ATLAS OF THE NORTHERN INDIAN OCEAN

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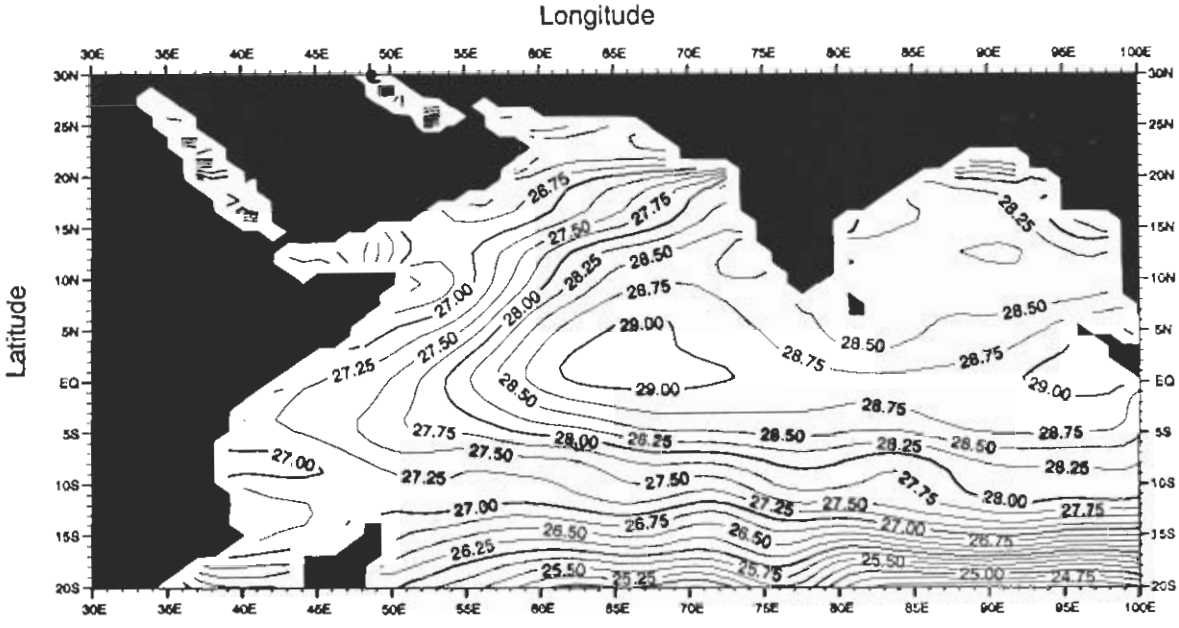
September 1994



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1. INTRODUCTION

The Ocean Climate Laboratory (OCL) at the National Oceanographic Data Center (NODC) is supported by the NOAA Climate and Global Change program to produce scientifically quality controlled oceanographic databases. Work to date includes quality control of historical temperature, salinity, oxygen, phosphate, nitrate, and silicate data and the preparation of one-degree latitude-longitude mean fields for each of these parameters using objective analysis techniques. Specifically, to date this project has produced four ocean atlases describing results (Conkright et *al.*, 1994a; Levitus and Boyer, 1994a; Levitus et *al.*, 1994b, 1994c) and two technical reports describing the quality control and processing procedures (Boyer and Levitus, 1994; Conkright et *al.*, 1994b). The World Ocean atlases include global distributions of temperature, salinity, oxygen, oxygen saturation and Apparent Oxygen Utilization (AOU), and the nutrients phosphate, silicate and nitrate. The figures in the Atlas of the Northern Indian Ocean are a subset of the global figures shown in the above mentioned world atlases.

Observed and standard level profile data (along with quality control flags) and the objectively analyzed one-degree latitude-longitude mean fields for each of the measured parameters and the derived parameters (Apparent Oxygen Utilization and oxygen saturation) and five-degree square statistics of standard levels values, used in the production of this atlas is being made available to the international oceanographic community on the World Ocean Atlas 1994 CD-ROM series. The WOA94 CD-ROMs are available on order from the NODC.

The Ocean Climate Laboratory expresses its thanks to all those who provided us with their comments and helped us develop an improved product.

2. DATA SOURCES

The data used in this project are all the data found in the NODC archives as of the first quarter of 1993. Levitus and Gelfeld (1992) show global distribution maps of the data held in these files for all years (1900-1992). In addition, data gathered as a result of the NODC's National Oceanographic Data Archaeology and Rescue (NODAR) and the IOC/IODE Global Oceanographic Data Archaeology and Rescue (GODAR) projects, not yet incorporated into the NODC master archives, were included in this study. A description of the NODAR and GODAR projects can be found in Levitus *et al.* (1994e).

A. STATION DATA

Parameters:
Temperature
Salinity
Oxygen
Phosphate
Silicate
Nitrate

Sources:
NODC Station Data
Alfred Wegner Institute for Polar Studies
Southern Ocean data set
Australian station data (CSIRO)
China Sea station data (from POI, Russia)
Combined Mediteranean area station data
German station data
Icelandic station data
ICES (International Council for the

Exploration of the Sea) station data
Indian NODC station data
Japanese station data (JODC)
Korean NODC station data
Miscellaneous ship of opportunity station data
Station Data from the Southtow cruise (Scripps Institution of Oceanography)
Station data from India

B. PARAMETER INFORMATION

Table 1. Precisions and number of profiles for each flagged parameter.

Parameter	Unit	Maximum stored precision	# of Profiles
Temperature	°C	xx.xxx	4,553,426
Salinity	p.s.u.	xx.xxx	1,254,771
Oxygen	ml/l	xx.xx	367,635
Phosphate	micromolar	xx.xx	184,153
Nitrate	micromolar	xx.x	75,403
Silicate	micromolar	xxx.x	110,413

C. DATA QUALITY CONTROL

The quality control procedures have been documented in two NOAA Technical Reports (Boyer and Levitus, 1994; Conkright *et al.*, 1994b).

The quality of the observed and standard level data was checked using the following procedures:

a. Preliminary checks - checks for duplicate profiles, depth inversions;
b. Range check of the observed level data for each major basin as a function of depth;
c. Large temperature inversion and gradient checks;
d. Density inversion check on the standard level data;
e. XBT drop rate correction before interpolation of observed level to standard level data for T4, T6, and T7 probes;
f. Standard deviation check;
g. Check for unrealistic features after an initial computation of the objective analysis.

D. AVAILABLE OBJECTIVELY ANALYZED FIELDS

Table 3. Available objectively analyzed fields for each parameter.

PARAMETER	ANNUAL*	SEASON**
Temperature	X	X
Salinity	X	X
Dissolved oxygen	X	X
Apparent Oxygen Utilization	X	X
Phosphate	X	X
Nitrate	X	X
Silicate	X	X

*ANNUAL - composite of all data regardless of season or year
**SEASON - data composited based on the seasons (follows Northern Hemisphere convention). The seasons are defined as follows:
Winter (January - March)
Spring (April - June)
Summer (July - September)
Fall (October - December)

Figure 1 shows the horizontal co-ordinate system used to store the analyzed data.

3. EXPLANATION OF STANDARD LEVEL FIGURES

Continents are indicated as solid - black areas. Ocean areas shallower than the standard depth level being displayed are gray. Negative regions are dot stippled. Gridpoints for which there were less than three one-degree-square values available to"correct the first guess are indicated by an X. Dashed lines represent non-standard contours. "H" and "L" indicate locations of the absolute maximum and minimum of the entire field. All figures were computer drafted. As a result some contours are not labelled. For clarity we use dark lines for every fourth or fifth contour in the standard level fields.

4. ACKNOWLEDGEMENTS

The University of South Florida contribution to this work was funded in part by the National Science Foundation, the National Aeronautics and Space Administration, and the Office of Naval Research.

Figure 1. One-degree horizontal co-ordinate system of the analyzed fields

Each element F(i,j) of an analyzed field F, where F is dimensioned F(360,180), is considered to represent the value at the center of a one-degree latitude longitude square

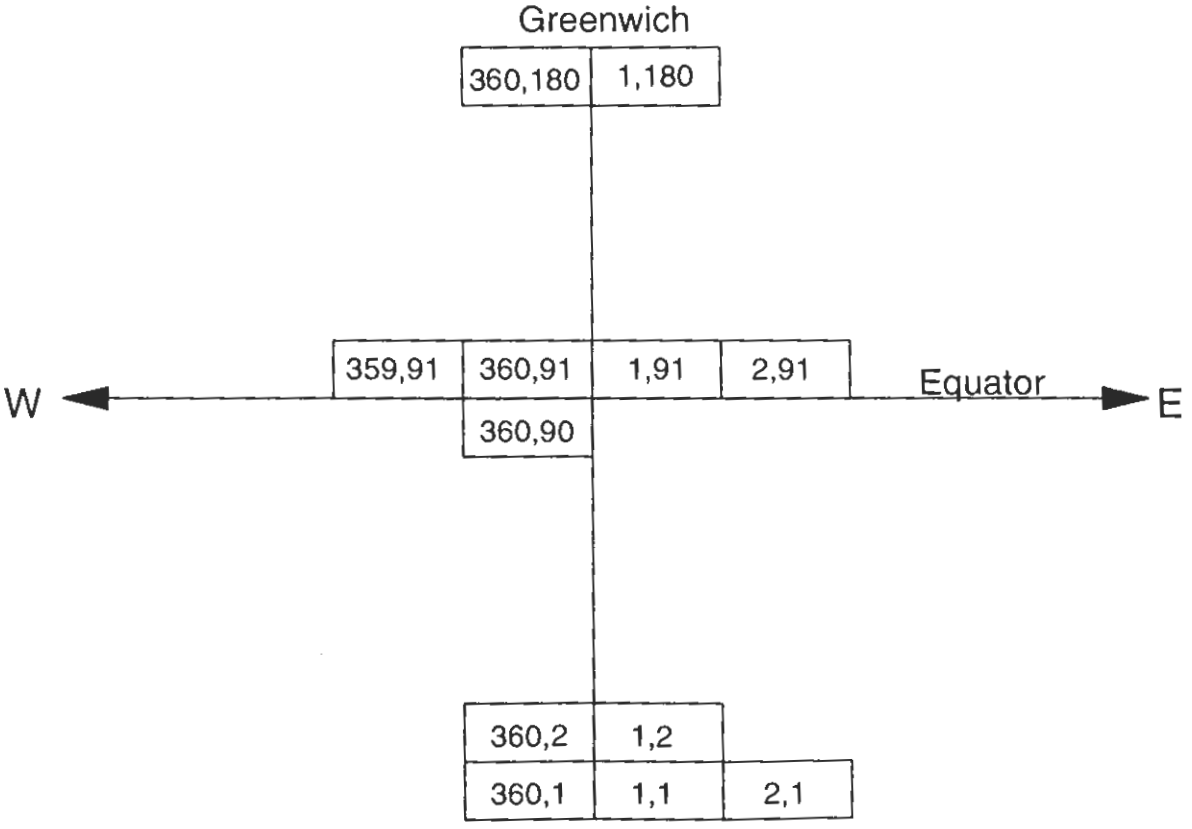
Longitude denoted by the variable "i", varies from 1 at 0.5 °E to 360 at 0.5°W

Latitude denoted by the variable "j", varies from 1 at 89.5 °S to 180 at 89.5°N

The point F(1,1) is the value at 0.5 °E, 89.5 °S

The point F(218,20) is the value at 142.5°W, 70.5°S

The point F(360,91) is the value at 0.5°W, 0.5°N



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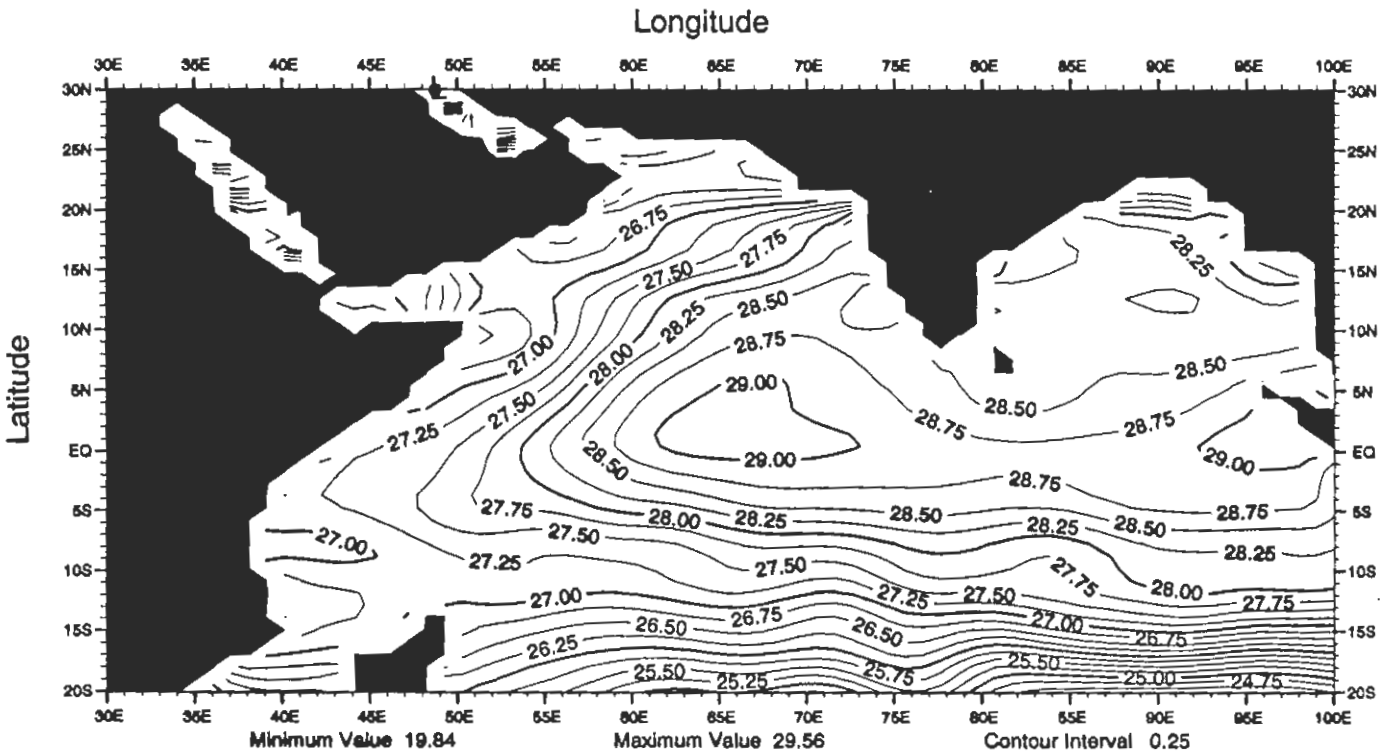


Fig. A1 Annual mean temperature (°c) at the surface

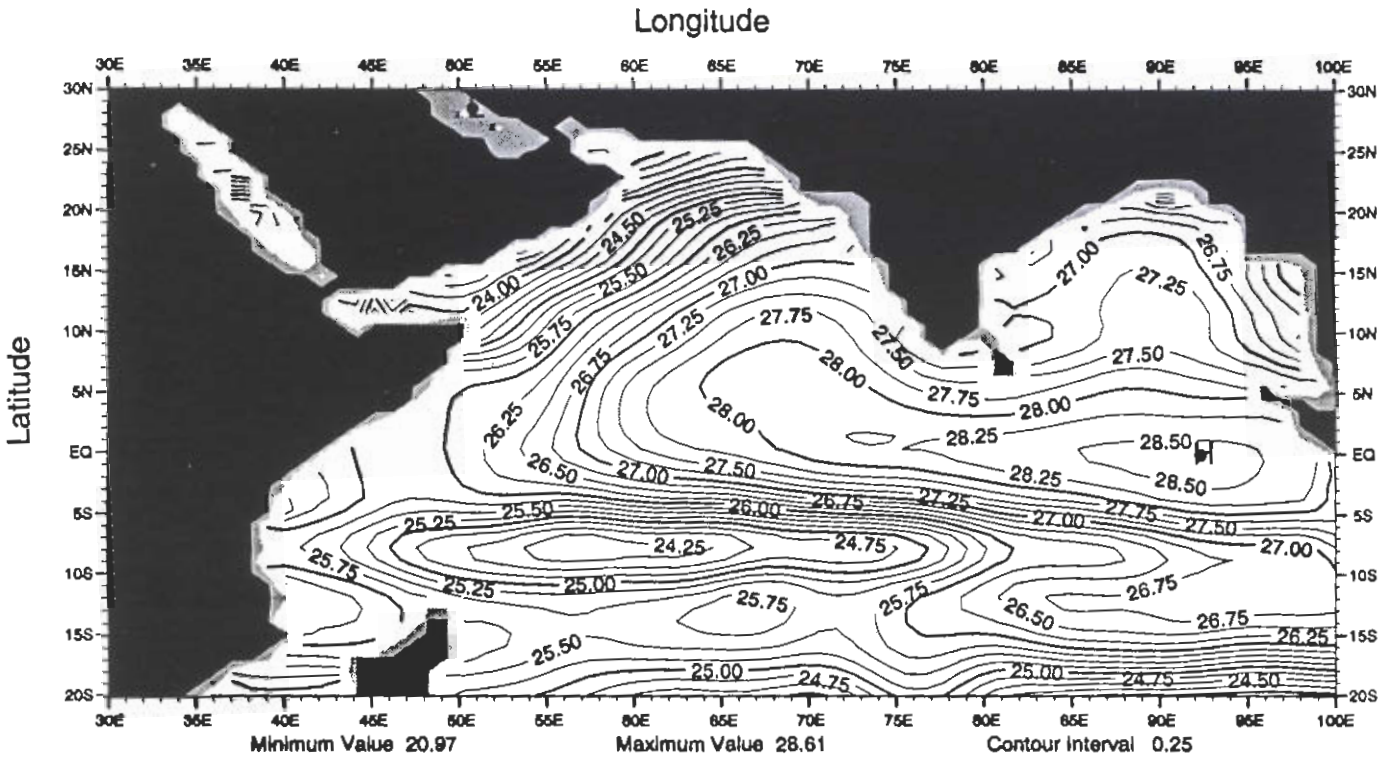


Fig. A2 Annual mean temperature (°c) at 50 m depth

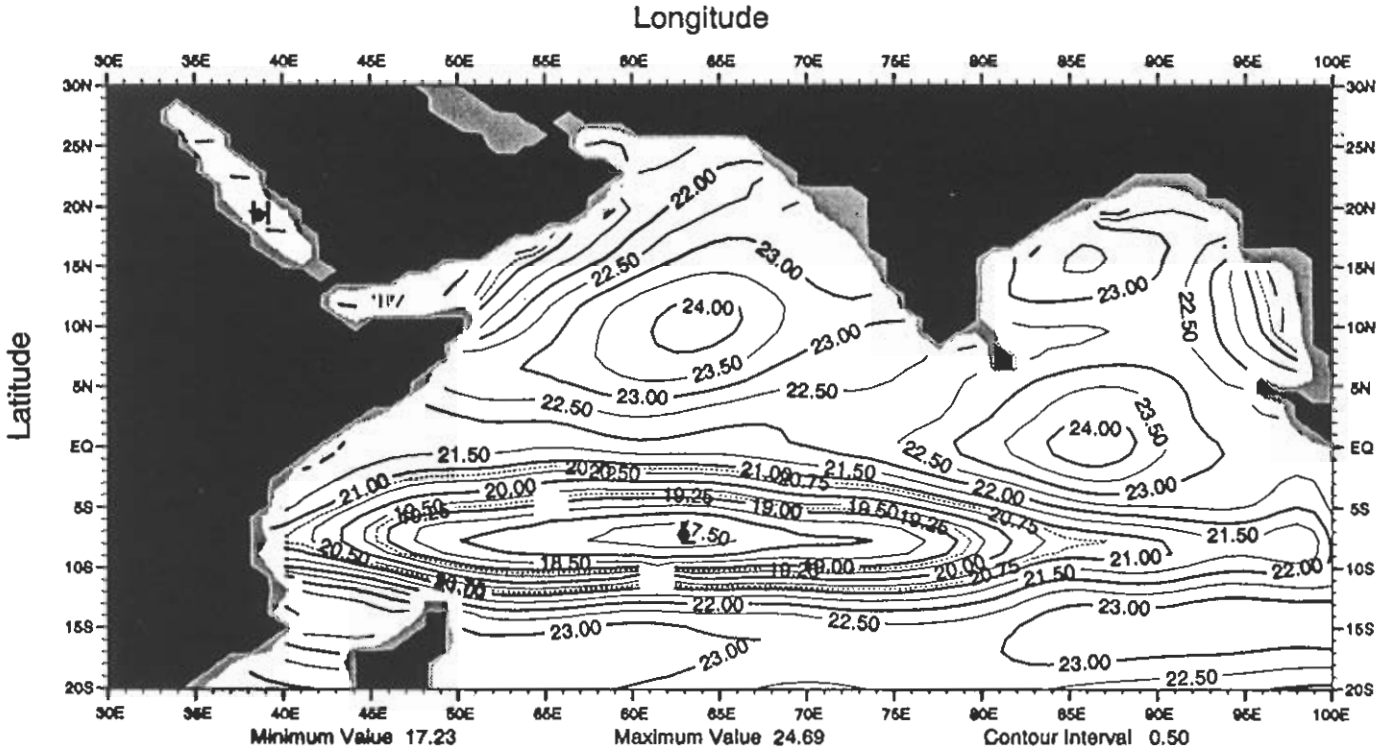


Fig. A3 Annual mean temperature (°c) at 100 m depth

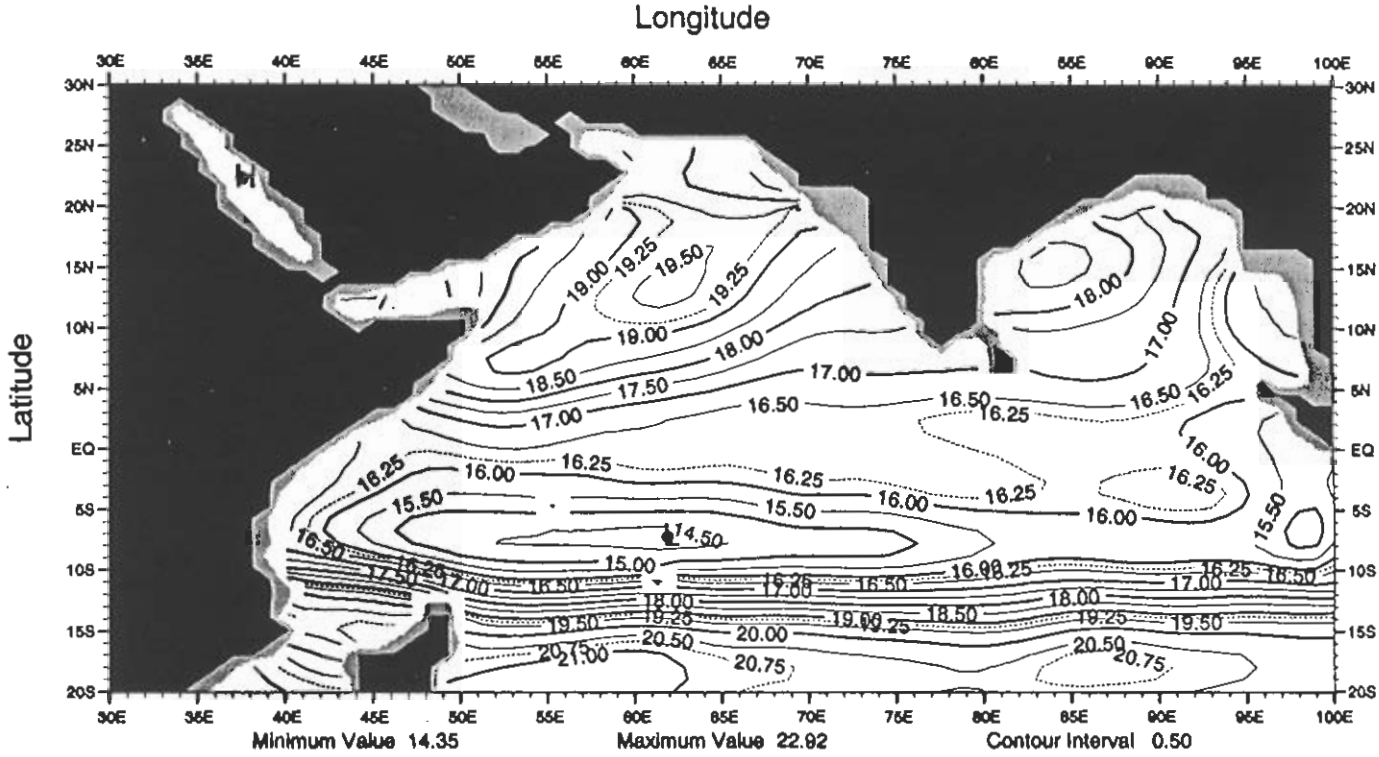


Fig. A4 Annual mean temperature (°c) at 150 m depth

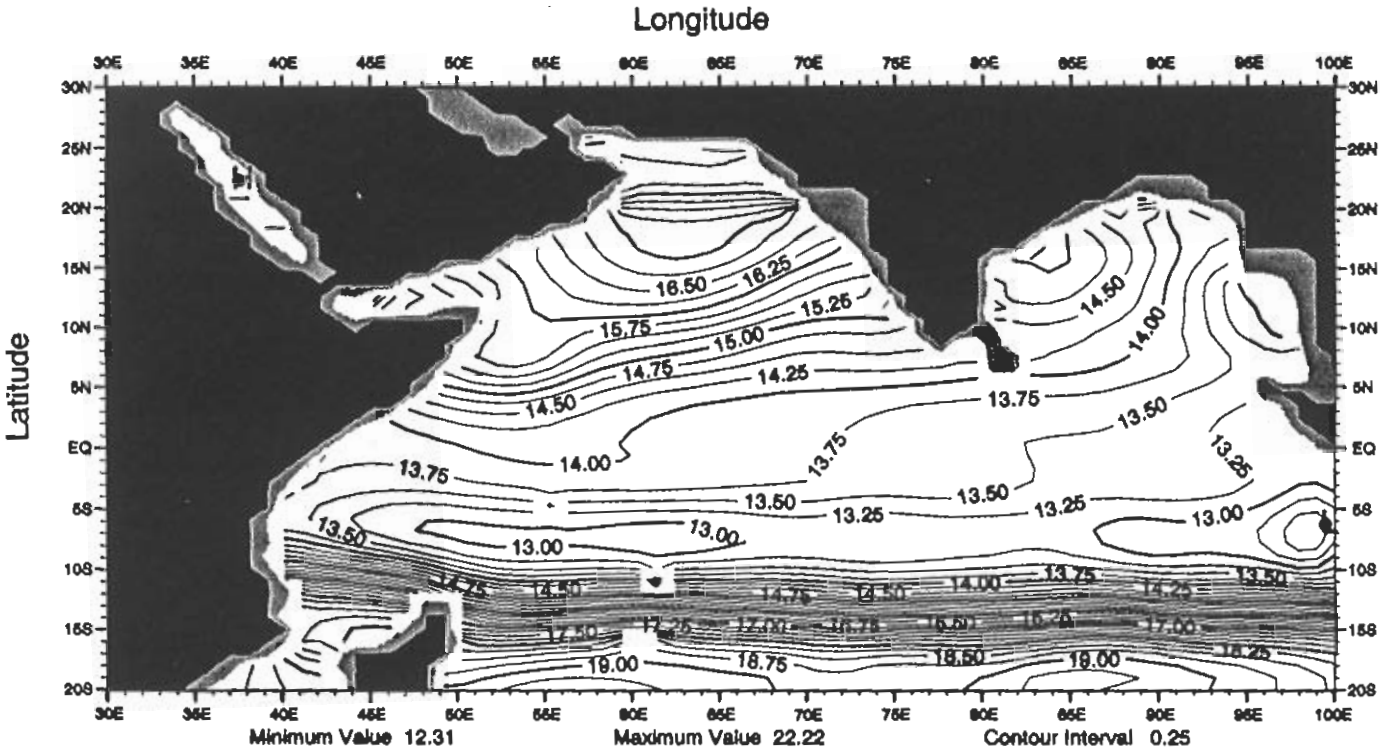


Fig. A5 Annual mean temperature (°C) at 200 m depth

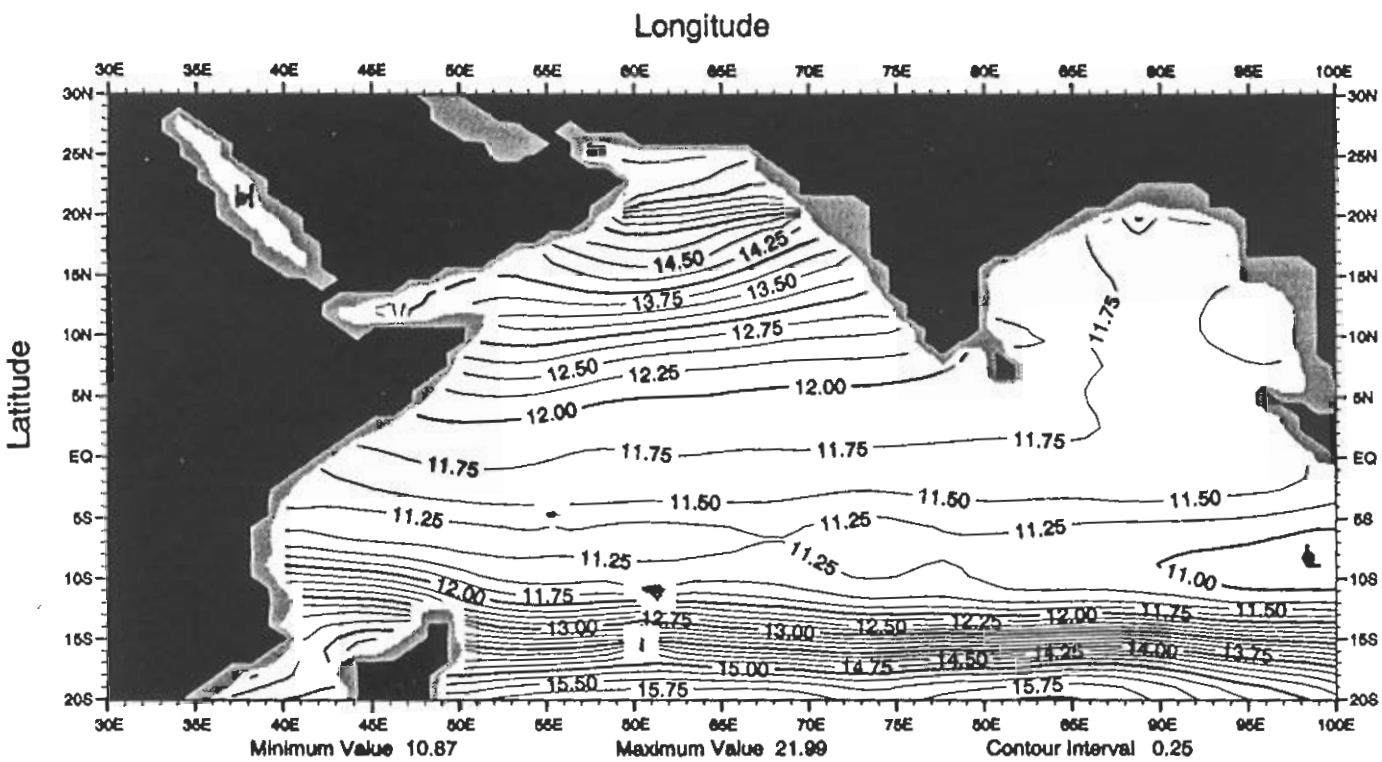


Fig. A6 Annual mean temperature (°C) at 300 m depth

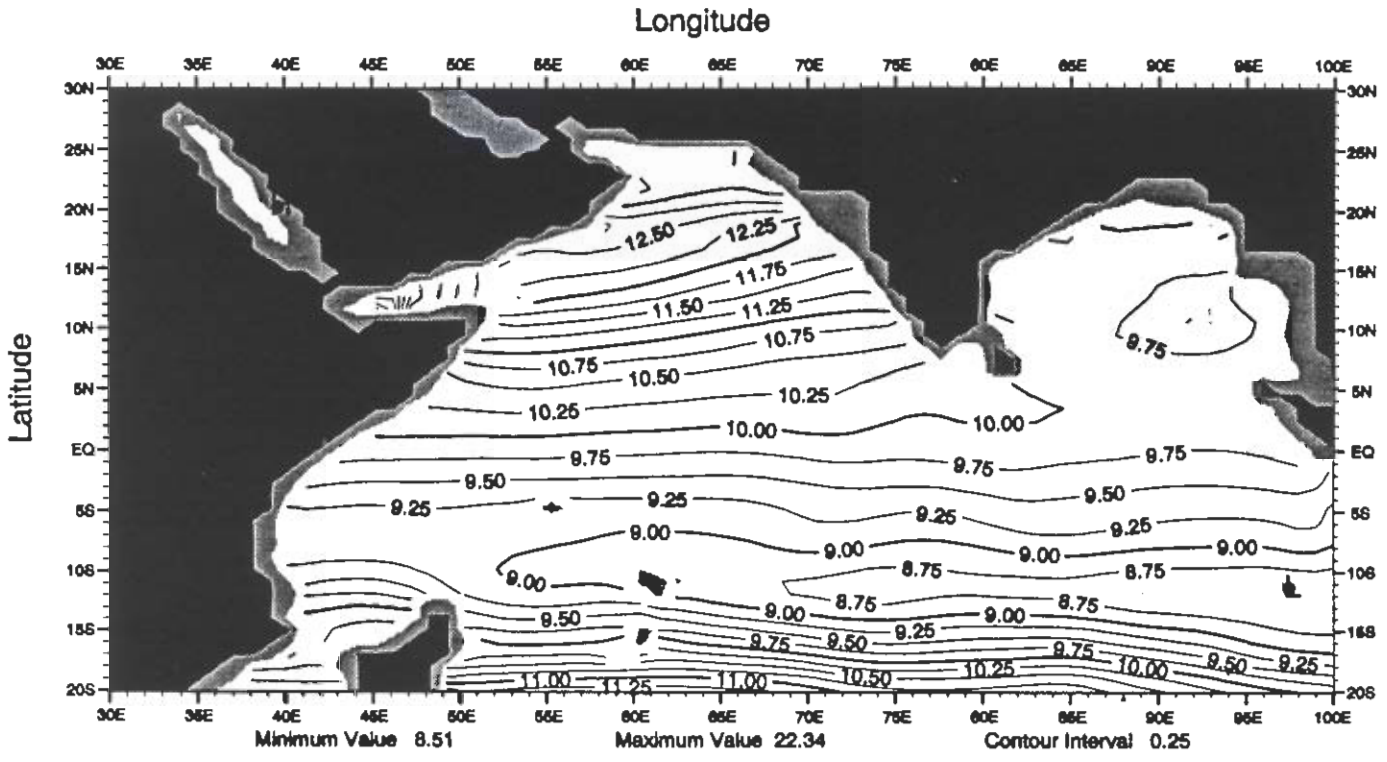


Fig. A7 Annual mean temperature (°C) at 500 m depth

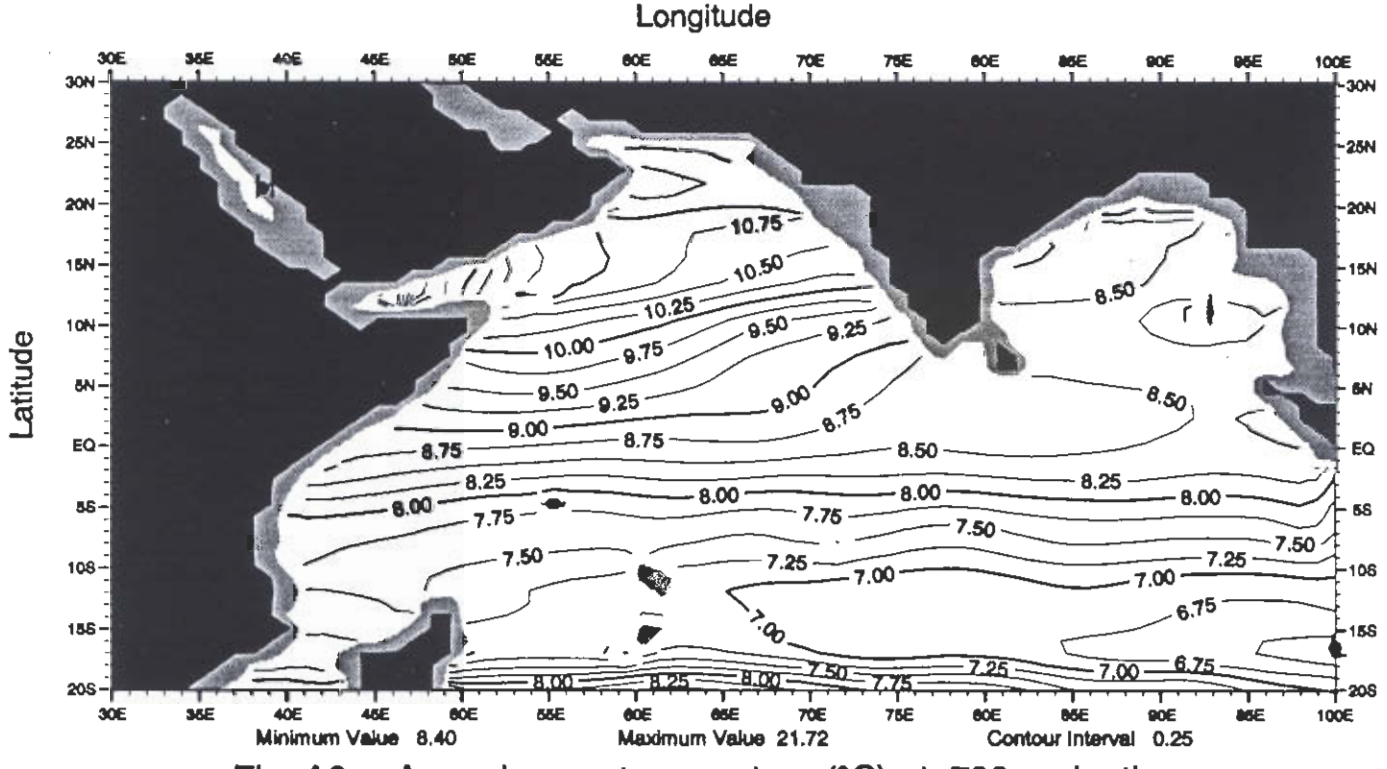


Fig. A8 Annual mean temperature (°C) at 700 m depth

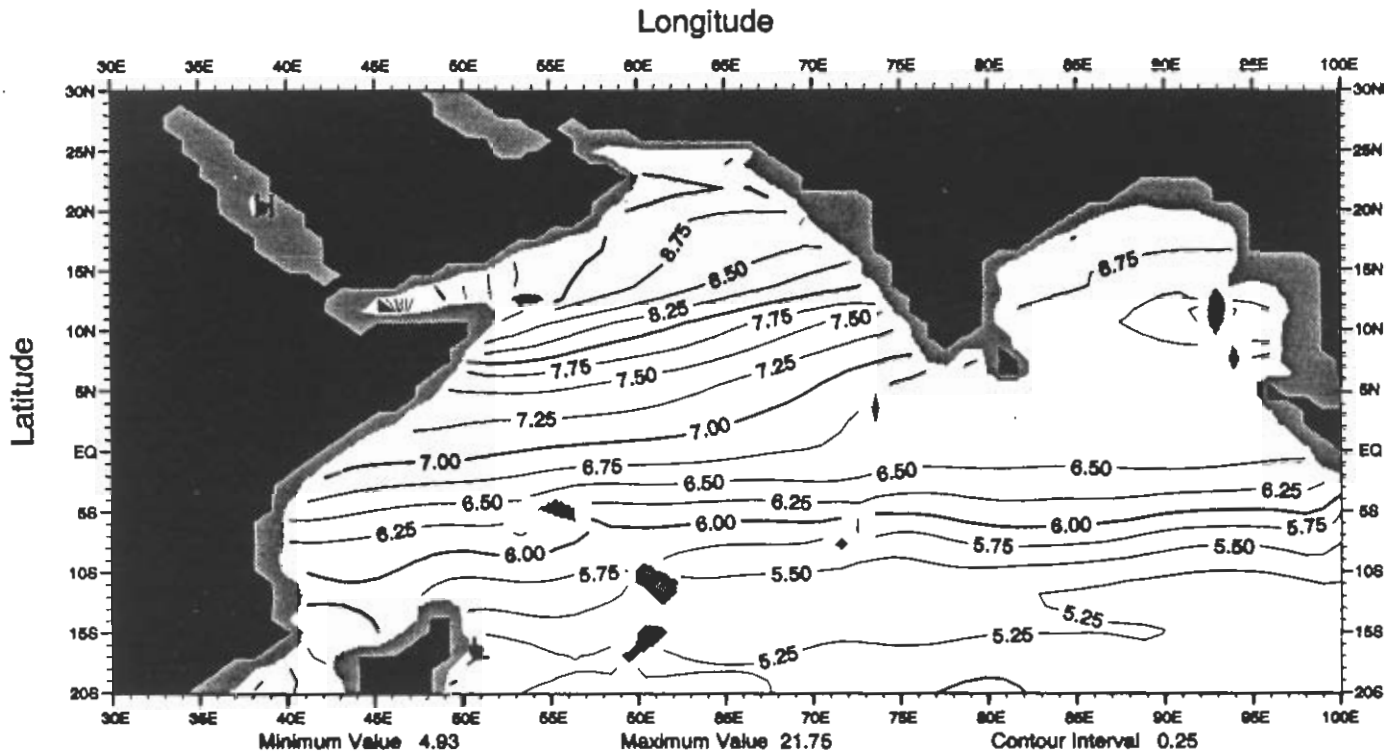


Fig. A9 Annual mean temperature (°C) at 1000 m depth

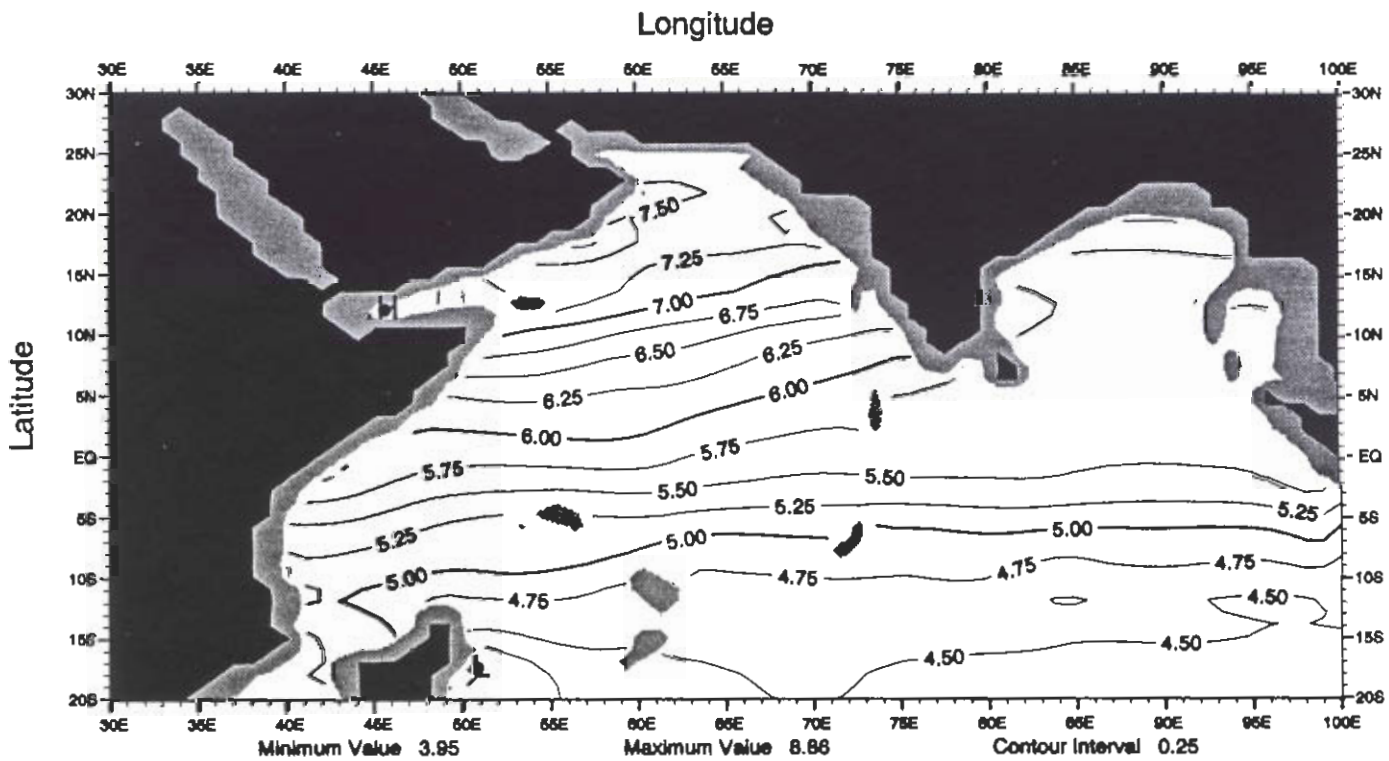


Fig. A10 Annual mean temperature (°C) at 1200 m depth

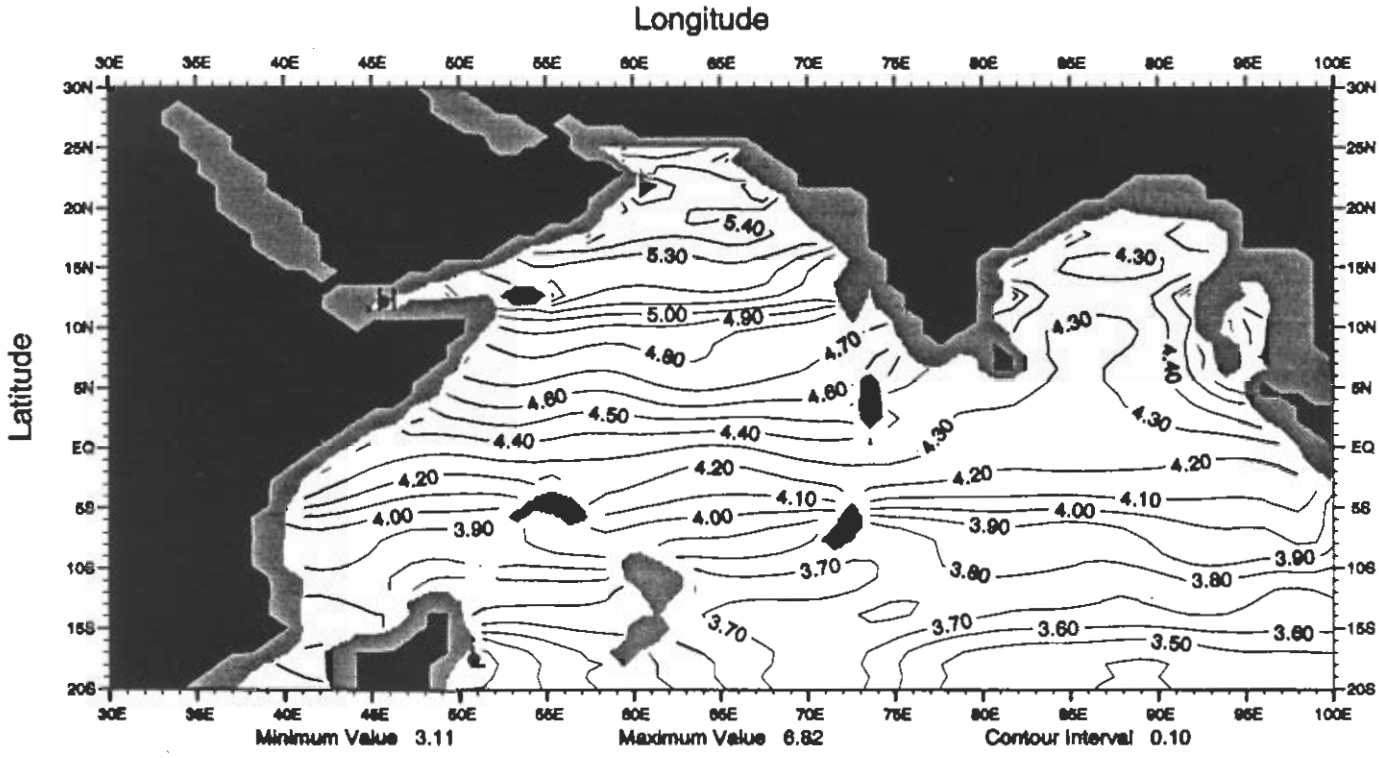


Fig. A11 Annual mean temperature (°C) at 1500 m depth

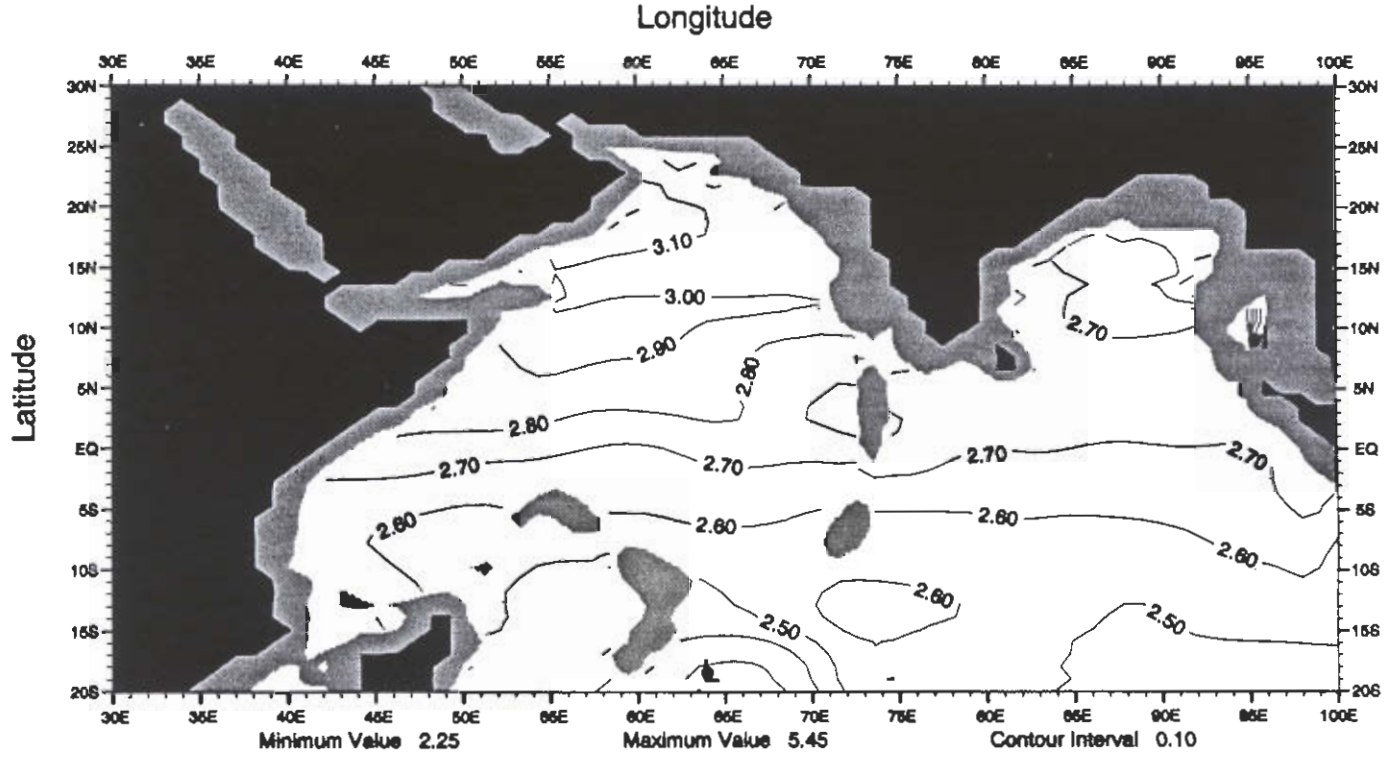


Fig. A12 Annual mean temperature (°C) at 2000 m depth

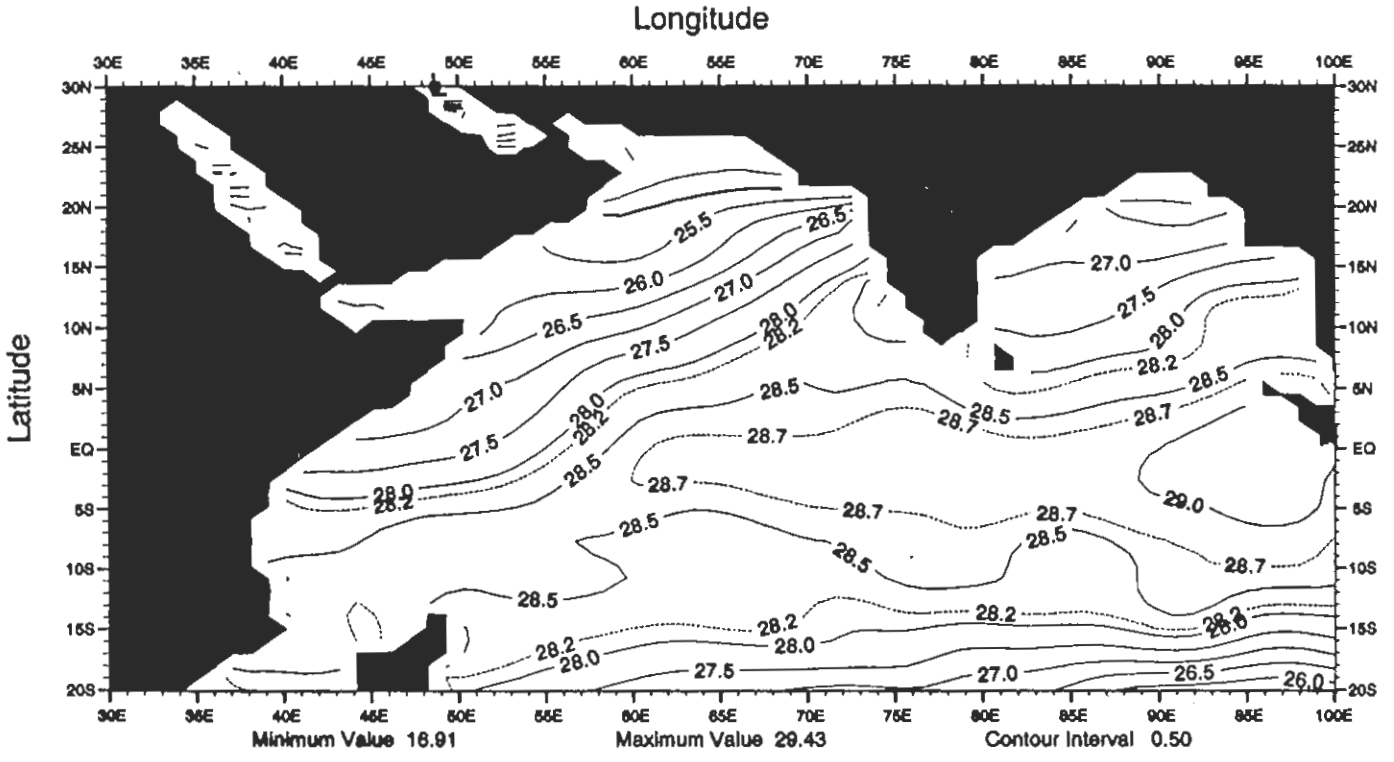


Fig. A13 Winter (Jan.Mar.) mean temperature (°C) at the surface

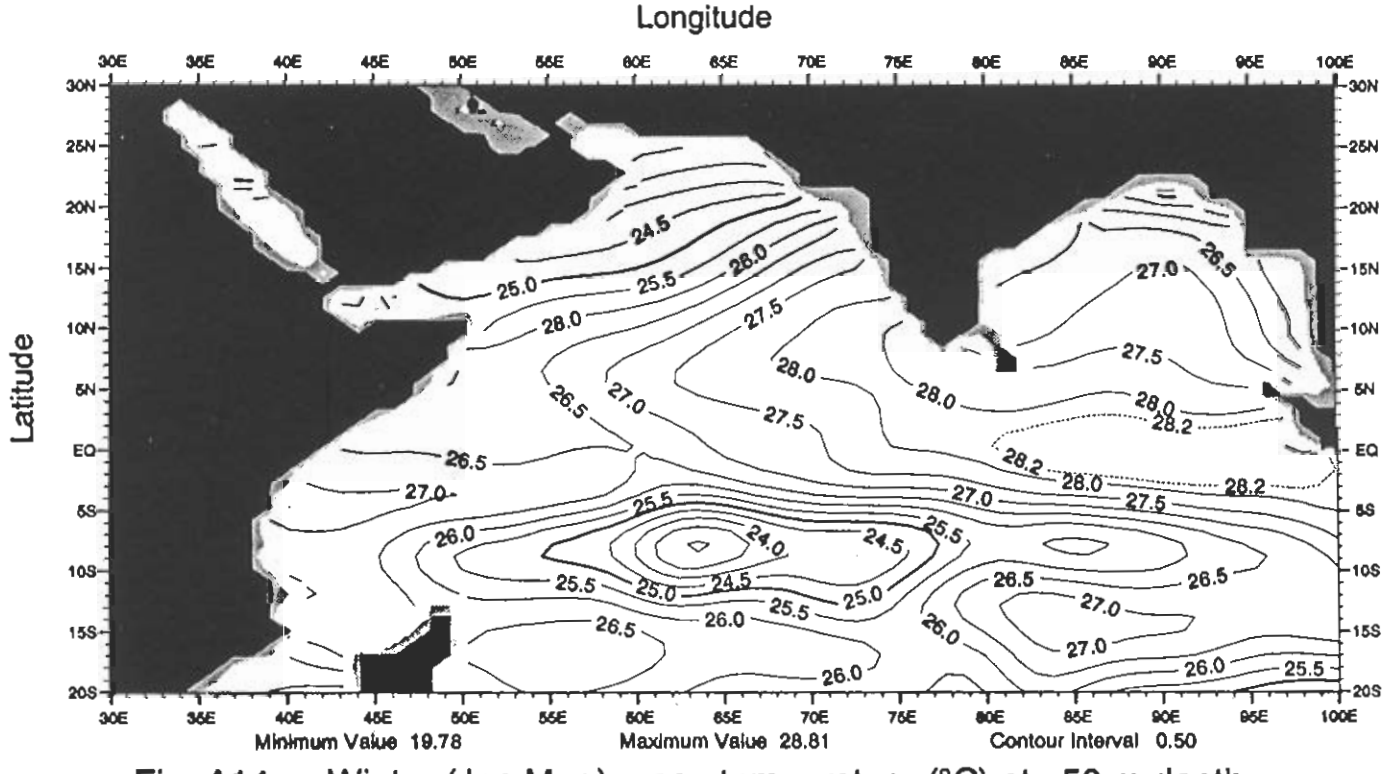


Fig. A14 Winter (Jan.Mar.) mean temperature (°C) at 50 m depth

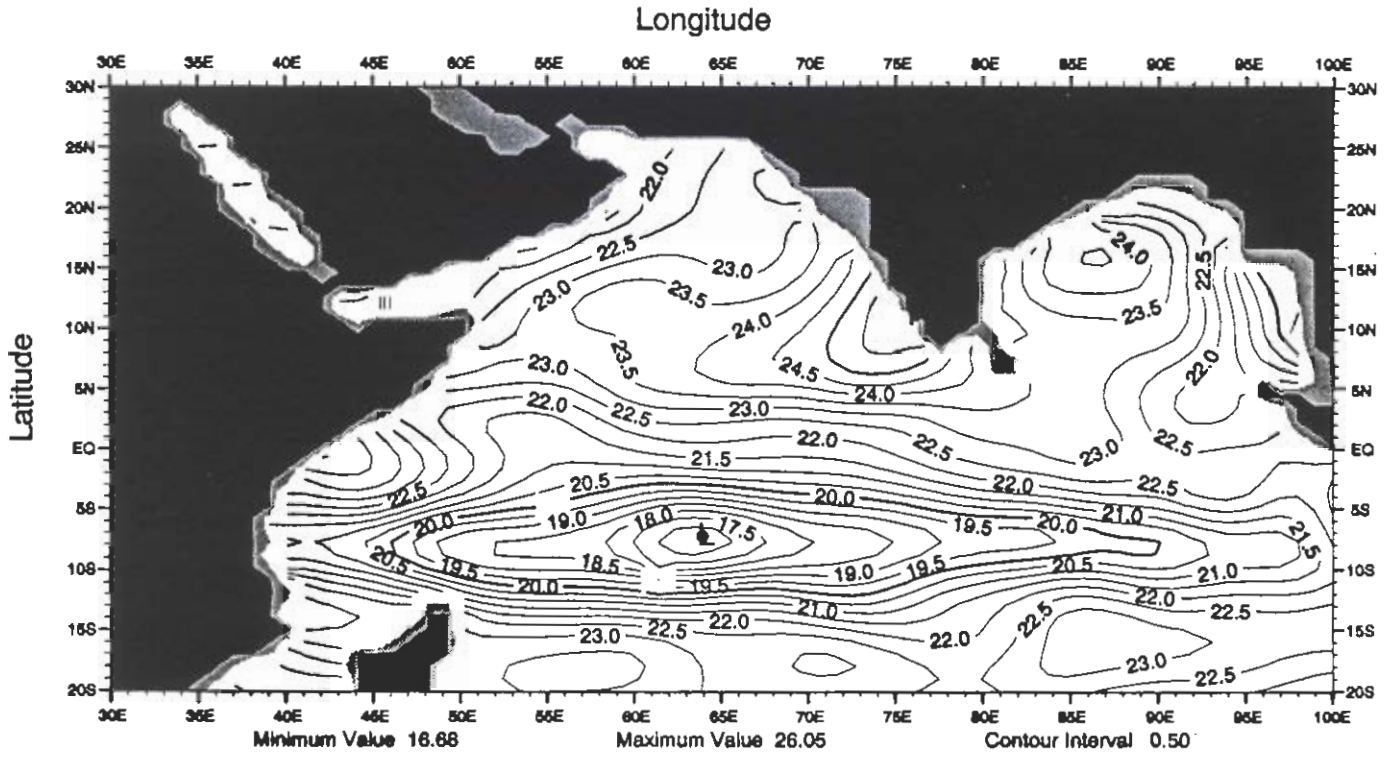


Fig. A15 Winter (Jan.Mar.) mean temperature (°C) at 100 m depth

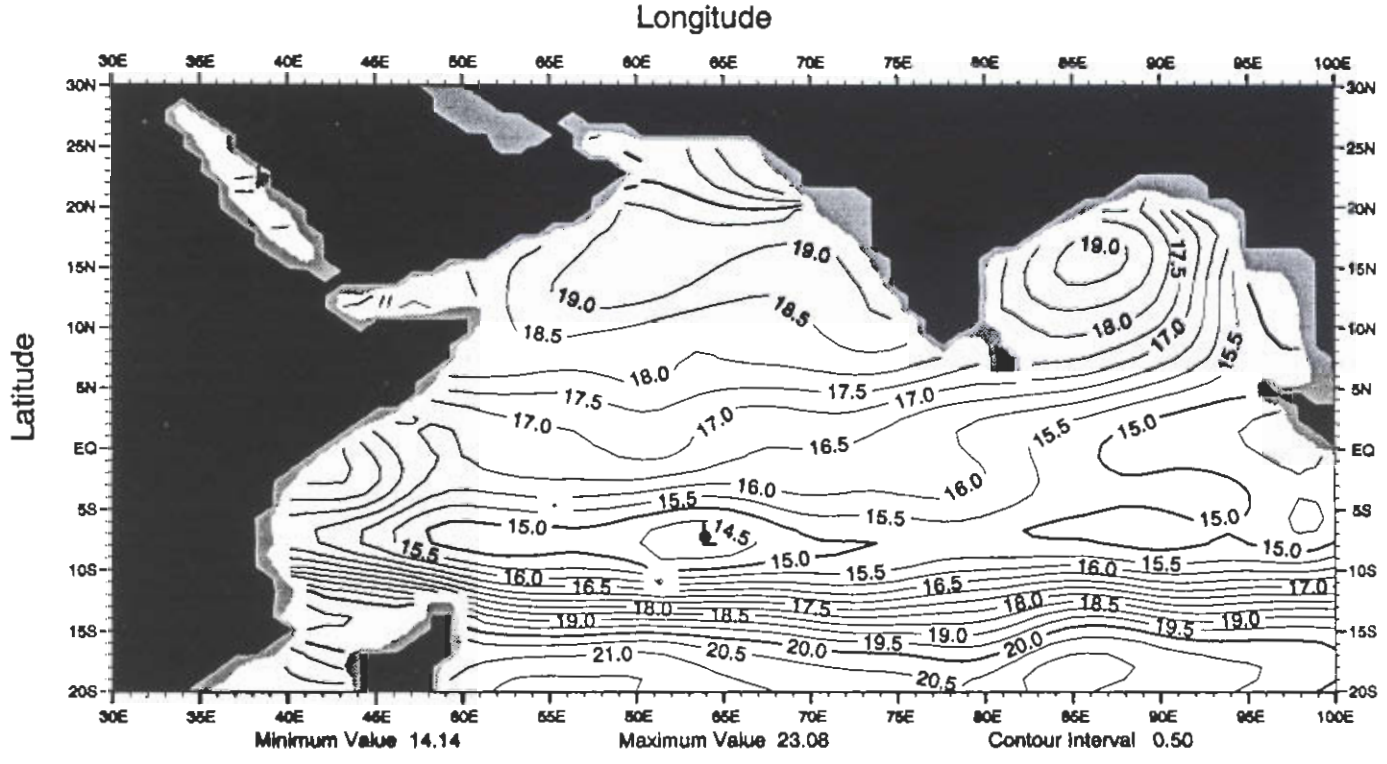


Fig. A16 Winter (Jan.Mar.) mean temperature (°C) at 150 m depth

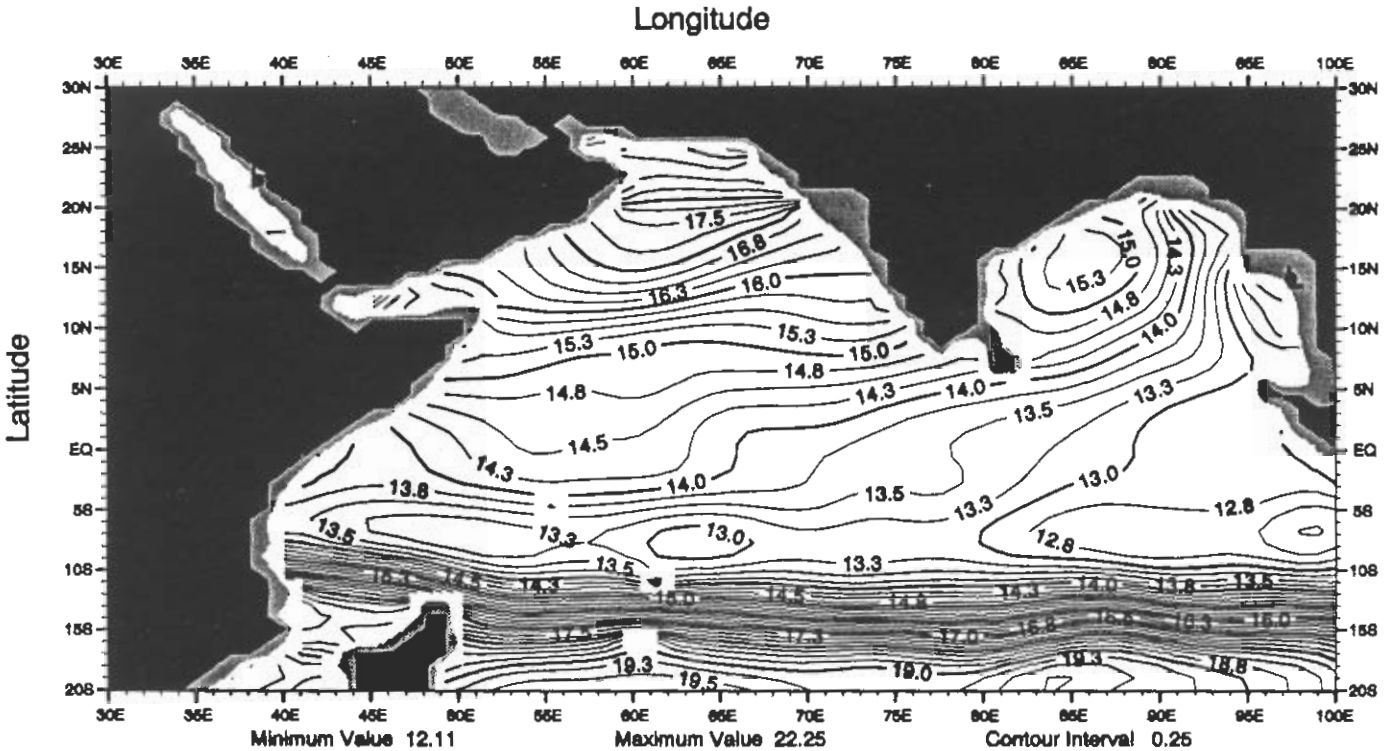


Fig. A17 Winter (Jan.-Mar.) mean temperature (°C) at 200 m depth

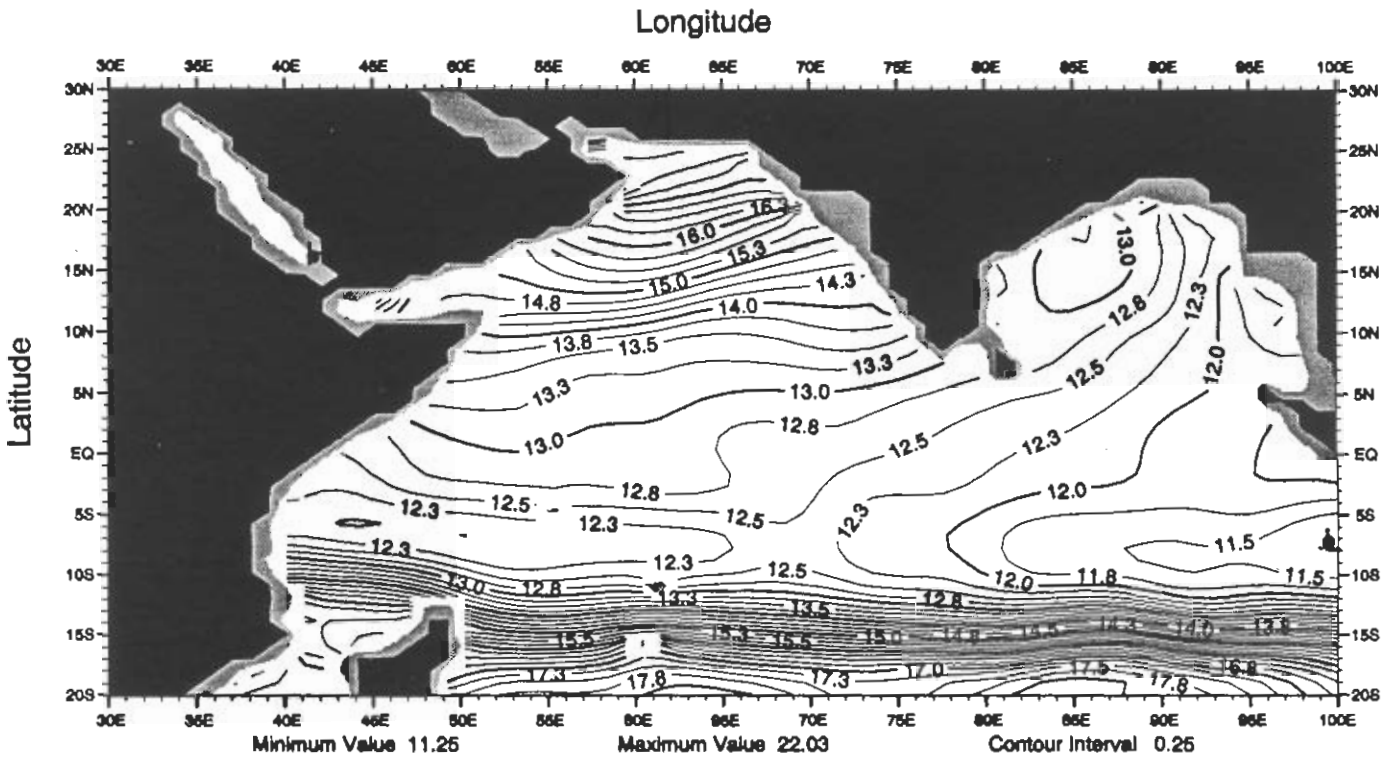


Fig. A18 Winter (Jan.-Mar.) mean temperature (°C) at 250 m depth

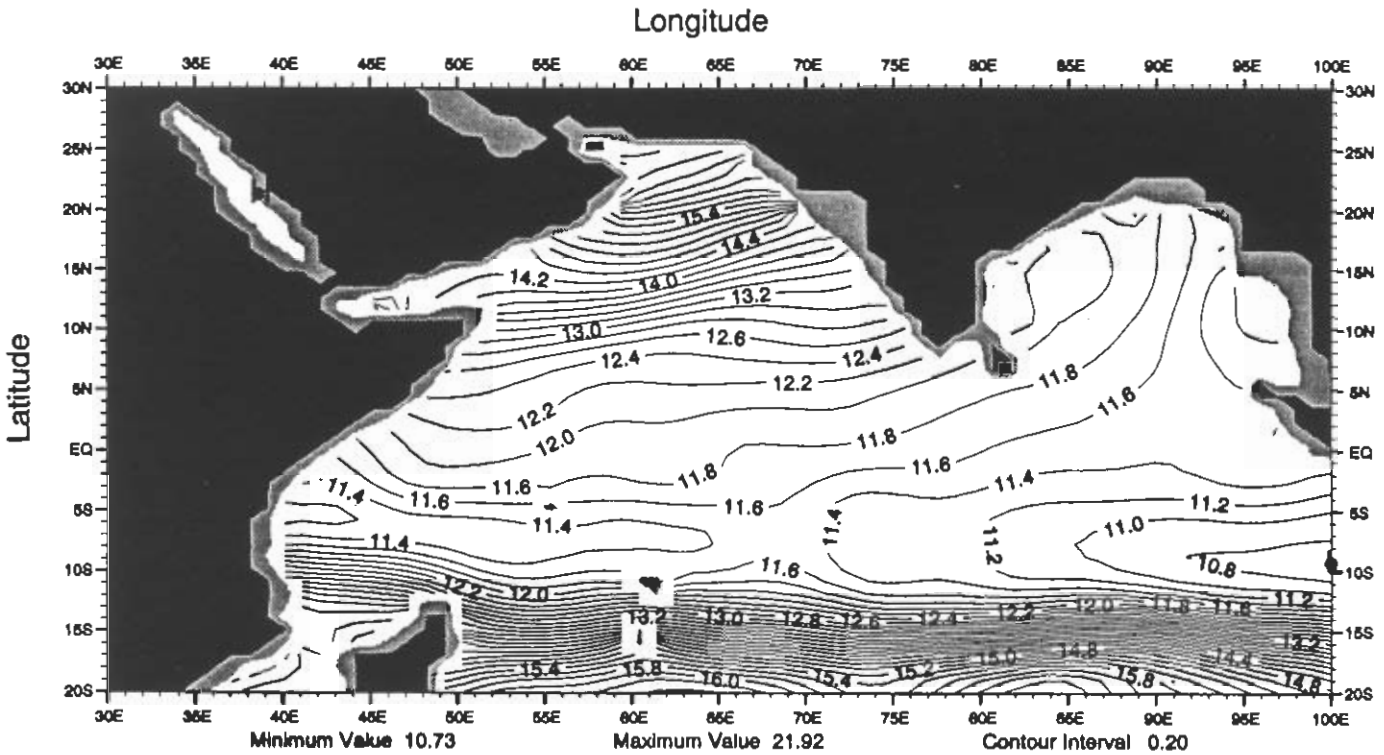


Fig. A19 Winter (Jan.Mar.) mean temperature (°C) at 300 m depth

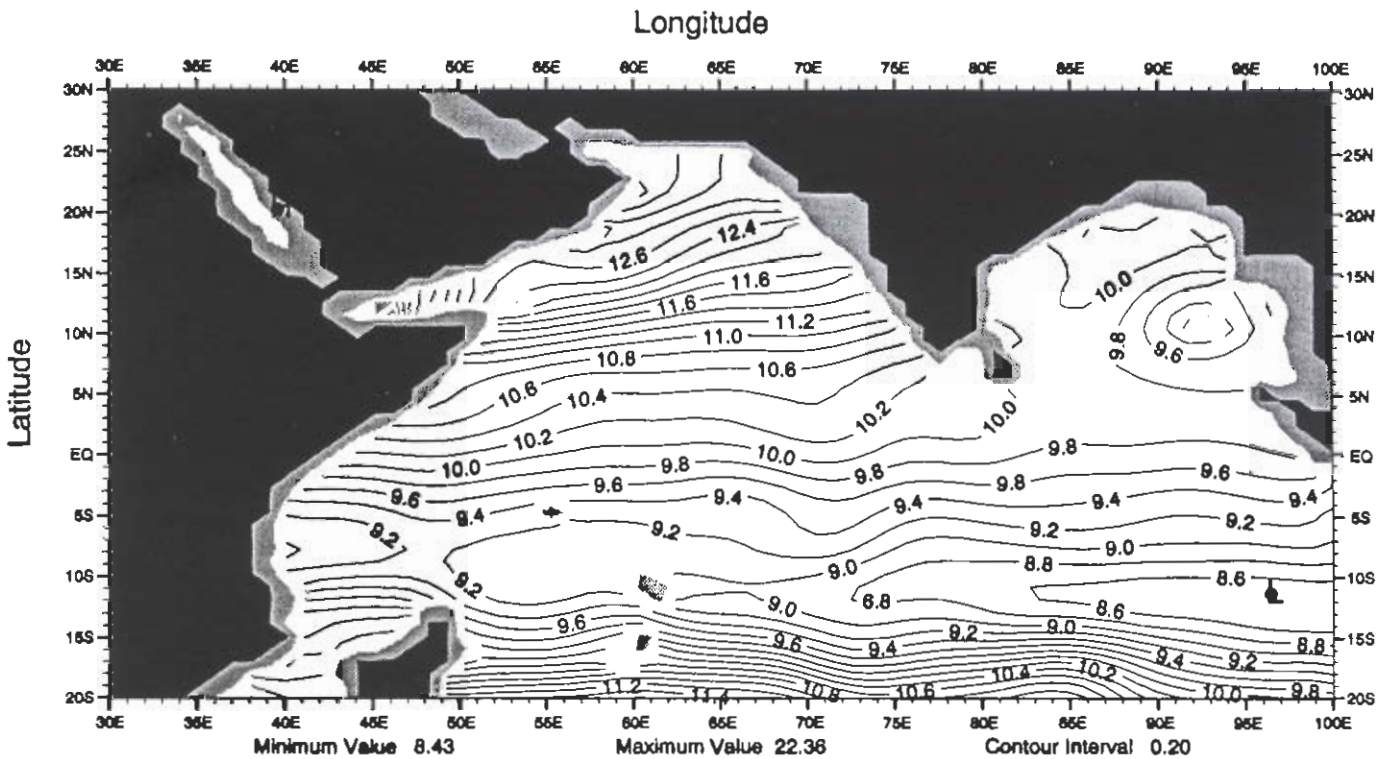


Fig. A20 Winter (Jan.Mar.) mean temperature (°C) at 500 m depth

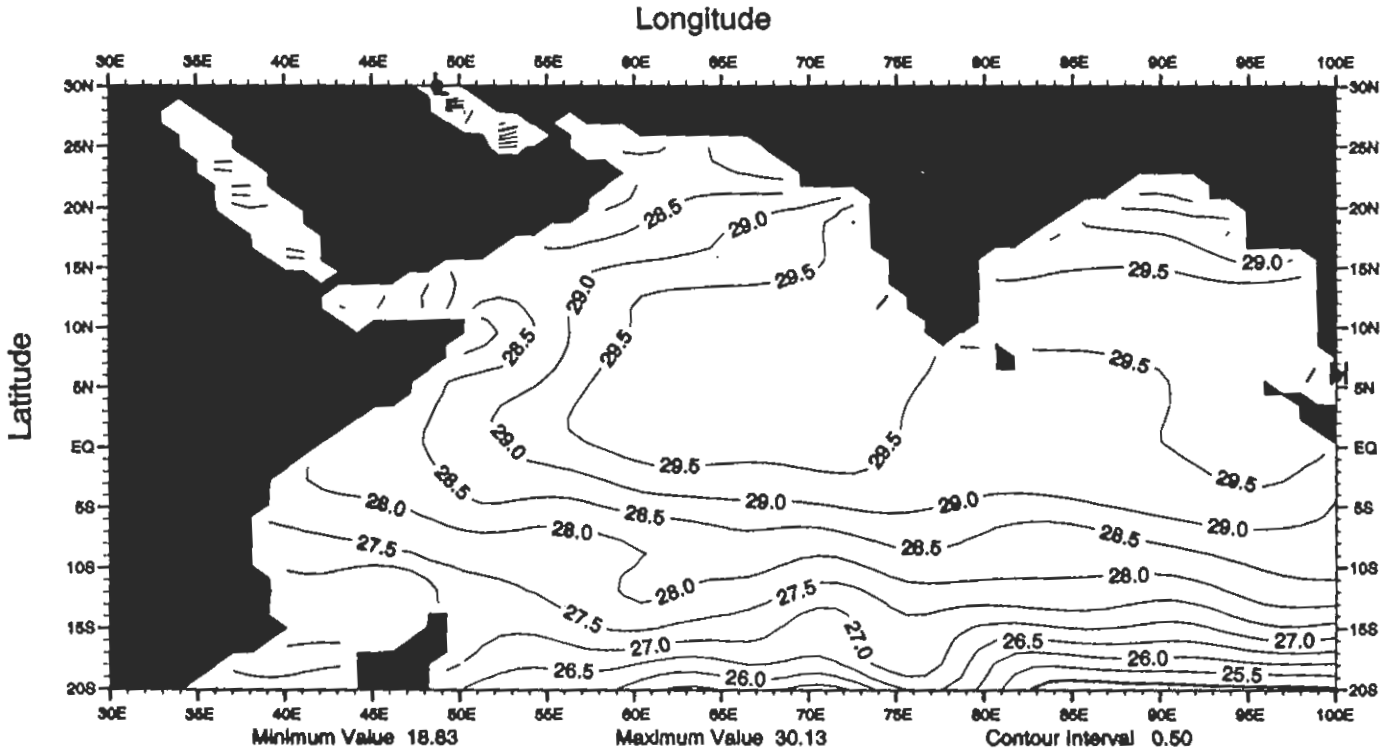


Fig. A21 Spring (Apr.-Jun.) mean temperature (°C) at the surface

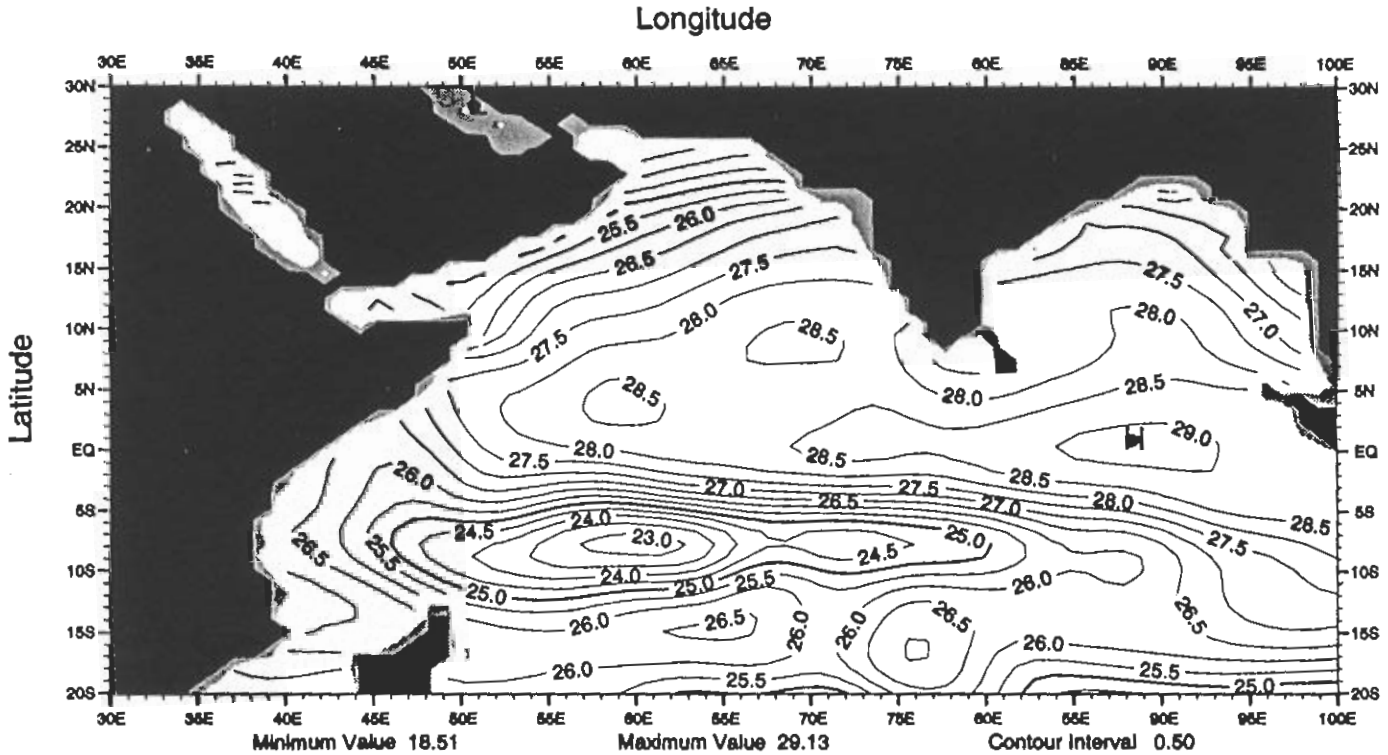


Fig. A22 Spring (Apr.-Jun.) mean temperature (°C) at 50 m depth

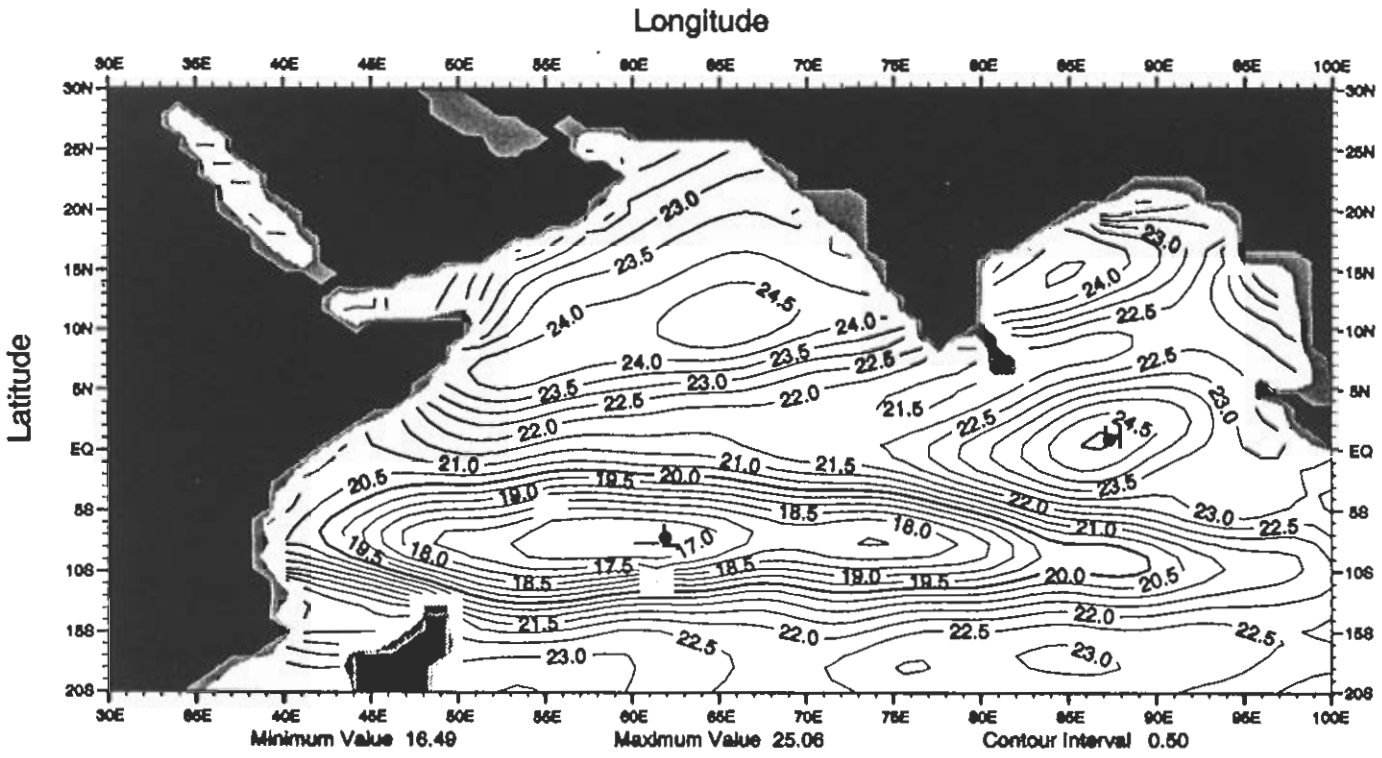


Fig. A23 Spring (Apr.-Jun.) mean temperature (°C) at 100 m depth

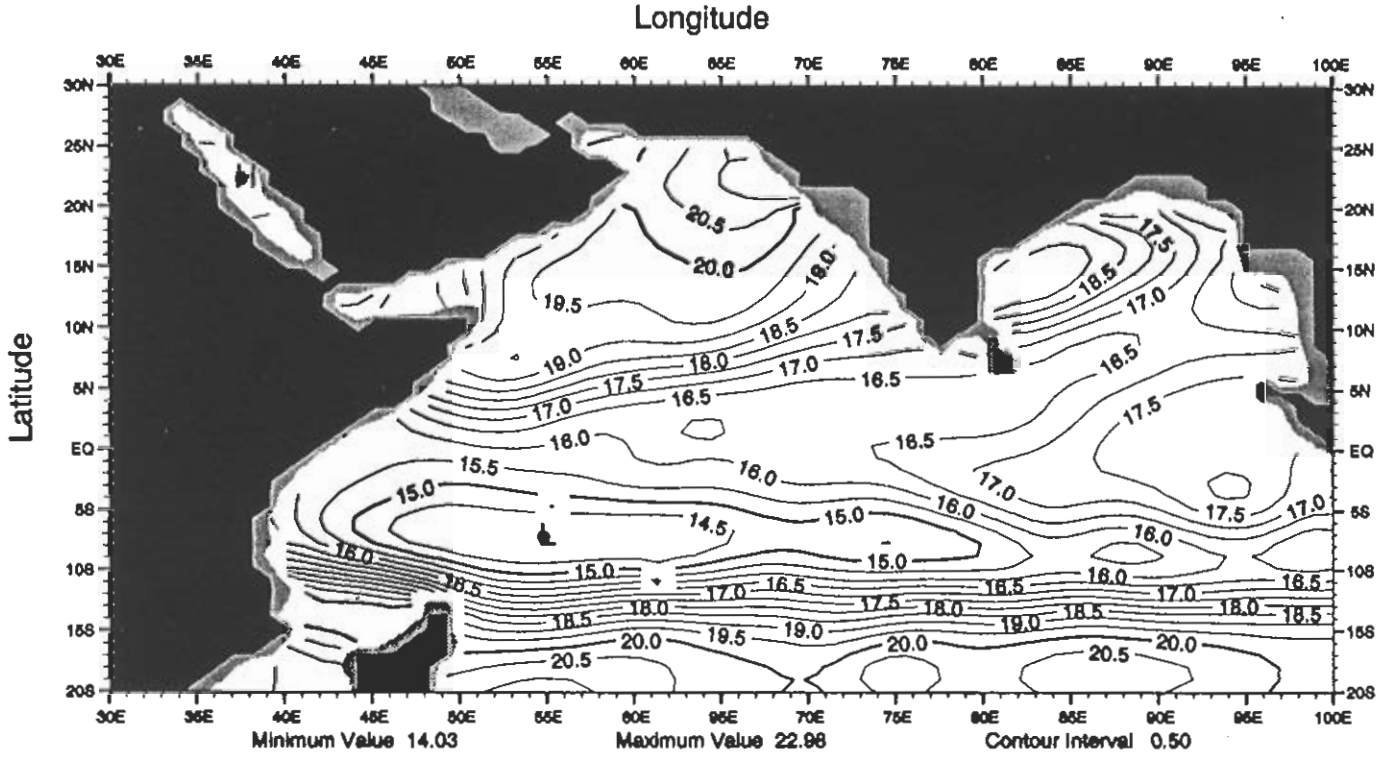


Fig. A24 Spring (Apr.-Jun.) mean temperature (°C) at 150 m depth

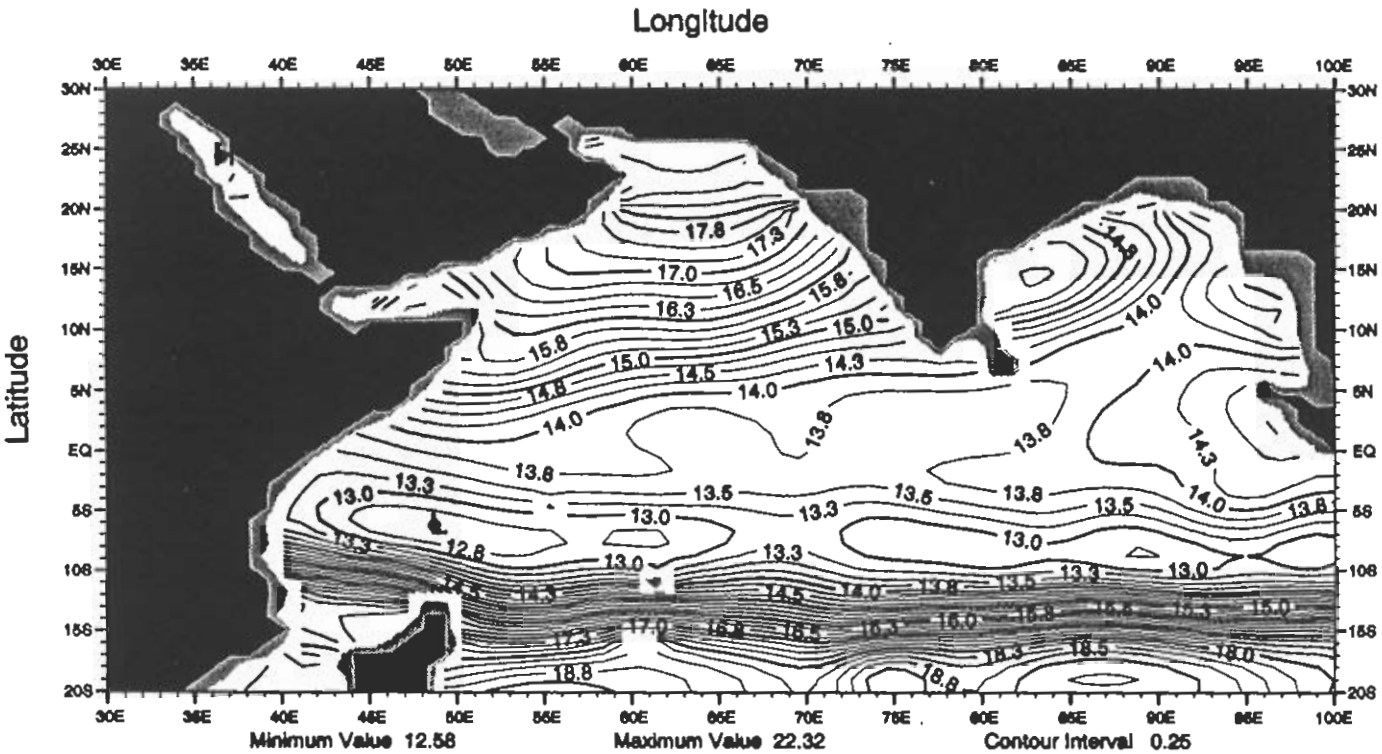


Fig. A25 Spring (Apr.-Jun.) mean temperature (°C) at 200 m depth

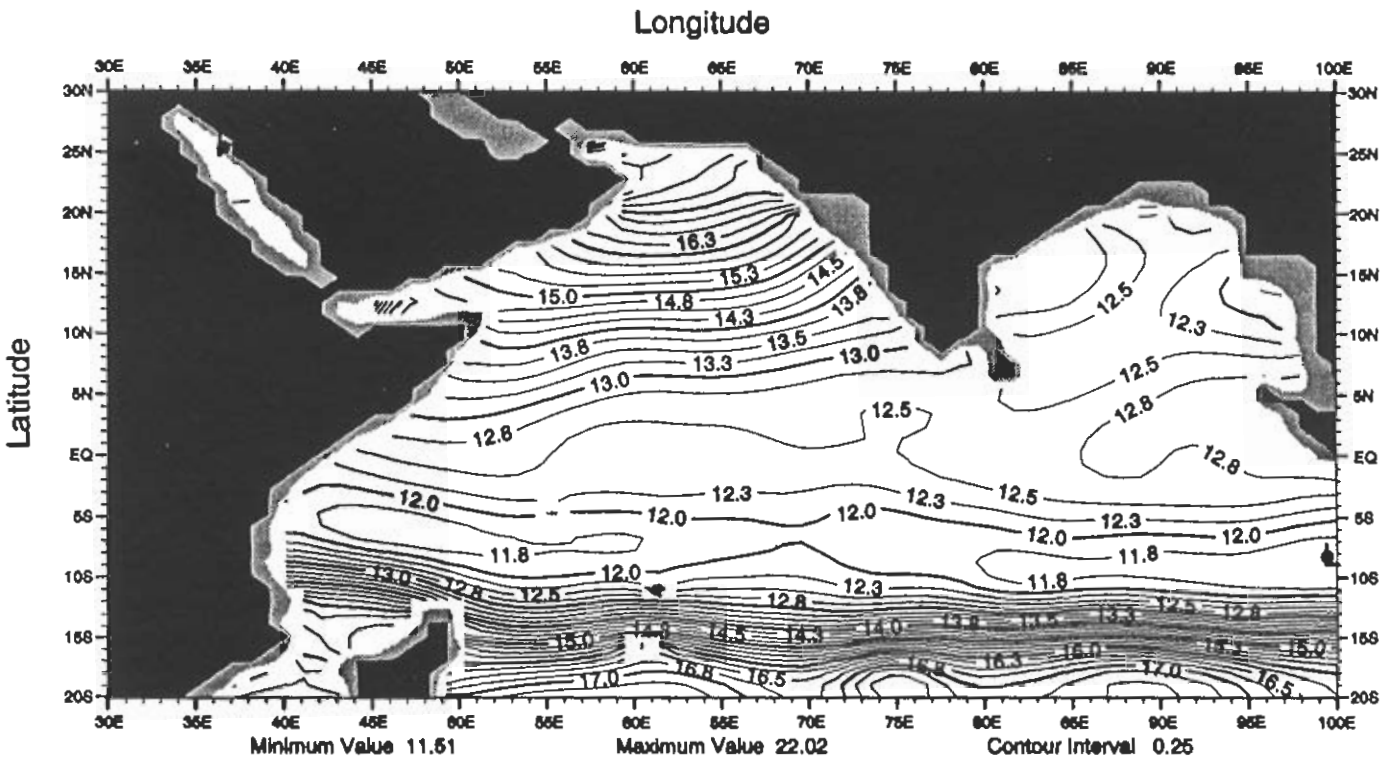


Fig. A26 Spring (Apr.-Jun.) mean temperature (°C) at 250 m depth

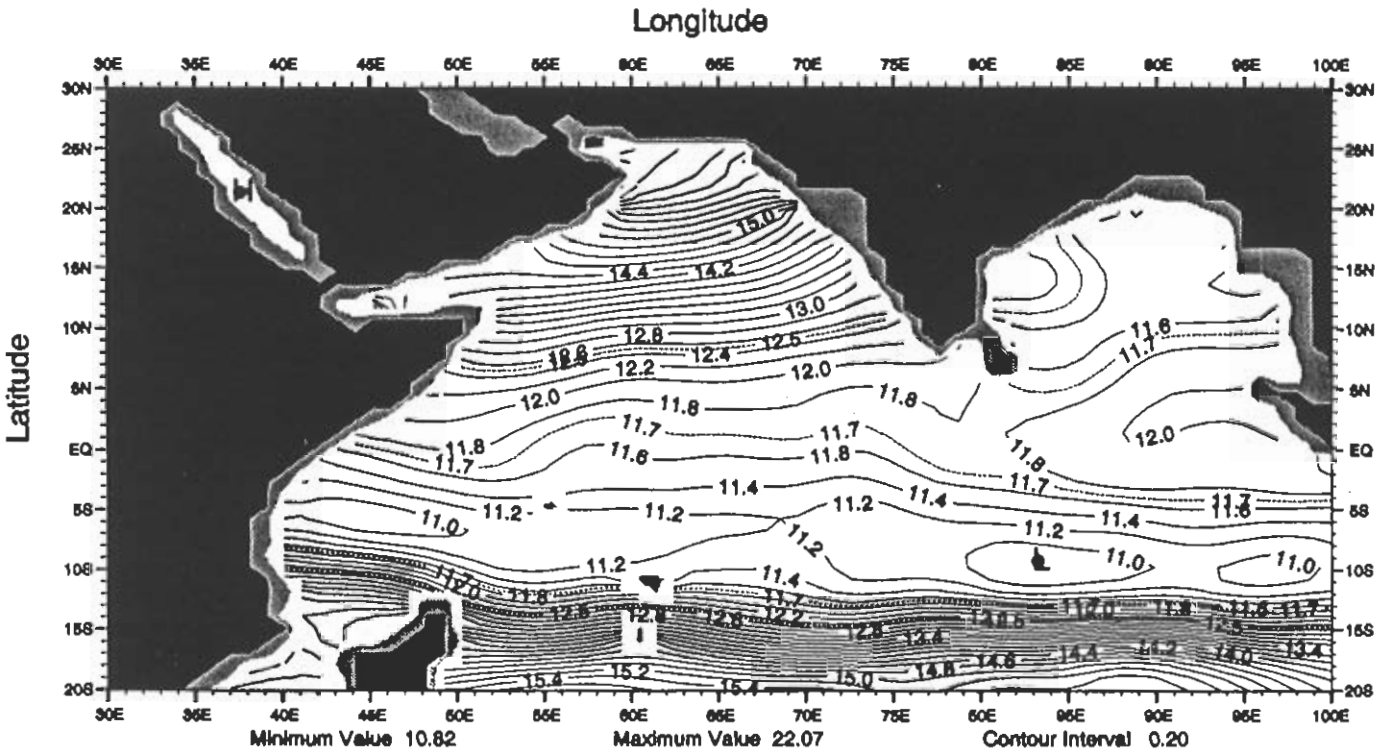


Fig. A27 Spring (Apr.-Jun.) mean temperature (°C) at 300 m depth

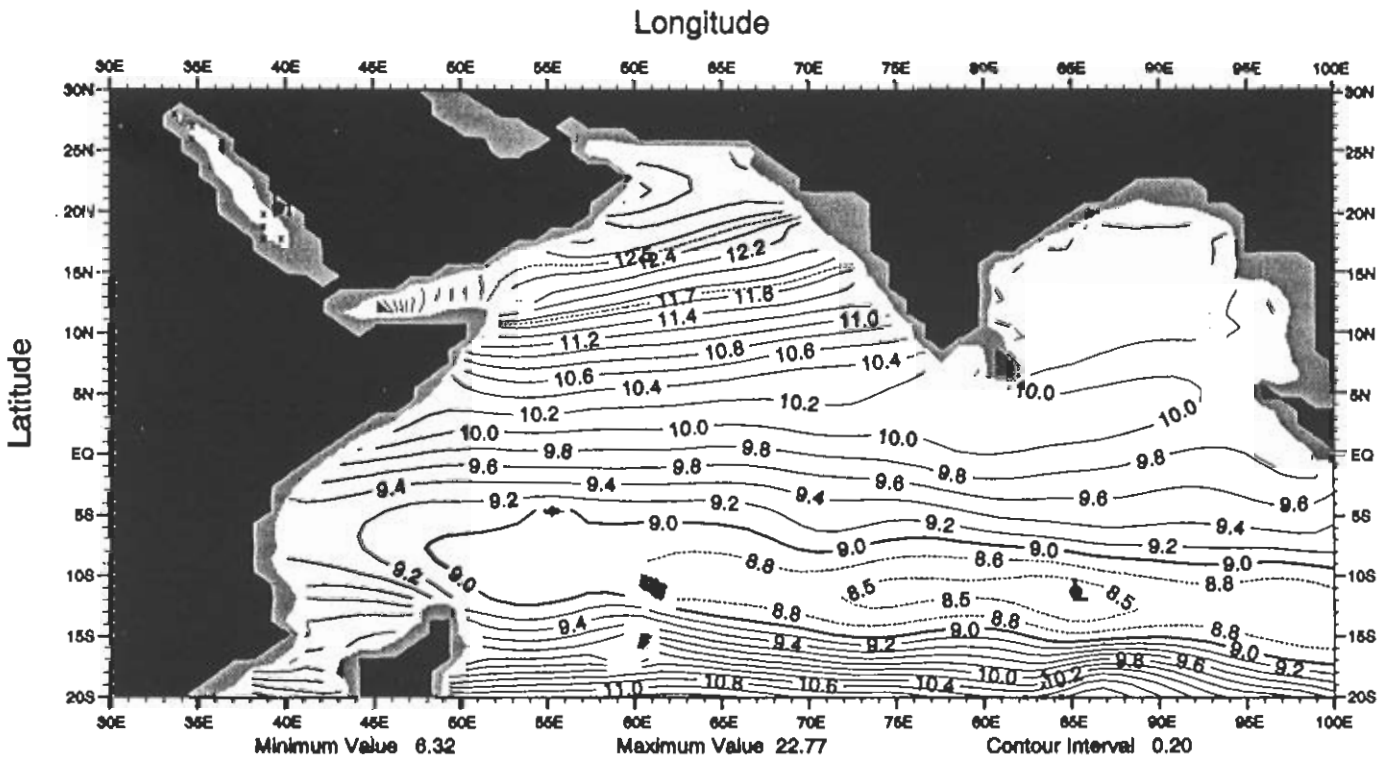


Fig. A28 Spring (Apr.-Jun.) mean temperature (°C) at 500 m depth

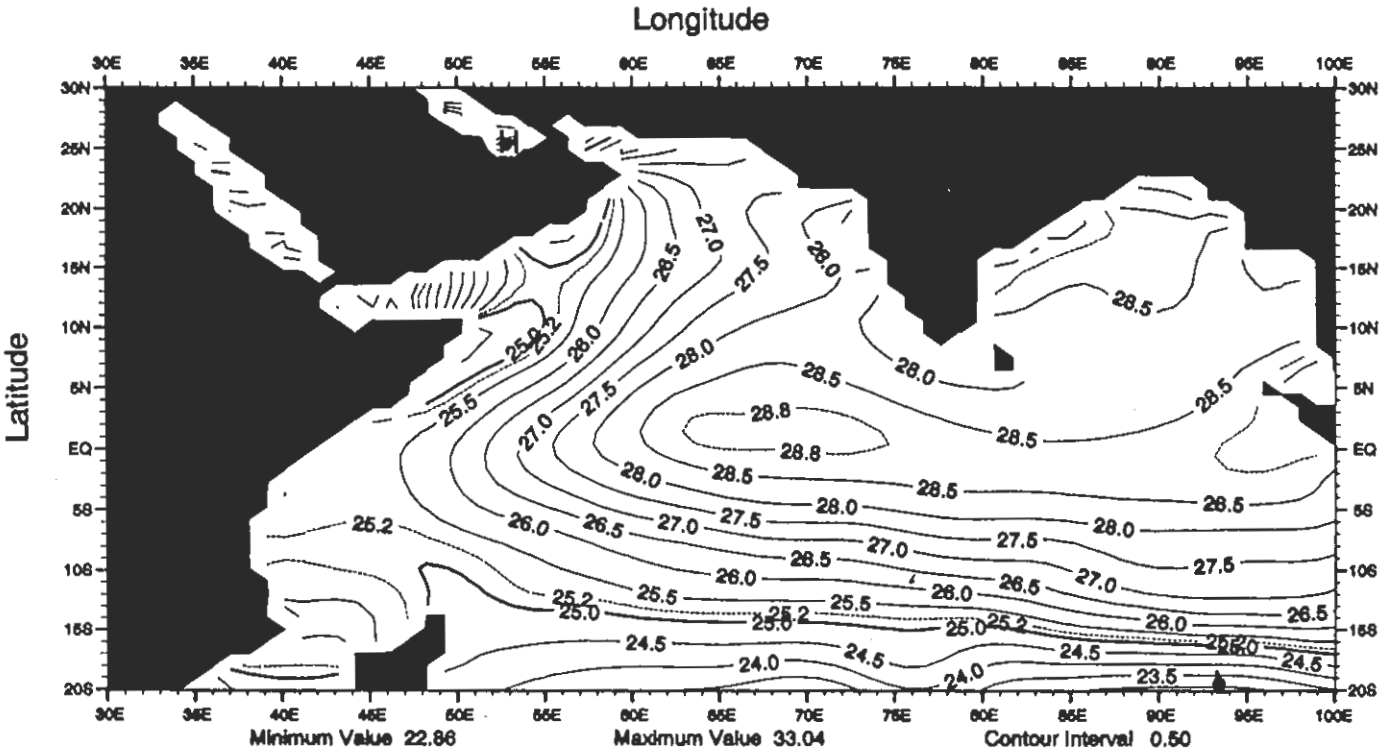


Fig. A29 Summer (Jul.-Sep.) mean temperature (°C) at the surface

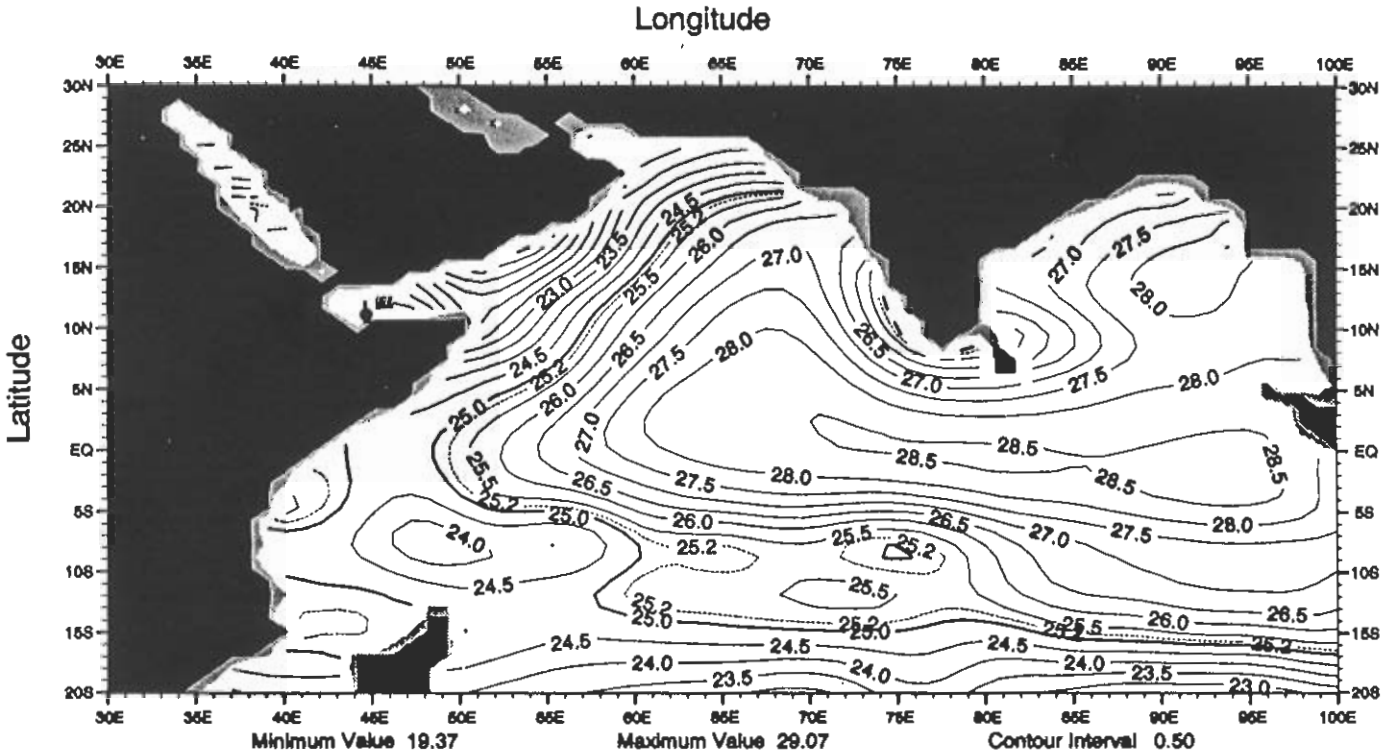


Fig. A30 Summer (Jul.-Sep.) mean temperature (°C) at 50 m depth

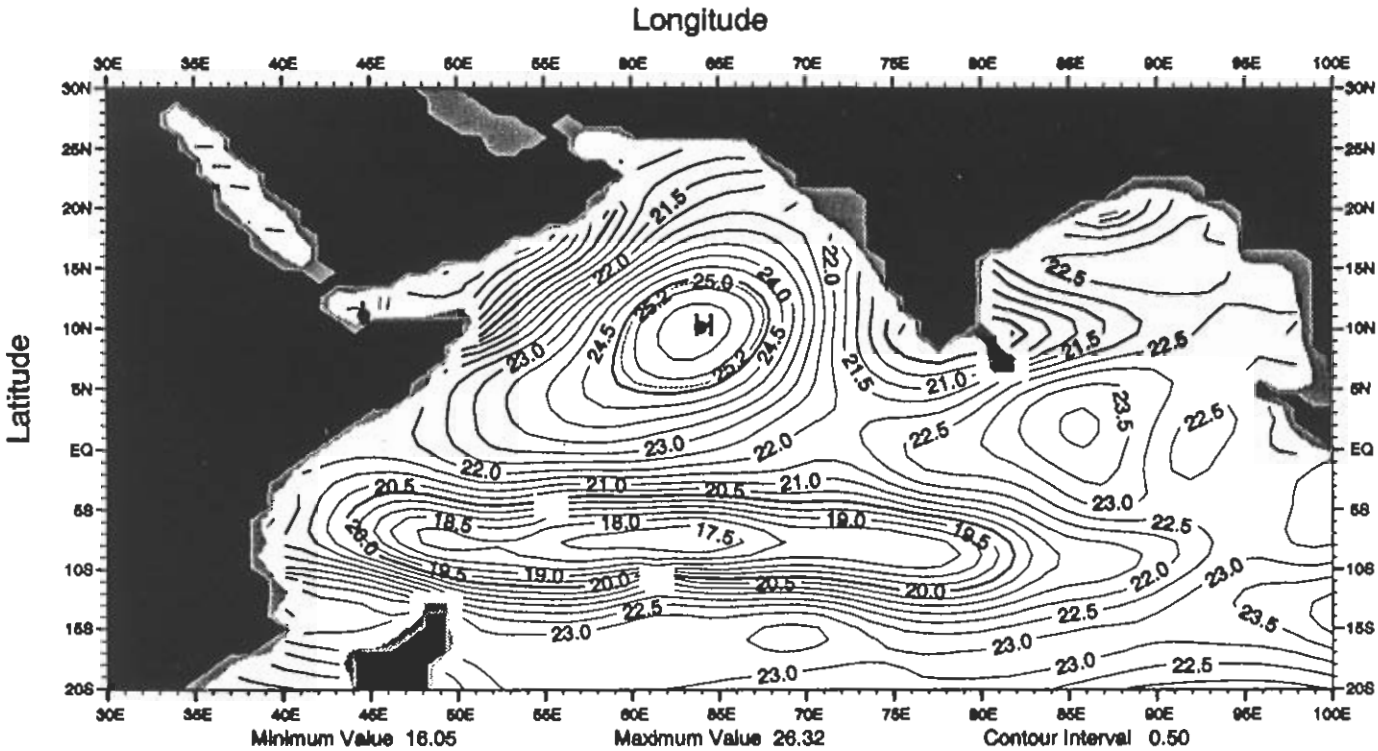


Fig. A31 Summer (Jul.-Sep.) mean temperature (°C) at 100 m depth

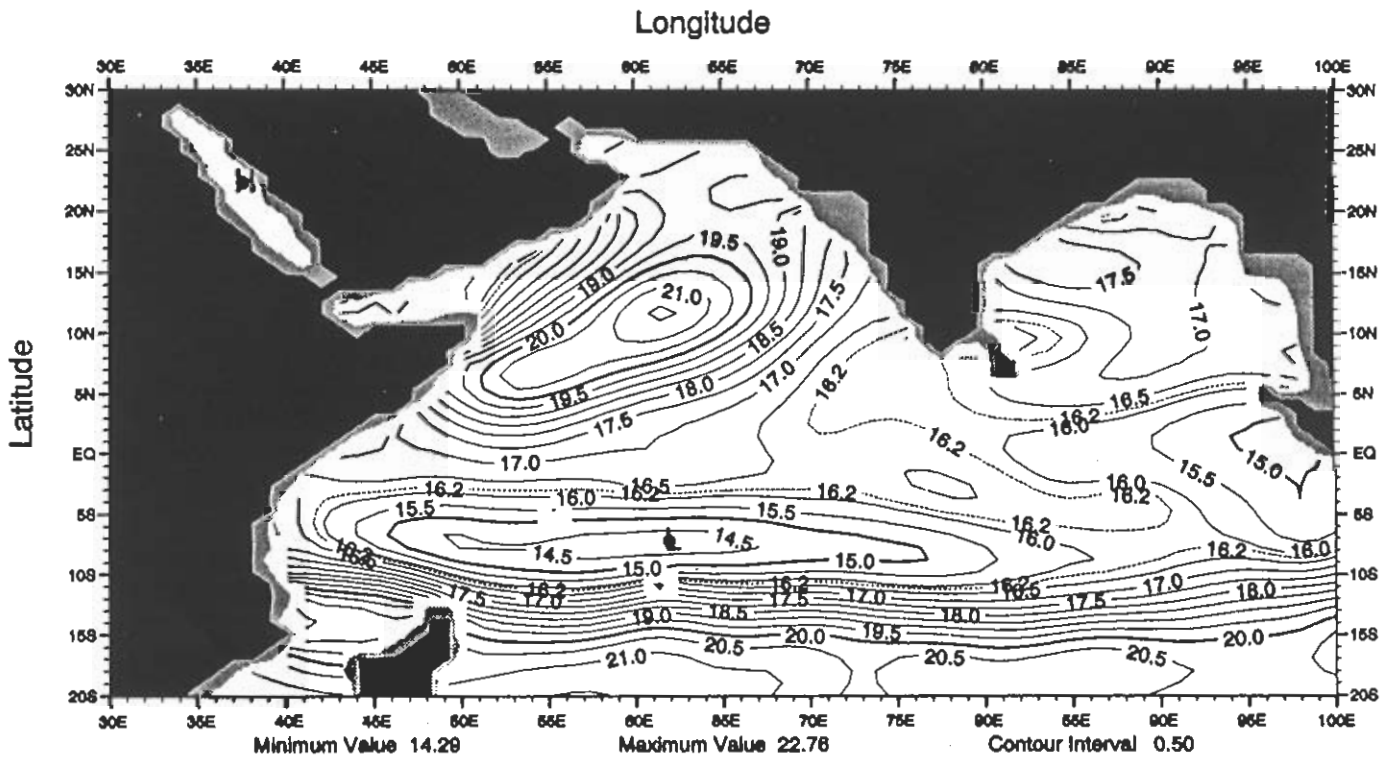
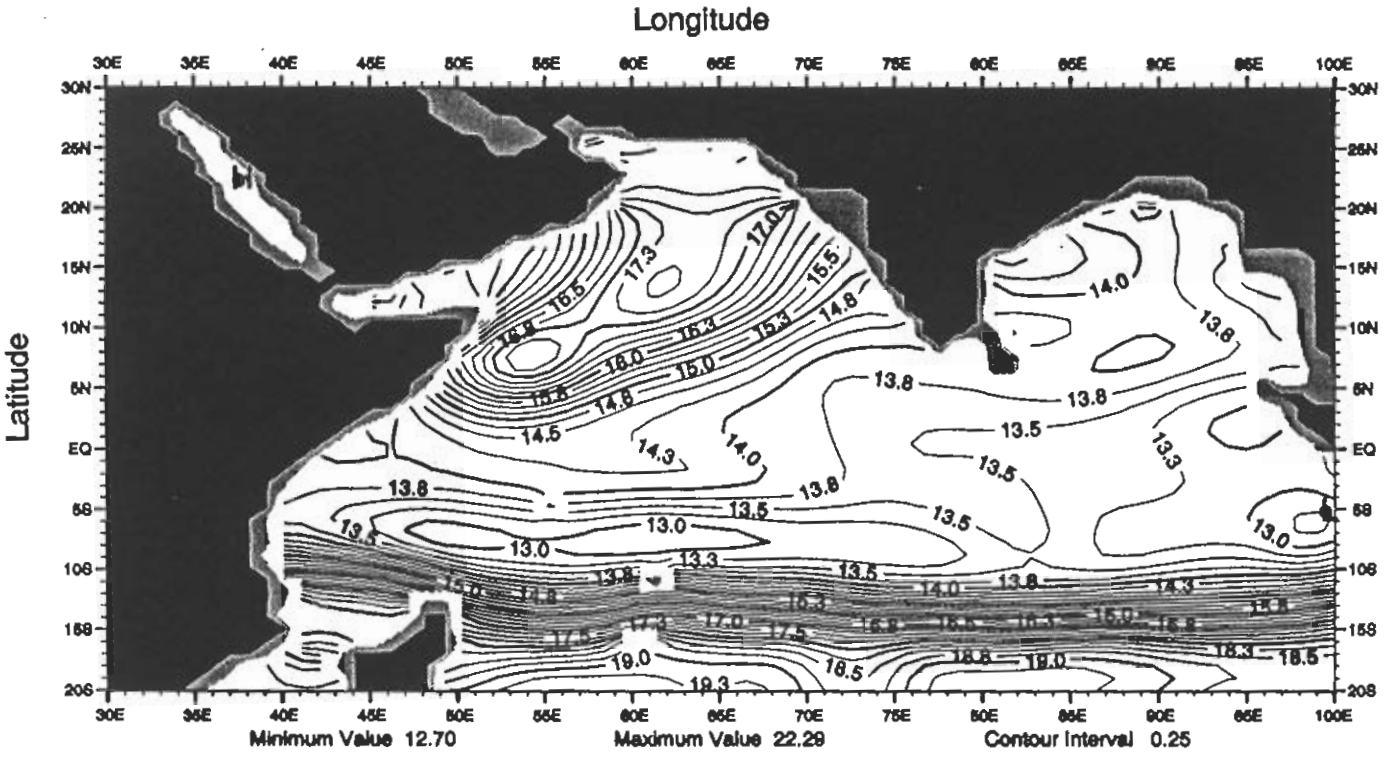


Fig. A32 Summer (Jul.-Sep.) mean temperature (°C) at 150 m depth



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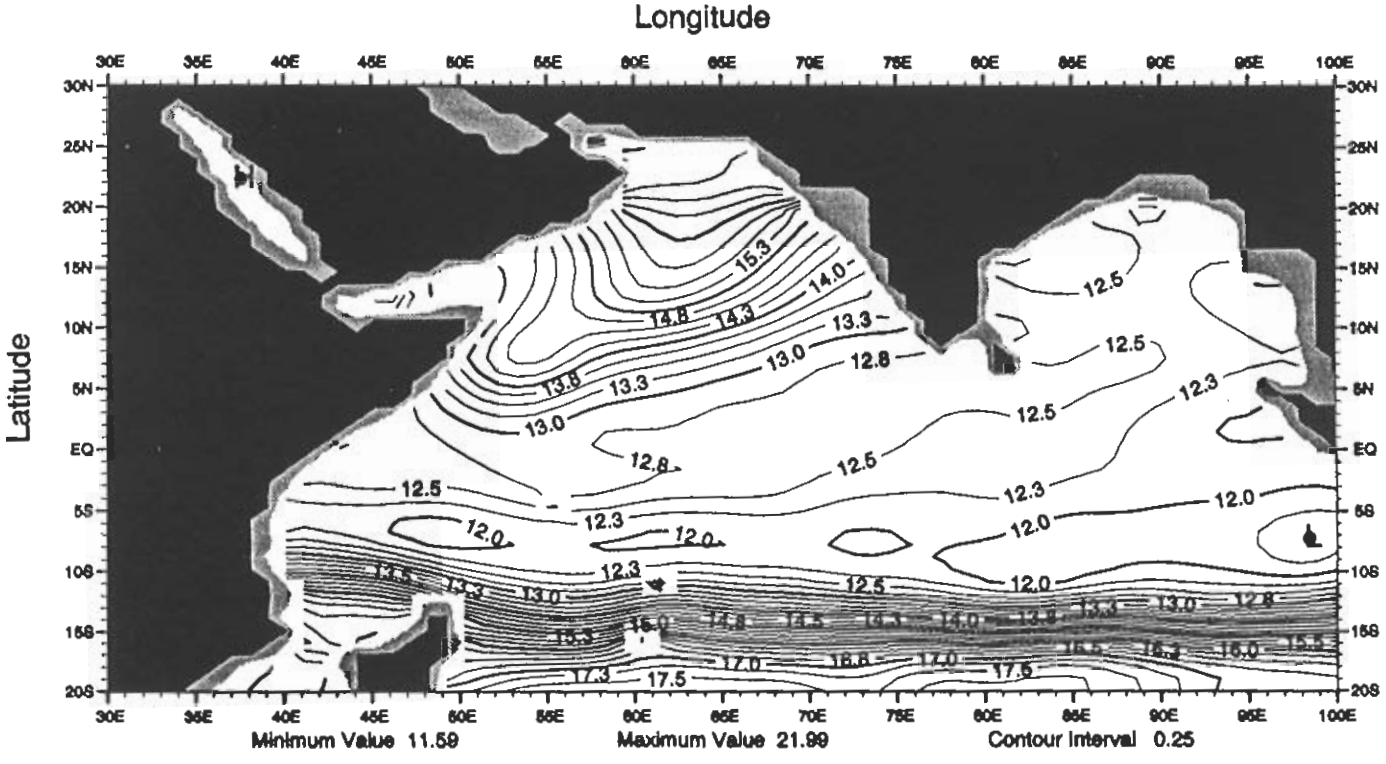

Fig. A34 Summer (Jul.-Sep.) mean temperature (°C) at 250 m depth

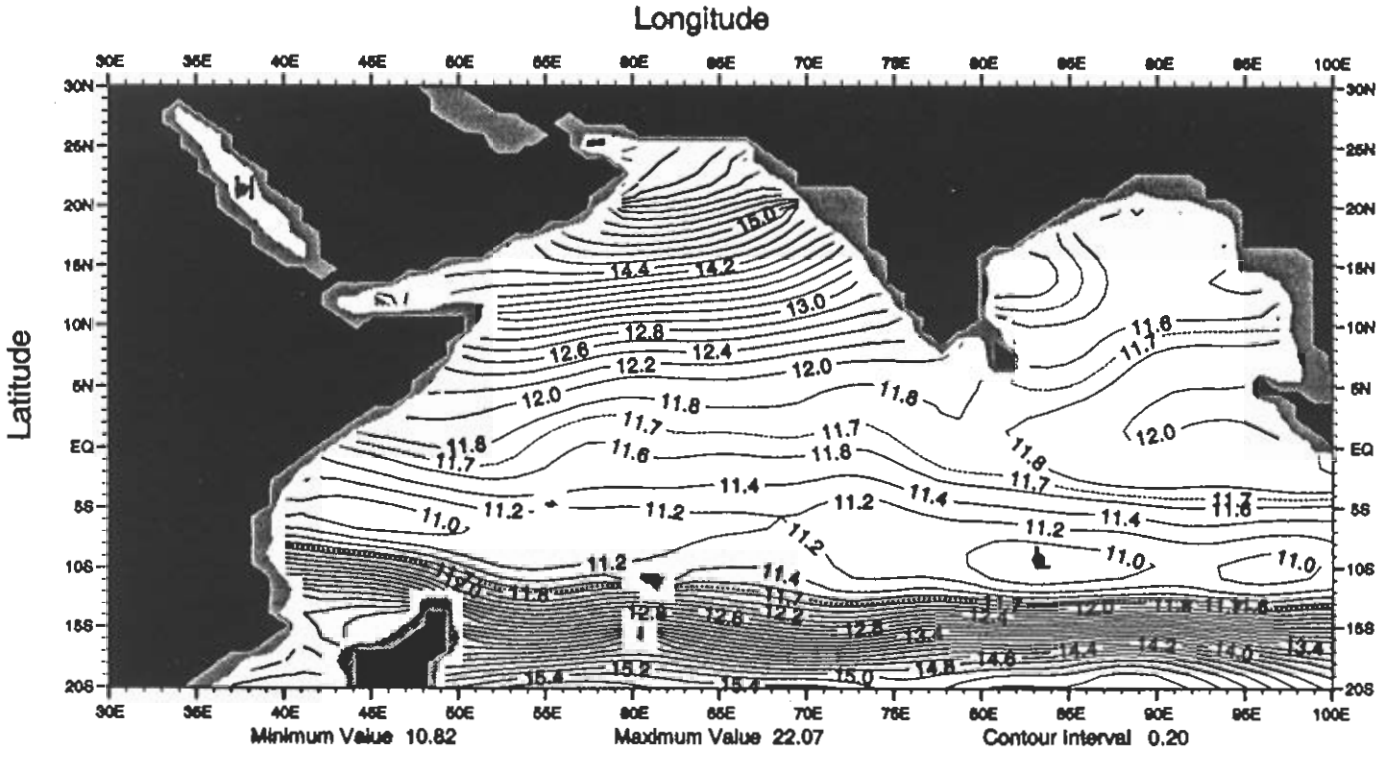

Fig. A35 Summer (Jul.-Sep.) mean temperature (°C) at 300 m depth

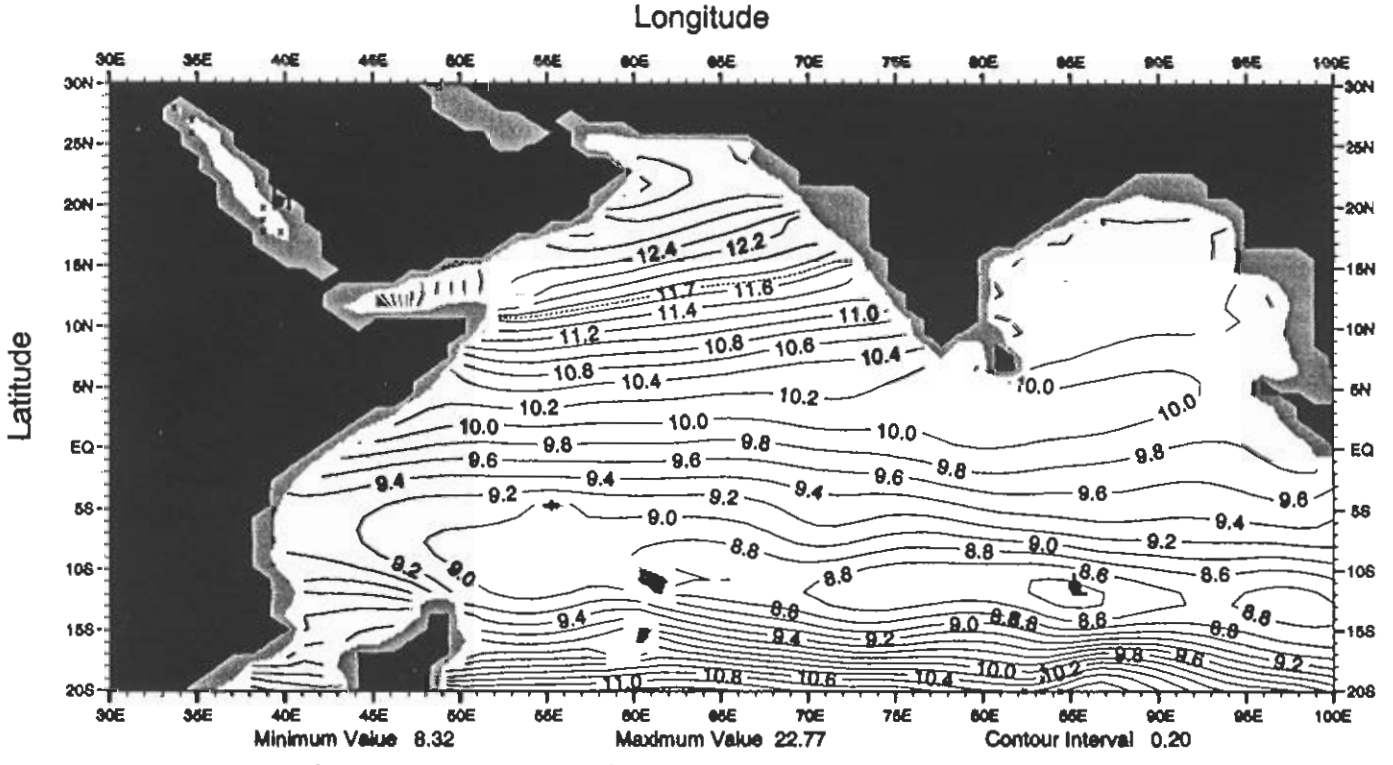

Fig. A36 Summer (Jul.-Sep.) mean temperature (°C) at 500 m depth

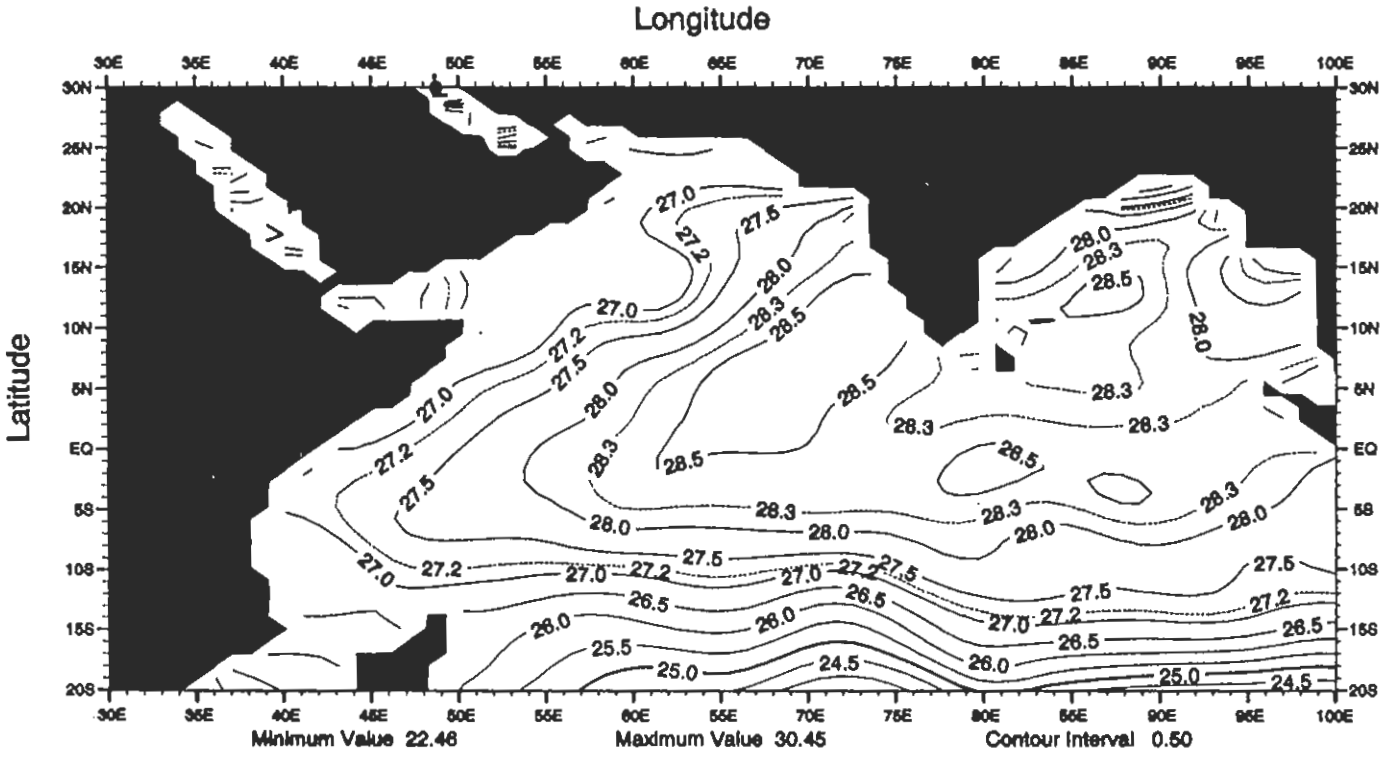

Fig. A37 Fall (Oct.-Dec.) mean temperature (°C) at the surface

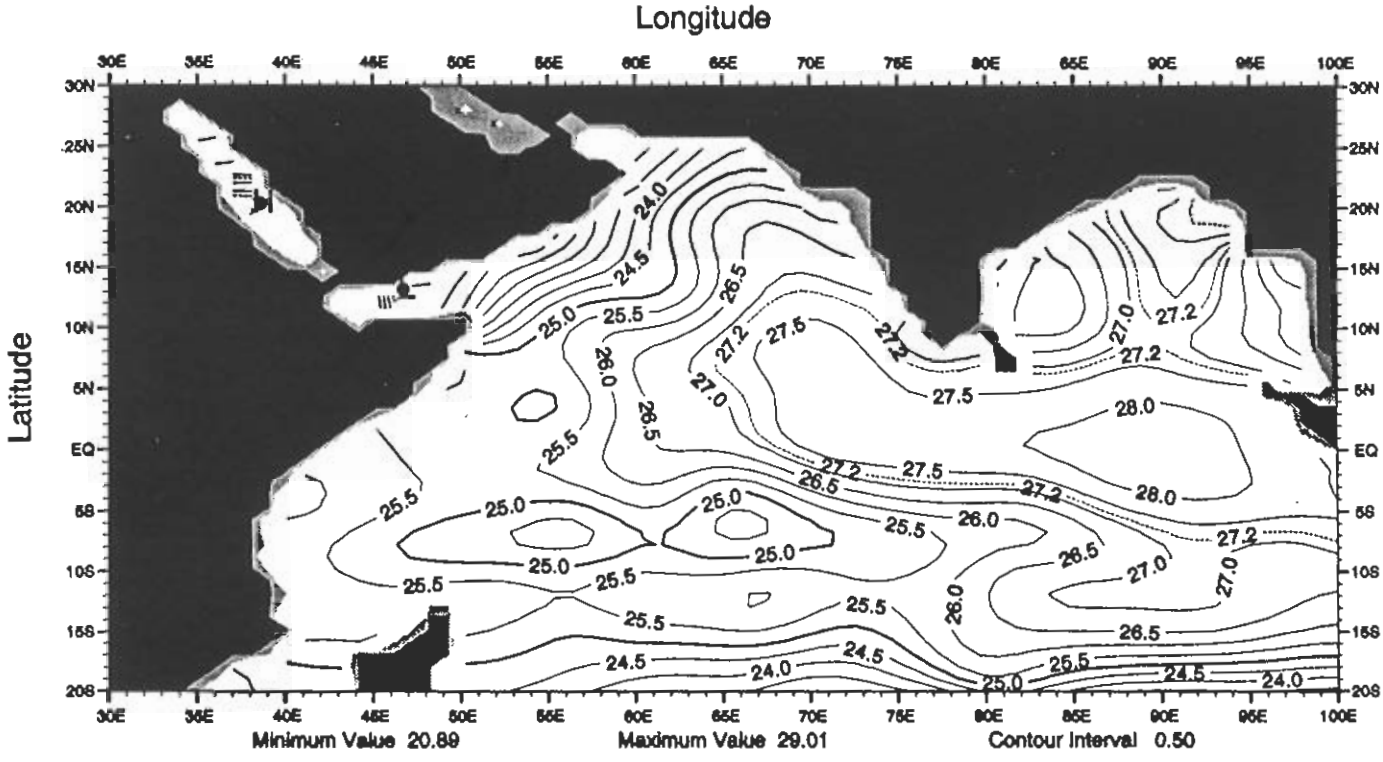

Fig. A38 Fall (Oct.-Dec.) mean temperature (°C) at 50 m depth

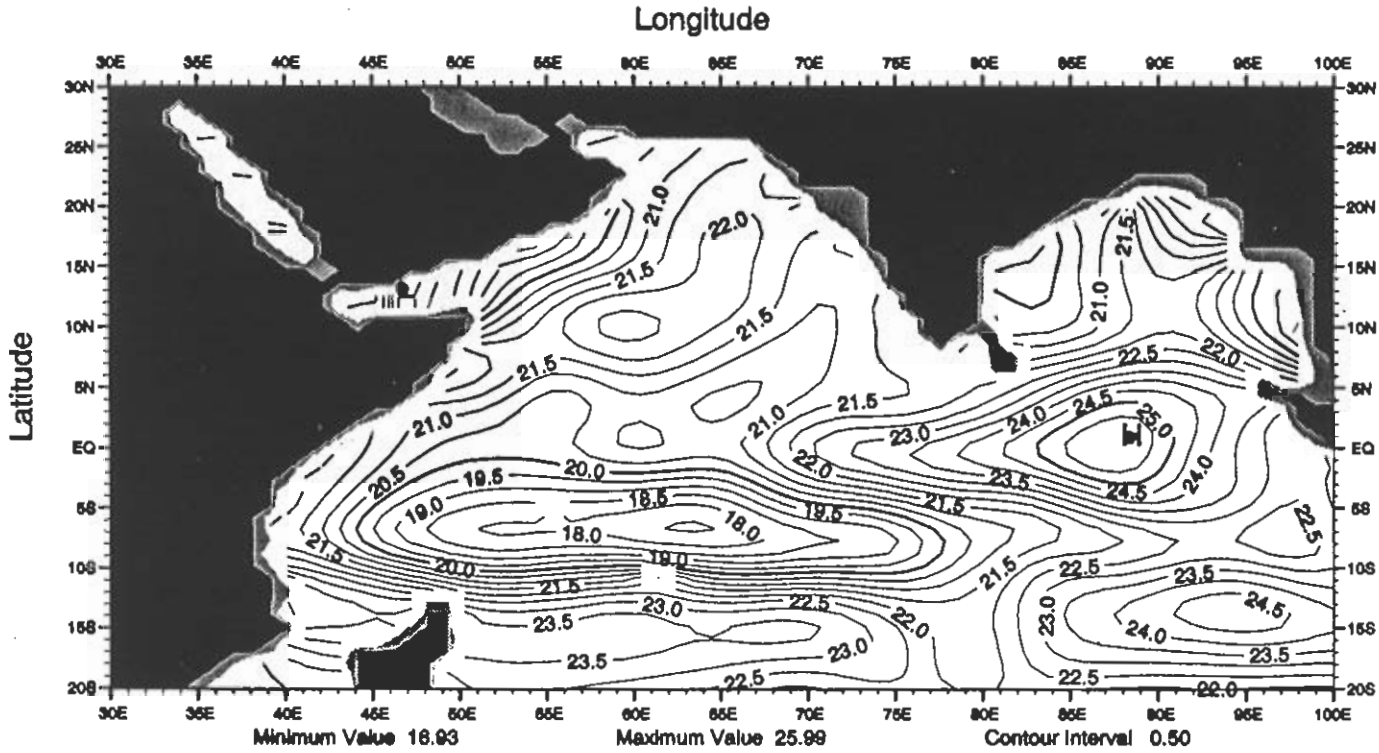

Fig. A39 Fall (Oct.-Dec.) mean temperature (°C) at 100 m depth

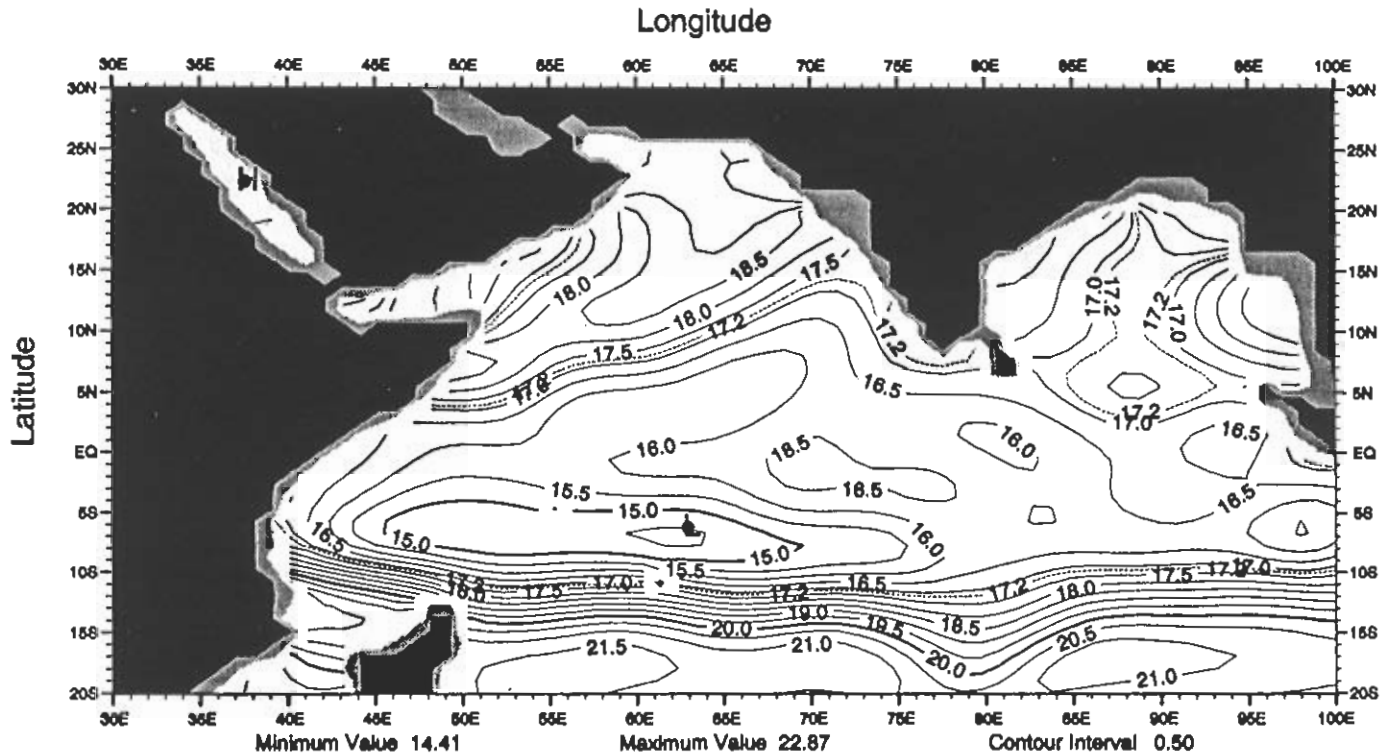

Fig. A40 Fall (Oct.-Dec.) mean temperature (°C) at 150 m depth

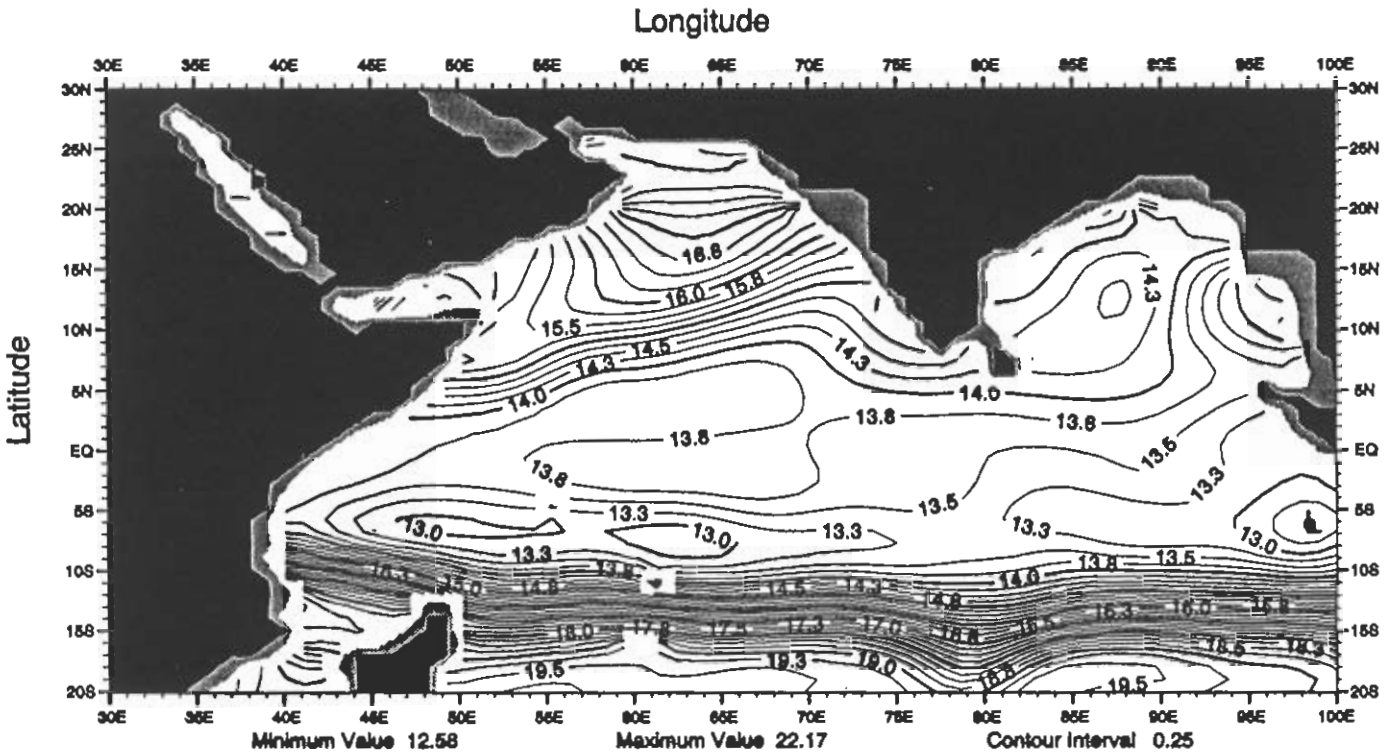

Fig. A41 Fall (Oct.-Dec.) mean temperature (°C) at 200 m depth

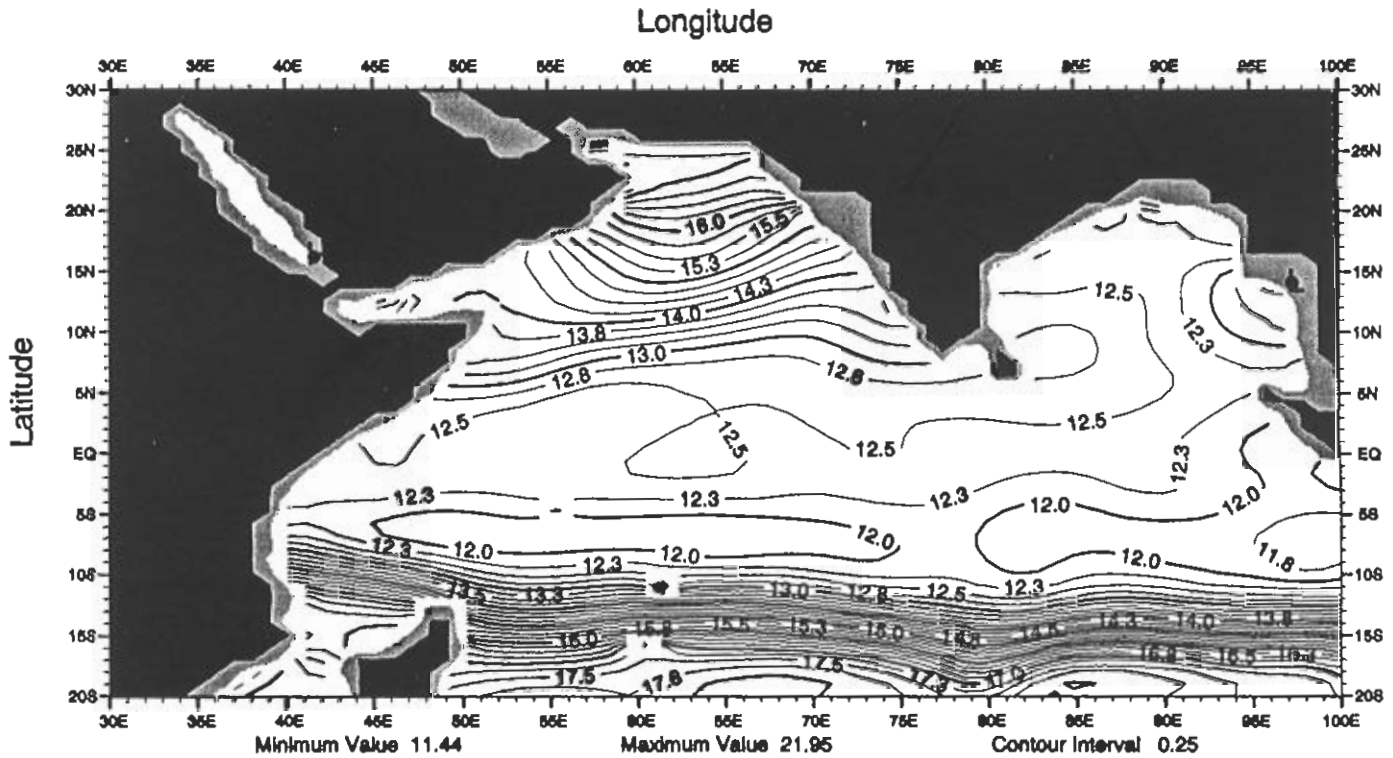

Fig. A42 Fall (Oct.-Dec.) mean temperature (°C) at 250 m depth

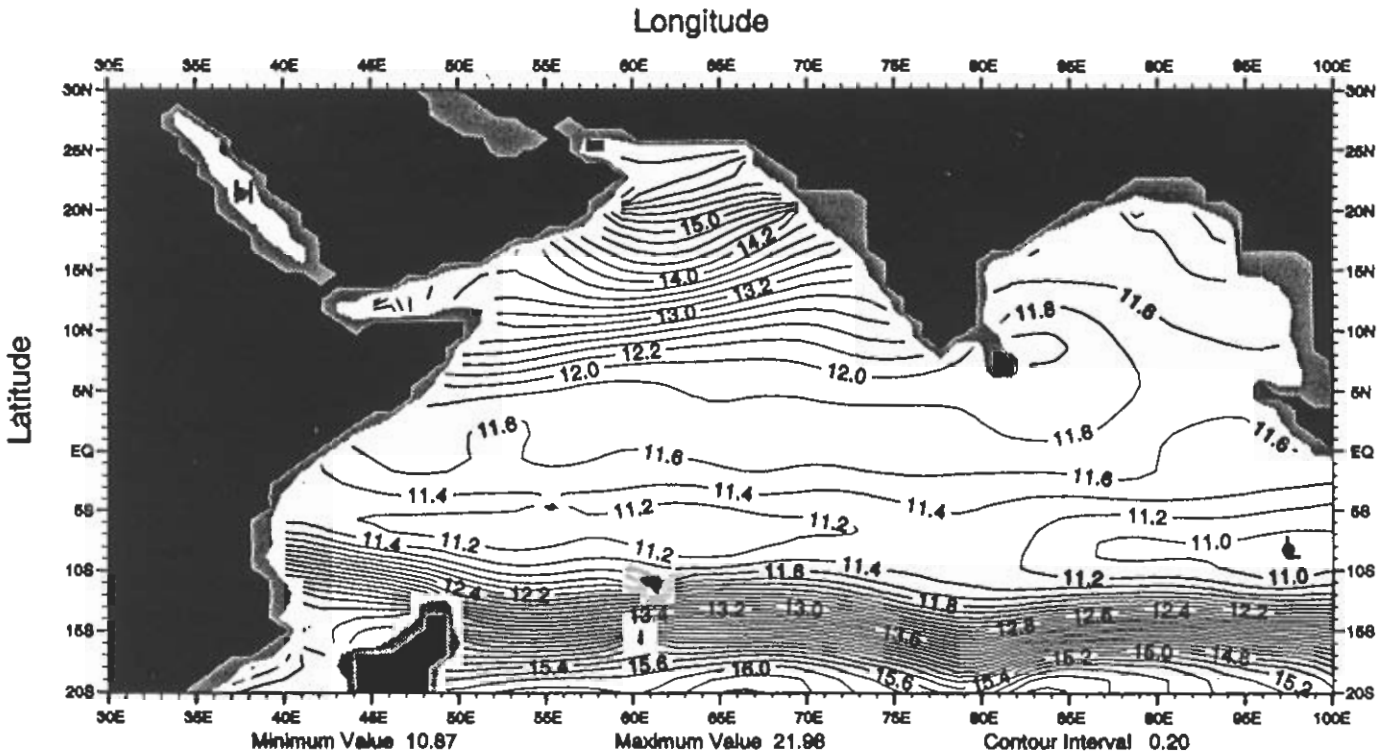

Fig. A43 Fall (Oct.-Dec.) mean temperature (°C) at 300 m depth

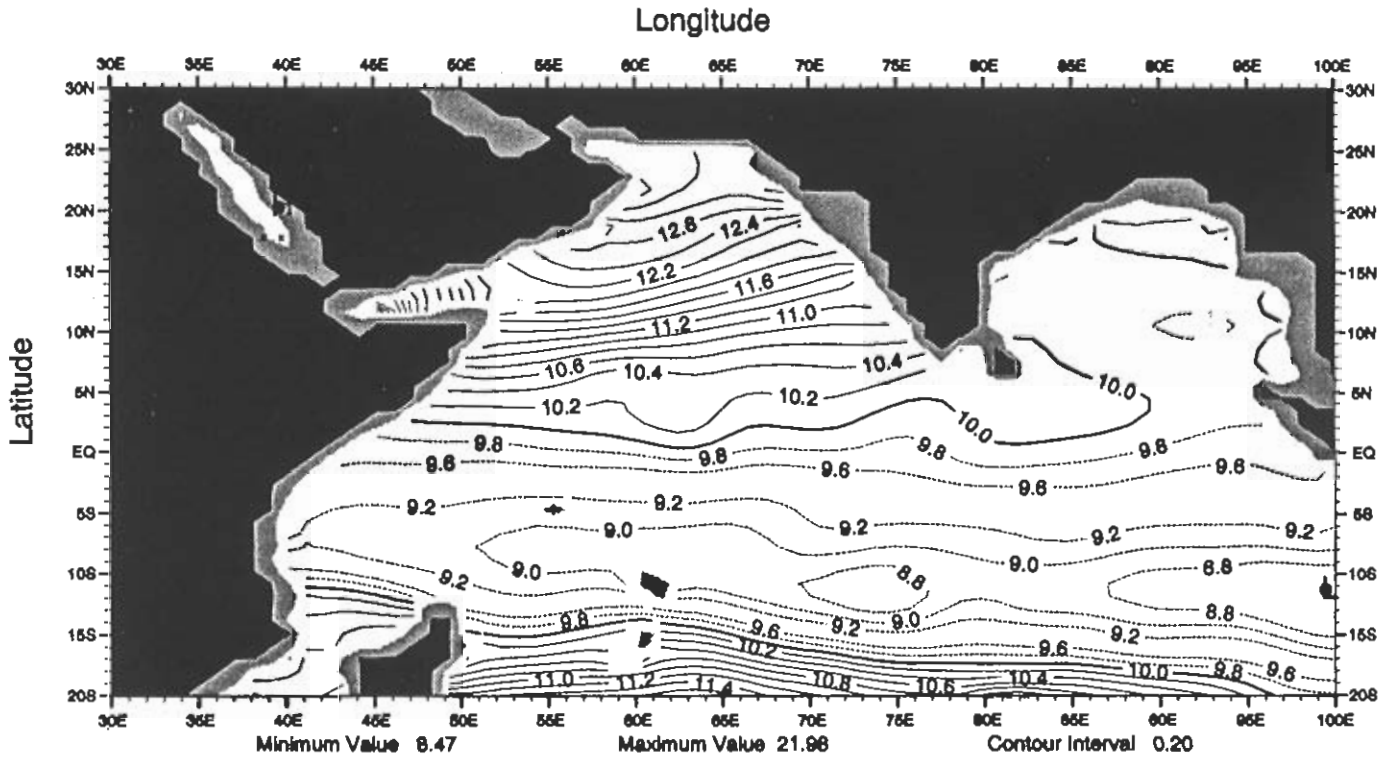

Fig. A44 Fall (Oct.-Dec.) mean temperature (°C) at 500 m depth

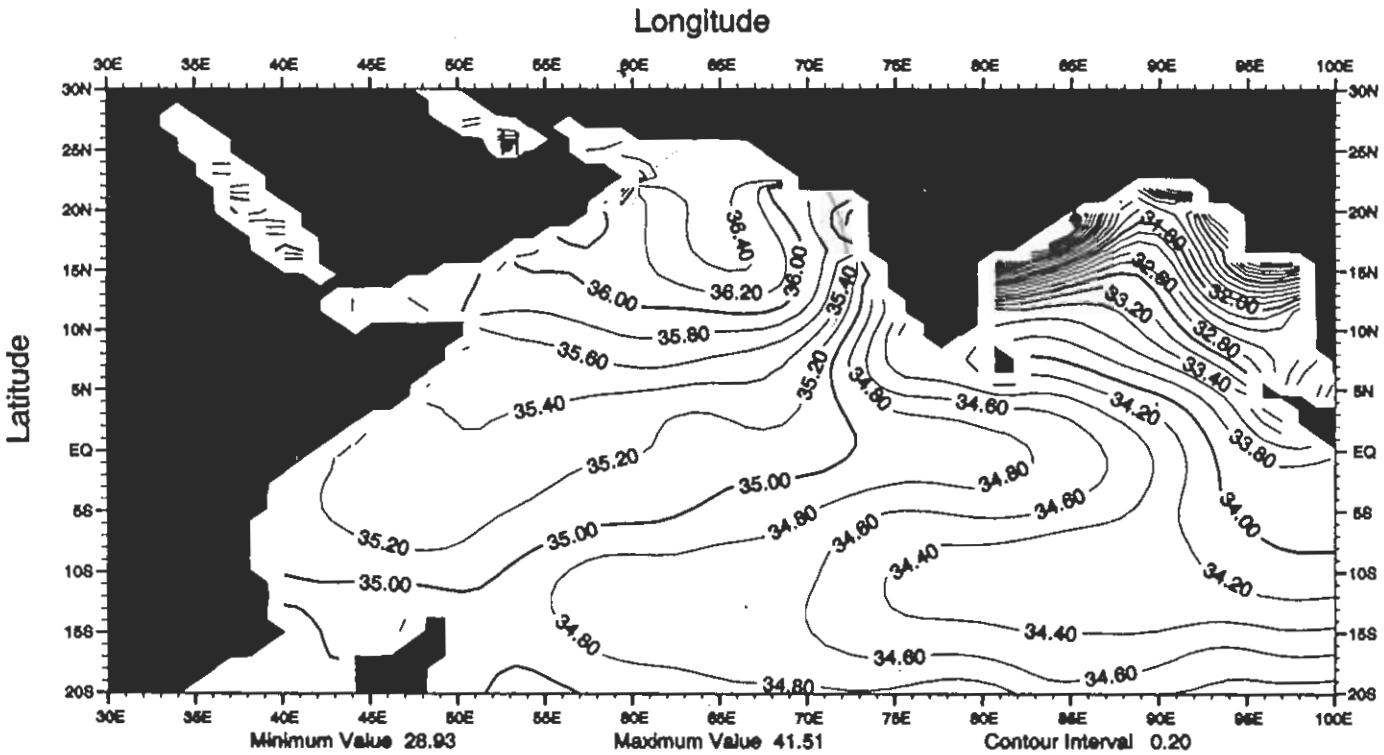

Fig. B1 Annual mean salinity (psu) at the surface

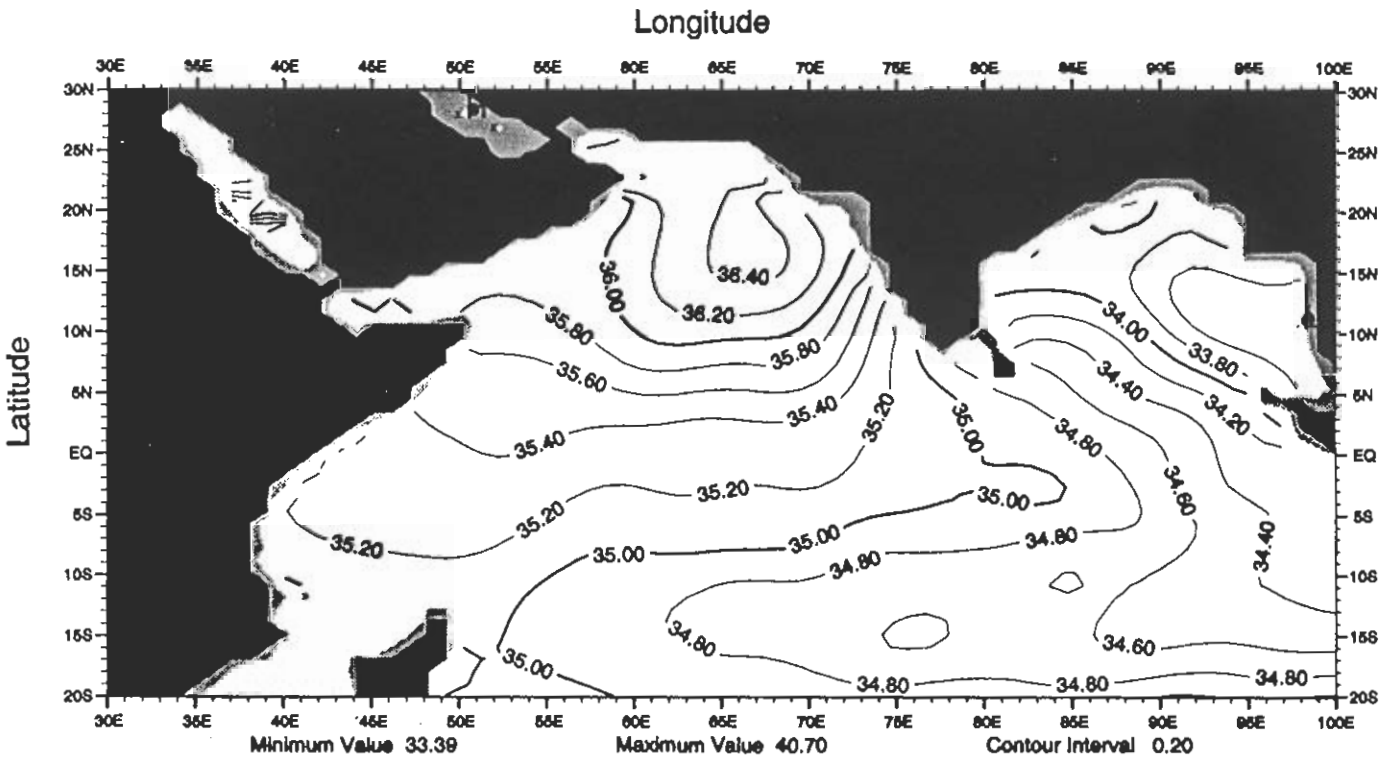

Fig. B2 Annual mean salinity (psu) at 50 m depth

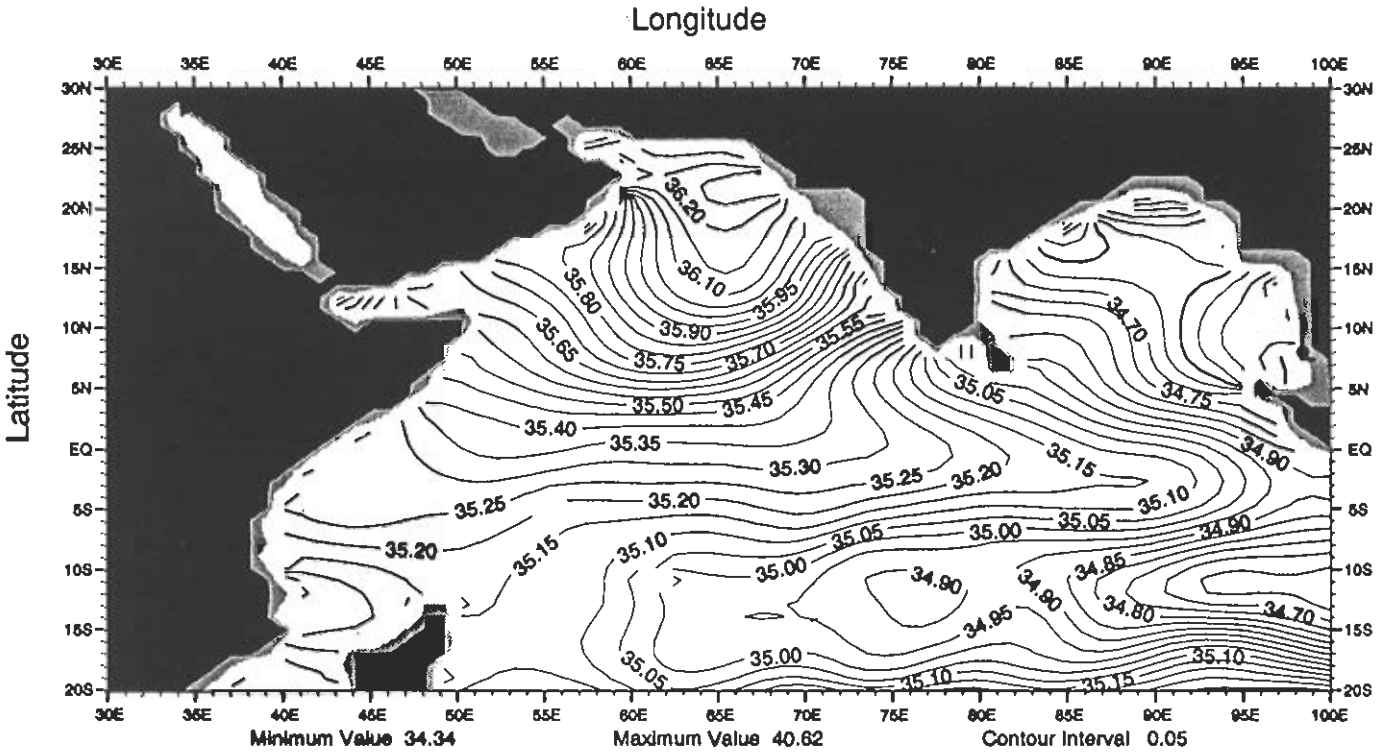

Fig. B3 Annual mean salinity (psu) at 100 m depth

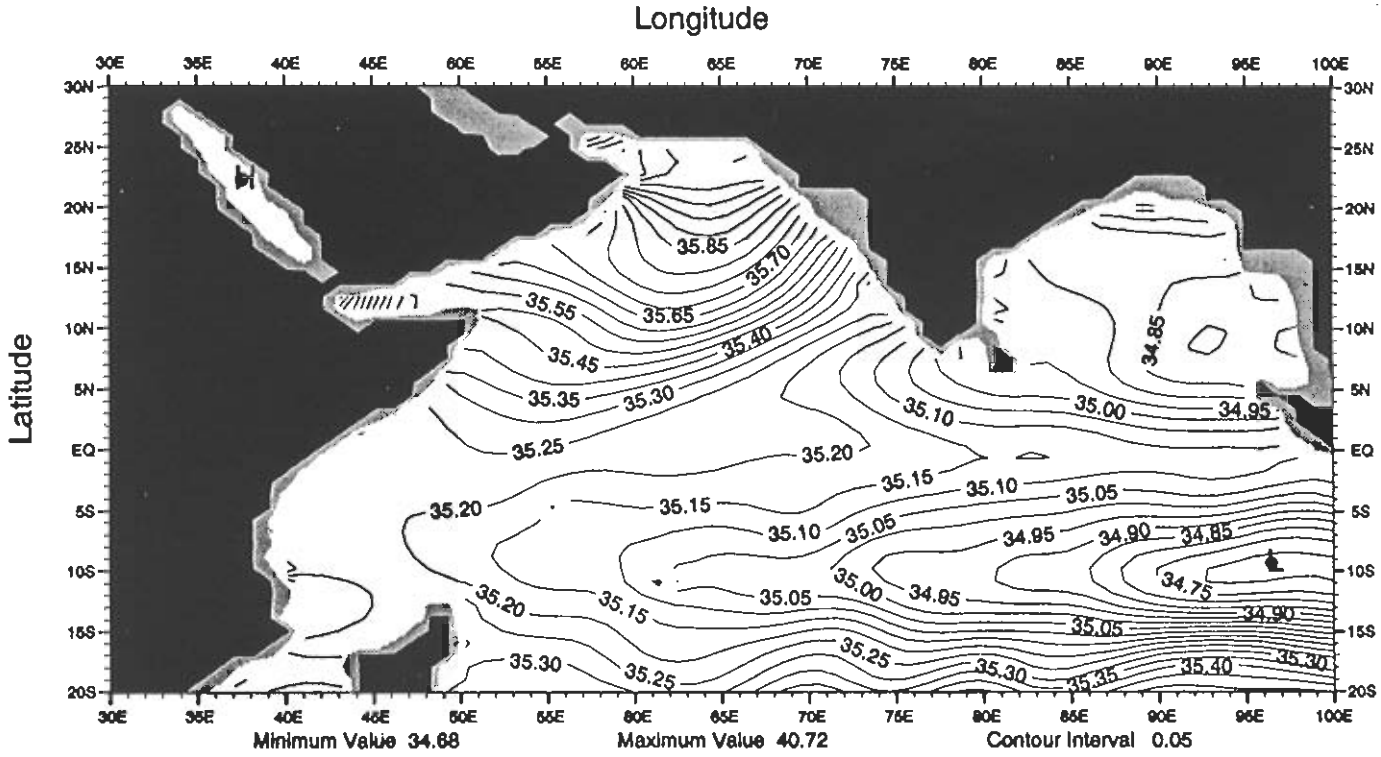

Fig. B4 Annual mean salinity (psu) at 150 m depth

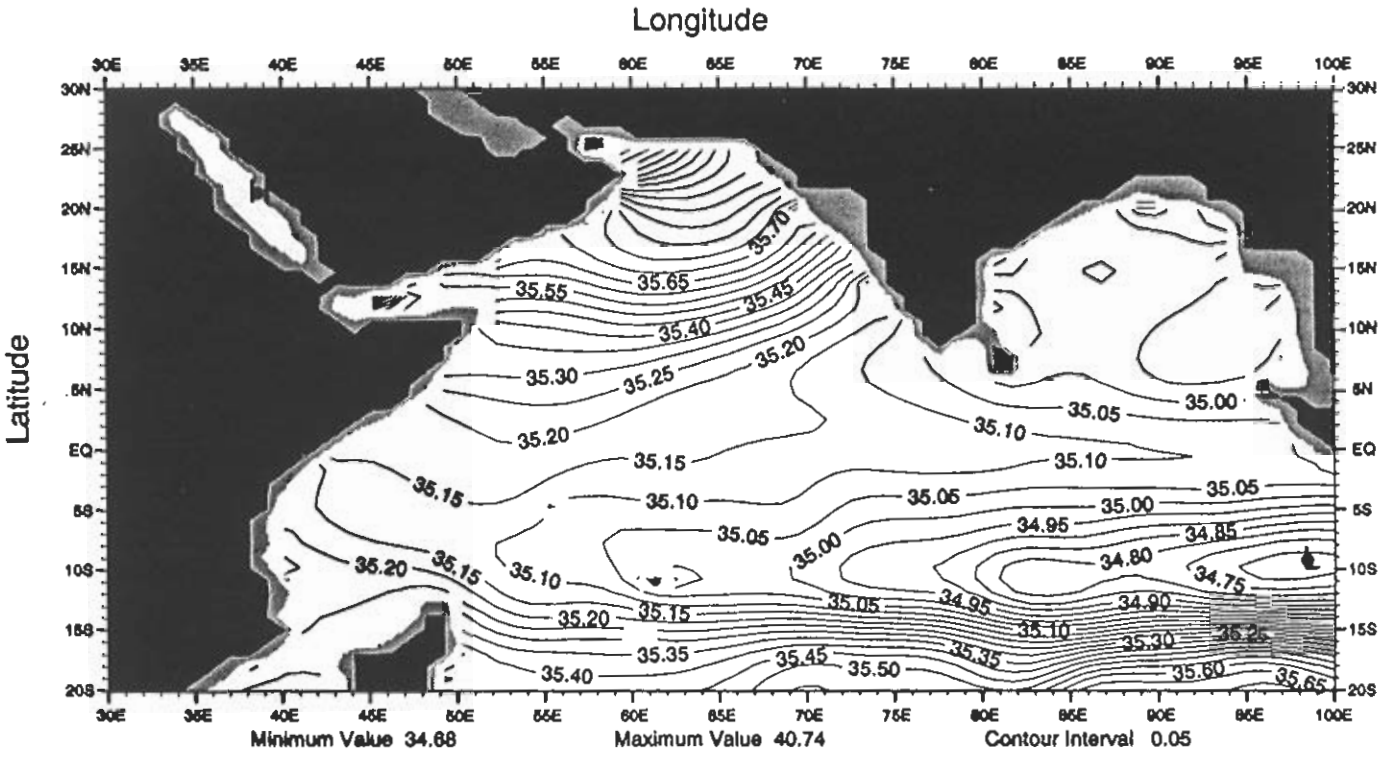

Fig. B5 Annual mean salinity (psu) at 200 m depth

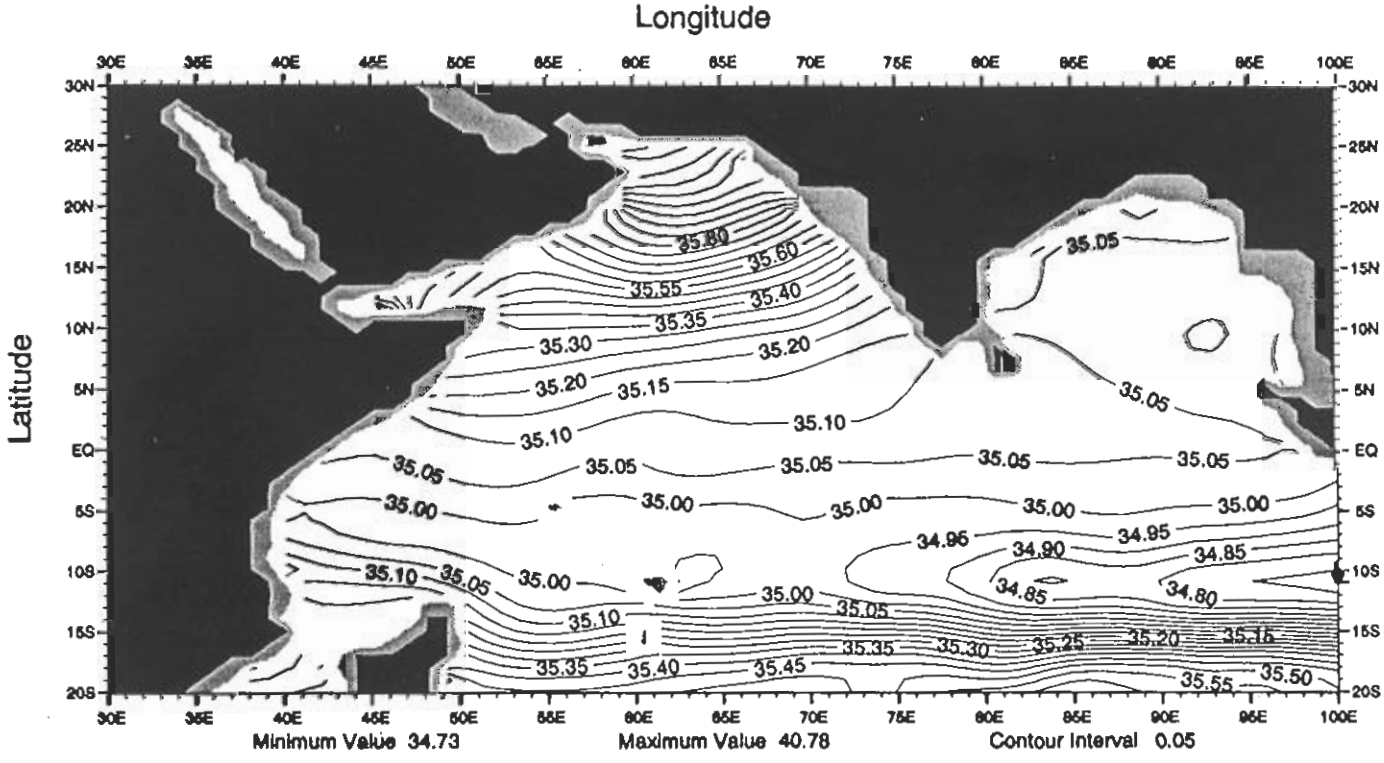

Fig. B6 Annual mean salinity (psu) at 300 m depth

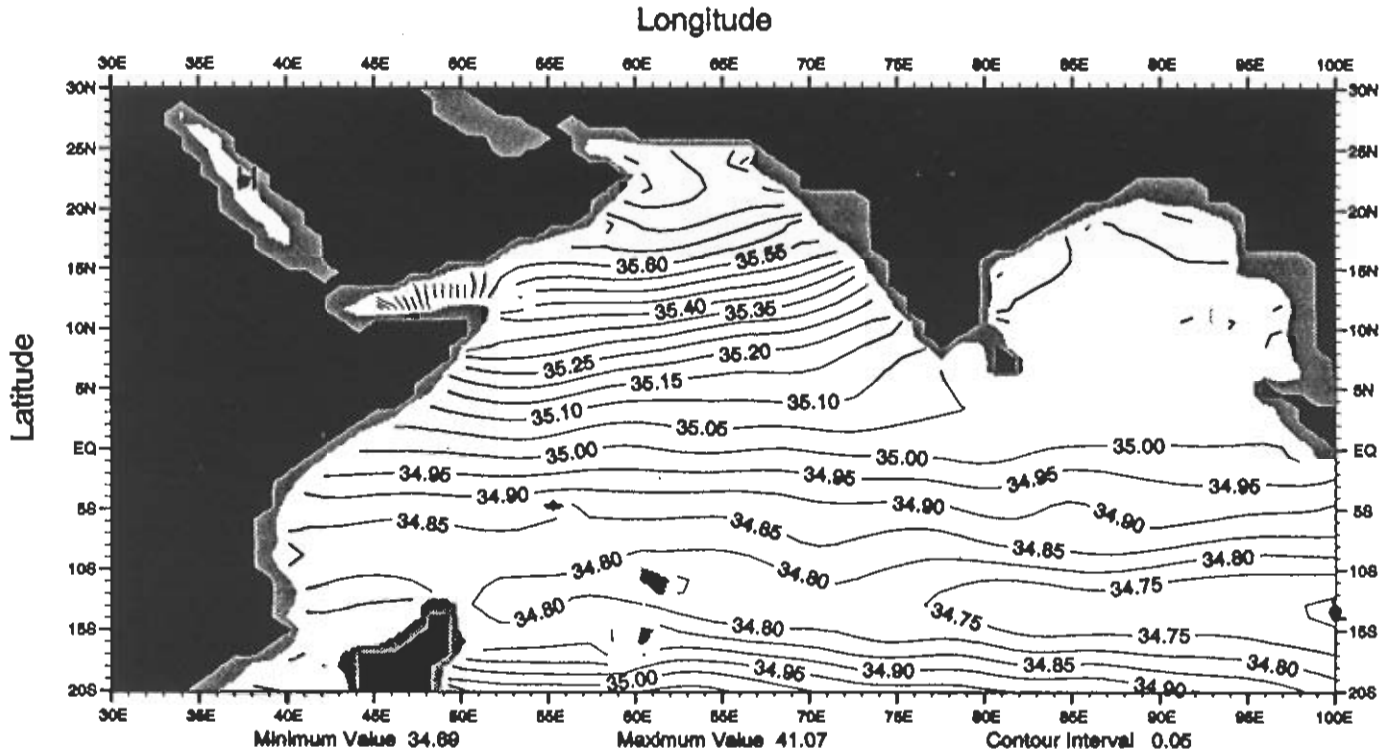

Fig. B7 Annual mean salinity (psu) at 500 m depth

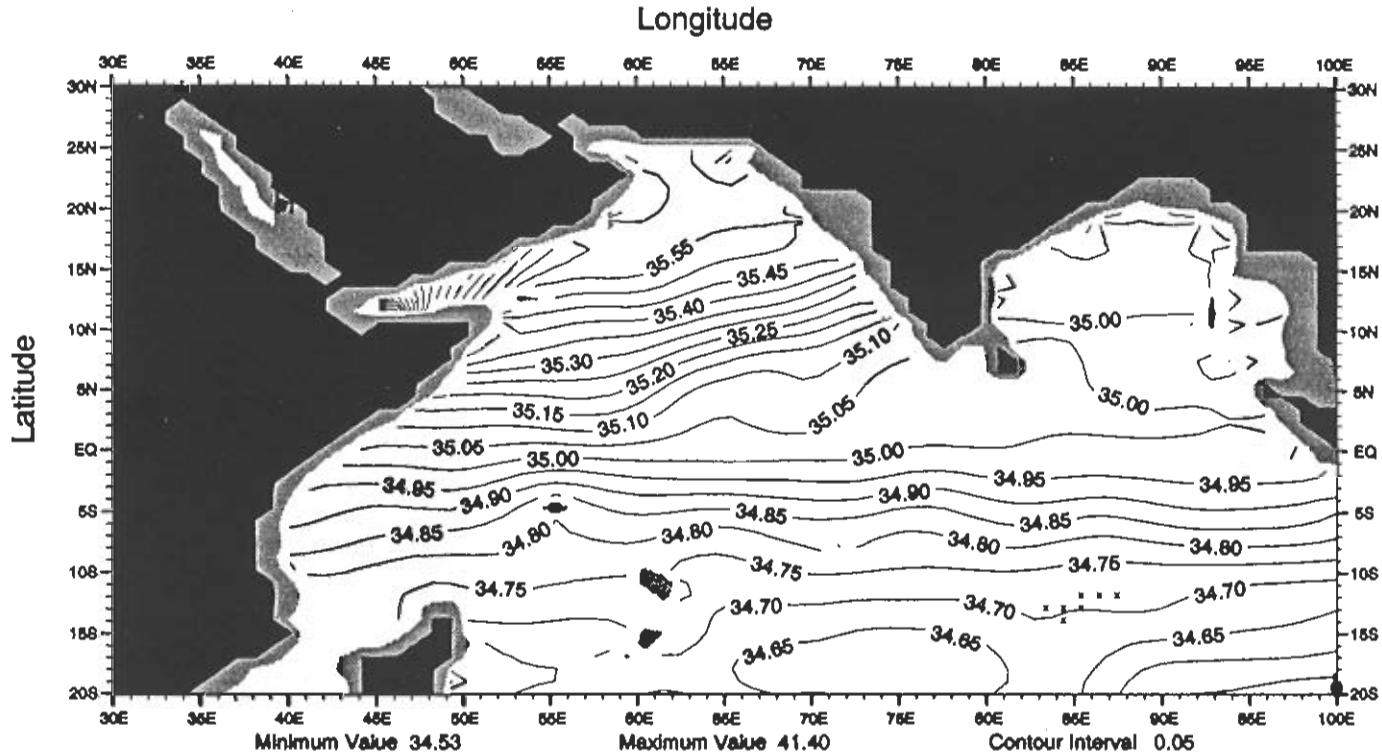

Fig. B8 Annual mean salinity (psu) at 700 m depth

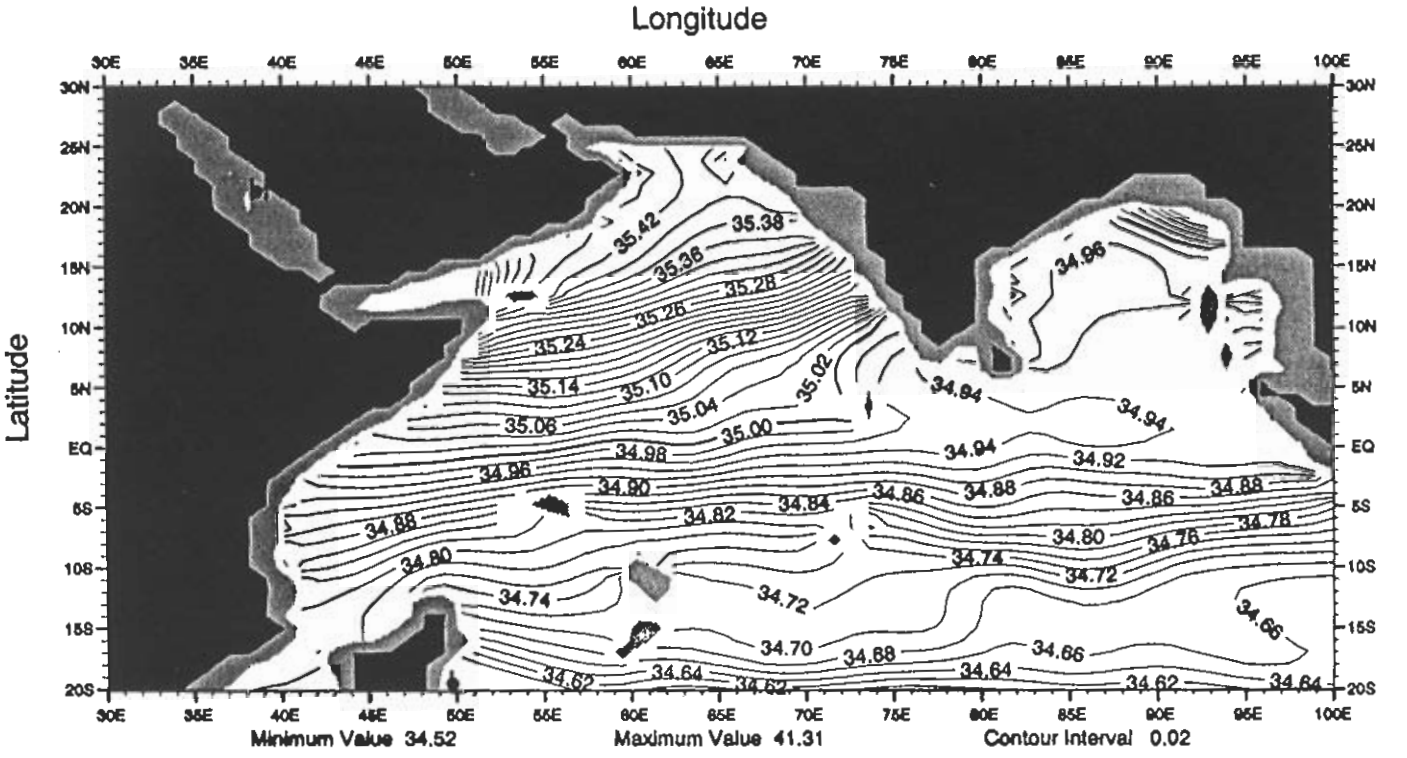

Fig. B9 Annual mean salinity (psu) at 1000 m depth

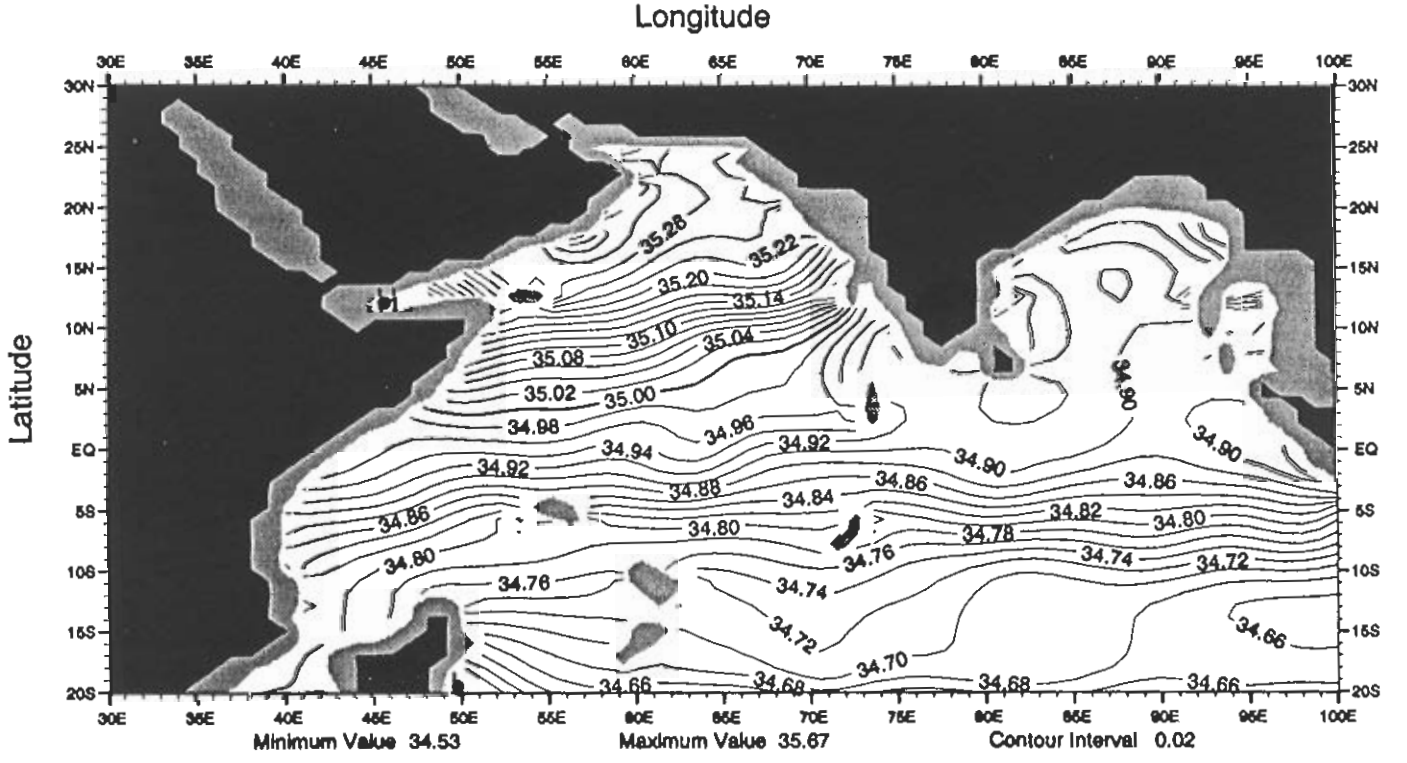

Fig. B10 Annual mean salinity (psu) at 1200 m depth

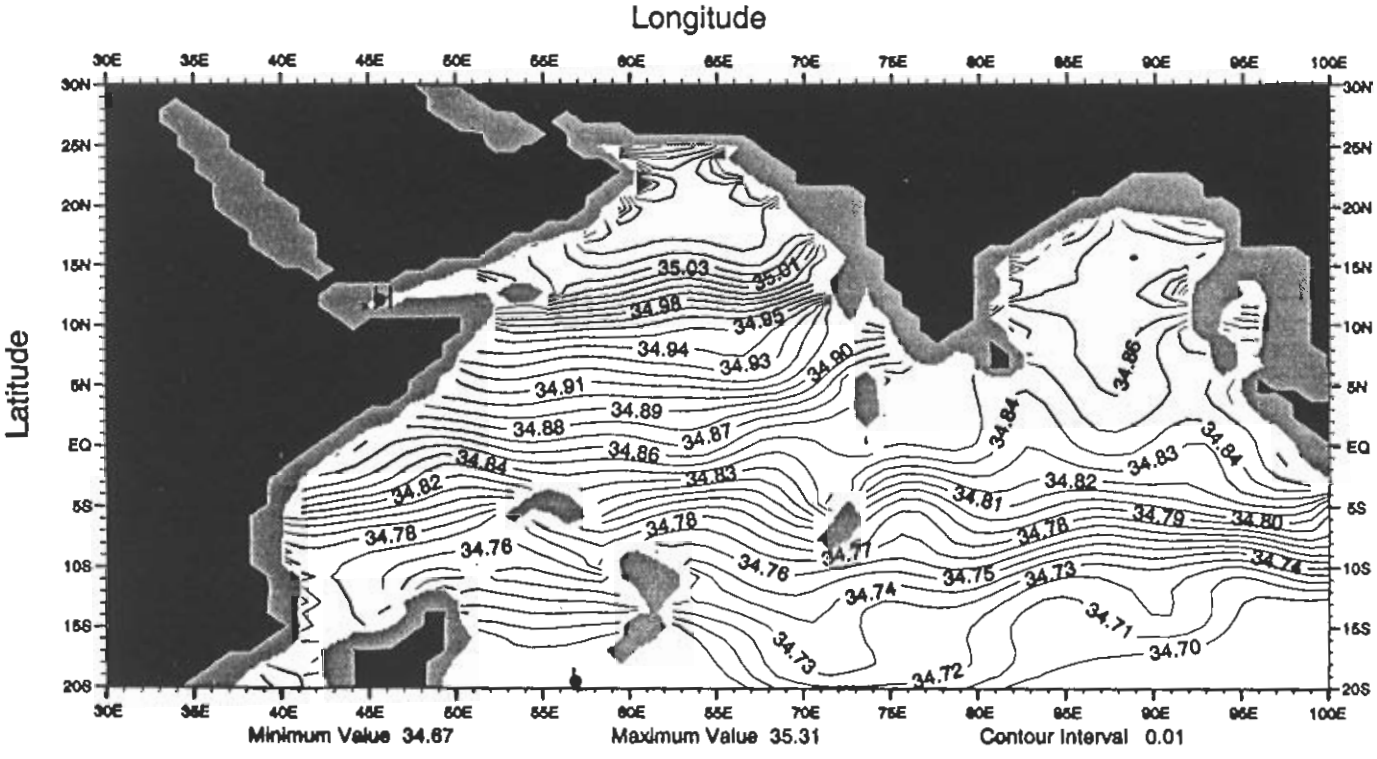

Fig. B11 Annual mean salinity (psu) at 1500 m depth

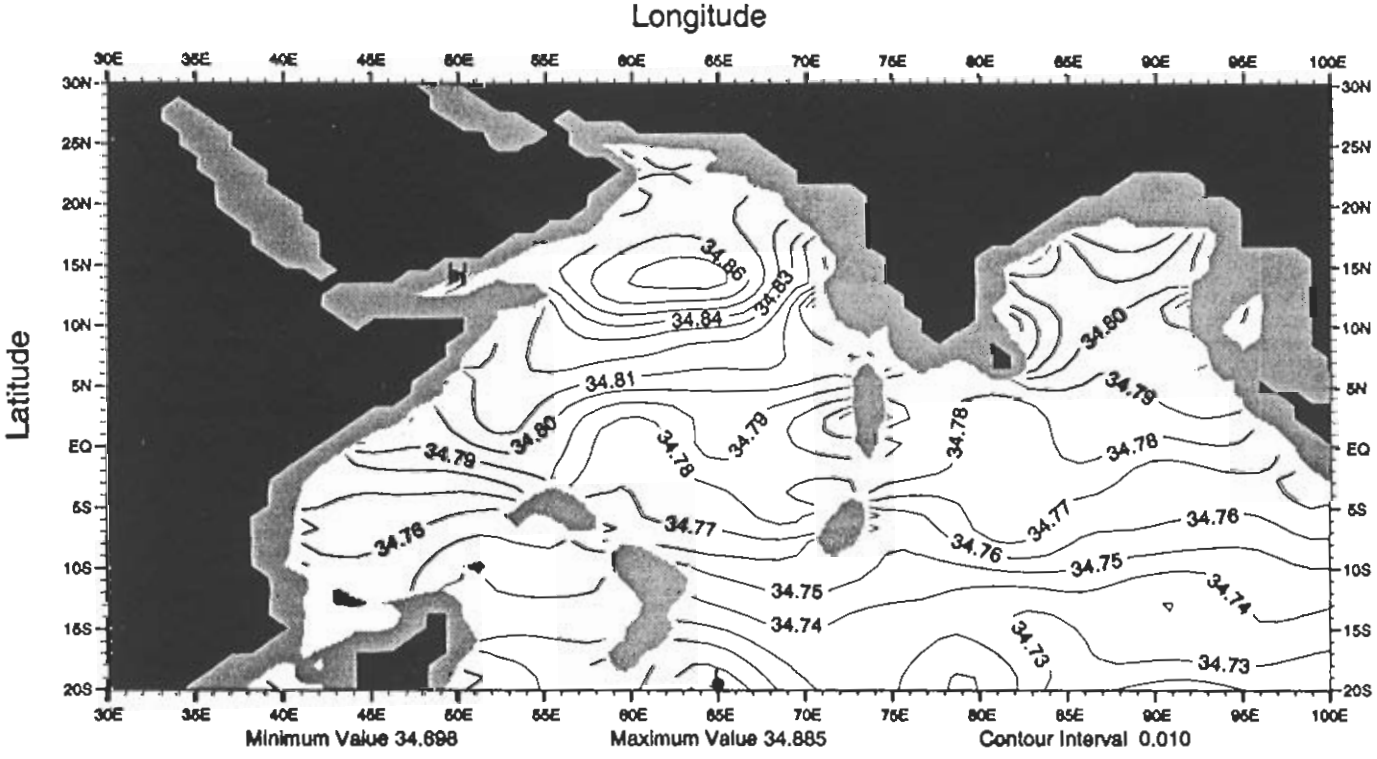

Fig. B12 Annual mean salinity (psu) at 2000 m depth

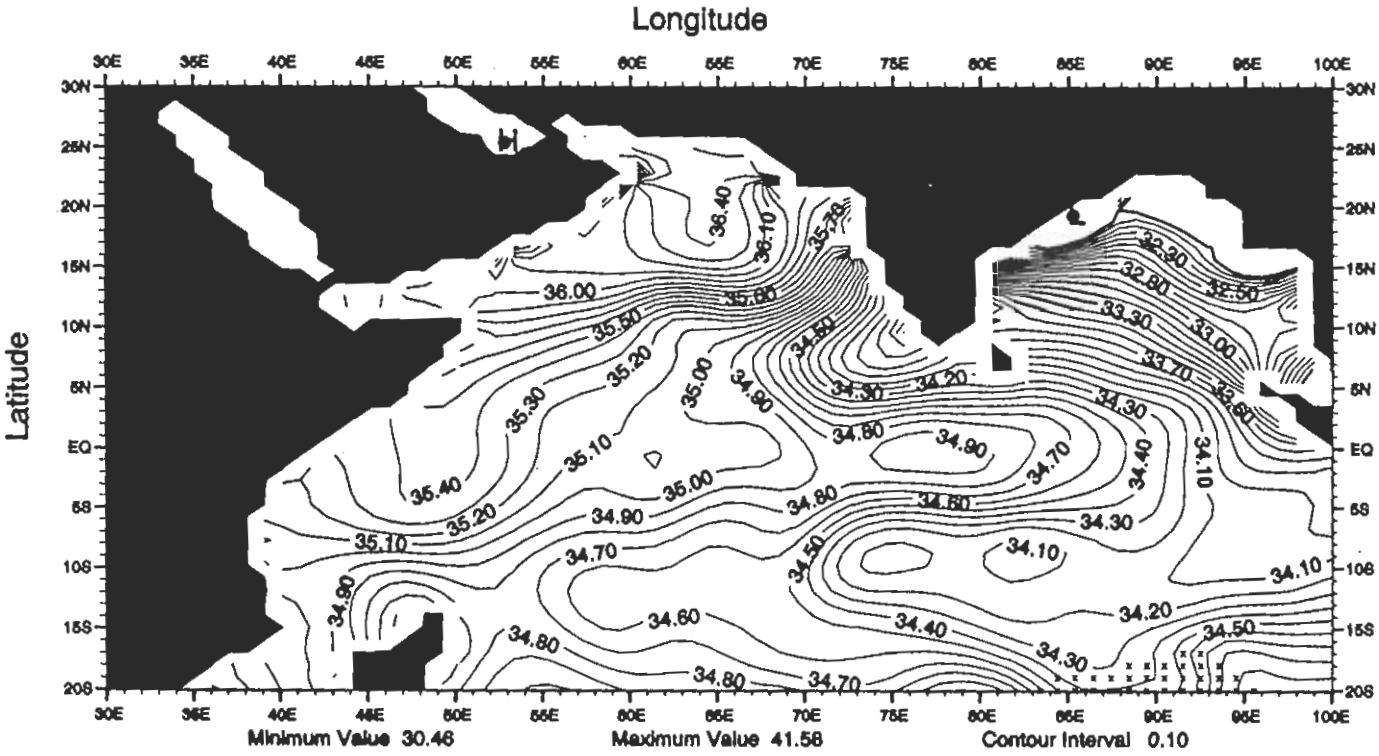

Fig. B13 Winter (Jan.-Mar.) mean salinity (psu) at the surface

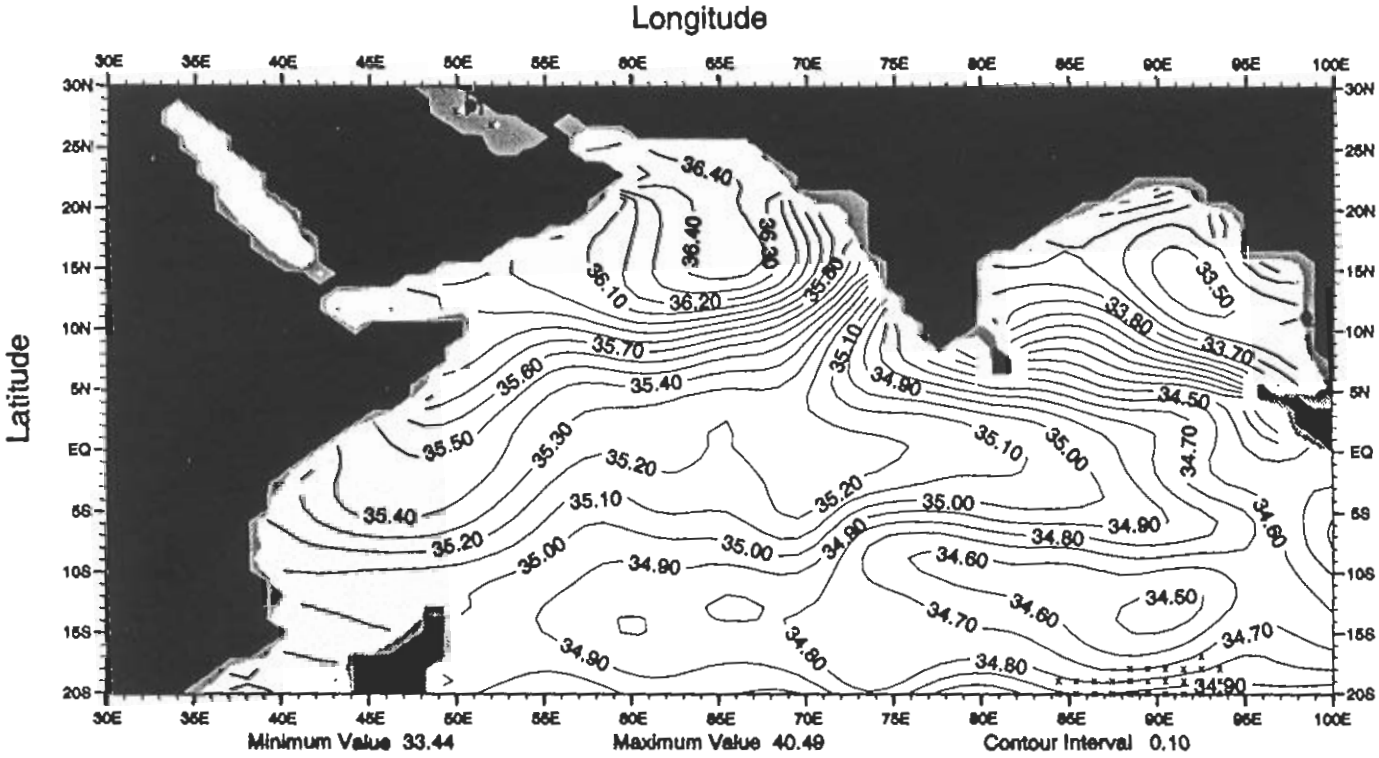

Fig. B14 Winter (Jan.-Mar.) mean salinity (psu) at 50 m depth

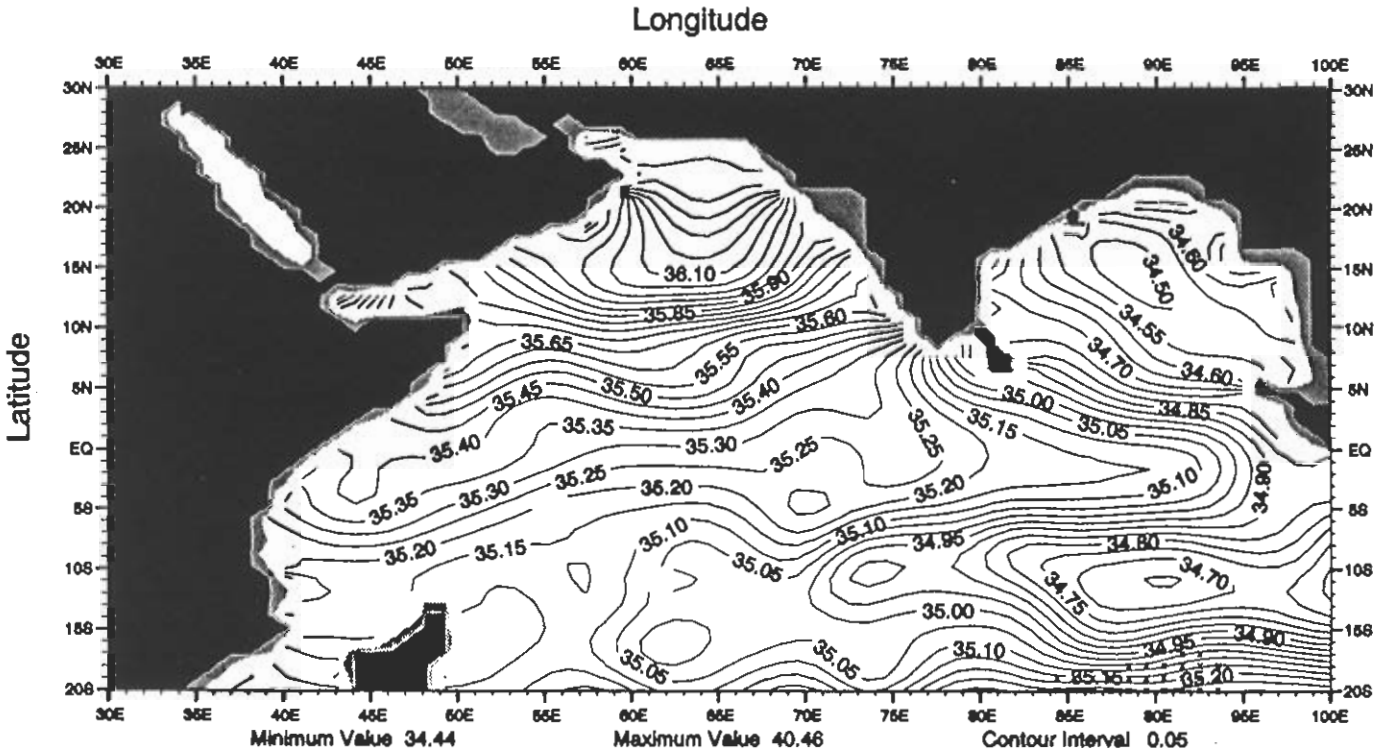

Fig. B15 Winter (Jan.-Mar.) mean salinity (psu) at 100 m depth

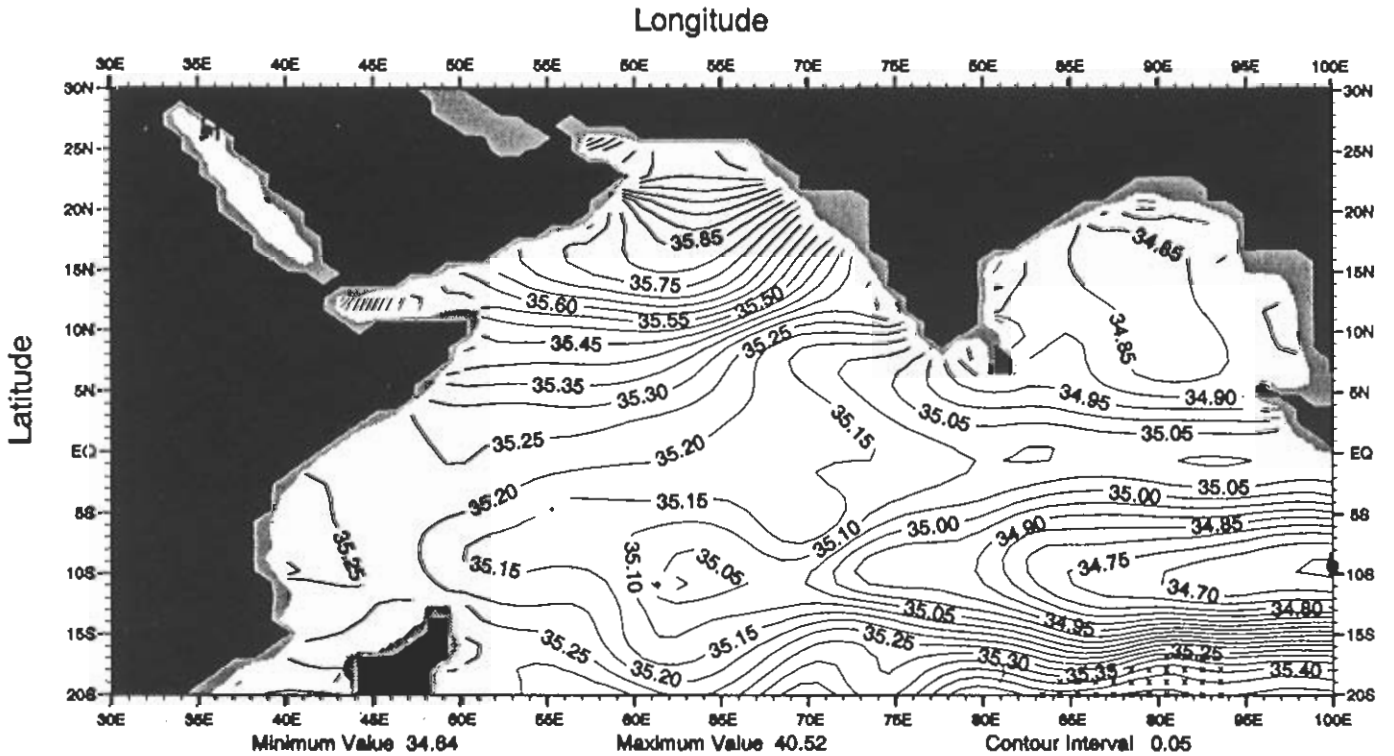

Fig. B16 Winter (Jan.-Mar.) mean salinity (psu) at 150 m depth

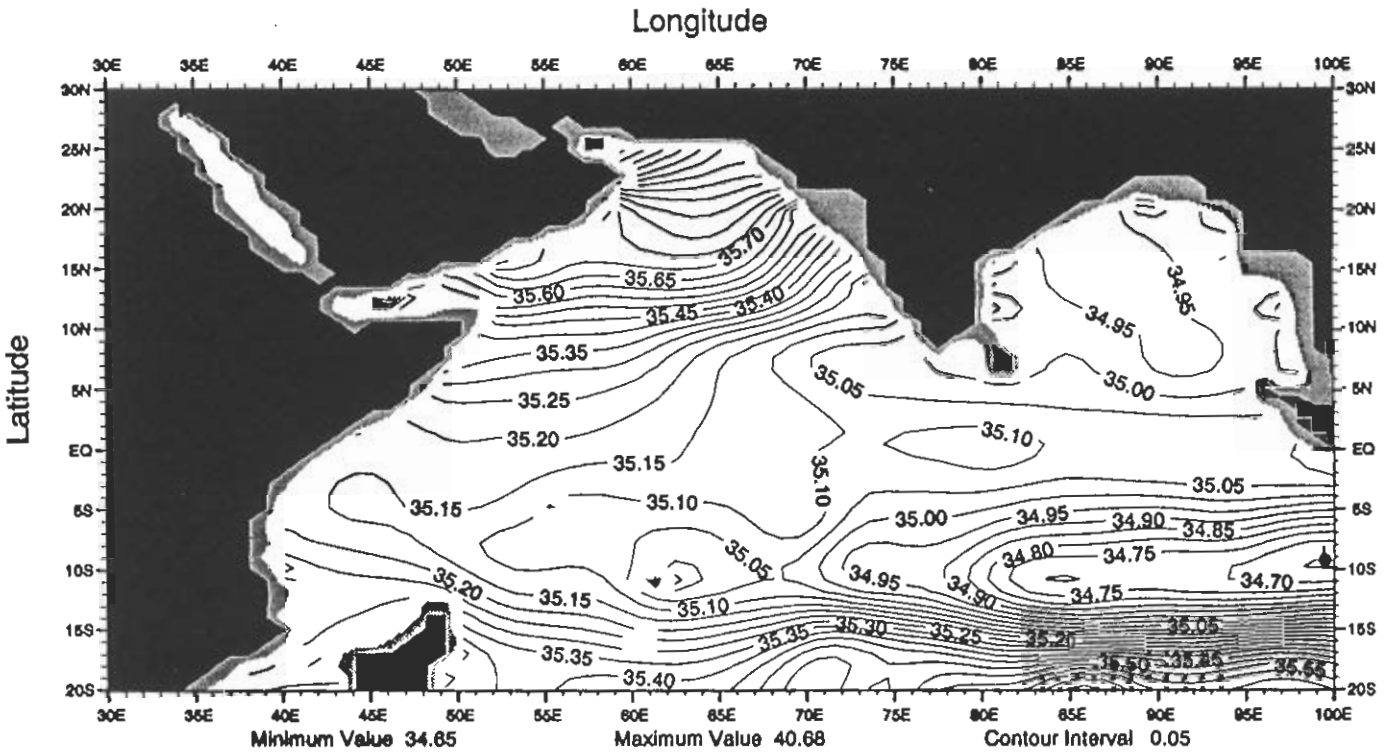

Fig. B17 Winter (Jan.-Mar.) mean salinity (psu) at 200 m depth

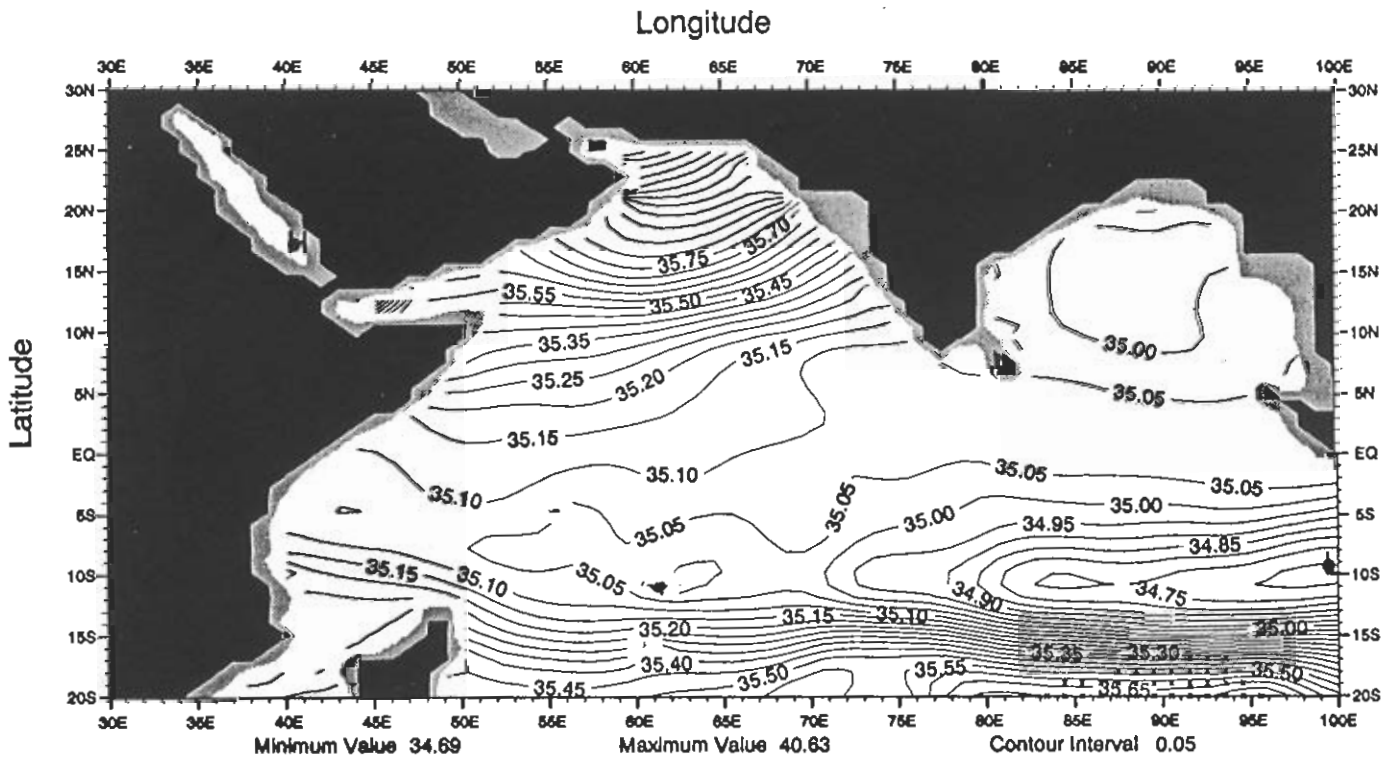

Fig. B18 Winter (Jan.-Mar.) mean salinity (psu) at 250 m depth

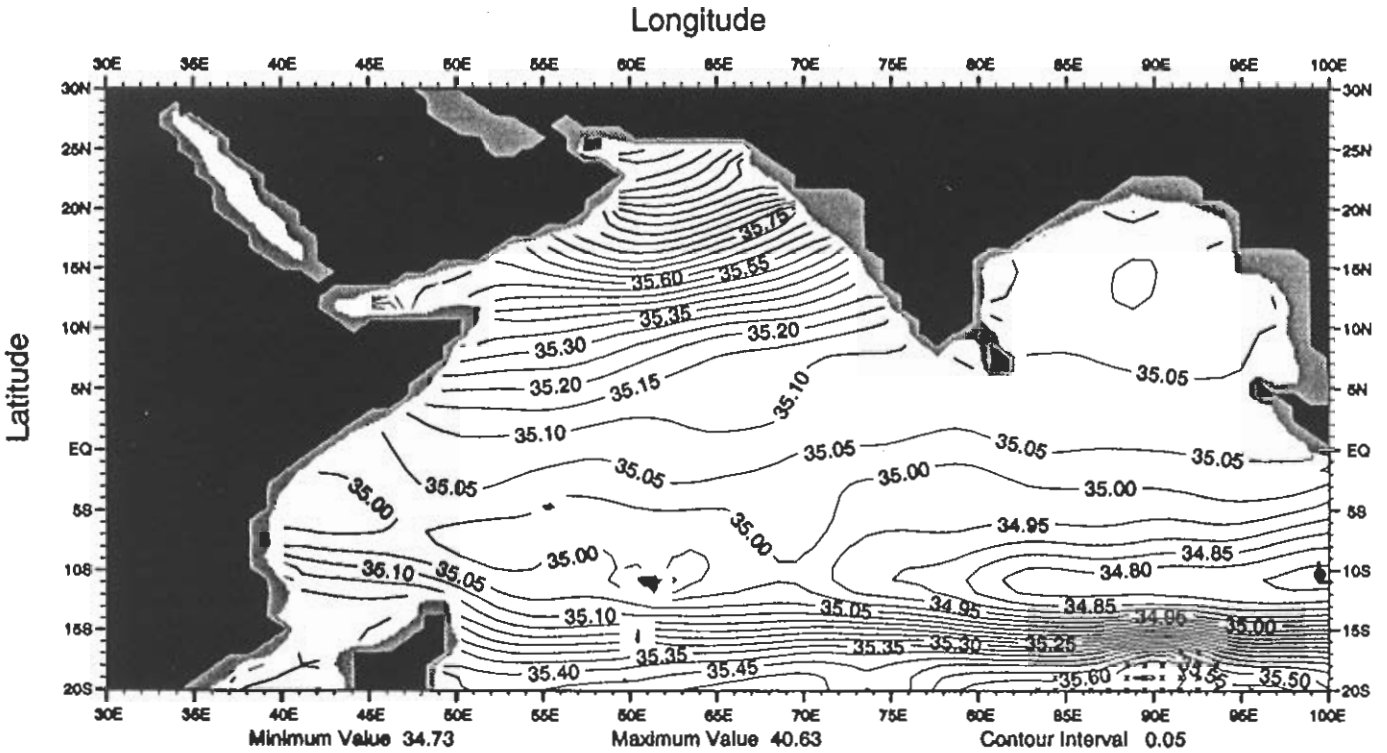

Fig. B19 Winter (Jan.-Mar.) mean salinity (psu) at 300 m depth

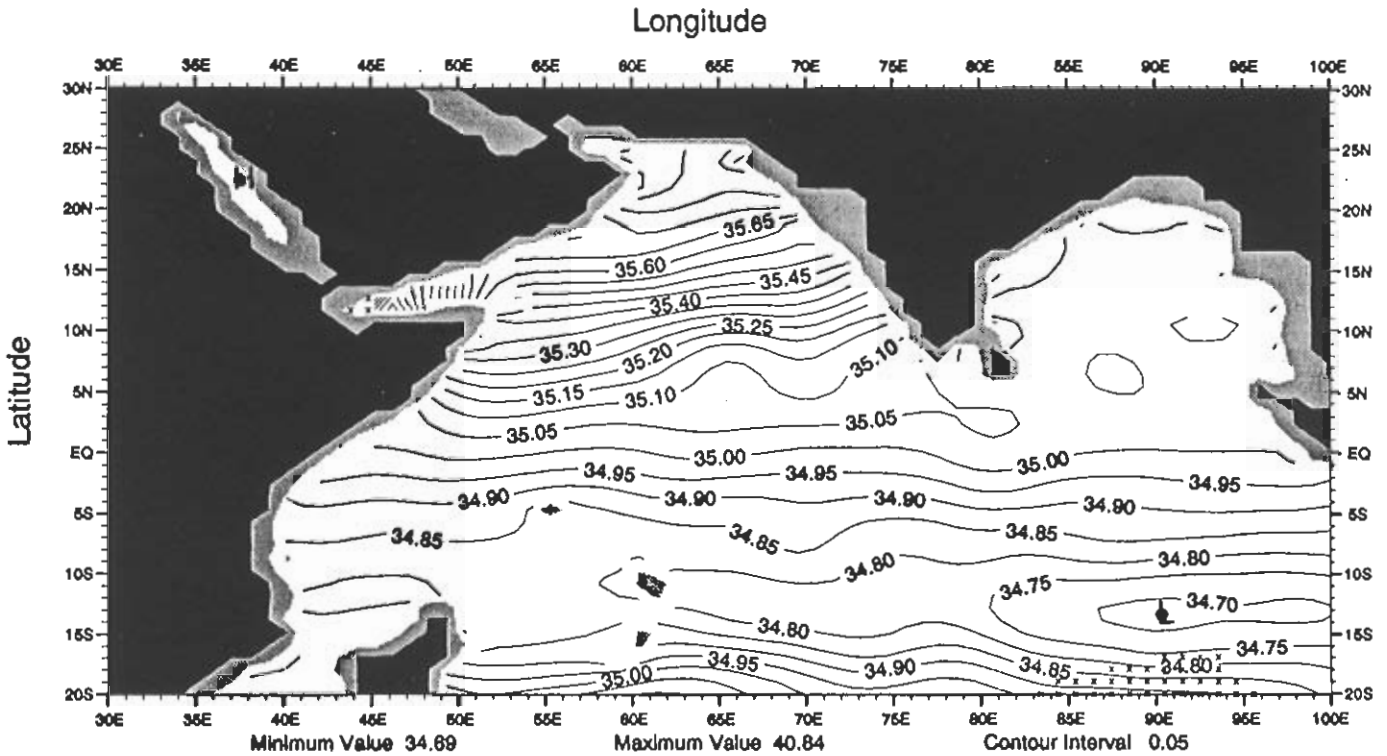

Fig. B20 Winter (Jan.-Mar.) mean salinity (psu) at 500 m depth

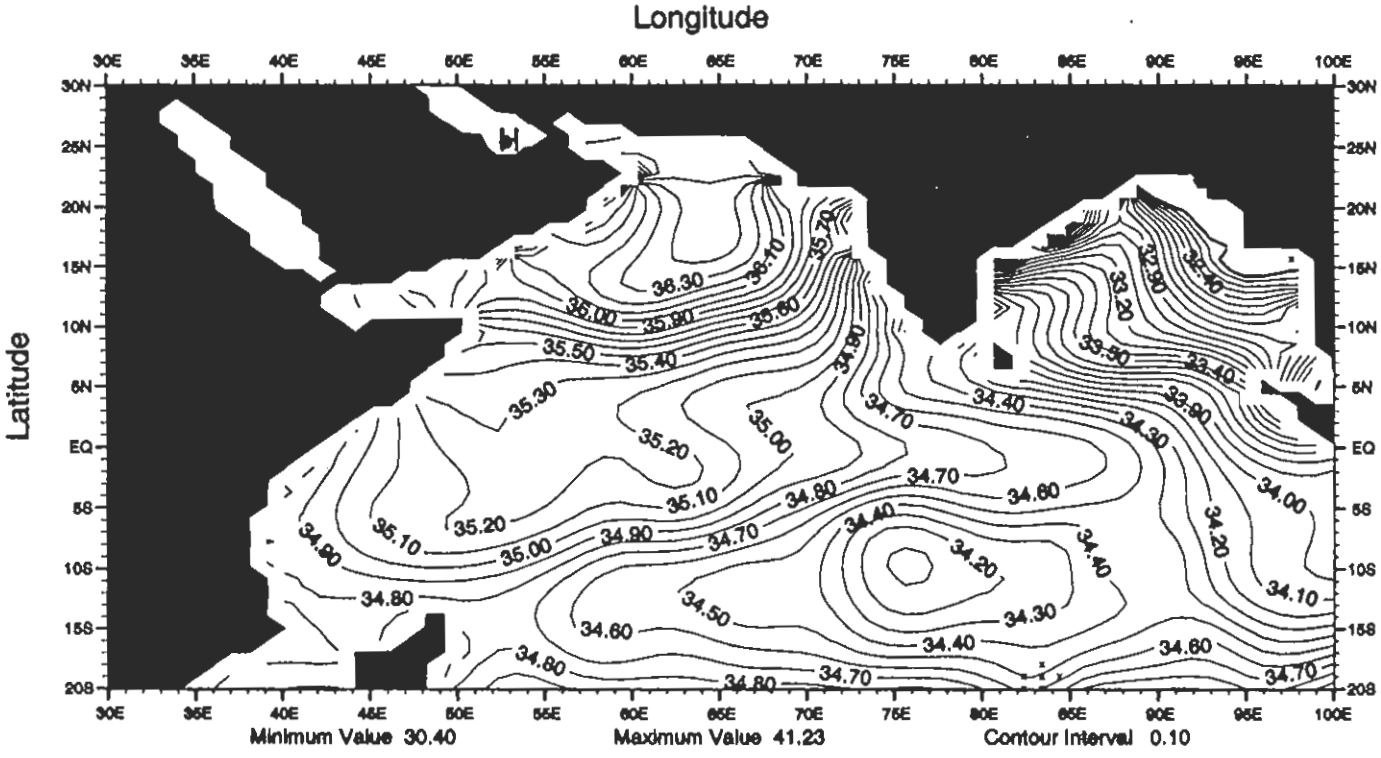

Fig. B21 Spring (Apr.-Jun.) mean salinity (psu) at the surface

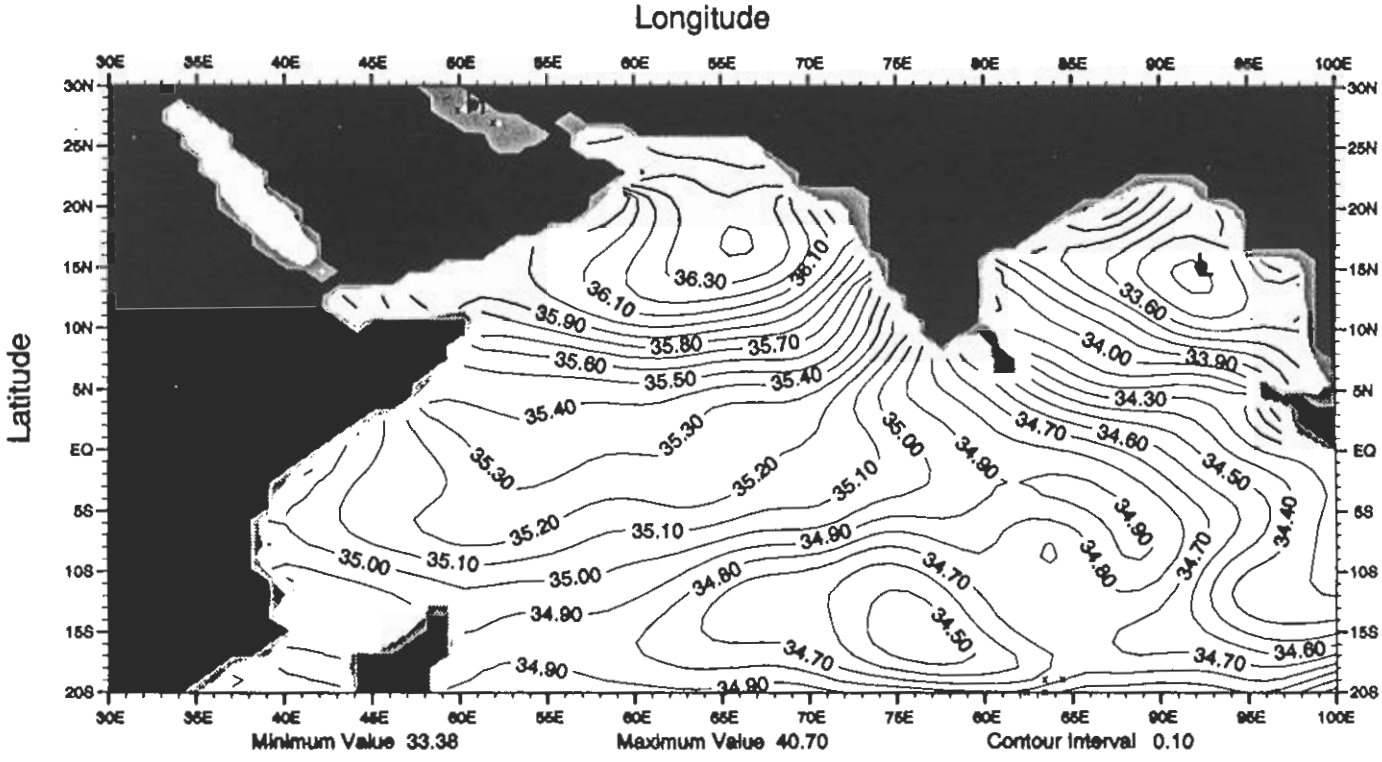

Fig. B22 Spring (Apr.-Jun.) mean salinity (psu) at 50 m depth

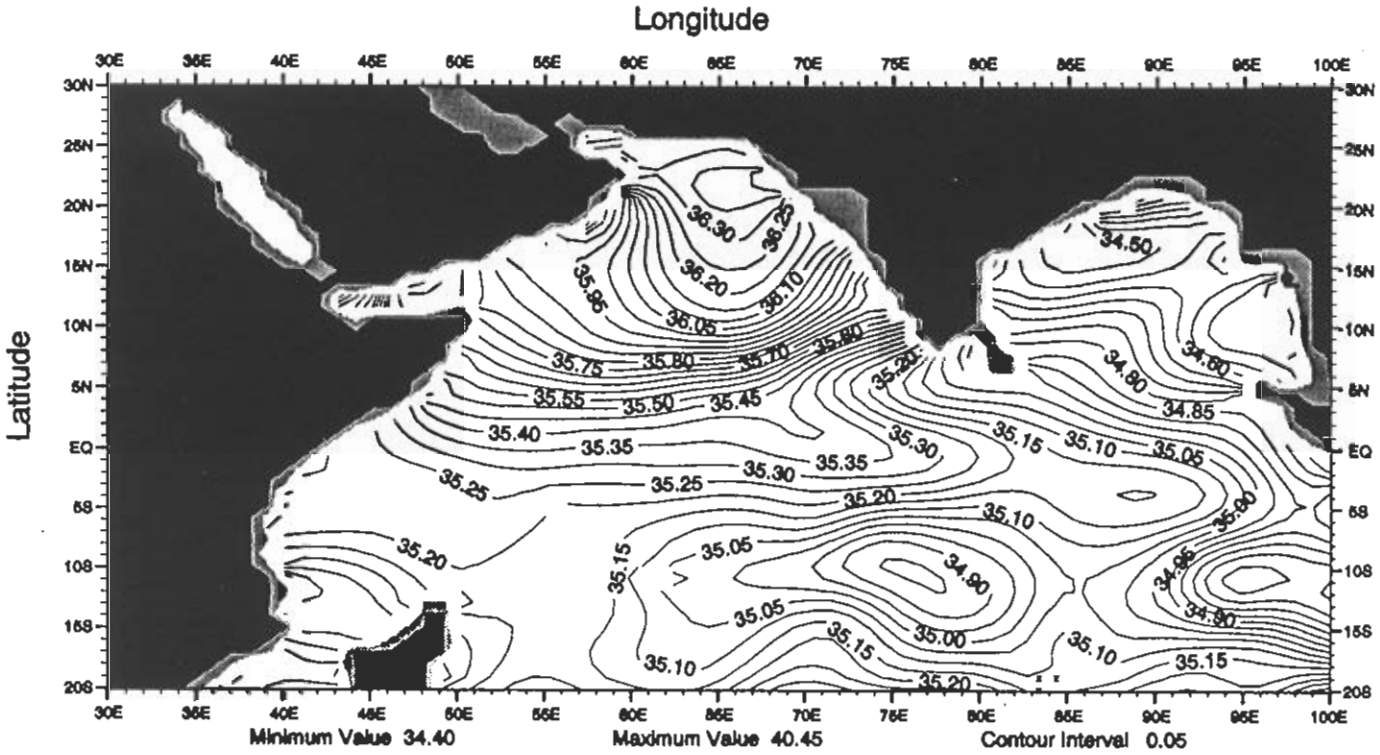

Fig. B23 Spring (Apr.-Jun.) mean salinity (psu) at 100 m depth

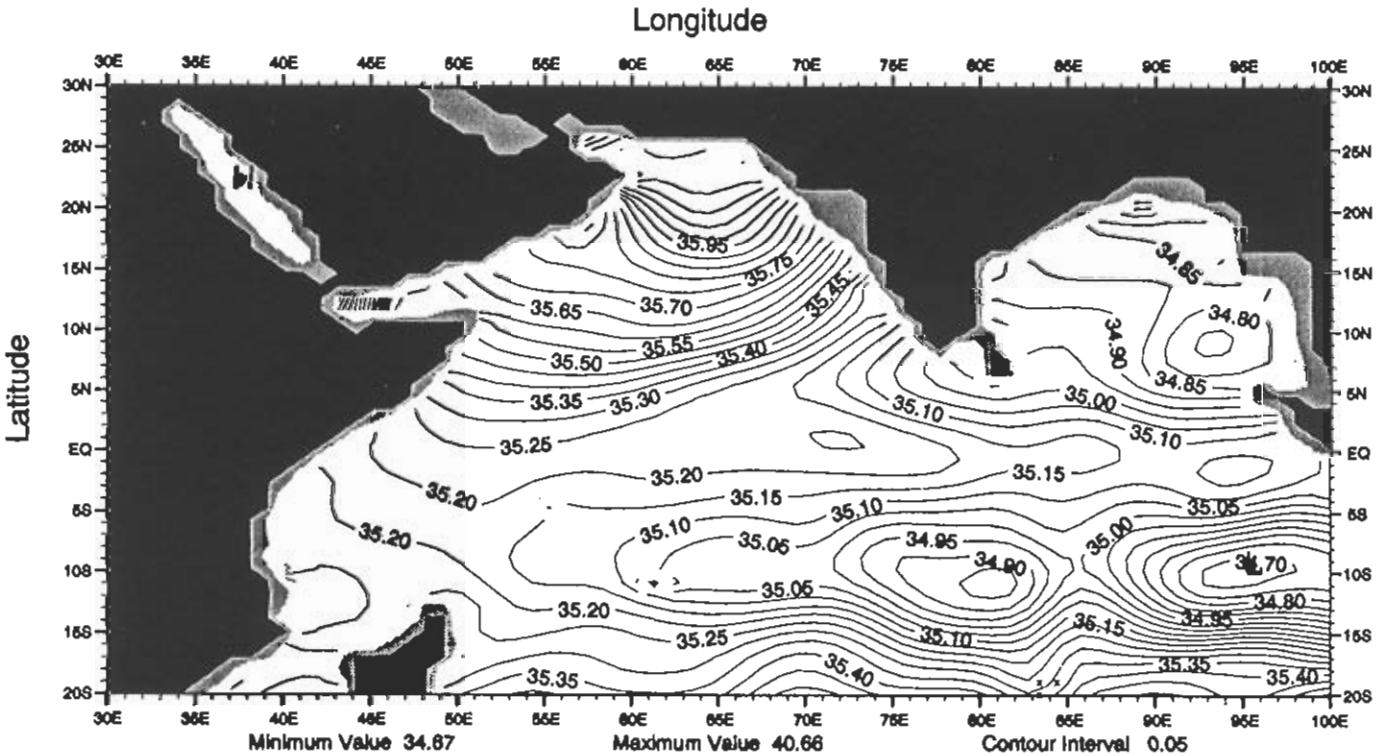

Fig. B24 Spring (Apr.-Jun.) mean salinity (psu) at 150 m depth

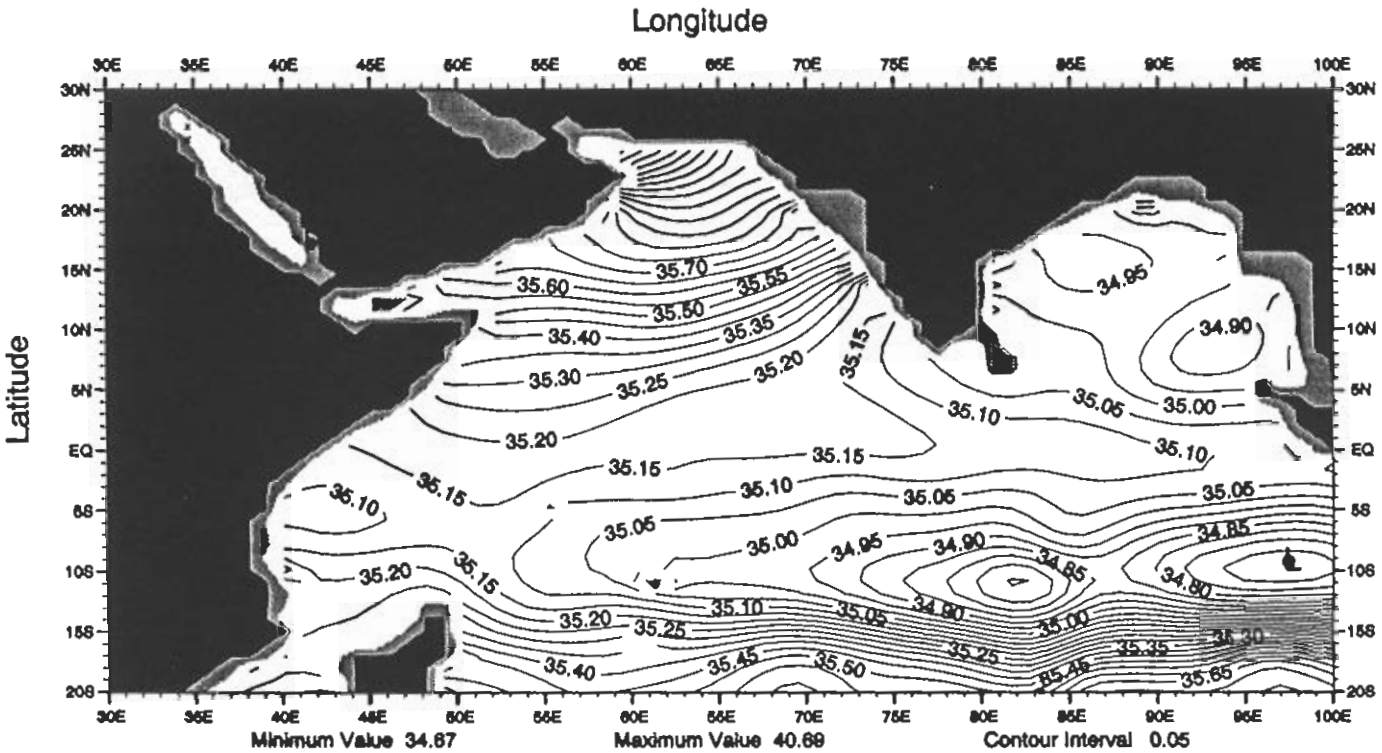

Fig. B25 Spring (Apr.-Jun.) mean salinity (psu) at 200 m depth

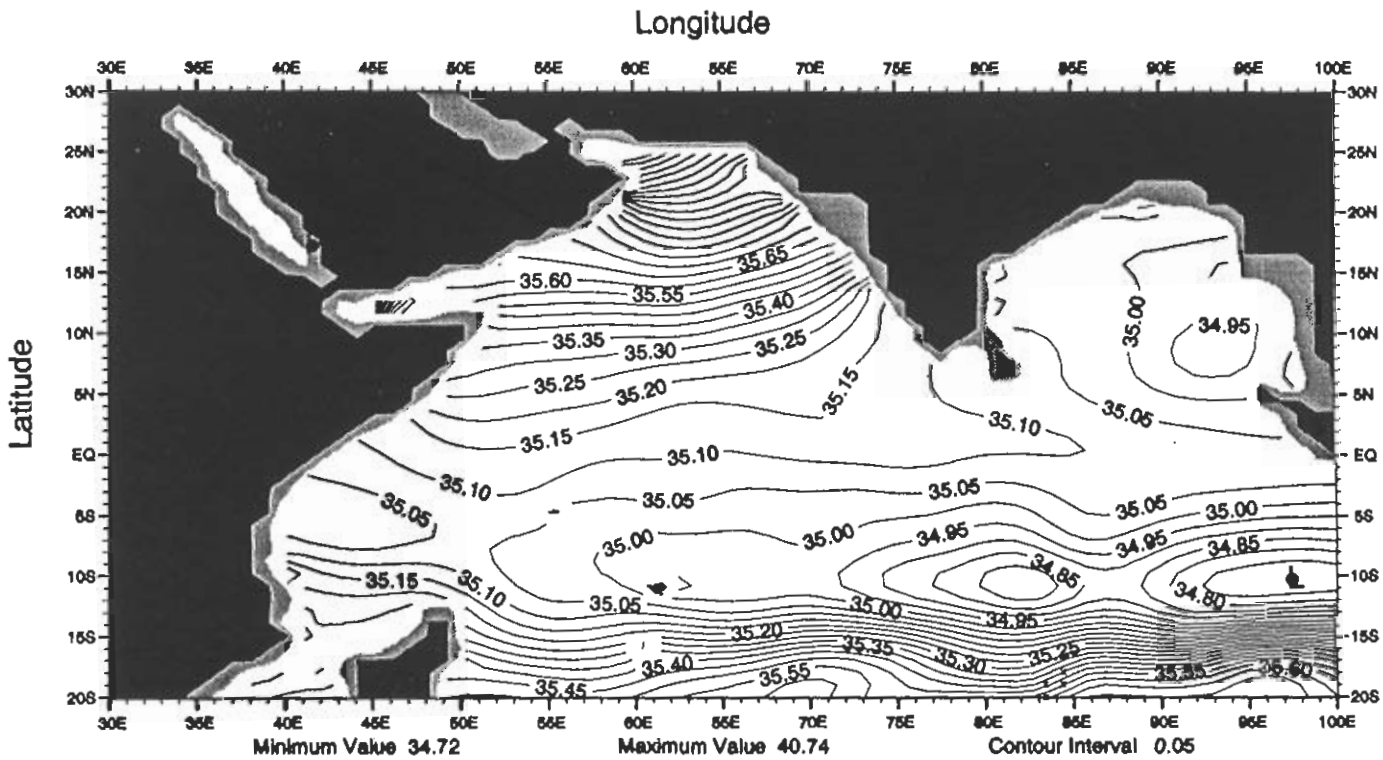

Fig. B26 Spring (Apr.-Jun.) mean salinity (psu) at 250 m depth

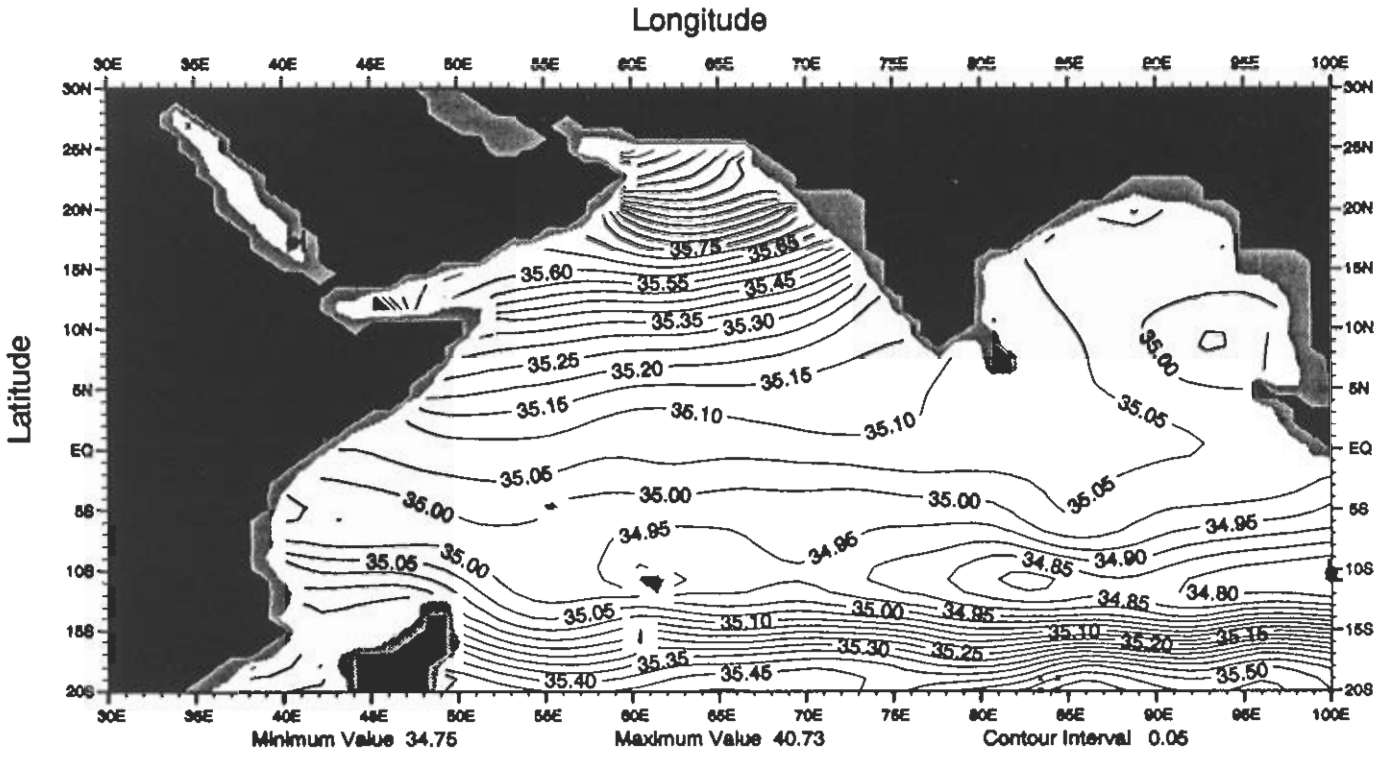

Fig. B27 Spring (Apr.-Jun.) mean salinity (psu) at 300 m depth

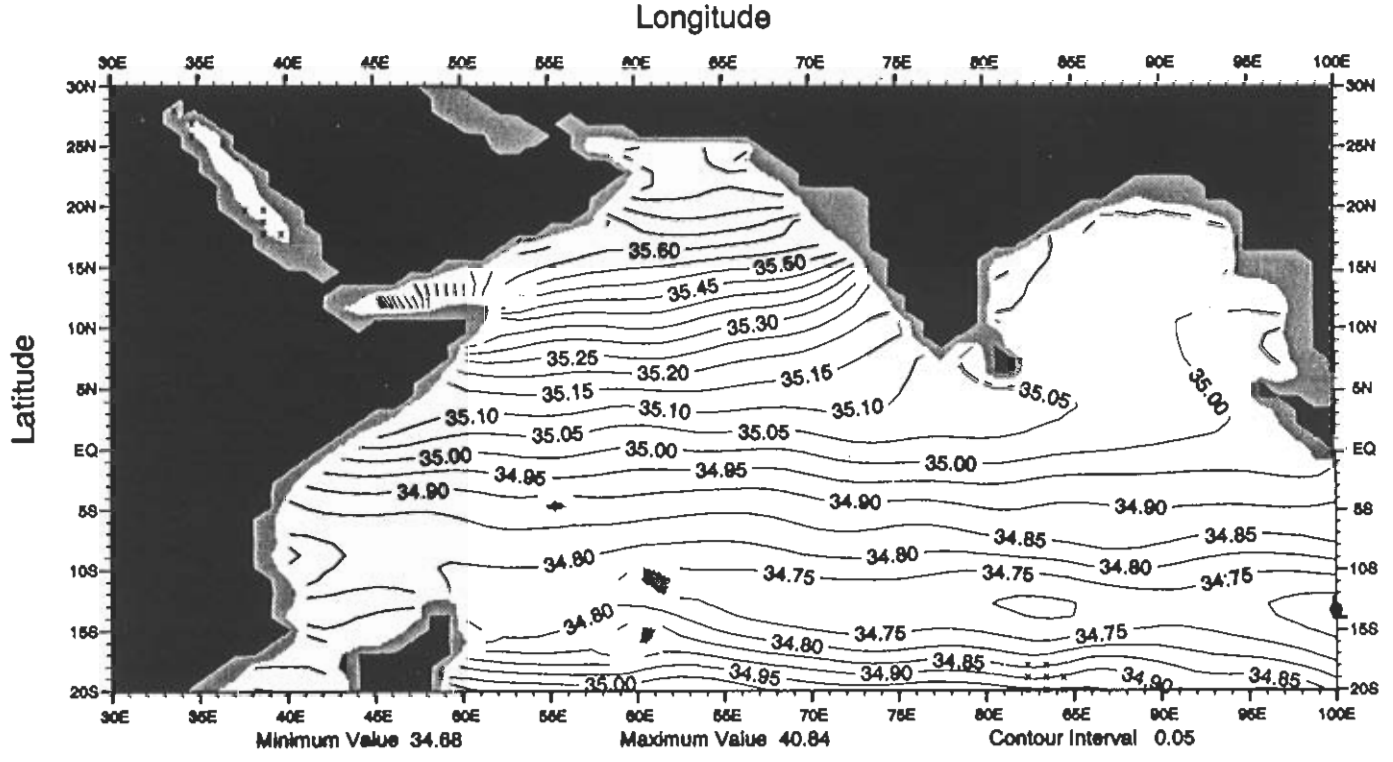

Fig. B28 Spring (Apr.-Jun.) mean salinity (psu) at 500 m depth

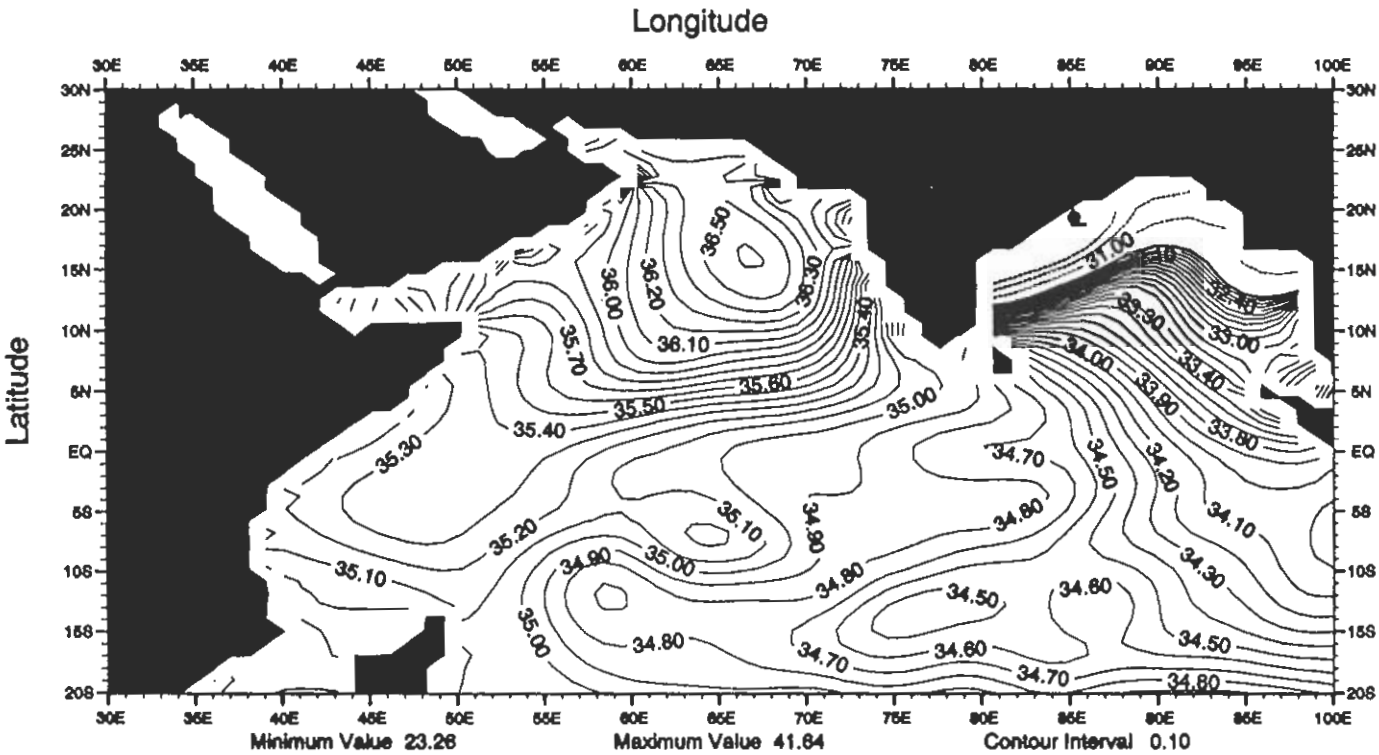

Fig. B29 Summer (Jul.-Sep.) mean salinity (psu) at the surface

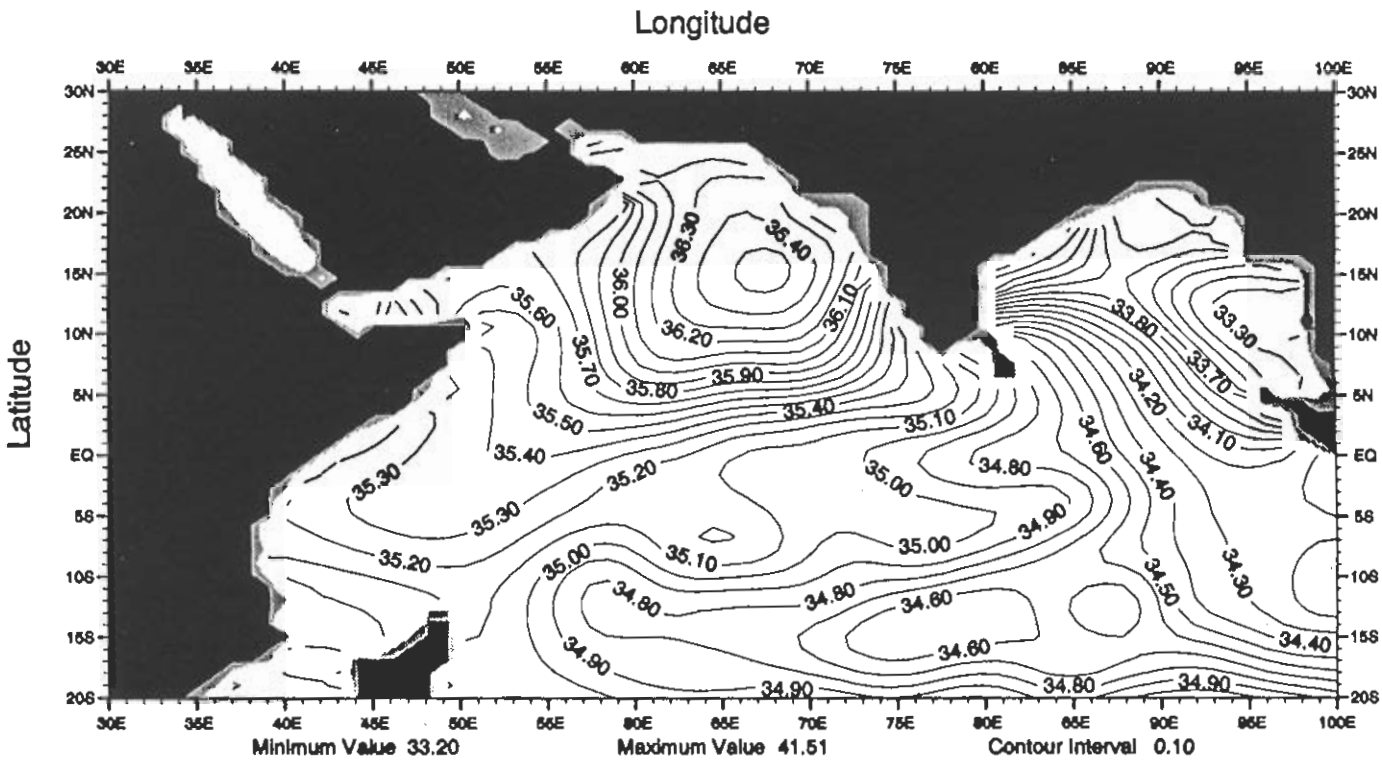

Fig. B30 Summer (Jul.-Sep.) mean salinity (psu) at 50 m depth

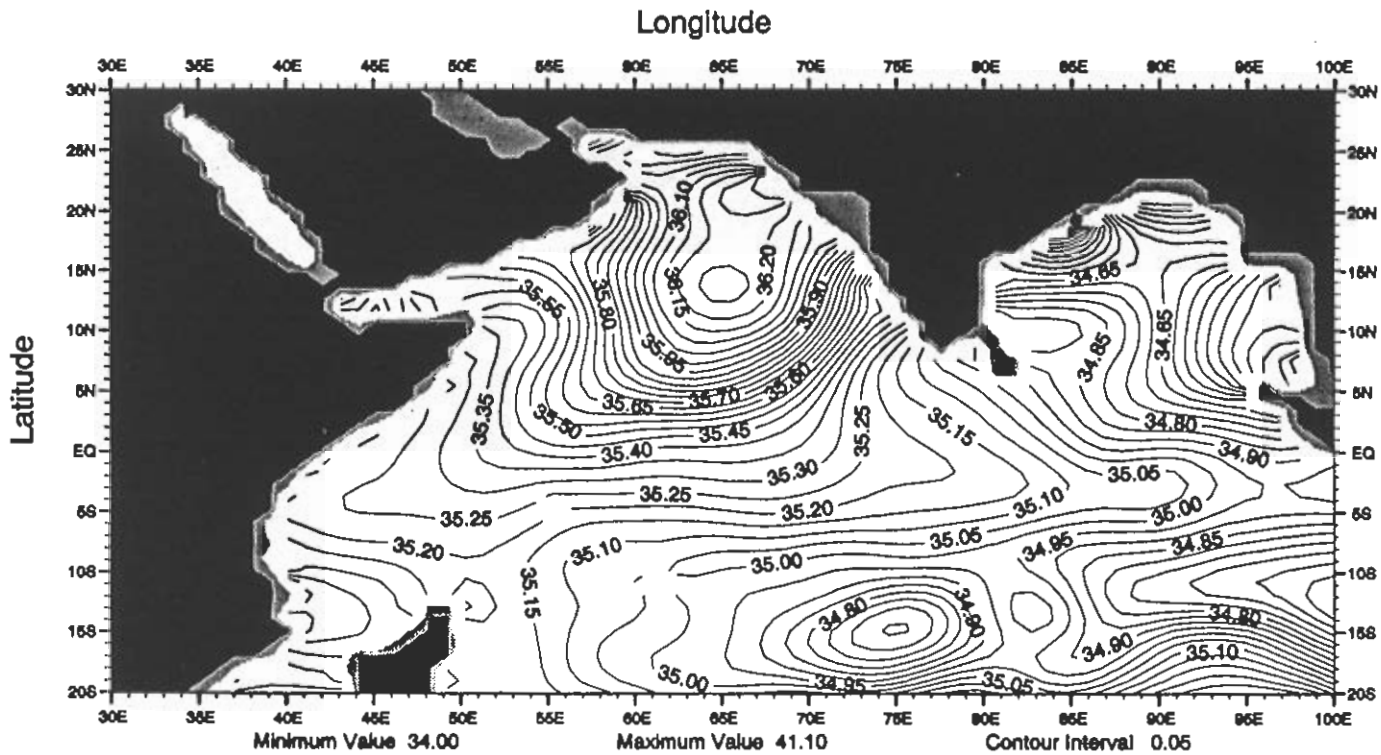

Fig. B31 Summer (Jul.-Sep.) mean salinity (psu) at 100 m depth

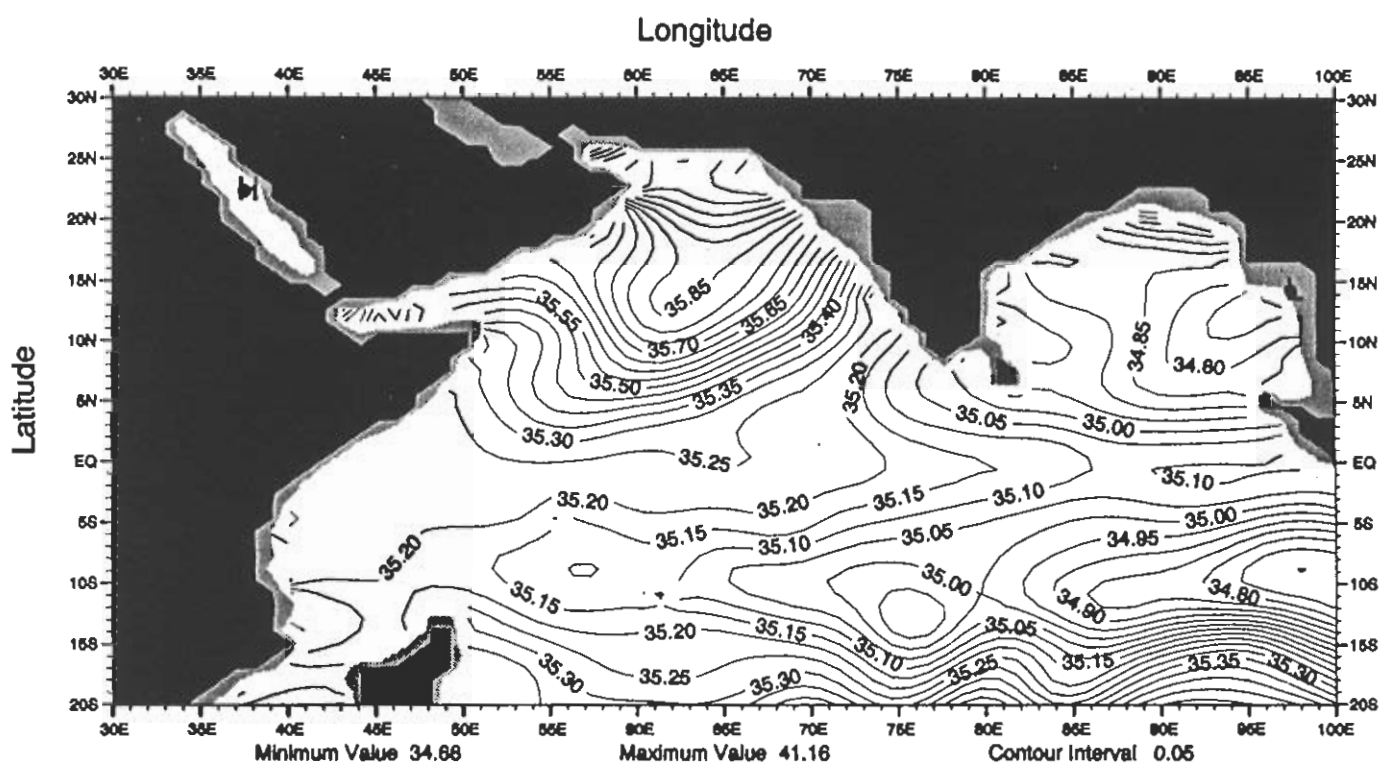

Fig. B32 Summer (Jul.-Sep.) mean salinity (psu) at 150 m depth

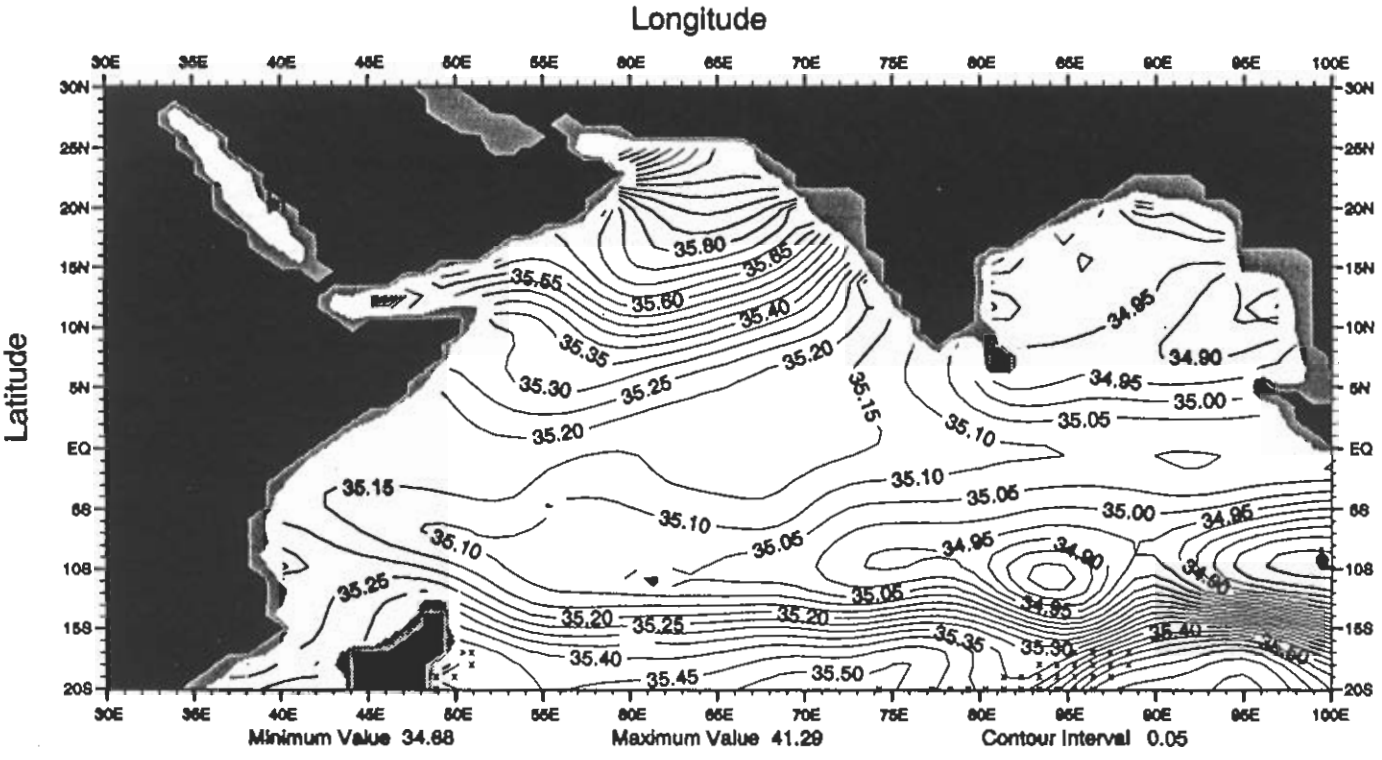

Fig. B33 Summer (Jul.-Sep.) mean salinity (psu) at 200 m depth

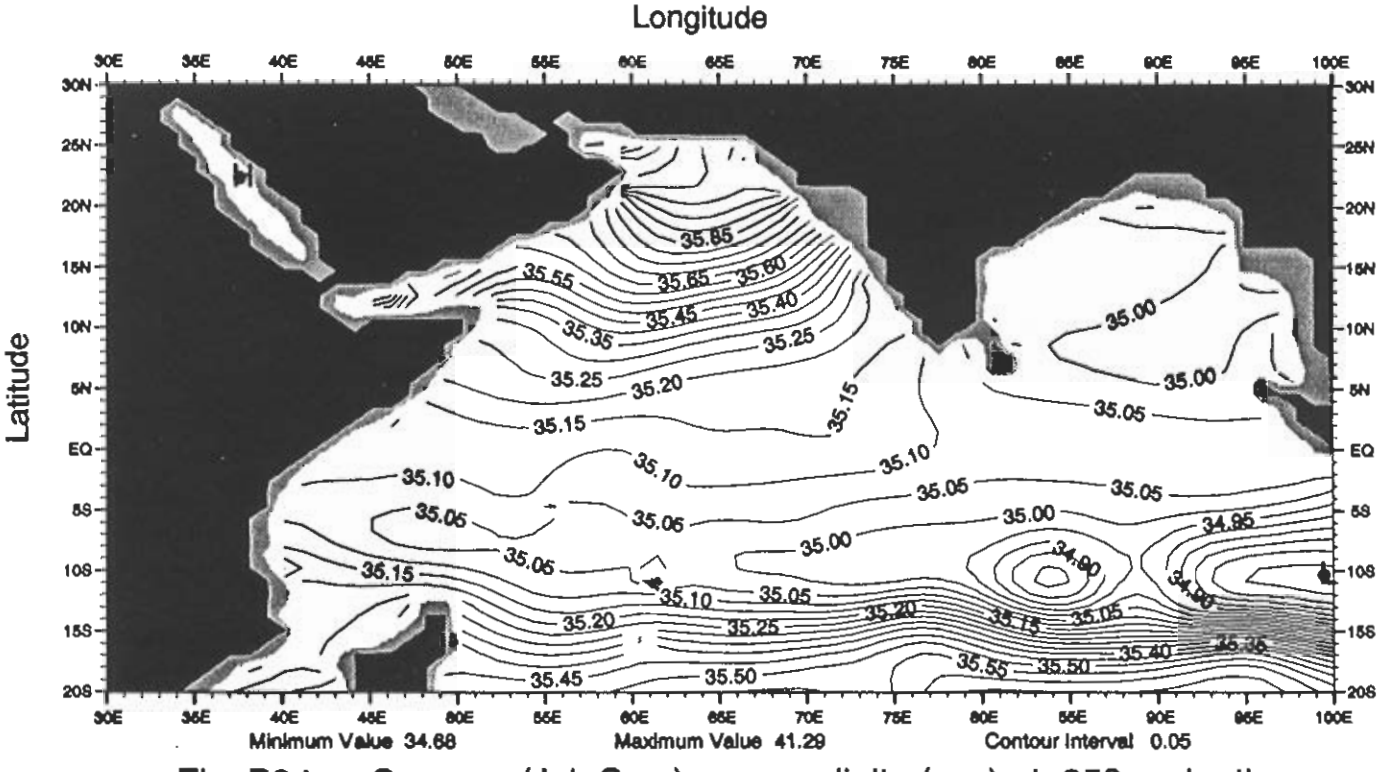

Fig. B34 Summer (Jul.-Sep.) mean salinity (psu) at 250 m depth

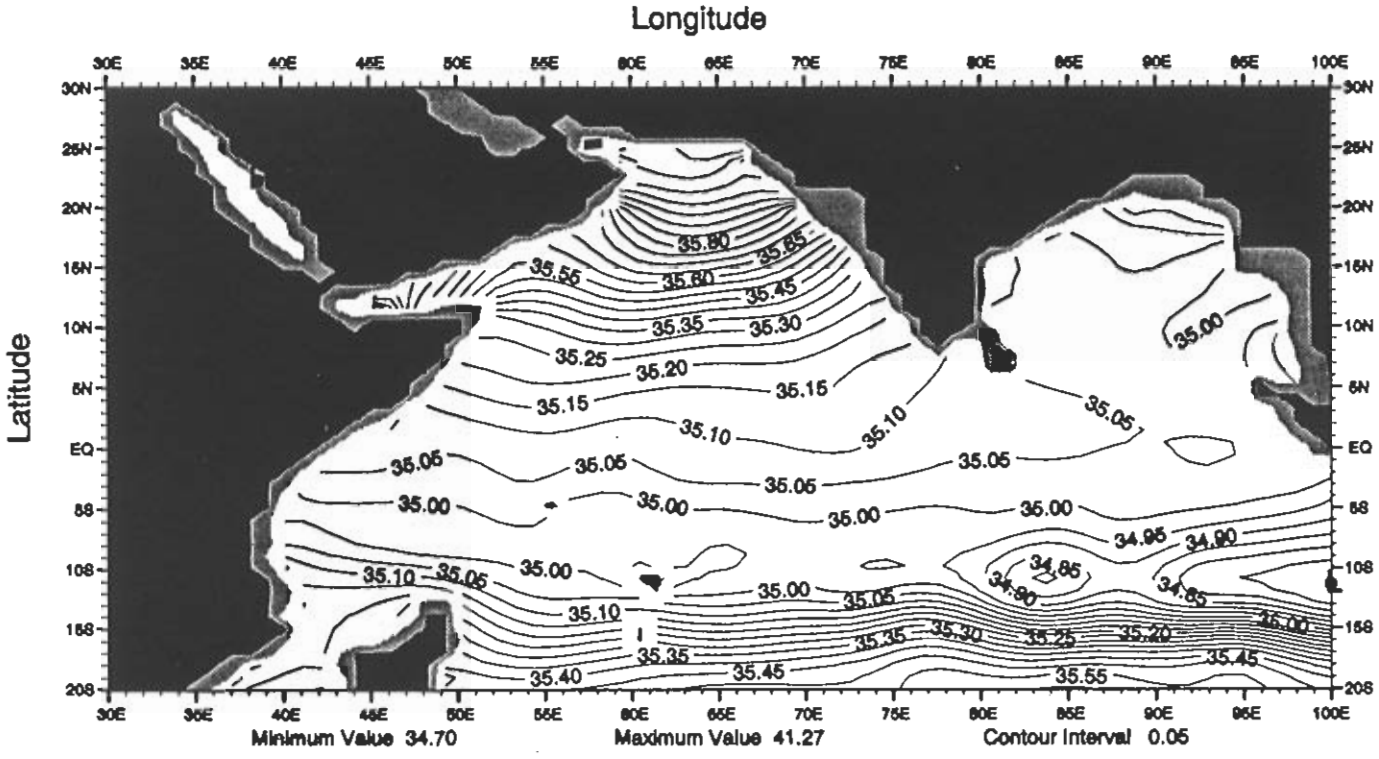

Fig. B35 Summer (Jul.-Sep.) mean salinity (psu) at 300 m depth

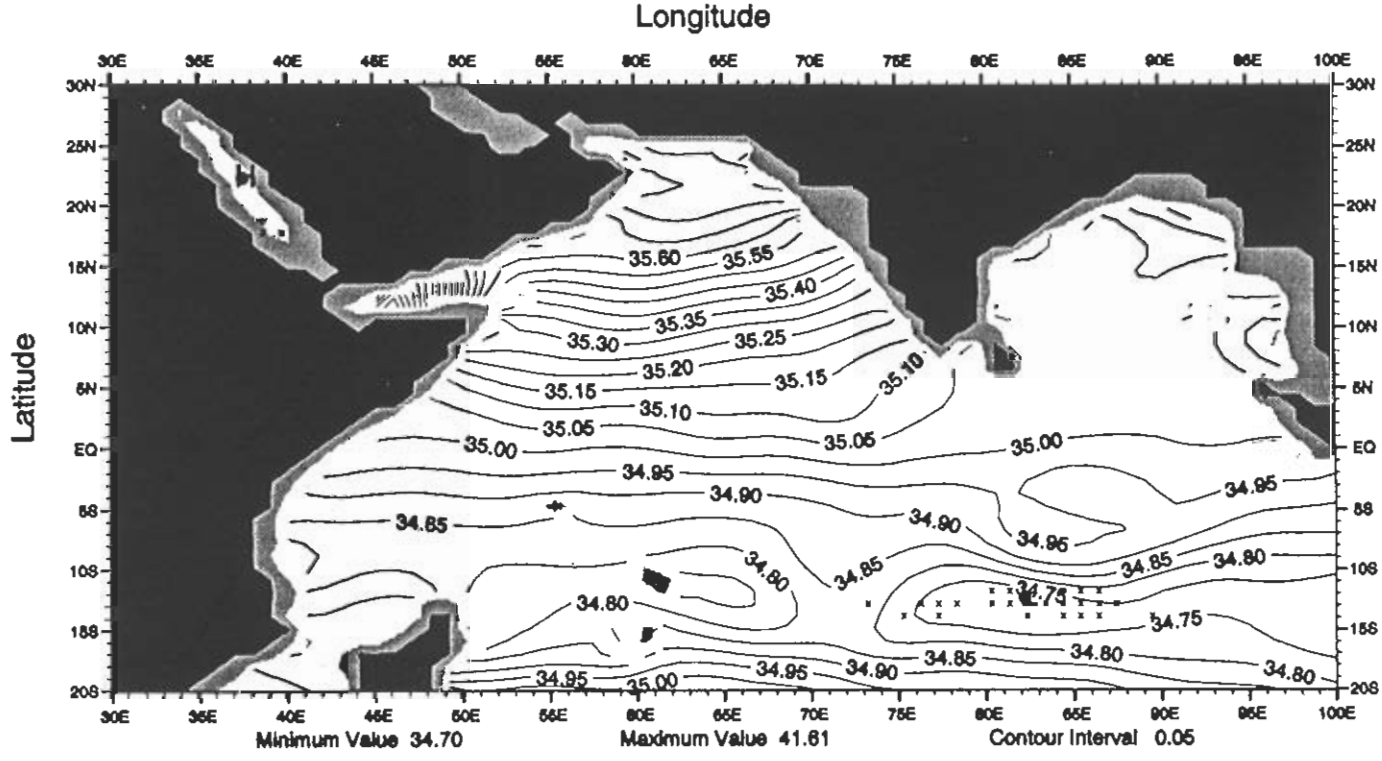

Fig. B36 Summer (Jul.-Sep.) mean salinity (psu) at 500 m depth

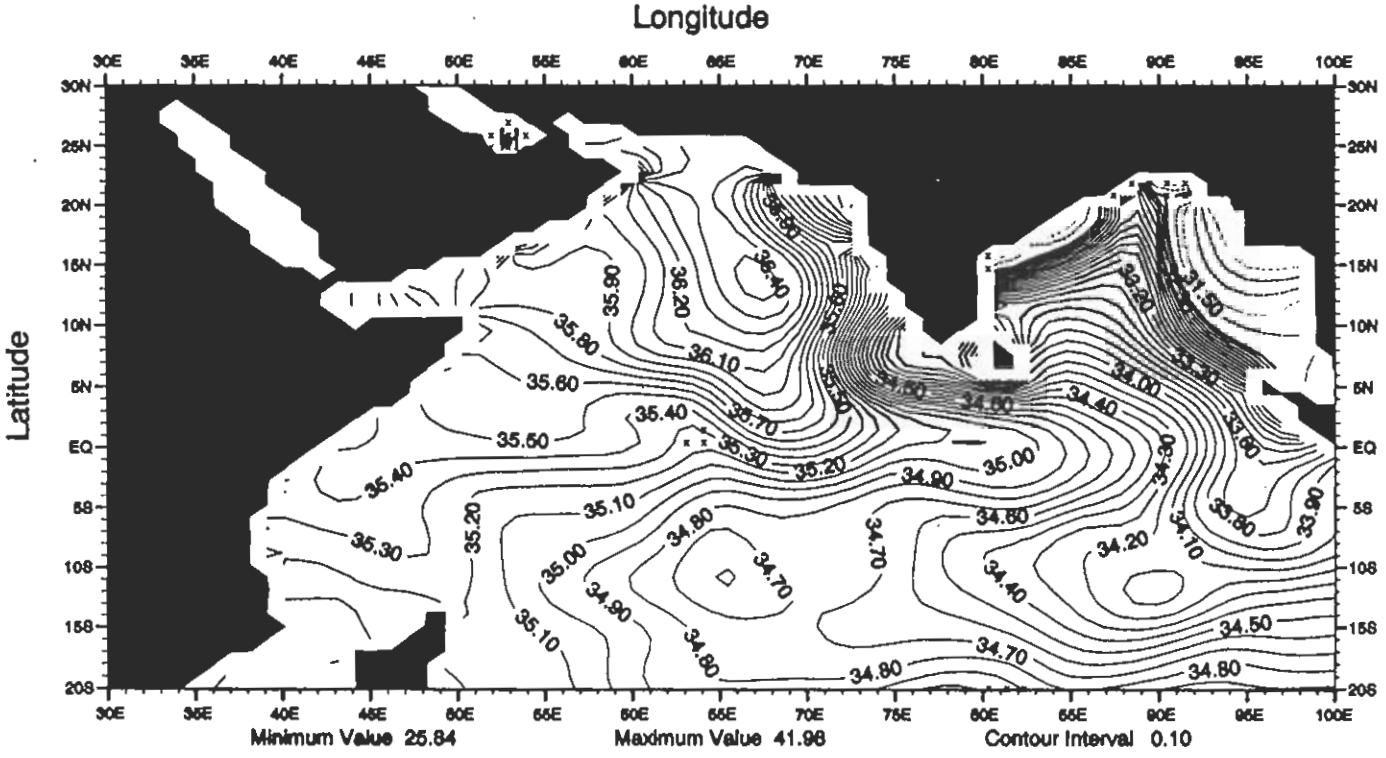

Fig. B37 Fall (Oct.-Dec.) mean salinity (psu) at the surface

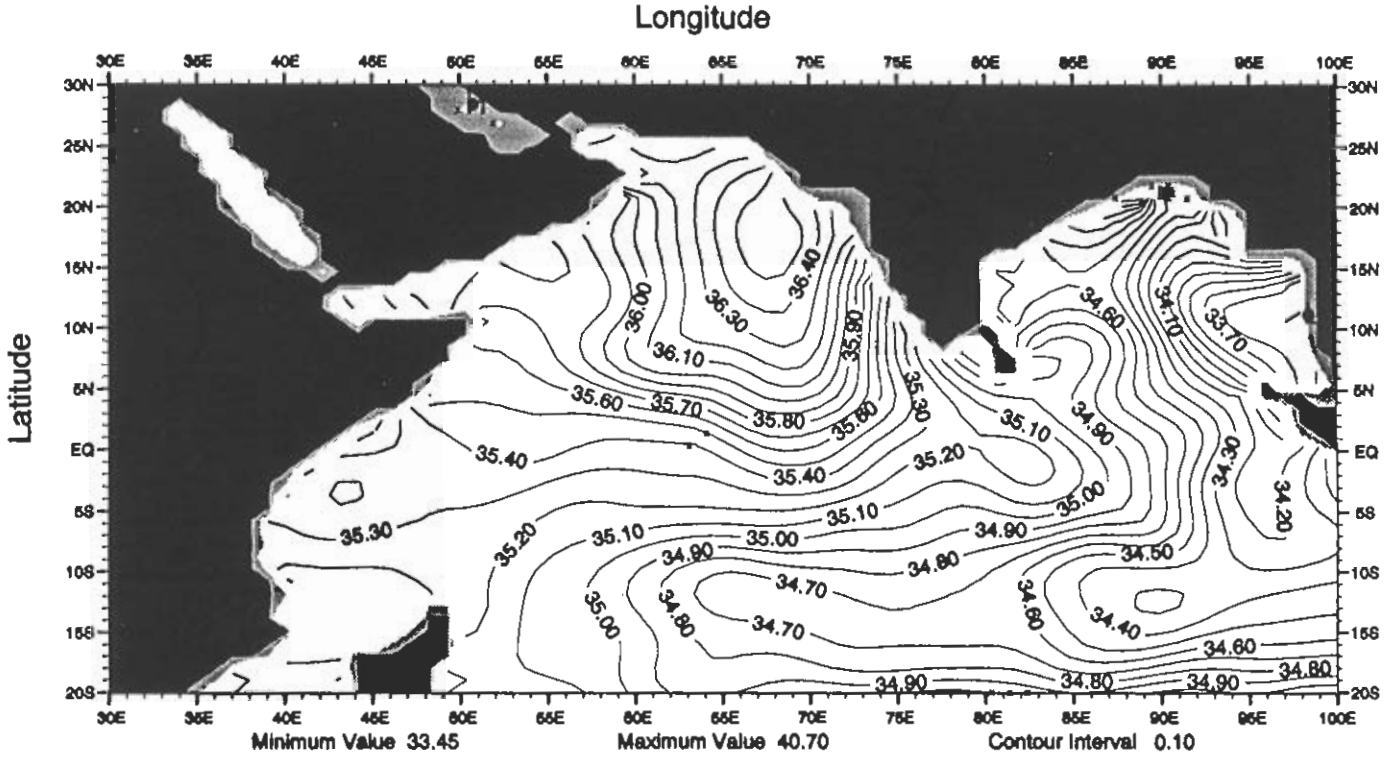

Fig. B38 Fall (Oct.-Dec.) mean salinity (psu) at 50 m depth

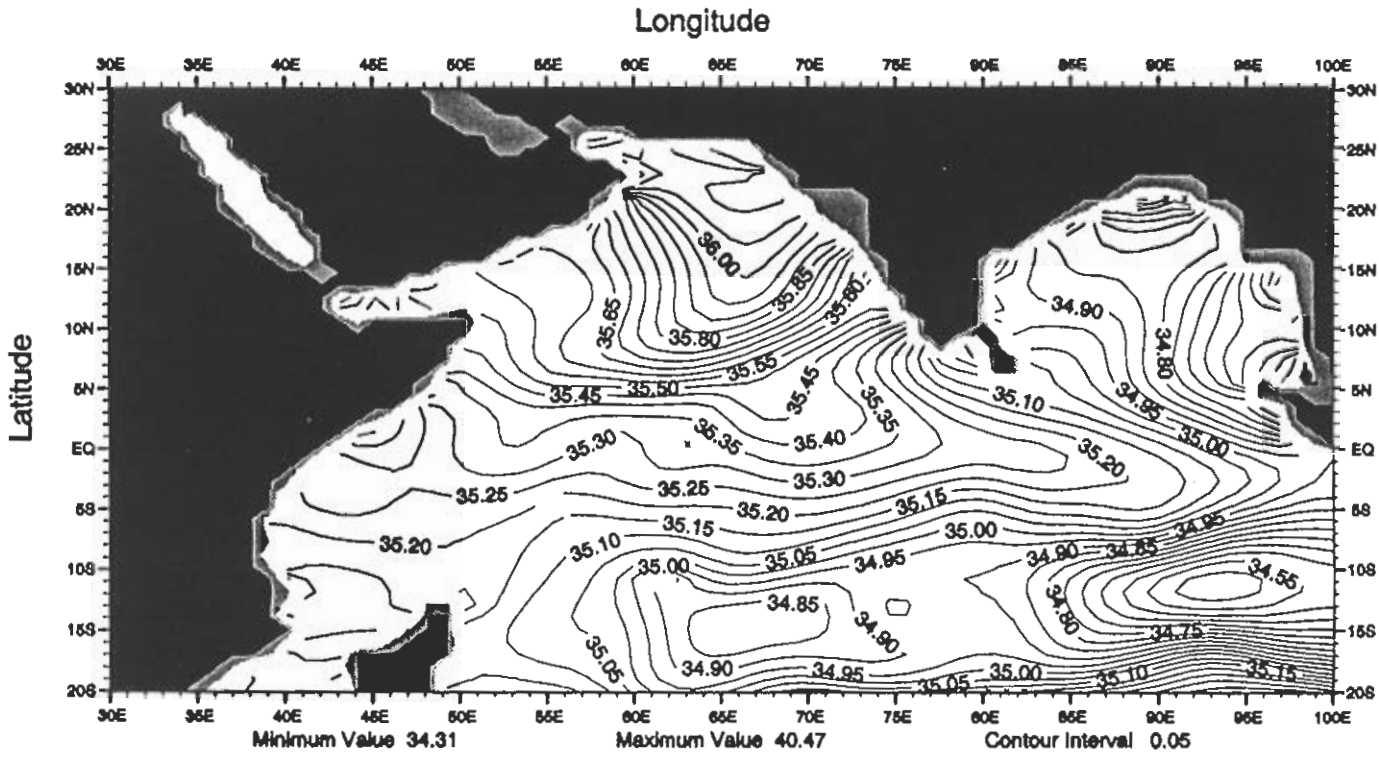

Fig. B39 Fall (Oct.-Dec.) mean salinity (psu) at 100 m depth

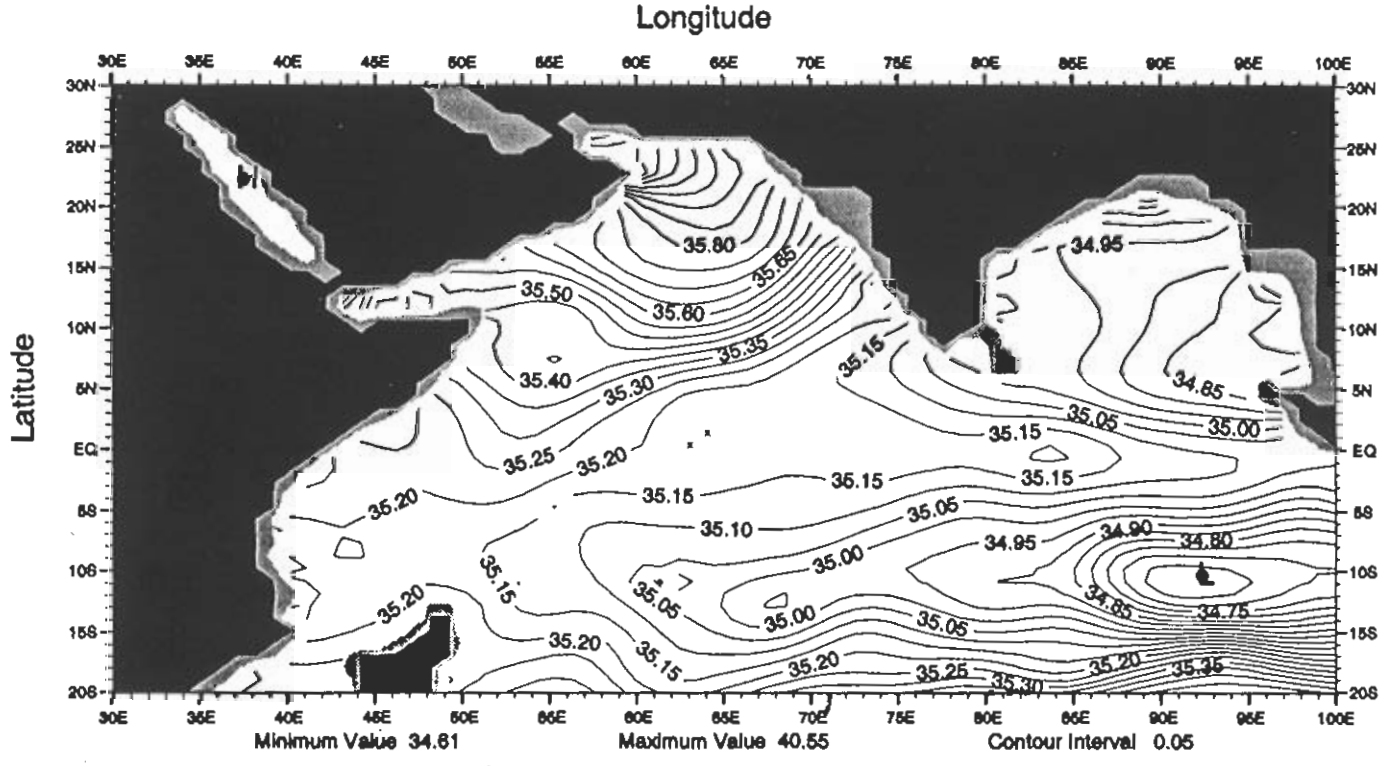

Fig. B40 Fall (Oct.-Dec.) mean salinity (psu) at 150 m depth

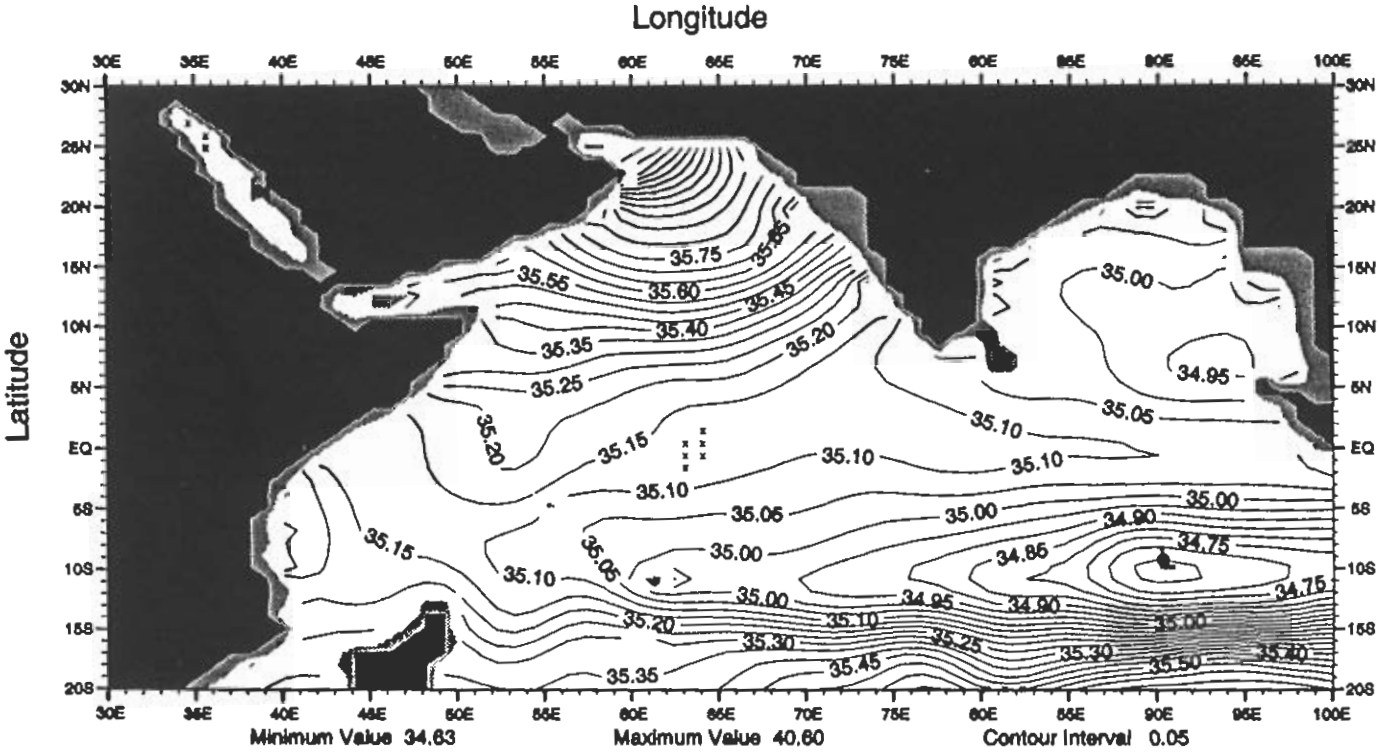

Fig. B41 Fall (Oct.-Dec.) mean salinity (psu) at 200 m depth

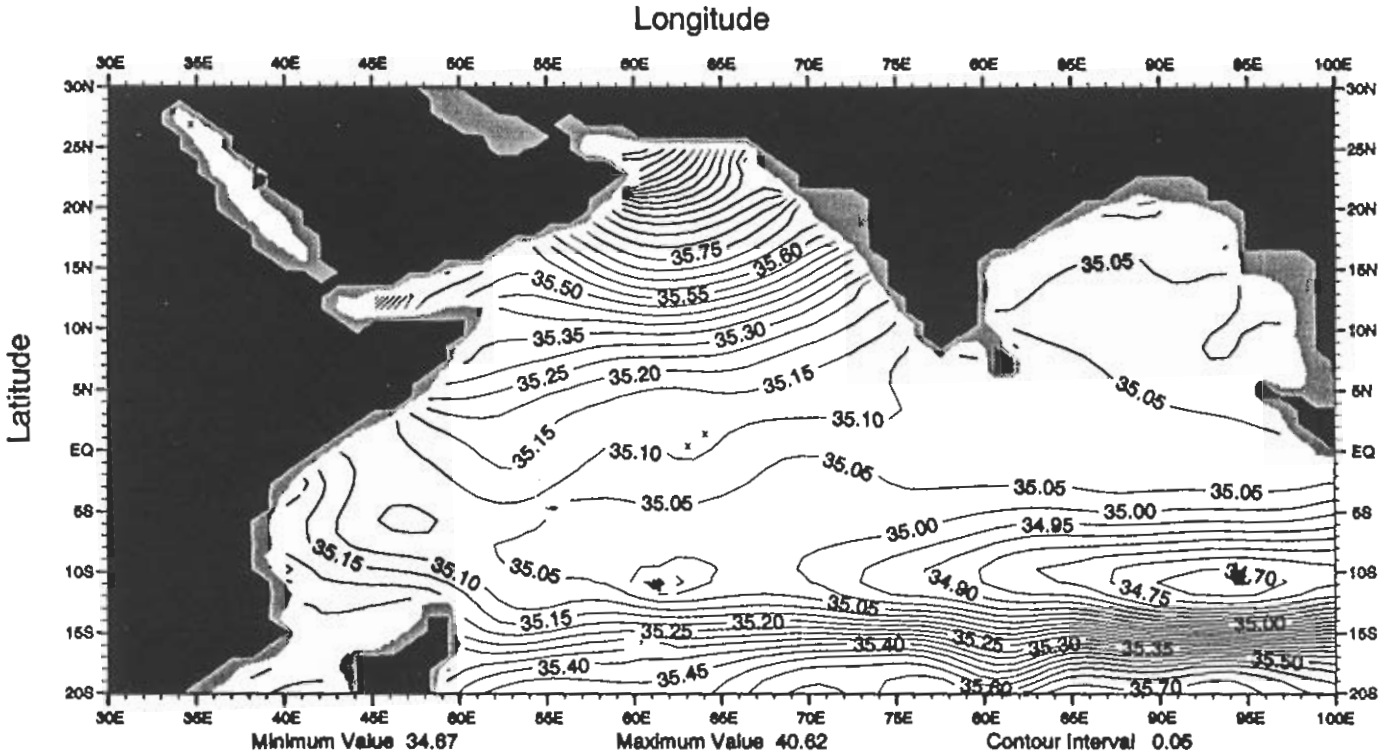

Fig. B42 Fall (Oct.-Dec.) mean salinity (psu) at 250 m depth

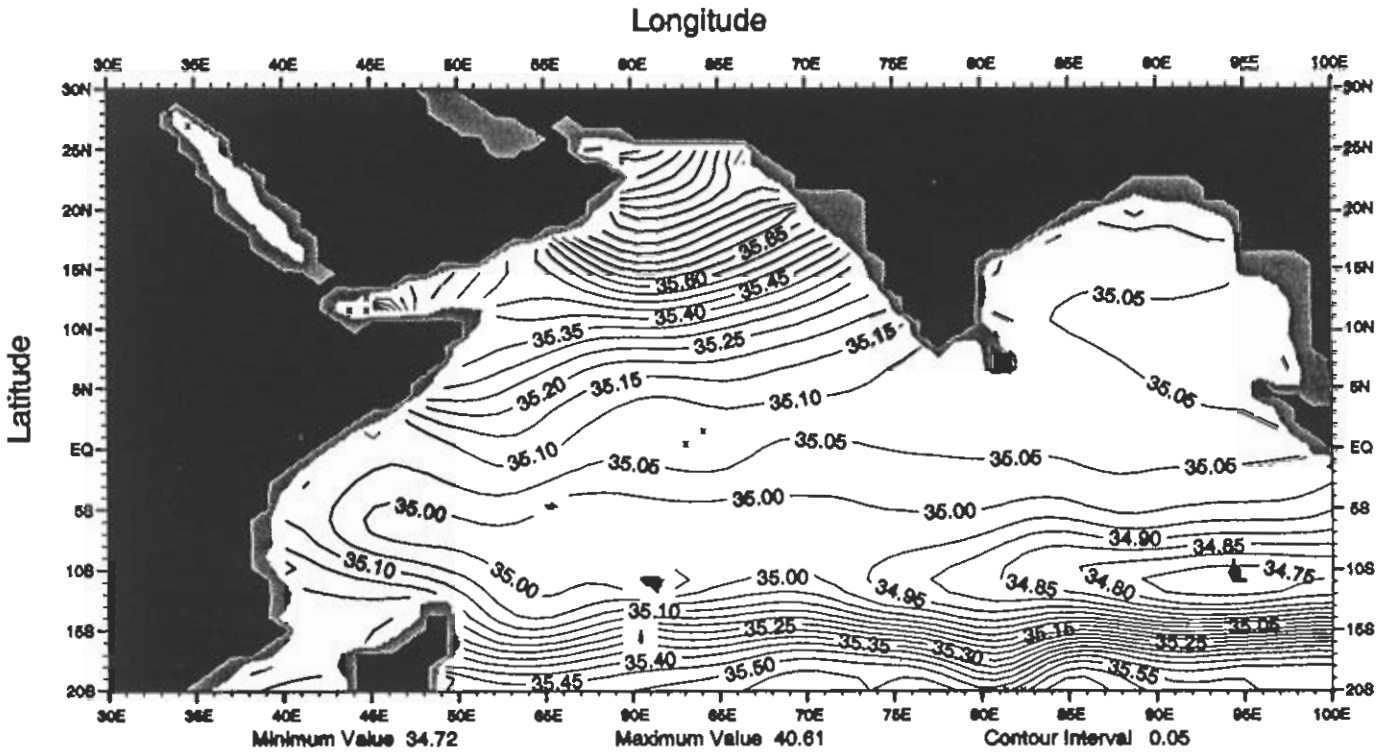

Fig. B43 Fall (Oct.-Dec.) mean salinity (psu) at 300 m depth

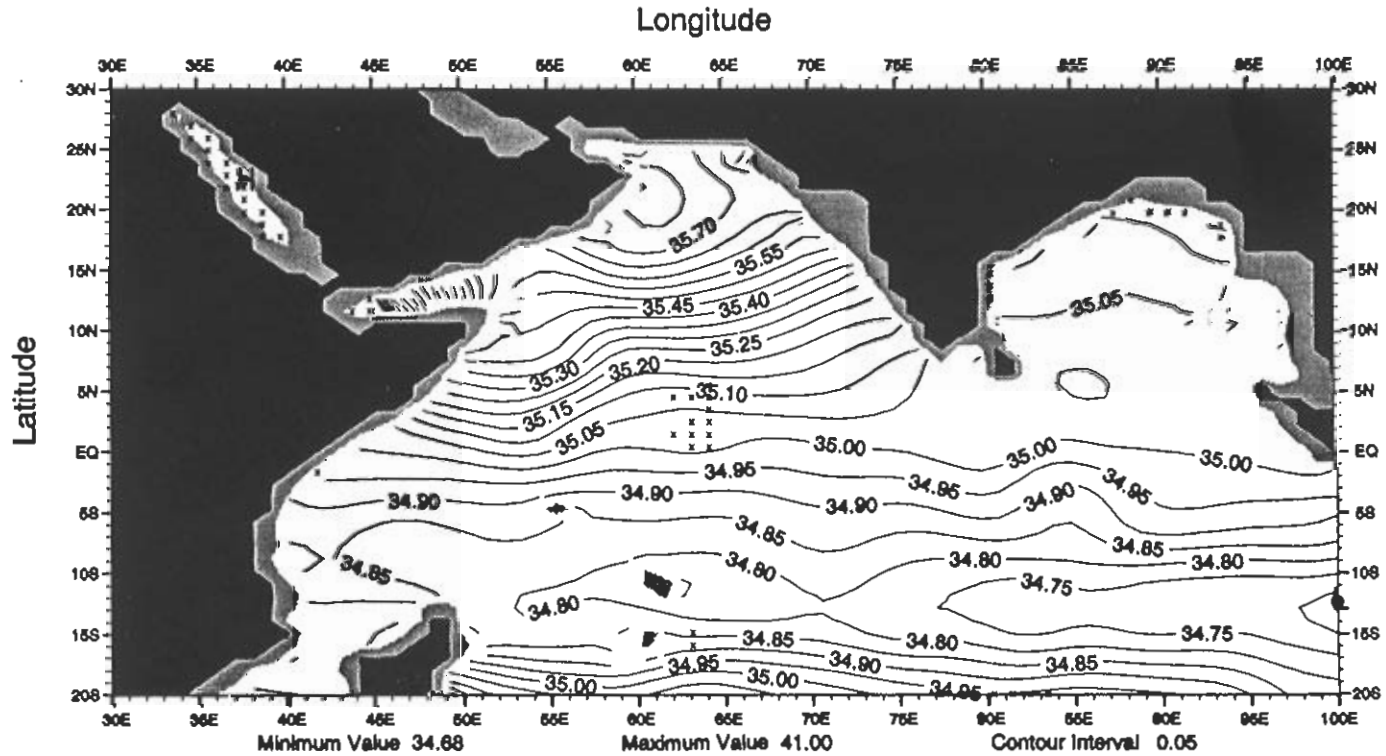

Fig. B44 Fall (Oct.-Dec.) mean salinity (psu) at 500 m depth

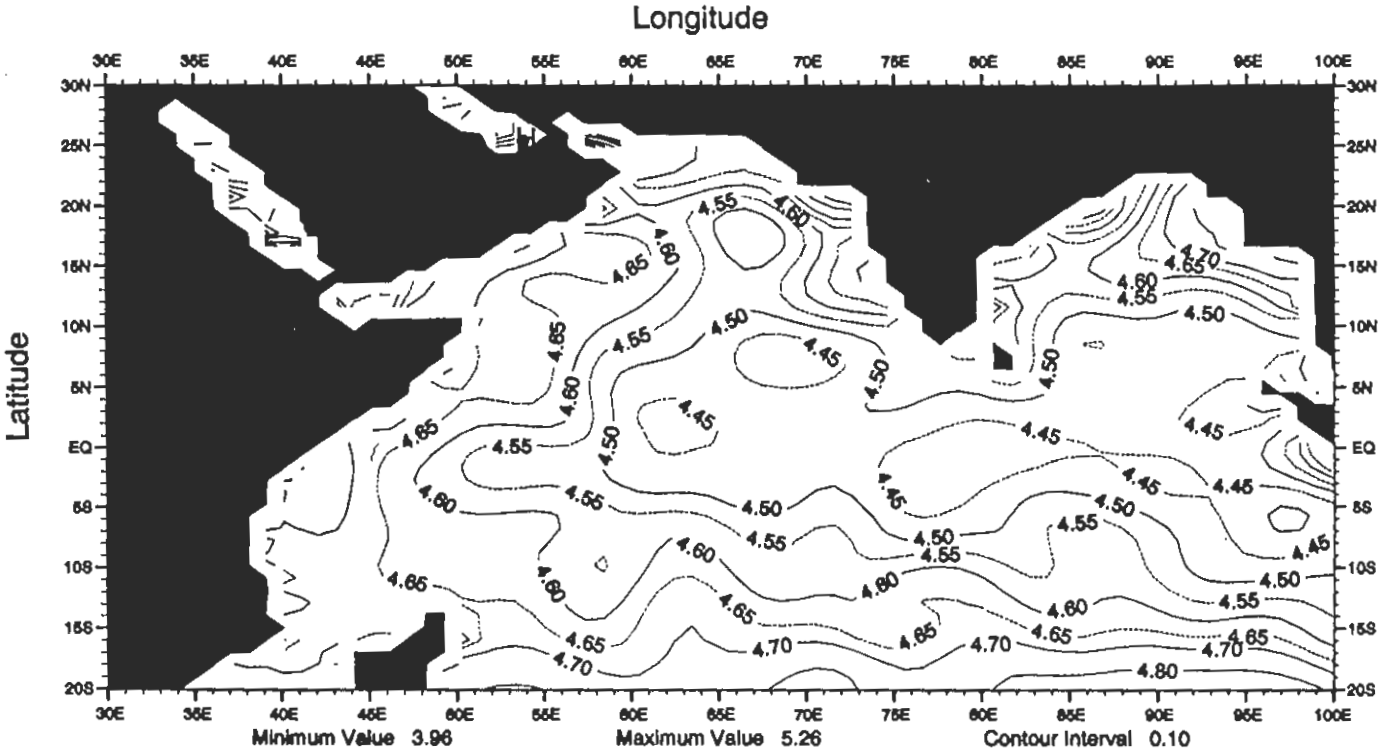

Fig. C1 Annual mean oxygen (ml/l) at the surface

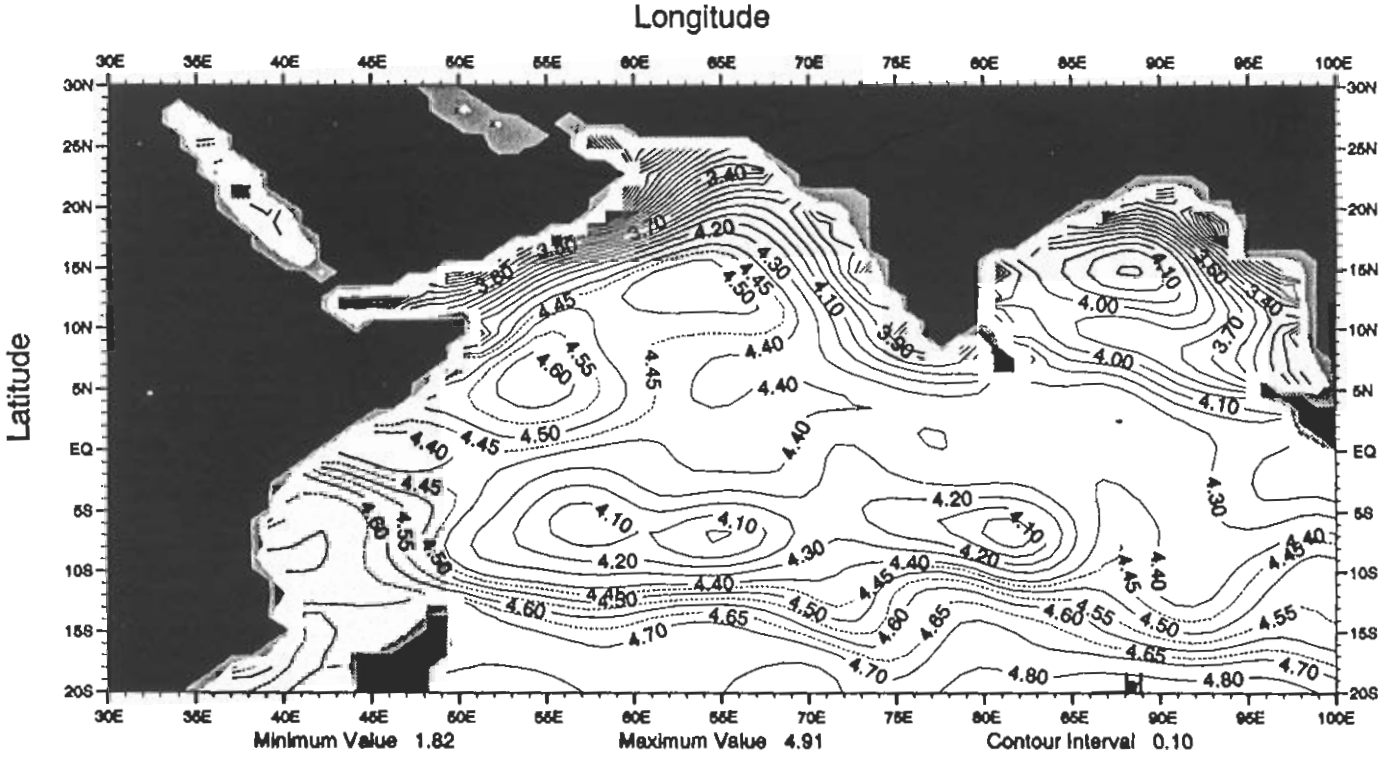

Fig. C2 Annual mean oxygen (ml/l) at 50 m depth

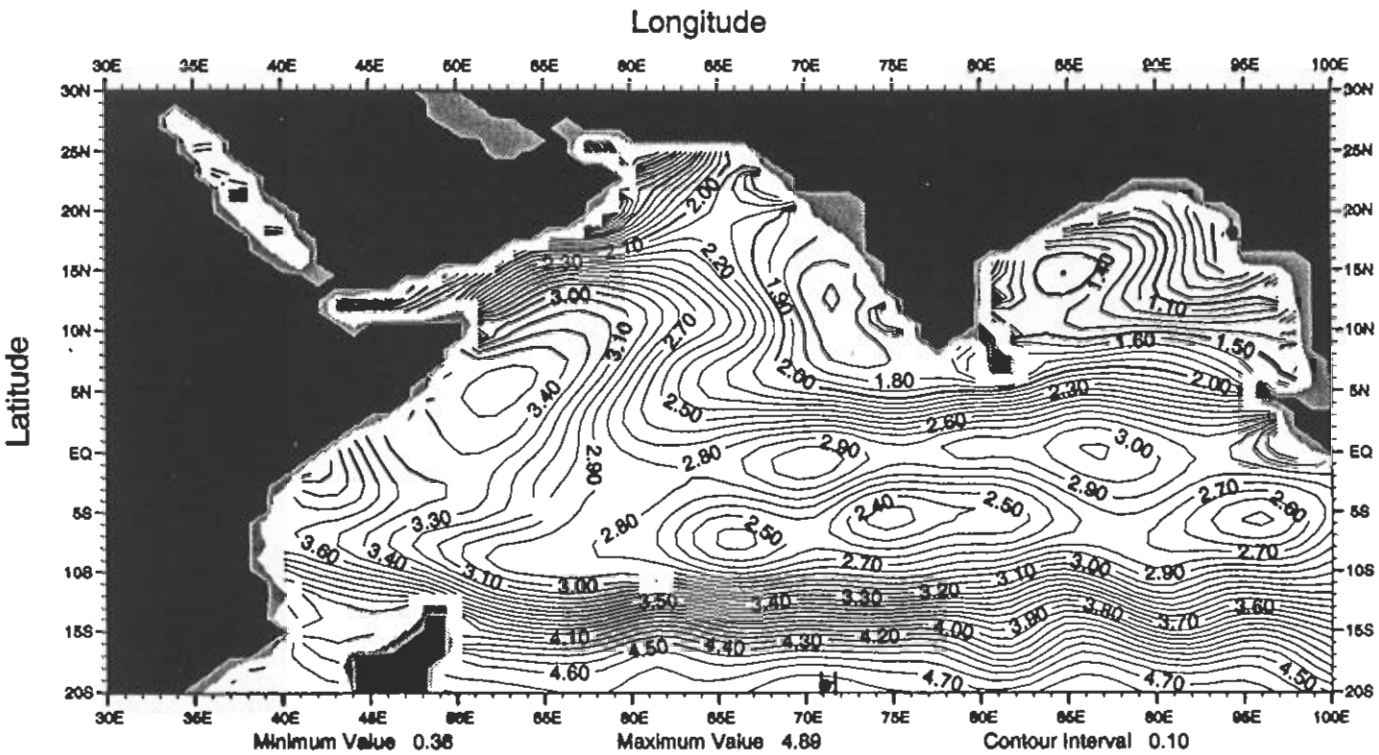

Fig. C3 Annual mean oxygen (ml/l) at 100 m depth

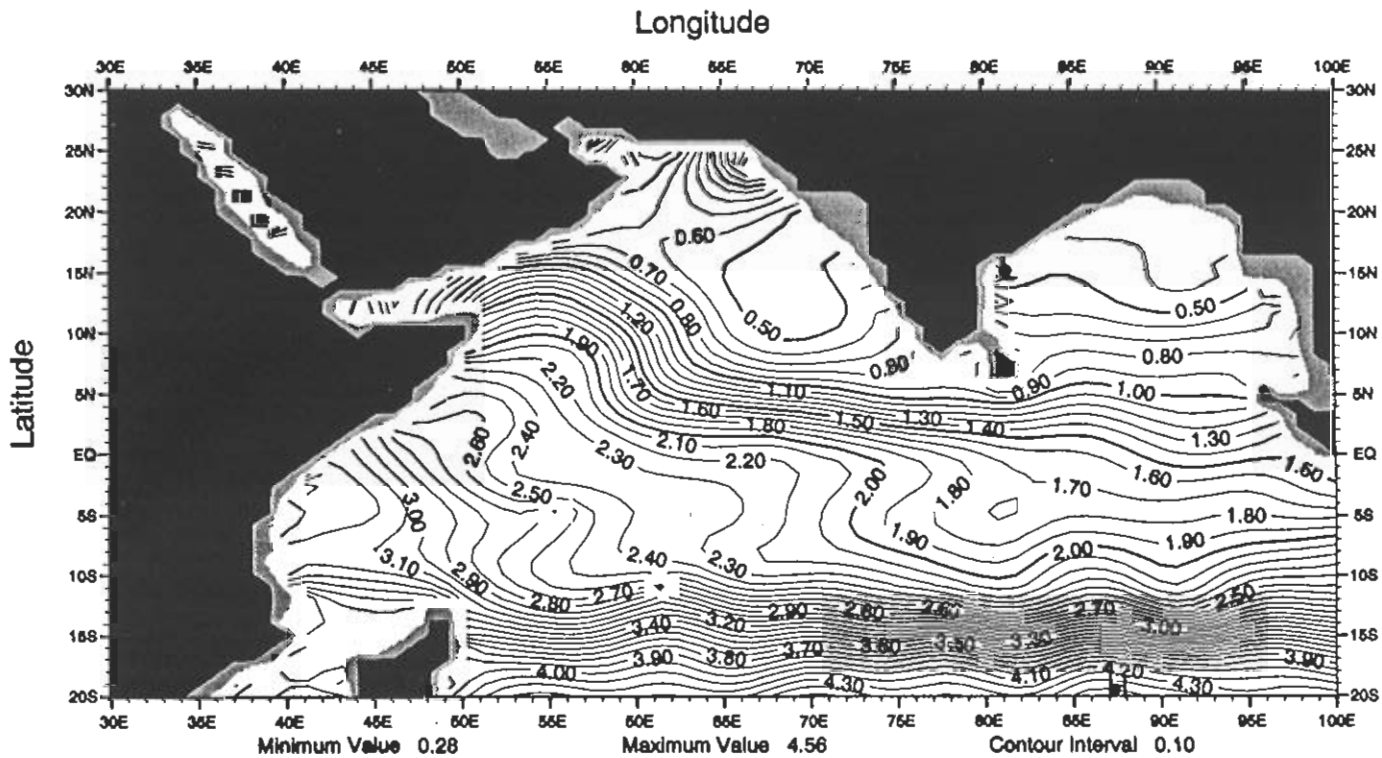

Fig. C4 Annual mean oxygen (ml/l) at 150 m depth

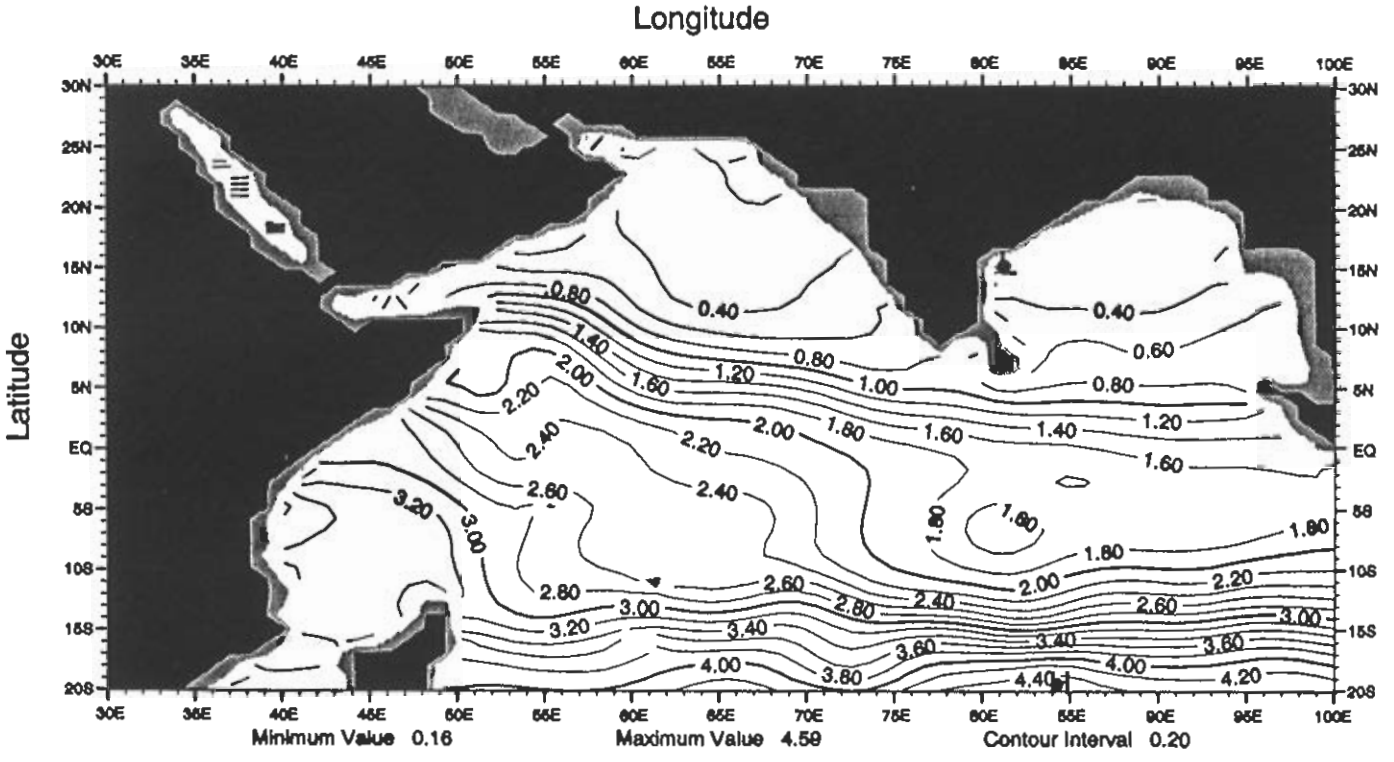

Fig. C5 Annual mean oxygen (ml/l) at 200 m depth

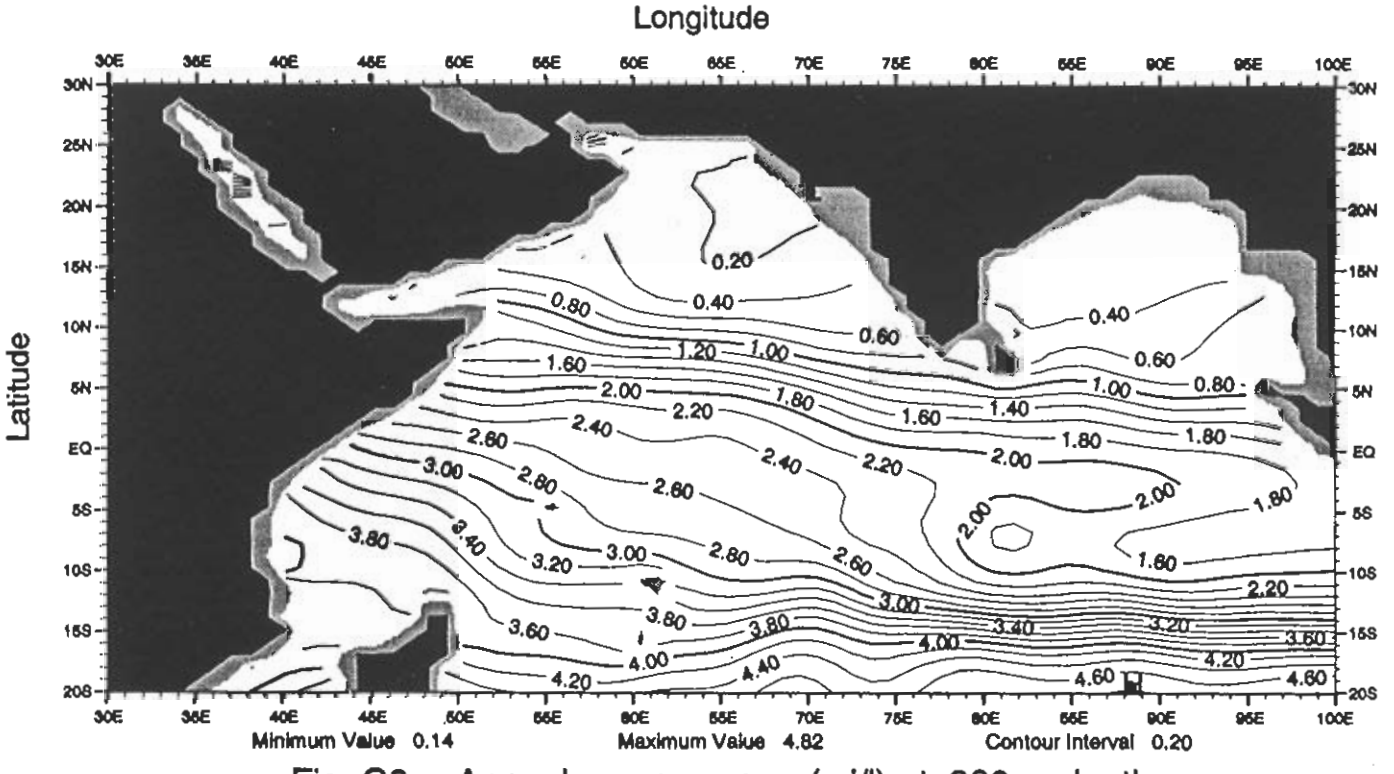

Fig. C6 Annual mean oxygen (ml/l) at 300 m depth

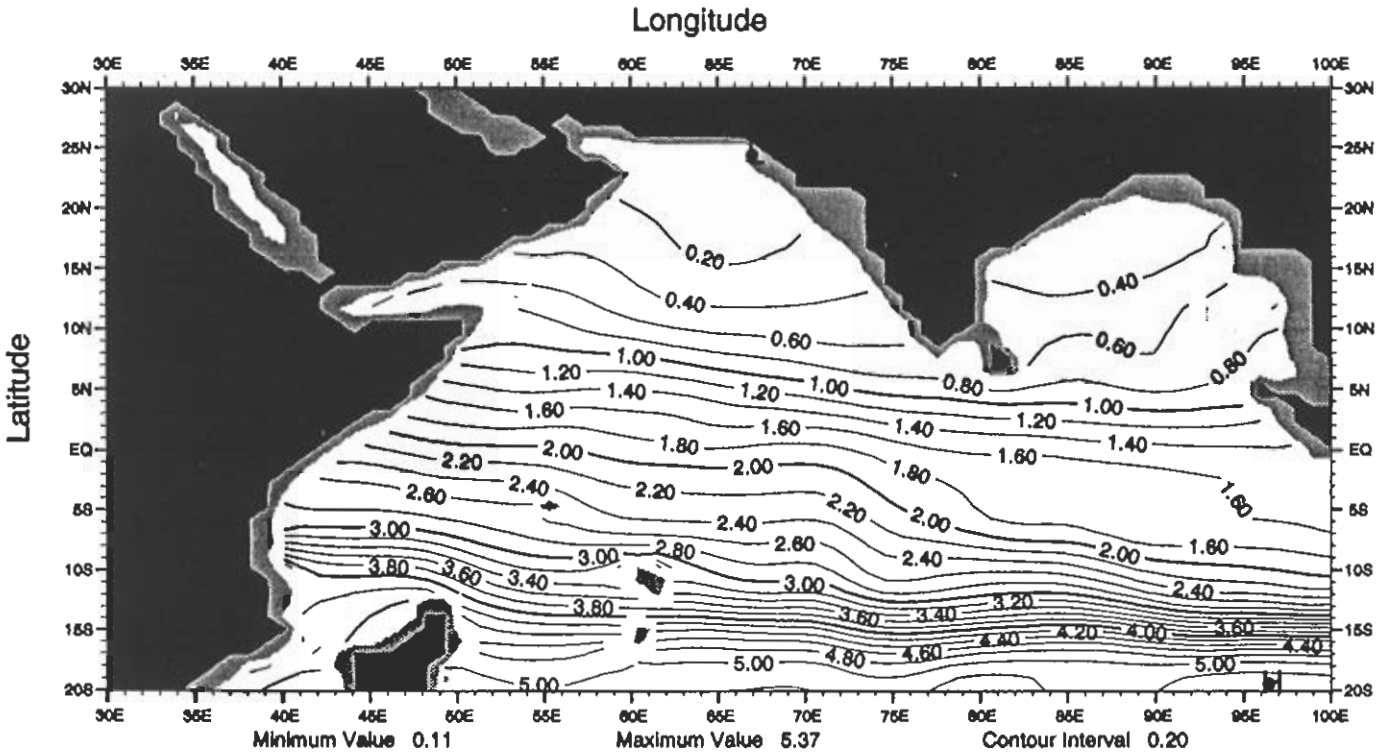

Fig. C7 Annual mean oxygen (ml/l) at 500 m depth

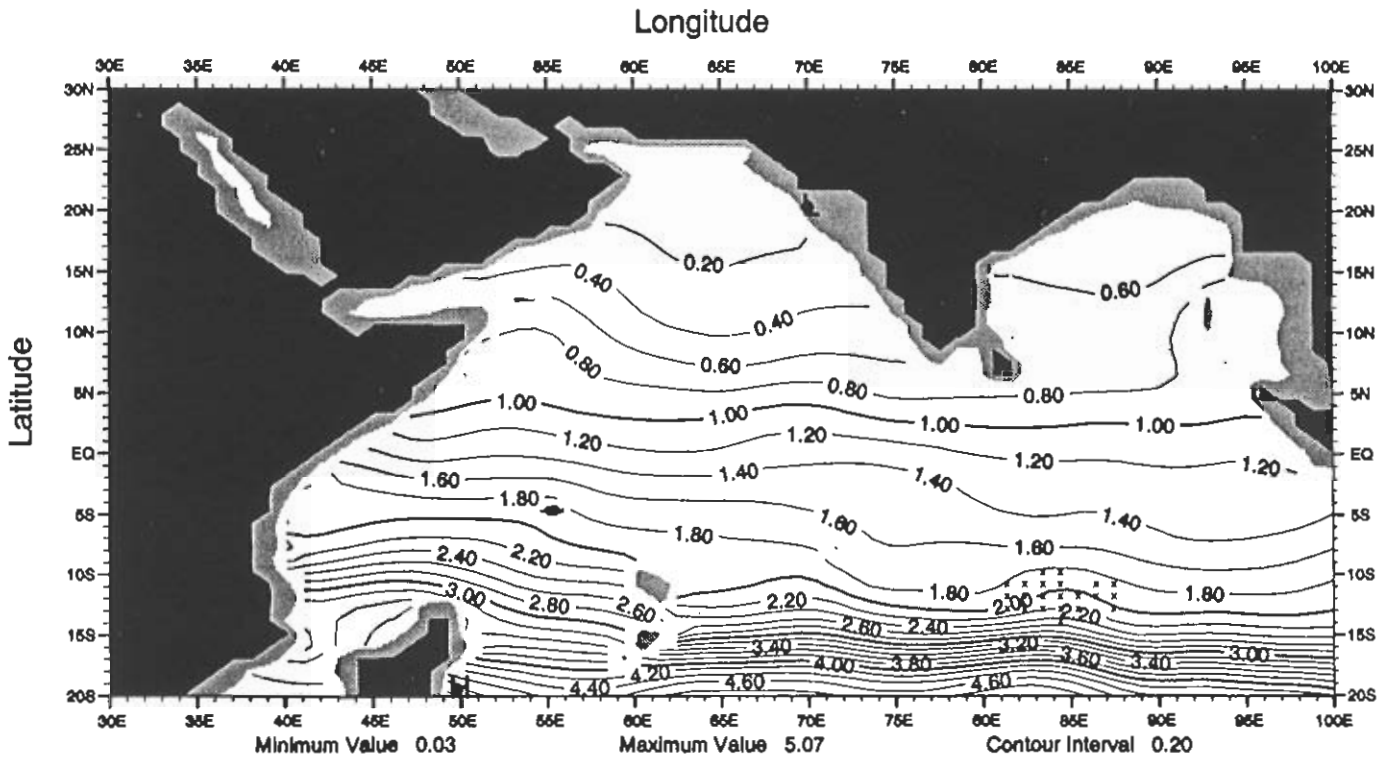

Fig. C8 Annual mean oxygen (ml/l) at 700 m depth

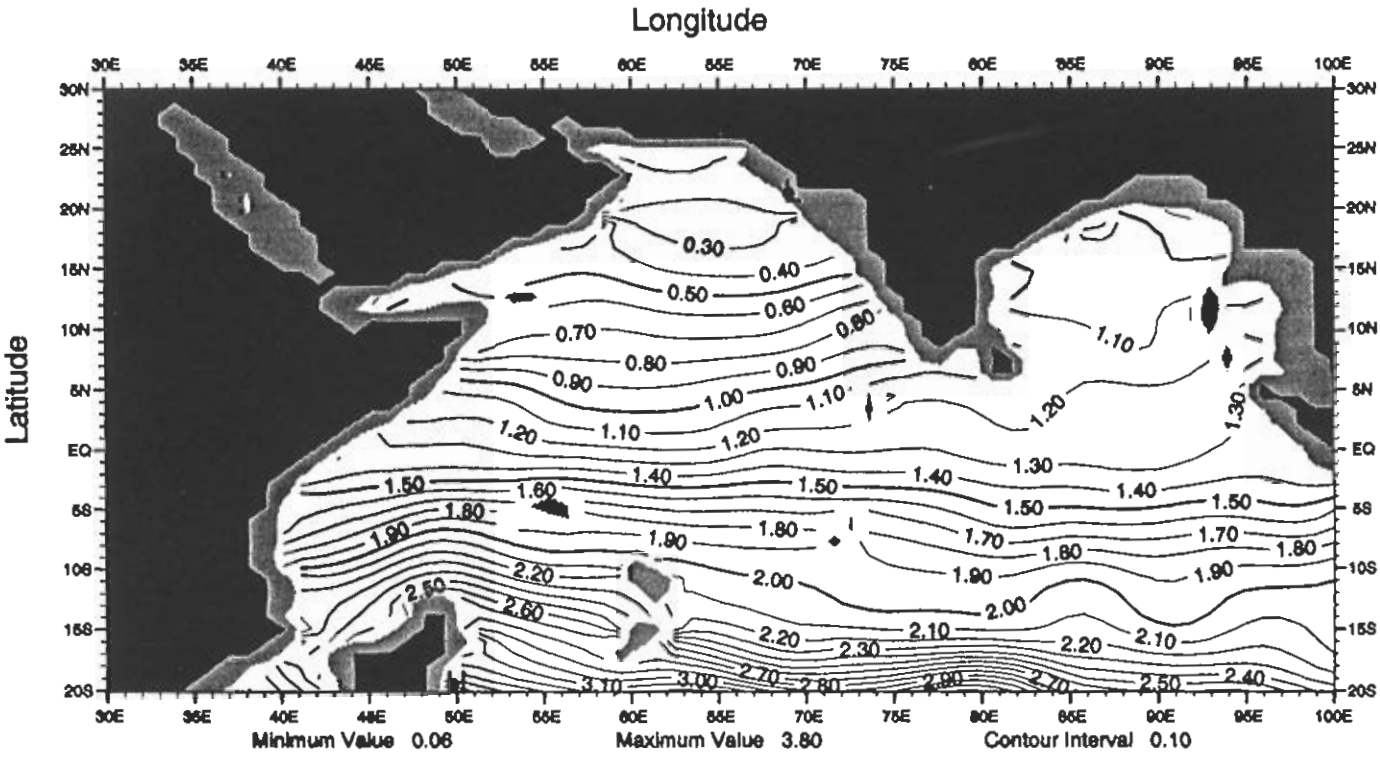

Fig. C9 Annual mean oxygen (ml/l) at 1000 m depth

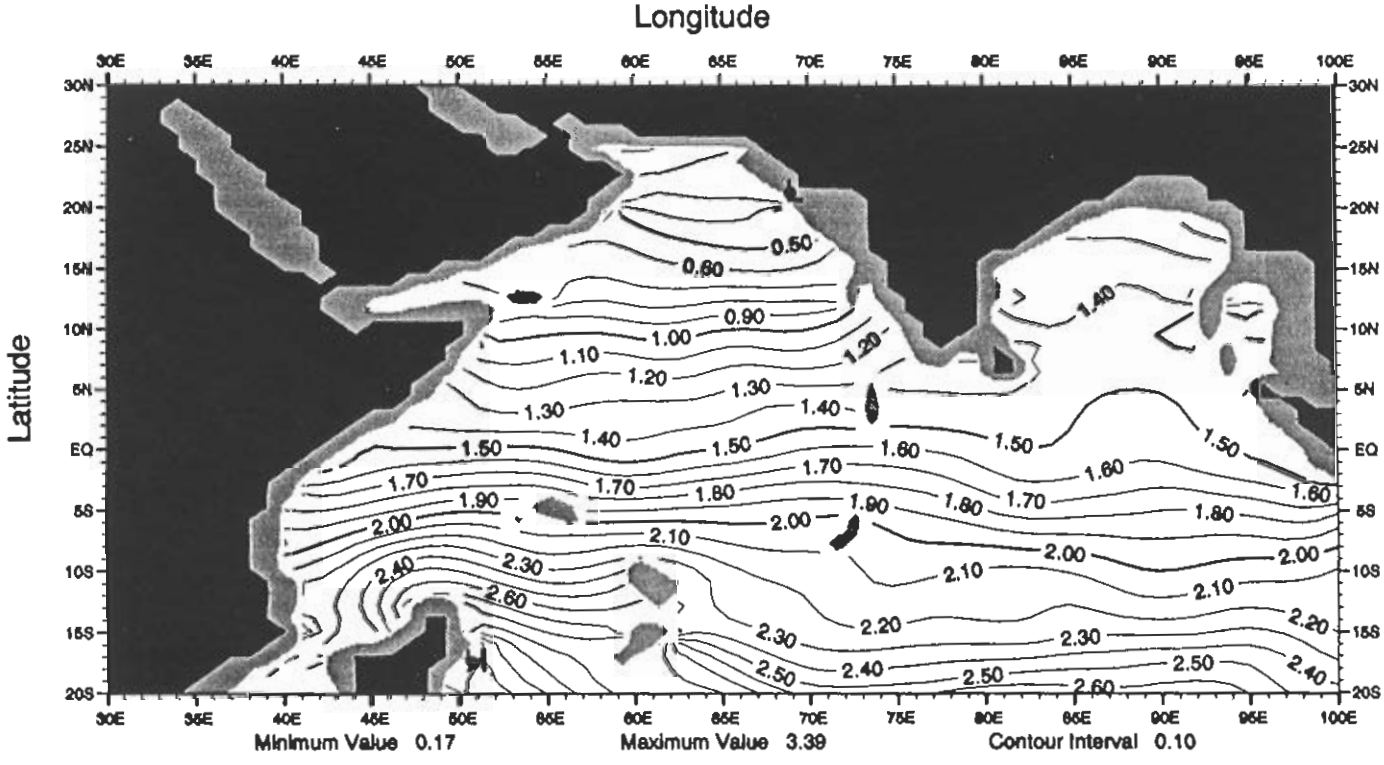

Fig. C10 Annual mean oxygen (ml/l) at 1200 m depth

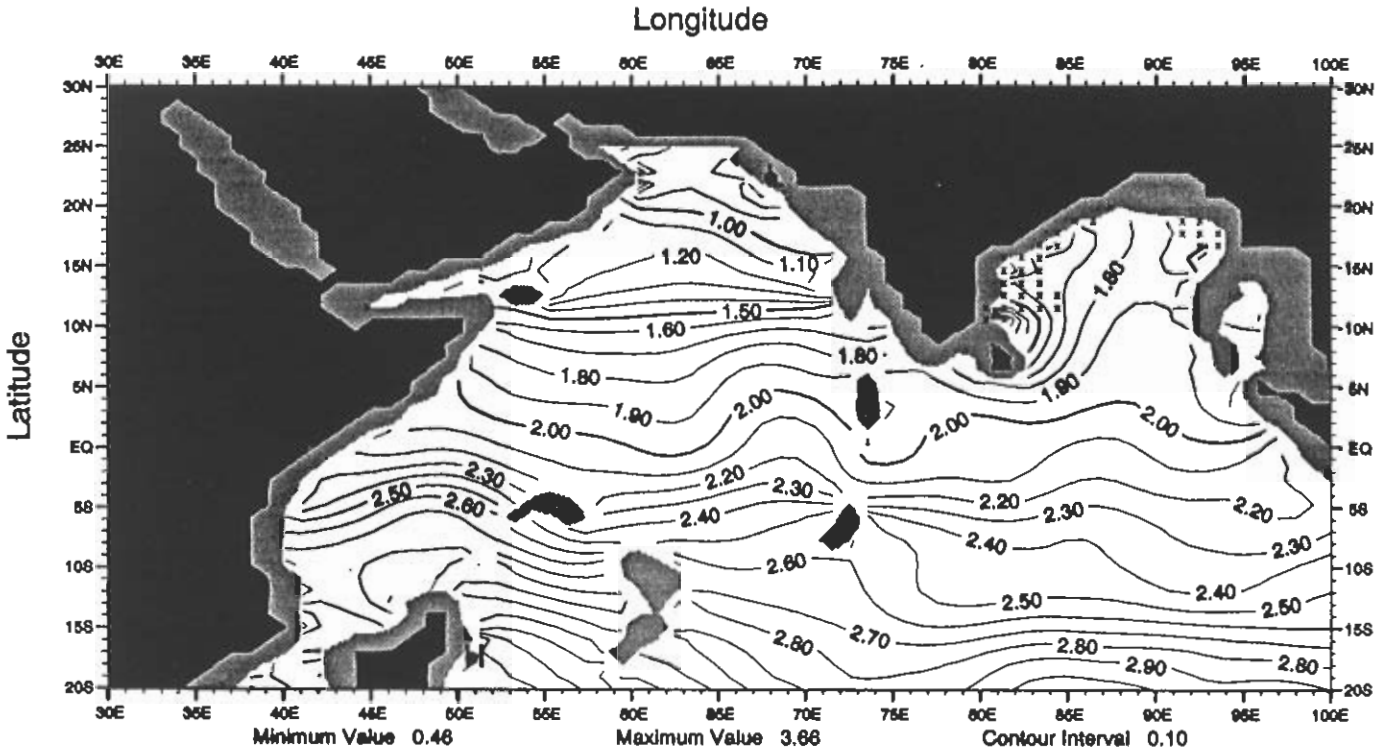

Fig. C11 Annual mean oxygen (ml/l) at 1500 m depth

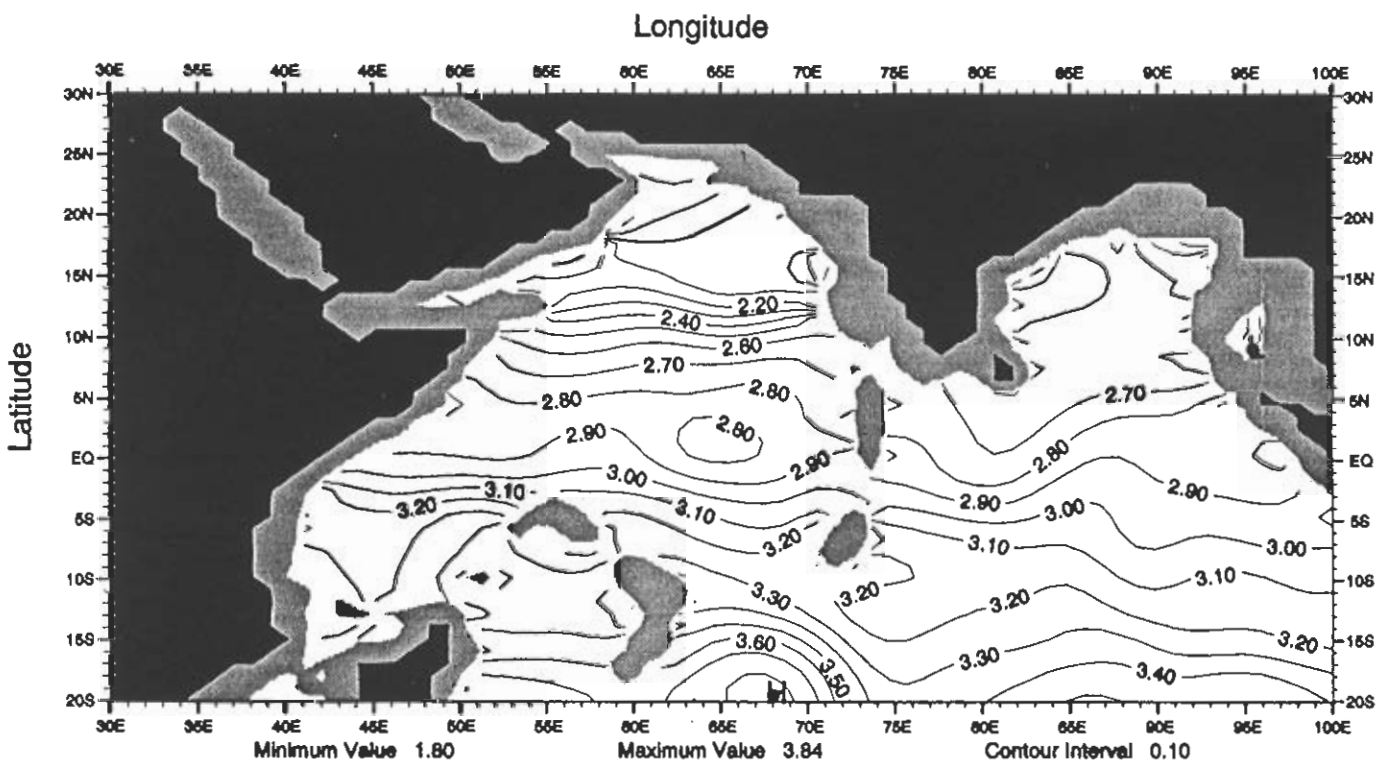

Fig. C12 Annual mean oxygen (ml/l) at 2000 m depth

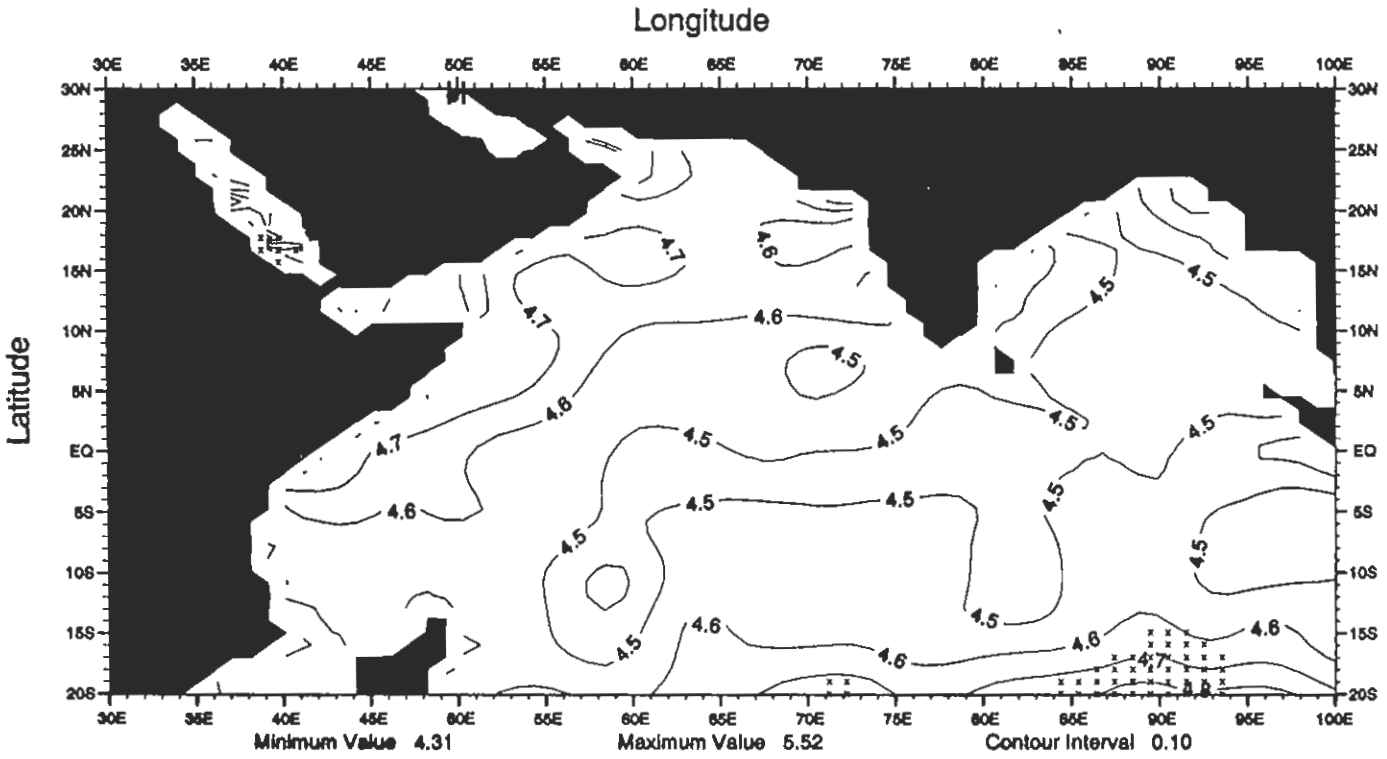

Fig. C13 Winter (Jan.Mar.) mean oxygen (ml/l) at the surface

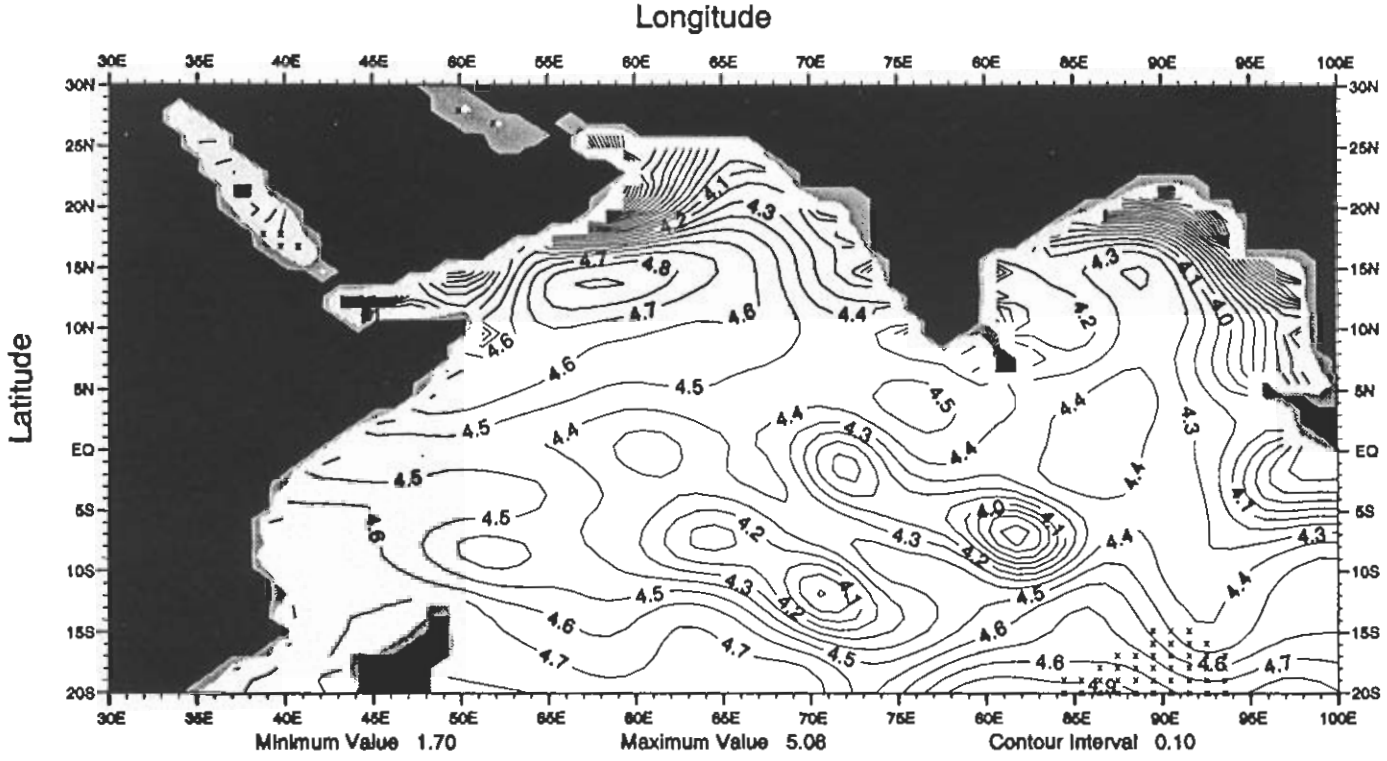

Fig. C14 Winter (Jan.Mar.) mean oxygen (ml/l) at 50 m depth

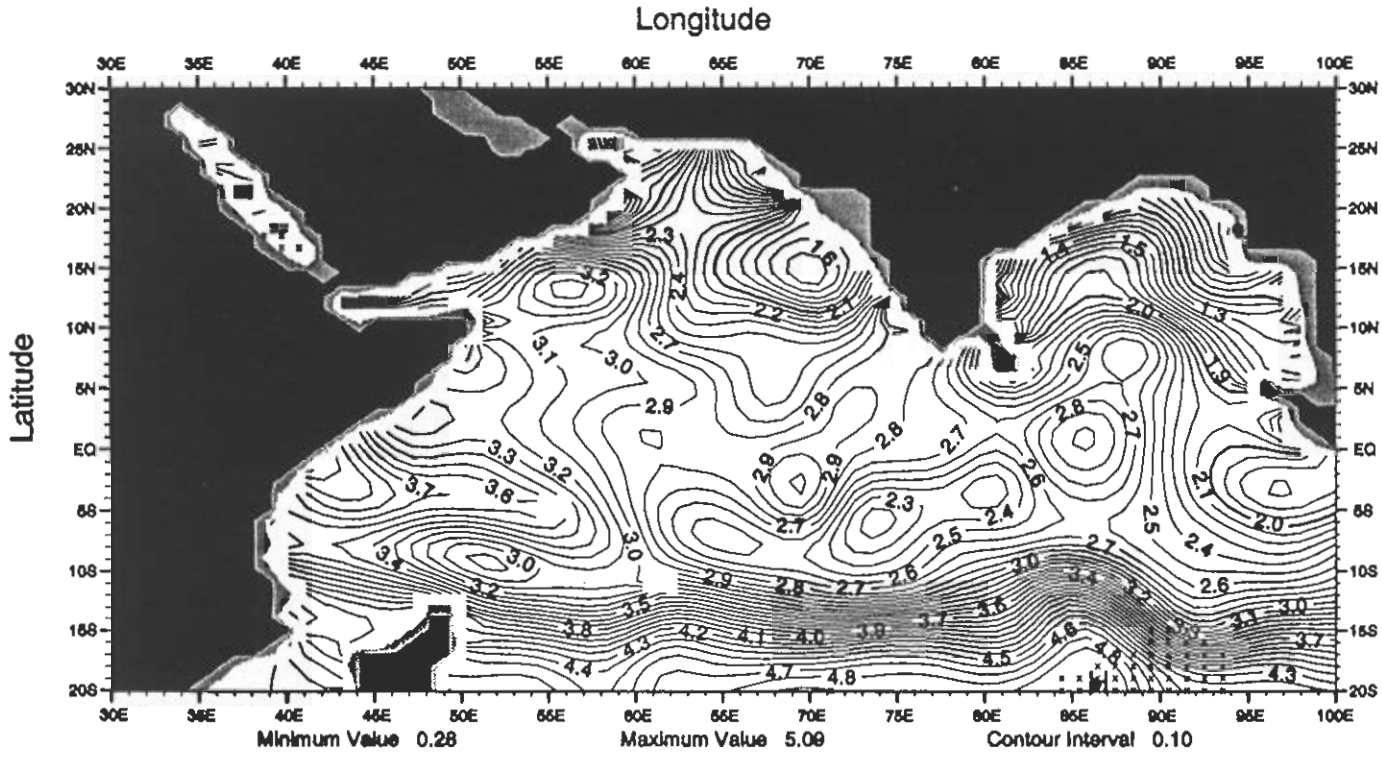

Fig. C15 Winter (Jan.Mar.) mean oxygen (ml/l) at 100 m depth

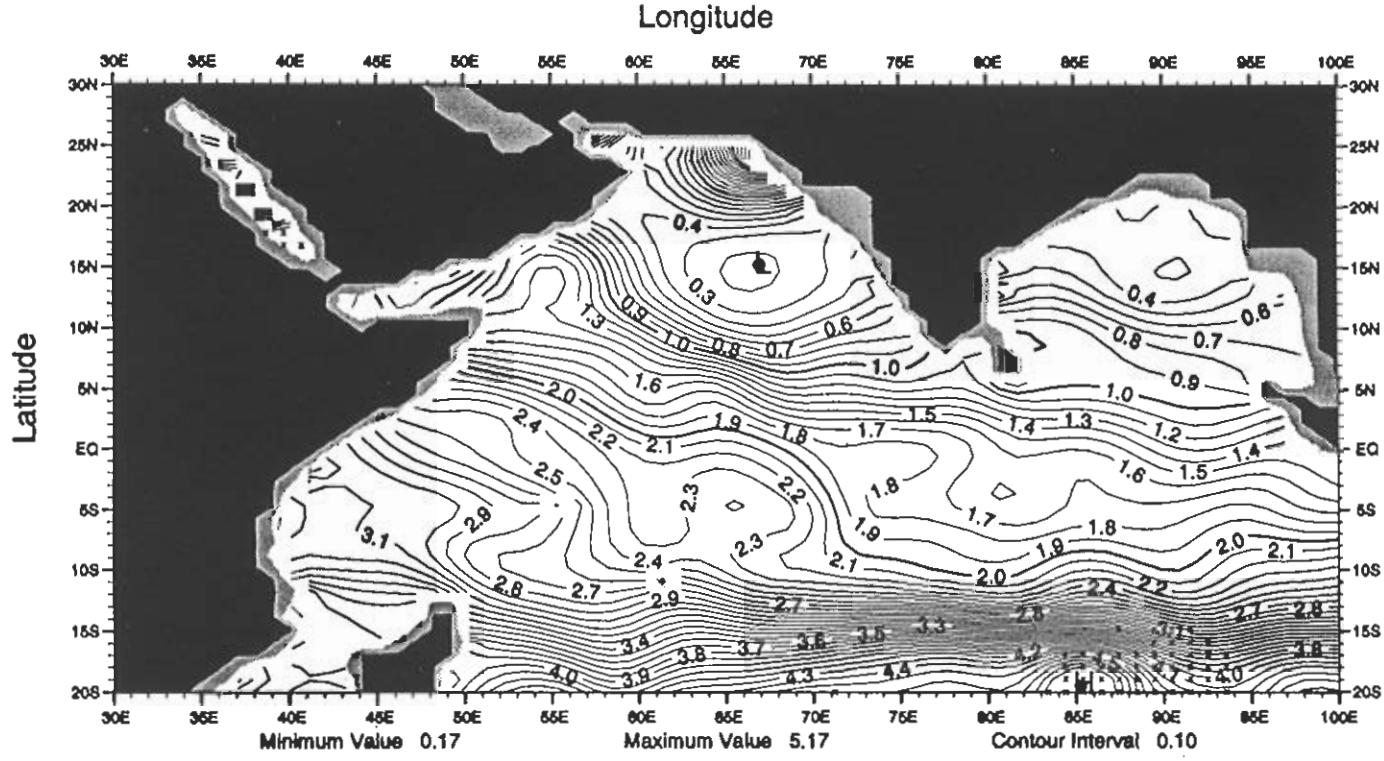

Fig. C16 Winter (Jan.Mar.) mean oxygen (ml/l) at 150 m depth

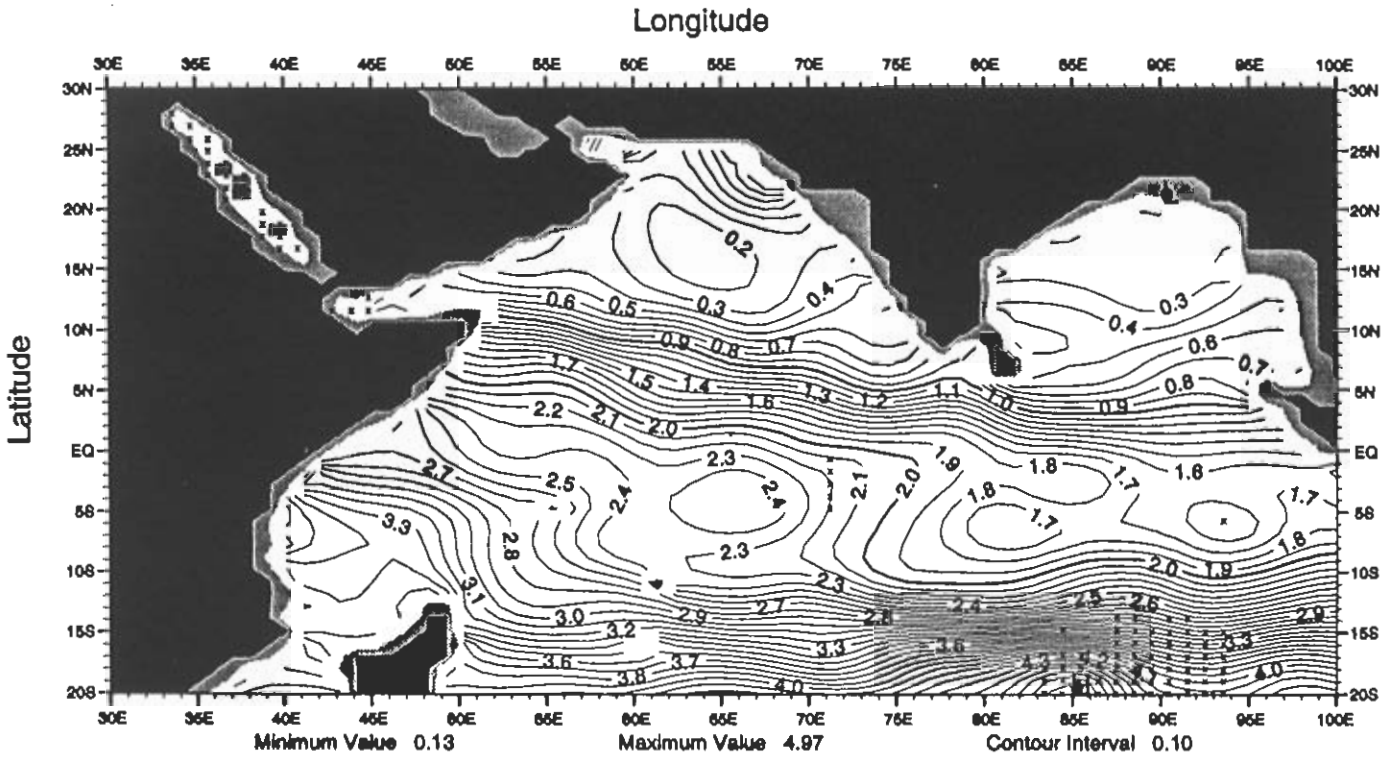

Fig. C17 Winter (Jan.Mar.) mean oxygen (ml/l) at 200 m depth

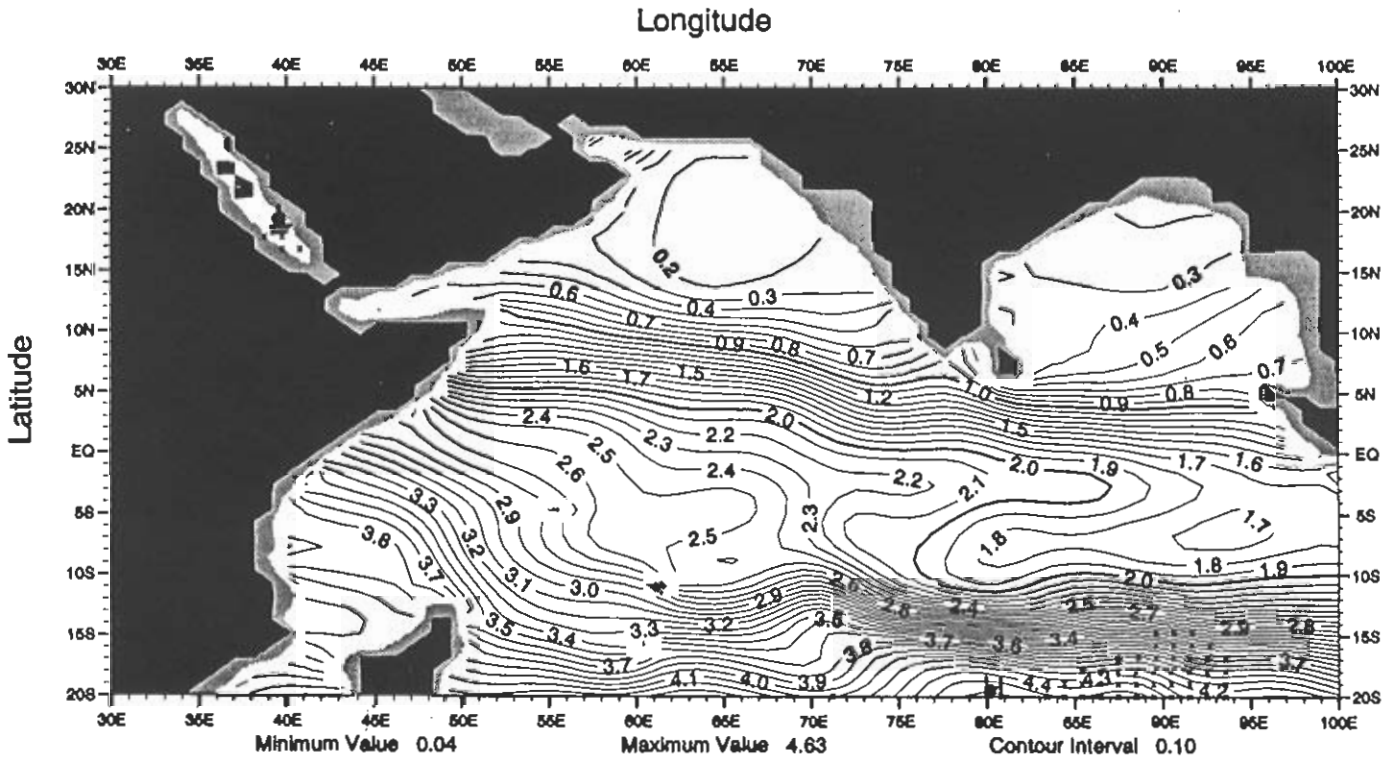

Fig. C18 Winter (Jan.Mar.) mean oxygen (ml/l) at 250 m depth

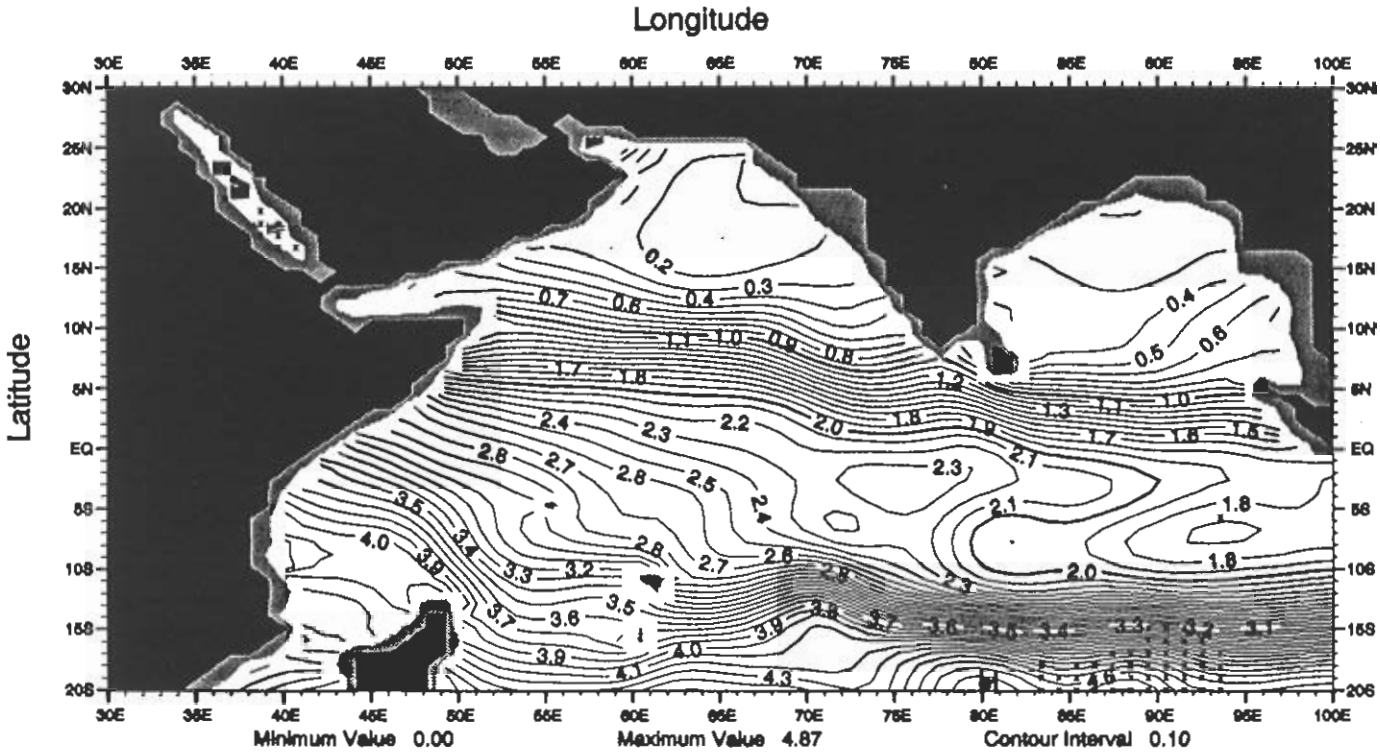

Fig. C19 Winter (Jan.-Mar.) mean oxygen (ml/l) at 300 m depth

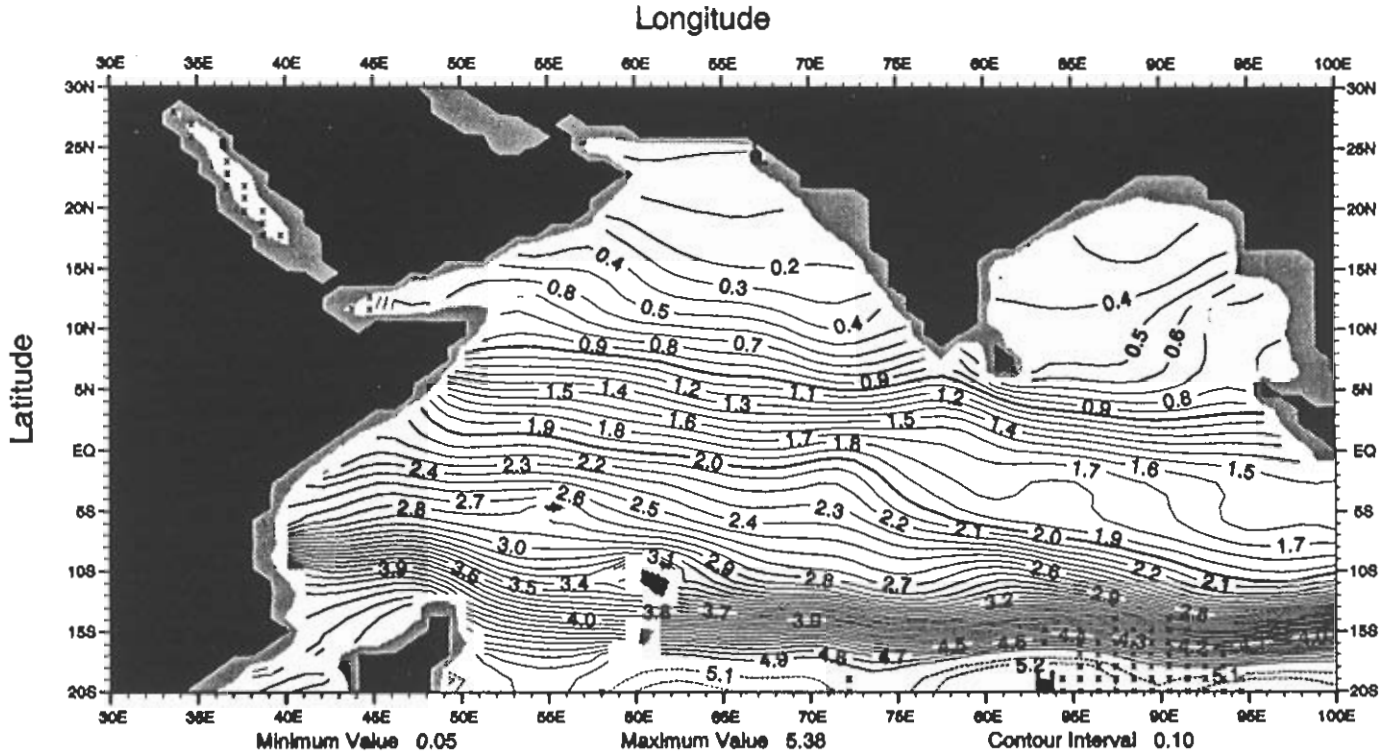

Fig. C20 Winter (Jan.-Mar.) mean oxygen (ml/l) at 500 m depth

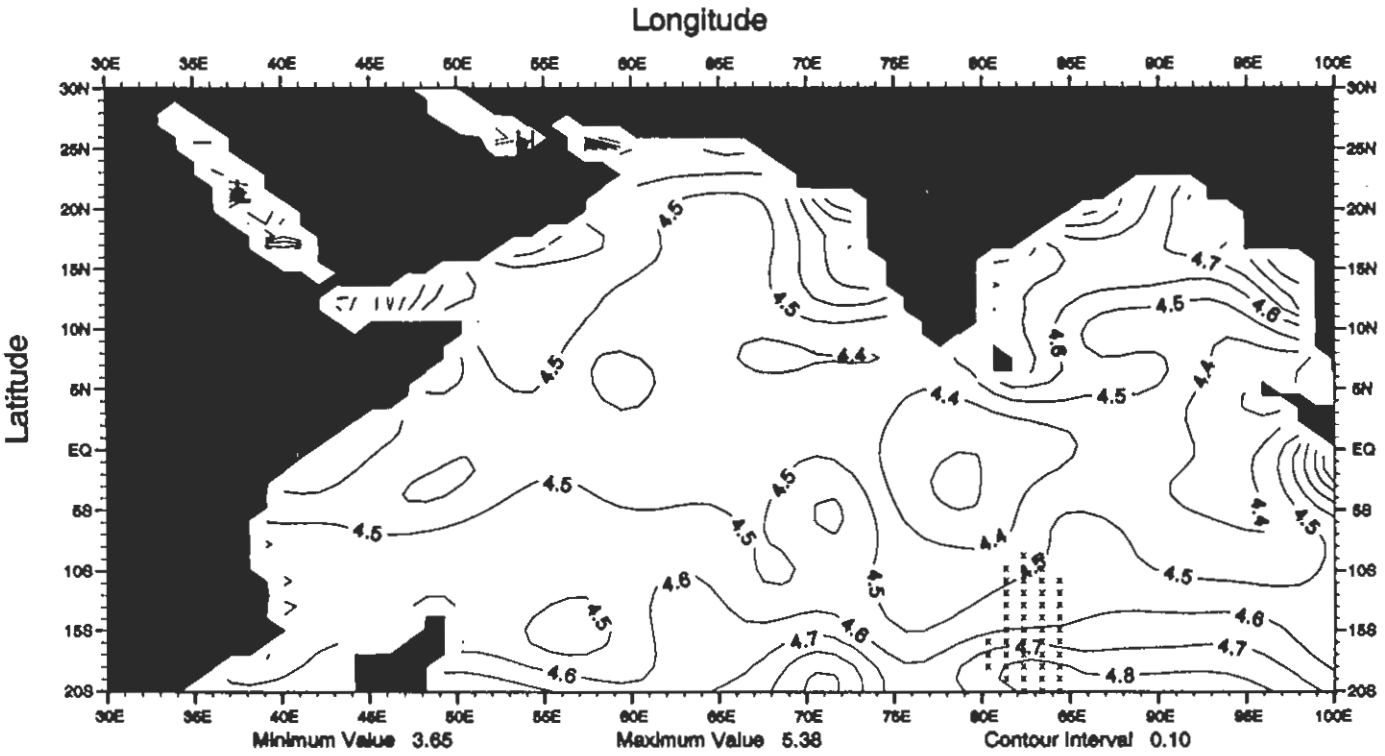

Fig. C21 Spring (Apr.-Jun.) mean oxygen (ml/l) at the surface

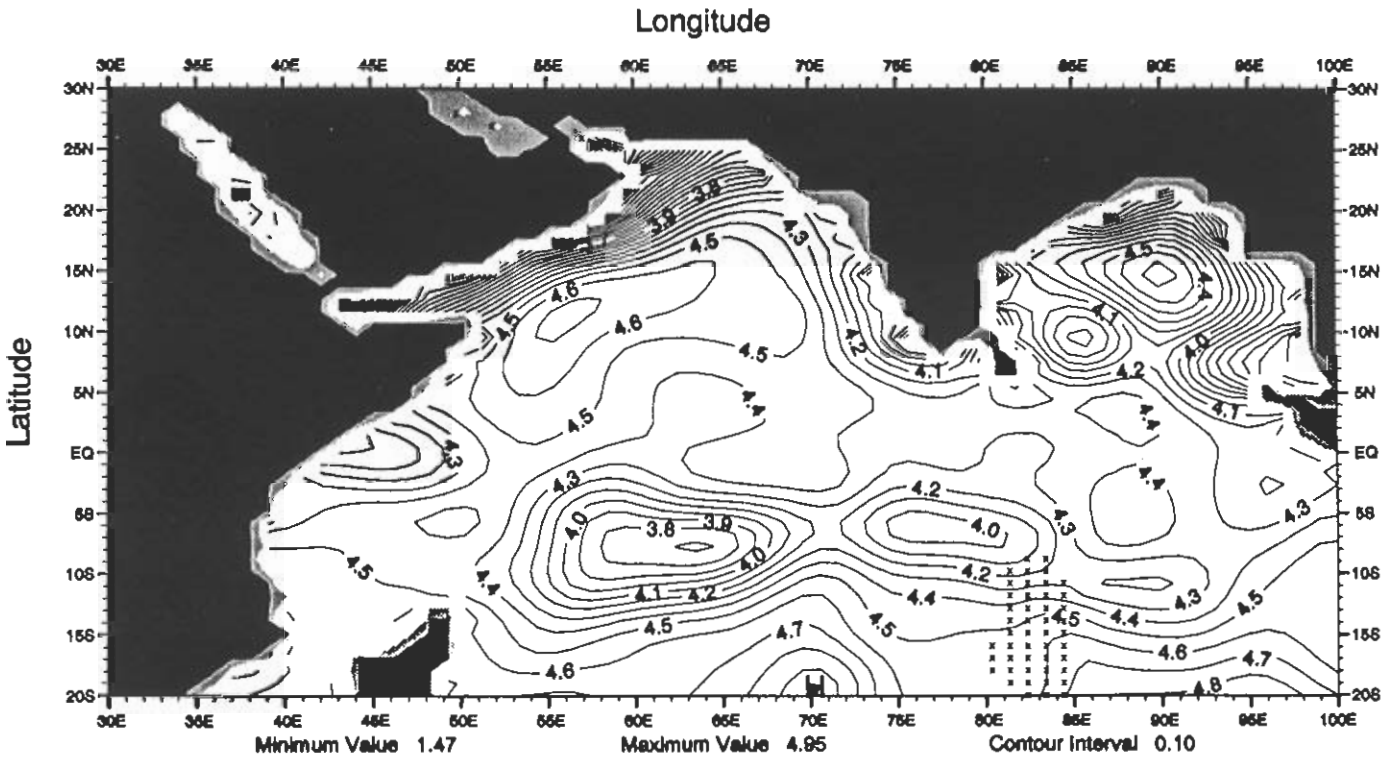

Fig. C22 Spring (Apr.-Jun.) mean oxygen (ml/l) at 50 m depth

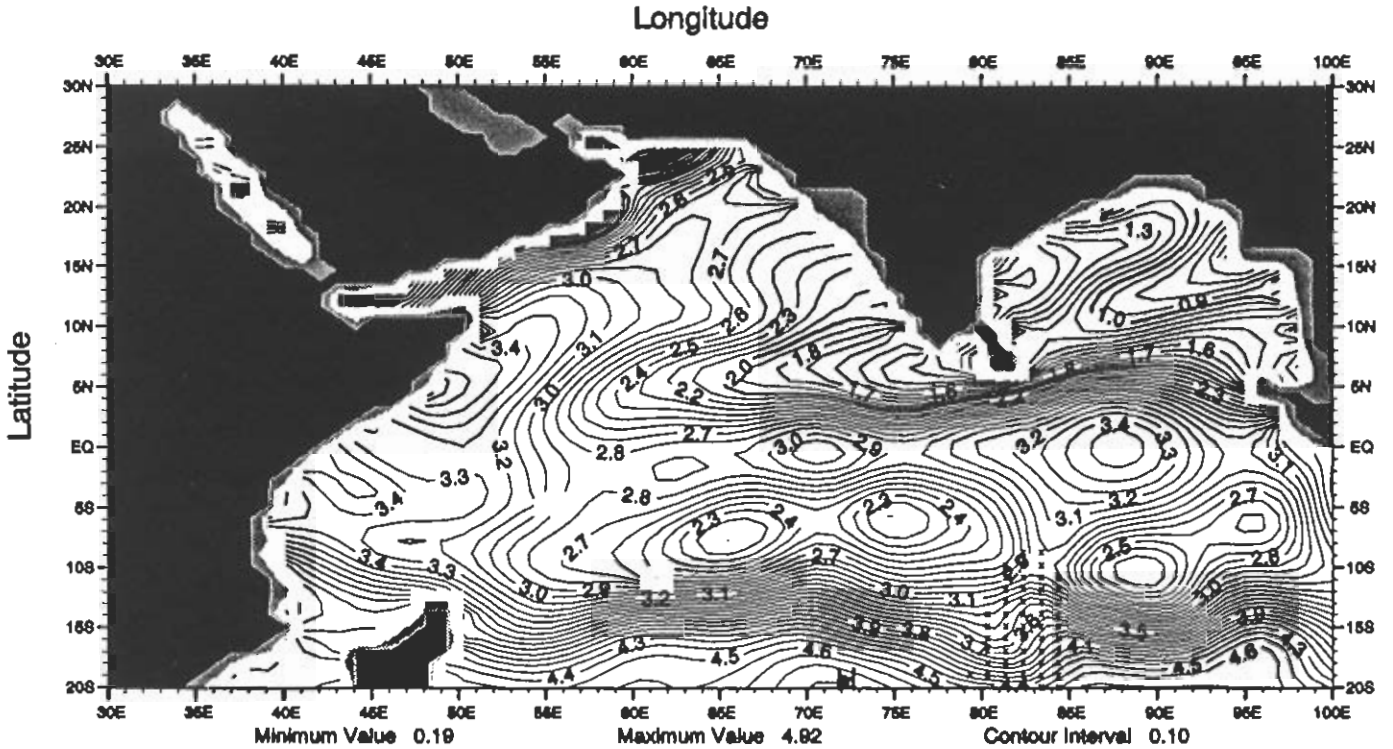

Fig. C23 Spring (Apr.-Jun.) mean oxygen (ml/l) at 100 m depth

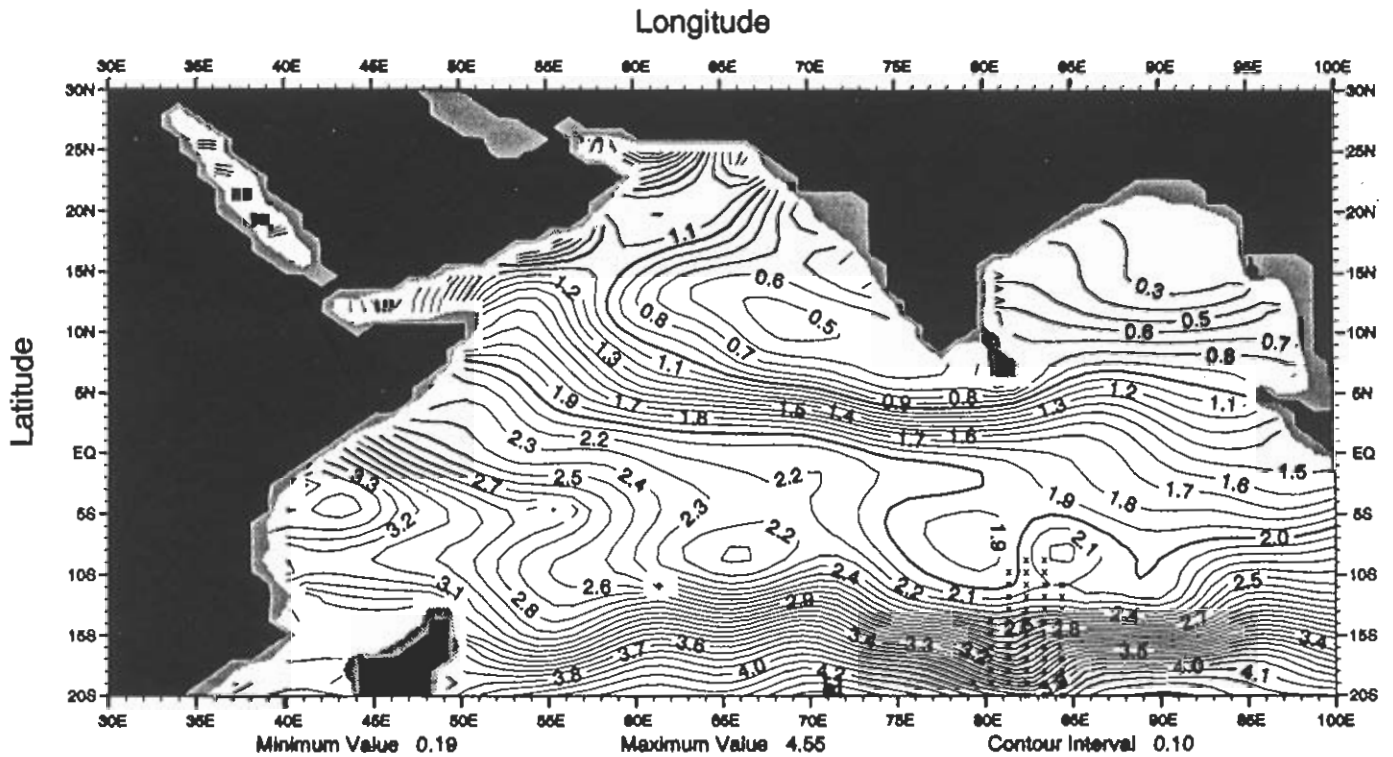

Fig. C24 Spring (Apr.-Jun.) mean oxygen (ml/l) at 150 m depth

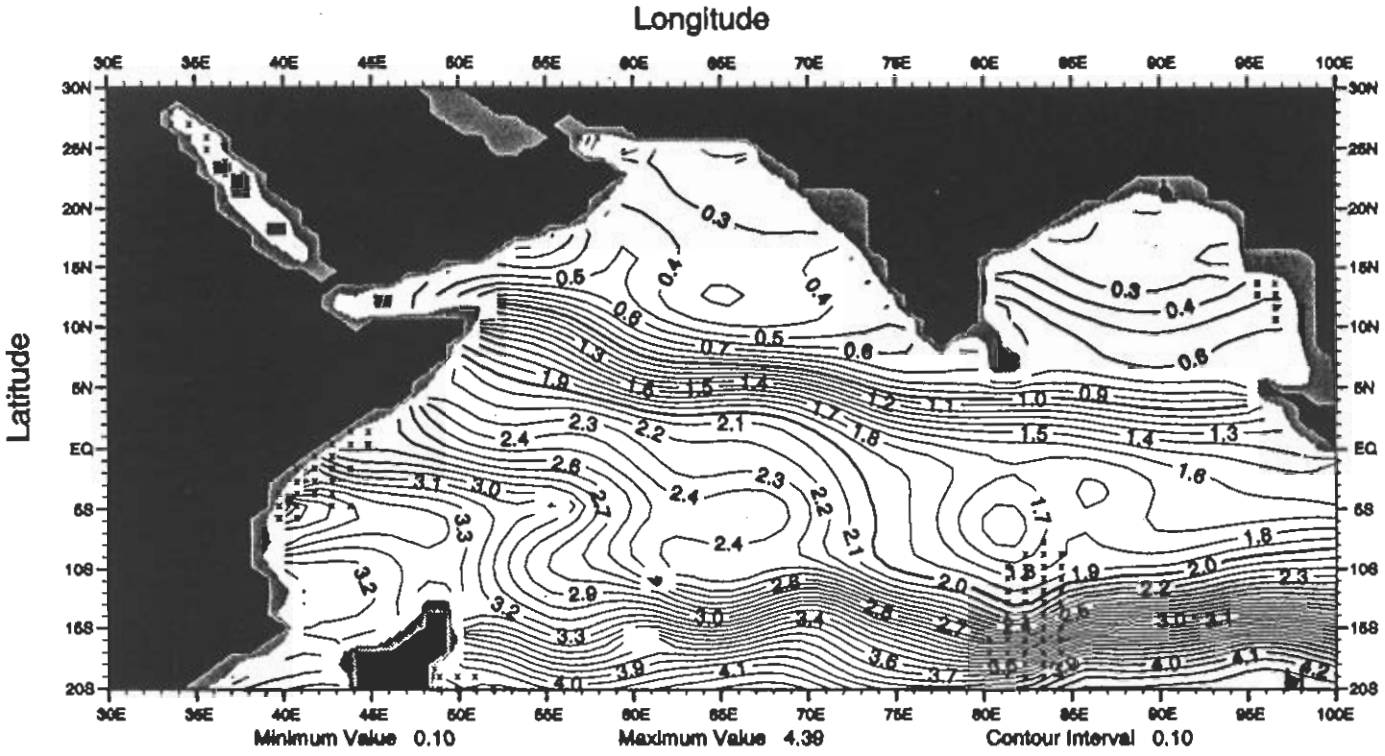

Fig. C25 Spring (Apr.-Jun.) mean oxygen (ml/l) at 200 m depth

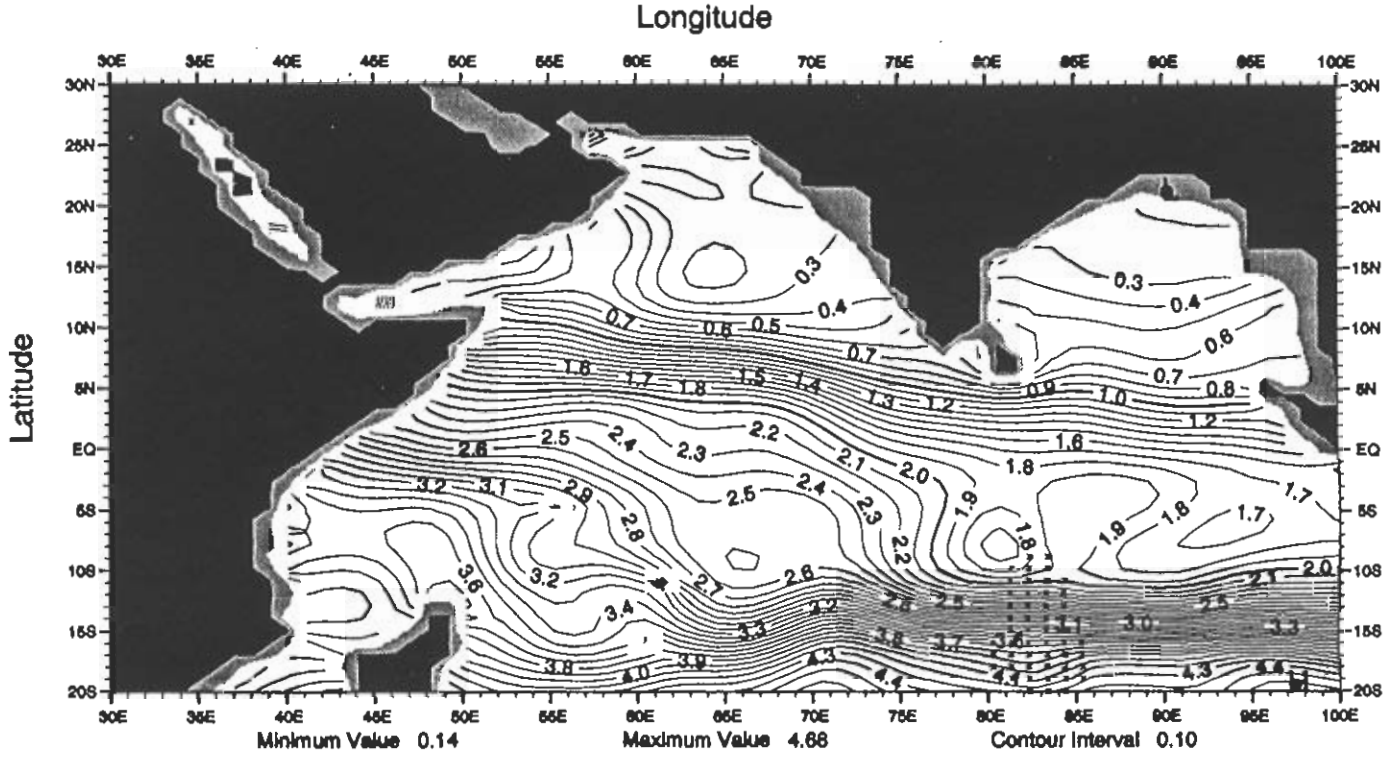

Fig. C26 Spring (Apr.-Jun.) mean oxygen (ml/l) at 250 m depth

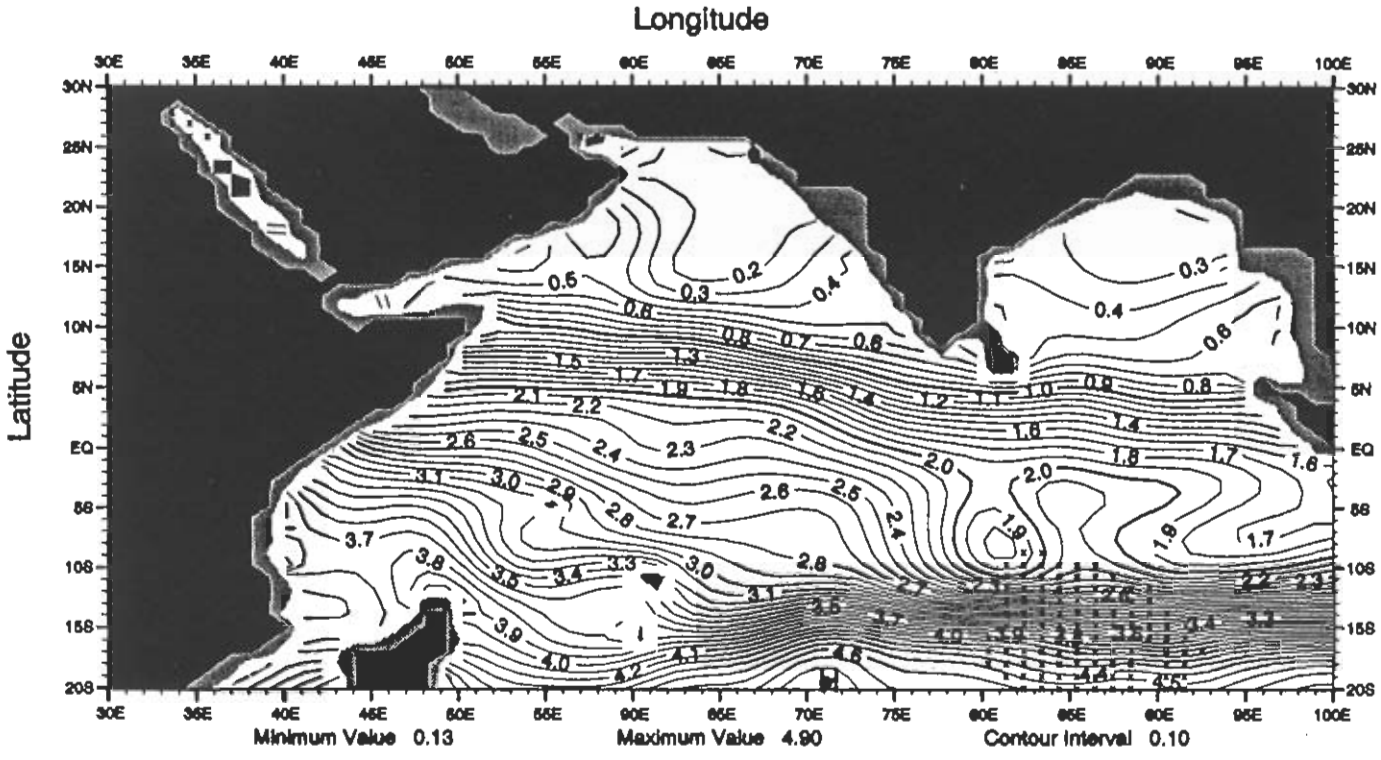

Fig. C27 Spring (Apr.-Jun.) mean oxygen (ml/l) at 300 m depth

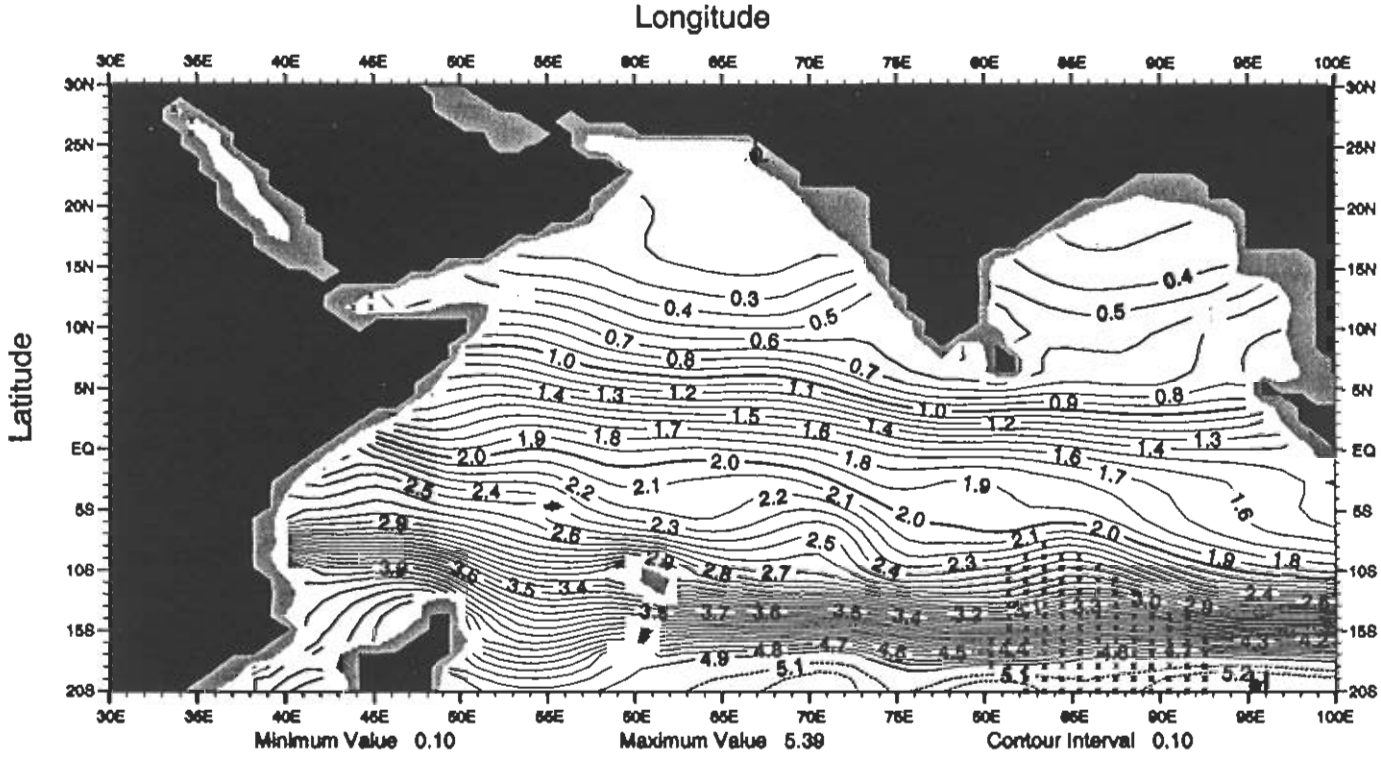

Fig. C28 Spring (Apr.-Jun.) mean oxygen (ml/l) at 500 m depth

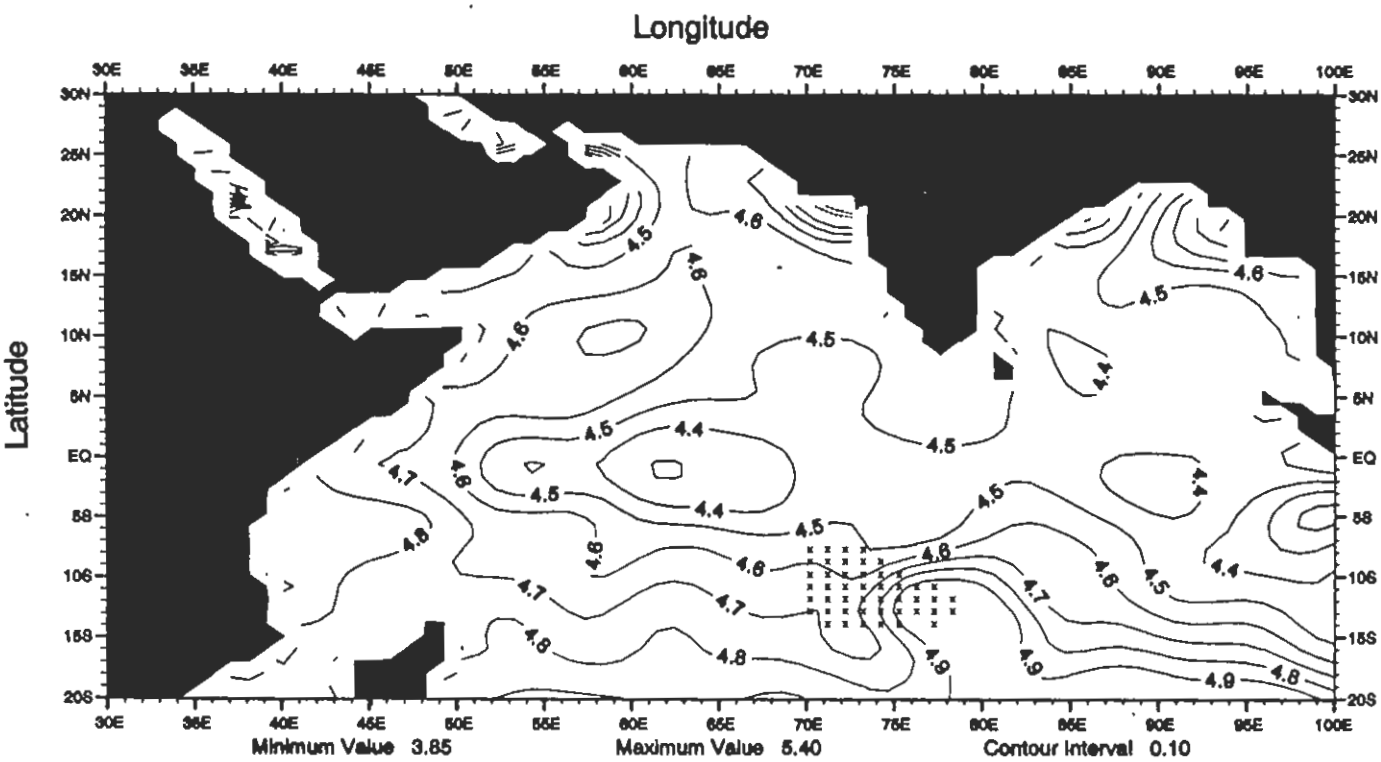

Fig. C29 Summer (Jul.-Sep.) mean oxygen (ml/l) at the surface

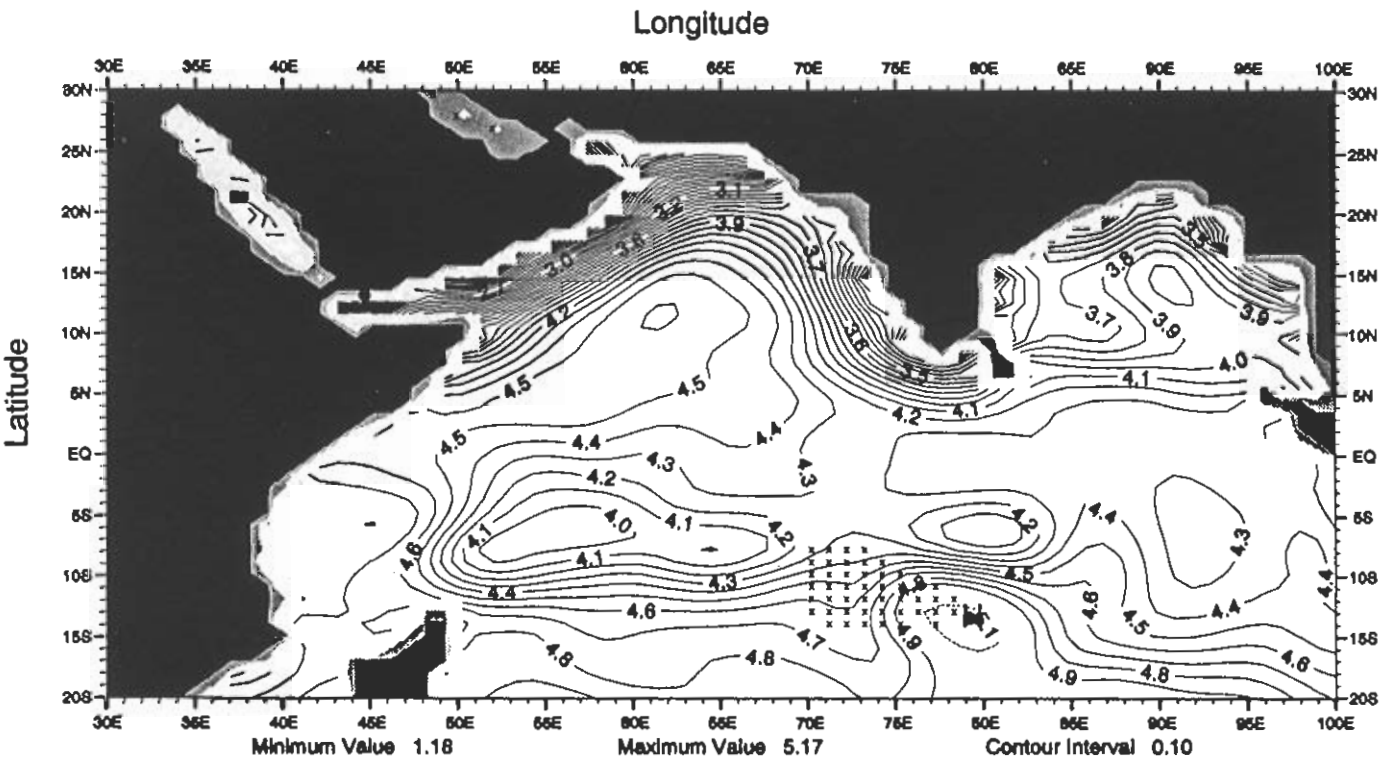

Fig. C30 Summer (Jul.-Sep.) mean oxygen (ml/l) at 50 m depth

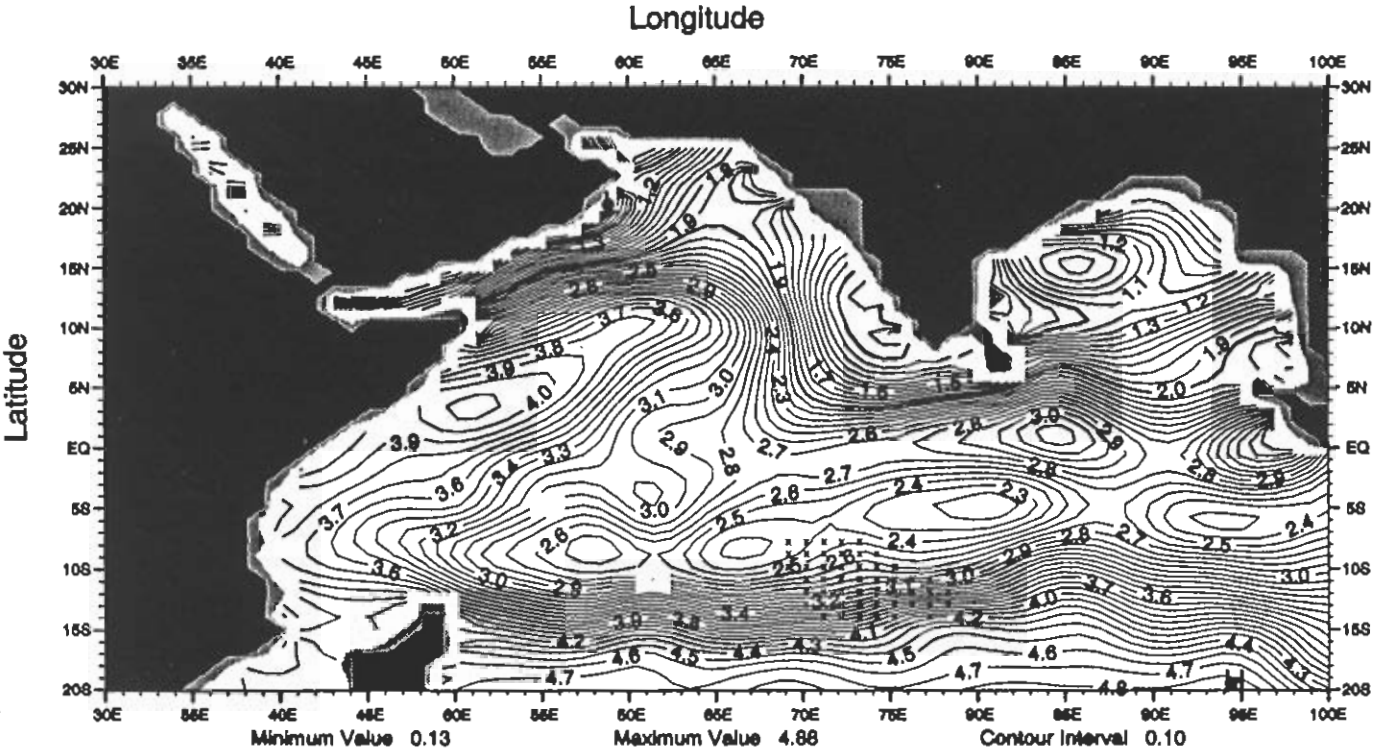

Fig. C31 Summer (Jul.-Sep.) mean oxygen (ml/l) at 100 m depth

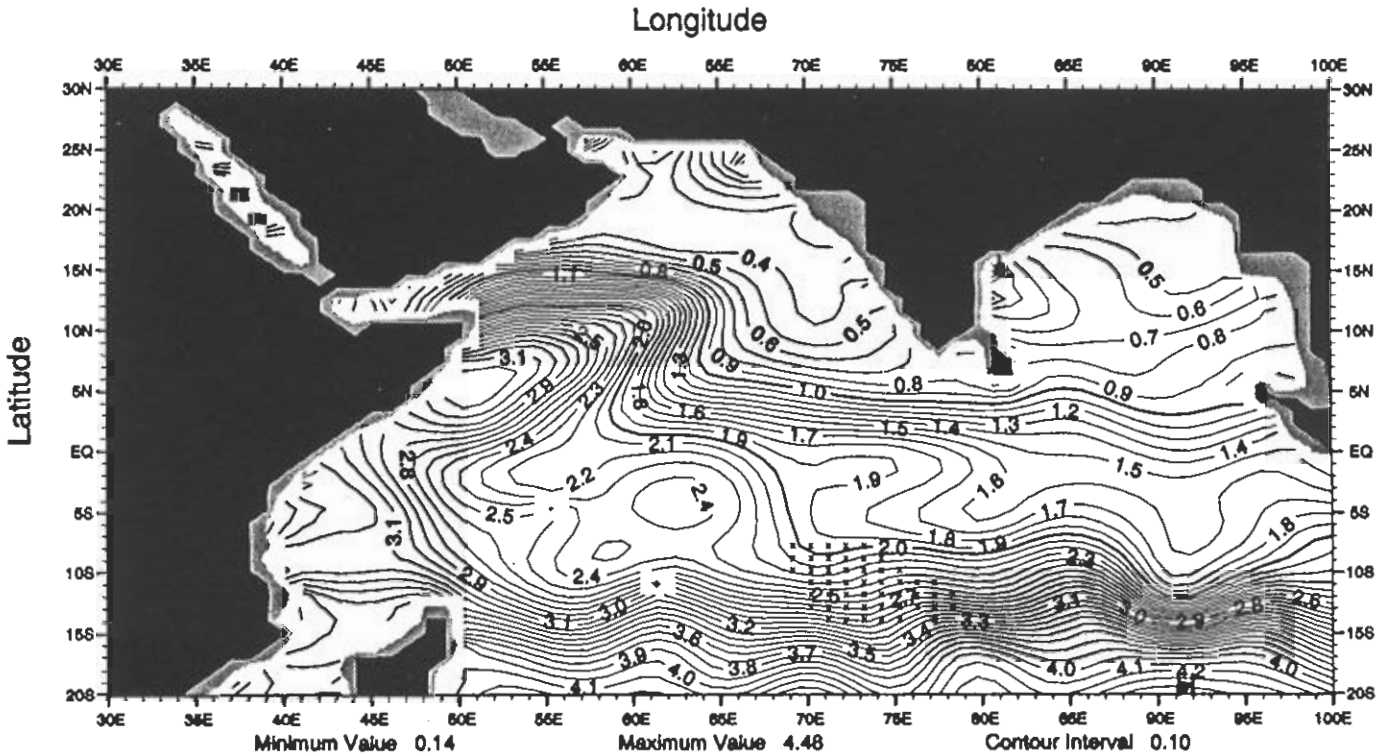

Fig. C32 Summer (Jul.-Sep.) mean oxygen (ml/l) at 150 m depth

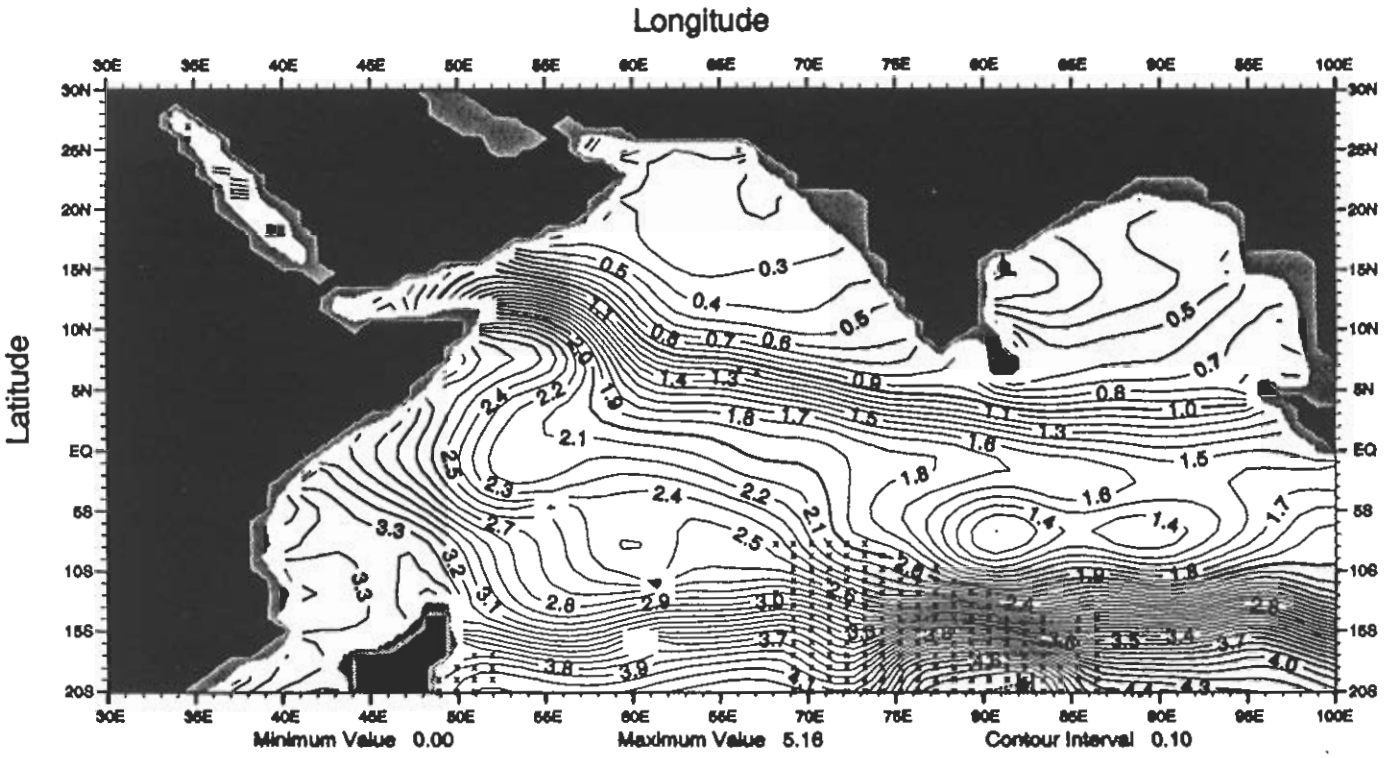

Fig. C33 Summer (Jul.-Sep.) mean oxygen (ml/l) at 200 m depth

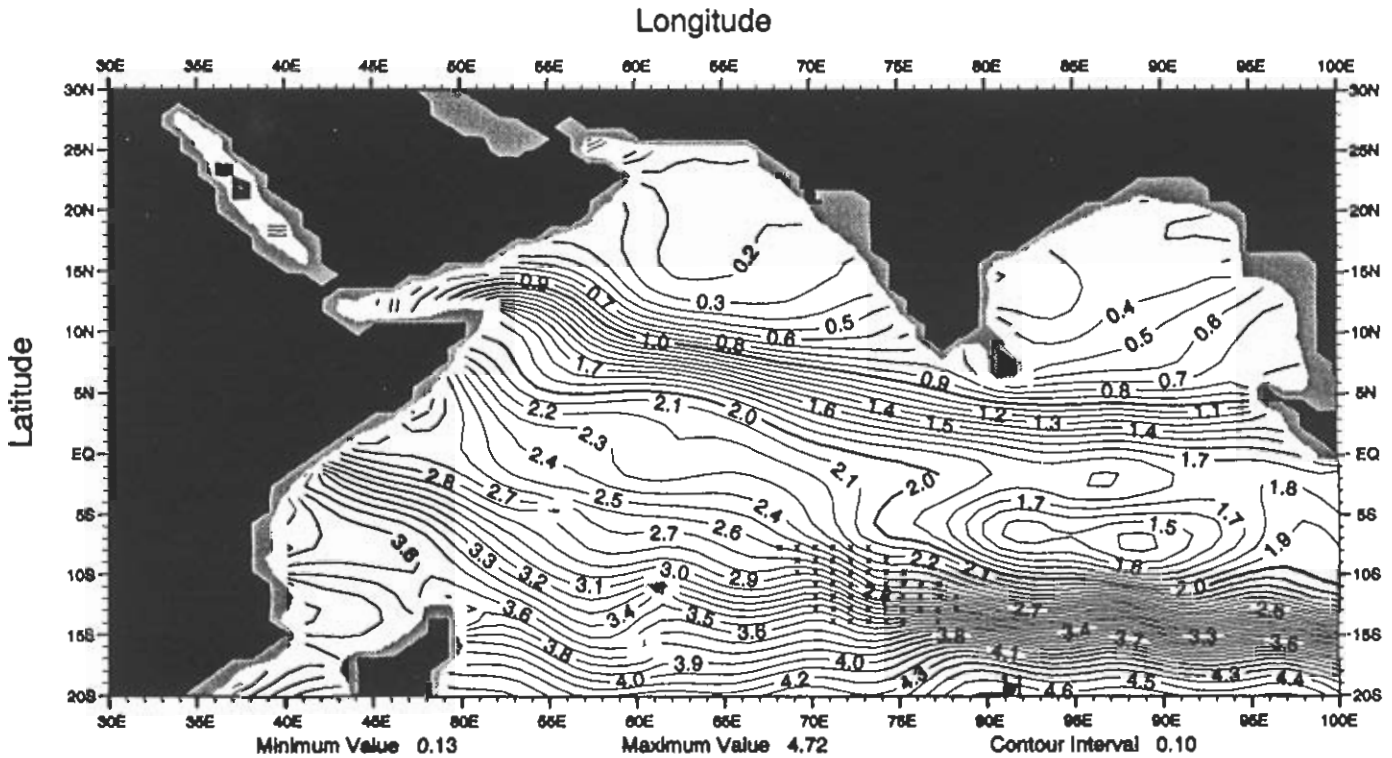

Fig. C34 Summer (Jul.-Sep.) mean oxygen (ml/l) at 250 m depth

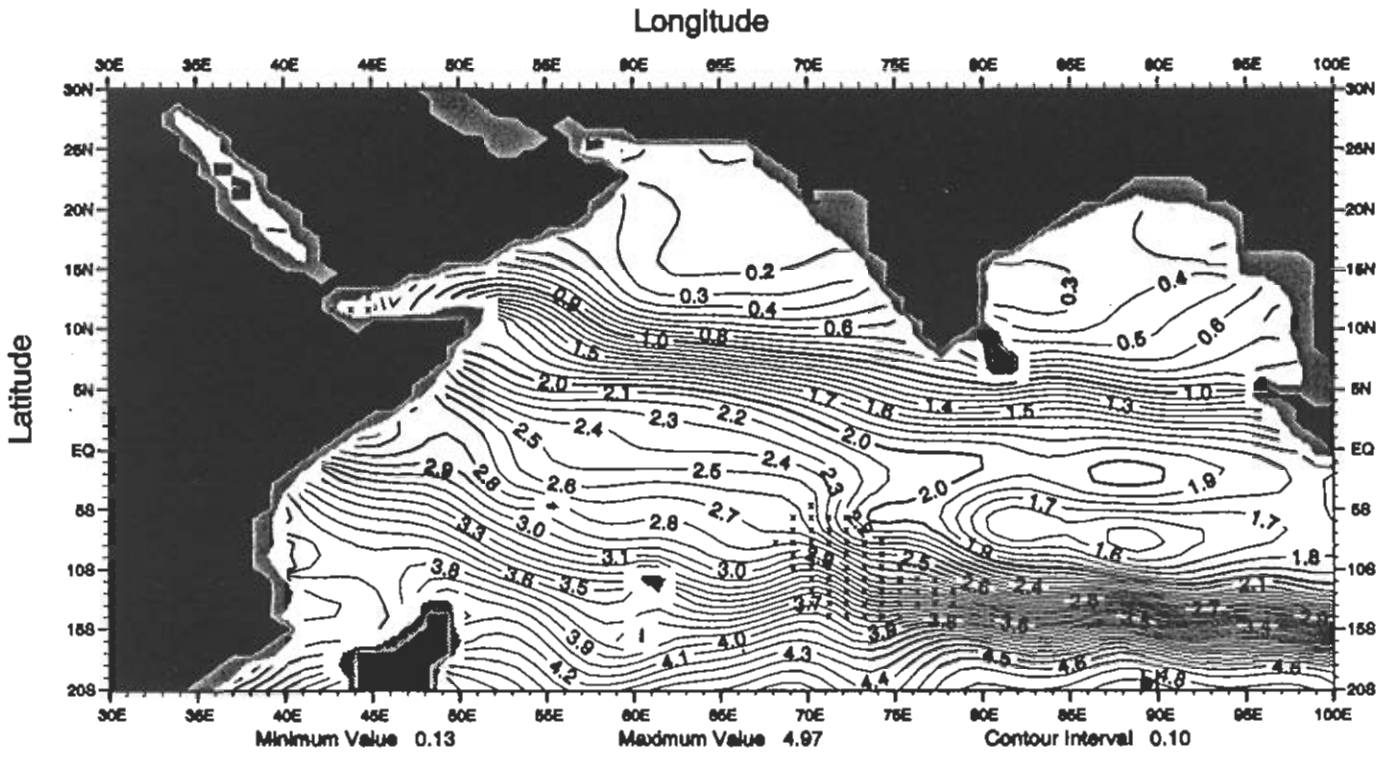

Fig. C35 Summer (Jul.-Sep.) mean oxygen (ml/l) at 300 m depth

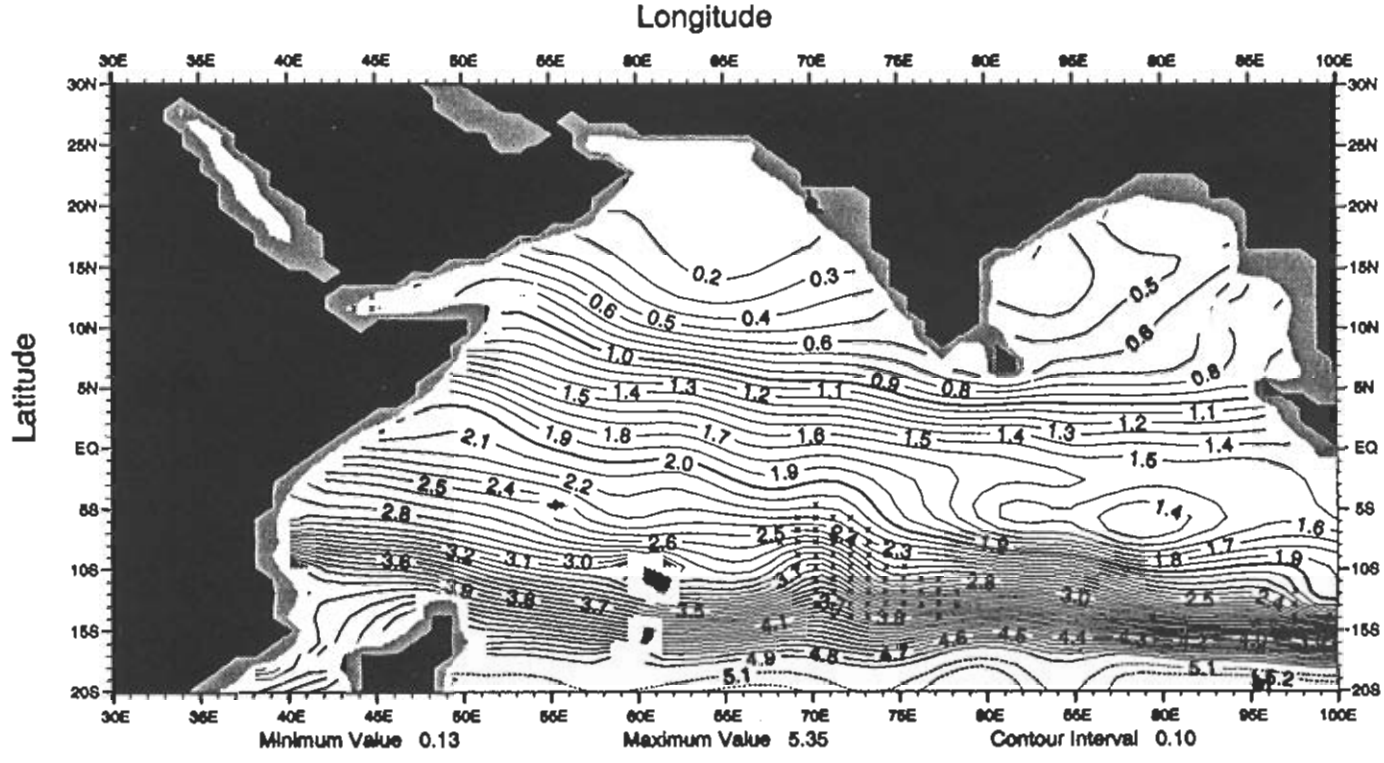

Fig. C36 Summer (Jul.-Sep.) mean oxygen (ml/l) at 500 m depth

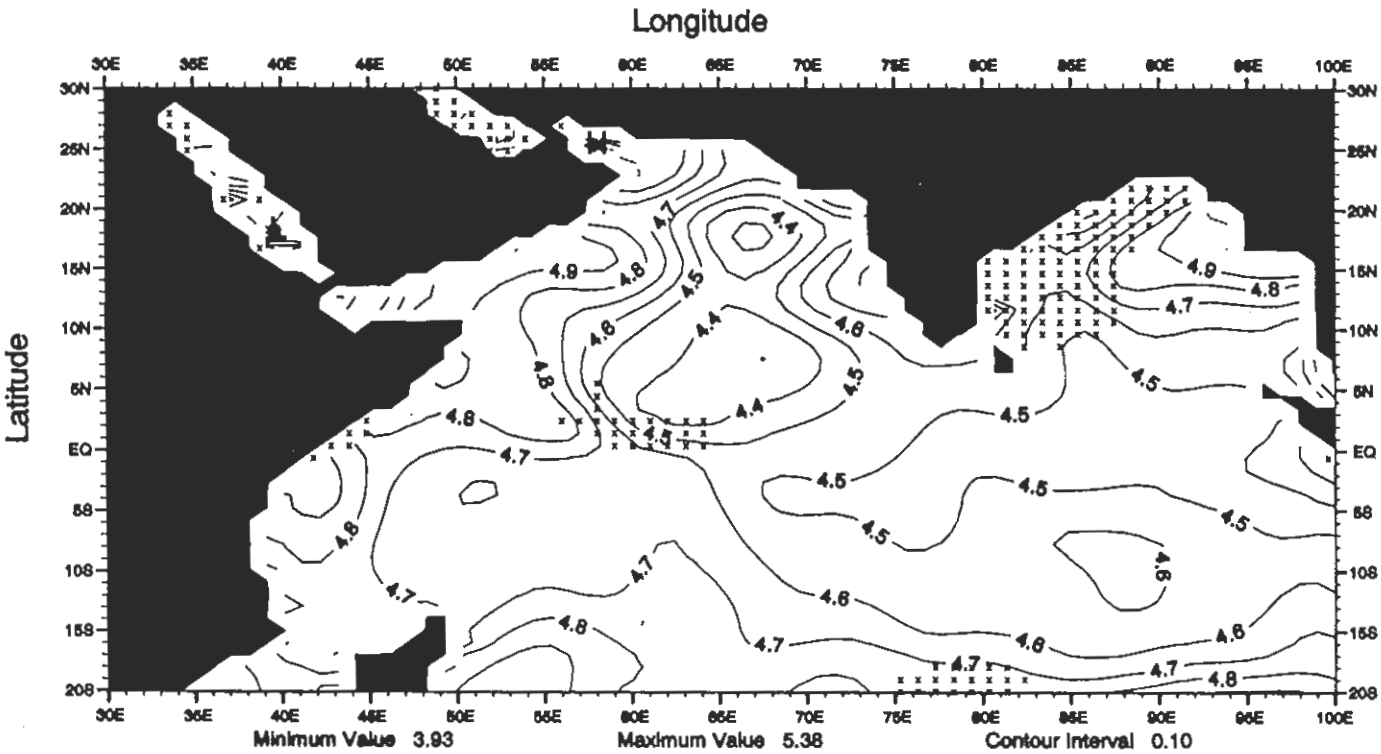

Fig. C37 Fall (Oct.-Dec.) mean oxygen (ml/l) at the surface

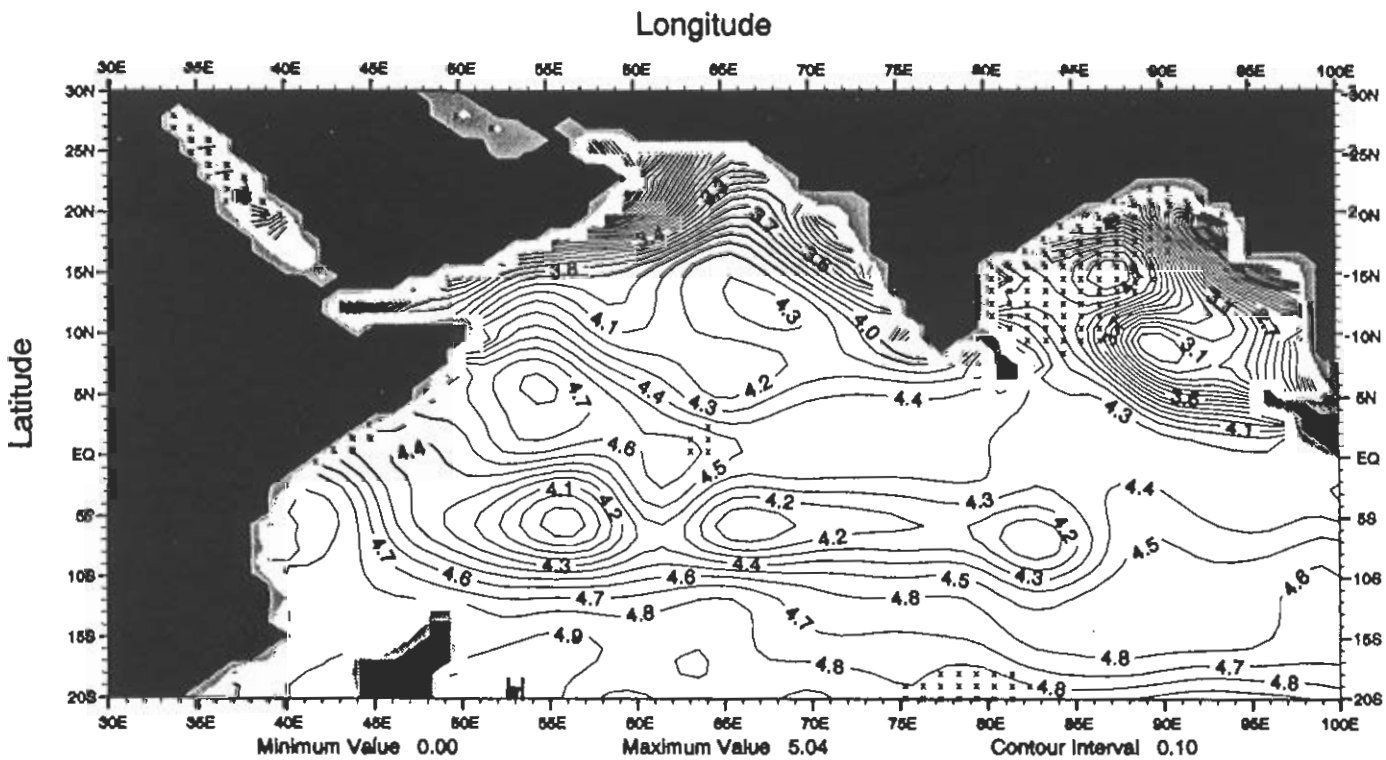

Fig. C38 Fall (Oct.-Dec.) mean oxygen (ml/l) at 50 m depth

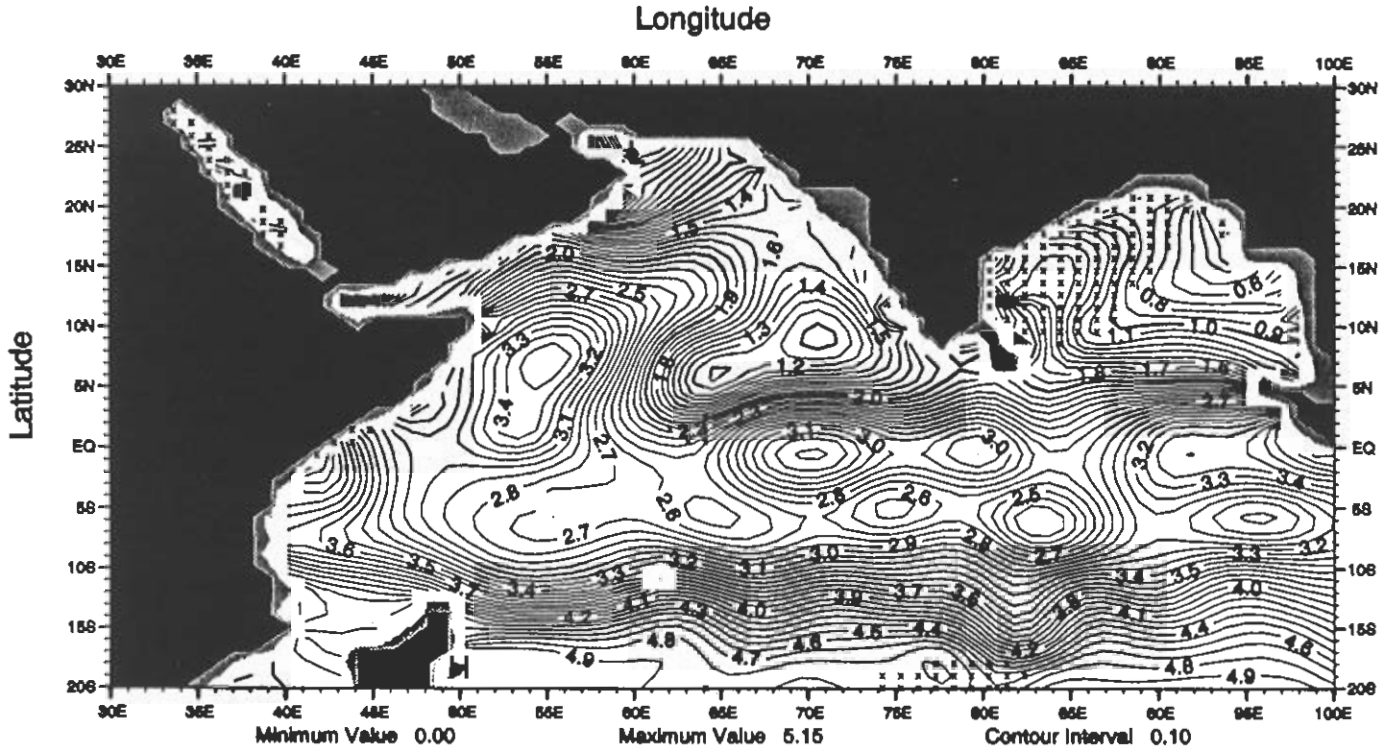

Fig. C39 Fall (Oct.-Dec.) mean oxygen (ml/l) at 100 m depth

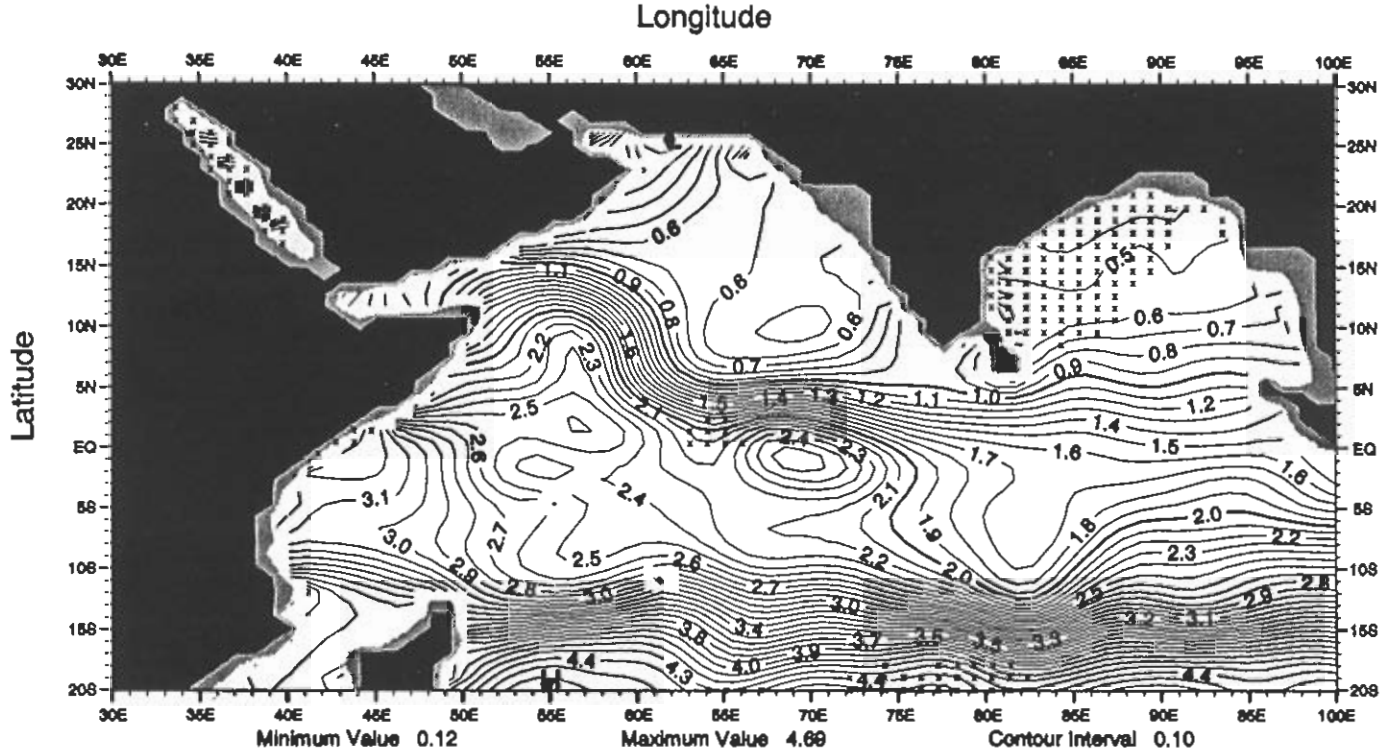

Fig. C40 Fall (Oct.-Dec.) mean oxygen (ml/l) at 150 m depth

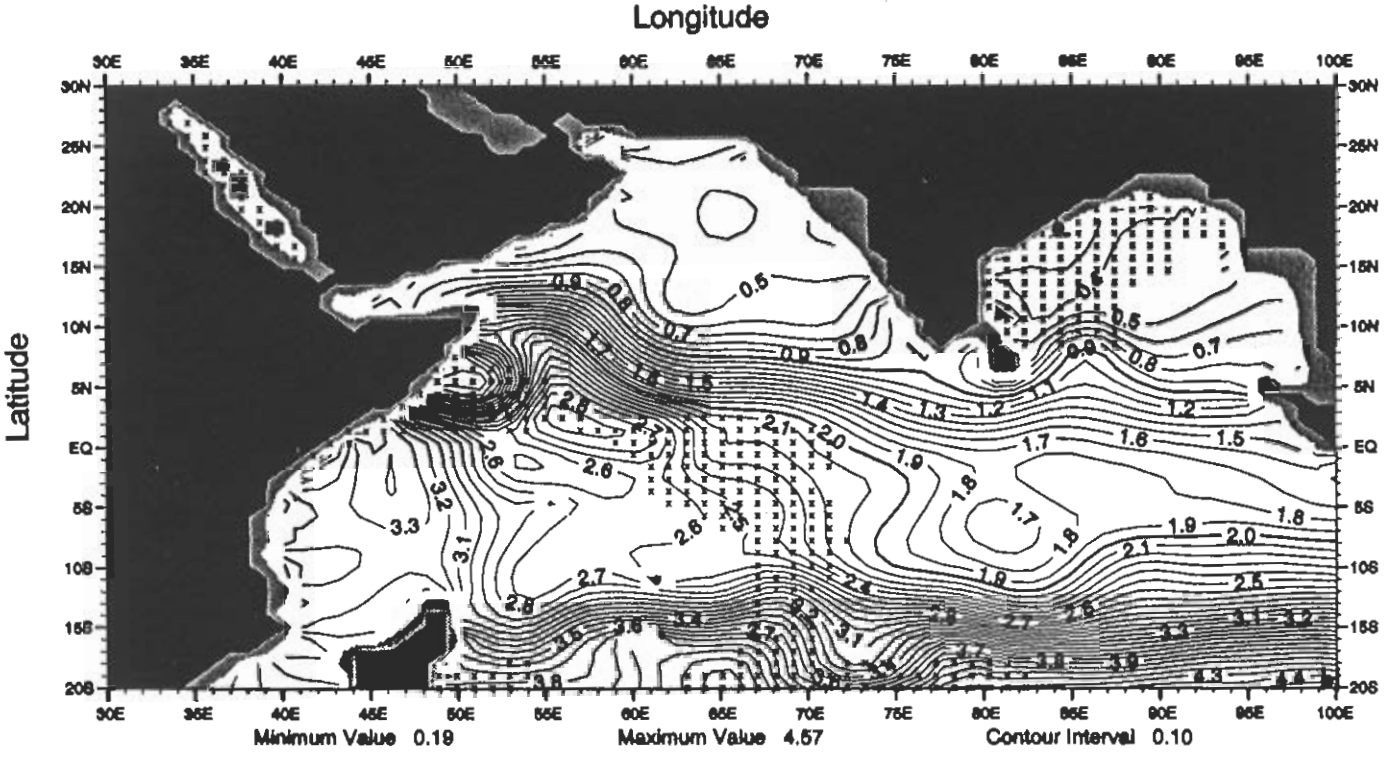

Fig. C41 Fall (Oct.-Dec.) mean oxygen (ml/l) at 200 m depth

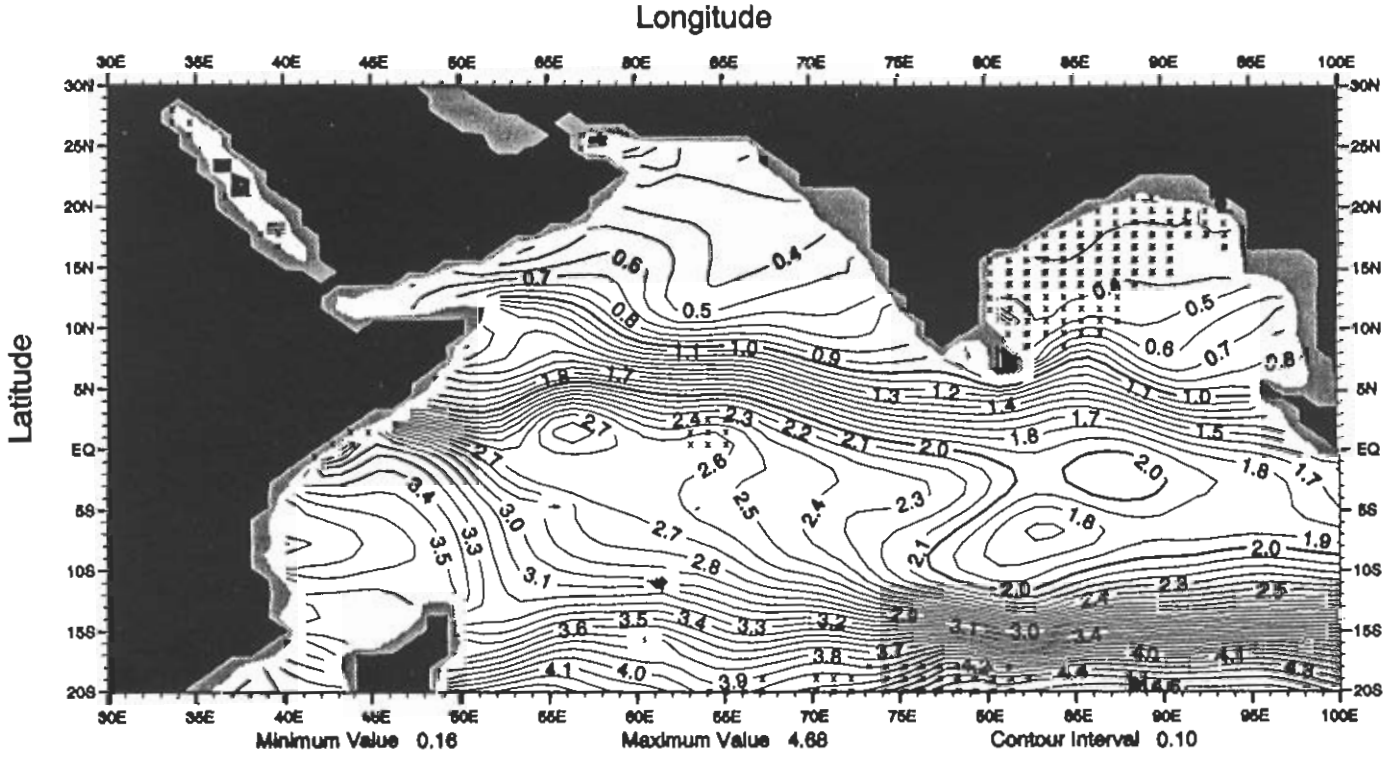

Fig. C42 Fall (Oct.-Dec.) mean oxygen (ml/l) at 250 m depth

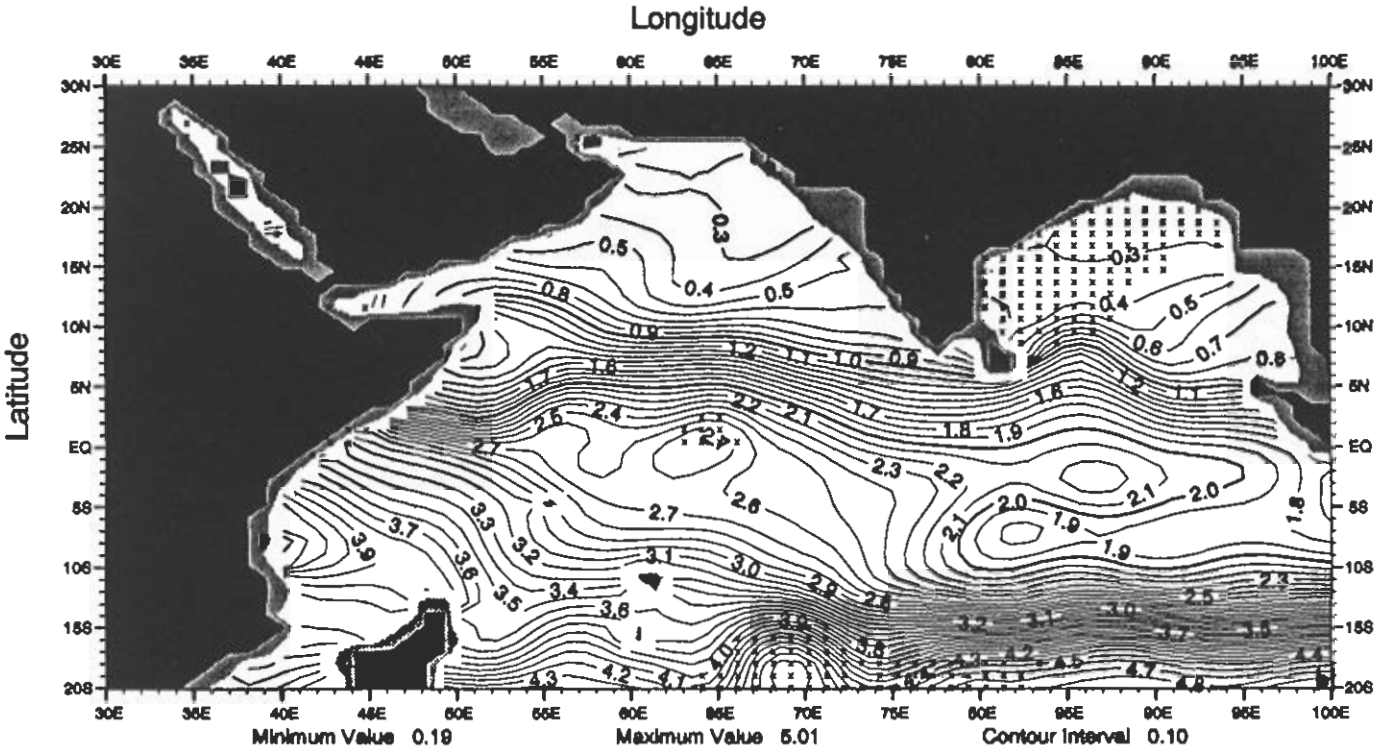

Fig. C43 Fall (Oct.-Dec.) mean oxygen (ml/l) at 300 m depth

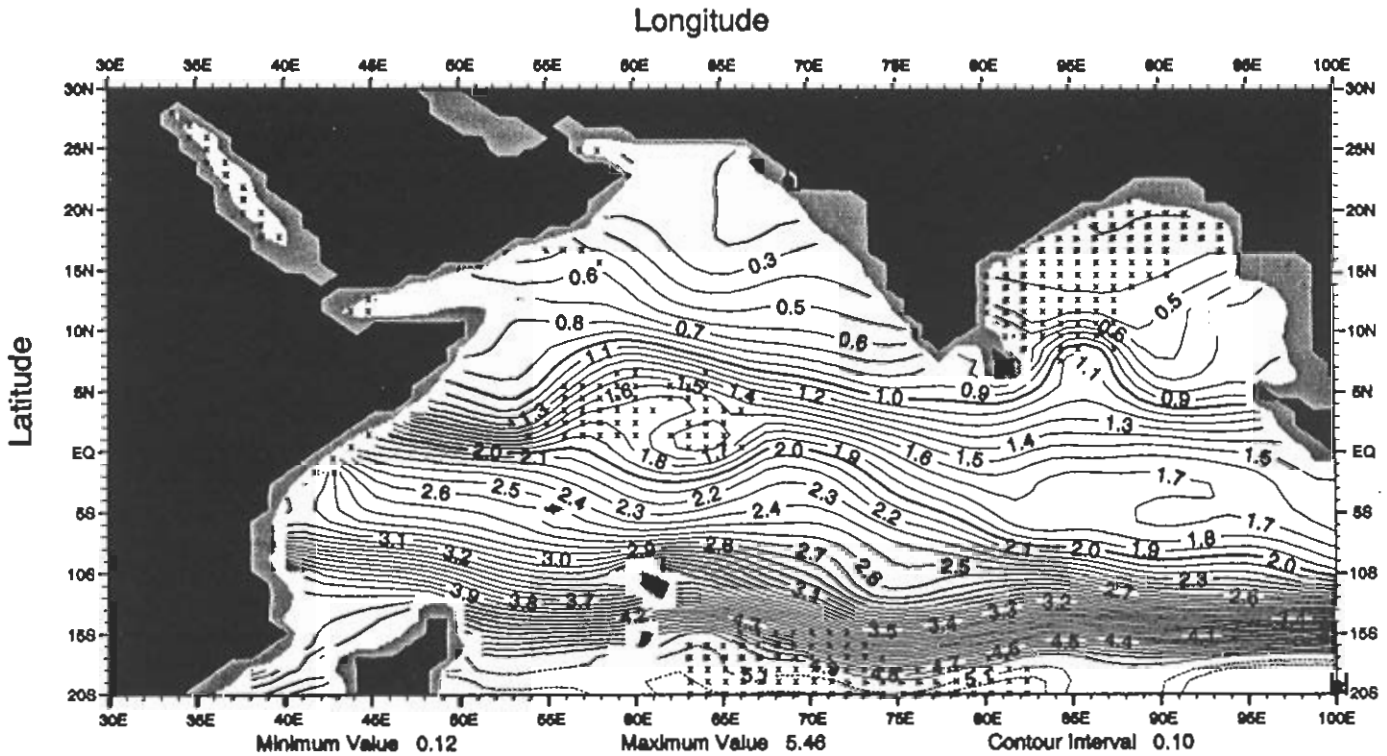

Fig. C44 Fall (Oct.-Dec.) mean oxygen (ml/l) at 500 m depth

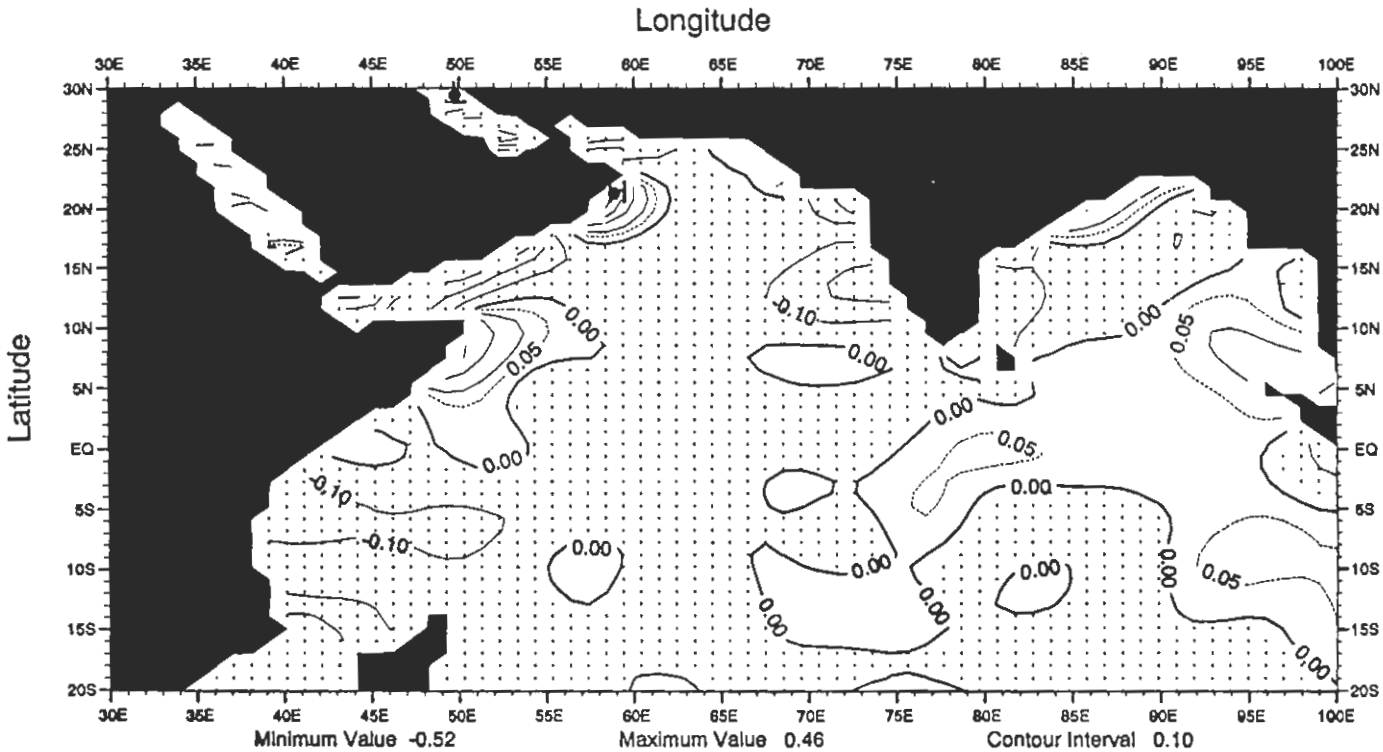

Fig. D1 Annual mean Apparent Oxygen Utilization (ml/l) at the surface

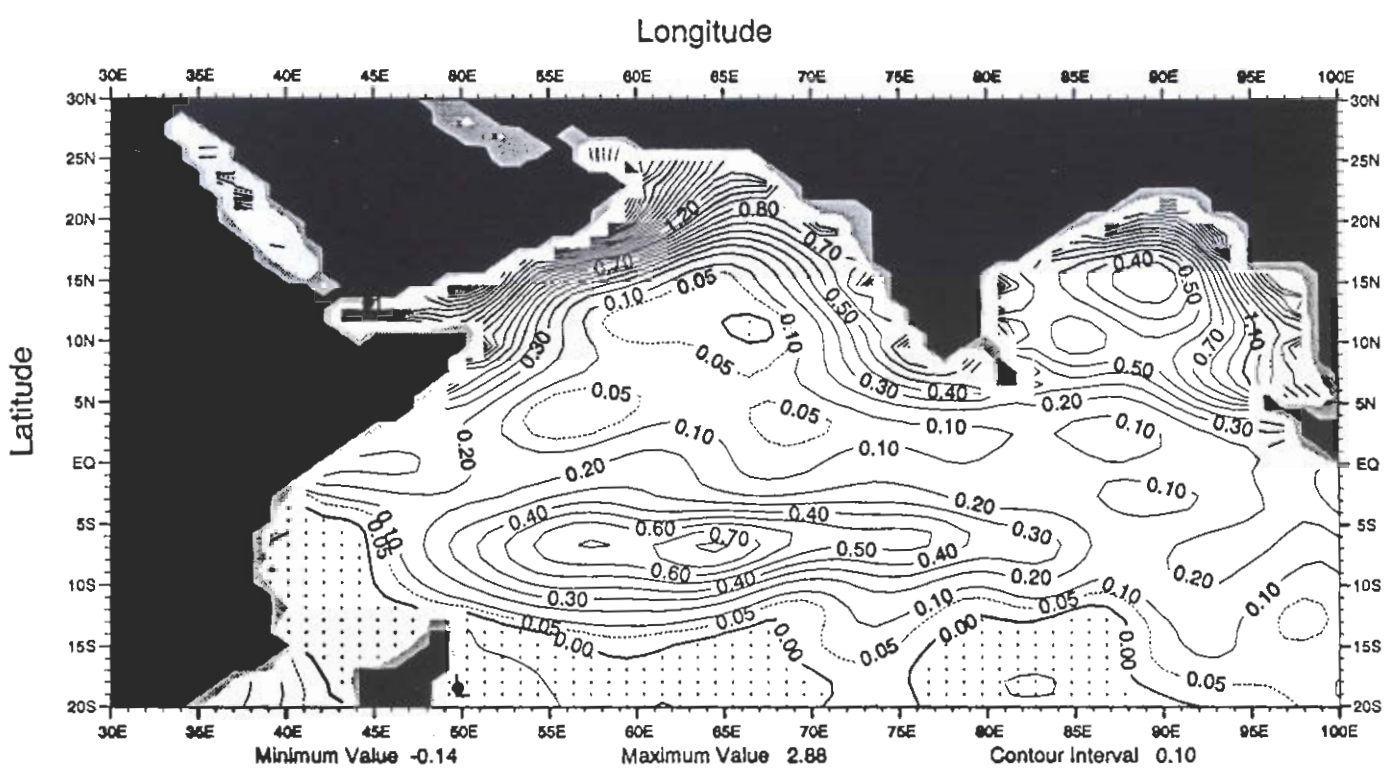

Fig. D2 Annual mean Apparent Oxygen Utilization (ml/l) at 50 m depth

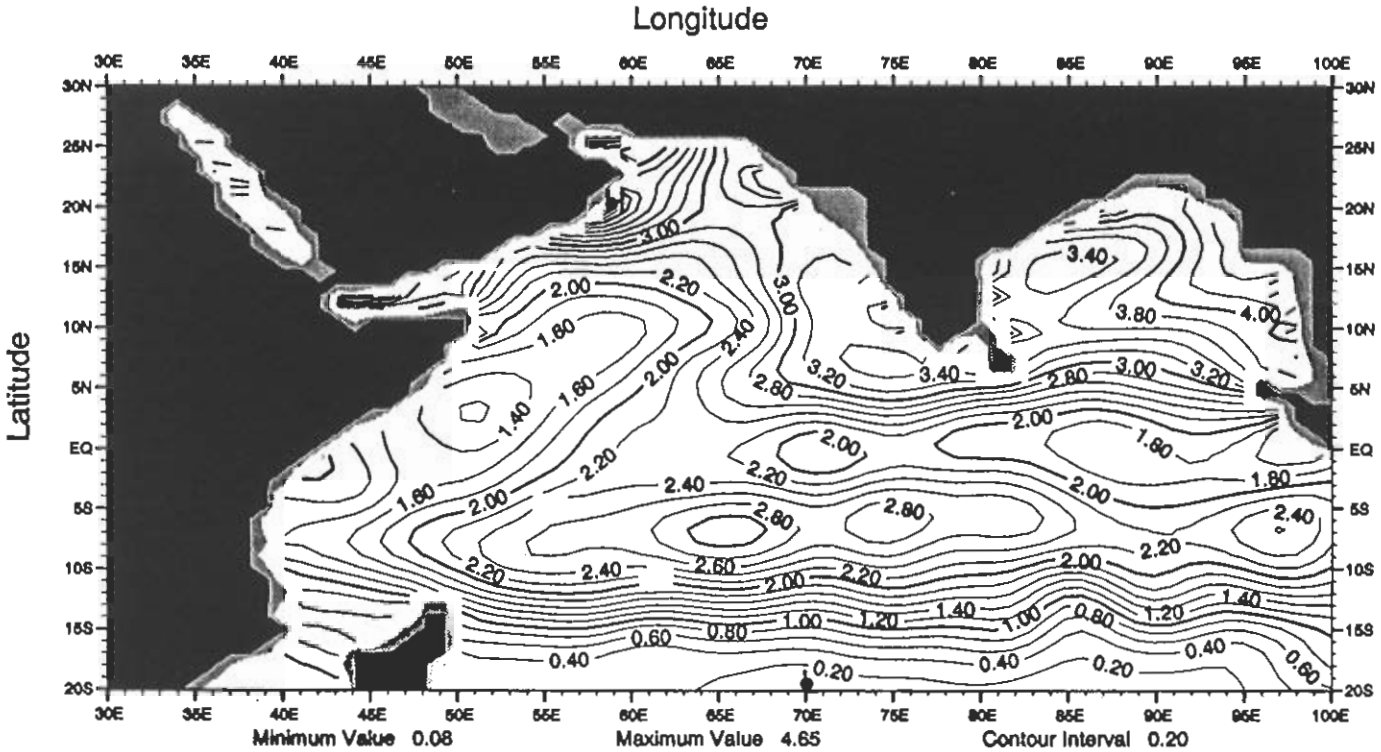

Fig. D3 Annual mean Apparent Oxygen Utilization (ml/l) at 100 m depth

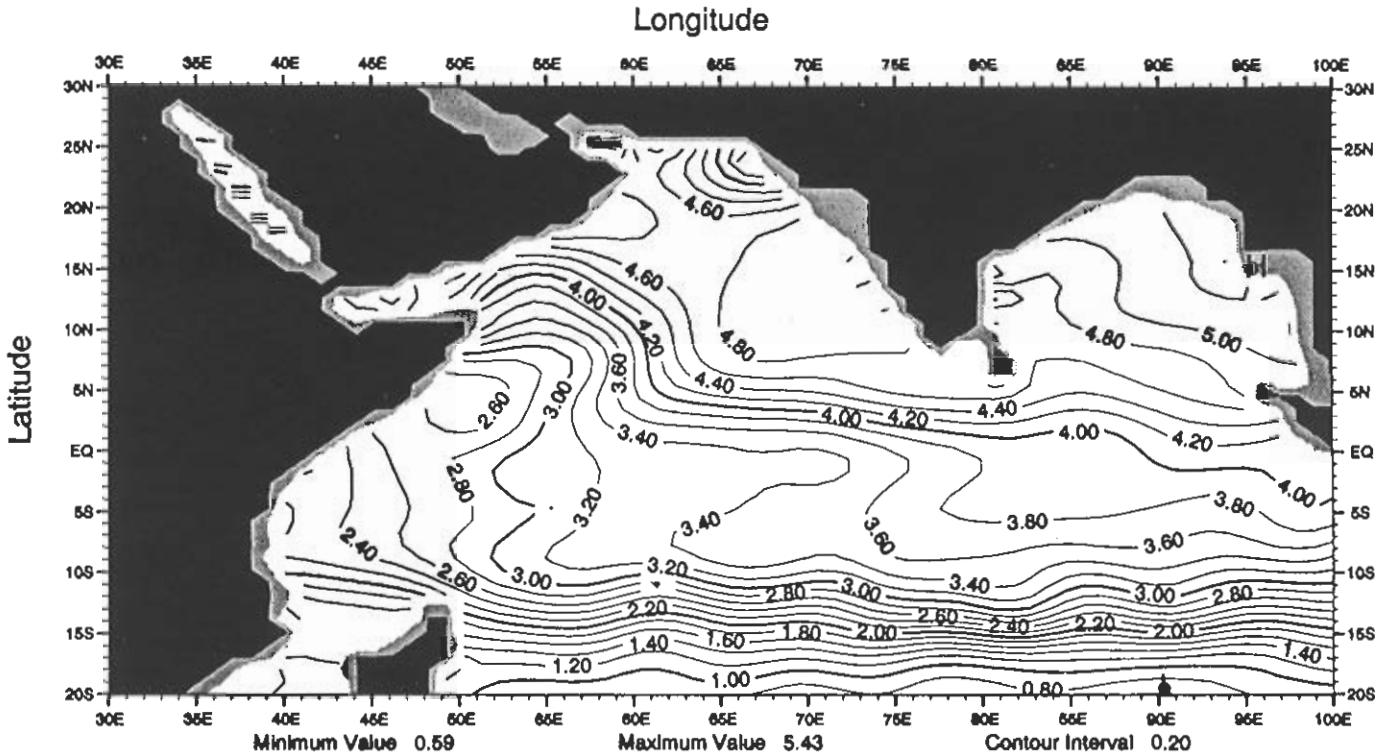

Fig. D4 Annual mean Apparent Oxygen Utilization (ml/l) at 150 m depth

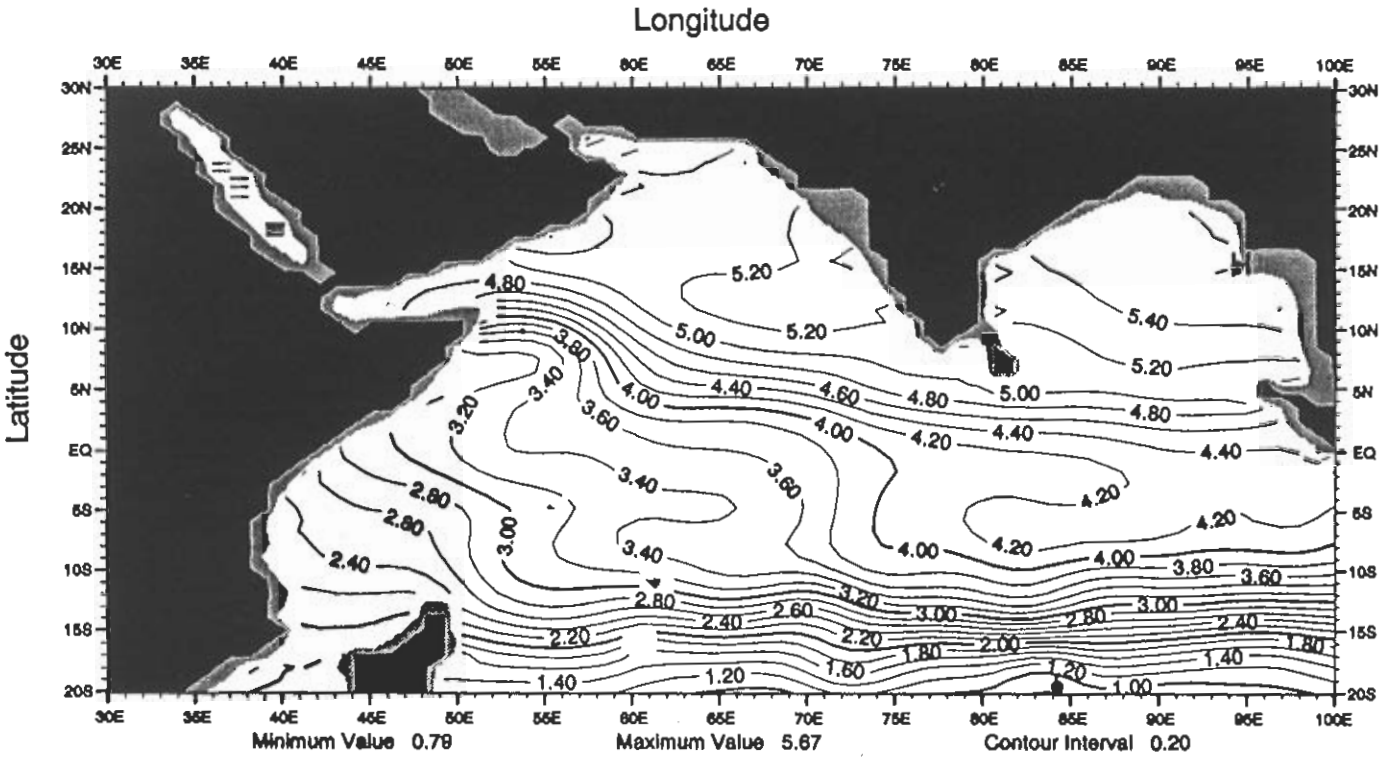

Fig. D5 Annual mean Apparent Oxygen Utilization (ml/l) at 200 m depth

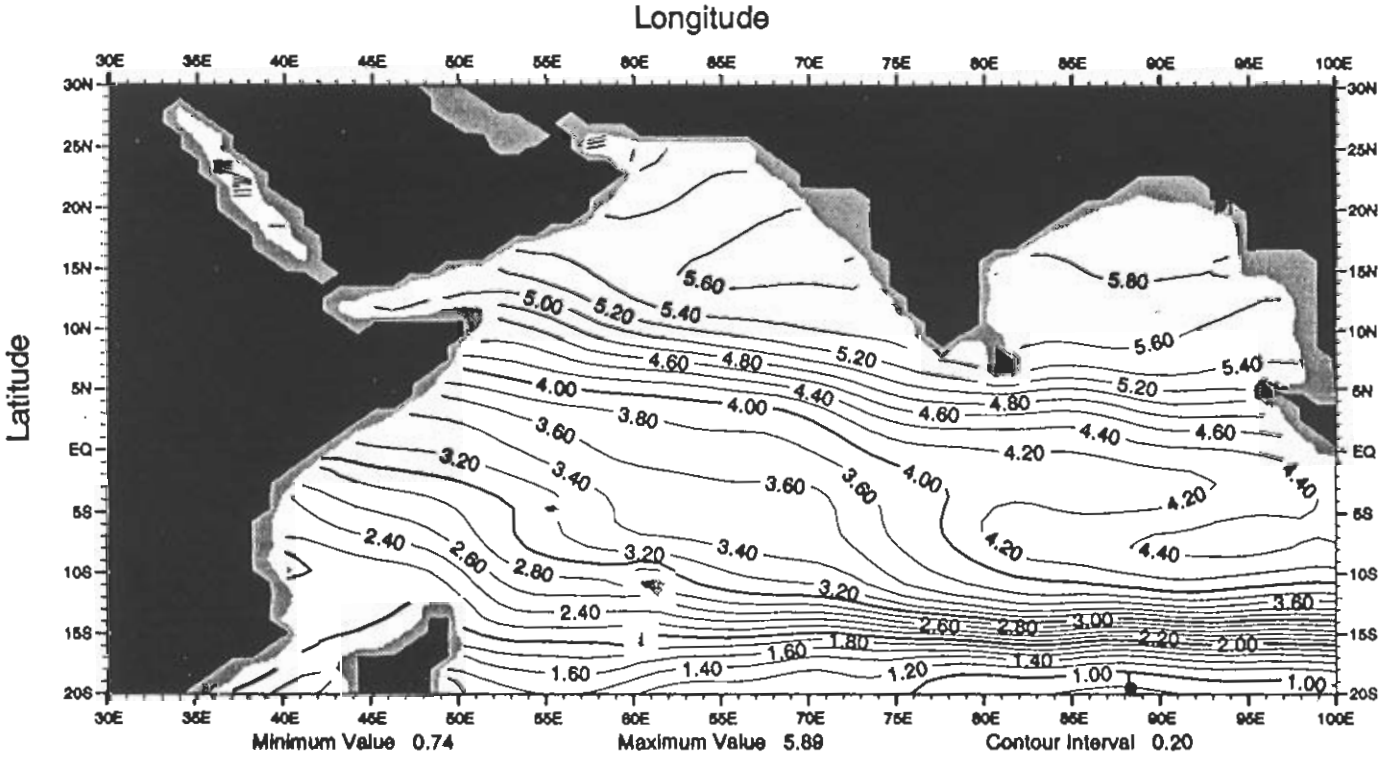

Fig. D6 Annual mean Apparent Oxygen Utilization (ml/l) at 300 m depth

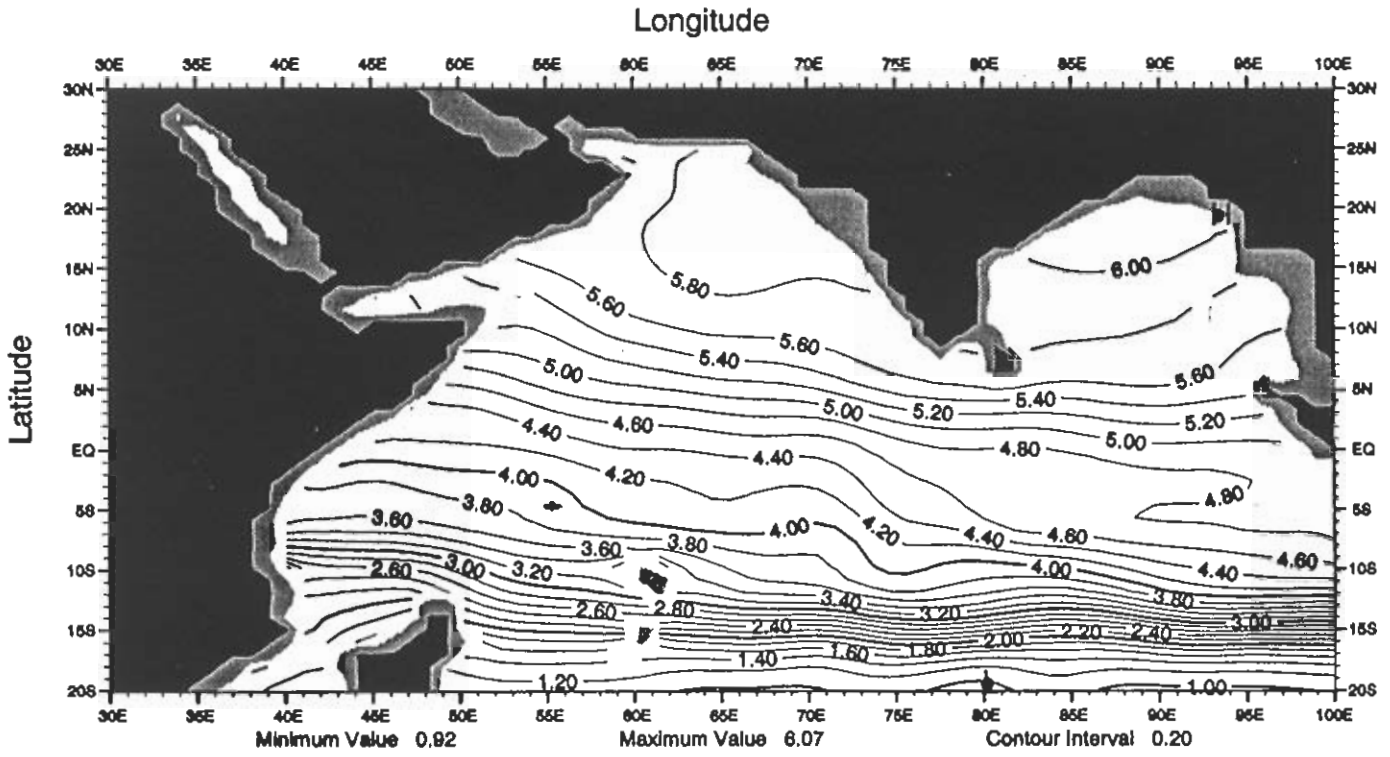

Fig. D7 Annual mean Apparent Oxygen Utilization (ml/l) at 500 m depth

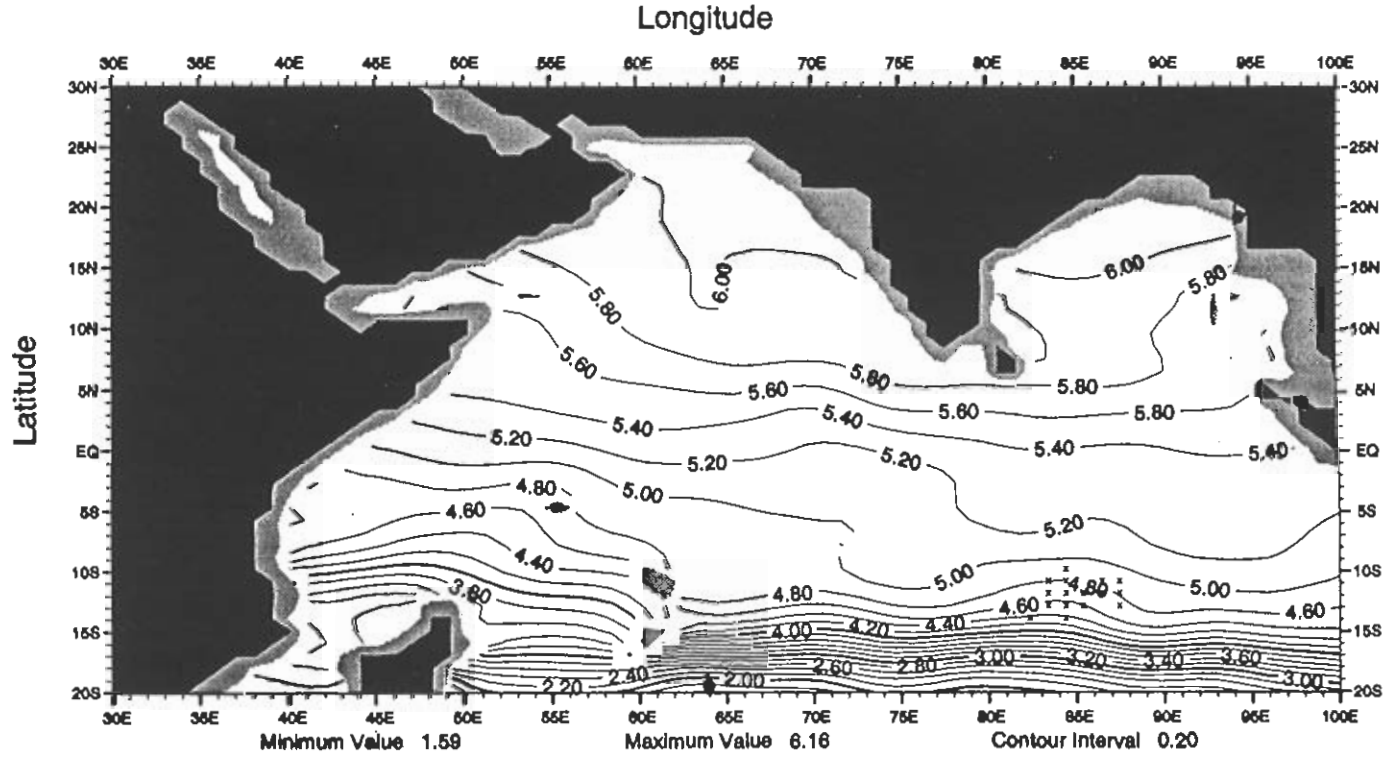

Fig. D8 Annual mean Apparent Oxygen Utilization (ml/l) at 700 m depth

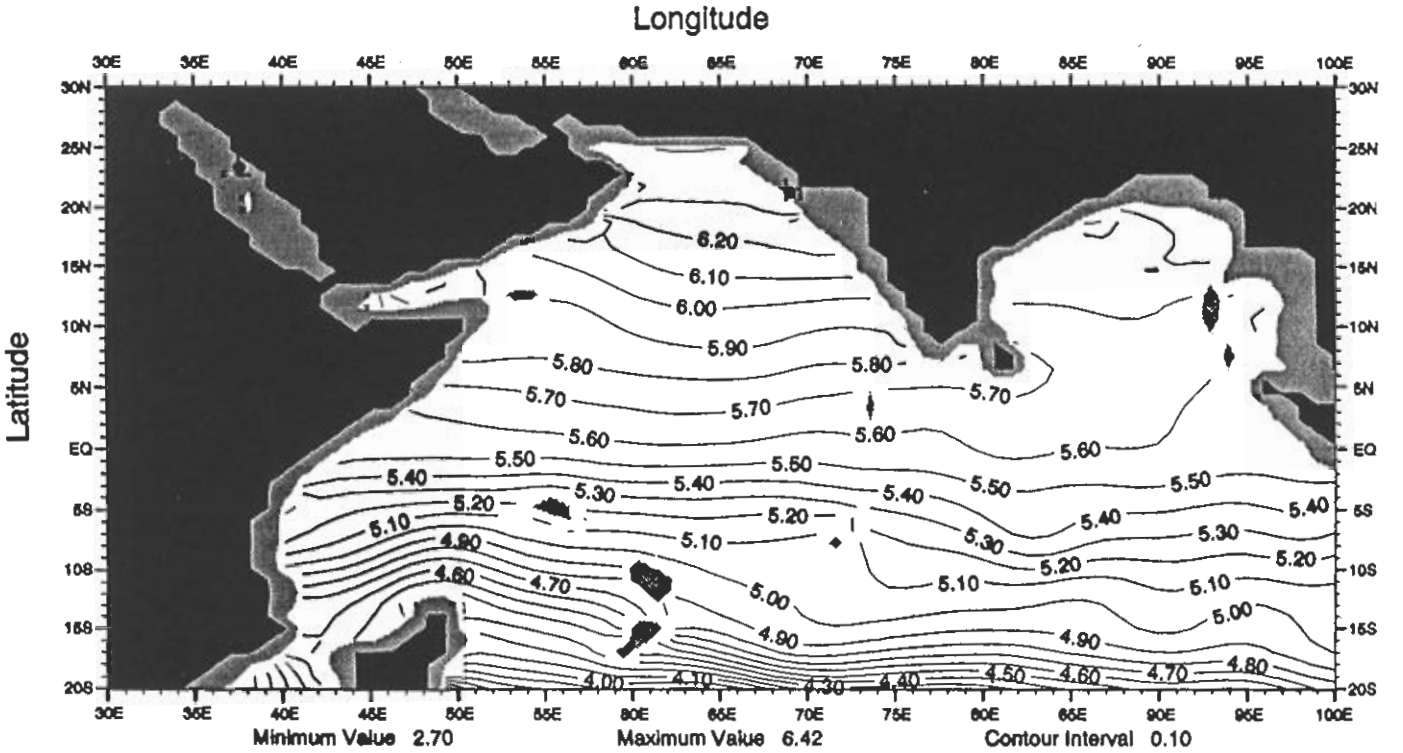

Fig. D9 Annual mean Apparent Oxygen Utilization (ml/l) at 1000 m depth

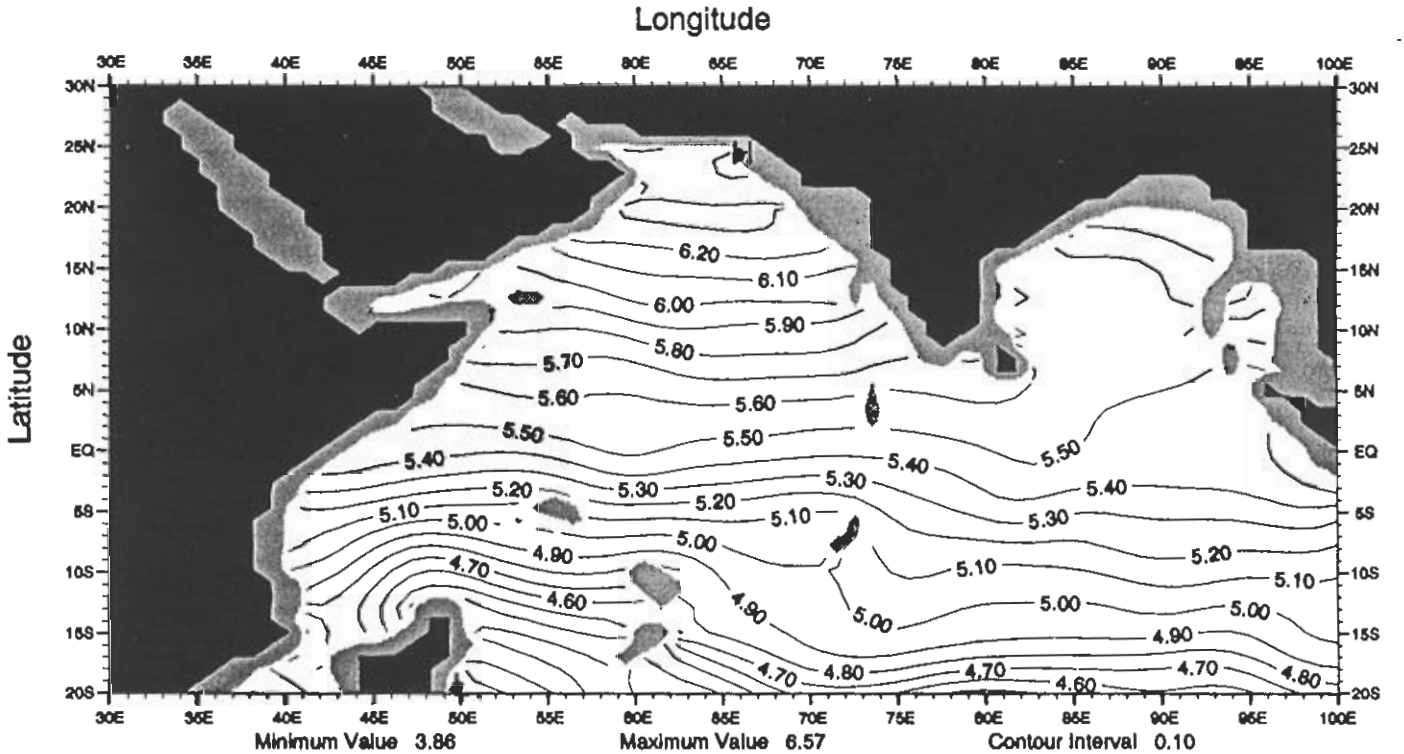

Fig. D10 Annual mean Apparent Oxygen Utilization (ml/l) at 1200 m depth

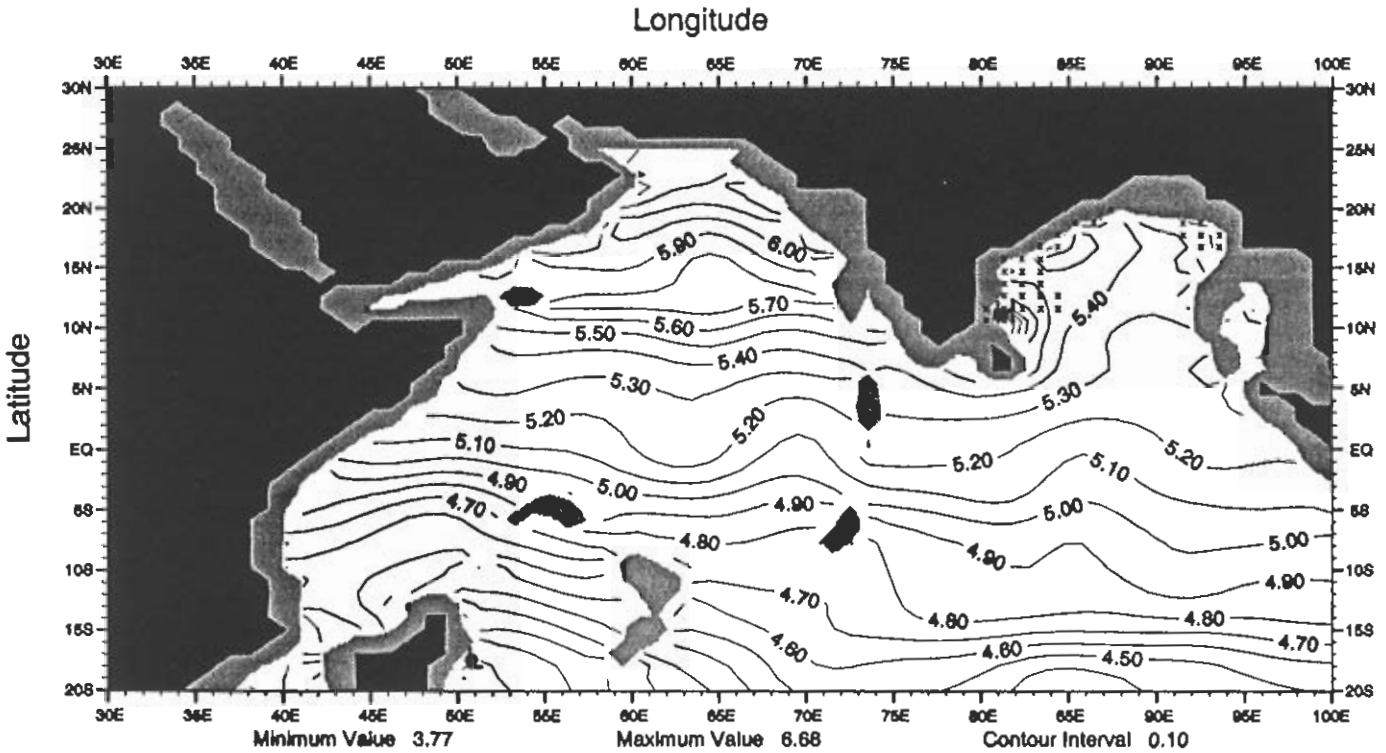

Fig. D11 Annual mean Apparent Oxygen Utilization (ml/l) at 1500 m depth

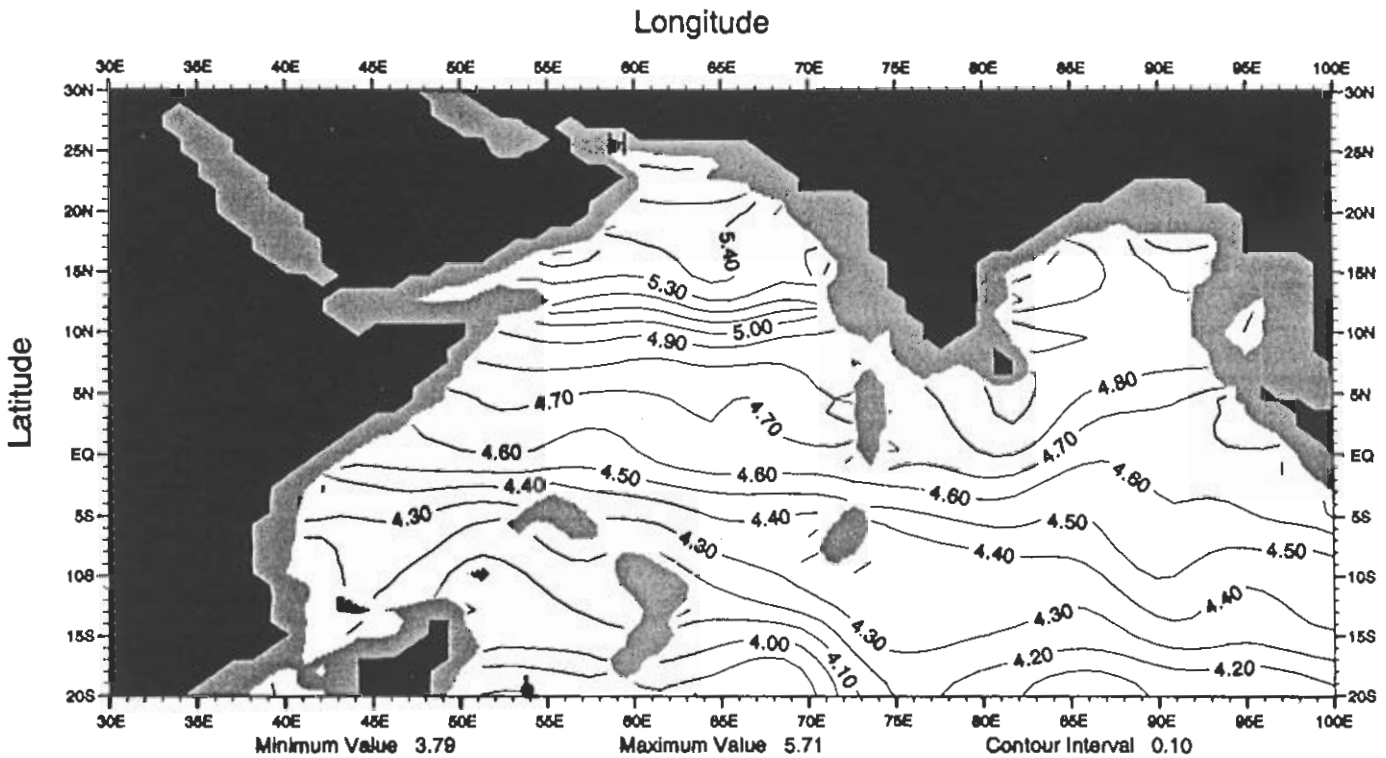

Fig. D12 Annual mean Apparent Oxygen Utilization (ml/l) at 2000 m depth

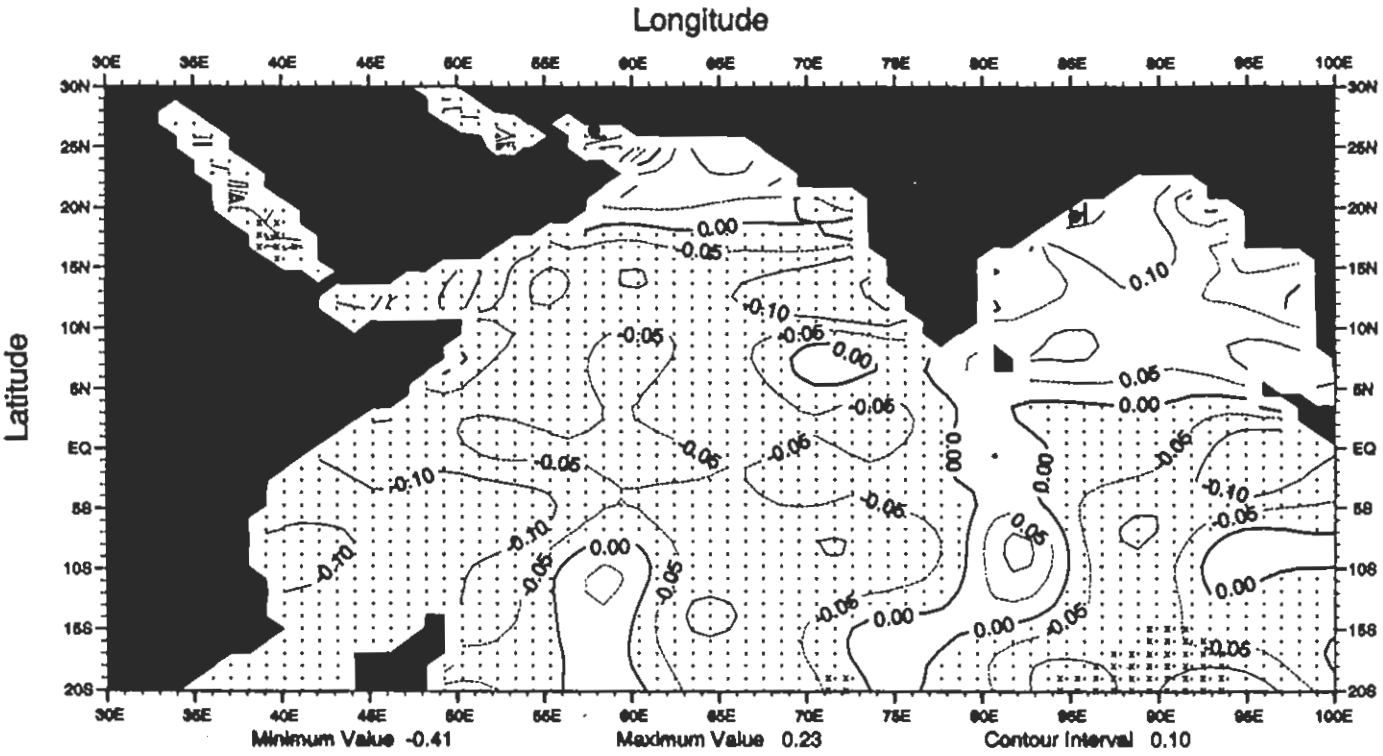

Fig. D13 Winter (Jan.-Mar.) mean Apparent Oxygen Utilization (ml/l) at the surface

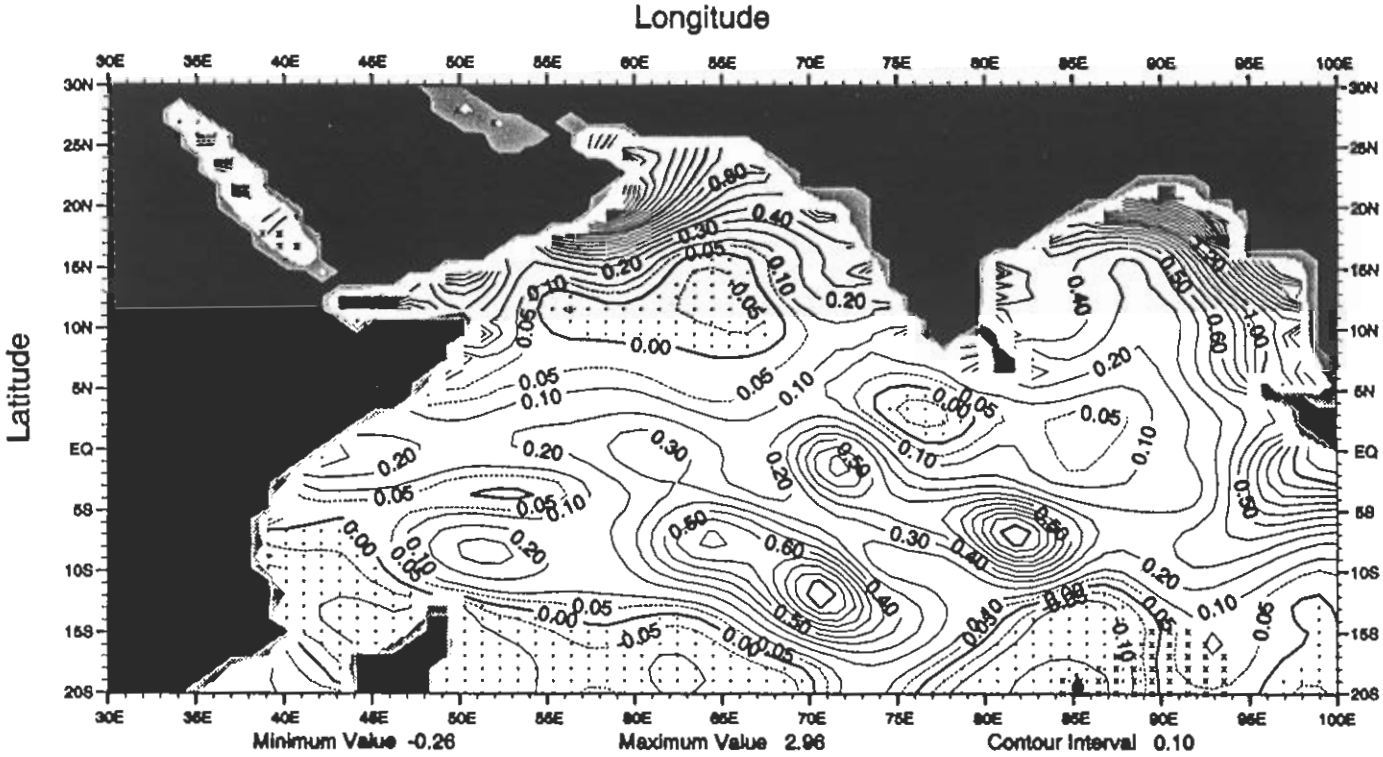

Fig. D14 Winter (Jan.-Mar.) mean Apparent Oxygen Utilization (ml/l) at 50 m depth

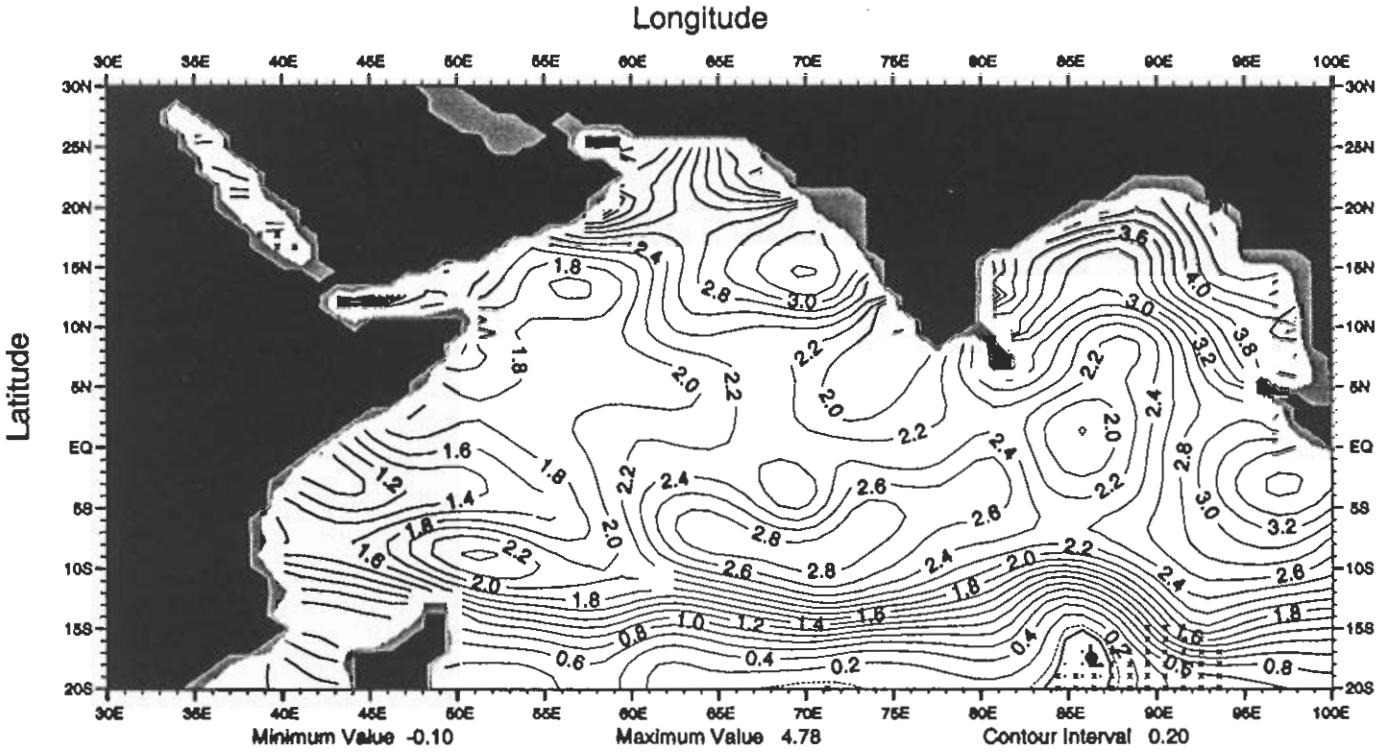

Fig. D15 Winter (Jan.Mar.) mean Apparent Oxygen Utilization (ml/l) at 100 m depth

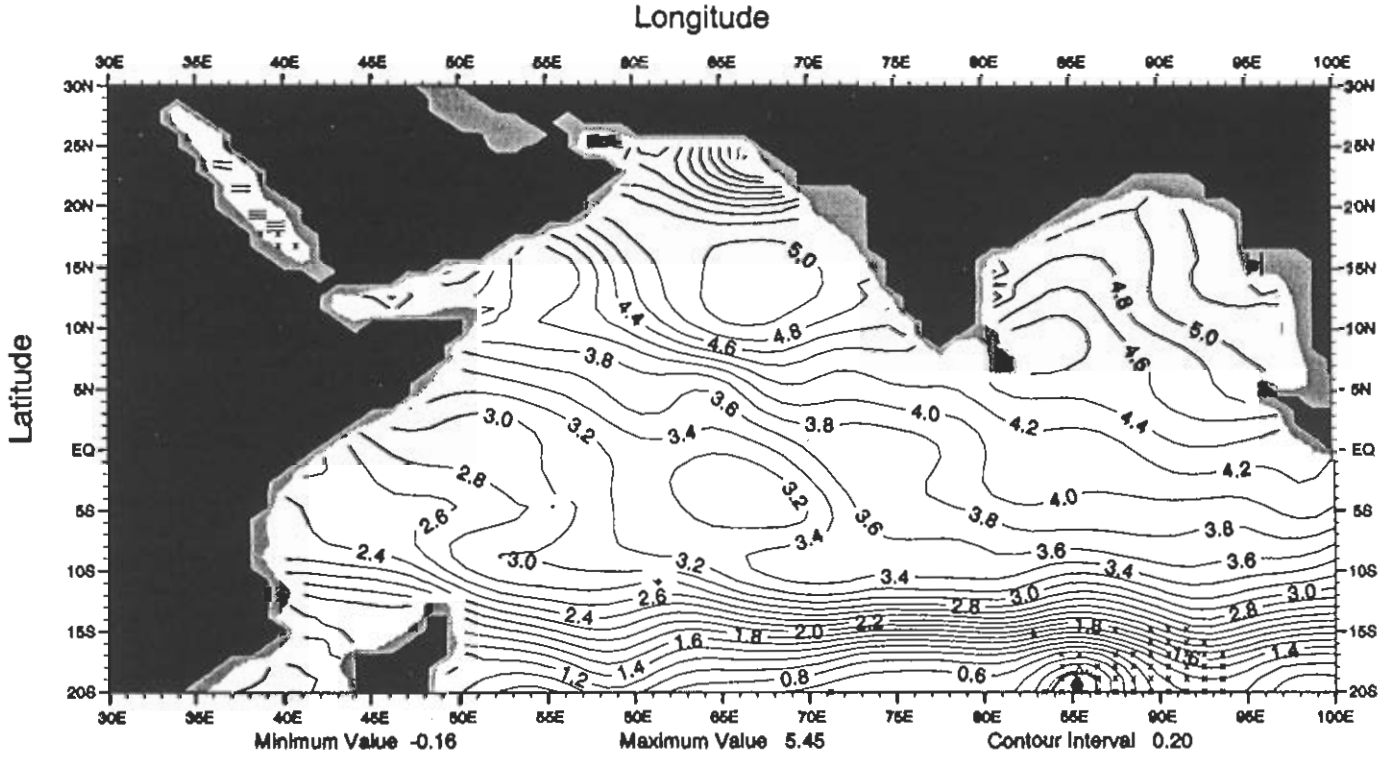

Fig. D16 Winter (Jan.Mar.) mean Apparent Oxygen Utilization (ml/l) at 150 m depth

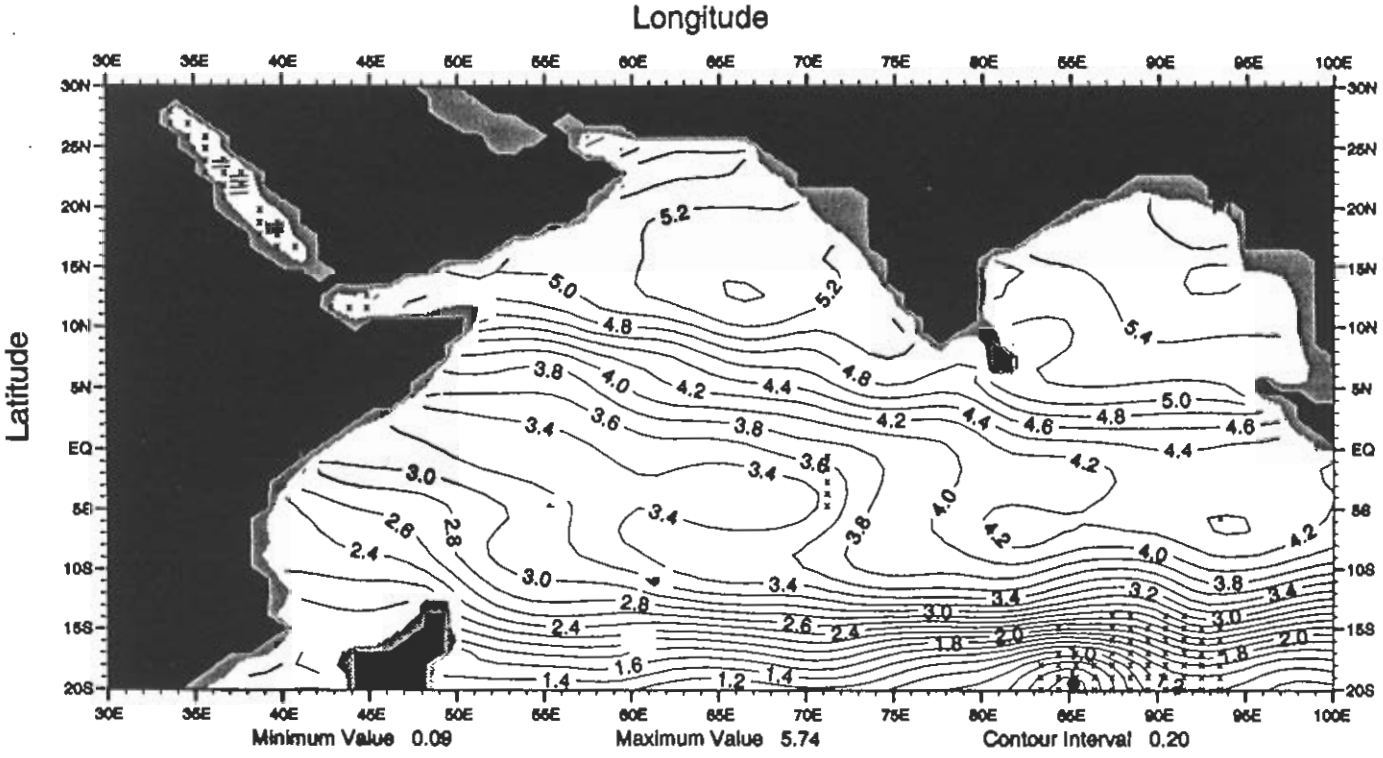

Fig. D17 Winter (Jan.Mar.) mean Apparent Oxygen Utilization (ml/l) at 200 m depth

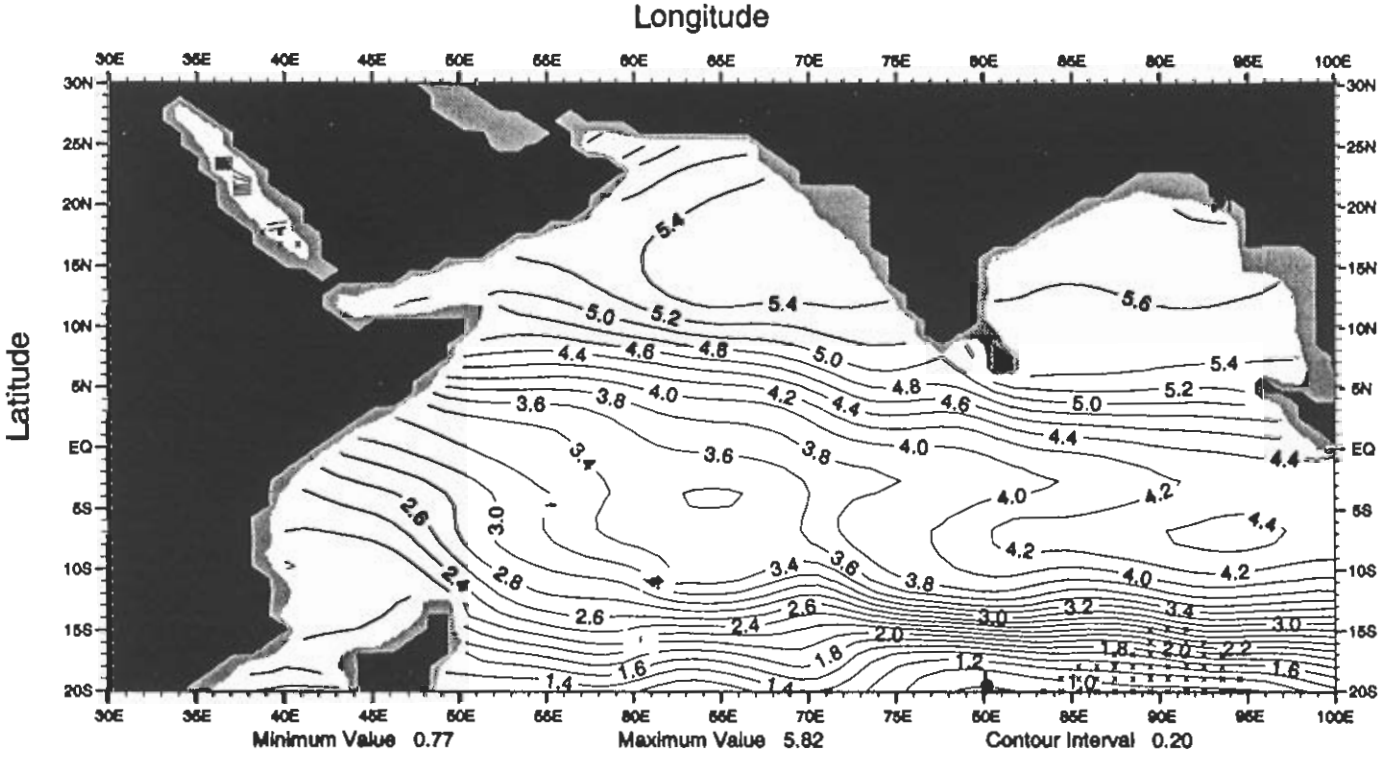

Fig. D18 Winter (Jan.Mar.) mean Apparent Oxygen Utilization (ml/l) at 250 m depth

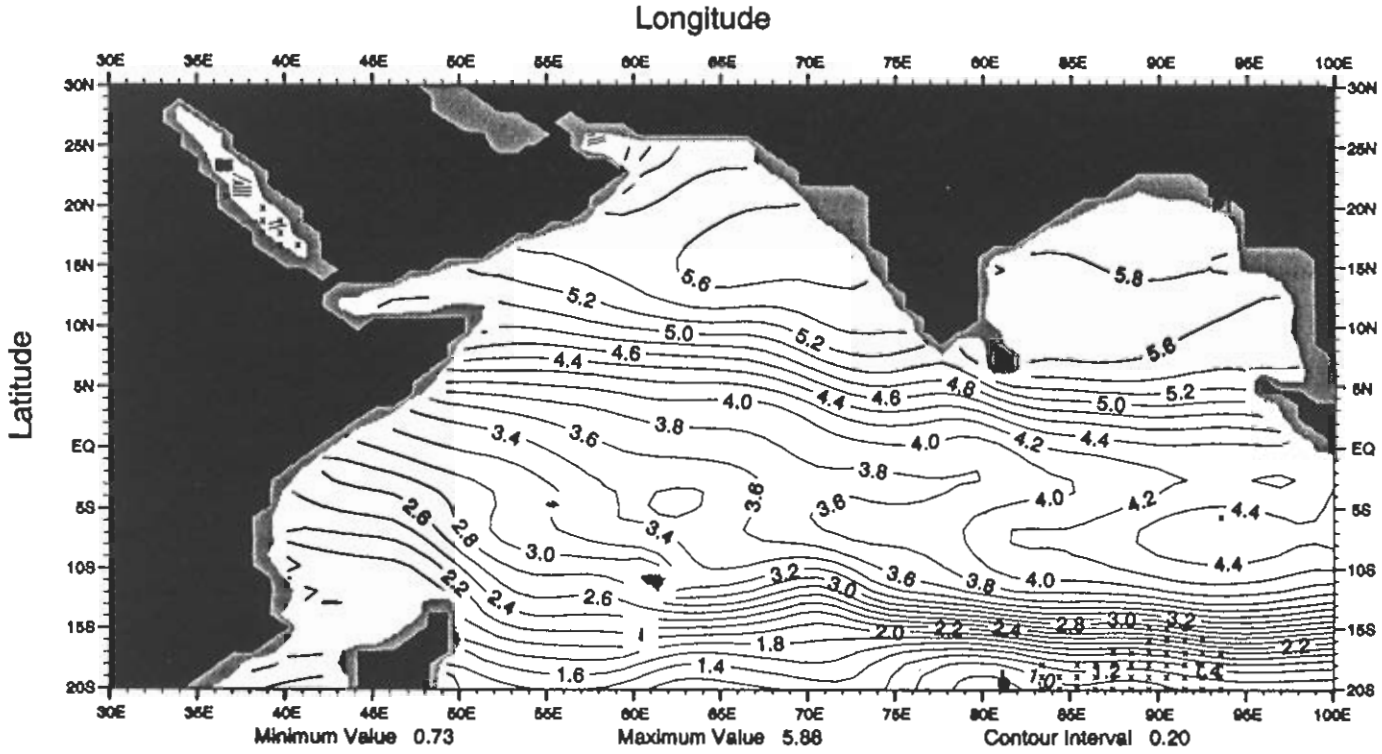

Fig. D19 Winter (Jan.Mar.) mean Apparent Oxygen Utilization (ml/l) at 300 m depth

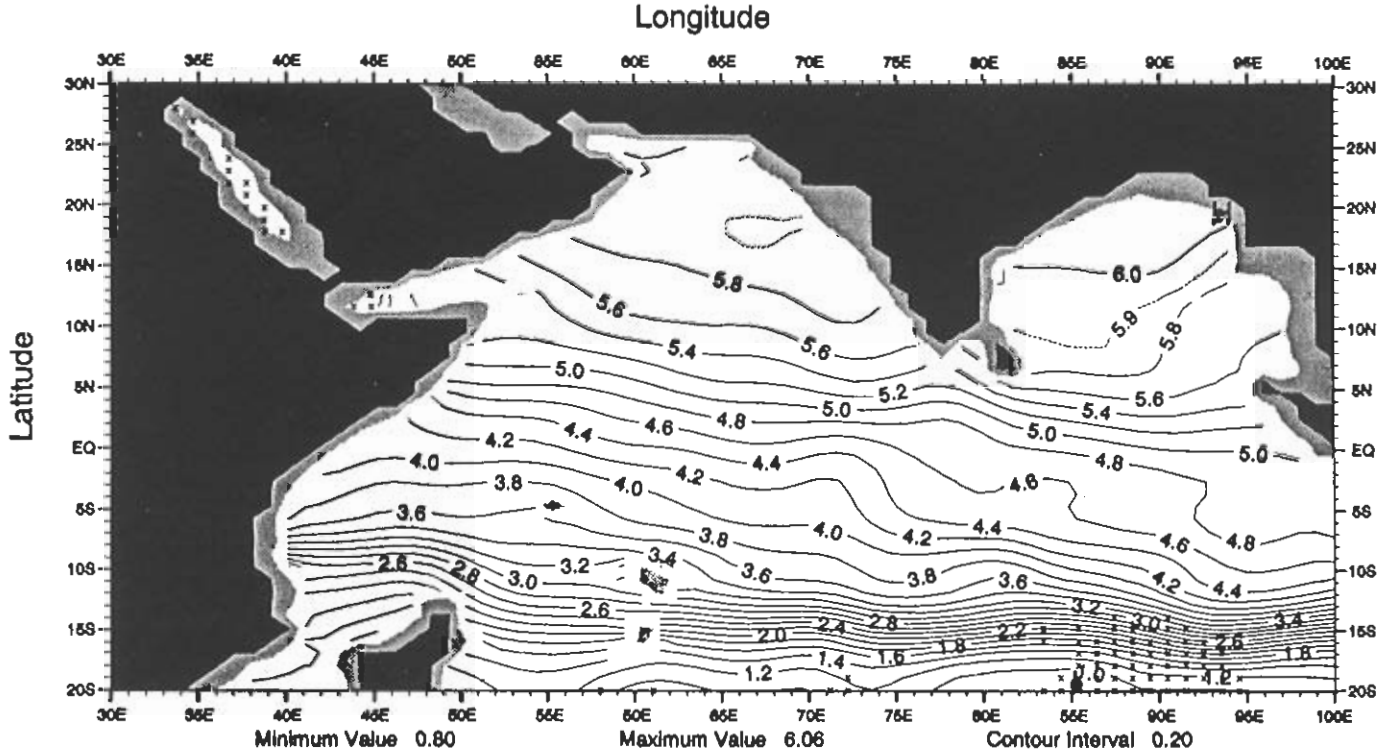

Fig. D20 Winter (Jan.Mar.) mean Apparent Oxygen Utilization (ml/l) at 500 m depth

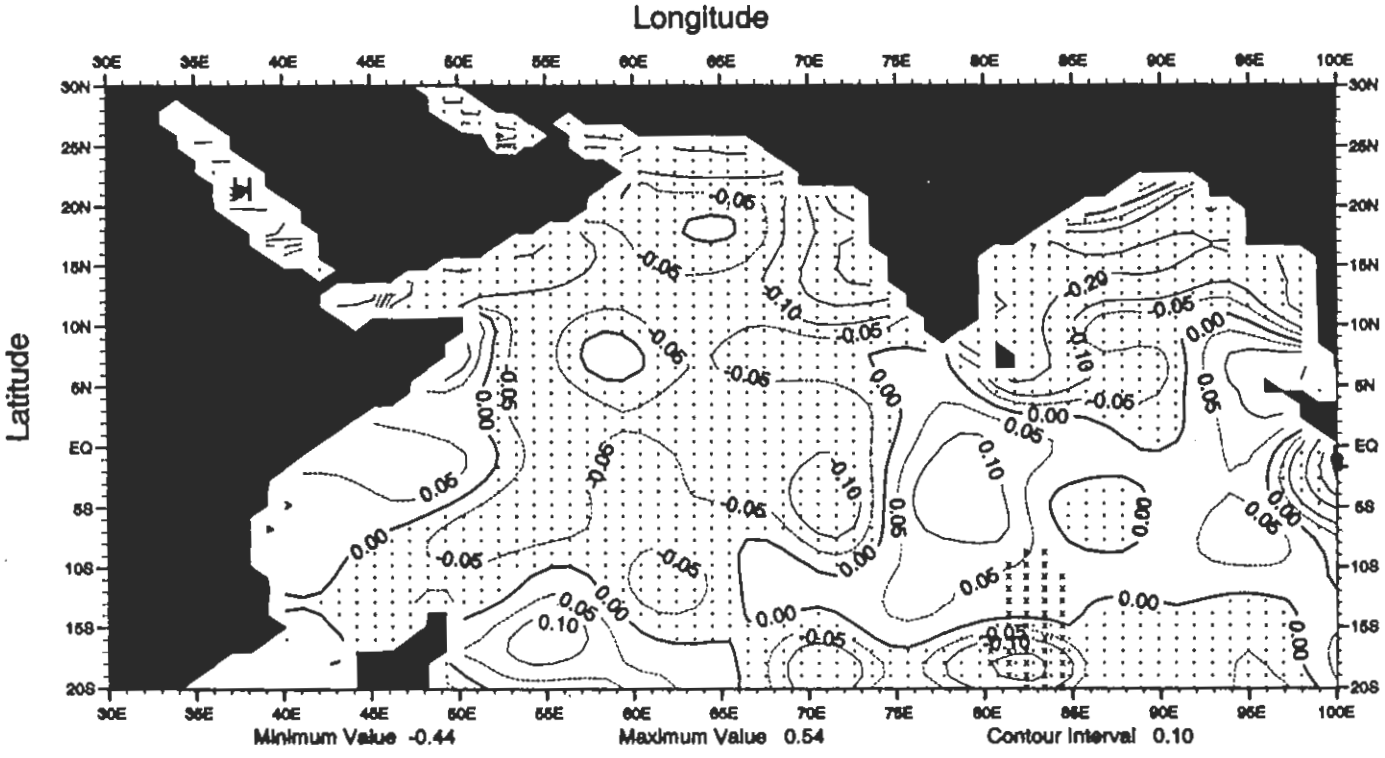

Fig. D21 Spring (Apr.-Jun.) mean Apparent Oxygen Utilization (ml/l) at the surface

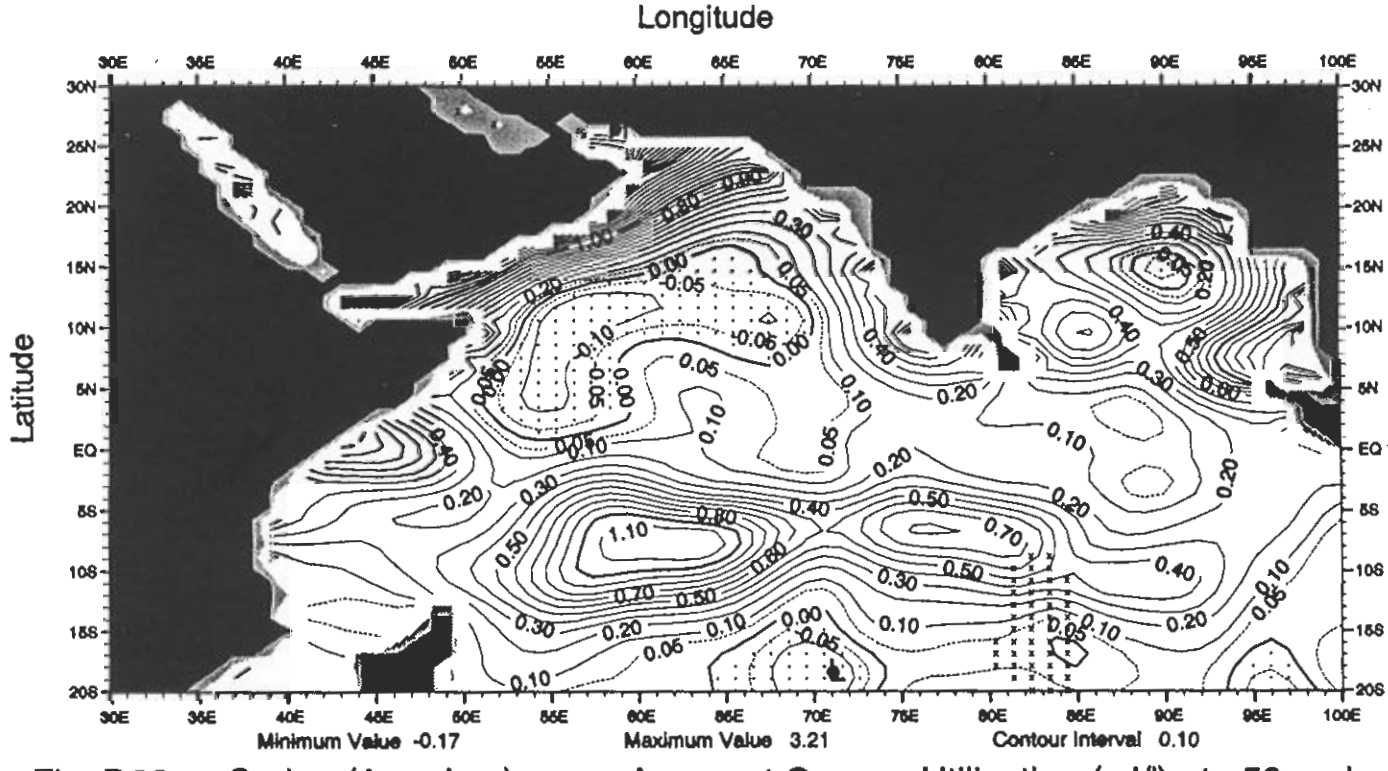

Fig. D22 Spring (Apr.-Jun.) mean Apparent Oxygen Utilization (ml/l) at 50 m depth

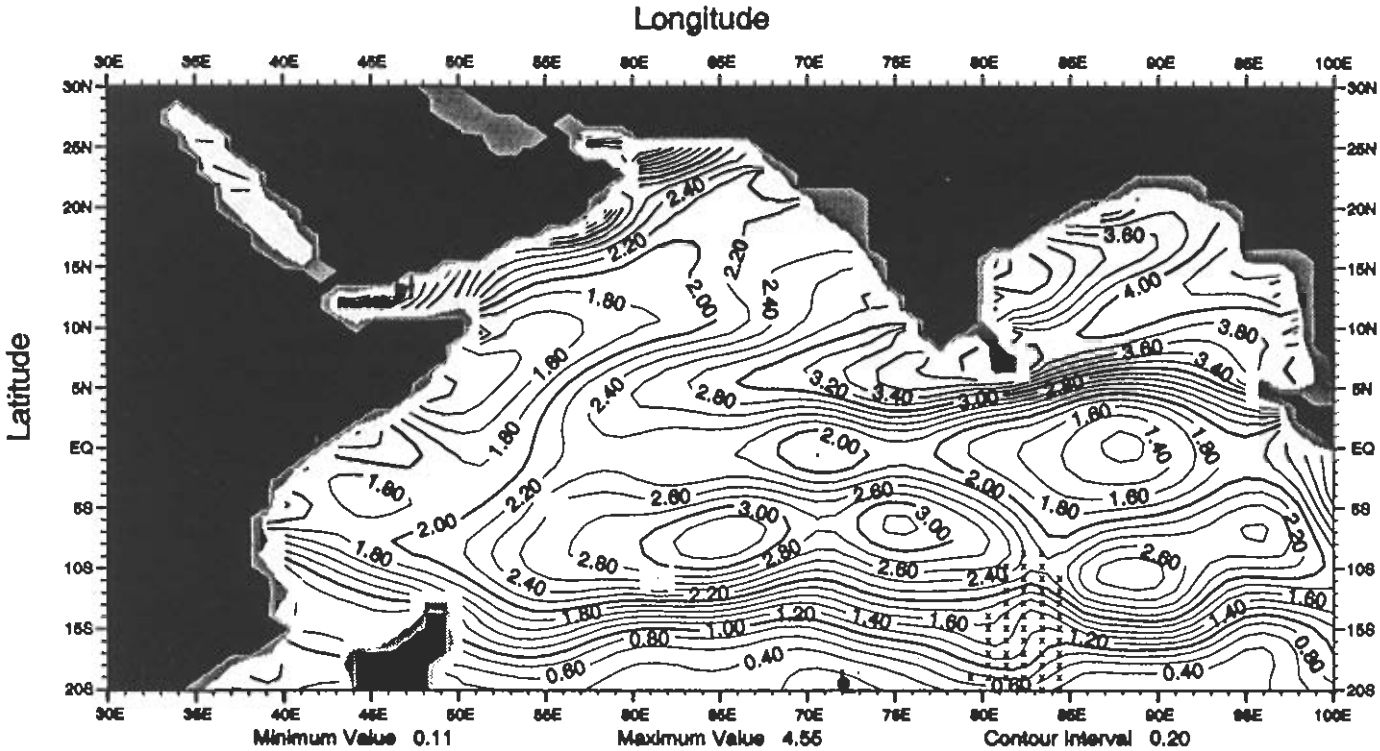

Fig. D23 Spring (Apr.-Jun.) mean Apparent Oxygen Utilization (ml/l) at 100 m depth

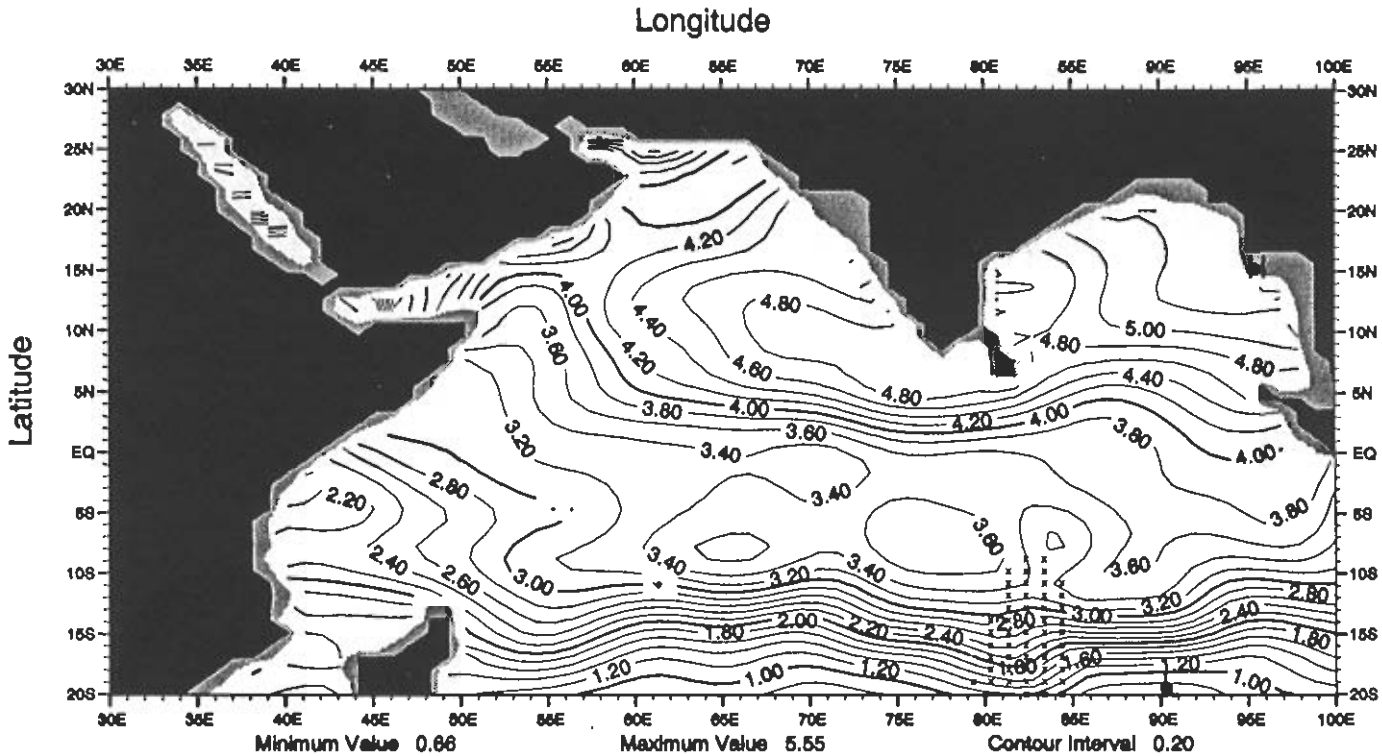

Fig. D24 Spring (Apr.-Jun.) mean Apparent Oxygen Utilization (ml/l) at 150 m depth

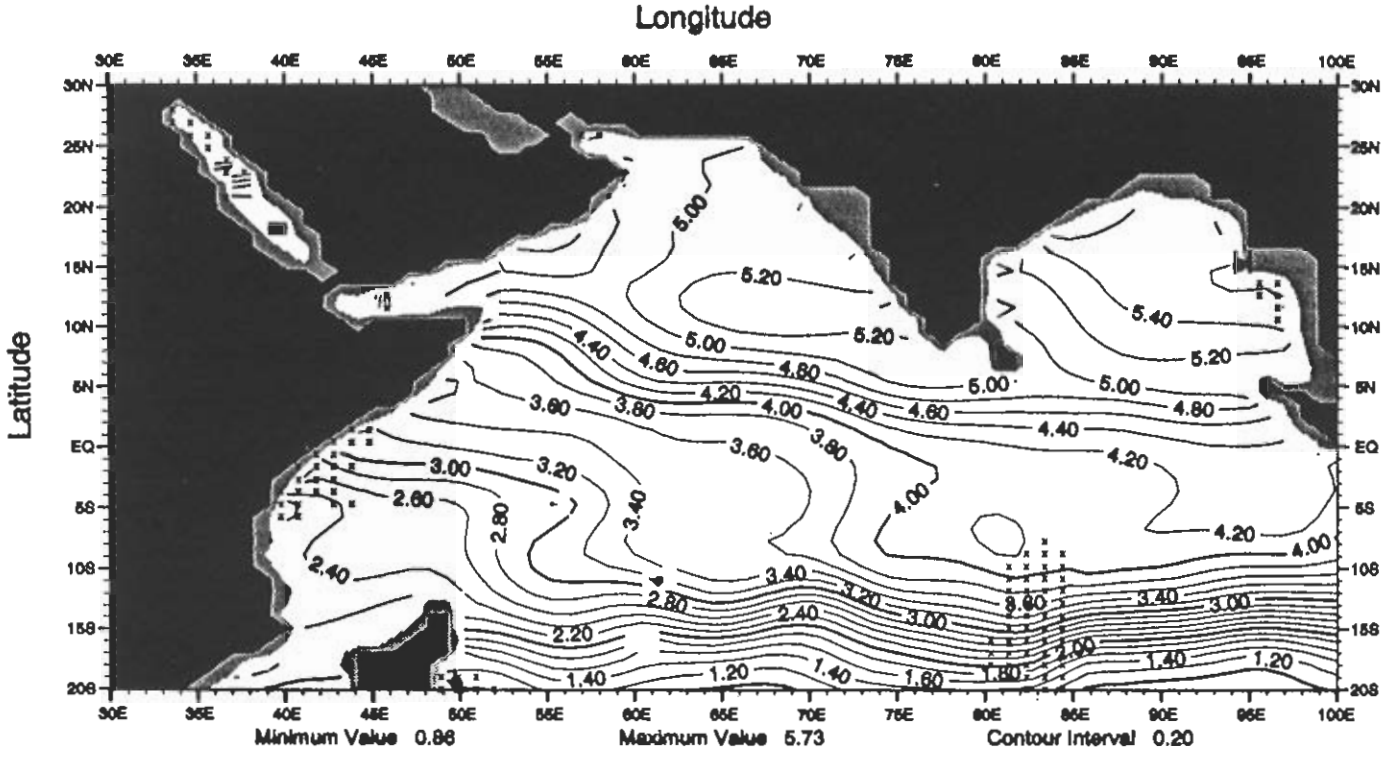

Fig. D25 Spring (Apr.-Jun.) mean Apparent Oxygen Utilization (ml/l) at 200 m depth

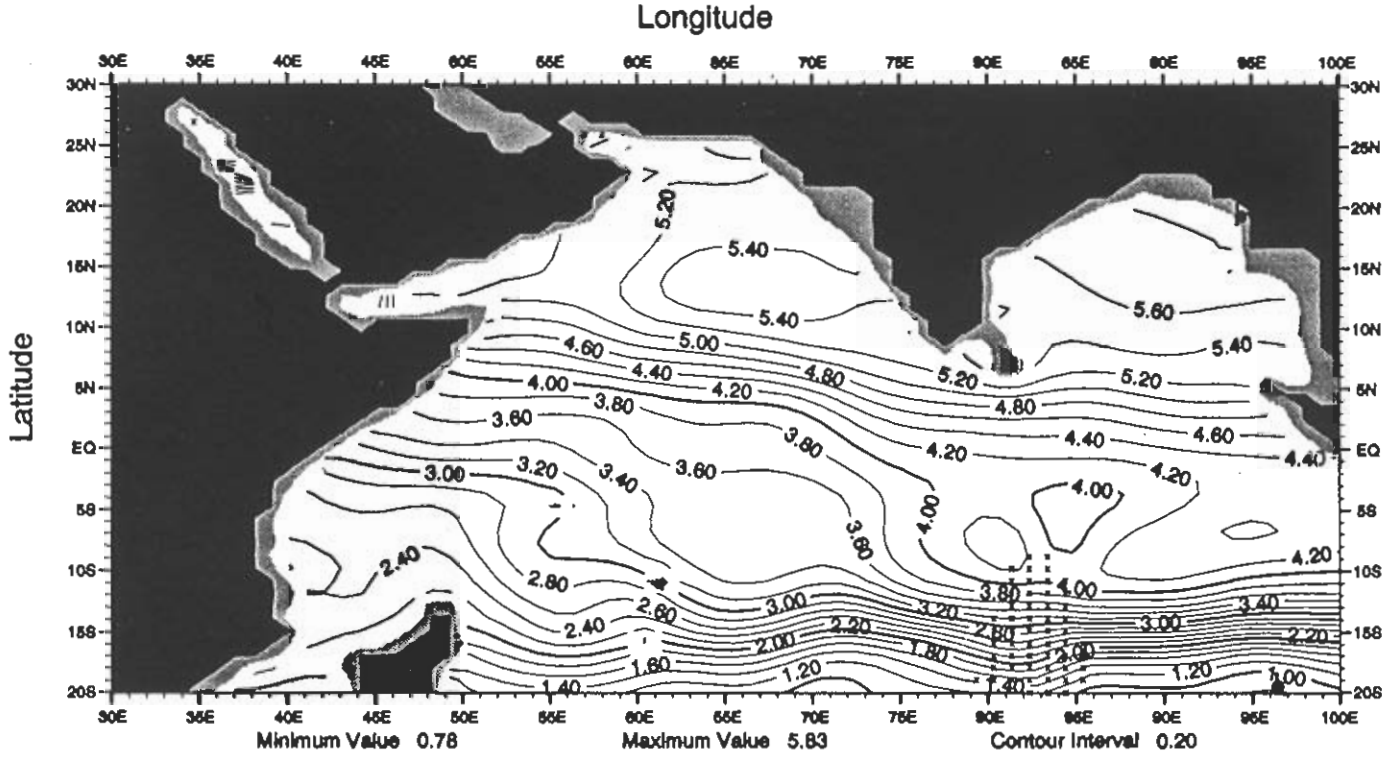

Fig. D26 Spring (Apr.-Jun.) mean Apparent Oxygen Utilization (ml/l) at 250 m depth

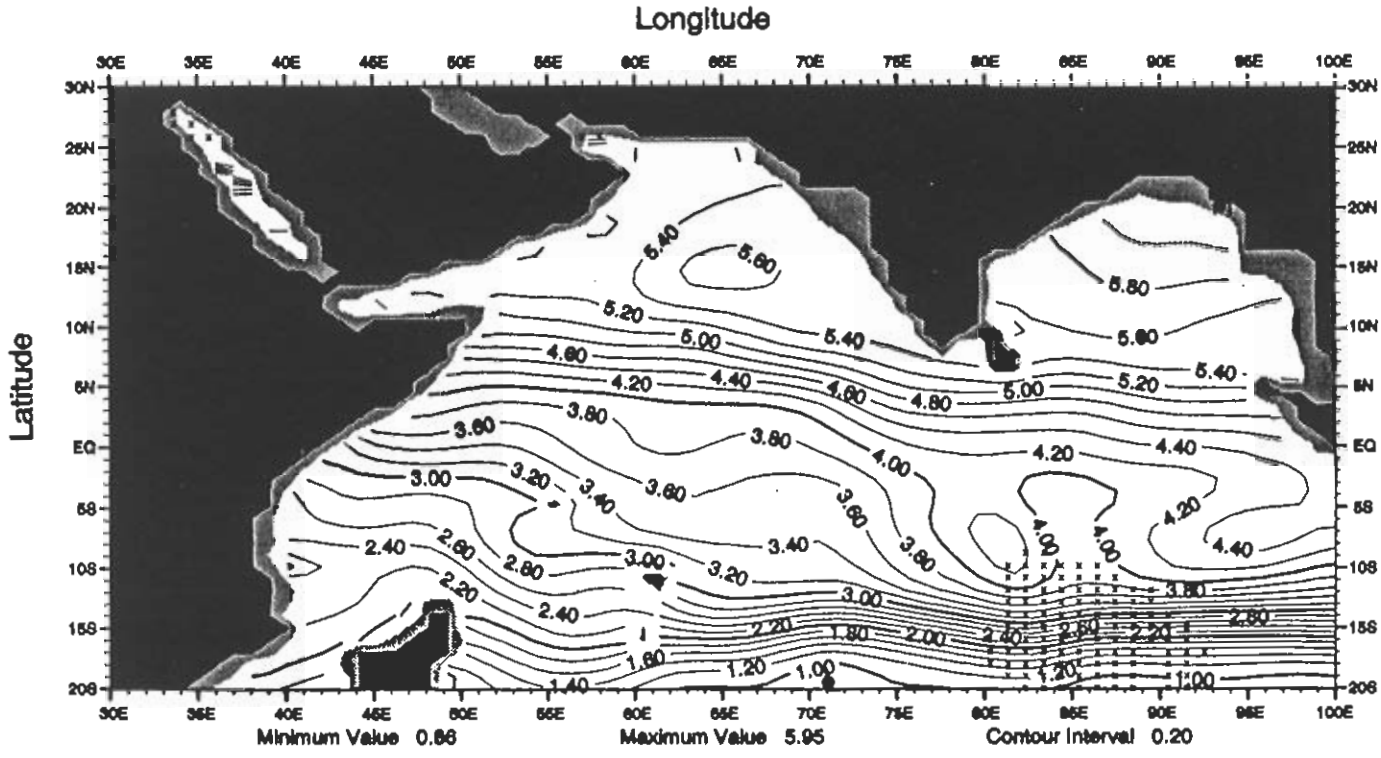

Fig. D27 Spring (Apr.-Jun.) mean Apparent Oxygen Utilization (ml/l) at 300 m depth

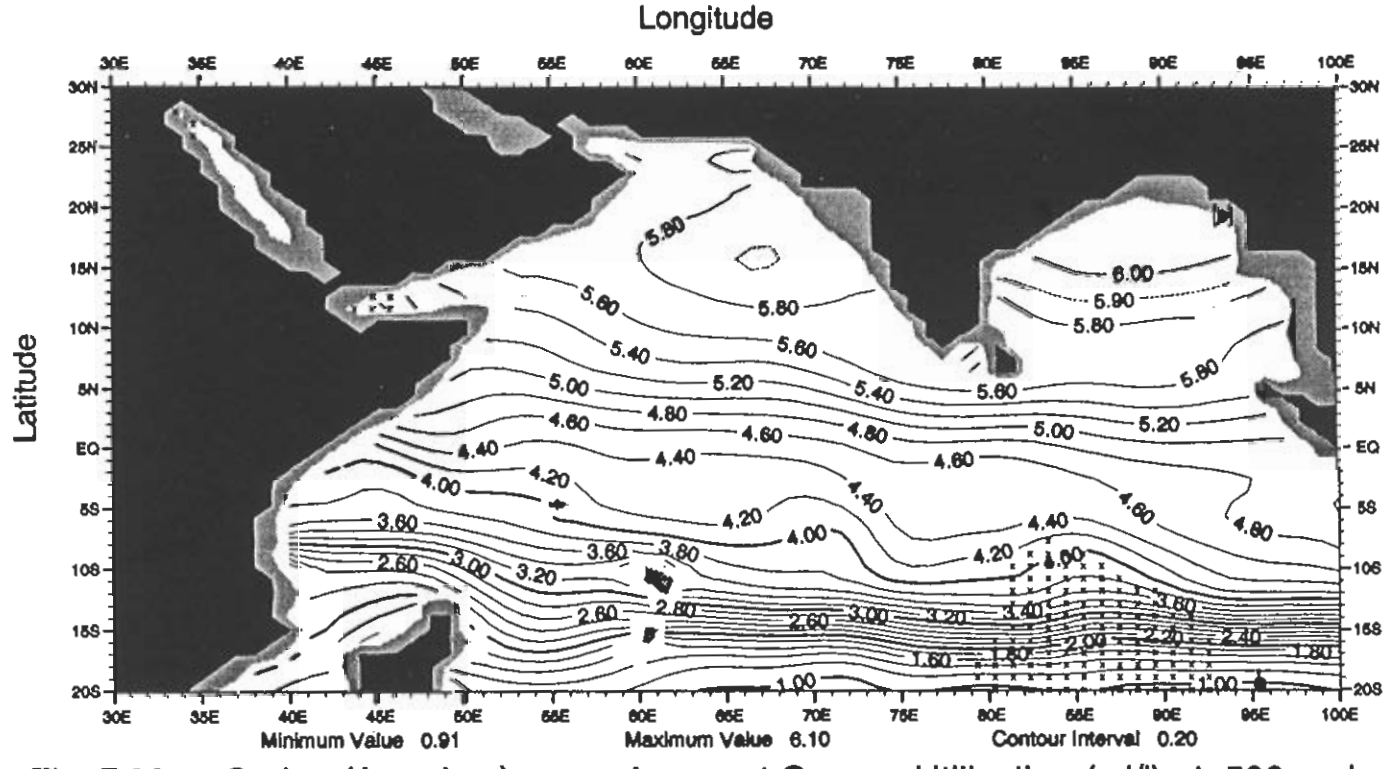

Fig. D28 Spring (Apr.-Jun.) mean Apparent Oxygen Utilization (ml/l) at 500 m depth

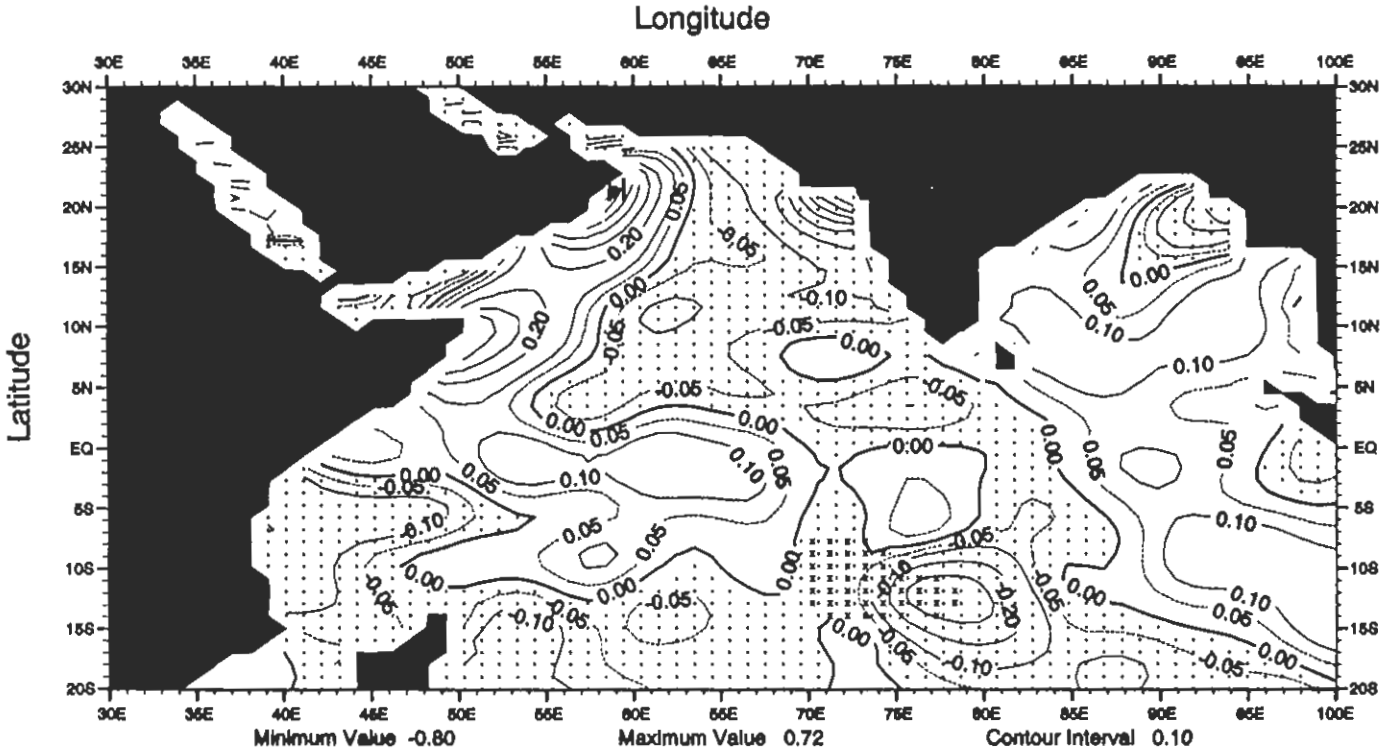

Fig. D29 Summer (Jul.-Sep.) mean Apparent Oxygen Utilization (ml/l) at the surface

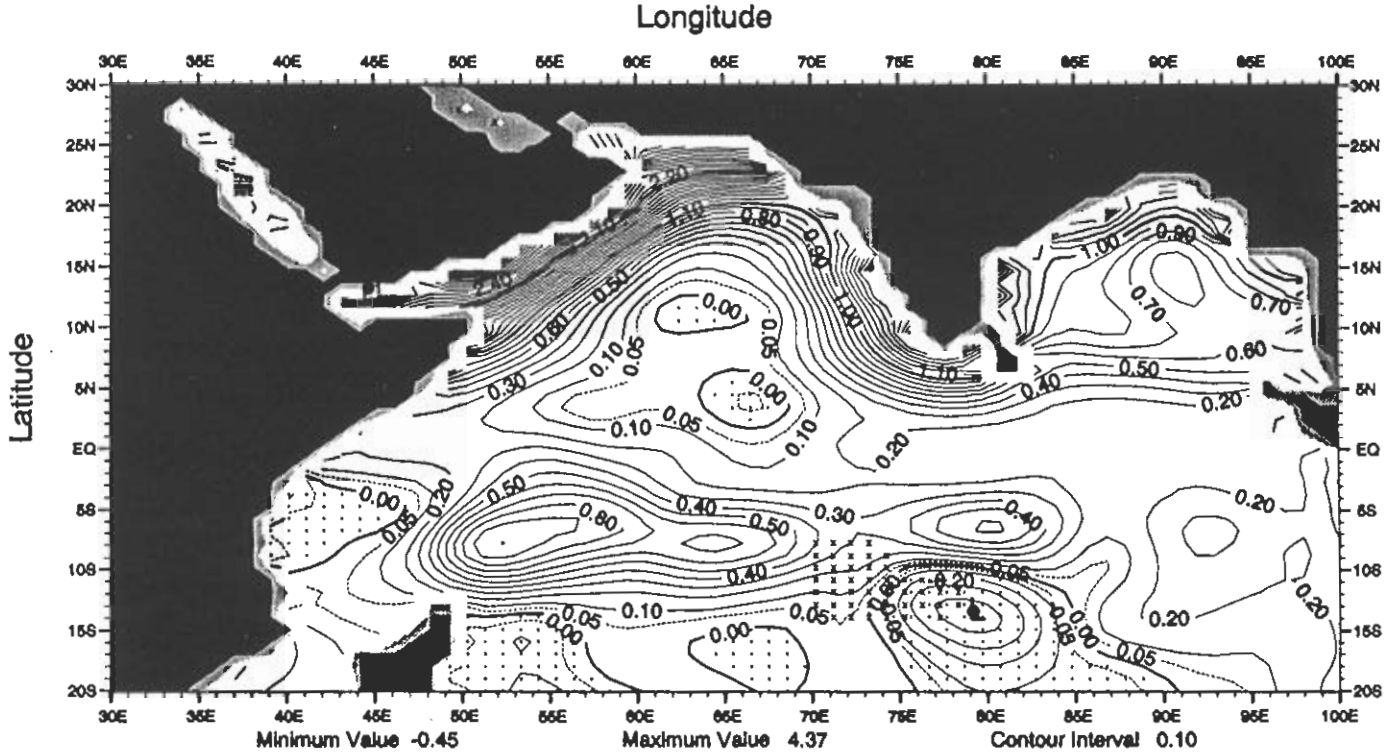

Fig. D30 Summer (Jul.-Sep.) mean Apparent Oxygen Utilization (ml/l) at 50 m depth

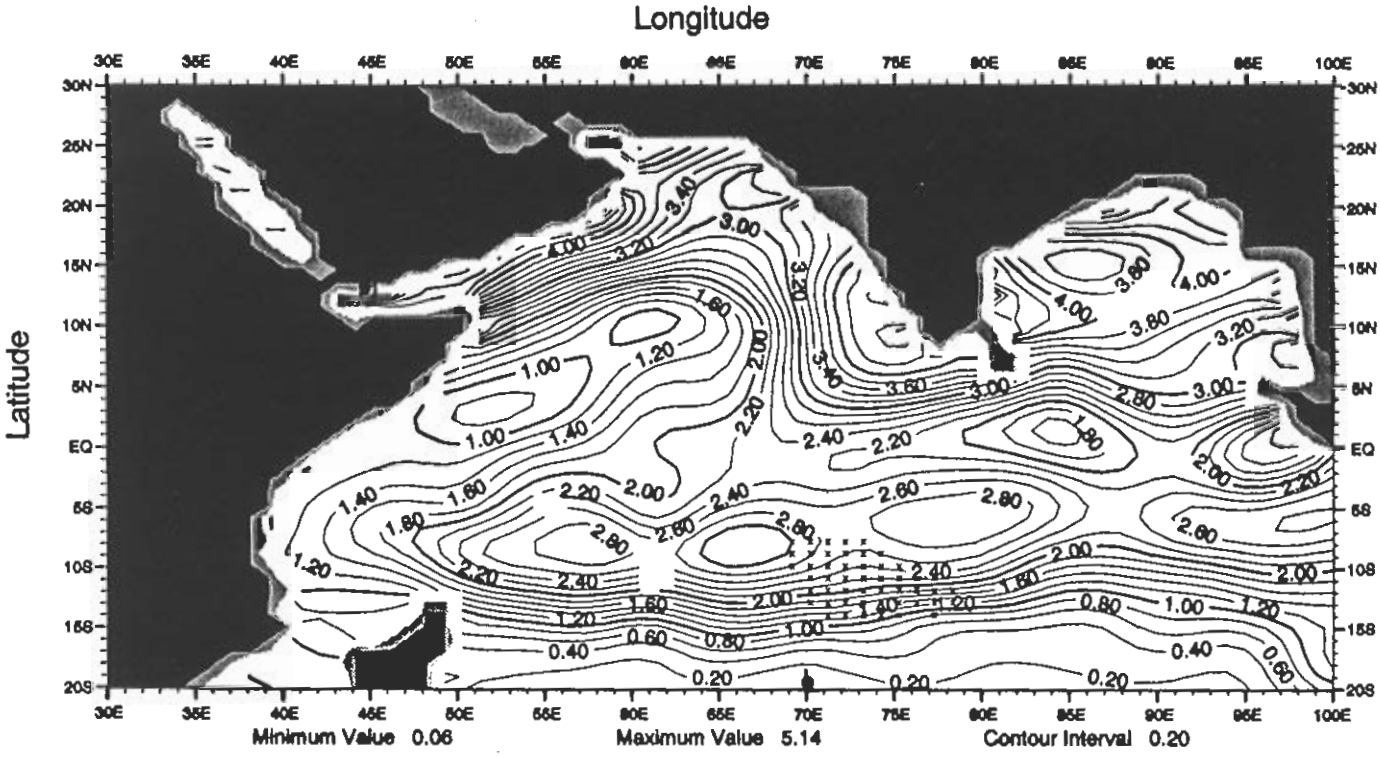

Fig. D31 Summer (Jul.-Sep.) mean Apparent Oxygen Utilization (ml/l) at 100 m depth

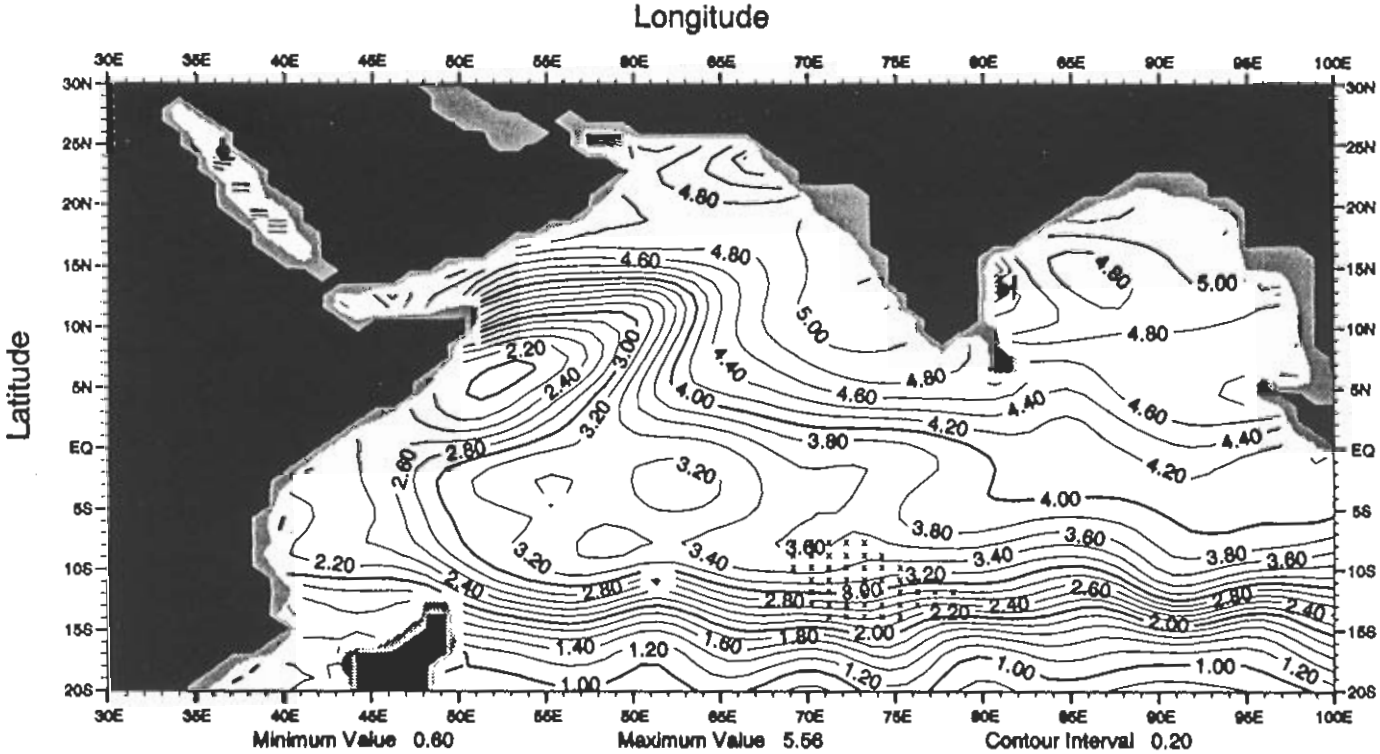

Fig. D32 Summer (Jul.-Sep.) mean Apparent Oxygen Utilization (ml/l) at 150 m depth

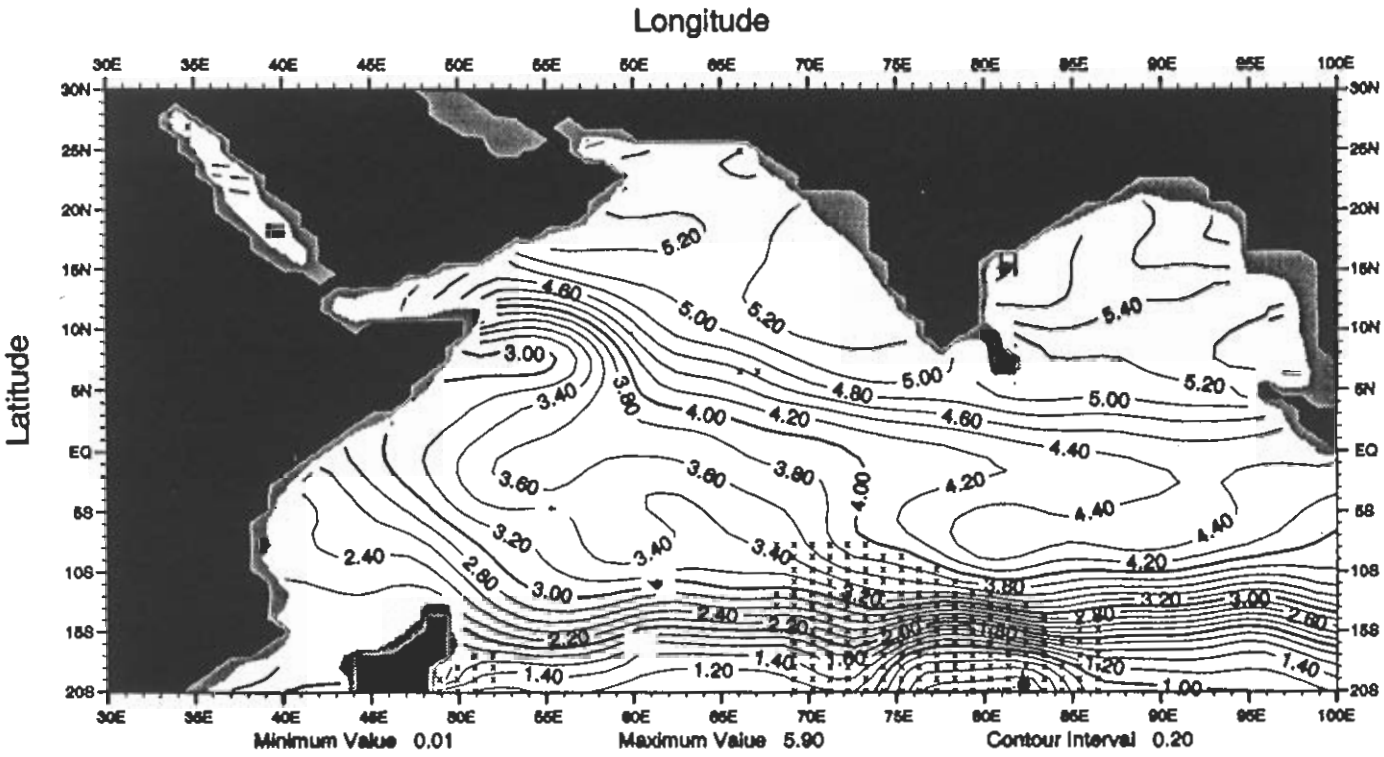

Fig. D33 Summer (Jul.-Sep.) mean Apparent Oxygen Utilization (ml/l) at 200 m depth

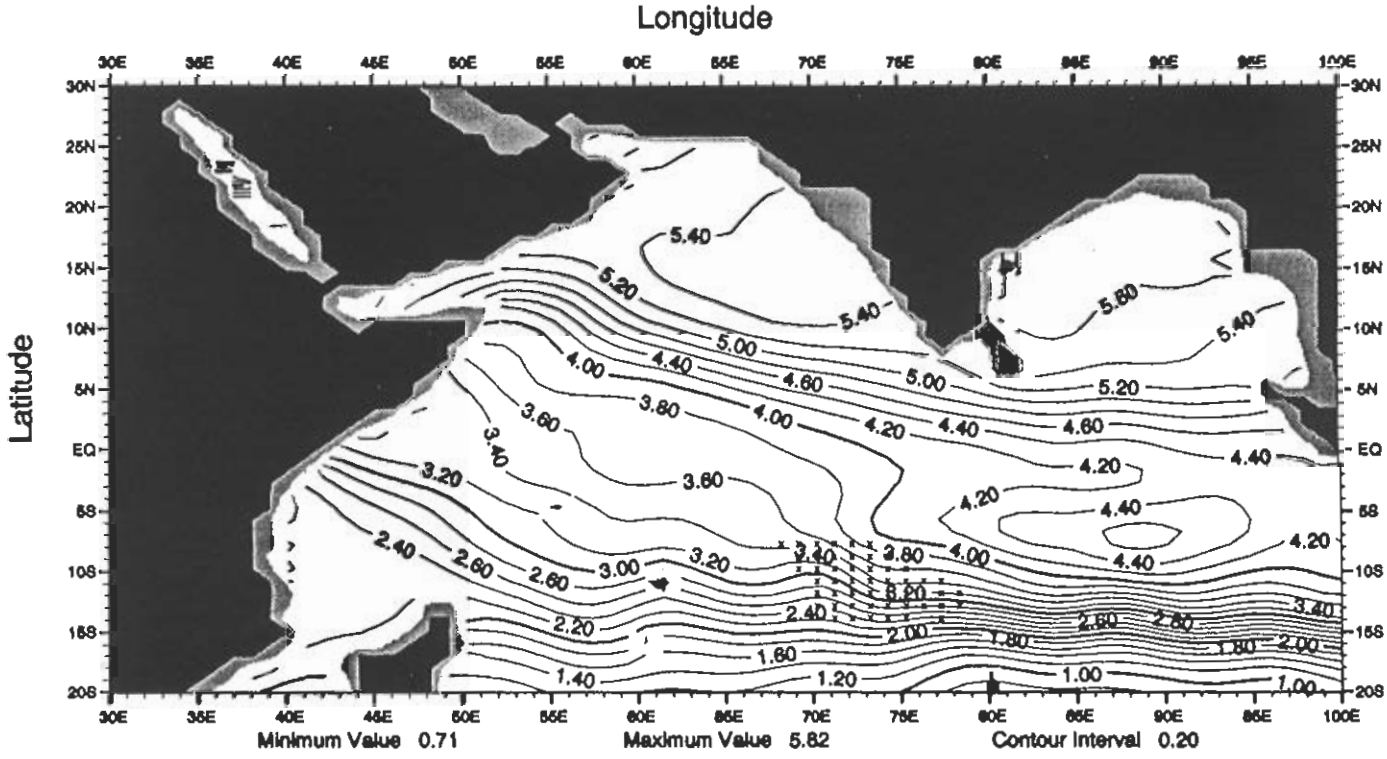

Fig. D34 Summer (Jul.-Sep.) mean Apparent Oxygen Utilization (ml/l) at 250 m depth

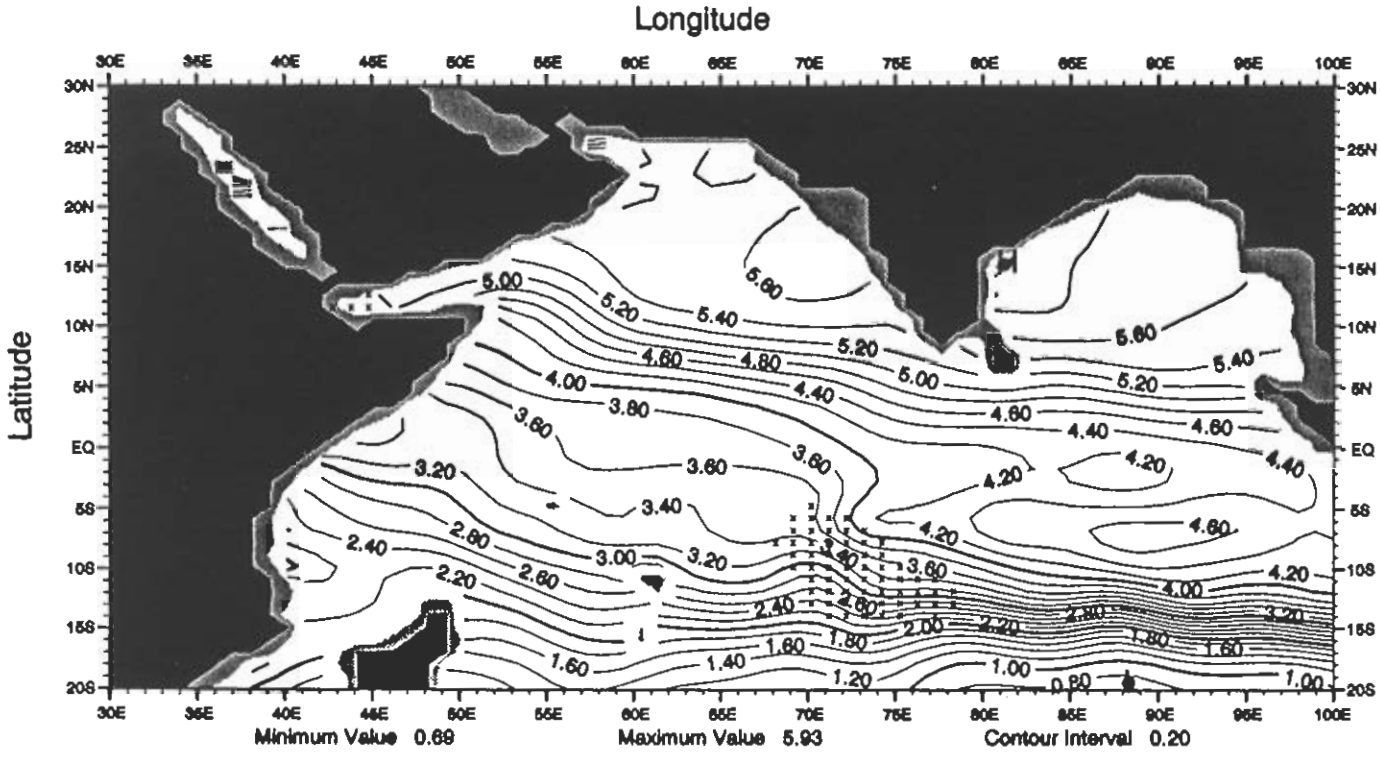

Fig. D35 Summer (Jul.-Sep.) mean Apparent Oxygen Utilization (ml/l) at 300 m depth

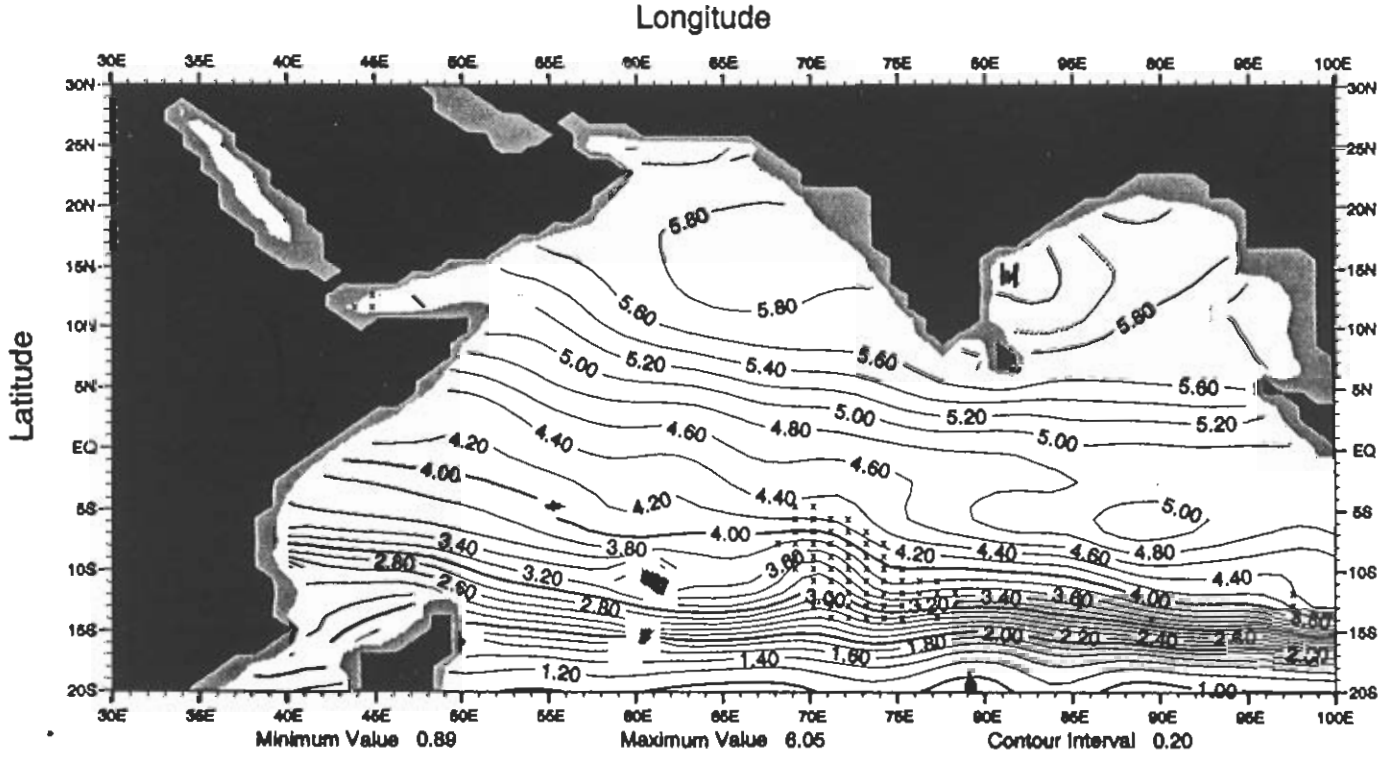

Fig. D36 Summer (Jul.-Sep.) mean Apparent Oxygen Utilization (ml/l) at 500 m depth

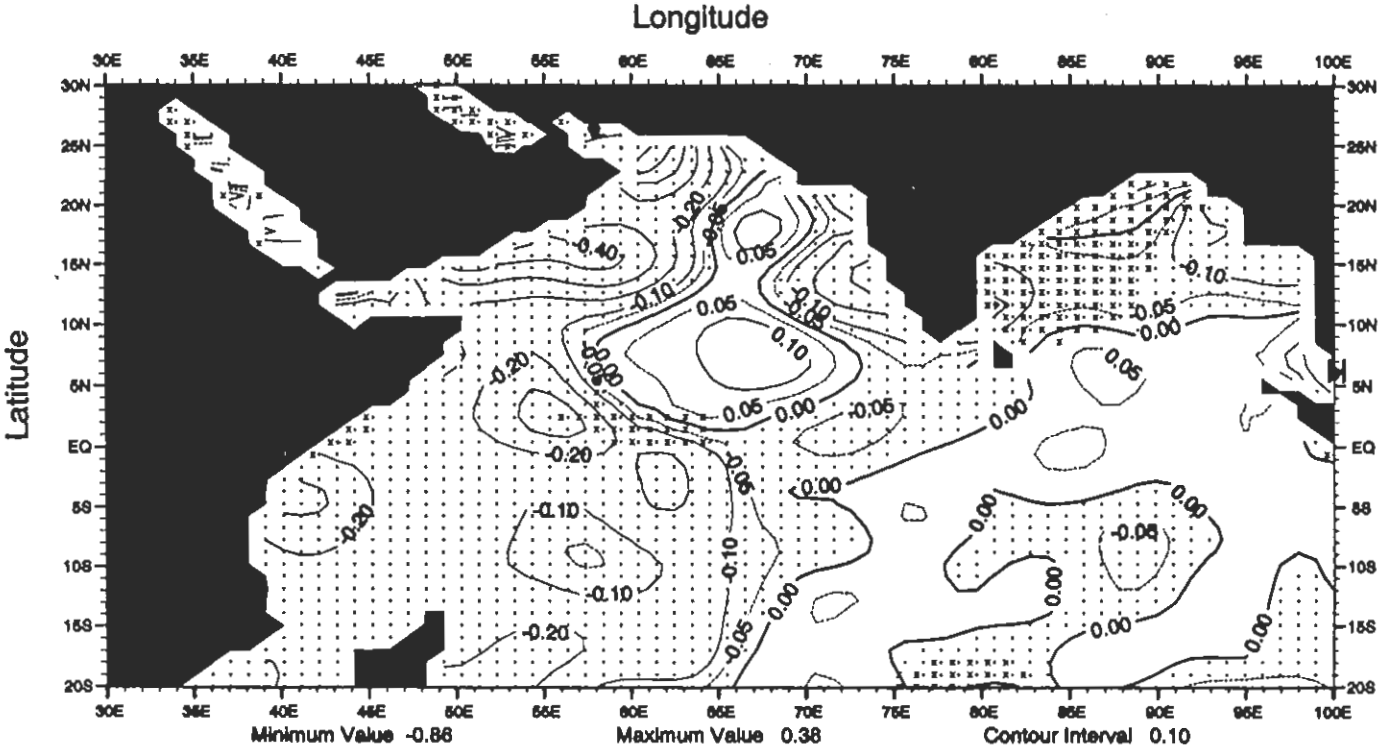

Fig. D37 Fall (Oct.-Dec.) mean Apparent Oxygen Utilization (ml/l) at the surface

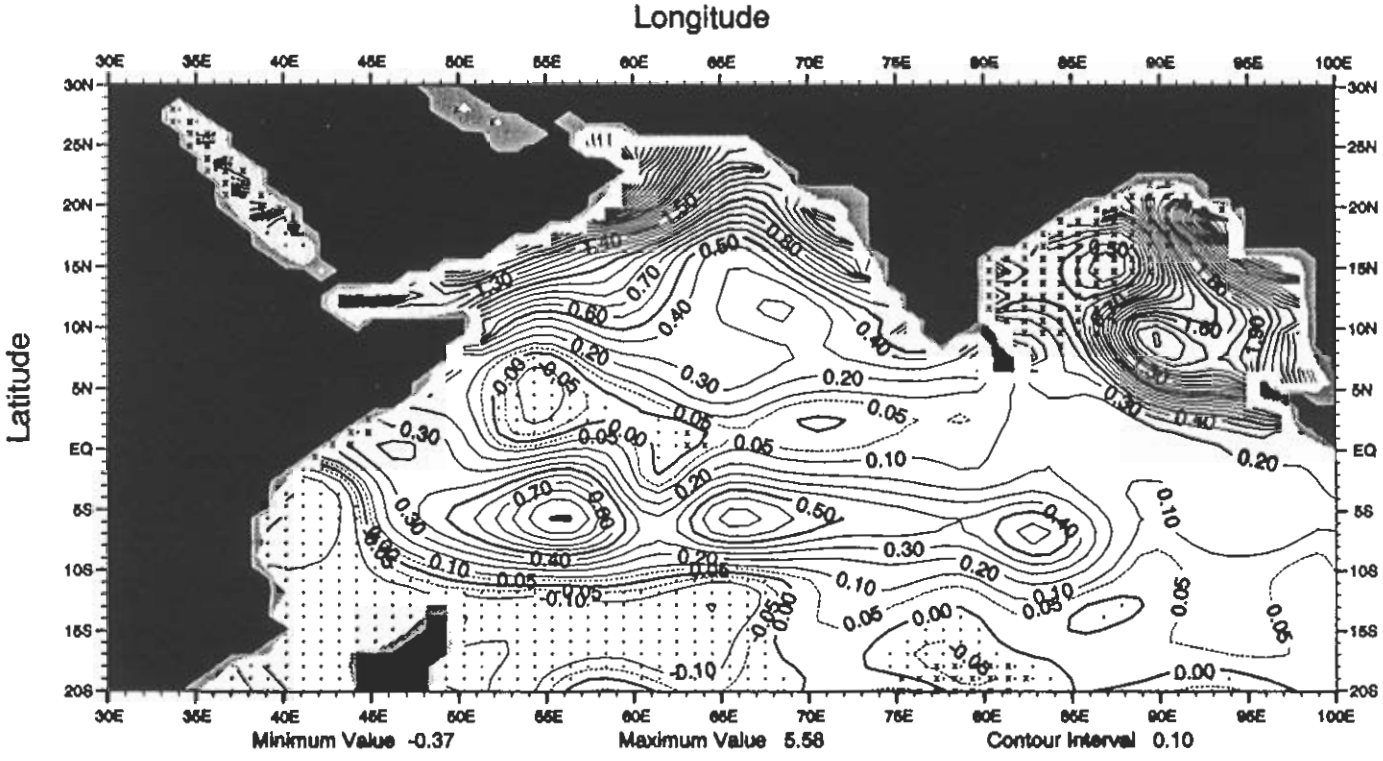

Fig. D38 Fall (Oct.-Dec.) mean Apparent Oxygen Utilization (ml/l) at 50 m depth

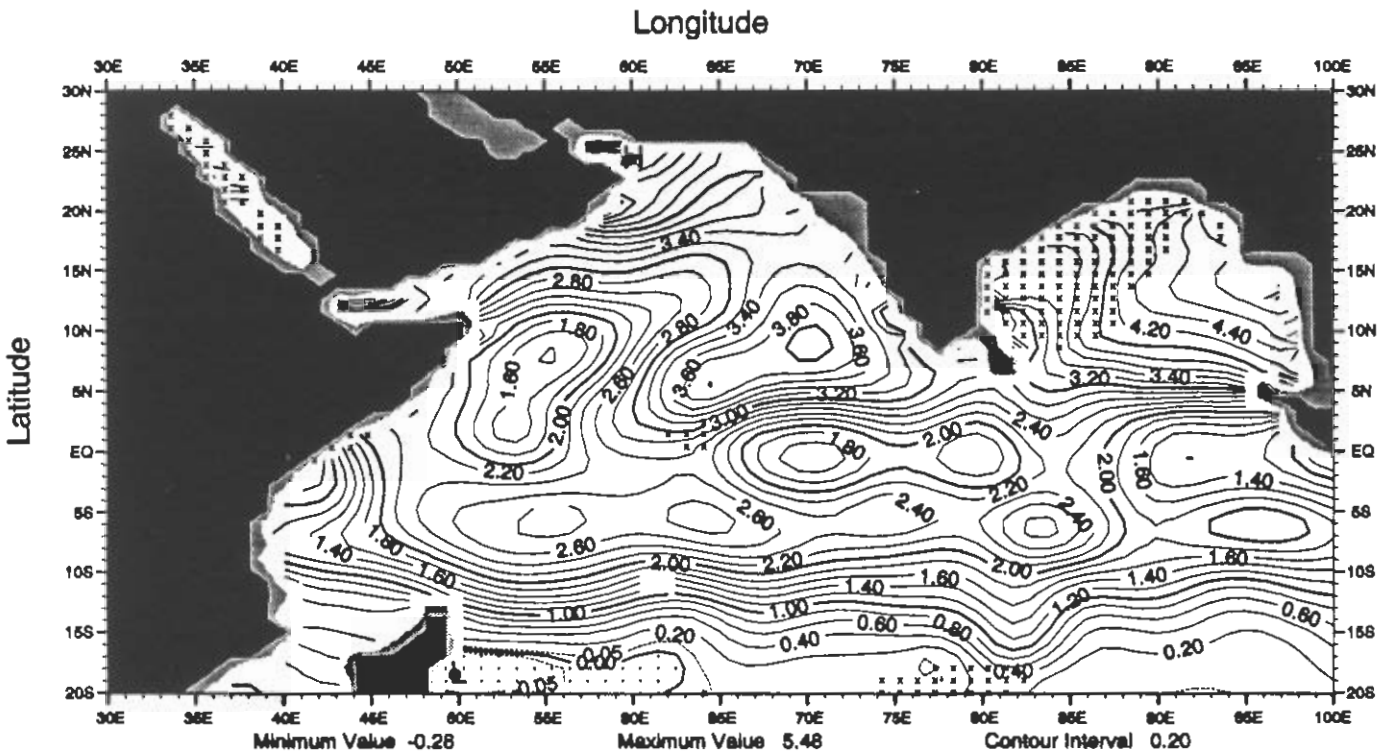

Fig. D39 Fall (Oct.-Dec.) mean Apparent Oxygen Utilization (ml/l) at 100 m depth

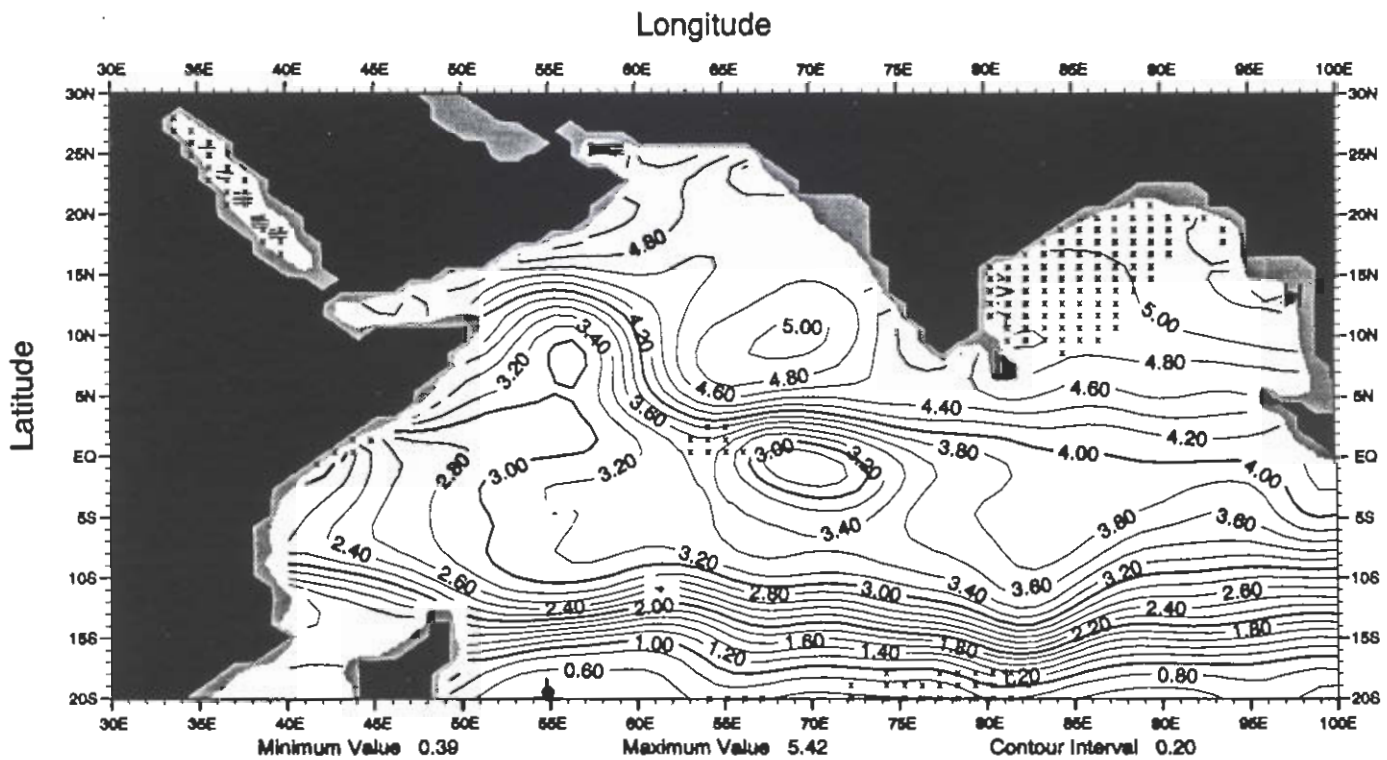

Fig. D40 Fall (Oct.-Dec.) mean Apparent Oxygen Utilization (ml/l) at 150 m depth

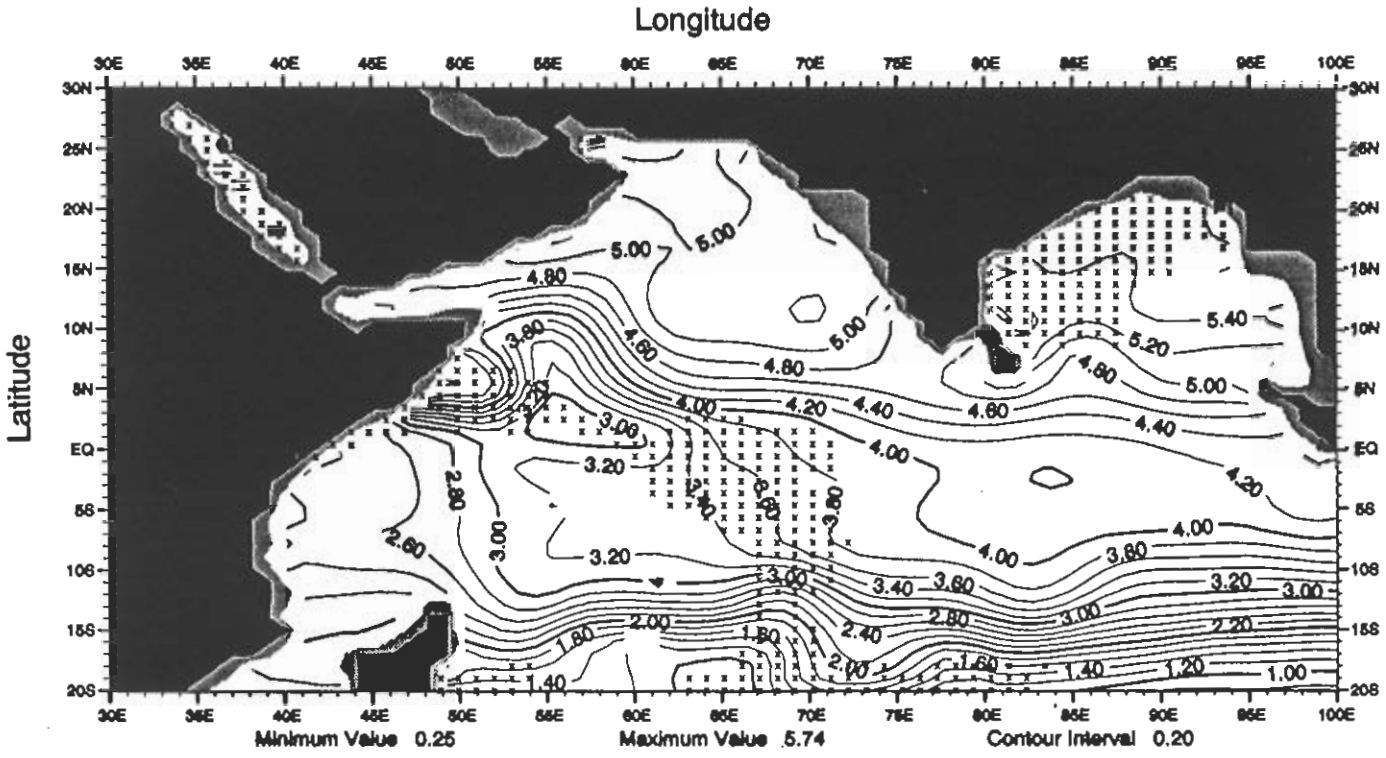

Fig. D41 Fall (Oct.-Dec.) mean Apparent Oxygen Utilization (ml/l) at 200 m depth

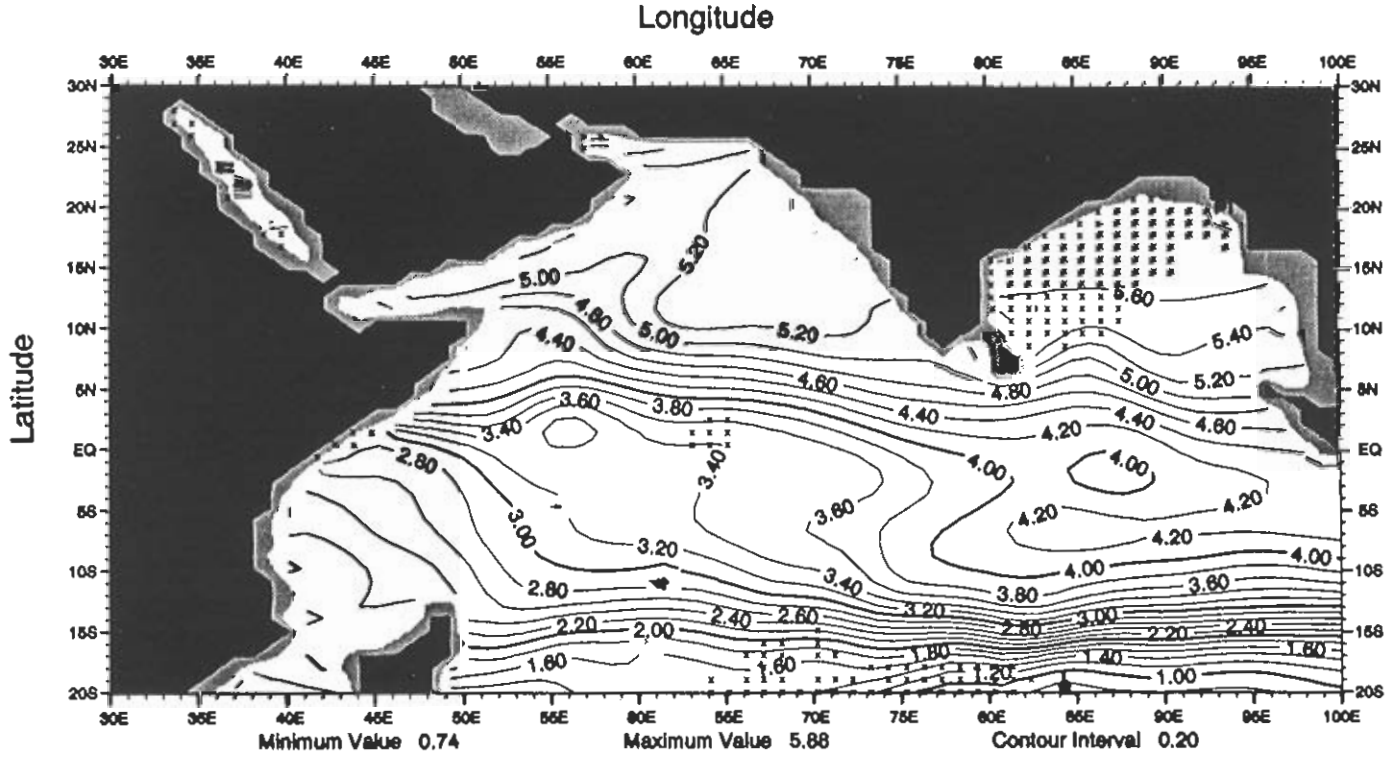

Fig. D42 Fall (Oct.-Dec.) mean Apparent Oxygen Utilization (ml/l) at 250 m depth

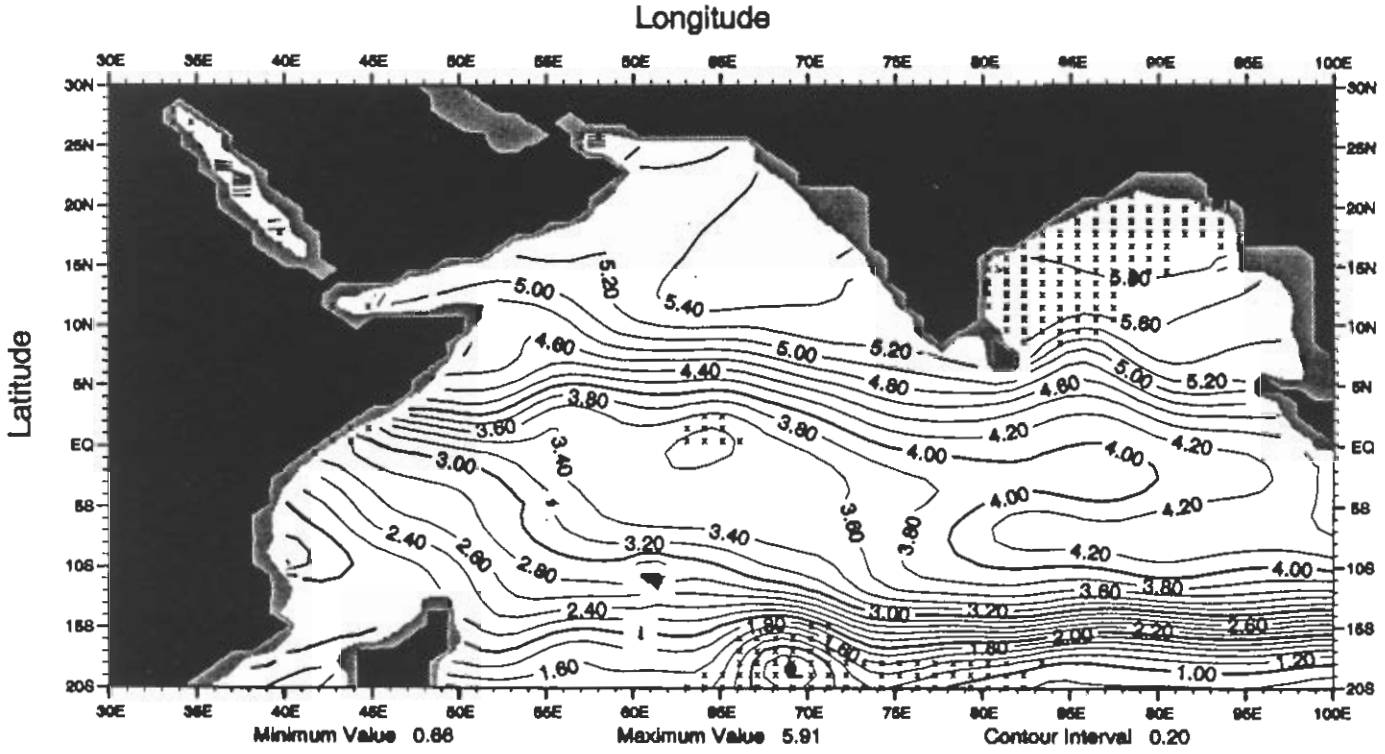

Fig. D43 Fall (Oct.-Dec.) mean Apparent Oxygen Utilization (ml/l) at 300 m depth

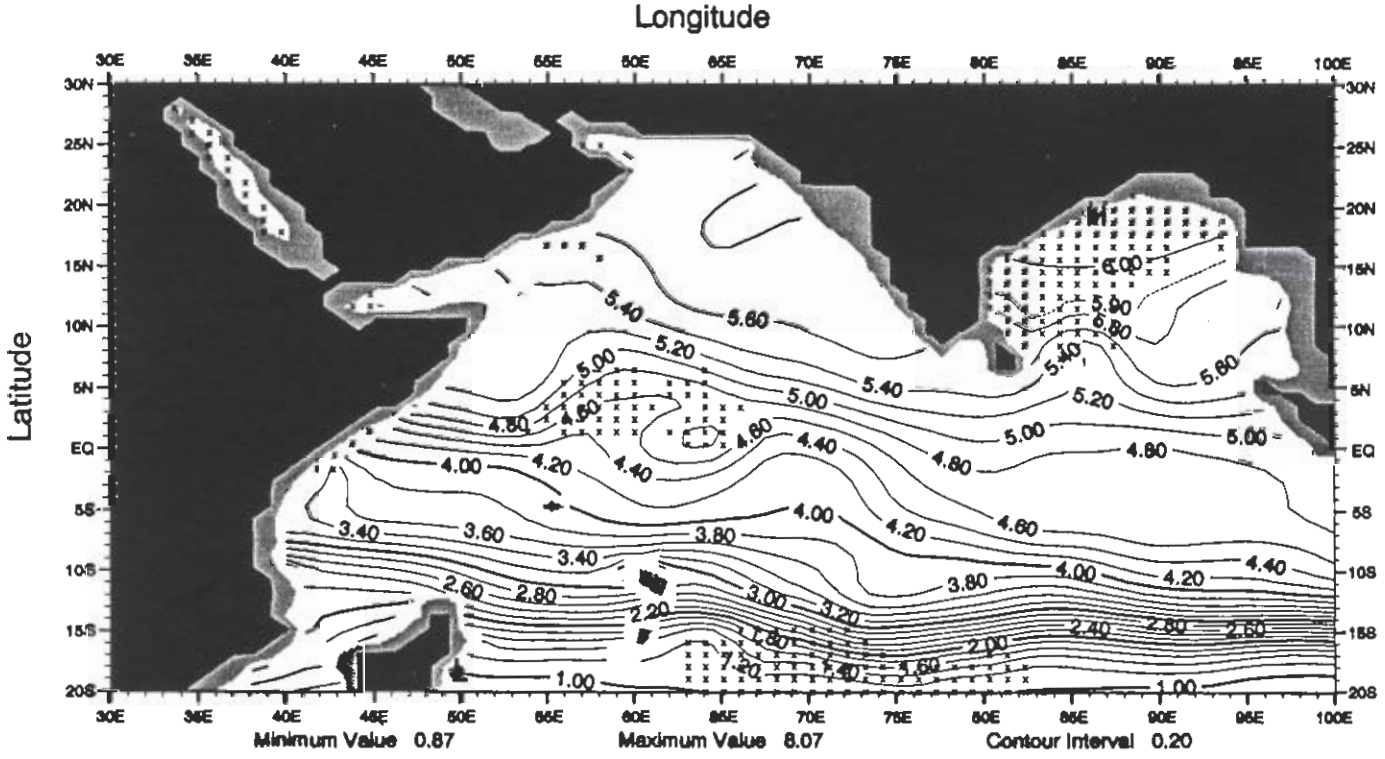

Fig. D44 Fall (Oct.-Dec.) mean Apparent Oxygen Utilization (ml/l) at 500 m depth

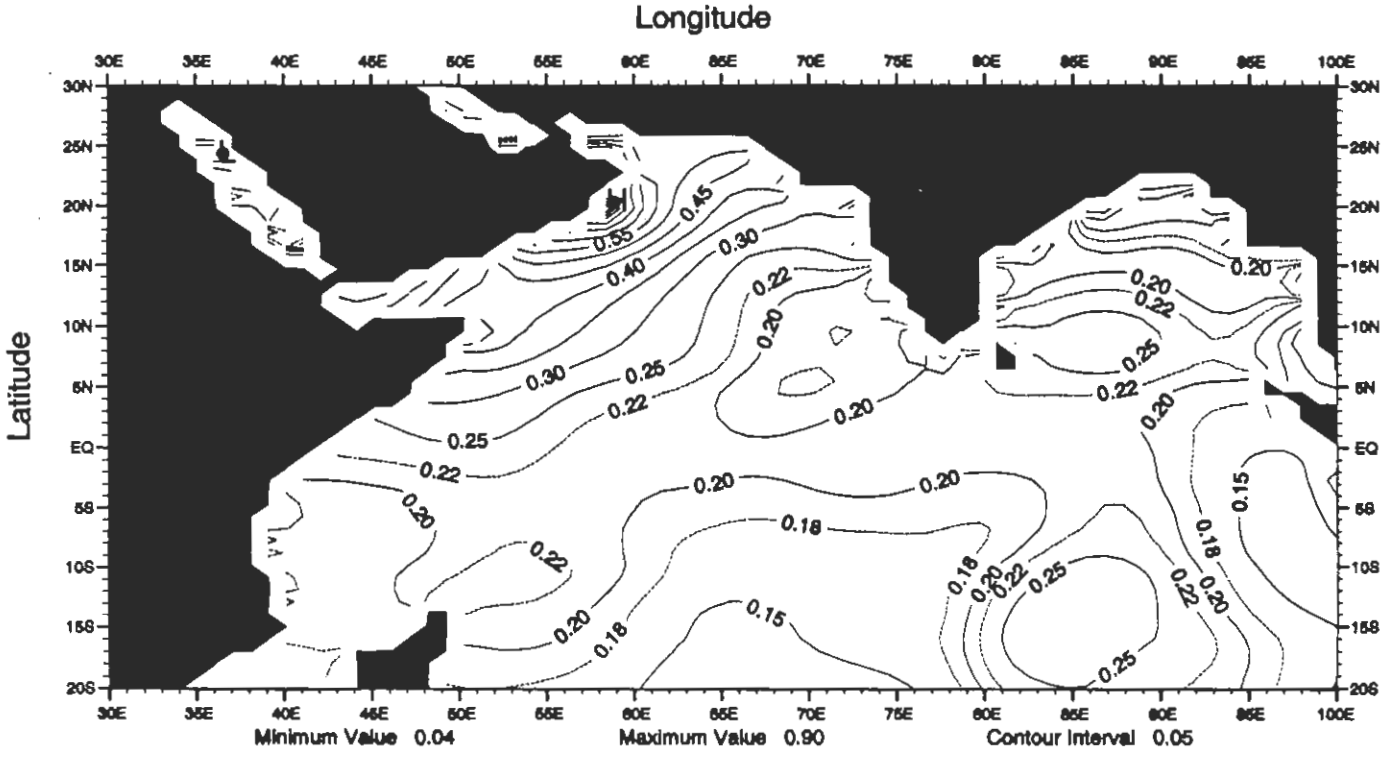

Fig. E1 Annual mean phosphate (μM) at the surface

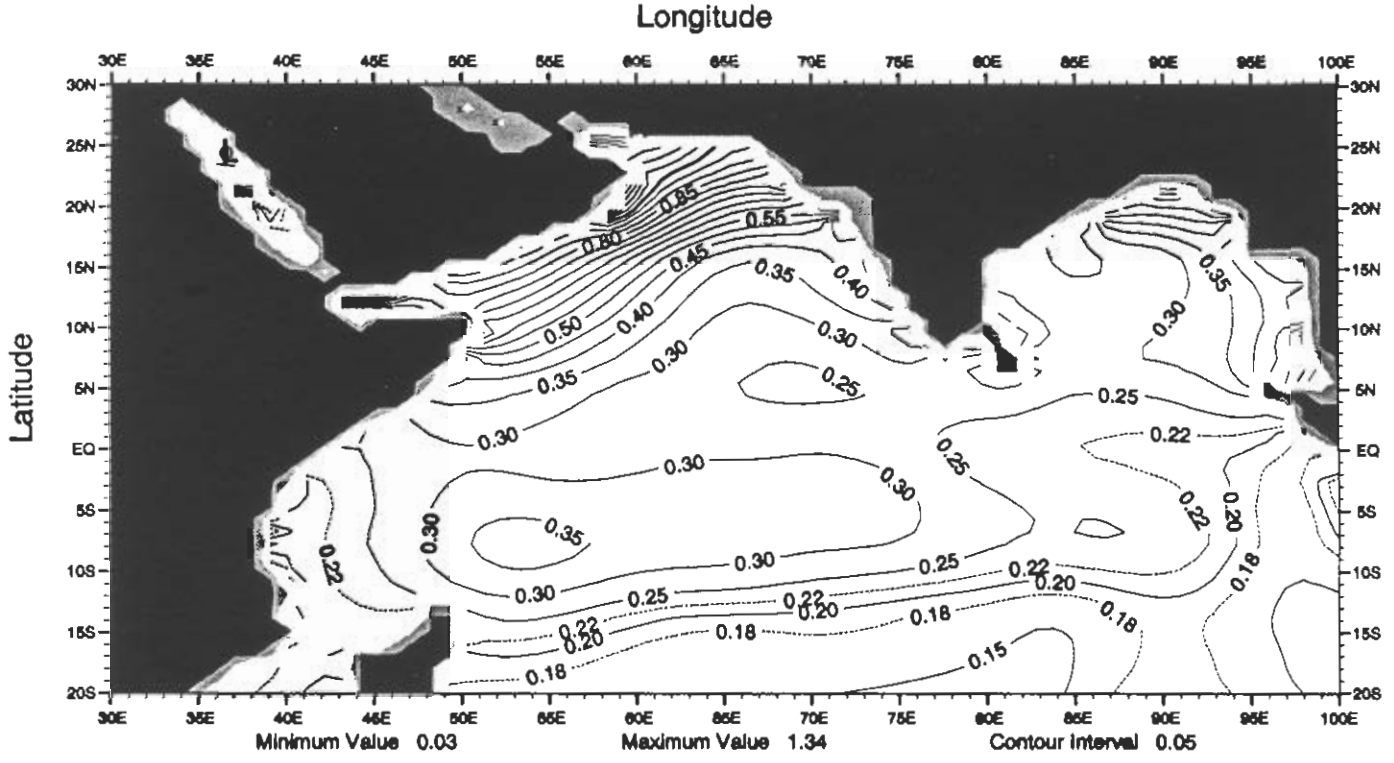

Fig. E2 Annual mean phosphate (μM) at 50 m depth

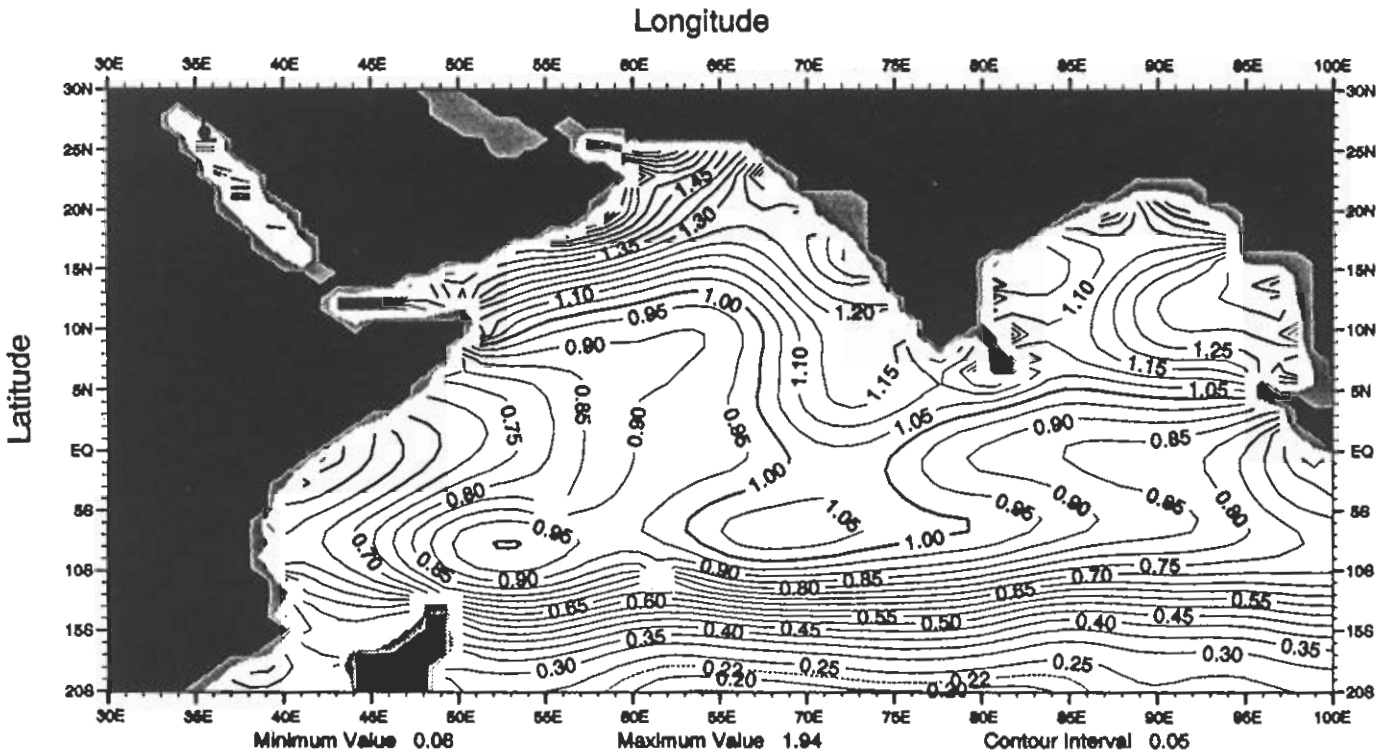

Fig. E3 Annual mean phosphate (μM) at 100 m depth

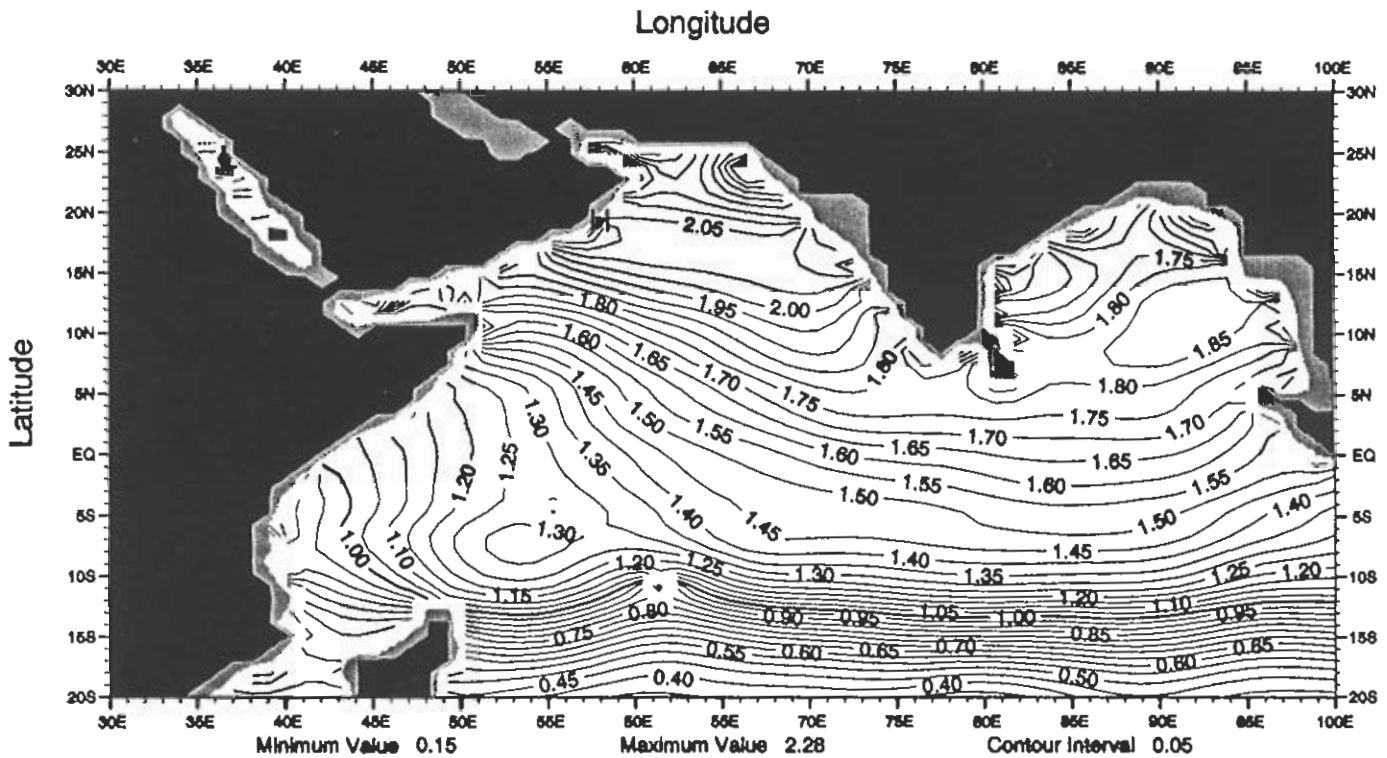

Fig. E4 Annual mean phosphate (μM) at 150 m depth

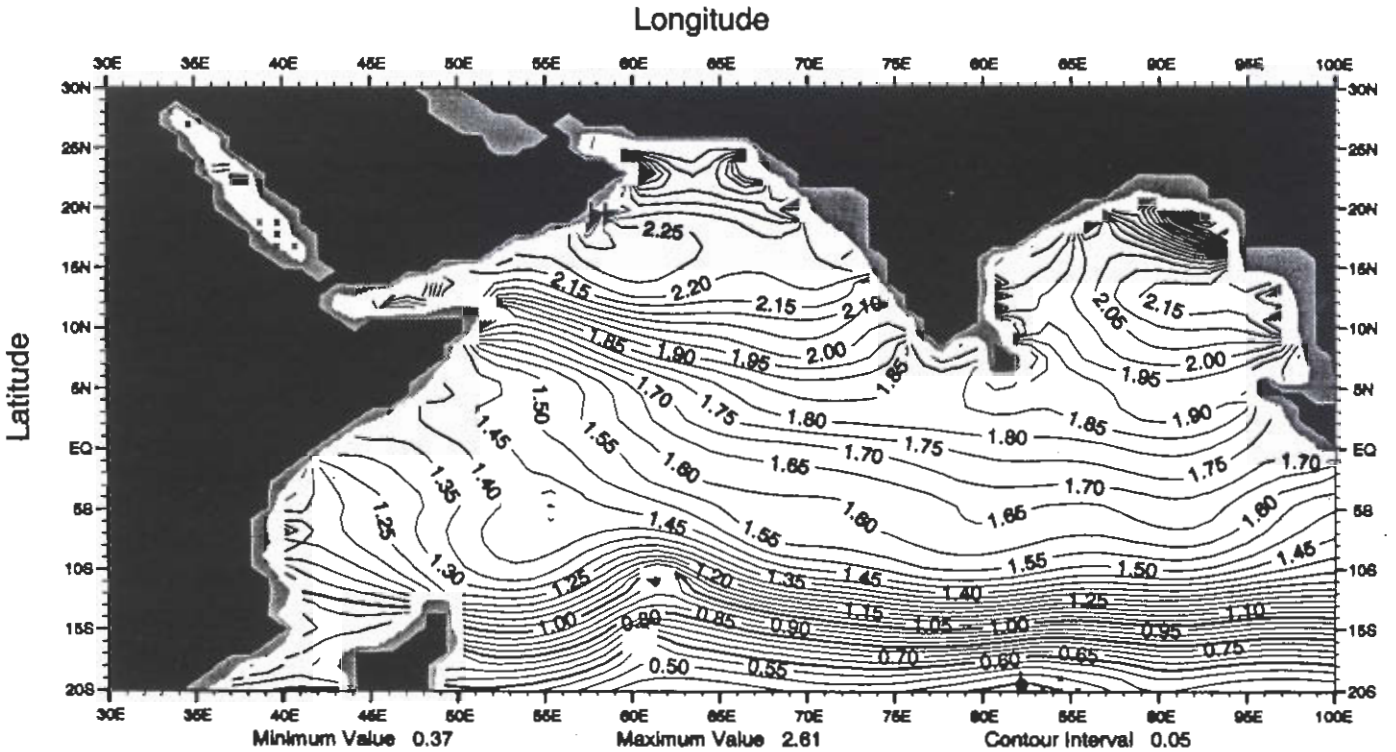

Fig. E5 Annual mean phosphate (μM) at 200 m depth

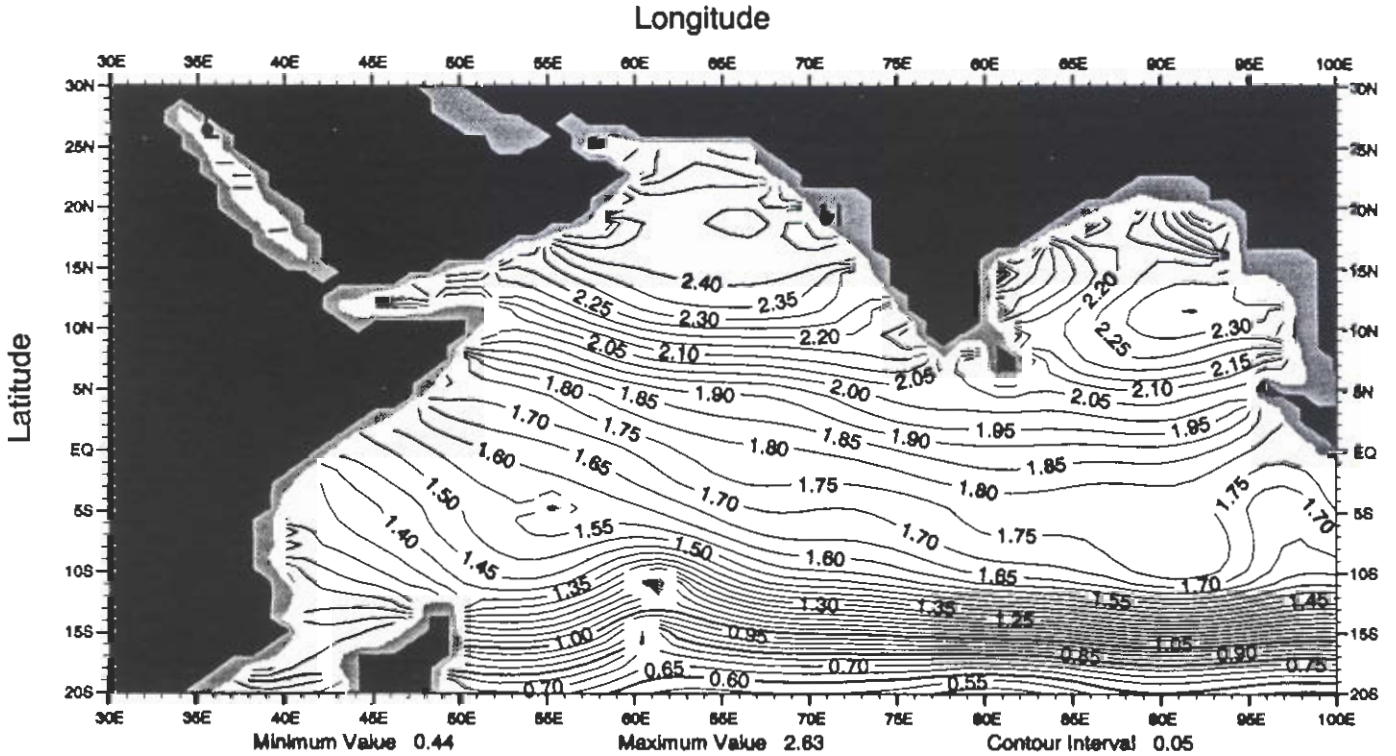

Fig. E6 Annual mean phosphate (μM) at 300 m depth

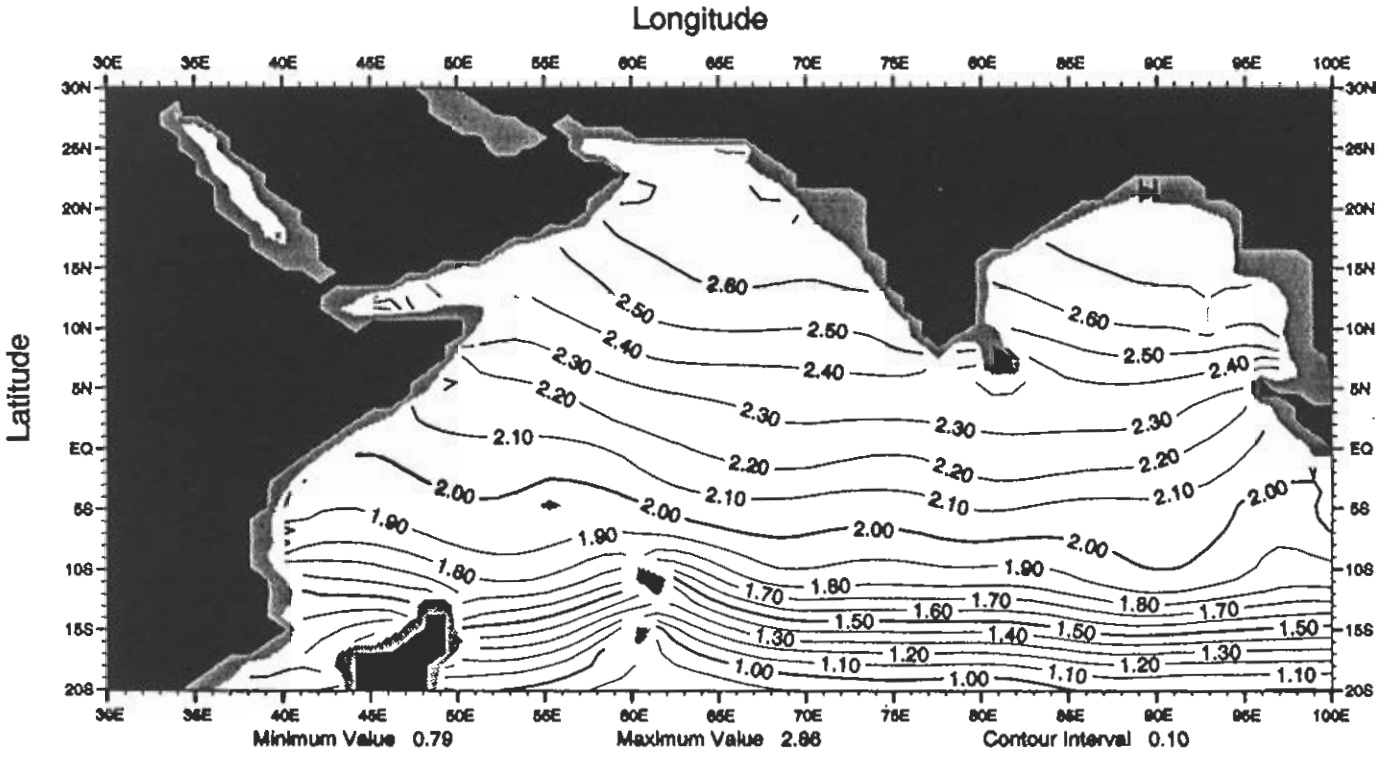

Fig. E7 Annual mean phosphate (μM) at 500 m depth

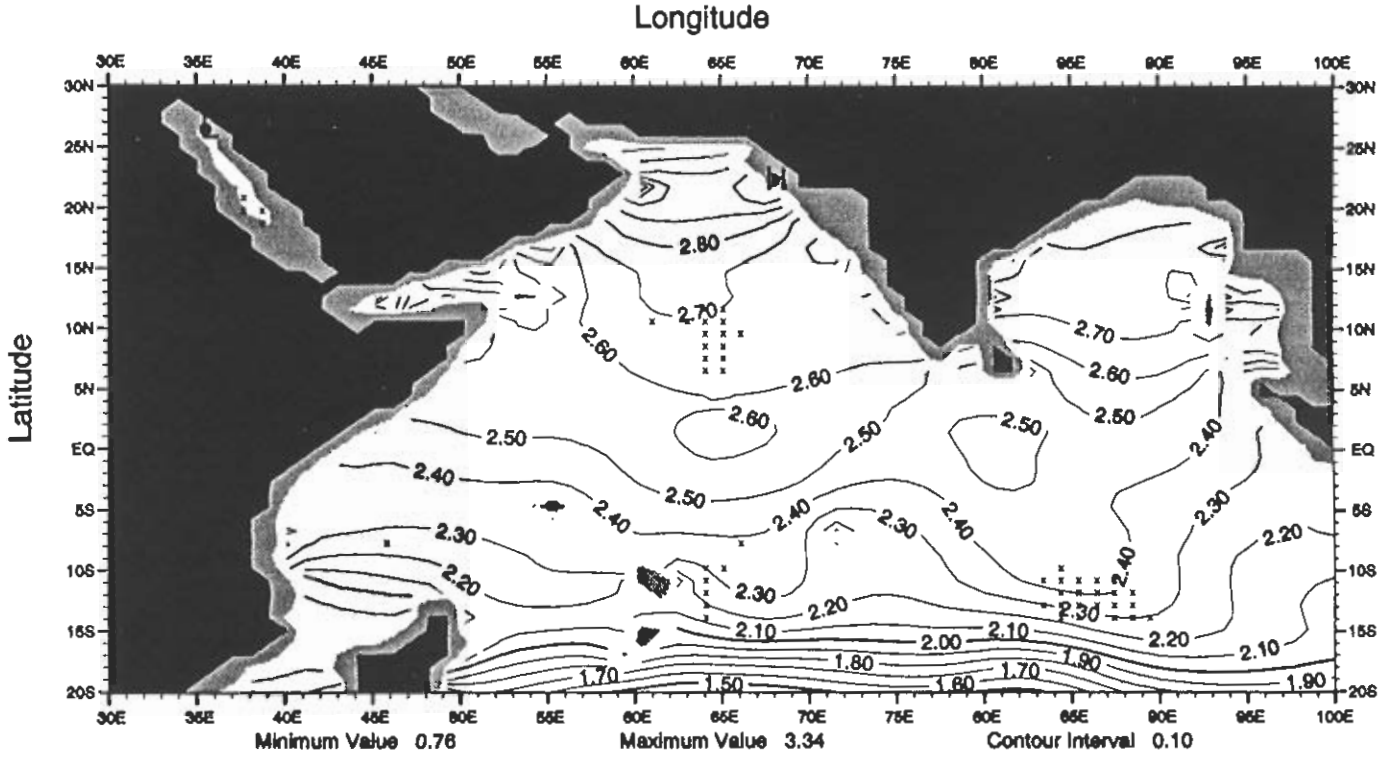

Fig. E8 Annual mean phosphate (μM) at 700 m depth

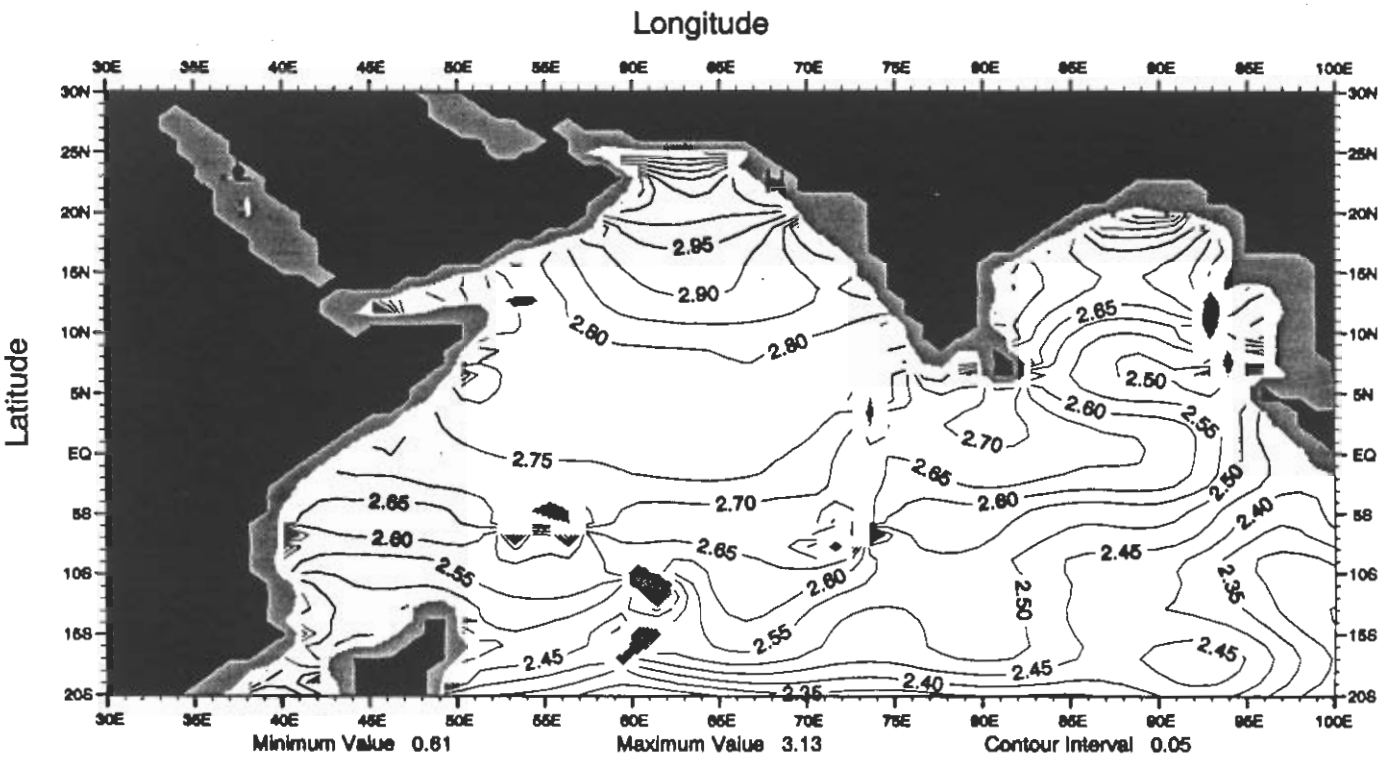

Fig. E9 Annual mean phosphate (μM) at 1000 m depth

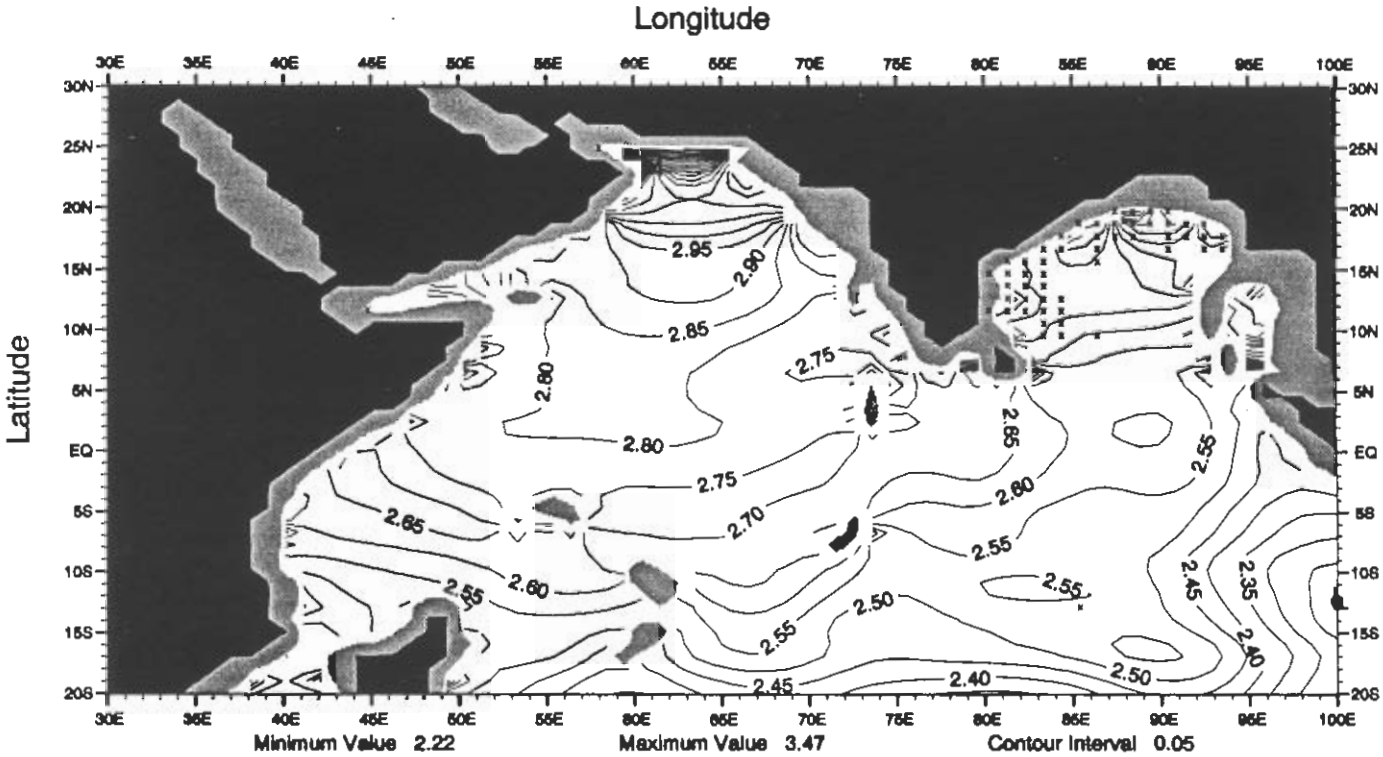

Fig. E10 Annual mean phosphate (μM) at 1200 m depth

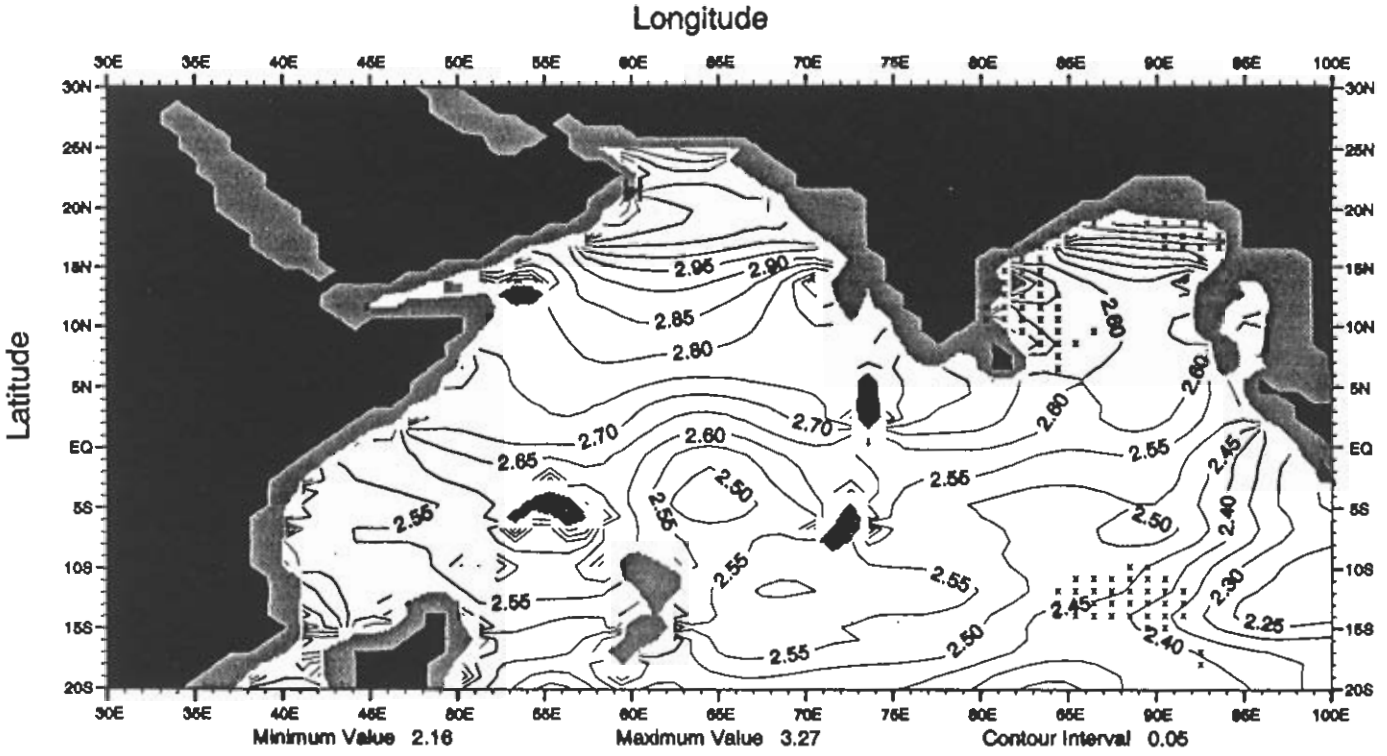

Fig. E11 Annual mean phosphate (μM) at 1500 m depth

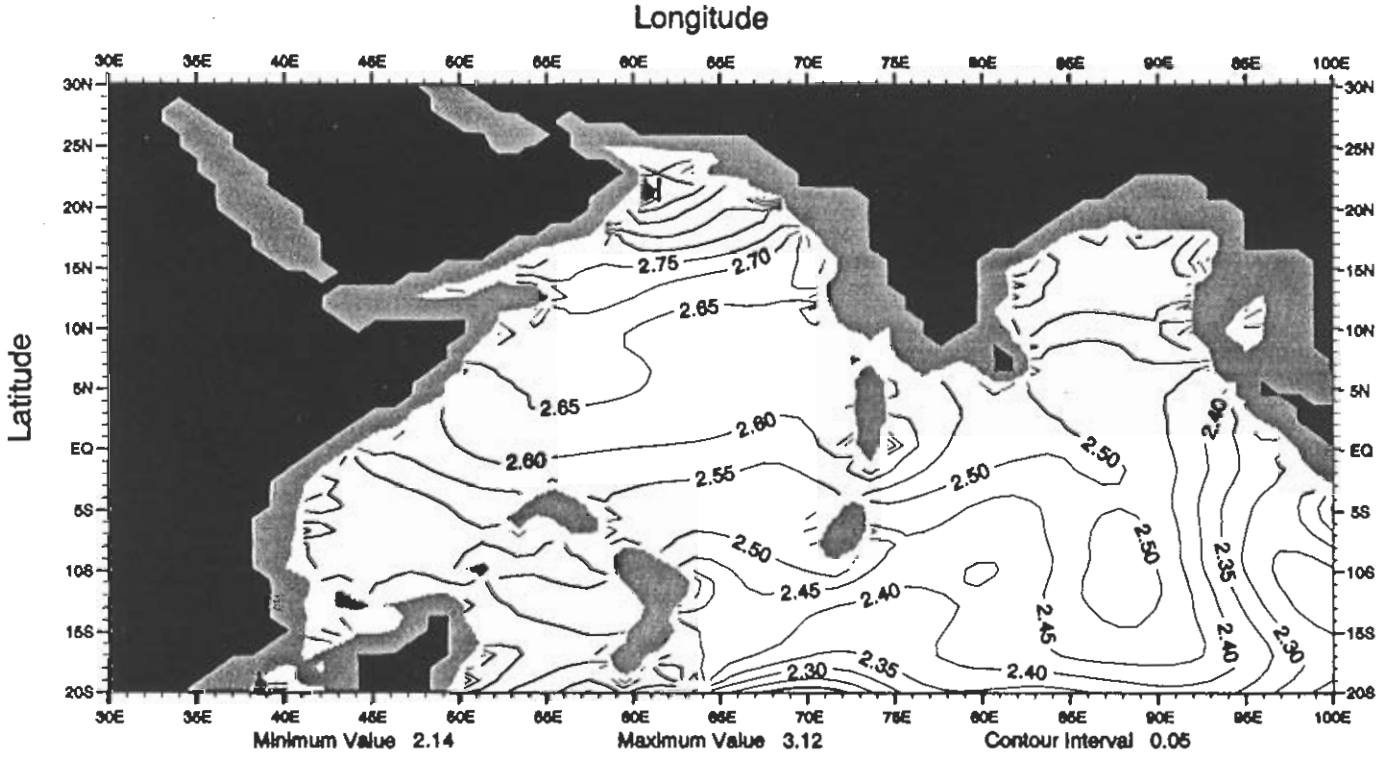

Fig. E12 Annual mean phosphate (μM) at 2000 m depth

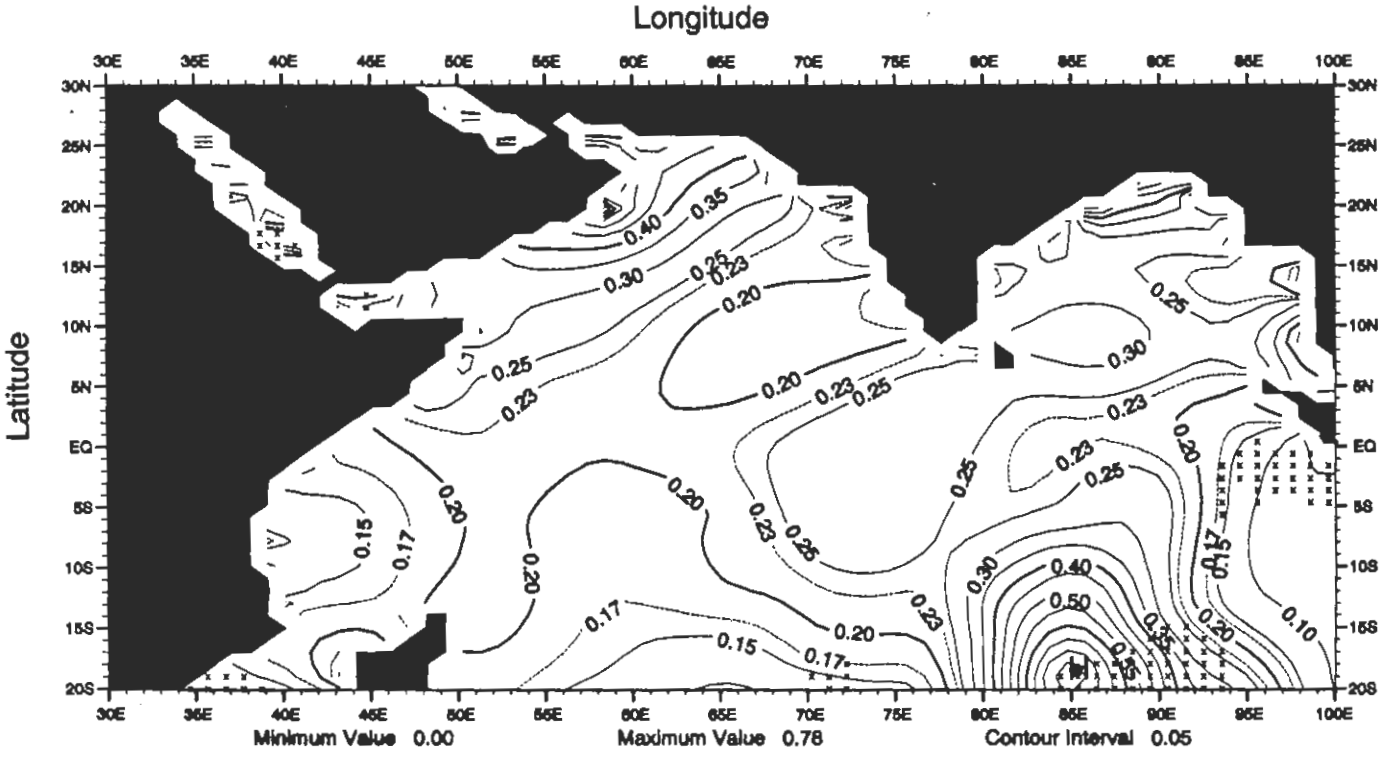

Fig. E13 Winter (Jan.-Mar.) mean phosphate (μM) at the surface

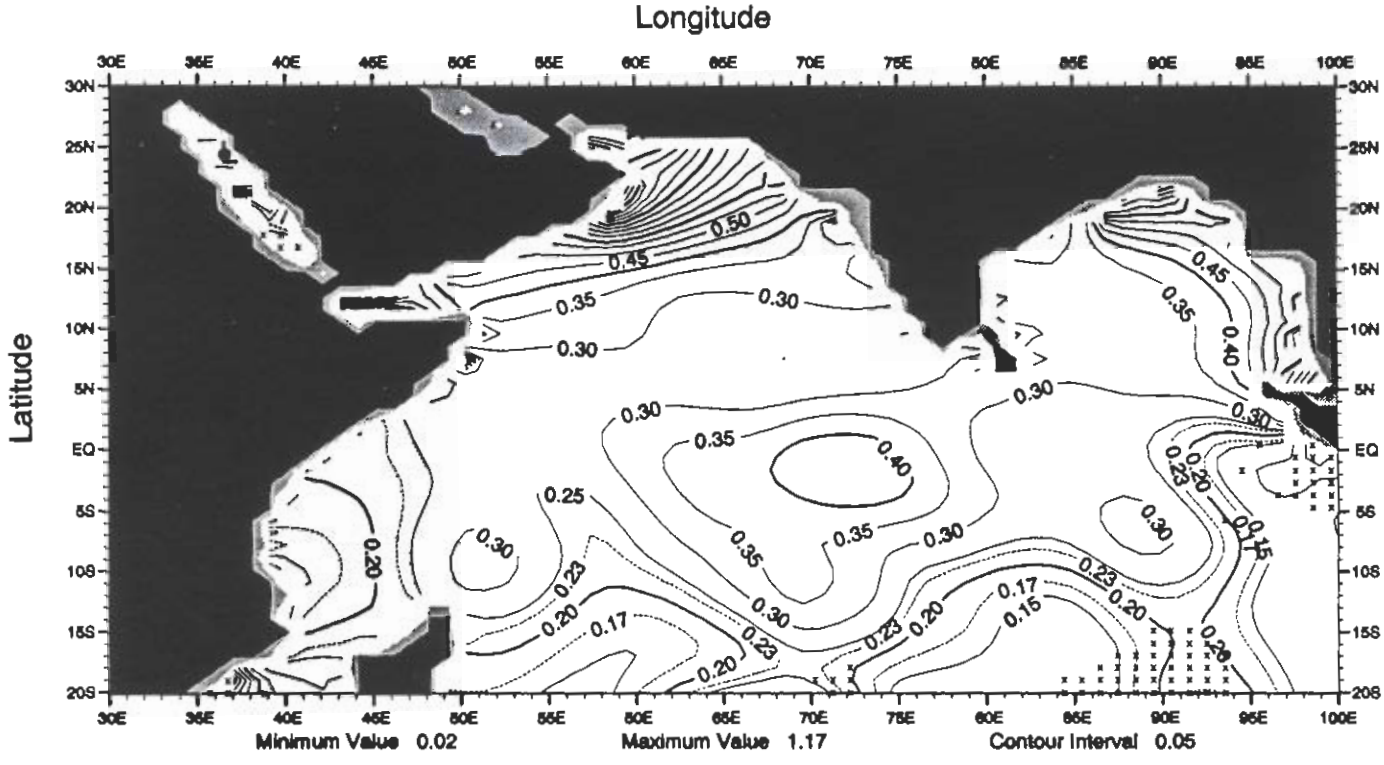

Fig. E14 Winter (Jan.-Mar.) mean phosphate (μM) at 50 m depth

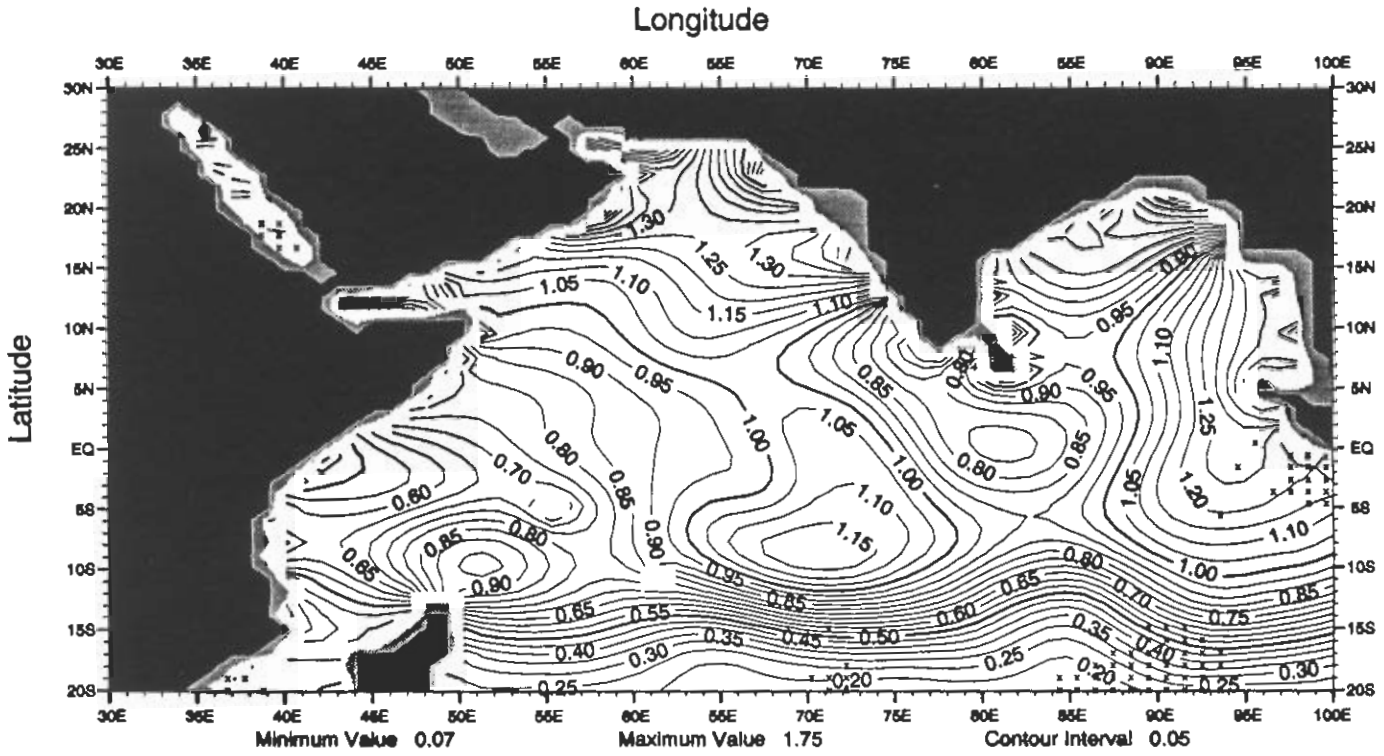

Fig. E15 Winter (Jan.Mar.) mean phosphate (μM) at 100 m depth

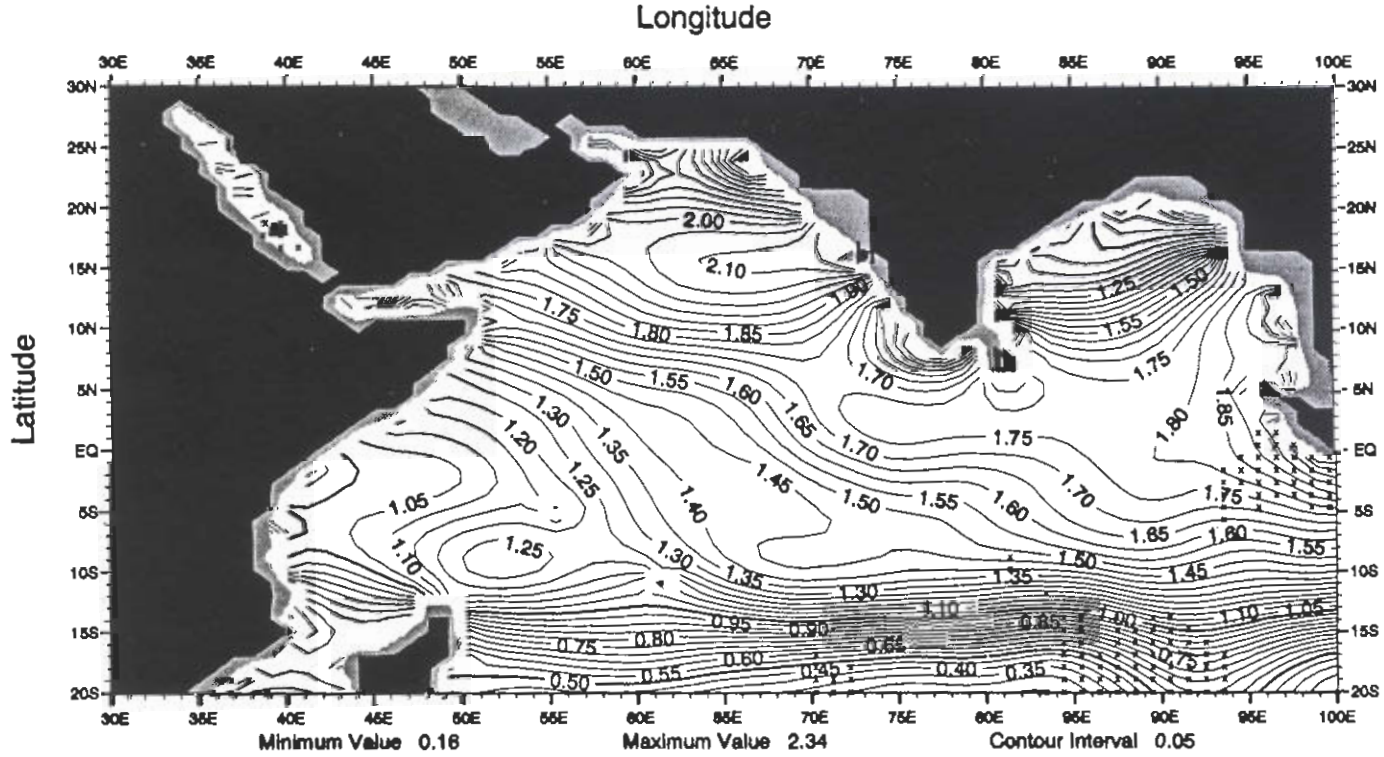

Fig. E16 Winter (Jan.Mar.) mean phosphate (μM) at 150 m depth

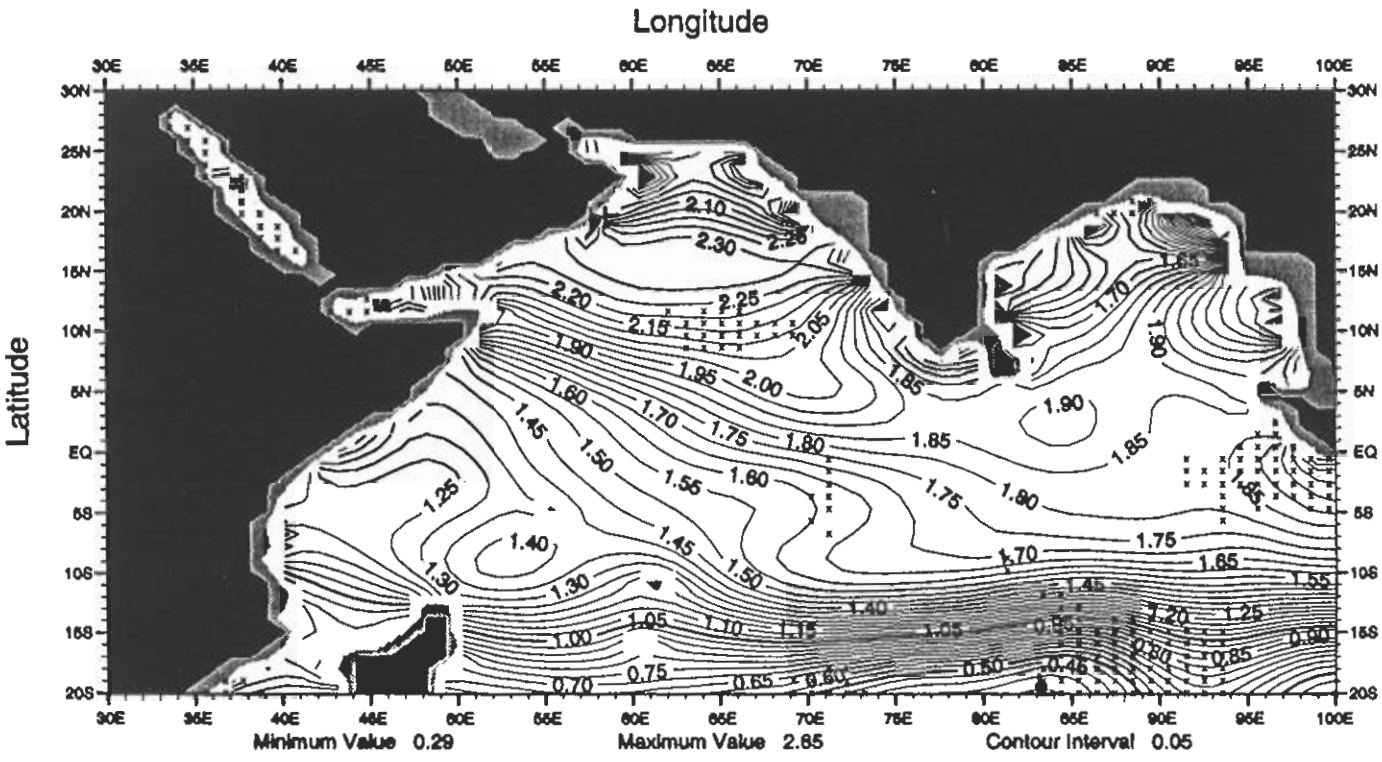

Fig. E17 Winter (Jan.Mar.) mean phosphate (μM) at 200 m depth

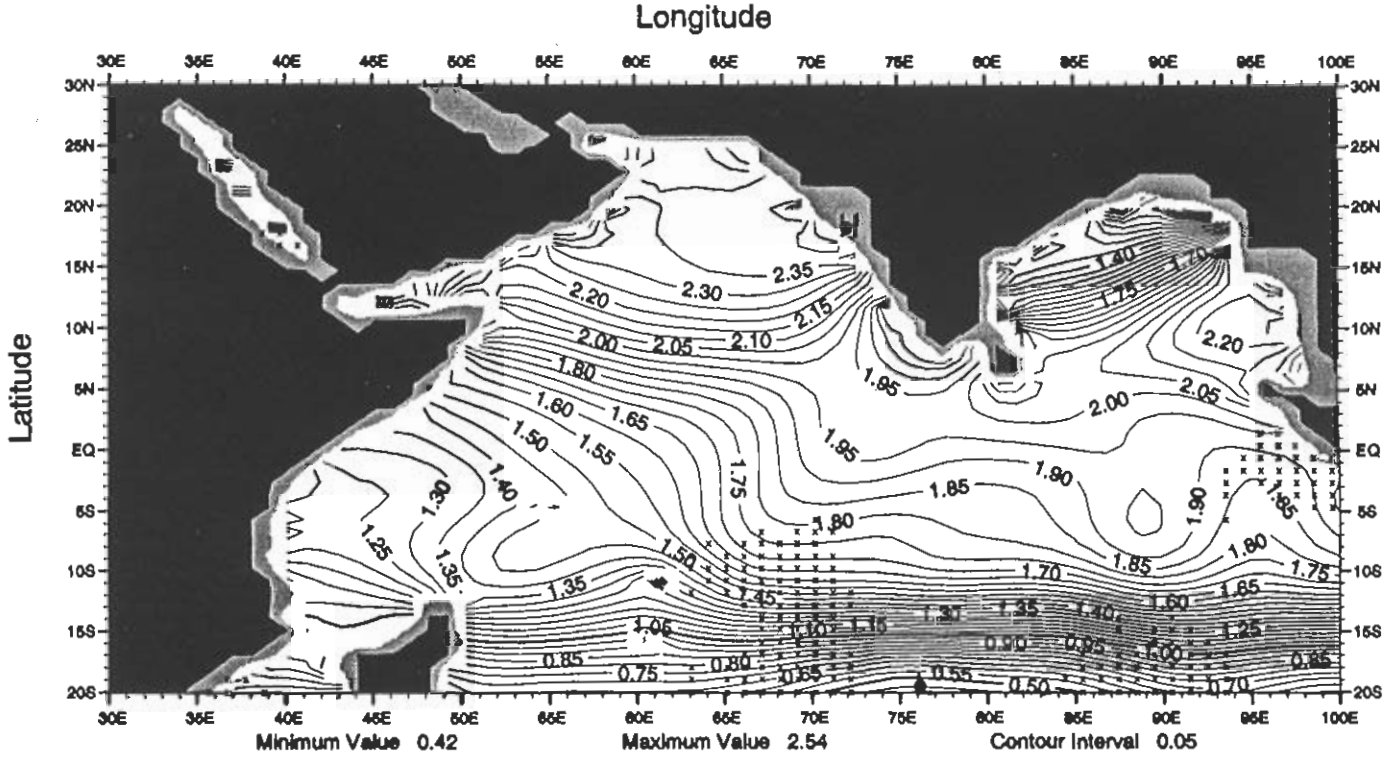

Fig. E18 Winter (Jan.Mar.) mean phosphate (μM) at 250 m depth

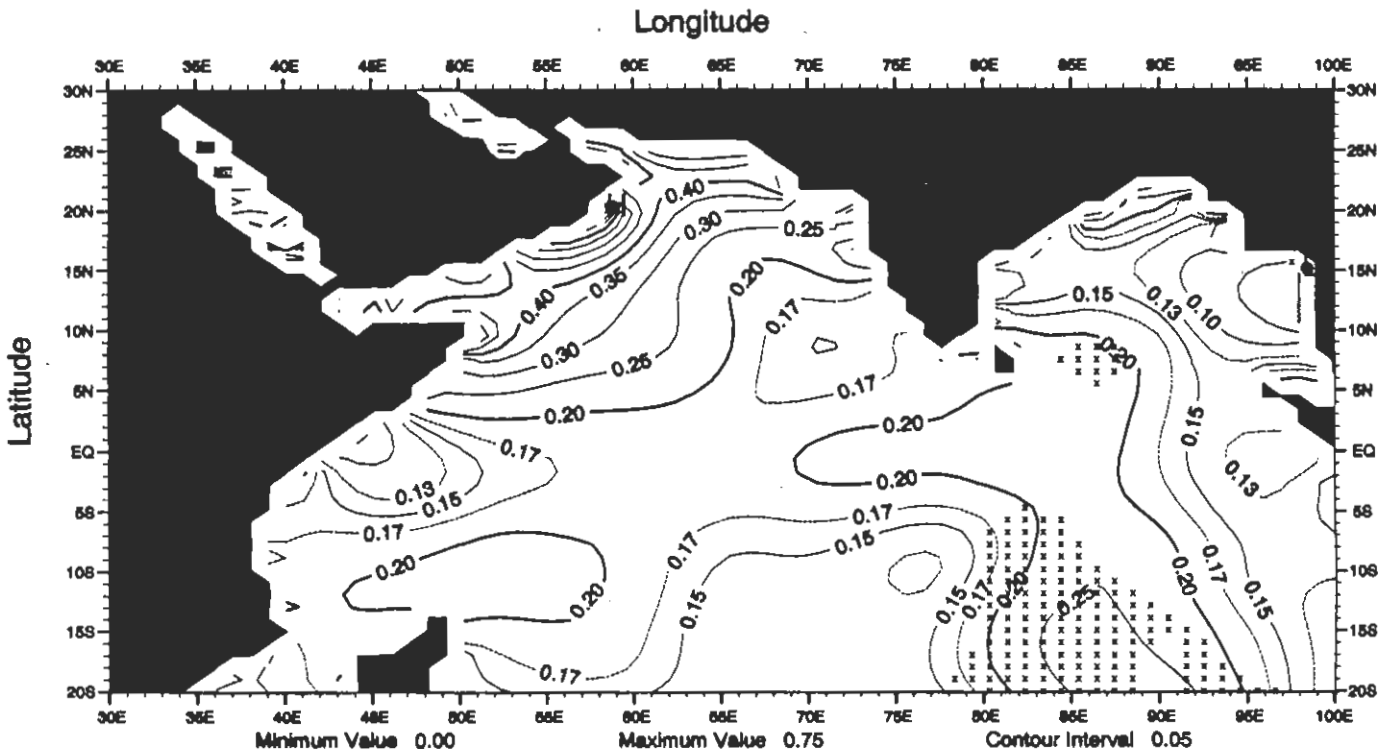

Fig. E19 Spring (Apr.-Jun.) mean phosphate (μM) at the surface

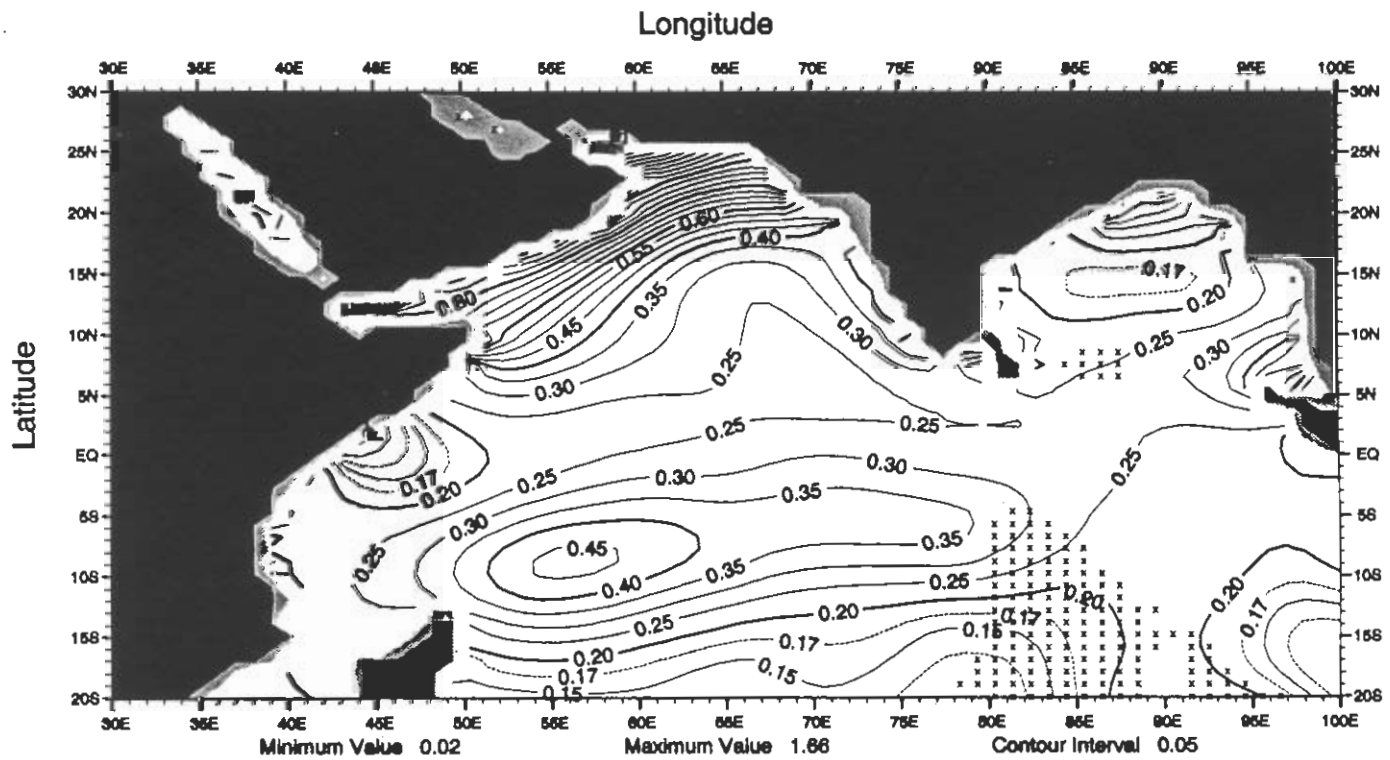

Fig. E20 Spring (Apr.-Jun.) mean phosphate (μM) at 50 m depth

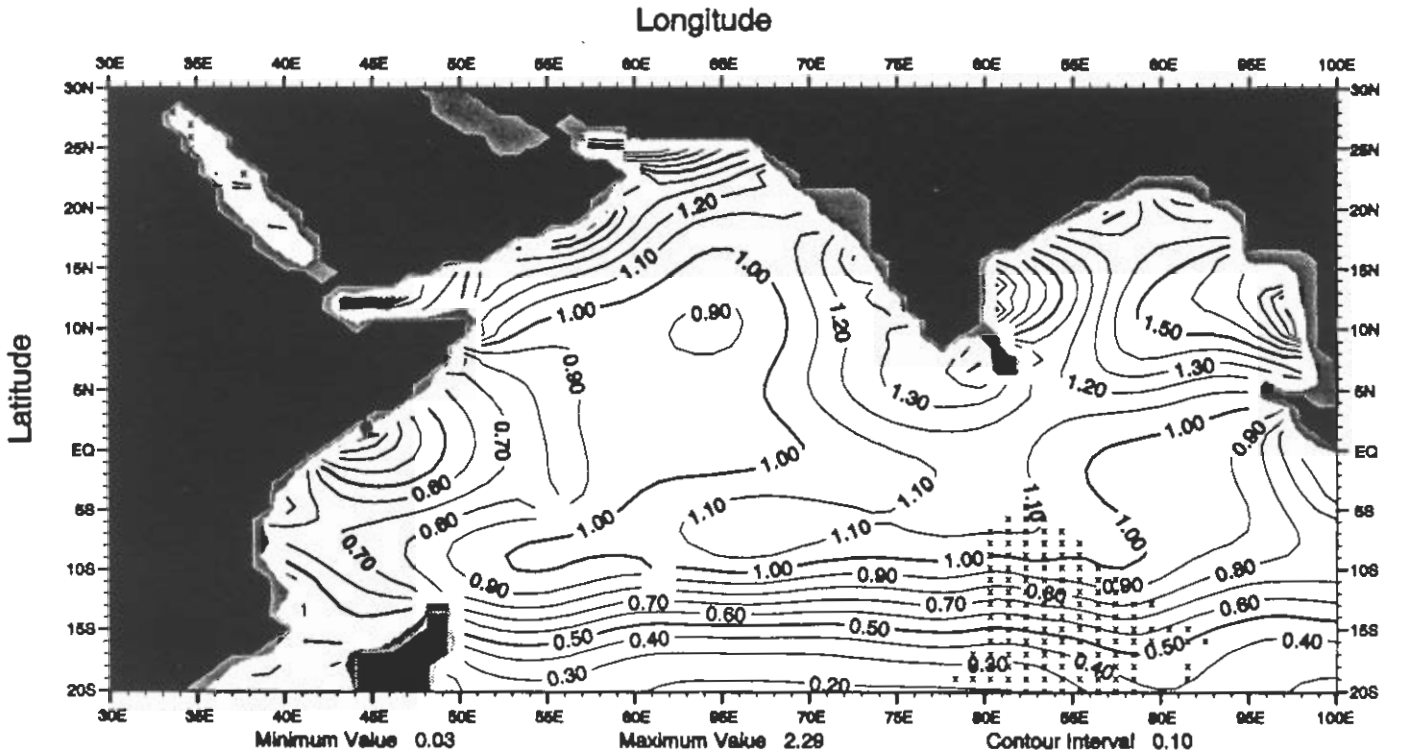

Fig. E21 Spring (Apr.-Jun.) mean phosphate (μM) at 100 m depth

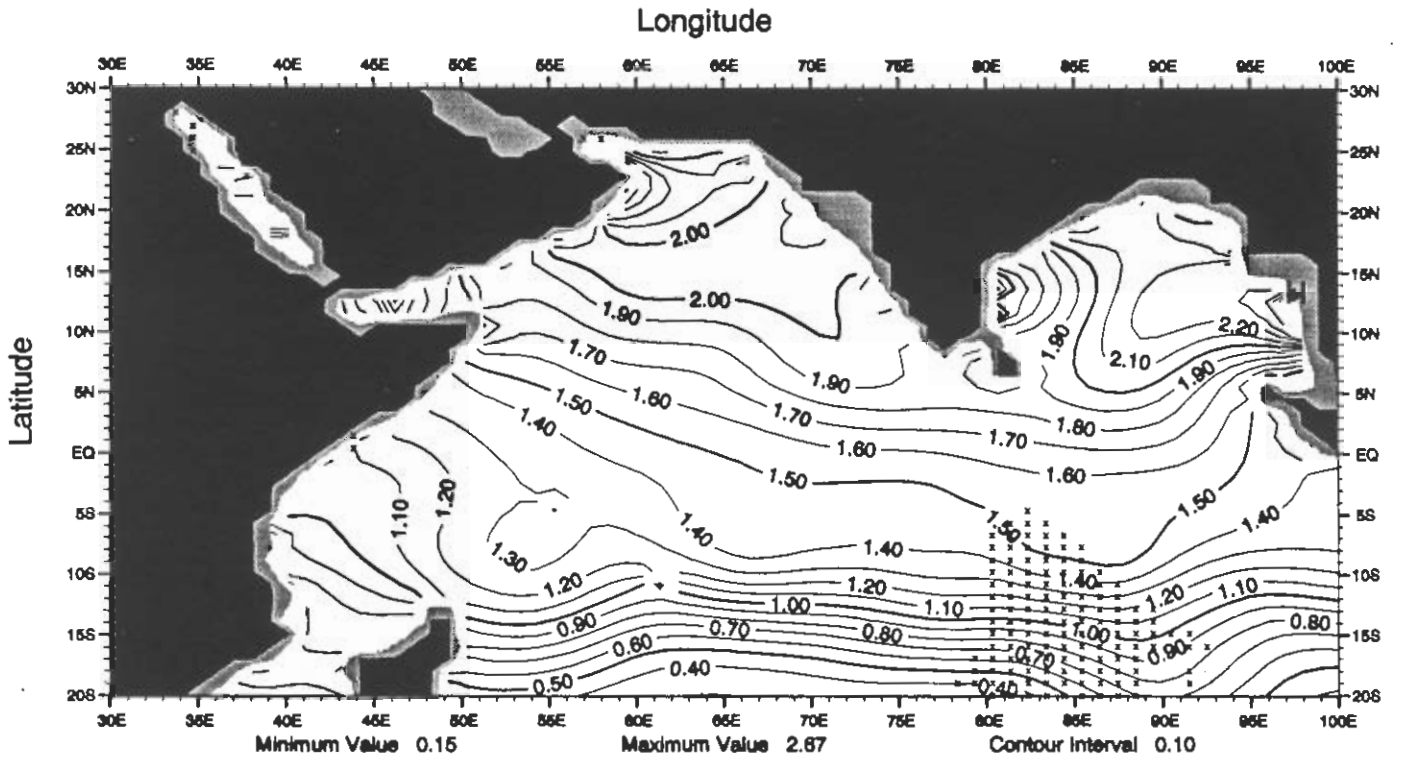

Fig. E22 Spring (Apr.-Jun.) mean phosphate (μM) at 150 m depth

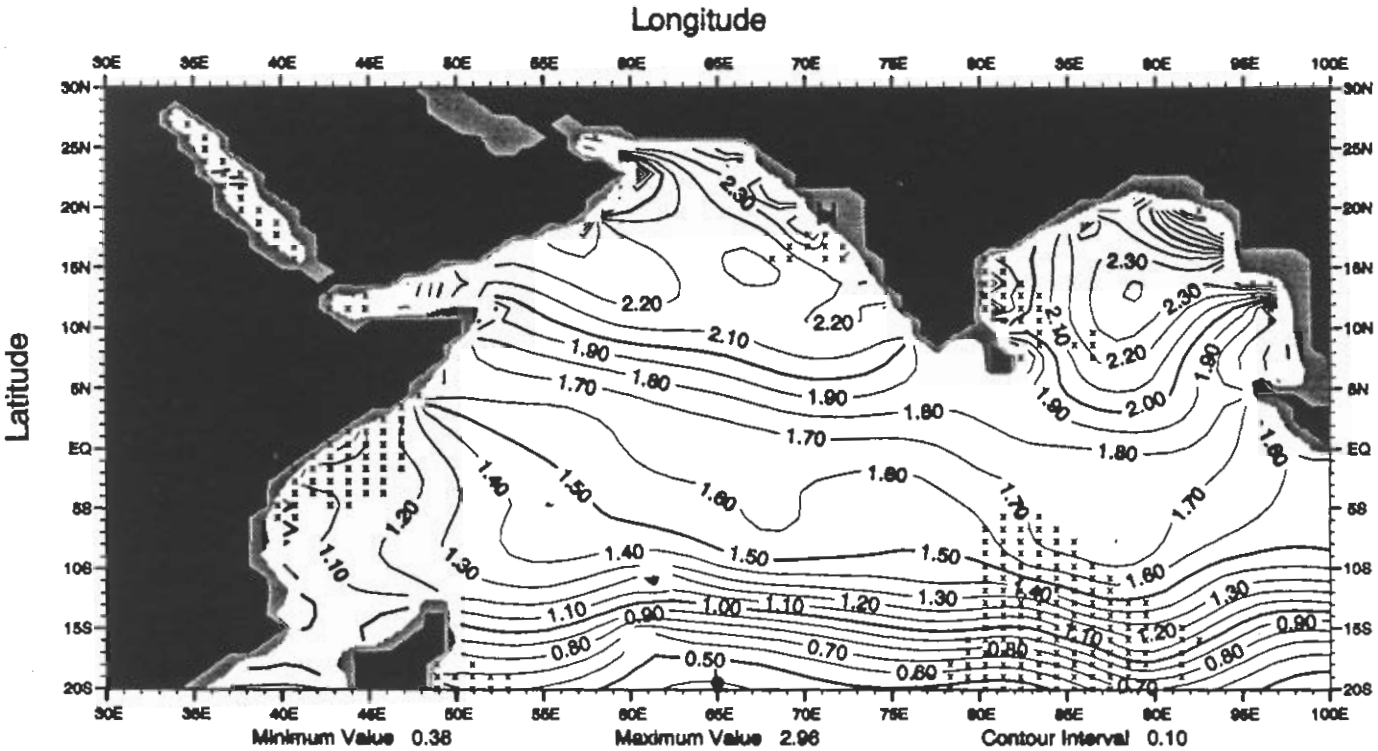

Fig. E23 Spring (Apr.-Jun.) mean phosphate (μM) at 200 m depth

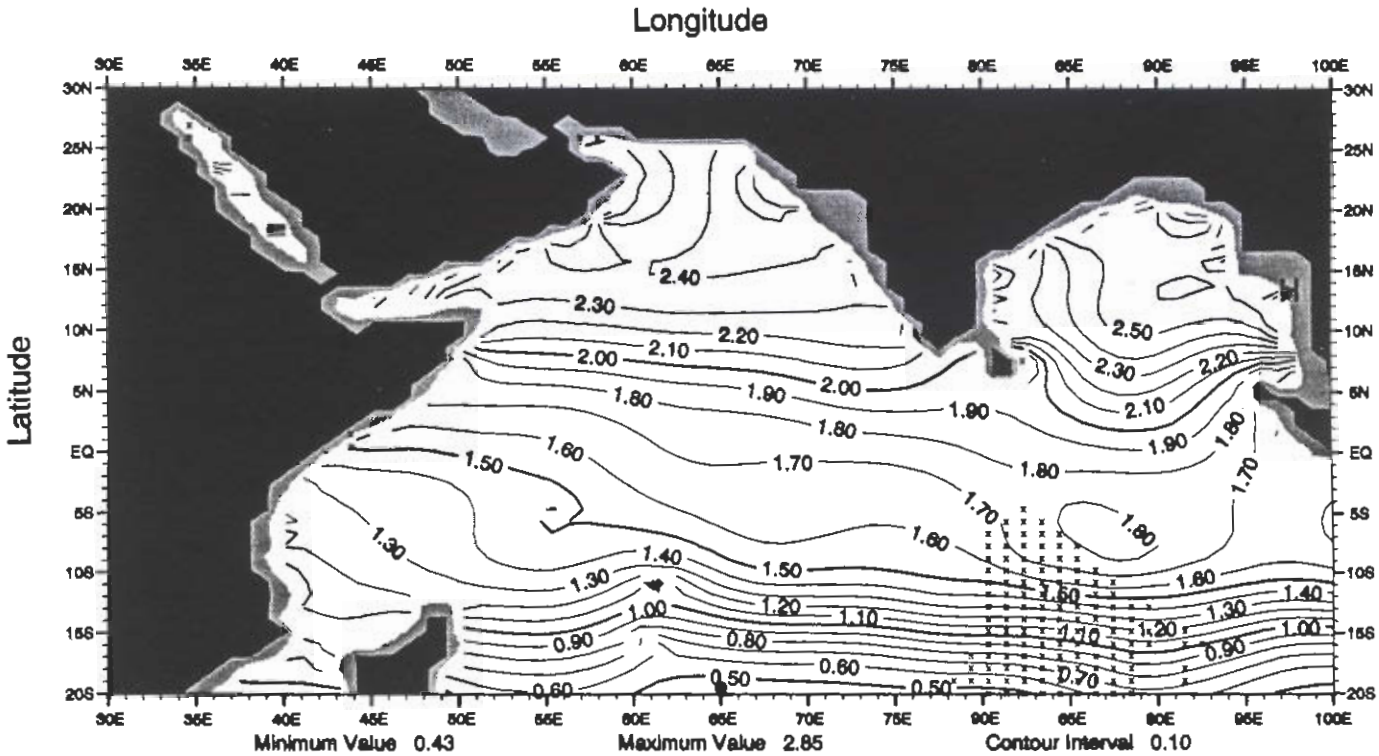

Fig. E24 Spring (Apr.-Jun.) mean phosphate (μM) at 250 m depth

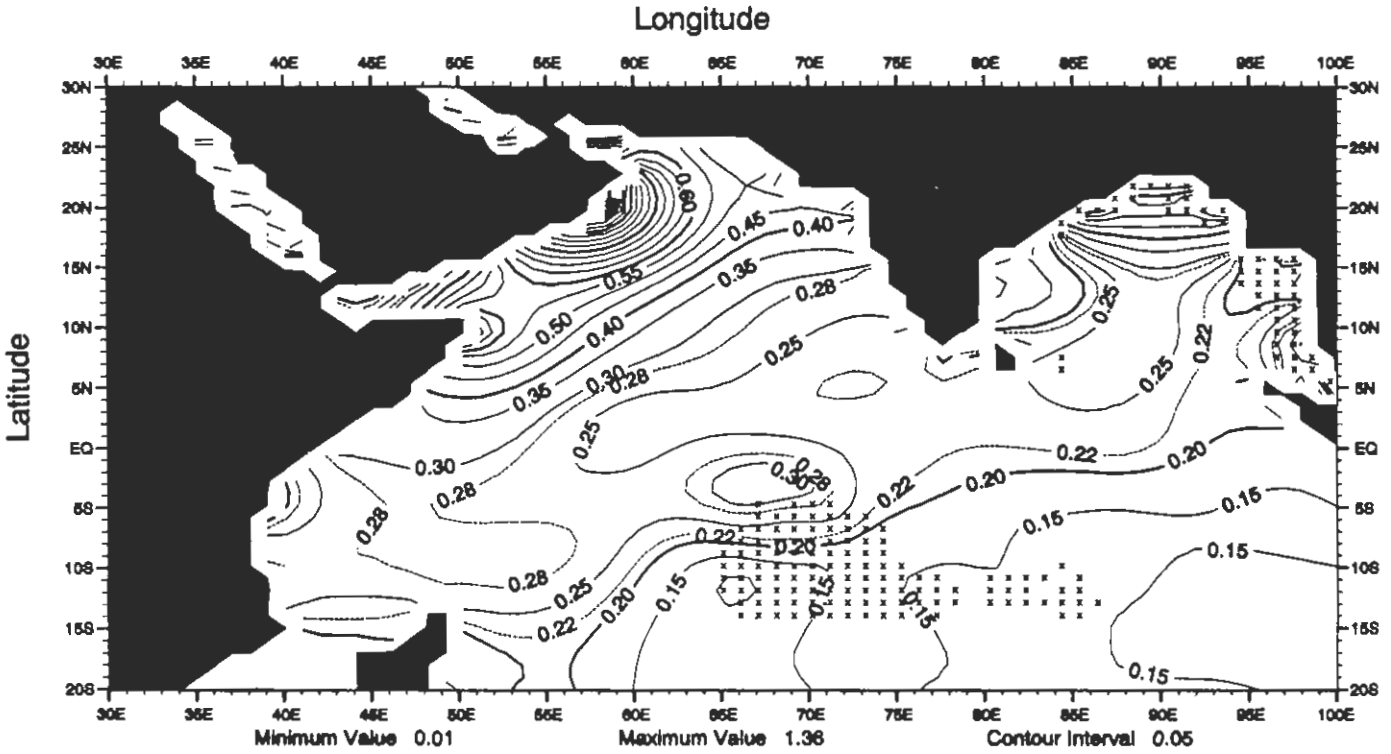

Fig. E25 Summer (Jul.-Sep.) mean phosphate (μM) at the surface

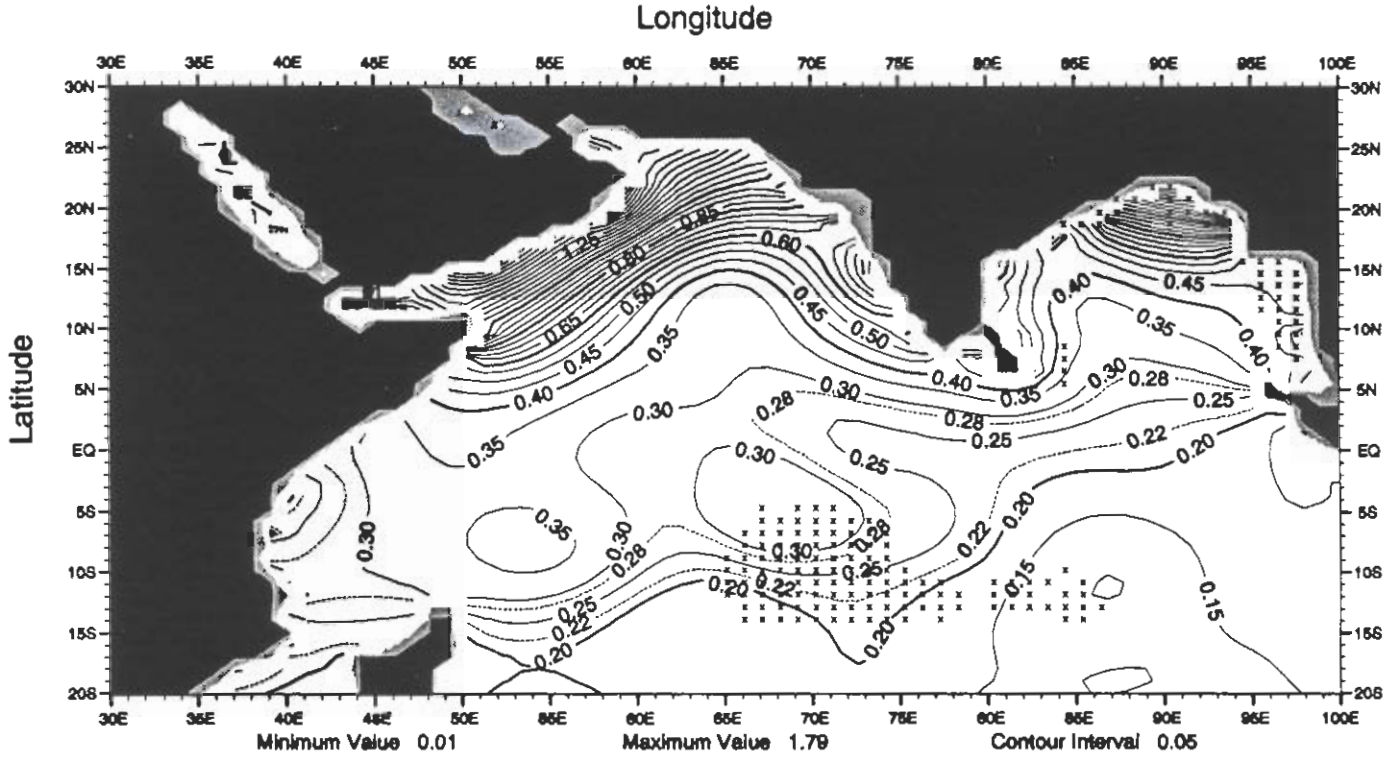

Fig. E26 Summer (Jul.-Sep.) mean phosphate (μM) at 50 m depth

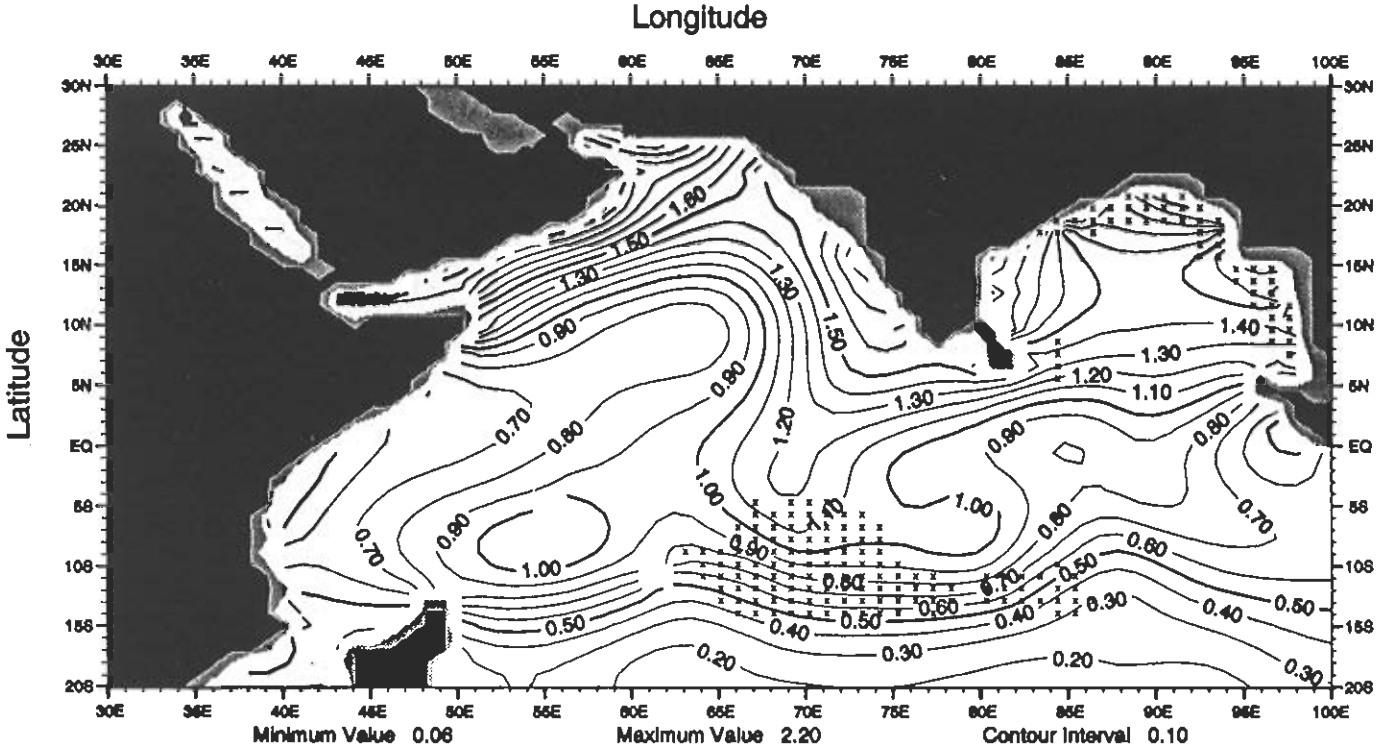

Fig. E27 Summer (Jul.-Sep.) mean phosphate (μM) at 100 m depth

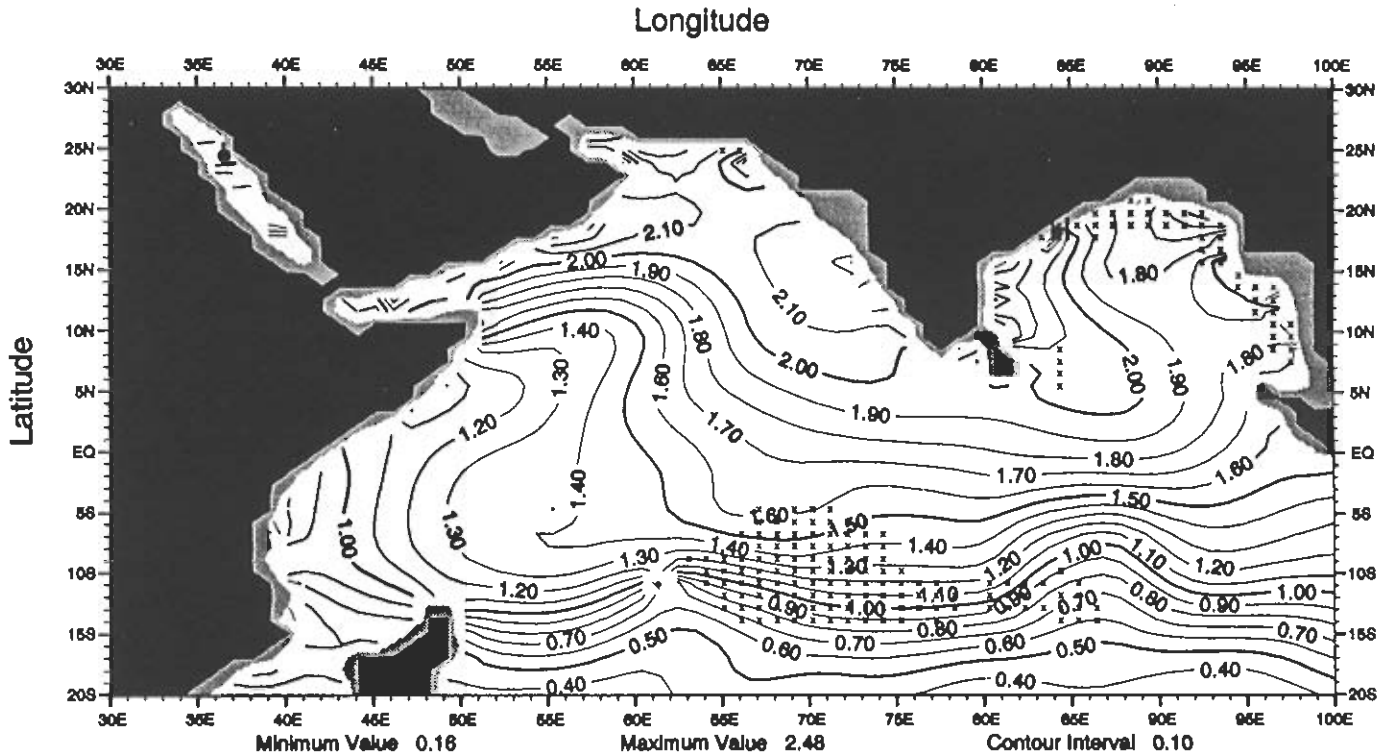

Fig. E28 Summer (Jul.-Sep.) mean phosphate (μM) at 150 m depth

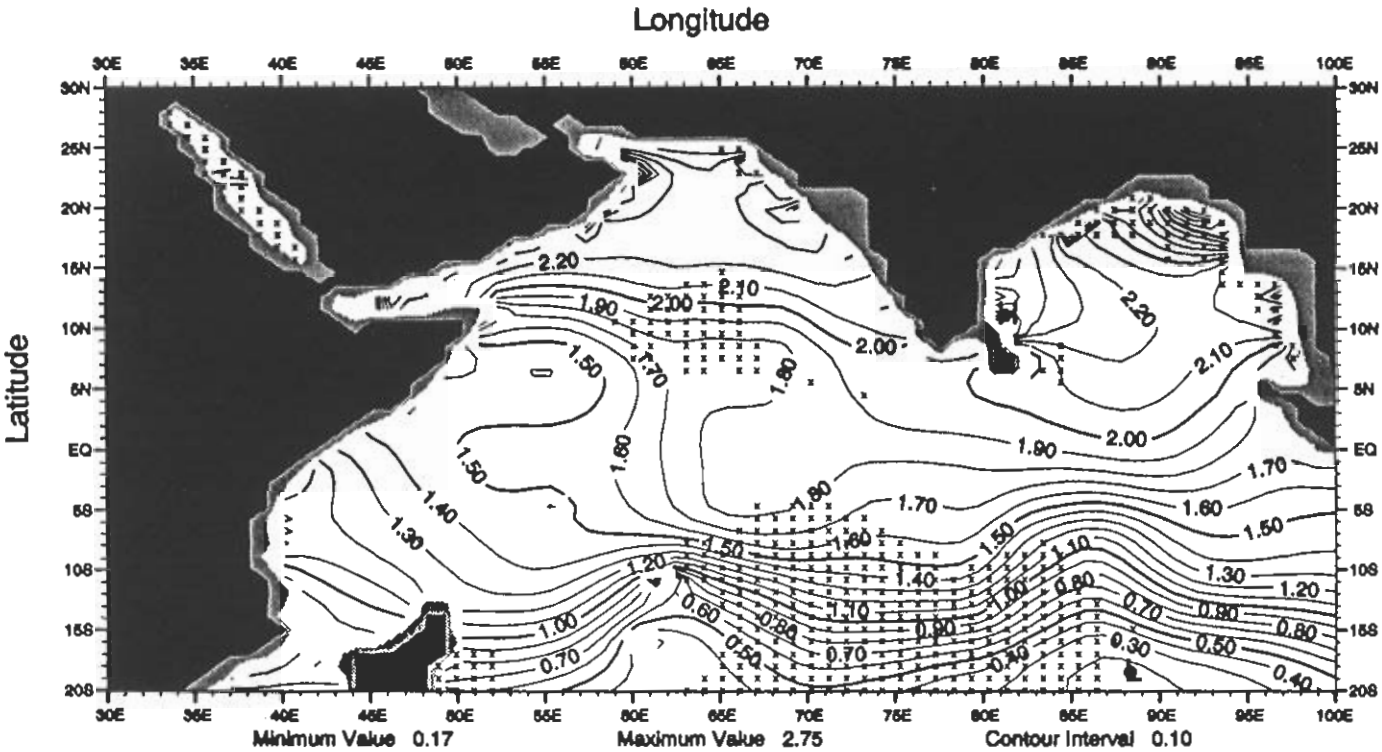

Fig. E29 Summer (Jul.-Sep.) mean phosphate (μM) at 200 m depth

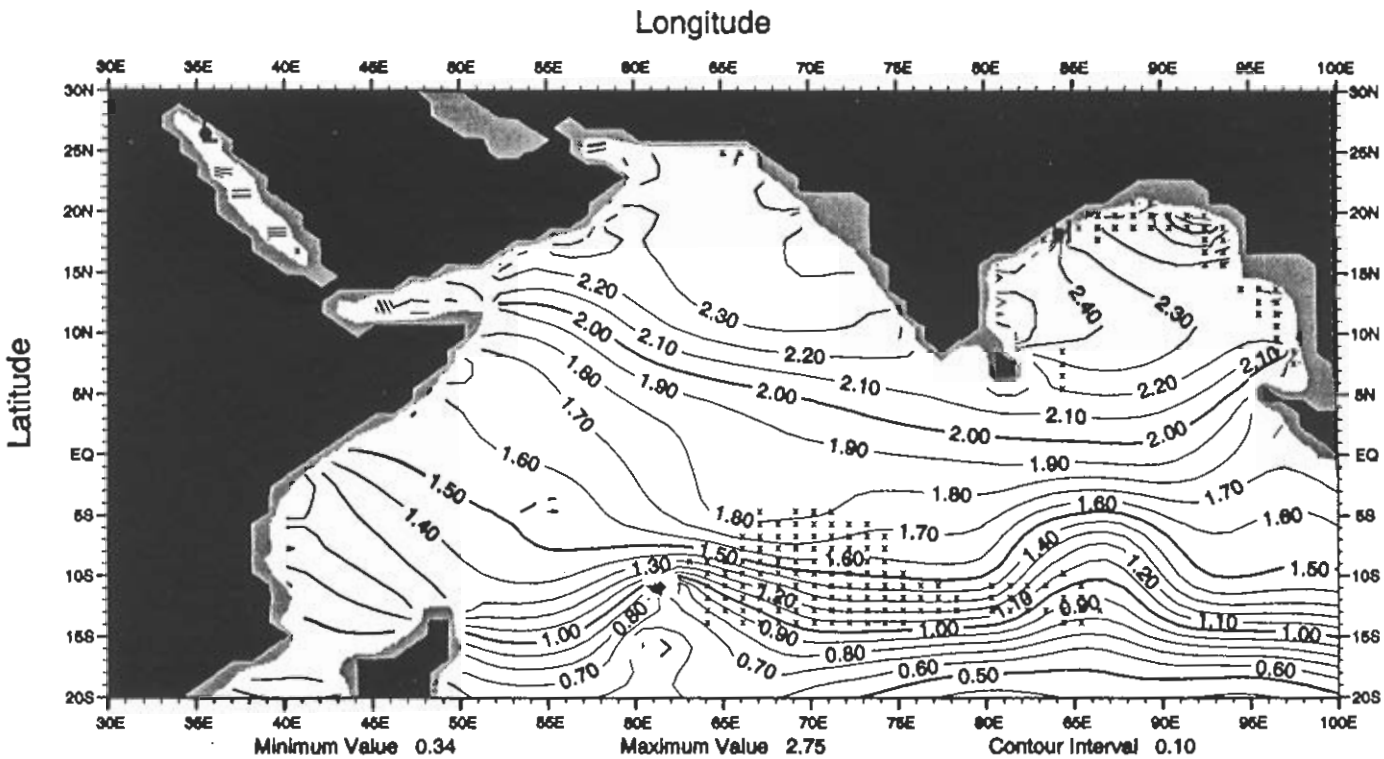

Fig. E30 Summer (Jul.-Sep.) mean phosphate (μM) at 250 m depth

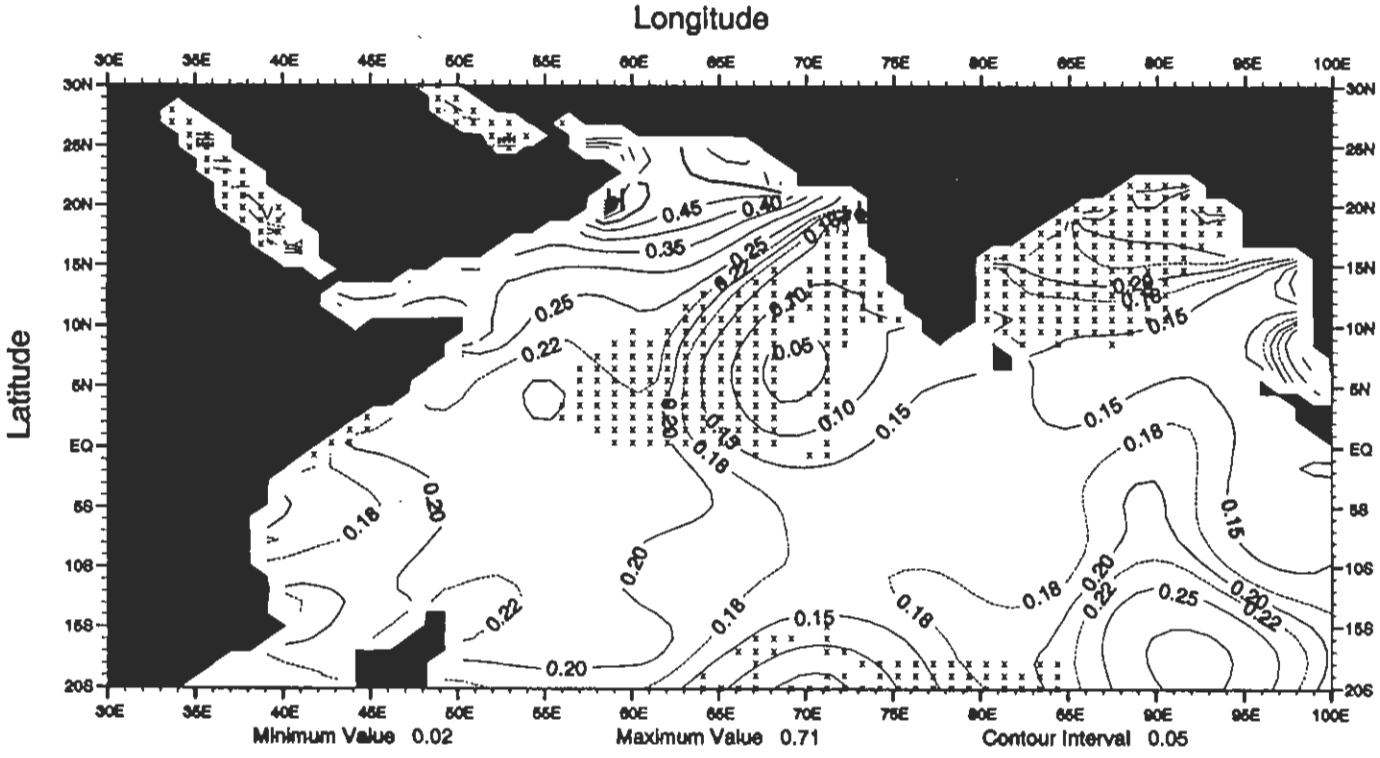

Fig. E31 Fall (Oct.-Dec.) mean phosphate (μM) at the surface

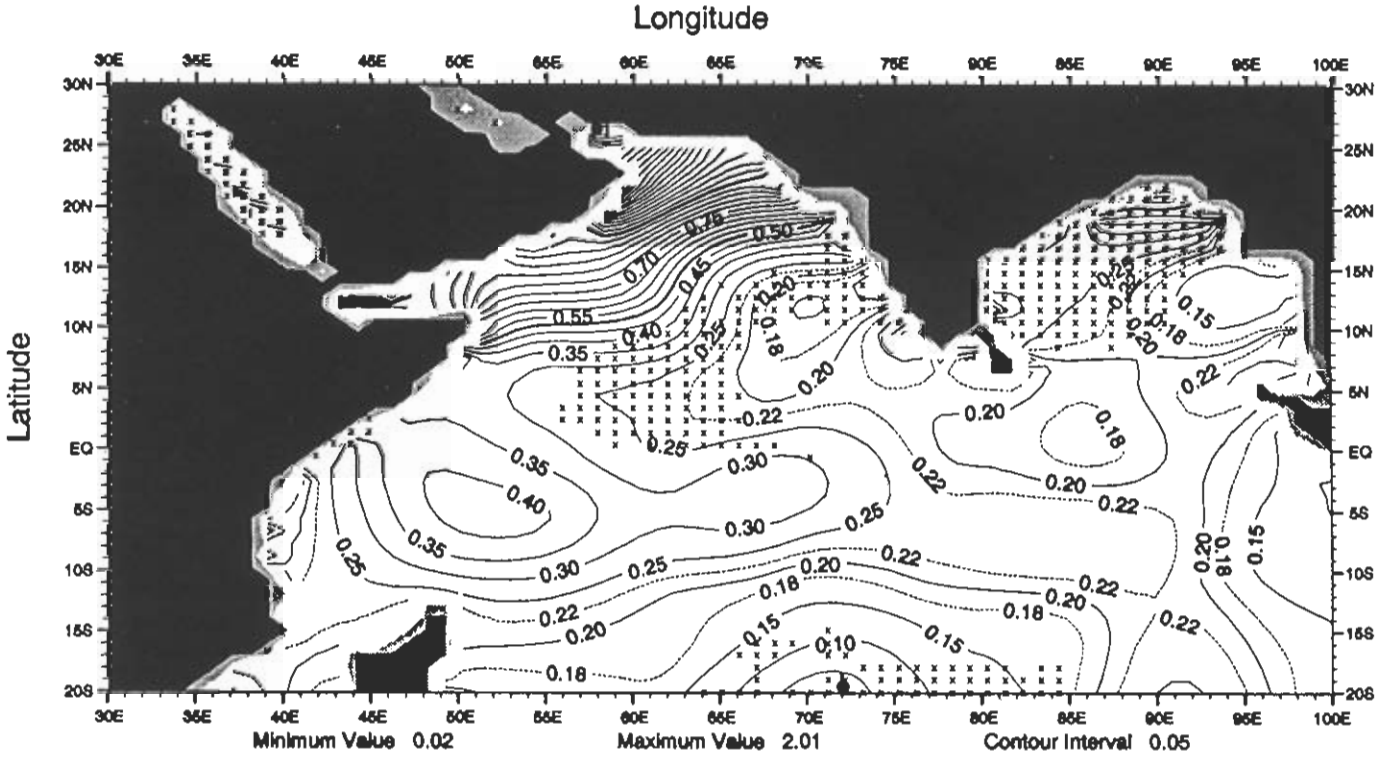

Fig. E32 Fall (Oct.-Dec.) mean phosphate (μM) at 50 m depth

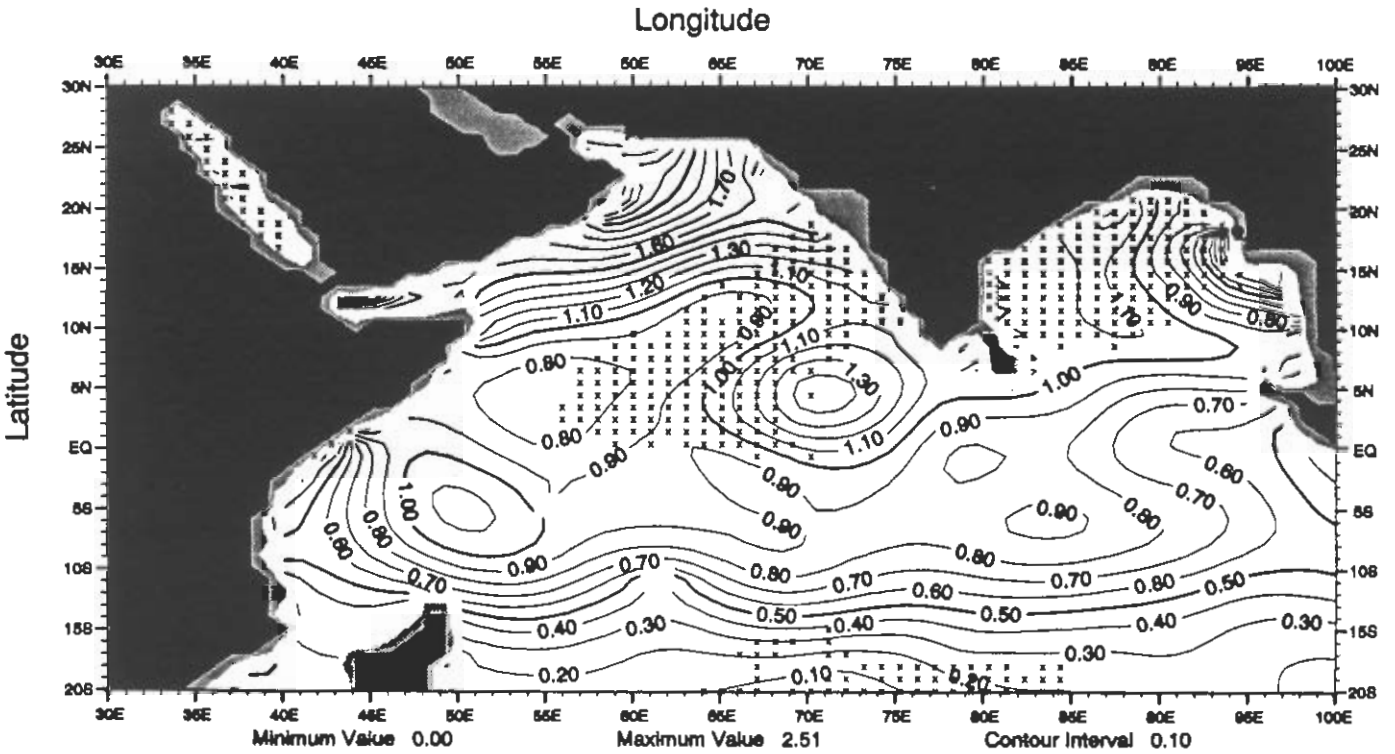

Fig. E33 Fall (Oct.-Dec.) mean phosphate (μM) at 100 m depth

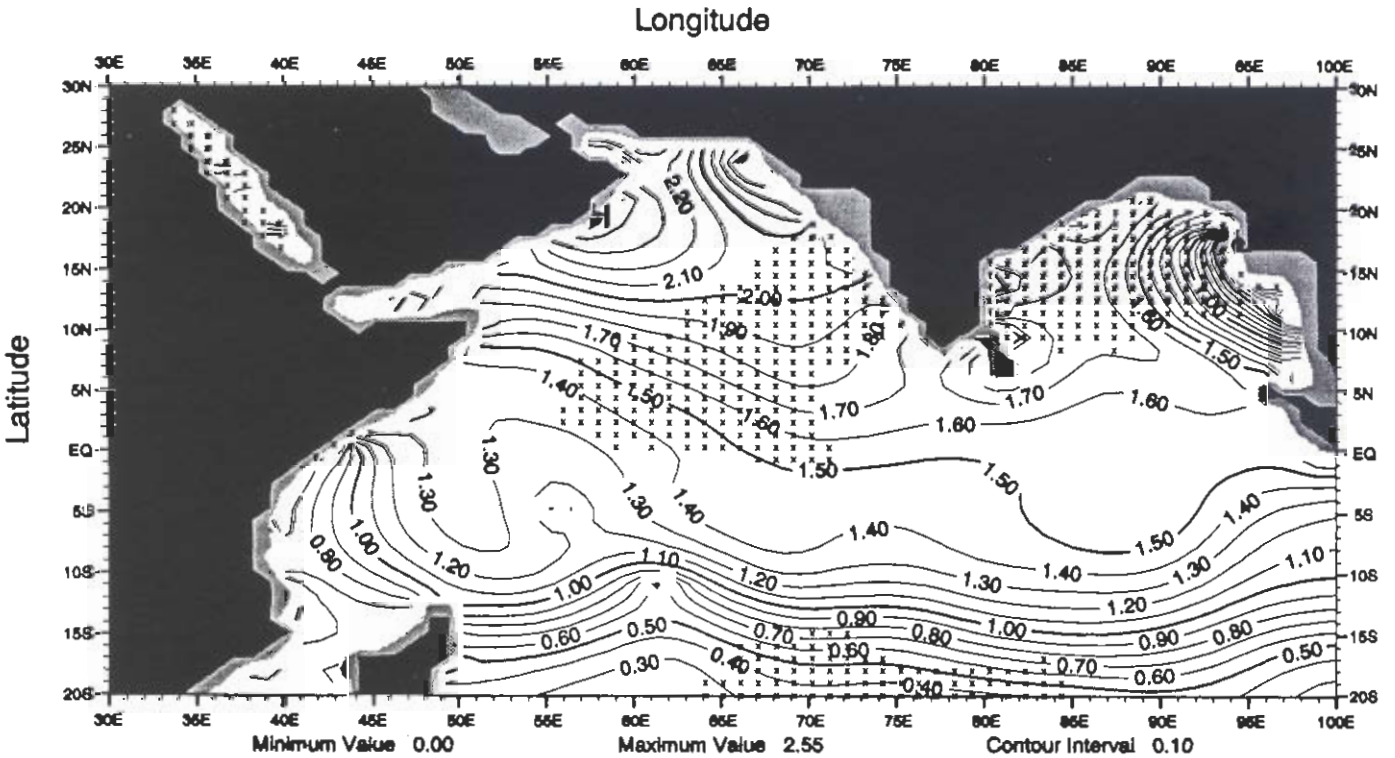

Fig. E34 Fall (Oct.-Dec.) mean phosphate (μM) at 150 m depth

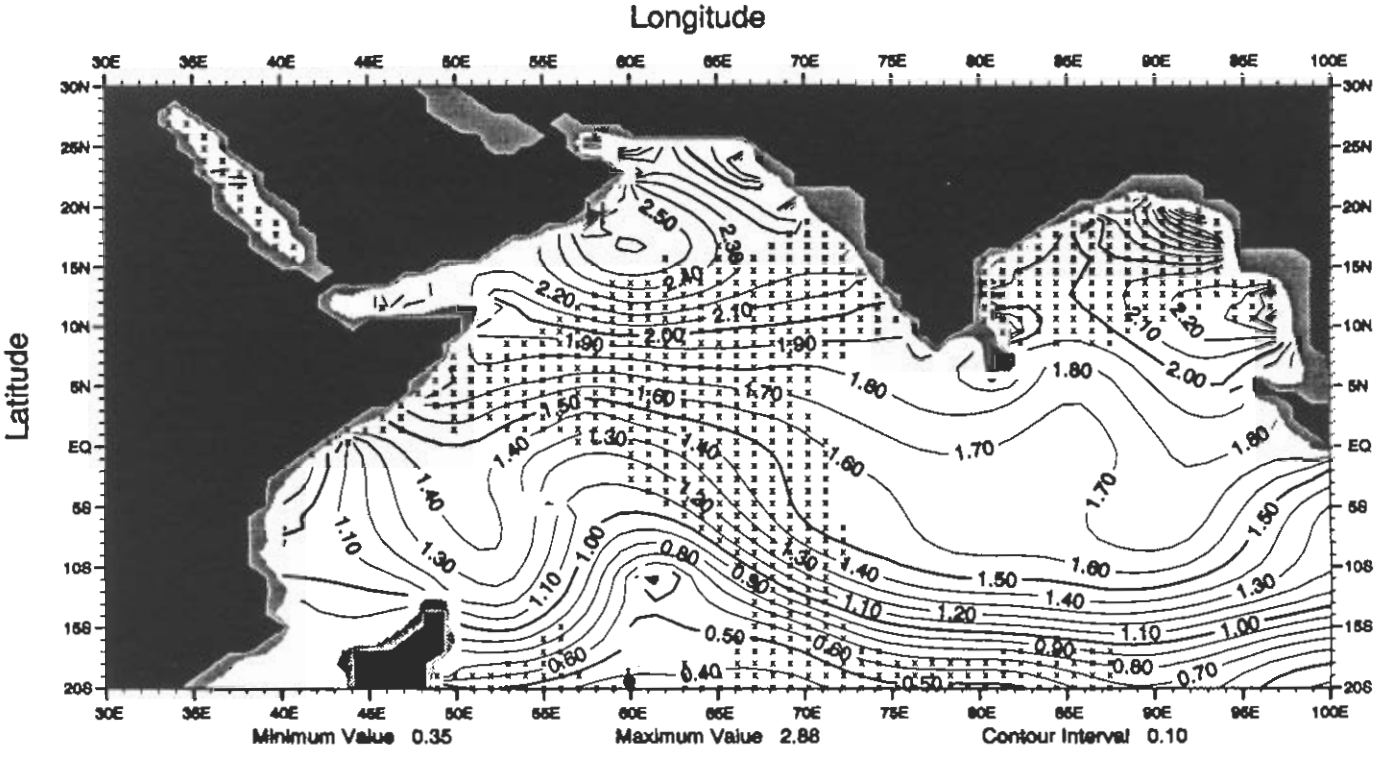

Fig. E35 Fall (Oct.-Dec.) mean phosphate (μM) at 200 m depth

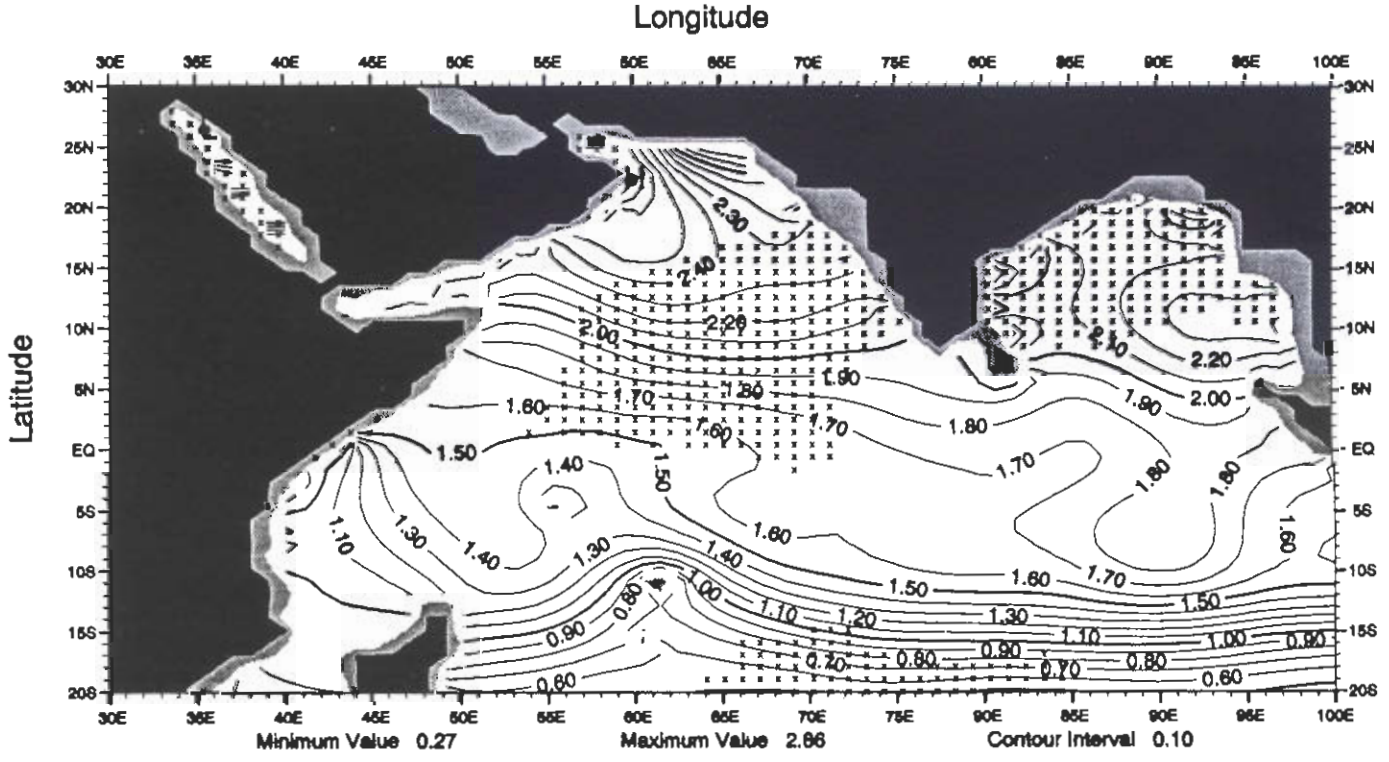

Fig. E36 Fall (Oct.-Dec.) mean phosphate (μM) at 250 m depth

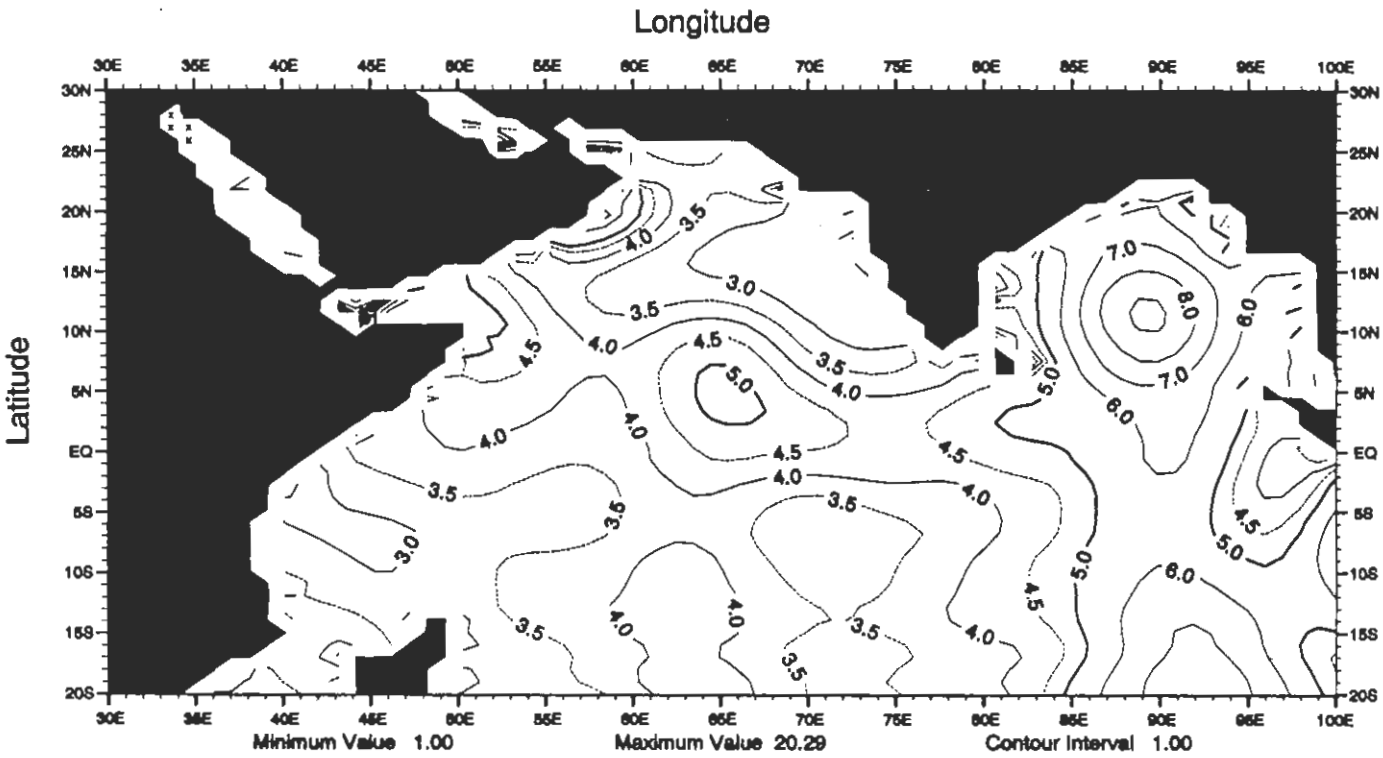

Fig. F1 Annual mean silicate (μM) at the surface

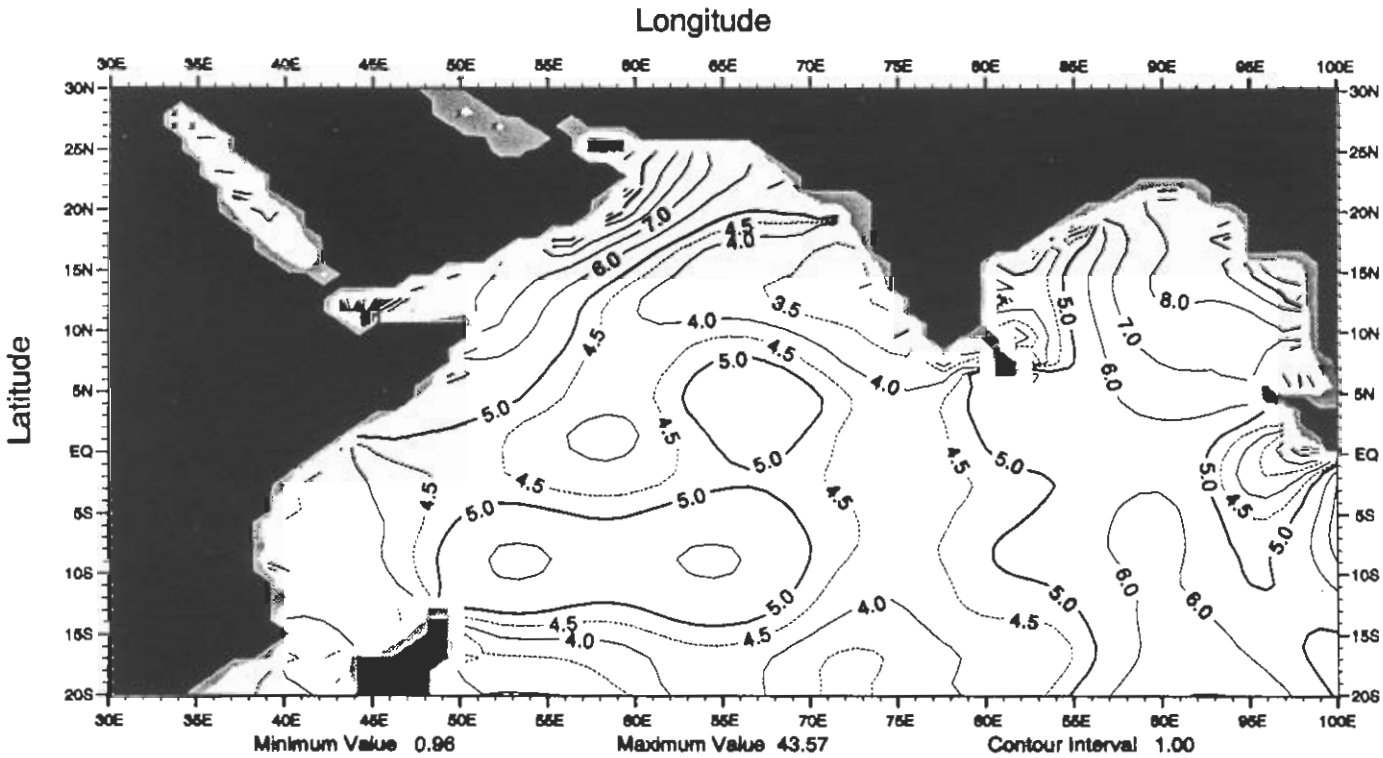

Fig. F2 Annual mean silicate (μM) at 50 m depth

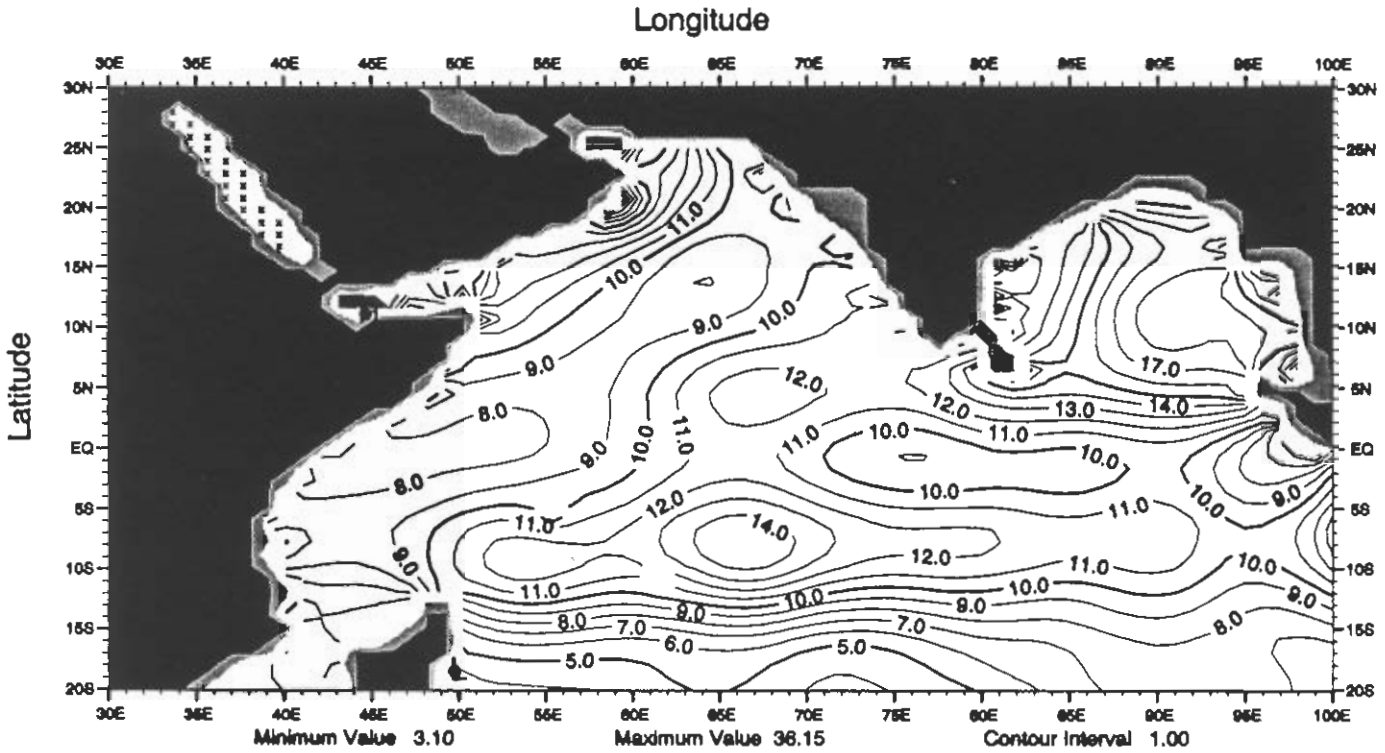

Fig. F3 Annual mean silicate (μM) at 100 m depth

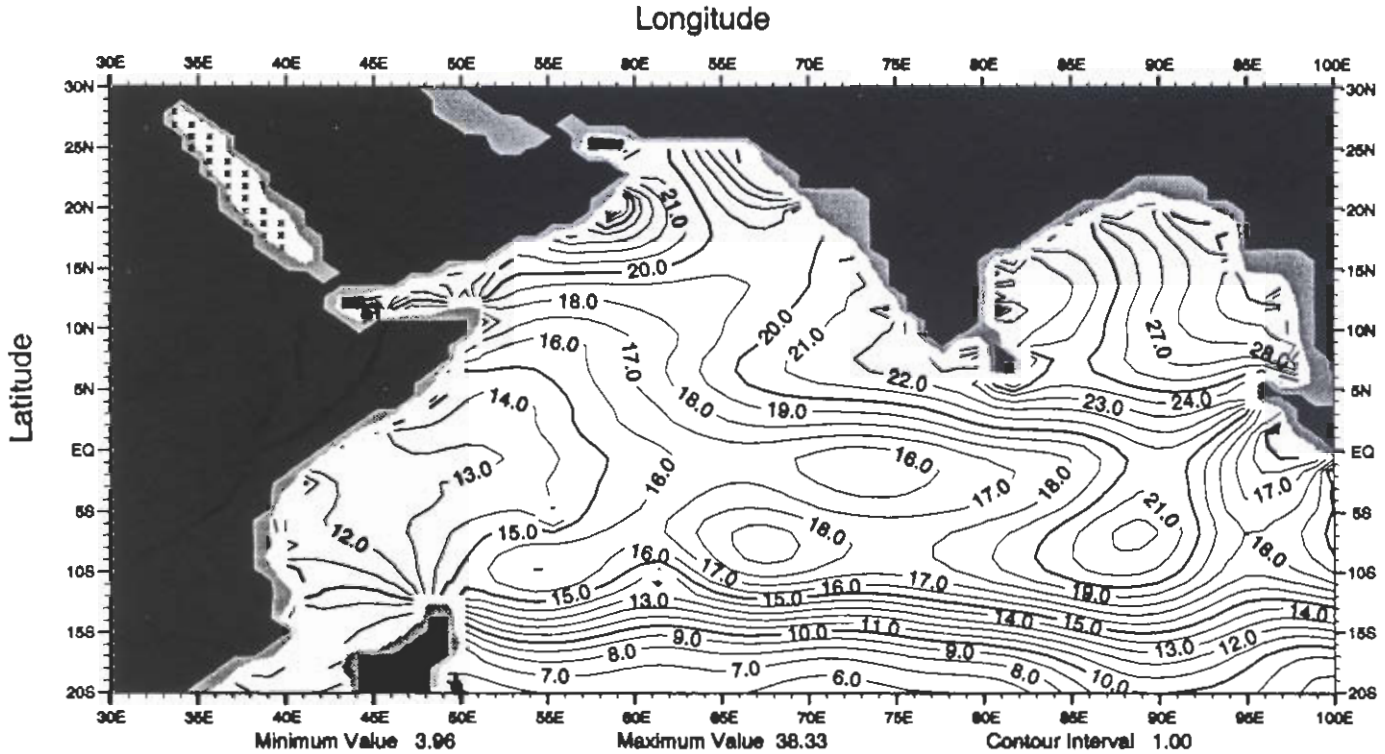

Fig. F4 Annual mean silicate (μM) at 150 m depth

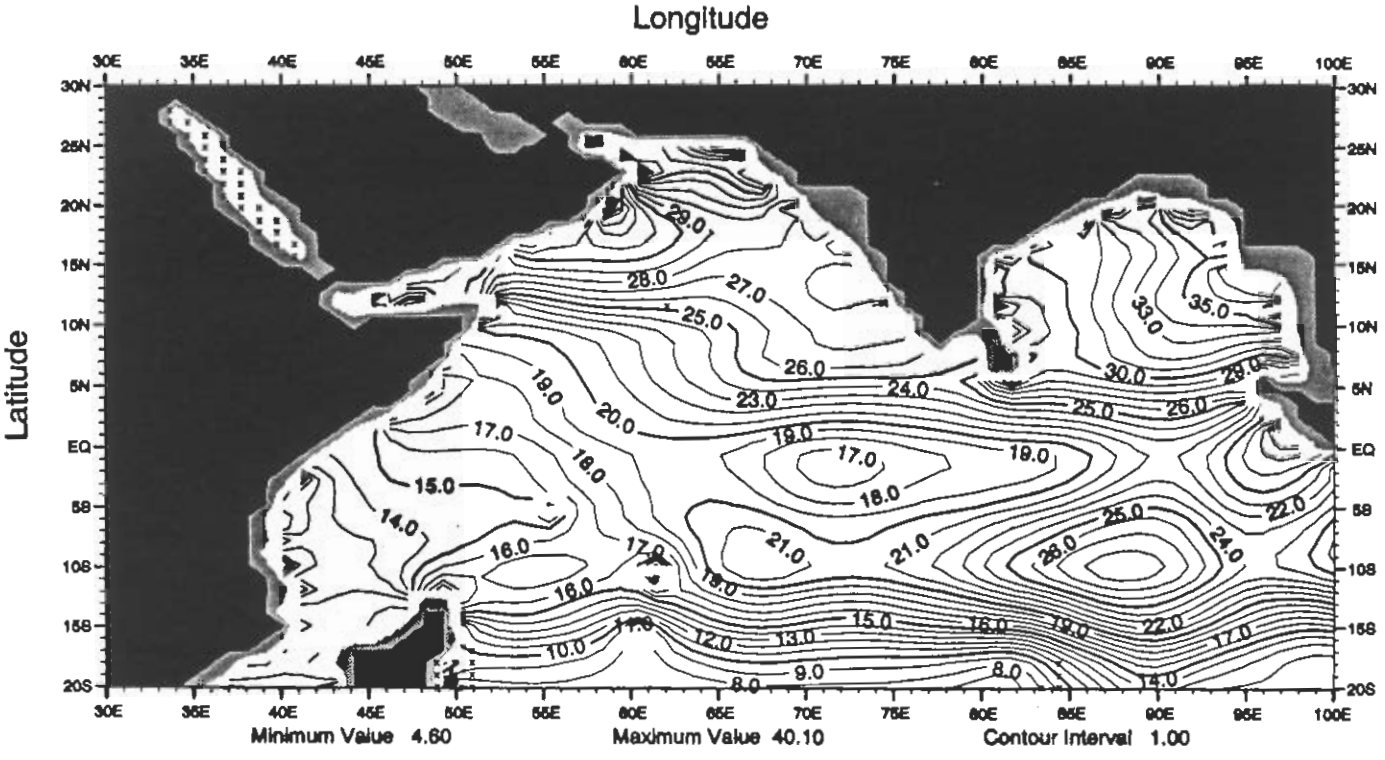

Fig. F5 Annual mean silicate (μM) at 200 m depth

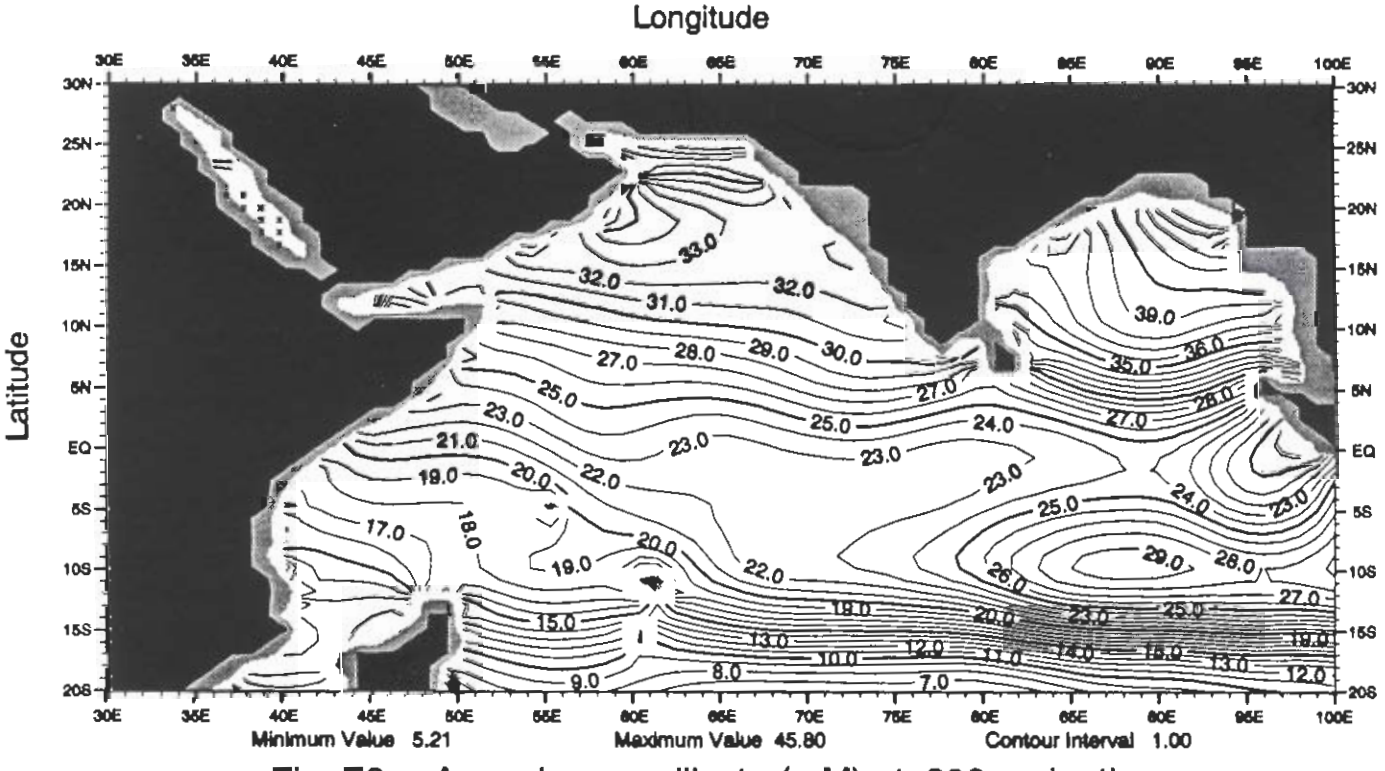

Fig. F6 Annual mean silicate (μM) at 300 m depth

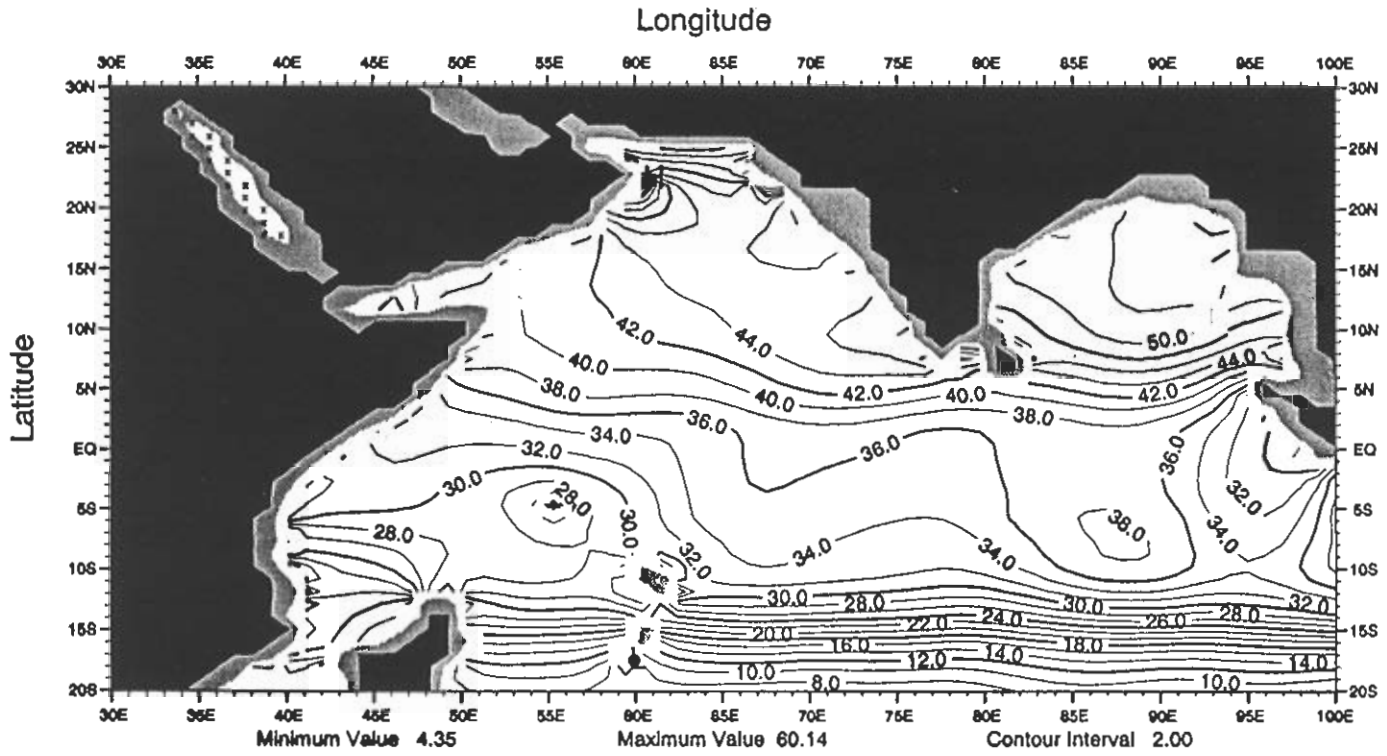

Fig. F7 Annual mean silicate (μM) at 500 m depth

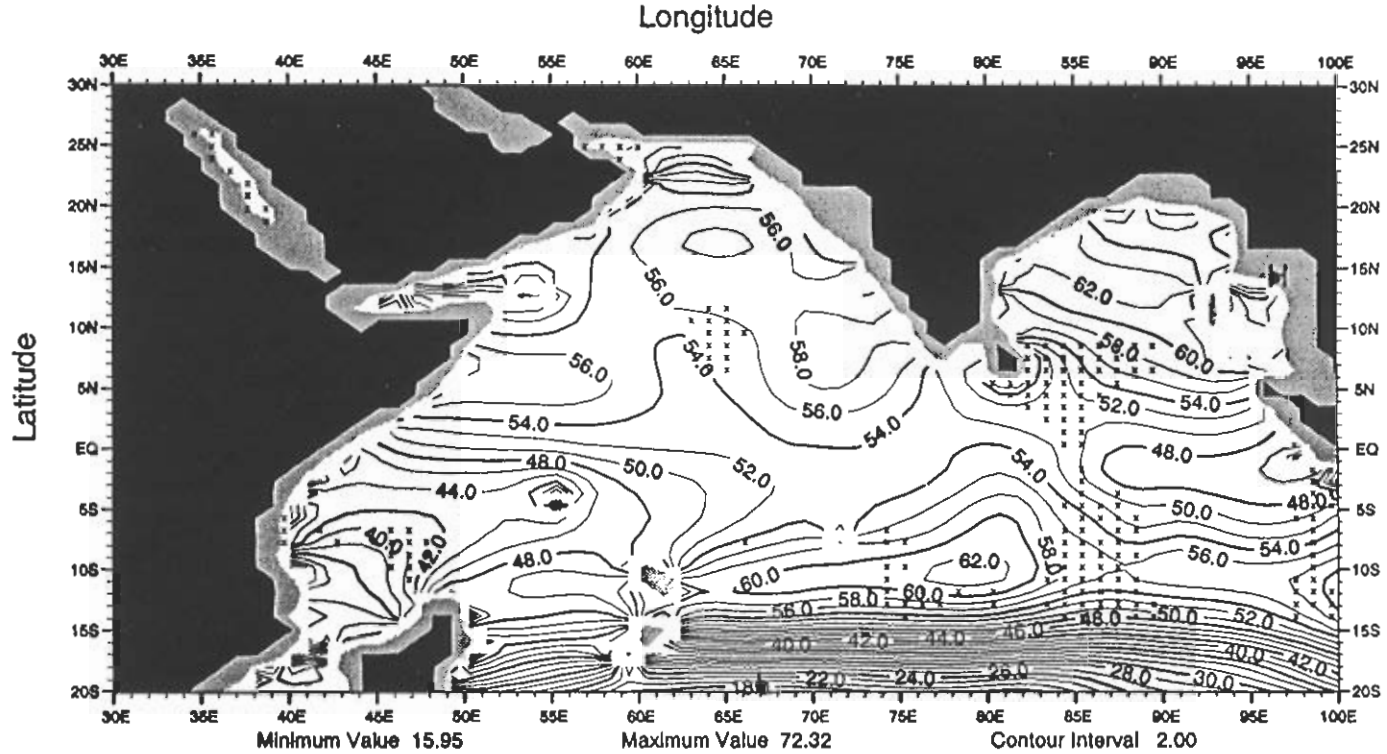

Fig. F8 Annual mean silicate (μM) at 700 m depth

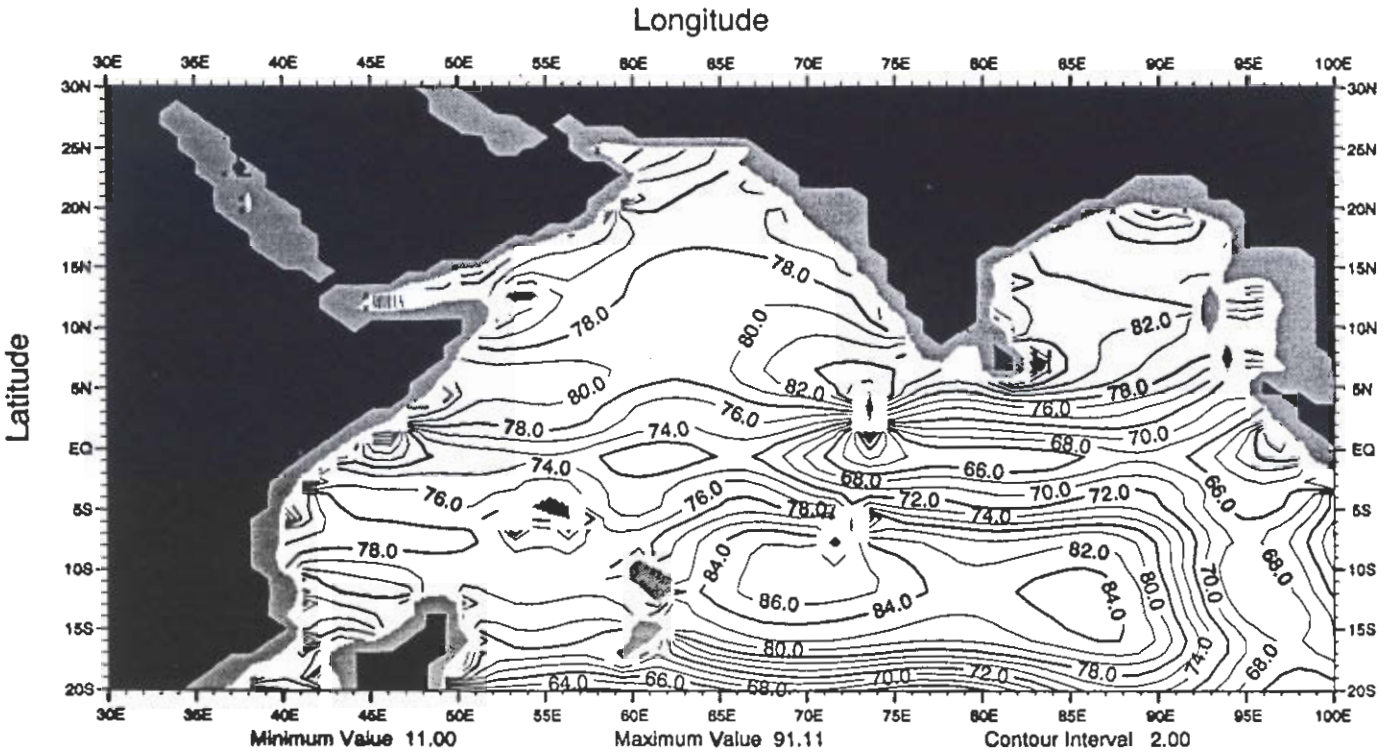

Fig. F9 Annual mean silicate (μM) at 1000 m depth

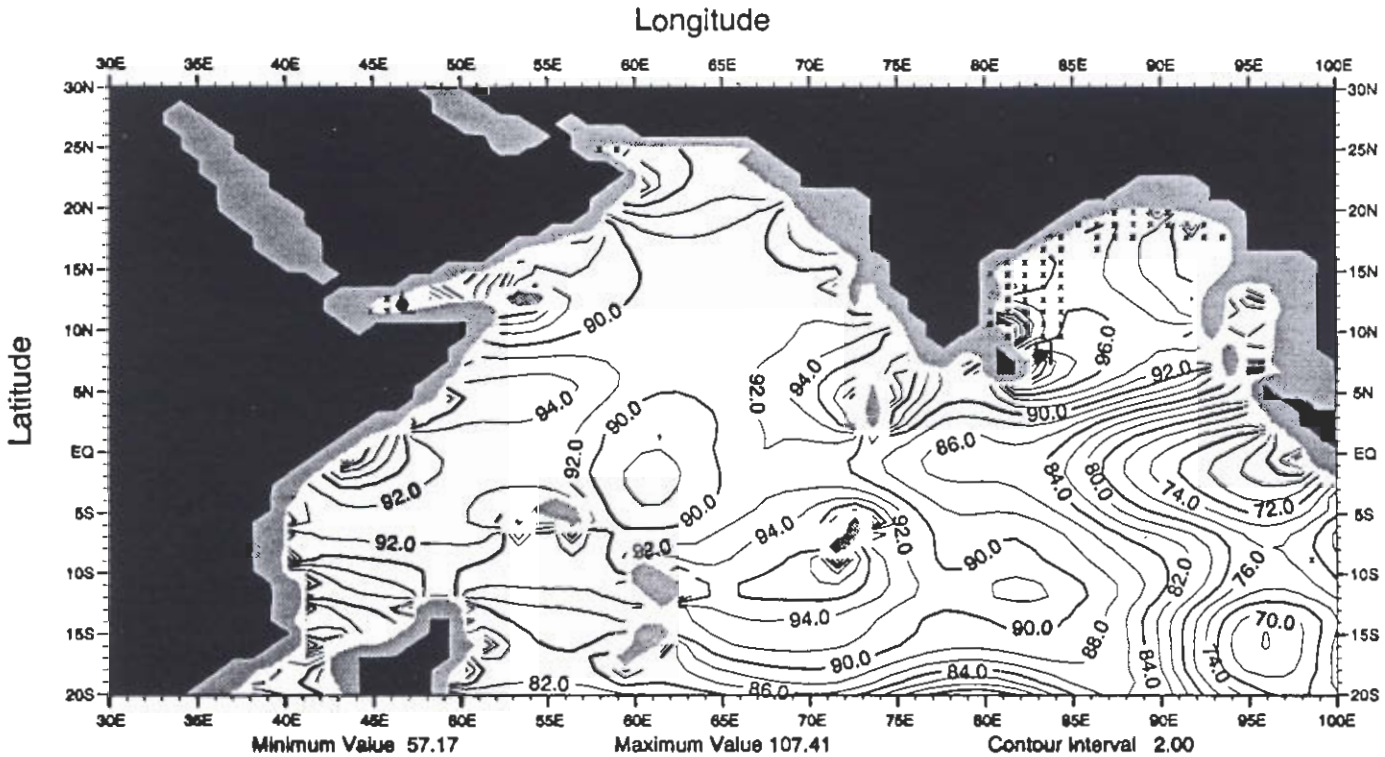

Fig. F10 Annual mean silicate (μM) at 1200 m depth

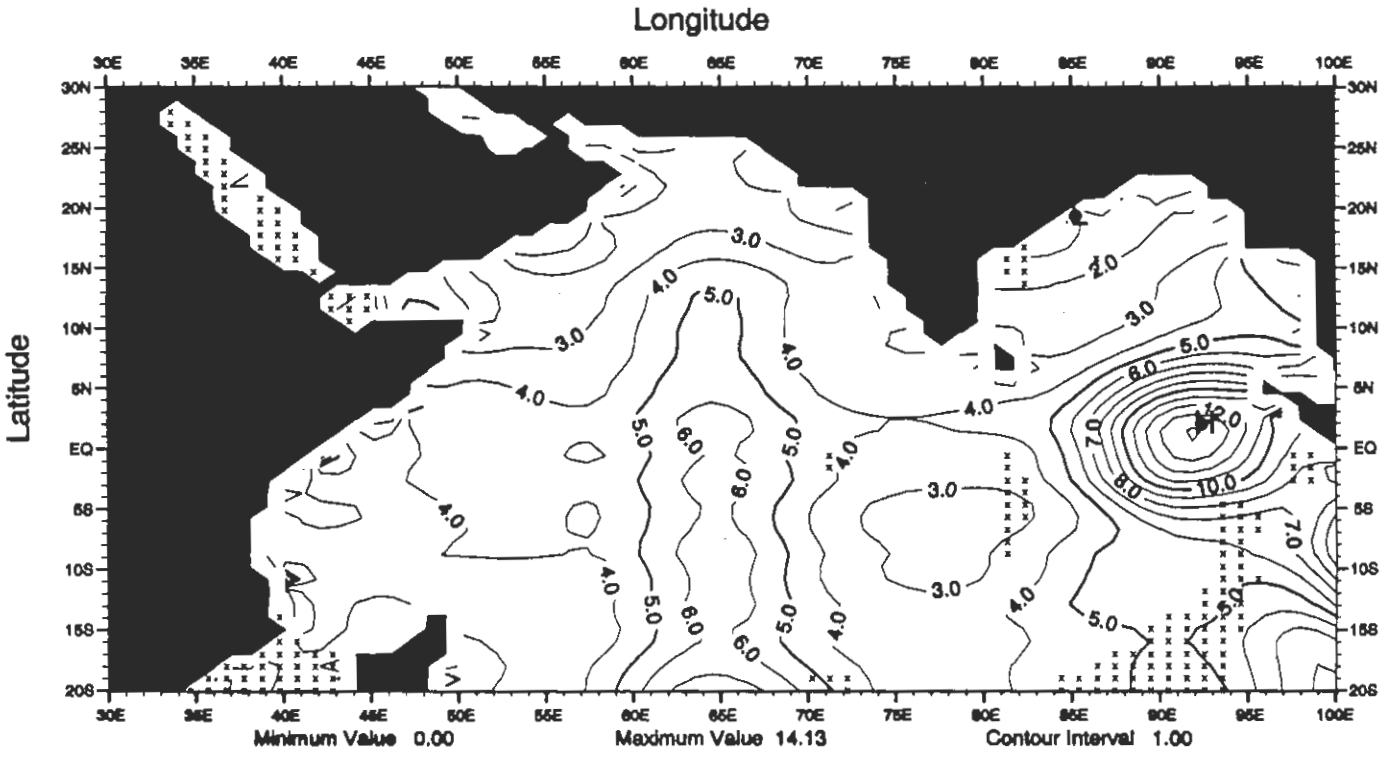

Fig. F13 Winter (Jan.-Mar.) mean silicate (μM) at the surface

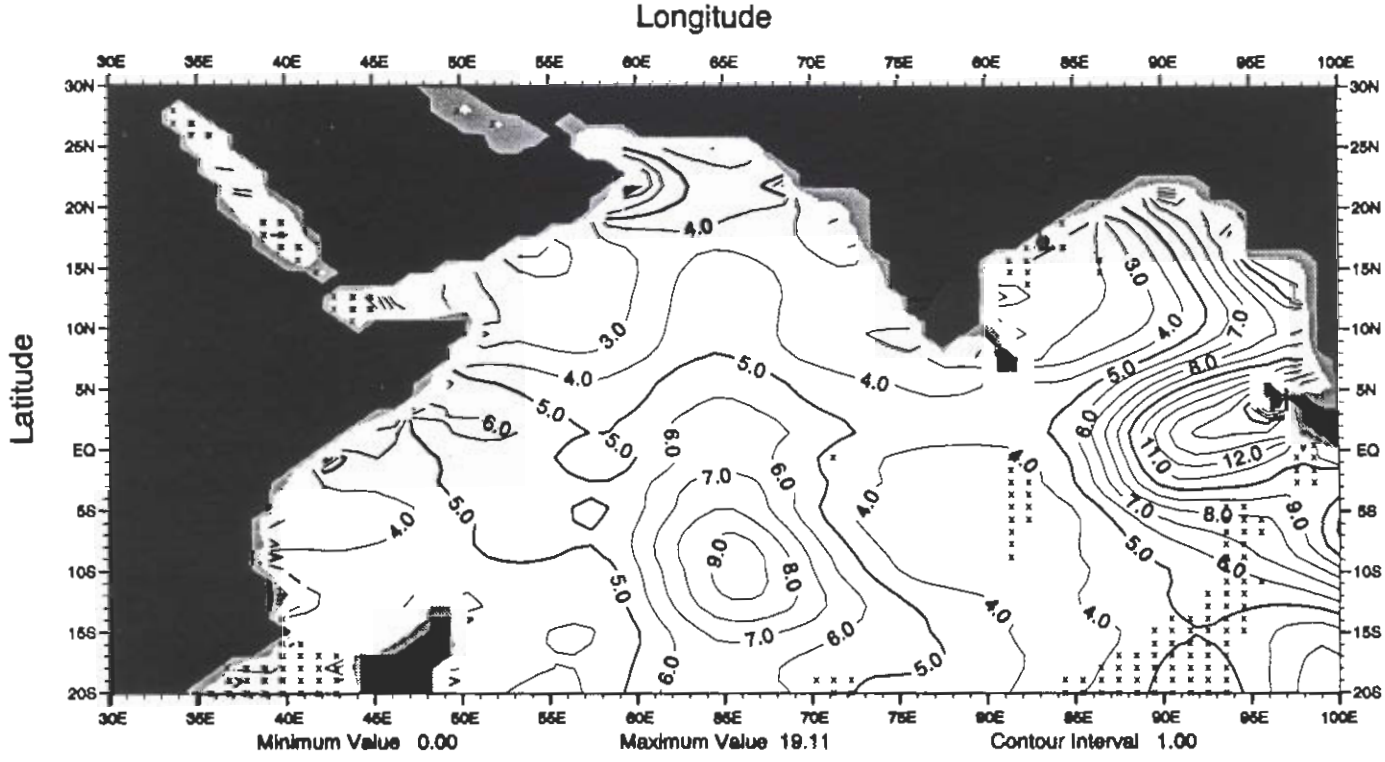

Fig. F14 Winter (Jan.-Mar.) mean silicate (μM) at 50 m depth

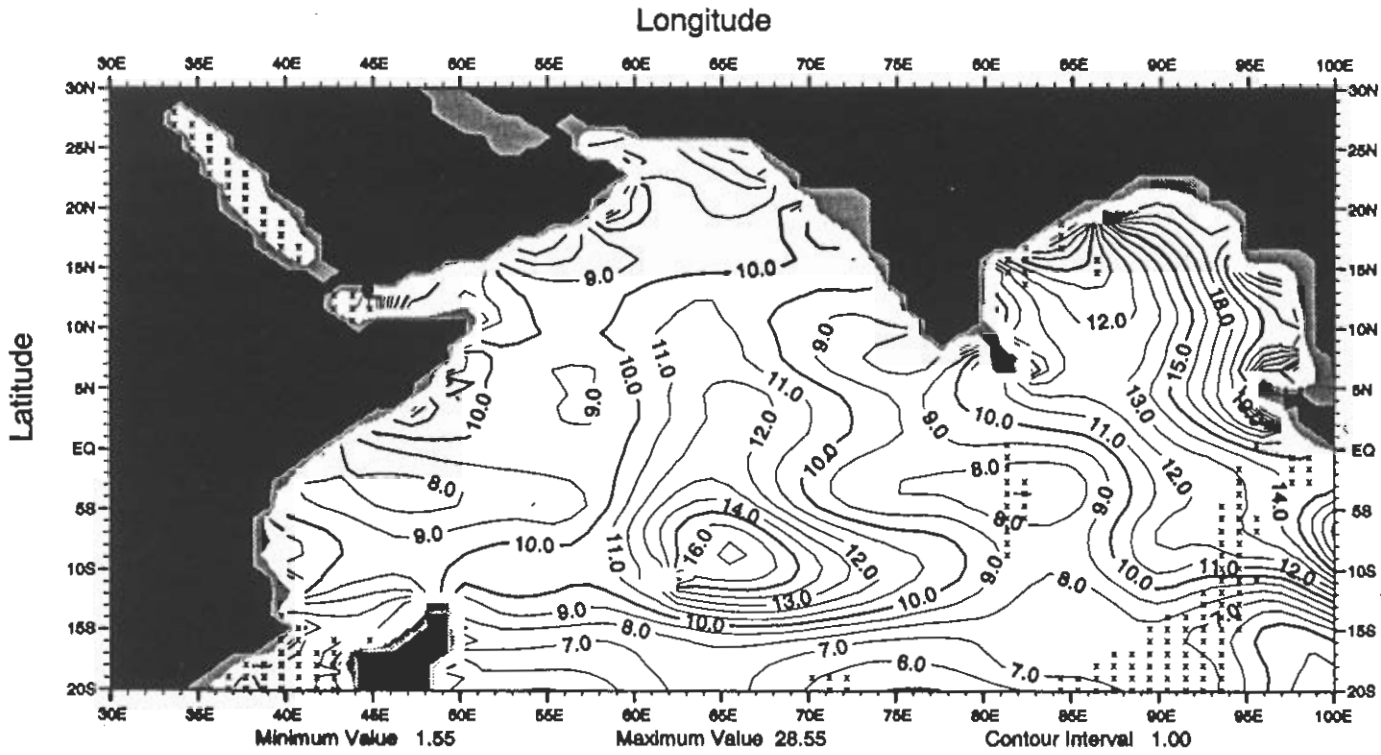

Fig. F15 Winter (Jan.-Mar.) mean silicate (μM) at 100 m depth

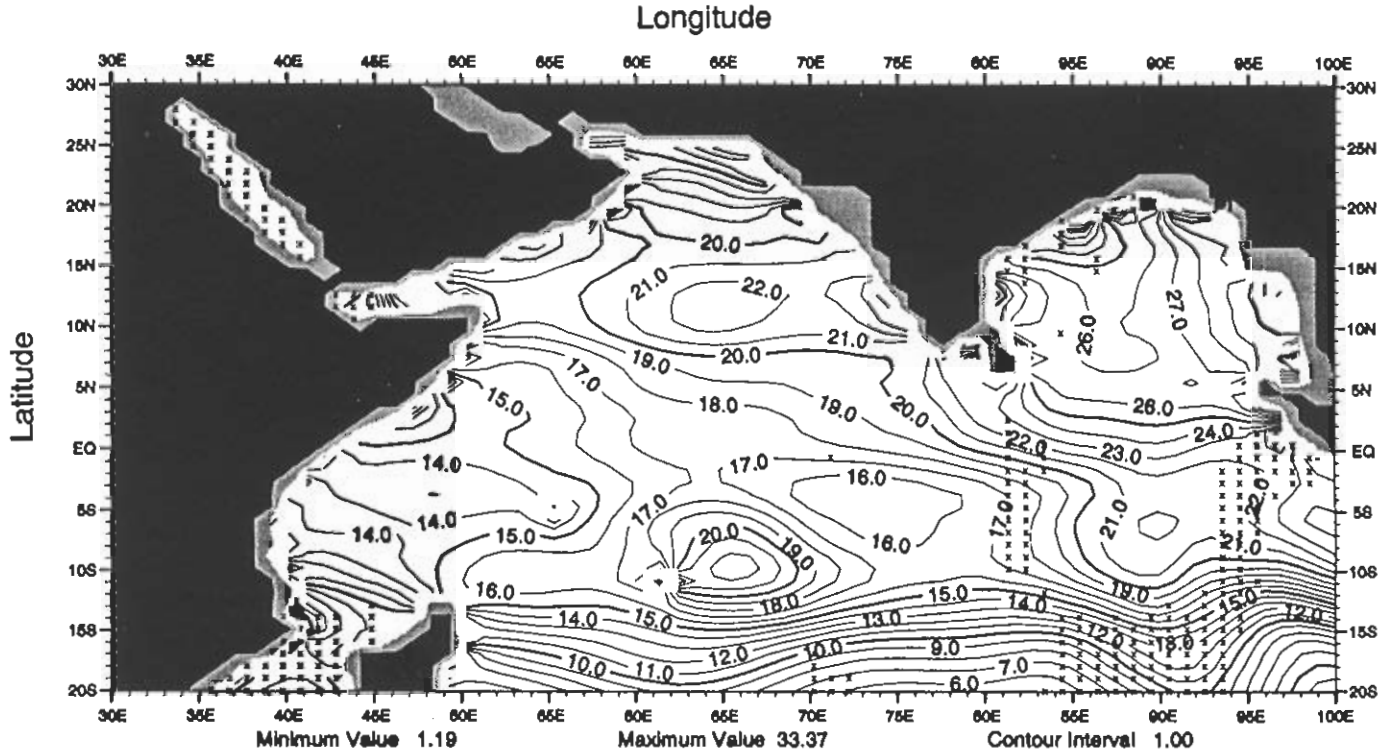

Fig. F16 Winter (Jan.-Mar.) mean silicate (μM) at 150 m depth

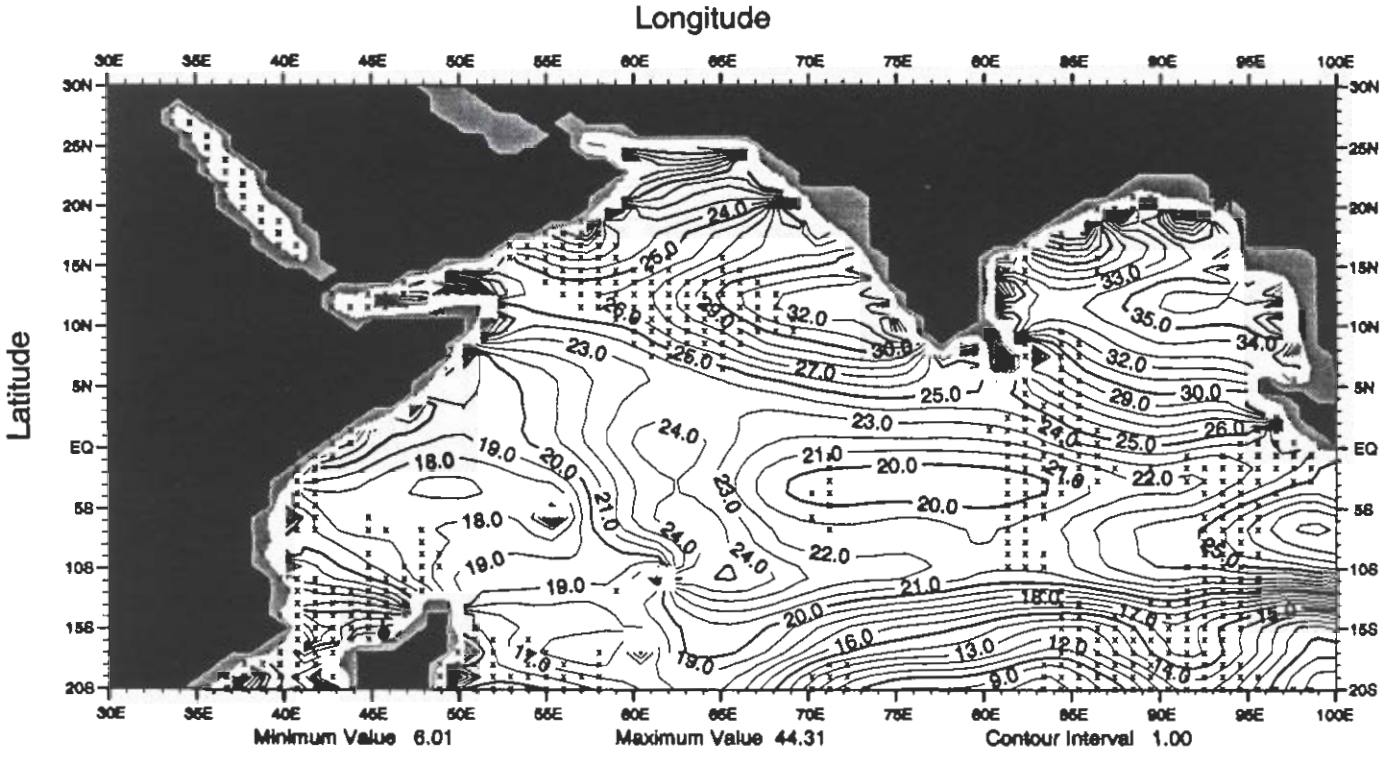

Fig. F17 Winter (Jan.-Mar.) mean silicate (μM) at 200 m depth

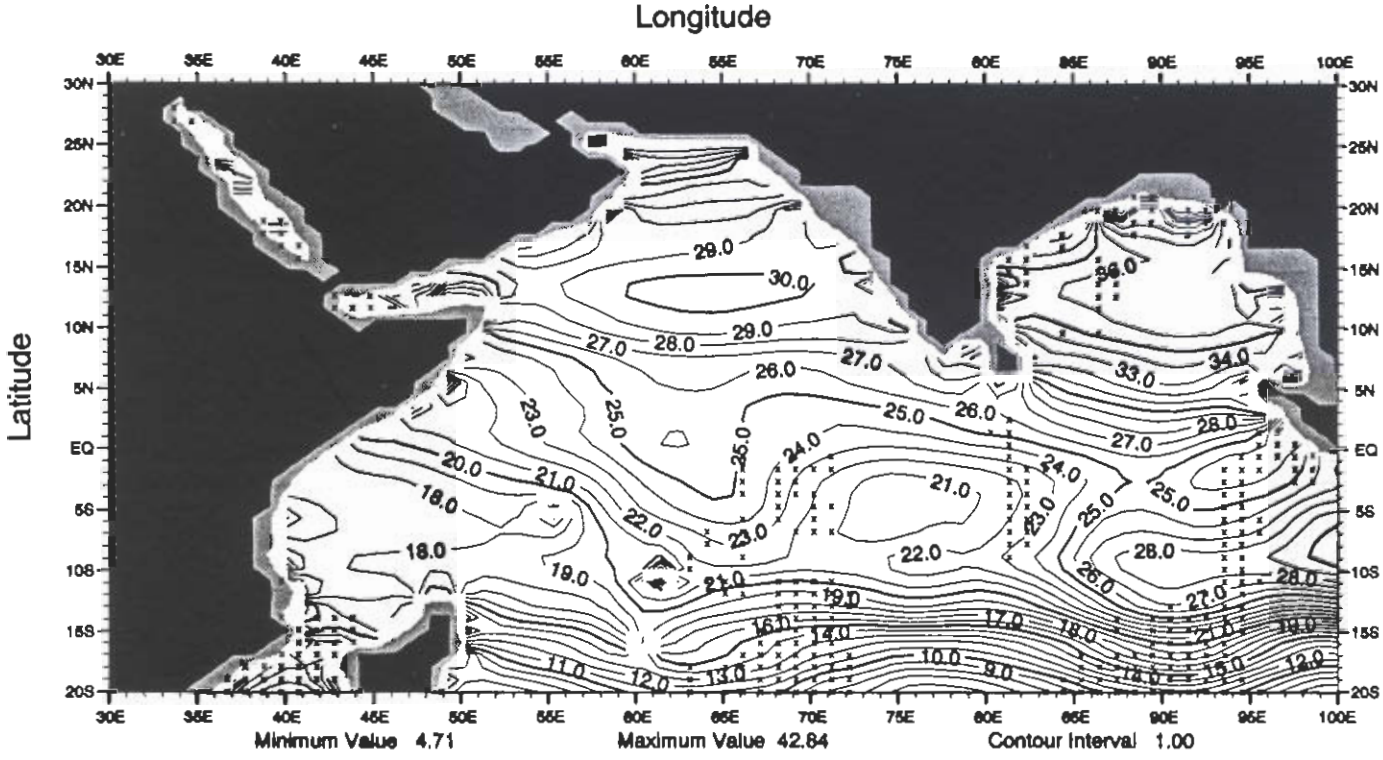

Fig. F18 Winter (Jan.-Mar.) mean silicate (μM) at 250 m depth

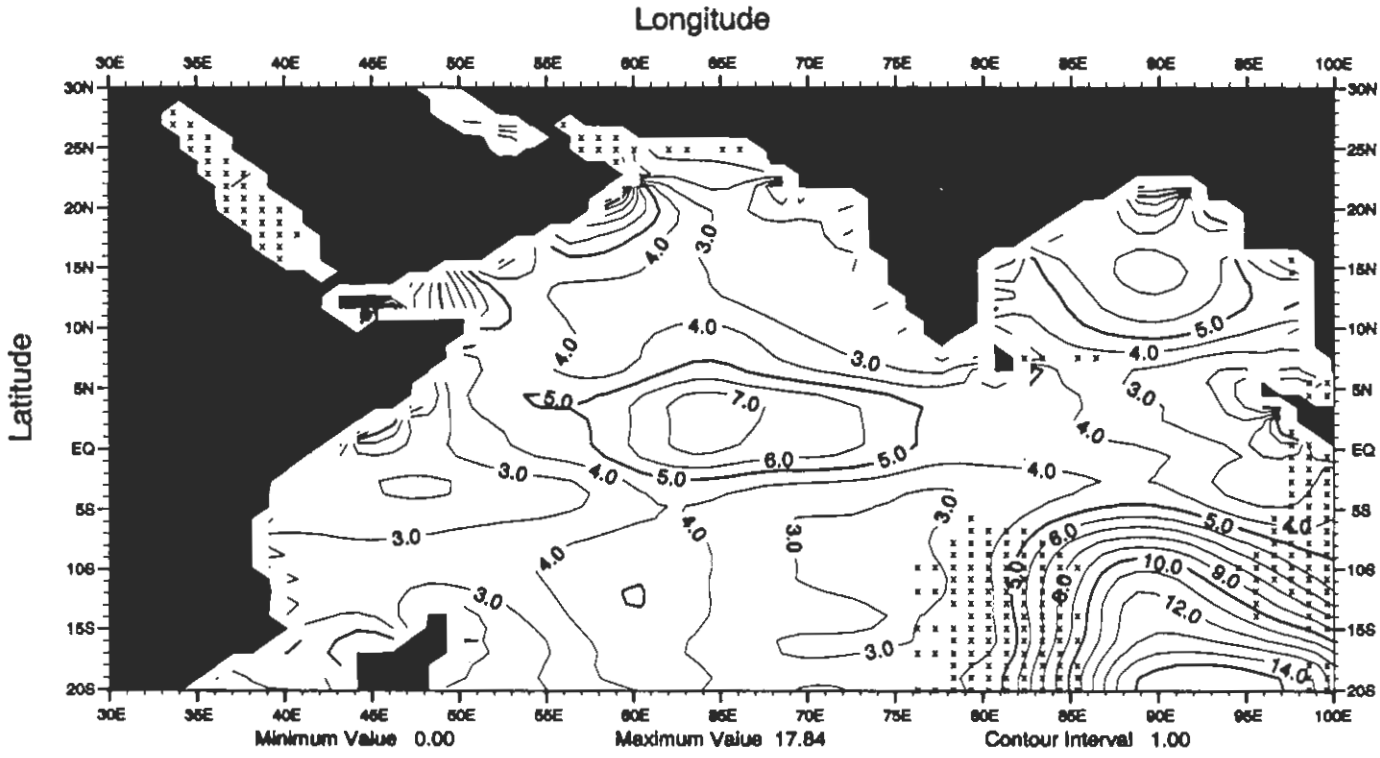

Fig. F19 Spring (Apr.-Jun.) mean silicate (μM) at the surface

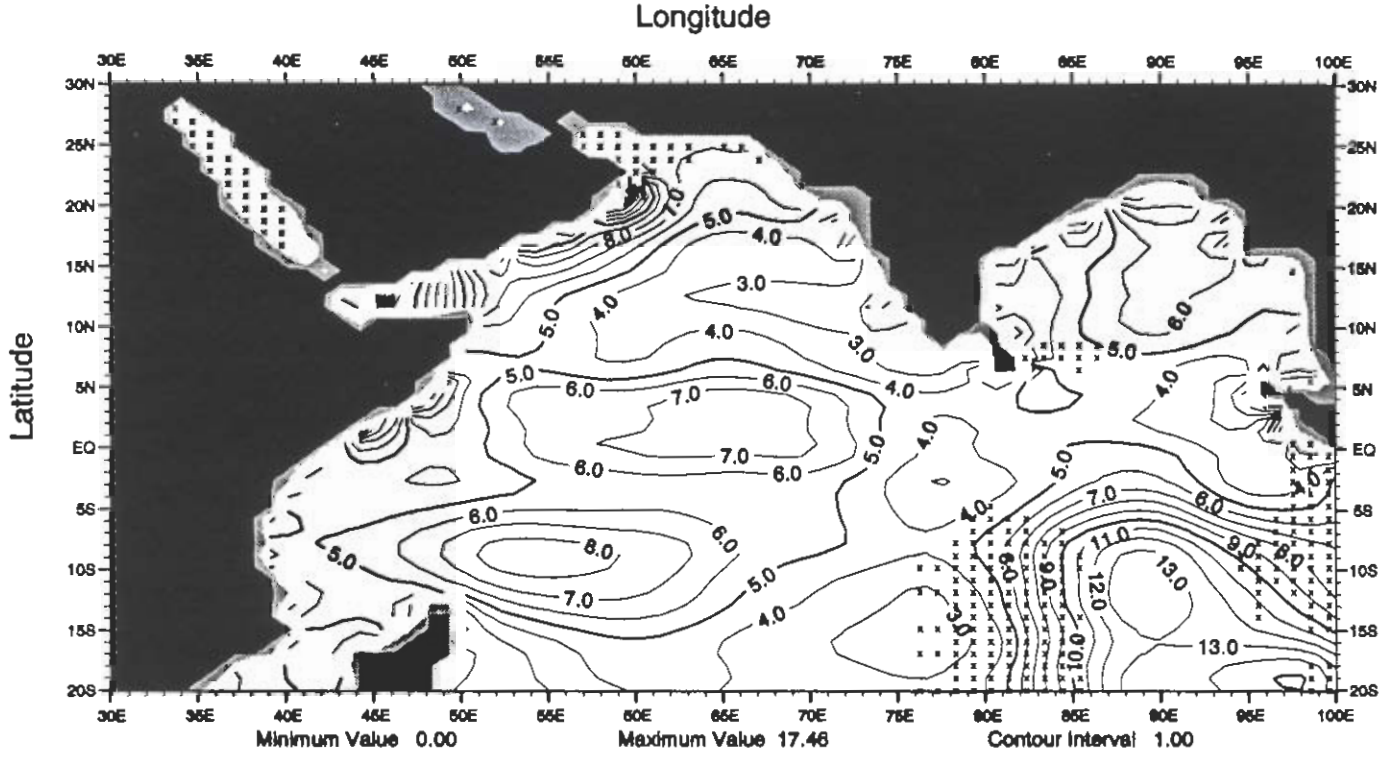

Fig. F20 Spring (Apr.-Jun.) mean silicate (μM) at 50 m depth

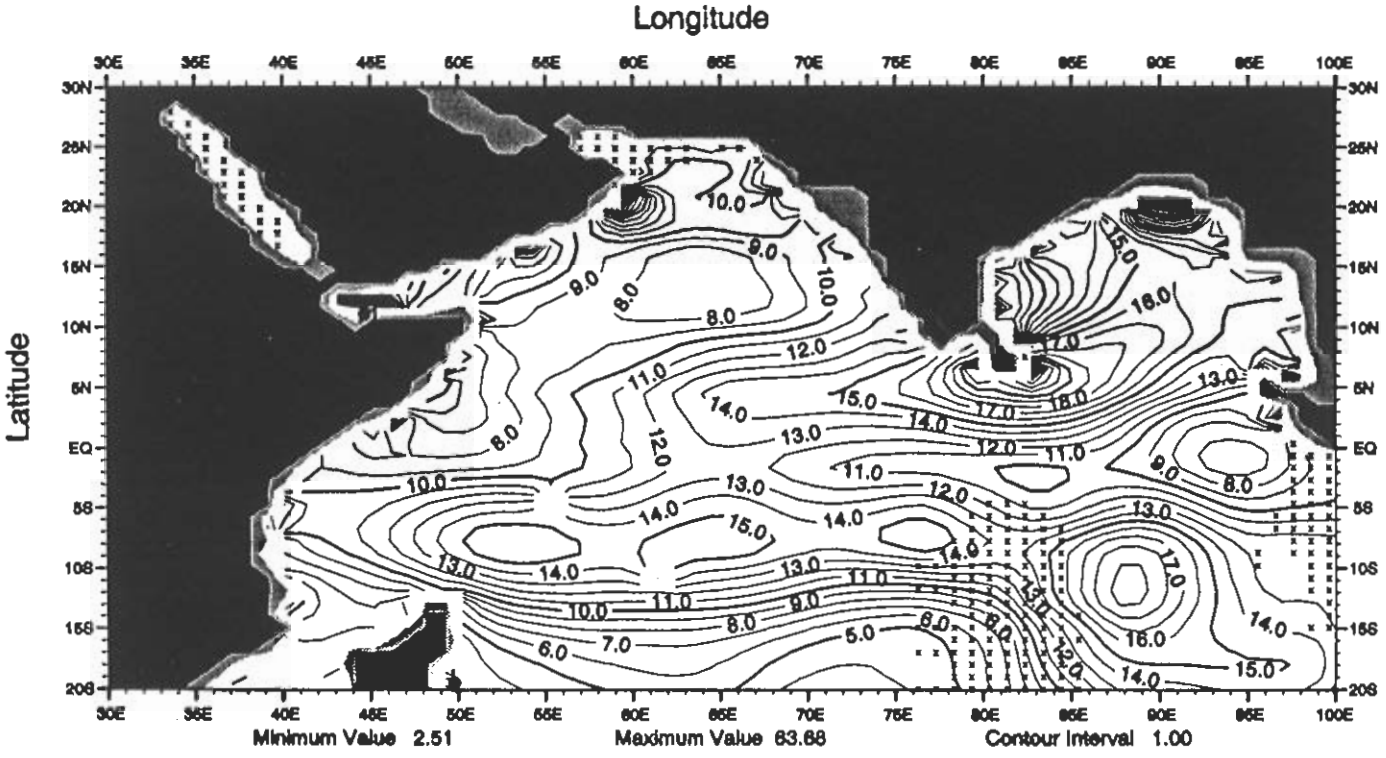

Fig. F21 Spring (Apr.-Jun.) mean silicate (μM) at 100 m depth

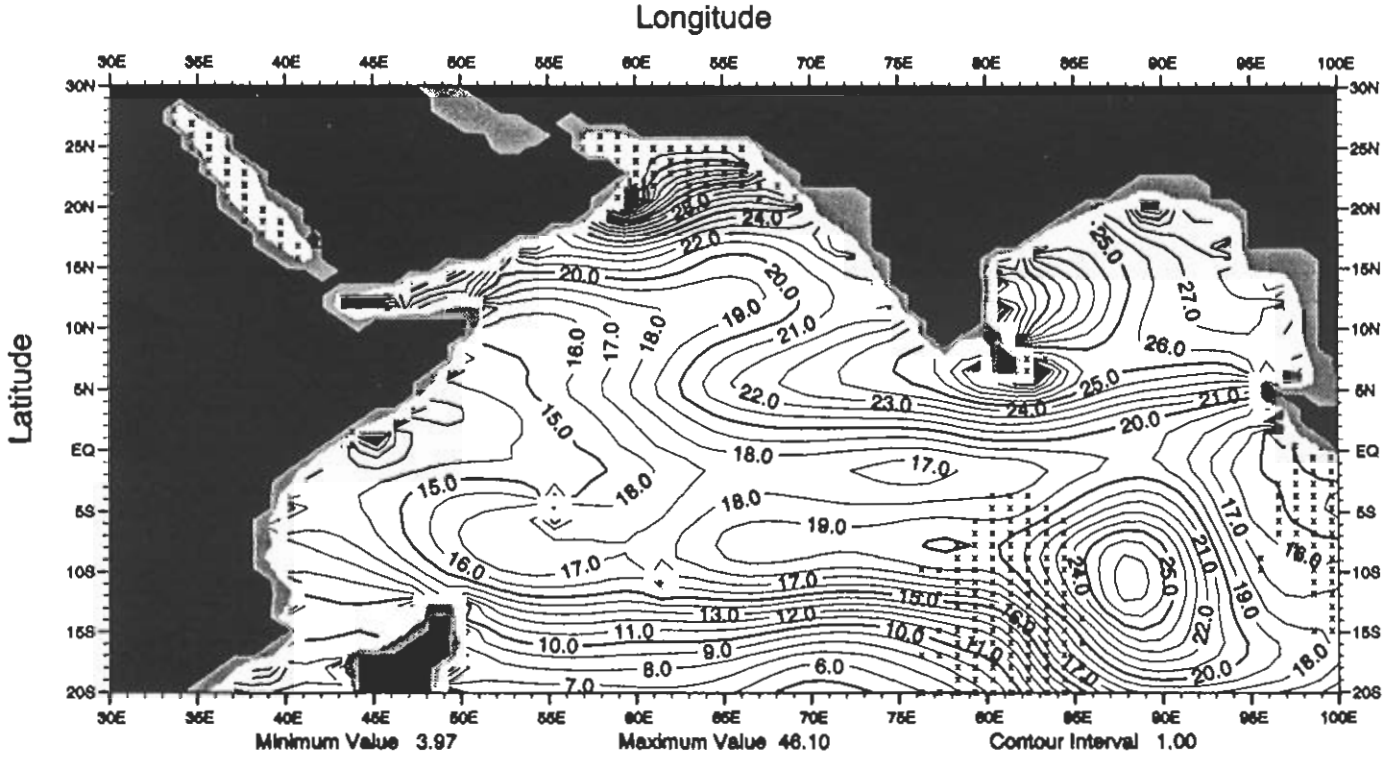

Fig. F22 Spring (Apr.-Jun.) mean silicate (μM) at 150 m depth

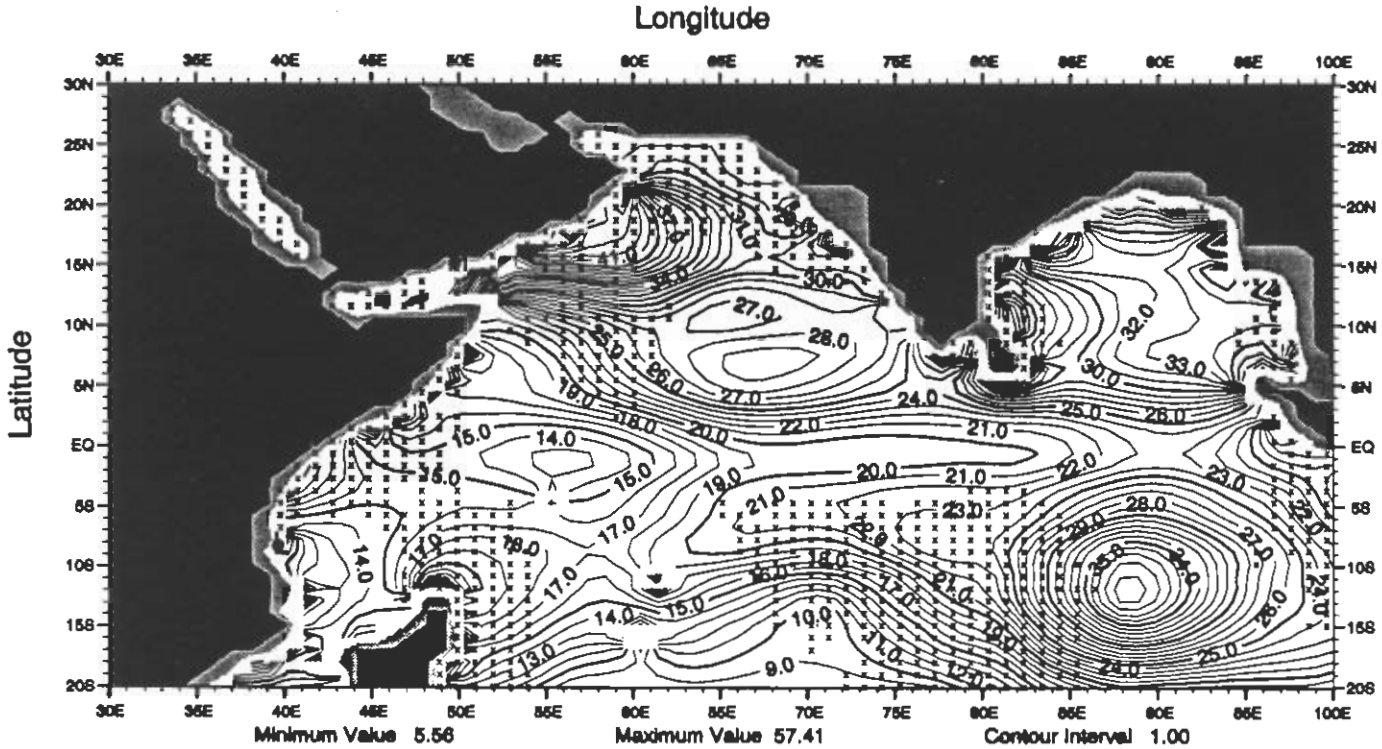

Fig. F23 Spring (Apr.-Jun.) mean silicate (μM) at 200 m depth

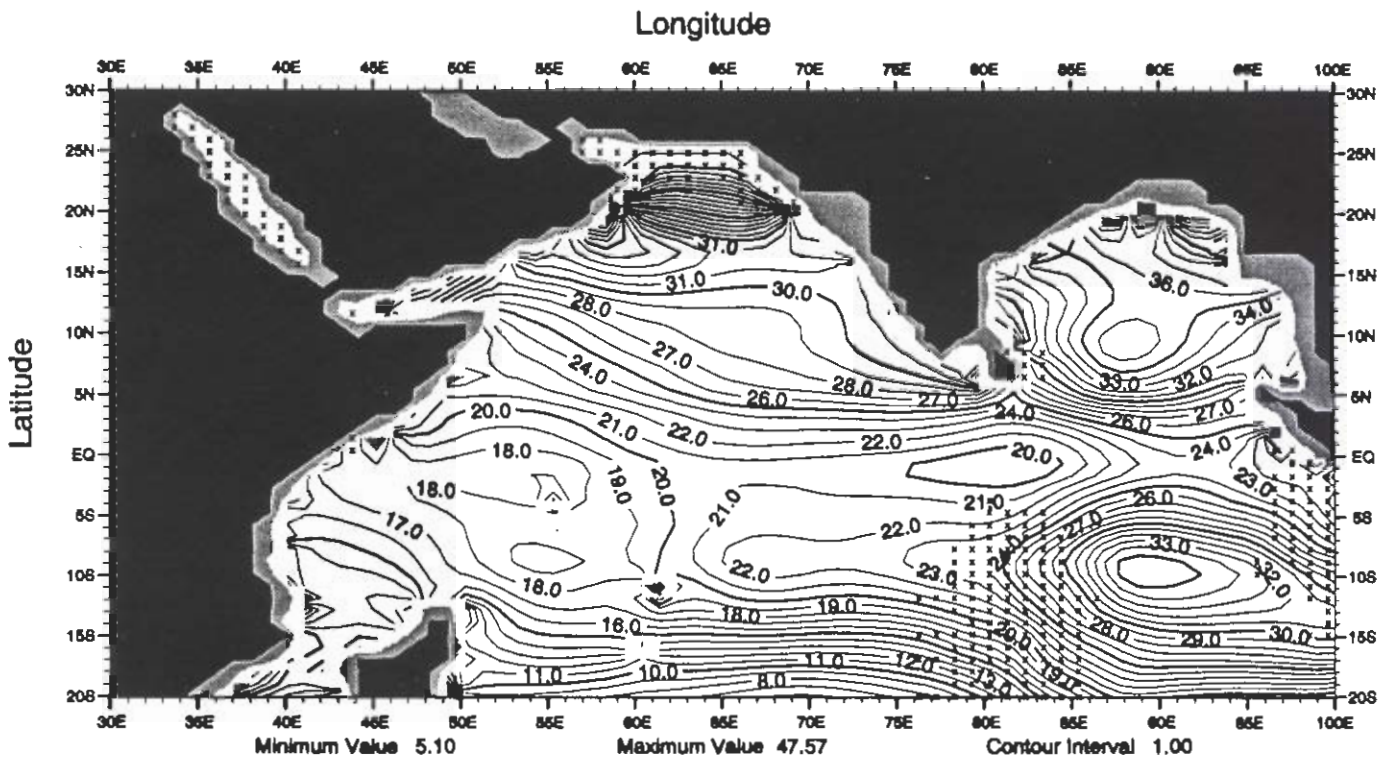

Fig. F24 Spring (Apr.-Jun.) mean silicate (μM) at 250 m depth

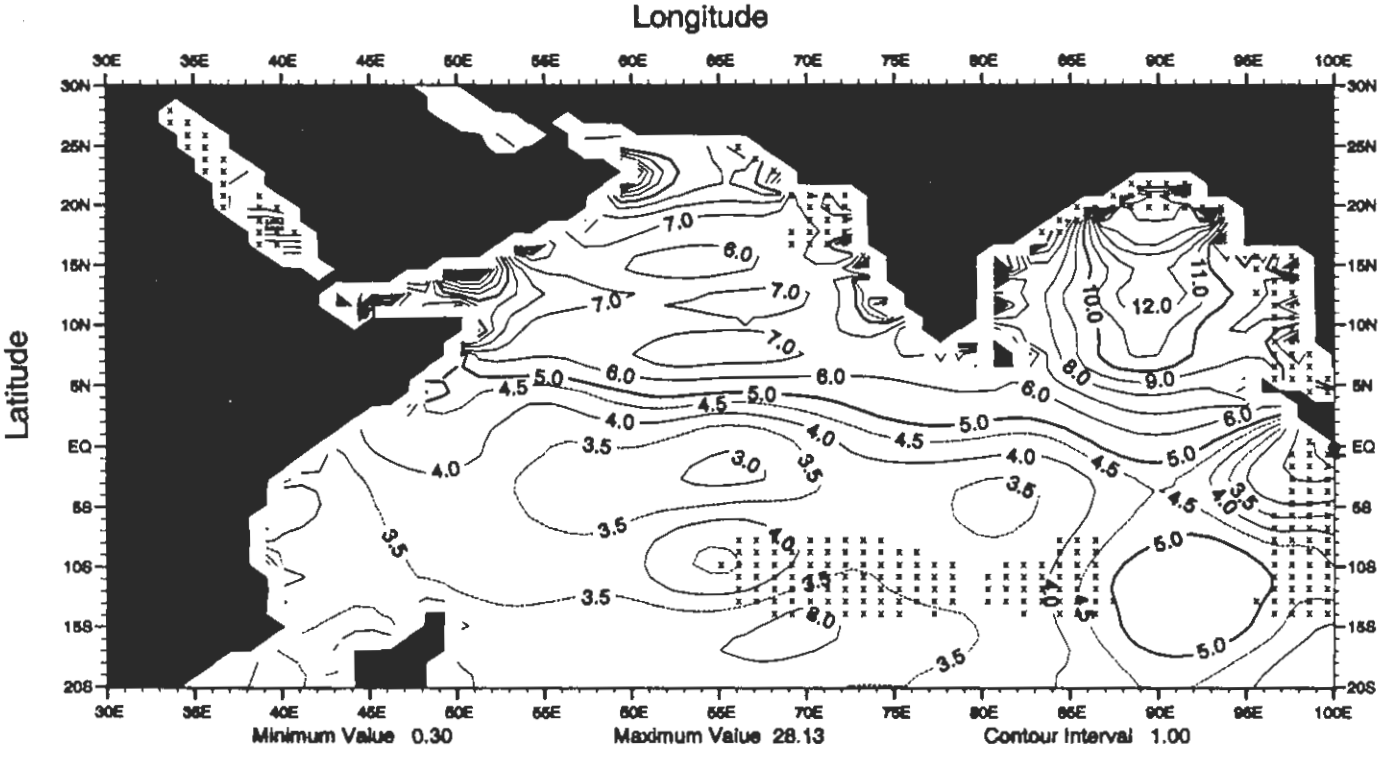

Fig. F25 Summer (Jul.-Sep.) mean silicate (μM) at the surface

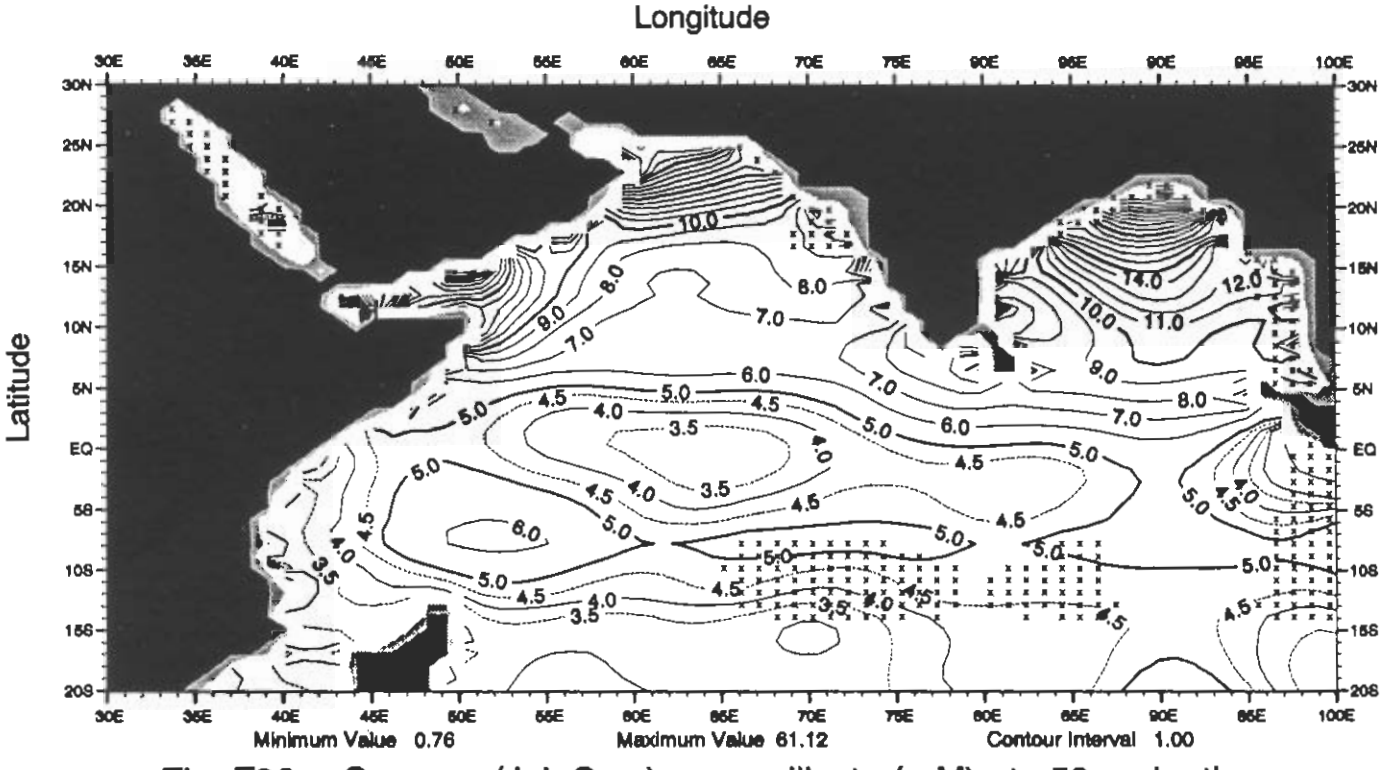

Fig. F26 Summer (Jul.-Sep.) mean silicate (μM) at 50 m depth

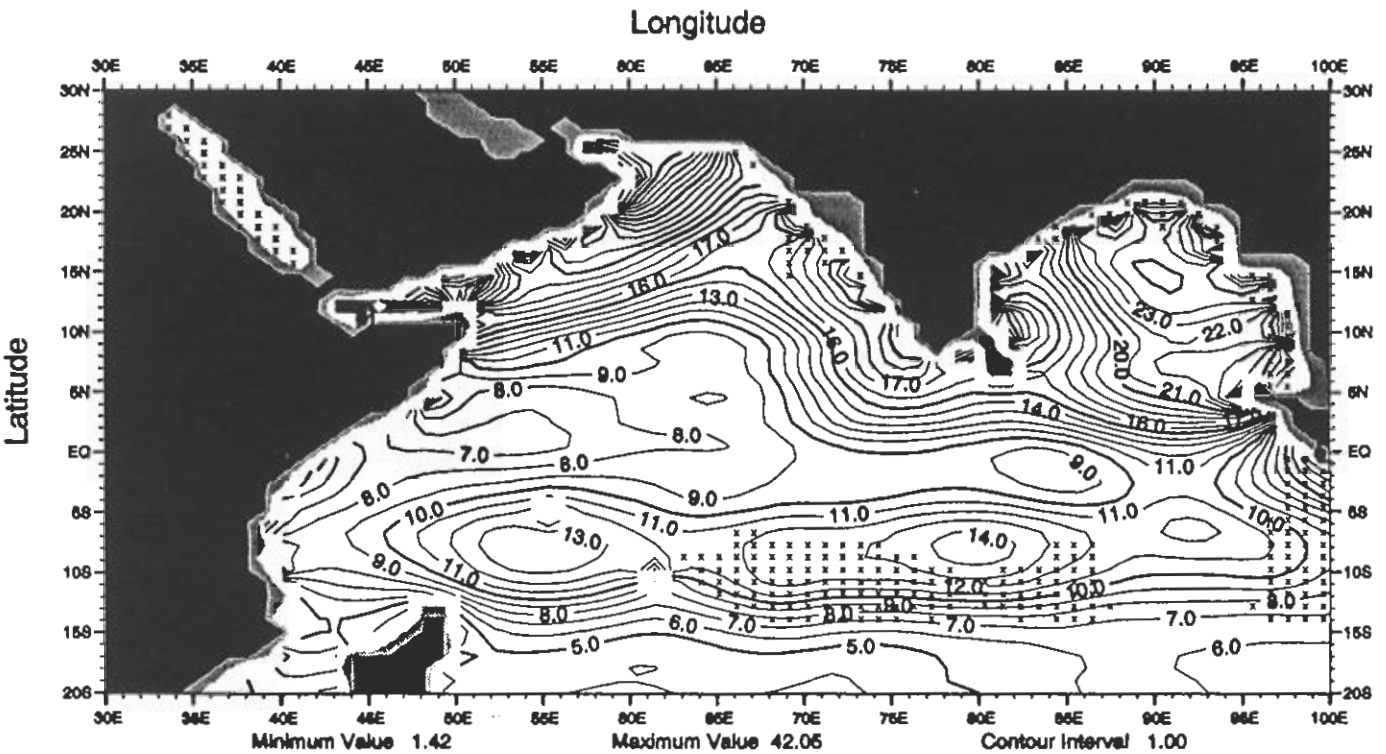

Fig. F27 Summer (Jul.-Sep.) mean silicate (μM) at 100 m depth

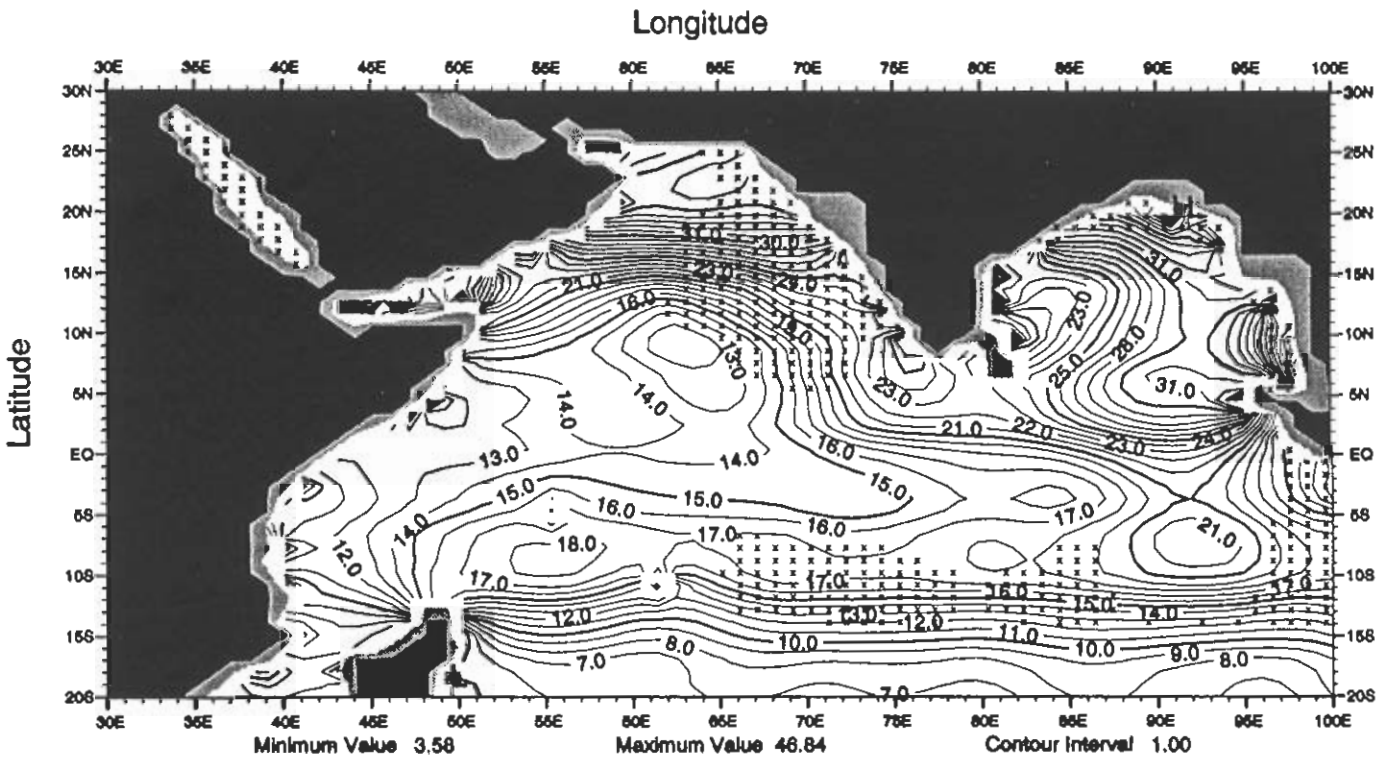

Fig. F28 Summer (Jul.-Sep.) mean silicate (μM) at 150 m depth

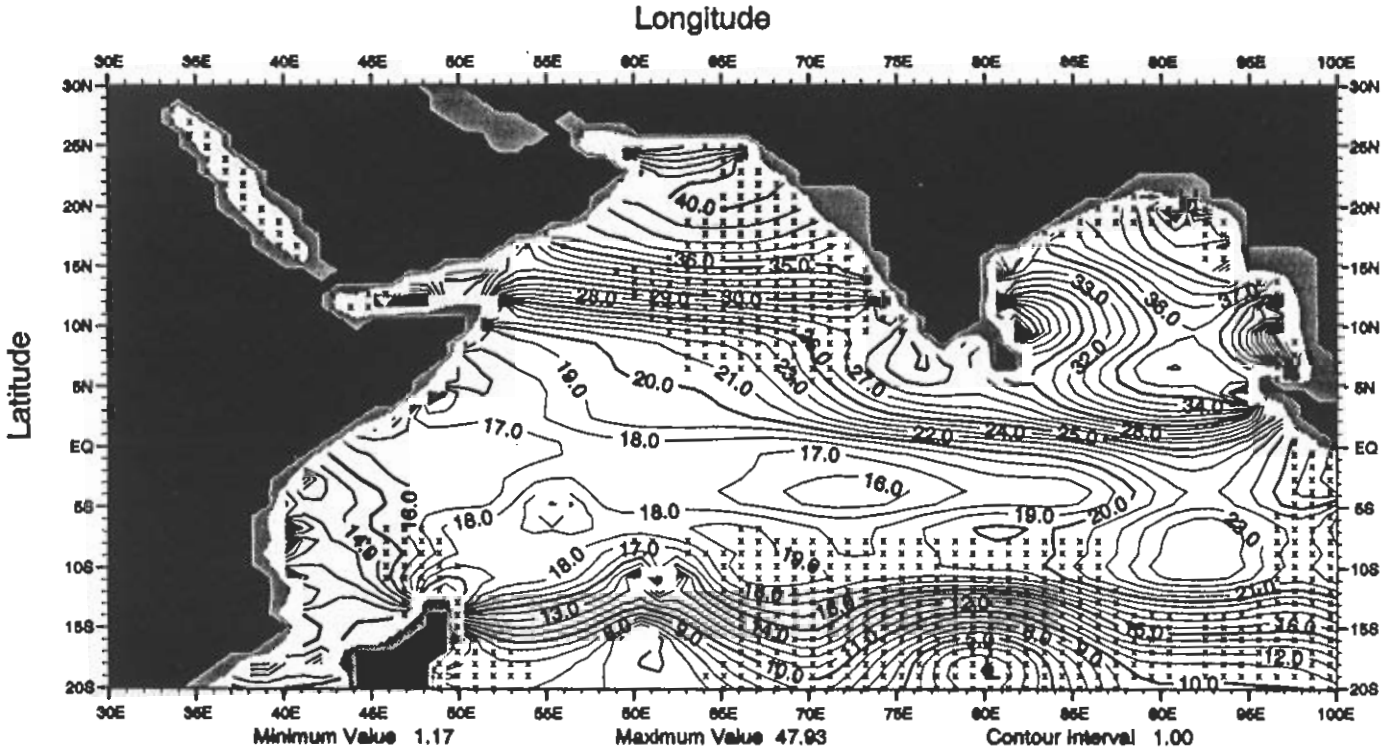

Fig. F29 Summer (Jul.-Sep.) mean silicate (μM) at 200 m depth

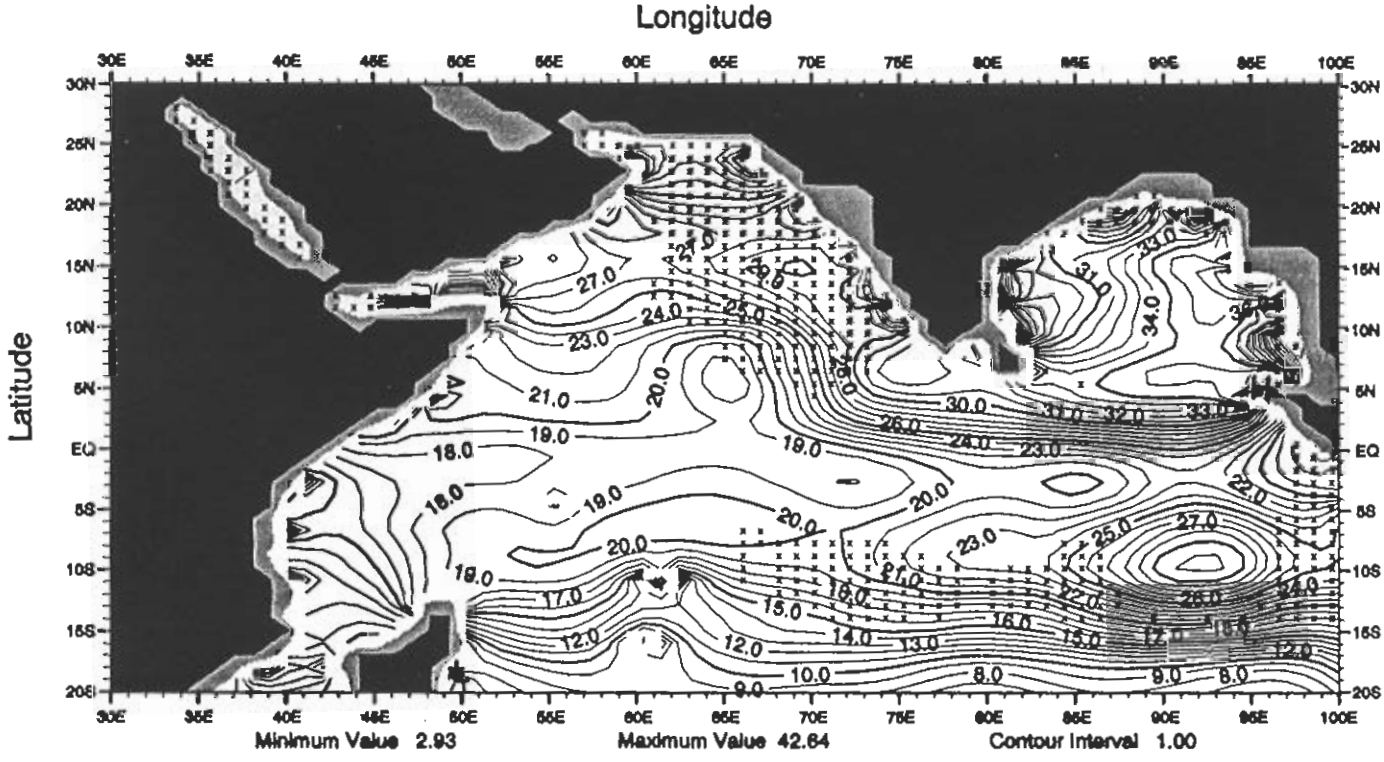

Fig. F30 Summer (Jul.-Sep.) mean silicate (μM) at 250 m depth

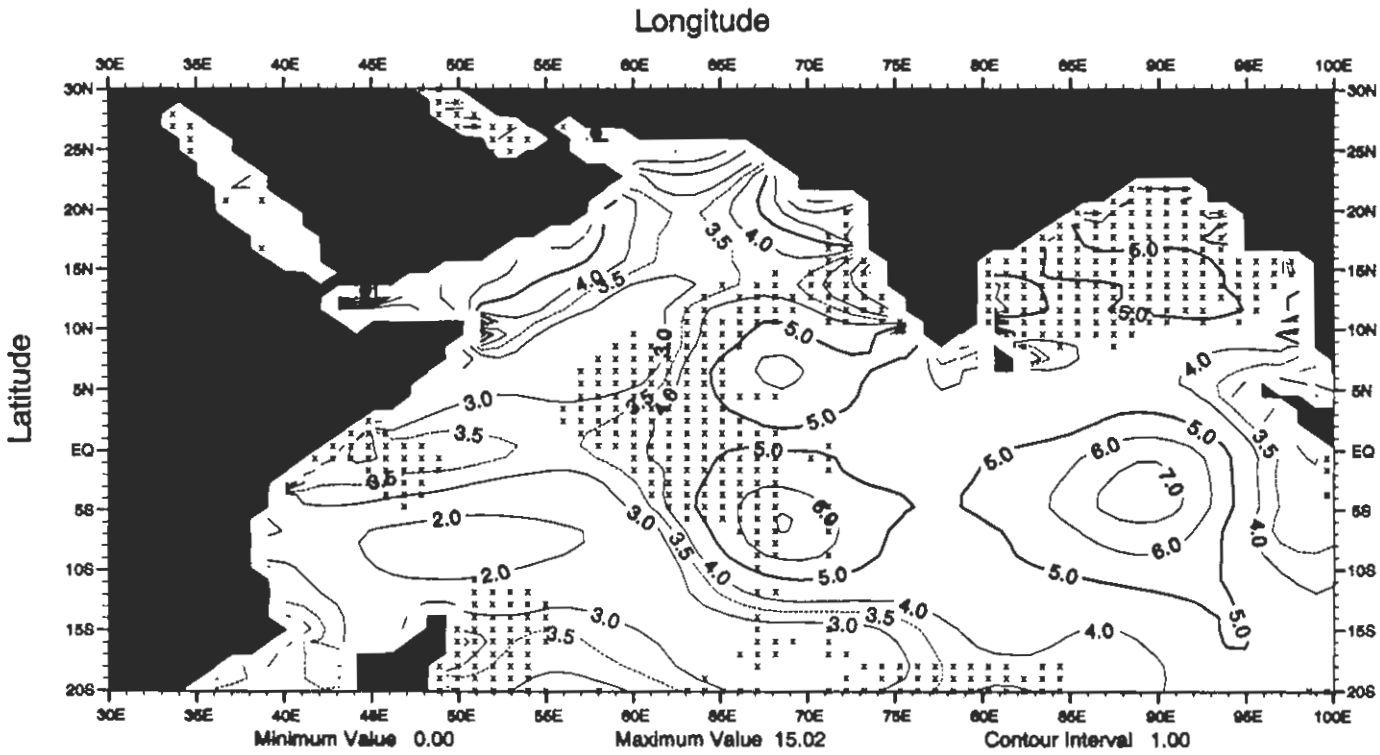

Fig. F31 Fall (Oct.-Dec.) mean silicate (μM) at the surface

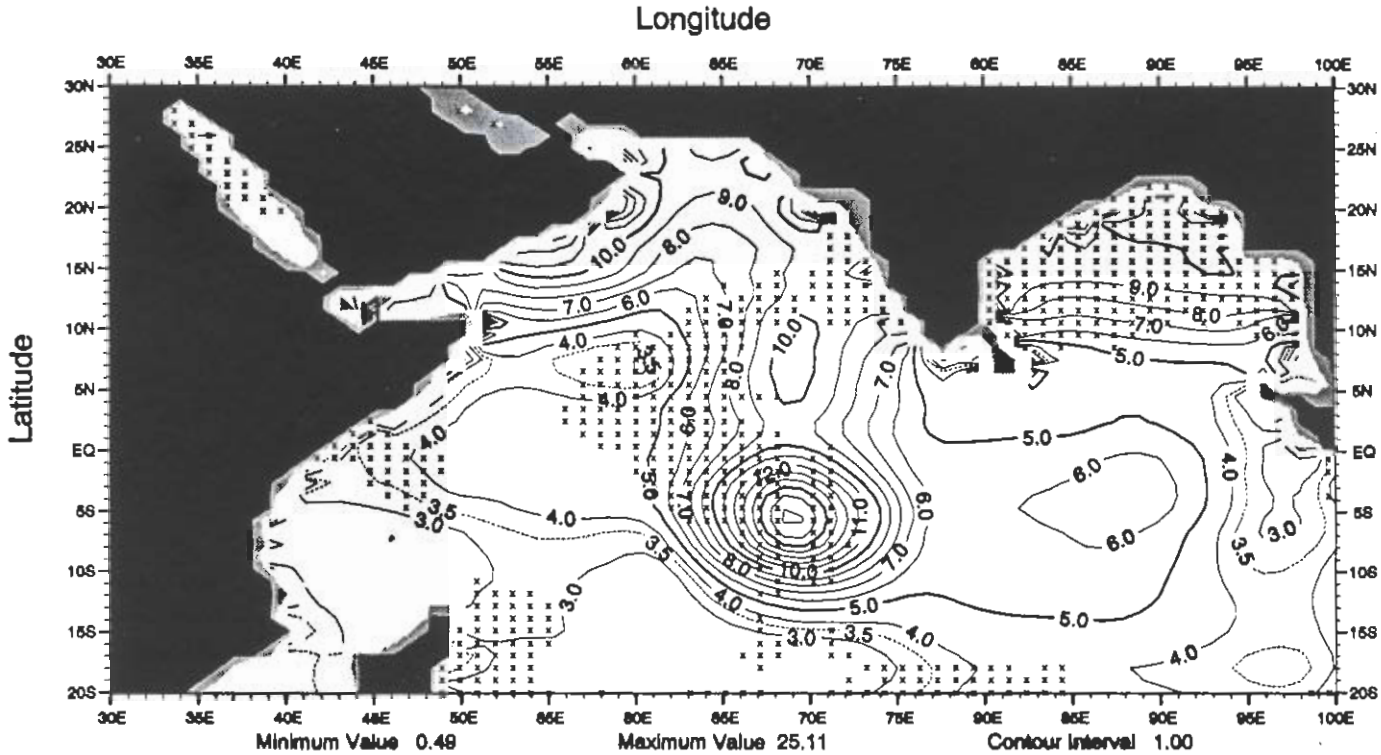

Fig. F32 Fall (Oct.-Dec.) mean silicate (μM) at 50 m depth

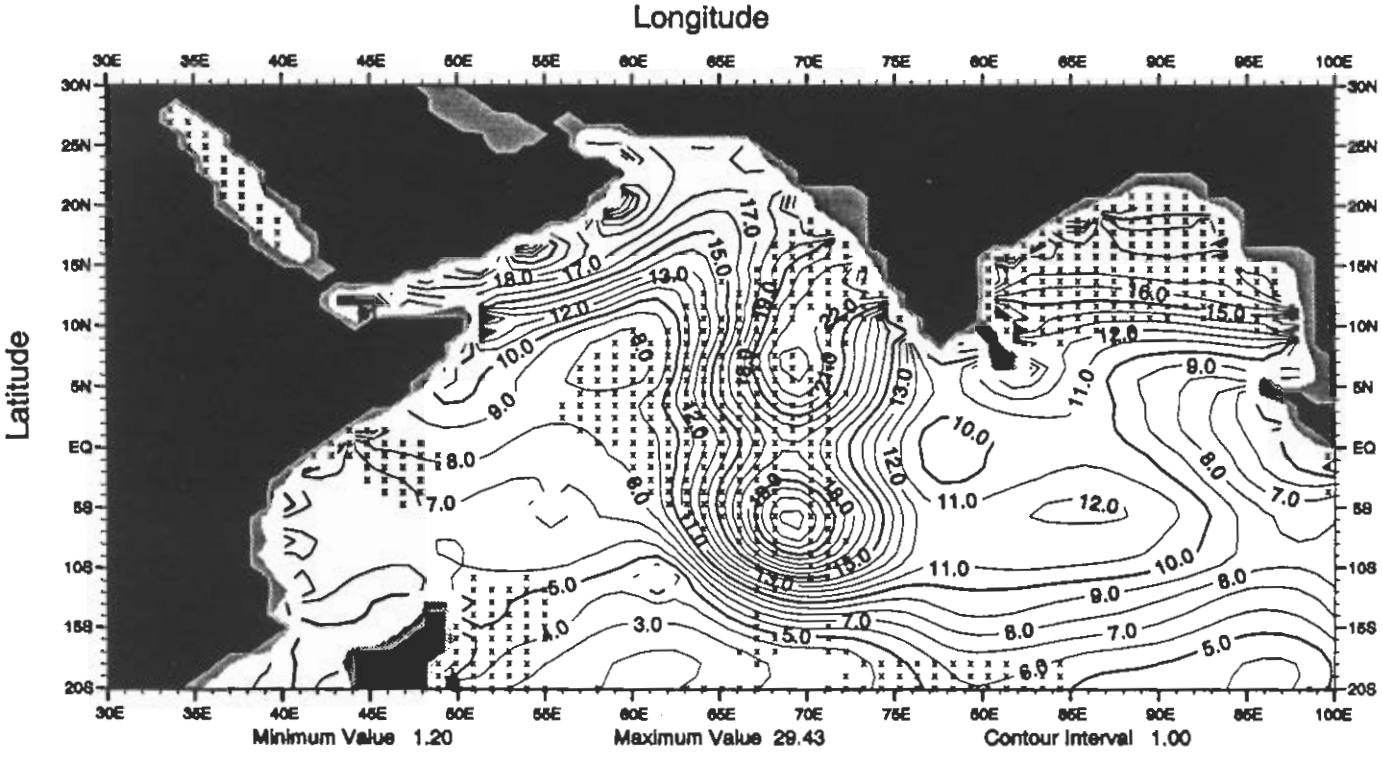

Fig. F33 Fall (Oct.-Dec.) mean silicate (μM) at 100 m depth

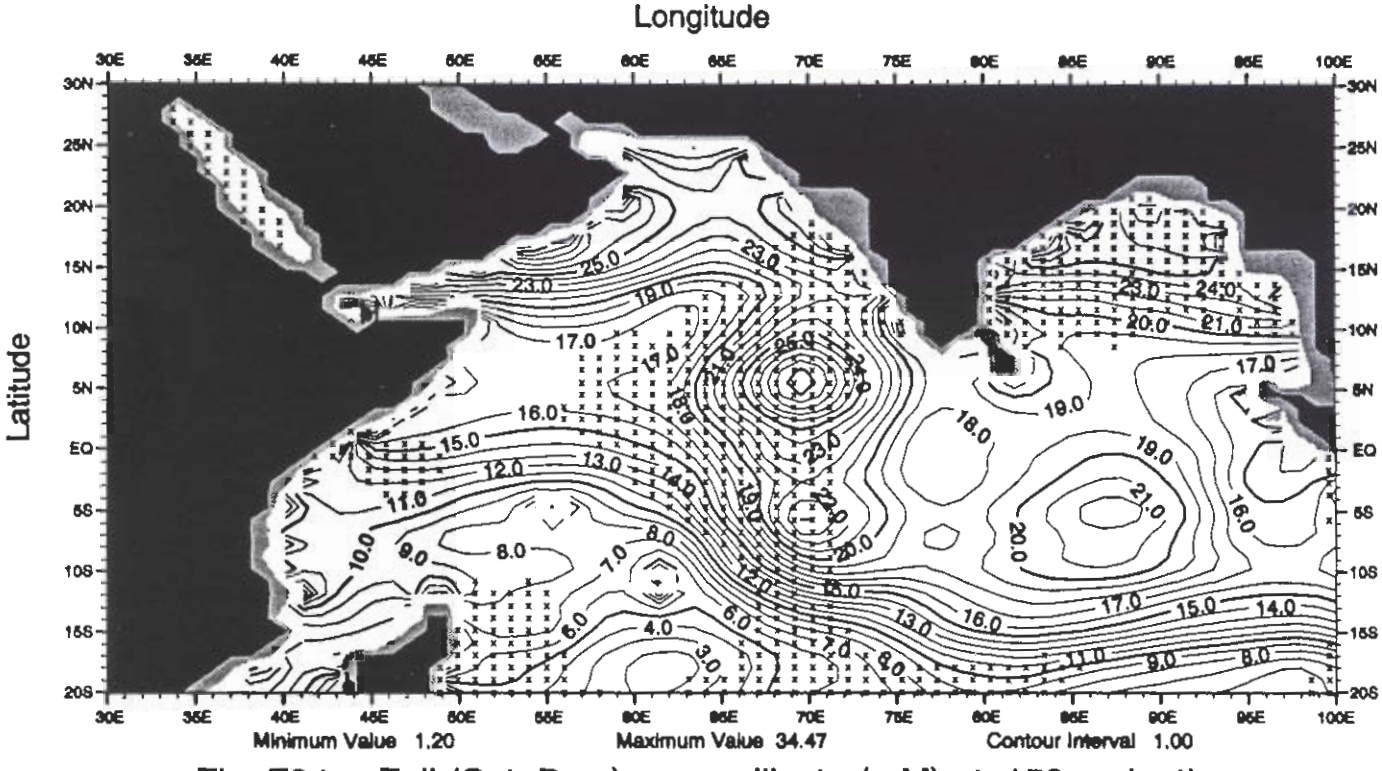

Fig. F34 Fall (Oct.-Dec.) mean silicate (μM) at 150 m depth

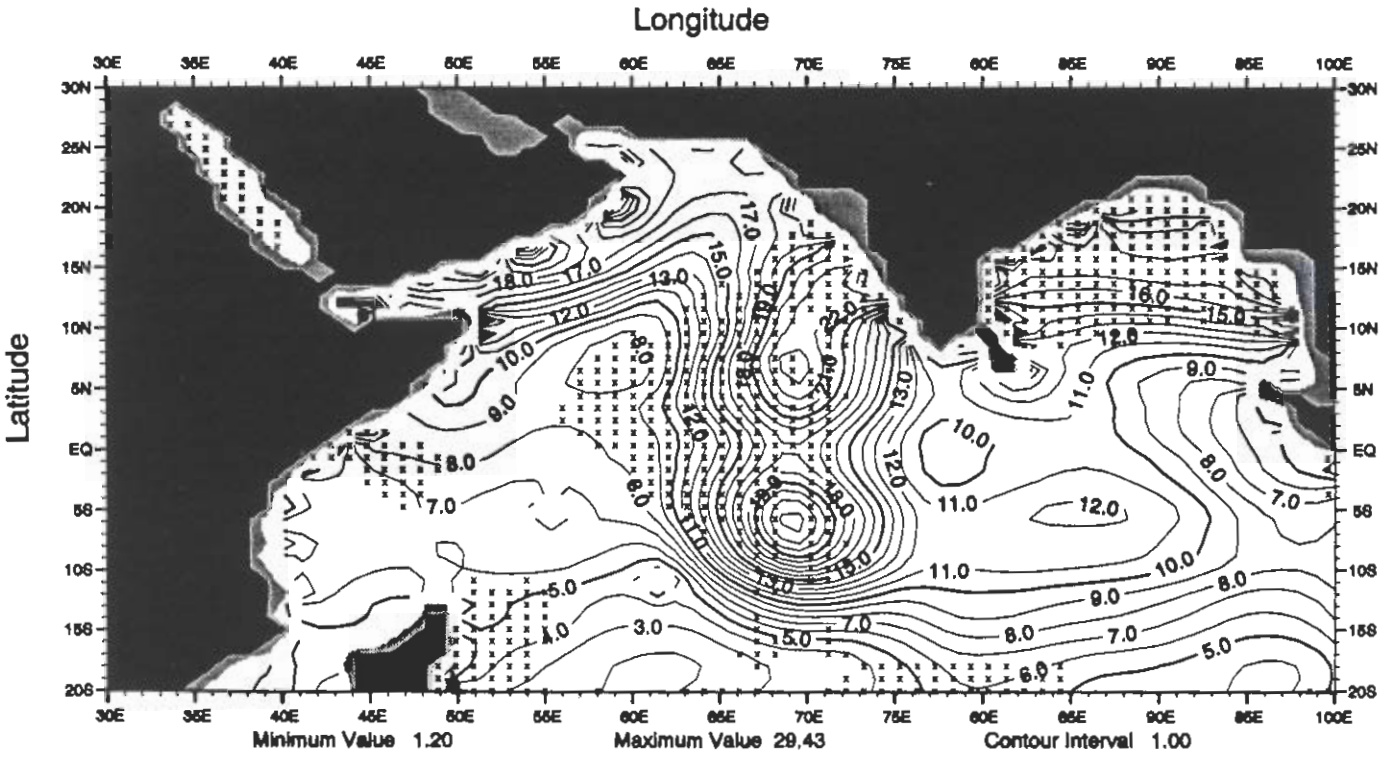

Fig. F33 Fall (Oct.-Dec.) mean silicate (μM) at 100 m depth

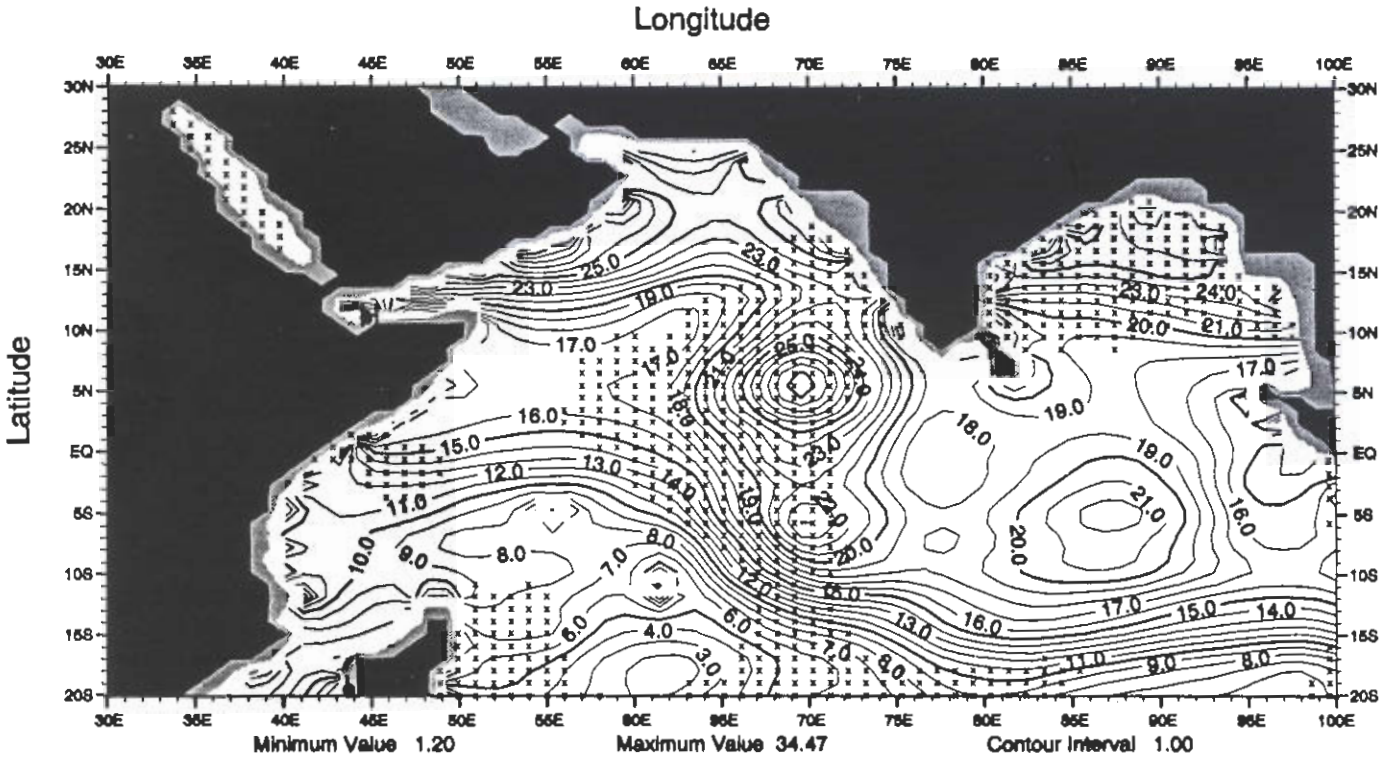

Fig. F34 Fall (Oct.-Dec.) mean silicate (μM) at 150 m depth

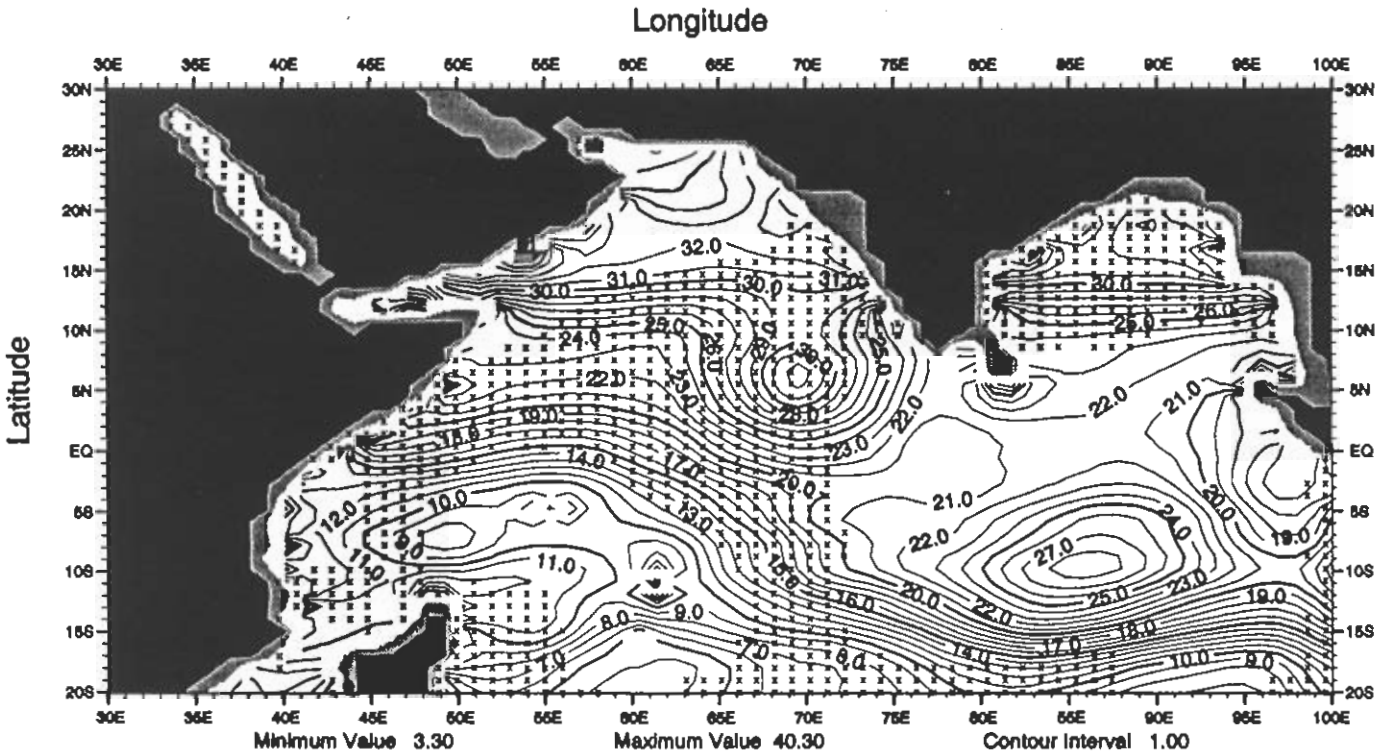

Fig. F35 Fall (Oct.-Dec.) mean silicate (μM) at 200 m depth

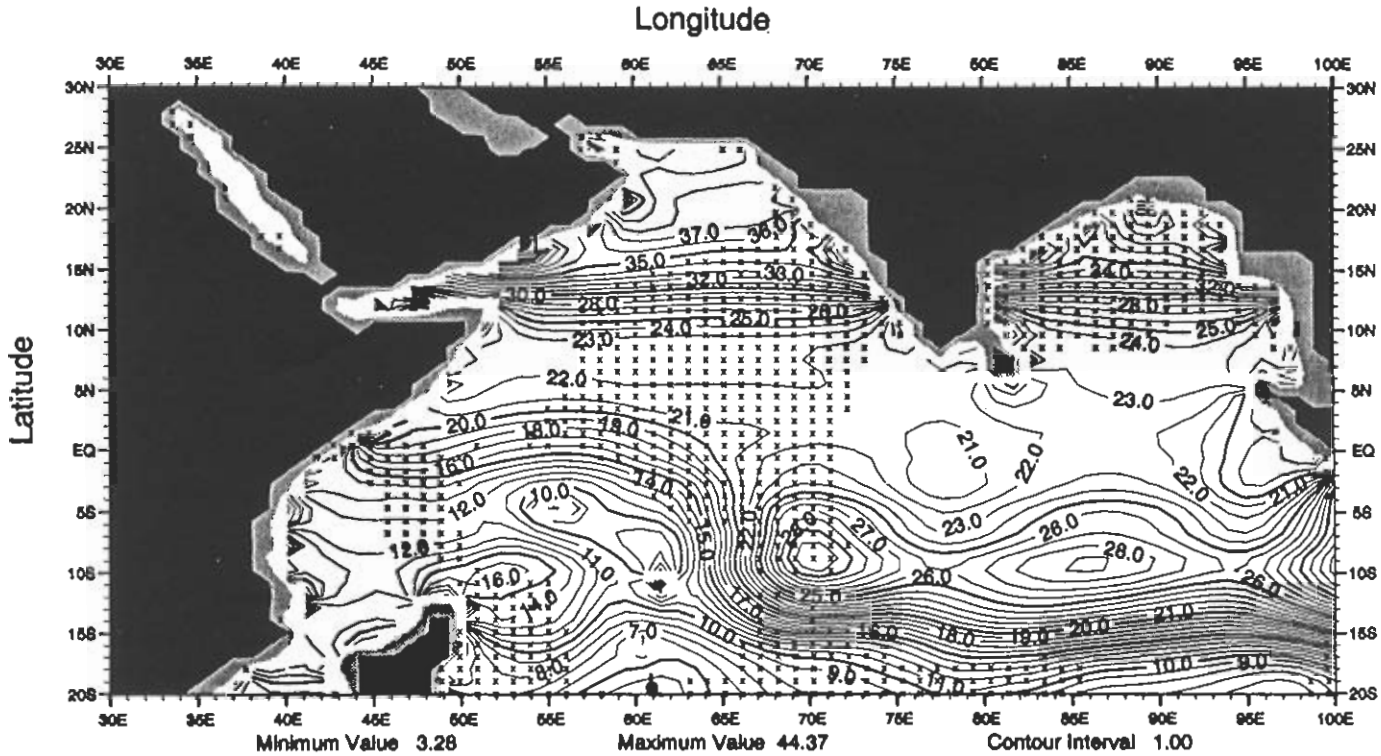

Fig. F36 Fall (Oct.-Dec.) mean silicate (μM) at 250 m depth

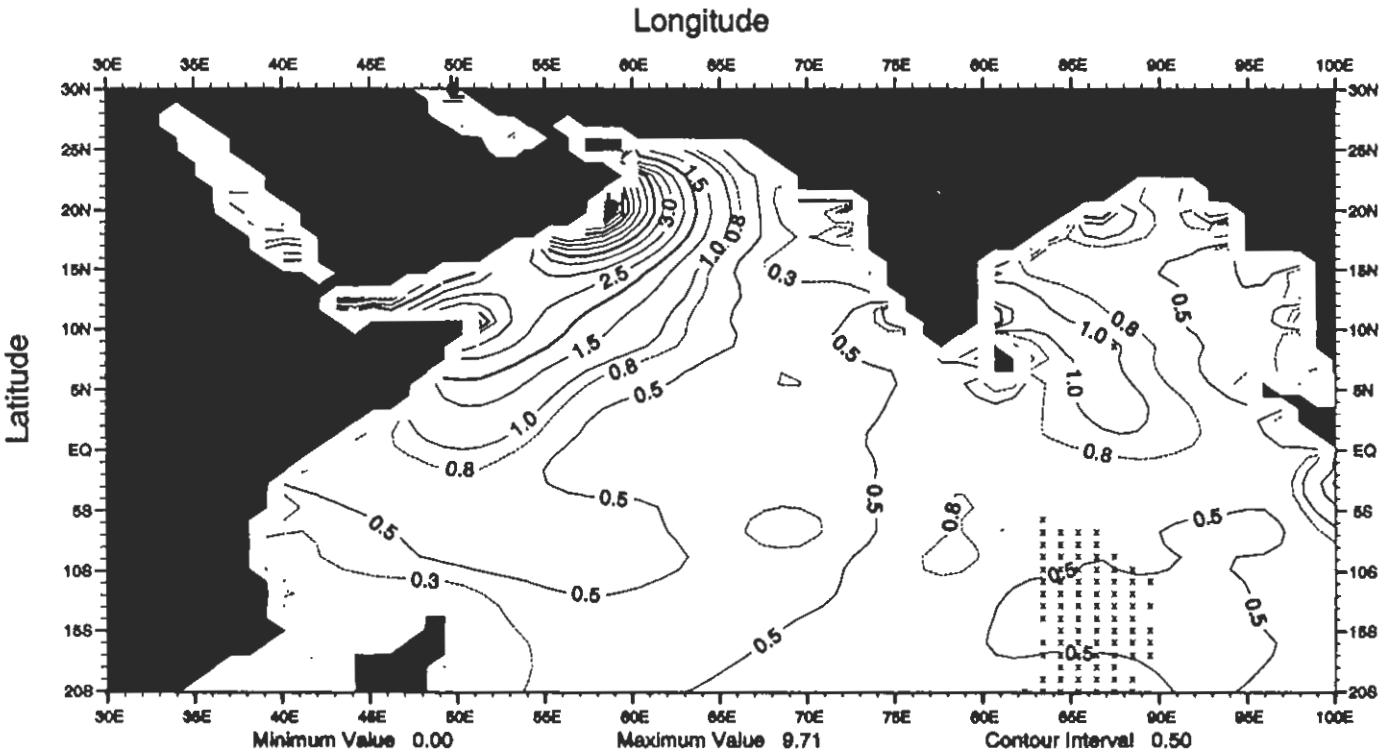

Fig. G1 Annual mean nitrate (μM) at the surface

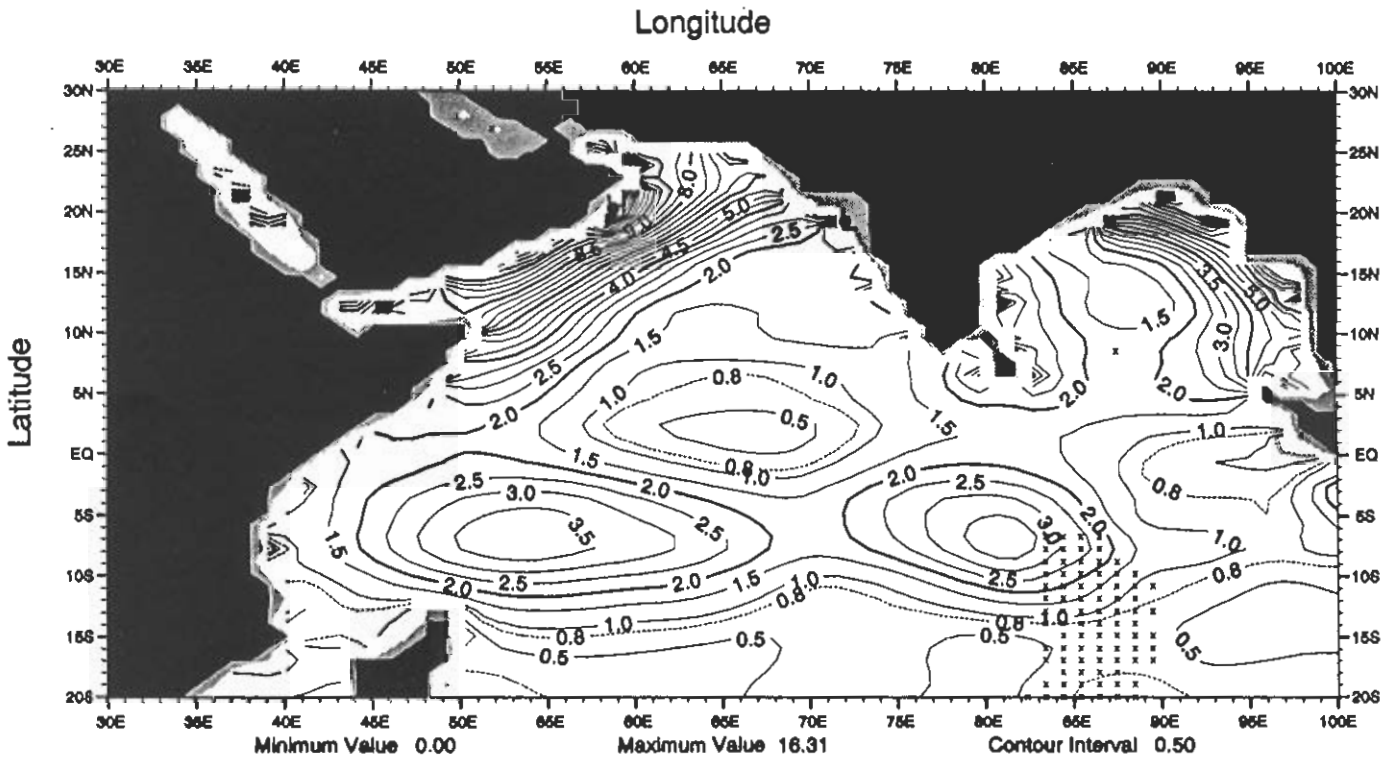

Fig. G2 Annual mean nitrate (μM) at 50 m depth

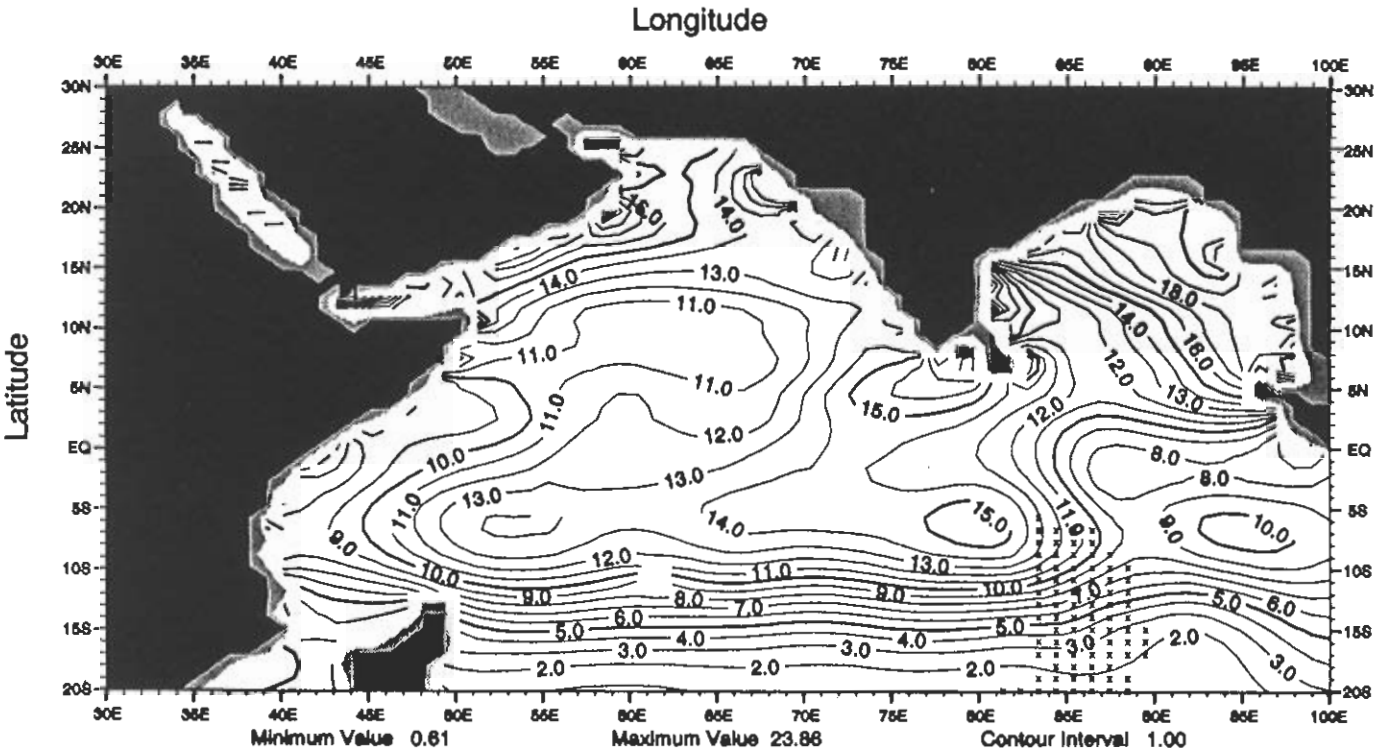

Fig. G3 Annual mean nitrate (μM) at 100 m depth

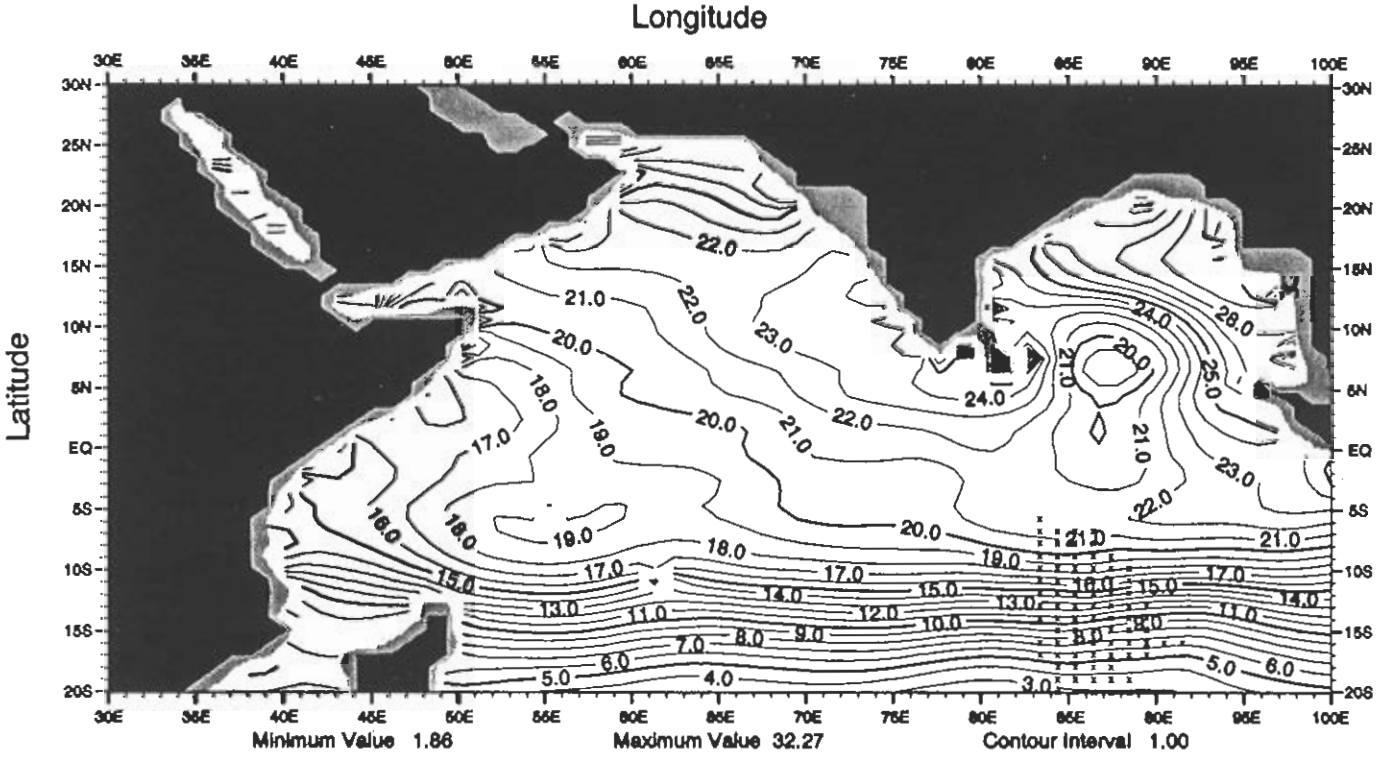

Fig. G4 Annual mean nitrate (μM) at 150 m depth

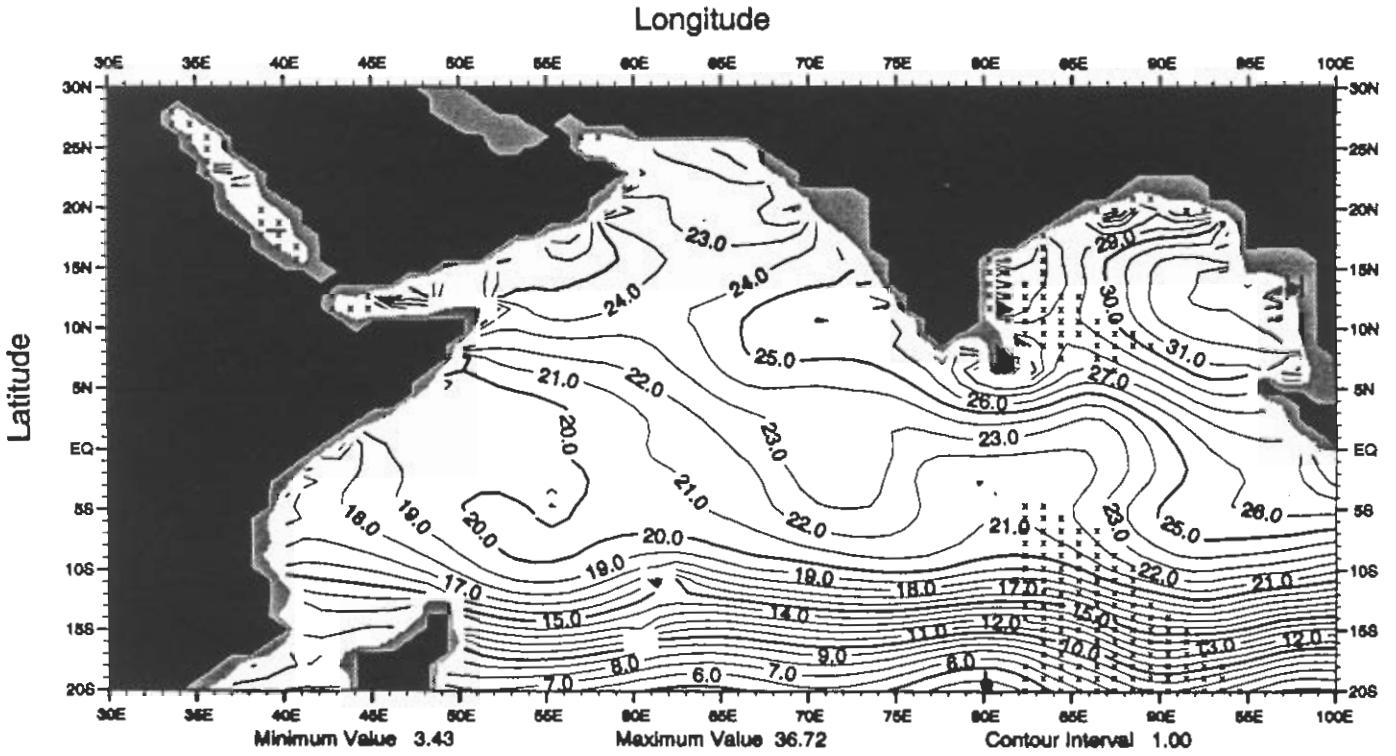

Fig. G5 Annual mean nitrate (μM) at 200 m depth

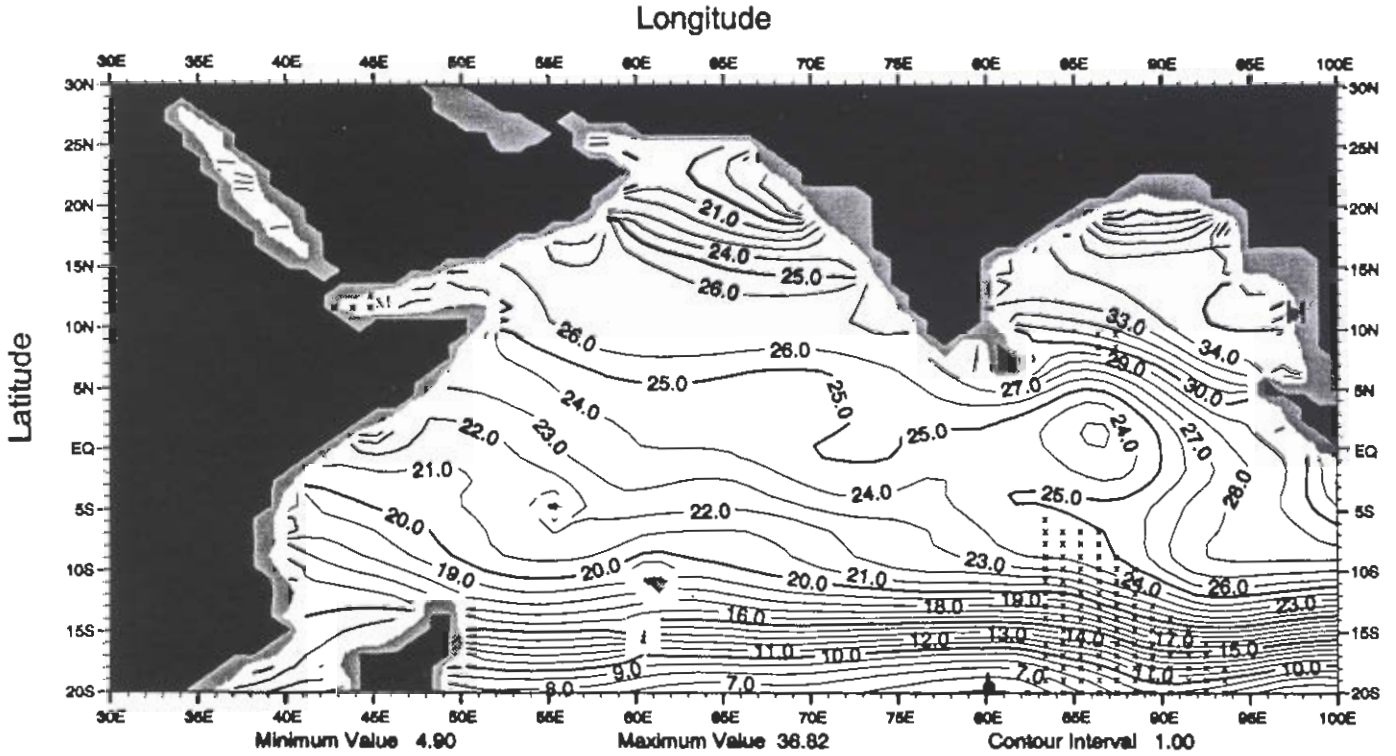

Fig. G6 Annual mean nitrate (μM) at 300 m depth

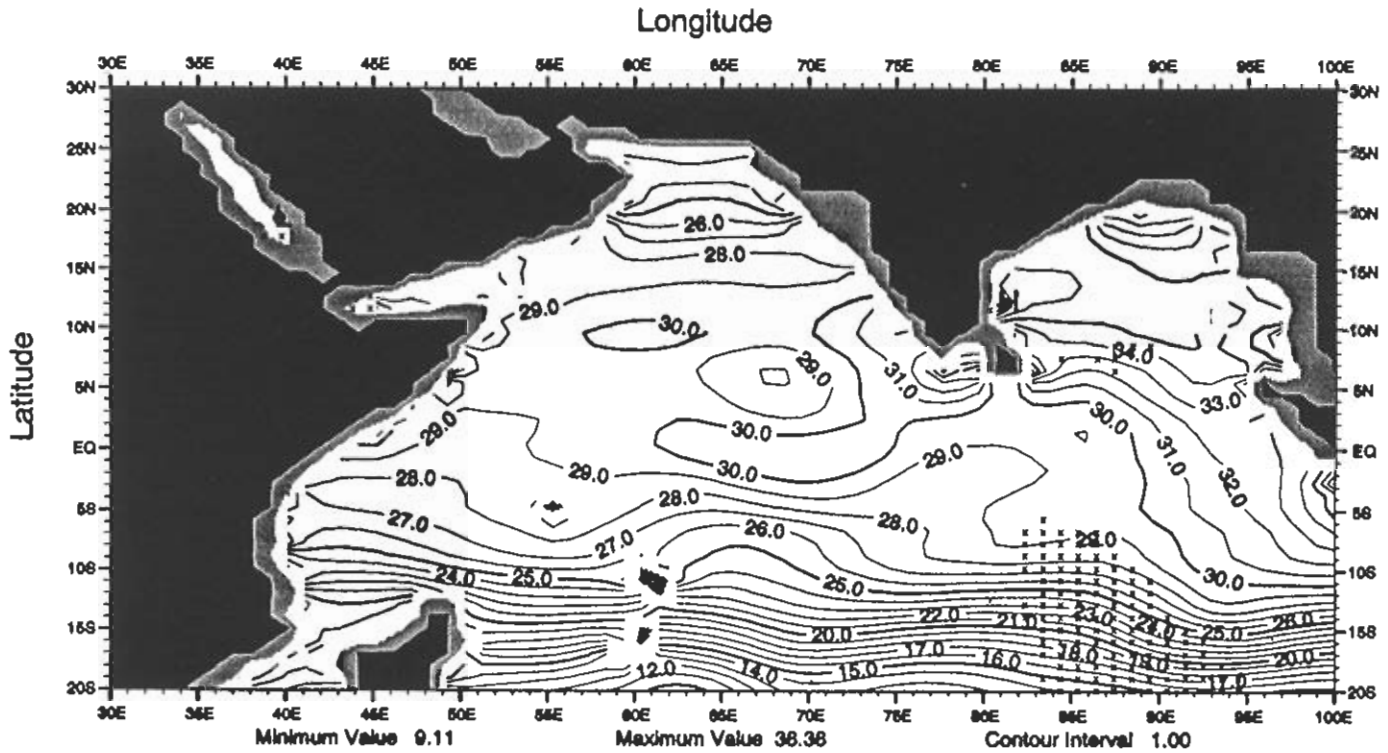

Fig. G7 Annual mean nitrate (μM) at 500 m depth

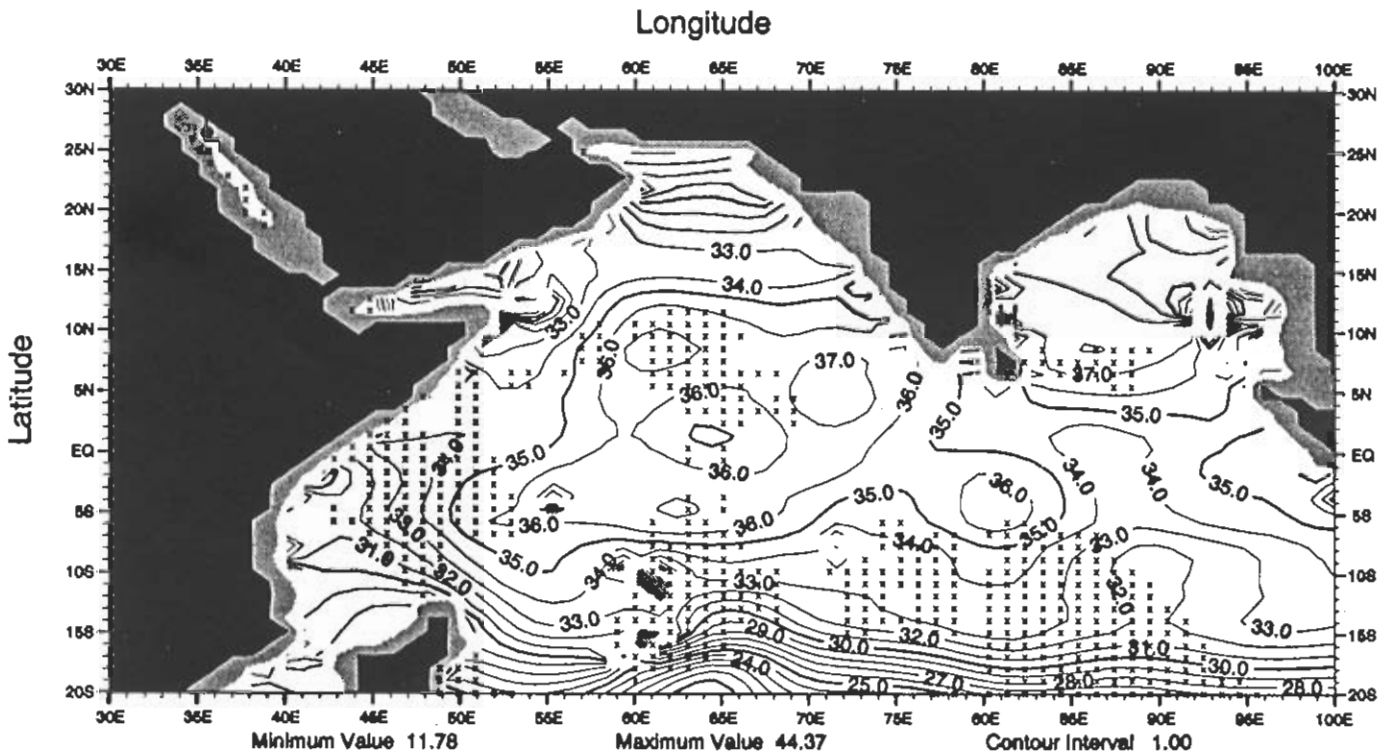

Fig. G8 Annual mean nitrate (μM) at 700 m depth

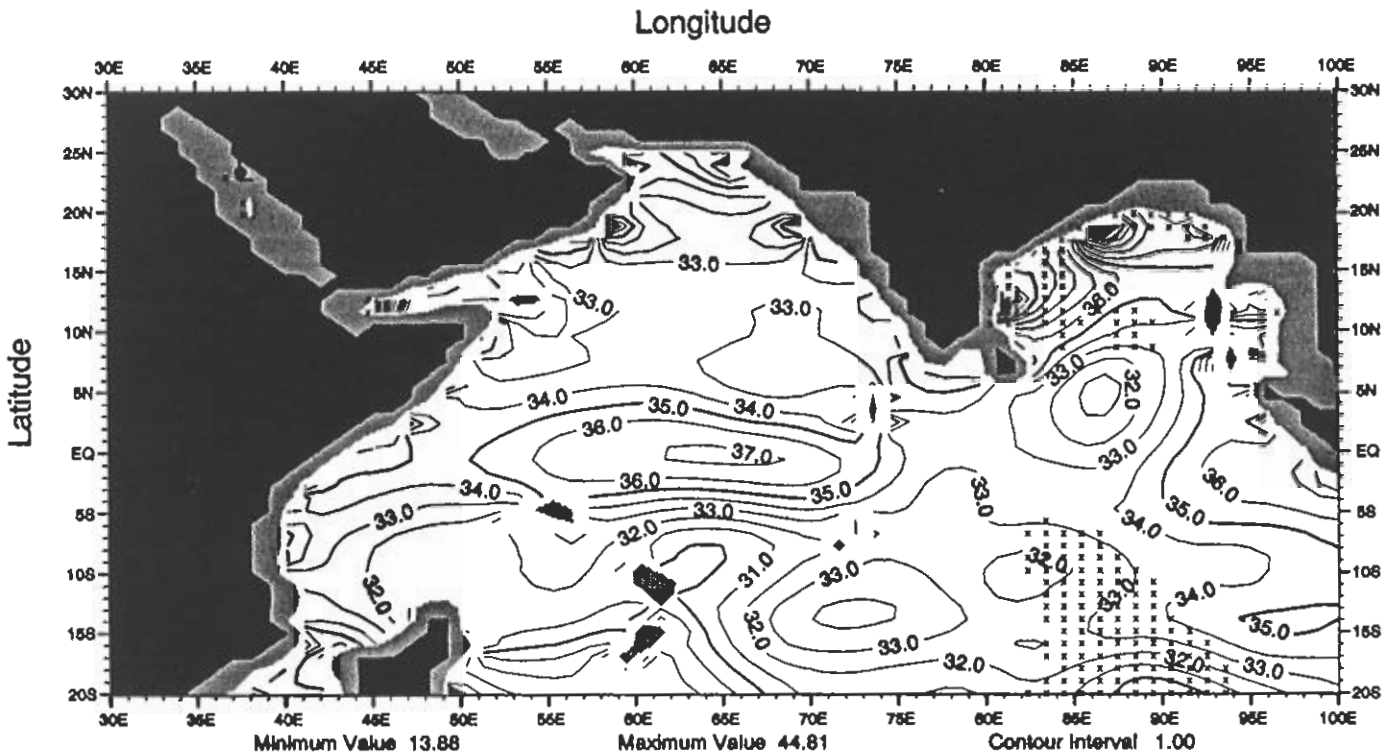

Fig. G9 Annual mean nitrate (μM) at 1000 m depth

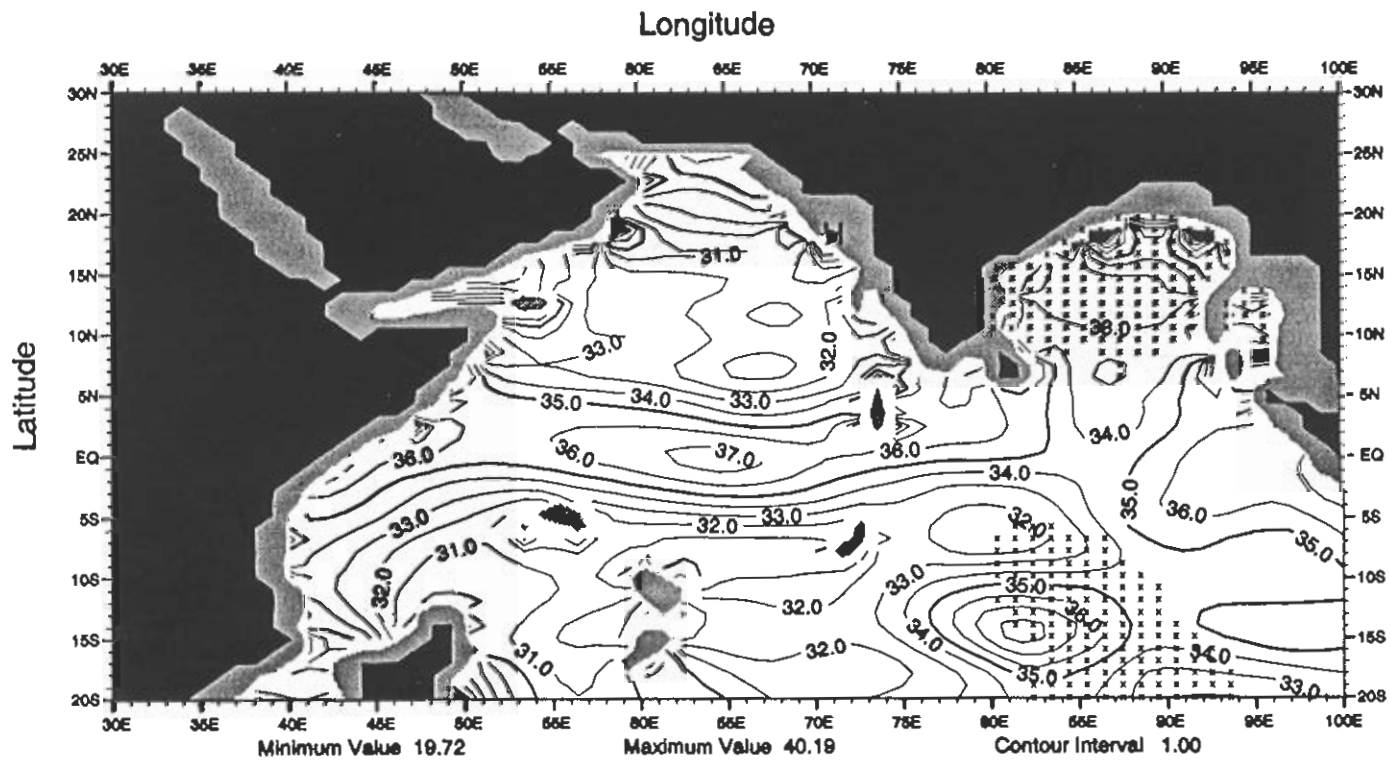

Fig. G10 Annual mean nitrate (μM) at 1200 m depth

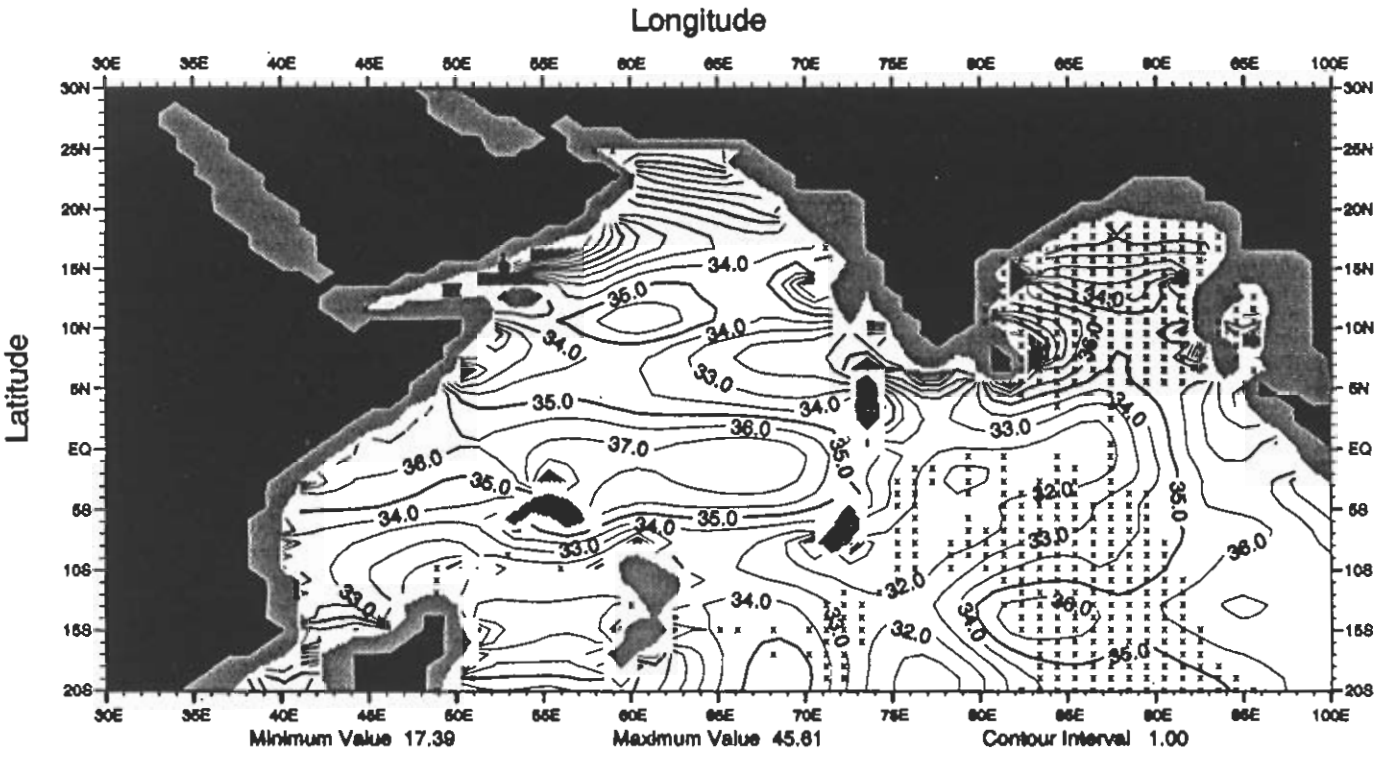

Fig. G11 Annual mean nitrate (μM) at 1500 m depth

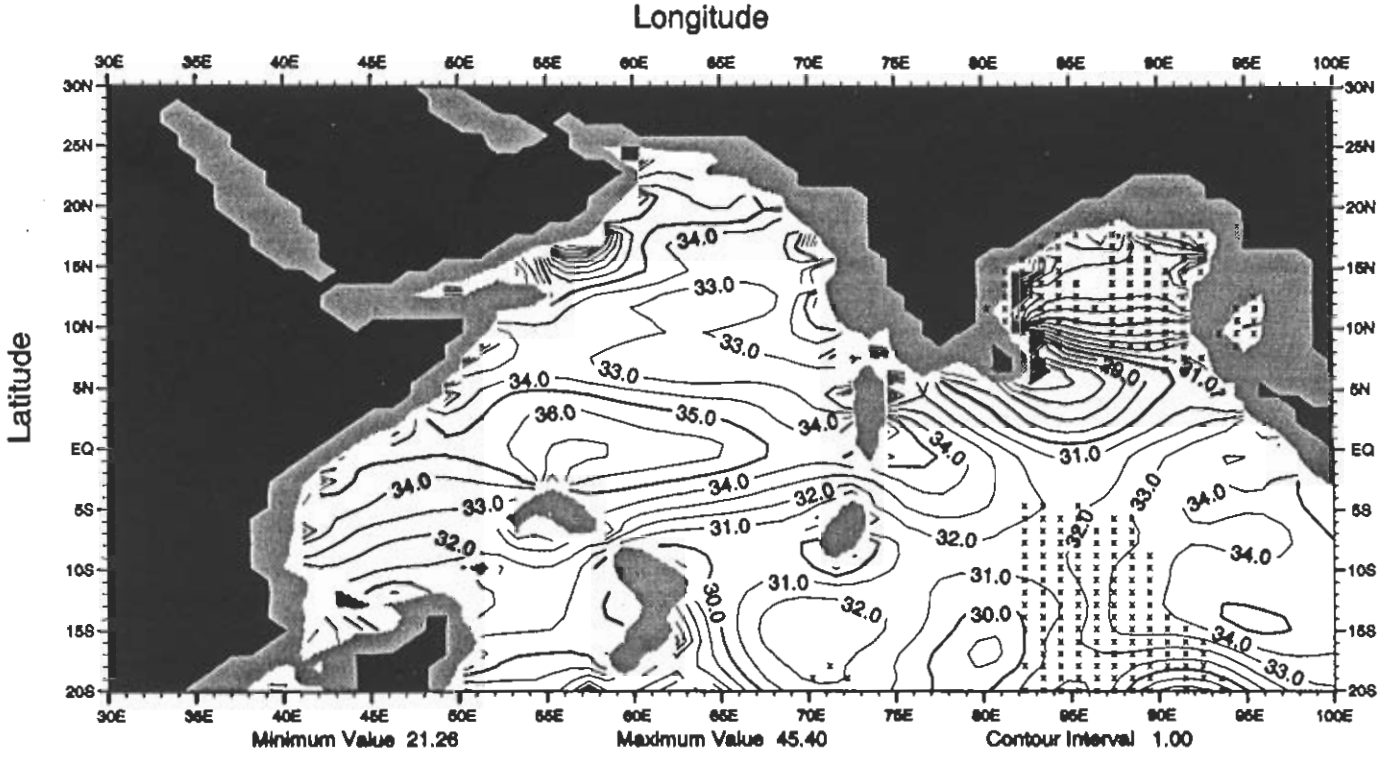

Fig. G12 Annual mean nitrate (μM) at 2000 m depth

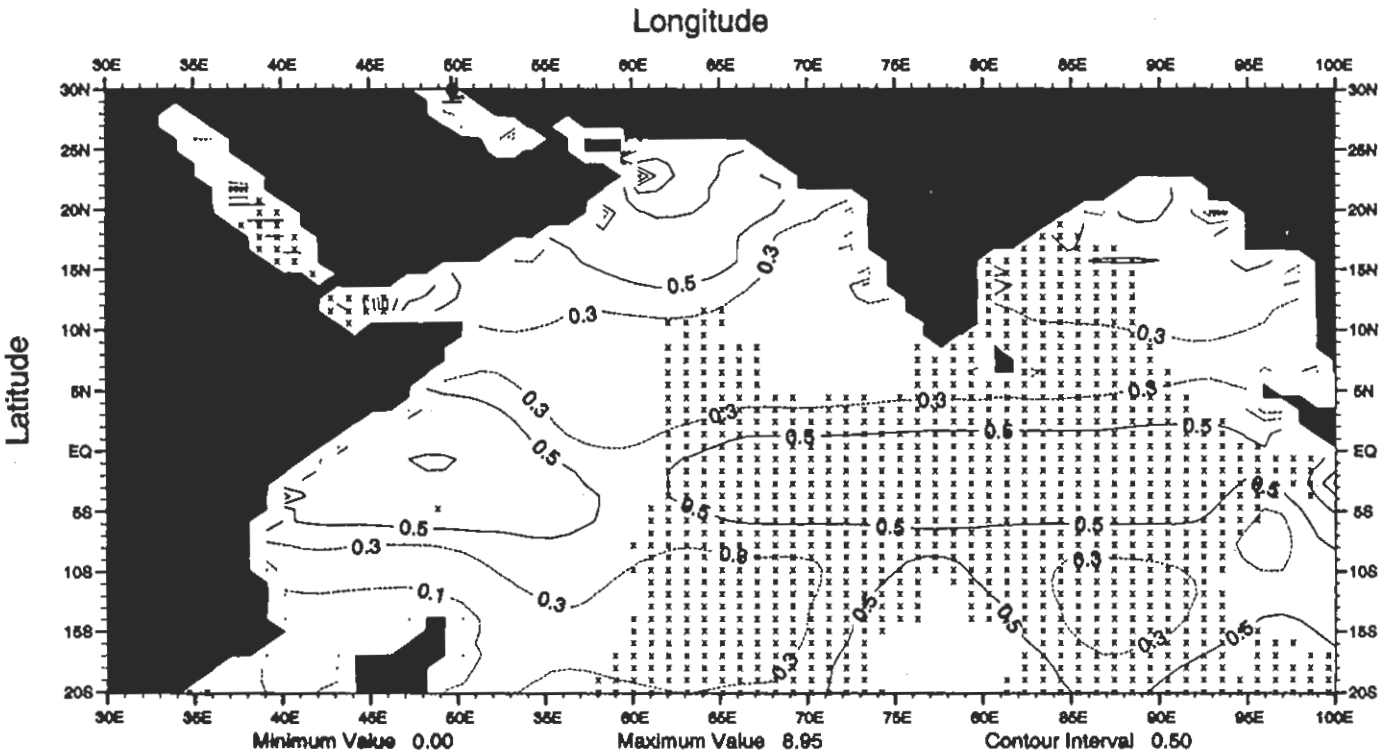

Fig. G13 Winter (Jan.-Mar.) mean nitrate (μM) at the surface

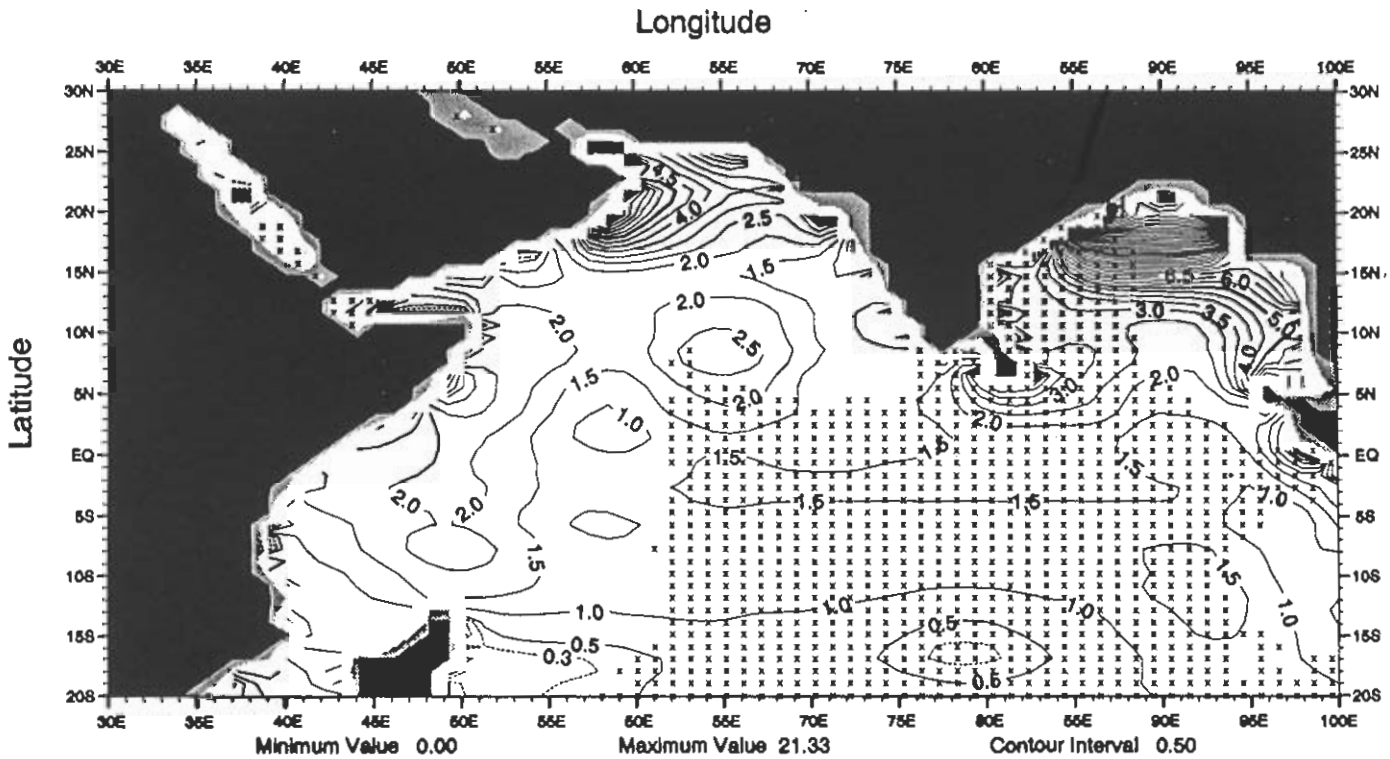

Fig. G14 Winter (Jan.-Mar.) mean nitrate (μM) at 50 m depth

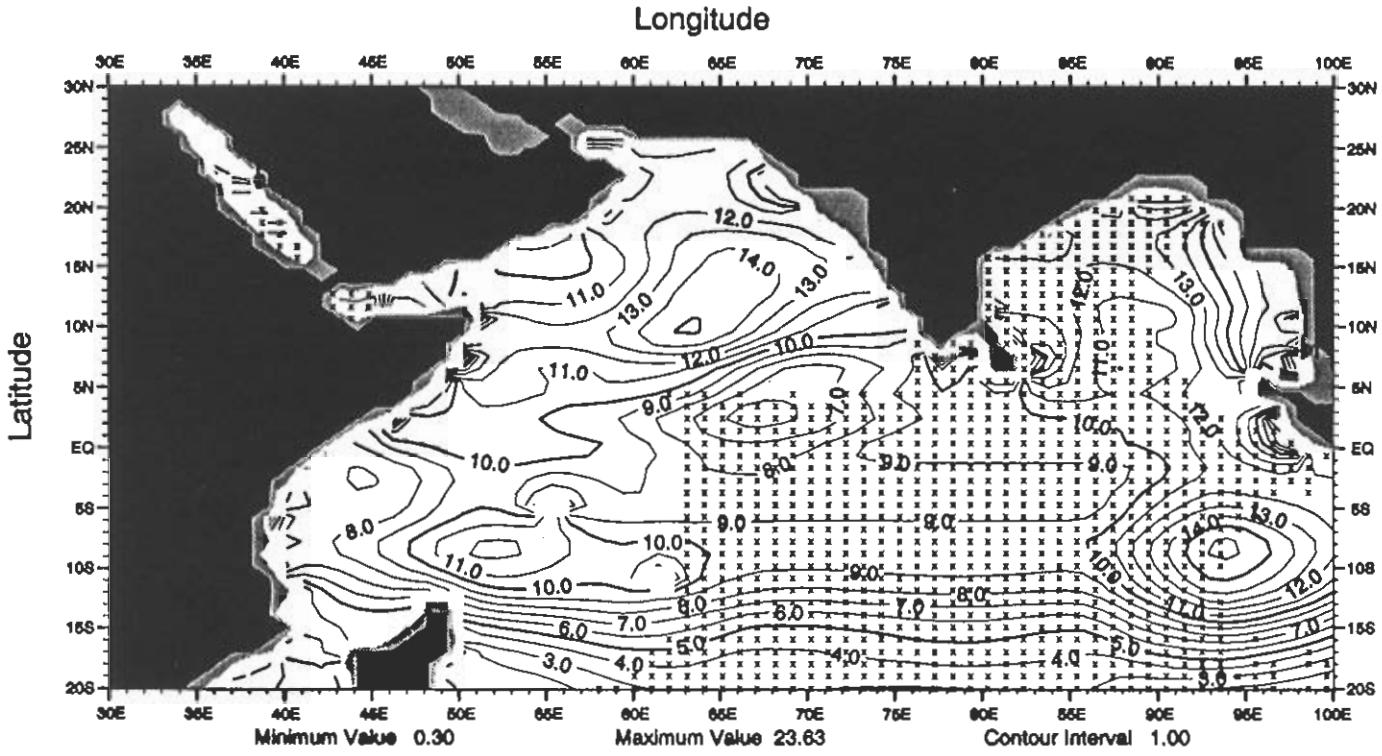

Fig. G15 Winter (Jan.-Mar.) mean nitrate (μM) at 100 m depth

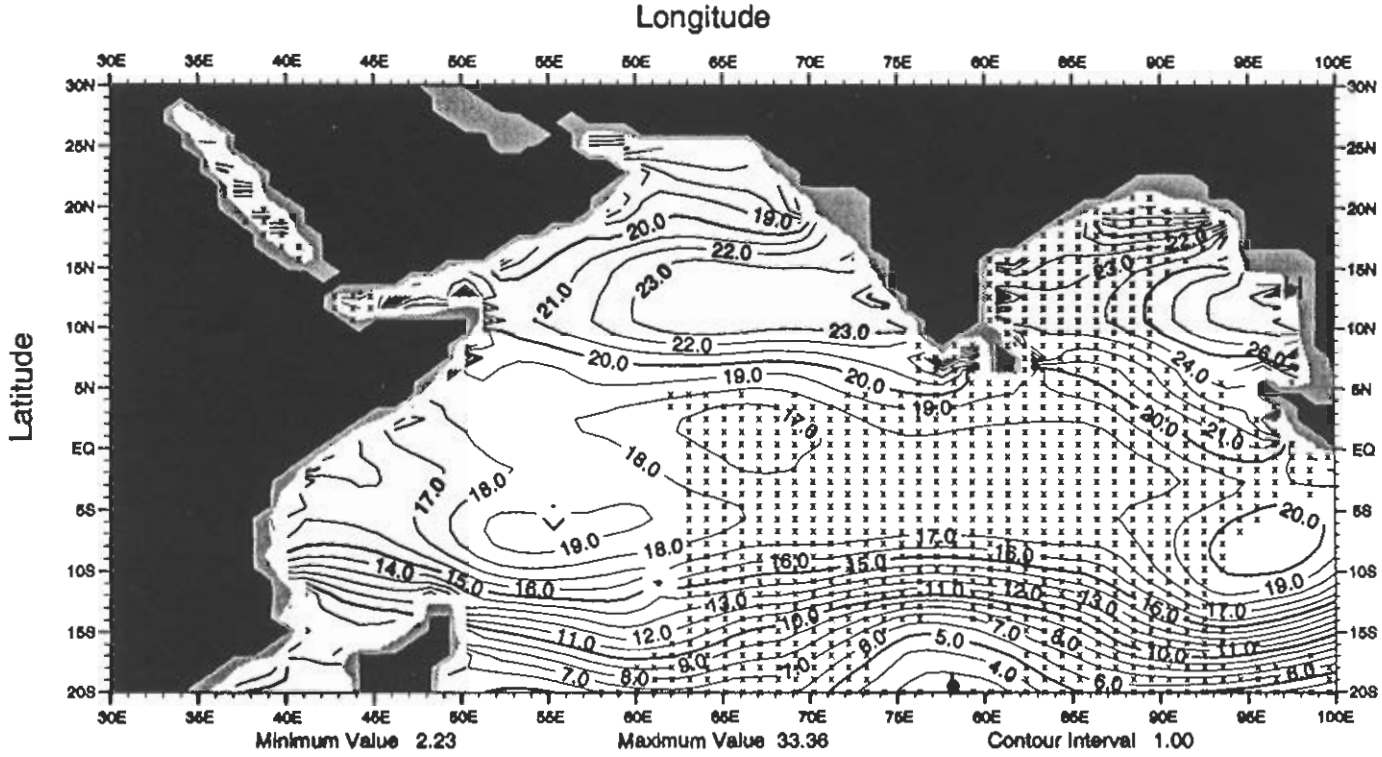

Fig. G16 Winter (Jan.-Mar.) mean nitrate (μM) at 150 m depth

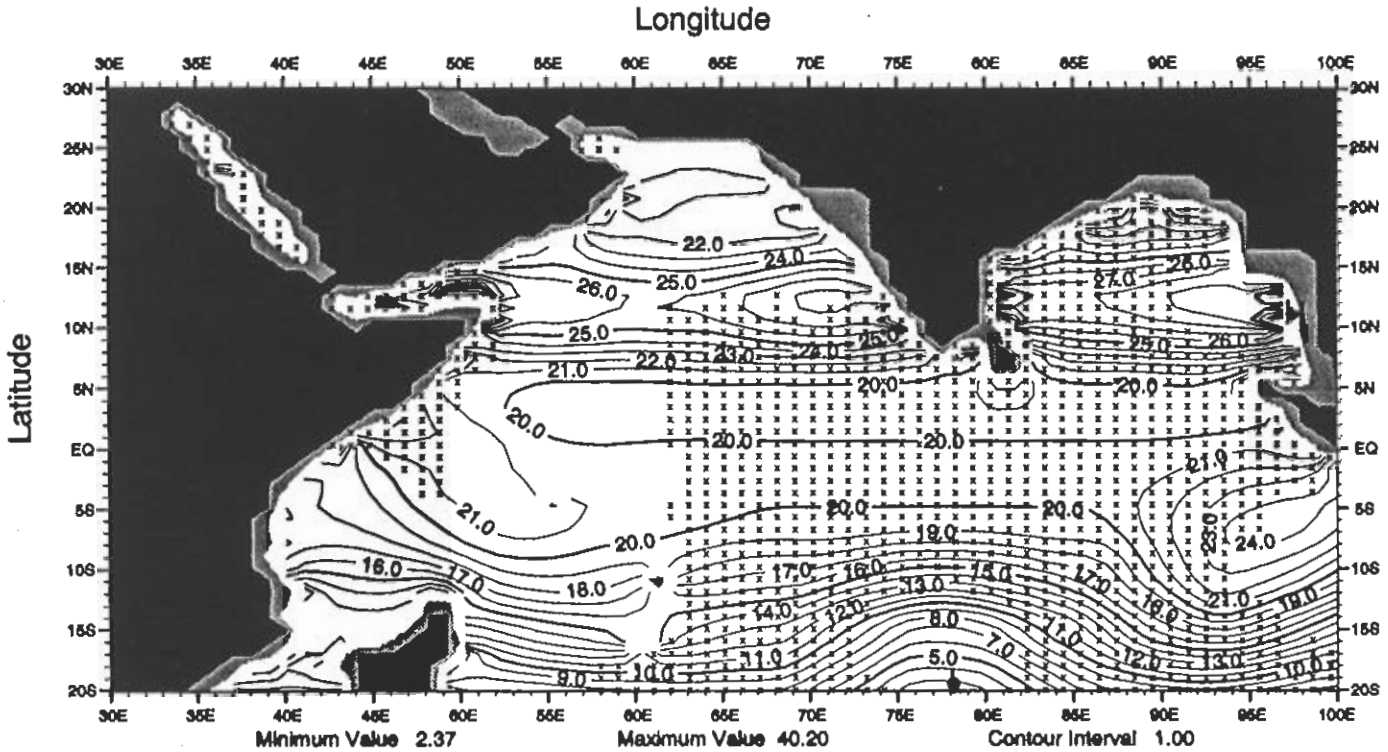

Fig. G17 Winter (Jan.-Mar.) mean nitrate (μM) at 200 m depth

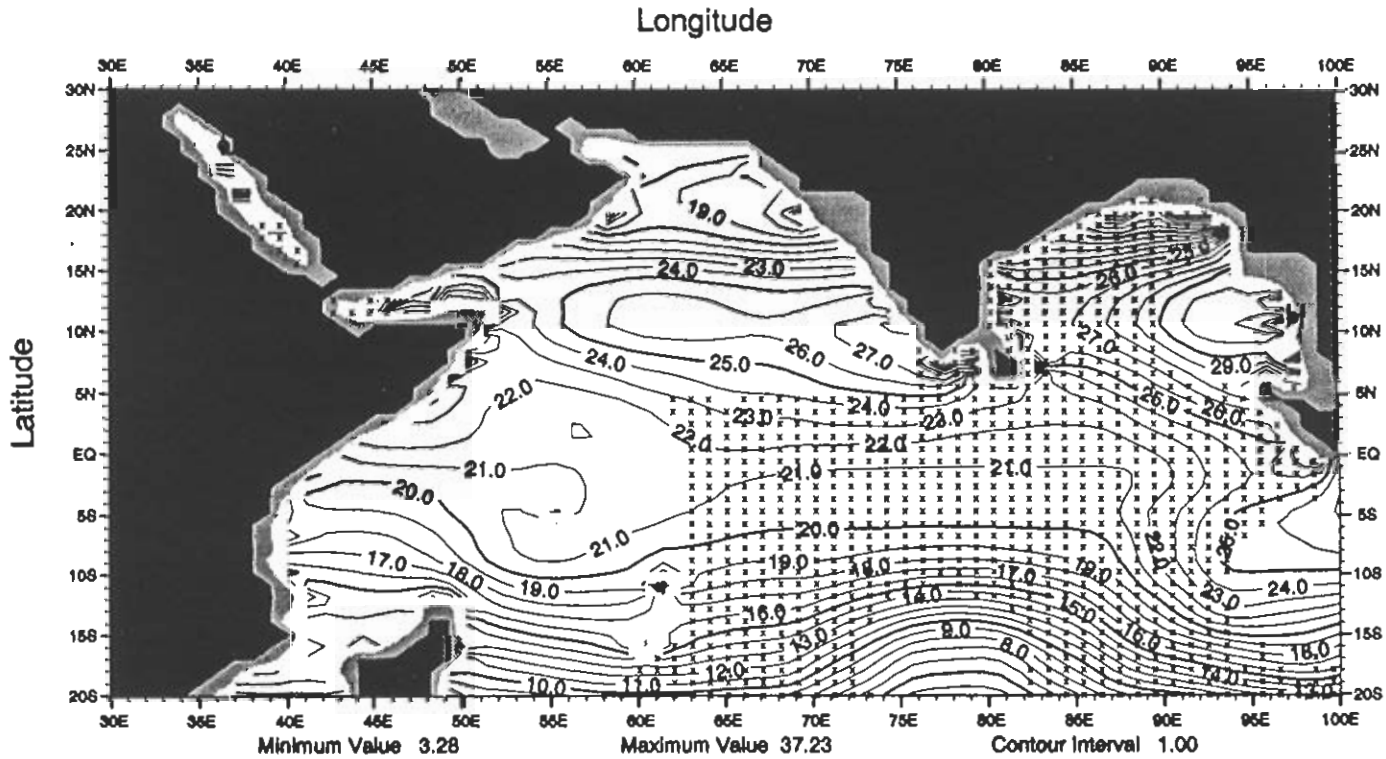

Fig. G18 Winter (Jan.-Mar.) mean nitrate (μM) at 250 m depth

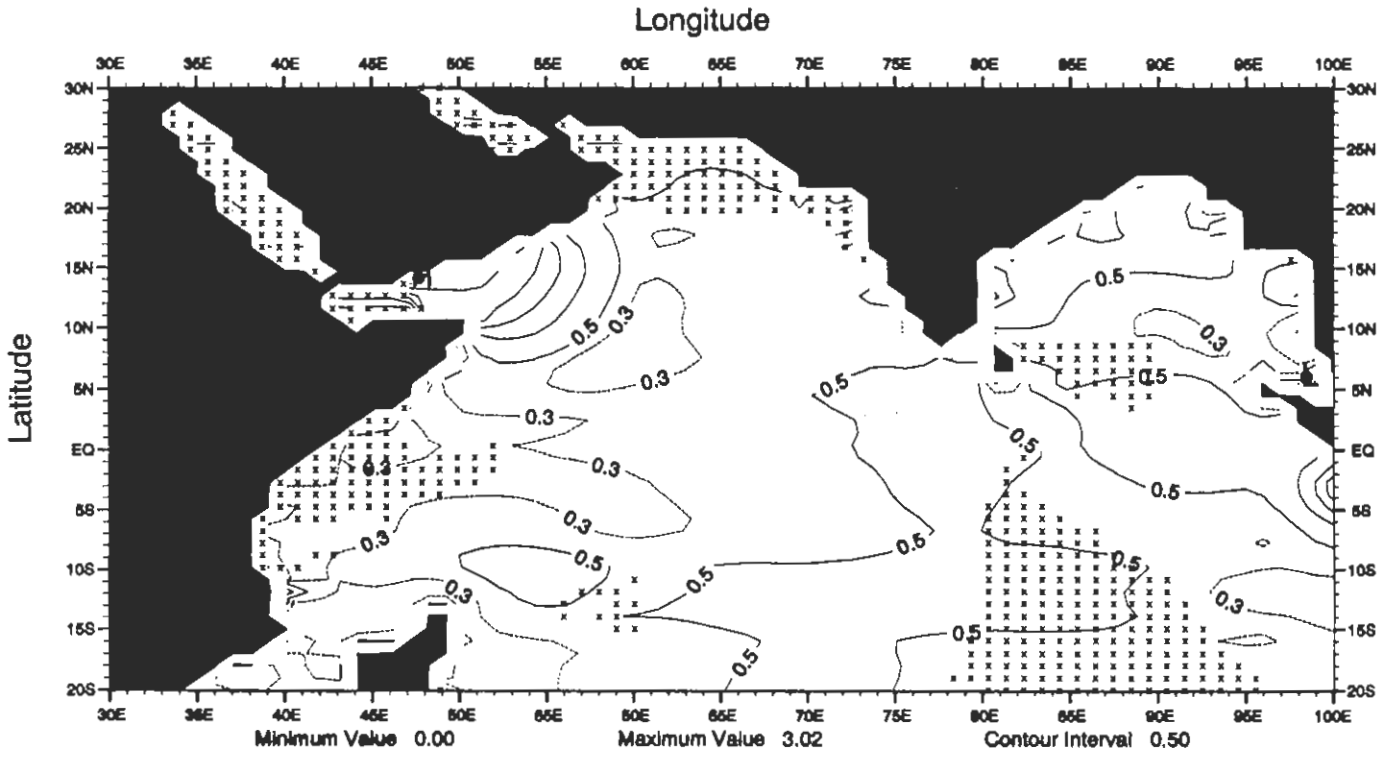

Fig. G19 Spring (Apr.-Jun.) mean nitrate (μM) at the surface

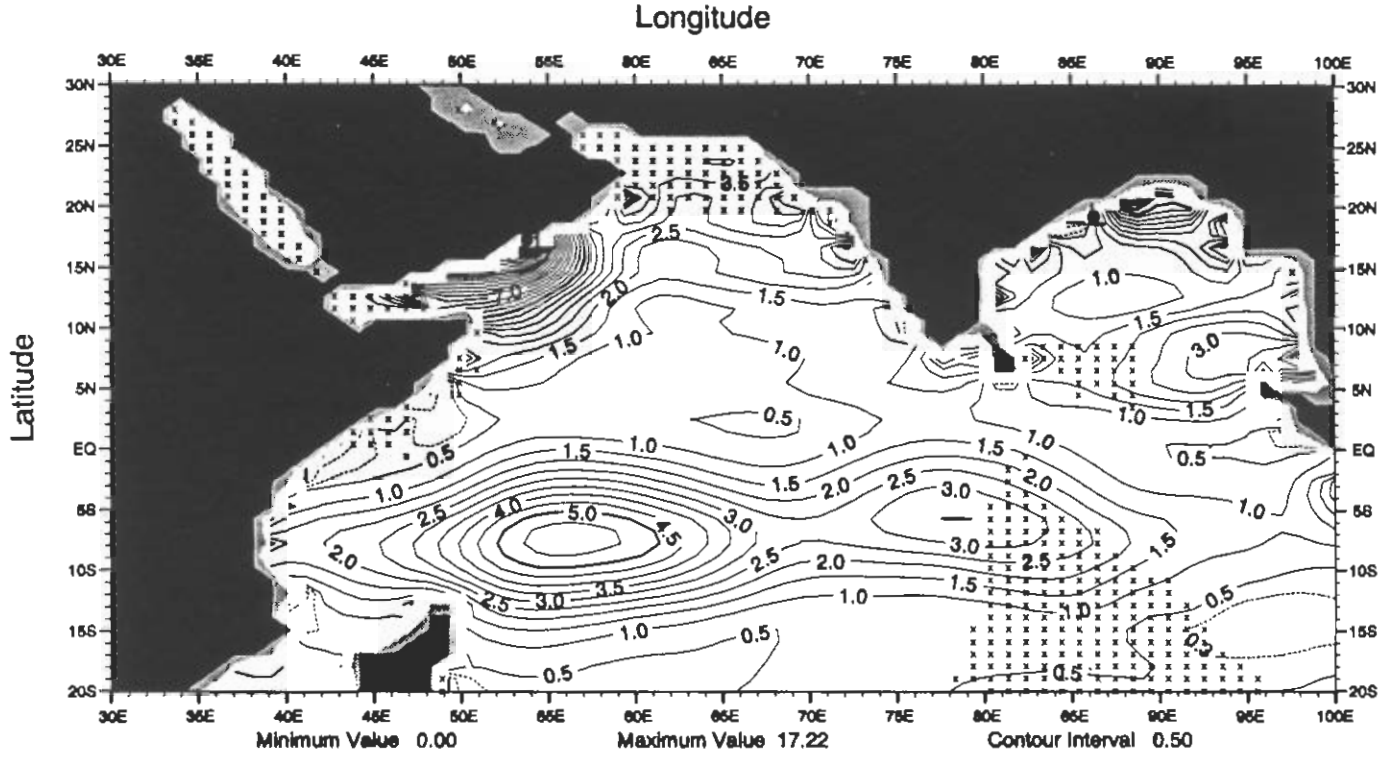

Fig. G20 Spring (Apr.-Jun.) mean nitrate (μM) at 50 m depth

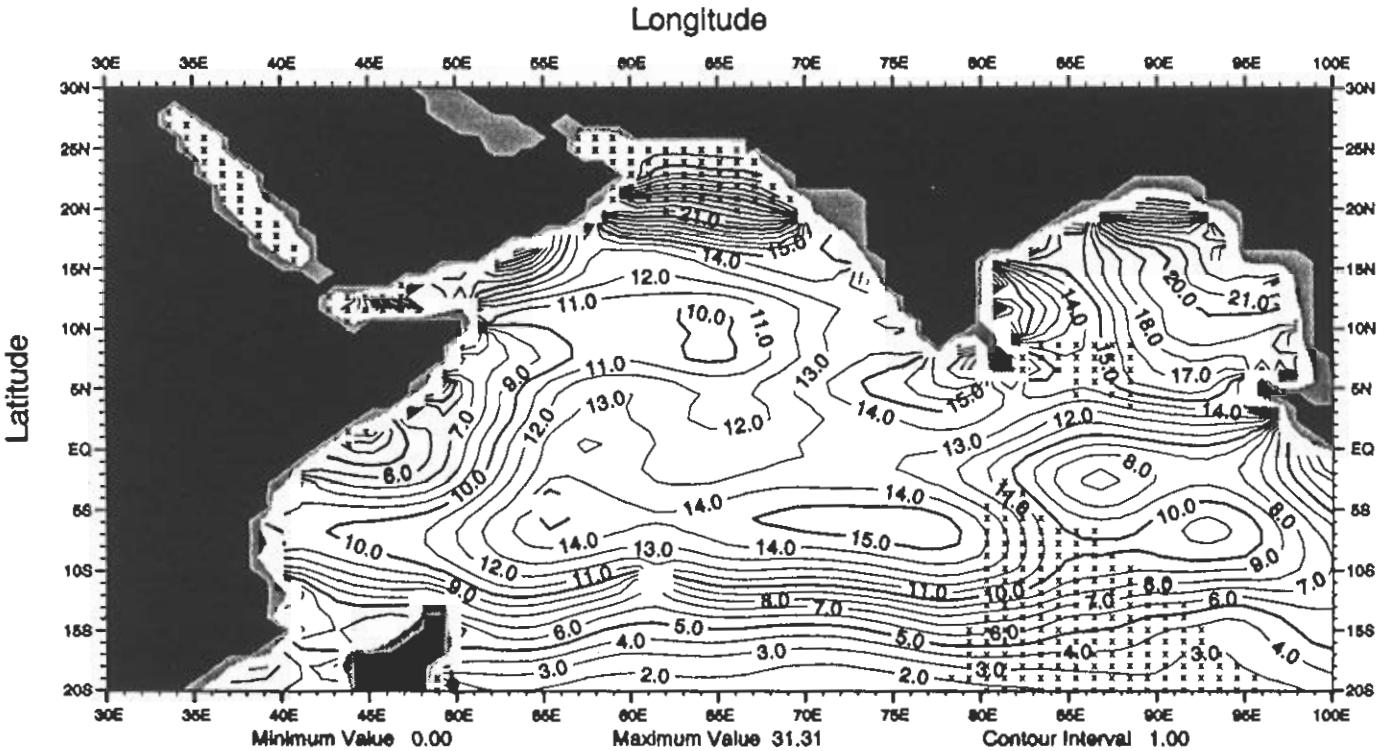

Fig. G21 Spring (Apr.-Jun.) mean nitrate (μM) at 100 m depth

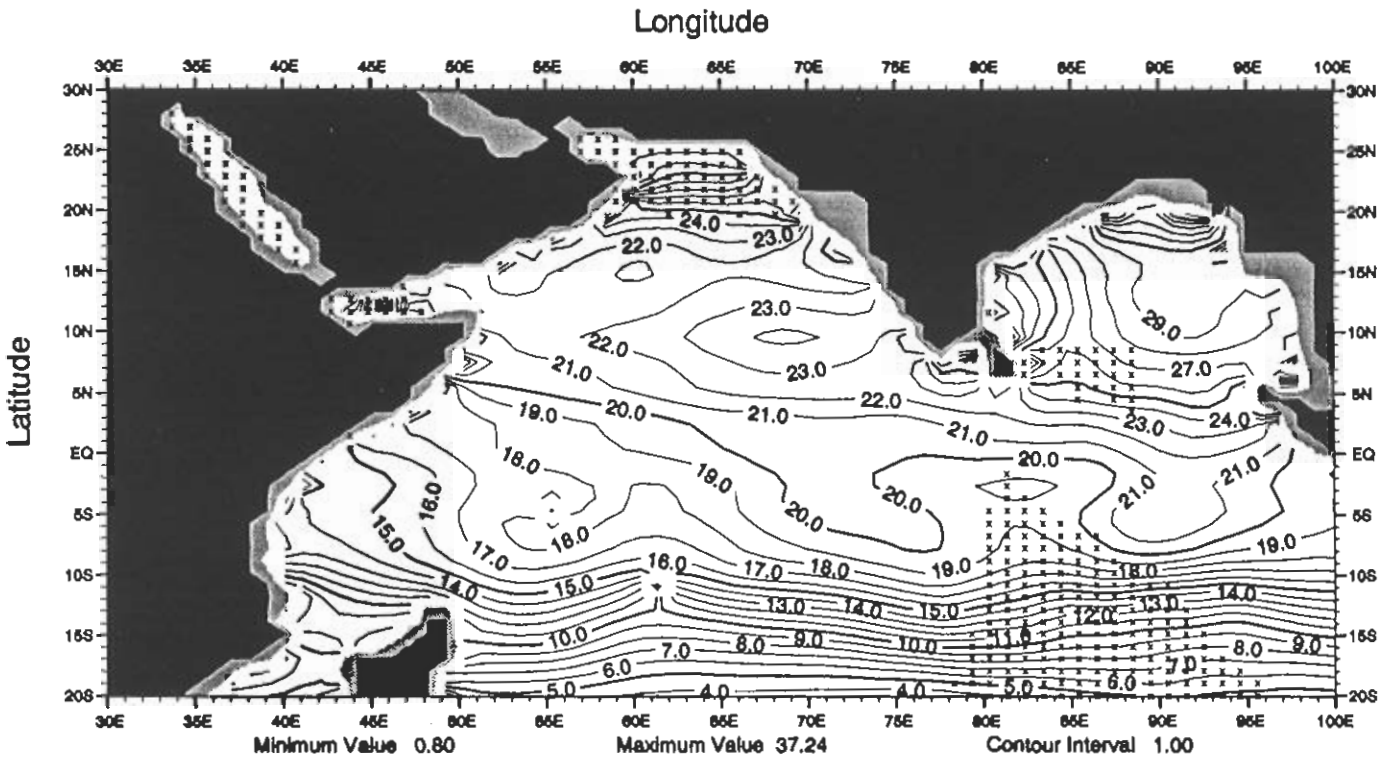

Fig. G22 Spring (Apr.-Jun.) mean nitrate (μM) at 150 m depth

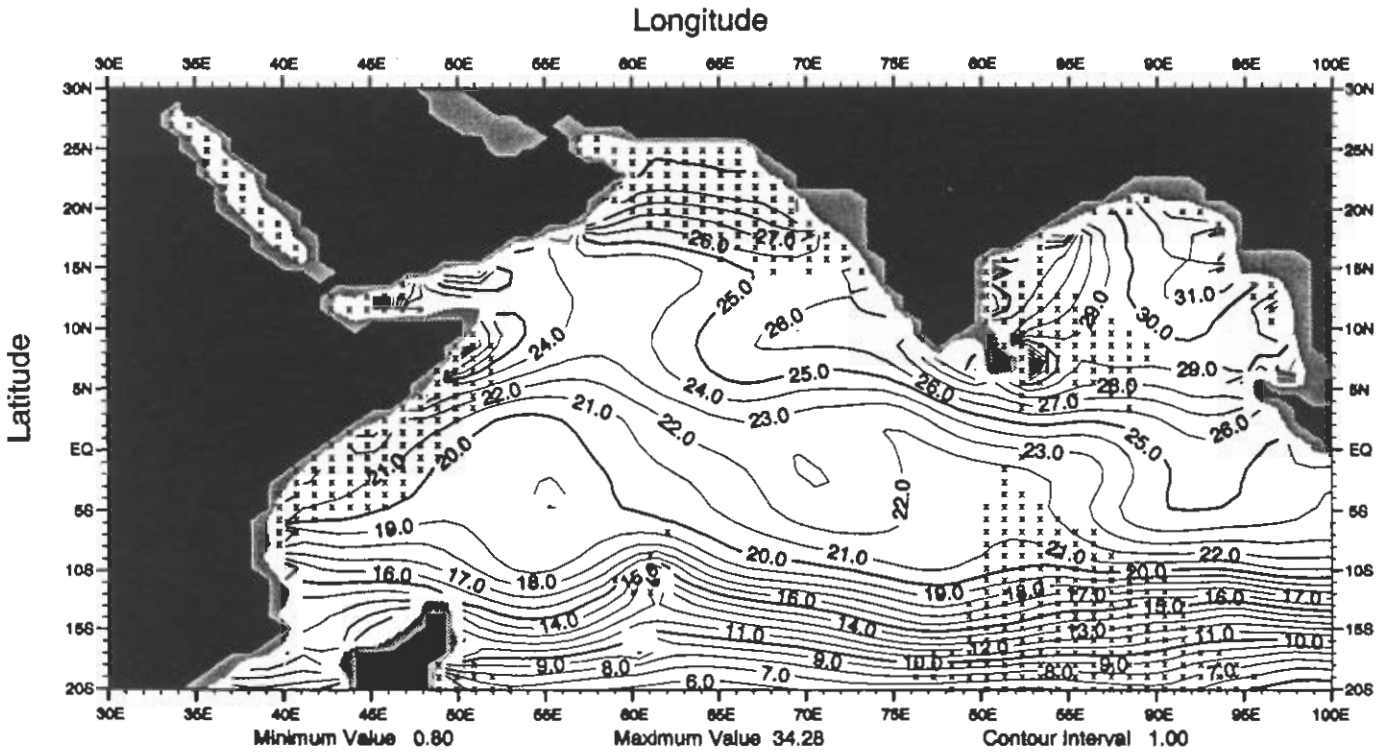

Fig. G23 Spring (Apr.-Jun.) mean nitrate (μM) at 200 m depth

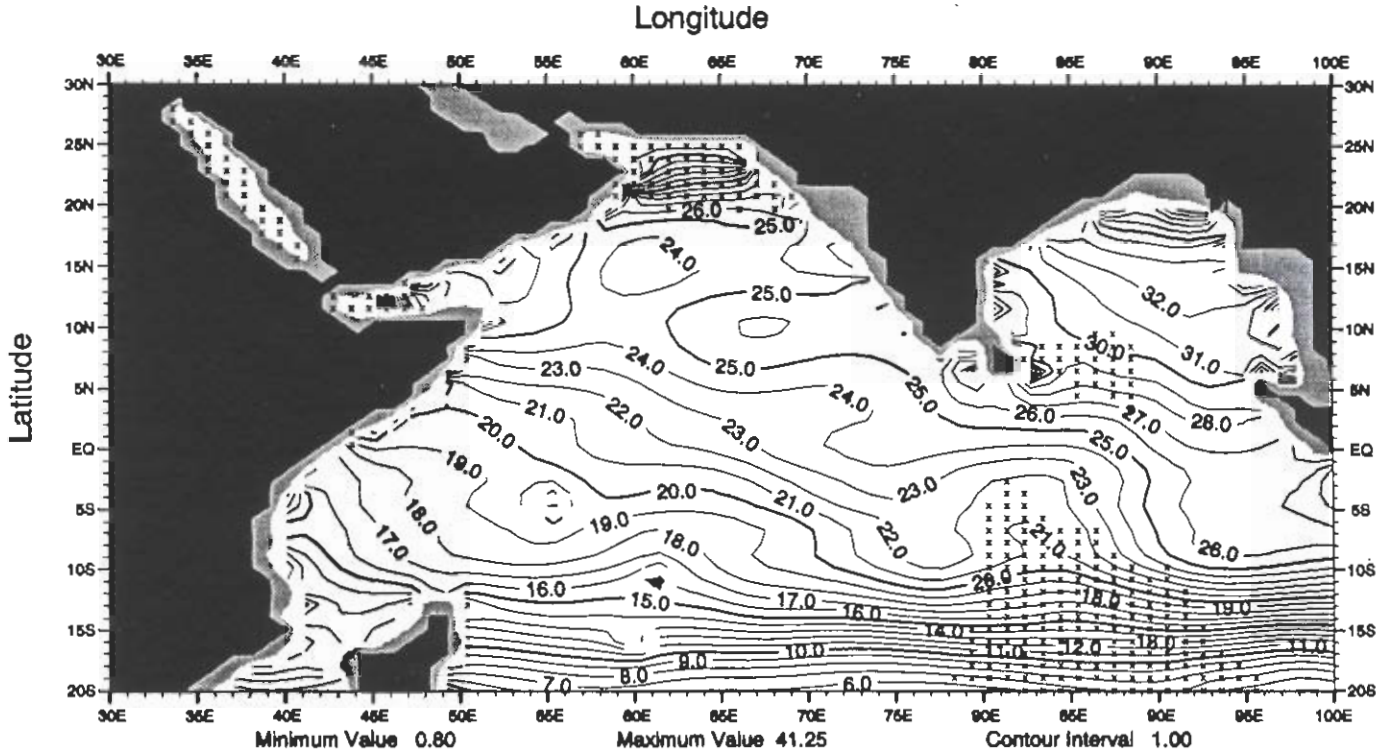

Fig. G24 Spring (Apr.-Jun.) mean nitrate (μM) at 250 m depth

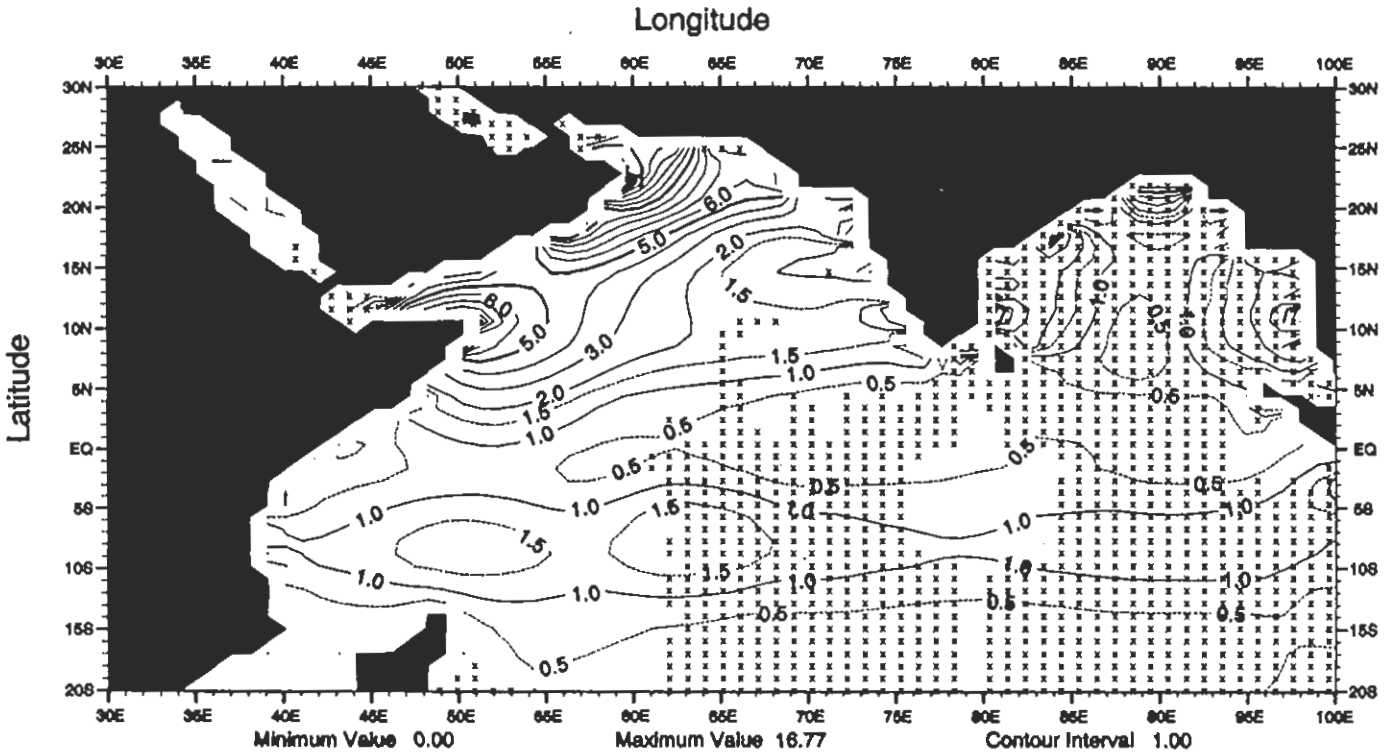

Fig. G25 Summer (Jul.-Sep.) mean nitrate (μM) at the surface

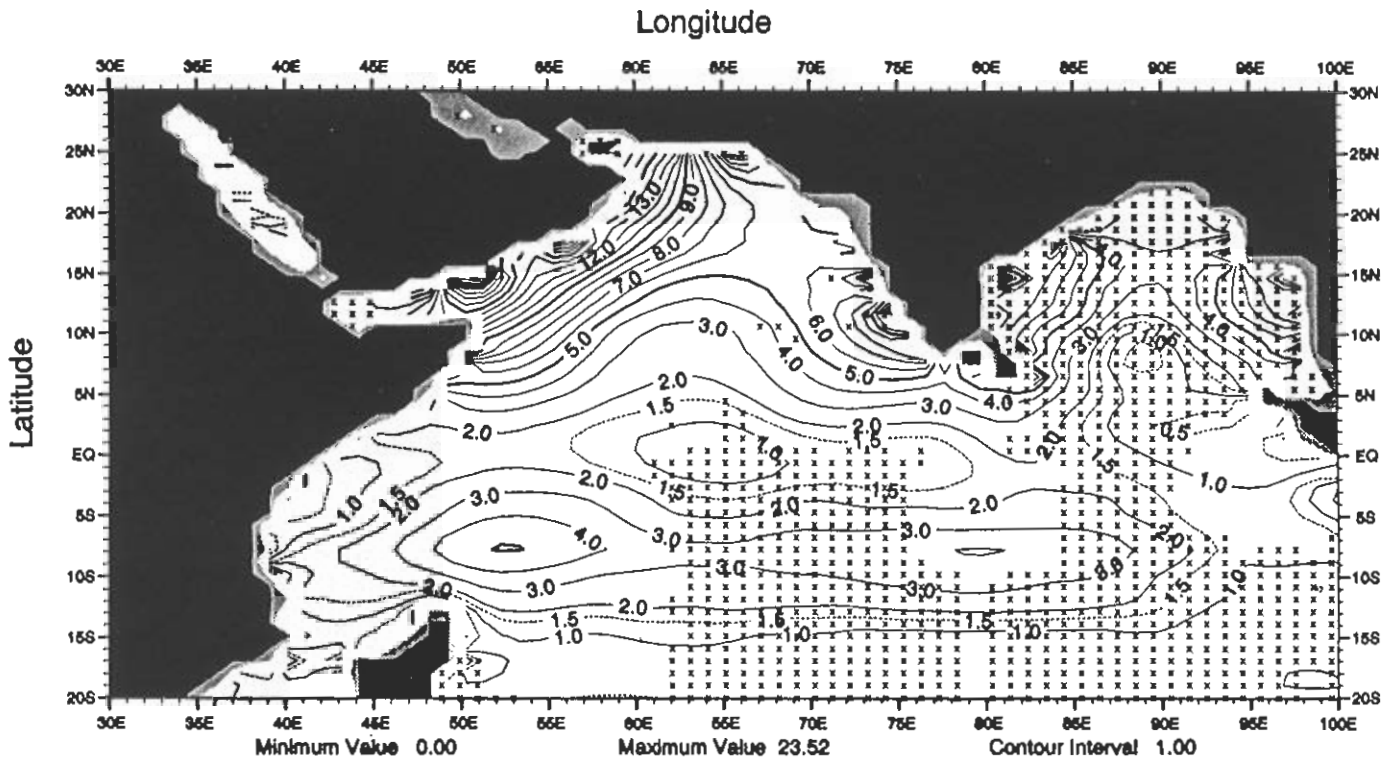

Fig. G26 Summer (Jul.-Sep.) mean nitrate (μM) at 50 m depth

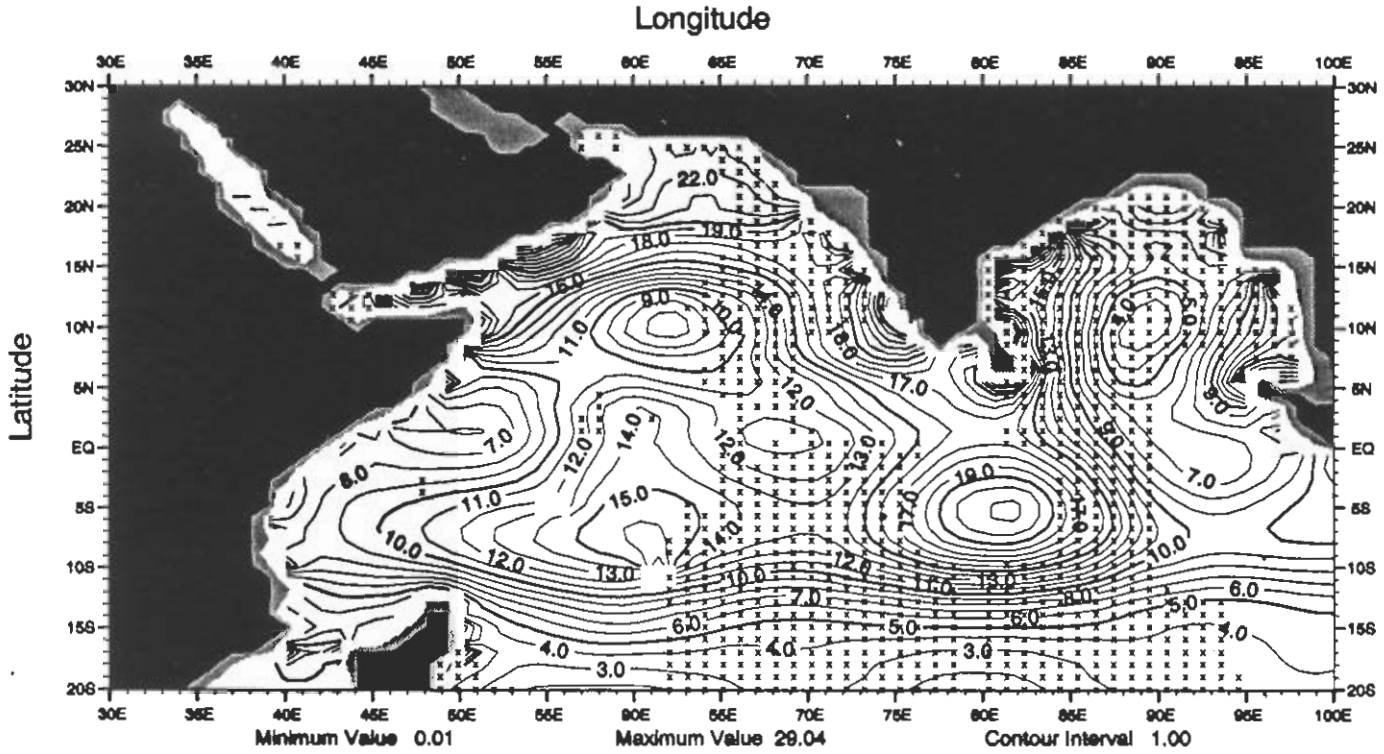

Fig. G27 Summer (Jul.-Sep.) mean nitrate (μM) at 100 m depth

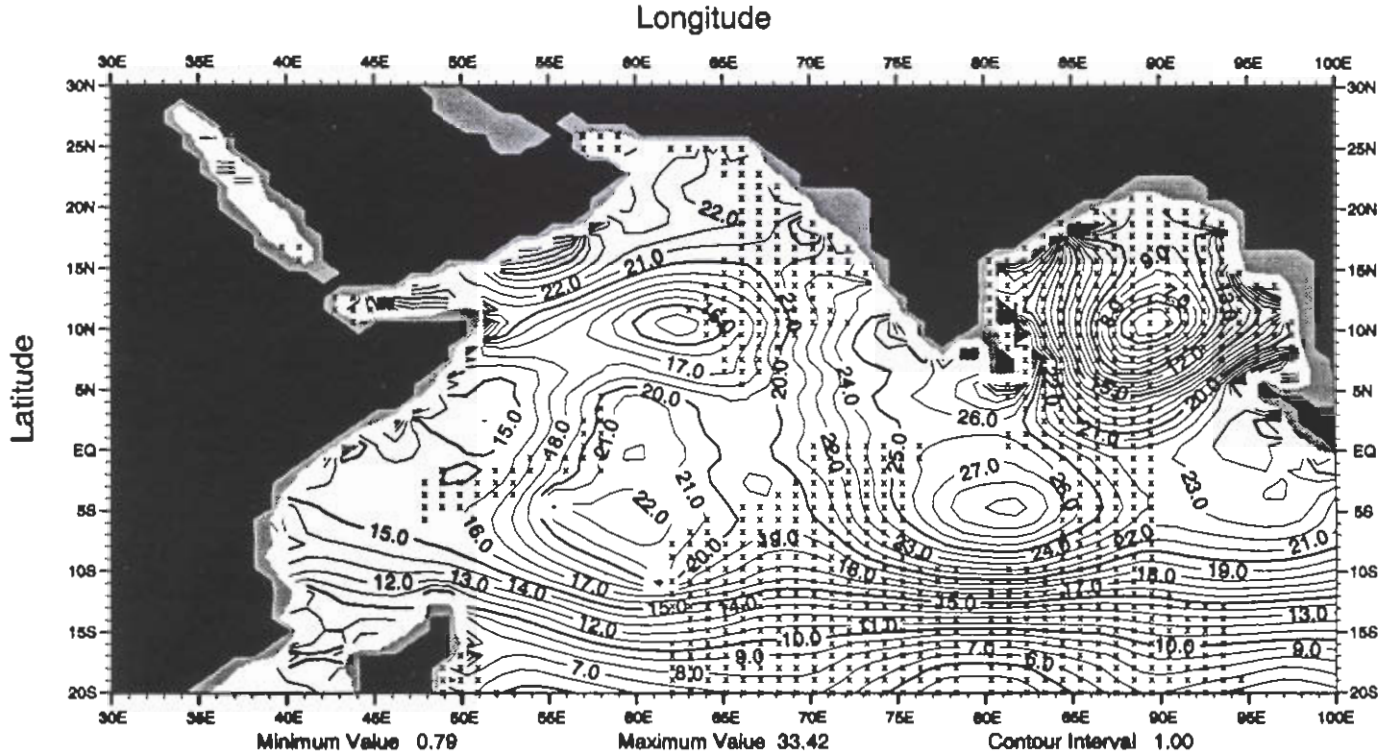

Fig. G28 Summer (Jul.-Sep.) mean nitrate (μM) at 150 m depth

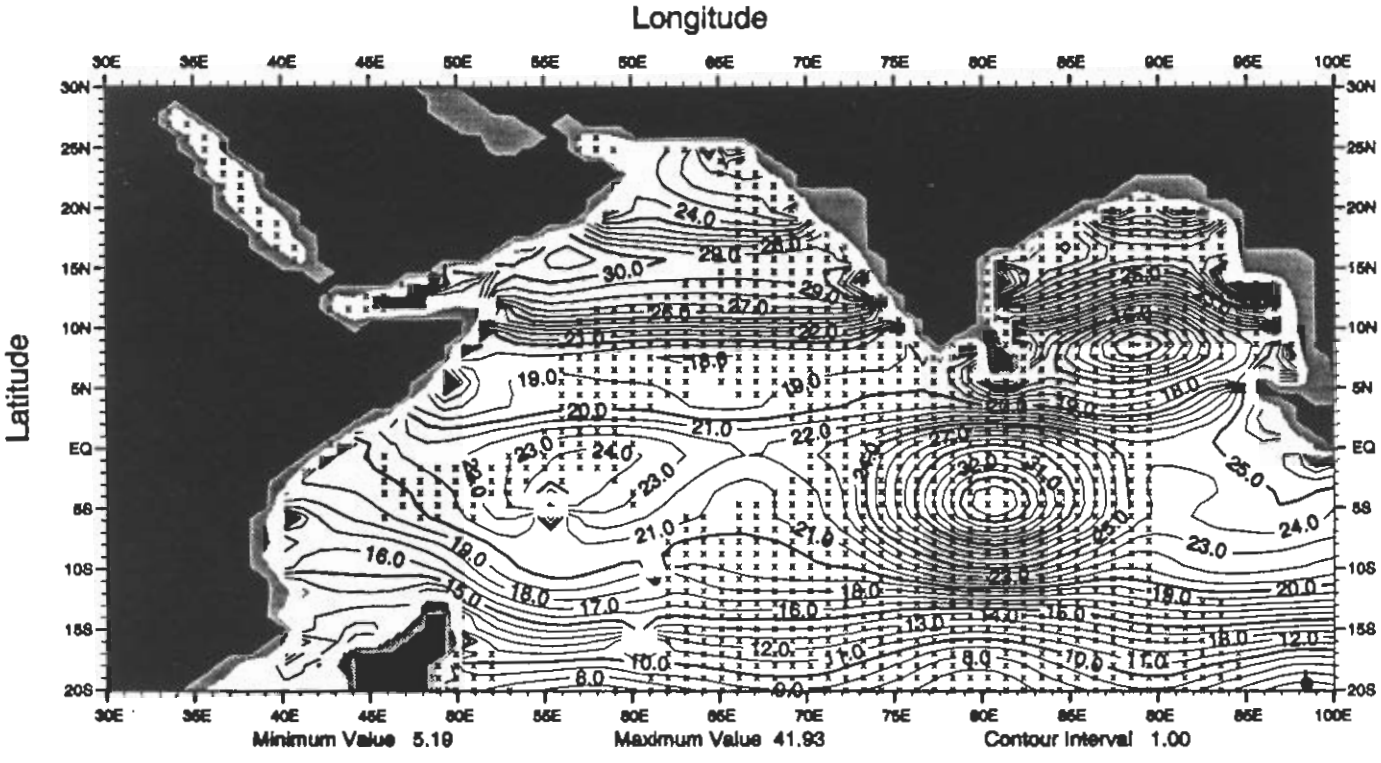

Fig. G29 Summer (Jul.-Sep.) mean nitrate (μM) at 200 m depth

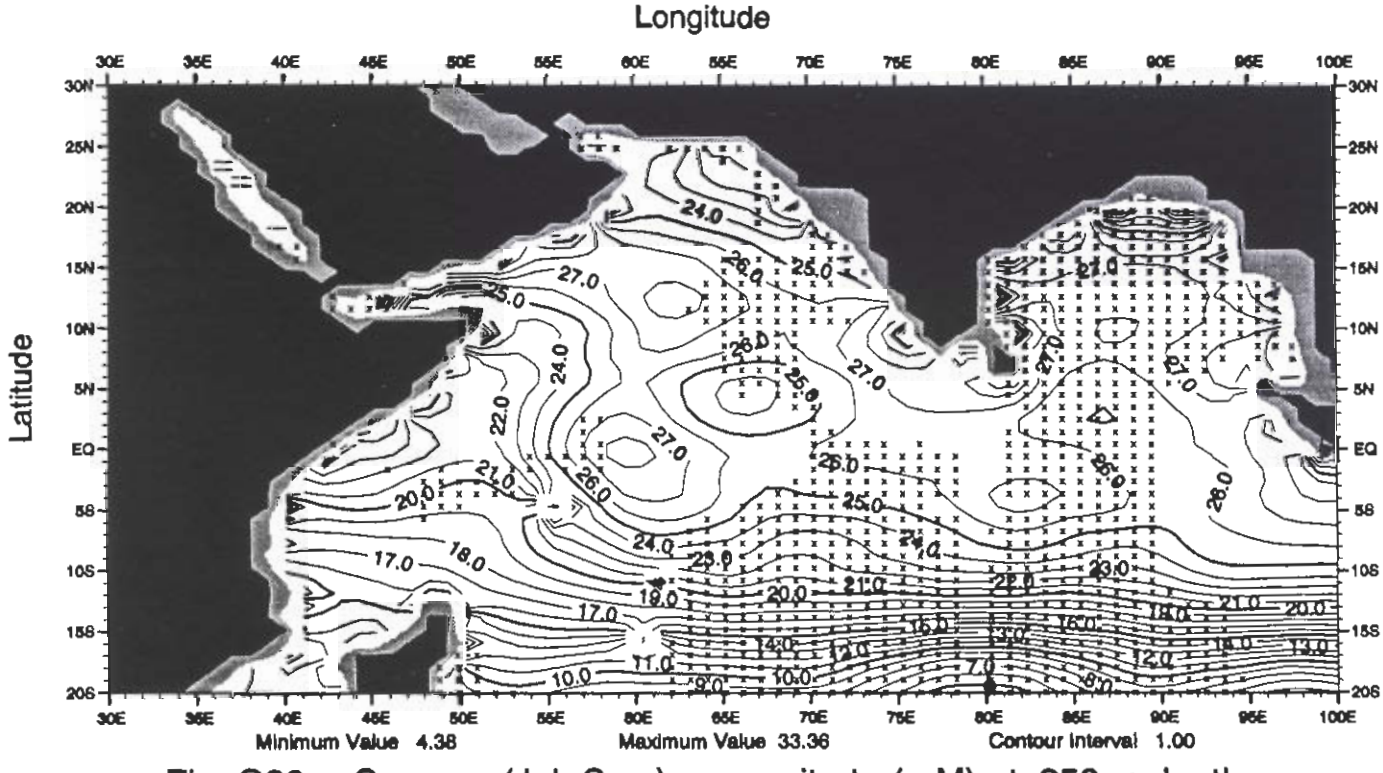

Fig. G30 Summer (Jul.-Sep.) mean nitrate (μM) at 250 m depth

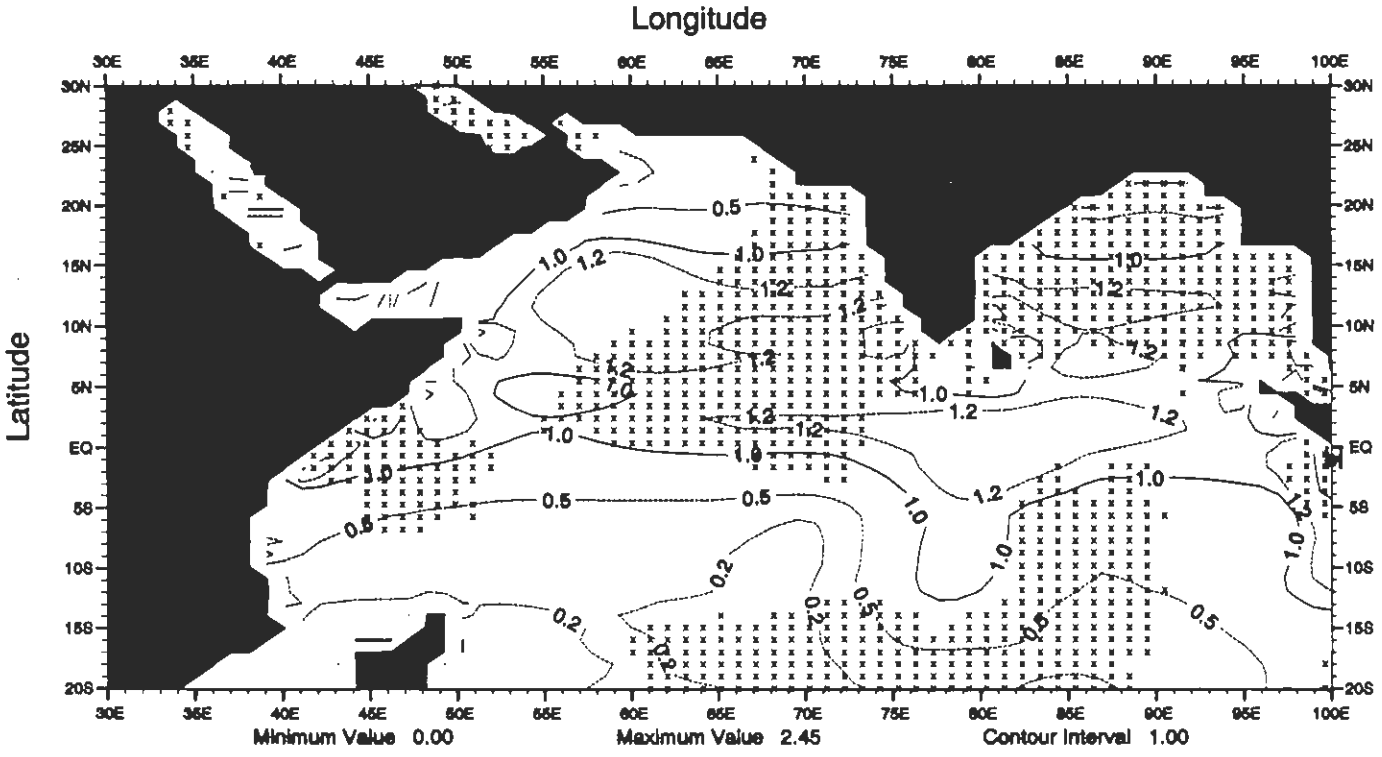

Fig. G31 Fall (Oct.-Dec.) mean nitrate (μM) at the surface

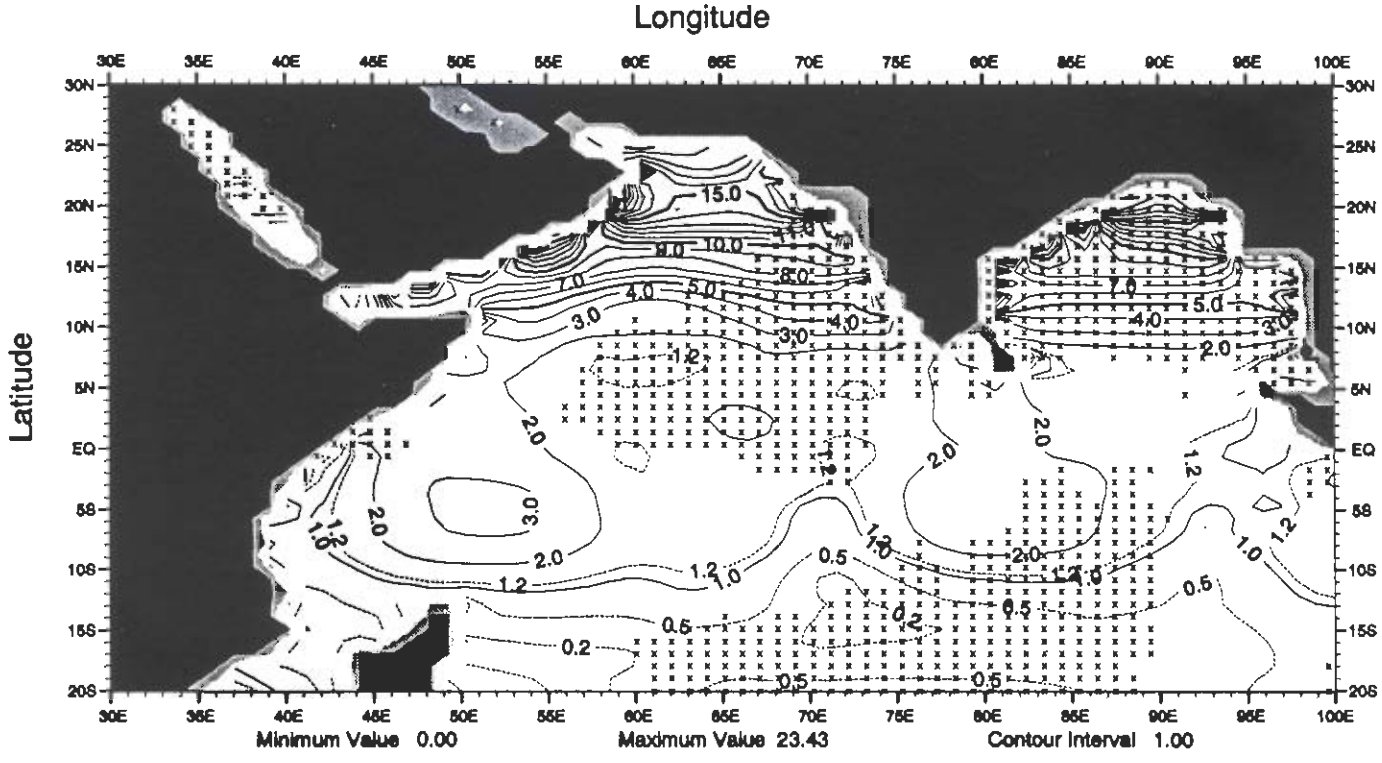

Fig. G32 Fall (Oct.-Dec.) mean nitrate (μM) at 50 m depth

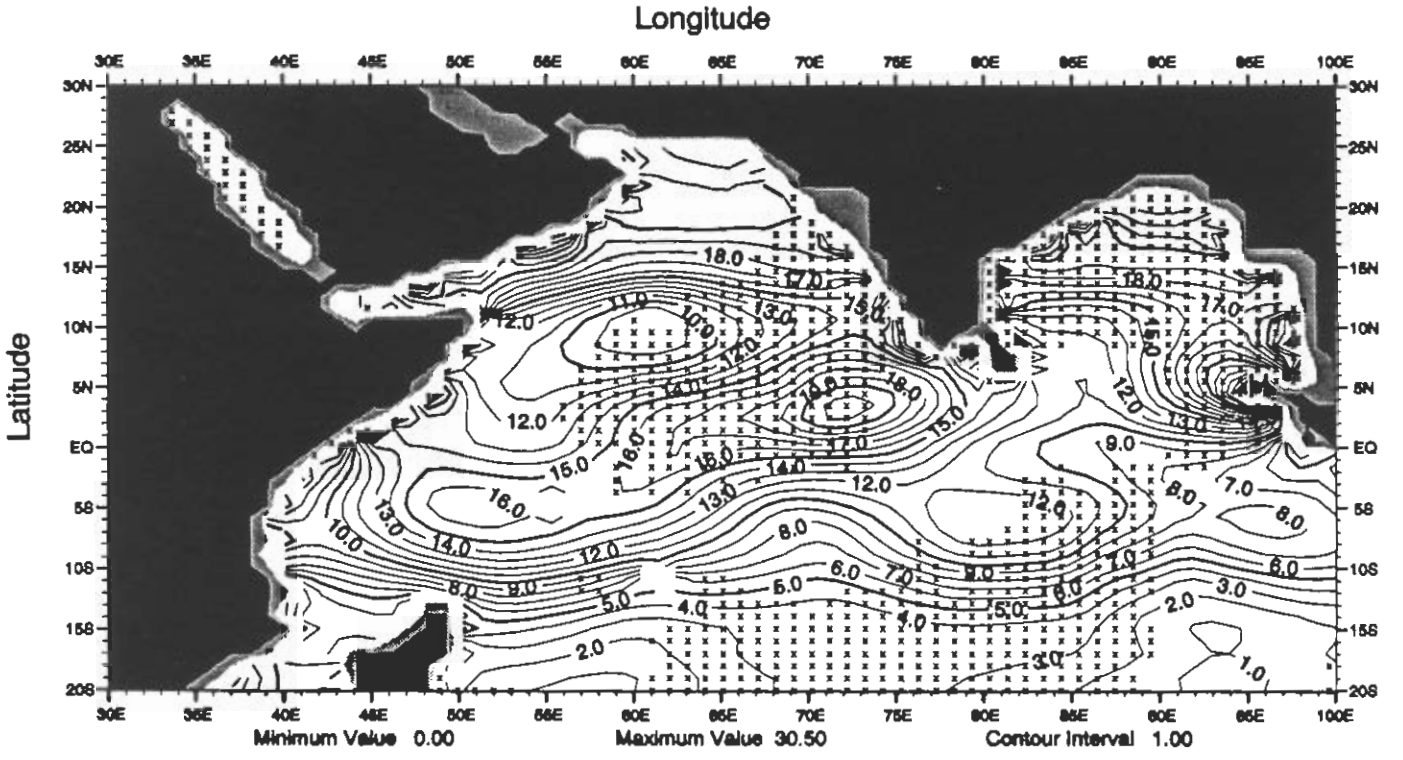

Fig. G33 Fall (Oct.-Dec.) mean nitrate (μM) at 100 m depth

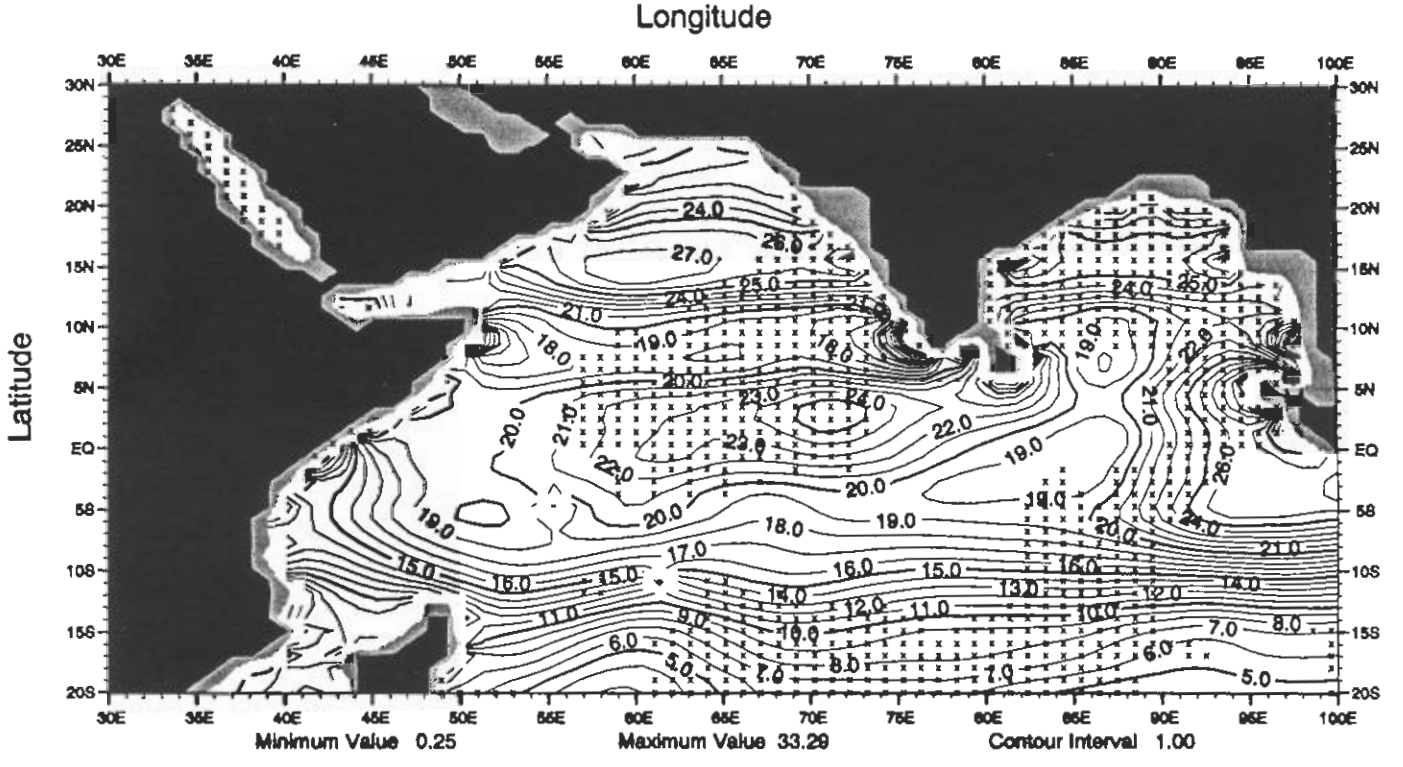

Fig. G34 Fall (Oct.-Dec.) mean nitrate (μM) at 150 m depth

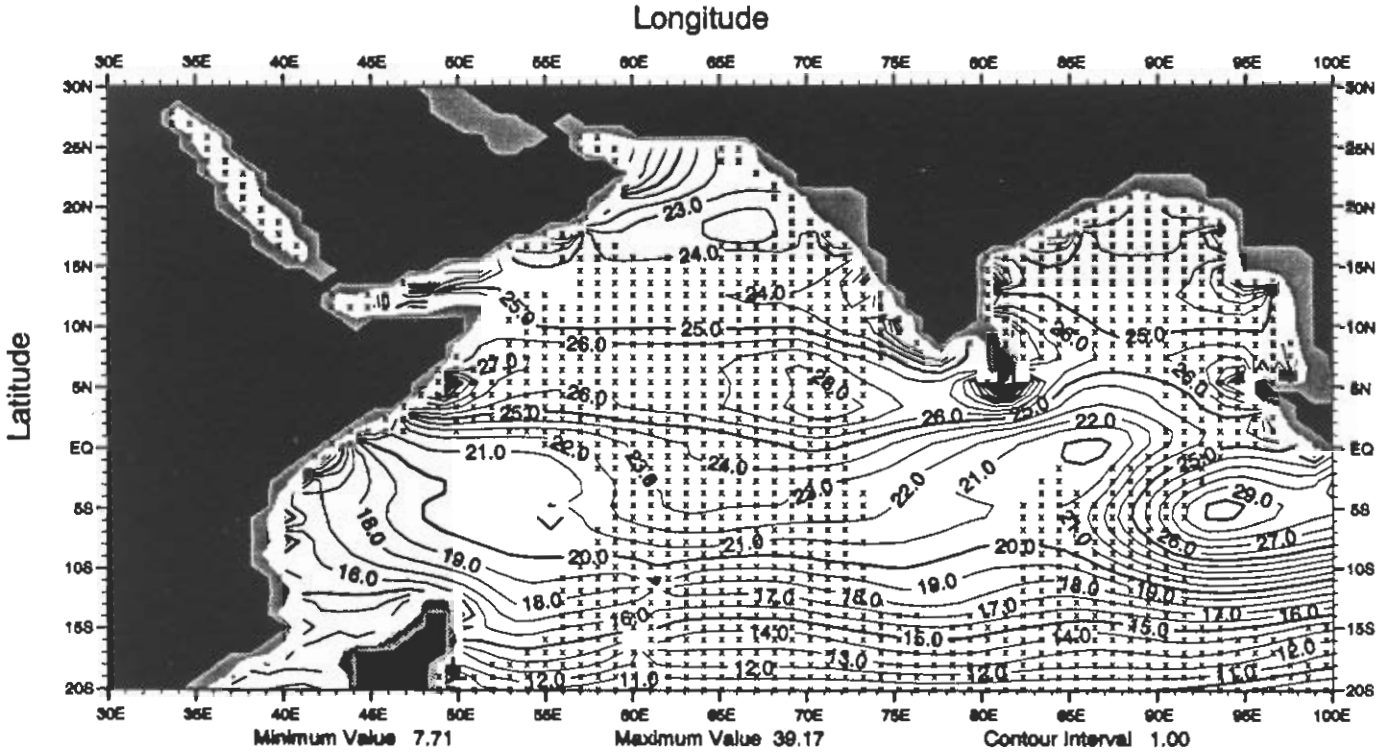

Fig. G35 Fall (Oct.-Dec.) mean nitrate (μM) at 200 m depth

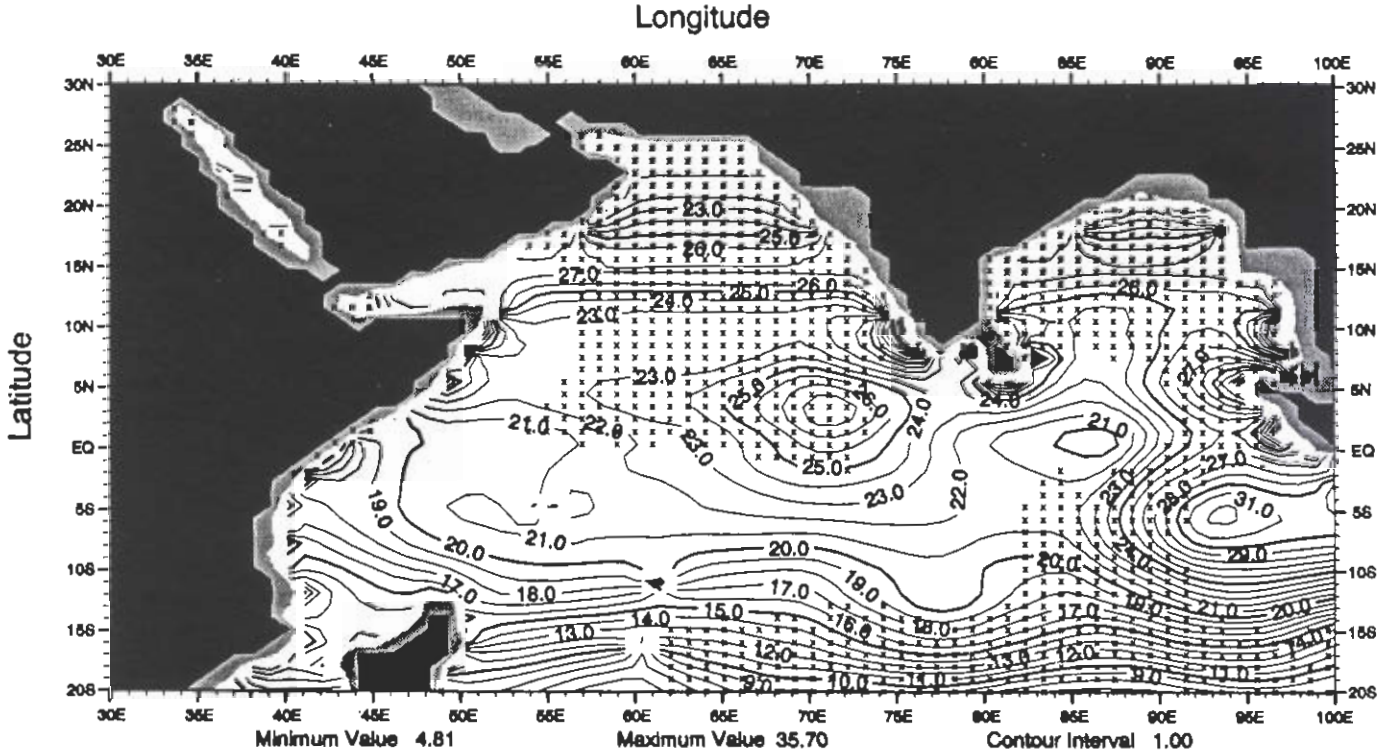

Fig. G36 Fall (Oct.-Dec.) mean nitrate (μM) at 250 m depth

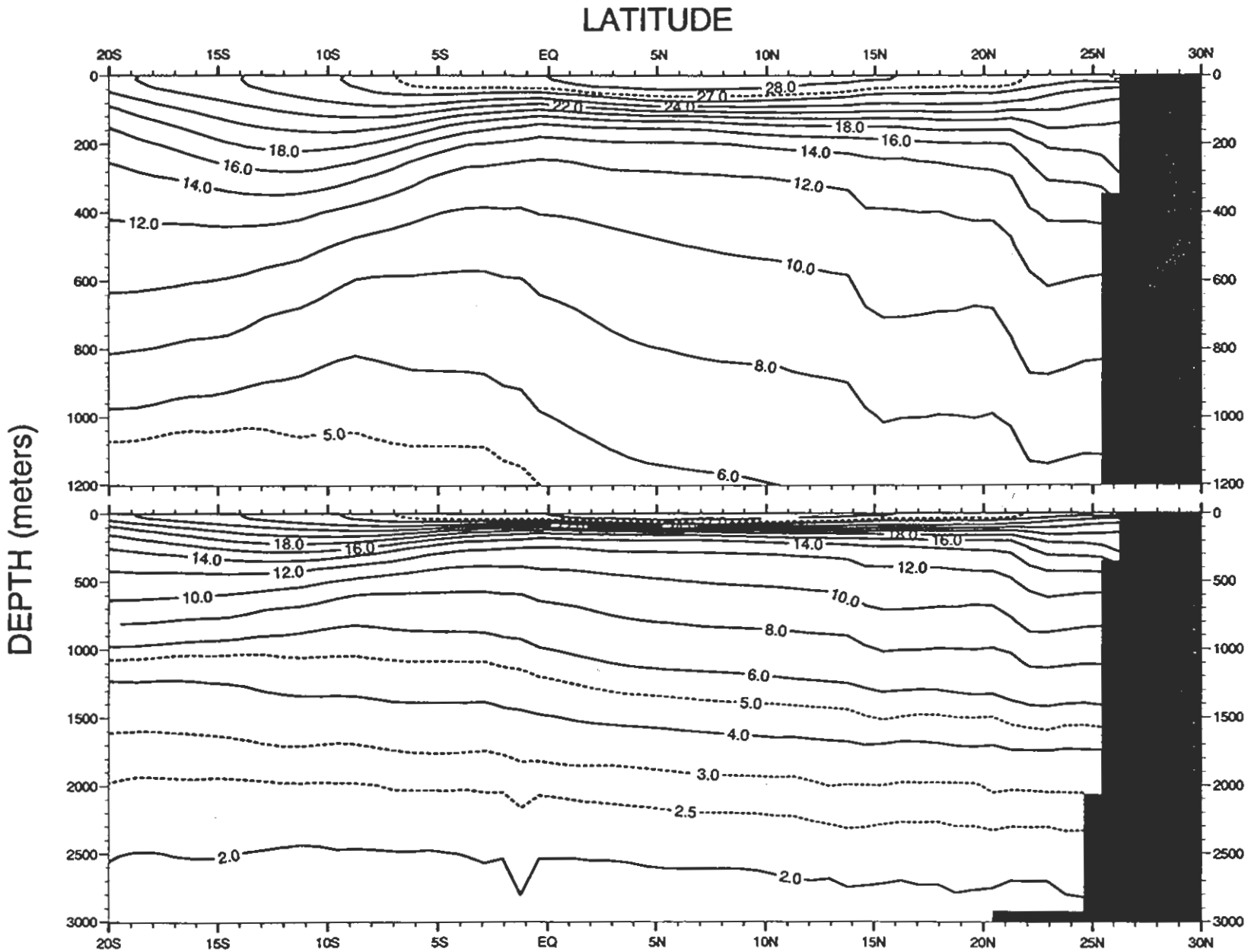

Fig H1. Annual Indian zonal average (by one-degree squares) of temperature (°C)

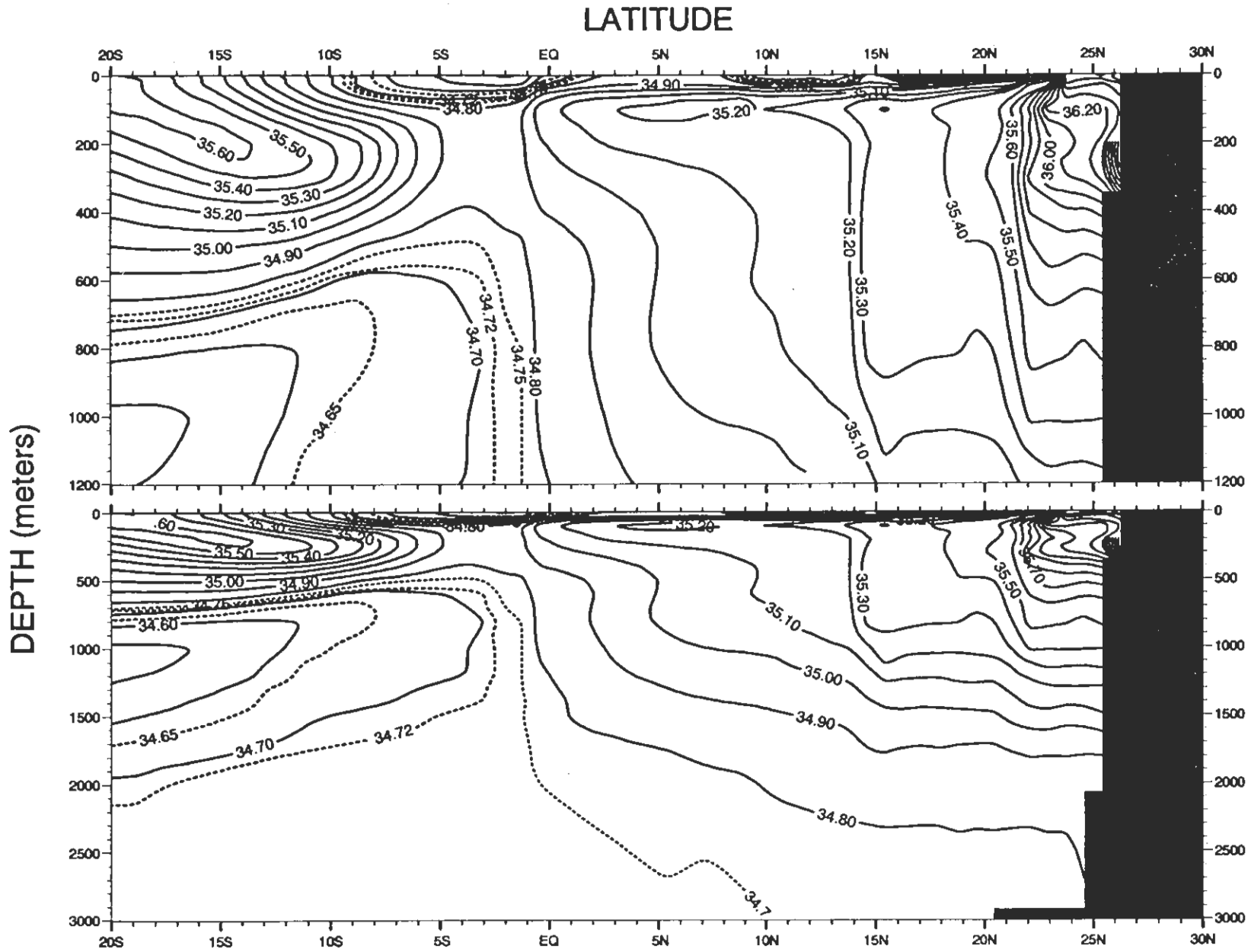

Fig H2. Annual Indian zonal average (by one-degree squares) of salinity (psu)

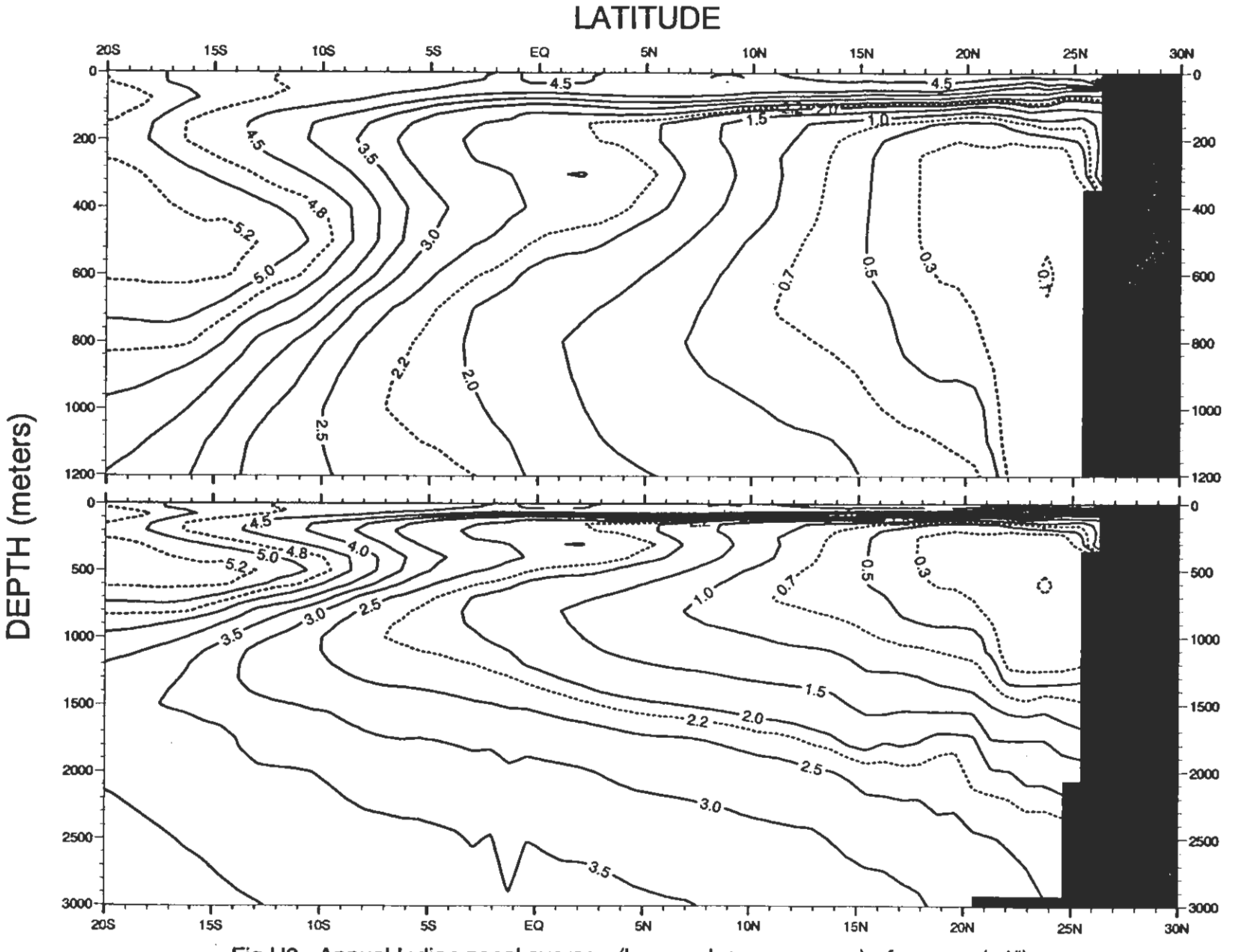

Fig H3. Annual Indian zonal average (by one-degree squares) of oxygen (ml/l)

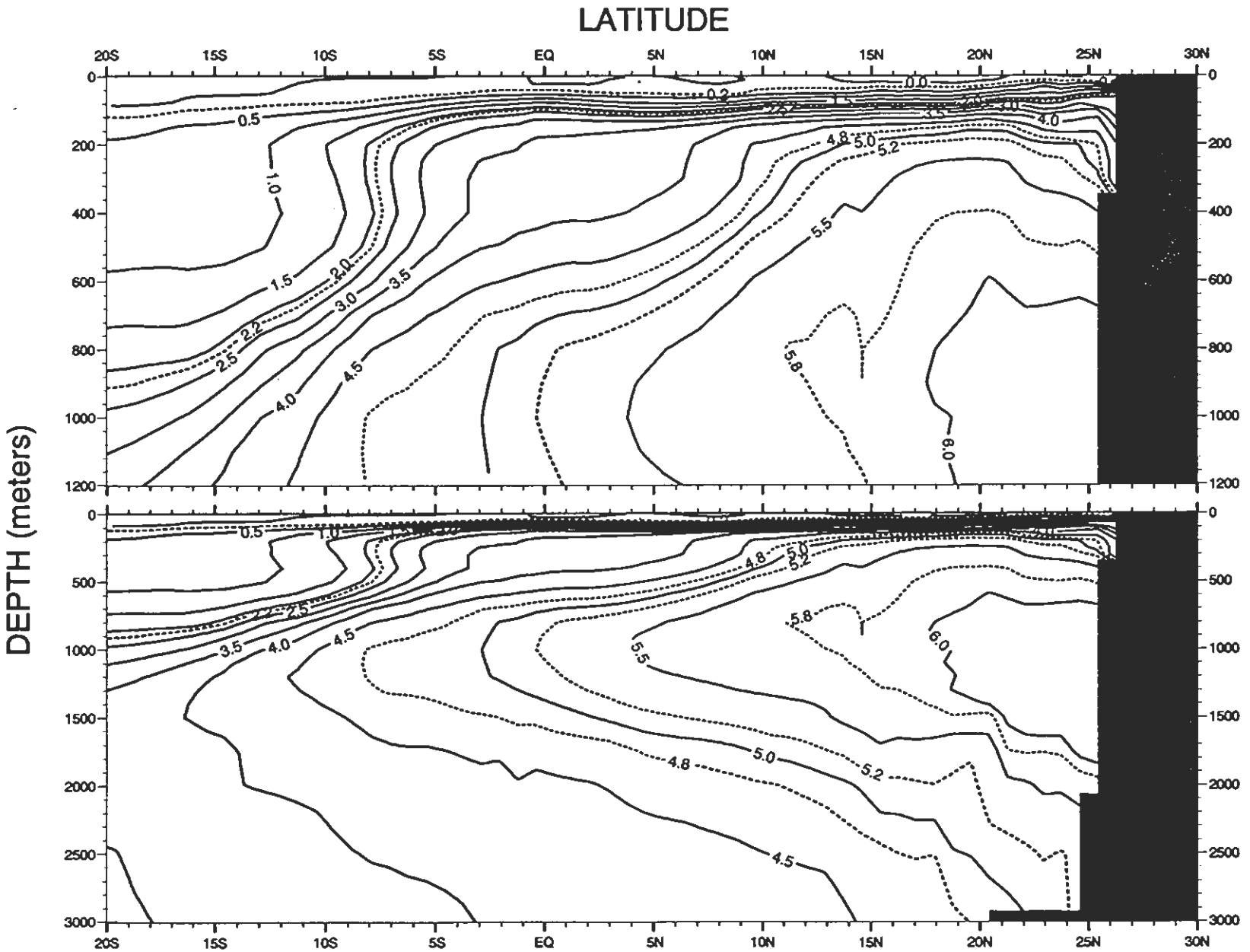

Fig H4. Annual Indian zonal average (by one-degree squares) of AOU (ml/l)

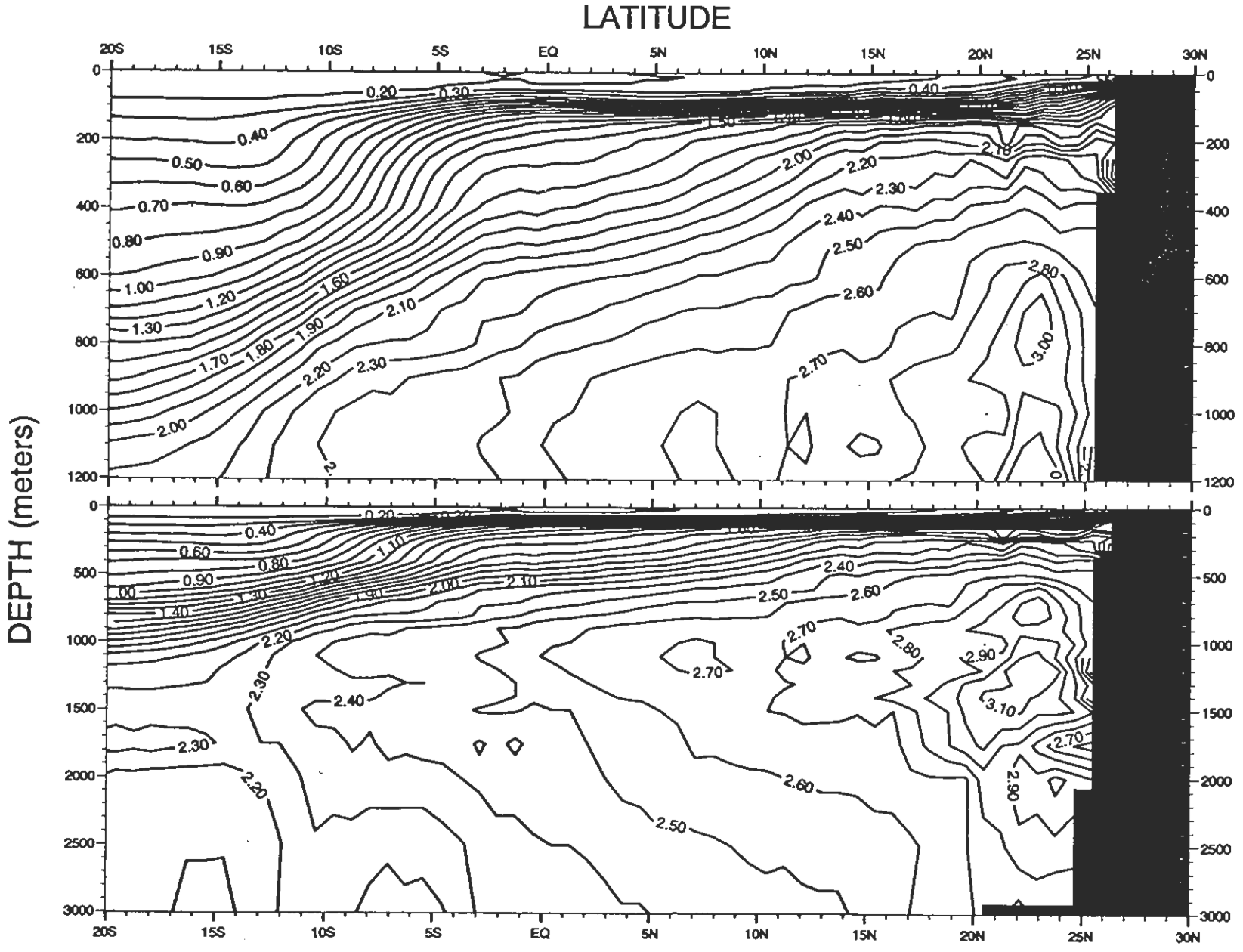

Fig H5. Annual Indian zonal average (by one-degree squares) of phosphate (μM)

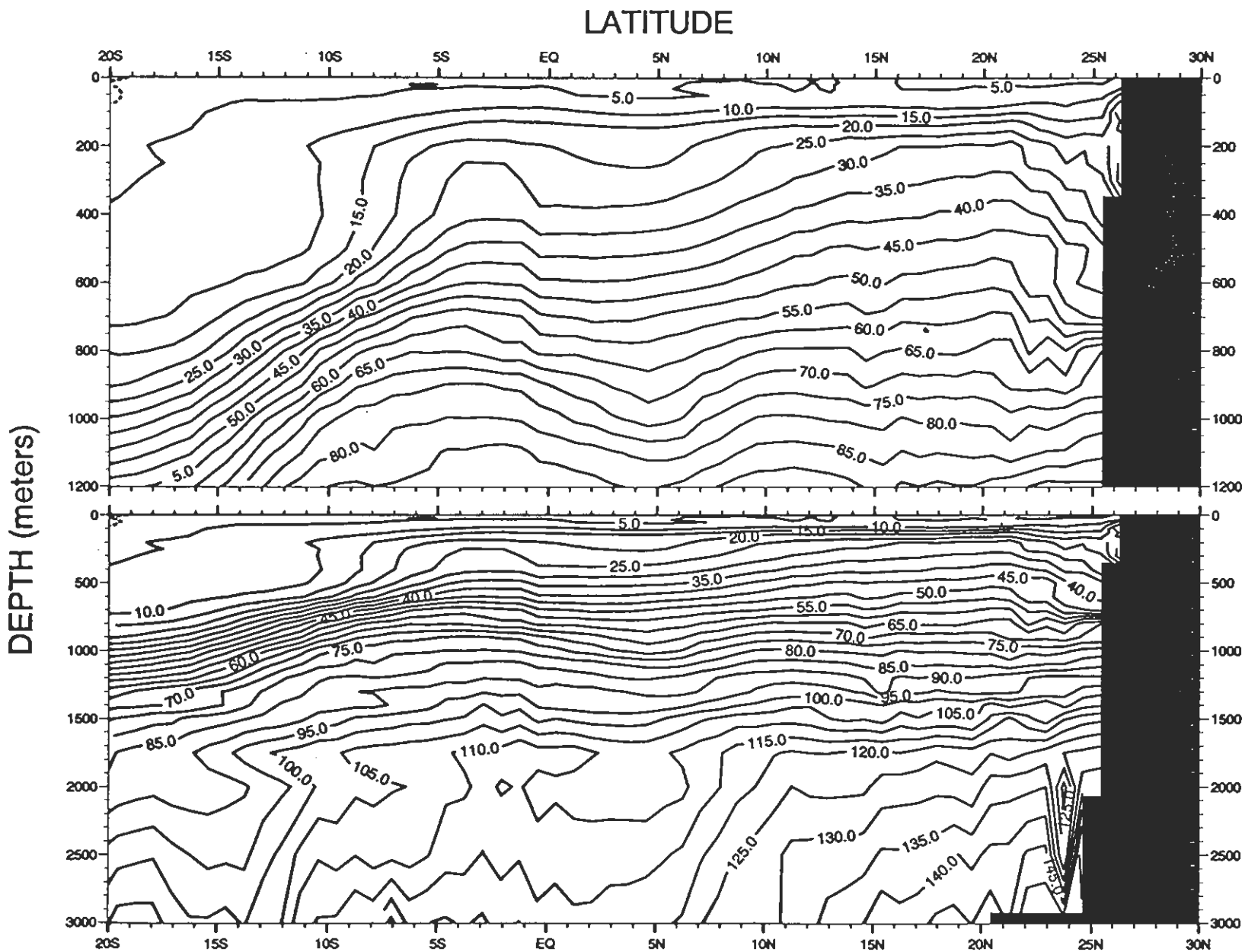

Fig H6. Annual Indian zonal average (by one-degree squares) of silicate (μM)

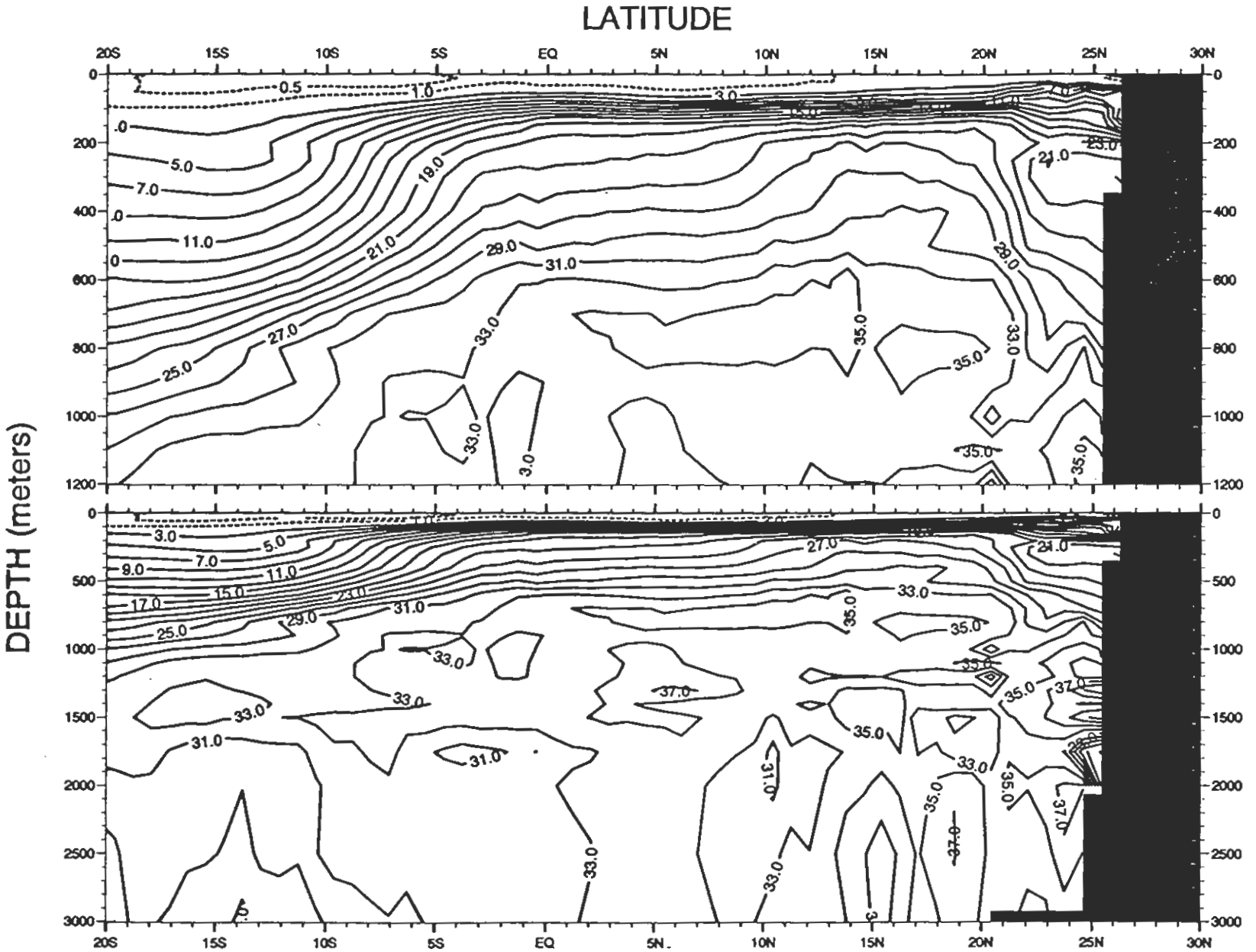

Fig H7. Annual Indian zonal average (by one-degree squares) of nitrate (μM)