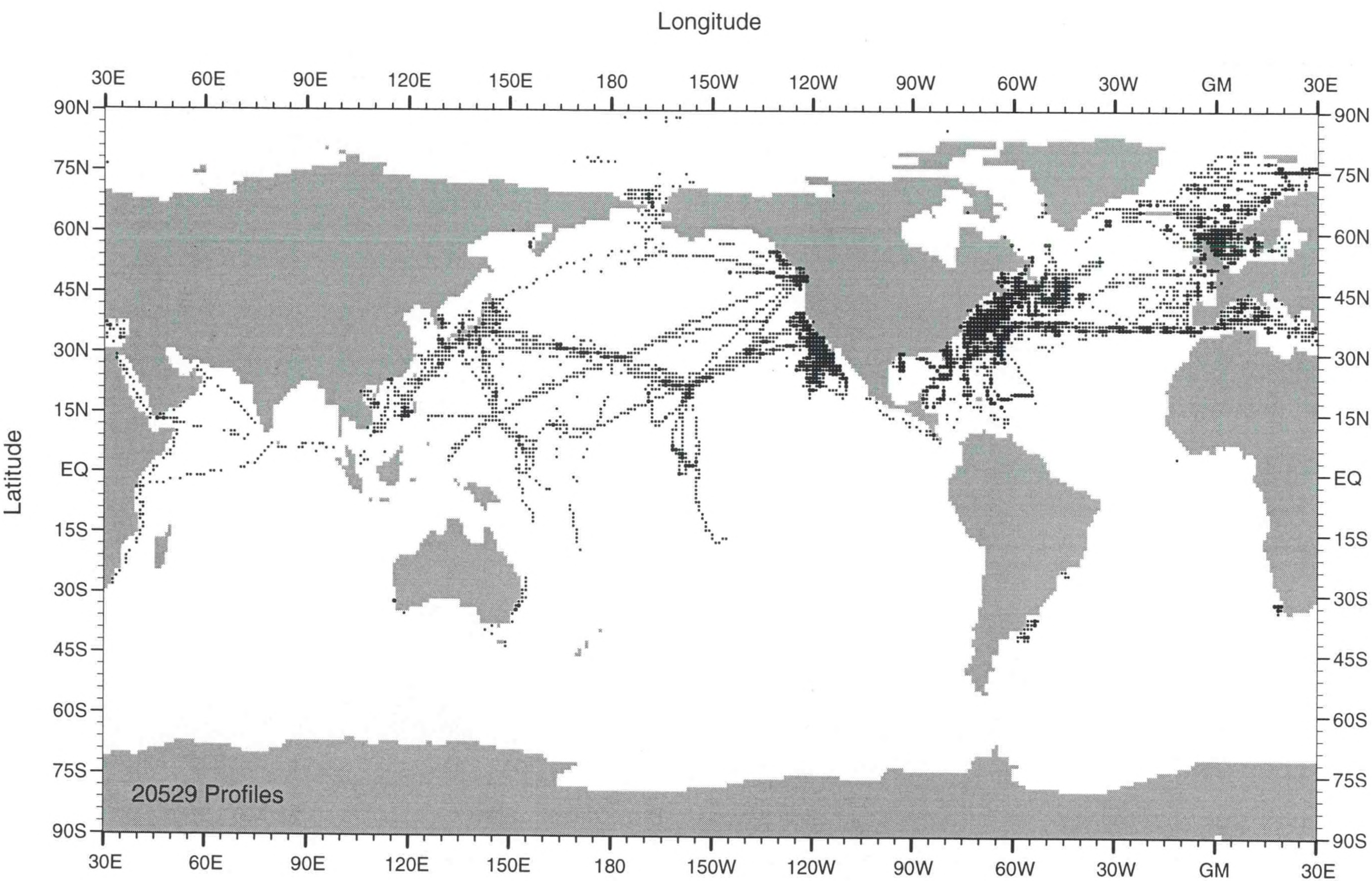


Fig. B54 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1954

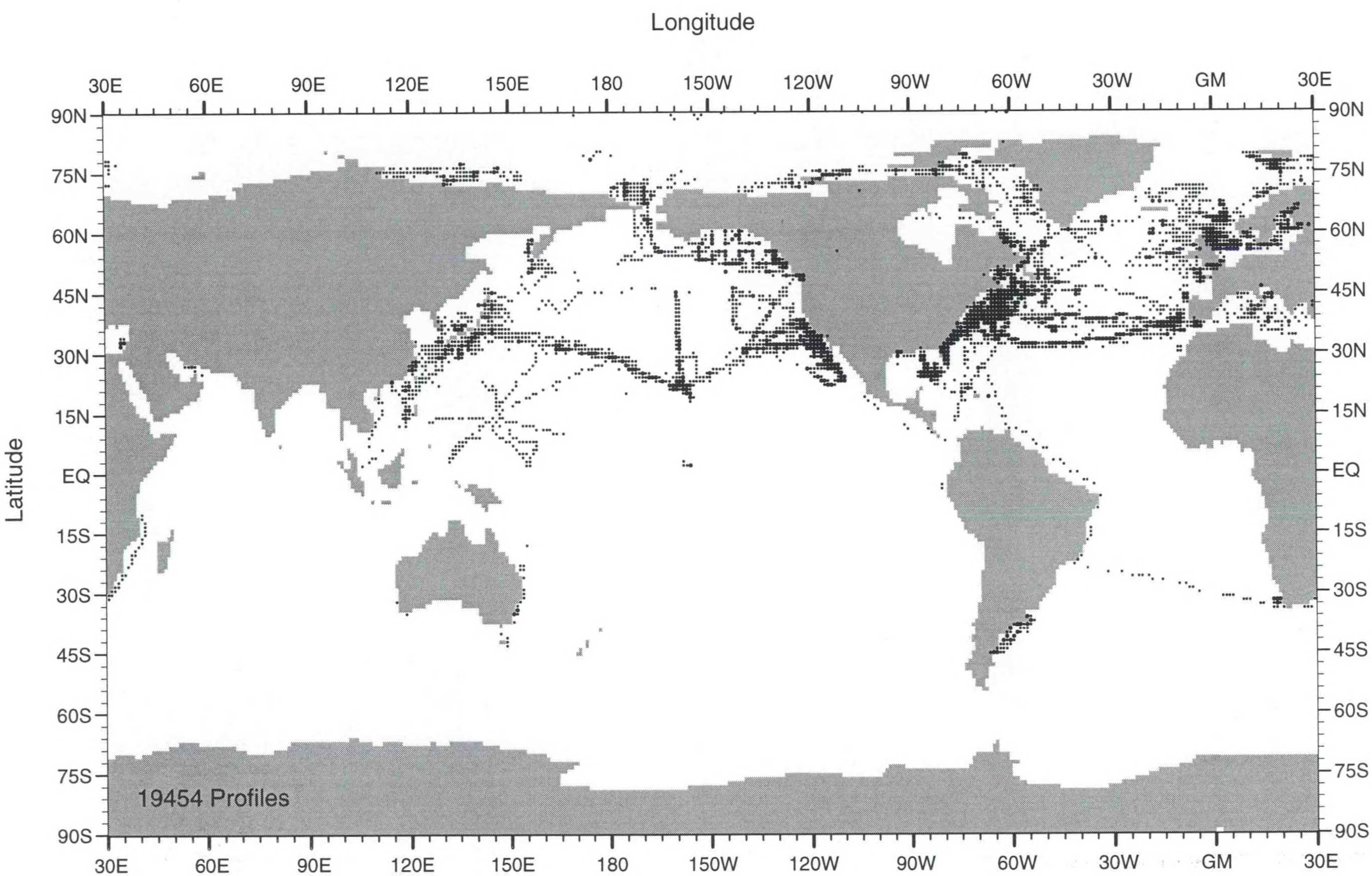


Fig. B55 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1954

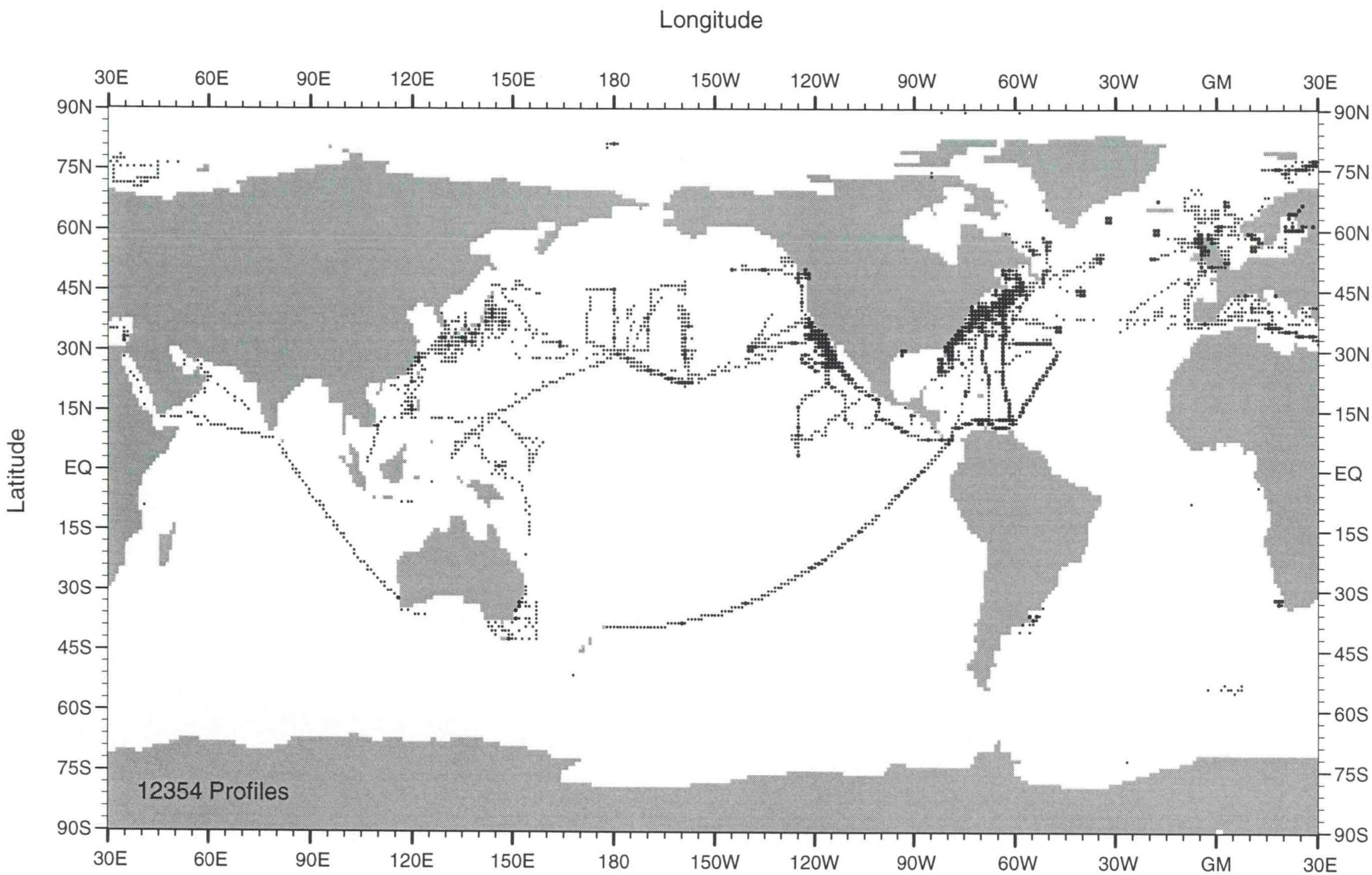


Fig. B56 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1954

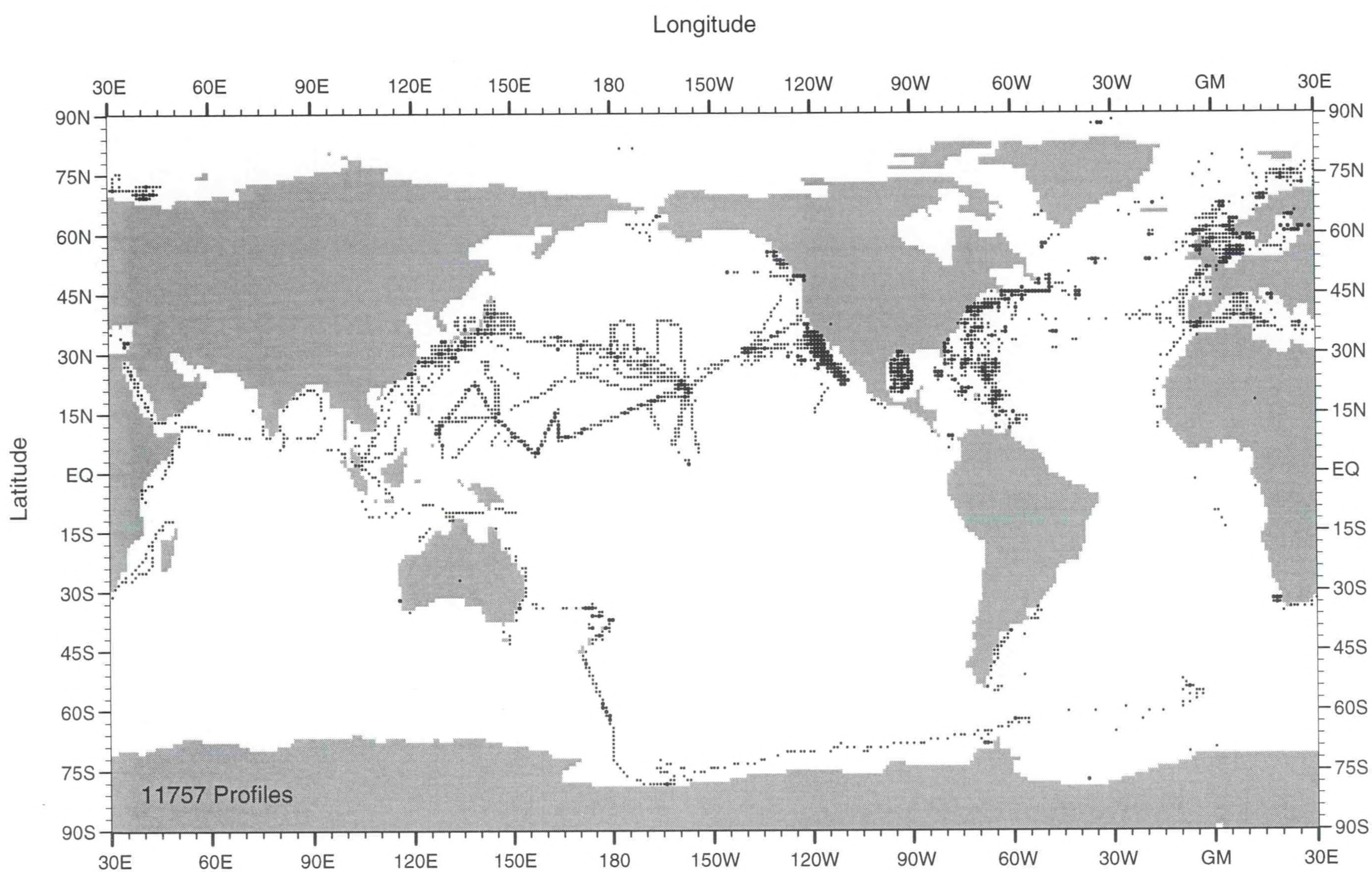


Fig. B57 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1955

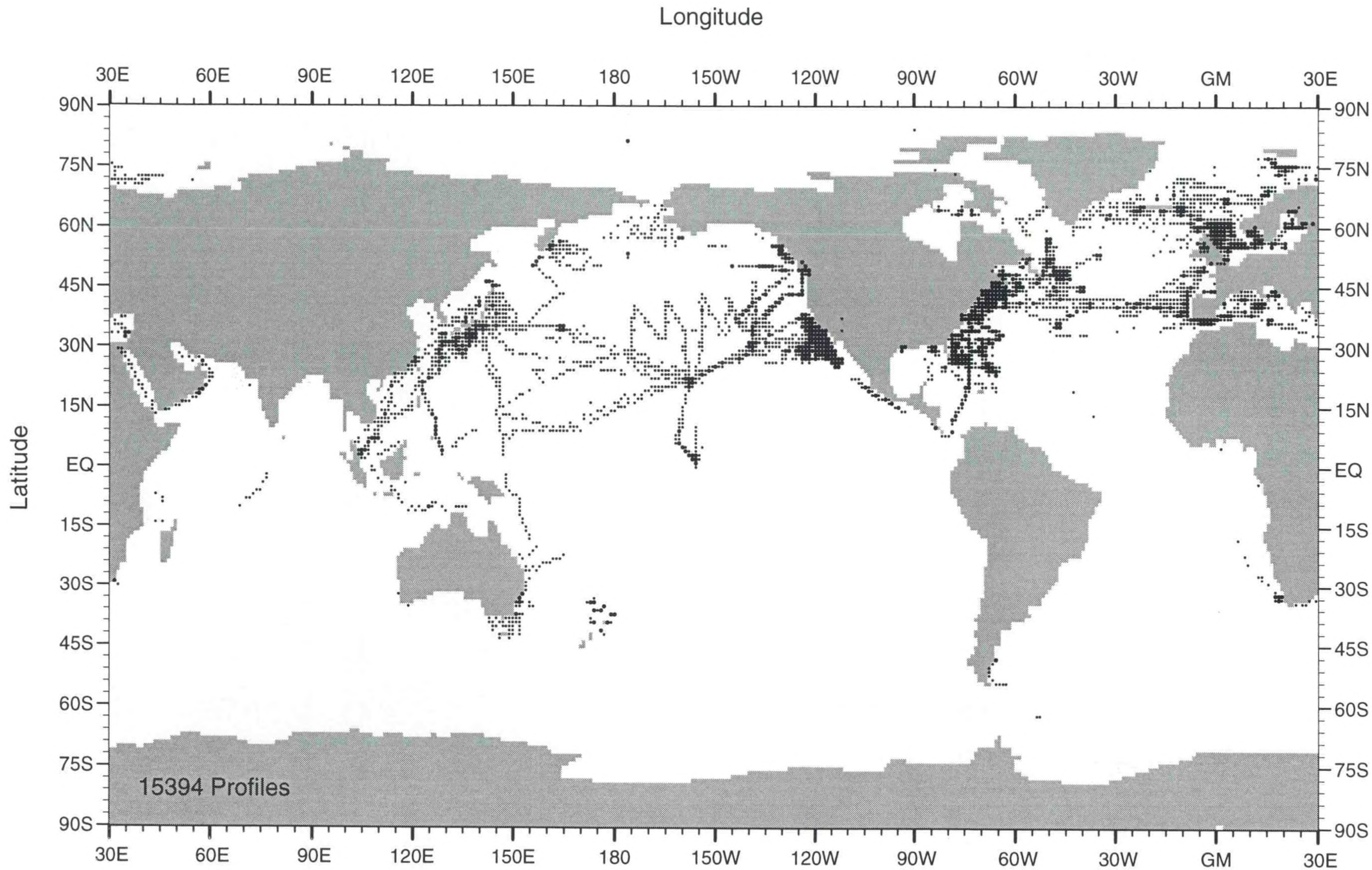


Fig. B58 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1955

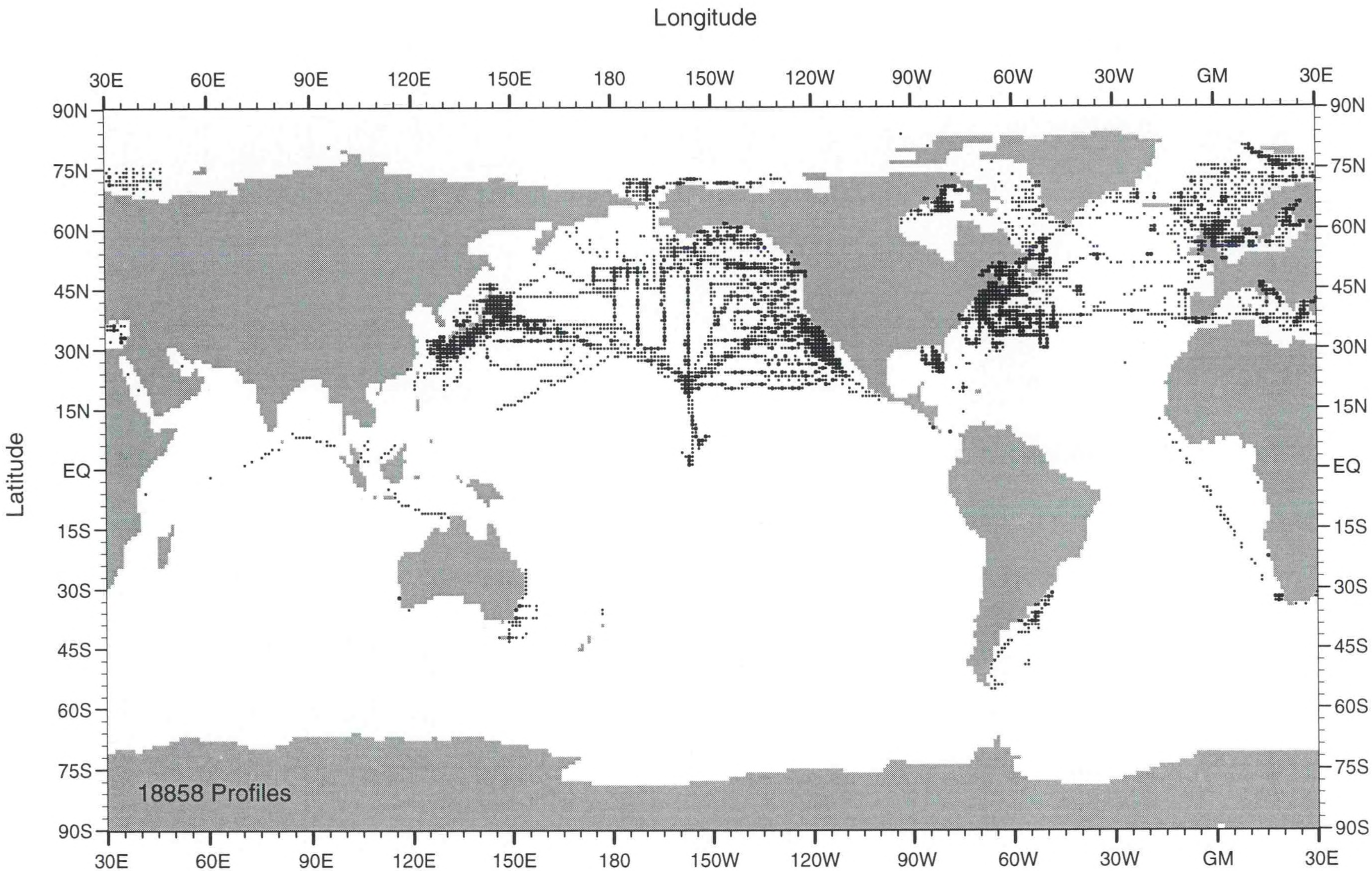


Fig. B59 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1955

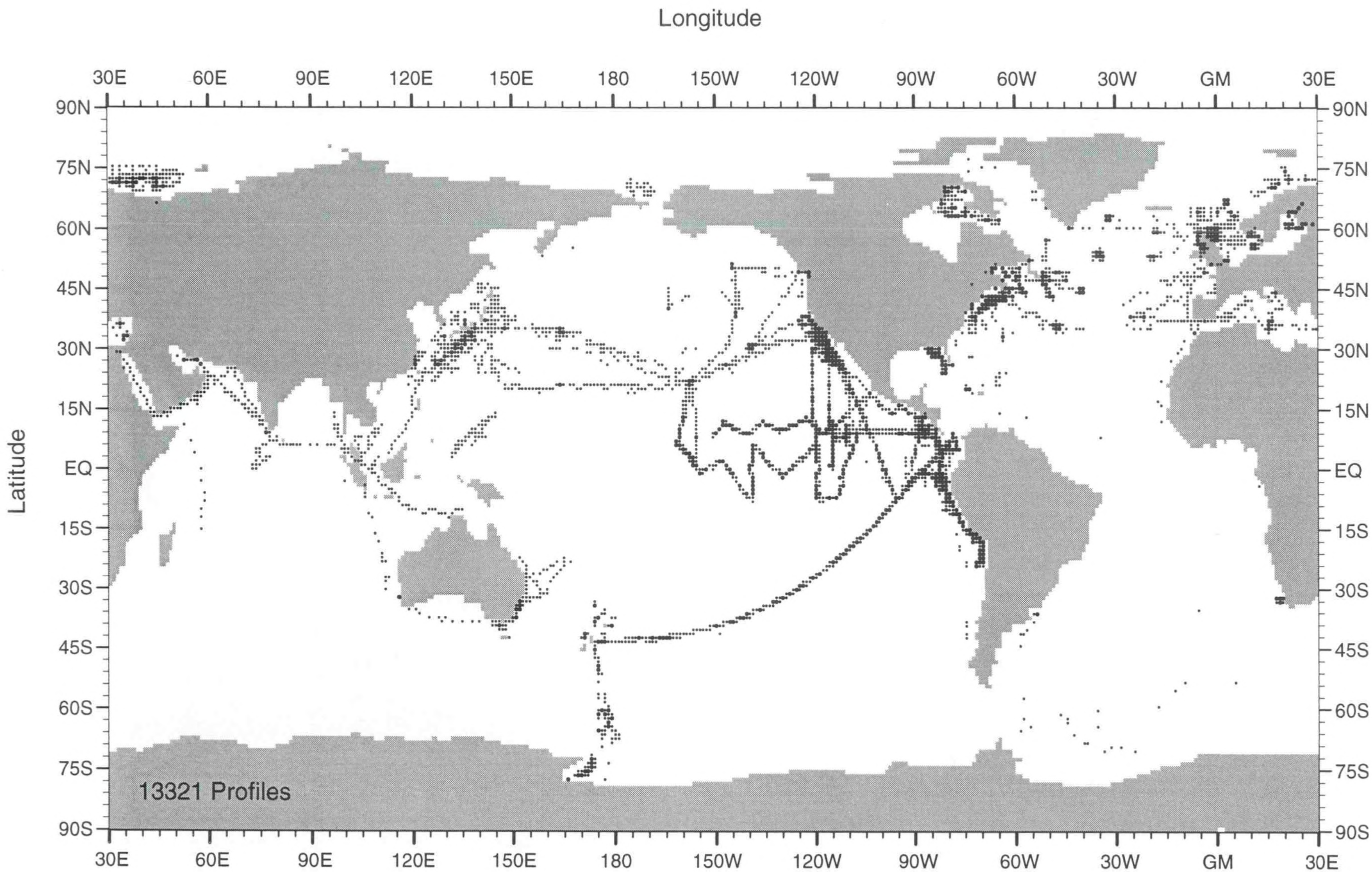


Fig. B60 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1955

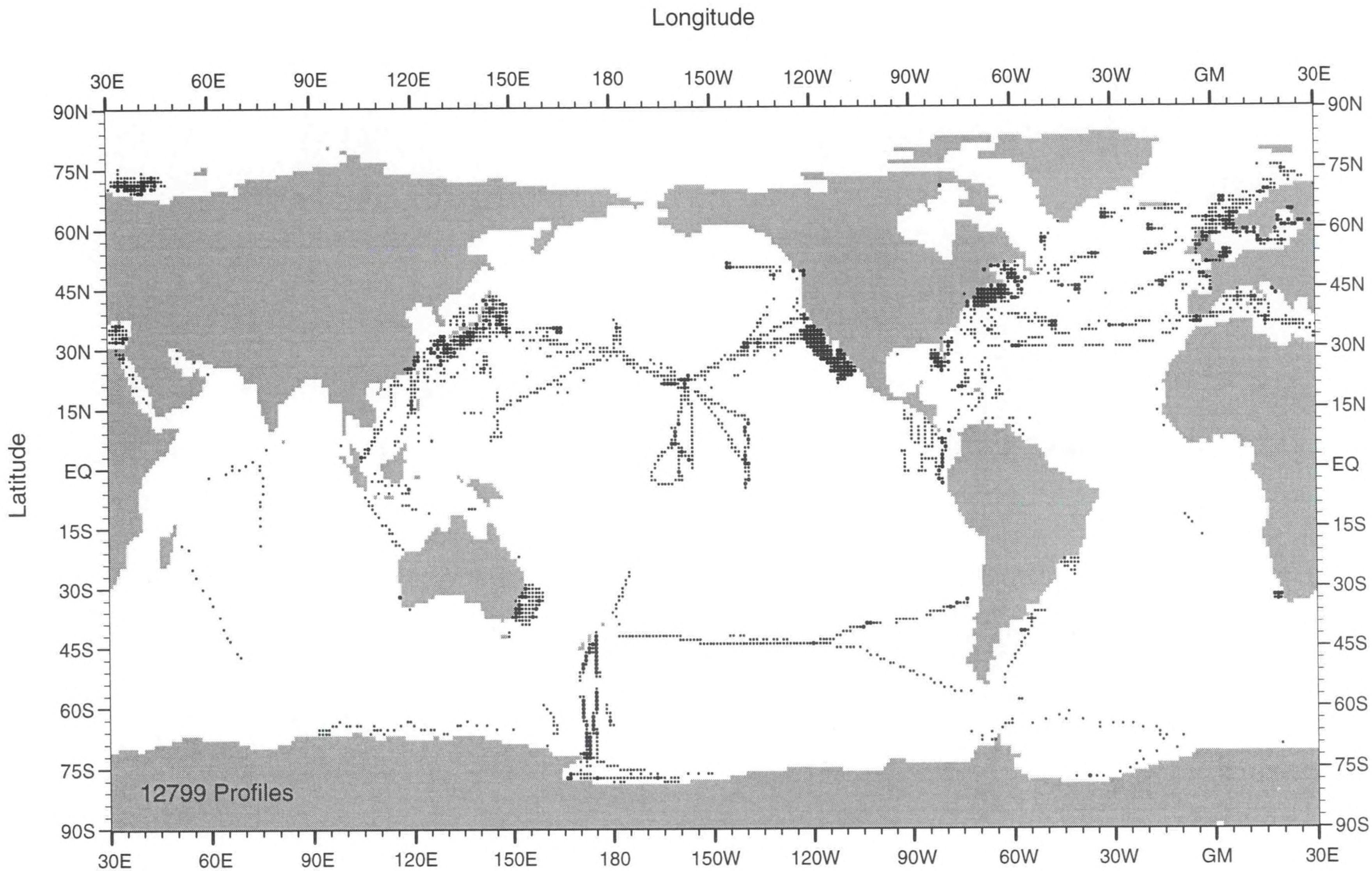


Fig. B61 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1956

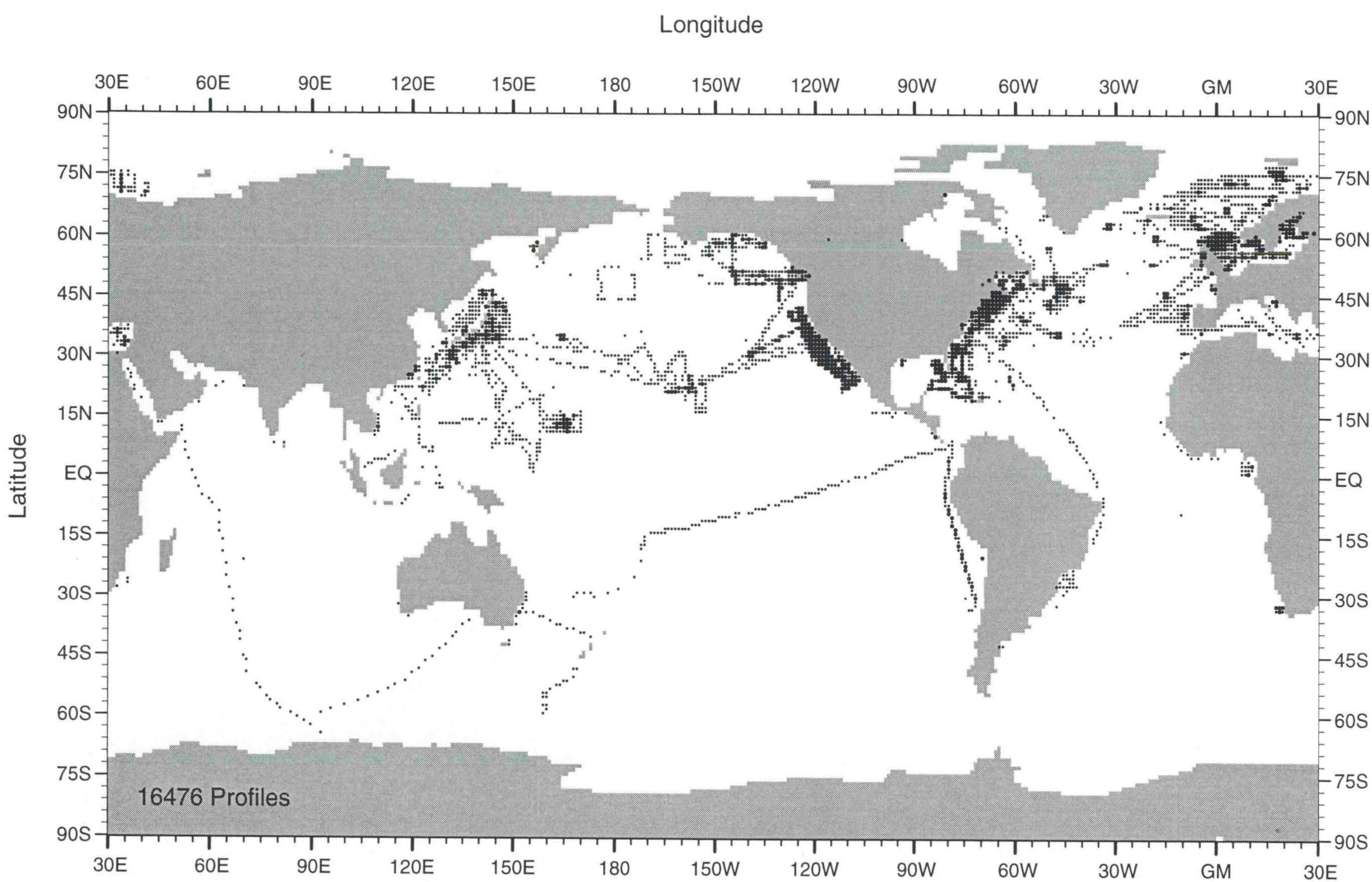


Fig. B62 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1956

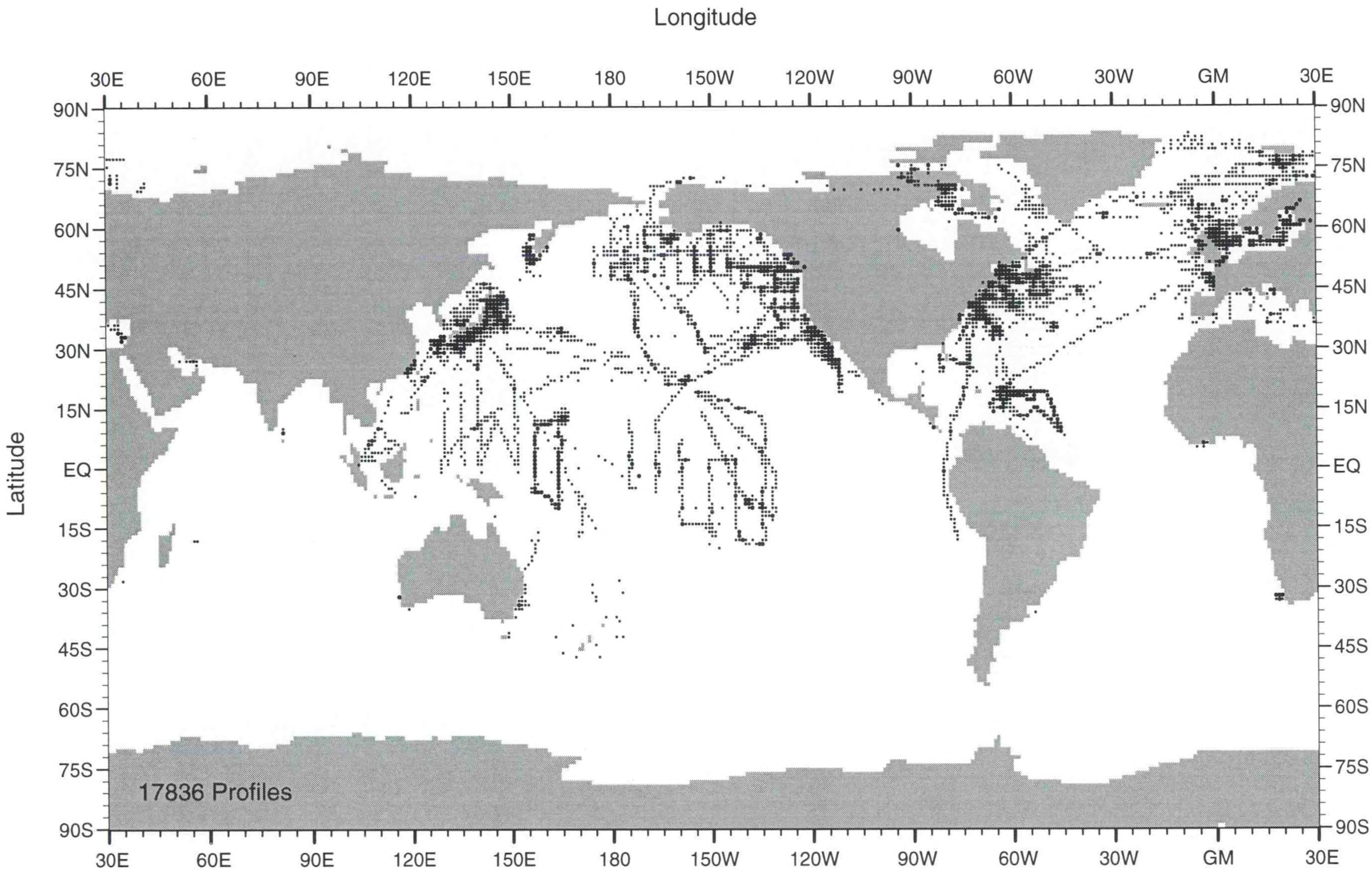


Fig. B63 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1956

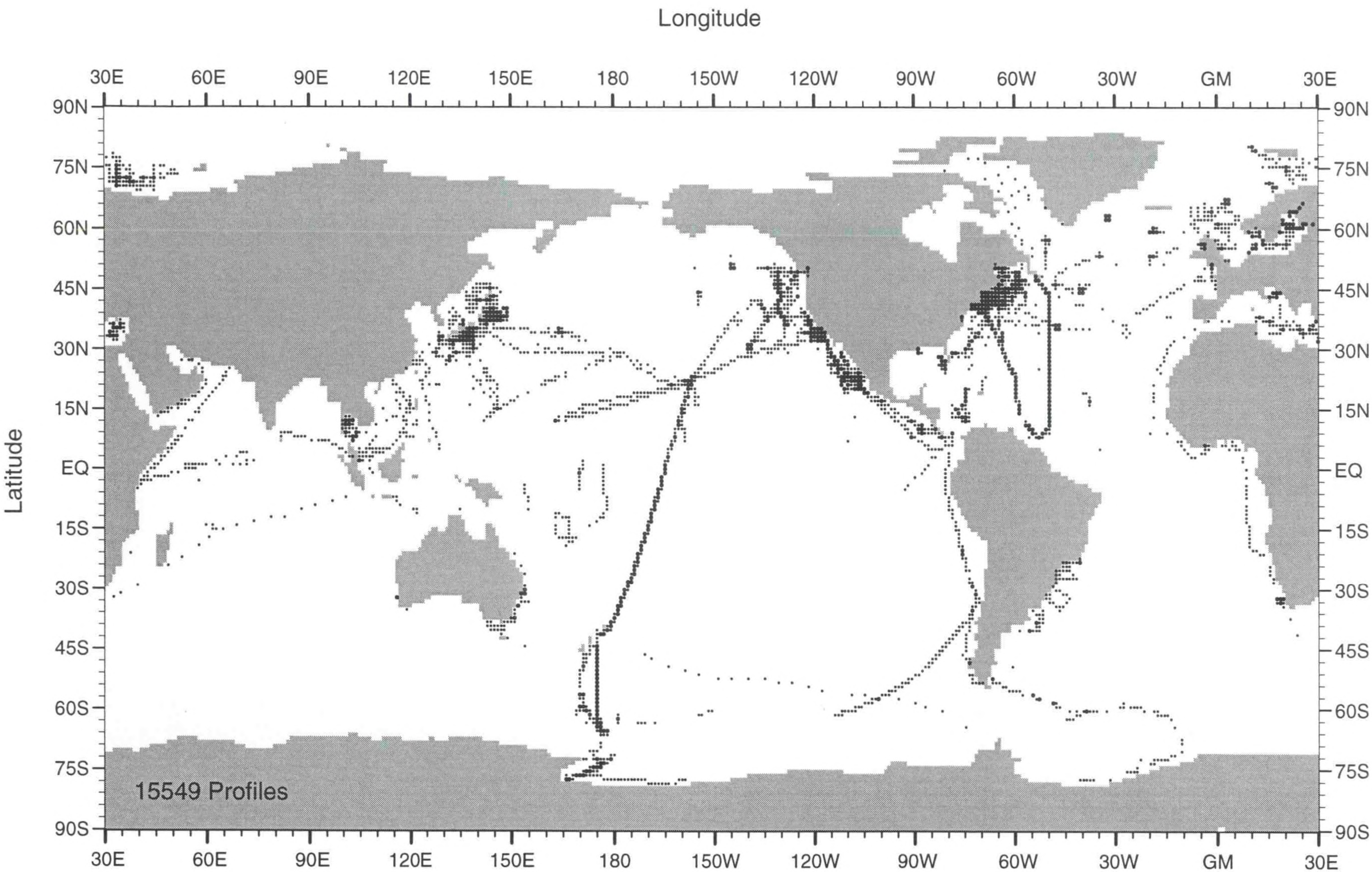


Fig. B64 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1956

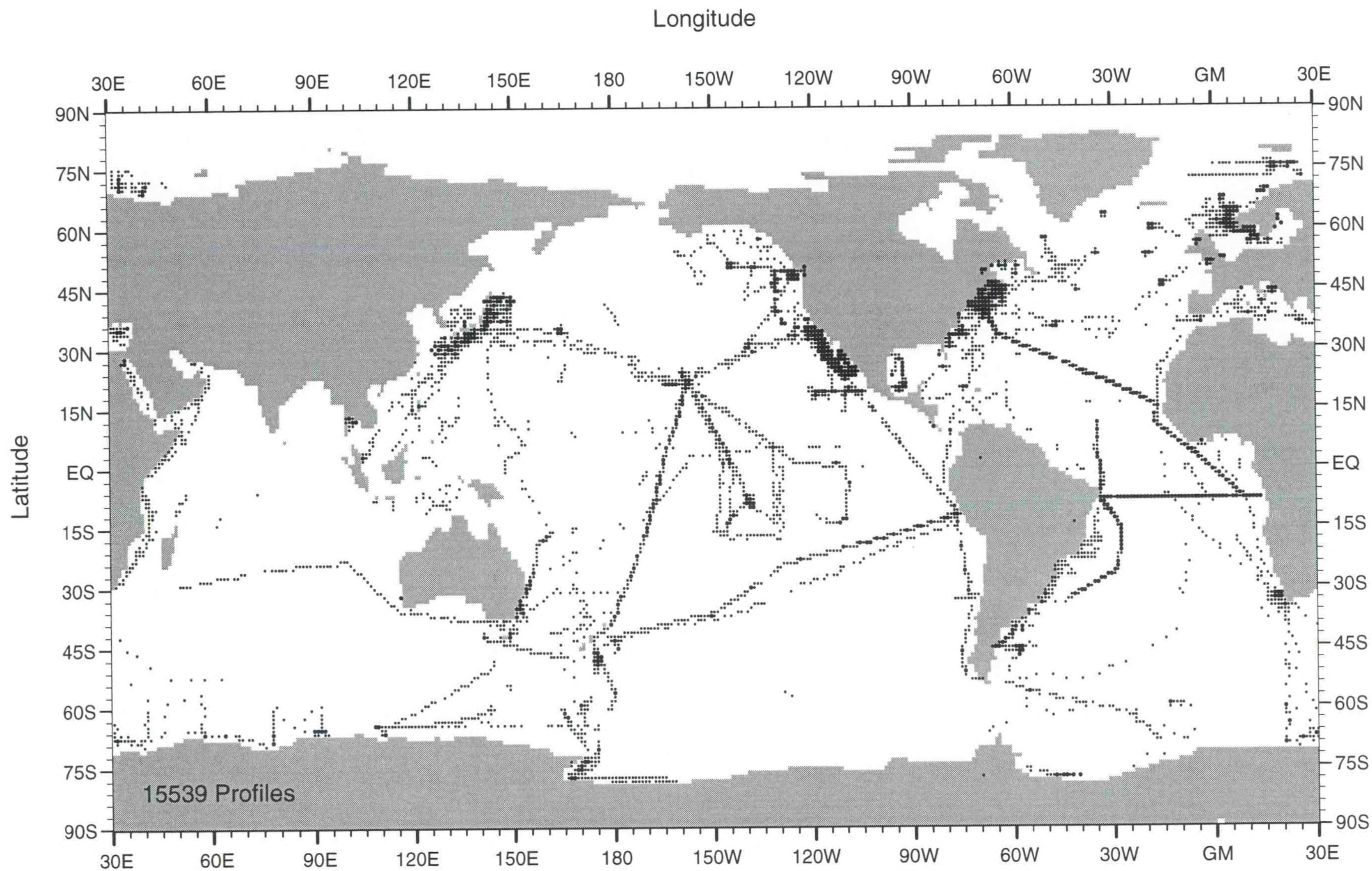


Fig. B65 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1957

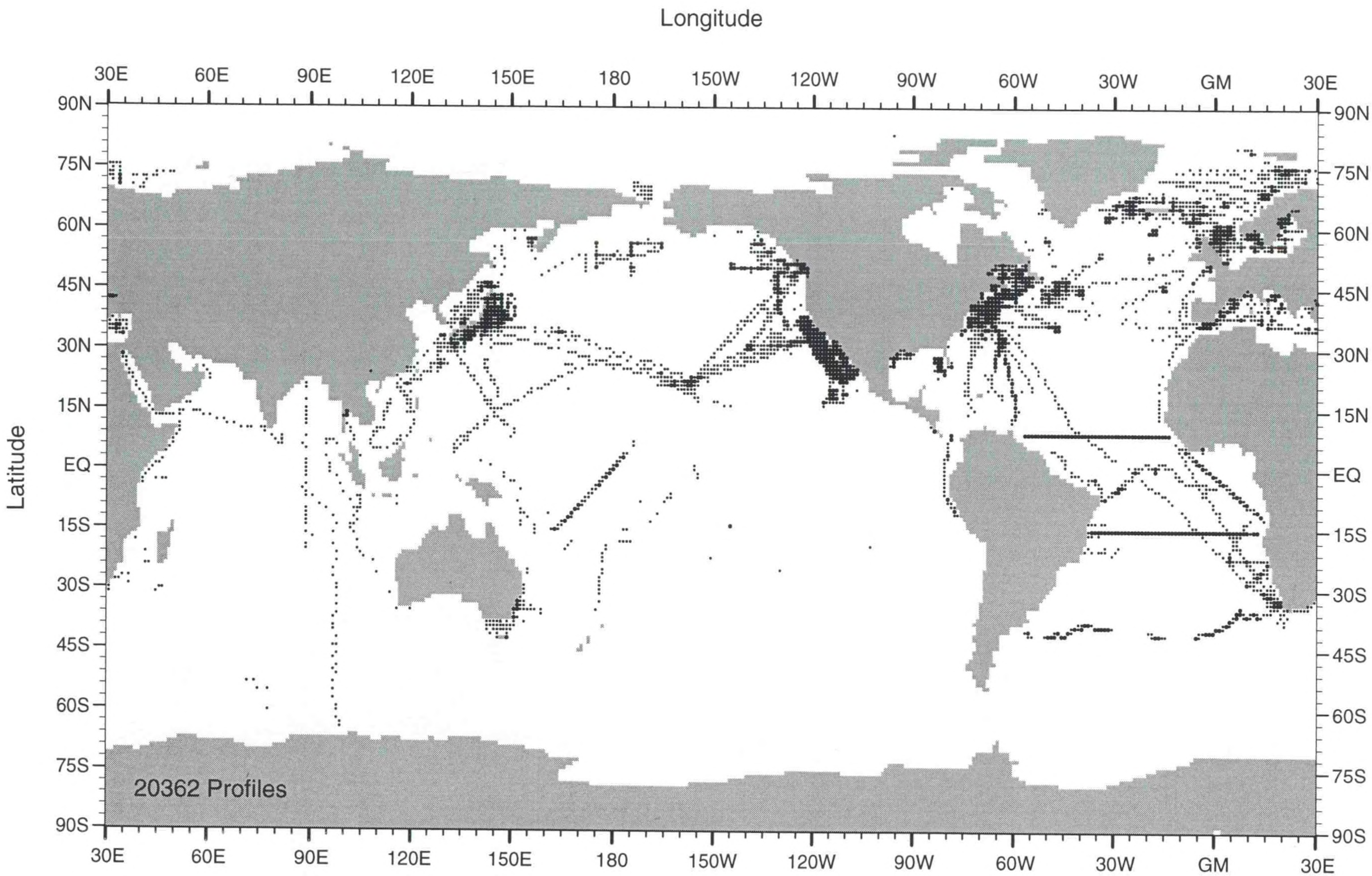


Fig. B66 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1957

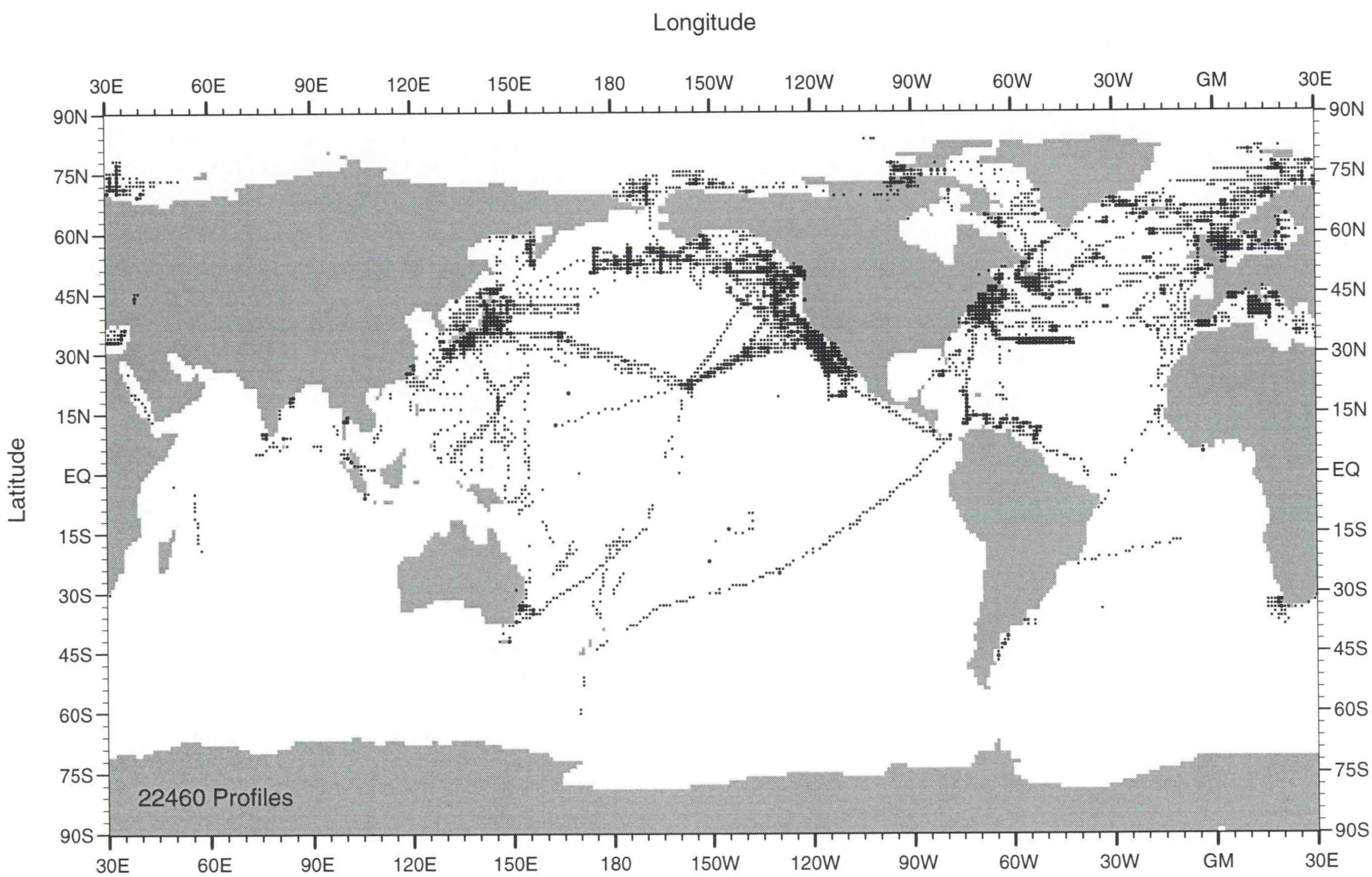


Fig. B67 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1957

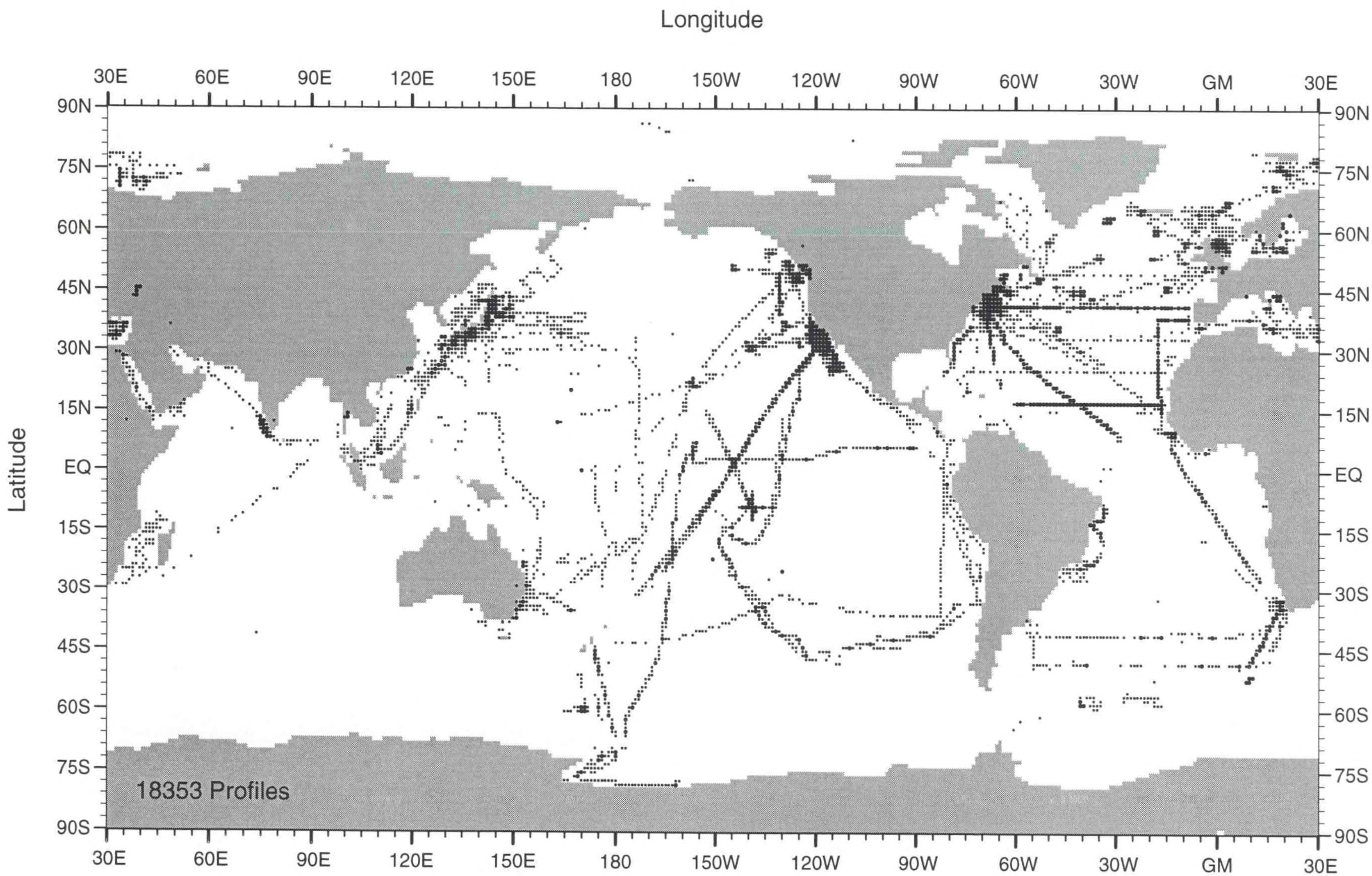


Fig. B68 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1957

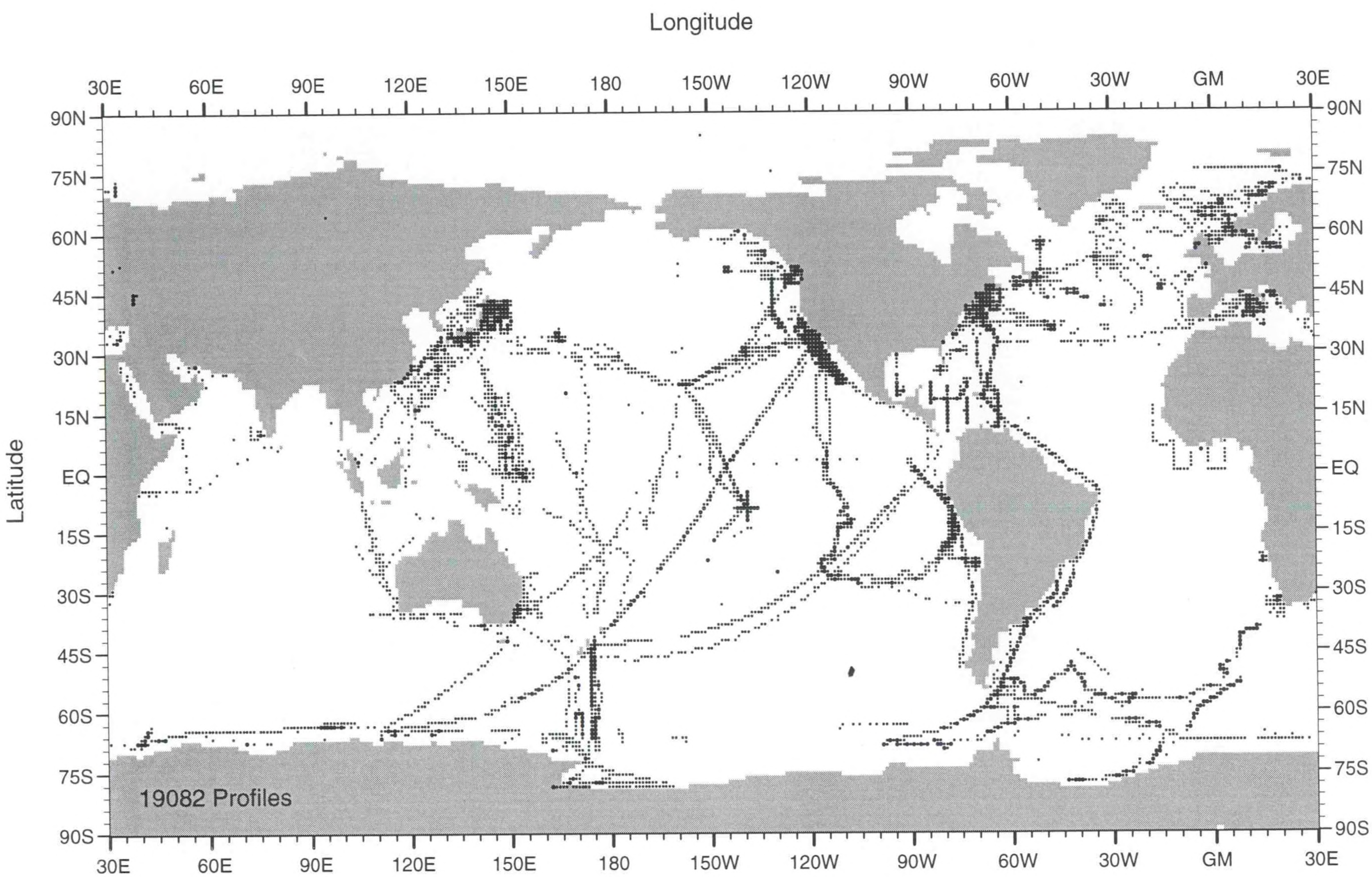


Fig. B69 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1958

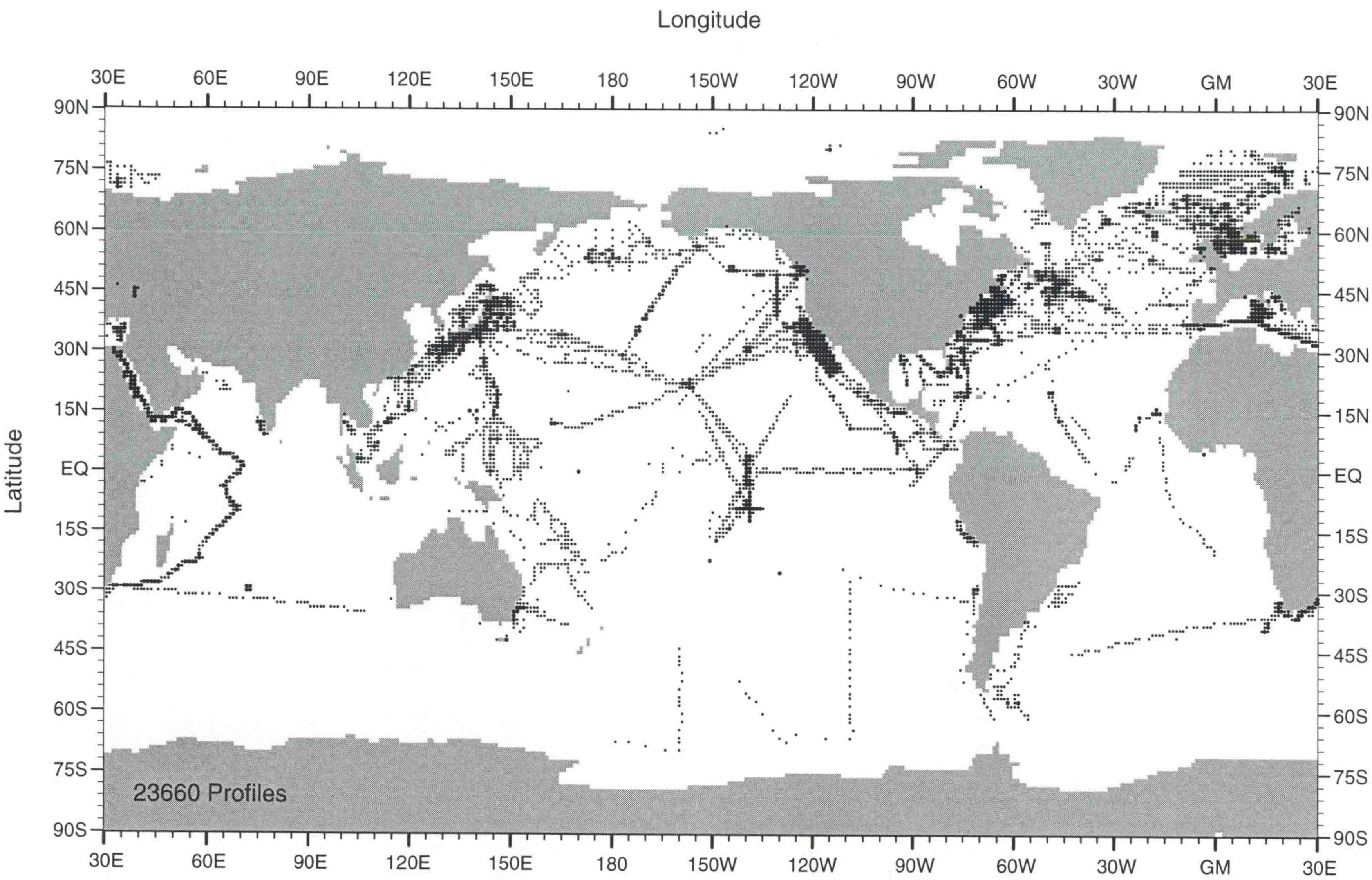


Fig. B70 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1958

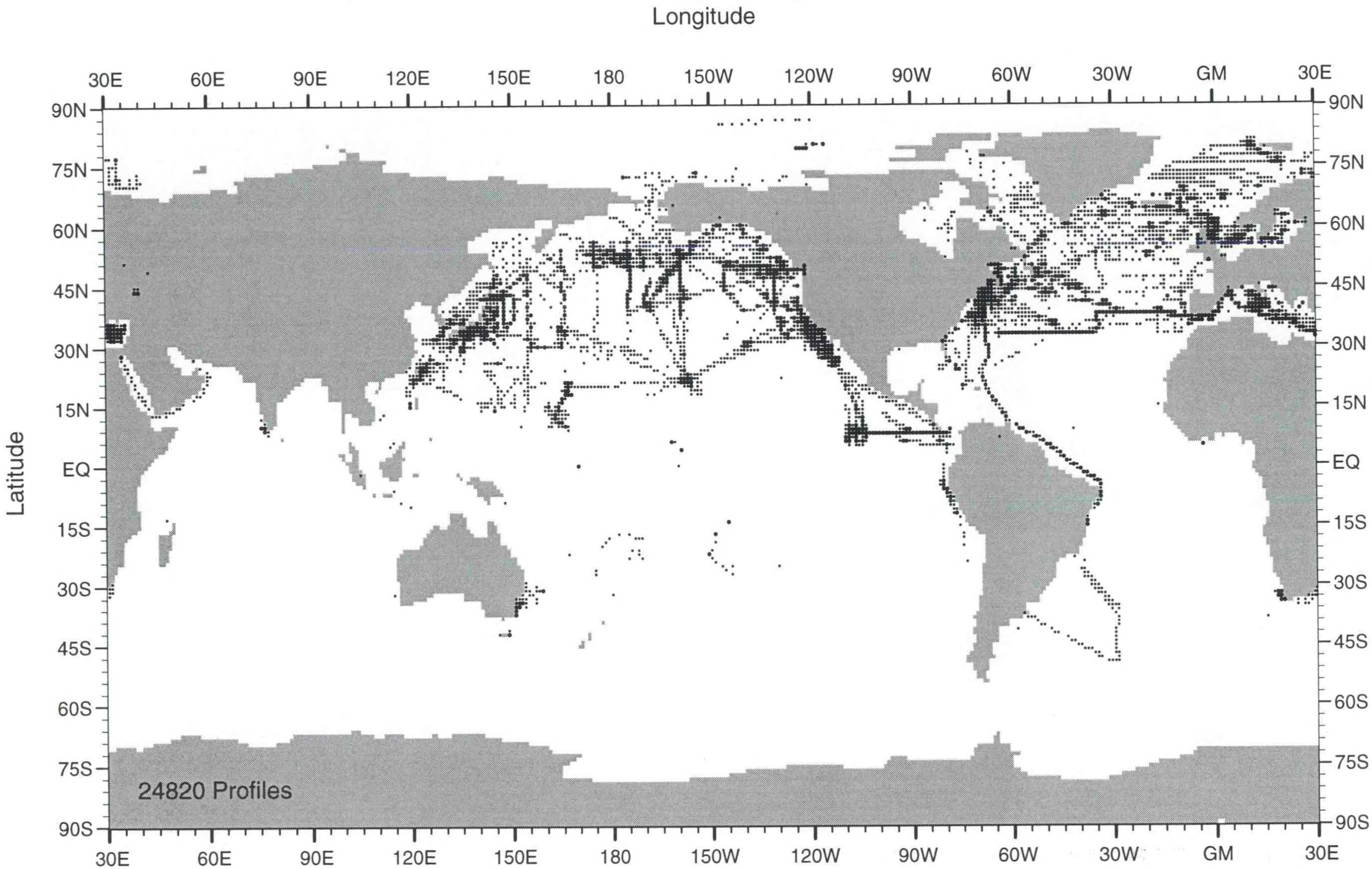


Fig. B71 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1958

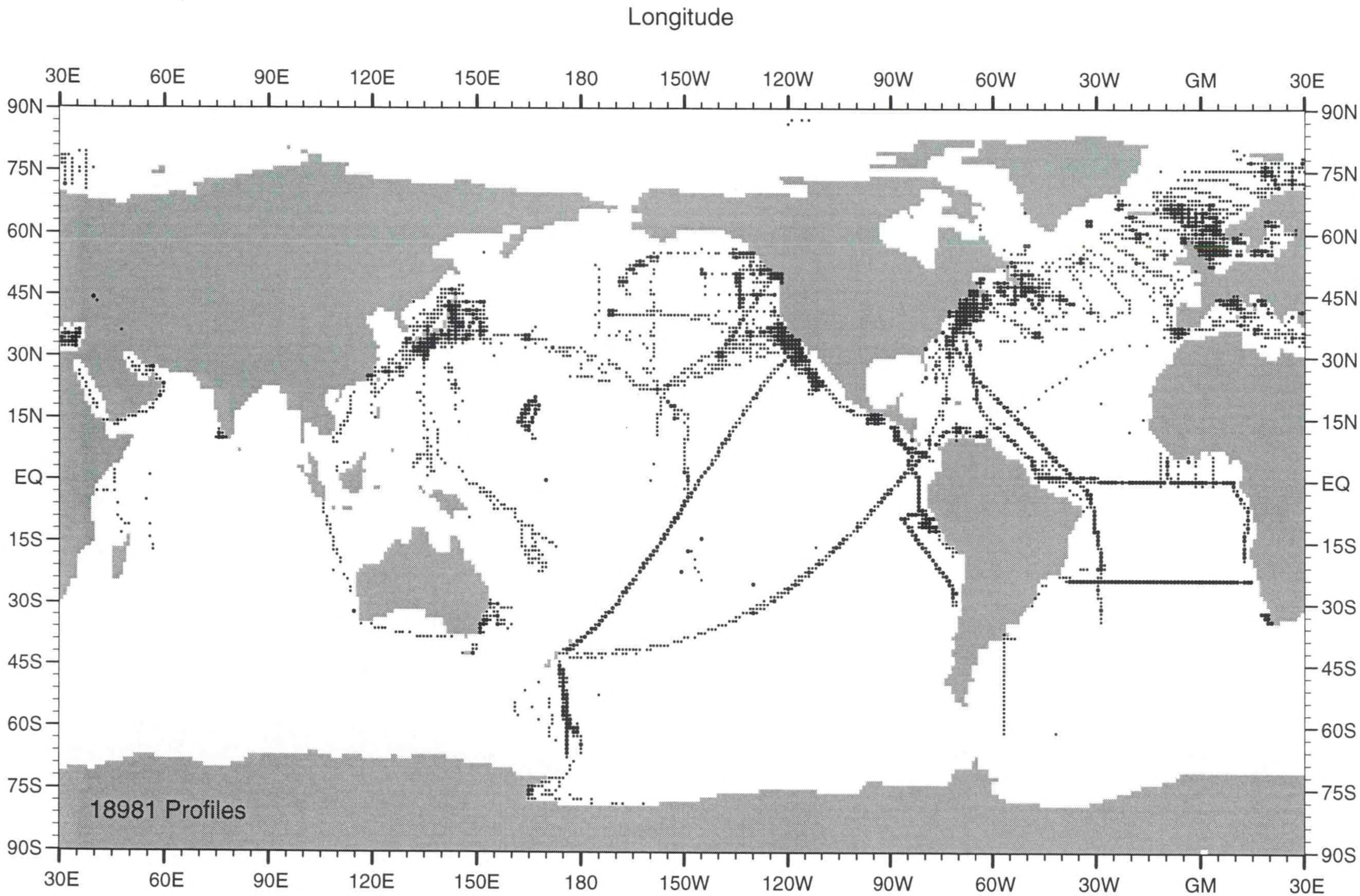


Fig. B72 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1958

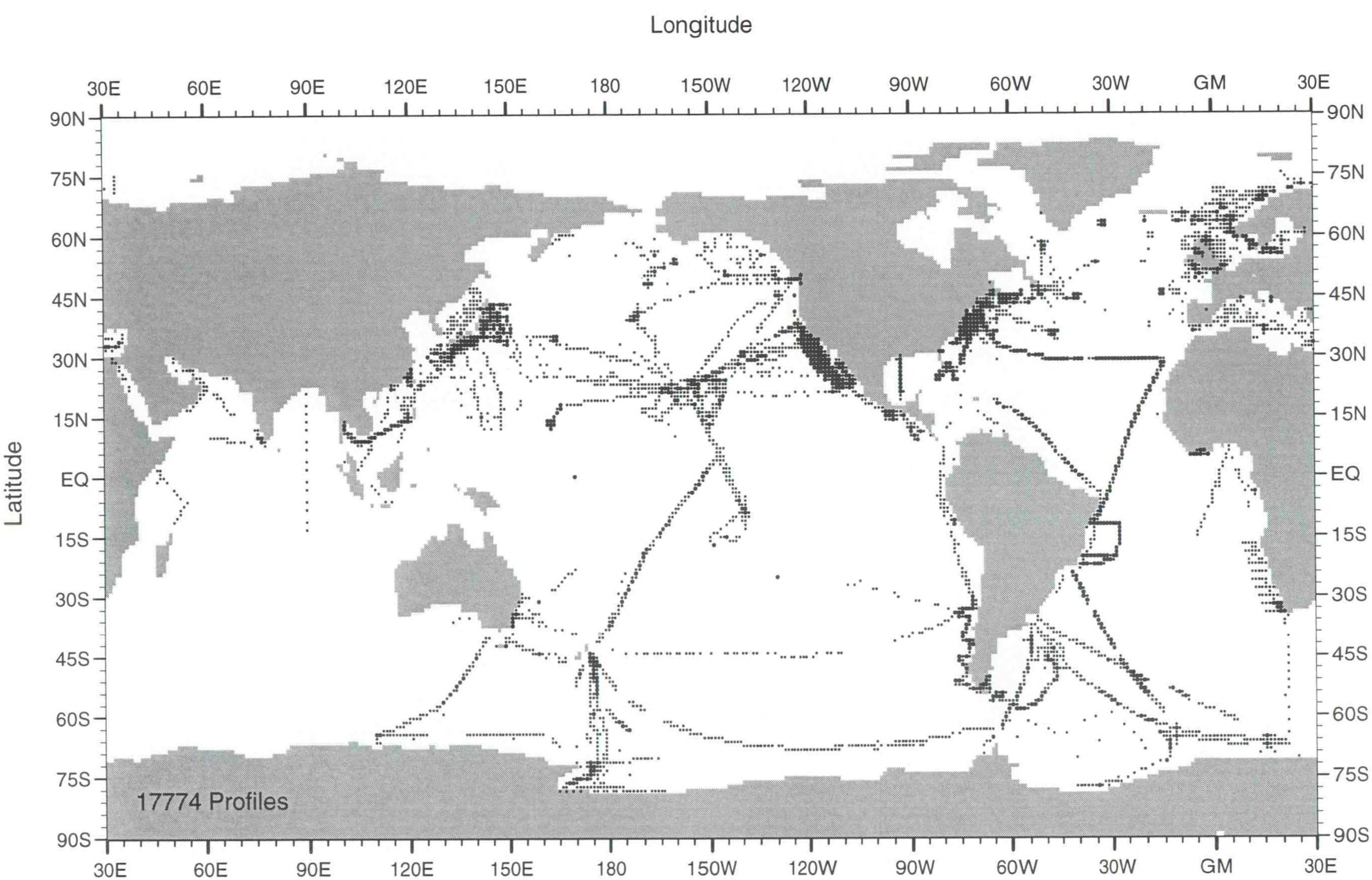


Fig. B73 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1959

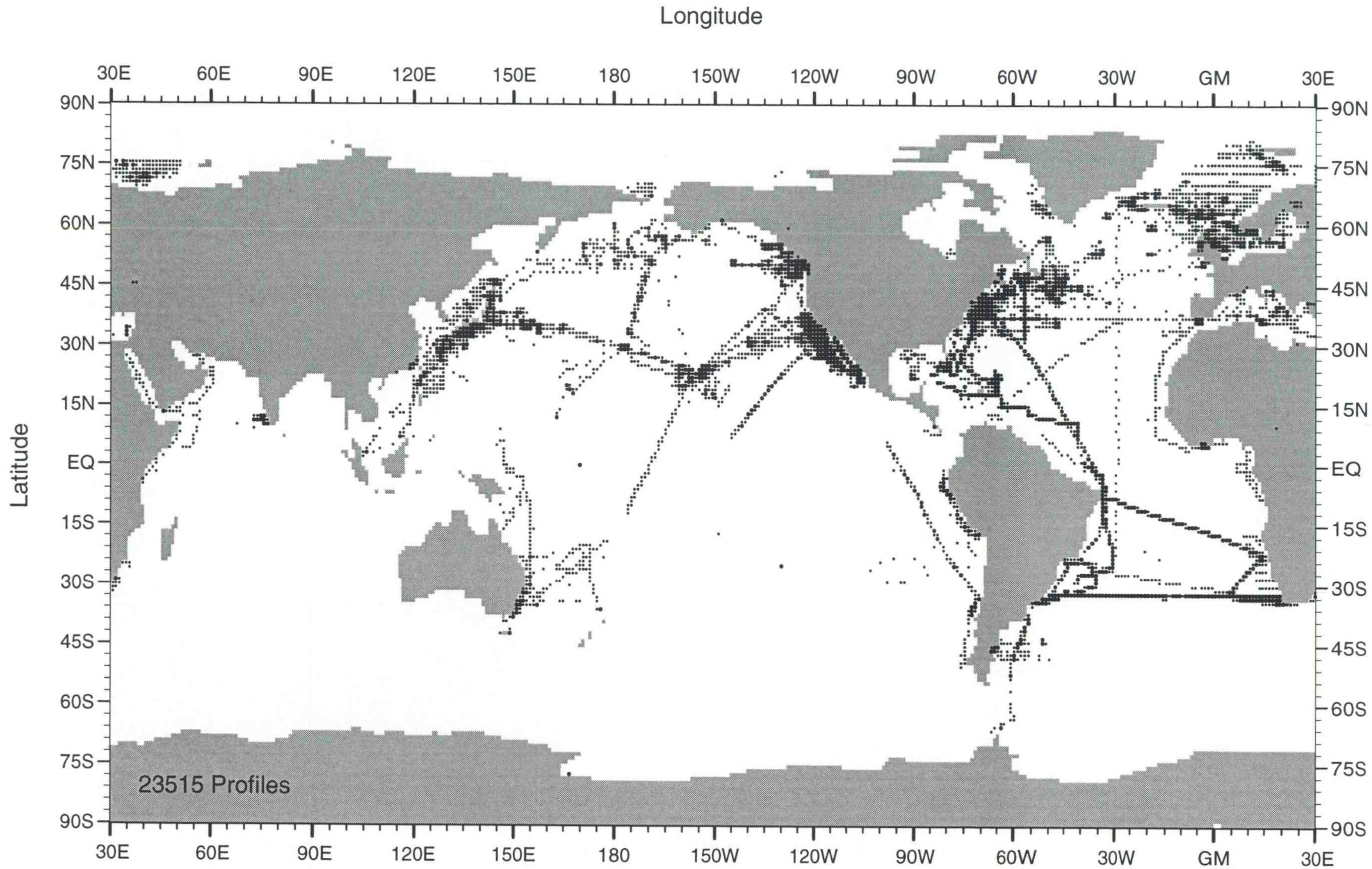


Fig. B74 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1959

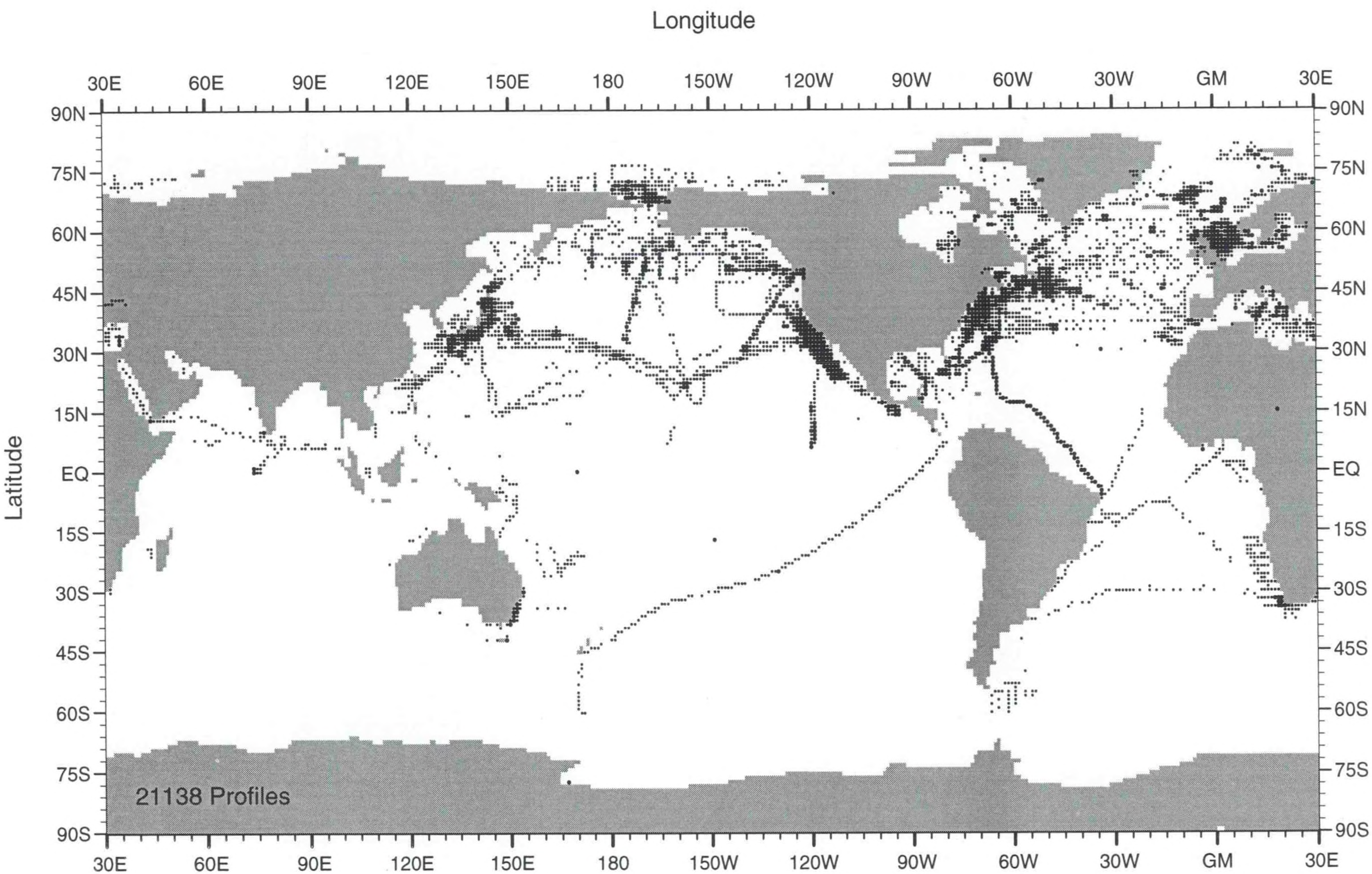


Fig. B75 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1959

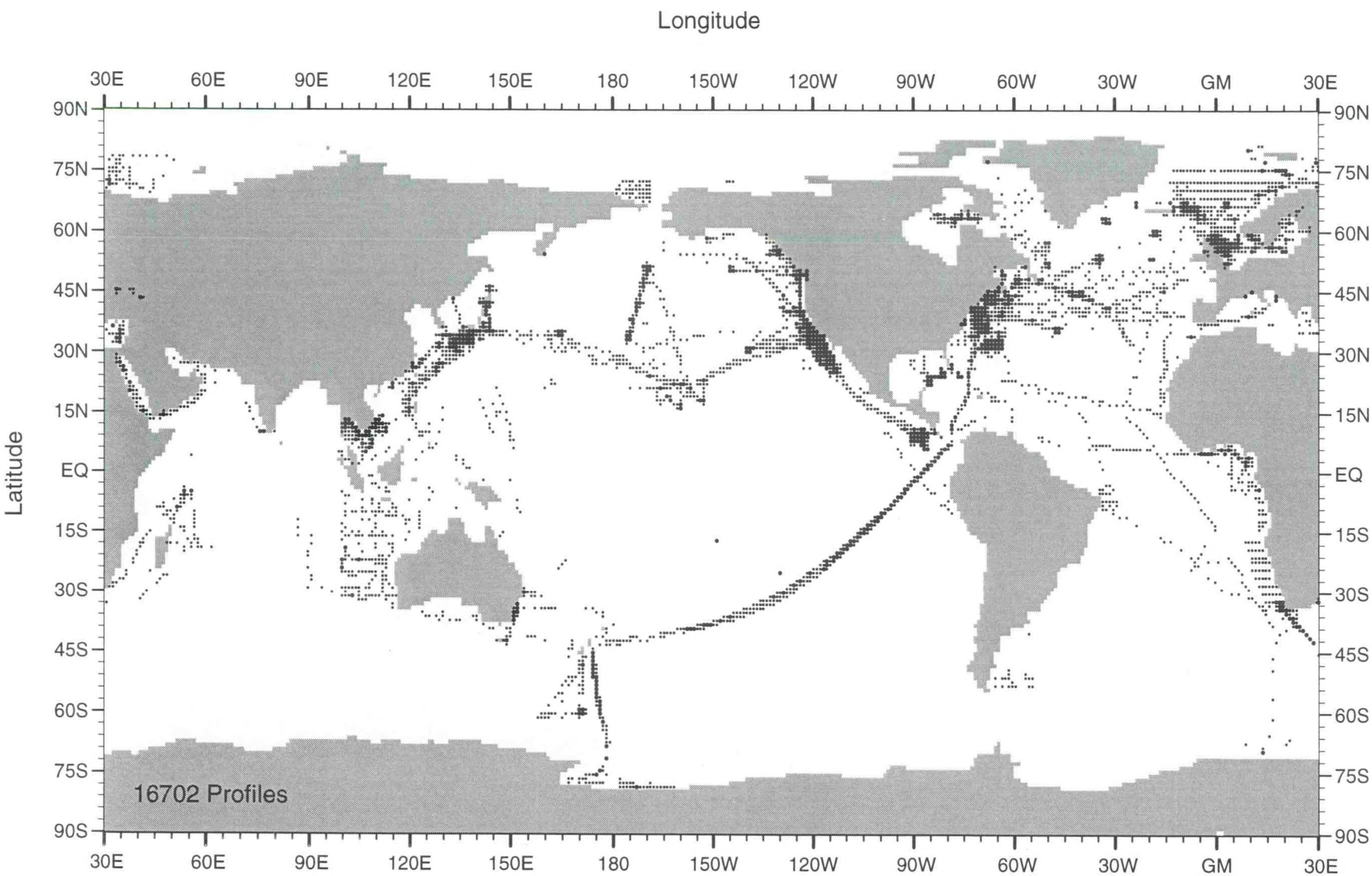


Fig. B76 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1959

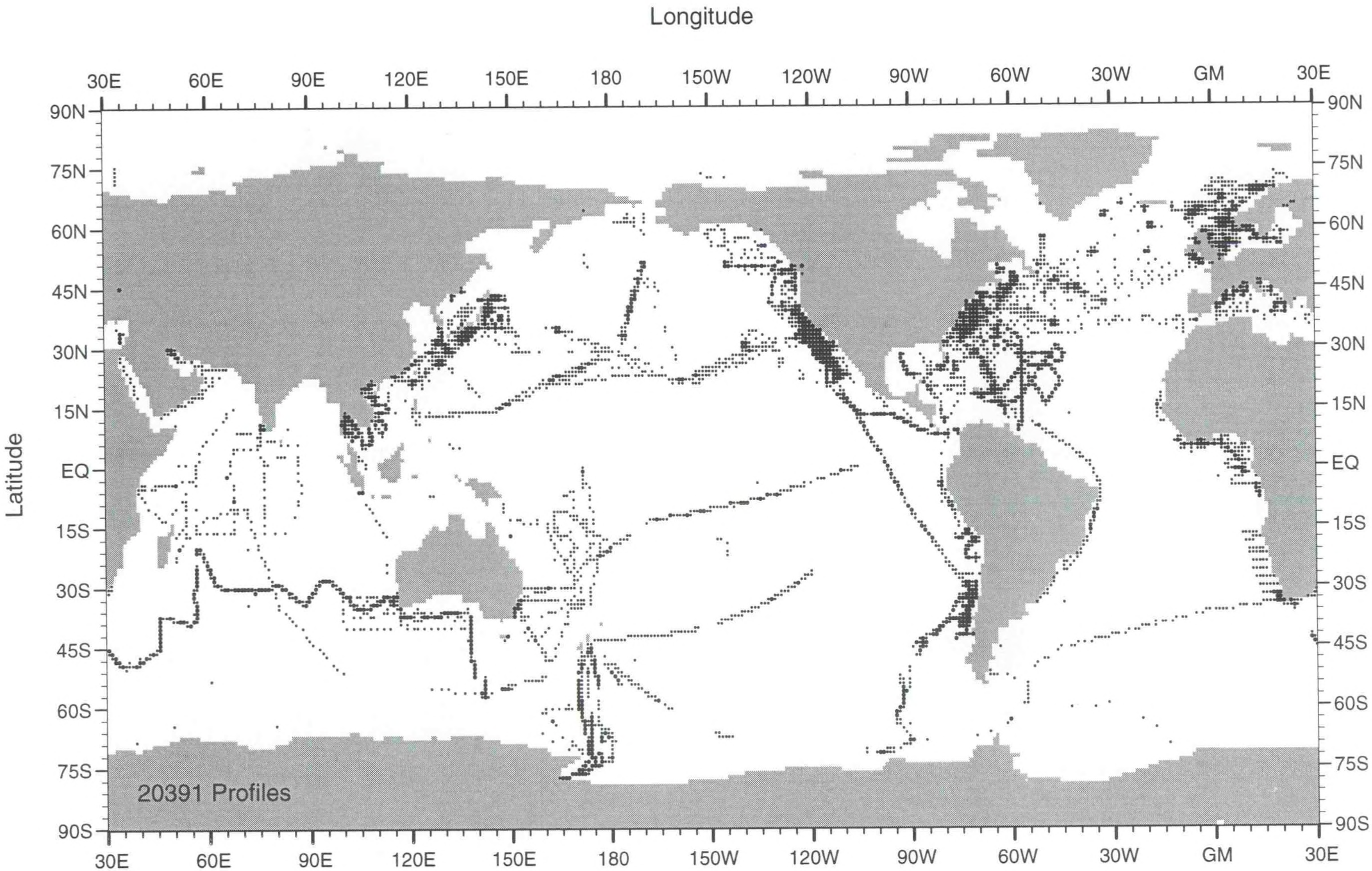


Fig. B77 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1960

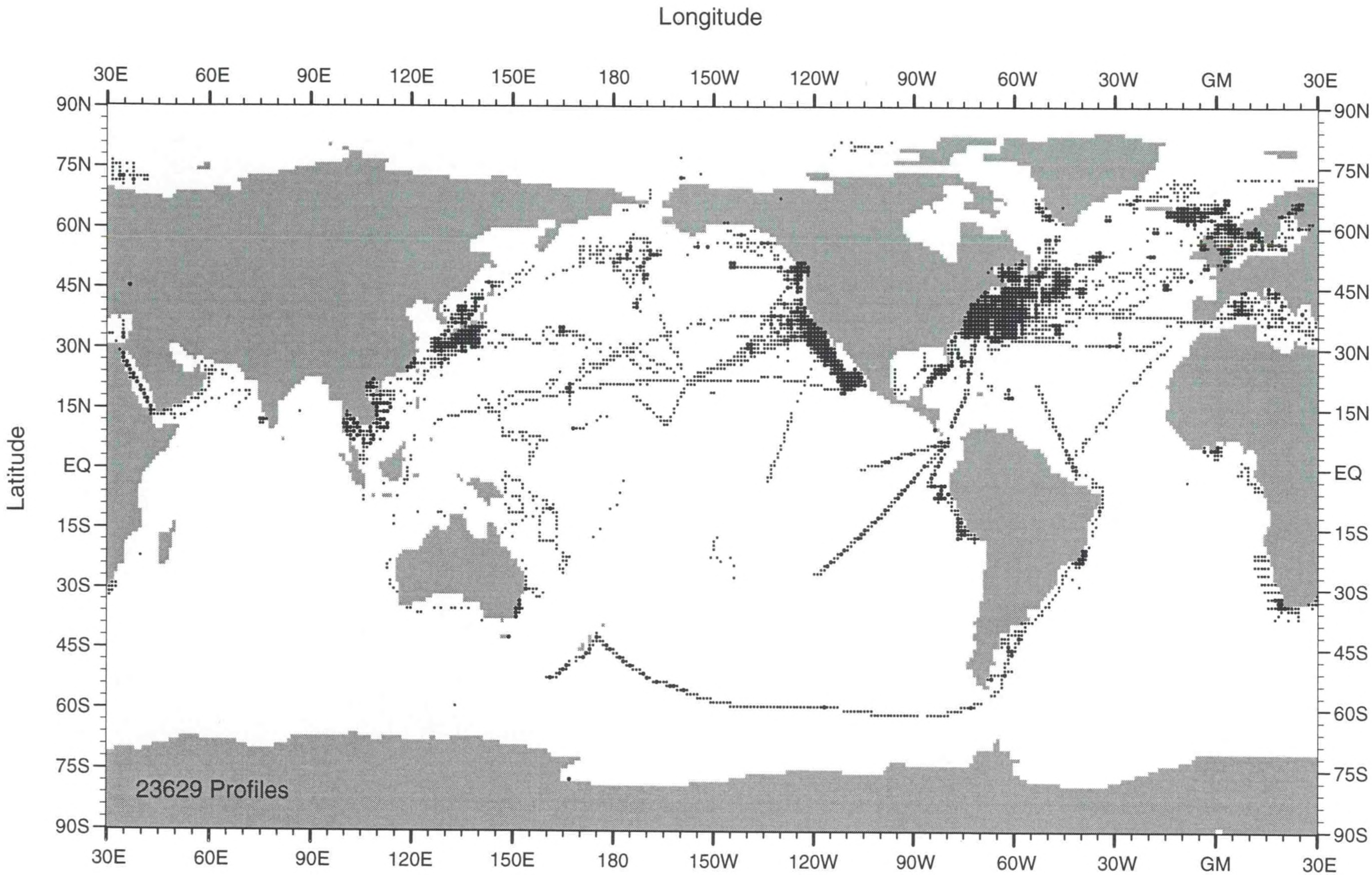


Fig. B78 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1960

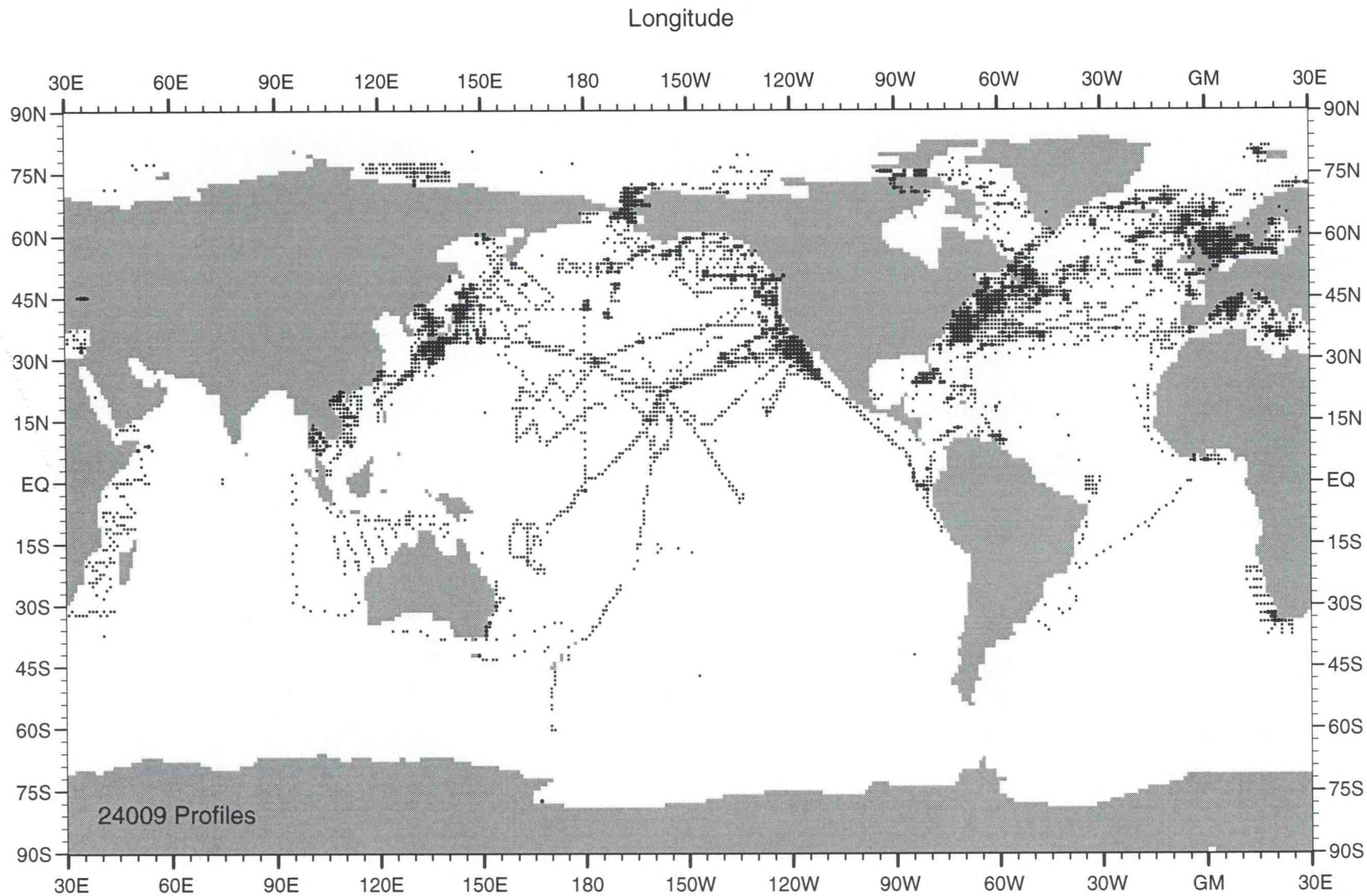


Fig. B79 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1960

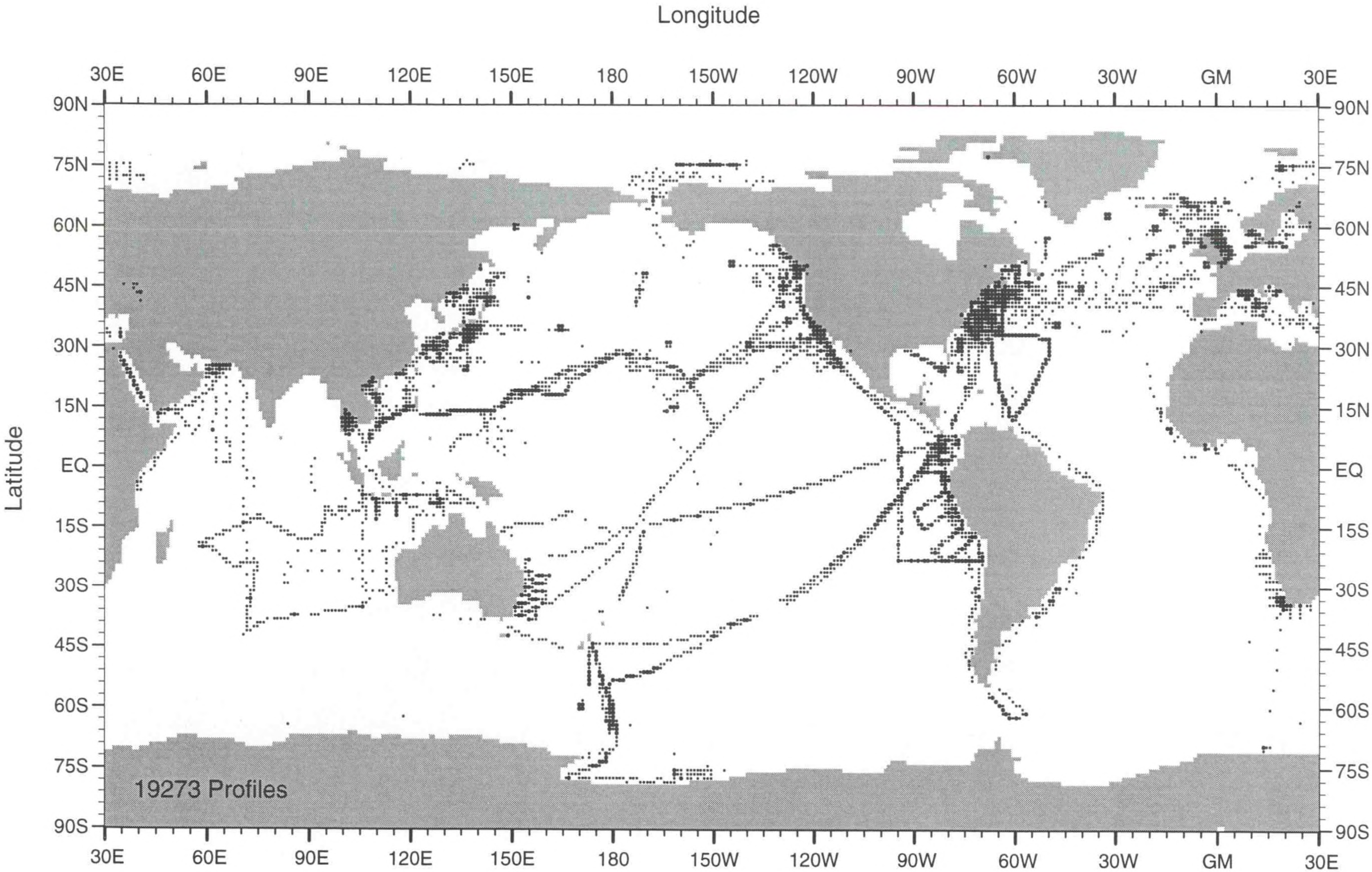


Fig. B80 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1960

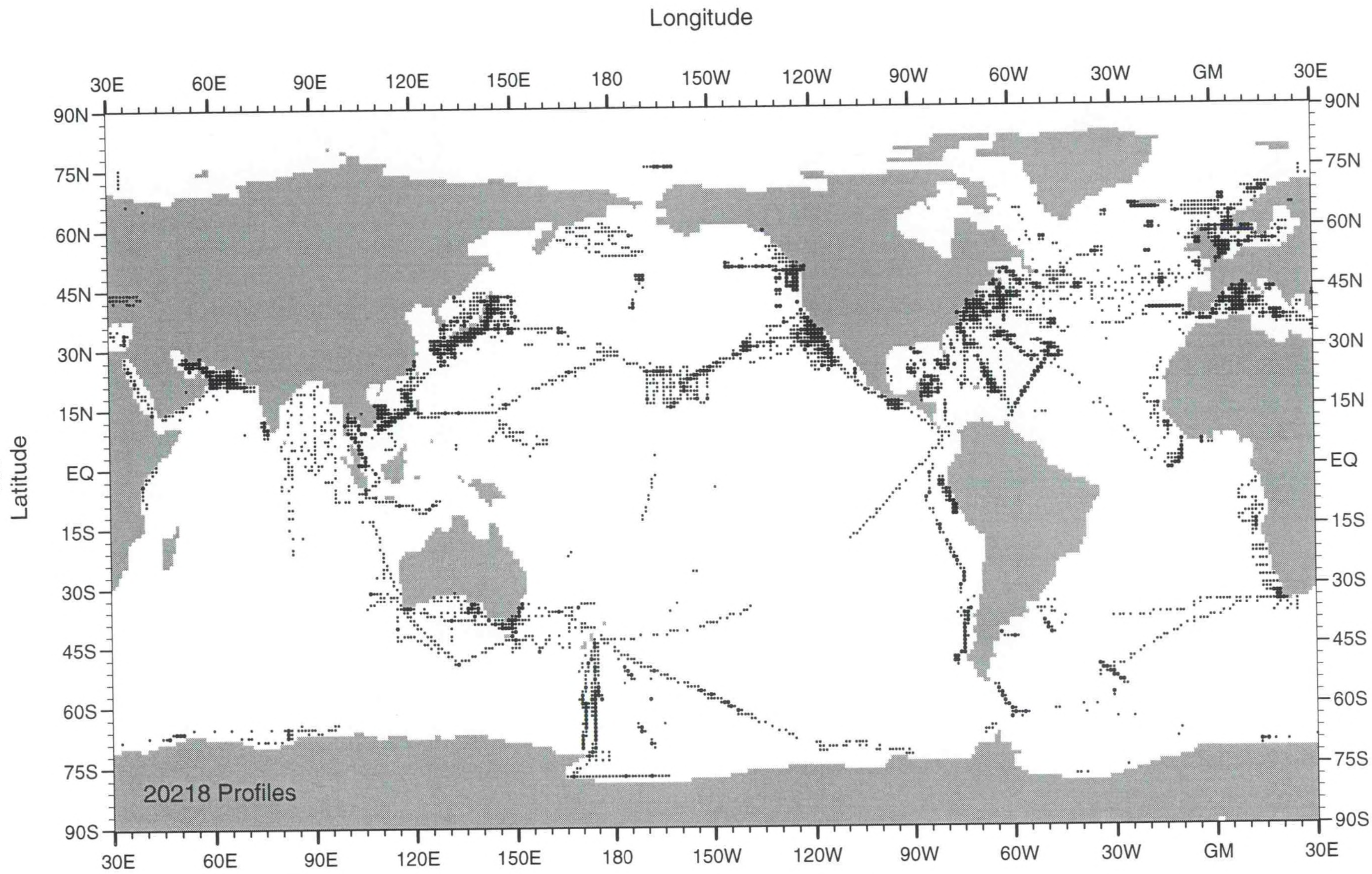


Fig. B81 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1961

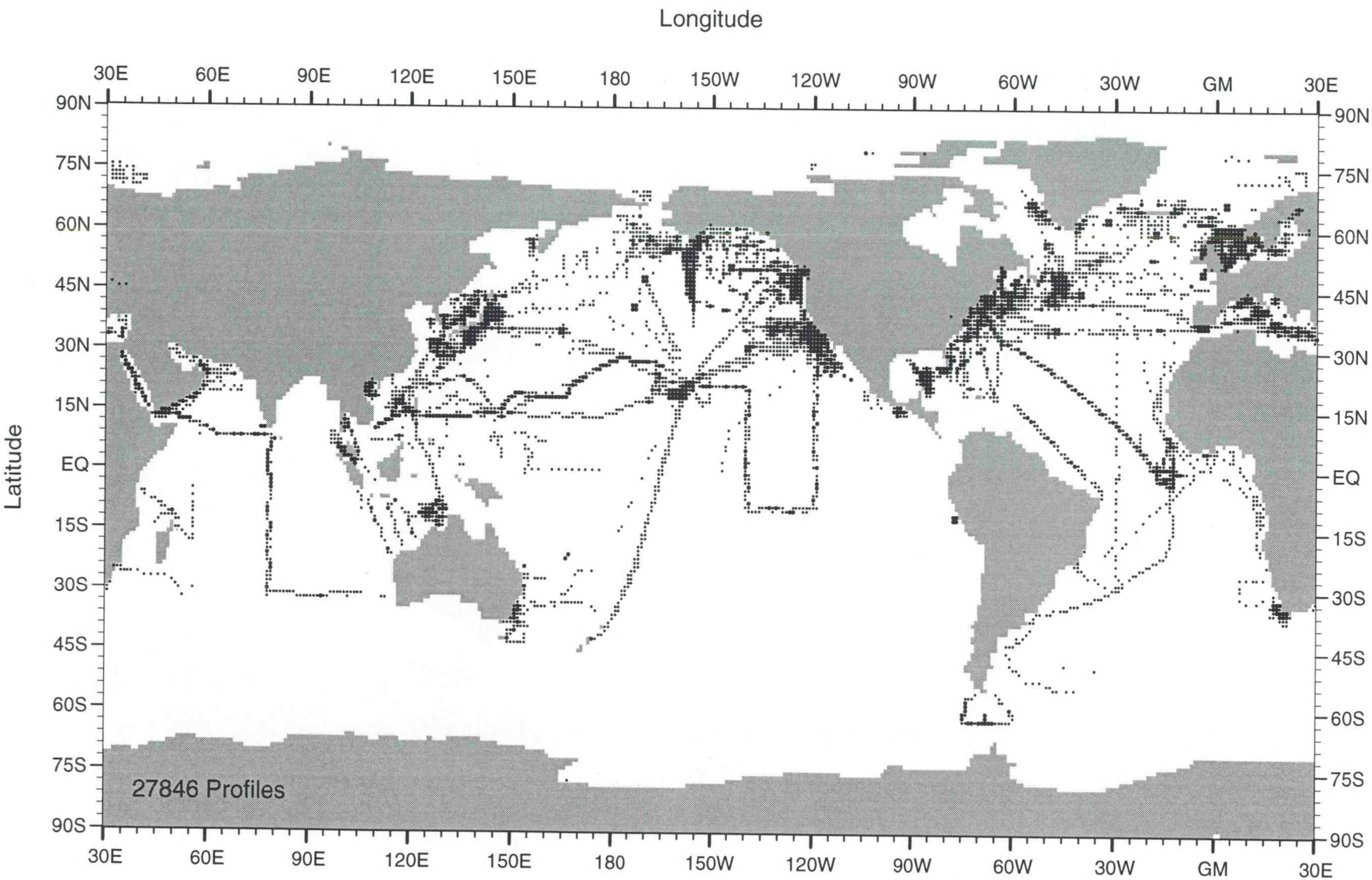


Fig. B82 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1961

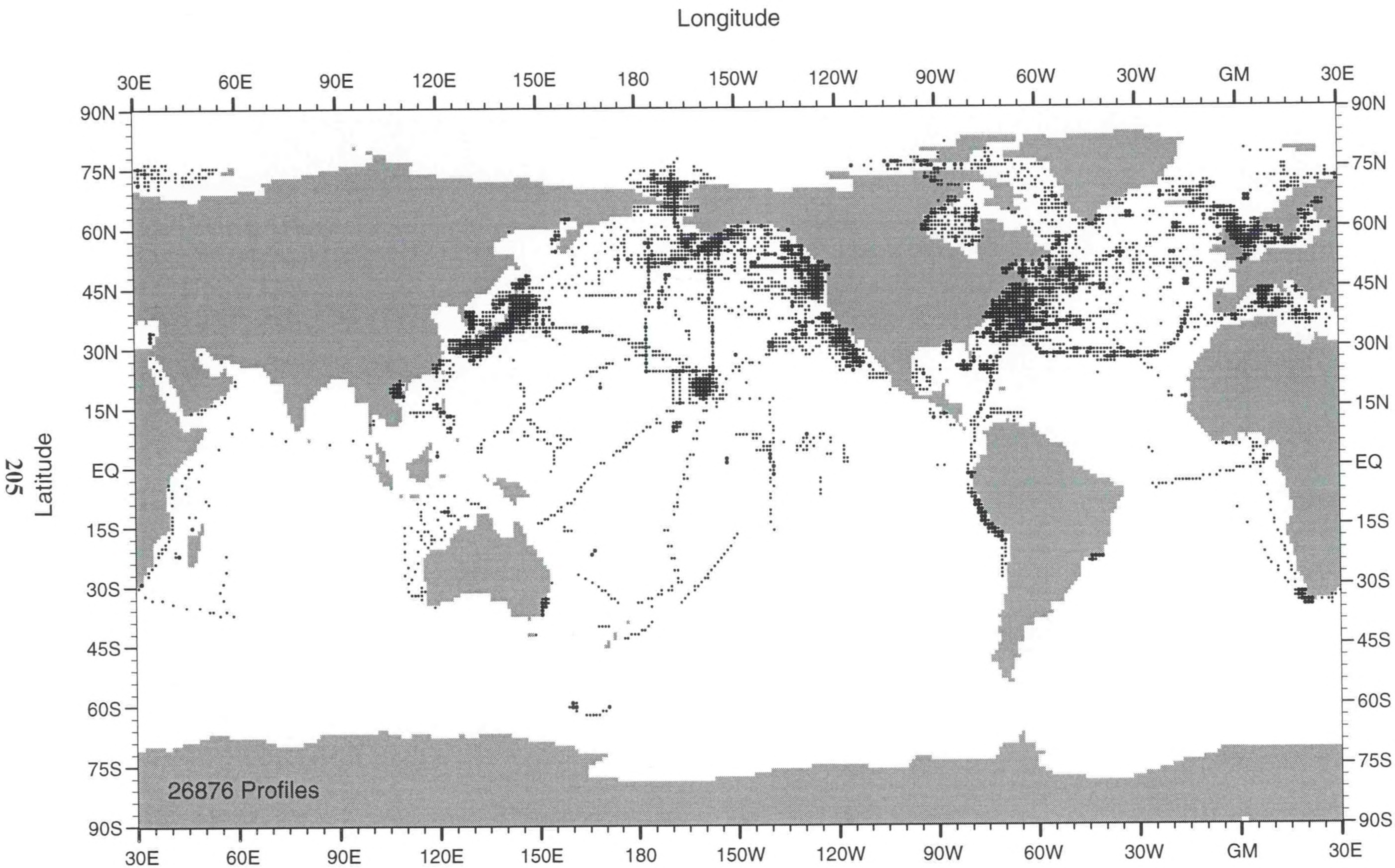


Fig. B83 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1961

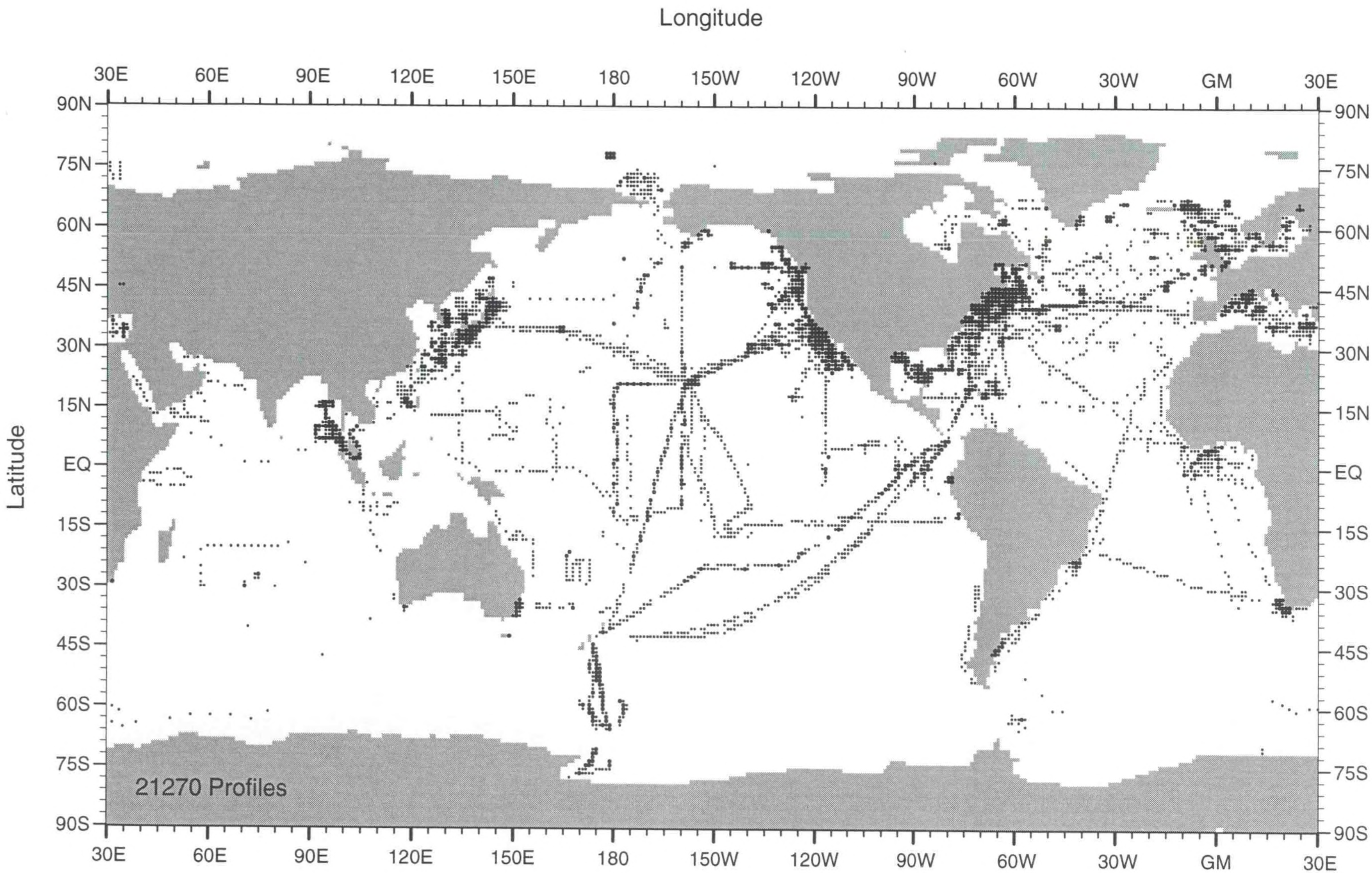


Fig. B84 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1961

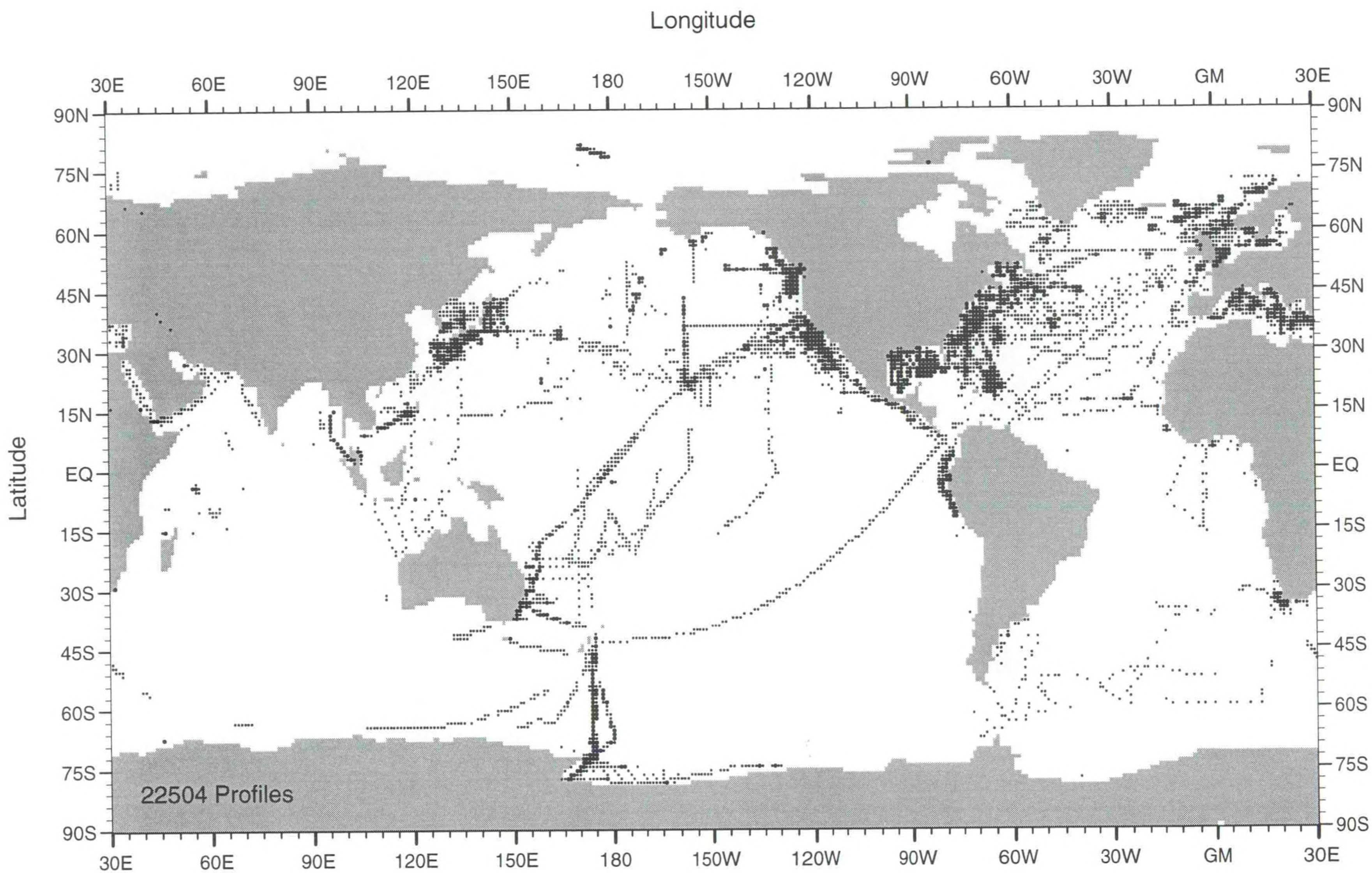


Fig. B85 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1962

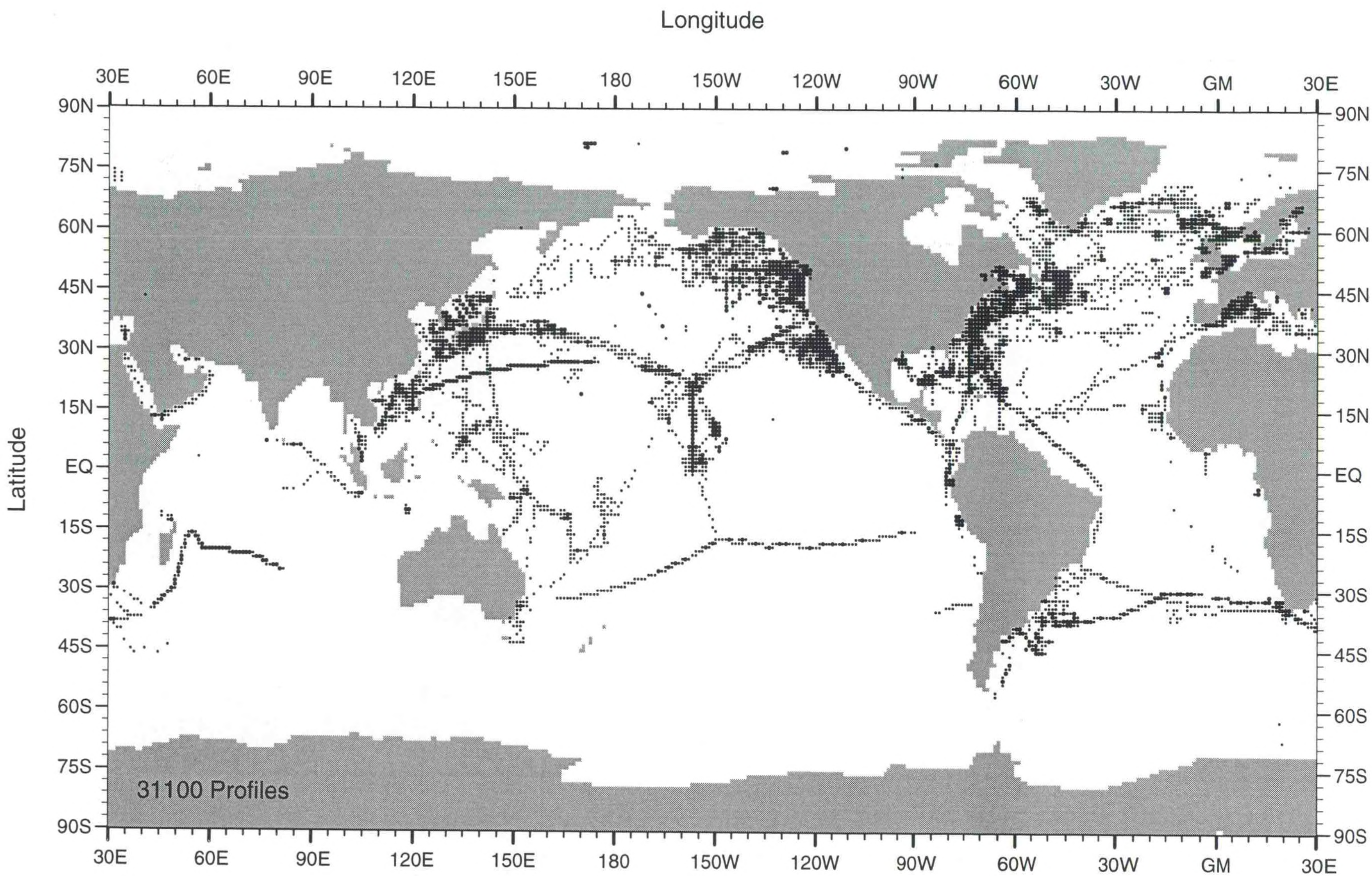


Fig. B86 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1962

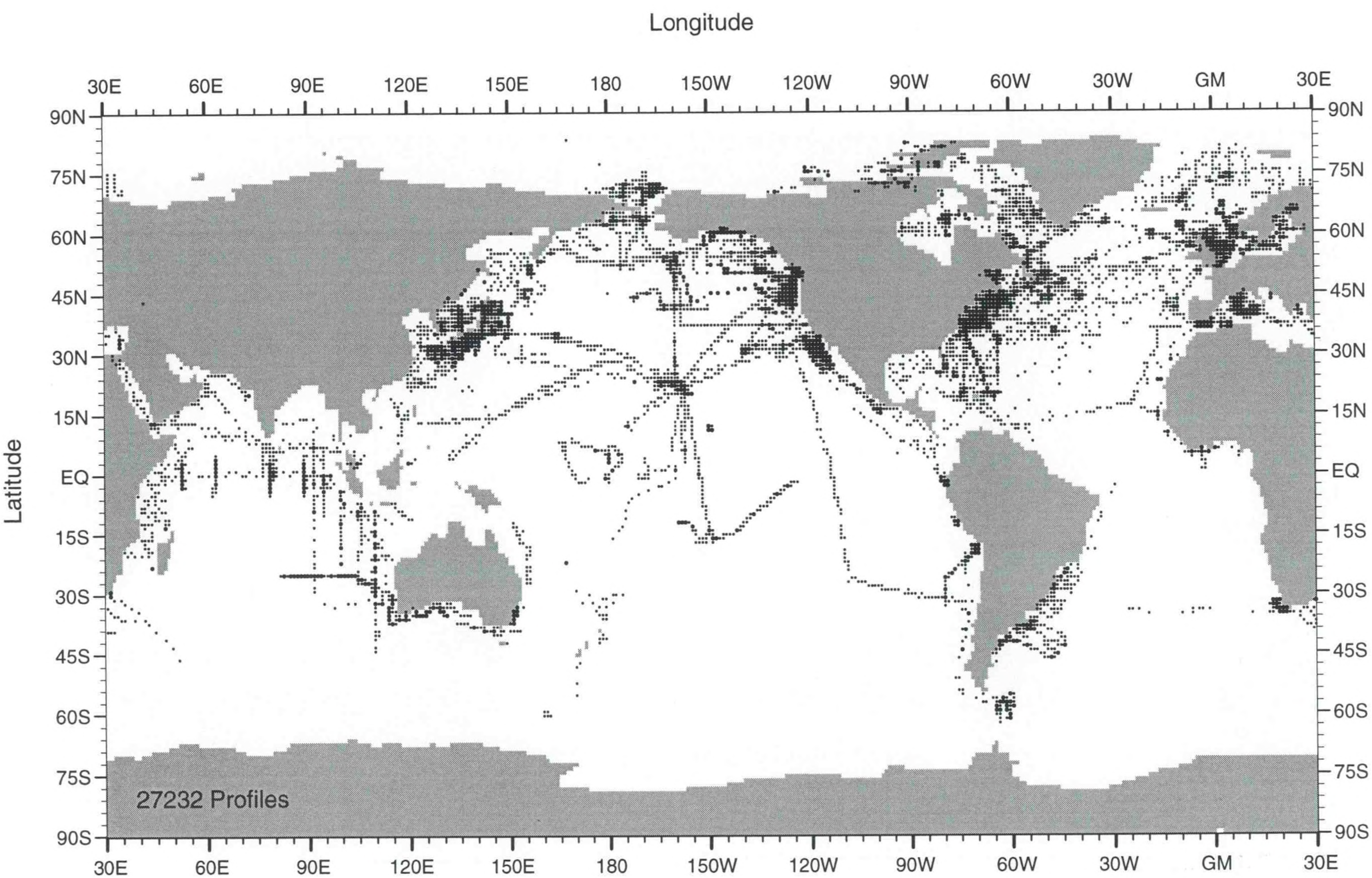


Fig. B87 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1962

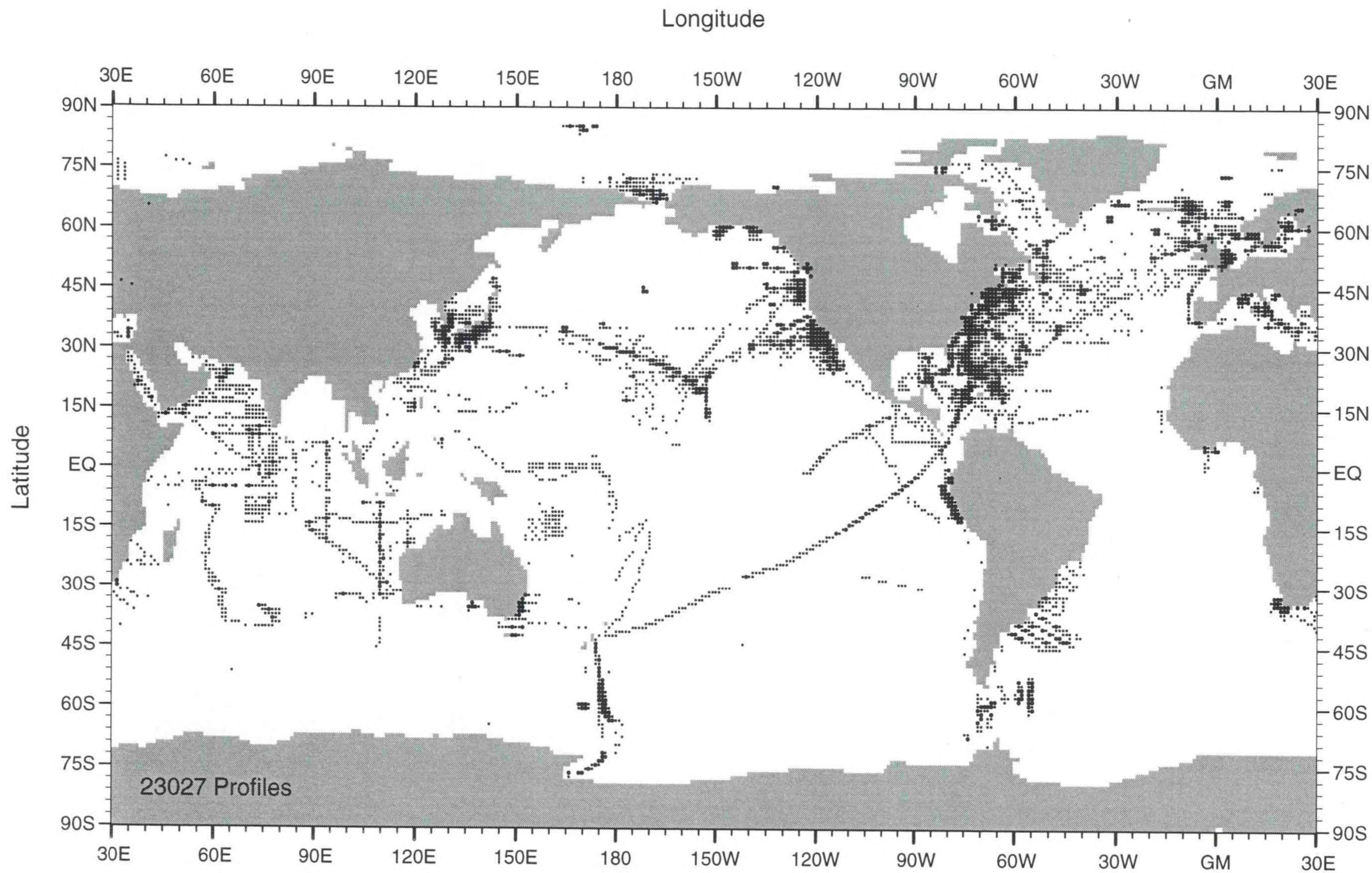


Fig. B88 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1962

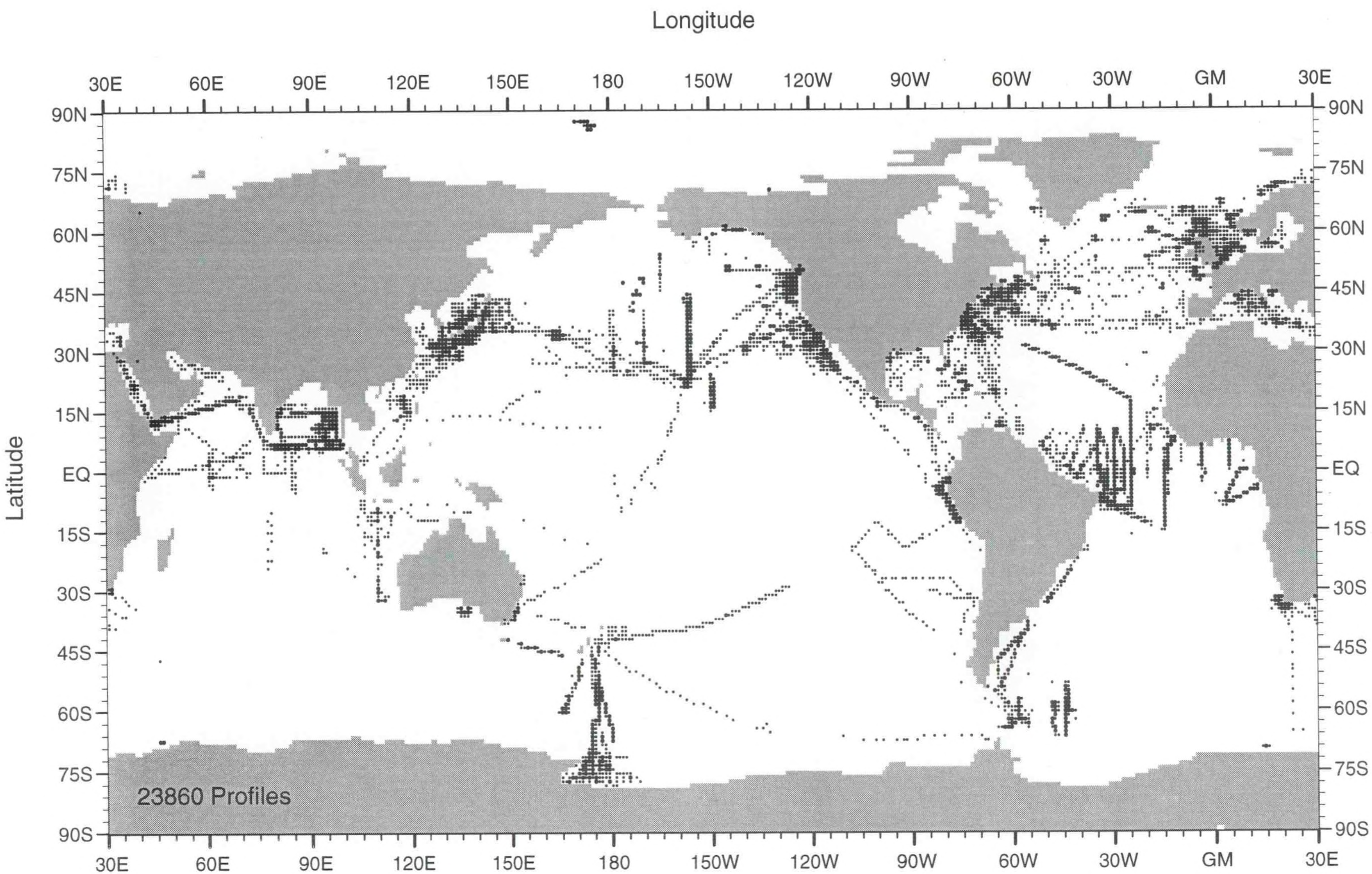


Fig. B89 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1963

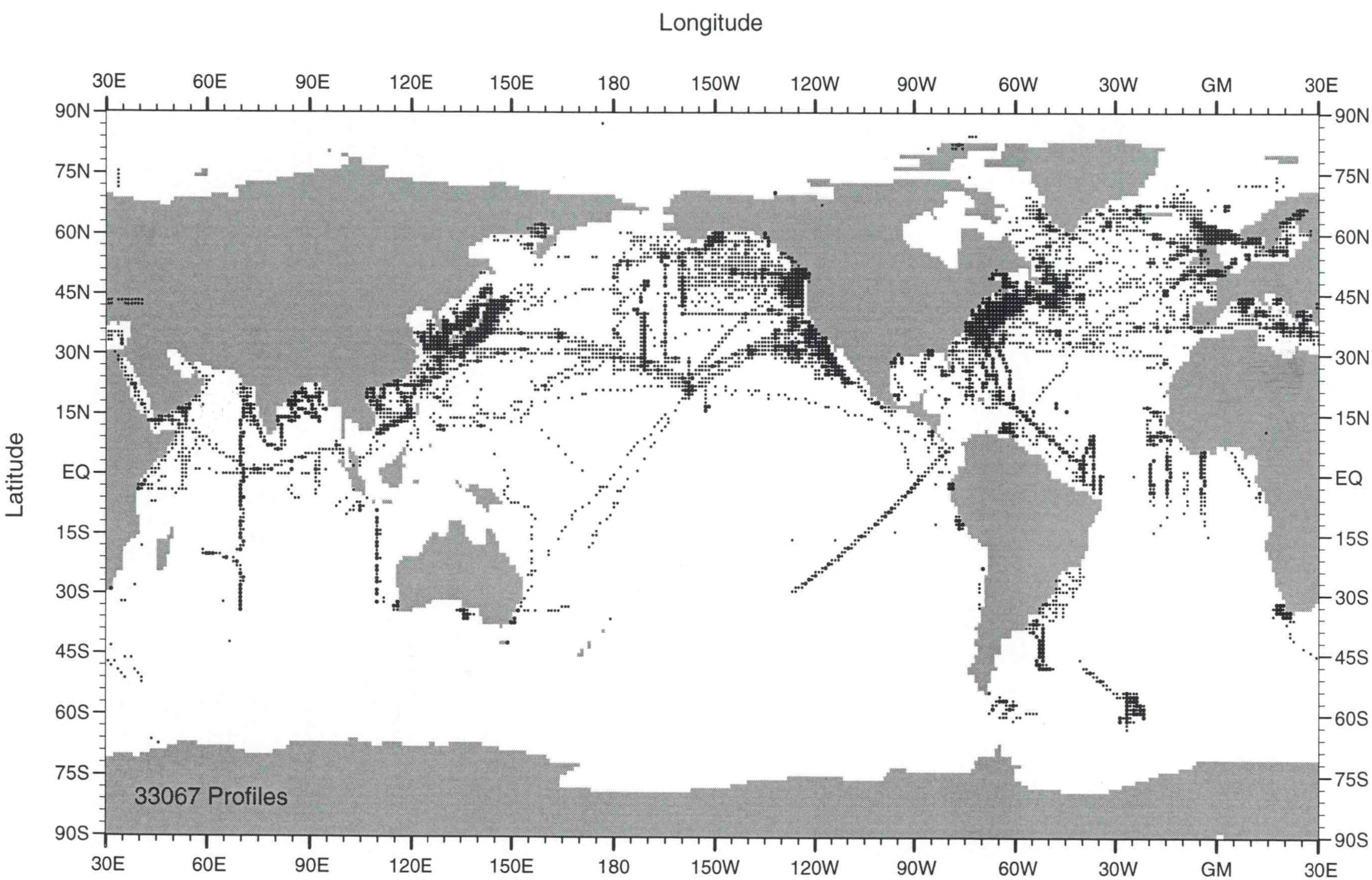


Fig. B90 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1963

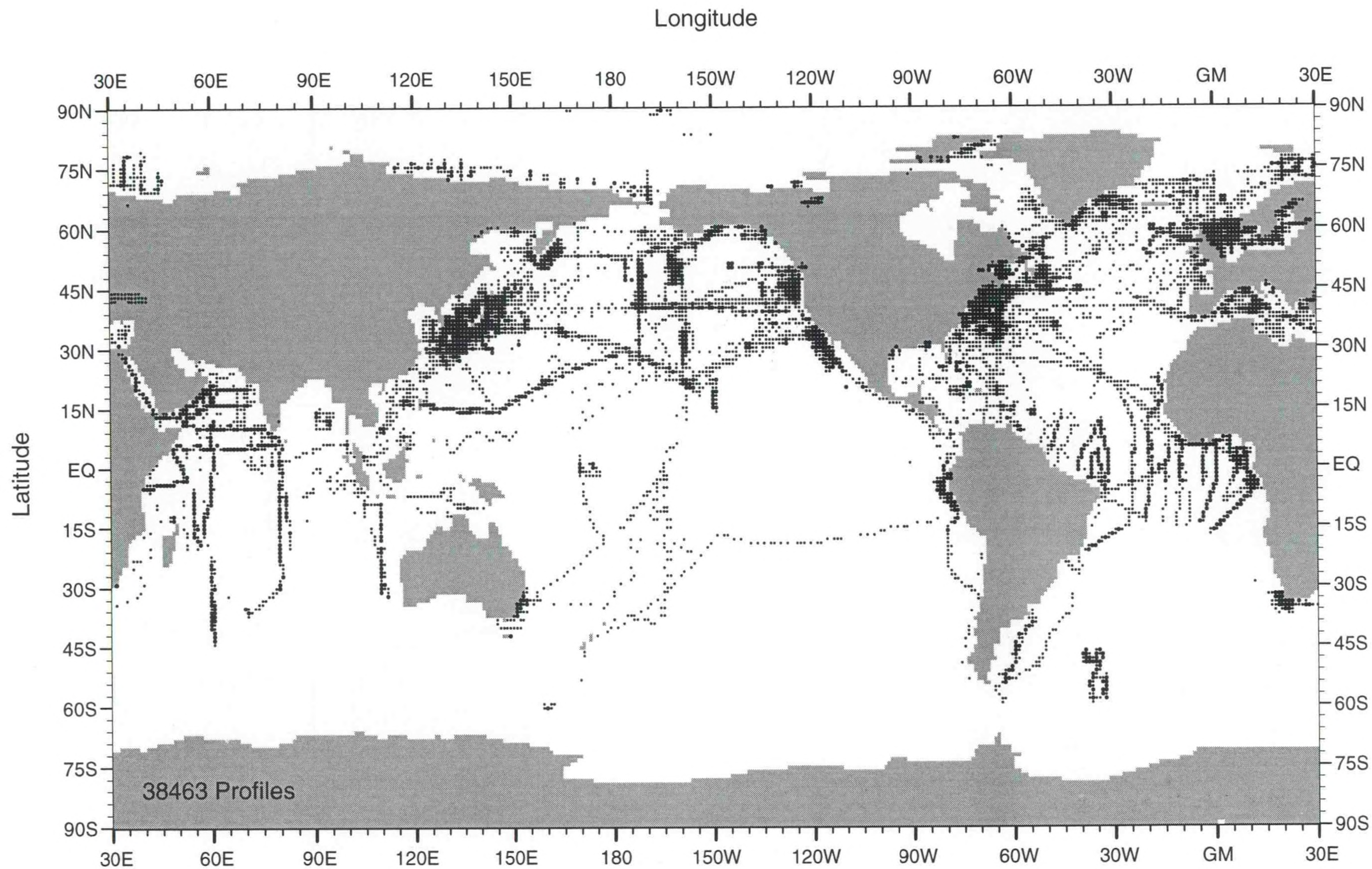


Fig. B91 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1963

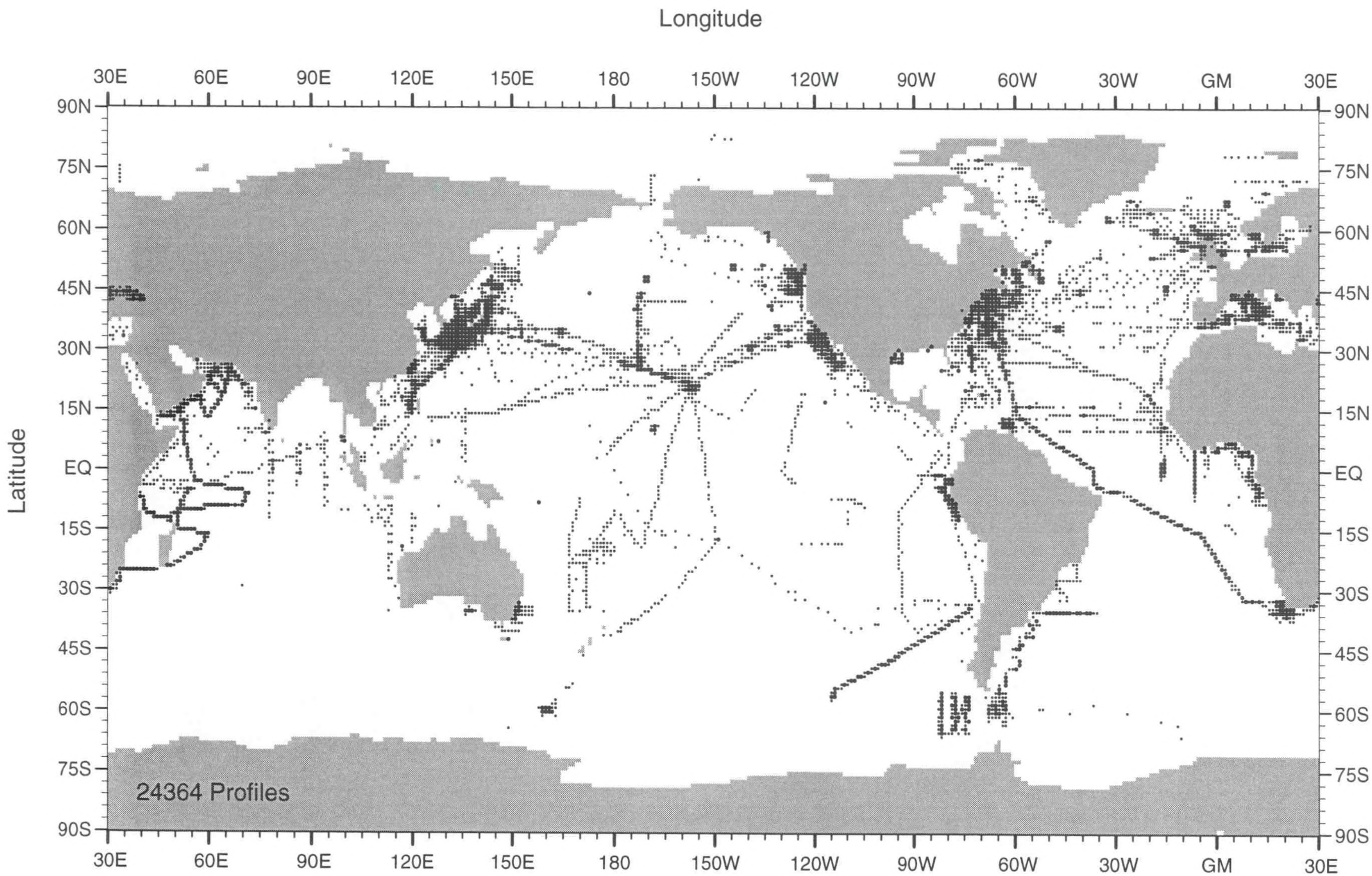


Fig. B92 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1963

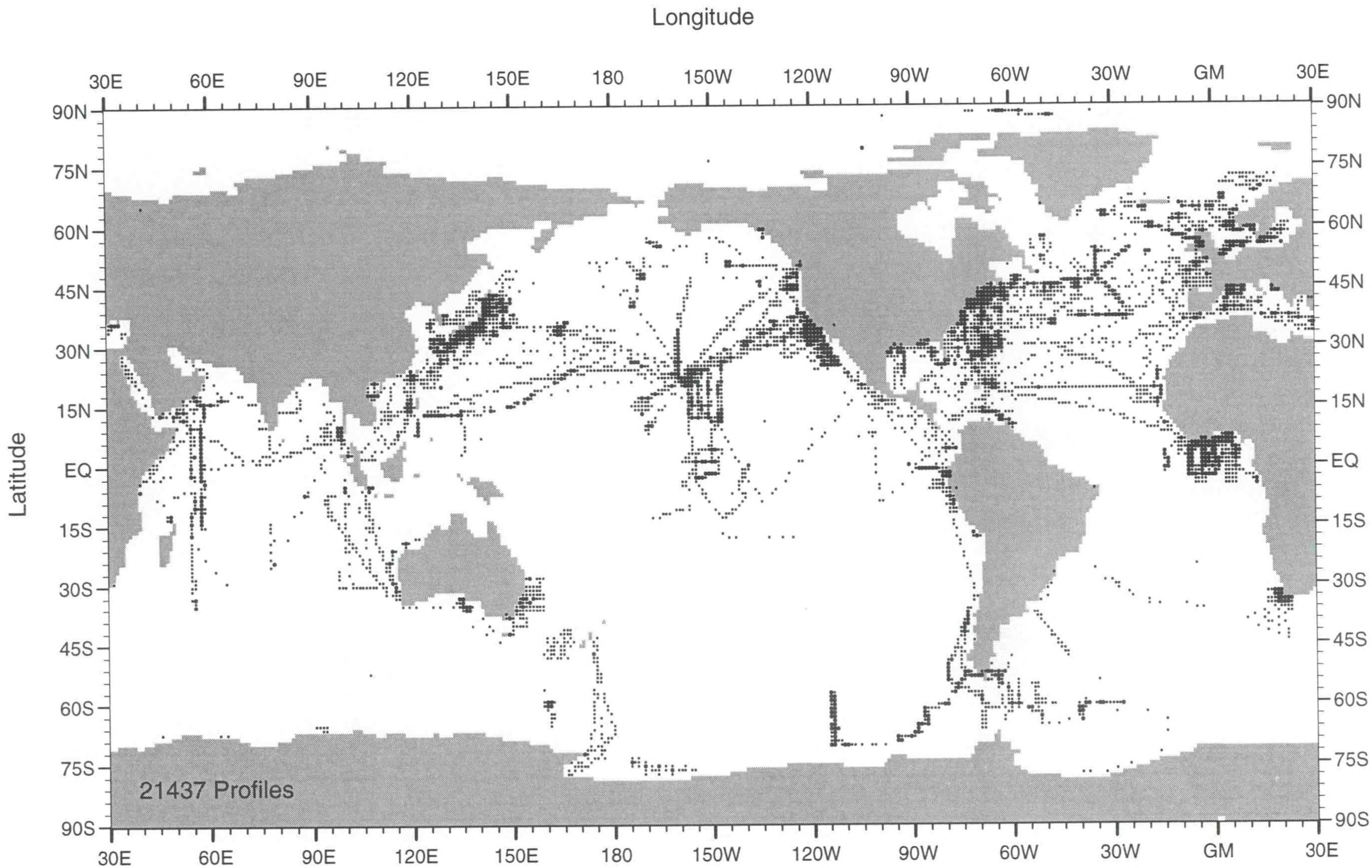


Fig. B93 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1964

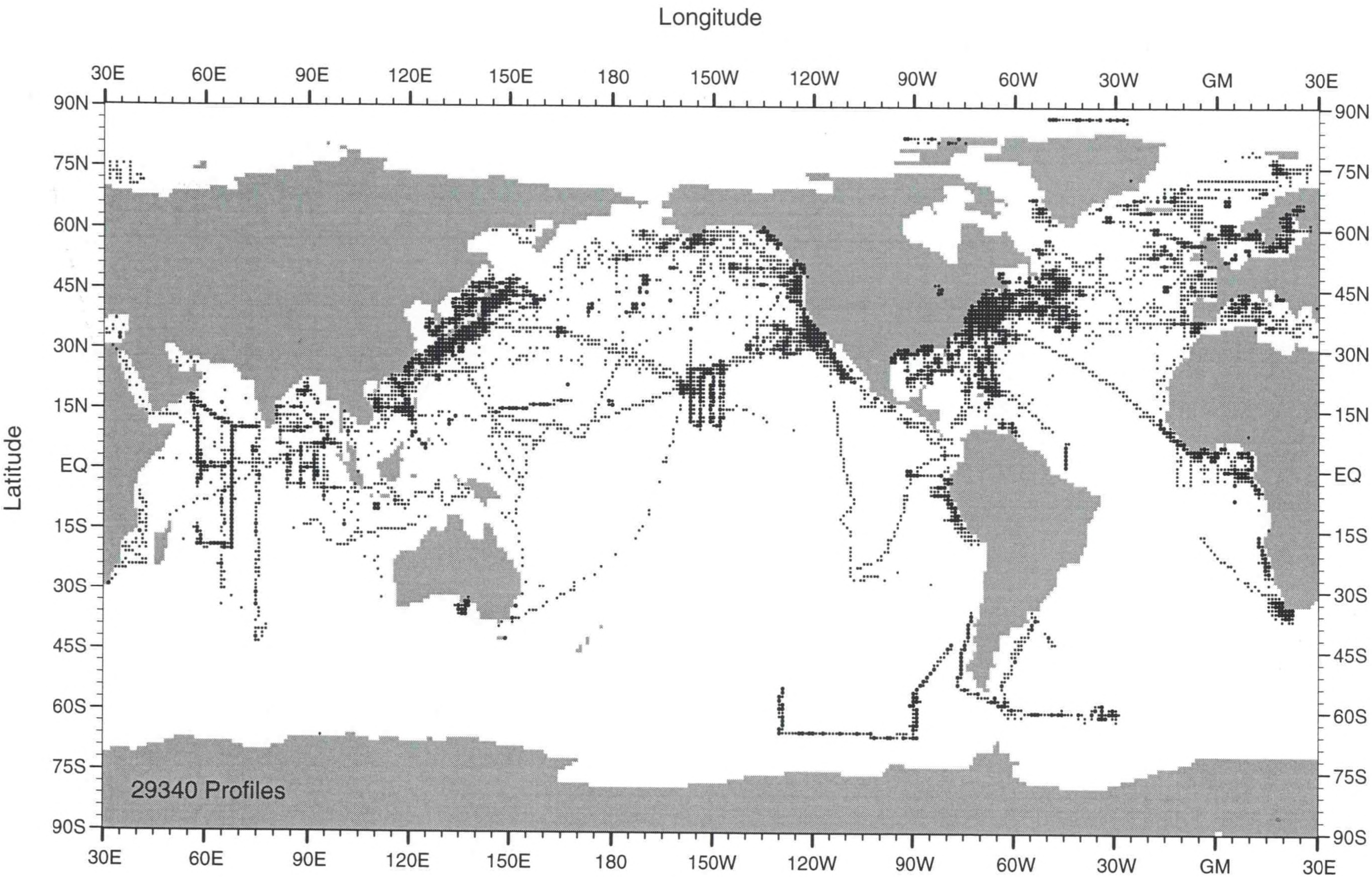


Fig. B94 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1964

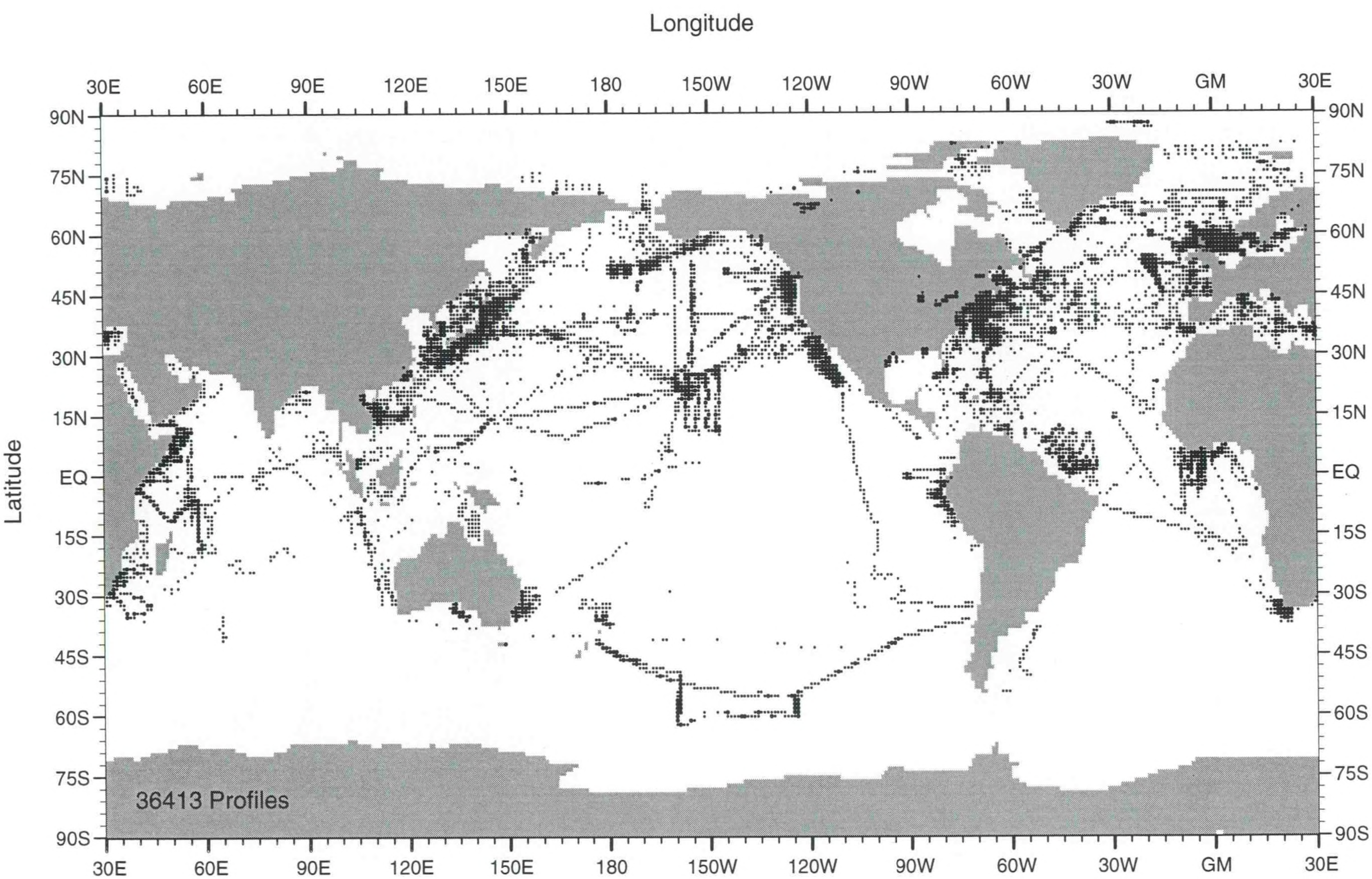


Fig. B95 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1964

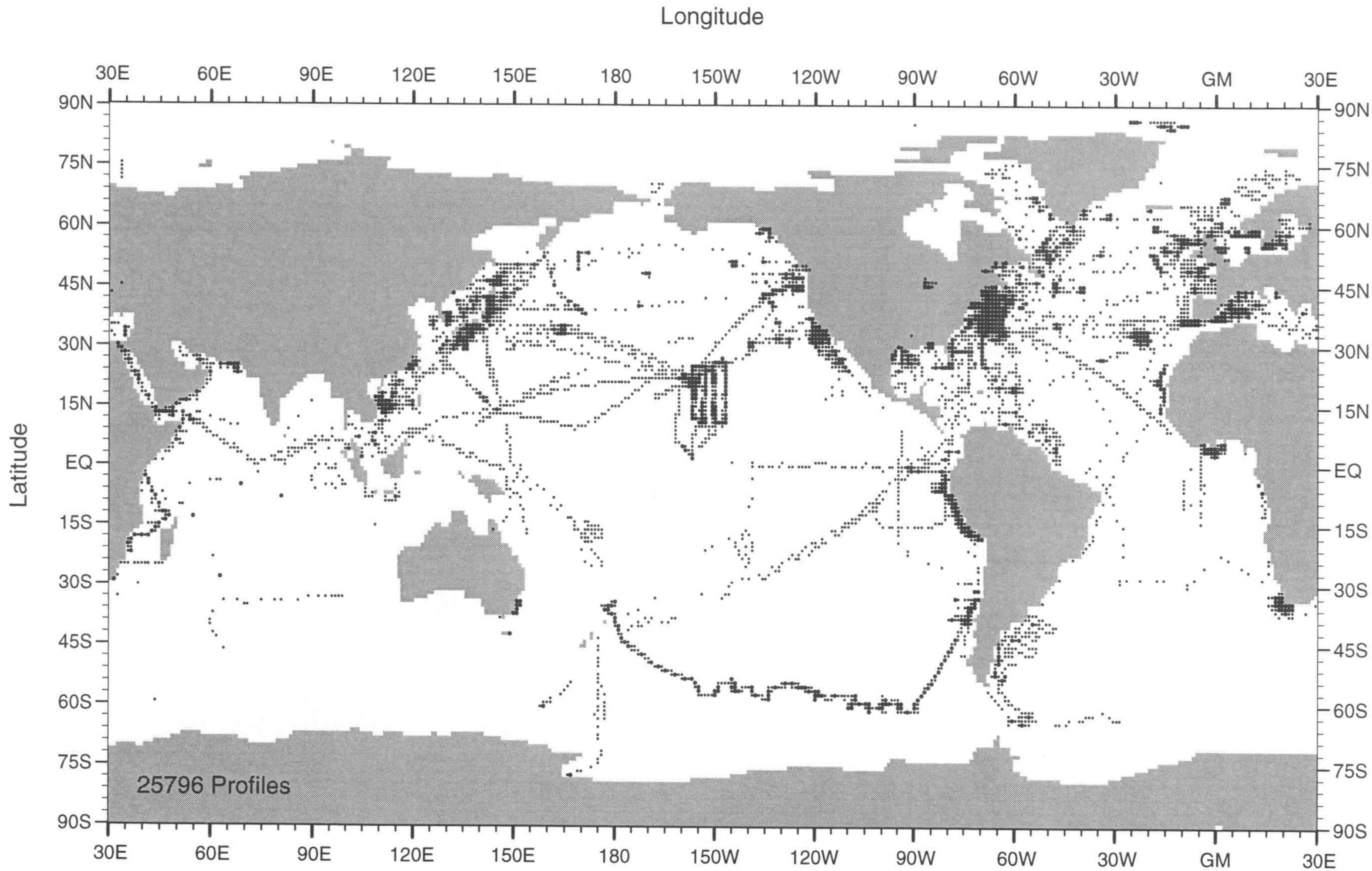


Fig. B96 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1964

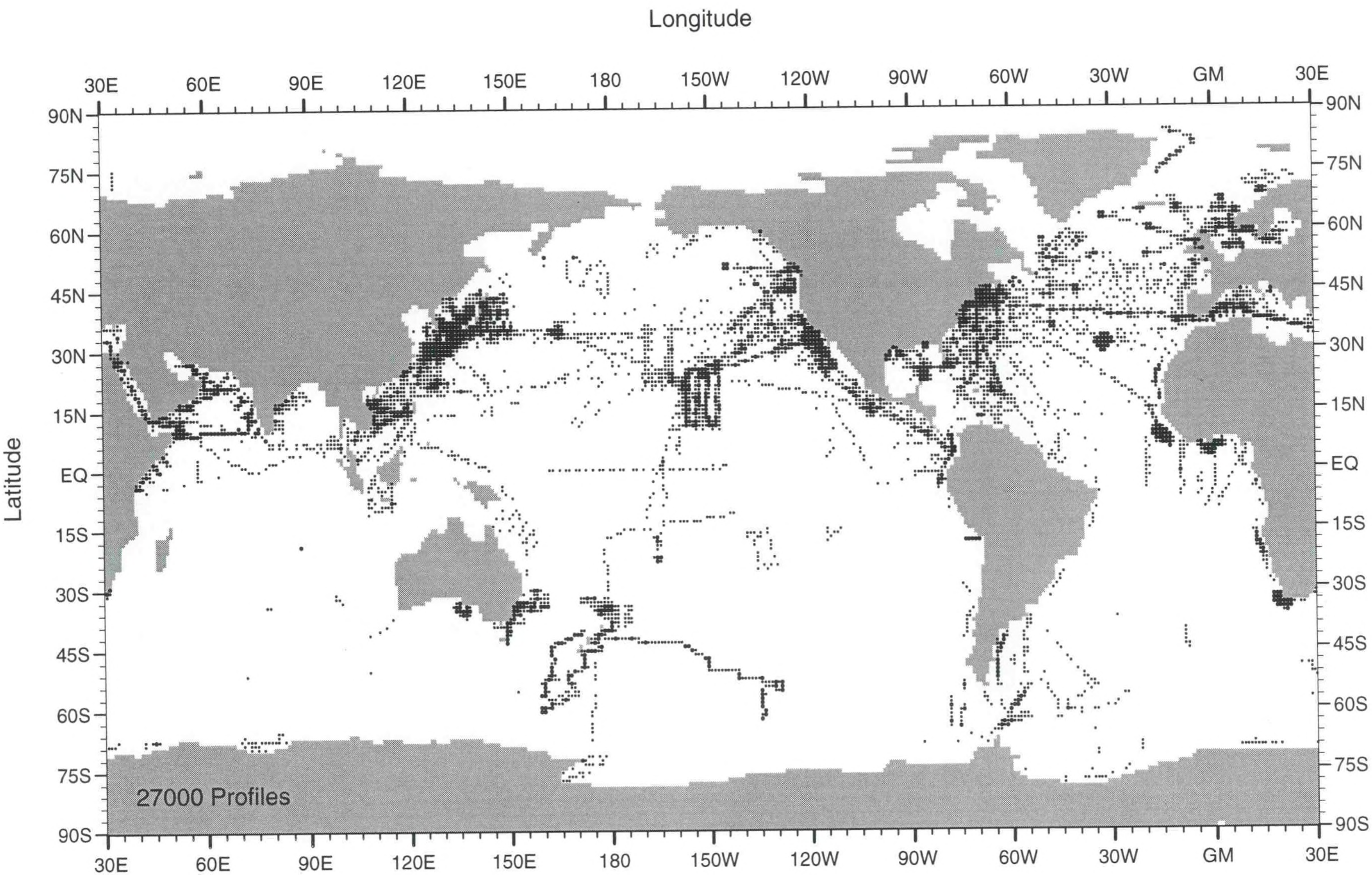


Fig. B97 Distribution of all data profiles (OSD+MBT) in WOD98 for January-March for 1965

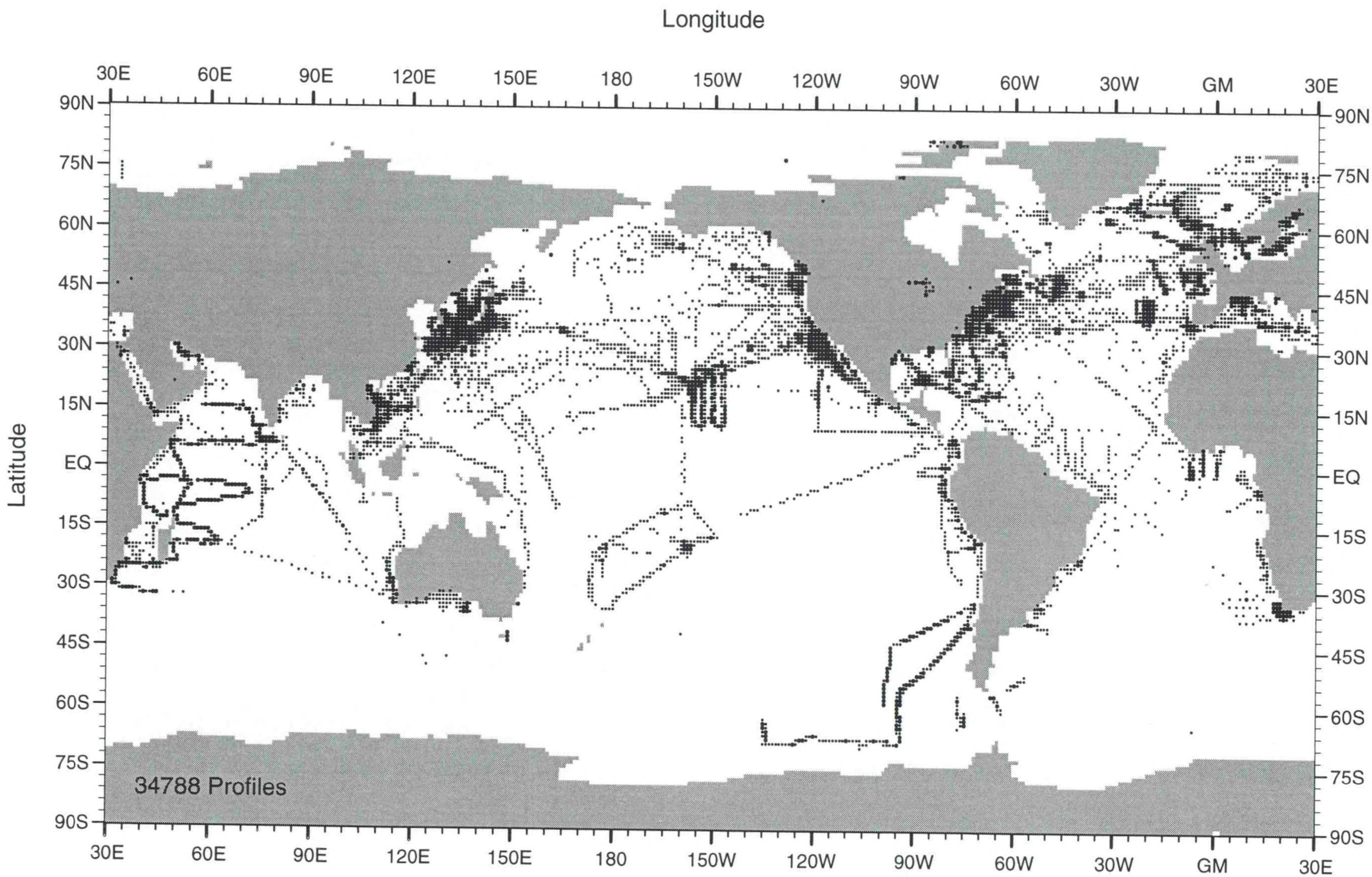


Fig. B98 Distribution of all data profiles (OSD+MBT) in WOD98 for April-June for 1965

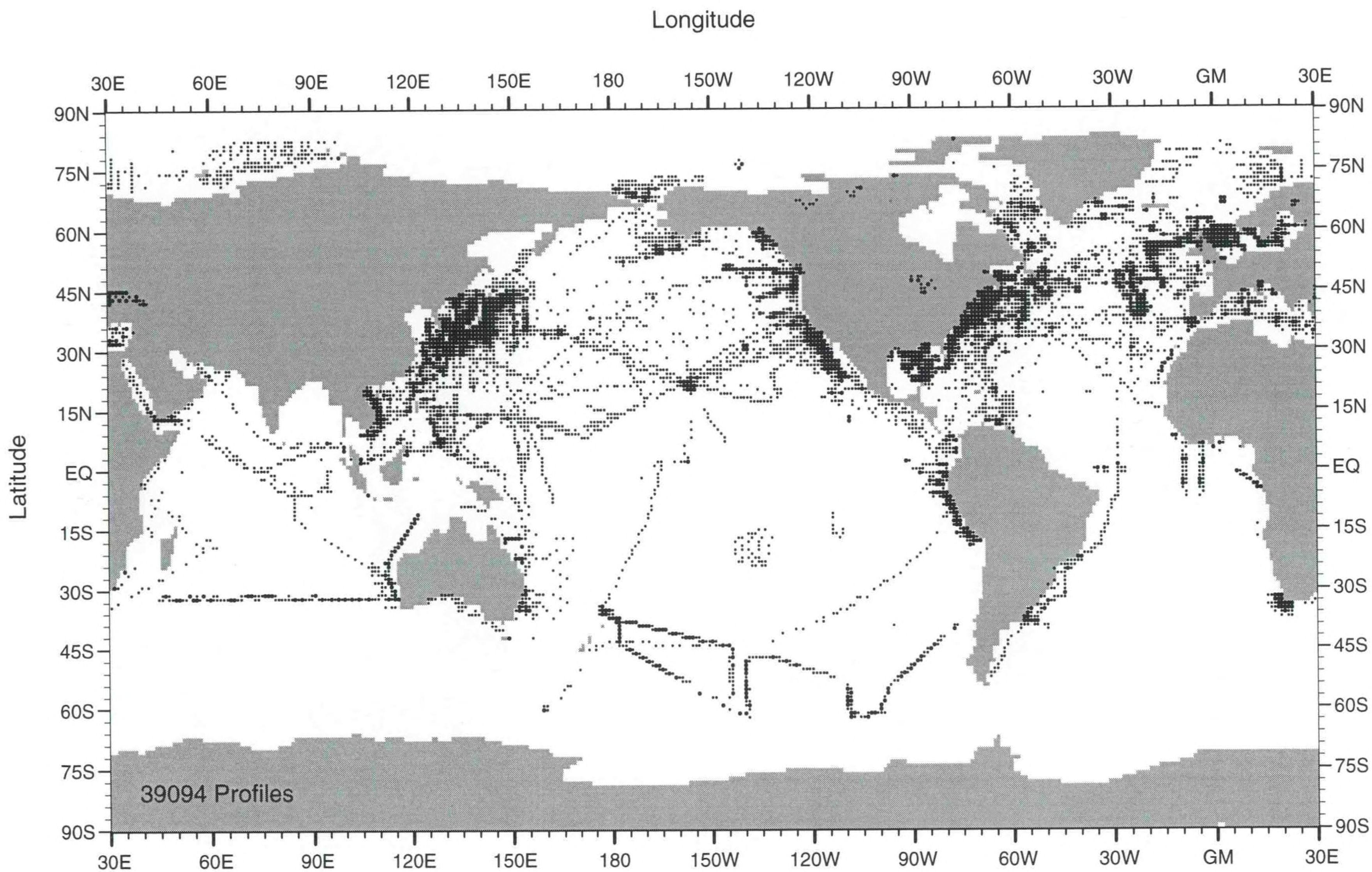


Fig. B99 Distribution of all data profiles (OSD+MBT) in WOD98 for July-September for 1965

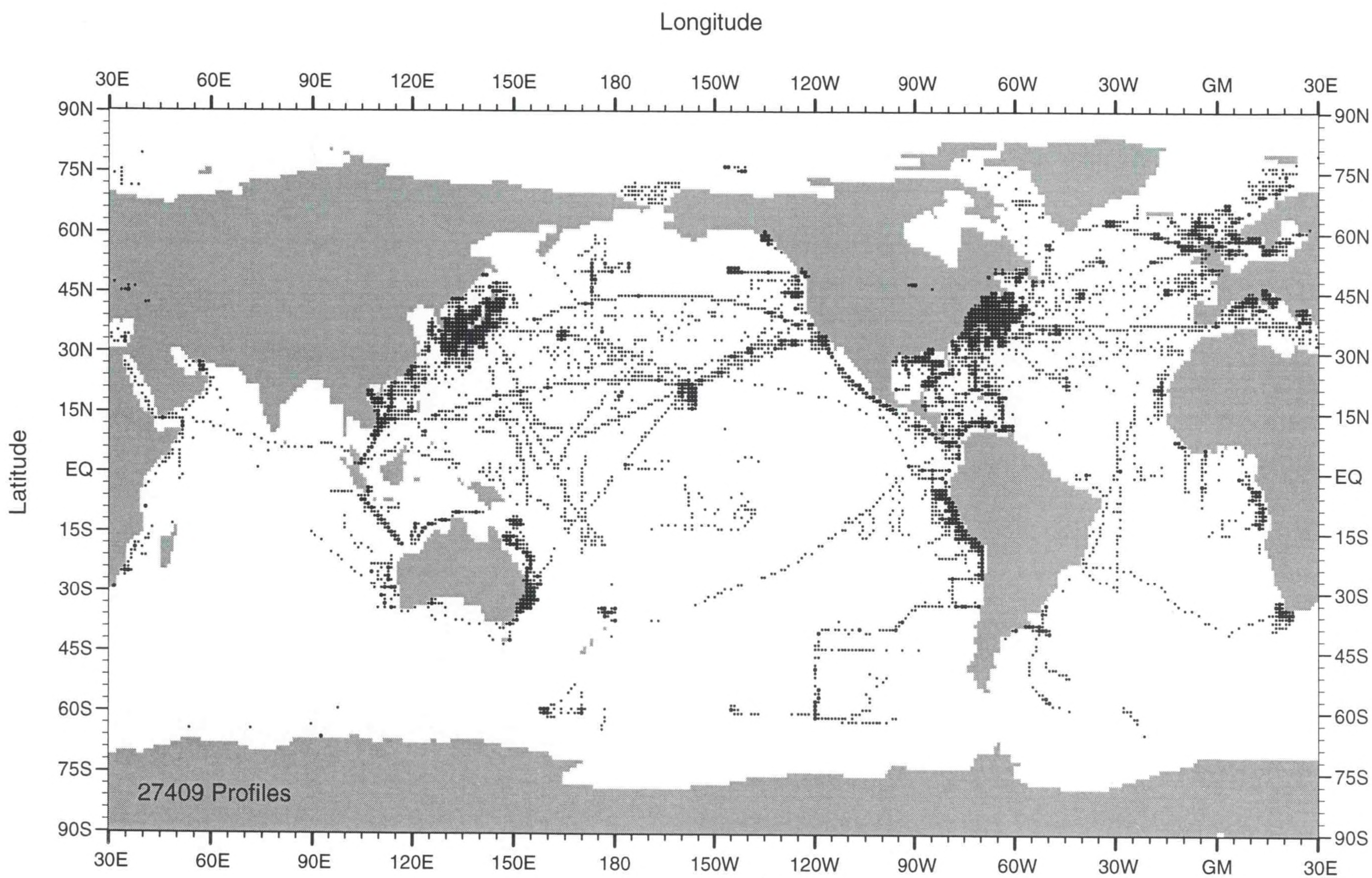


Fig. B100 Distribution of all data profiles (OSD+MBT) in WOD98 for October-December for 1965

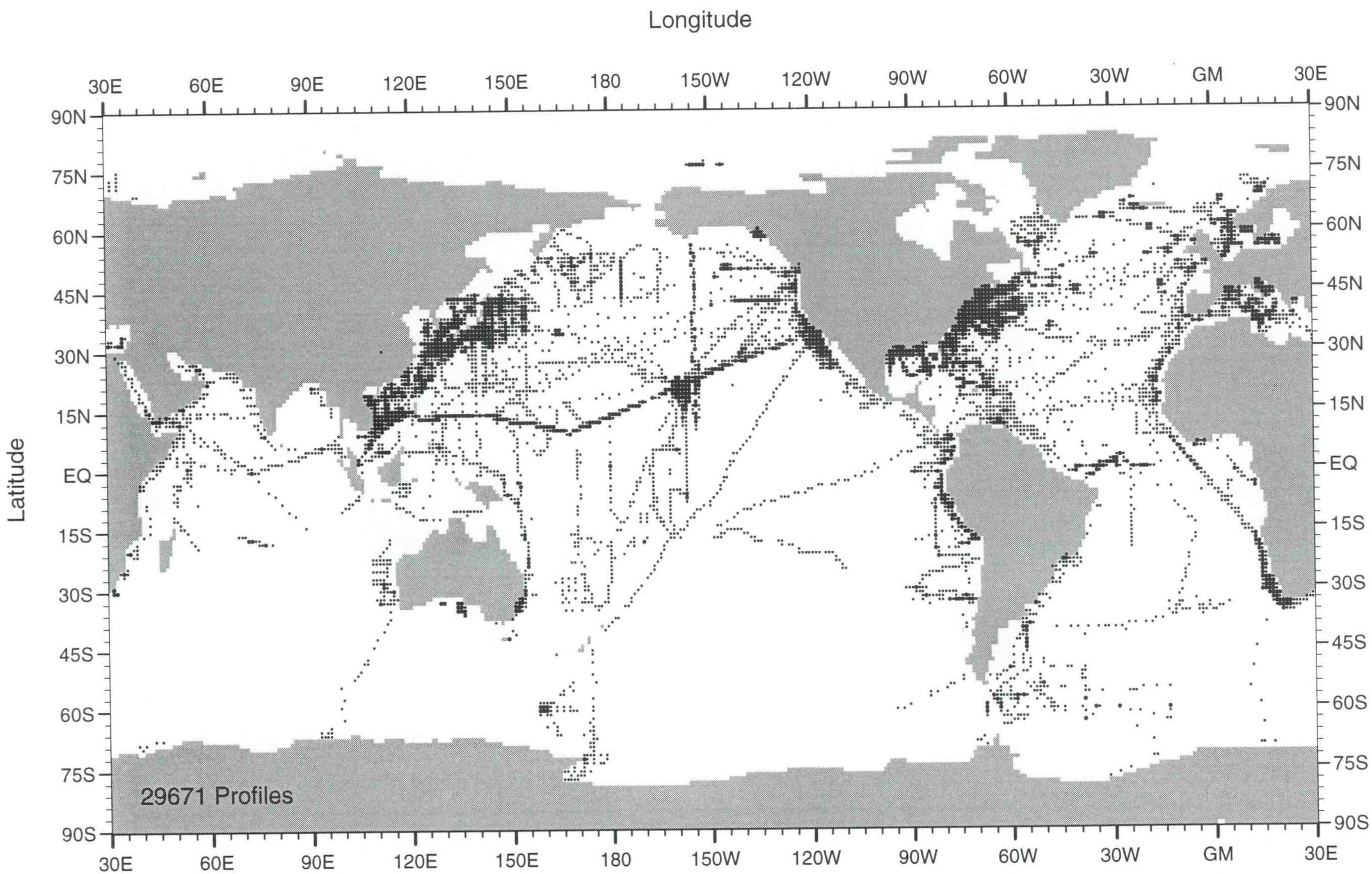


Fig. B101 Distribution of all data profiles (OSD+MBT+XBT) in WOD98 for January-March for 1966

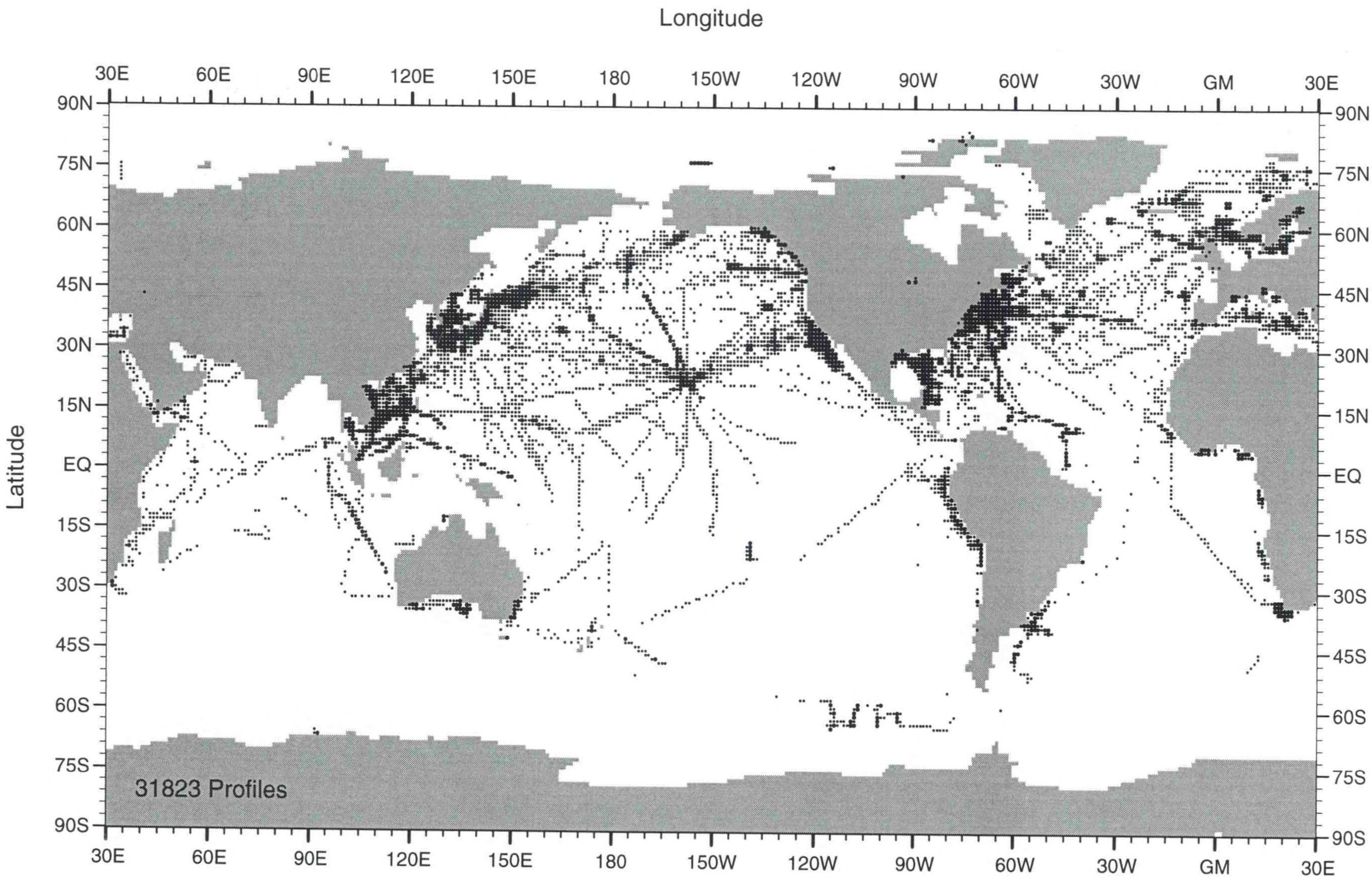


Fig. B102 Distribution of all data profiles (OSD+MBT+XBT) in WOD98 for April-June for 1966

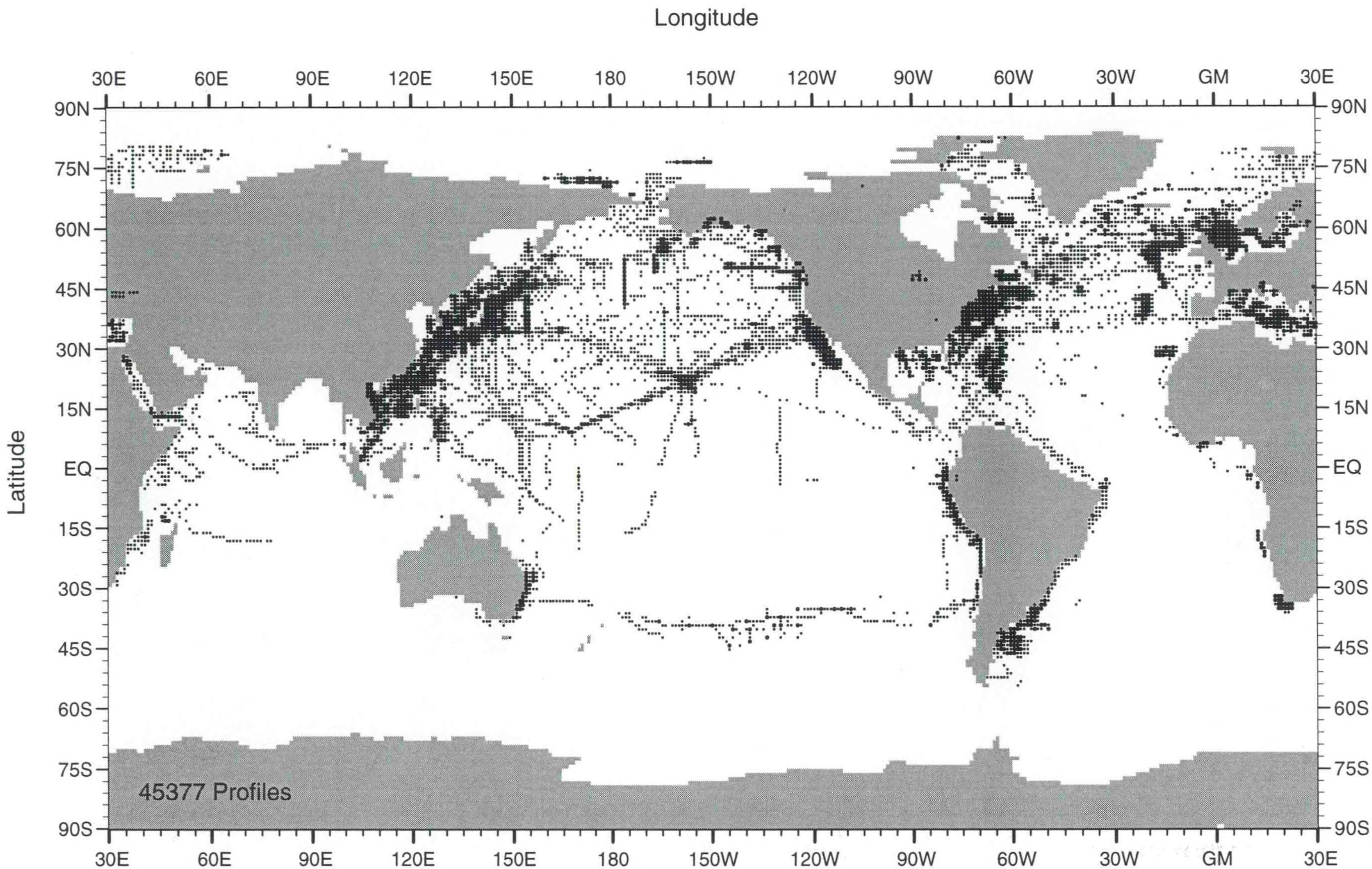


Fig. B103 Distribution of all data profiles (OSD+MBT+XBT) in WOD98 for July-September for 1966

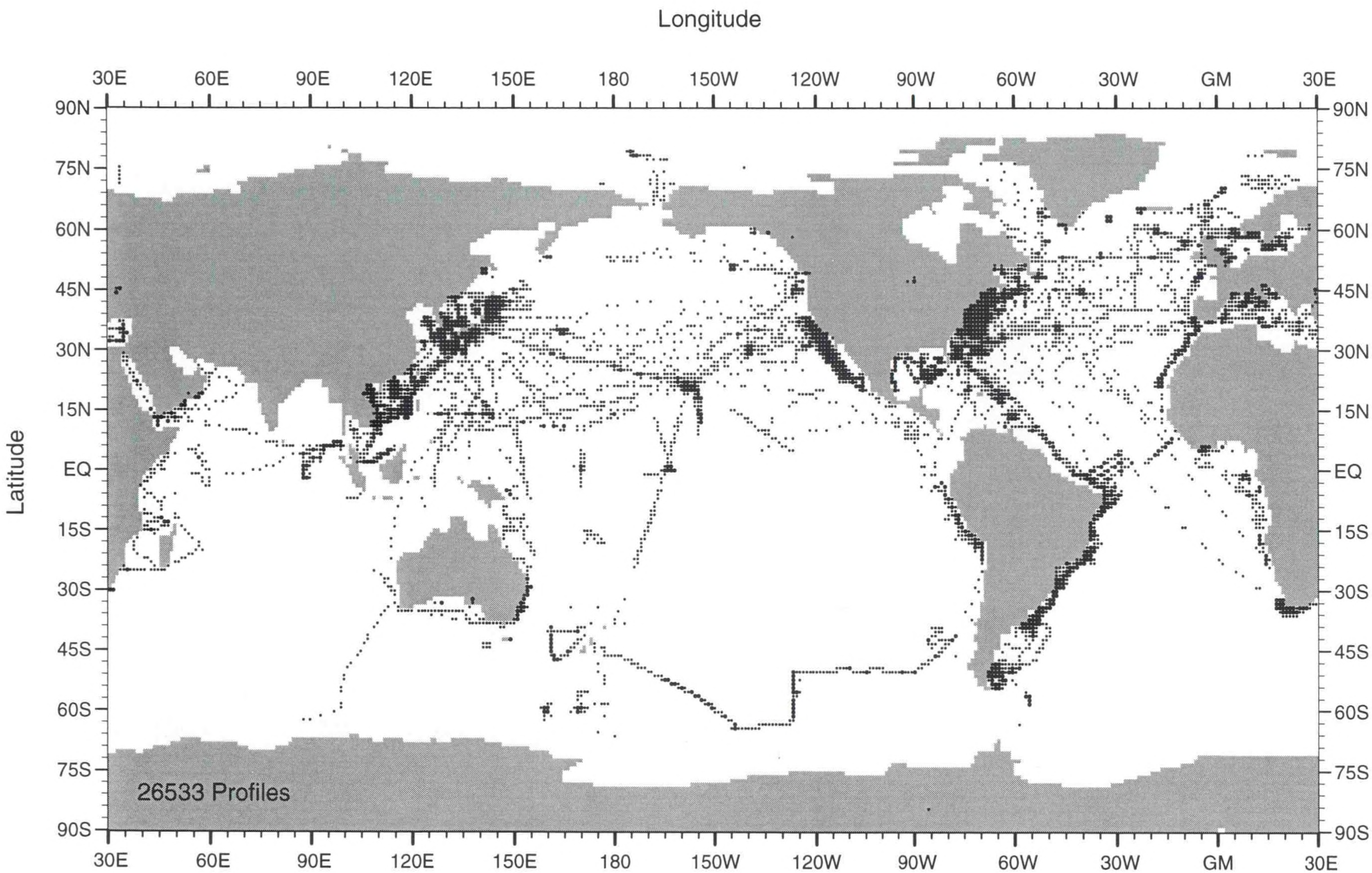


Fig. B104 Distribution of all data profiles (OSD+MBT+XBT) in WOD98 for October-December for 1966

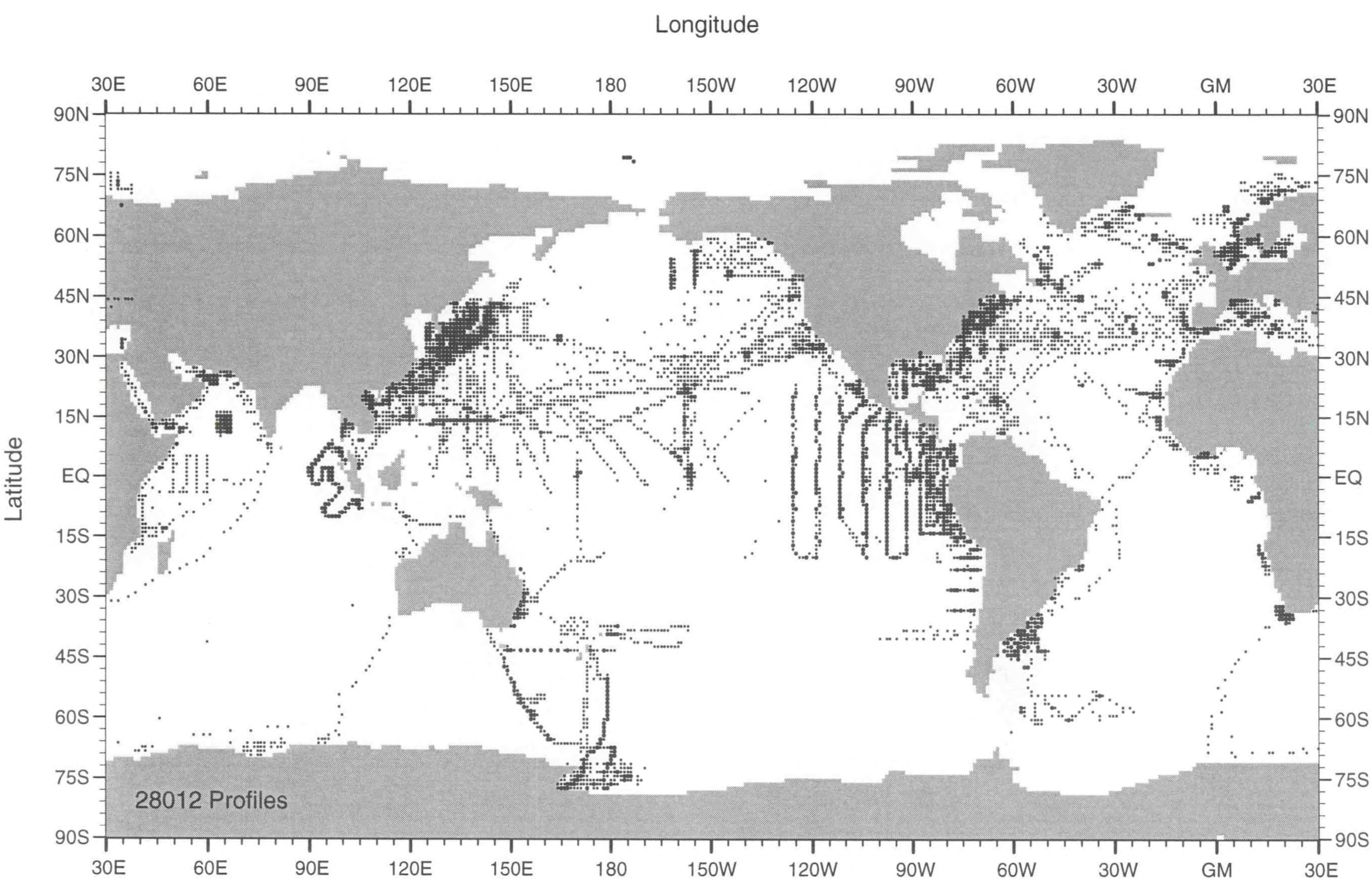


Fig. B105 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1967

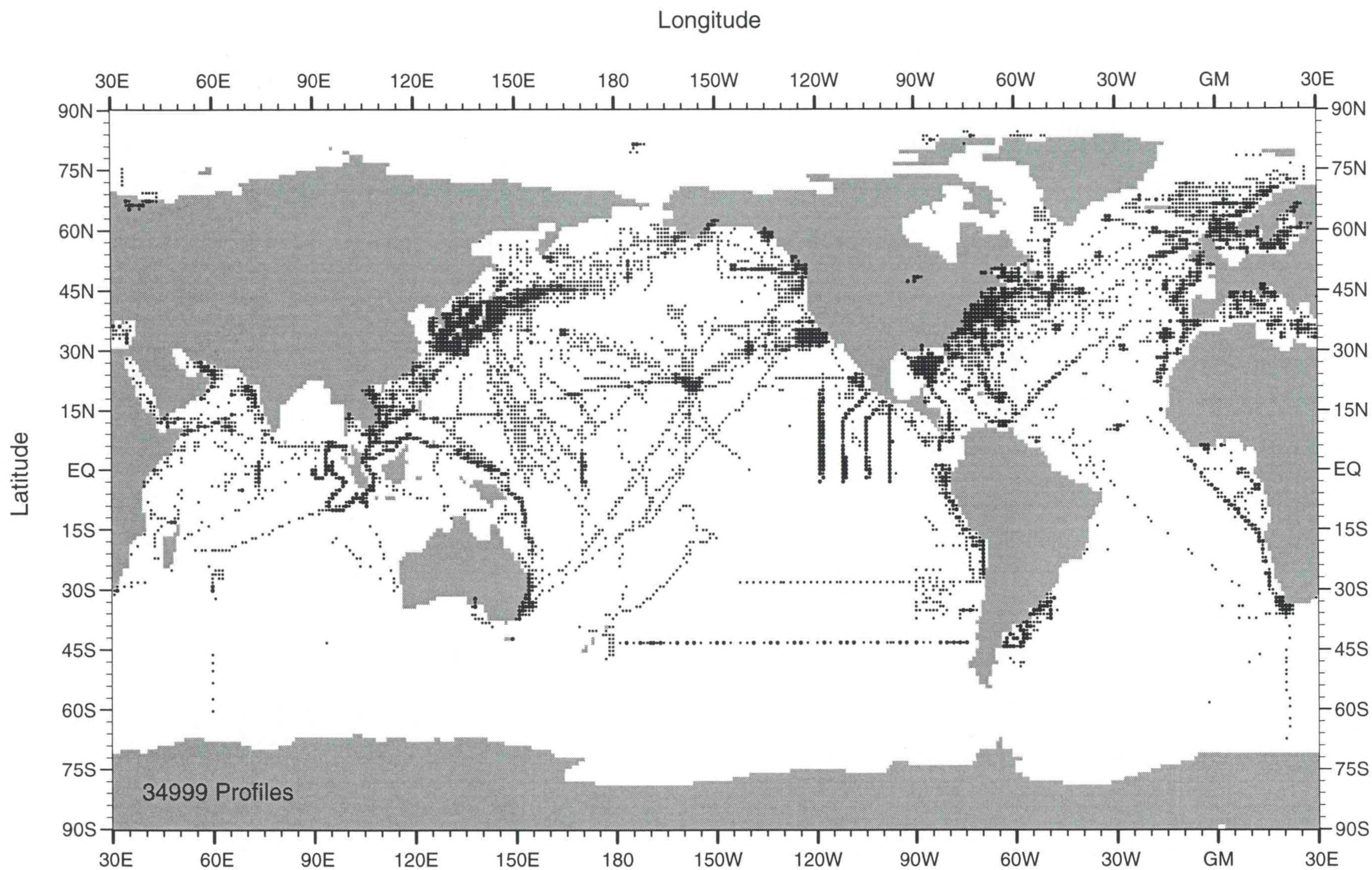


Fig. B106 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1967

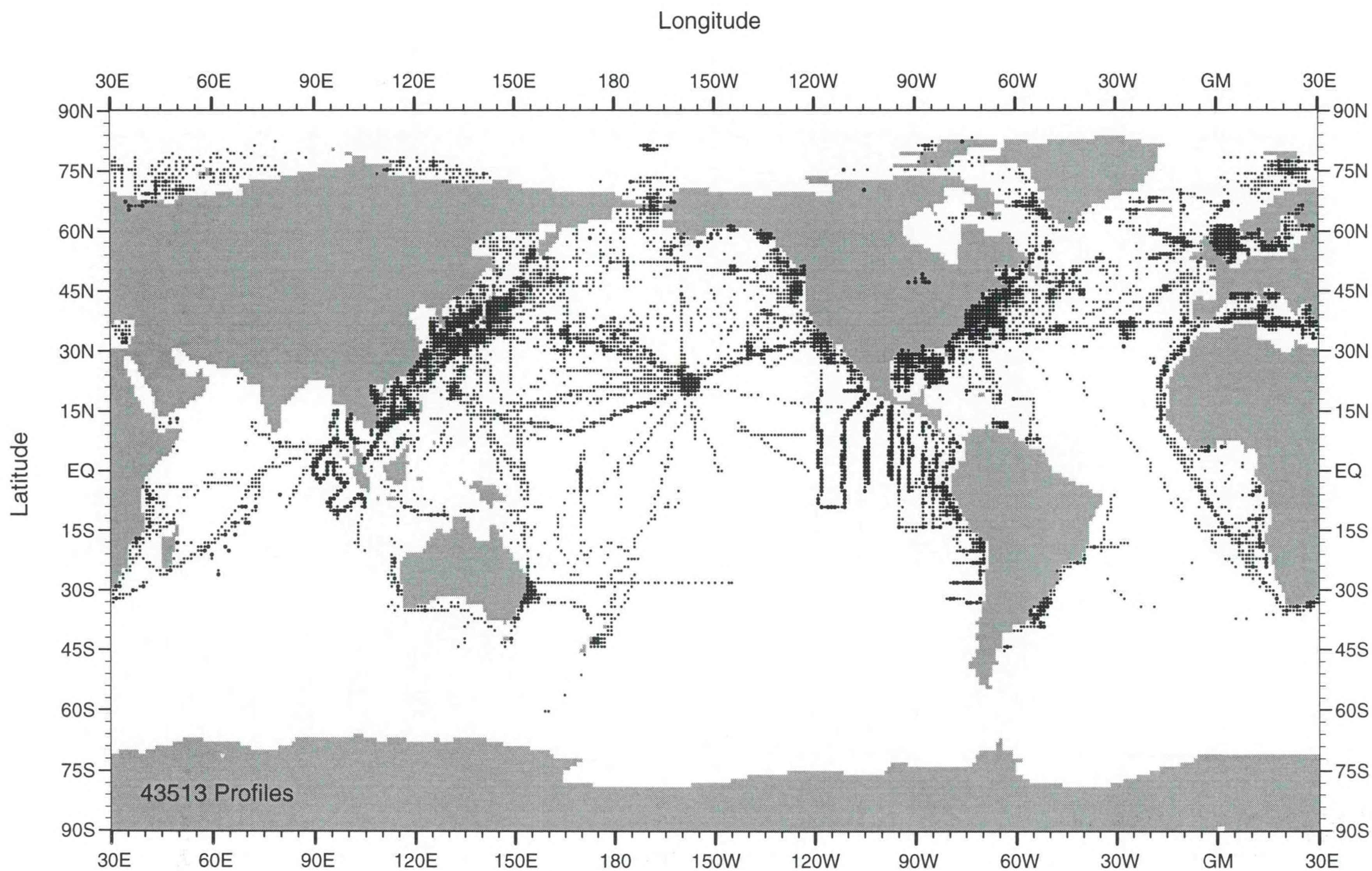


Fig. B107 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1967

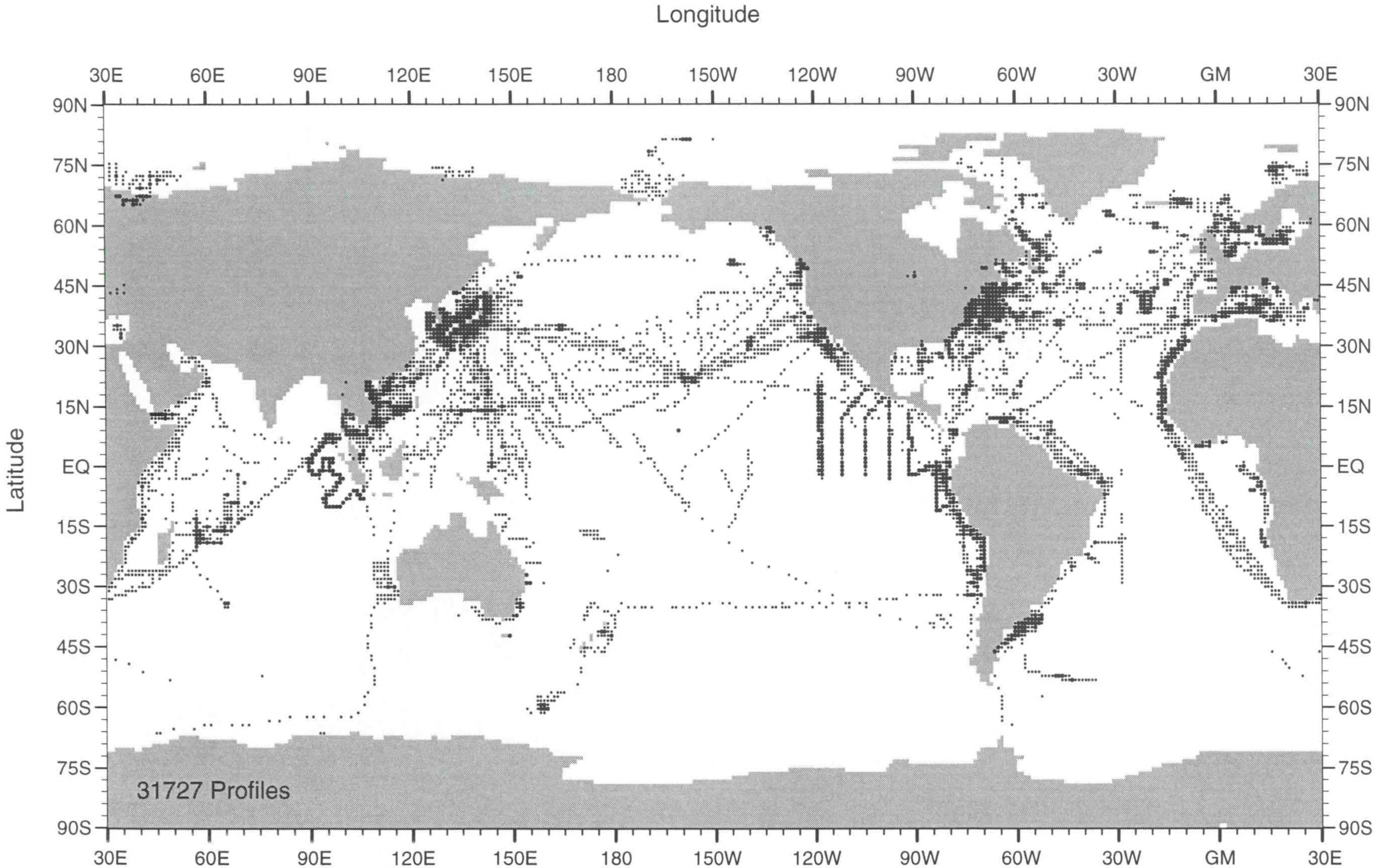


Fig. B108 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1967

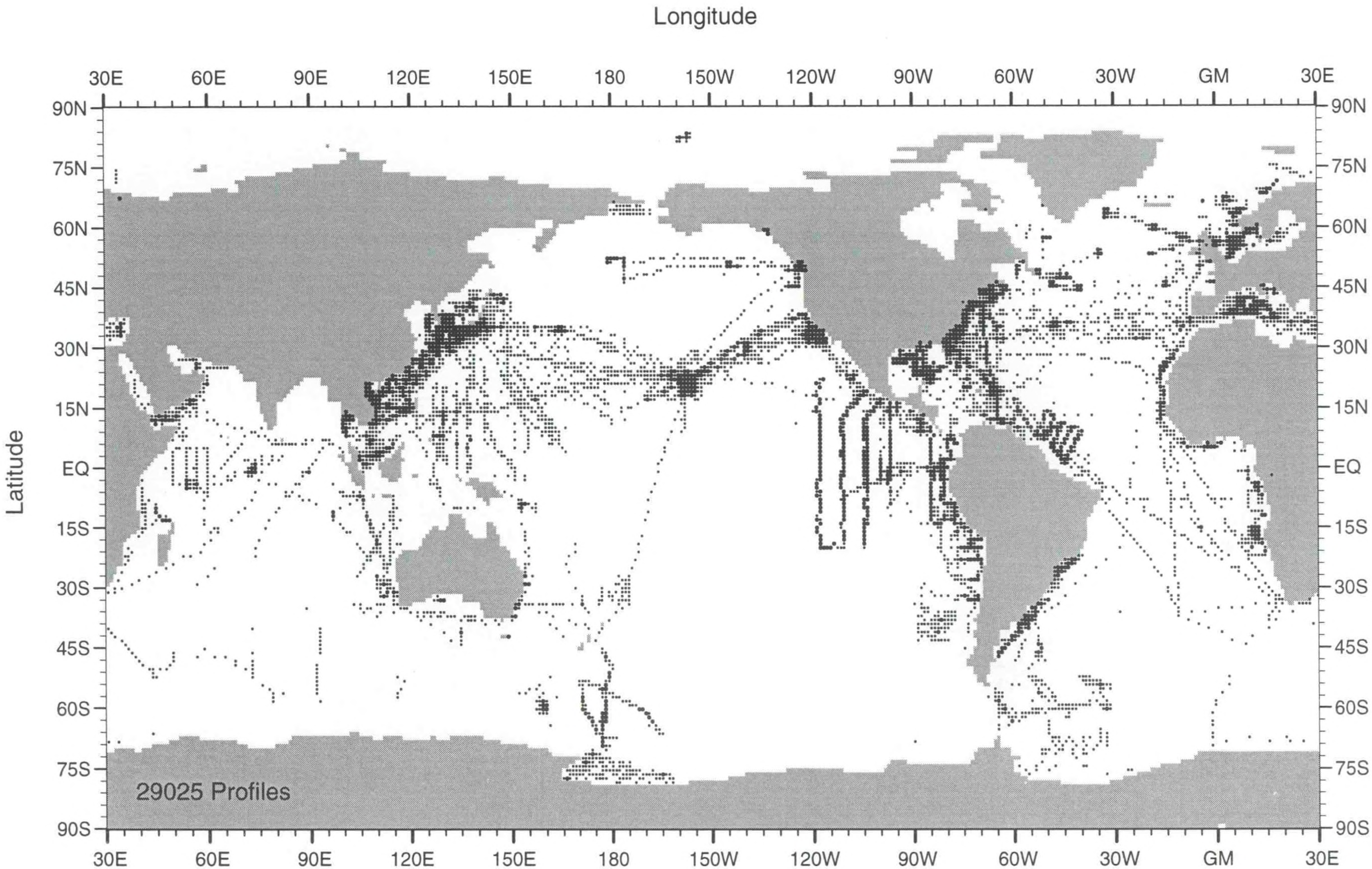


Fig. B109 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1968

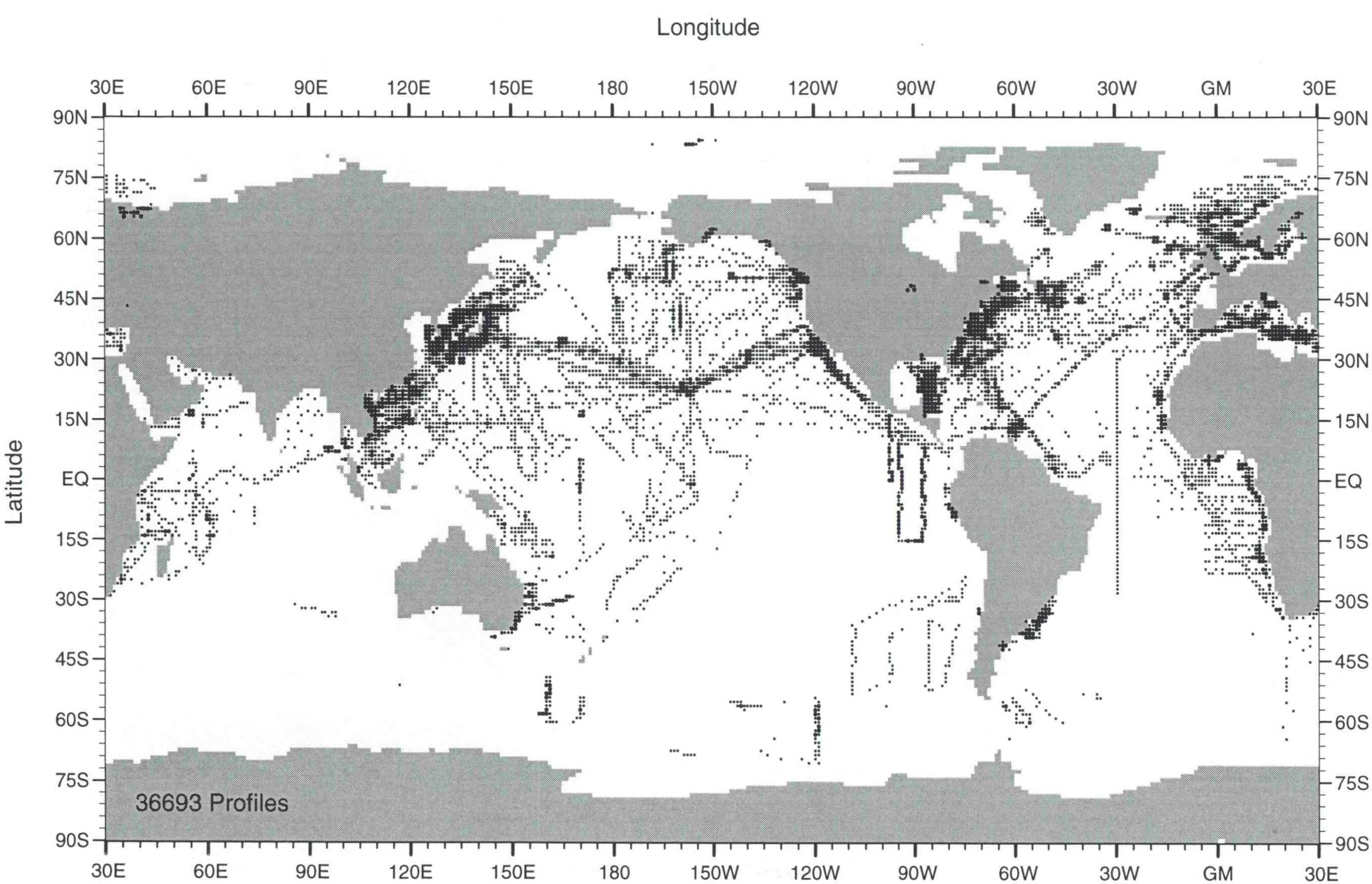


Fig. B110 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1968

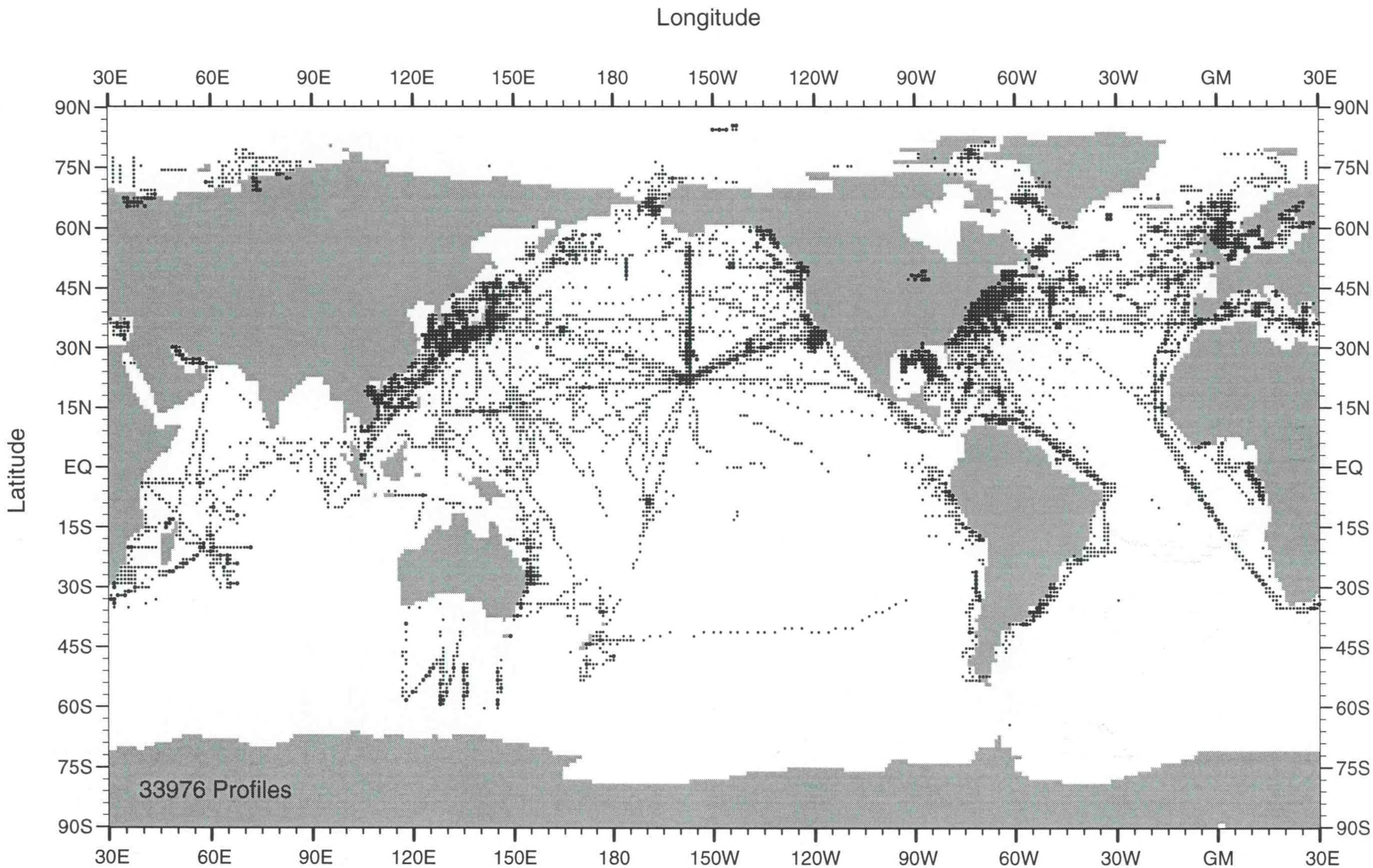


Fig. B111 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1968

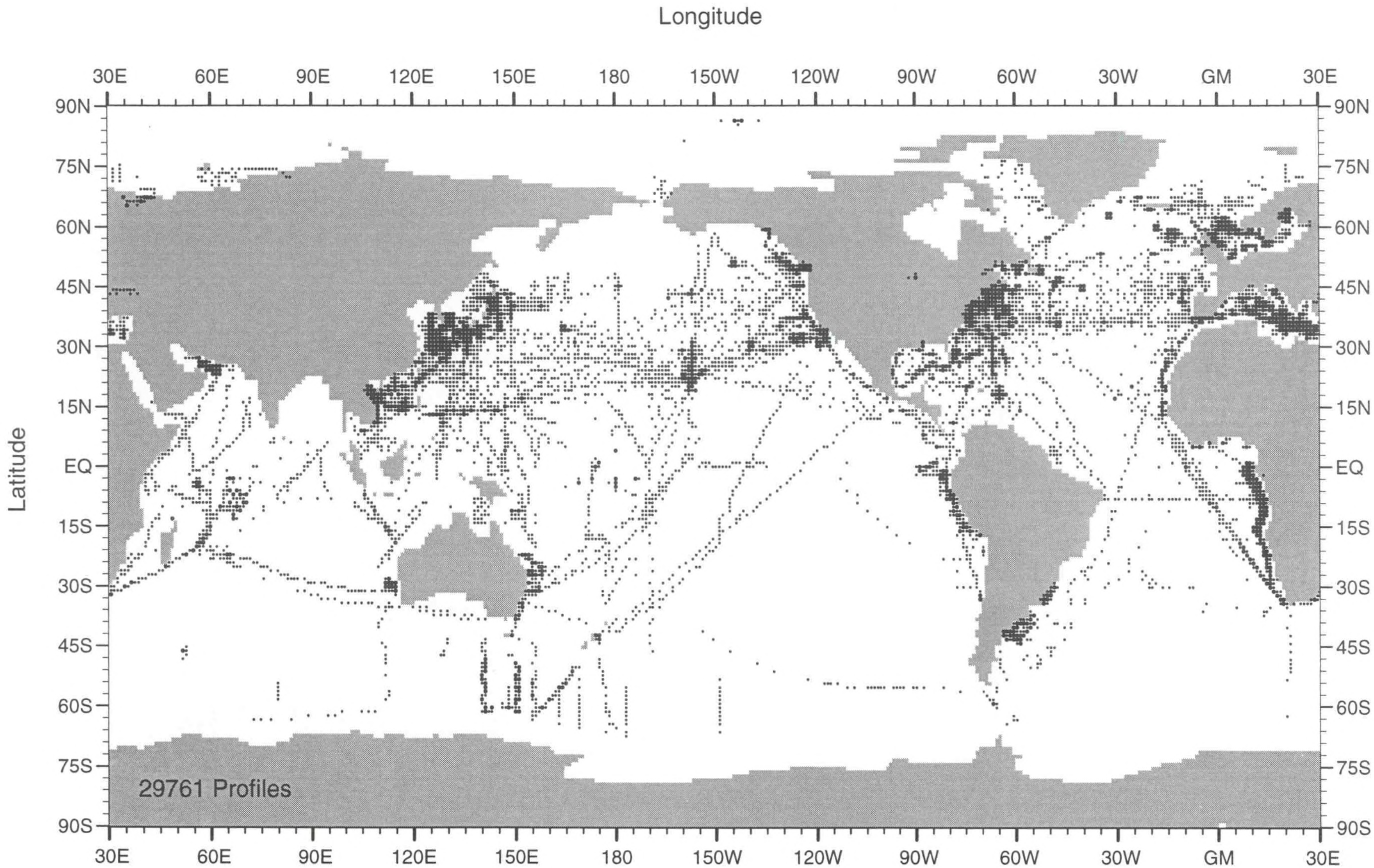


Fig. B112 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1968

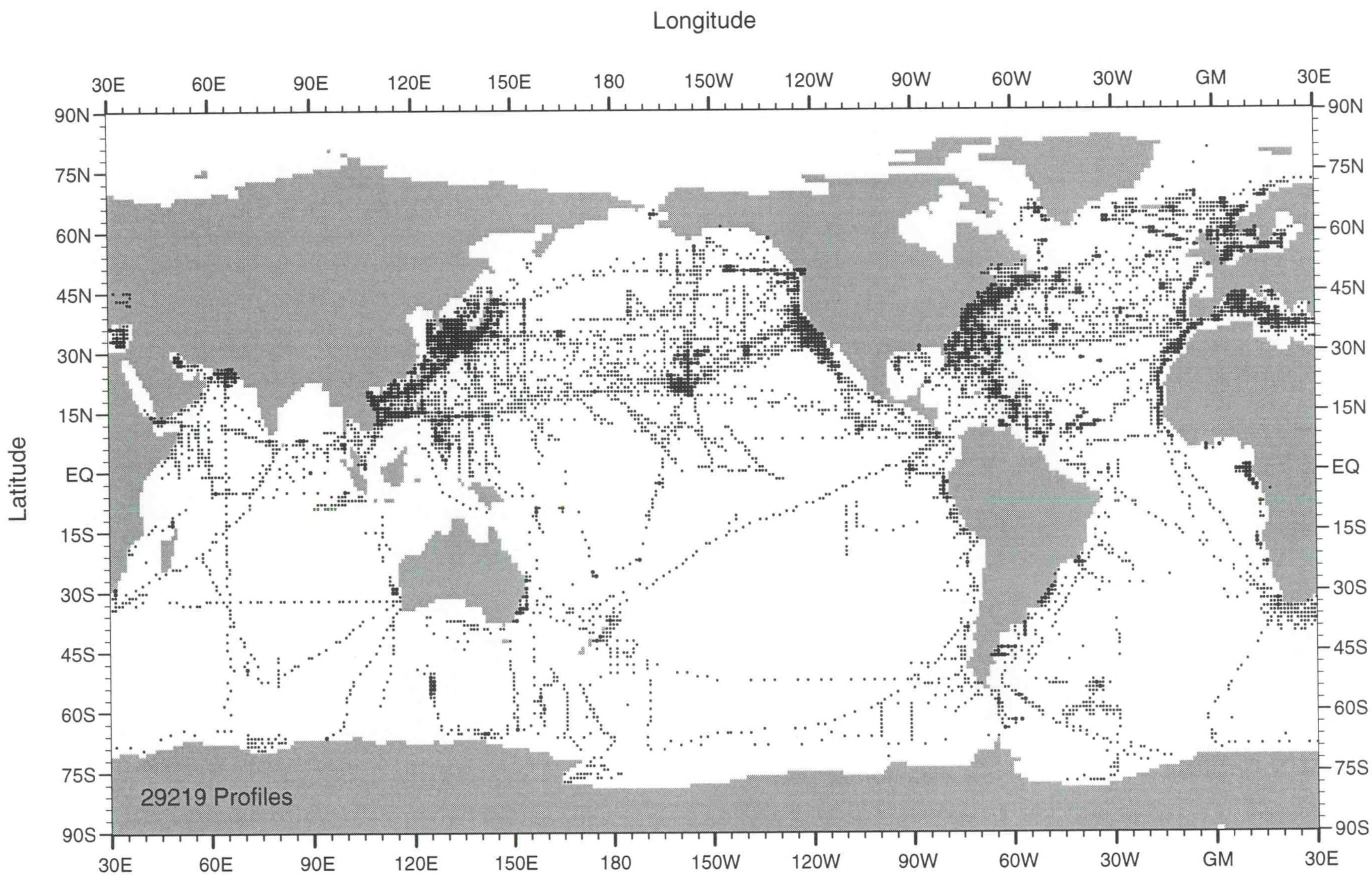


Fig. B113 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1969

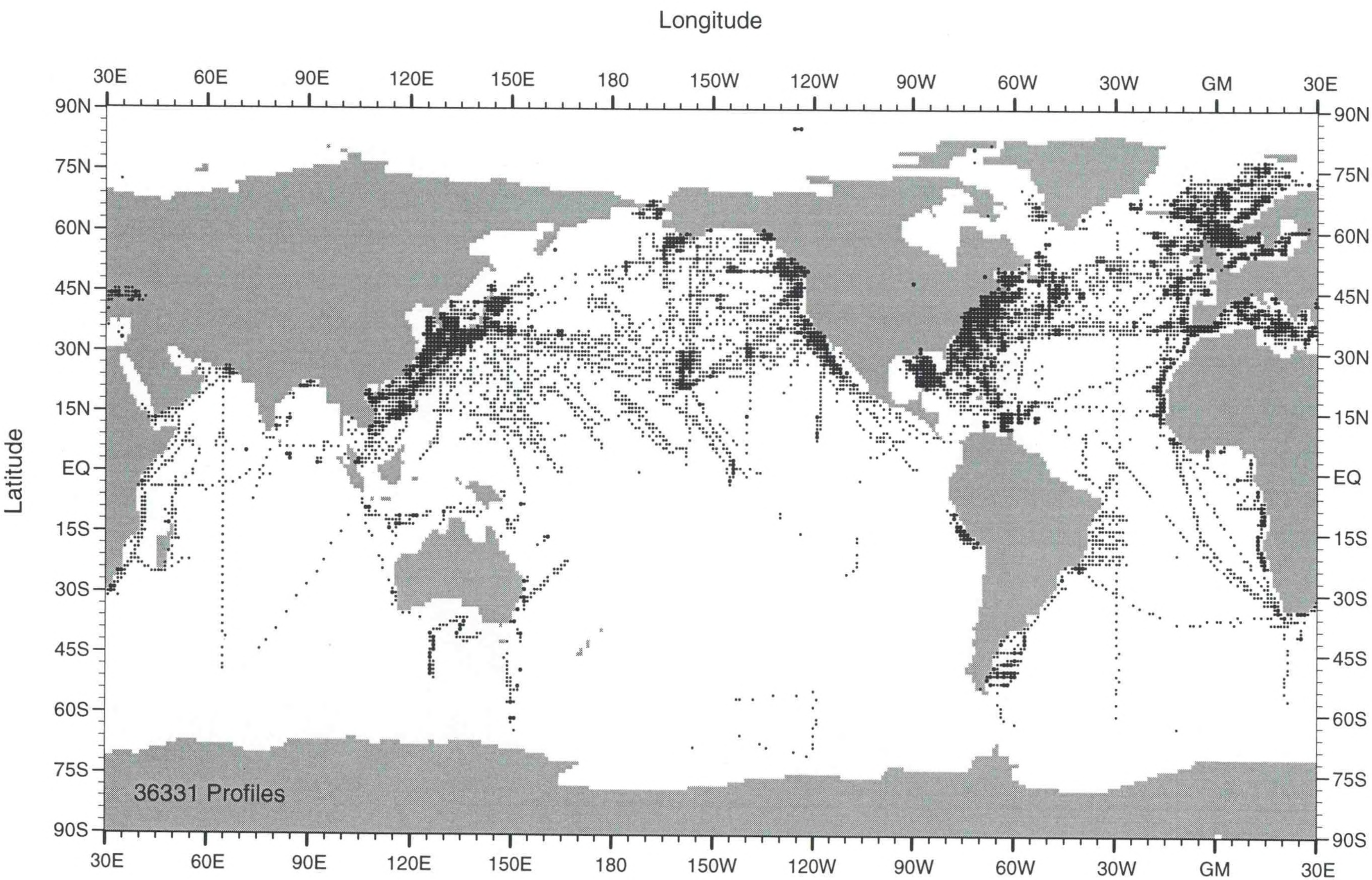


Fig. B114 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1969

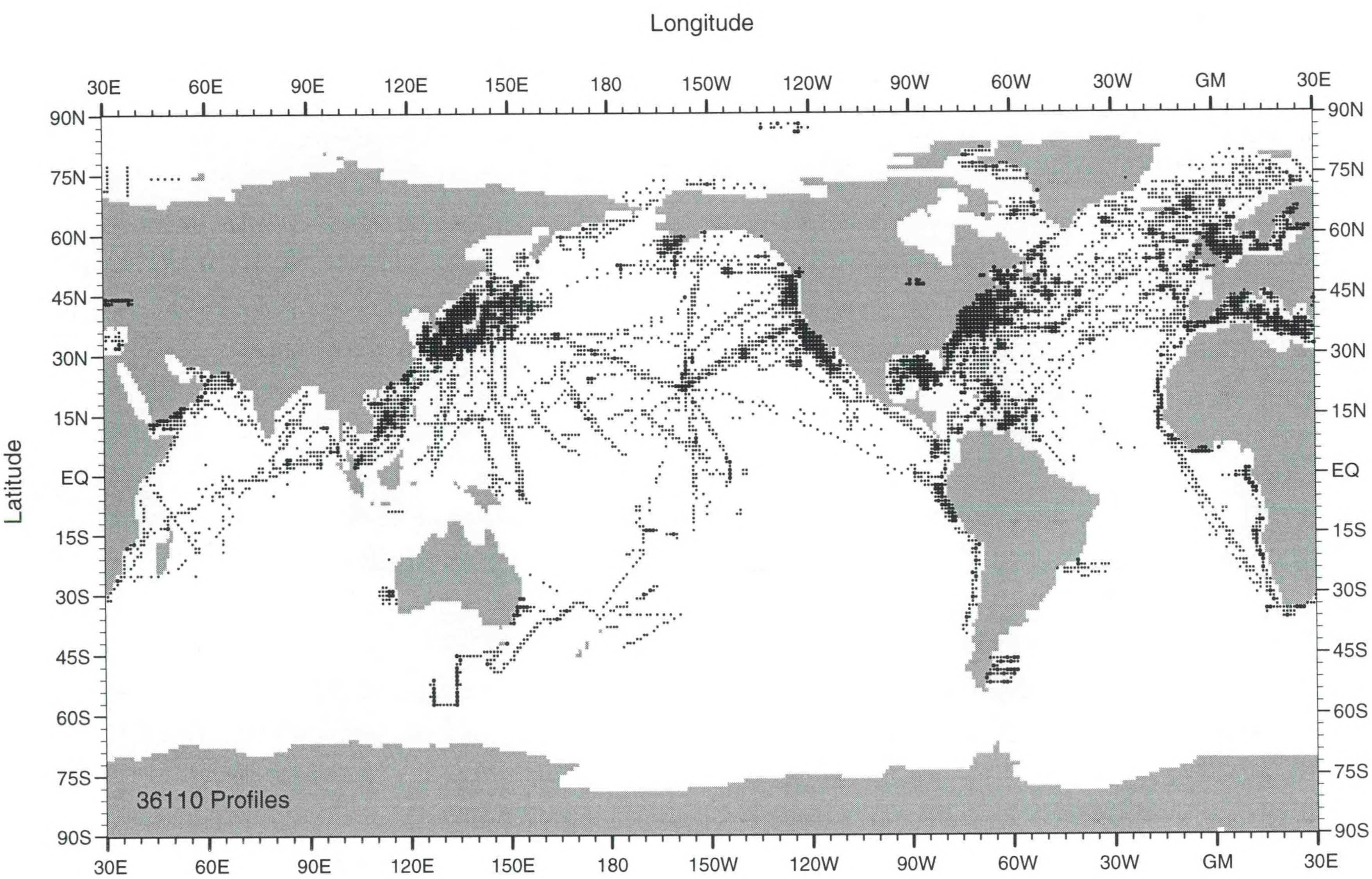


Fig. B115 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1969

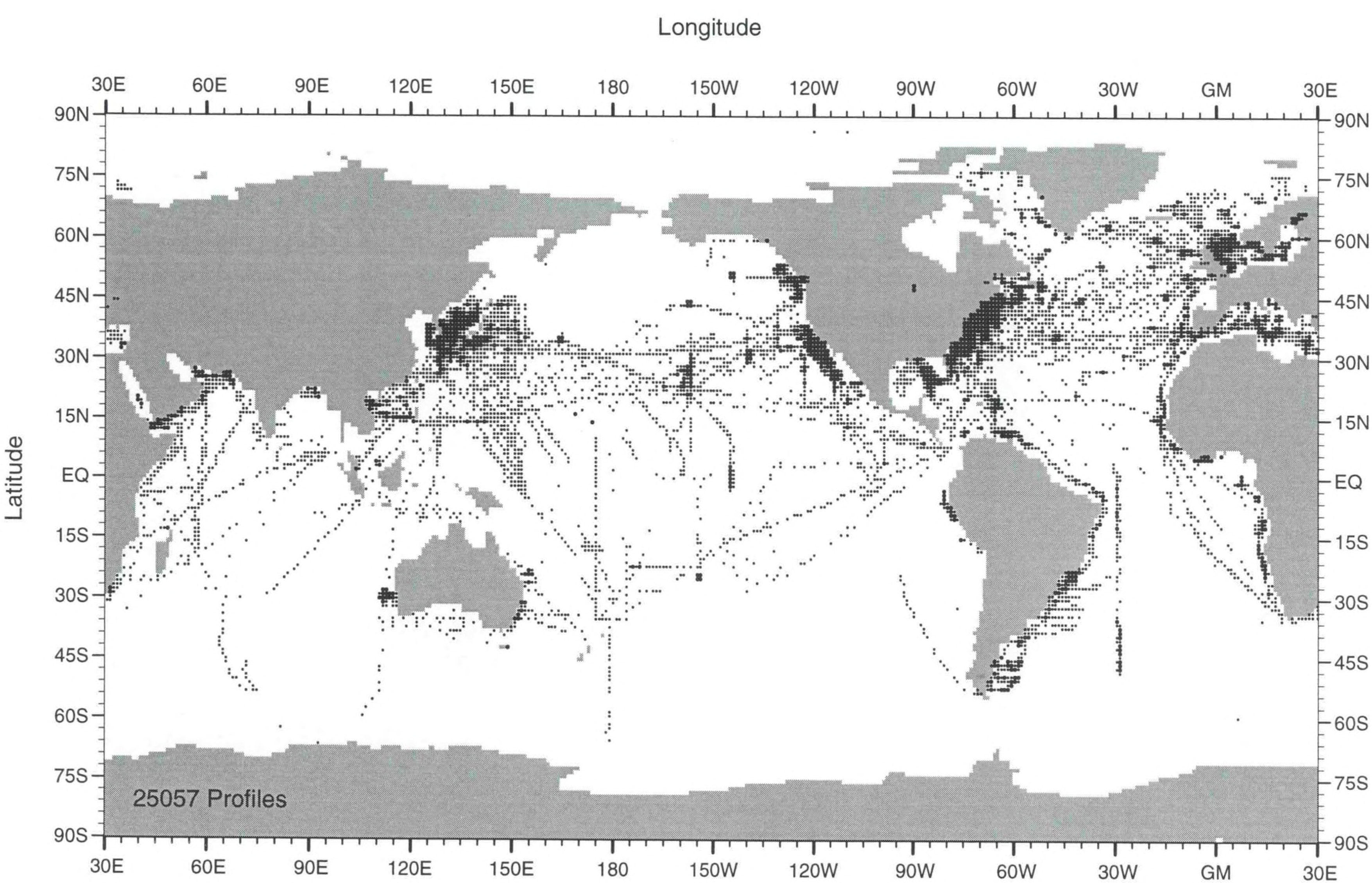


Fig. B116 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1969

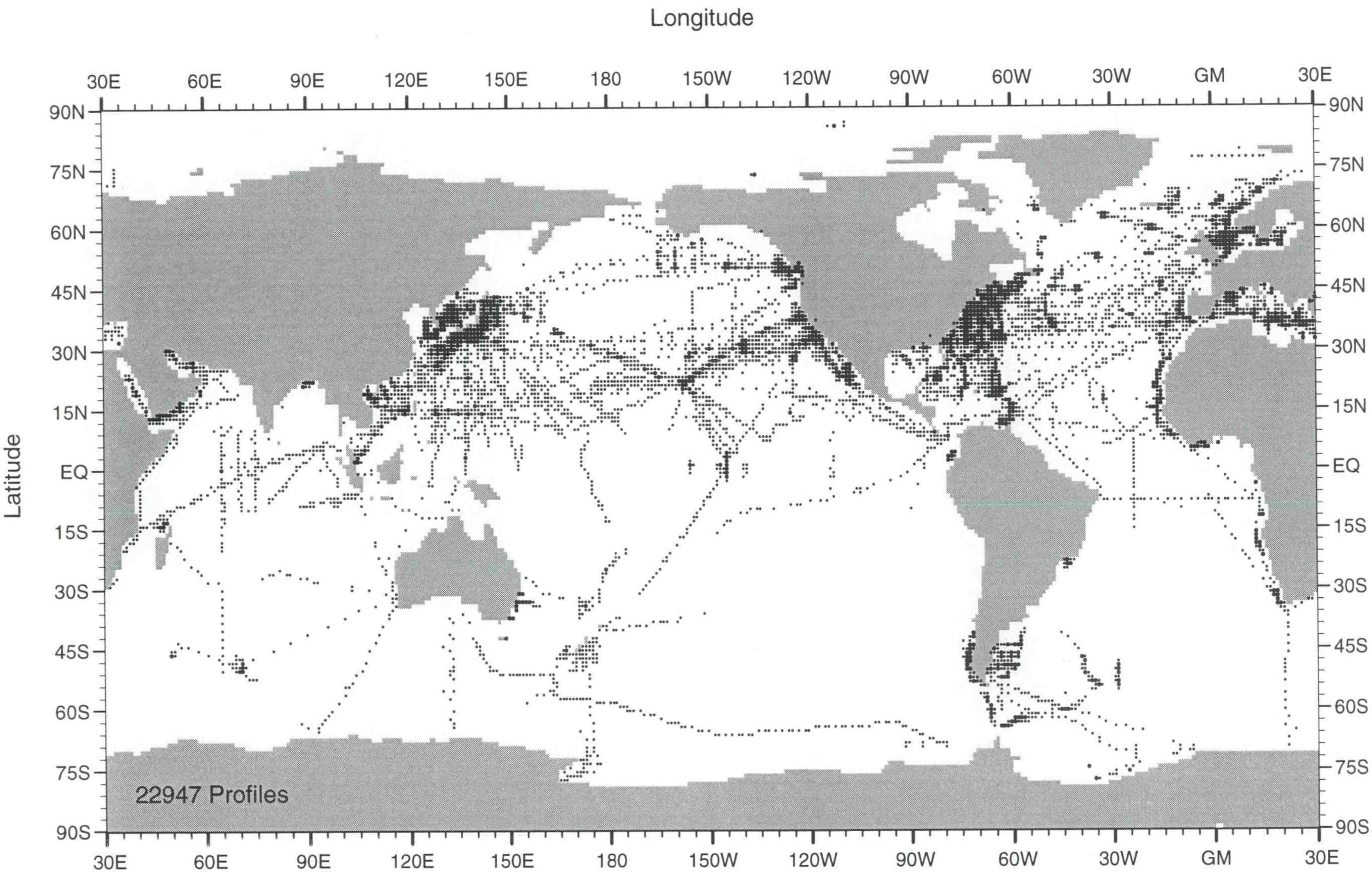


Fig. B117 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1970

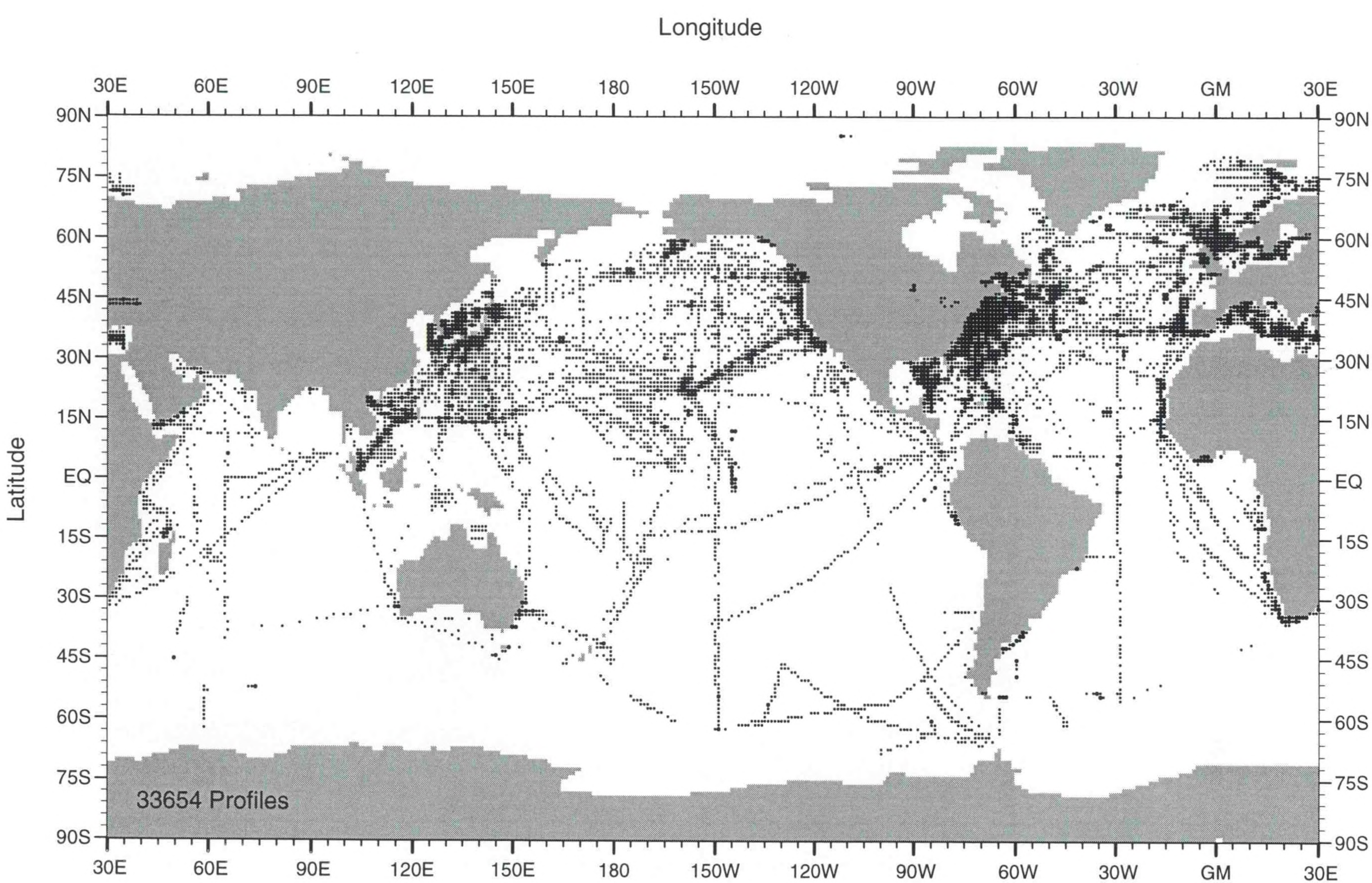


Fig. B118 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1970

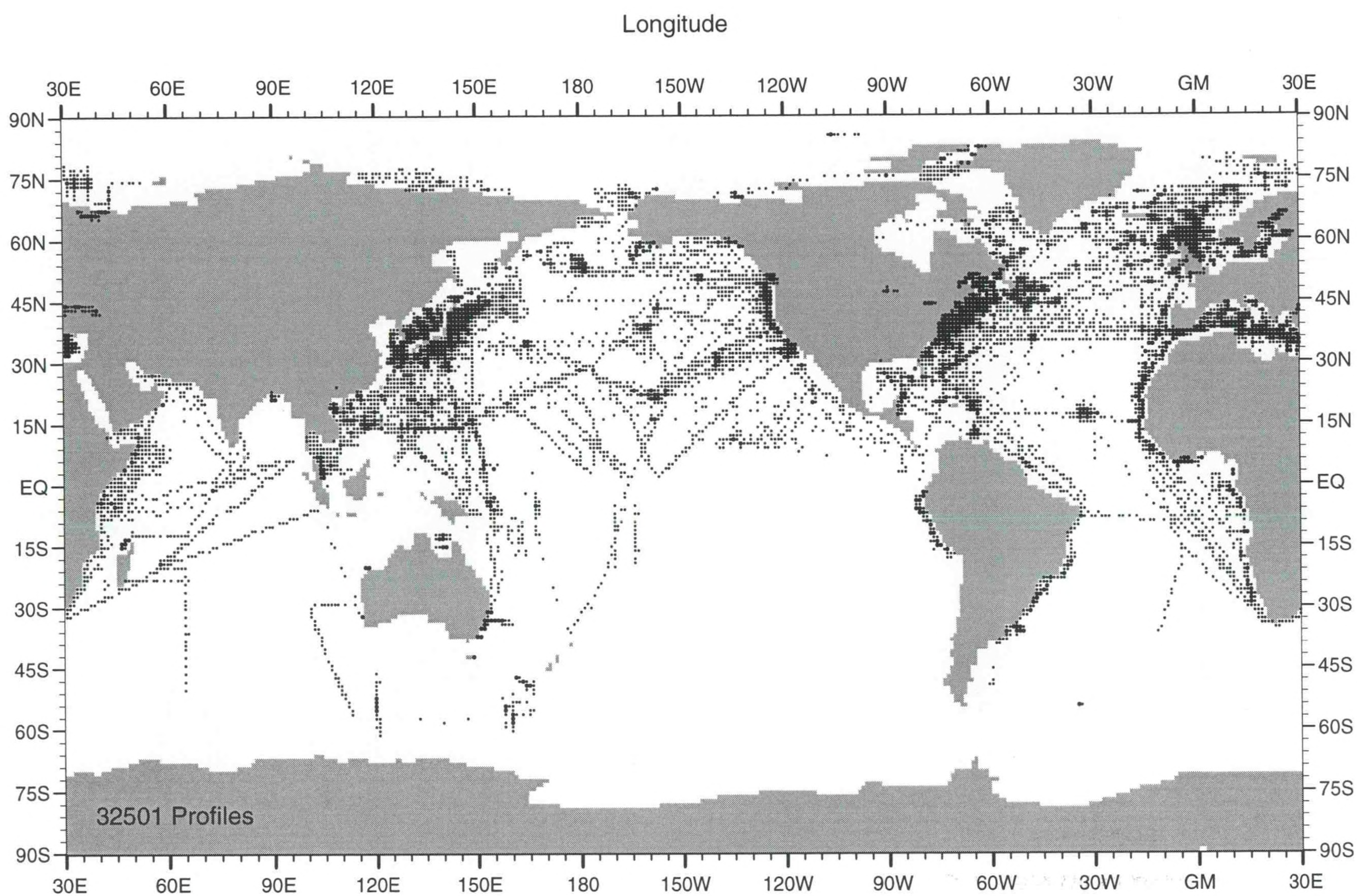


Fig. B119 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1970

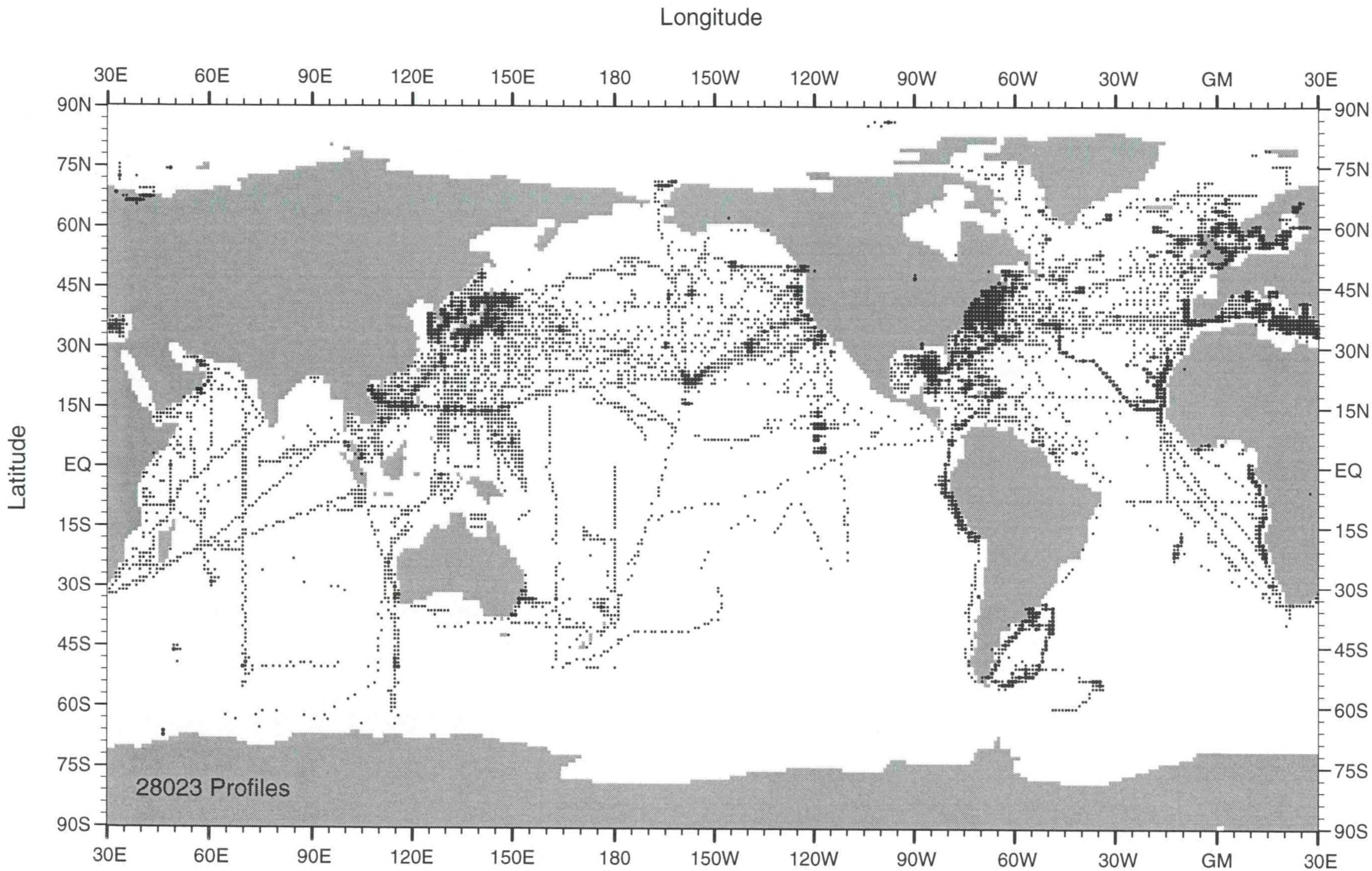


Fig. B120 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1970

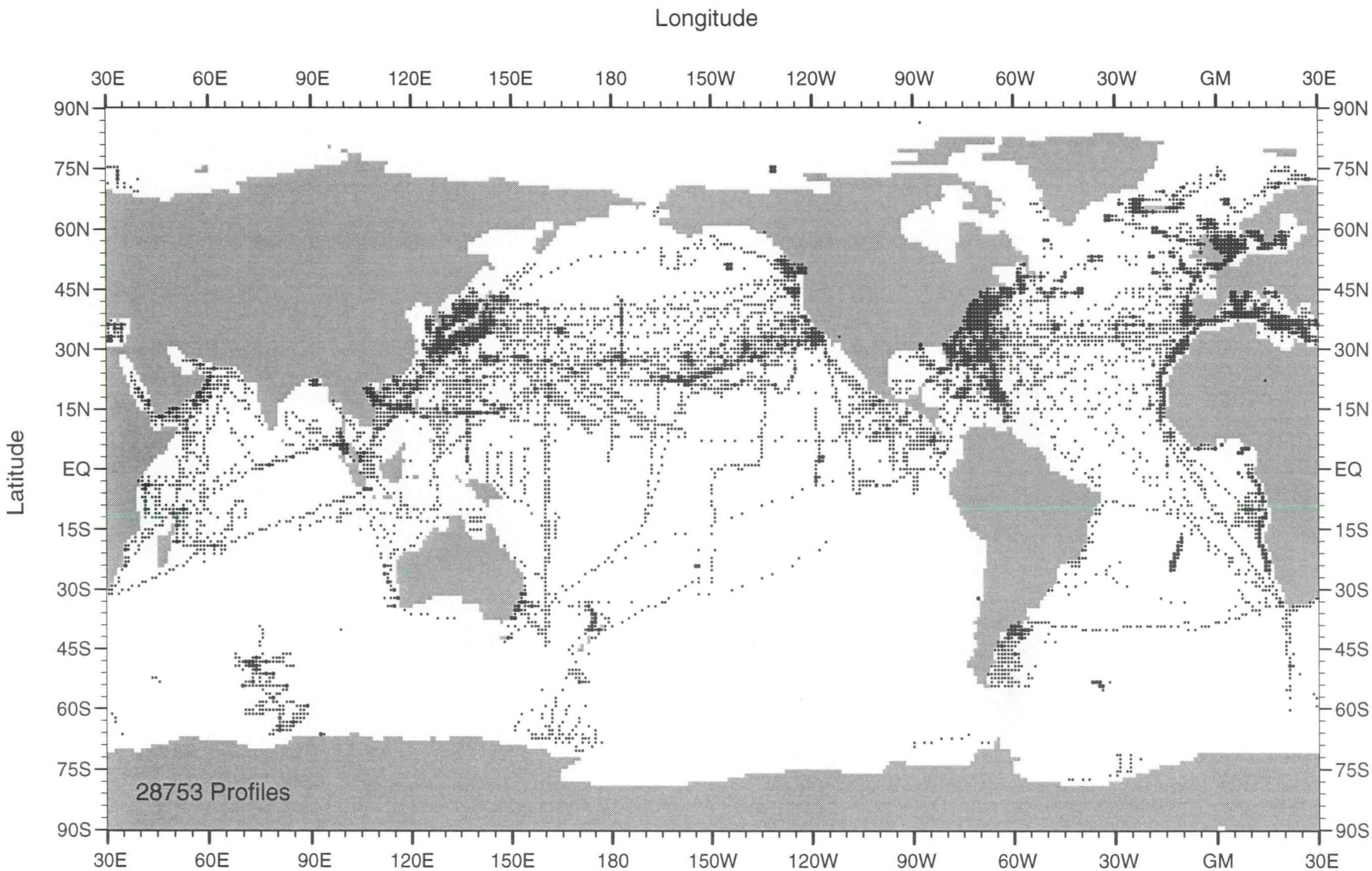


Fig. B121 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1971

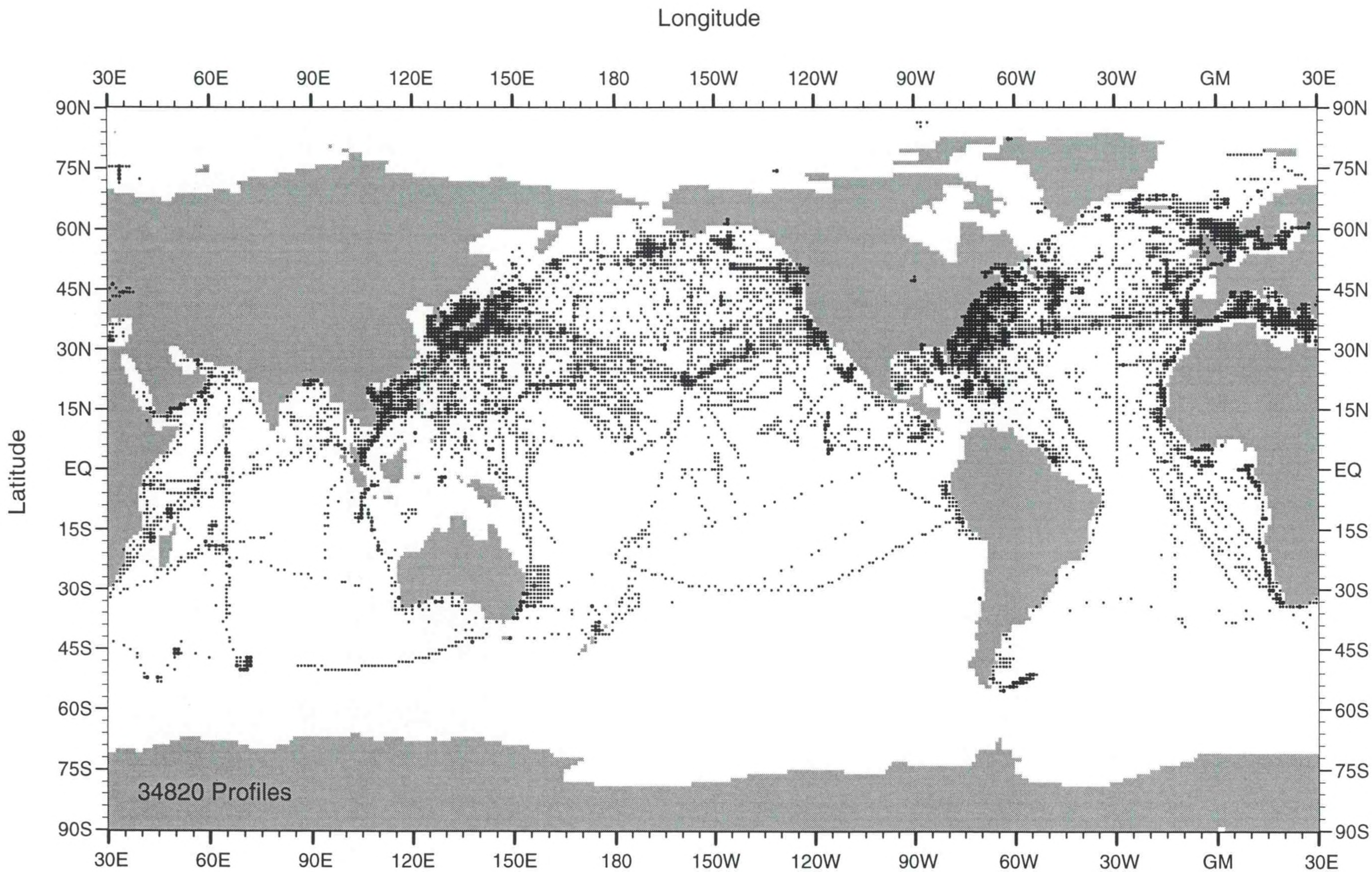


Fig. B122 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1971

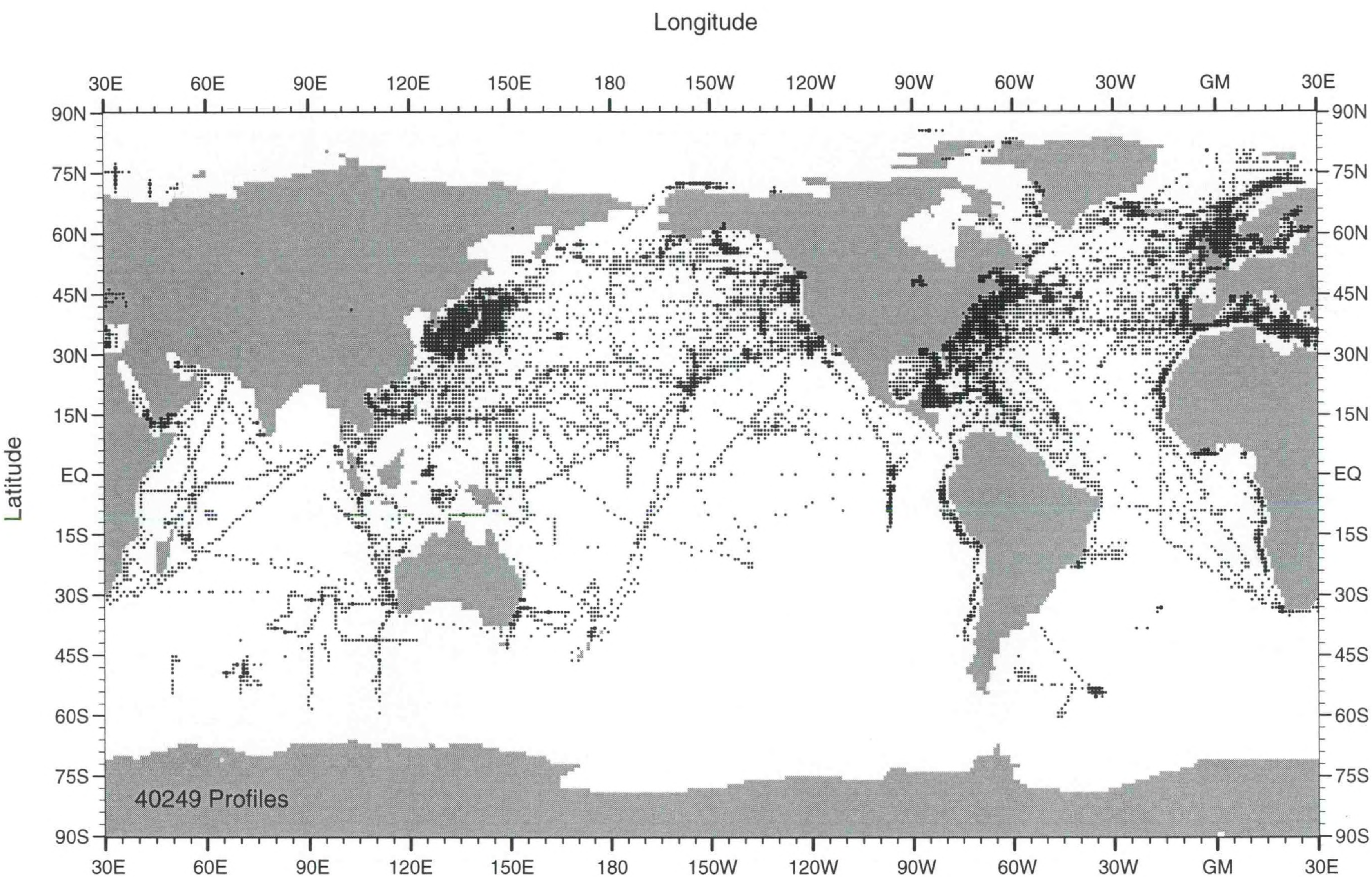


Fig. B123 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1971

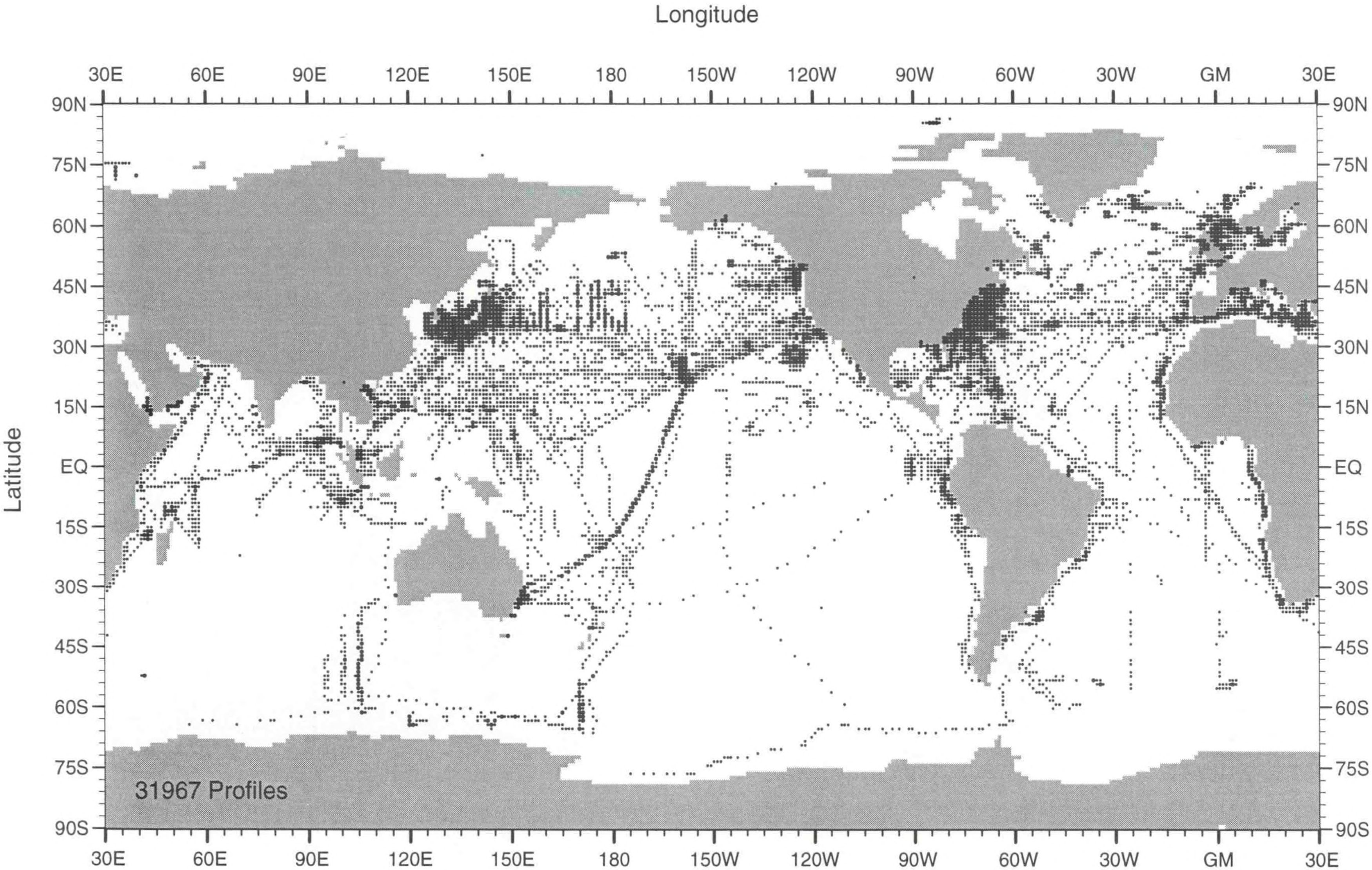


Fig. B124 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1971

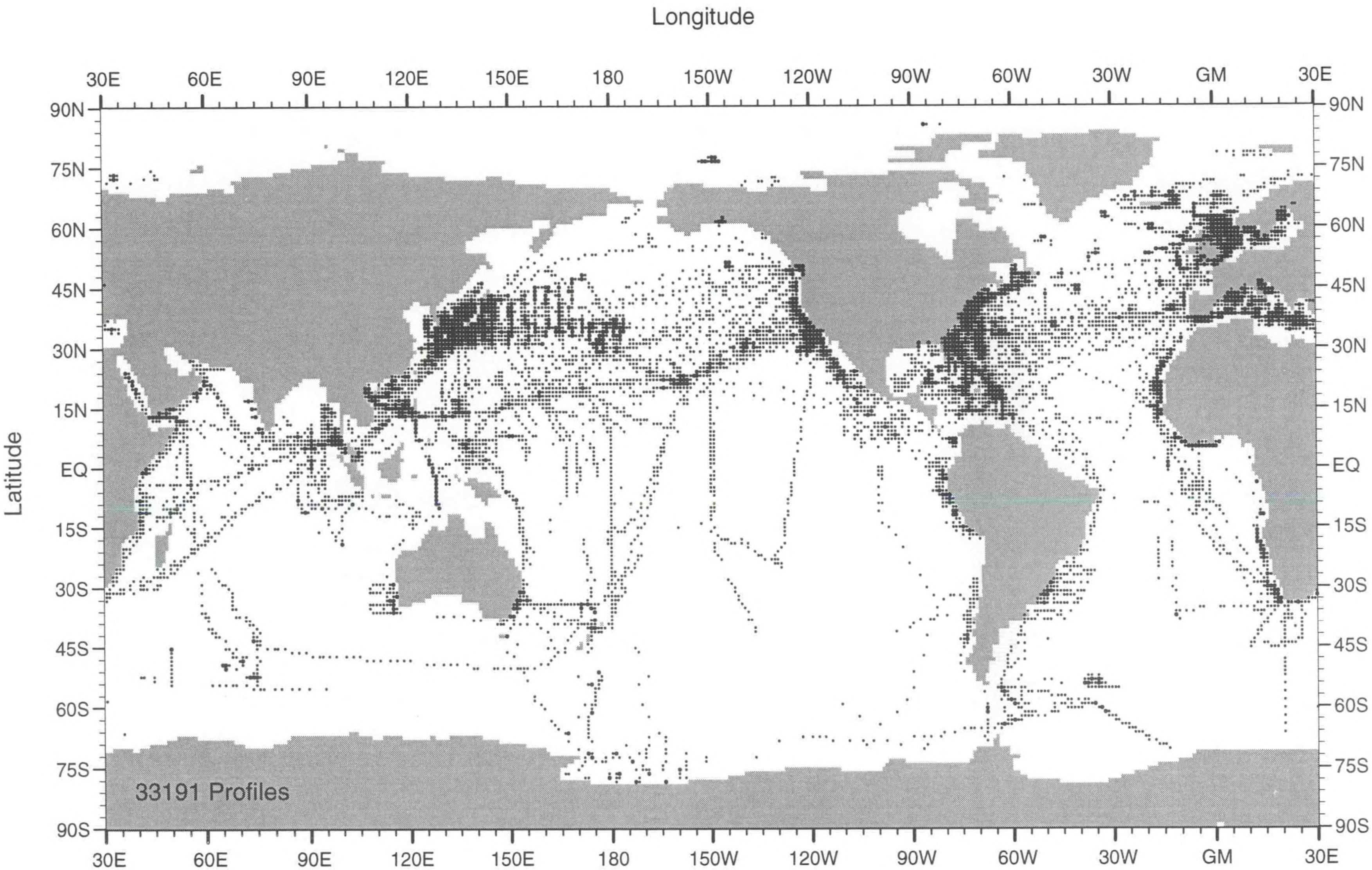


Fig. B125 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1972

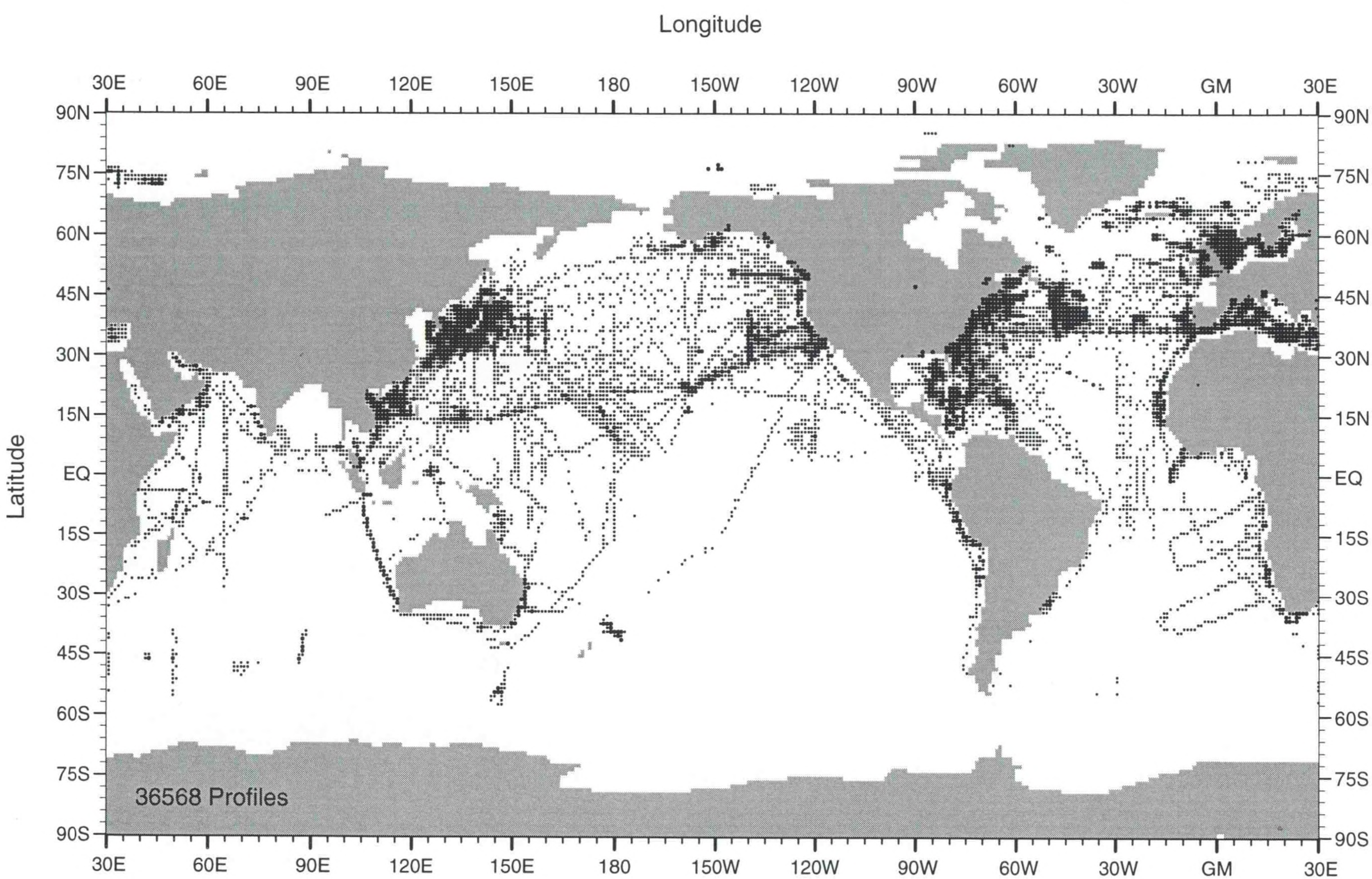


Fig. B126 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1972

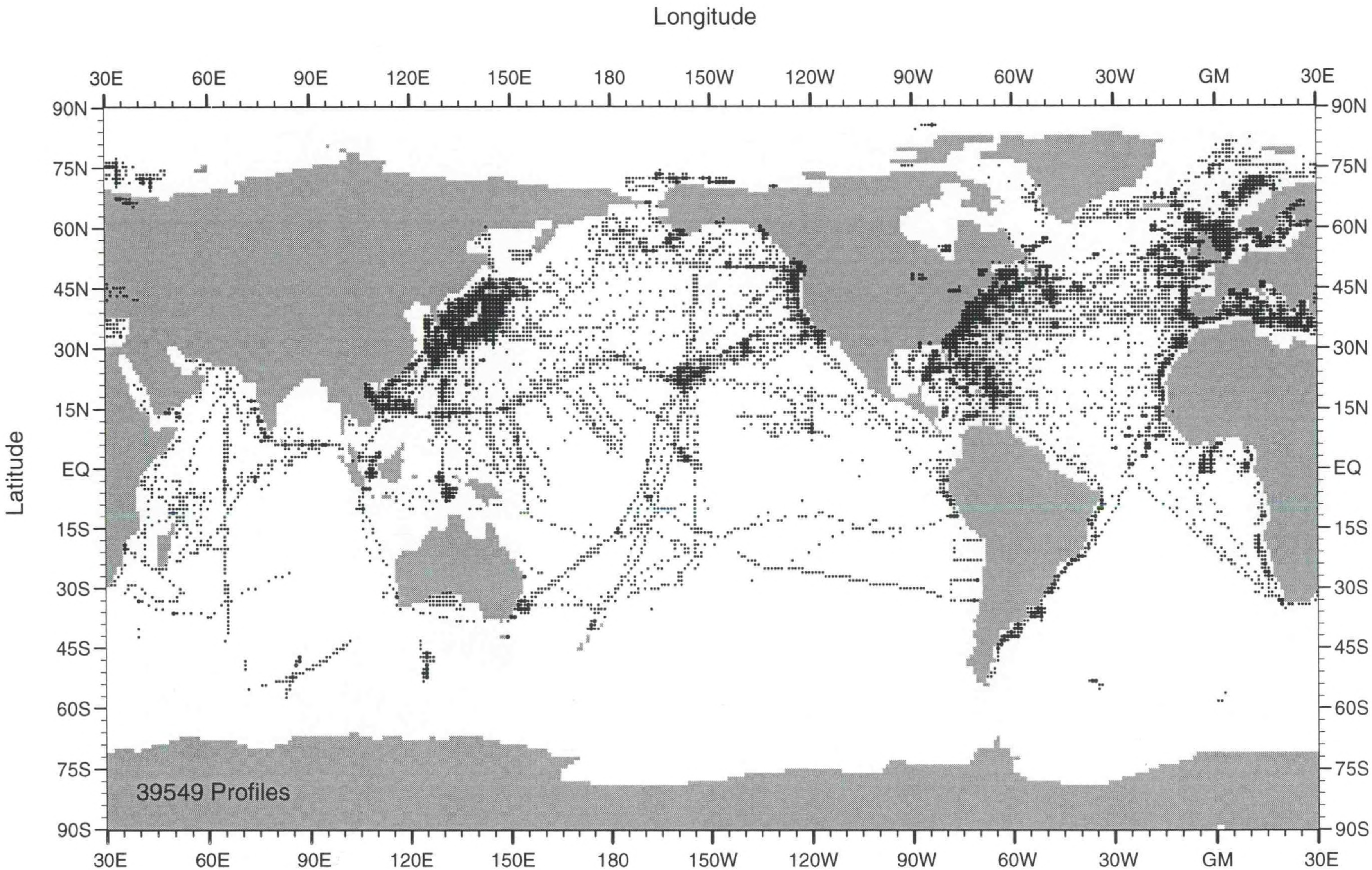


Fig. B127 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1972

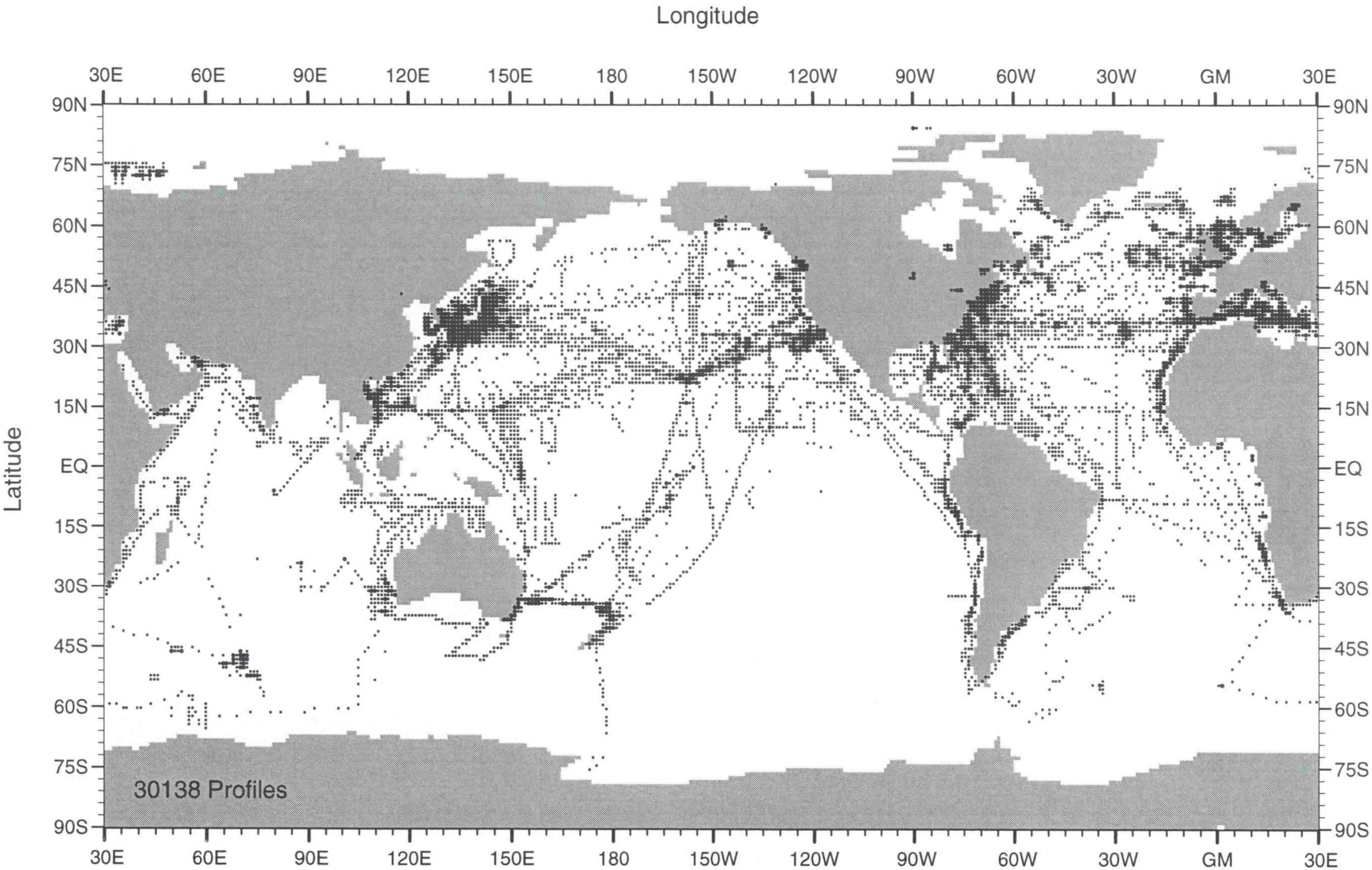


Fig. B128 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1972

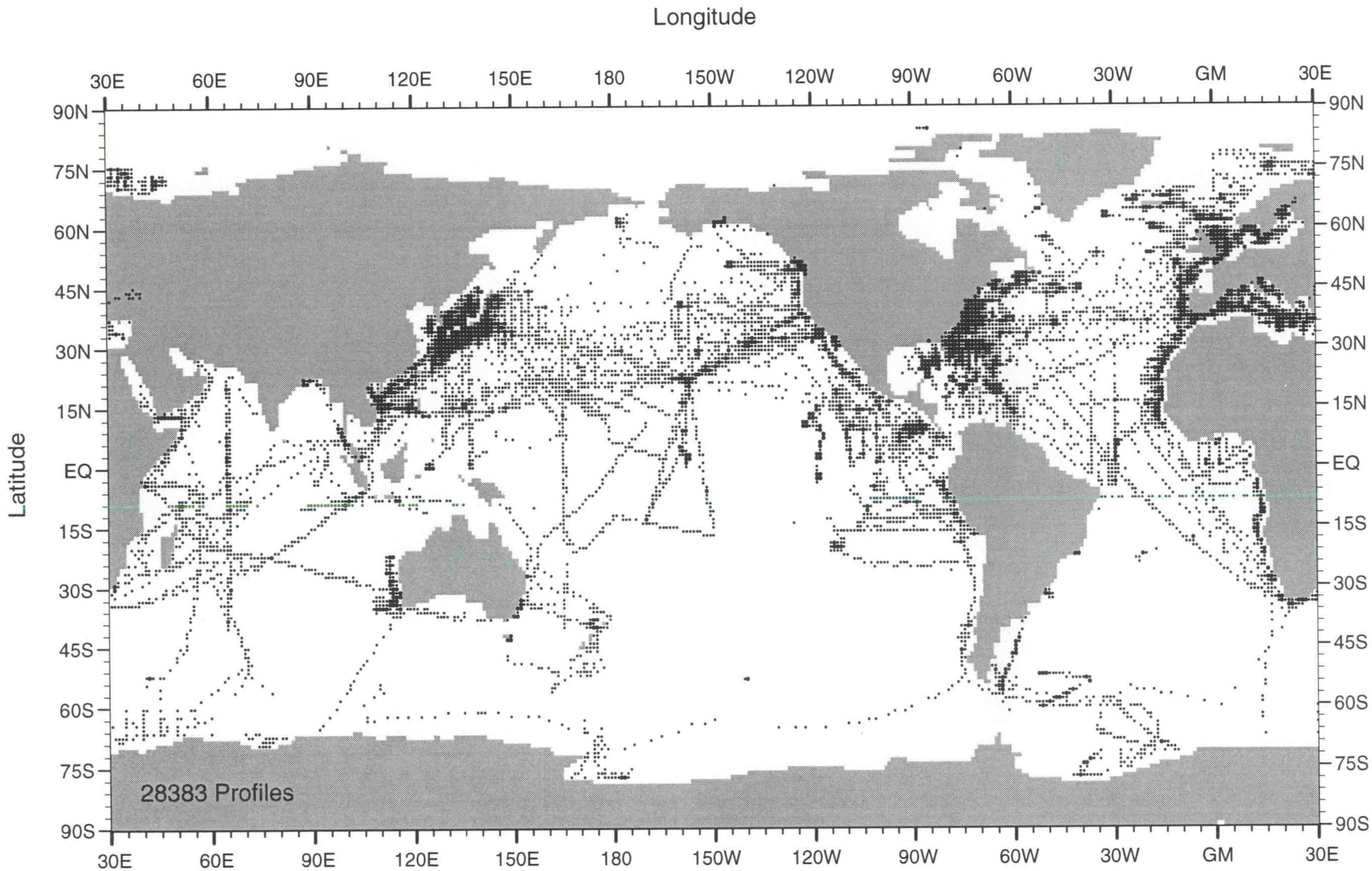


Fig. B129 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1973

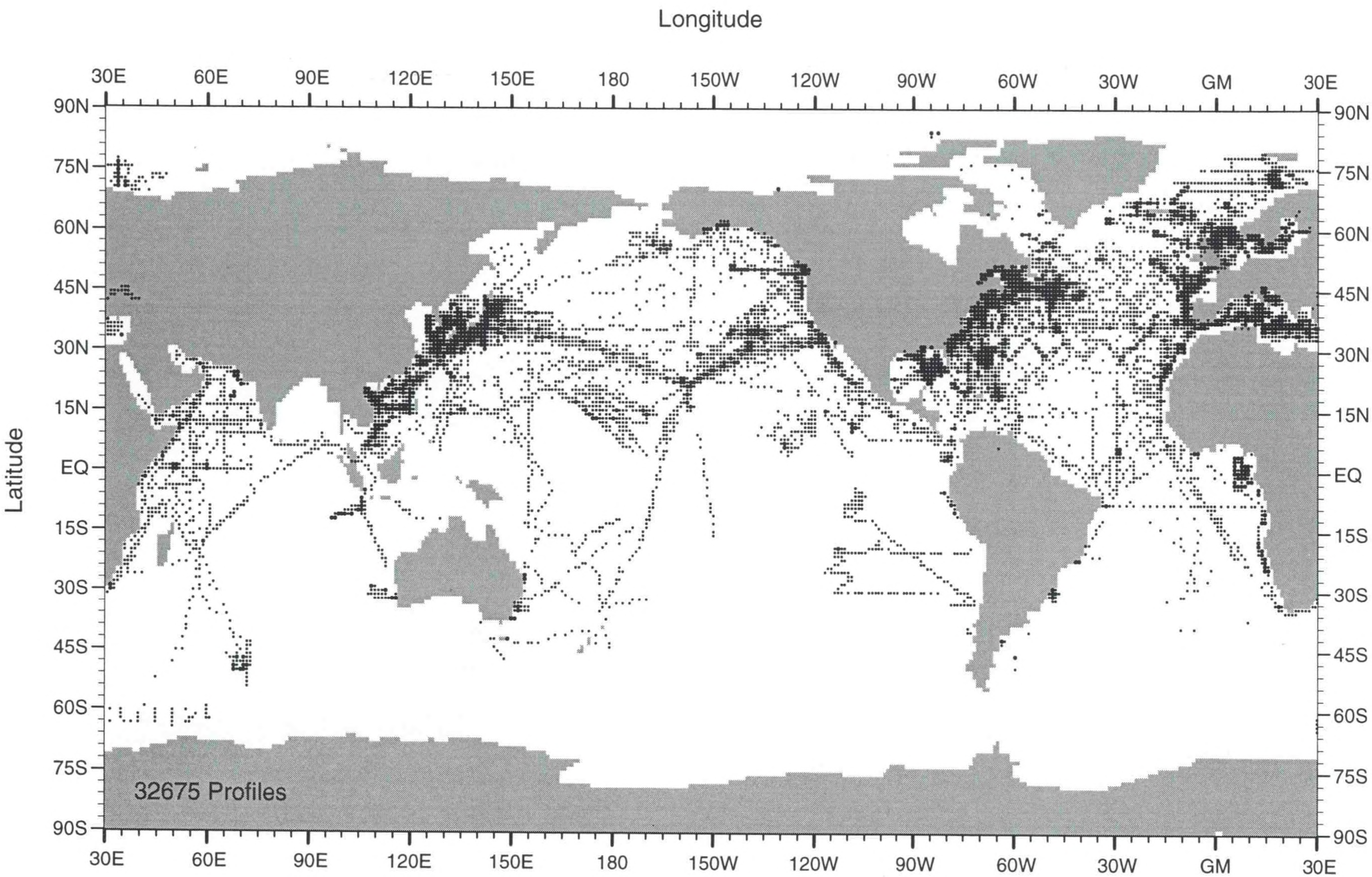


Fig. B130 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1973

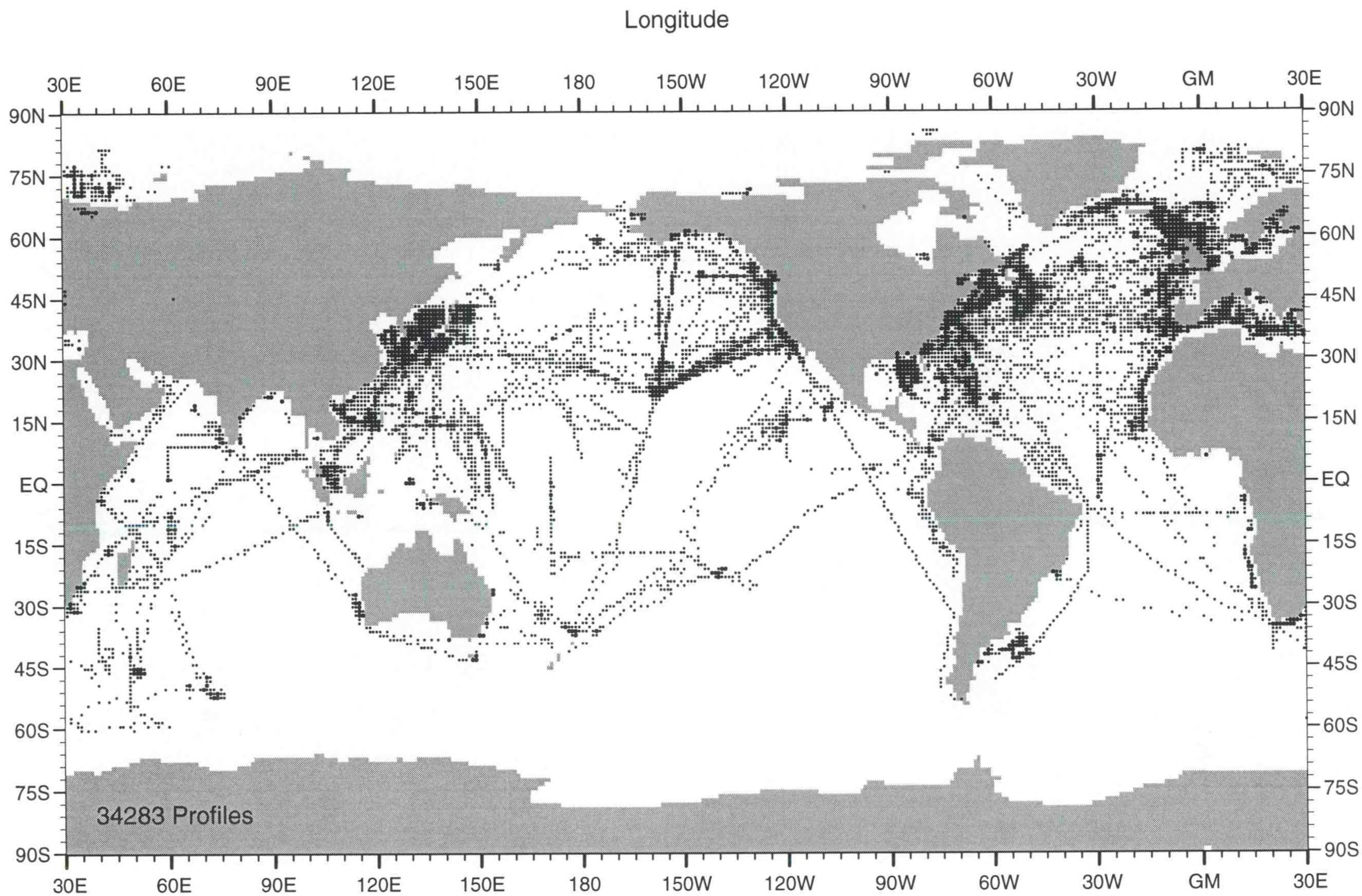


Fig. B131 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1973

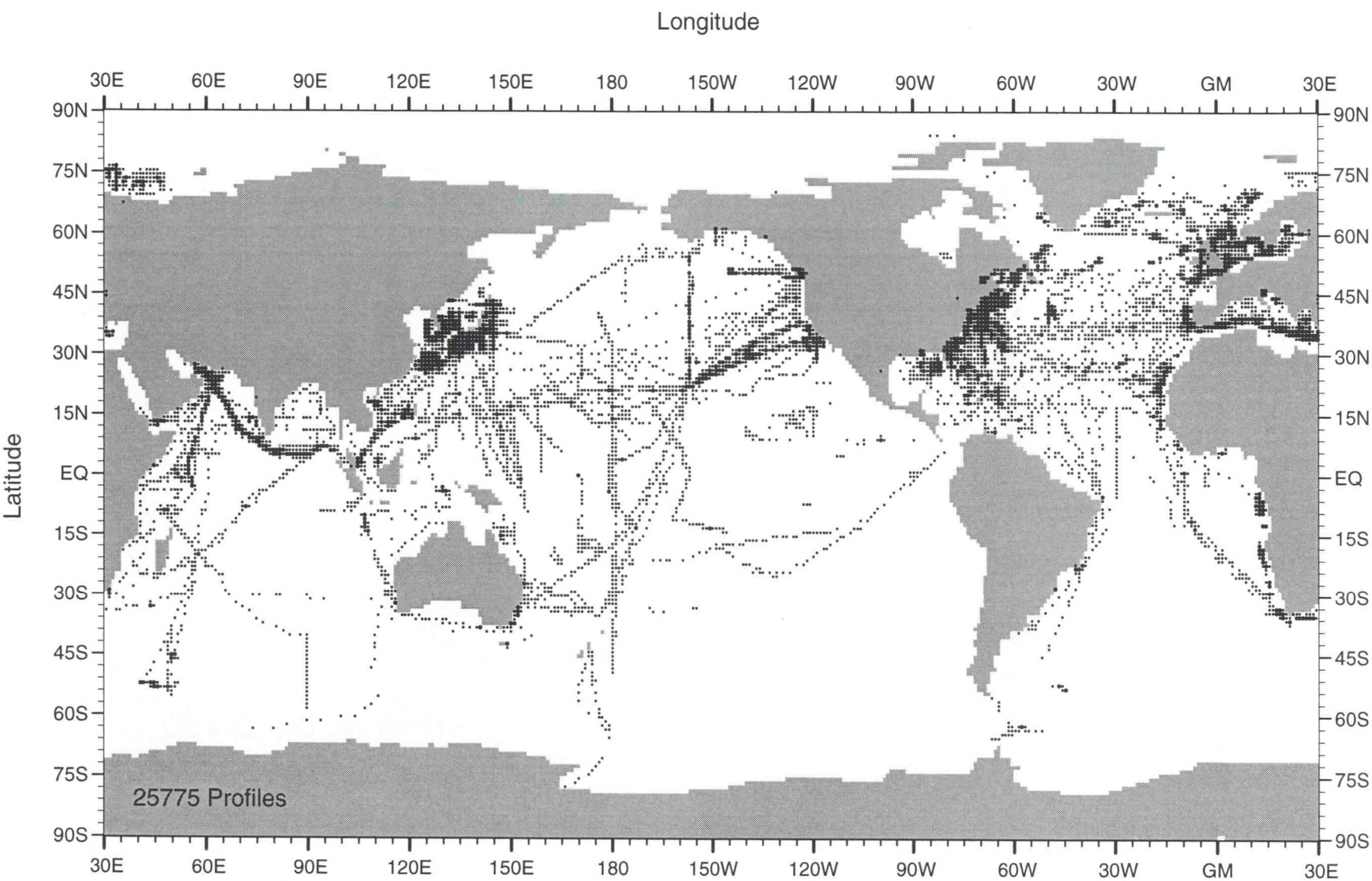


Fig. B132 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1973

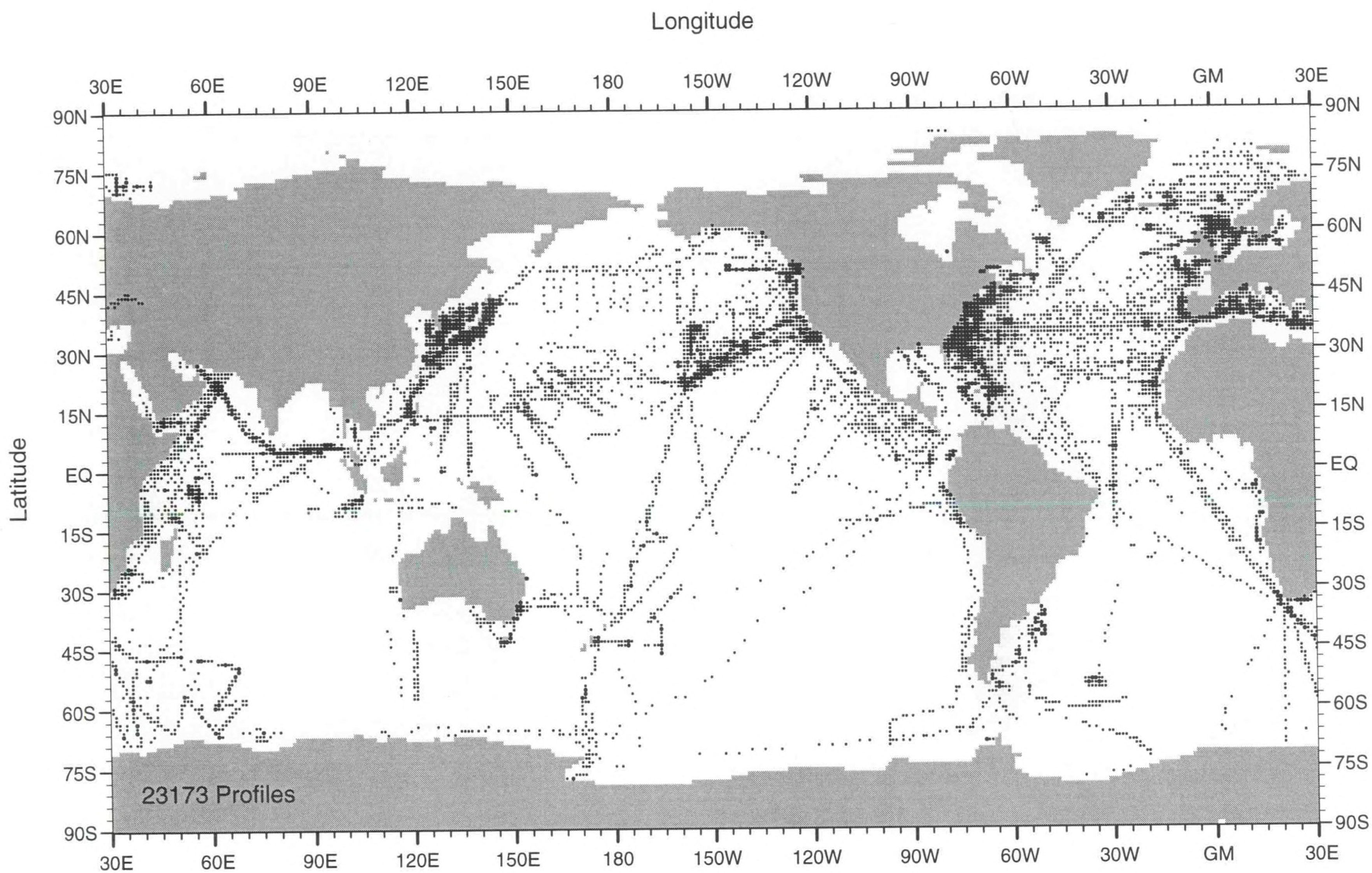


Fig. B133 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1974

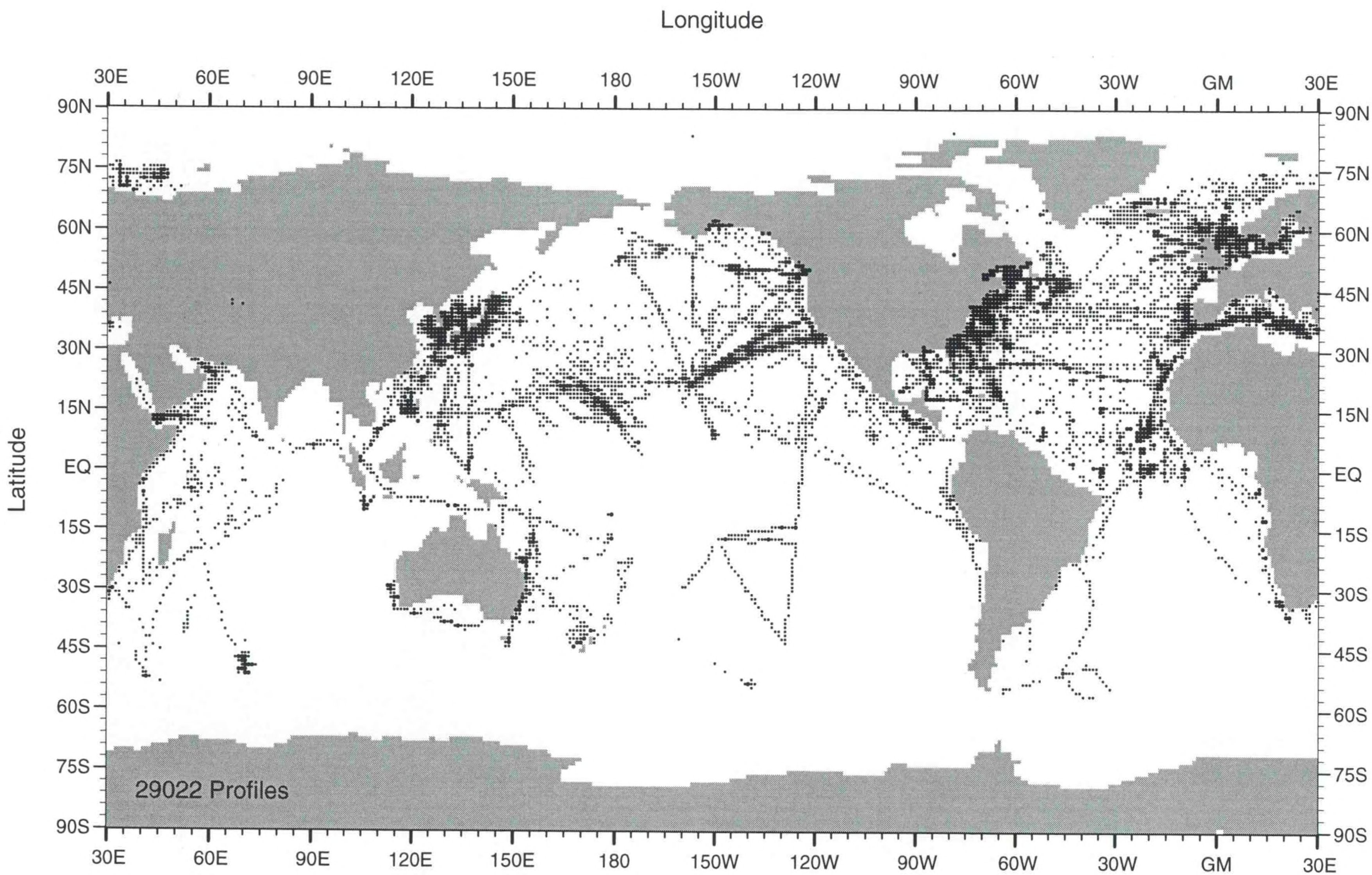


Fig. B134 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1974

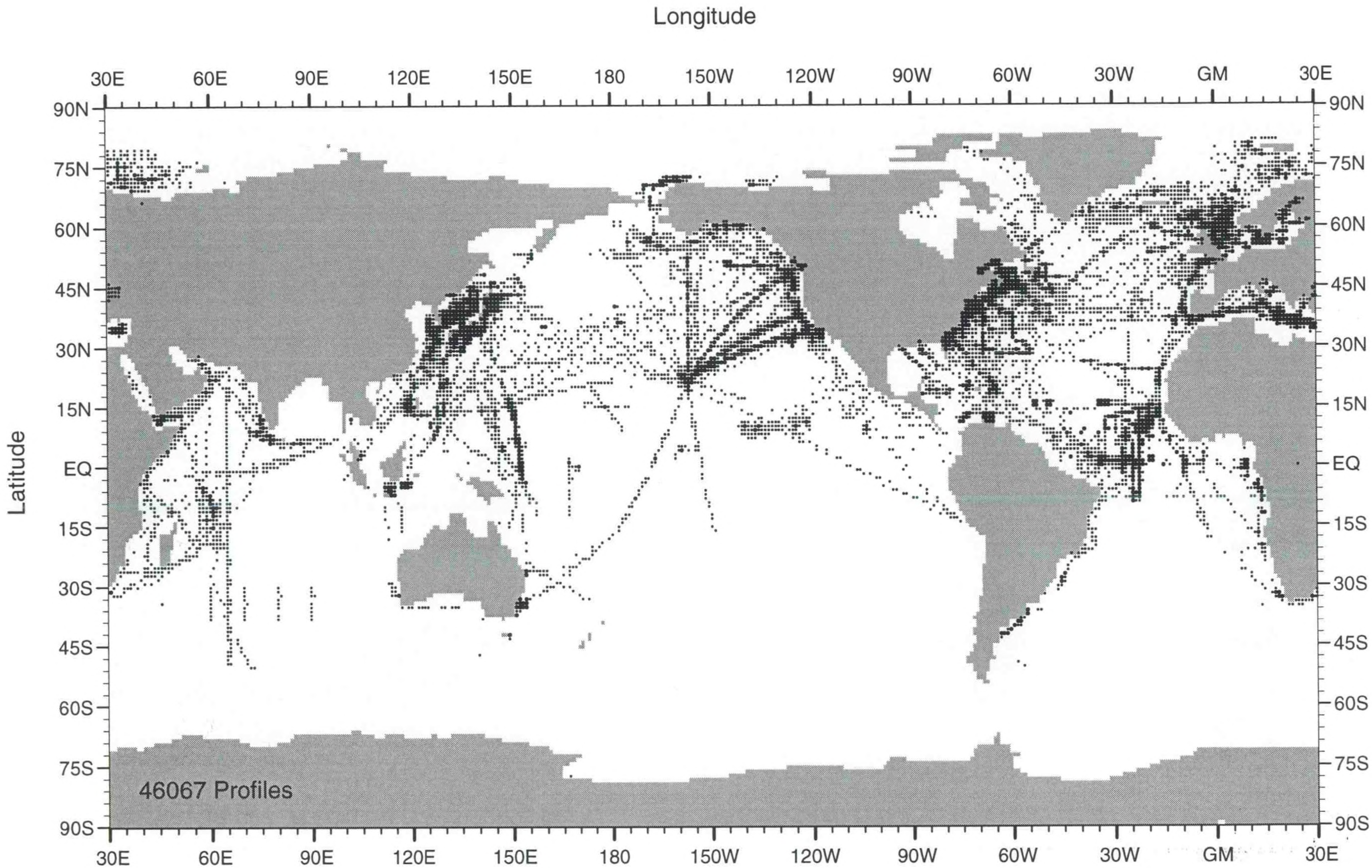


Fig. B135 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1974

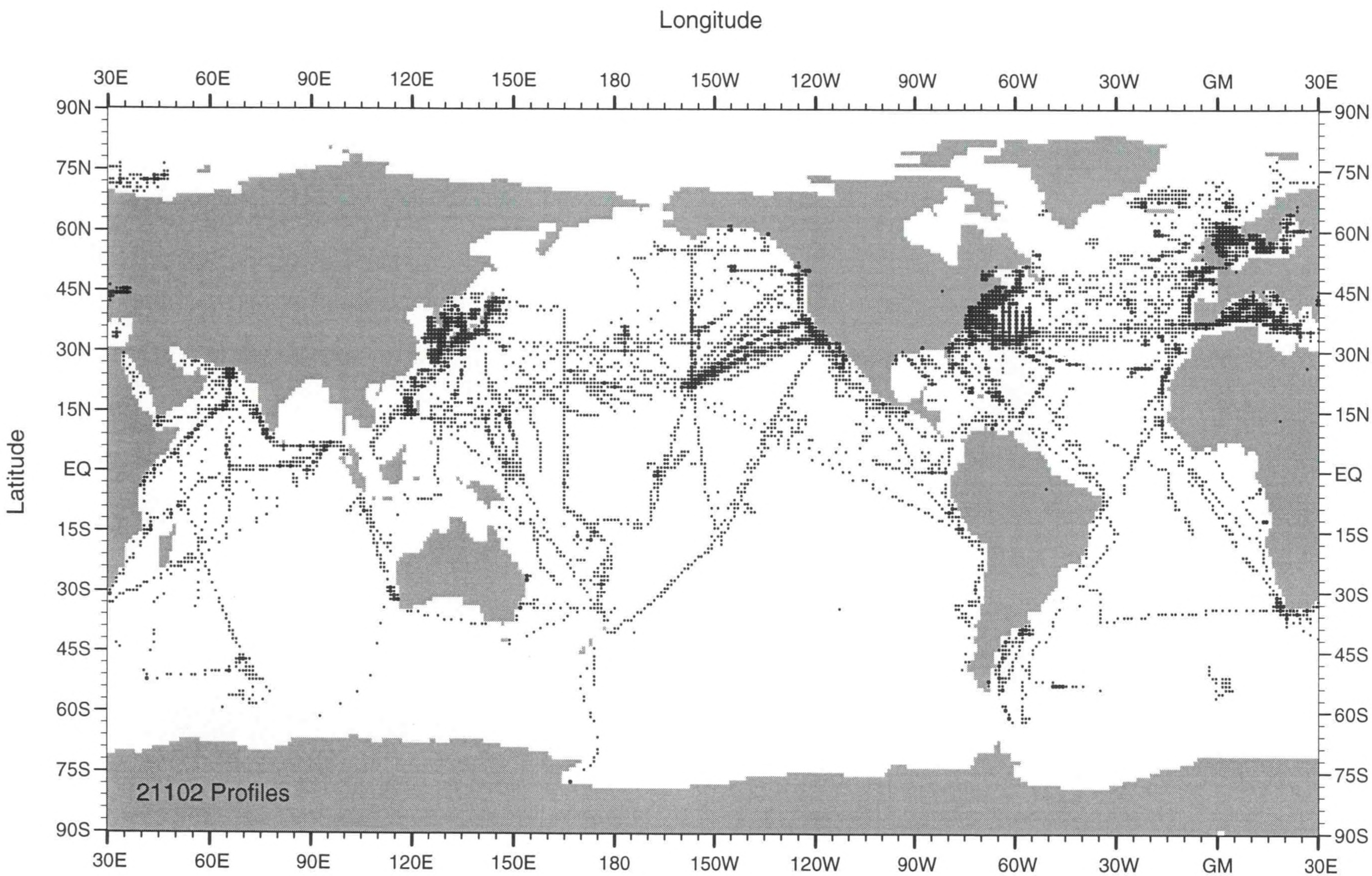


Fig. B136 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1974

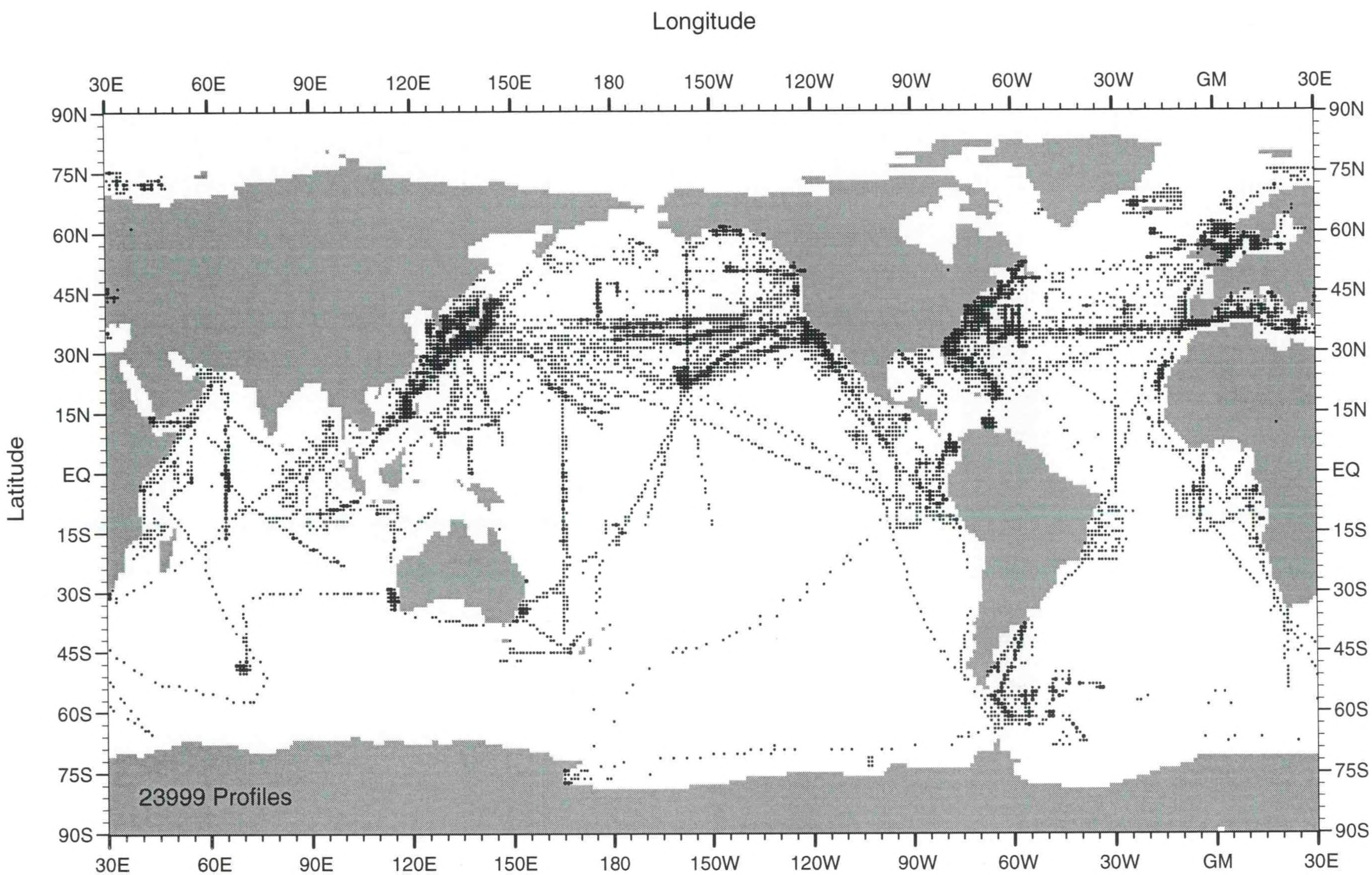


Fig. B137 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1975

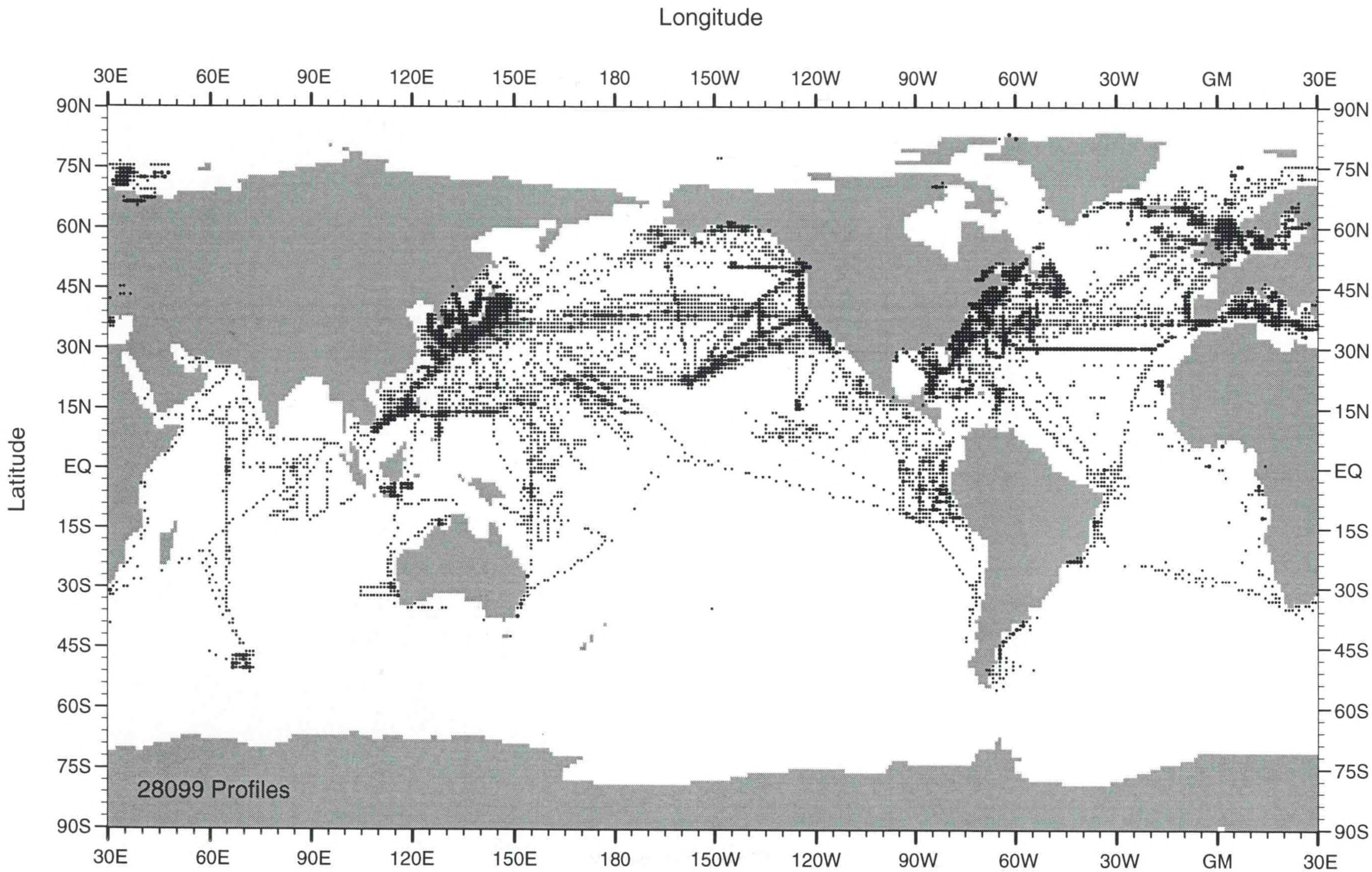


Fig. B138 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1975

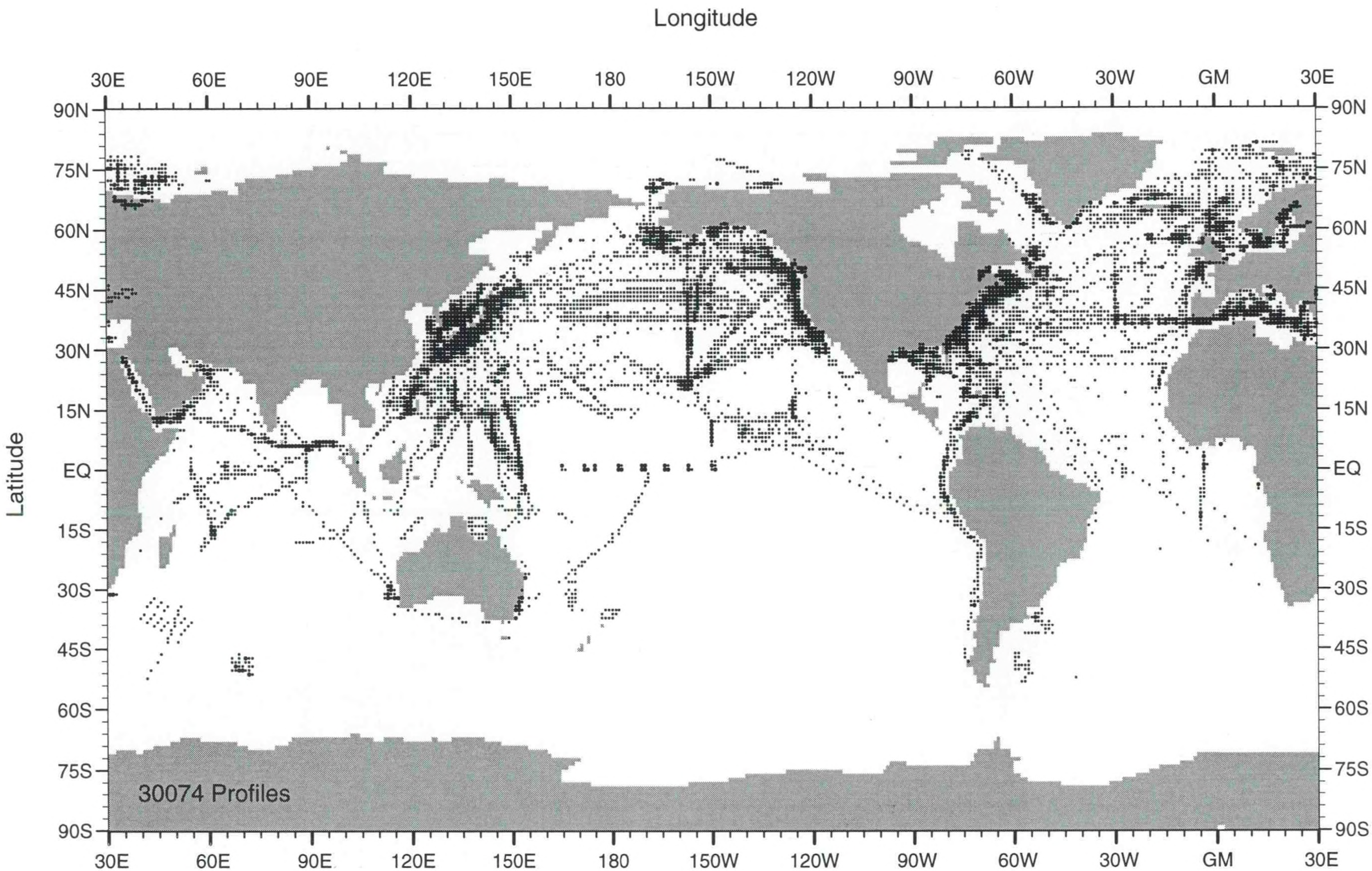


Fig. B139 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1975

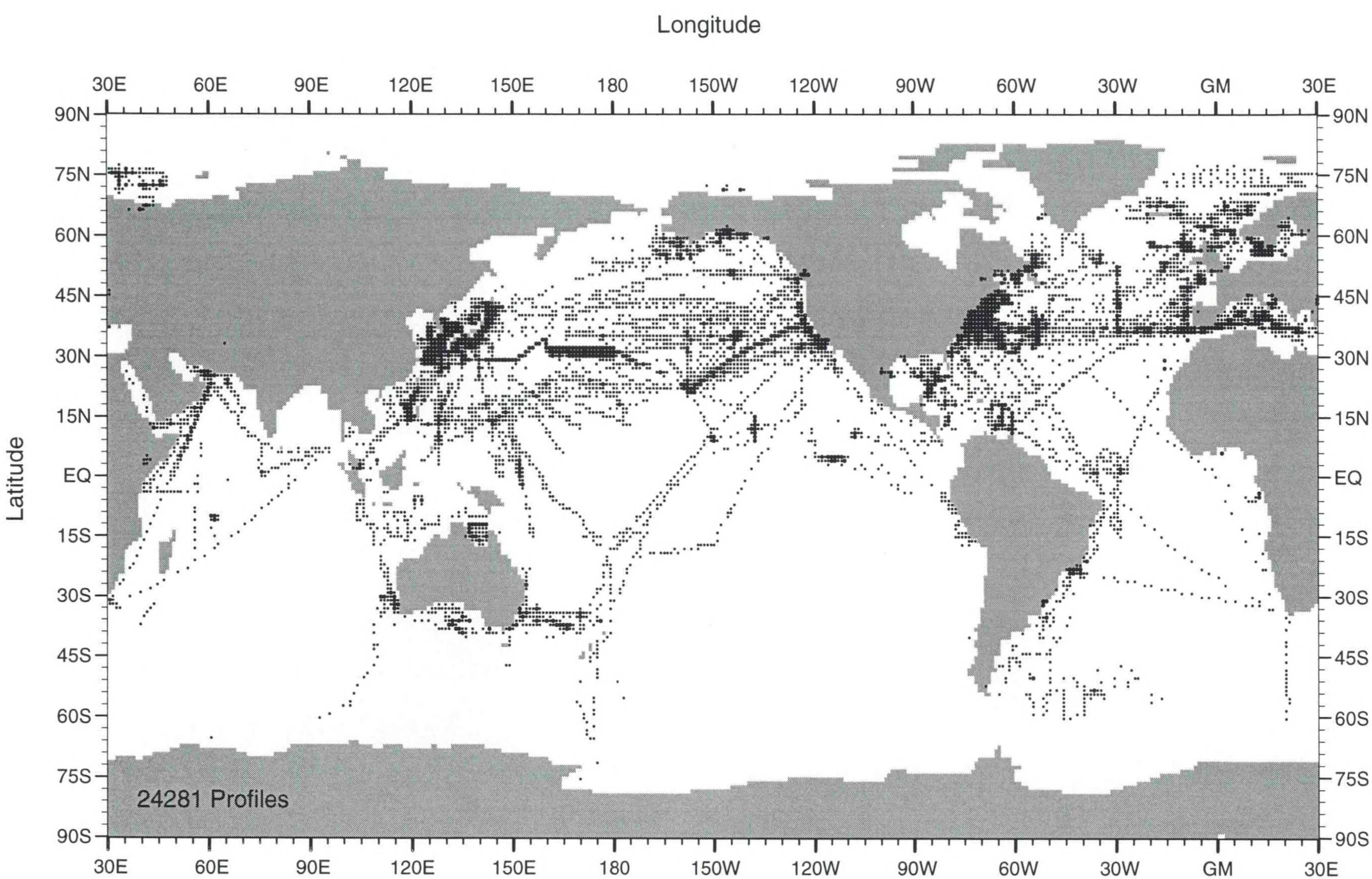


Fig. B140 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1975

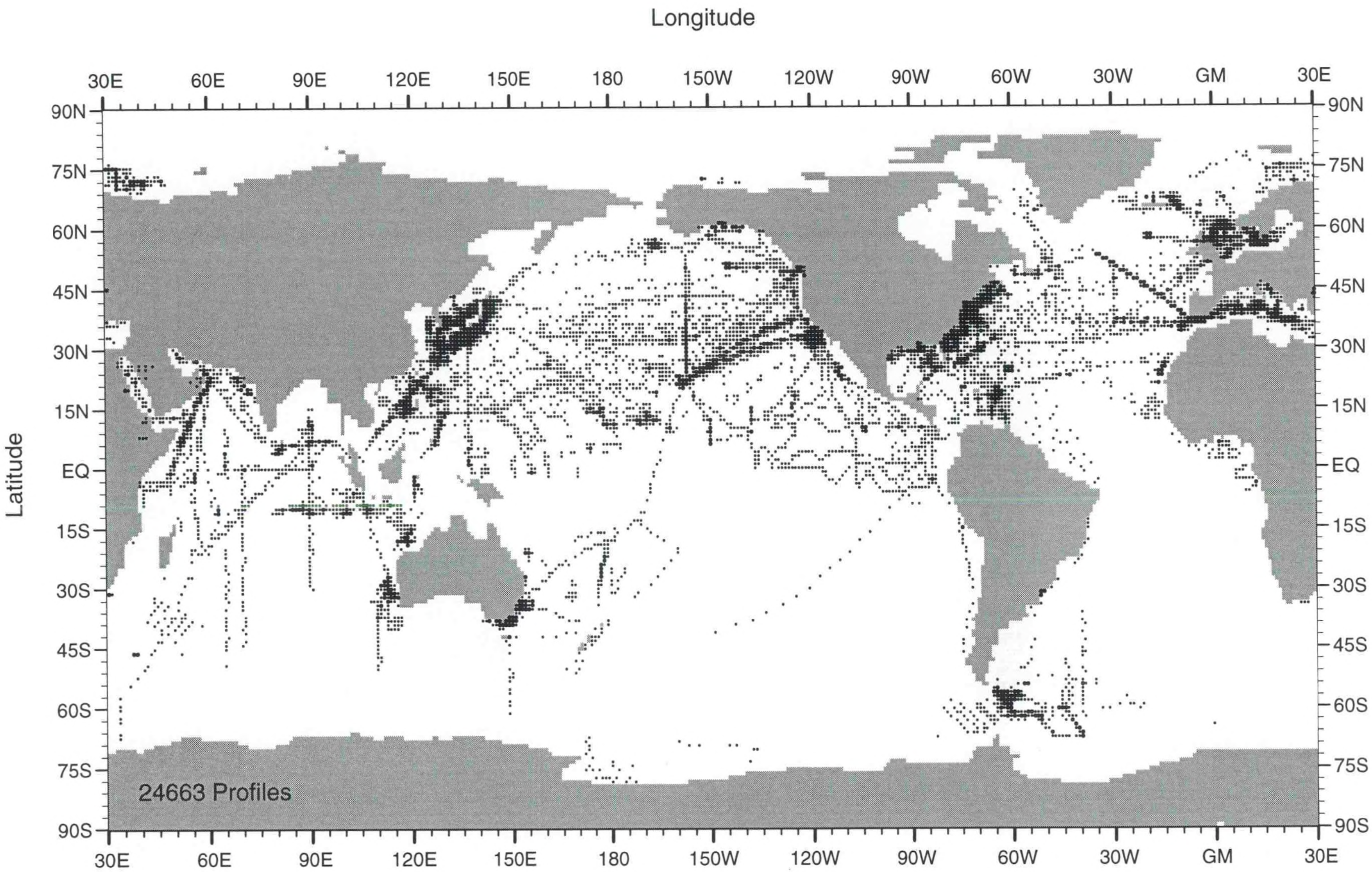


Fig. B141 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1976

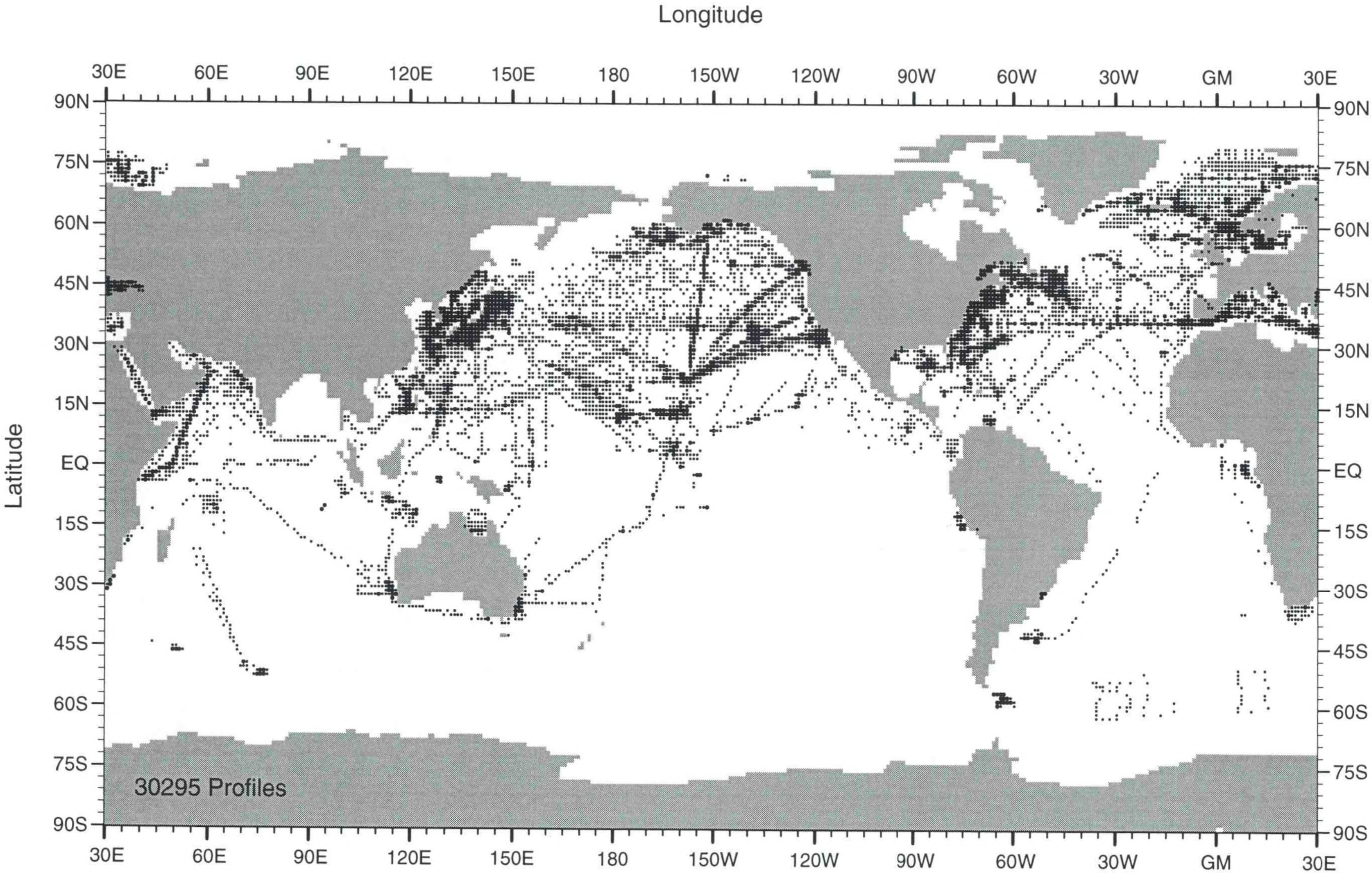


Fig. B142 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1976

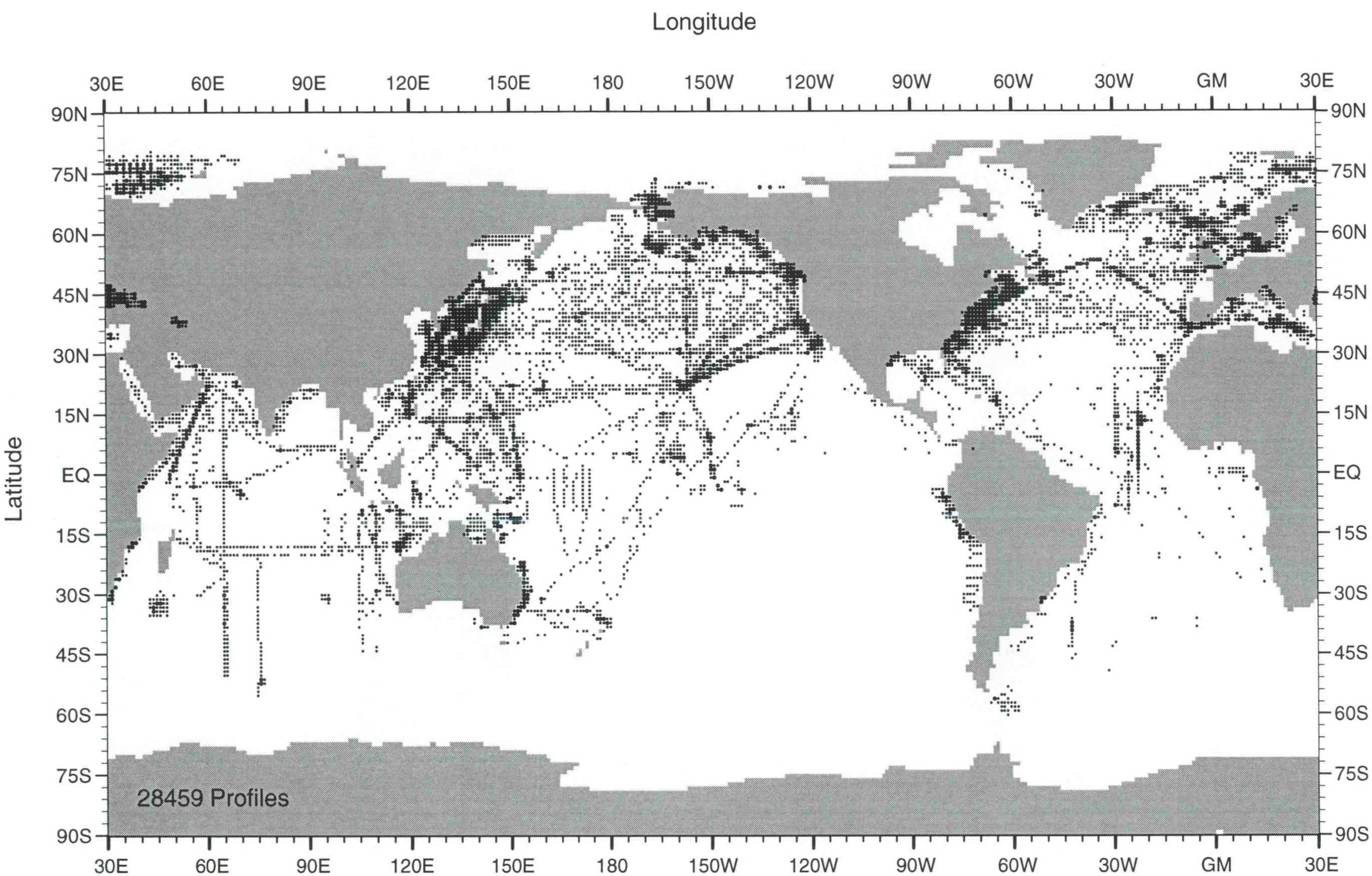


Fig. B143 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1976

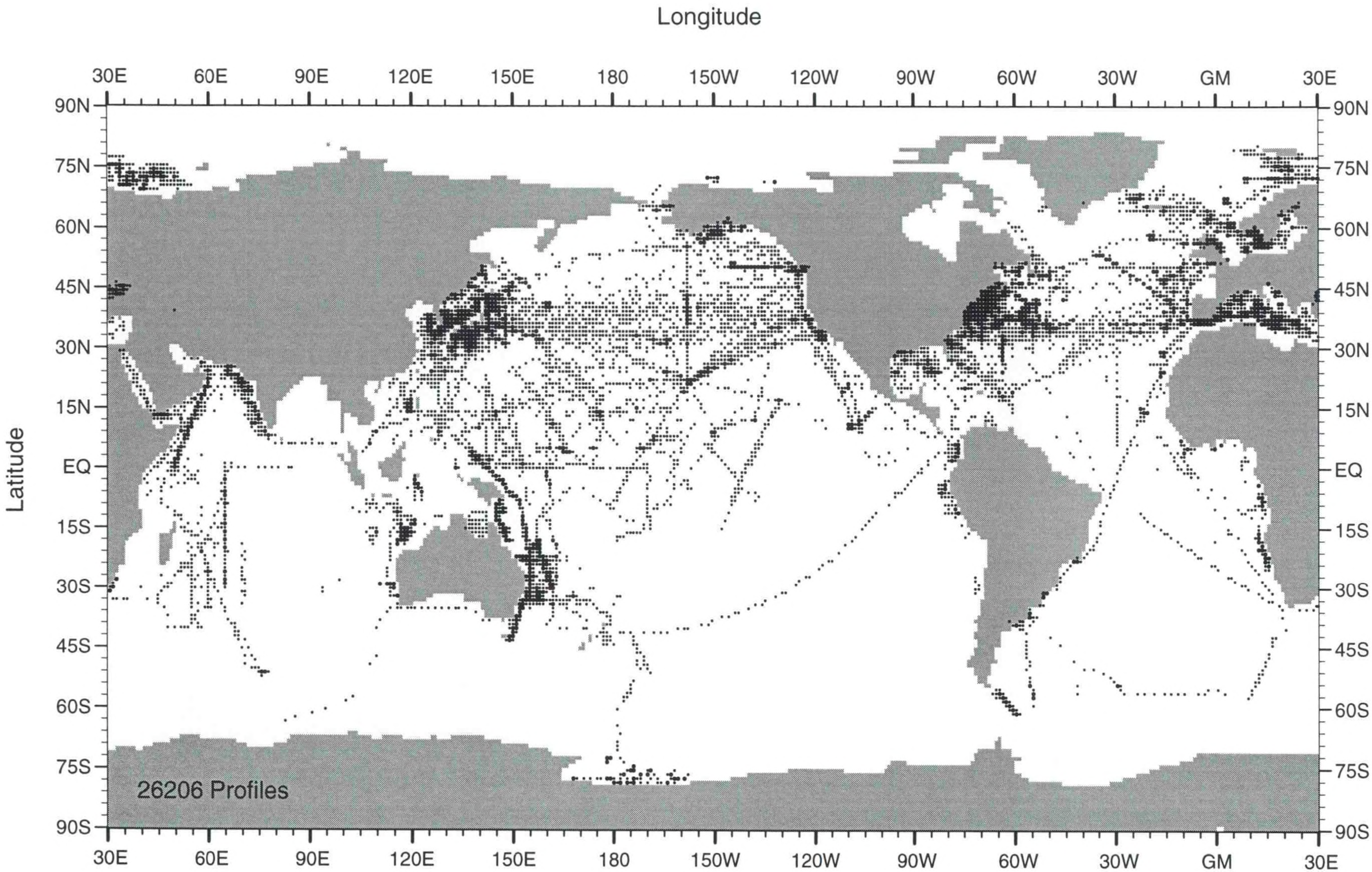


Fig. B144 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1976

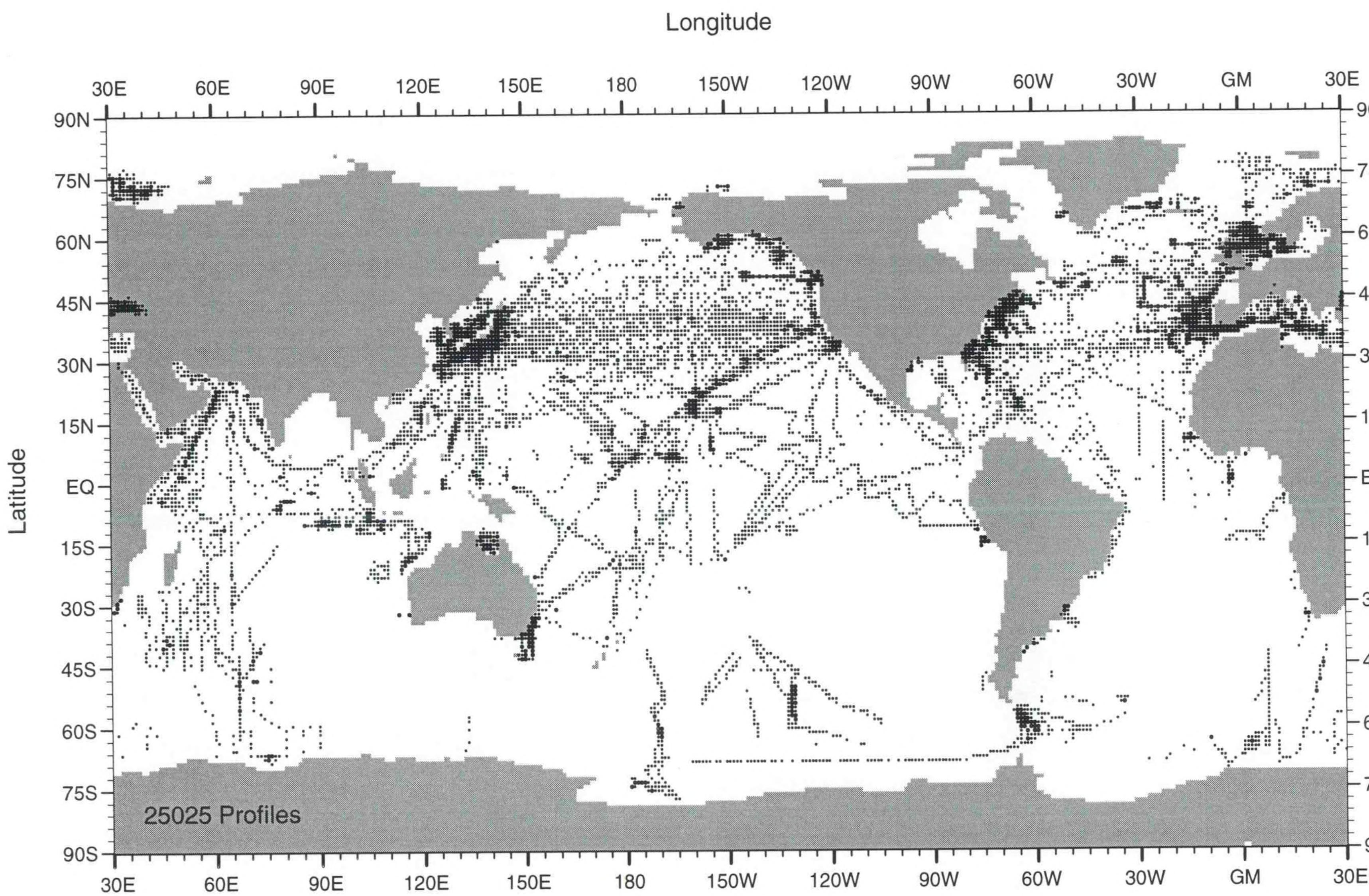


Fig. B145 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1977

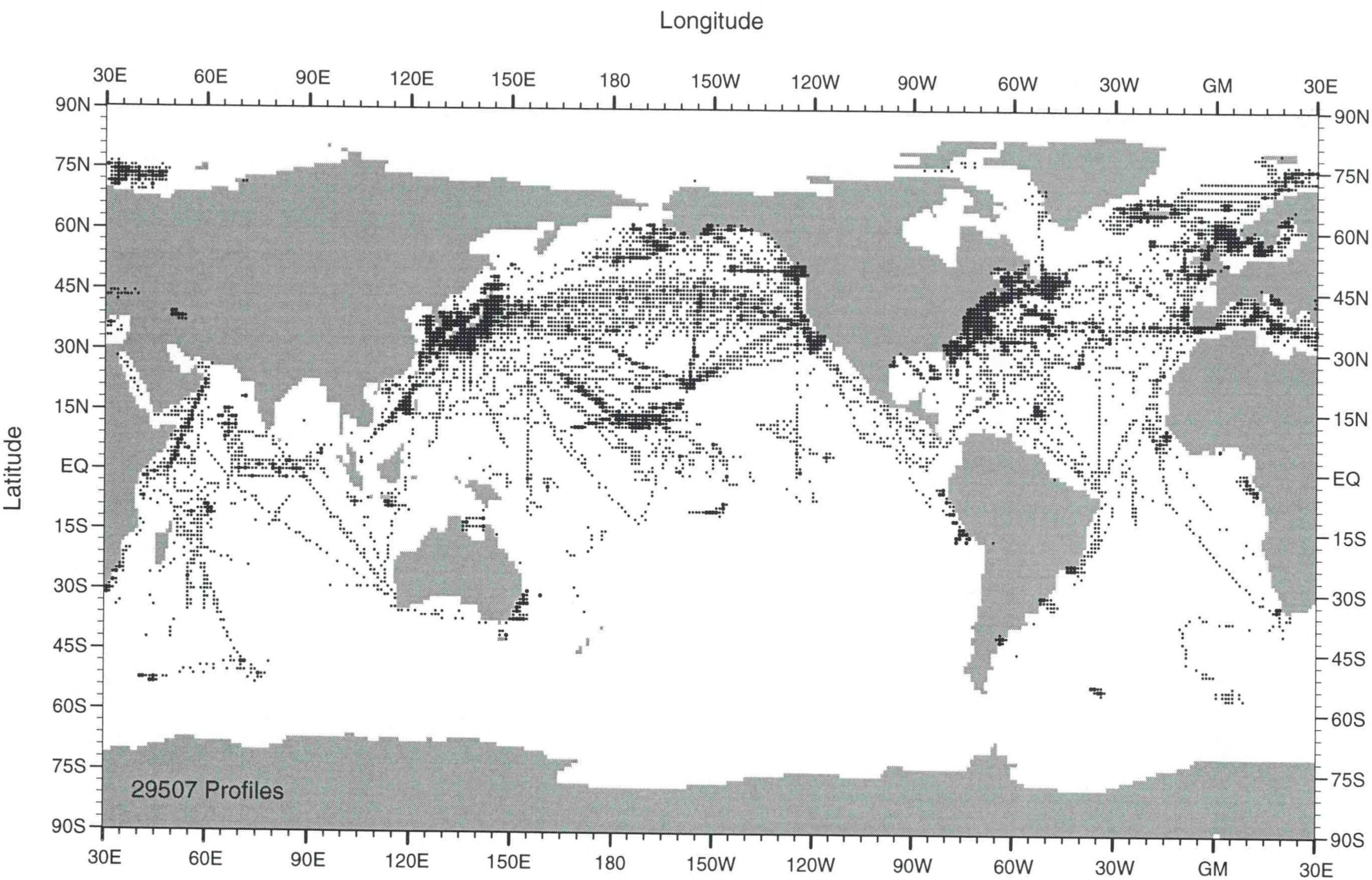


Fig. B146 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1977

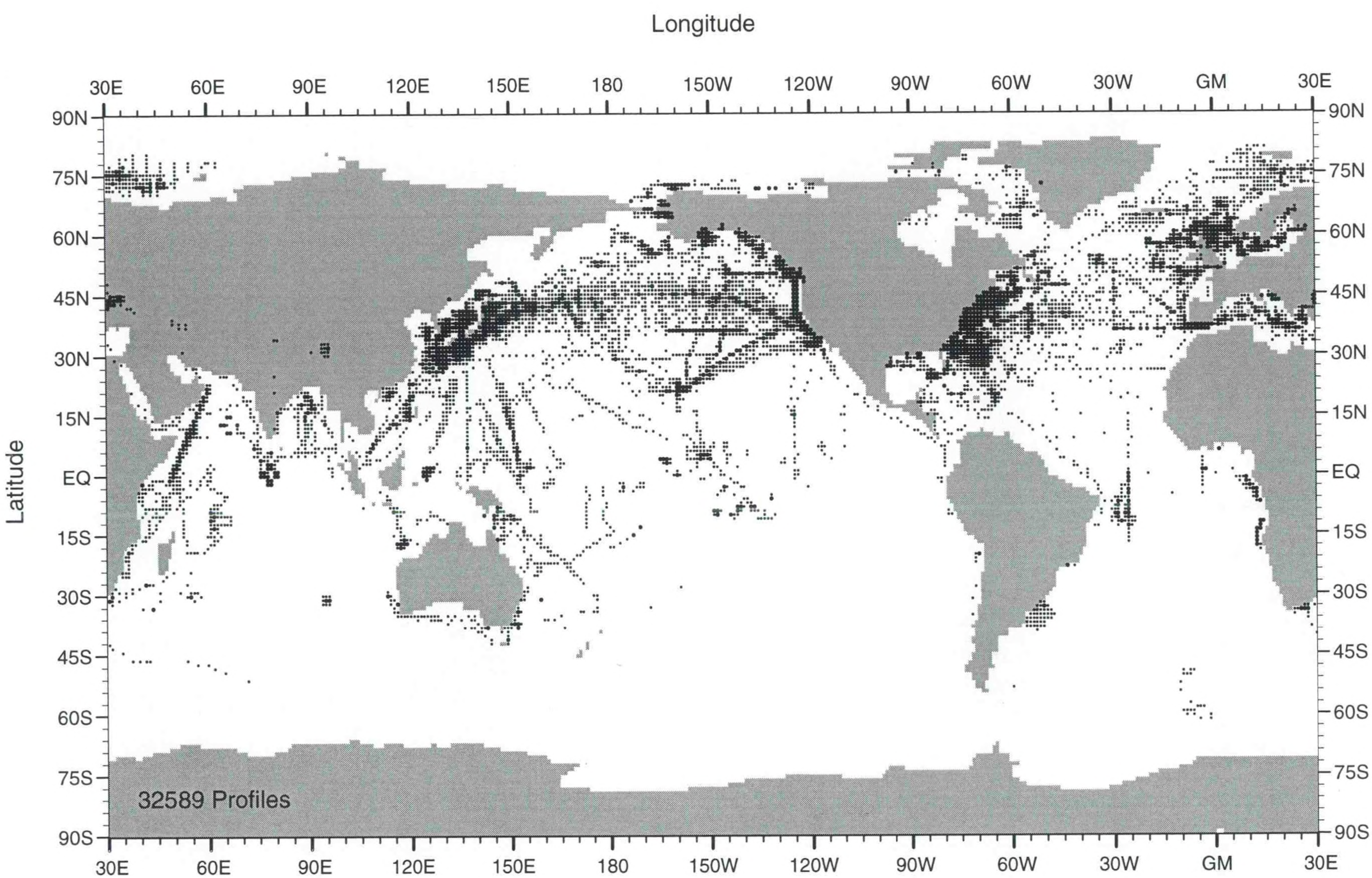


Fig. B147 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1977

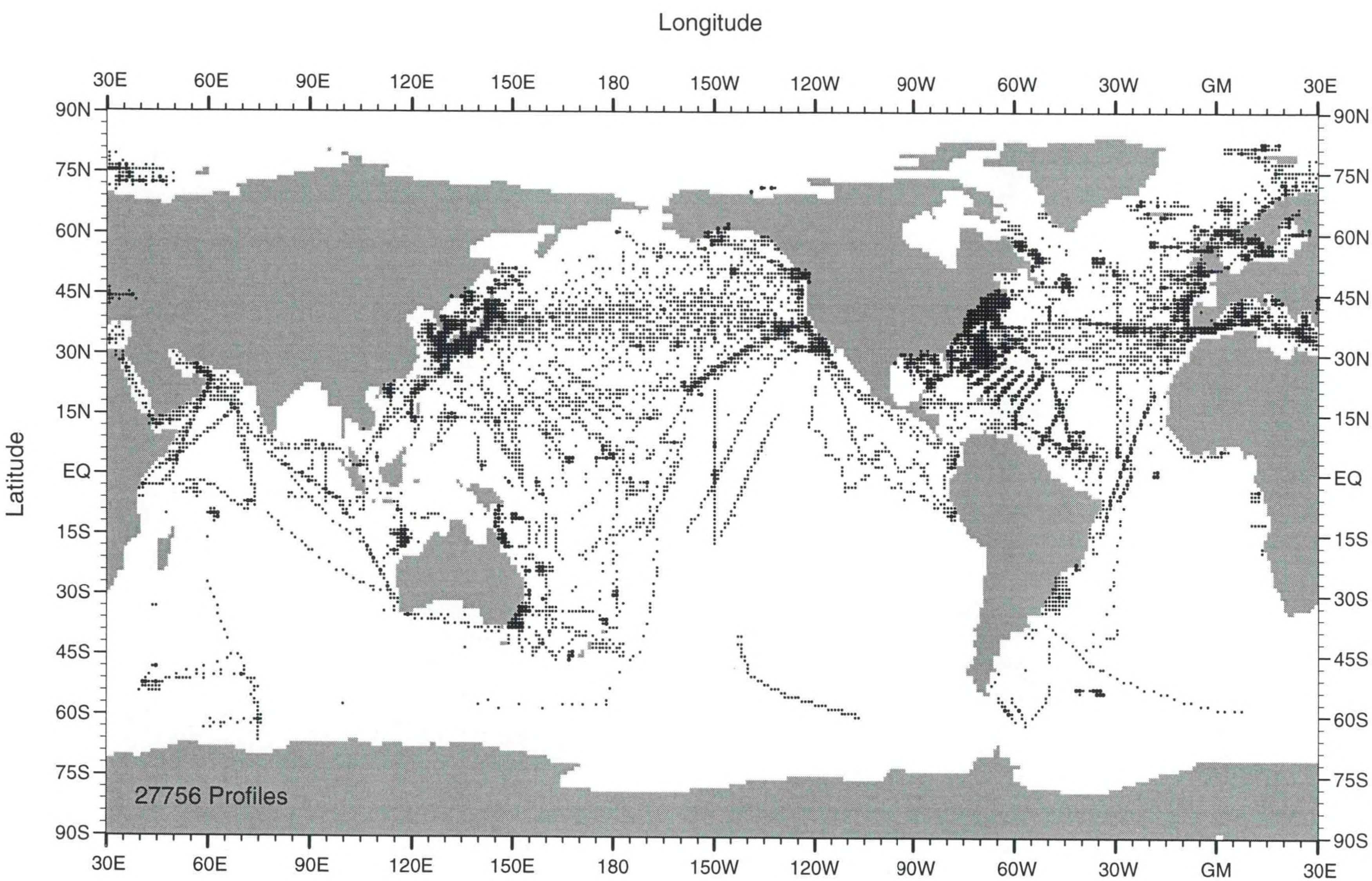


Fig. B148 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1977

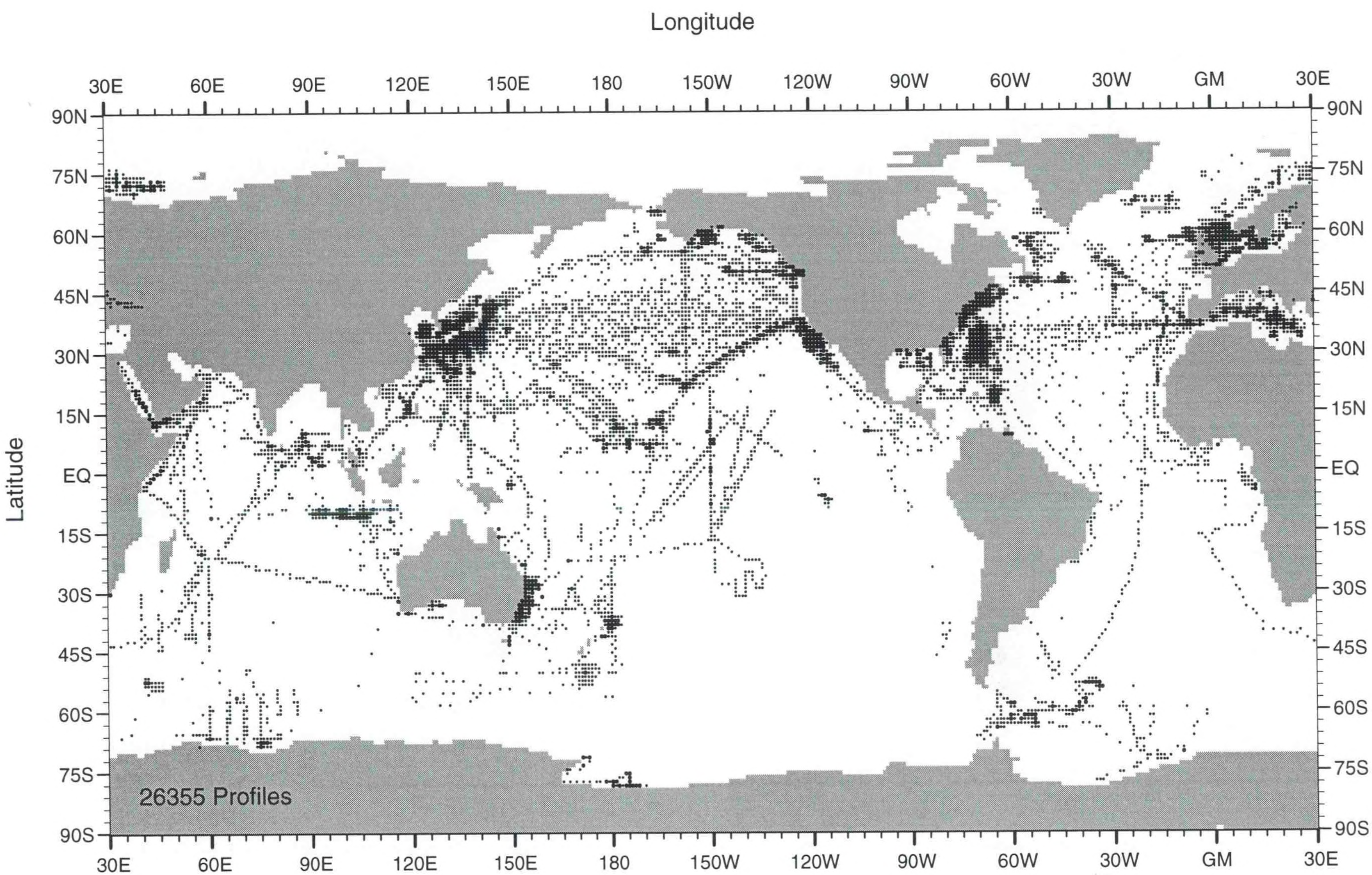


Fig. B149 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1978

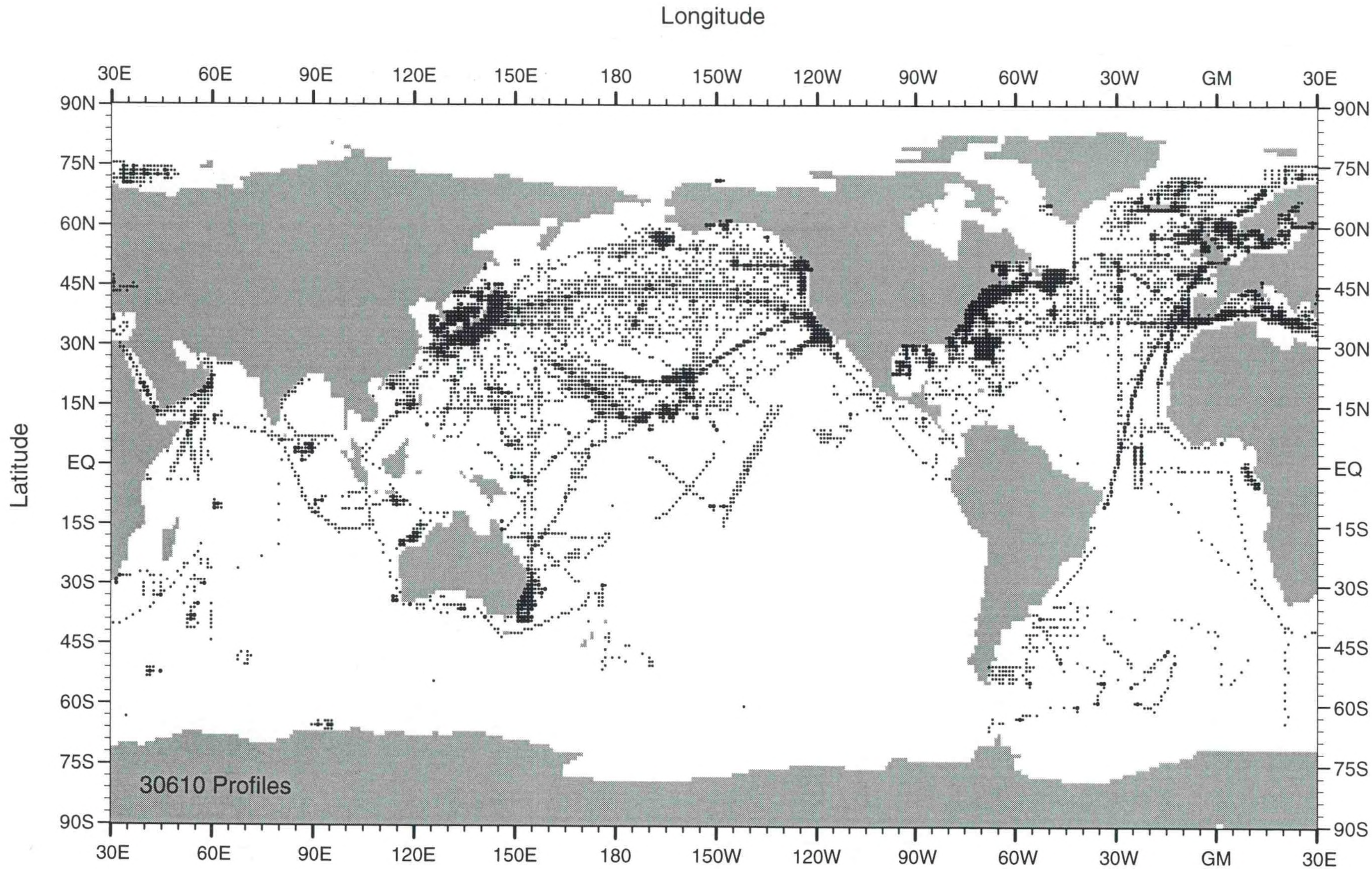


Fig. B150 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1978

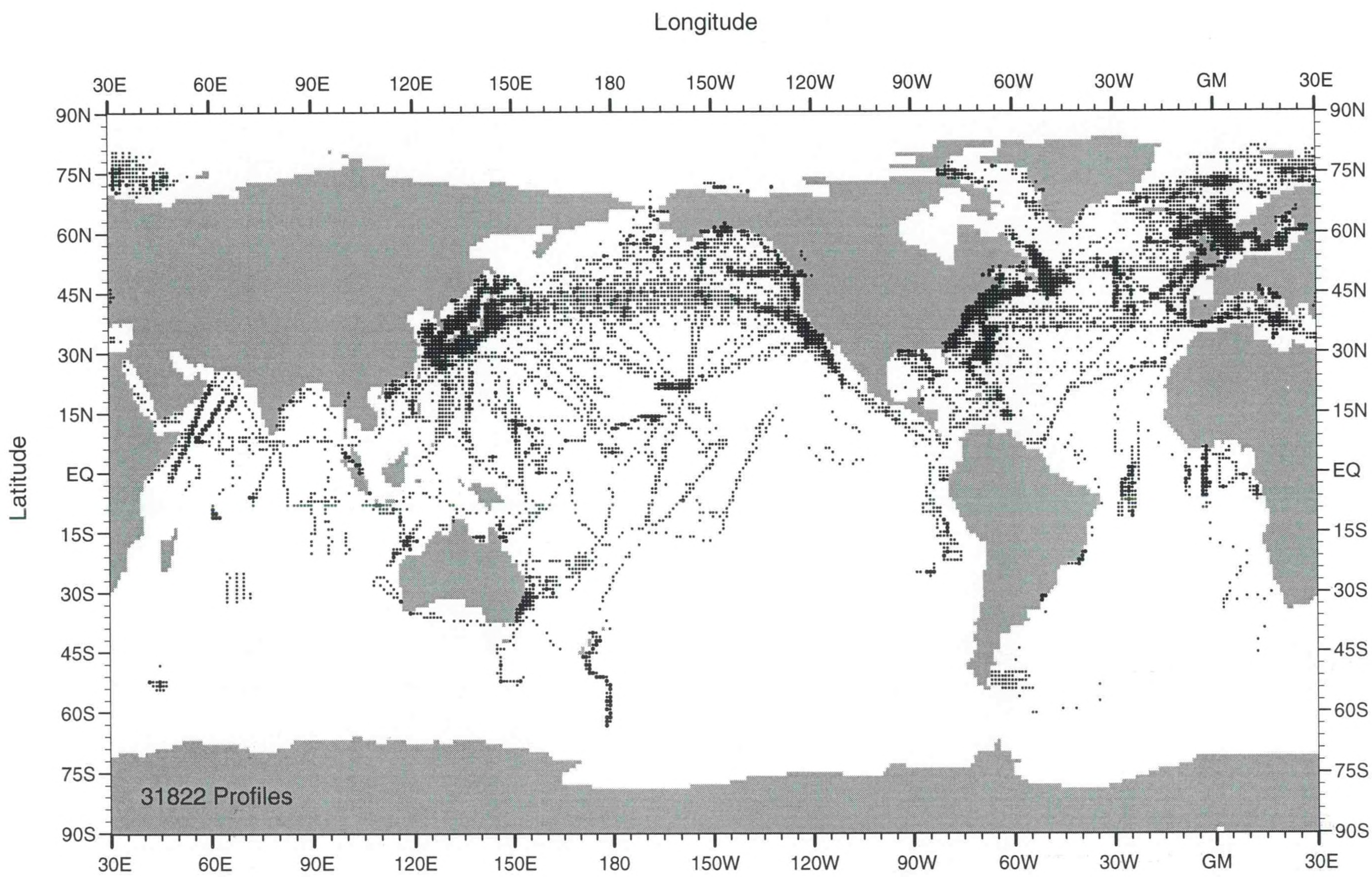


Fig. B151 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1978

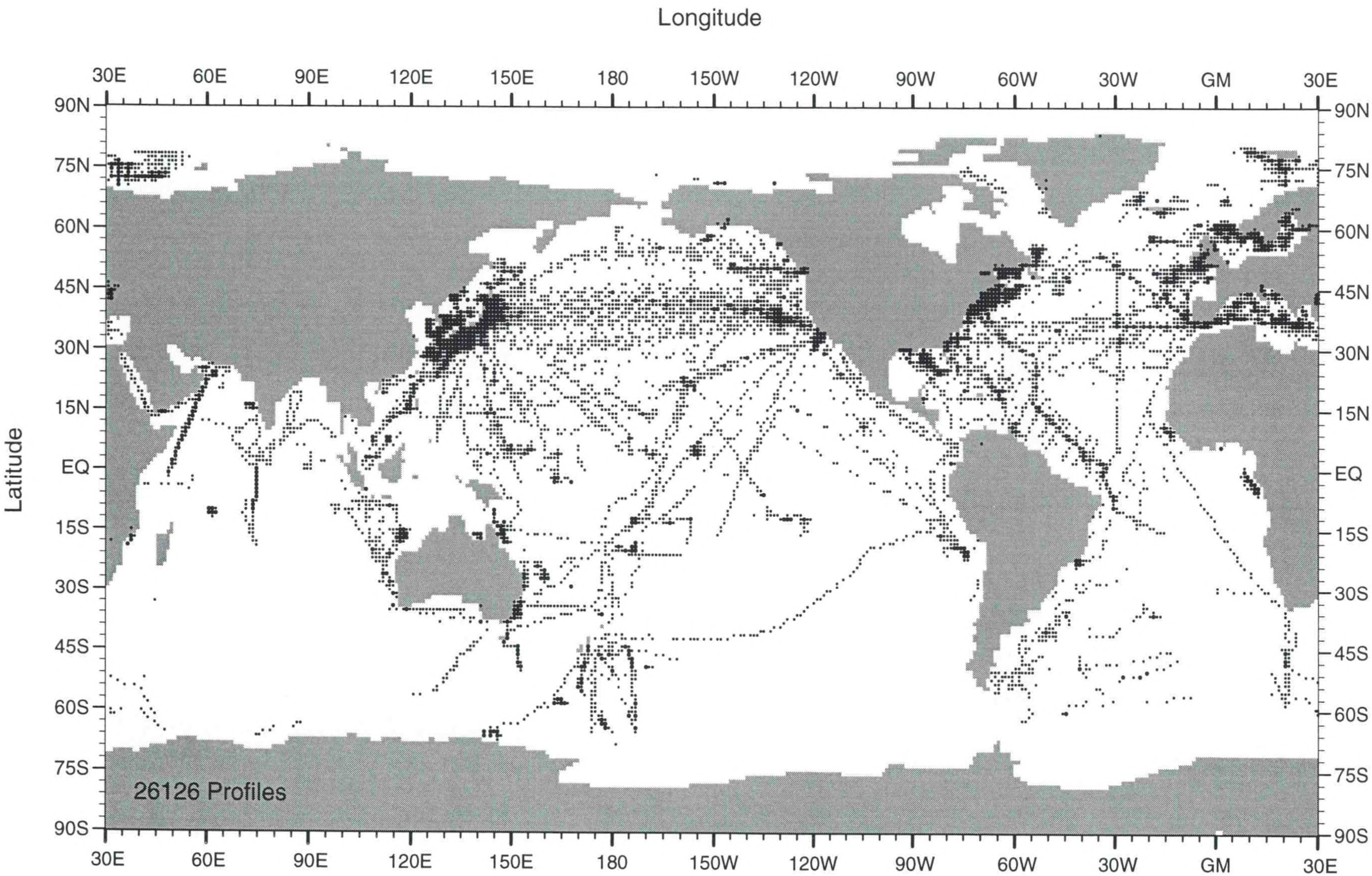


Fig. B152 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1978

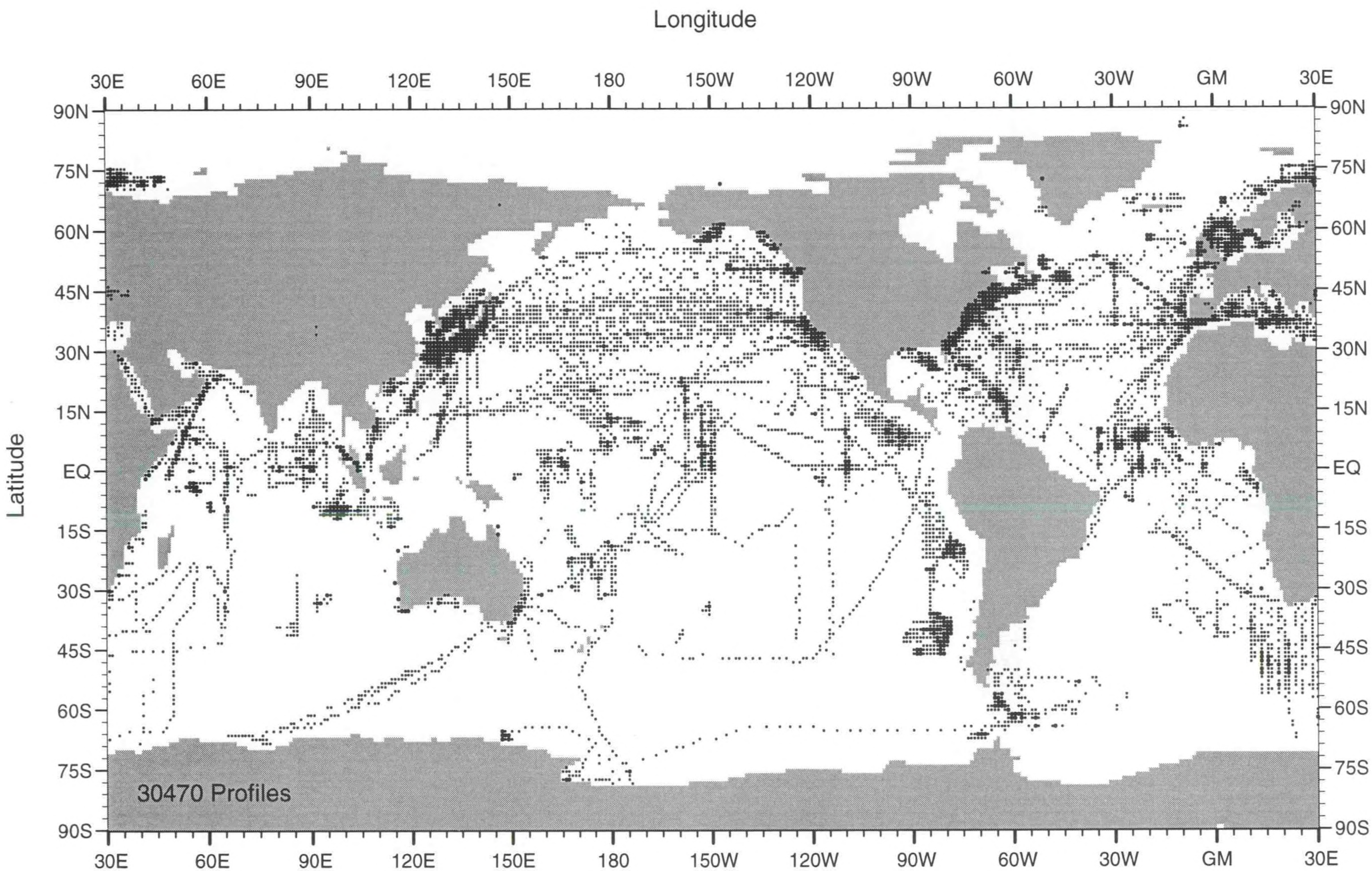


Fig. B153 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1979

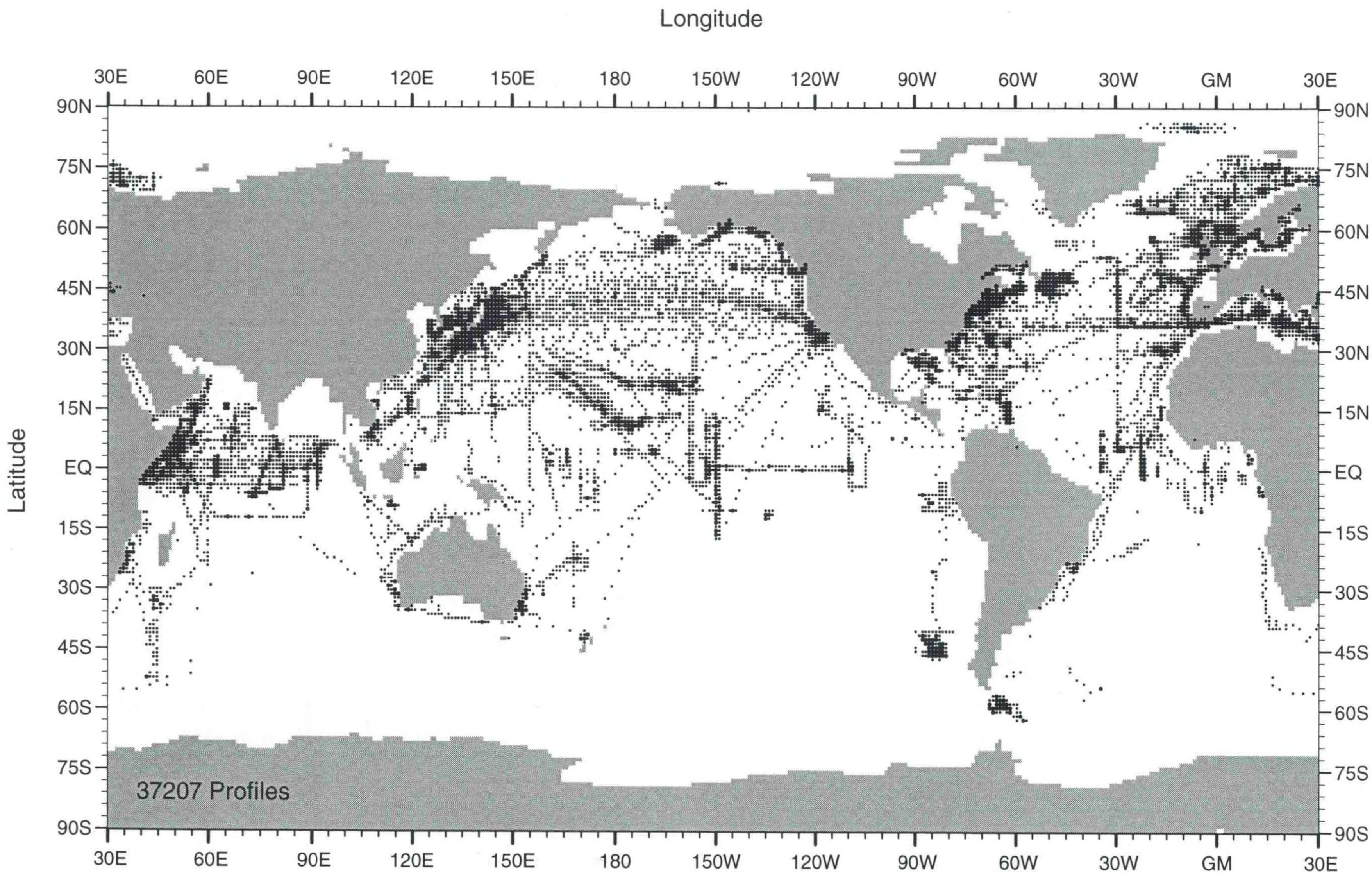


Fig. B154 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1979

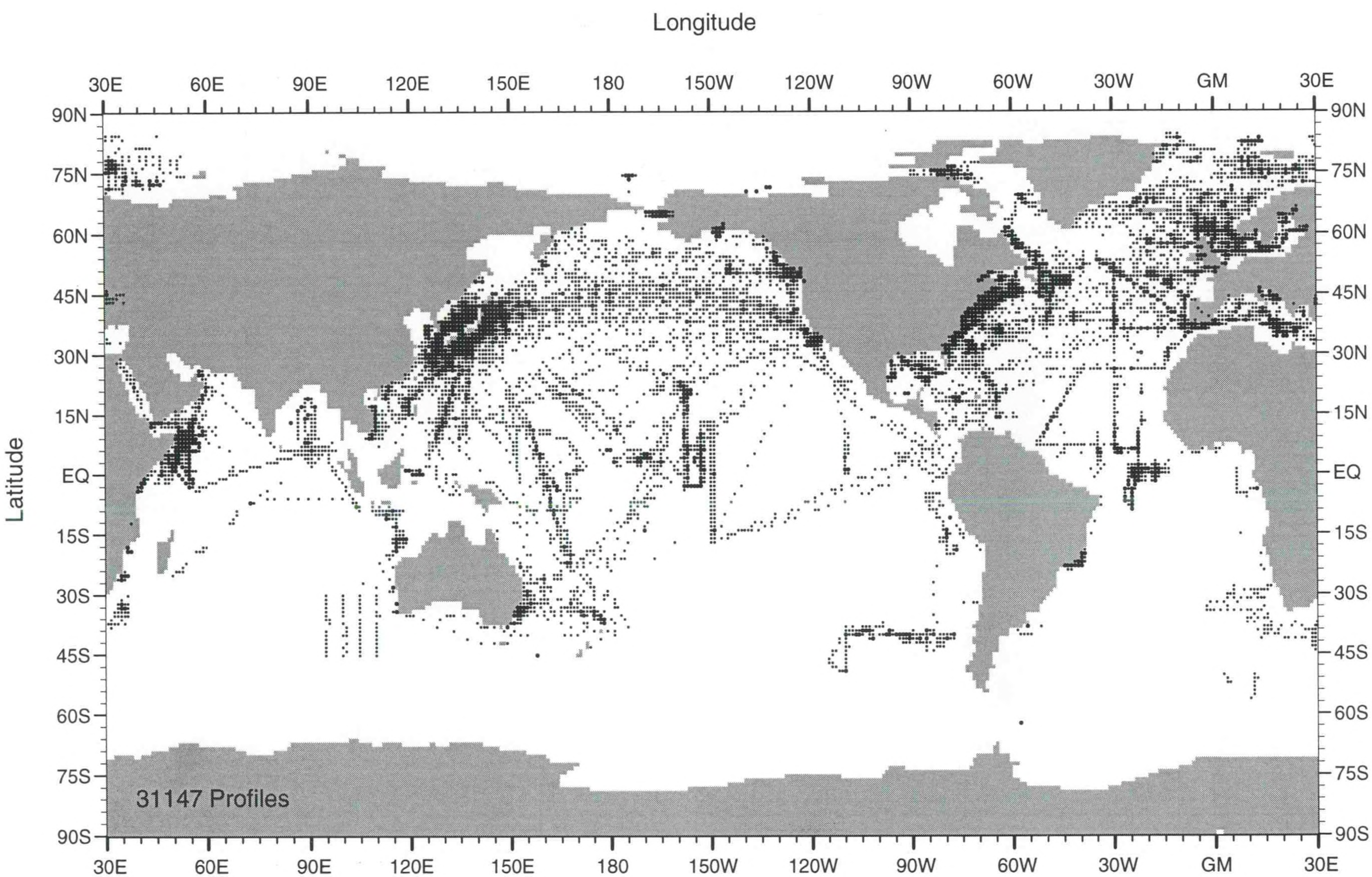


Fig. B155 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1979

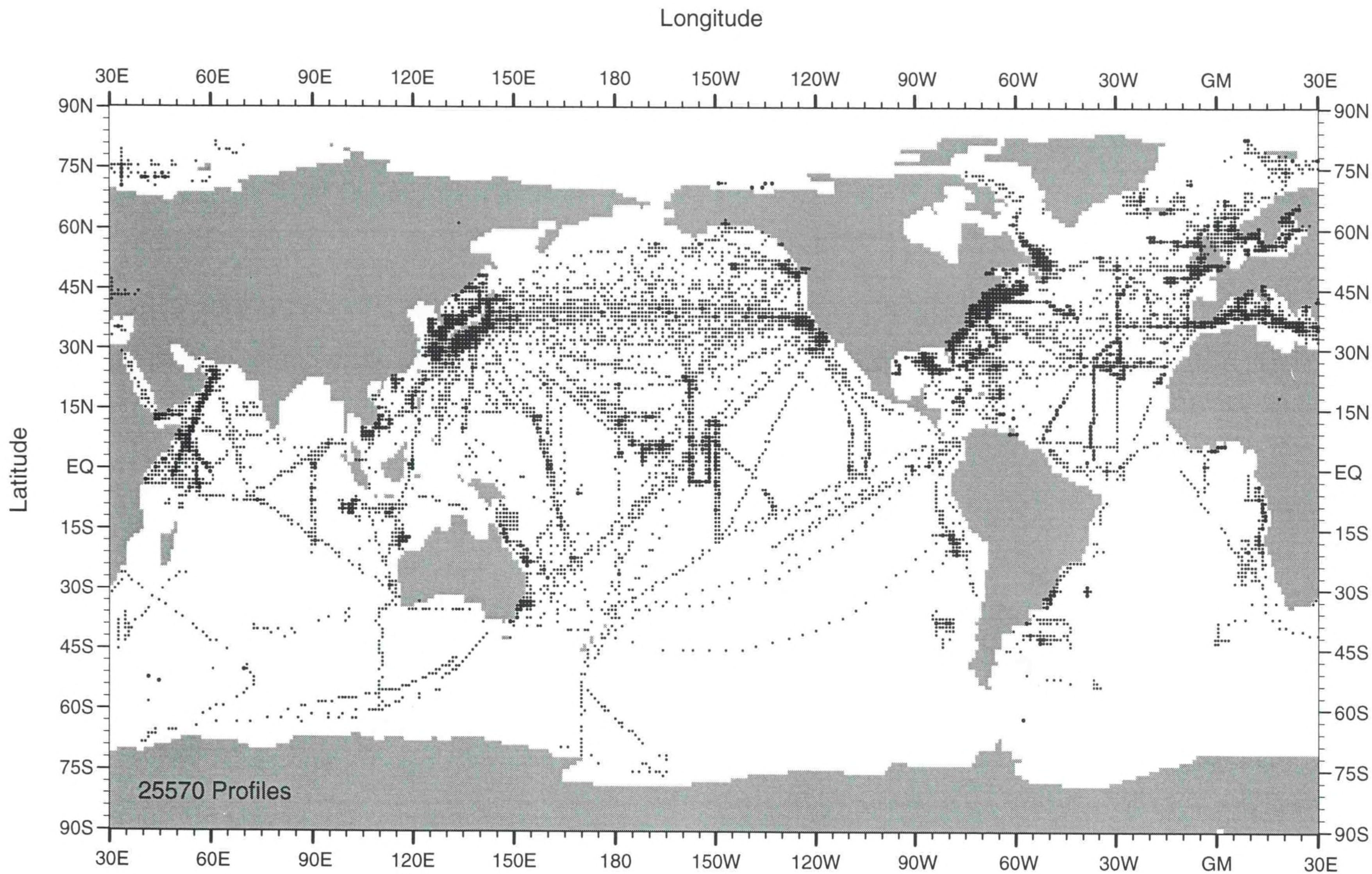


Fig. B156 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1979

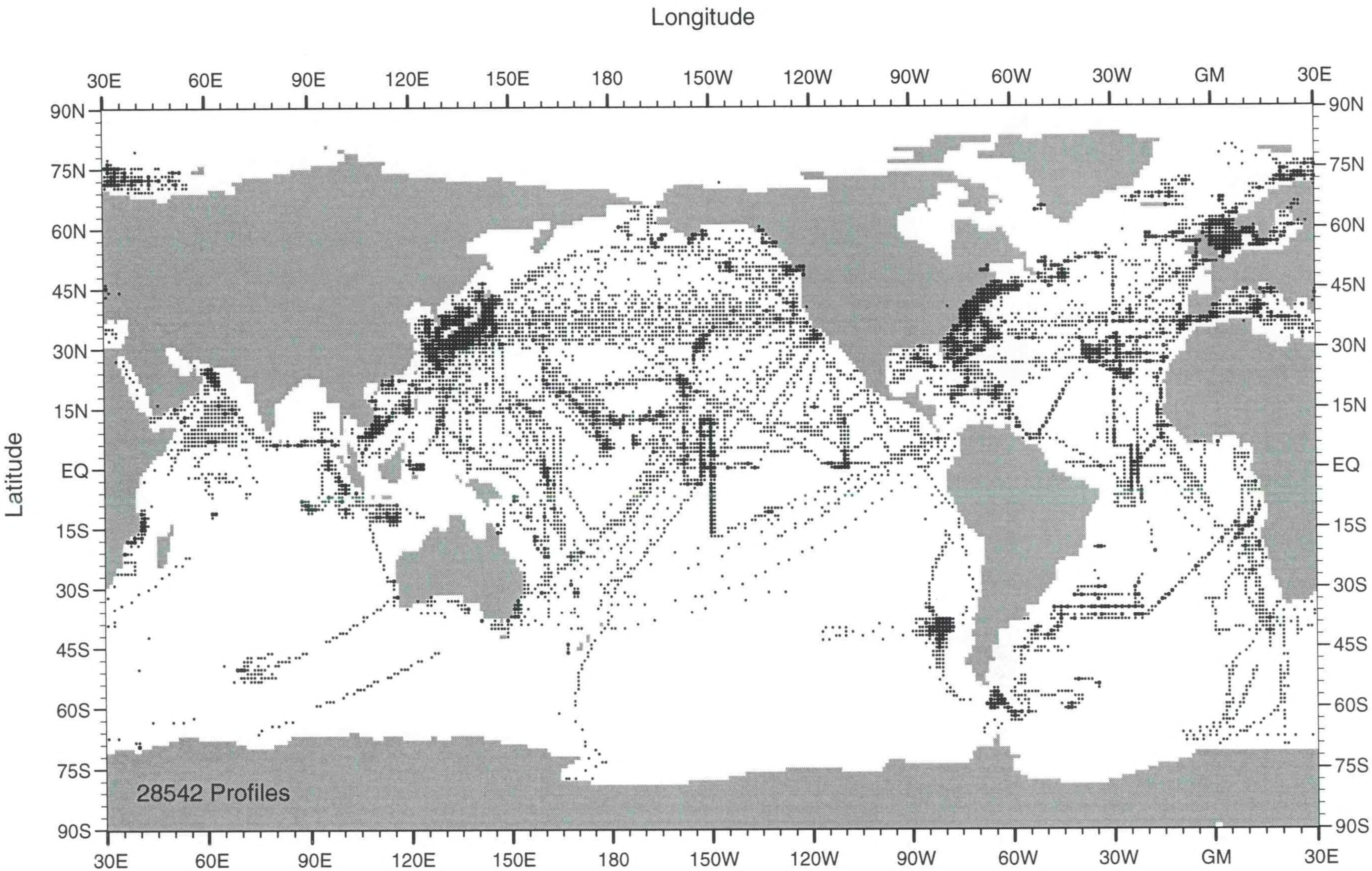


Fig. B157 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1980

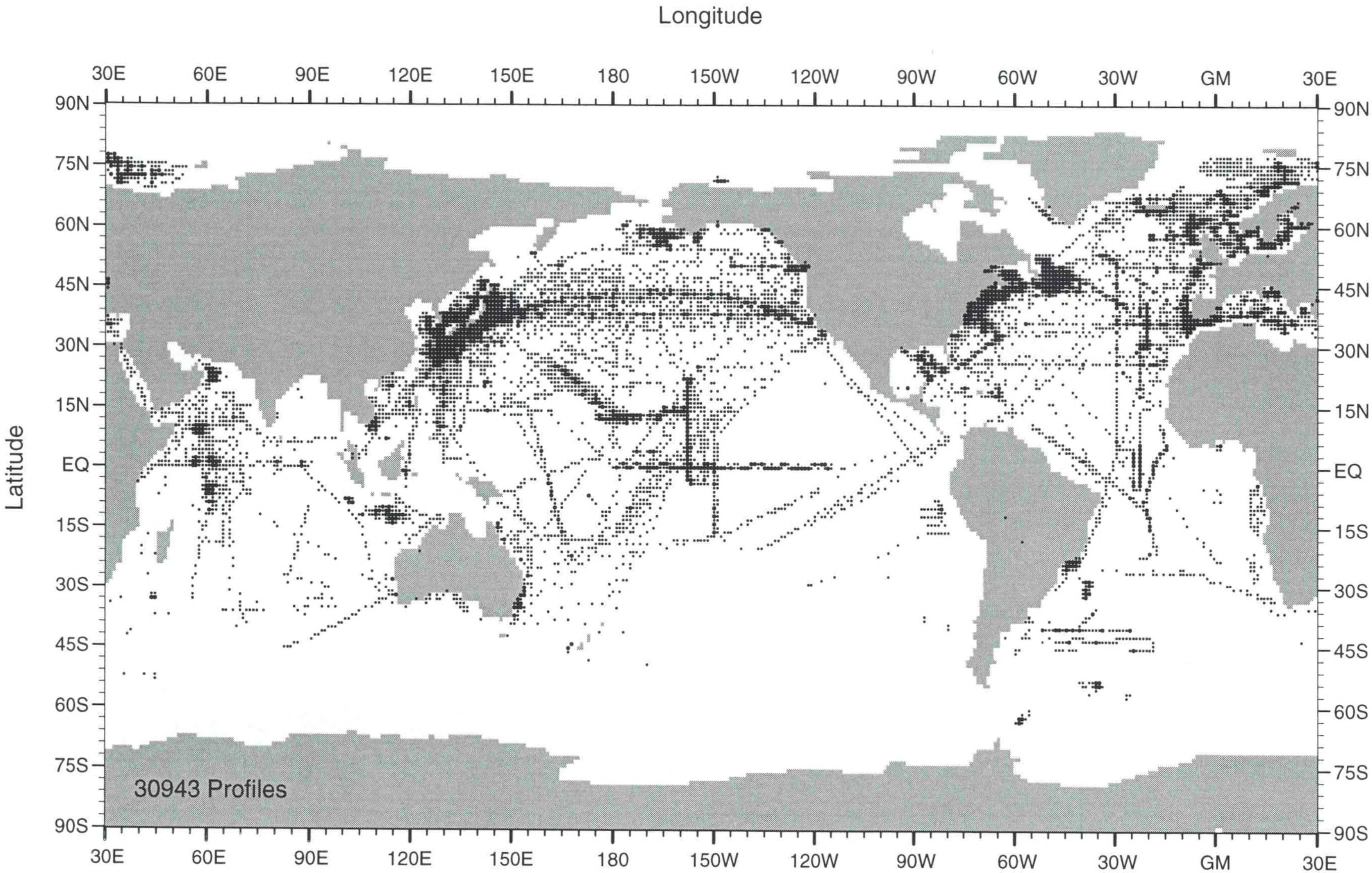


Fig. B158 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1980

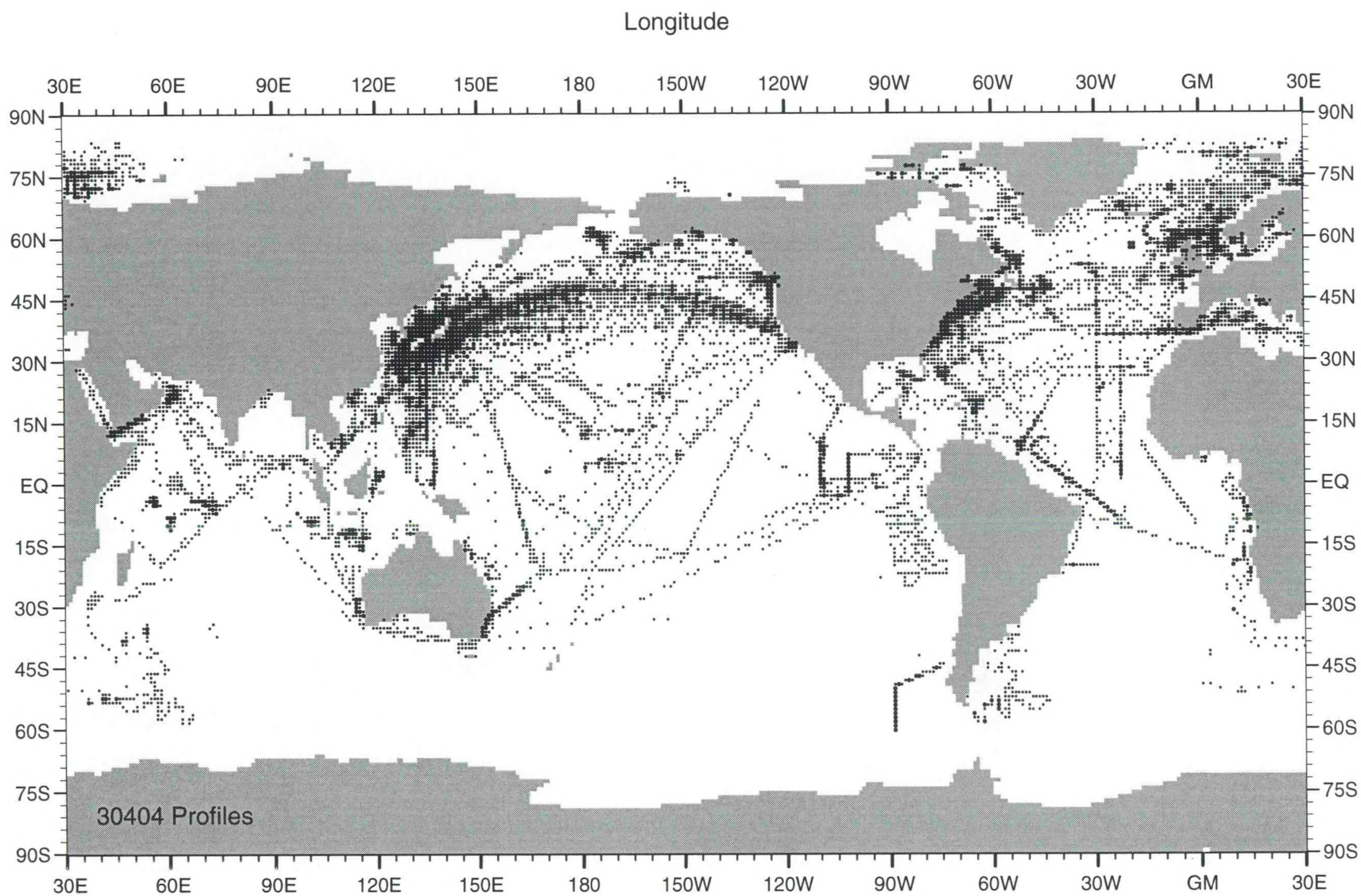


Fig. B159 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1980

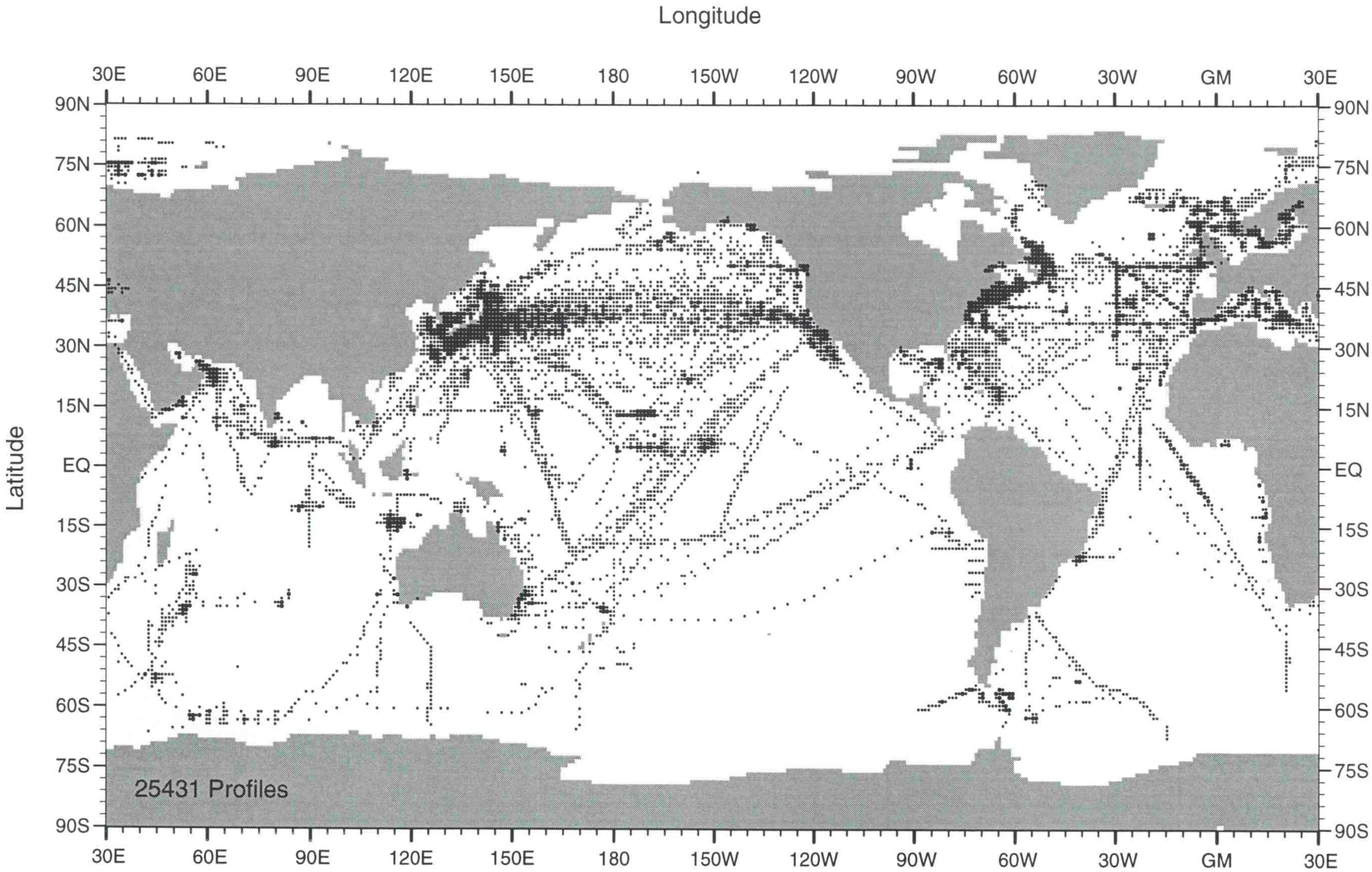


Fig. B160 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1980

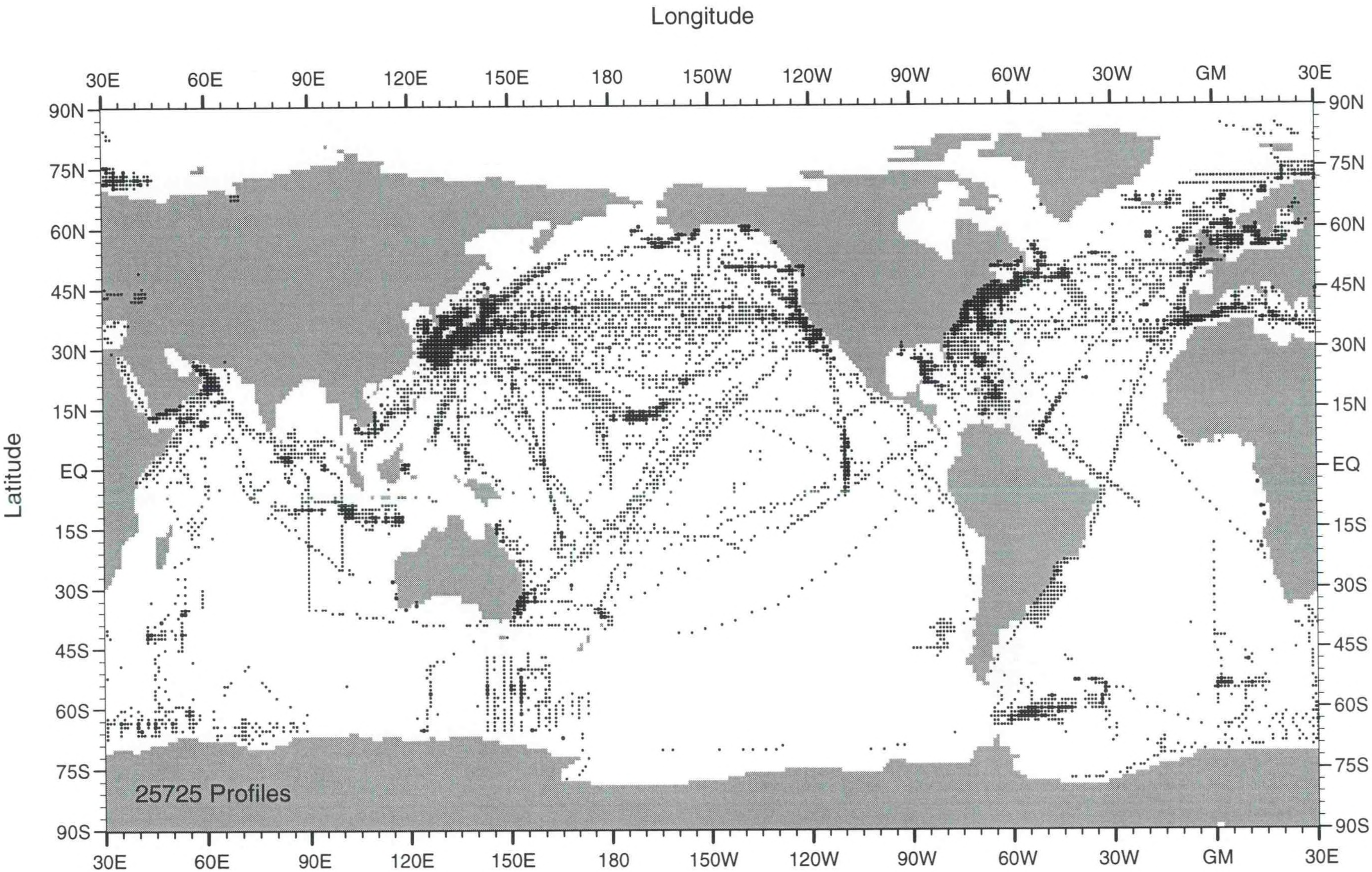


Fig. B161 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1981

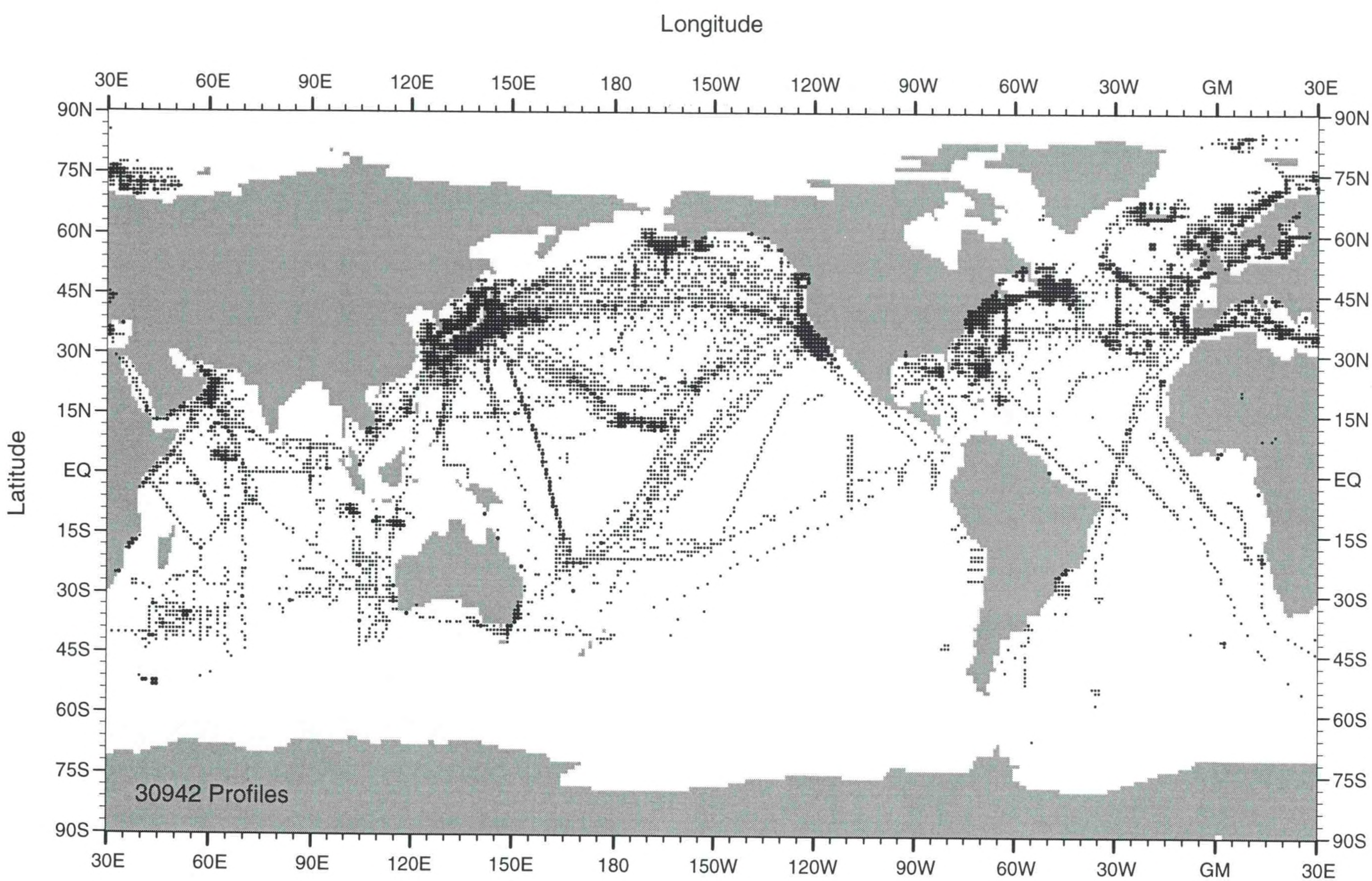


Fig. B162 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1981

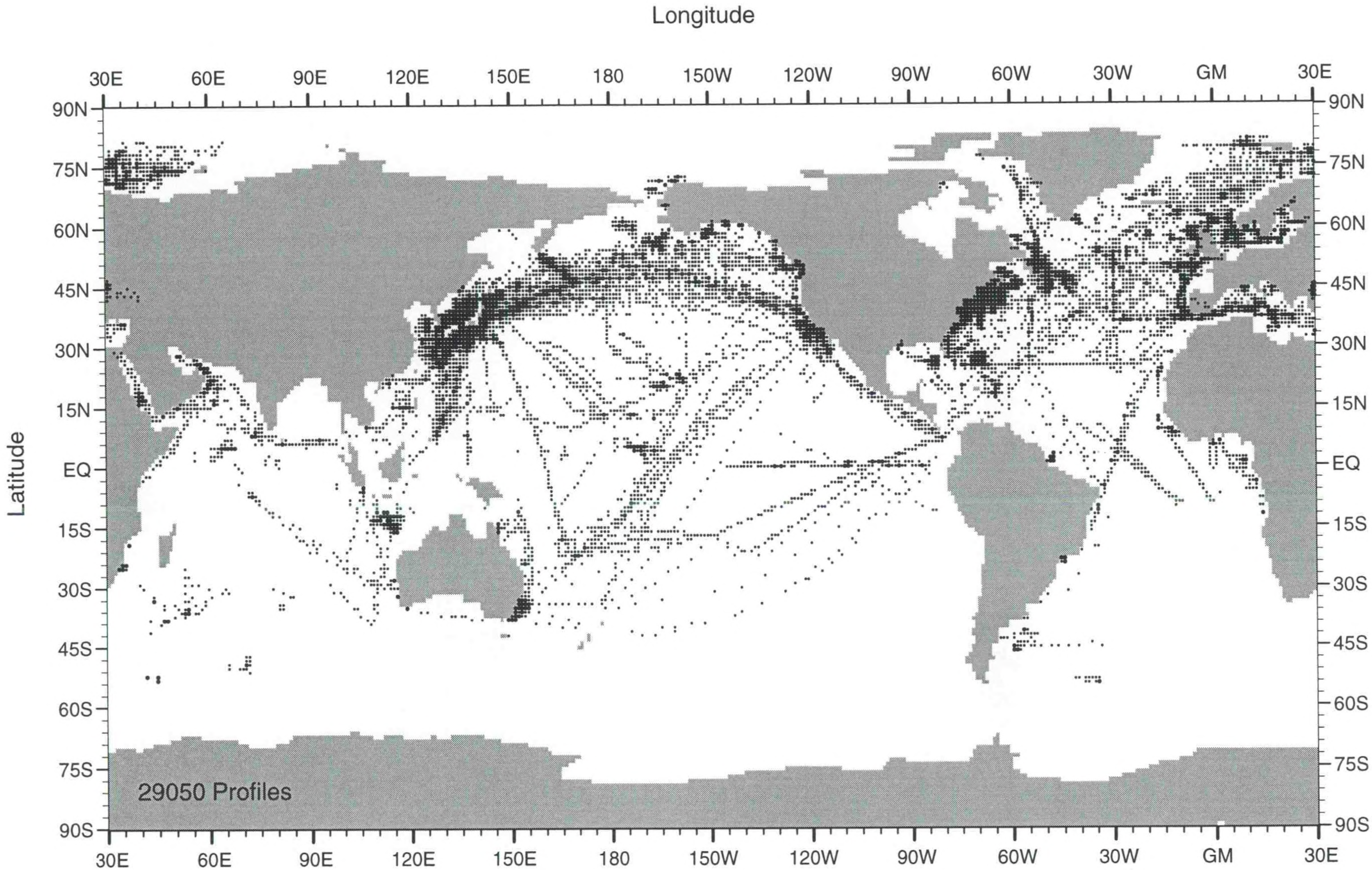


Fig. B163 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1981

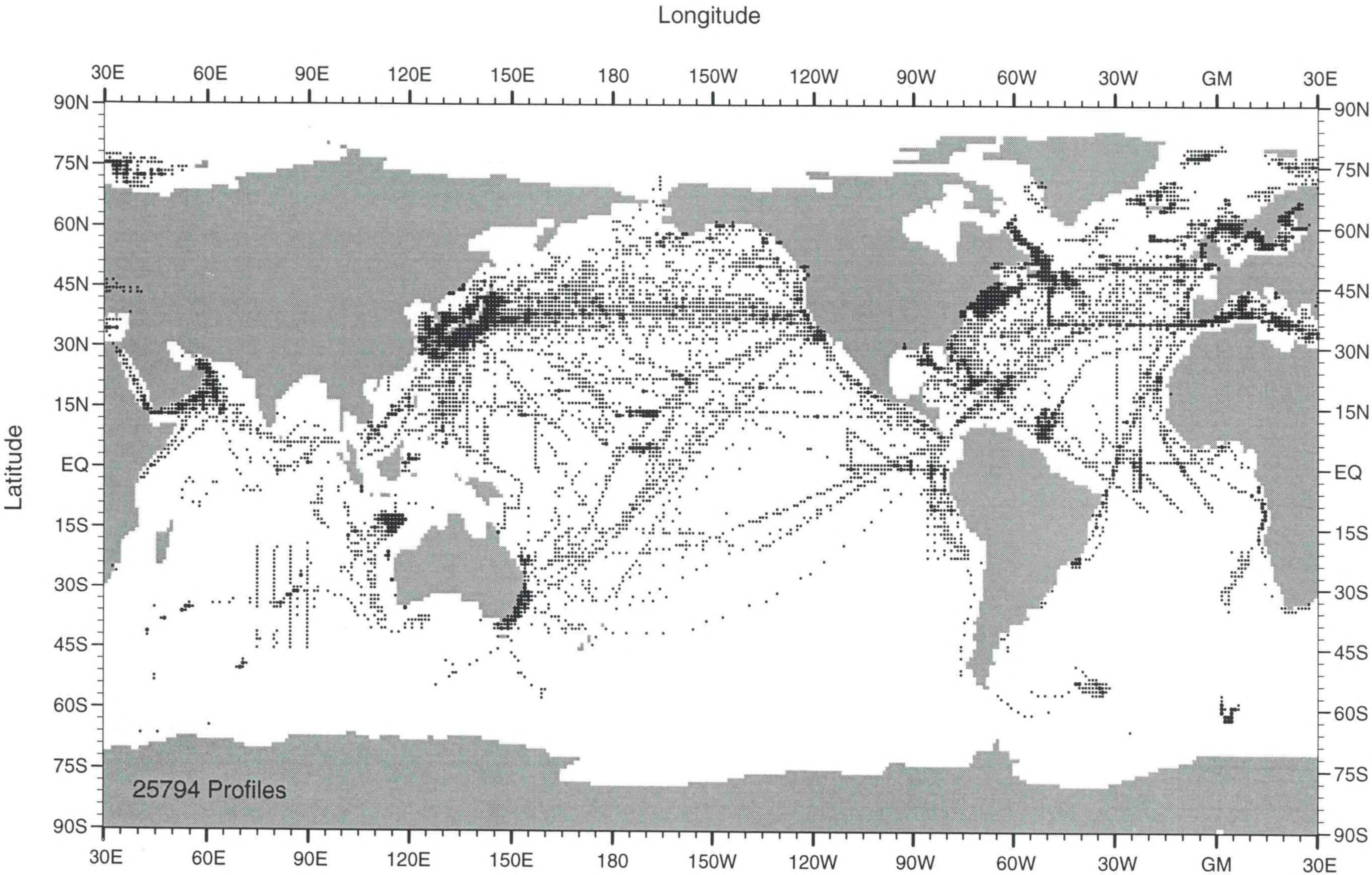


Fig. B164 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1981

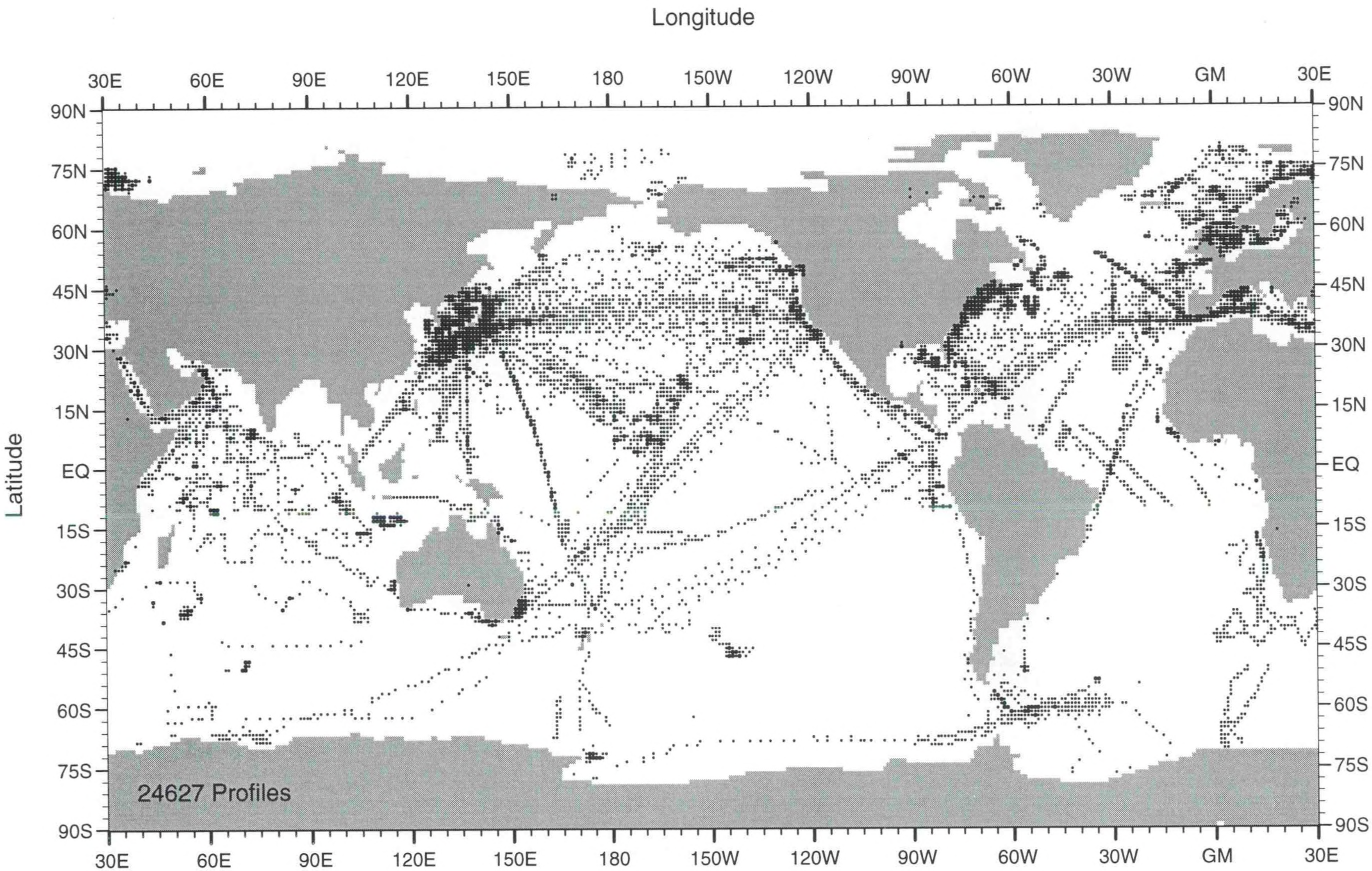


Fig. B165 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1982

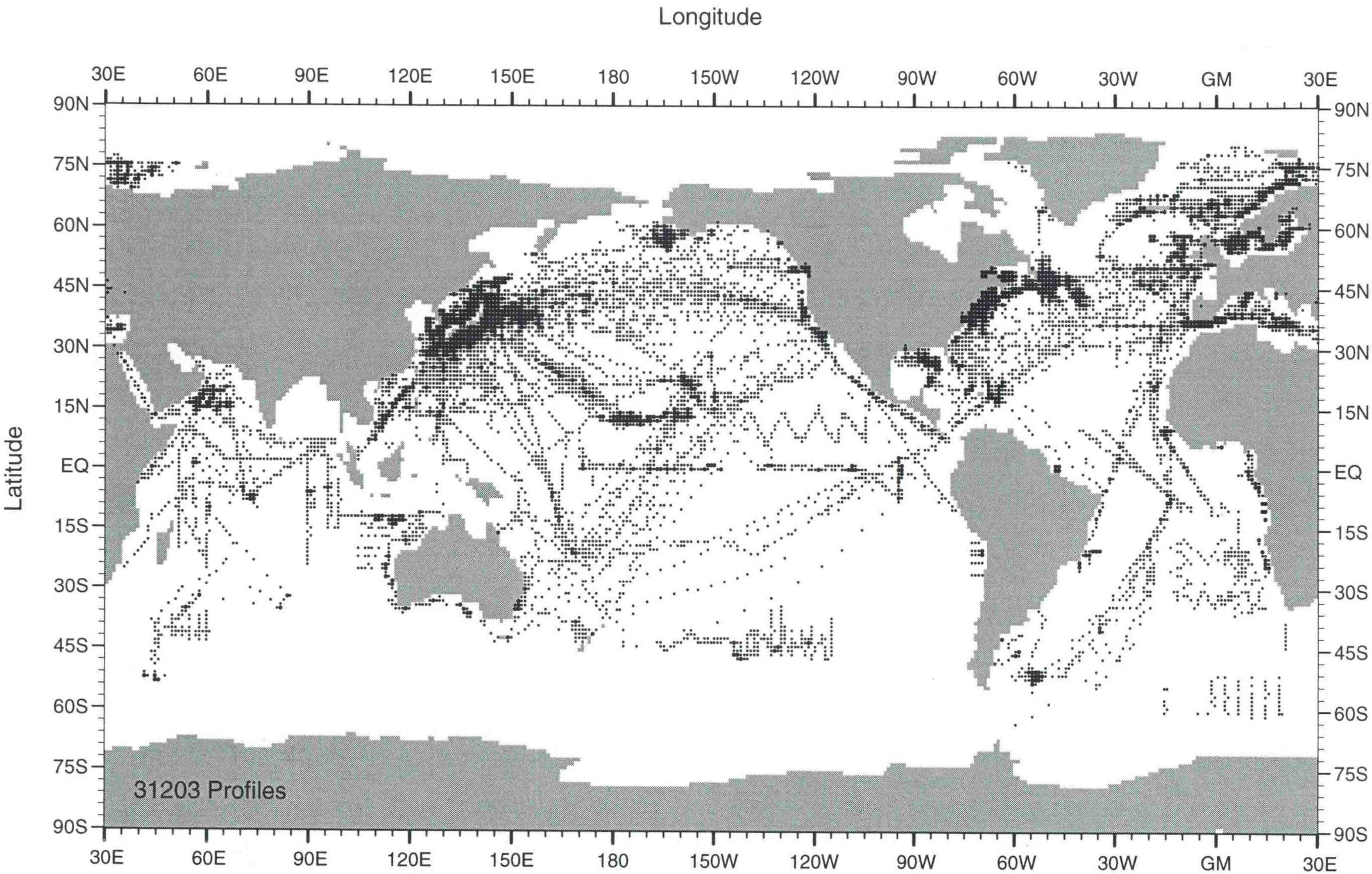


Fig. B166 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1982

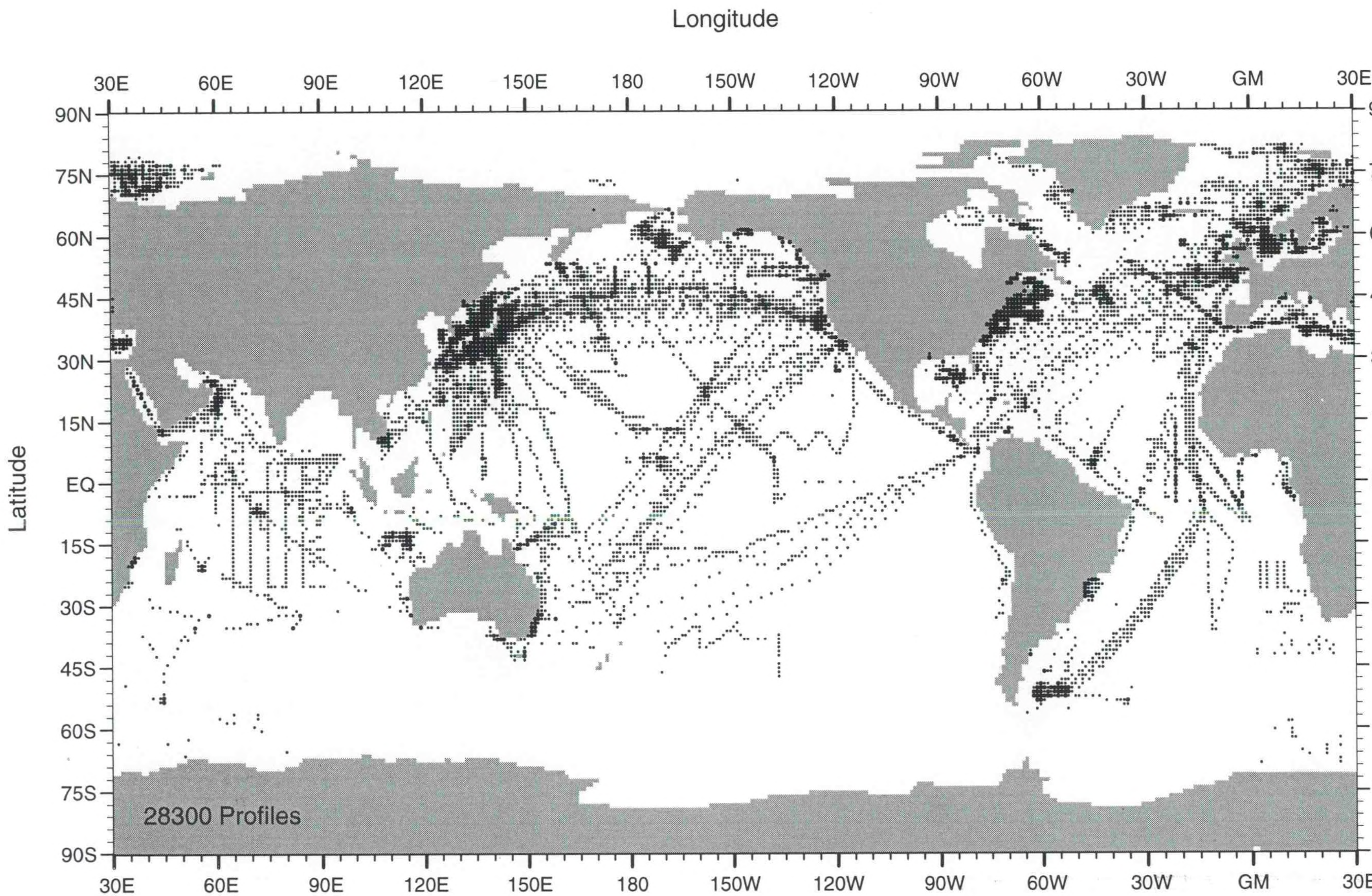


Fig. B167 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1982

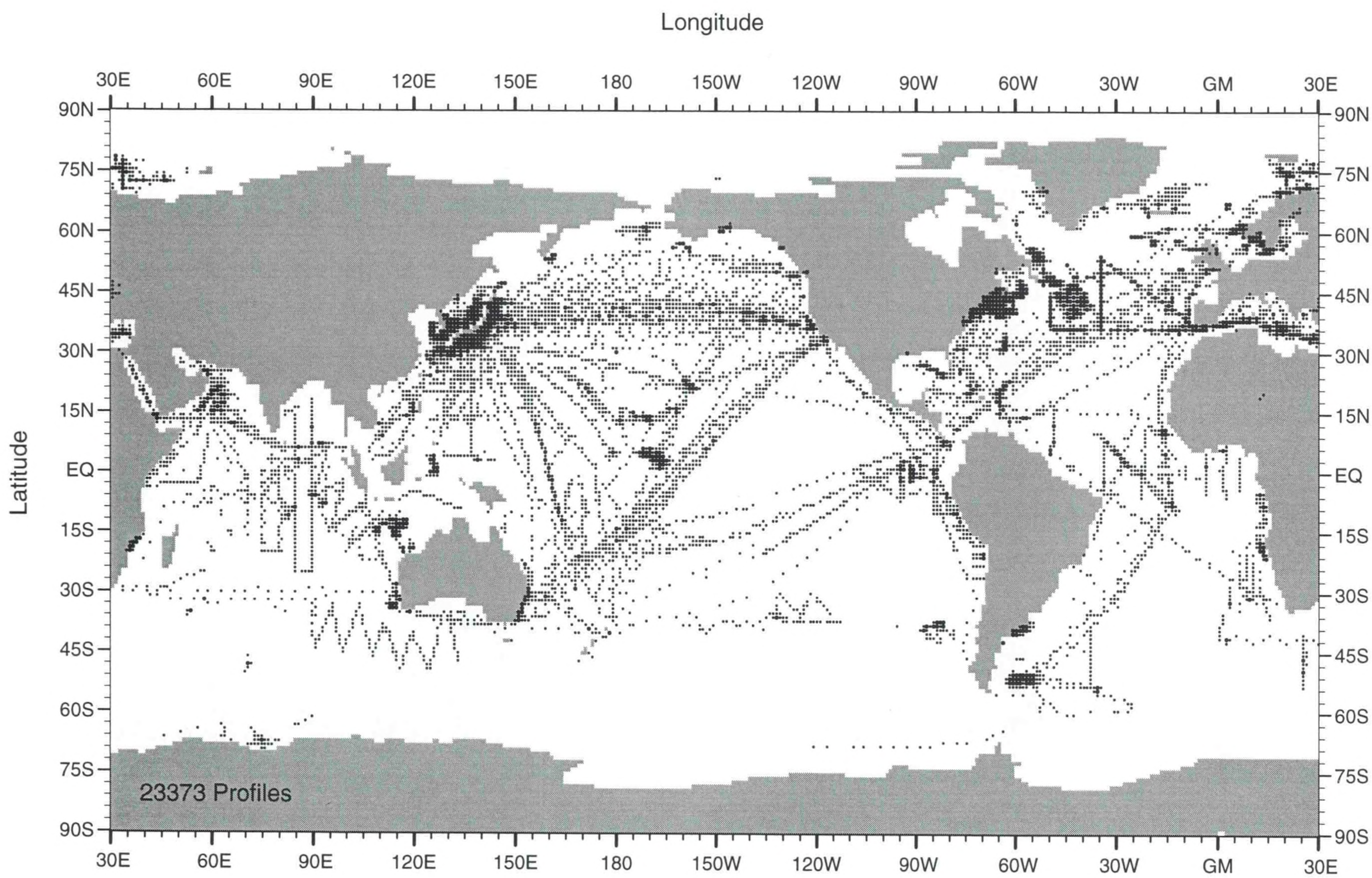


Fig. B168 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1982

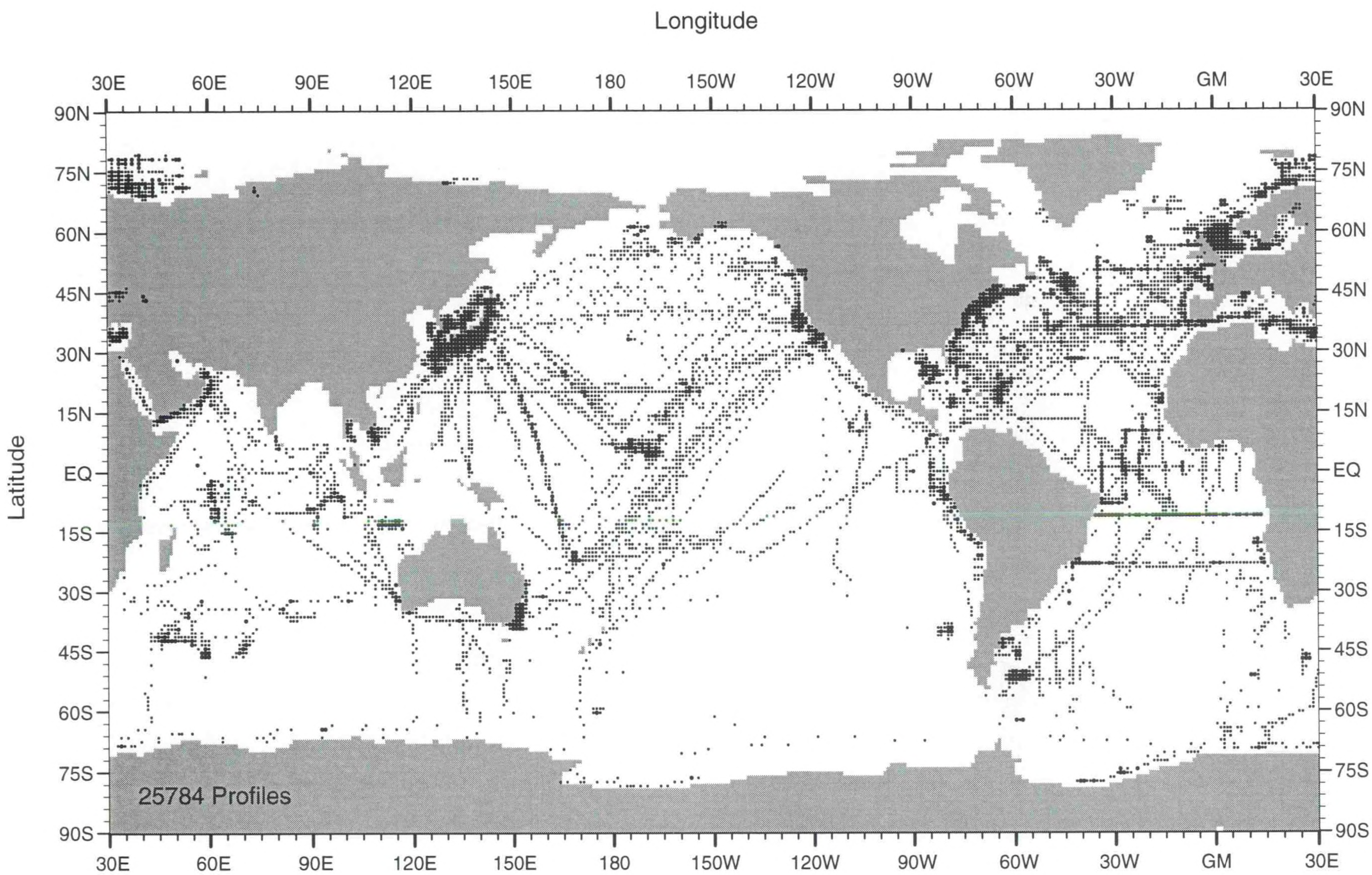


Fig. B169 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1983

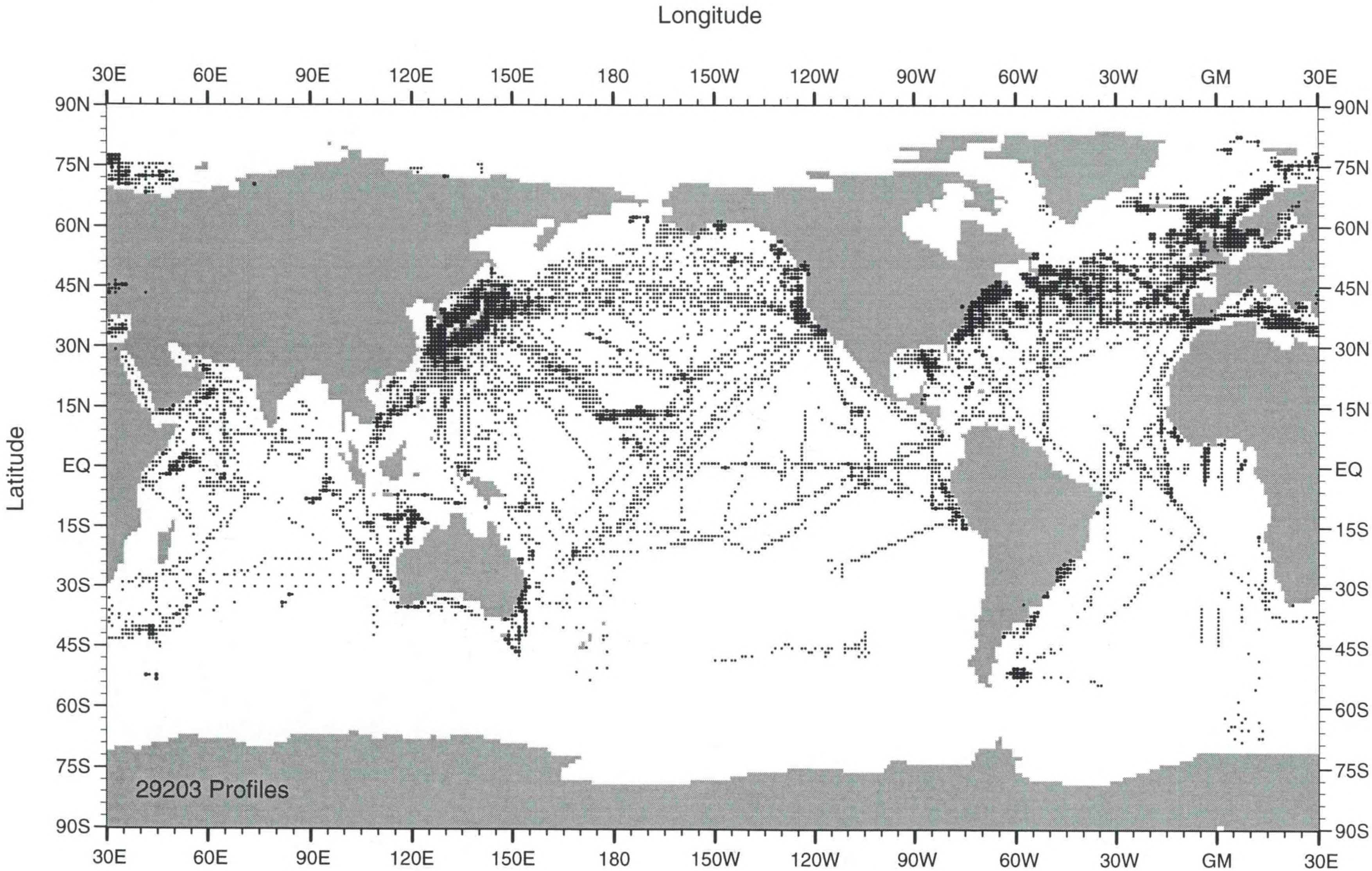


Fig. B170 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1983

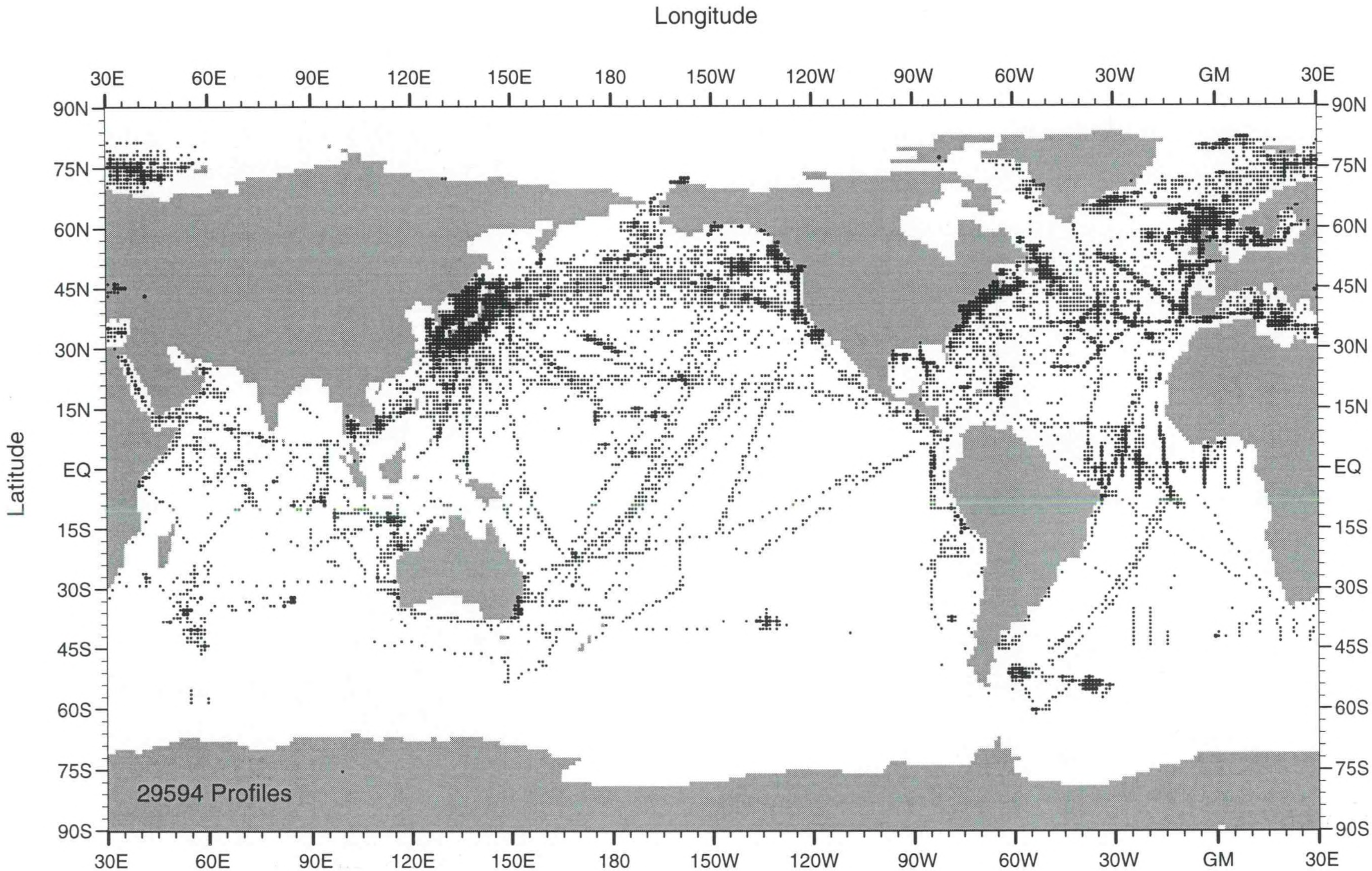


Fig. B171 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1983

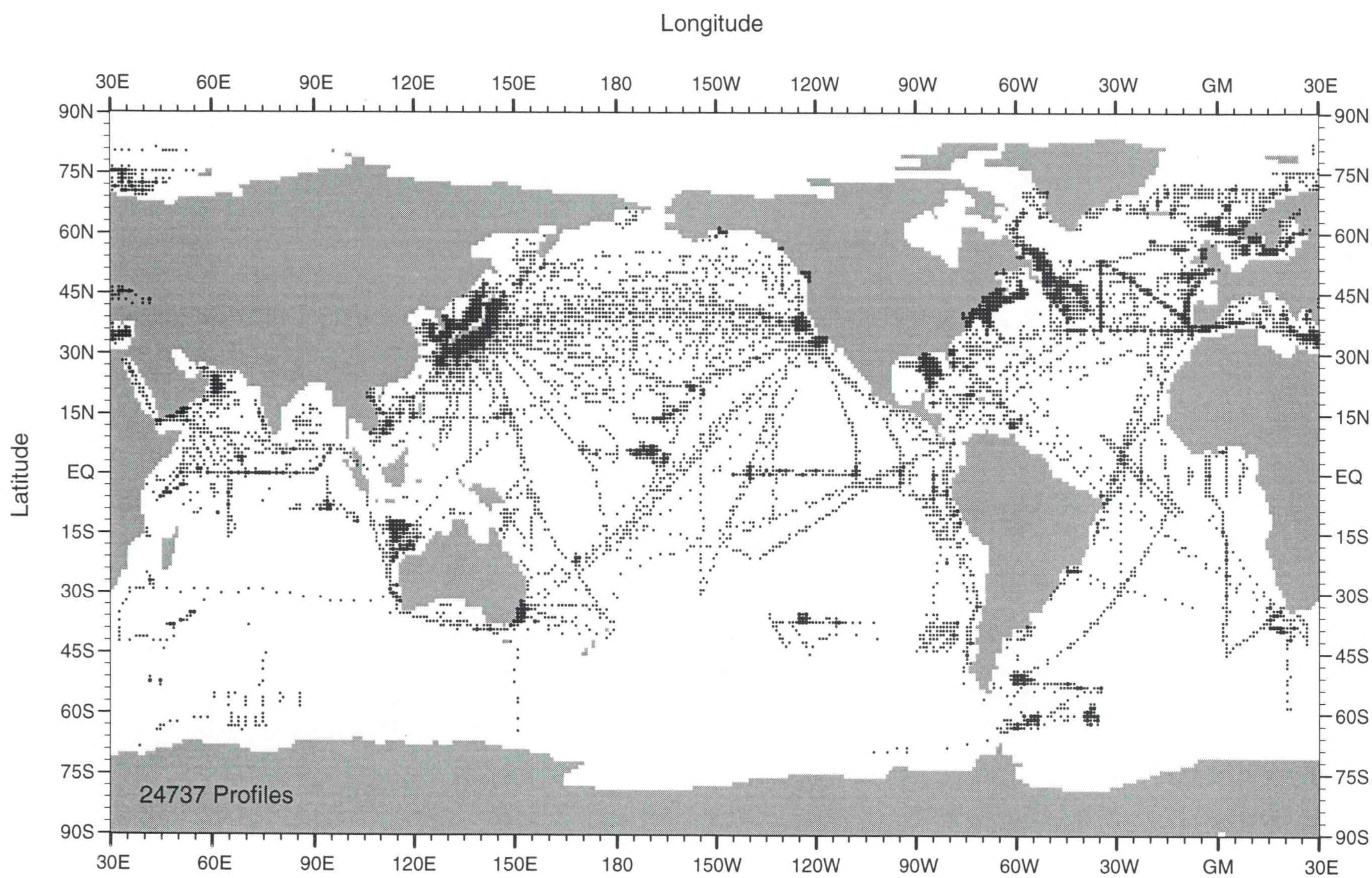


Fig. B172 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1983

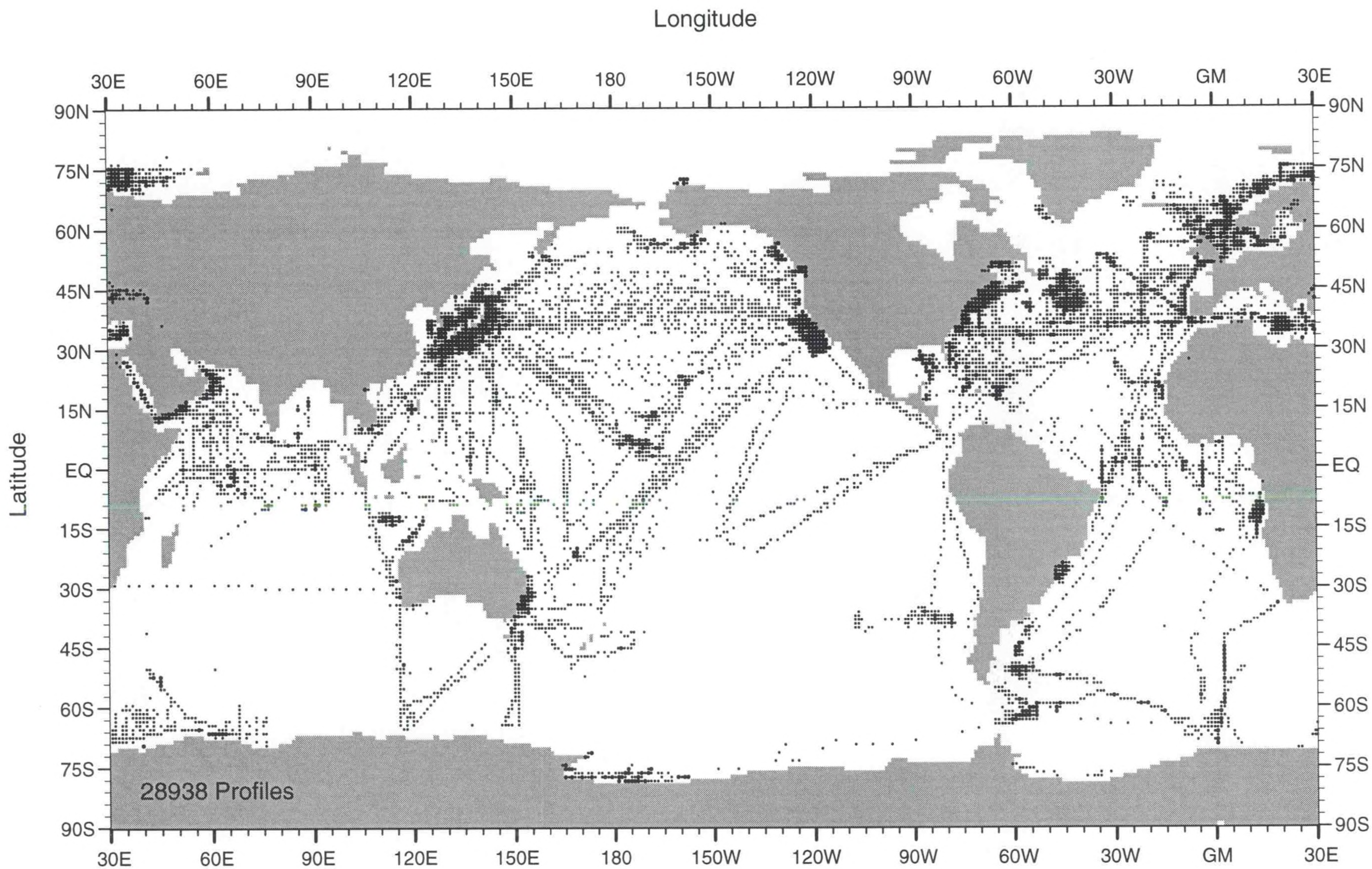


Fig. B173 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1984

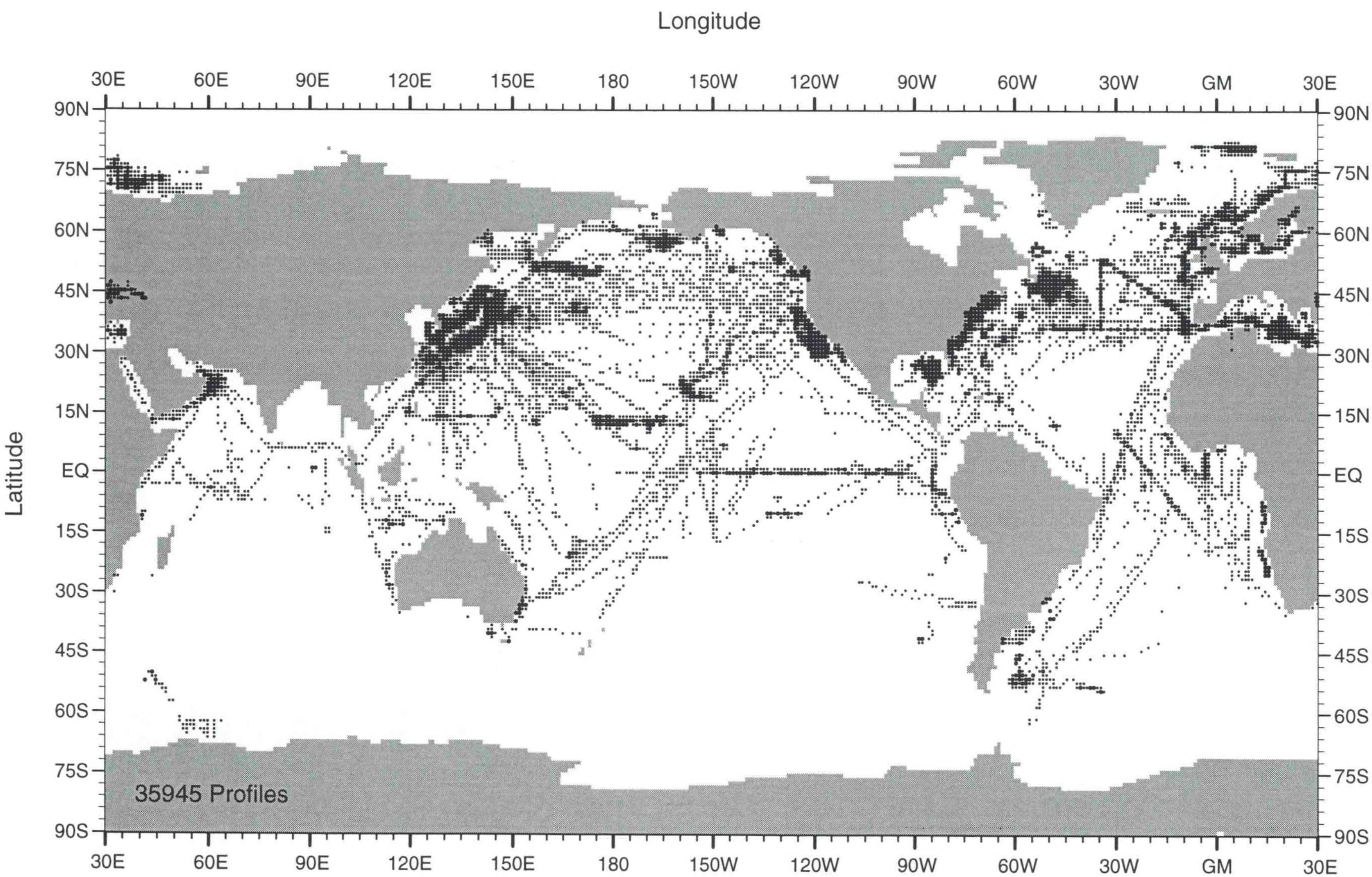


Fig. B174 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1984

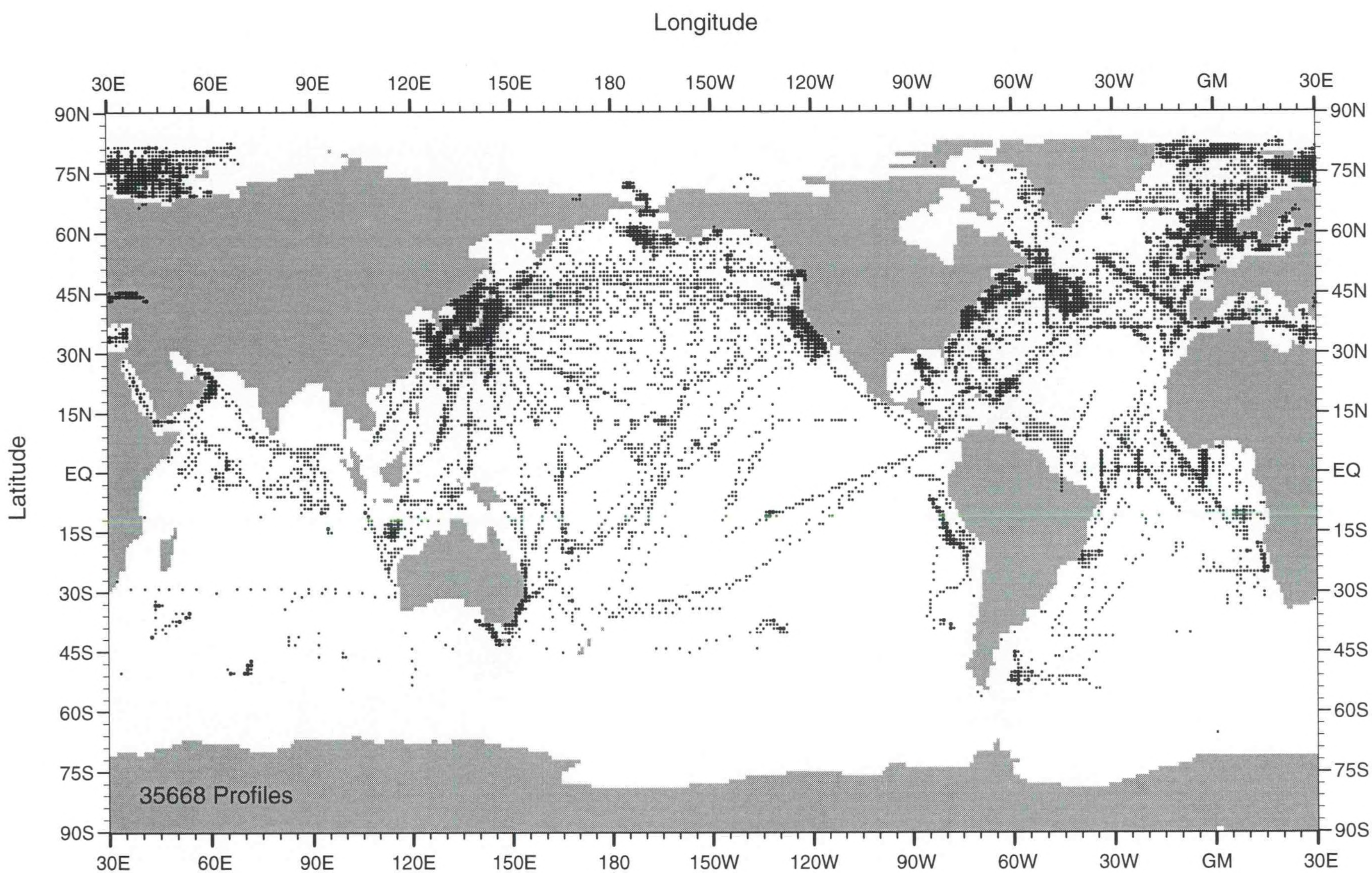


Fig. B175 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1984

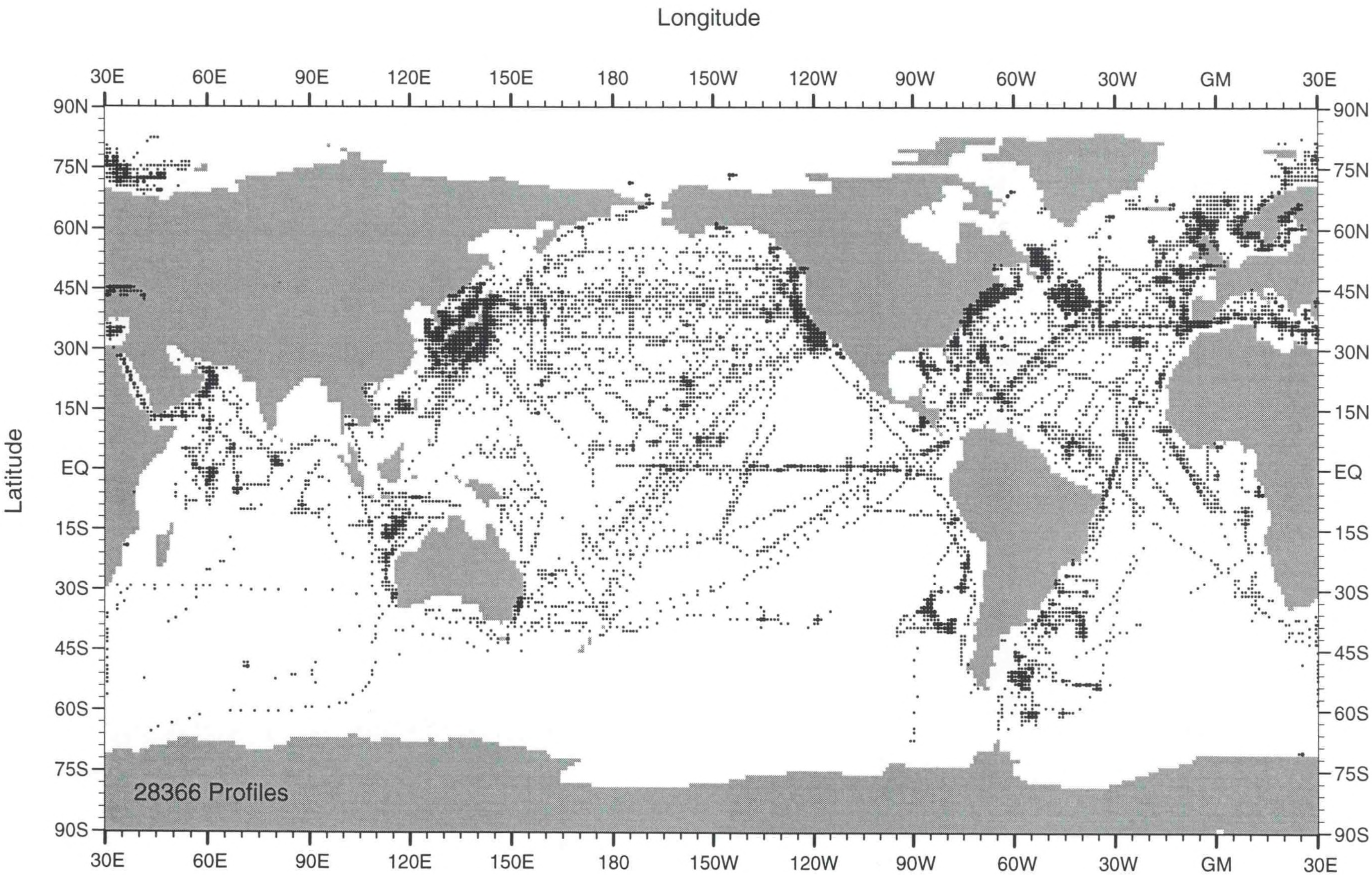


Fig. B176 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1984

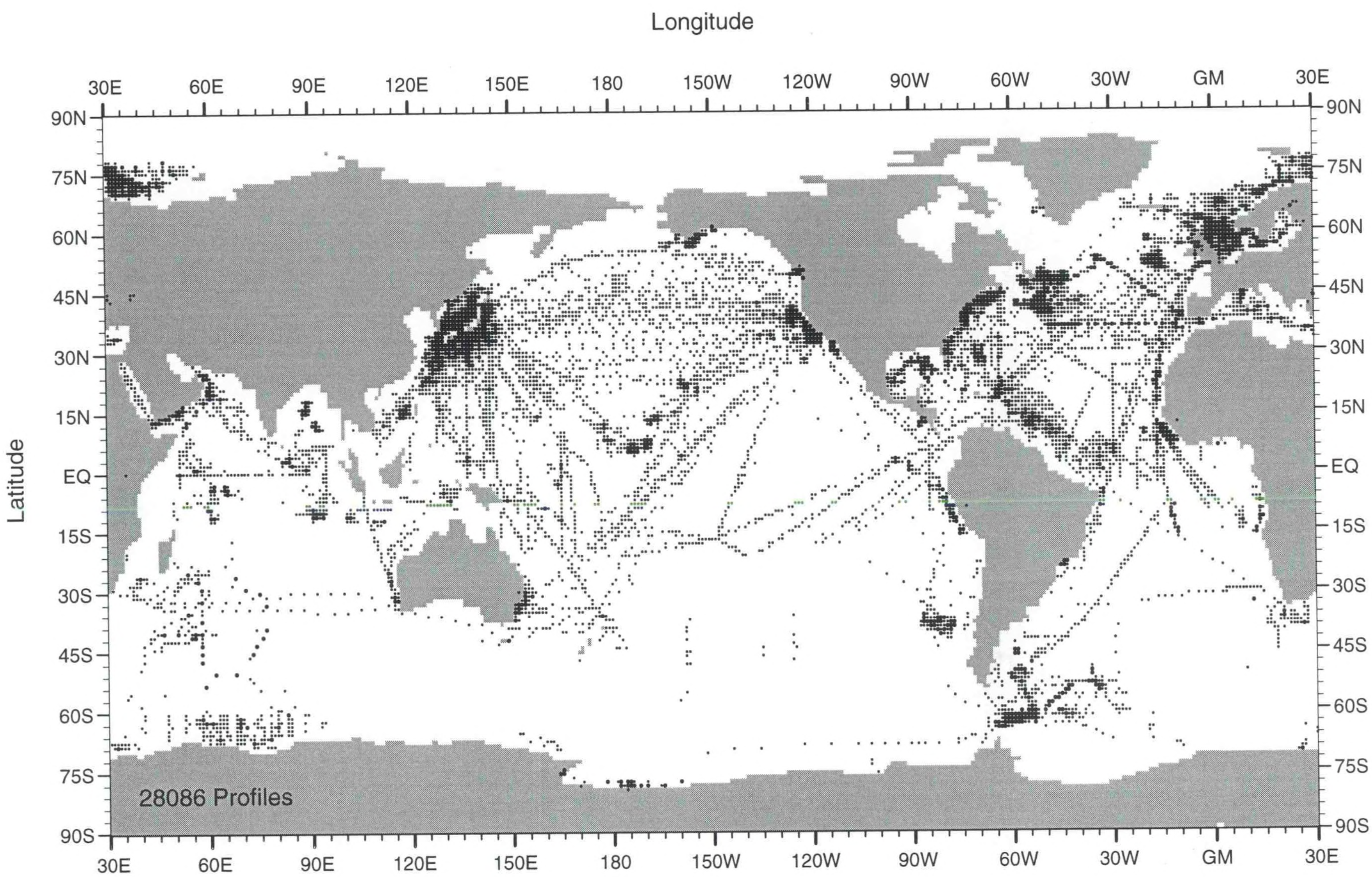


Fig. B177 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1985

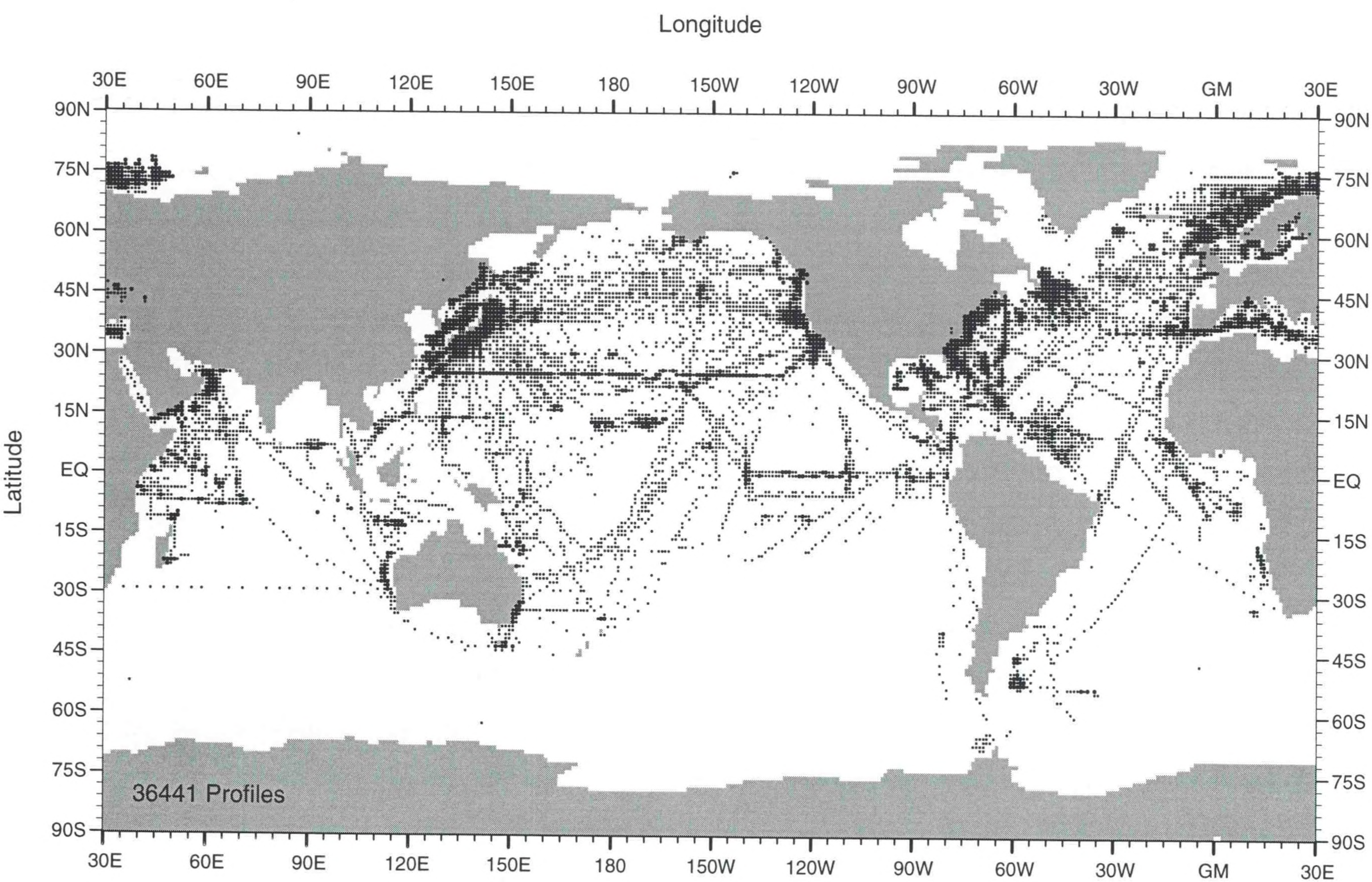


Fig. B178 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1985

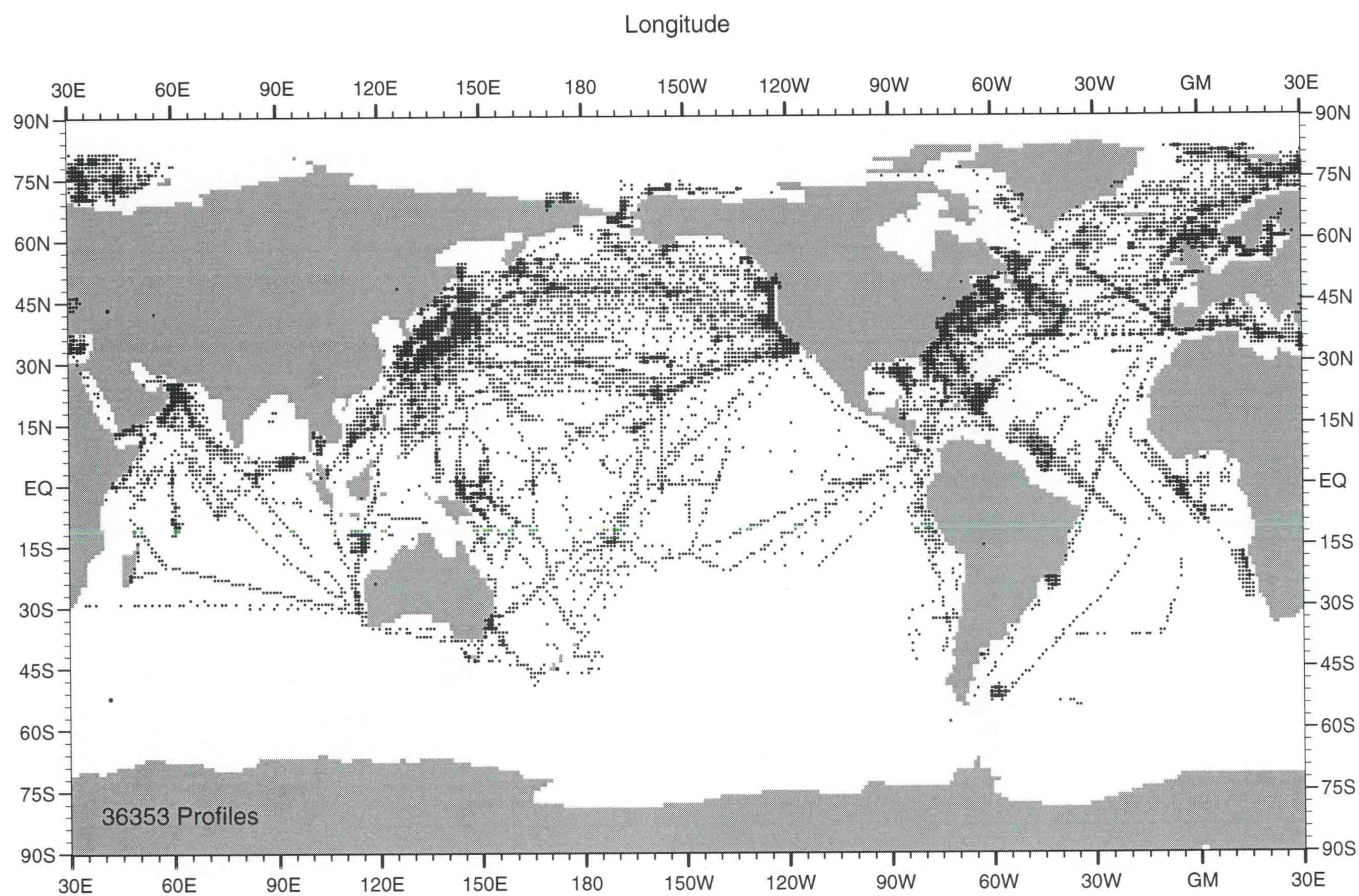


Fig. B179 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1985

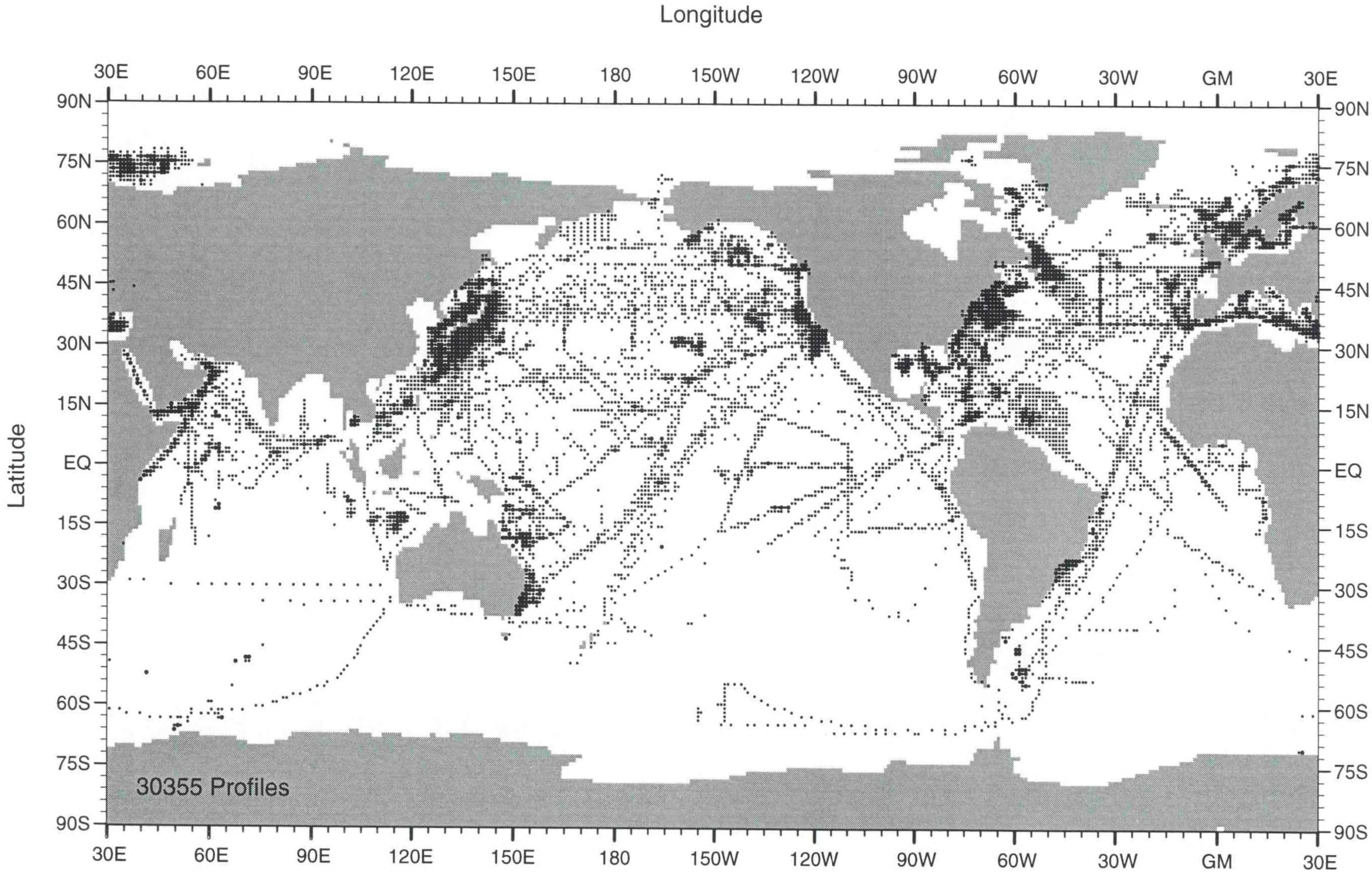


Fig. B180 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1985

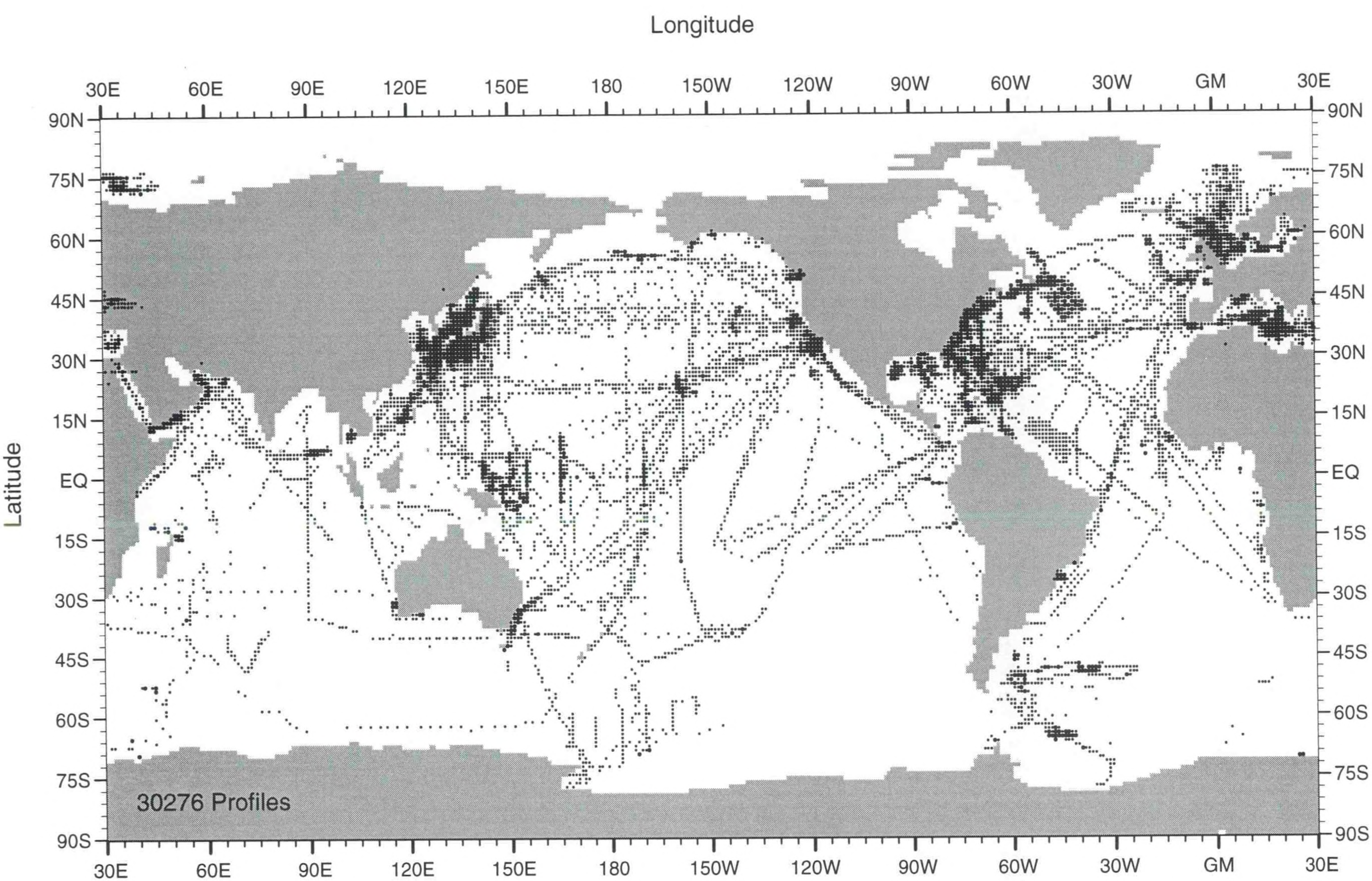


Fig. B181 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1986

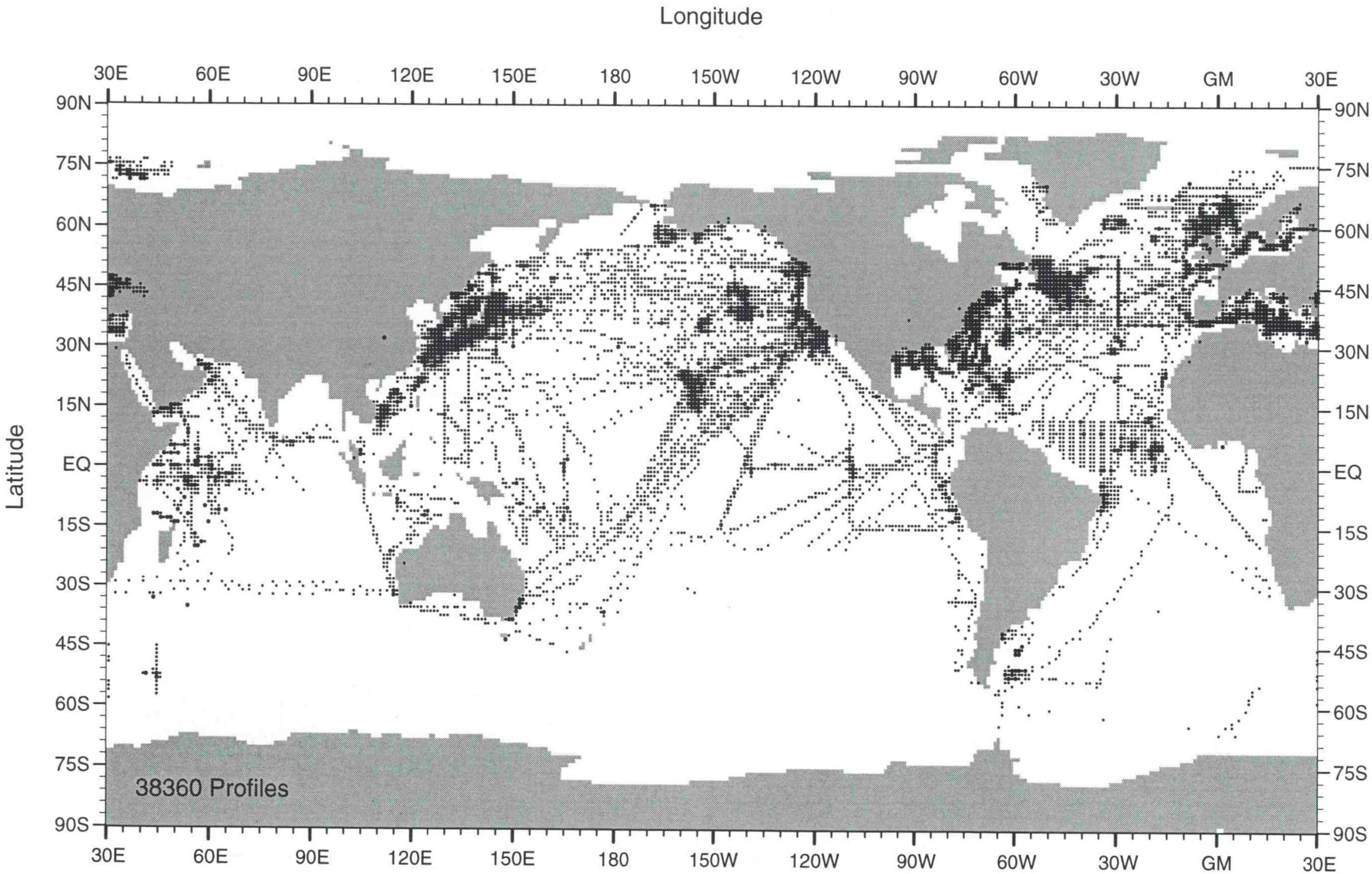


Fig. B182 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1986

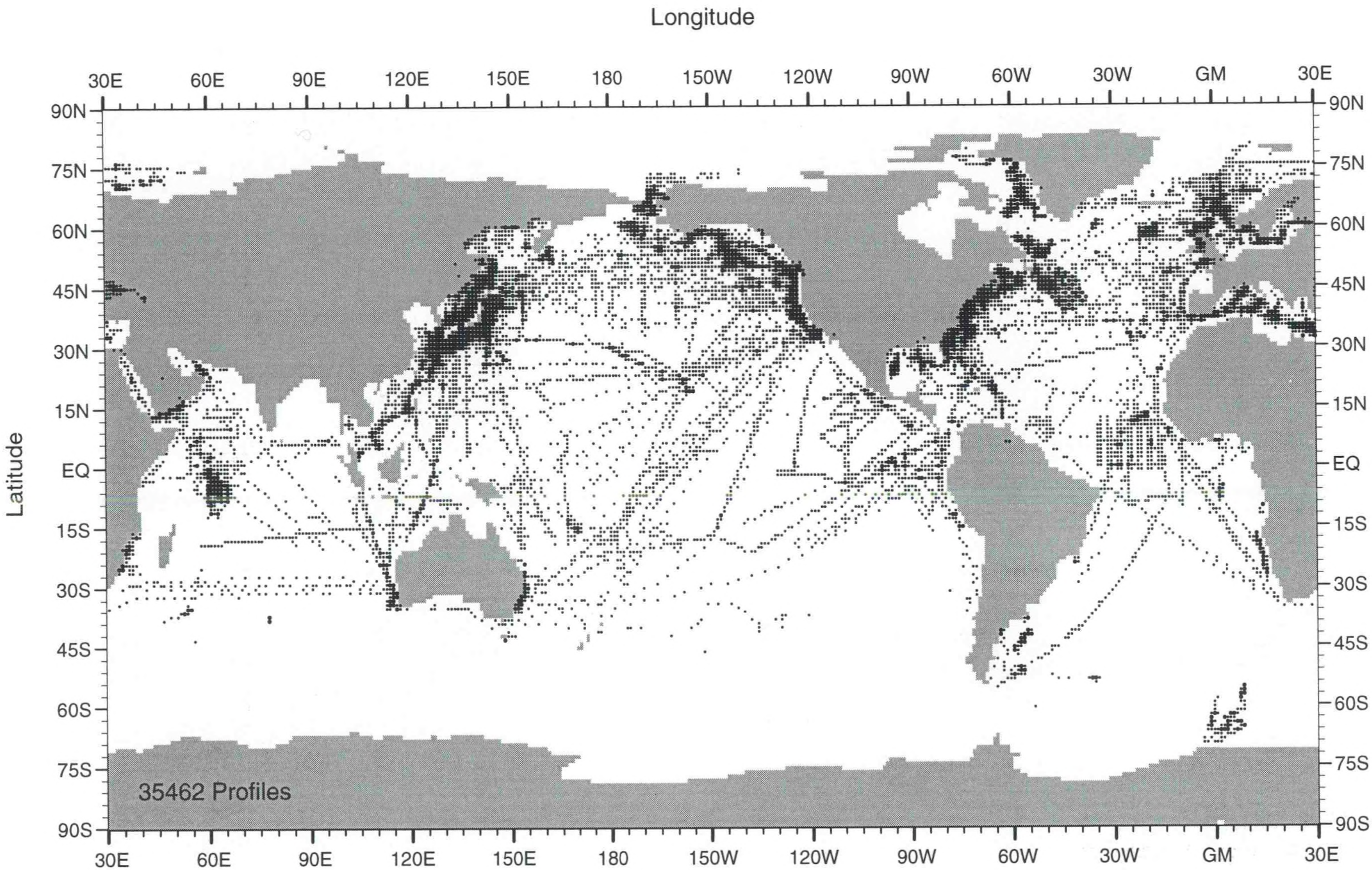


Fig. B183 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1986

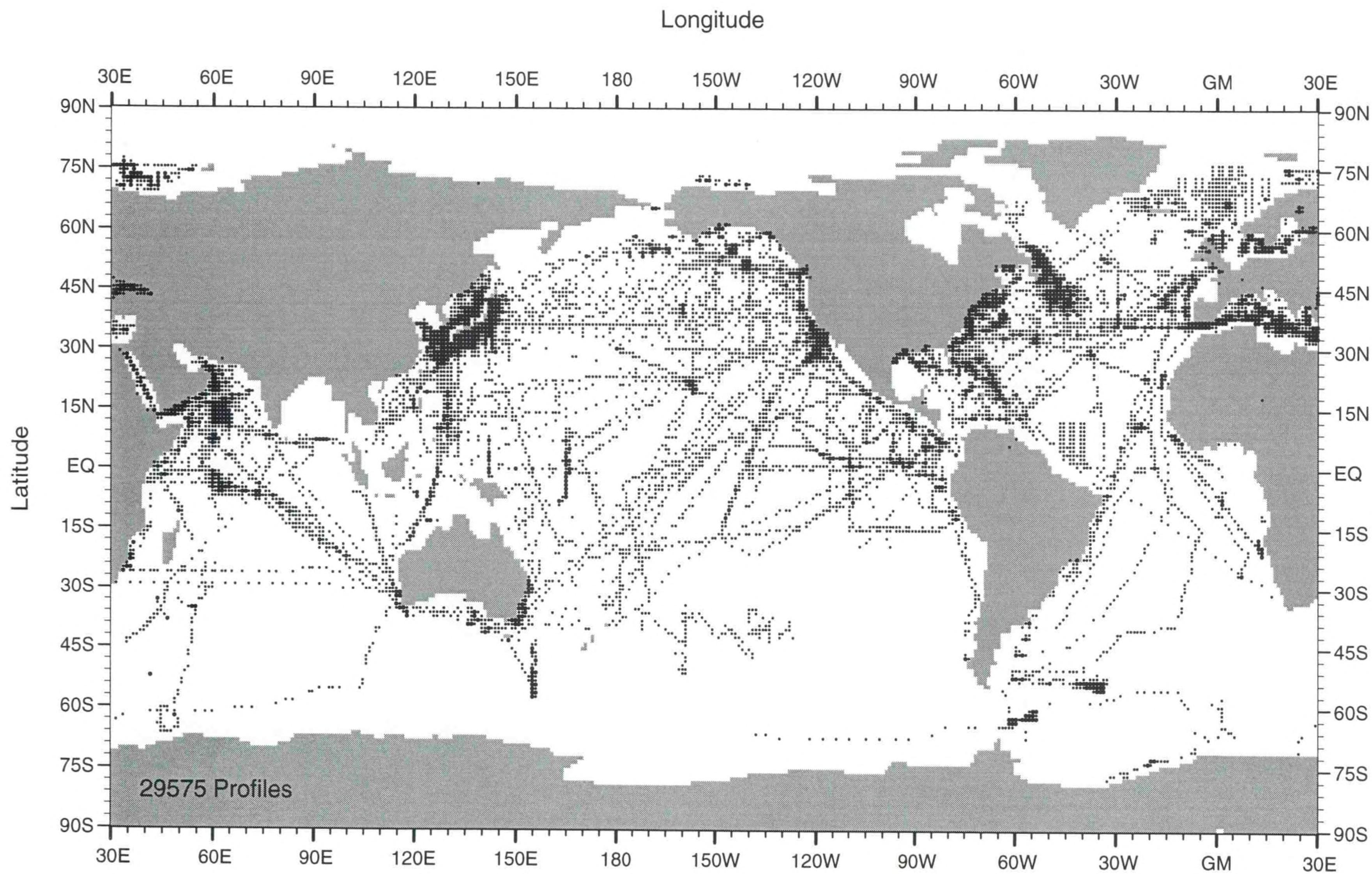


Fig. B184 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1986

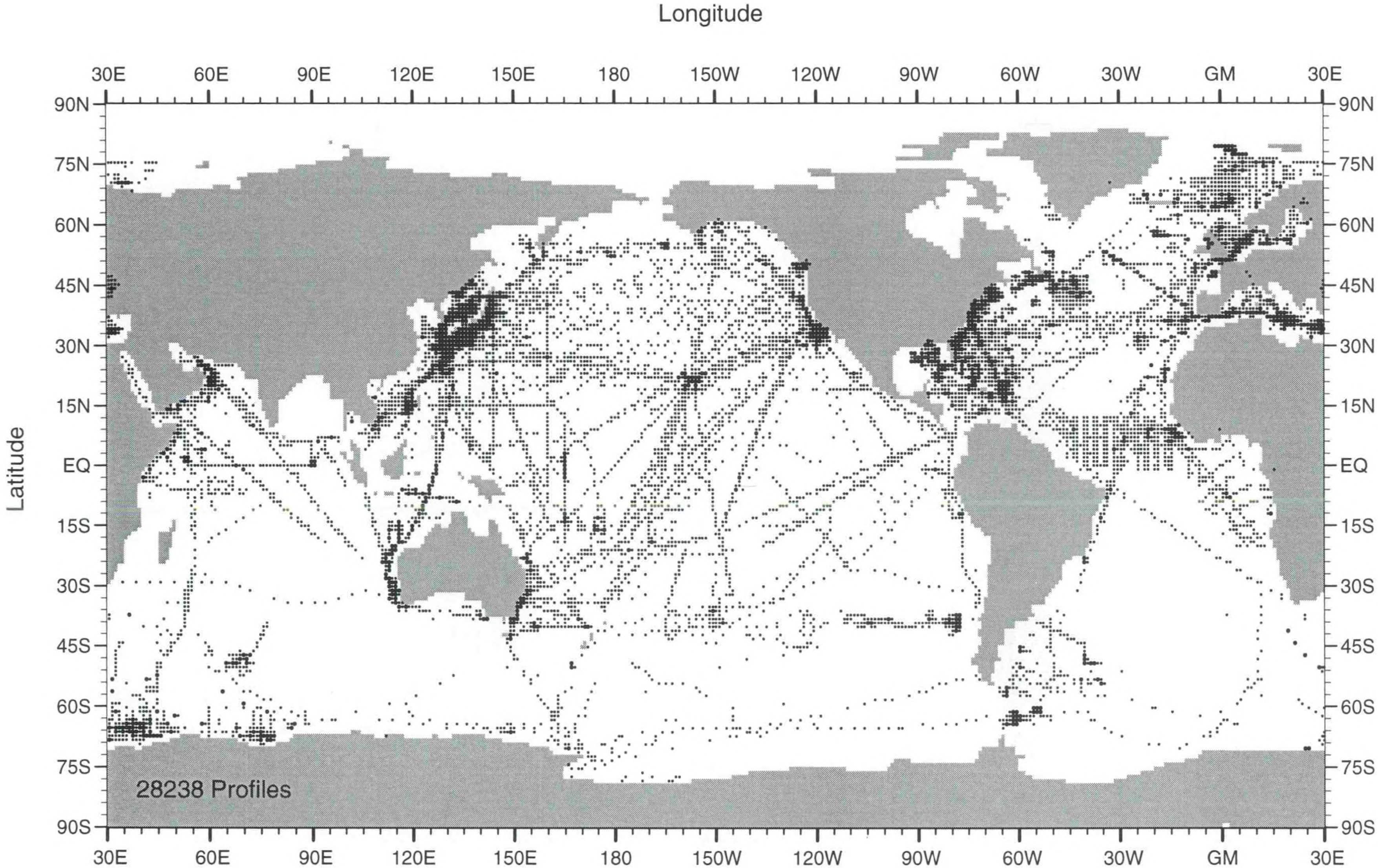


Fig. B185 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1987

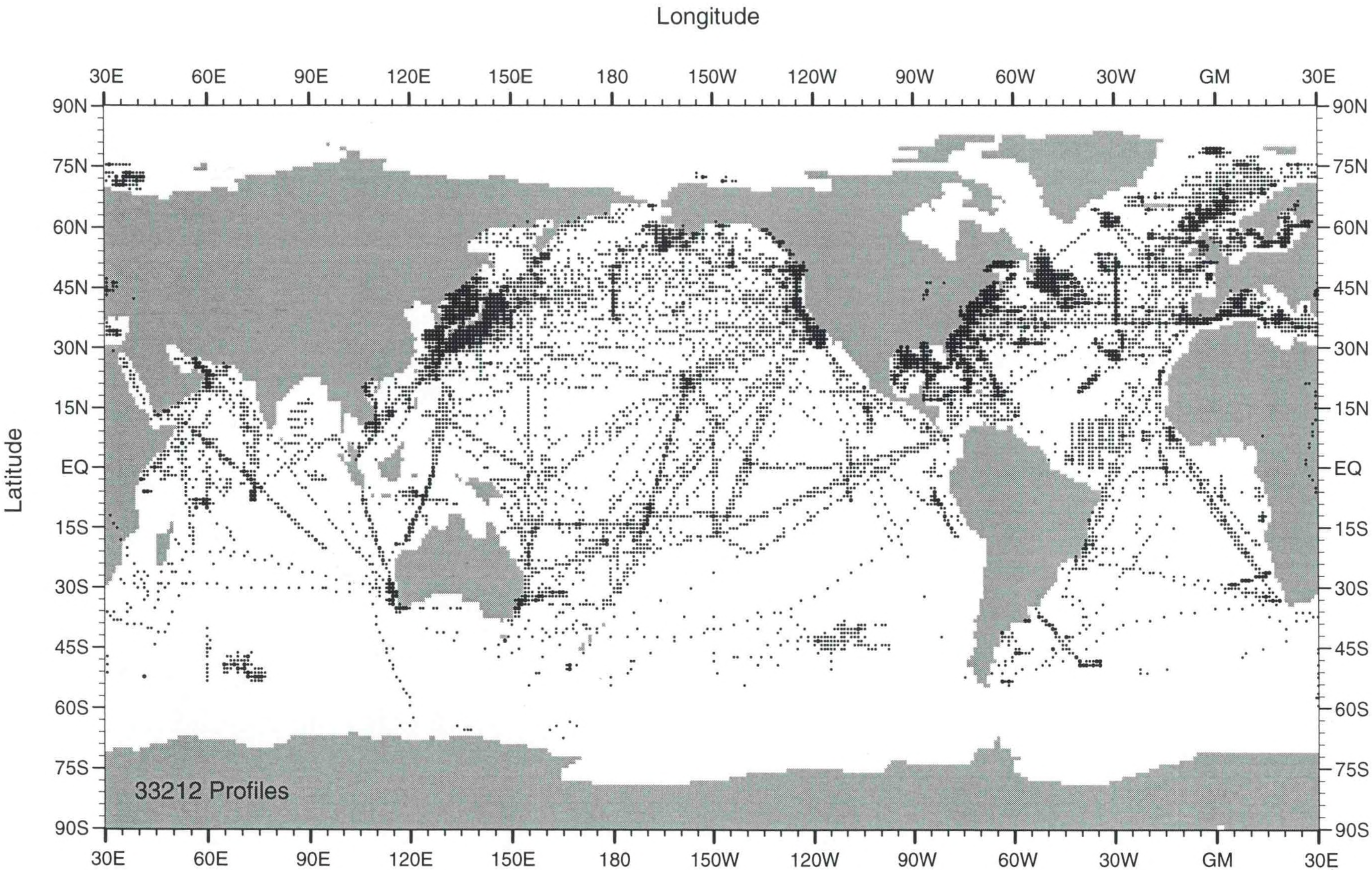


Fig. B186 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1987

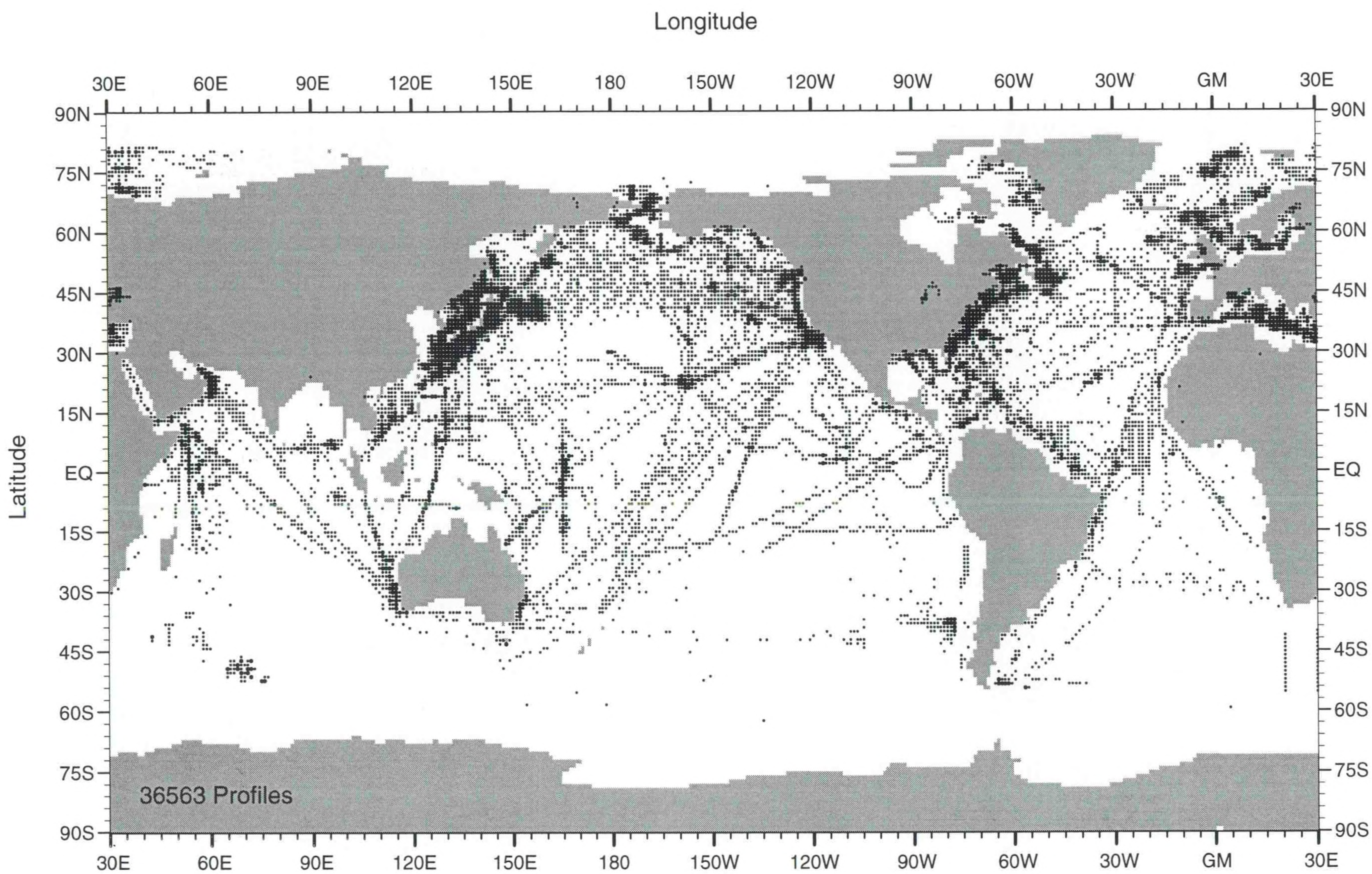


Fig. B187 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1987

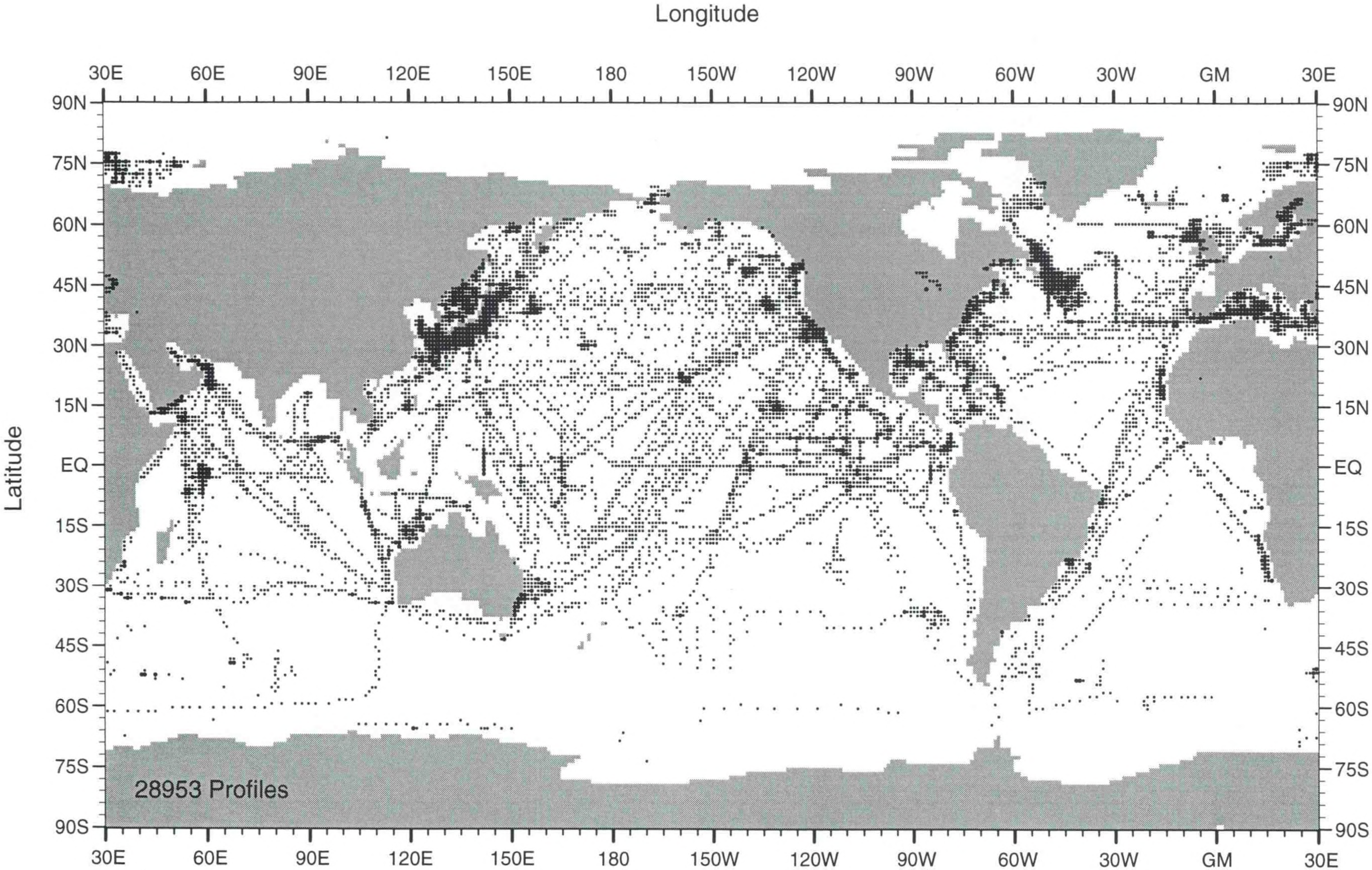


Fig. B188 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1987

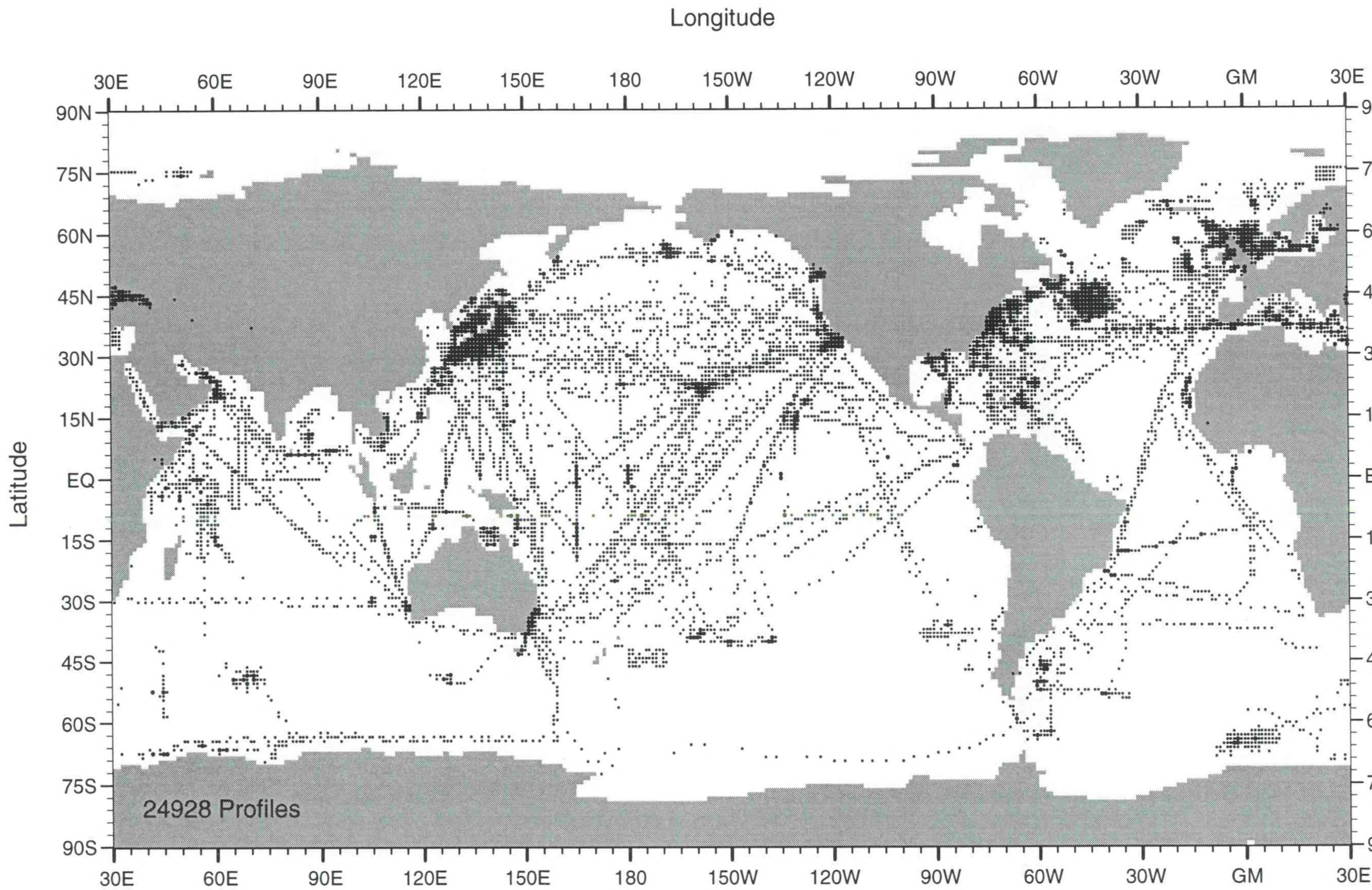


Fig. B189 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1988

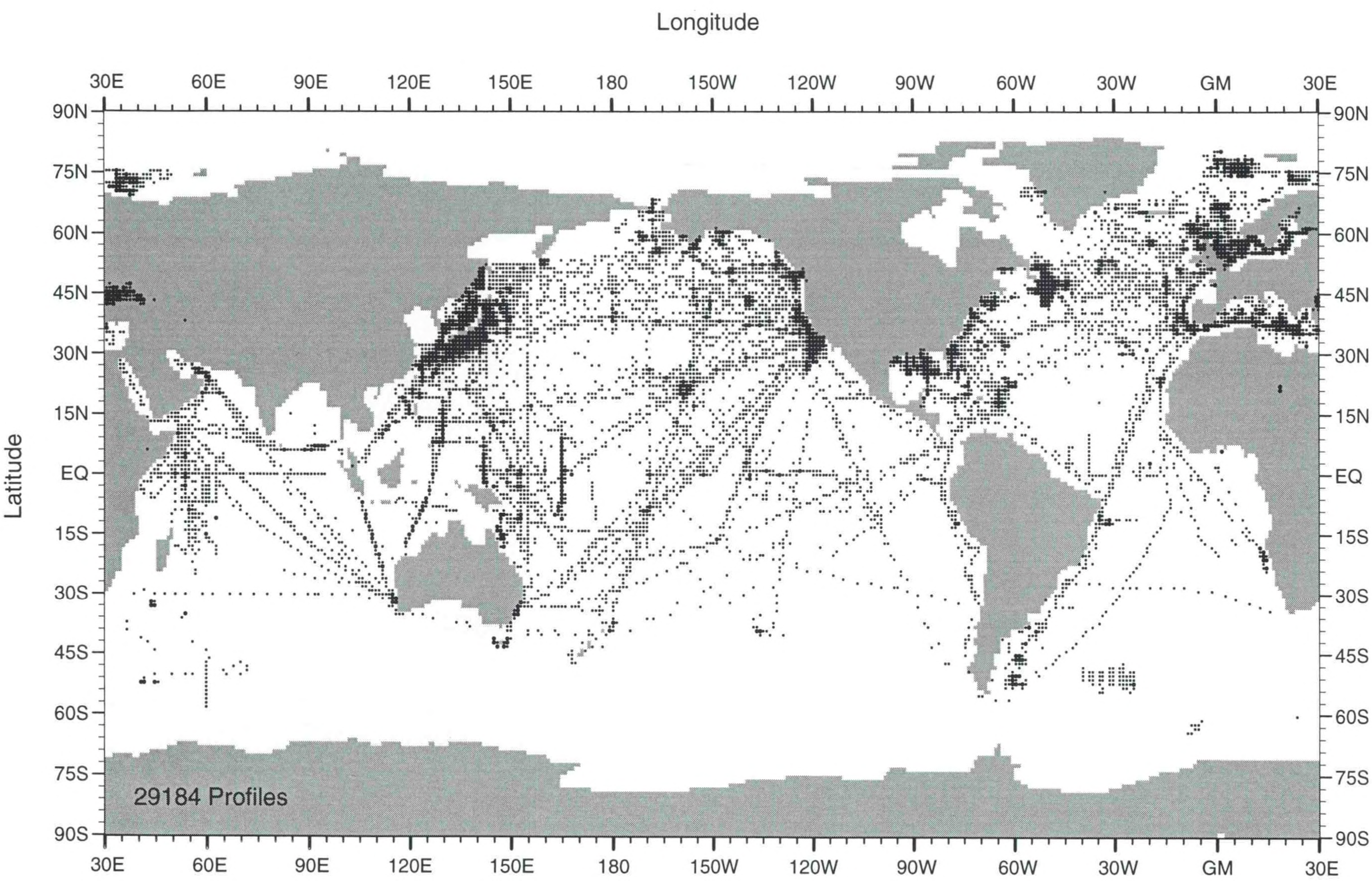


Fig. B190 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1988

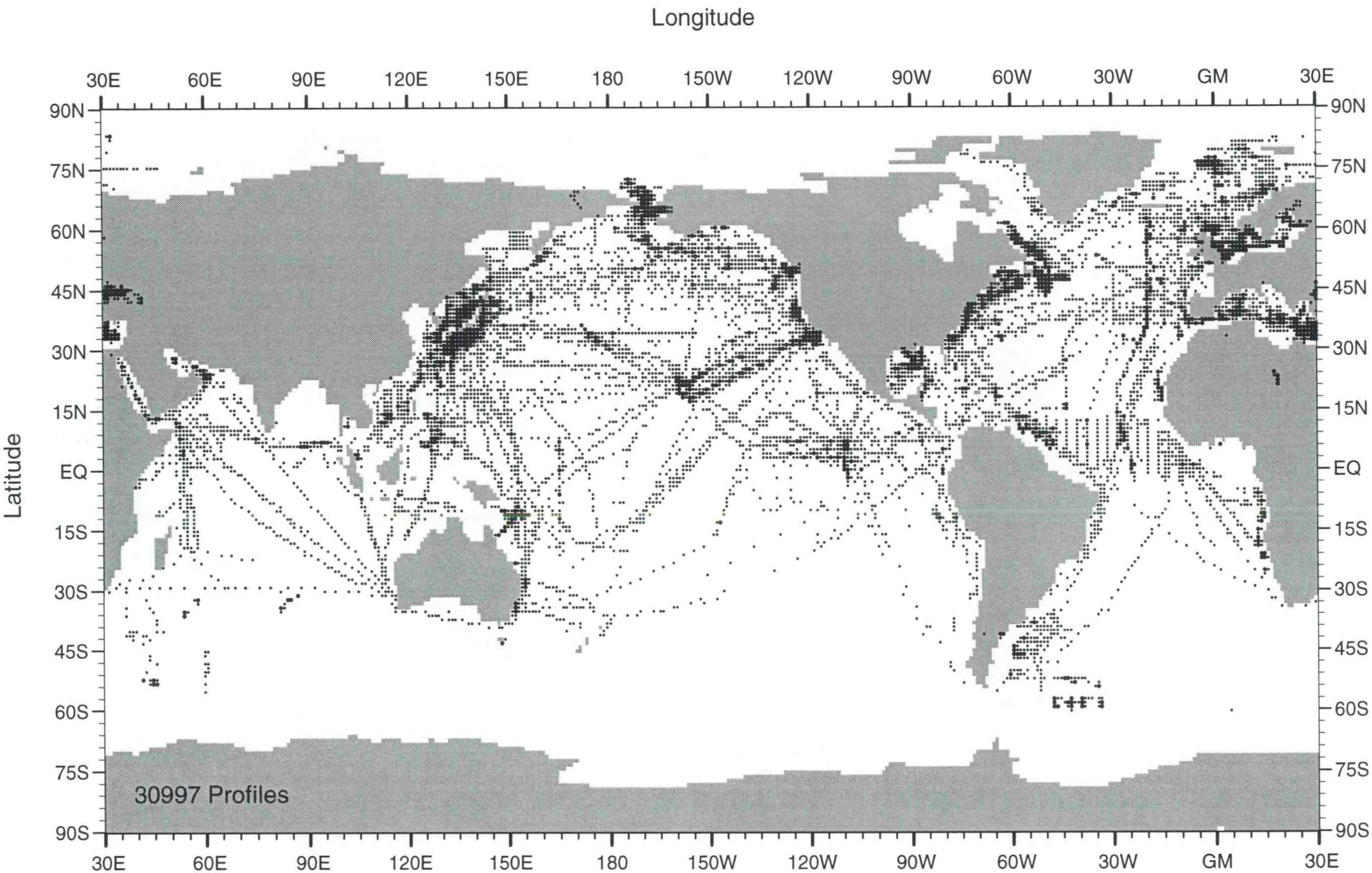


Fig. B191 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1988

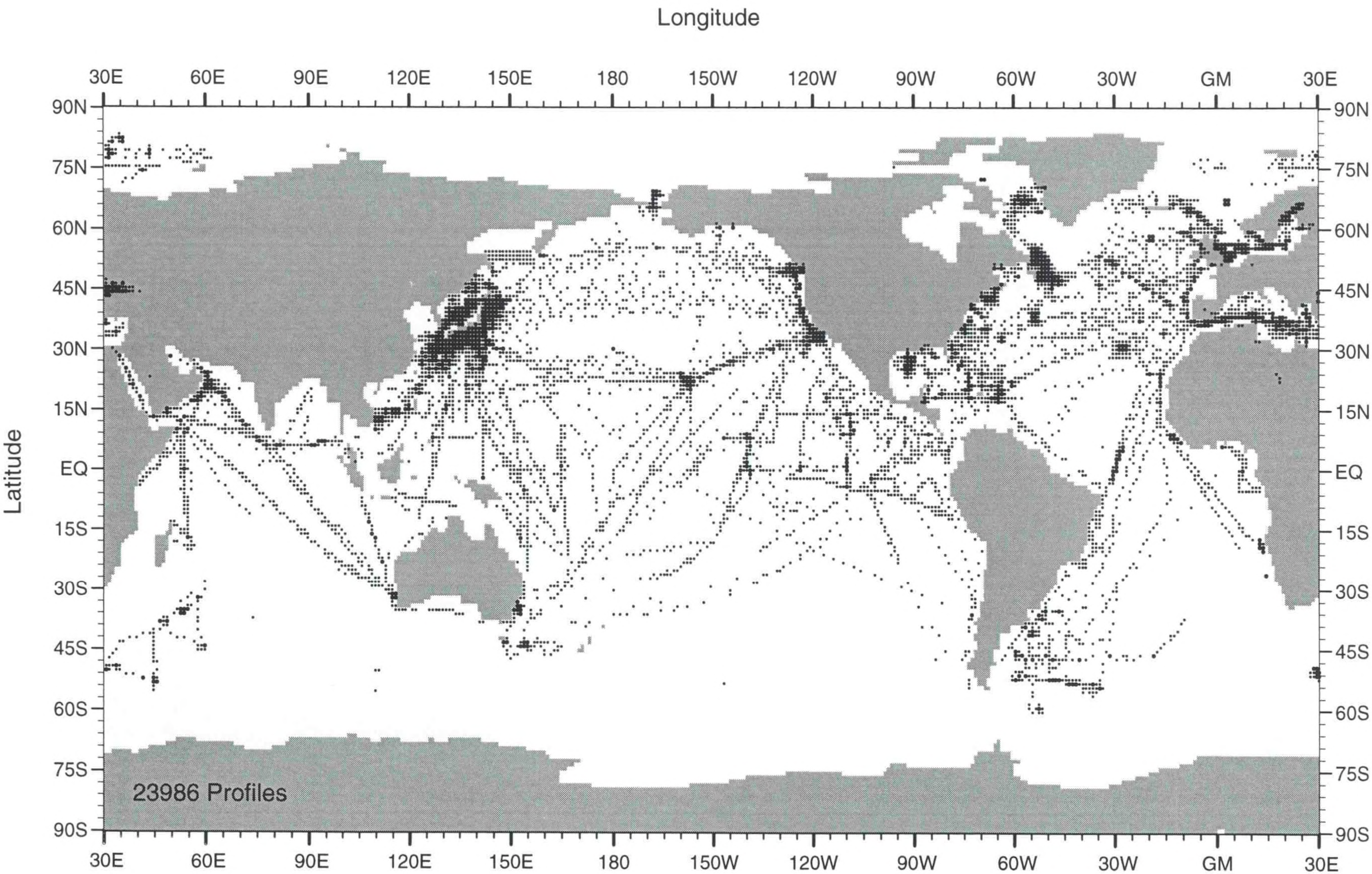


Fig. B192 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1988

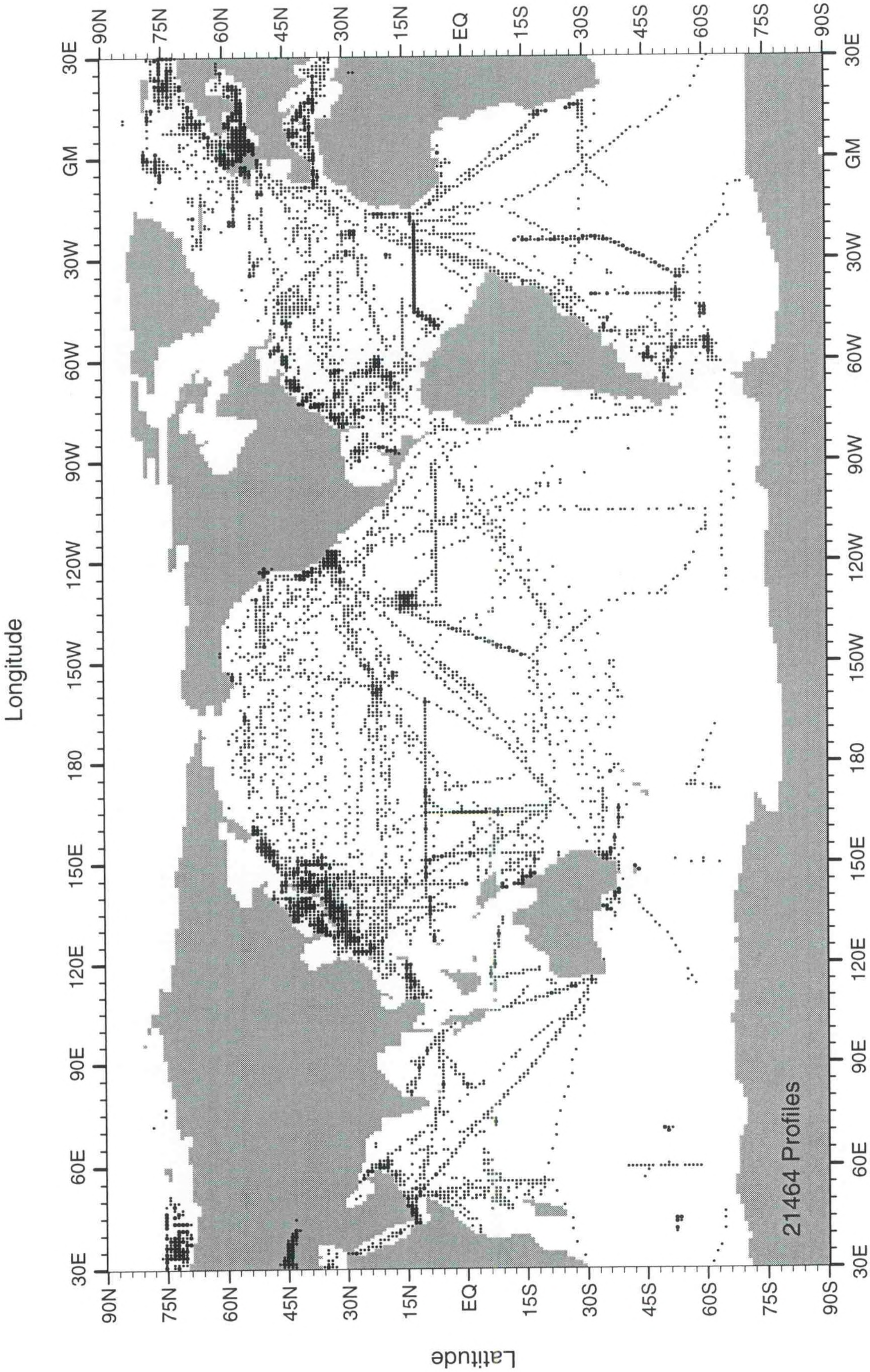


Fig. B193 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for January-March for 1989

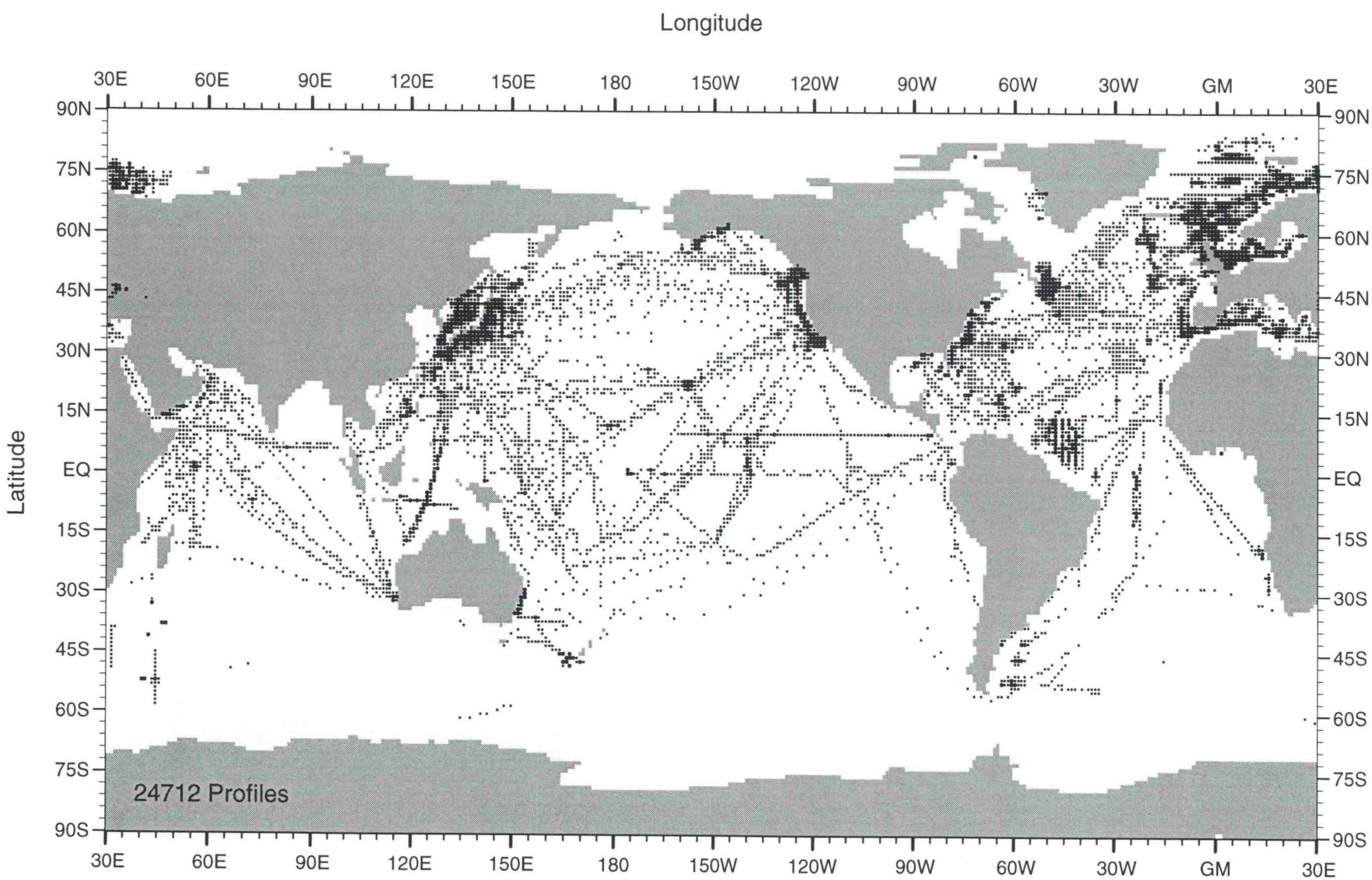


Fig. B194 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for April-June for 1989

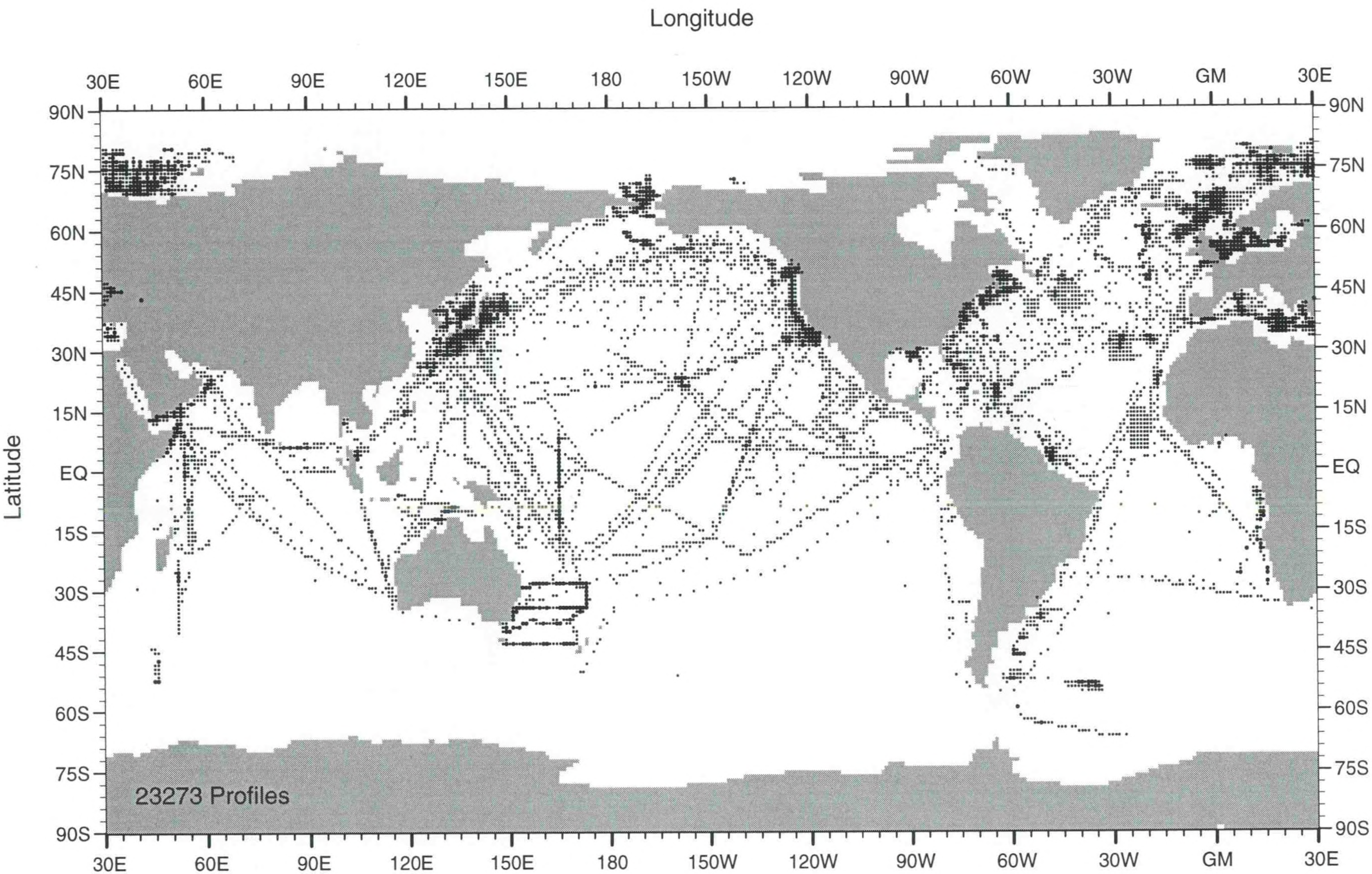


Fig. B195 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for July-September for 1989

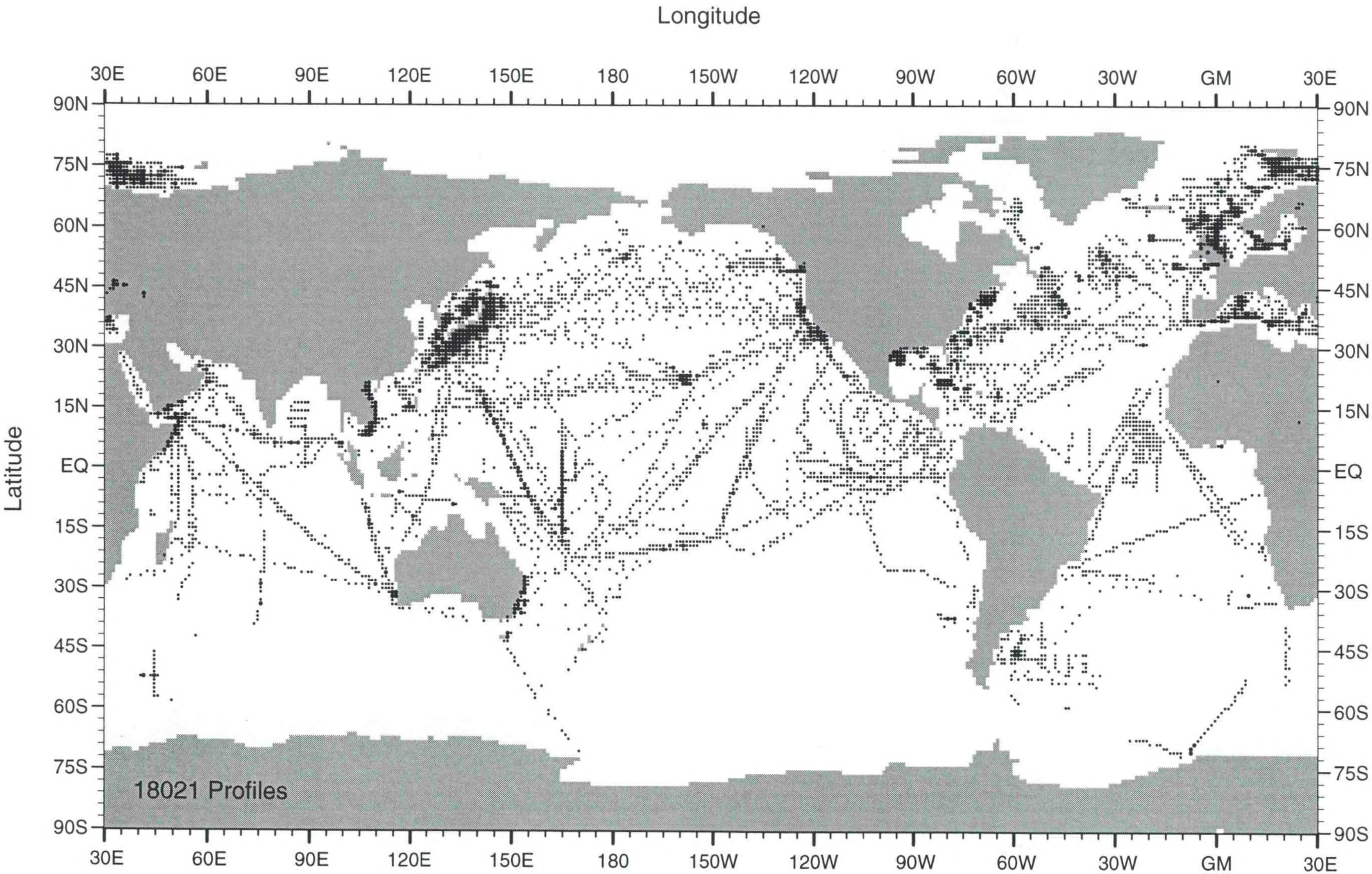


Fig. B196 Distribution of all data profiles (OSD+MBT+XBT+CTD) in WOD98 for October-December for 1989

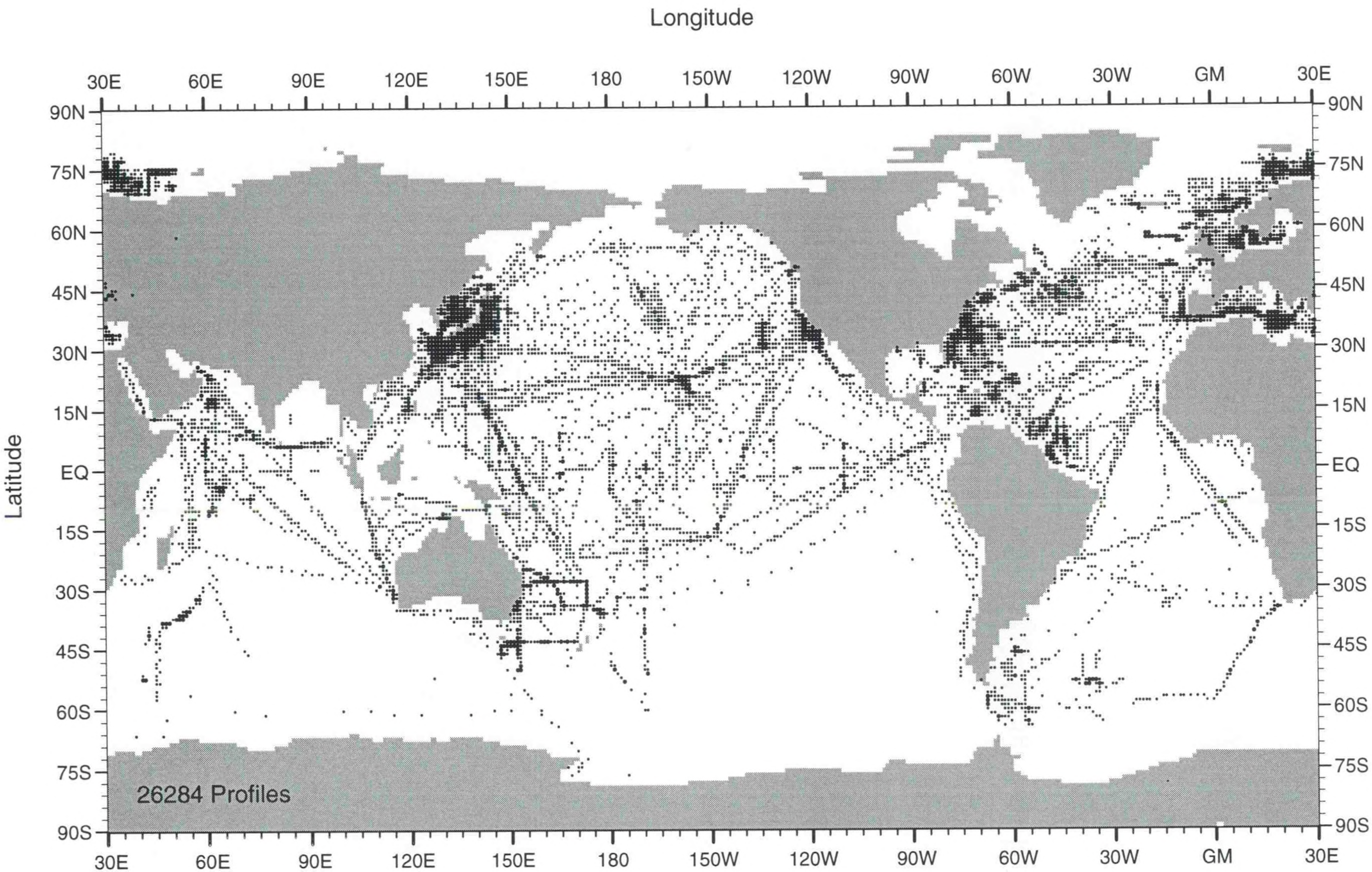


Fig. B197 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for January-March for 1990

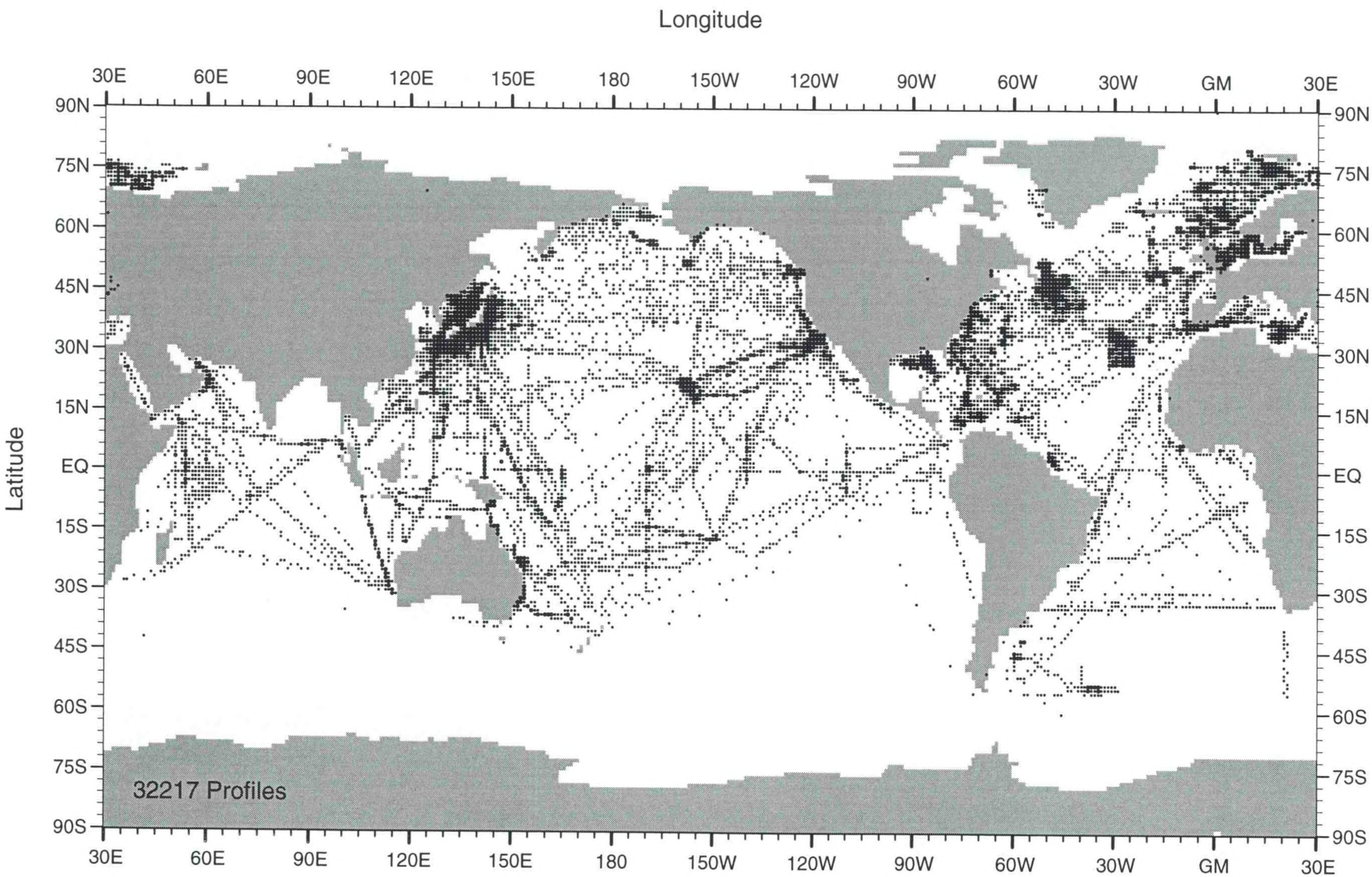


Fig. B198 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for April-June for 1990

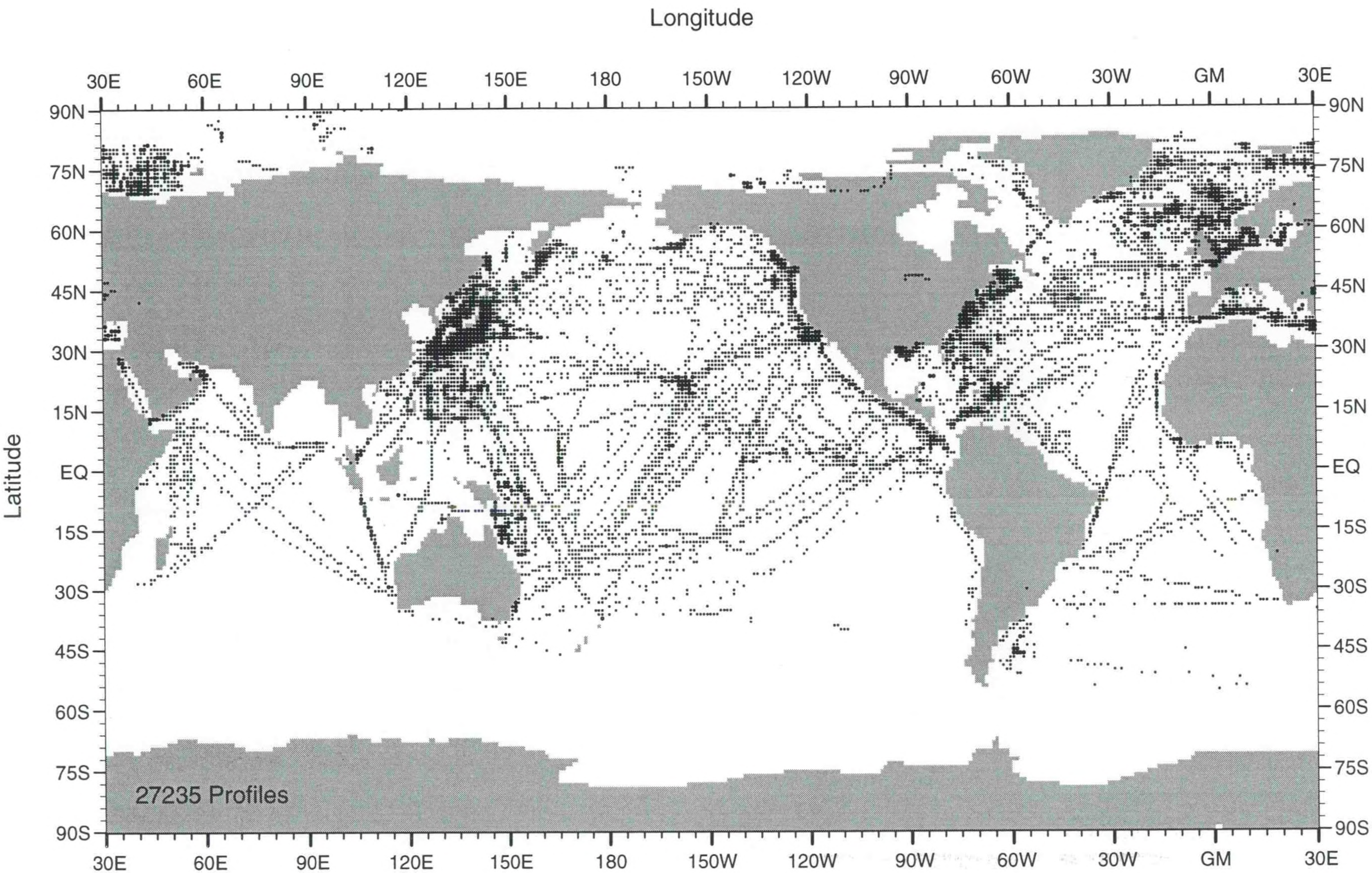


Fig. B199 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for July-September for 1990

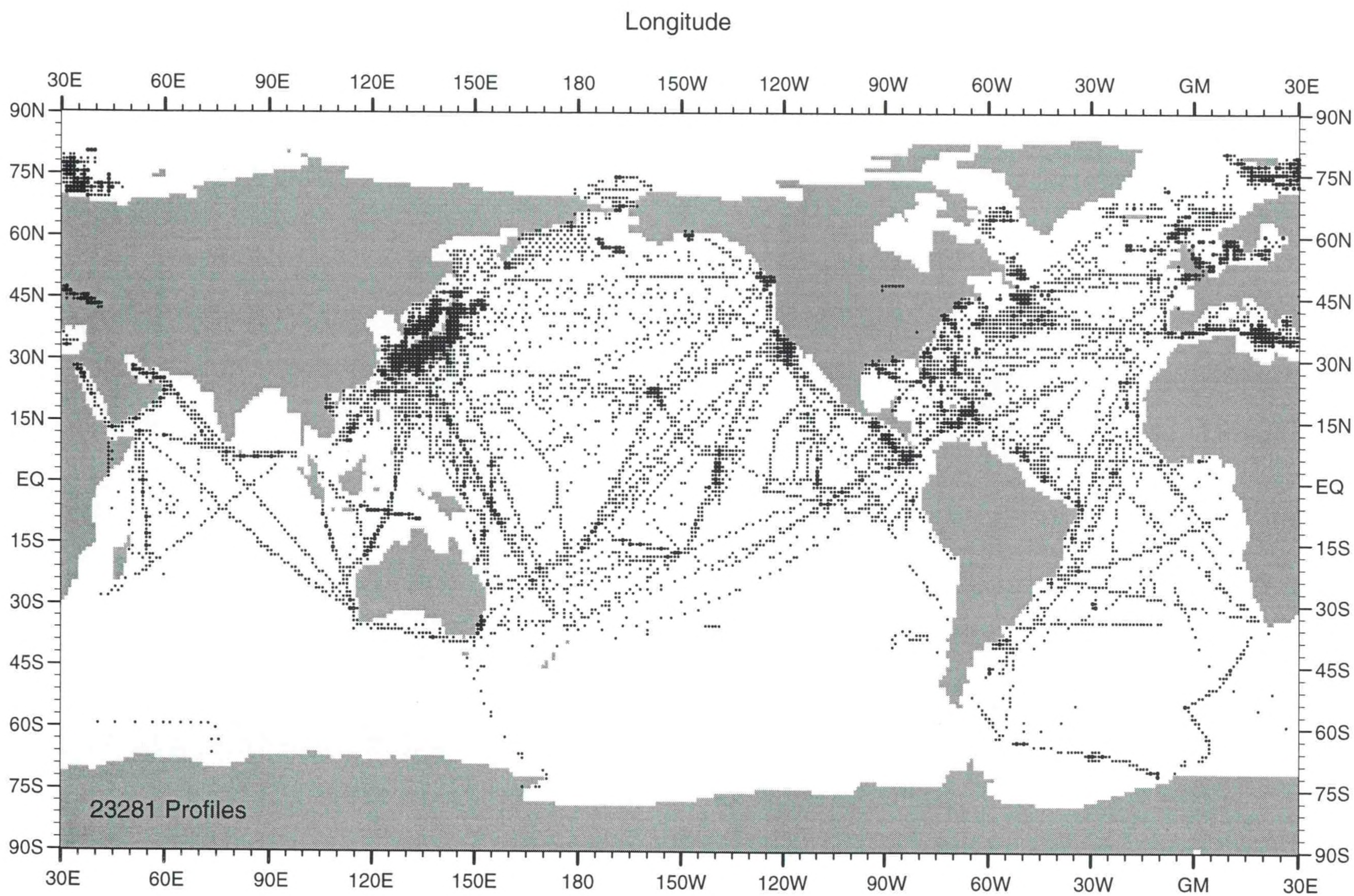


Fig. B200 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for October-December for 1990

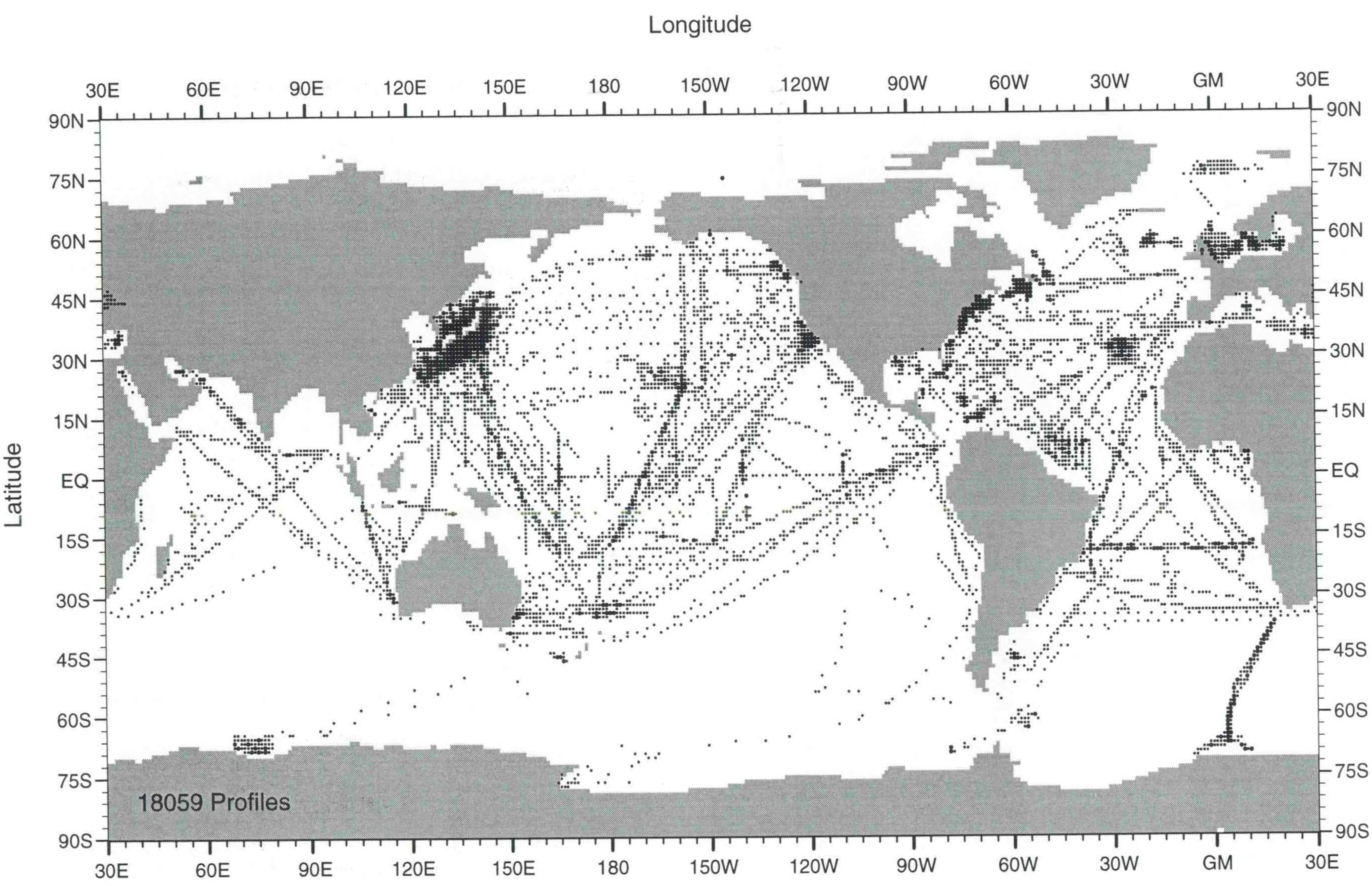


Fig. B201 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for January-March for 1991

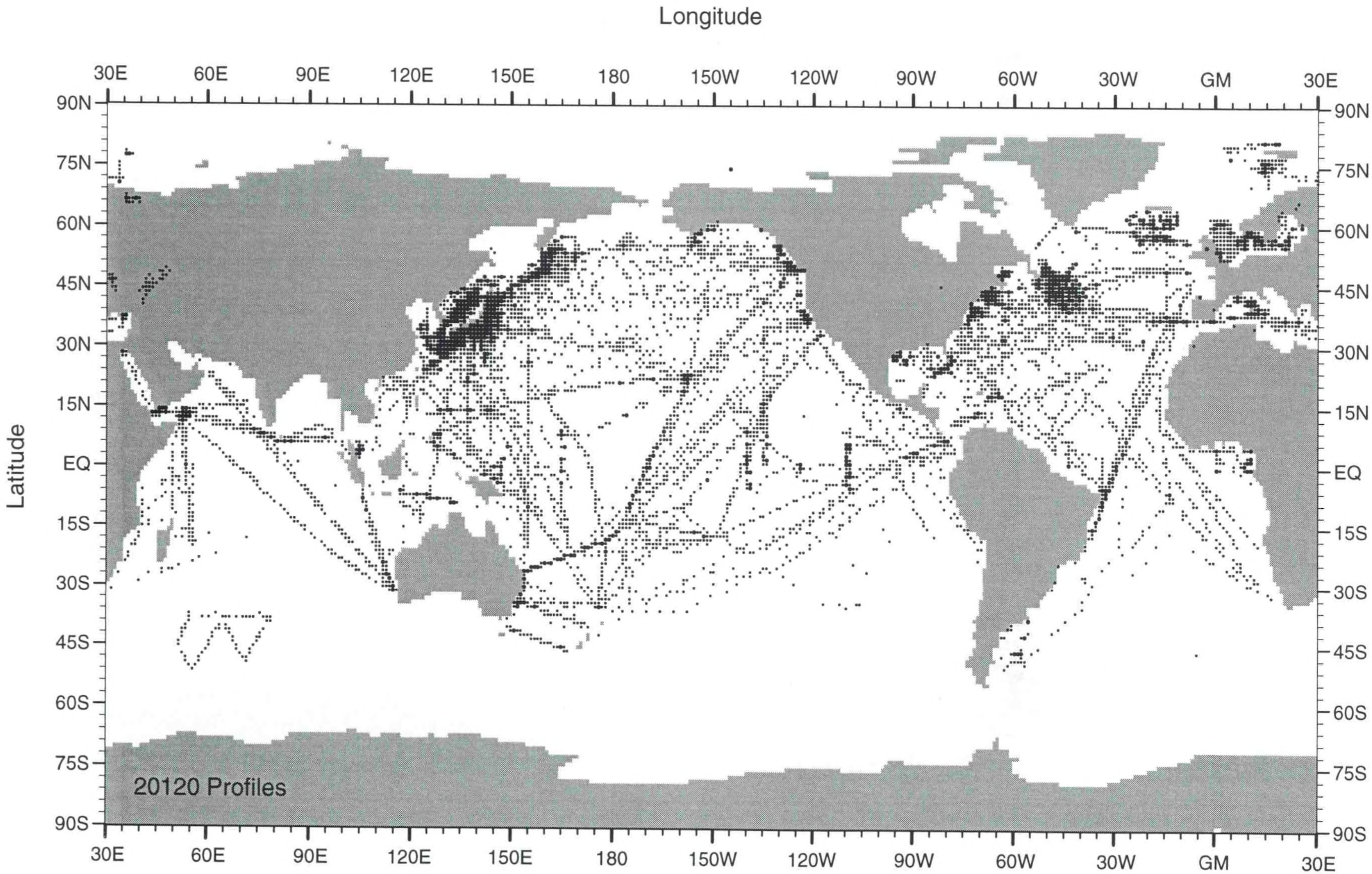


Fig. B202 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for April-June for 1991

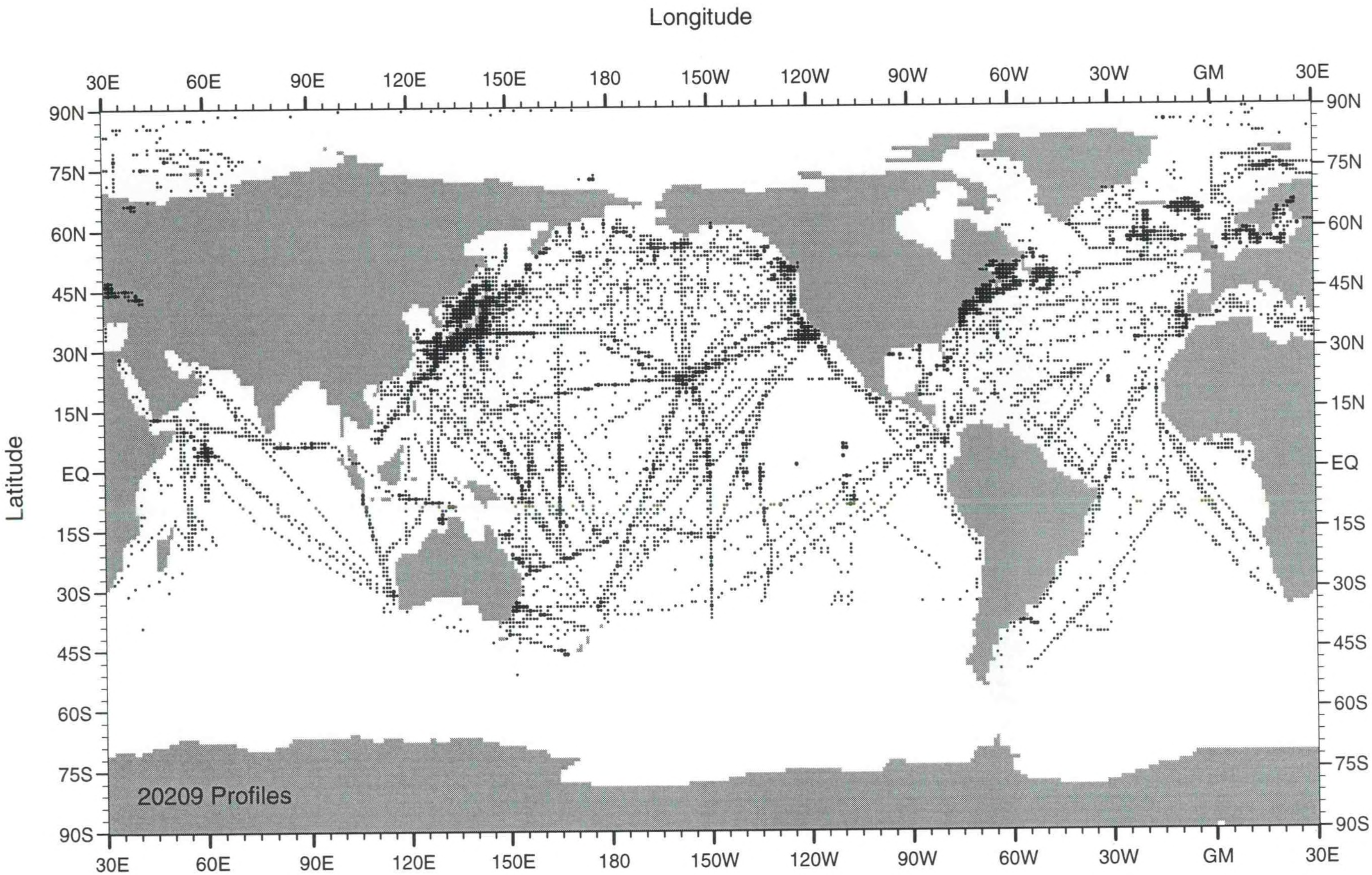


Fig. B203 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for July-September for 1991

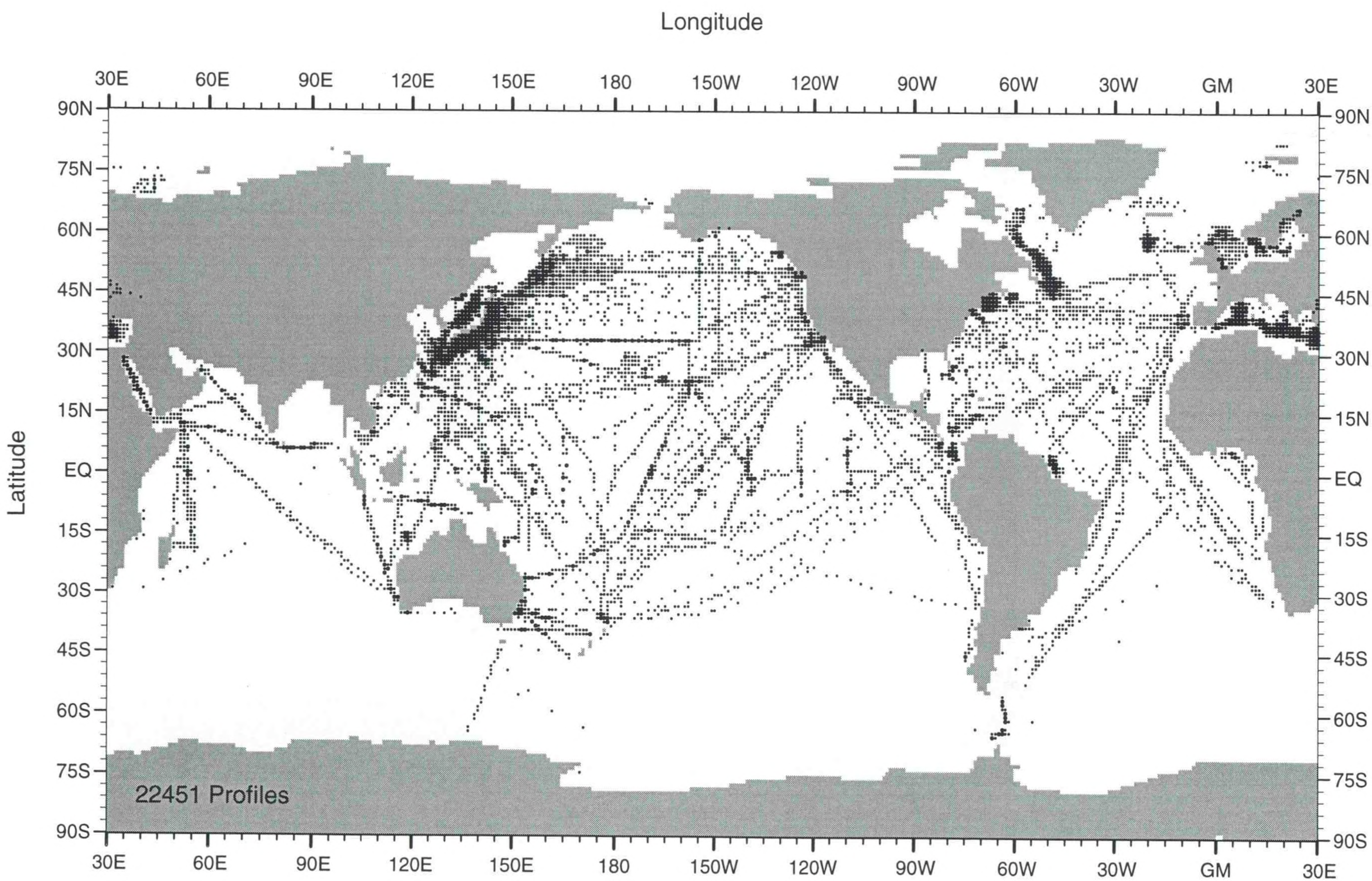


Fig. B204 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for October-December for 1991

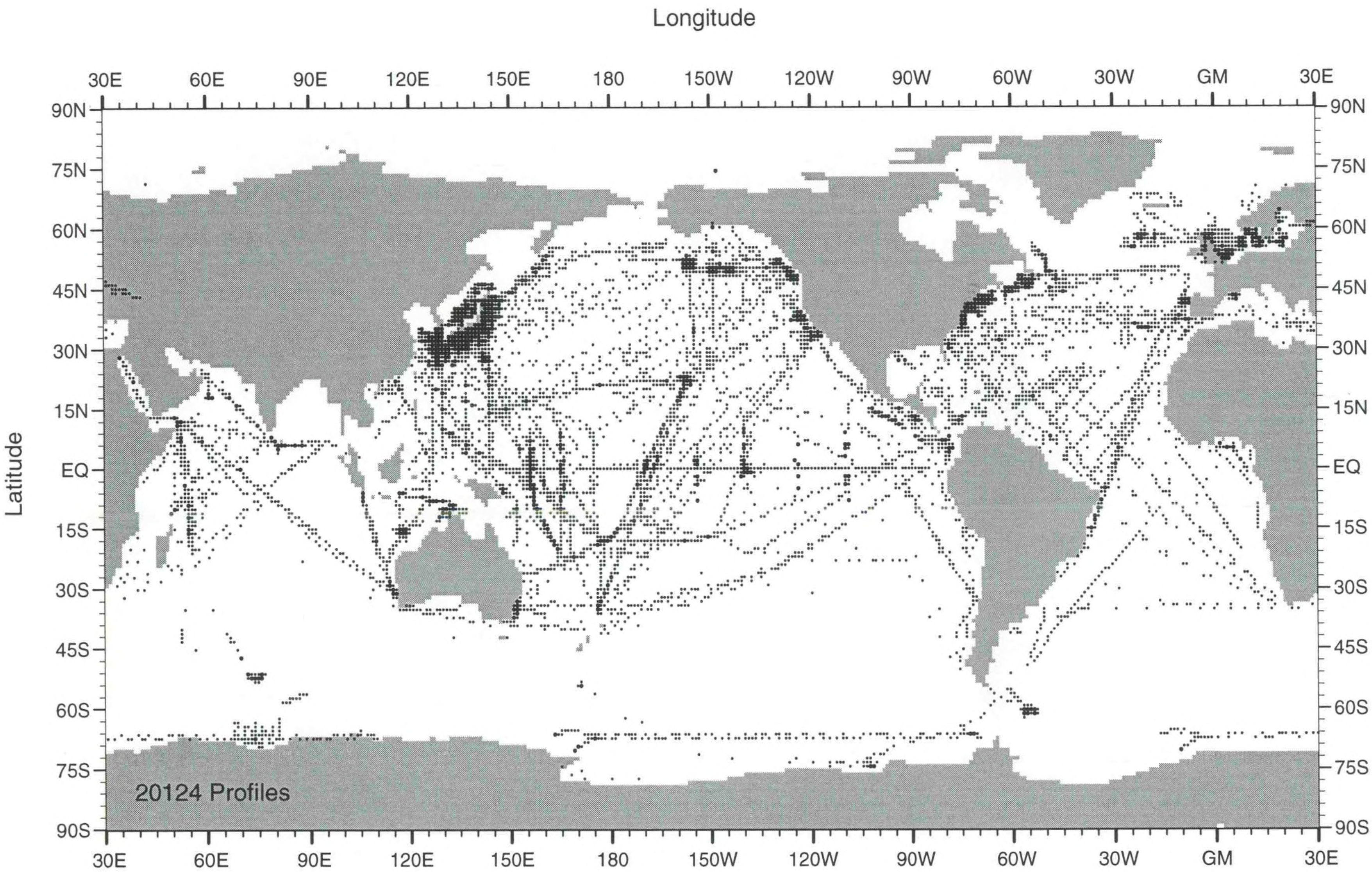


Fig. B205 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for January-March for 1992

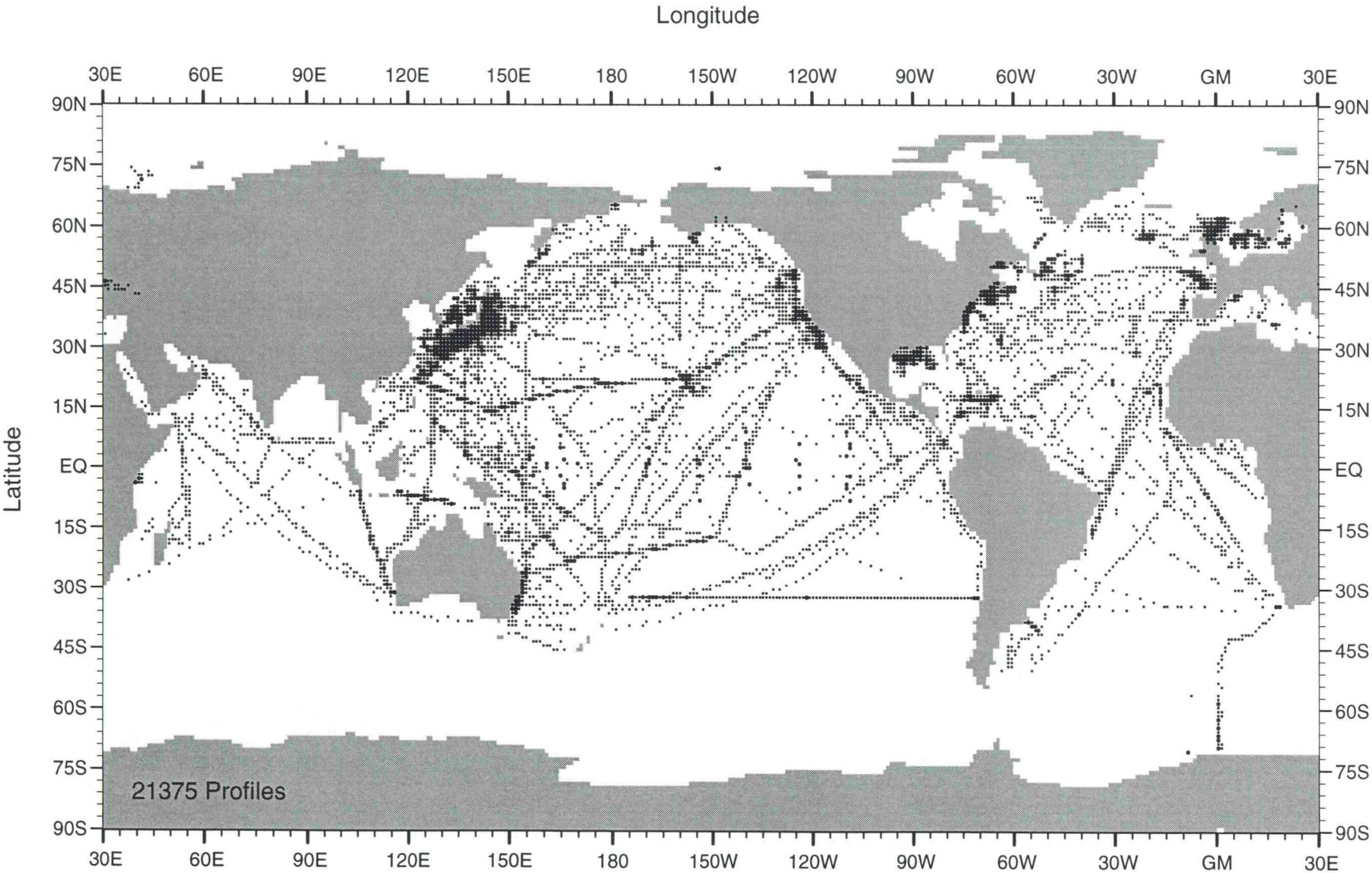


Fig. B206 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for April-June for 1992

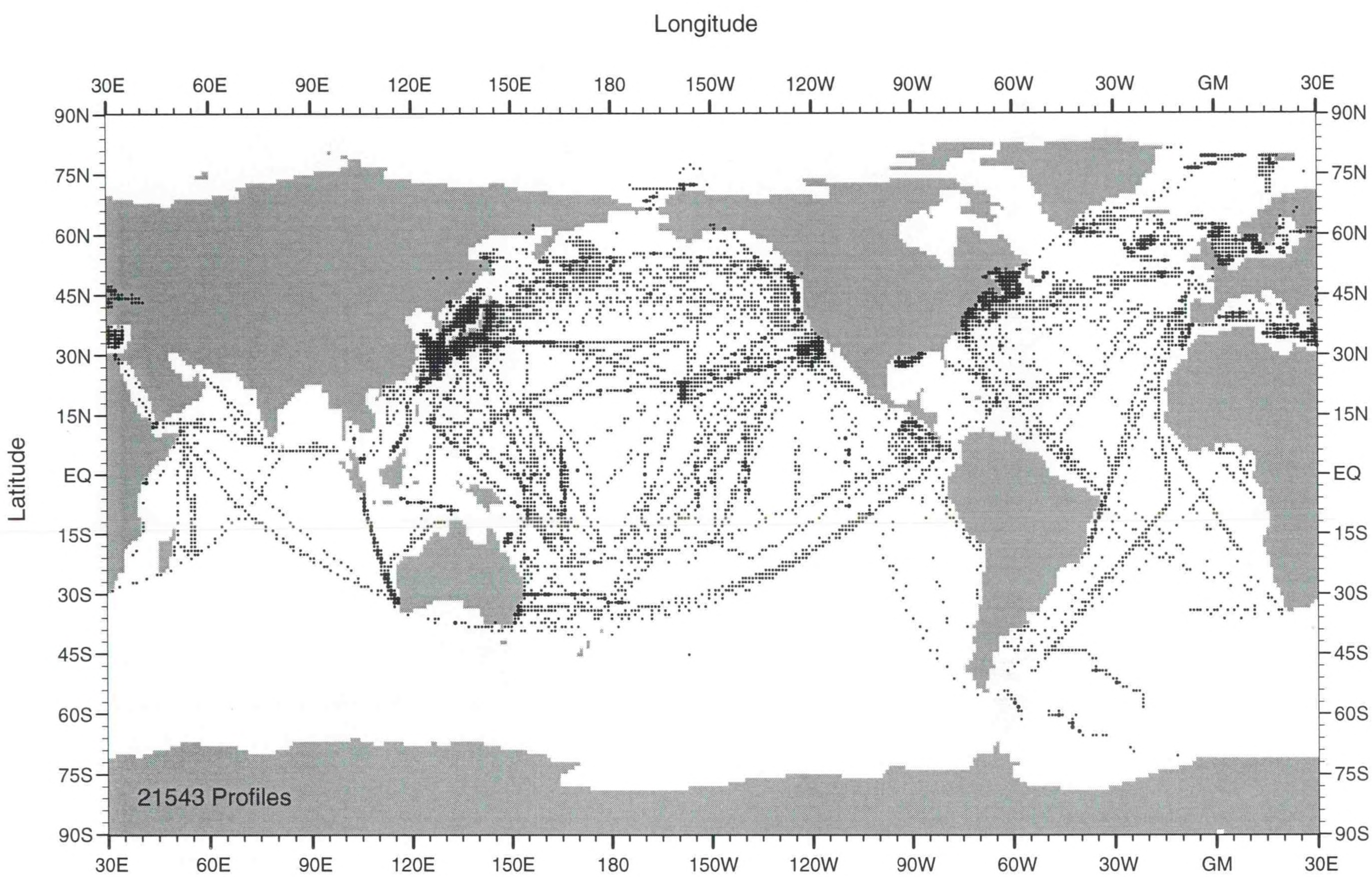


Fig. B207 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for July-September for 1992

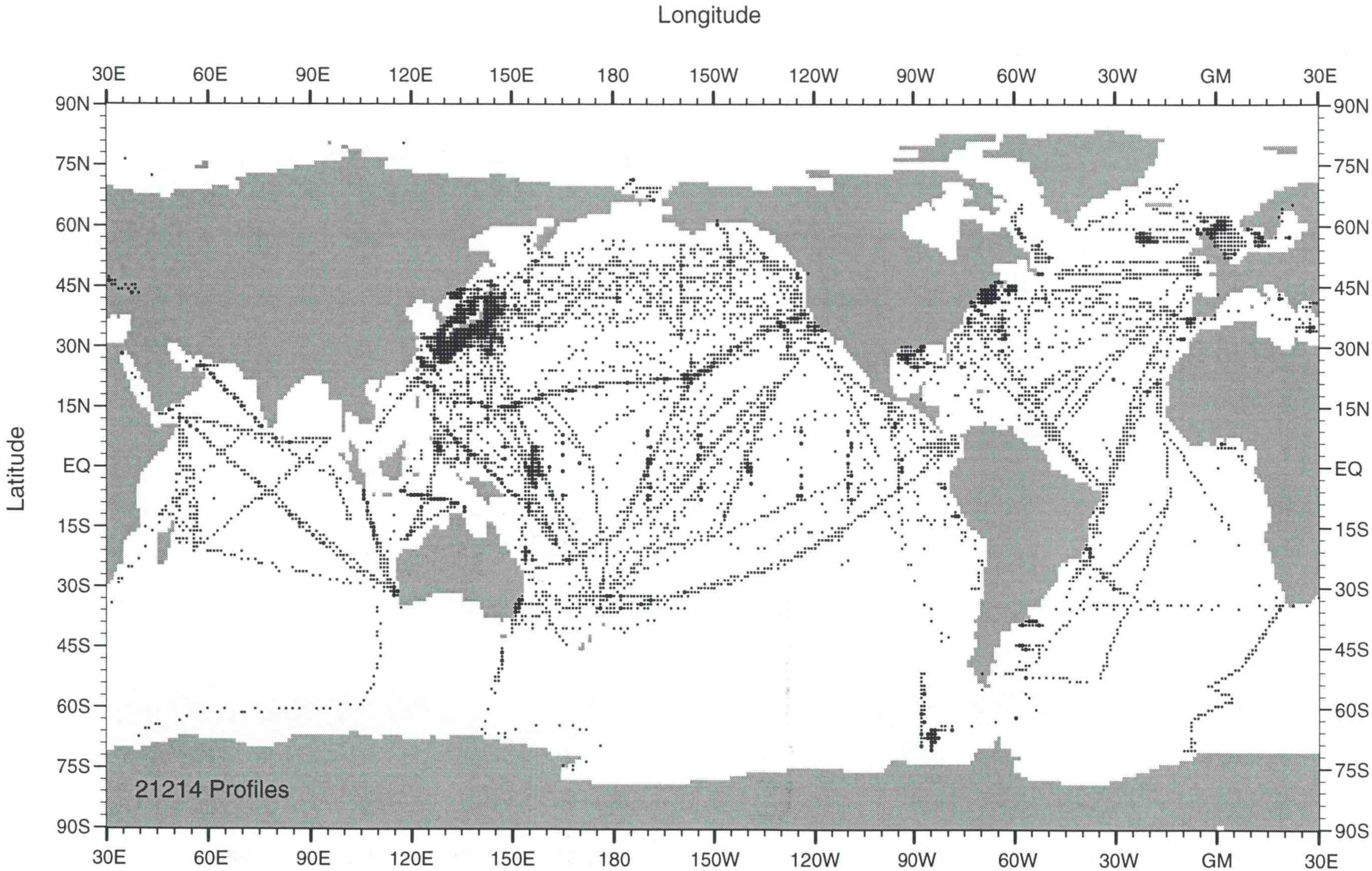


Fig. B208 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for October-December for 1992

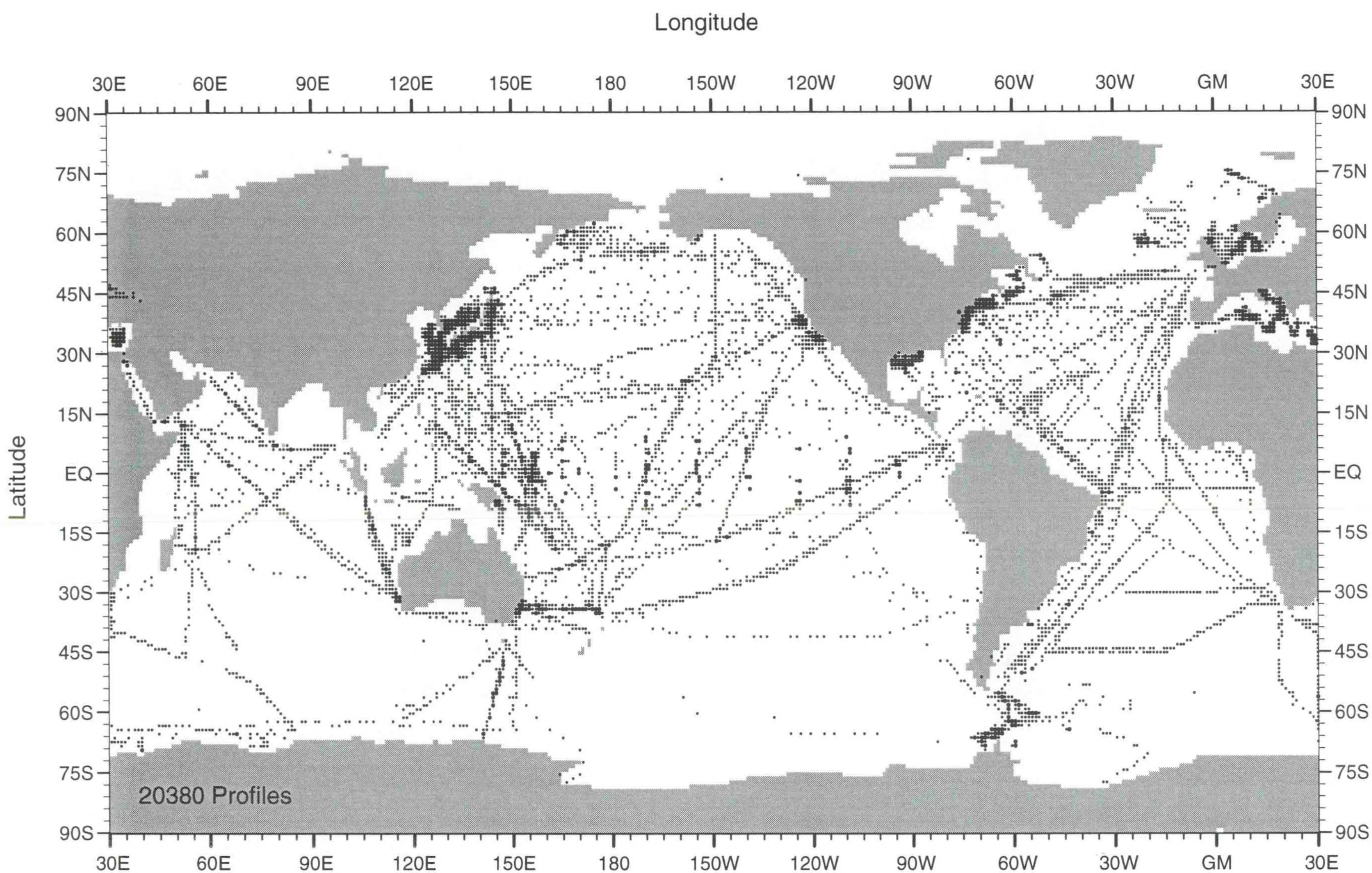


Fig. B209 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for January-March for 1993

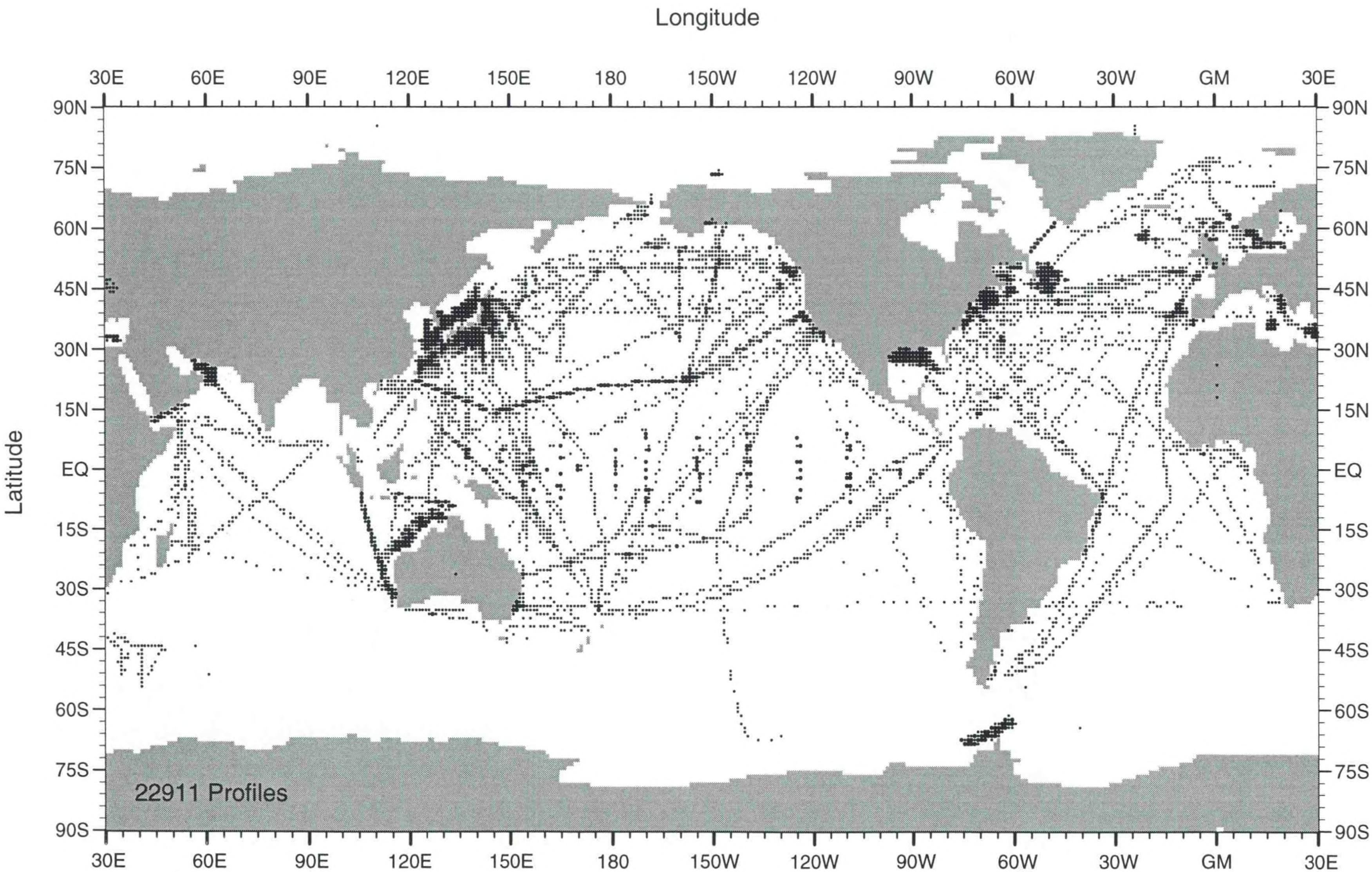


Fig. B210 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for April-June for 1993

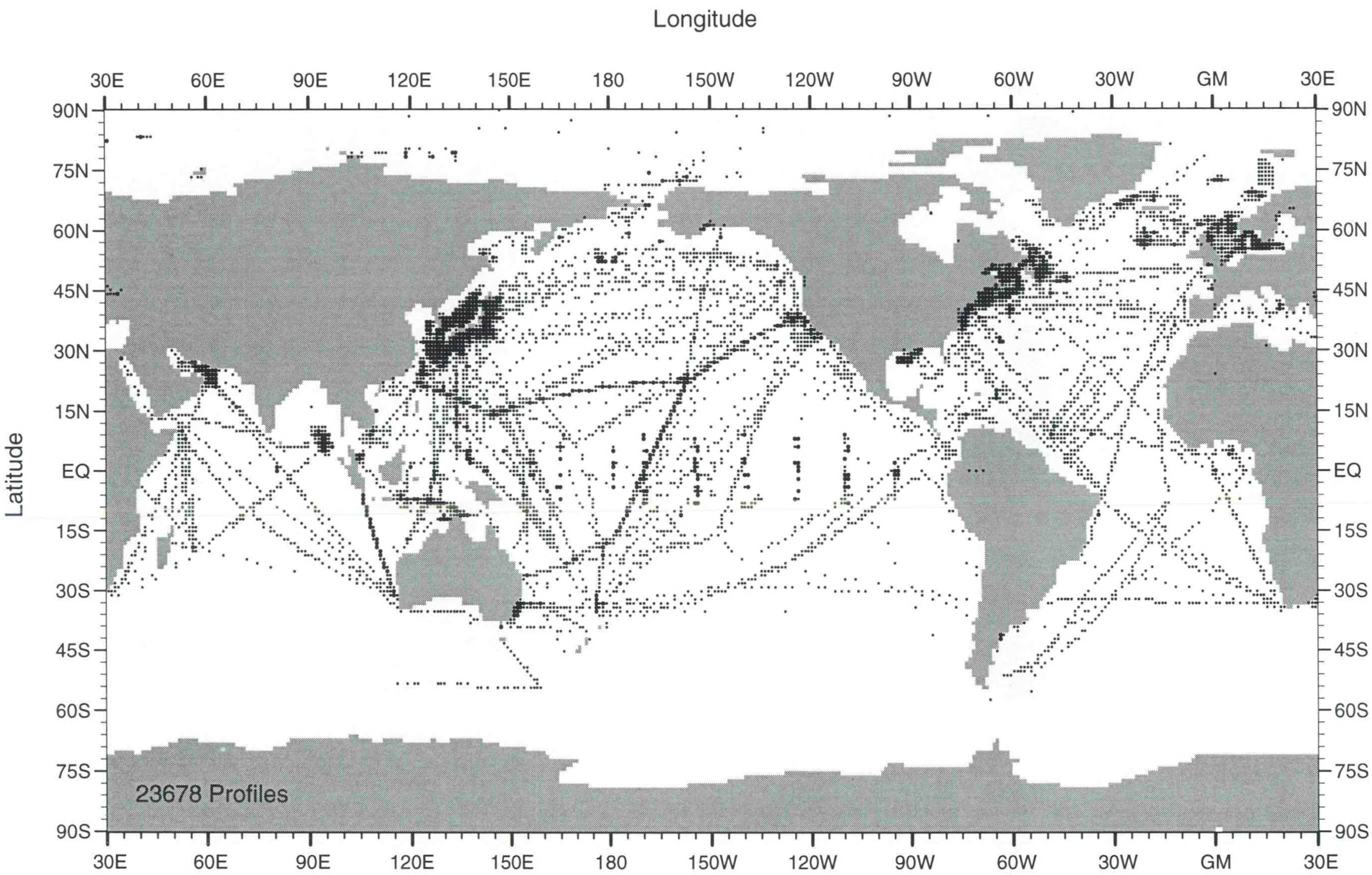


Fig. B211 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for July-September for 1993

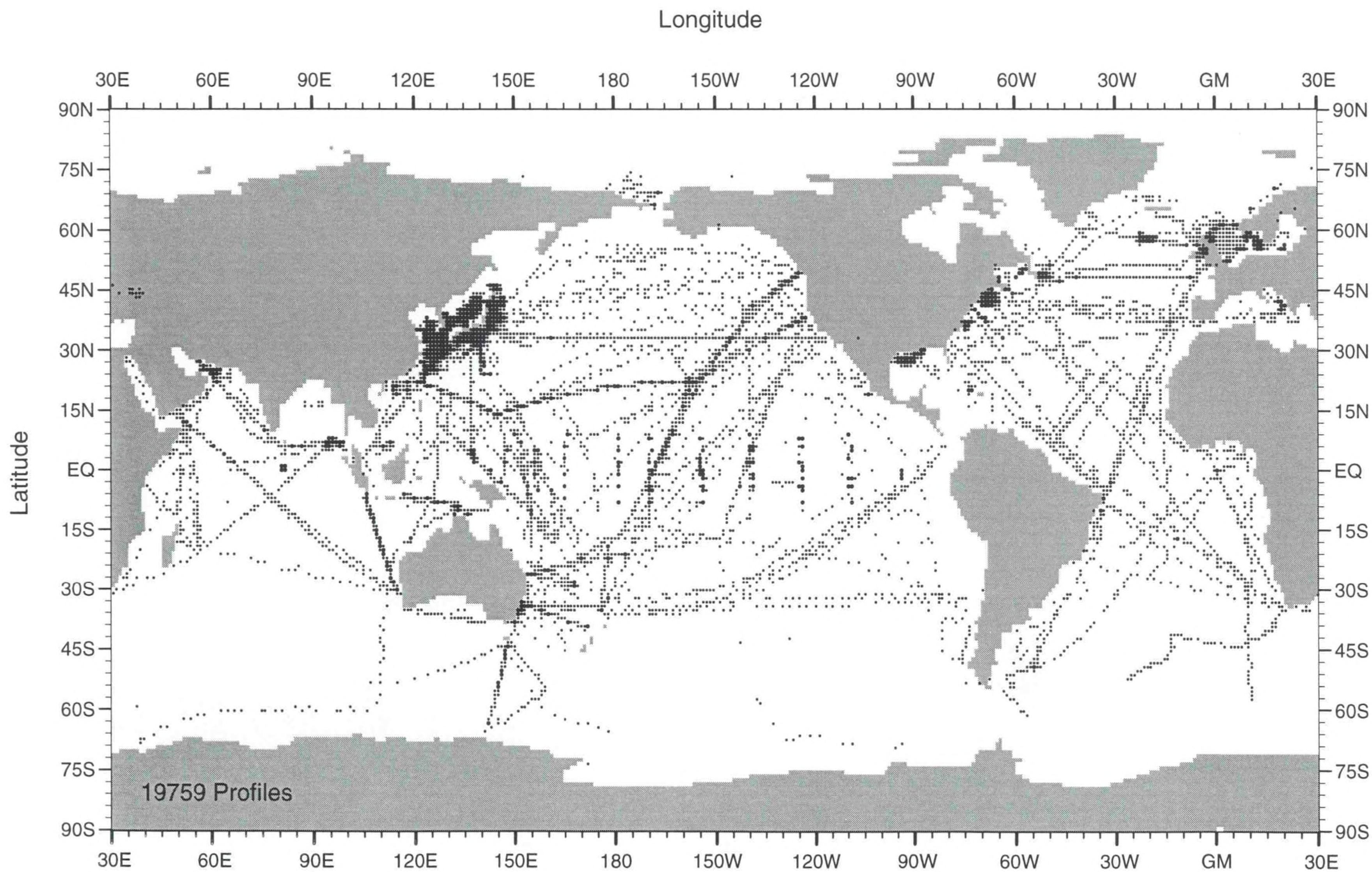


Fig. B212 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for October-December for 1993

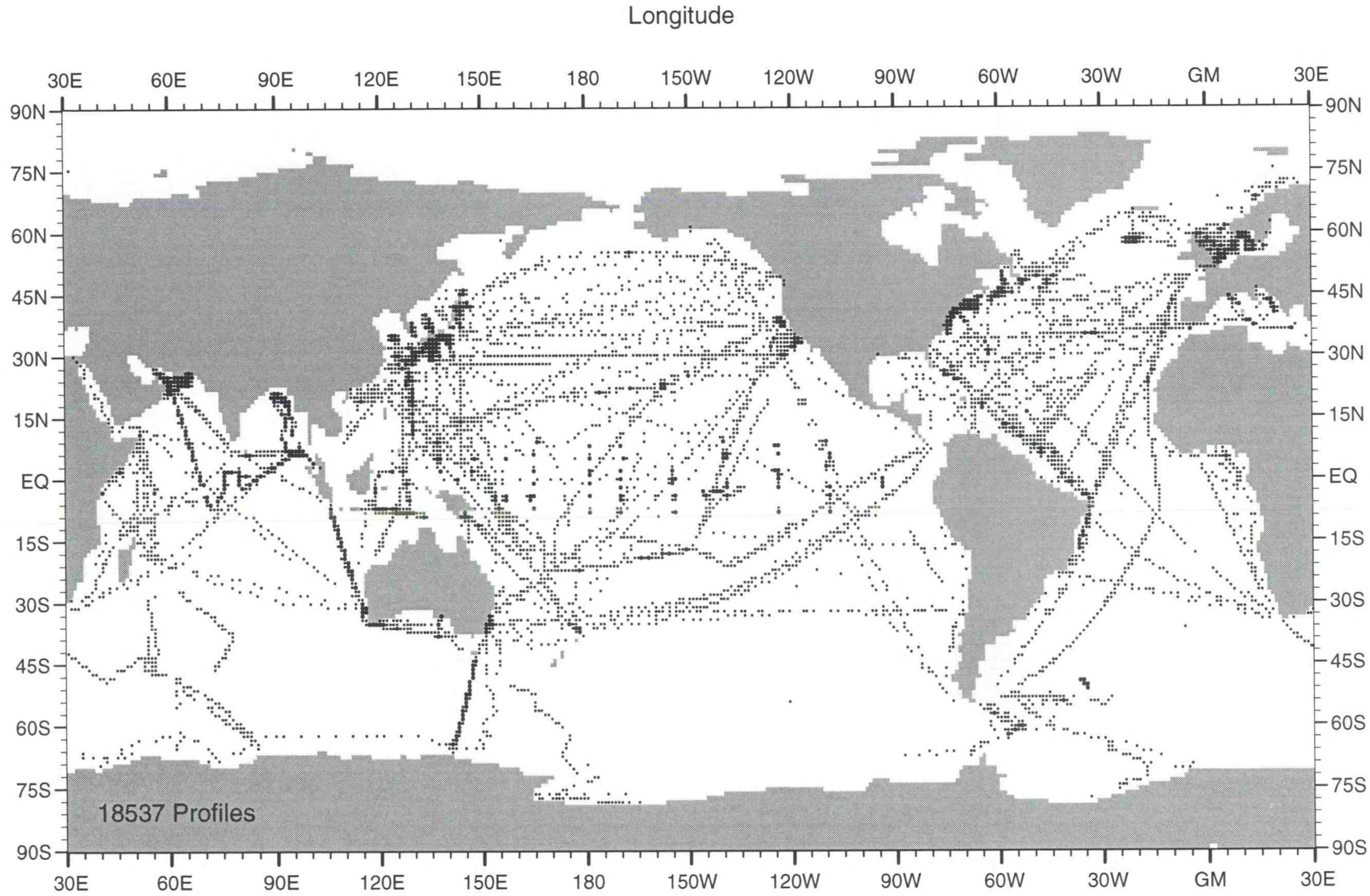


Fig. B213 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for January-March for 1994

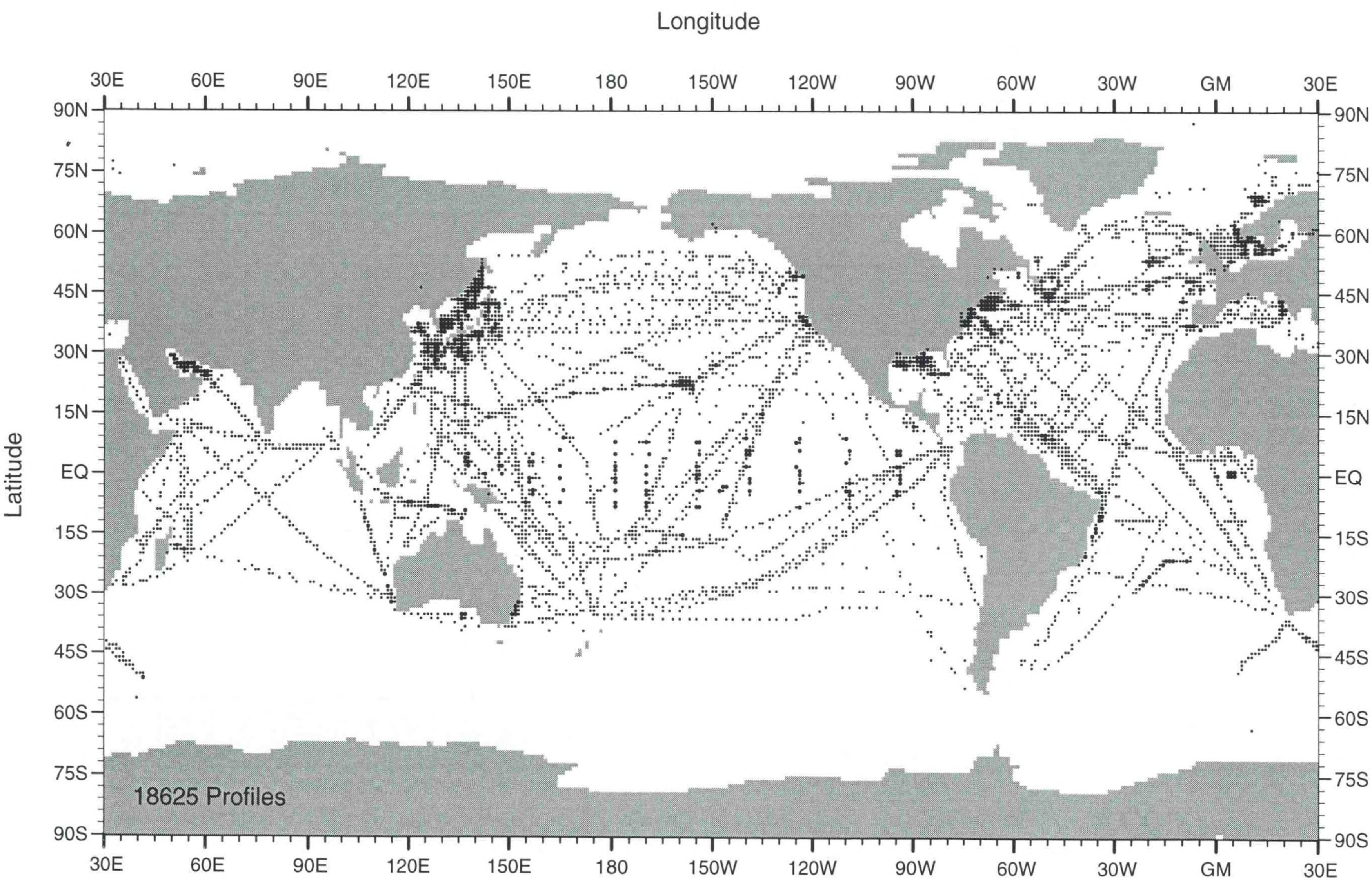


Fig. B214 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for April-June for 1994

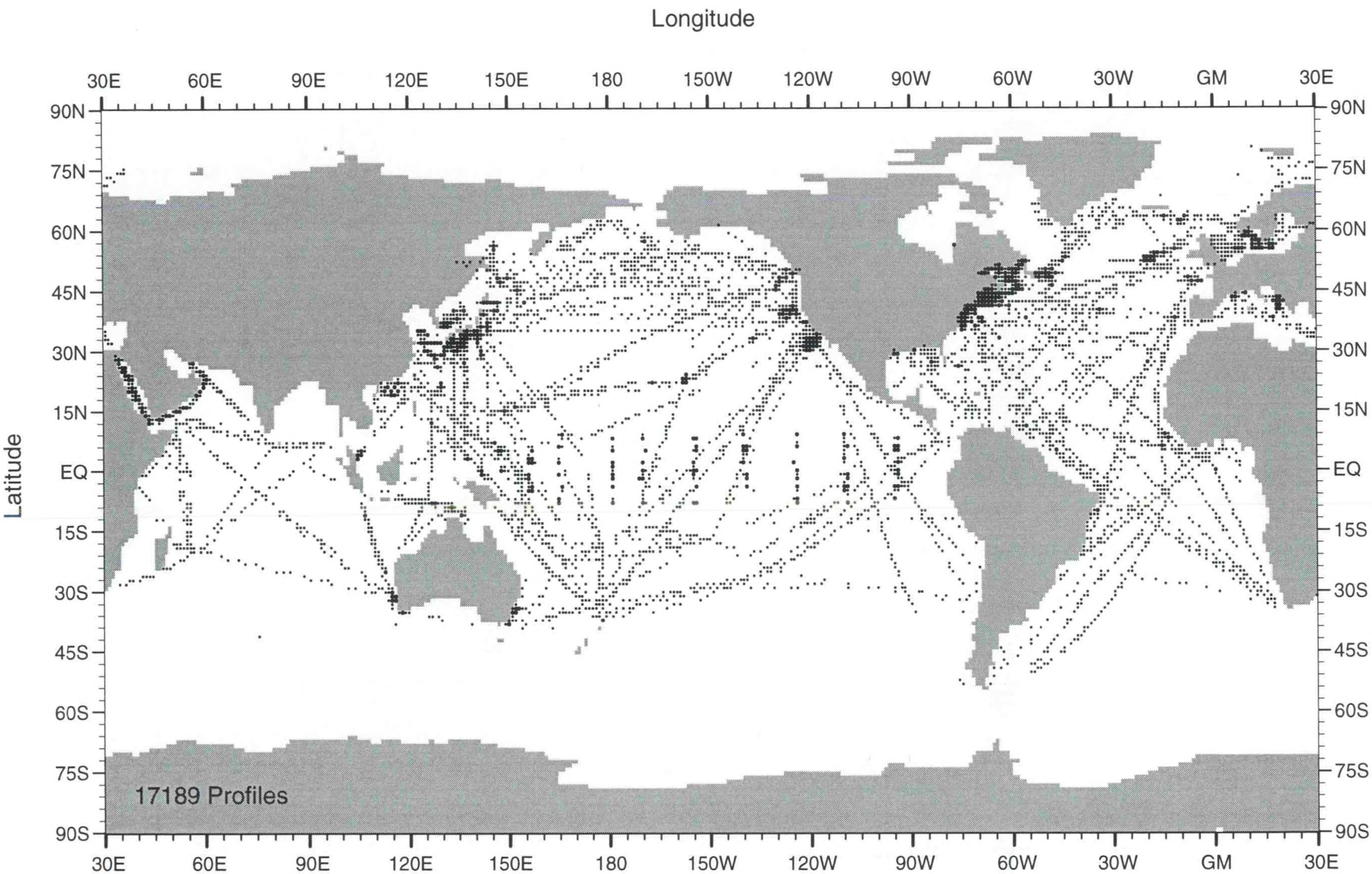


Fig. B215 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for July-September for 1994

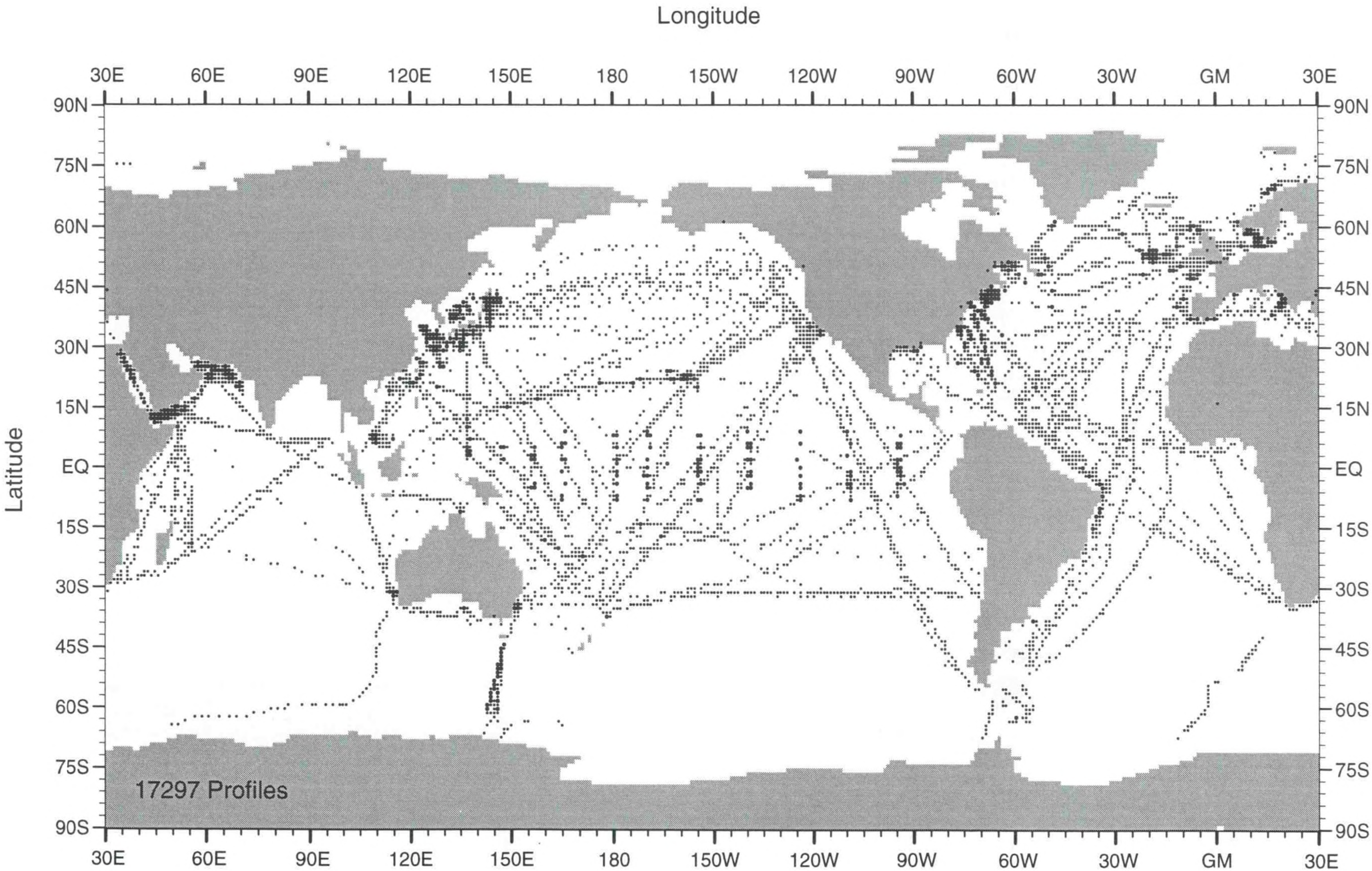


Fig. B216 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for October-December for 1994

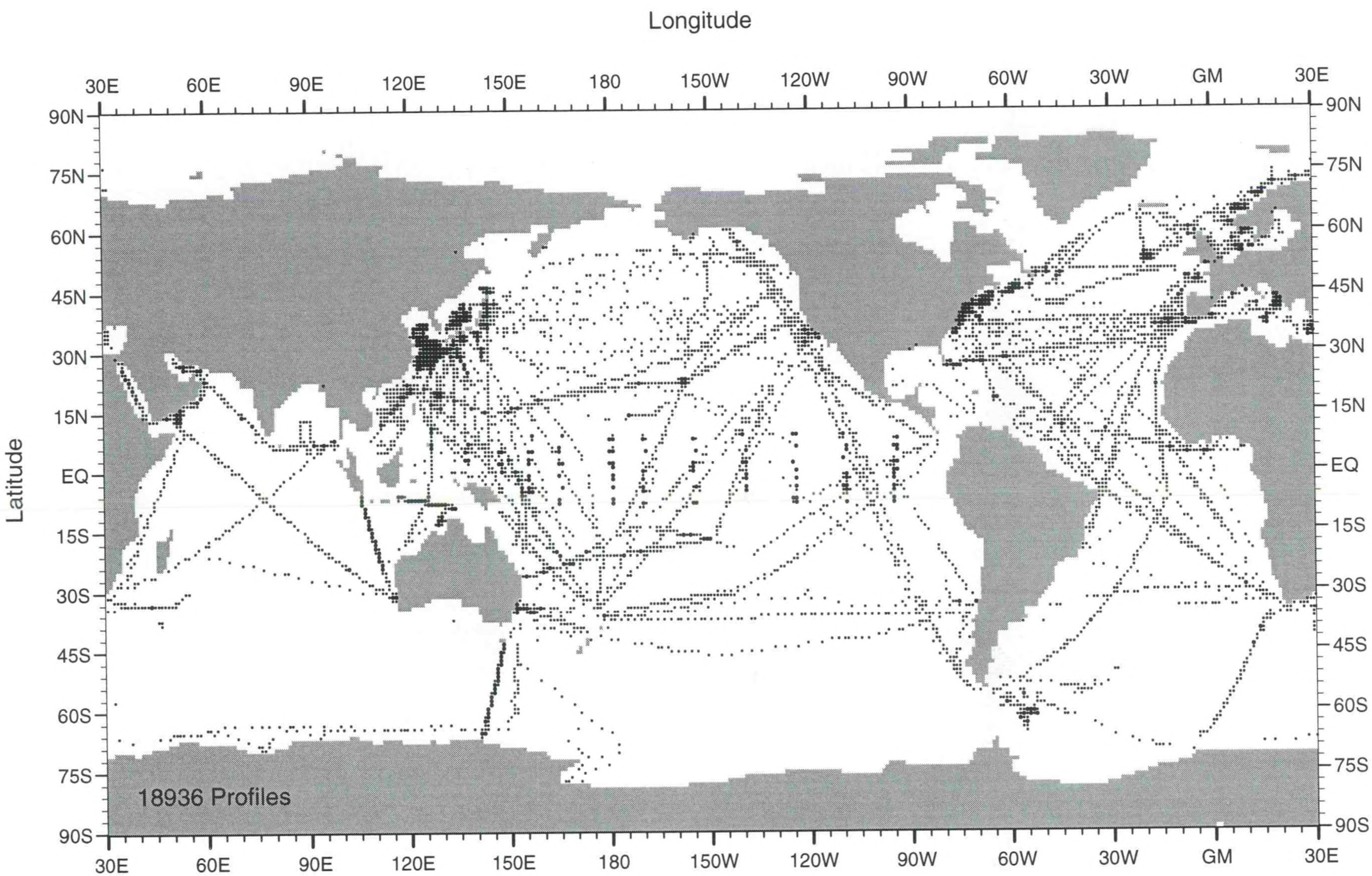


Fig. B217 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for January-March for 1995

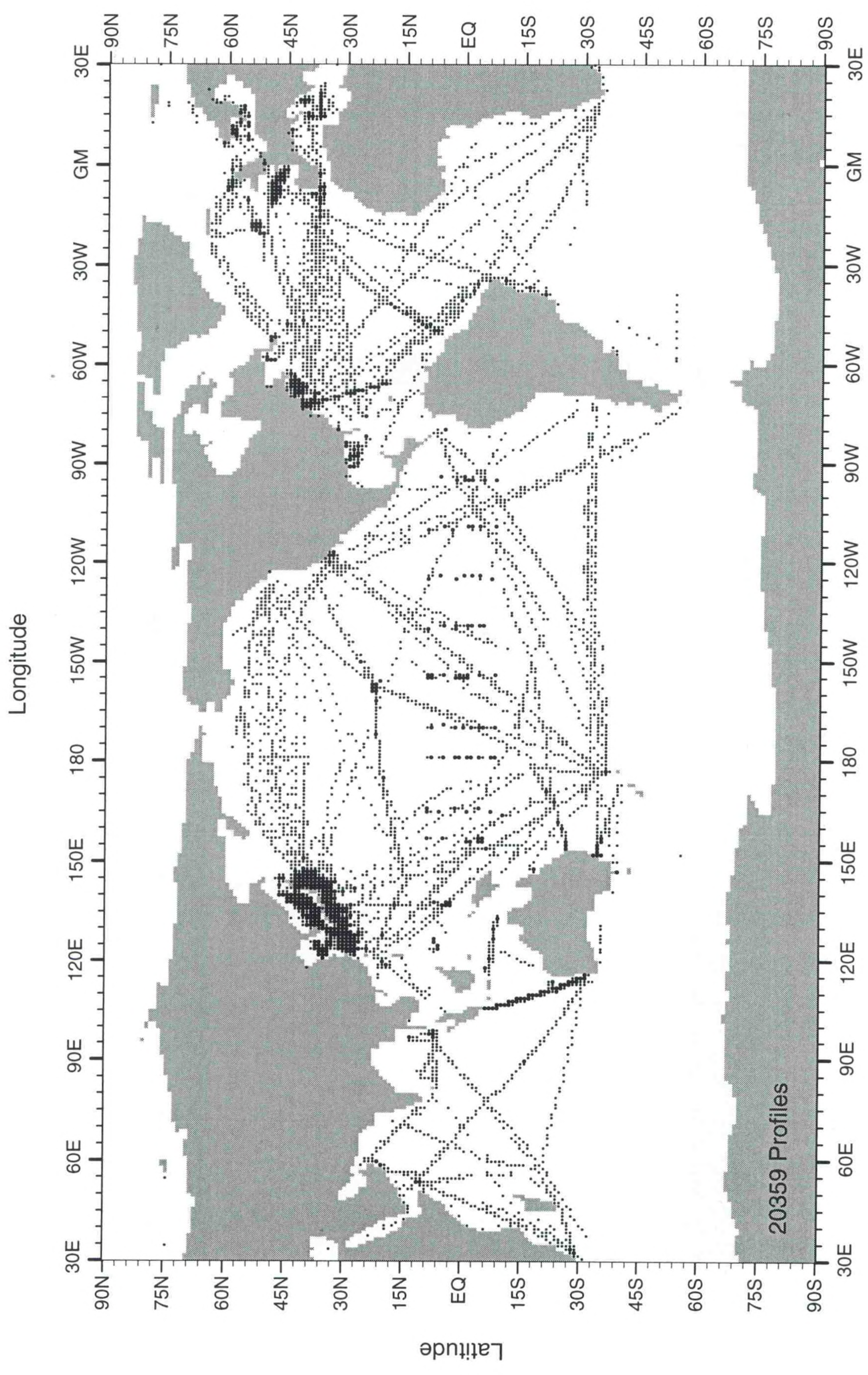


Fig. B218 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for April-June for 1995

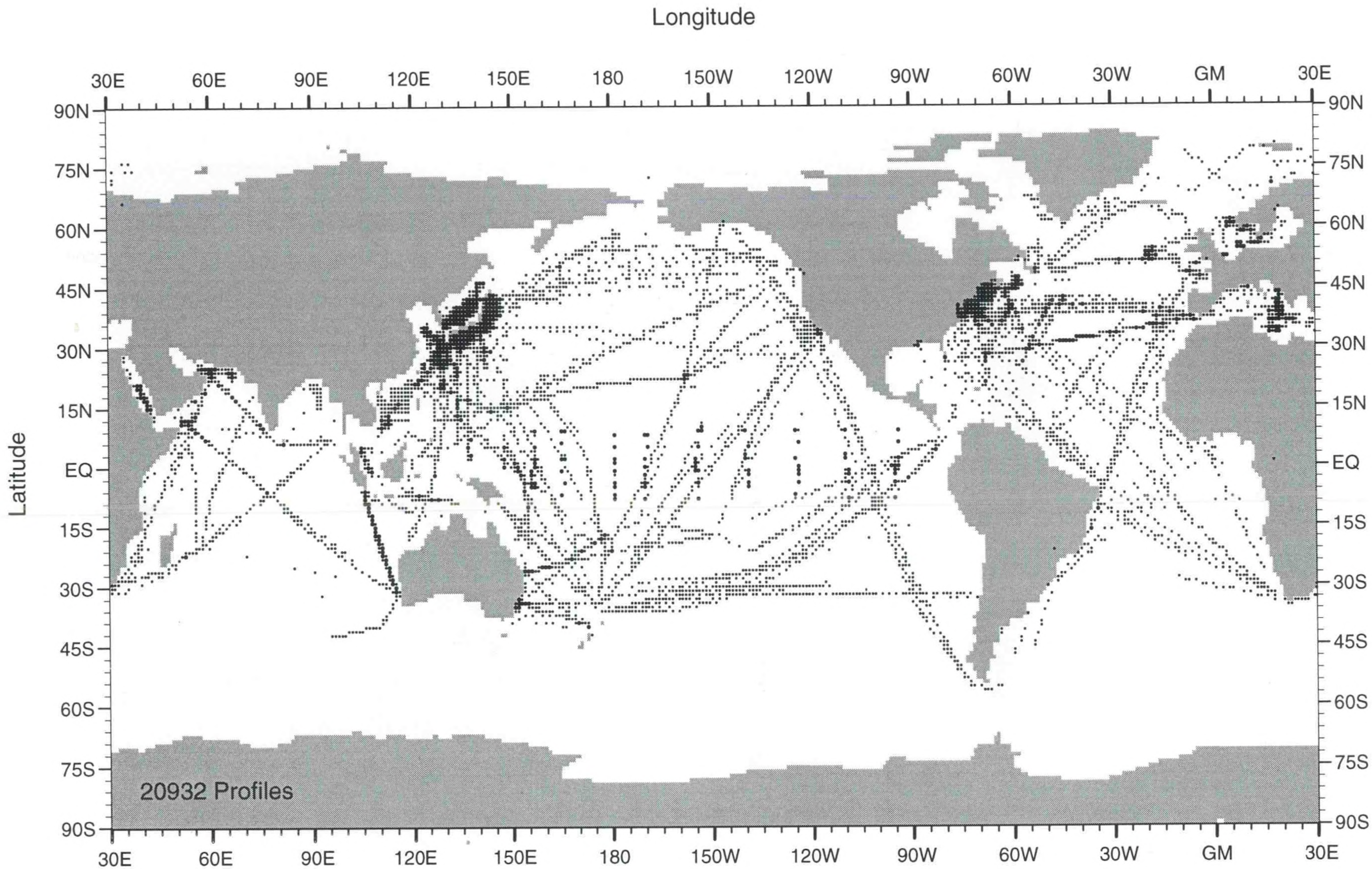


Fig. B219 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for July-September for 1995

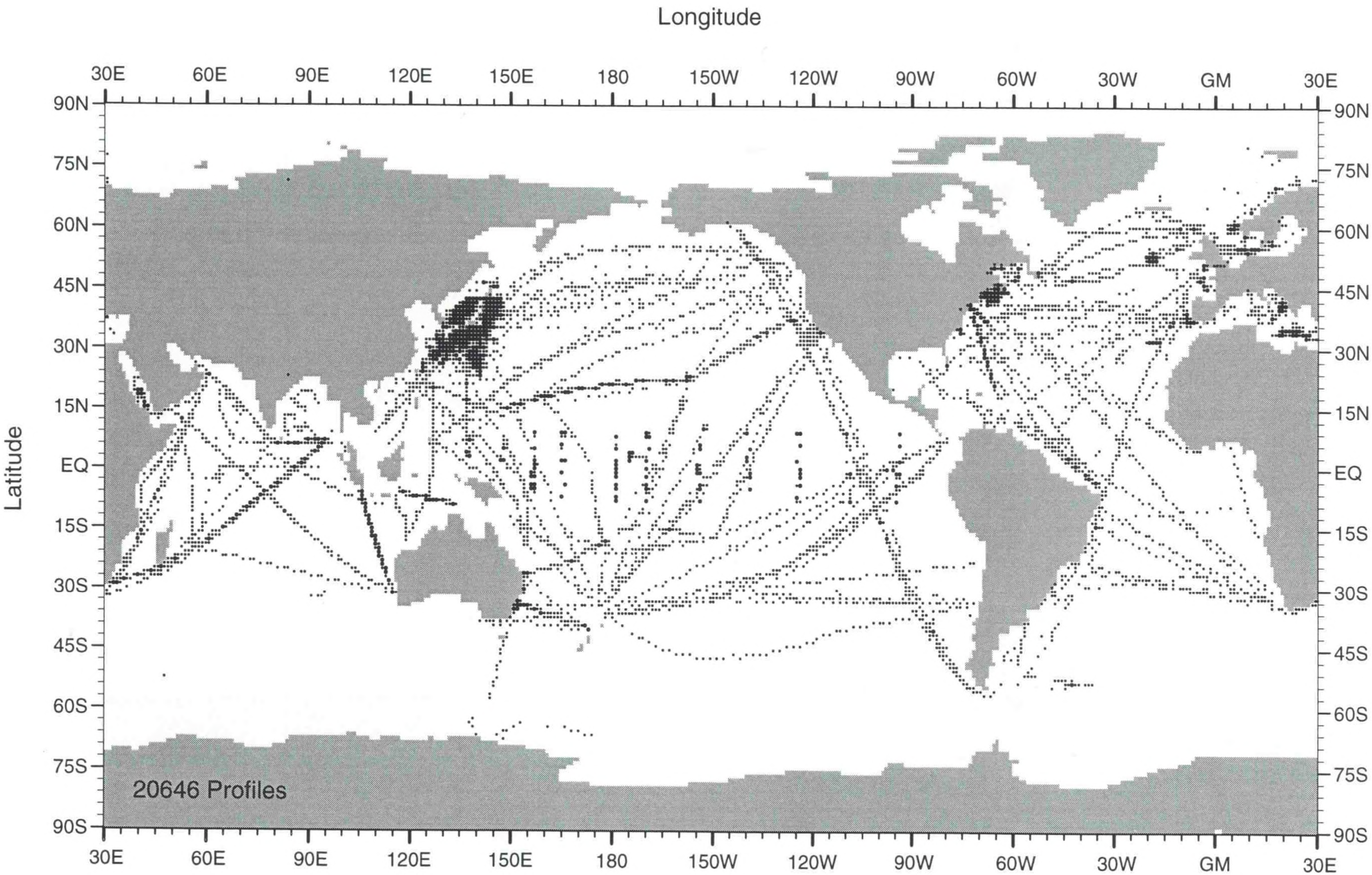


Fig. B220 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for October-December for 1995

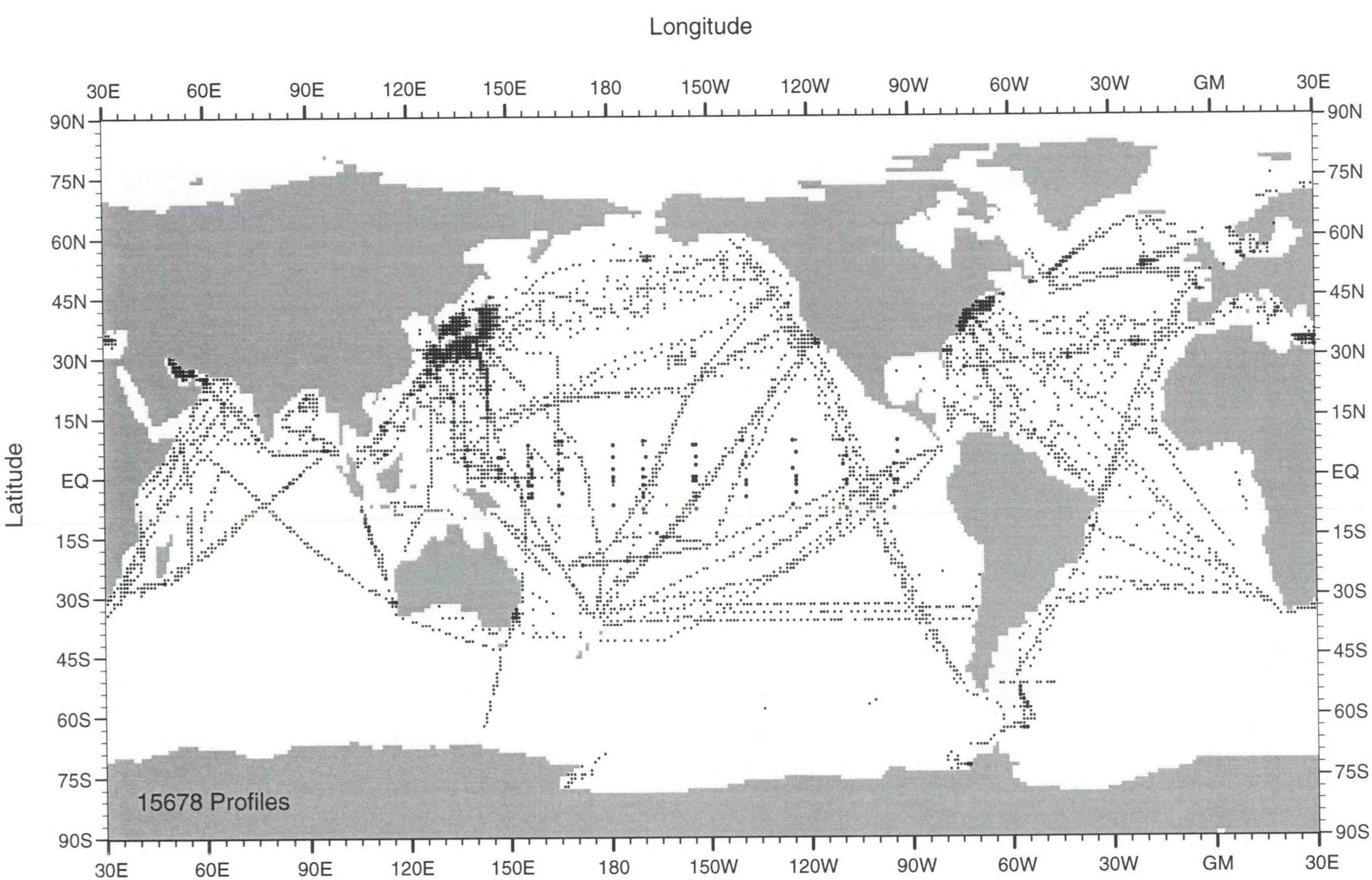


Fig. B221 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for January-March for 1996

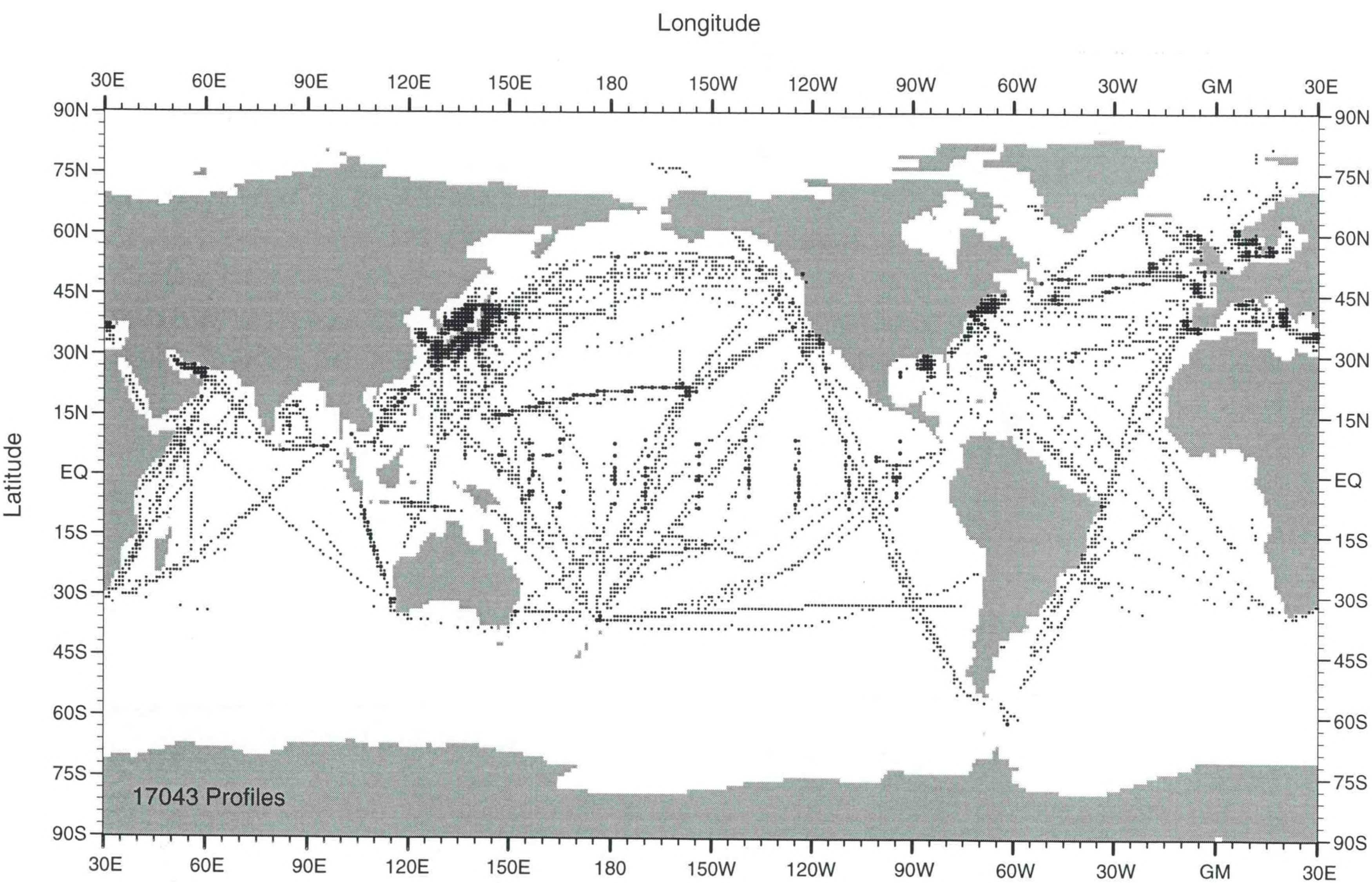


Fig. B222 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for April-June for 1996

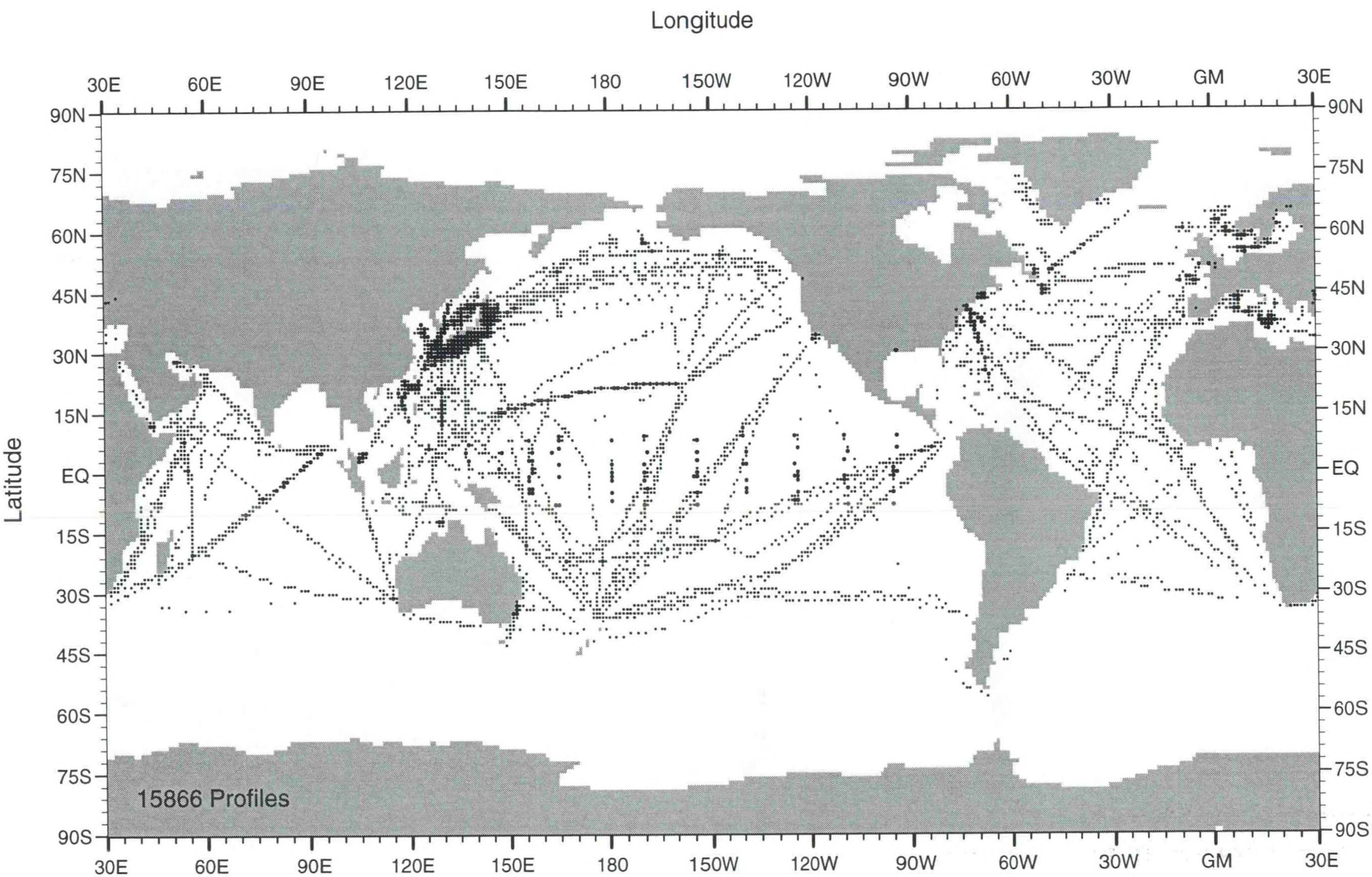


Fig. B223 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for July-September for 1996

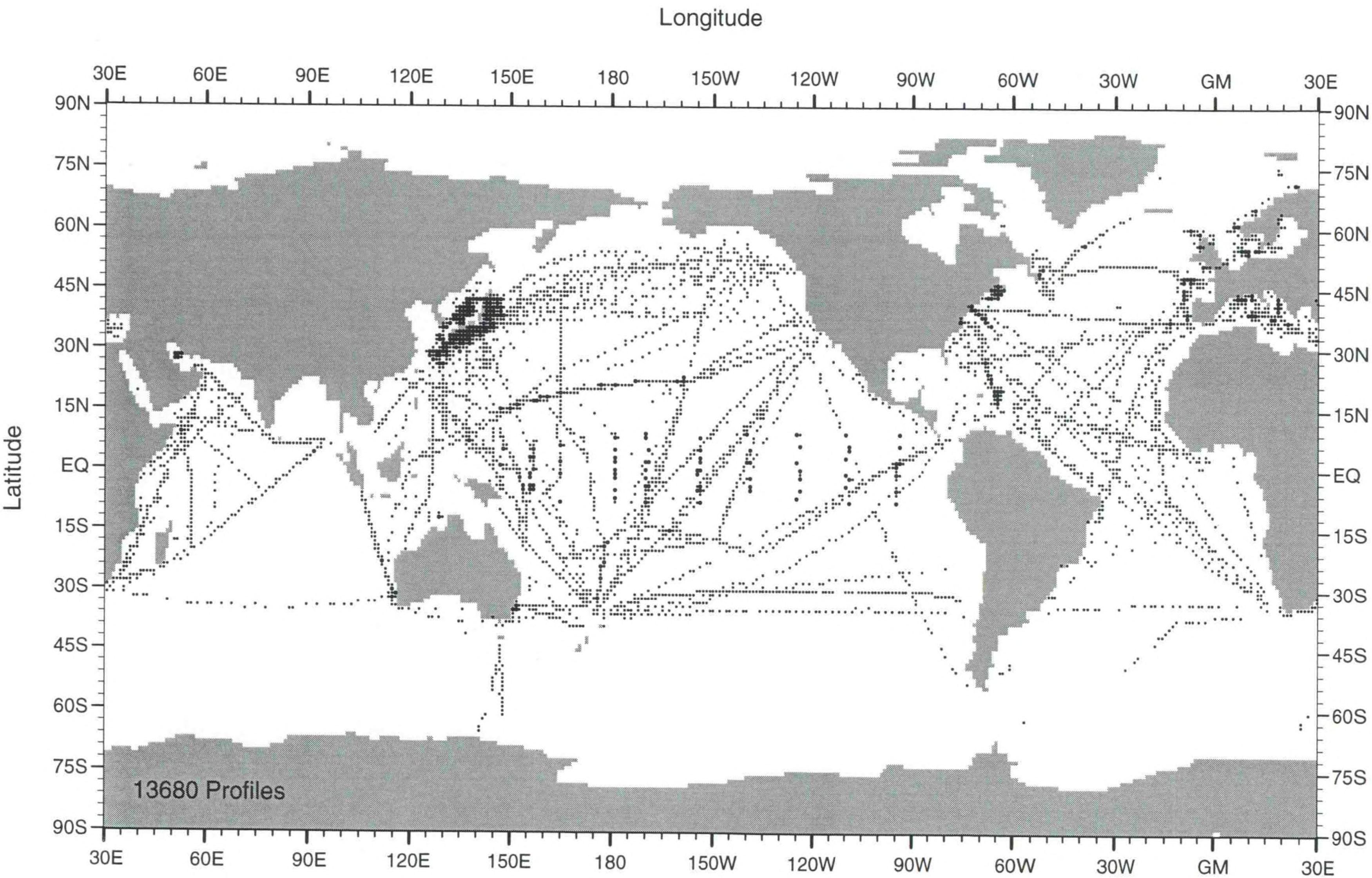


Fig. B224 Distribution of all data profiles (OSD+MBT+XBT+CTD+TAO) in WOD98 for October-December for 1996

NOAA SCIENTIFIC AND TECHNICAL PUBLICATIONS

The National Oceanic and Atmospheric Administration was established as part of the Department of Commerce on October 3, 1970. The mission responsibilities of NOAA are to assess the socioeconomic impact of natural and technological changes in the environment and to monitor and predict the state of the solid Earth, the oceans and their living resources, the atmosphere, and the space environment of the Earth.

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