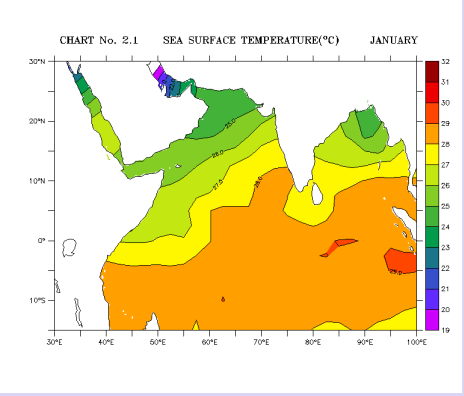
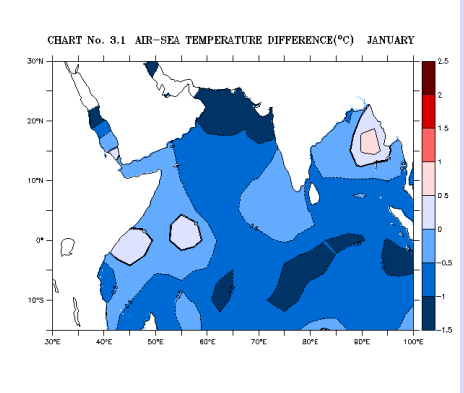
भारत सरकार
GOVERNMENT OF INDIA
पृथ्वी विज्ञान मंत्रालय
MINISTRY OF EARTH SCIENCES
भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

Years of Service to the Nation
राष्ट्र सेवा के 150 वर्ष

Marine Climatological Atlas (1991-2020)





OFFICE OF THE HEAD, CLIMATE RESEARCH & SERVICES
INDIA METEOROLOGICAL DEPARTMENT
PUNE - 411 005

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GOVERNMENT OF INDIA

भारत मौसम विज्ञान विभाग

INDIA METEOROLOGICAL DEPARTMENT

MARINE CLIMATOLOGICAL ATLAS 1991 – 2020

ISSUED BY

DIRECTOR GENERAL OF METEOROLOGY

Data Compilation and Computation
Climate Monitoring and Prediction Group
Climate Research and Services, Pune

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PREFACE

Historically, marine weather and climate services were initiated by the meteorological services of coastal and maritime nations, considering the vulnerability of mariners to sea hazards. But in addition to their obvious economic importance, the oceans are also known to exert a major influence on global climate and in daily weather conditions. Thus, marine data resources are of great value to the global community.

The provision of marine weather and climate services is dependent on a steady flow of accurate and timely observations of meteorological parameters like wind, weather, waves, air and sea temperatures etc. which is accomplished by an approximate 7000 numbers of commercial ships navigating the global ocean. These ships are enrolled by the World Meteorological Organization (WMO) in its Voluntary Observing Fleet (VOF) Programme, conceptualized in 1947. Since the adoption of resolution 35(Cg IV) of the WMO in 1963, the India Meteorological Department (IMD) was assigned the responsibility of collecting and archiving marine meteorological data for the Indian Ocean. The India Meteorological Department acknowledges with deep appreciation the excellent work done by the officers and staff of the ships enrolled in the VOF. The data have been collected and compiled by the ships belonging to various nations and criss-crossing over the Indian Ocean, in true spirit of international collaboration. The data is subjected to quality control and then archived in digital format at the National Data Centre, Pune of IMD.

To fulfill its obligations, IMD decided to prepare a Marine Climatological Atlas of the Indian sea area for the 30 years period, 1991-2020. This volume is a result of this intent and will contribute significantly to advancing our understanding of atmosphere – ocean climate system over the north Indian Ocean.

The atlas was prepared under the supervision and technical guidance of Dr. O. P. Sreejith, Sc. F, CMPG. Shri Arvind R. Pagire, JRF also contributed in the preparation of codes and plots. Shri Ranjan Phukan, Sc. C and Smt. Bharati S. Sabade, Met. B aided in the compilation of data. Shri. Sunil Narke, Met. A. and Smt. Manisha Vikam, Met. A have helped in the various stages of this publication. The DTP & publication unit created the cover page and the layout design. Shri. .K. S. Hosalikar, Sc. G , Head, Climate Research and Services, Pune gave overall guidance and support for bringing out this publication I would like to express my sincere appreciation of their efforts in bringing out this informative and useful publication.

New Delhi
February 2024

M. Mohapatra
Director General of Meteorology

Caution

This Publication is prepared and published in the interest of international collaboration for the exchange of Meteorological information. The Government of India makes no warranty, statement or representation, expressed or implied with respect to the accuracy, completeness or usefulness of the information contained herein and in so for as permitted by law, shall not have any legal liability or responsibility (including for negligence) for any loss, damage and injury (including death) which may result, whether directly or indirectly from the supply or use of this publication.

Introduction

Since the adoption of resolution 35(Cg IV) of the World Meteorological Organization (WMO) in 1963, the India Meteorological Department (IMD) was assigned the responsibility of collecting and archiving marine meteorological data for the area north of Latitude 15^0 S & between Longitude 20^0 E to 100^0 E and publication of marine climatological summaries. To fulfill these obligations, IMD has so far published the Decadal Marine Climatological Summary Charts 1971-1980, 1991-2000, 2001-2010, 2011-2020. IMD has now prepared this Marine Climatological Atlas for the Indian Sea area of responsibility.

1. Data Sources

The data used to prepare the Atlas were obtained from two sources:

a) Weather observations recorded in the meteorological log books by Indian Voluntary Fleet (IVOF).
b) Weather observations made by other ships in the Indian area of responsibility & sent to India by the other WMO members in the IMMT formats.

All marine observations available with IMD for the period 1961-90 have been used for the preparation of this Atlas.

2. Data Processing

Observations obtained from the meteorological logbooks of the IVOF were scrutinized to eliminate instrumental, positional & coding errors. These data together with those received from other WMO members were examined & the corrected data were assimilated into the data bank for the further processing. As per the WMO guidelines, the data have been subjected to further quality control procedures like filtration of duplicate observations, internal consistency checks, identification of extreme values and outliers etc.

The area of responsibility is divided into boxes with constant grid spacing of 2.5 degree each, in latitude and longitude. All available quality controlled observations are averaged in each box for each month during the

30 year period. The monthly mean fields were then objectively analyzed to filter out spatial noises. The objective analysis scheme used to filter out the spatial noise is an iterative difference-correction scheme with a weight function. We have used the Barnes weight function, which is defined as

$$\mathbf{W_i = exp\ (-4r^2\ R^{-2})\ for\ r < R,}$$

Where, r is the distance between the grid point and analysis grid point. R is the radius of influence. The radius of influence is decreased with each pass in order to analyze smaller scale features with each successive iteration. Since the smallest wavelengths are noisy, the smallest radius of influence needs to be at least seven to eight times the average separation distance. The smallest radius of influence we used 1925 Km, is seven times the average separation distance of a 2.5 degree grid resolution. For the preparation of climatology, 3 passes of the analysis scheme were performed with radii of influence equal to 3000 km, 2500 km and 1925 km.

3. Data Presentation

The monthly climatology of the following 15 parameters were prepared and presented in chart form

Air Temperature	(^{0}C)	Prevailing Wind Direction	Degrees
Sea Surface Temperature	(^{0}C)	Gale Wind	%
Dew Point Temperature	(^{0}C)	Mean Wave Height	meters
Air-Sea Surface Temperature Difference	(^{0}C)	Wave Height ≥ 4.0 m	%
Sea Level Pressure	hPa	Maximum Wave Height	meters
Wind Speed	Meter/second	Mean Wave Period	seconds
Total Cloud	%	Visibility ≥ 10 km	%
Low Cloud	%		

The charts of Air Temperature, Sea surface temperature, Dew point temperature, Air-Sea surface temperature difference, Mean sea level pressure, Wind speed, Total cloud and Low cloud are presented with isolines. The remaining elements are presented in grid format.

TABLE 1: MONTHWISE DISTRIBUTION OF DATA

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1991	5822	5322	5970	5785	4687	4784	4602	4852	5146	5059	3774	3787	59590
1992	4031	3395	3161	3087	3084	3142	4143	3144	3688	3847	3431	3833	41986
1993	5829	3737	5051	4446	4853	4733	5438	5231	4187	5033	6284	7949	62771
1994	10362	10284	12295	12616	13108	13434	16718	16686	17525	20487	22963	20211	186689
1995	23541	20887	23708	23046	21966	23429	24216	24267	23007	23650	21661	21323	274701
1996	20893	19258	20852	14500	13754	12506	20925	22349	21036	22908	22697	21242	232920
1997	21013	22280	23887	19182	18712	18270	17924	18398	16890	16973	16845	17945	228319
1998	17874	15987	19109	19690	19425	17993	16073	16552	18127	19016	19945	18510	218301
1999	15830	15841	18605	16359	16558	14620	14136	14452	14898	15448	15834	15106	187687
2000	13750	15051	15546	15500	15959	14886	16897	16764	16518	16601	15515	16177	189164
2001	13511	12440	12197	12839	11678	10380	10545	10719	10835	10985	10674	10568	137371
2002	11051	9751	12230	9837	12480	10461	11127	11123	10784	11791	9985	10378	130998
2003	9114	9315	11035	10172	9910	9099	9940	8894	9578	9978	9963	10722	117720
2004	12603	10729	10339	10541	11692	10823	10624	11135	10952	12124	10177	10439	132178
2005	10644	9400	12661	12833	13607	11672	11750	13521	12361	12588	13160	11737	145934
2006	10817	10098	11678	10412	11151	11107	10904	10811	10886	10835	10547	8742	127988
2007	8329	7351	7388	6393	6787	6797	7278	6762	8006	8122	8930	8702	90845
2008	9197	8929	9110	9554	9316	7930	7914	8600	8680	8983	10033	9876	108122
2009	9712	9624	9458	7689	7924	7513	7801	8122	7930	7859	8783	8196	100611
2010	8199	7516	9296	9233	7169	7248	8002	7979	7168	8155	7634	7309	94908
2011	7296	6401	7028	7919	8878	8643	7726	8541	7940	8484	8369	9500	96725
2012	9679	8292	8870	9461	9570	9202	8888	8605	8223	9786	8290	8547	107413
2013	9106	9120	8324	8033	7558	7679	7373	7147	8061	9488	9302	8792	99983
2014	8811	8089	6969	8669	8310	5599	4984	3925	3530	6167	6589	7025	78667
2015	7168	8697	8098	7993	7833	6377	6138	6646	7258	8419	8507	9097	92231
2016	9722	8044	9042	8820	8813	8782	8070	7691	7384	8181	8197	8016	100762
2017	6557	6815	8610	9010	8372	11698	8749	11541	9963	10894	10215	9071	111495
2018	7969	11589	10683	8513	9546	8371	7330	8225	9594	12516	11405	10722	116463
2019	10172	11222	8781	10348	12824	10769	11738	11127	10358	12629	13302	12986	136256
2020	13978	13098	14532	11272	12595	11179	12520	11645	12869	14551	14304	17233	159776
Total	332580	318562	344513	323752	328119	309126	320473	325454	323382	351557	347315	343741	3968574

Number of Weather Observations over the Area of Responsibility of India contributed by WMO members

WMO Country Code	Name of WMO Number	Number of Observations
AU	Australia	39495
CA	Canada	602
HR	Croatia	12694
DK	Denmark	54
FR	France	126258
DE	Germany	450906
HK	Hong Kong	16092
IN	India	182037
IL	Israel	11482
JP	Japan	18358
KR	Korea Republic	442
MY	Malaysia	1508
NL	Netherlands	115273
NC	New Caledon	10
NZ	New Zealand	185
PL	Poland	5806
RU	Russia	45993
SG	Singapore	3607
ZA	South Africa	2176
SE	Sweden	257
GB	United Kingdom	311266
US	United States	110507
	others	2567

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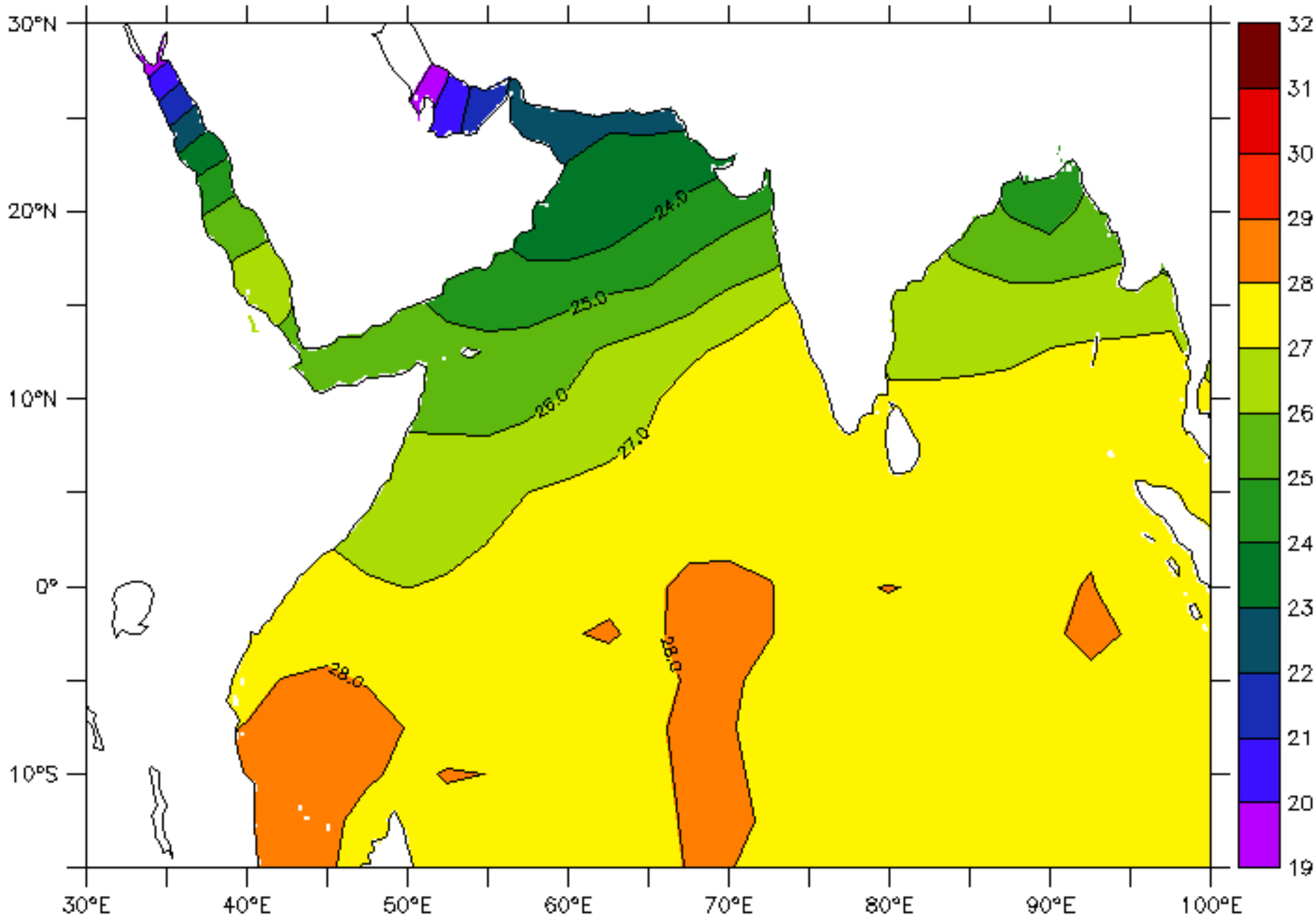
Parameter	*CHART NO.*	*January*	*February*	*March*	*April*	*May*	*June*	*July*	*August*	*September*	*October*	*November*	*December*
		Page No	Page No	Page No	Page No	Page No	Page No	Page No	Page No	Page No	Page No	Page No	Page No
Air Temperature (°C)	1.1 - 1.12	1	2	3	4	5	6	7	8	9	10	11	12
Sea Surface Temperature (°C)	2.1 – 2.12	13	14	15	16	17	18	19	20	21	22	23	24
Air-Sea Temperature Difference (°C)	3.1 – 3.12	25	26	27	28	29	30	31	32	33	34	35	36
Dew Point Temperature (°C)	4.1 – 4.12	37	38	39	40	41	42	43	44	45	46	47	48
Sea Level Pressure (hPa)	5.1 – 5.12	49	50	51	52	53	54	55	56	57	58	59	60
Wind Speed (m/sec)	6.1 – 6.12	61	62	63	64	65	66	67	68	69	70	71	72
Prevailing Wind Direction (Degrees)	7.1 – 7.12	73	74	75	76	77	78	79	80	81	82	83	84
Percentage of Gale (%)	8.1 – 8.12	85	86	87	88	89	90	91	92	93	94	95	96
Total Cloud Amount (%)	9.1 – 9.12	97	98	99	100	101	102	103	104	105	106	107	108
Low Cloud Amount (%)	10.1 – 10.12	109	110	111	112	113	114	115	116	117	118	119	120
Mean Wave Height (m)	11.1 – 11.12	121	122	123	124	125	126	127	128	129	130	131	132
Wave Height ≥ 4.0 m (%)	12.1 – 12.12	133	134	135	136	137	138	139	140	141	142	143	144
Maximum Wave Height (m)	13.1 – 13.12	145	146	147	148	149	150	151	152	153	154	155	156
Mean Wave Period (sec)	14.1 – 14.12	157	158	159	160	161	162	163	164	165	166	167	168
Percentage of Observation of Visibility ≥10 km (%)	15.1 -15.12	169	170	171	172	173	174	175	176	177	178	179	180

CHART No. 1.1 AIR TEMPERATURE(°C) JANUARY



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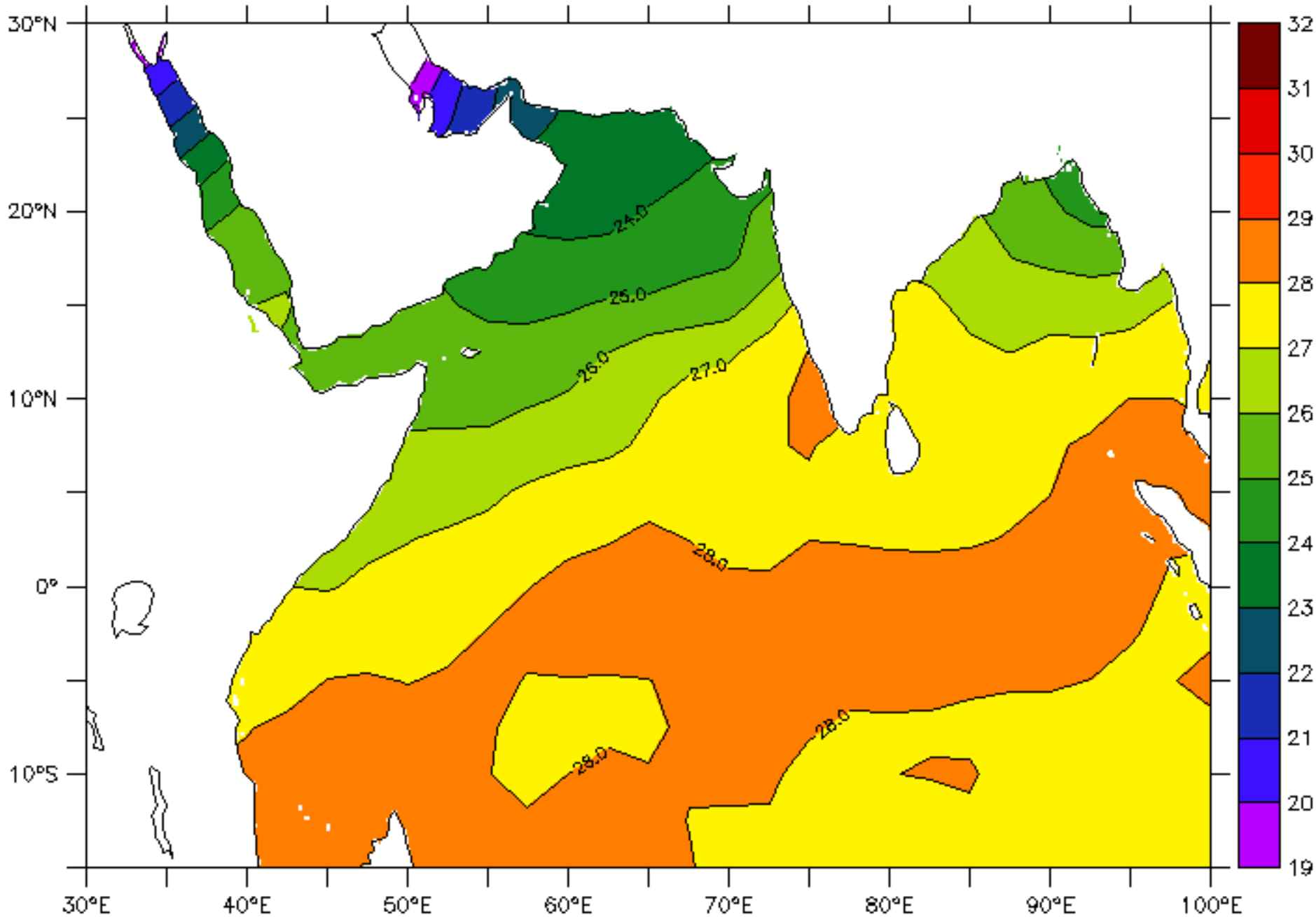

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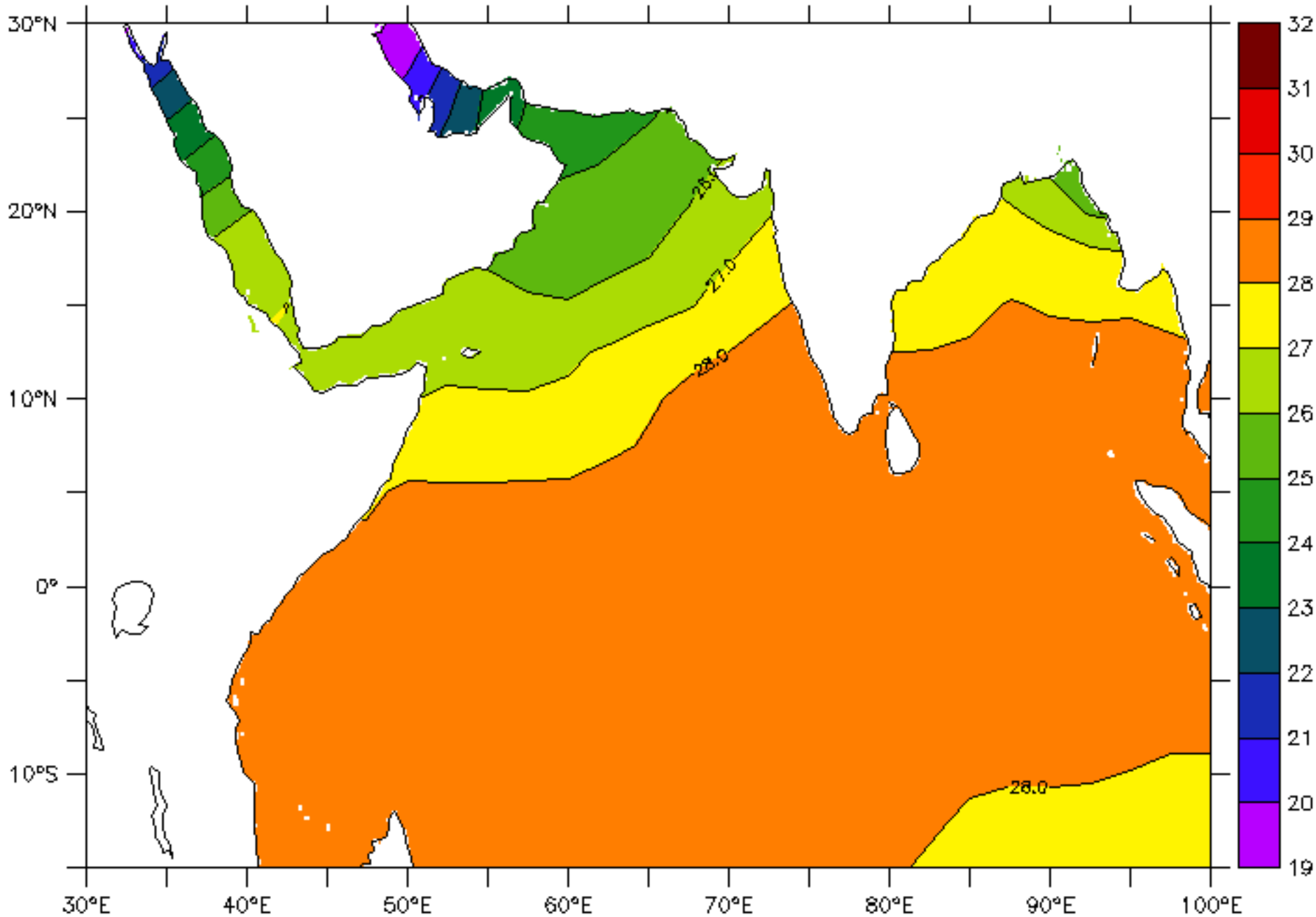

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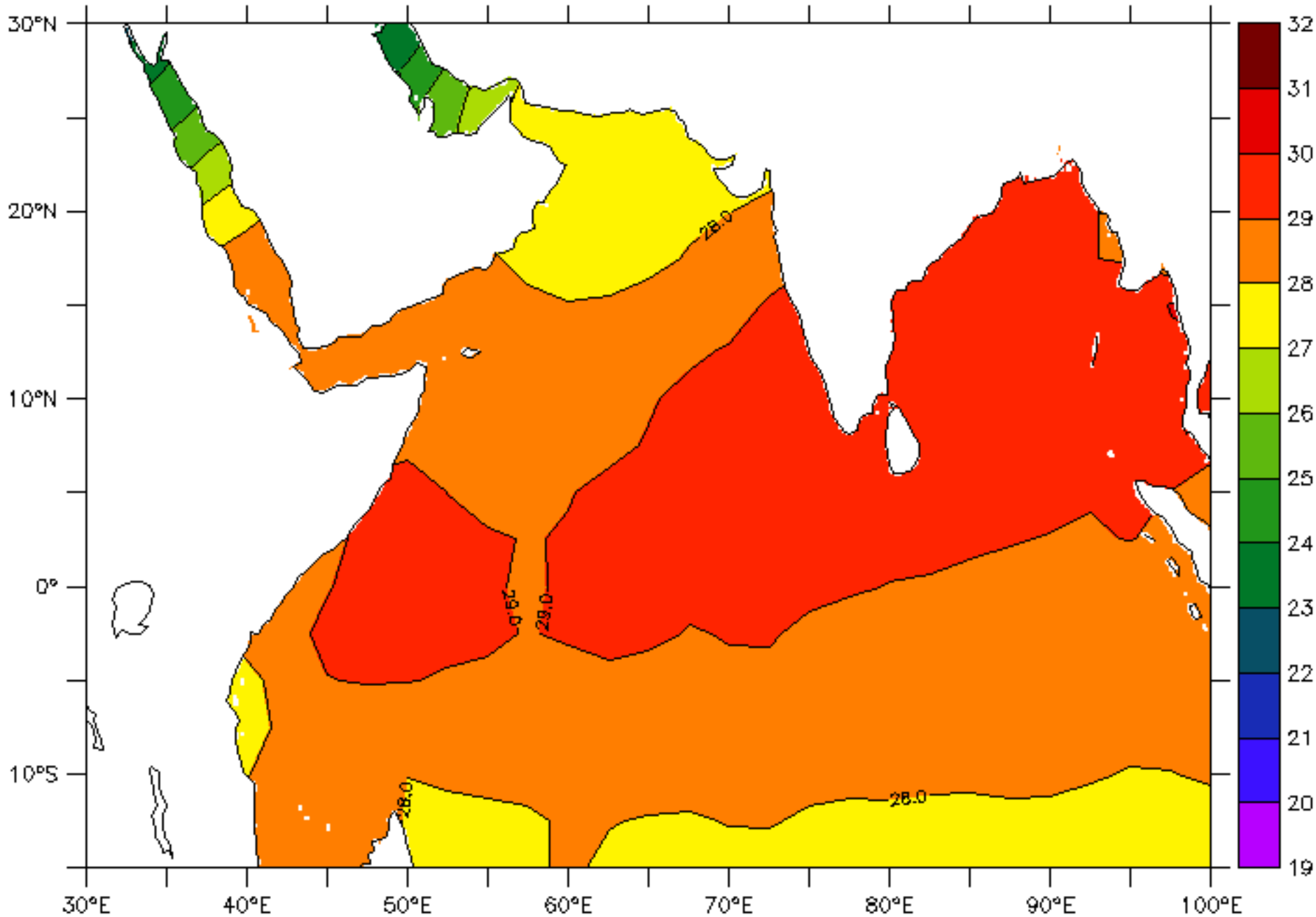

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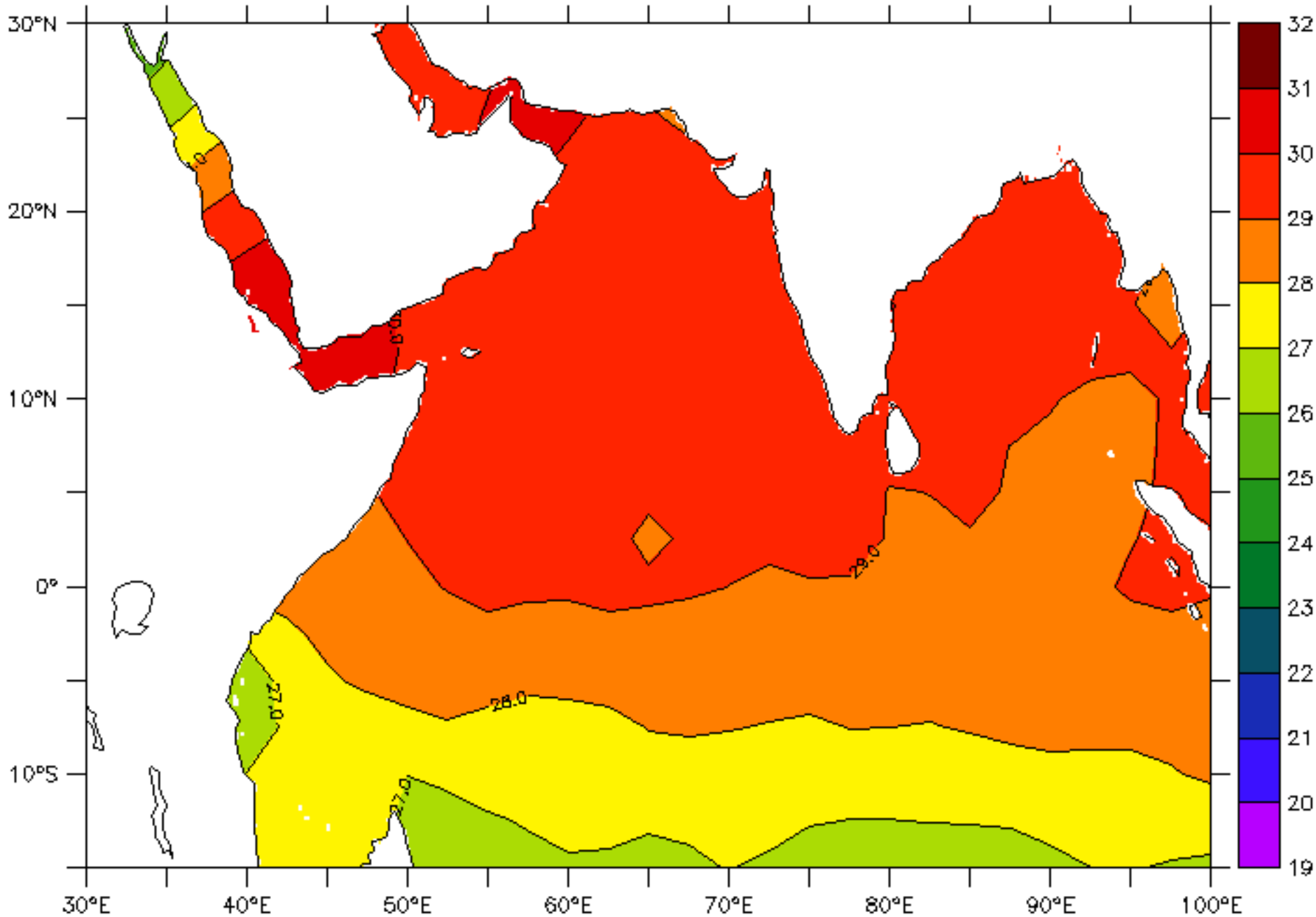

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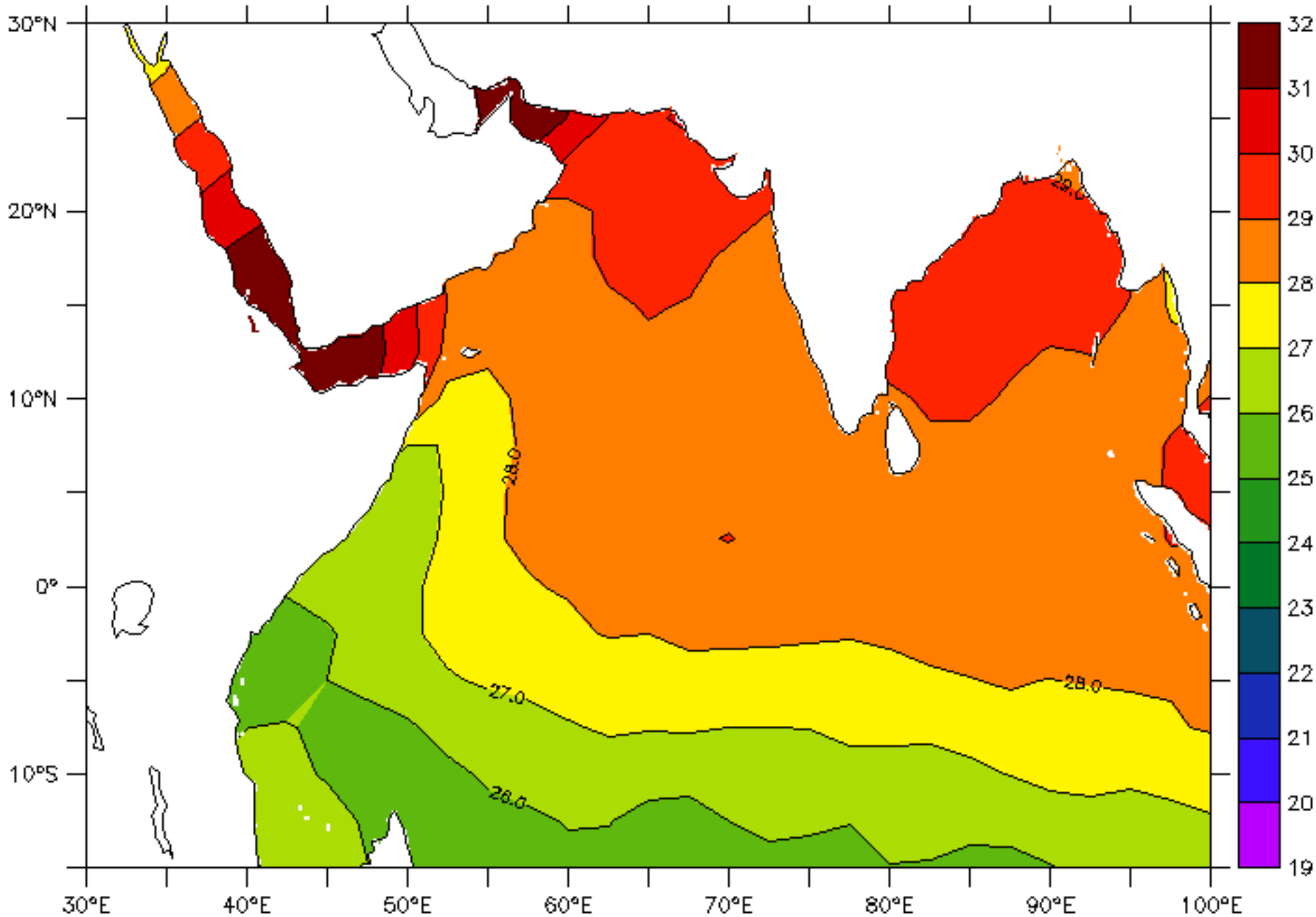

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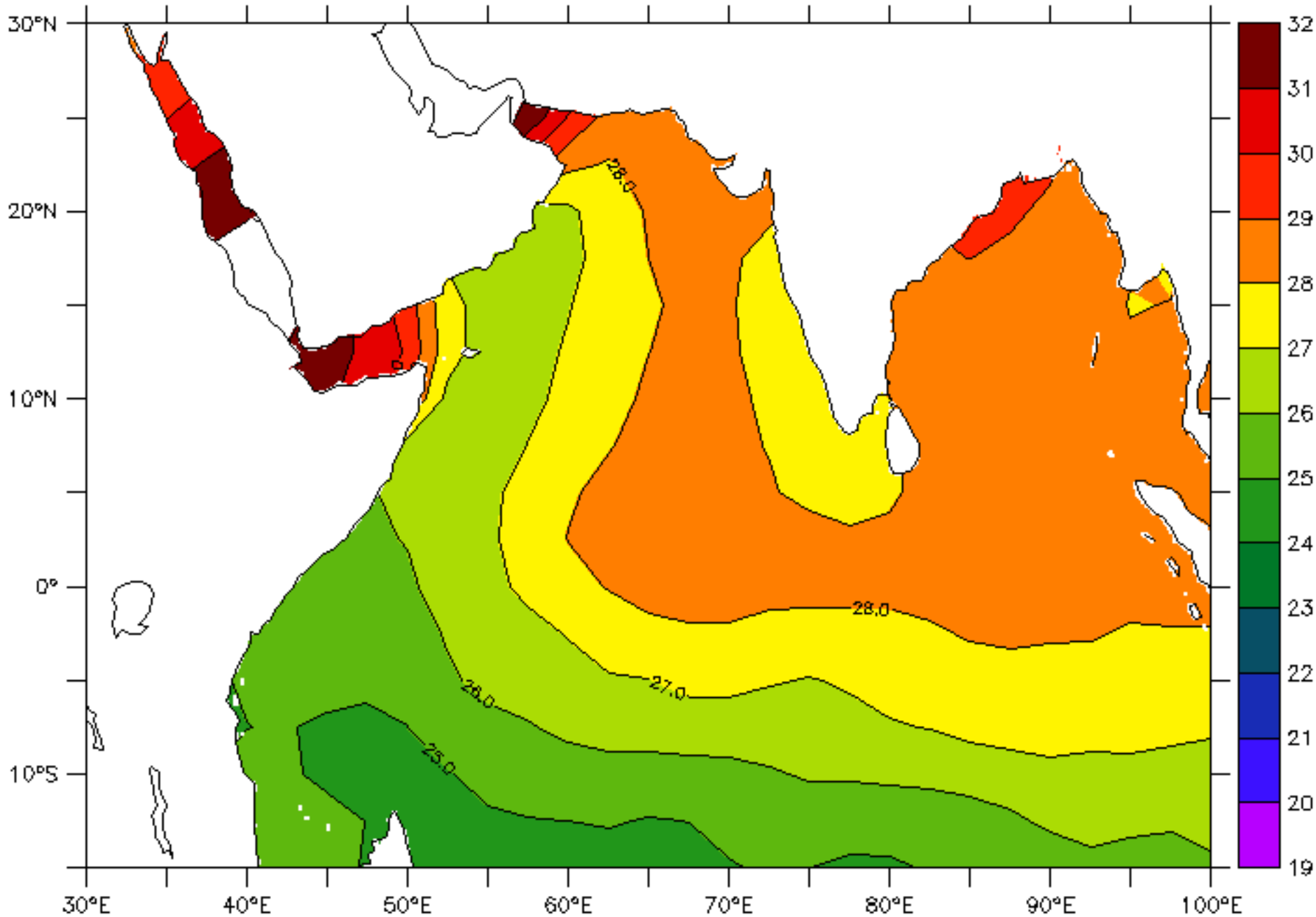

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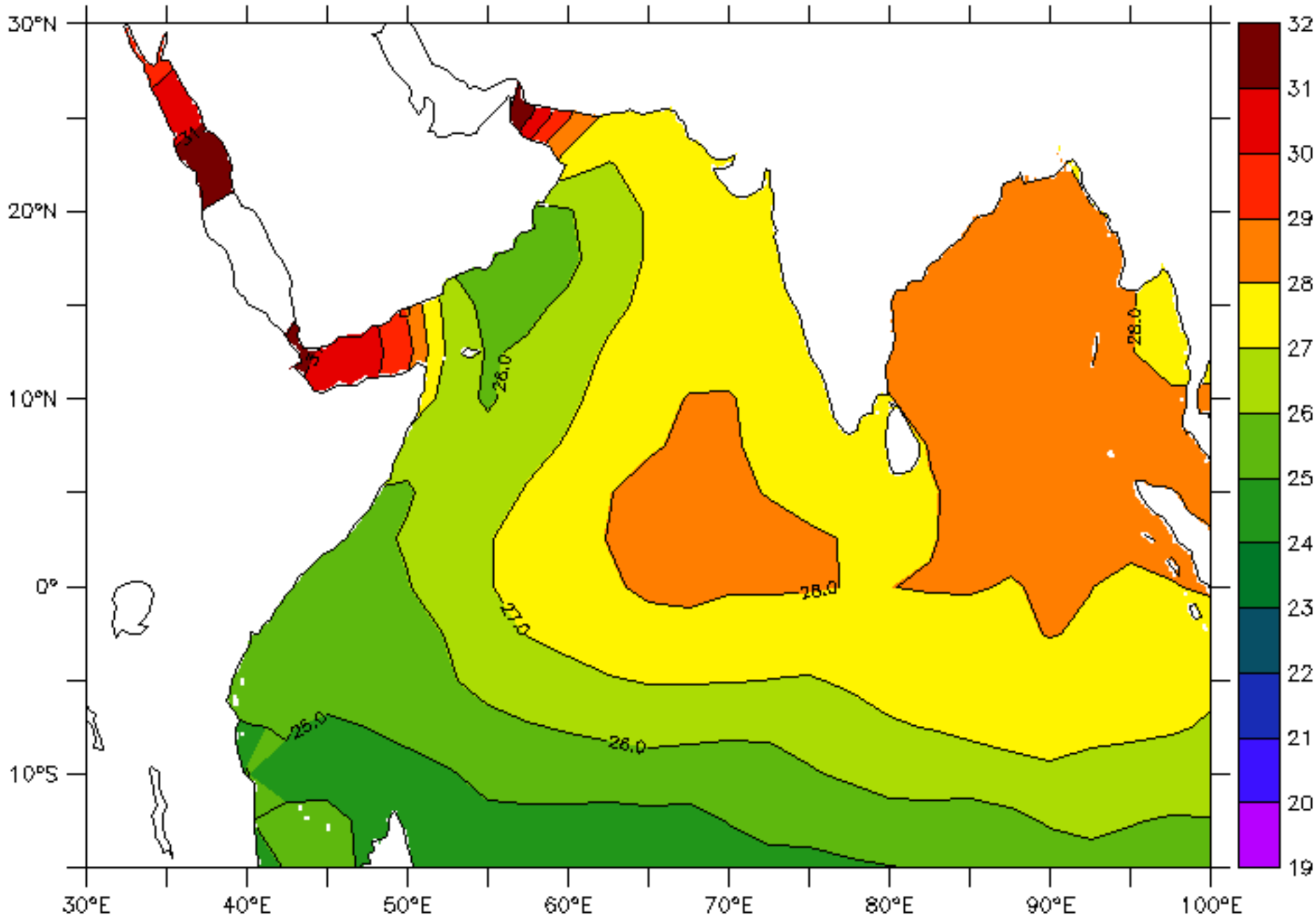

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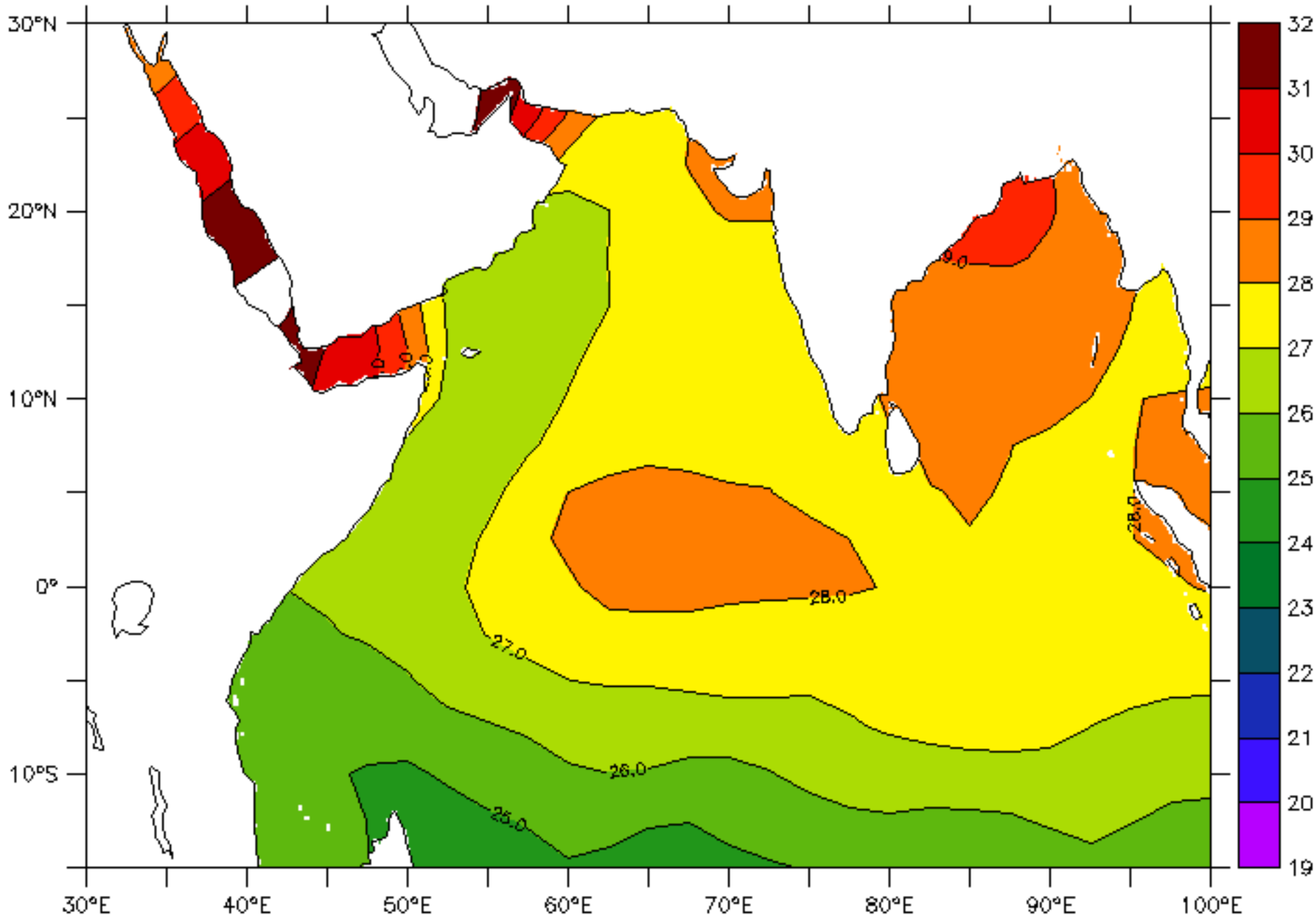

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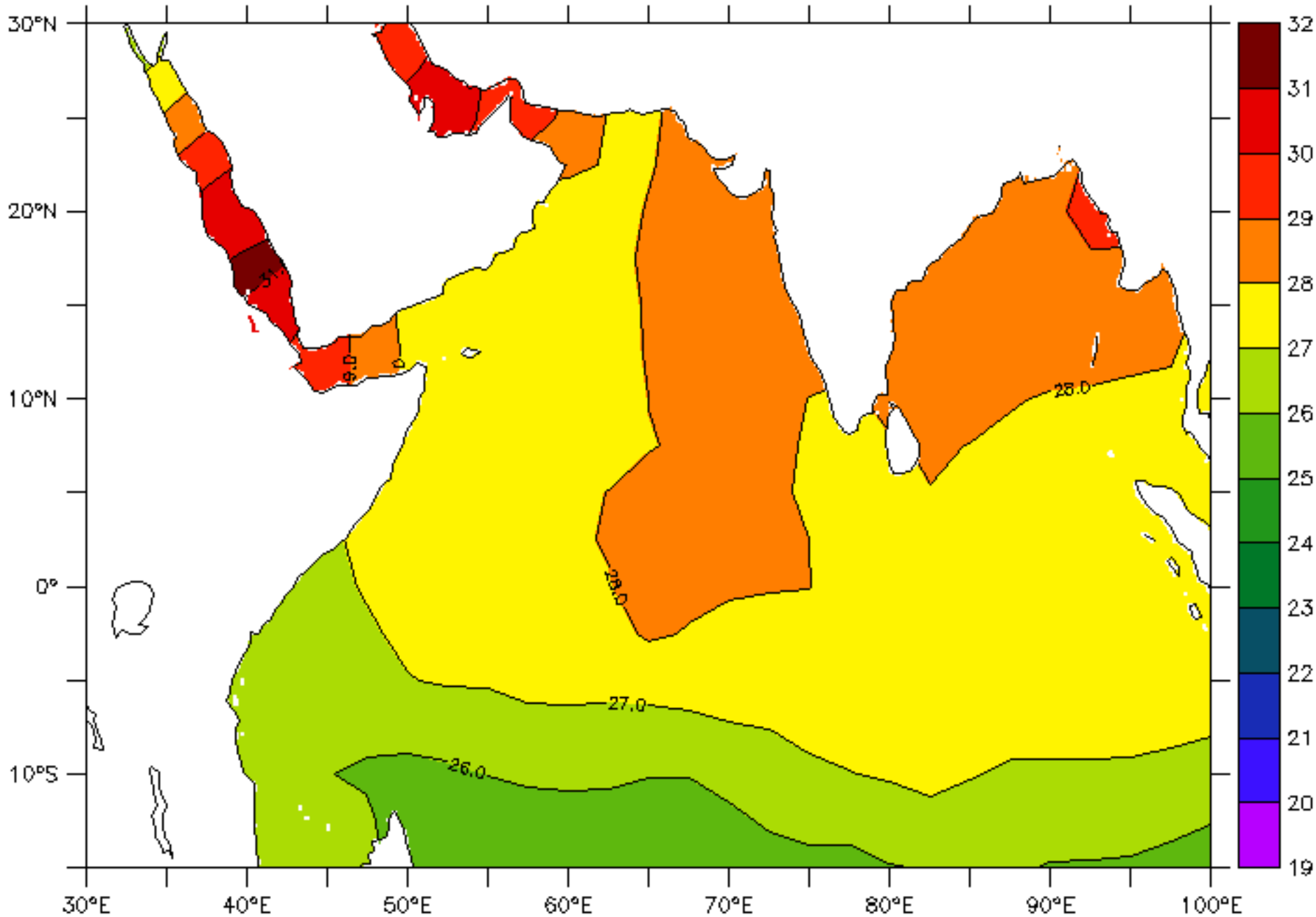

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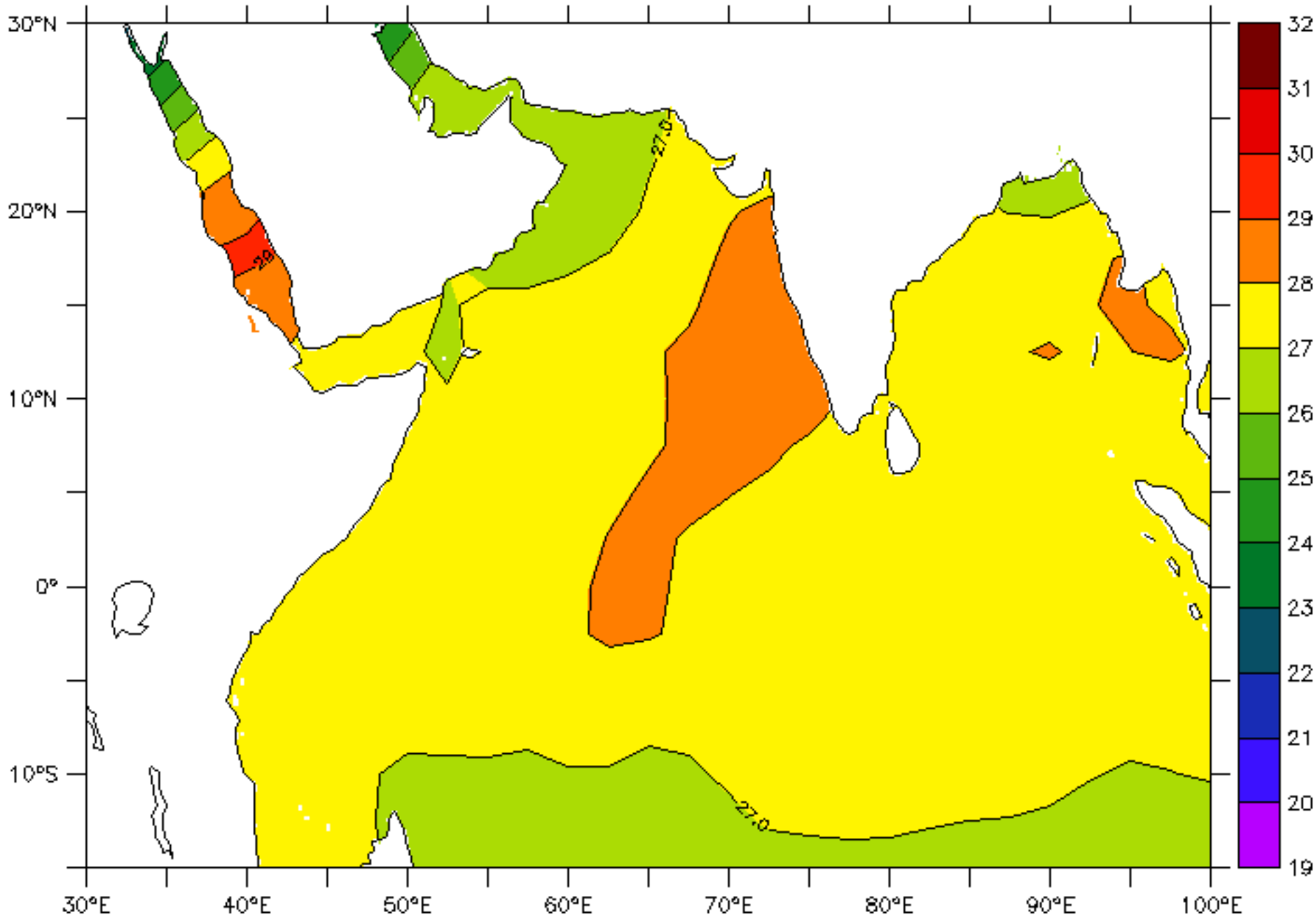

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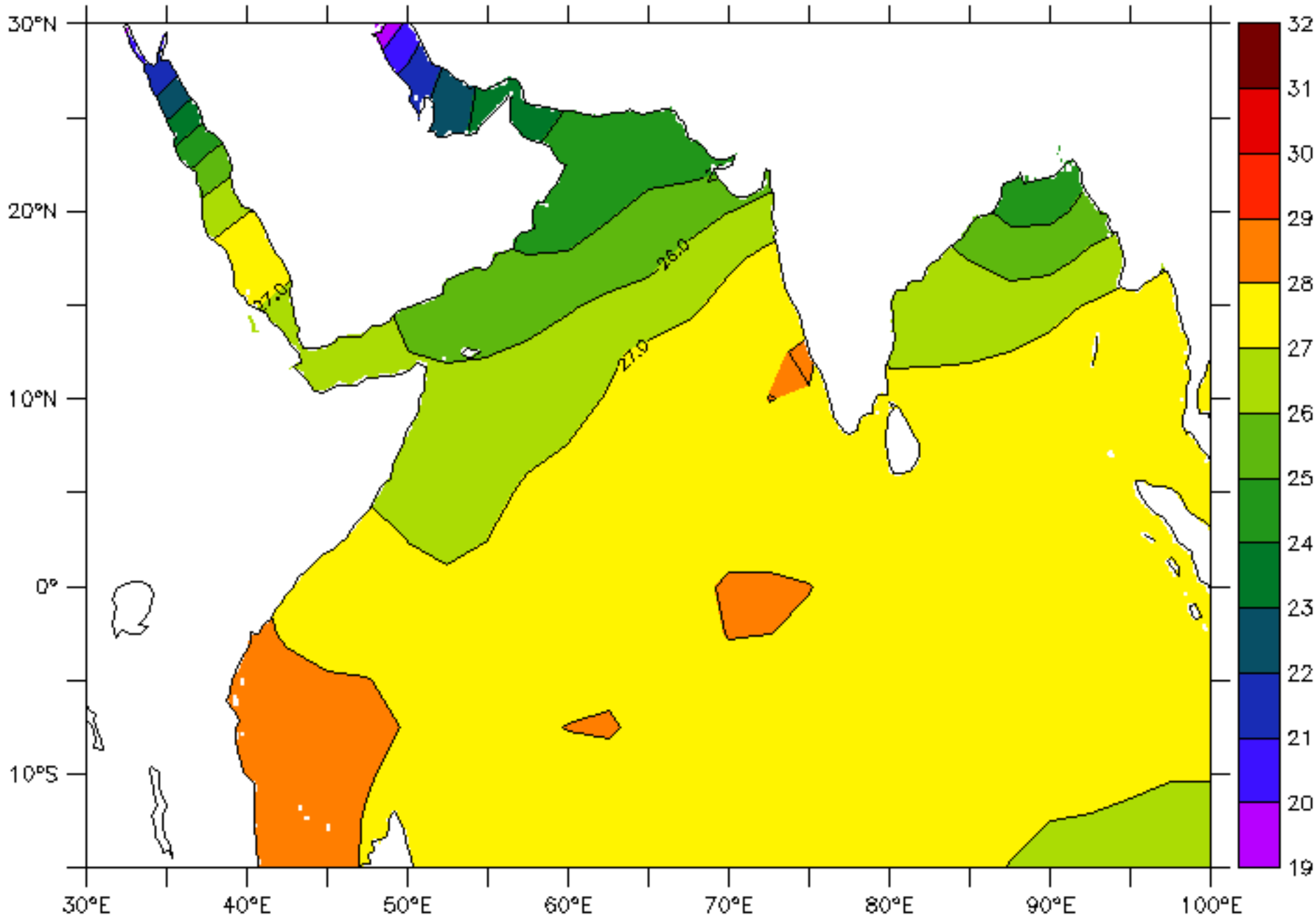

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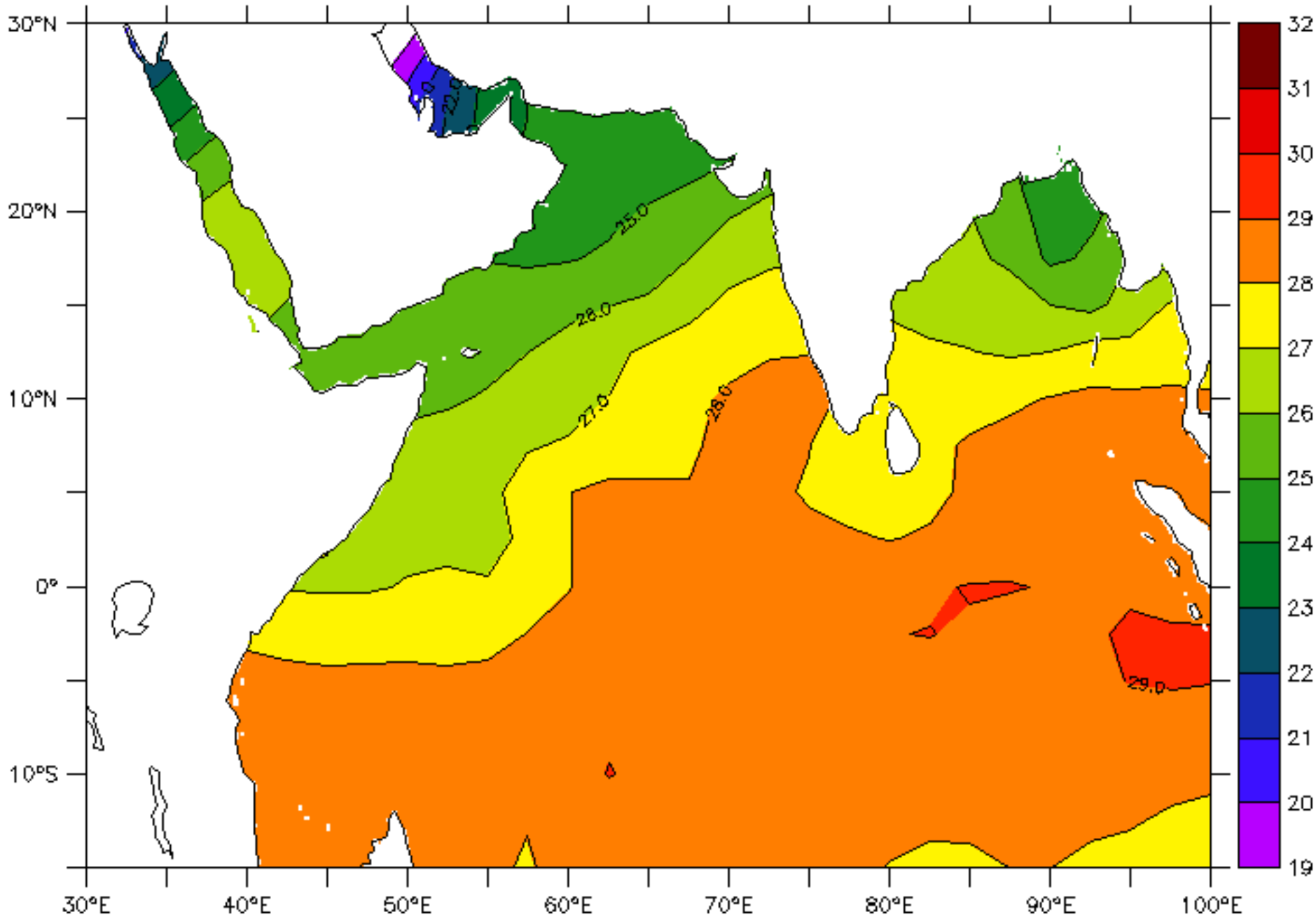

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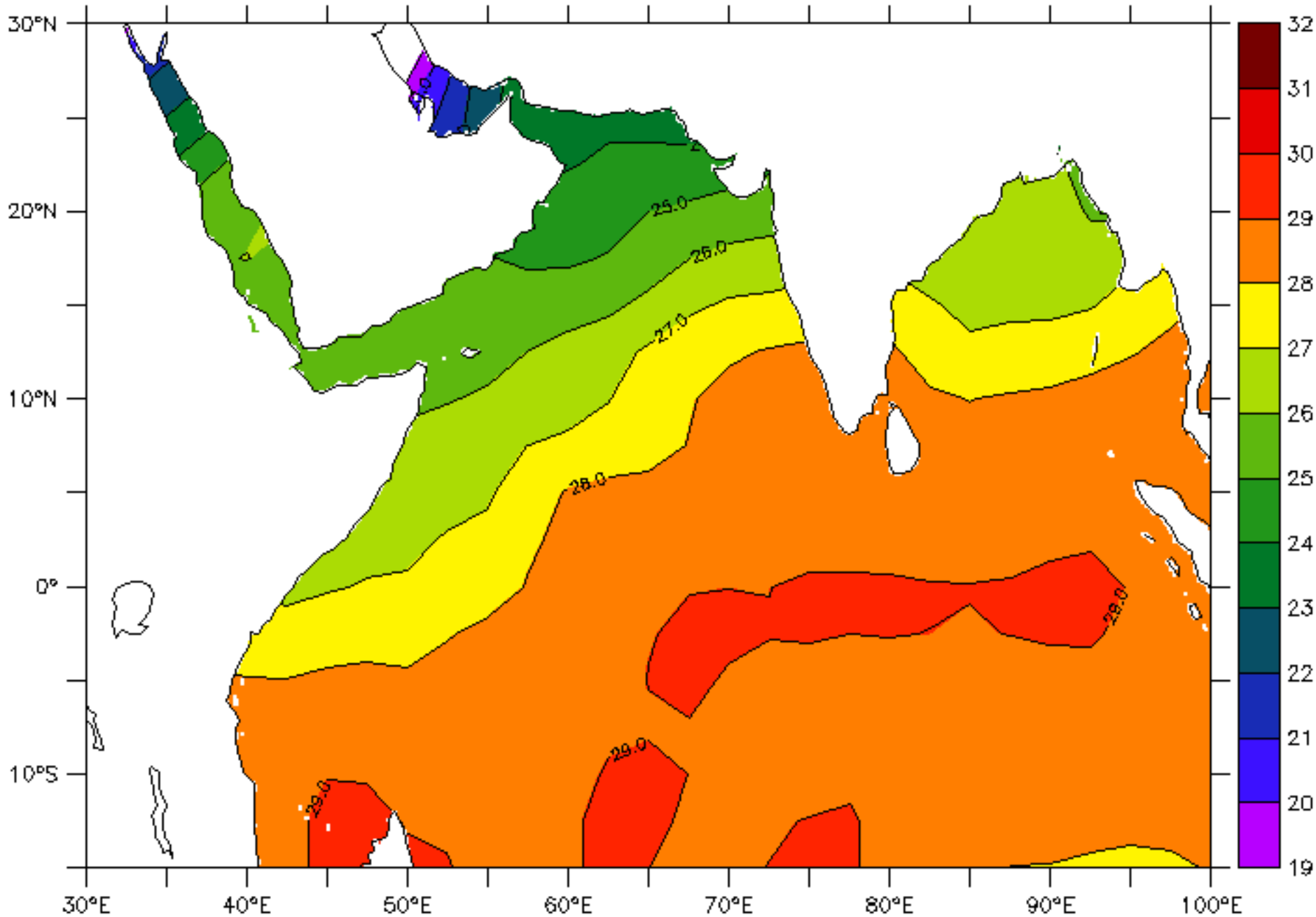

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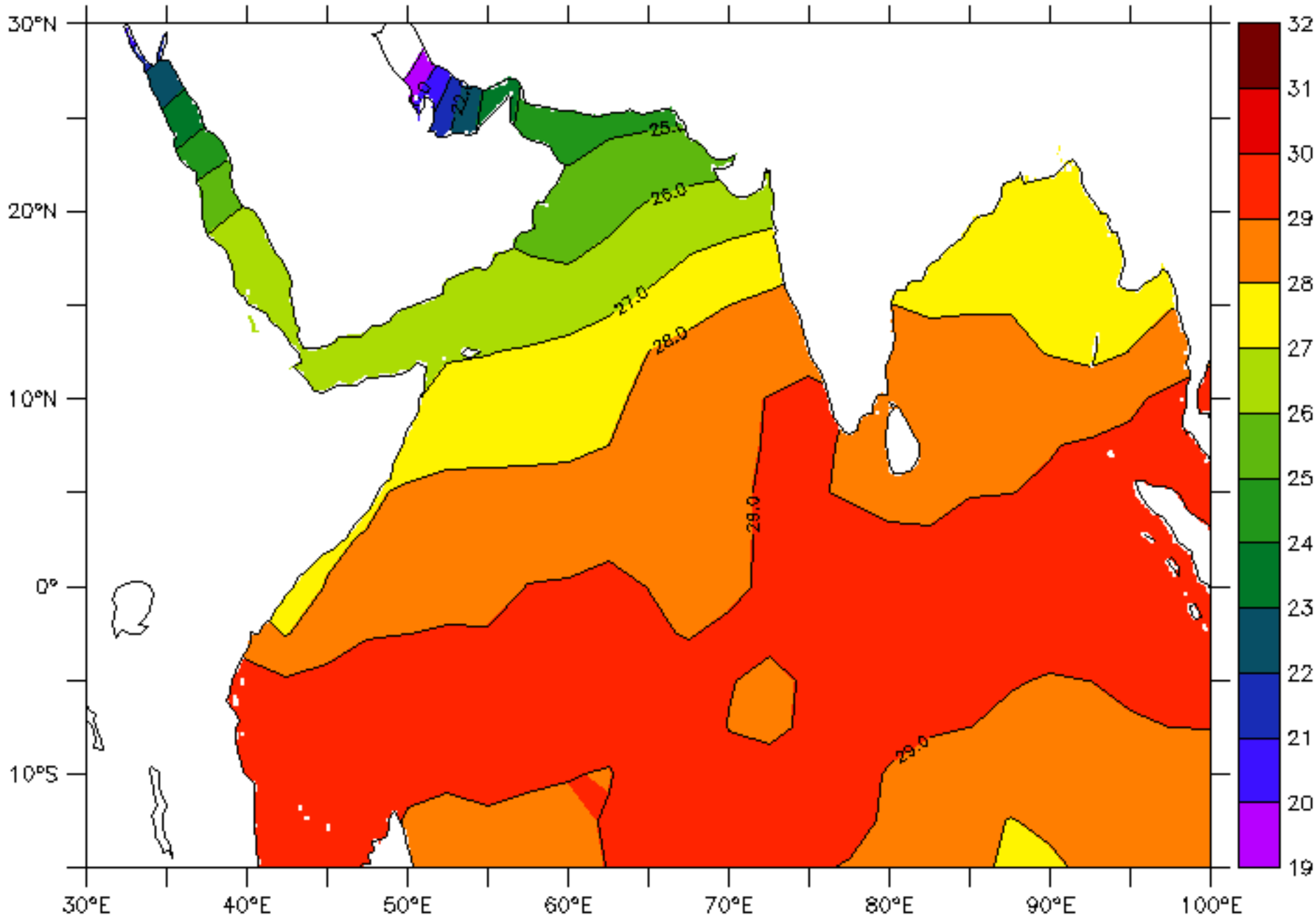

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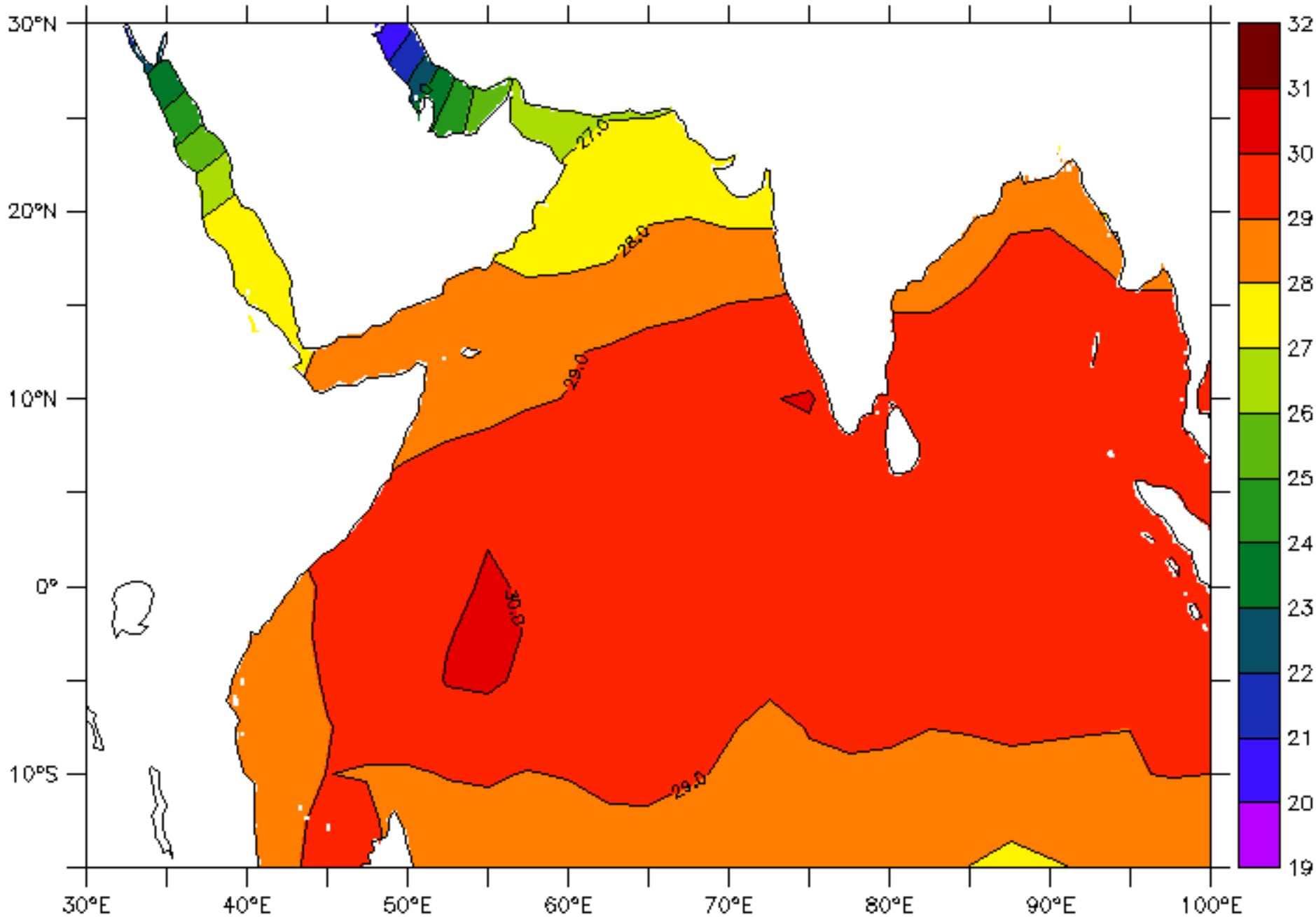

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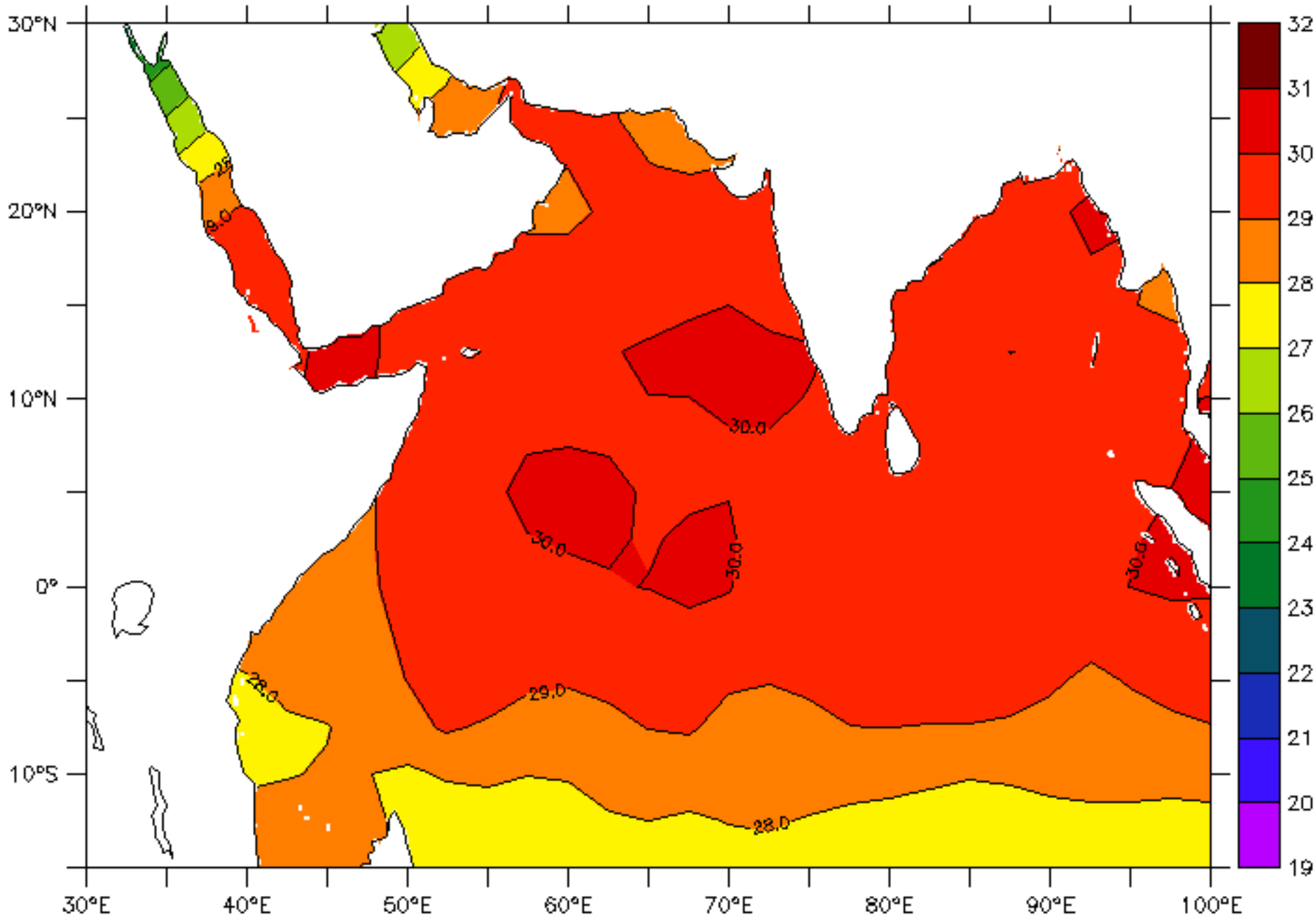

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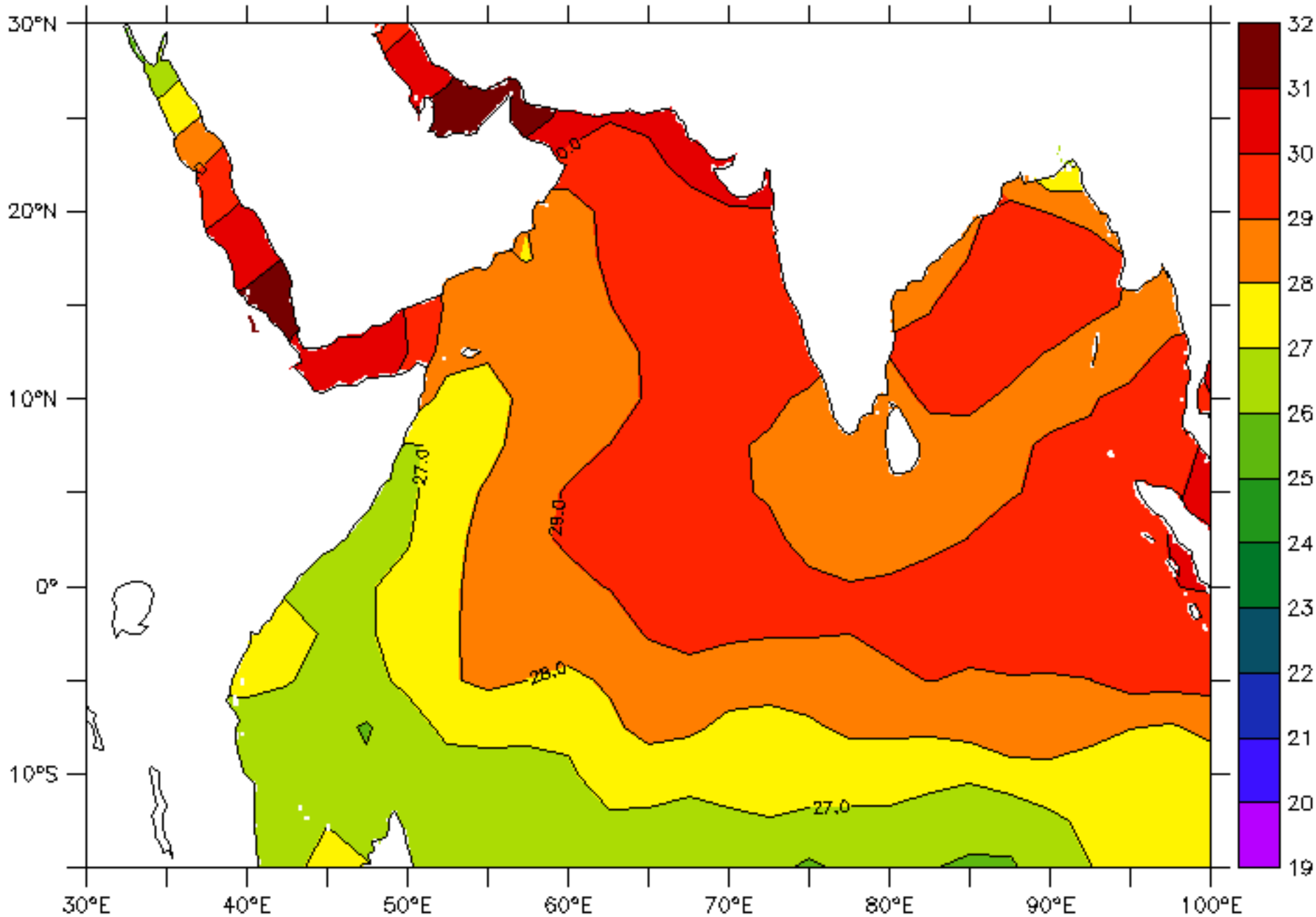

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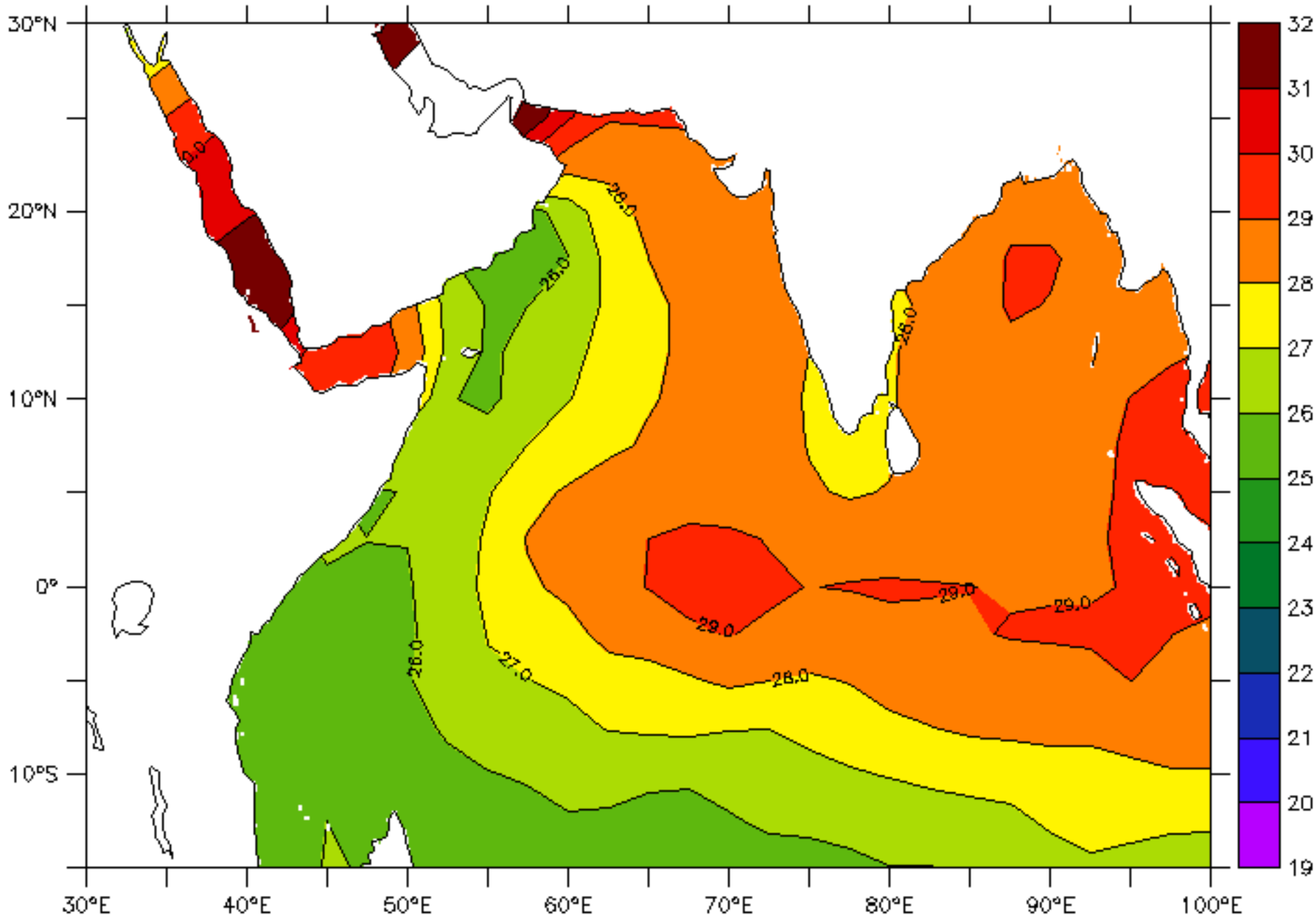

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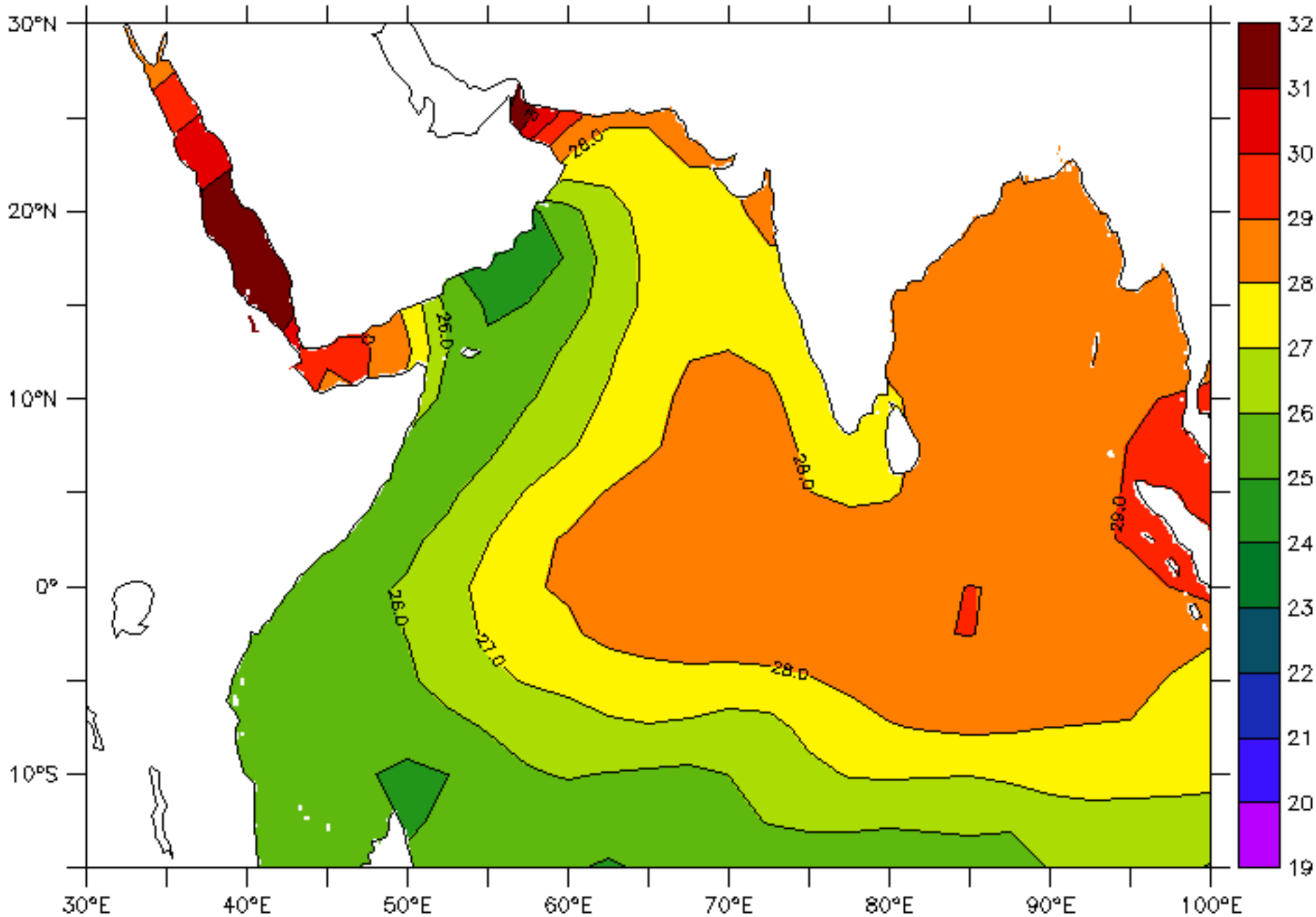

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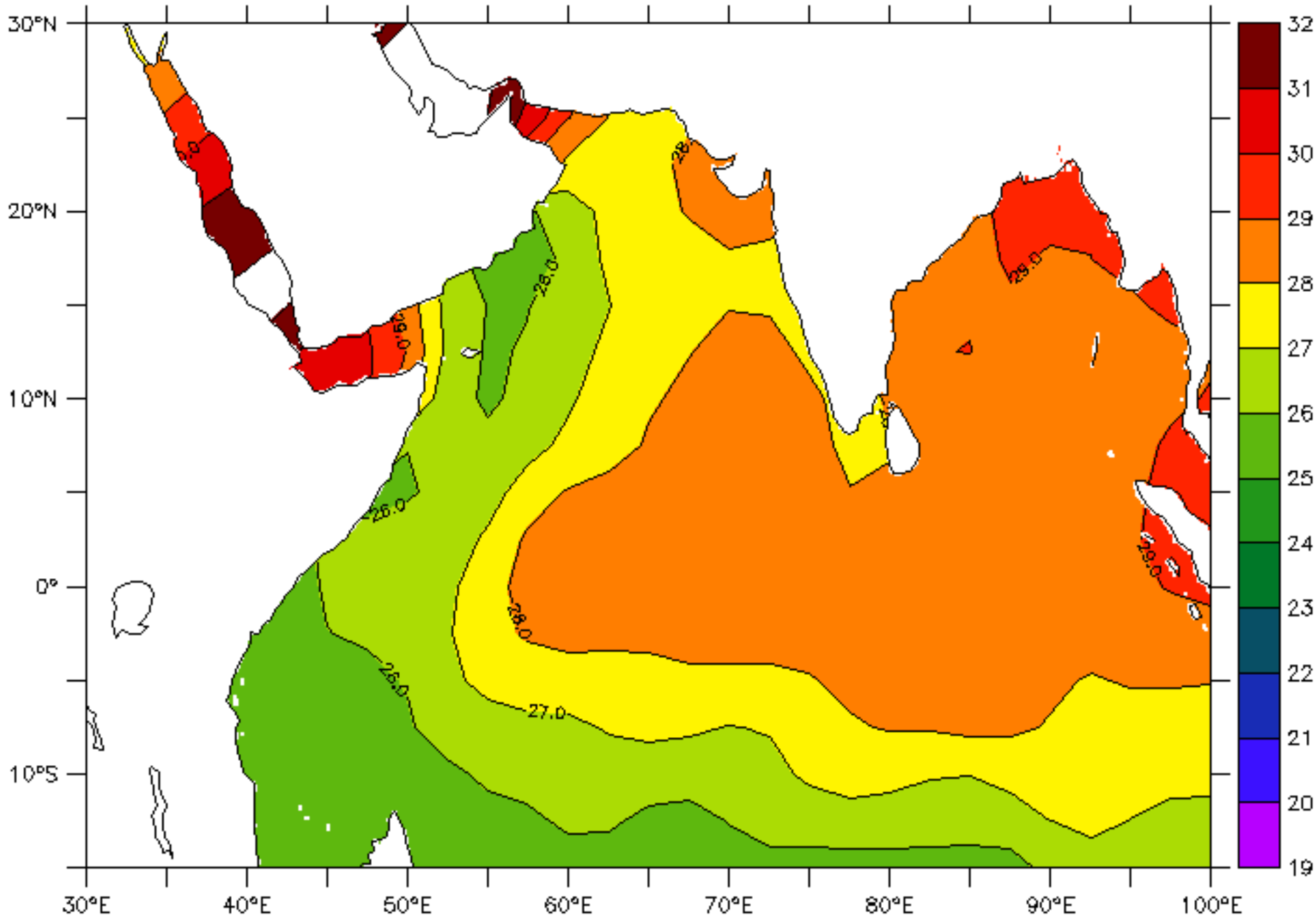

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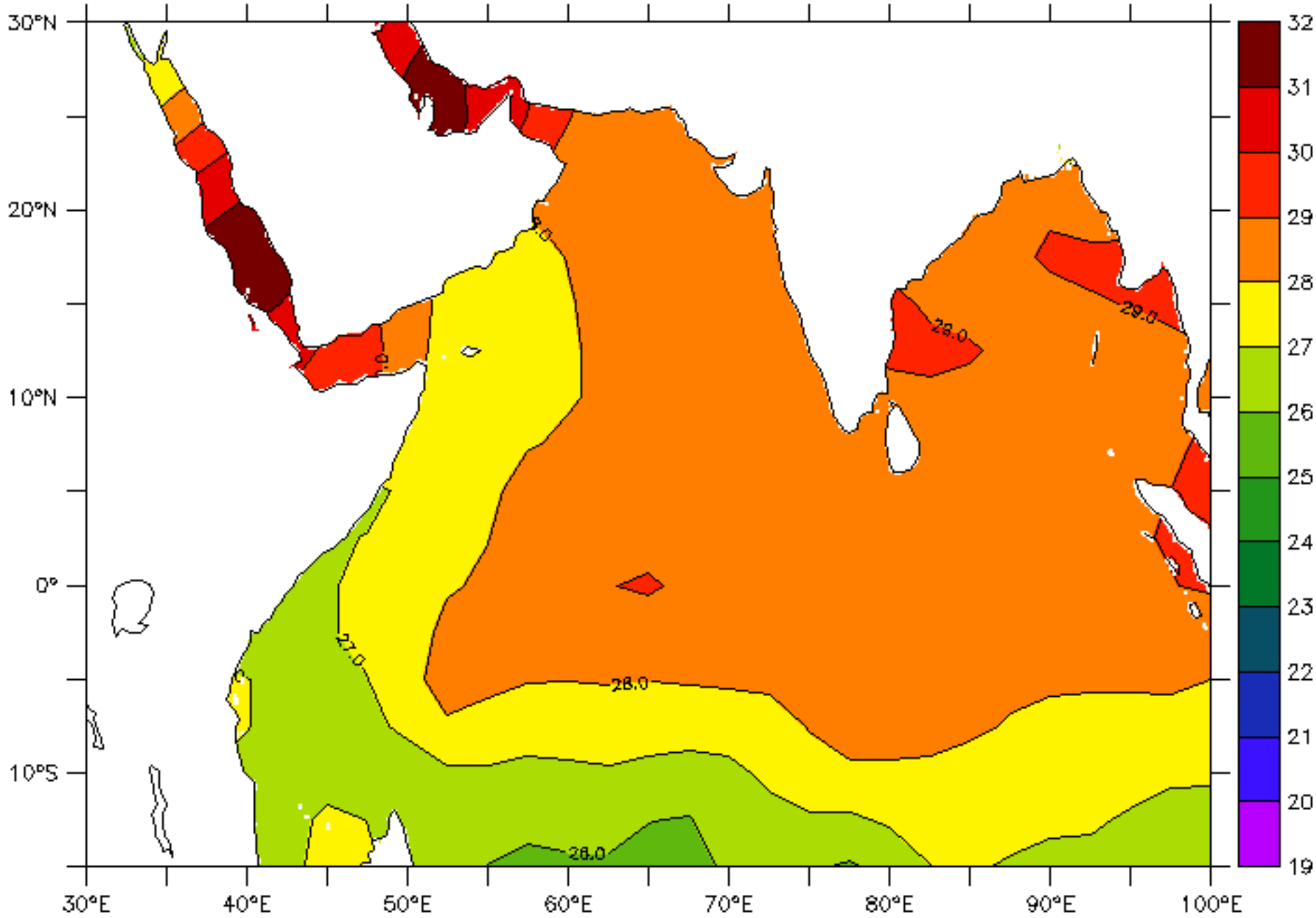


CHART No. 2.11 SEA SURFACE TEMPERATURE(°C) NOVEMBER

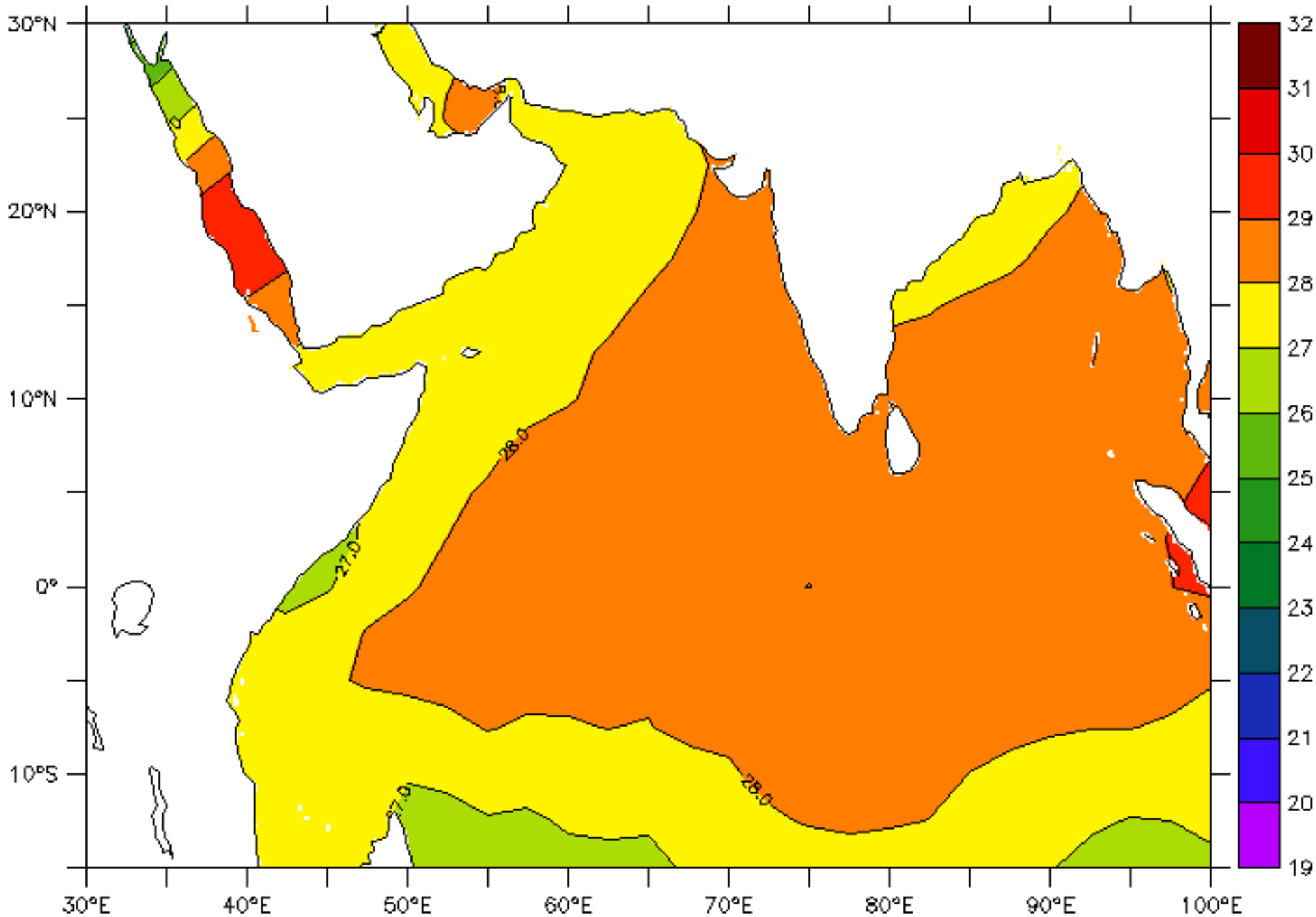


CHART No. 2.12 SEA SURFACE TEMPERATURE(°C) DECEMBER

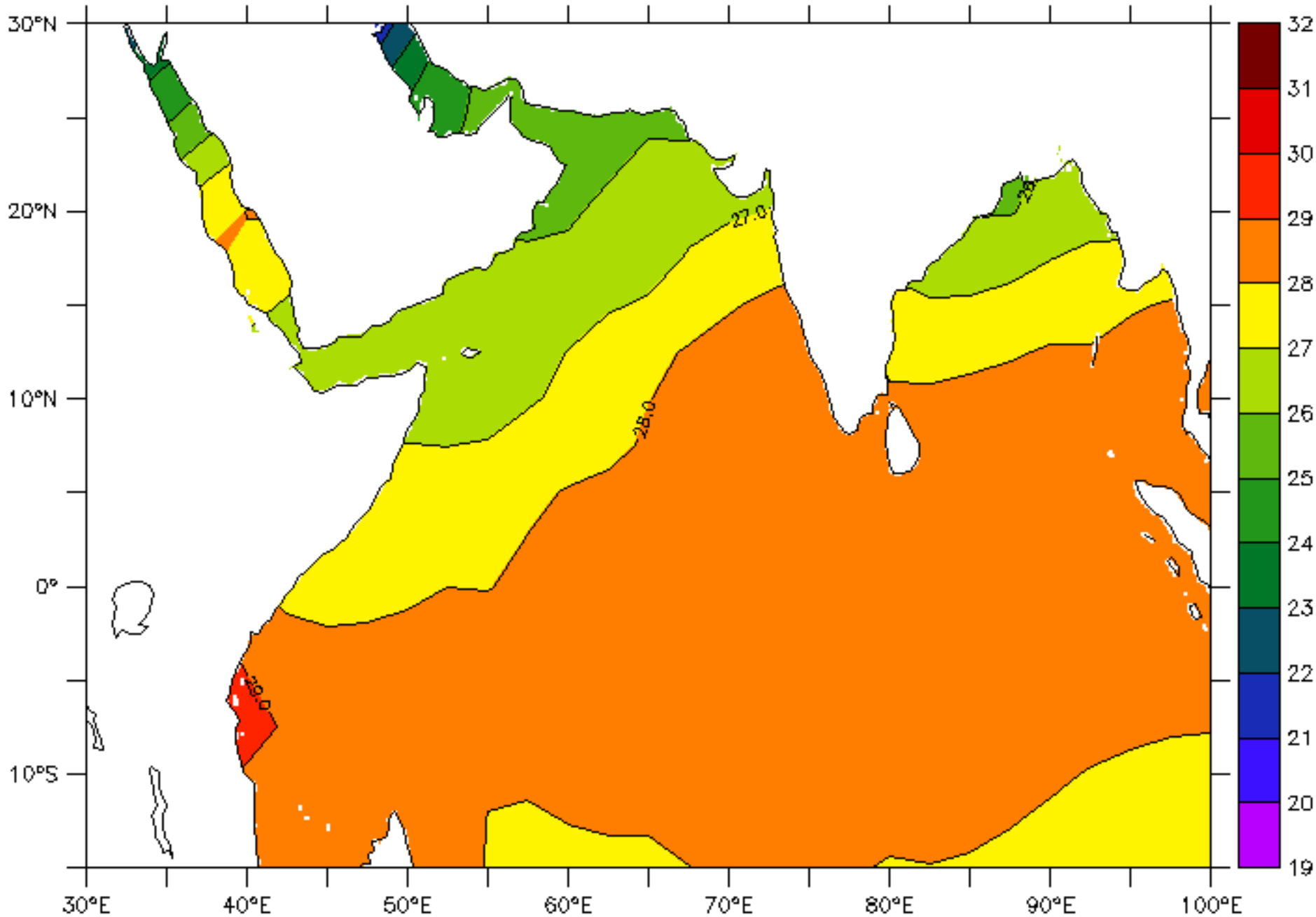


CHART No. 3.1 AIR–SEA TEMPERATURE DIFFERENCE(°C) JANUARY

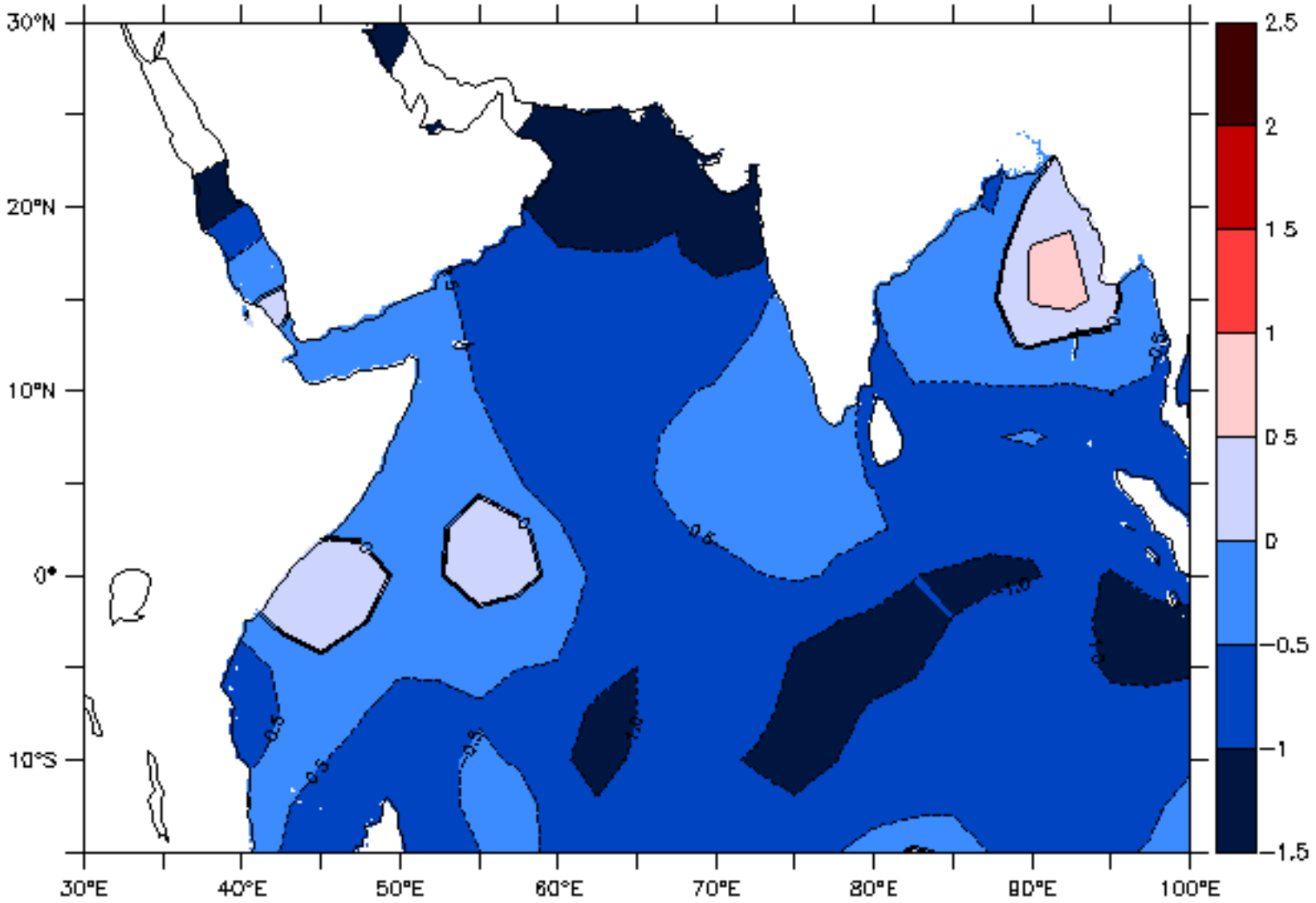


CHART No. 3.2 AIR–SEA TEMPERATURE DIFFERENCE(°C) FEBRUARY

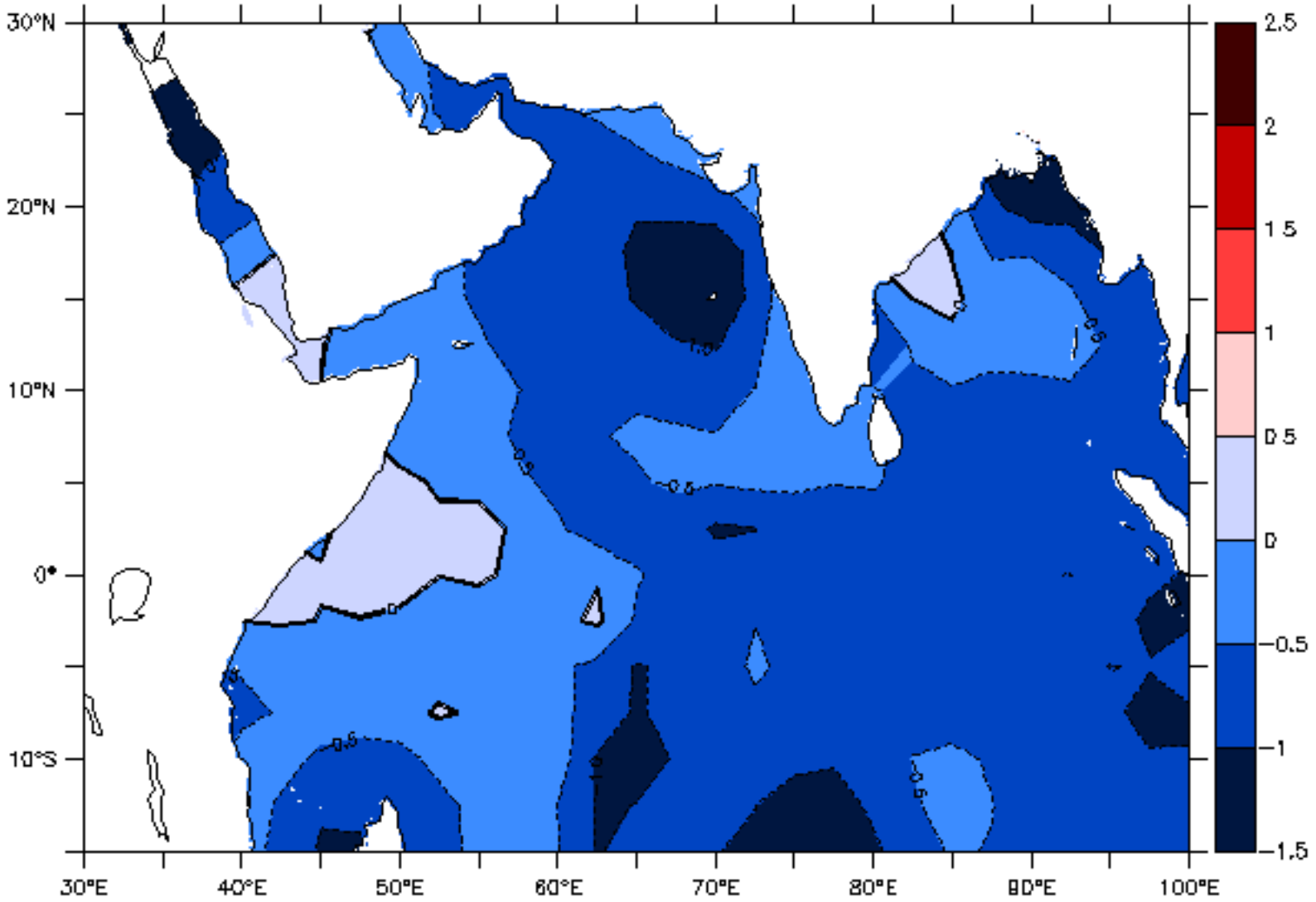


CHART No. 3.3 AIR–SEA TEMPERATURE DIFFERENCE(°C) MARCH

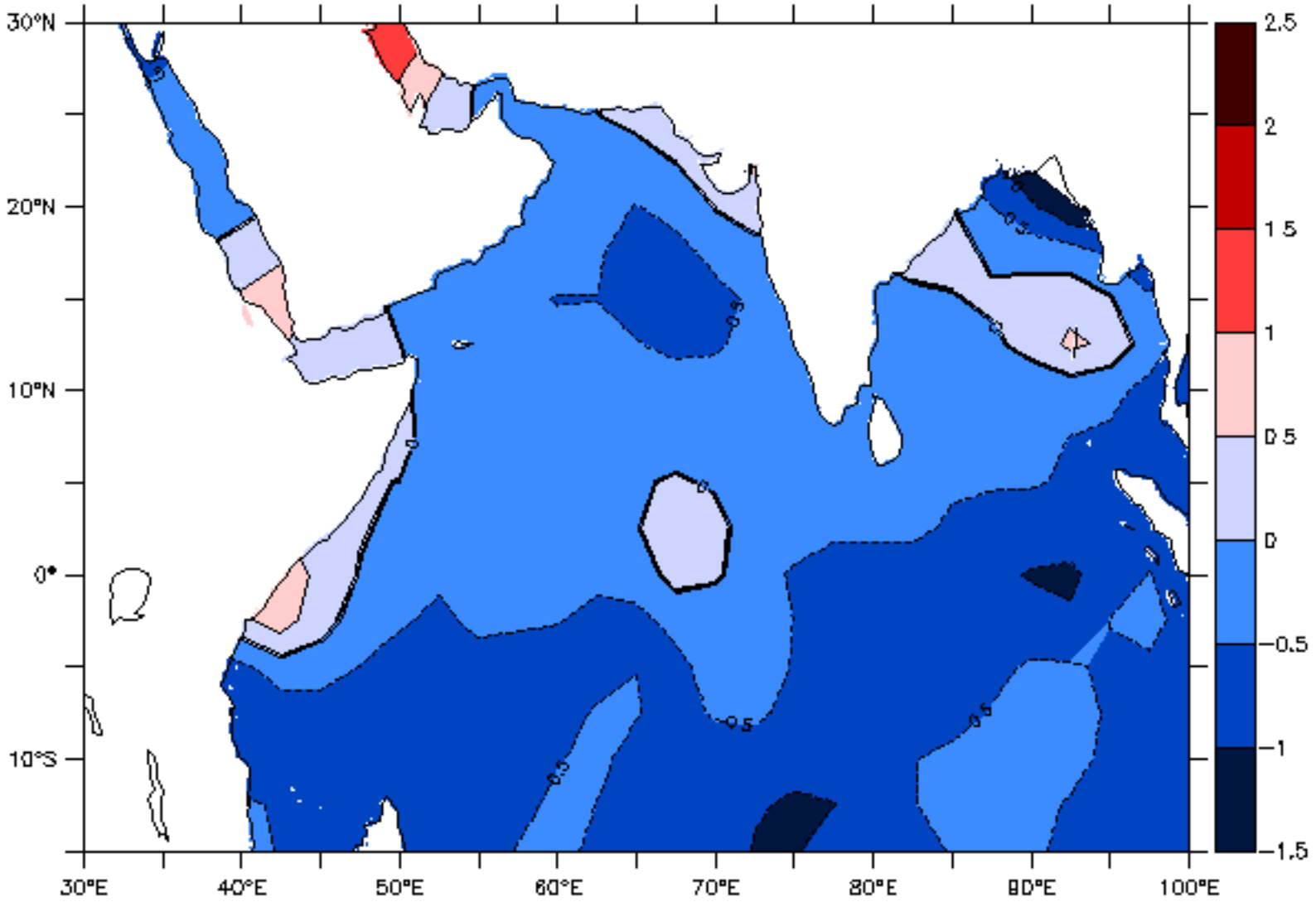


CHART No. 3.4 AIR–SEA TEMPERATURE DIFFERENCE(°C) APRIL

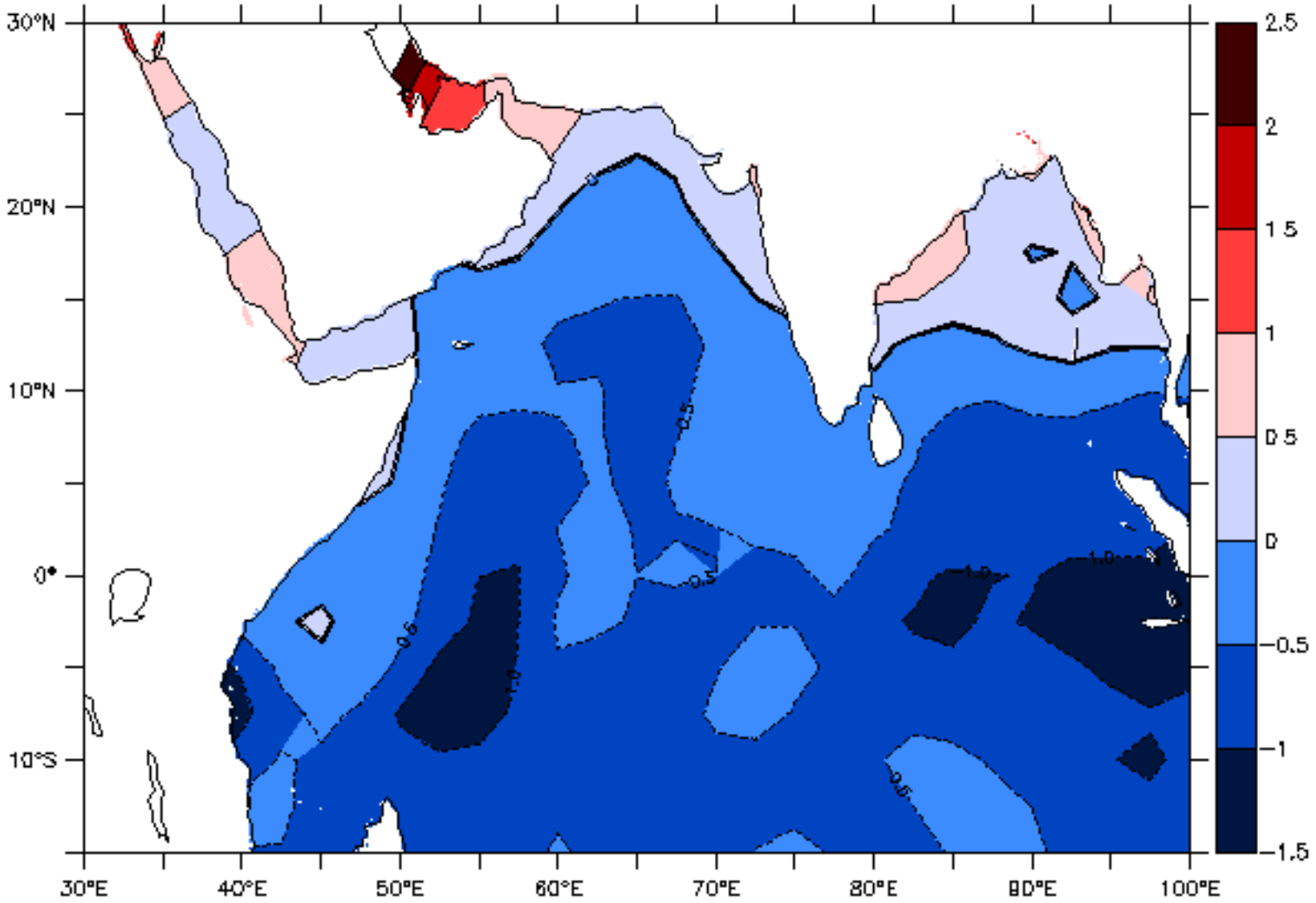


CHART No. 3.5 AIR–SEA TEMPERATURE DIFFERENCE(°C) MAY

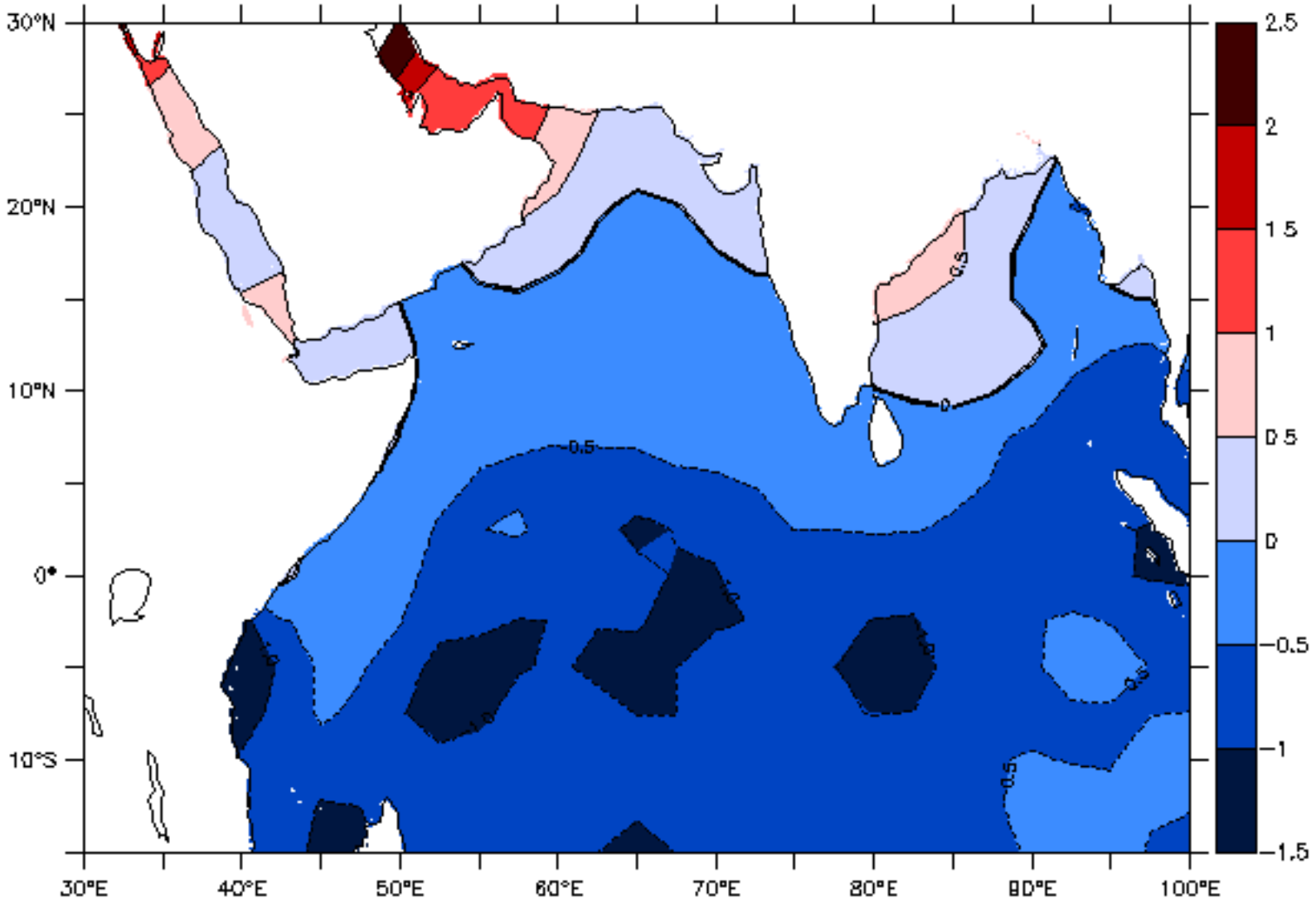


CHART No. 3.6 AIR–SEA TEMPERATURE DIFFERENCE(°C) JUNE

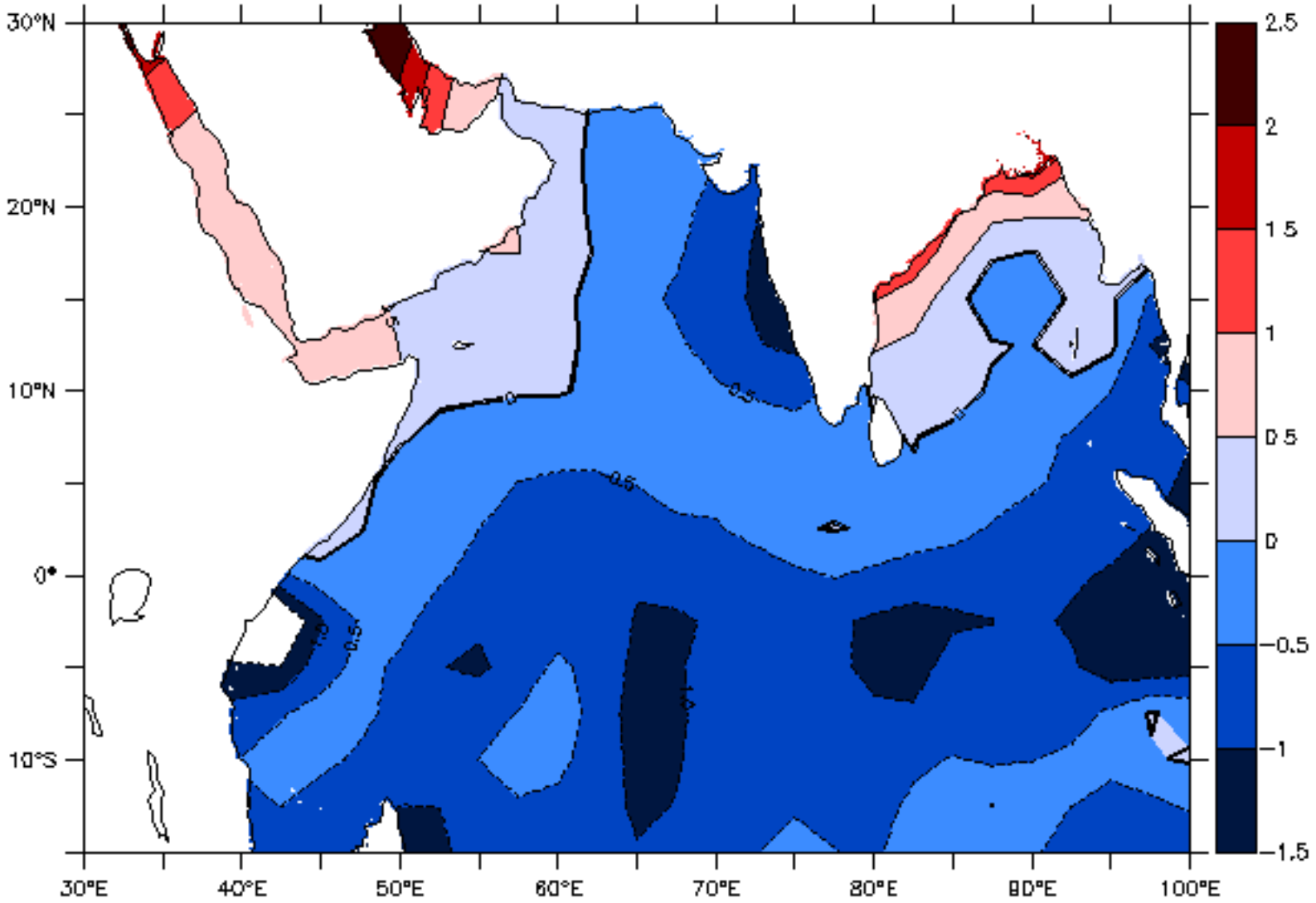


CHART No. 3.7 AIR–SEA TEMPERATURE DIFFERENCE(°C) JULY

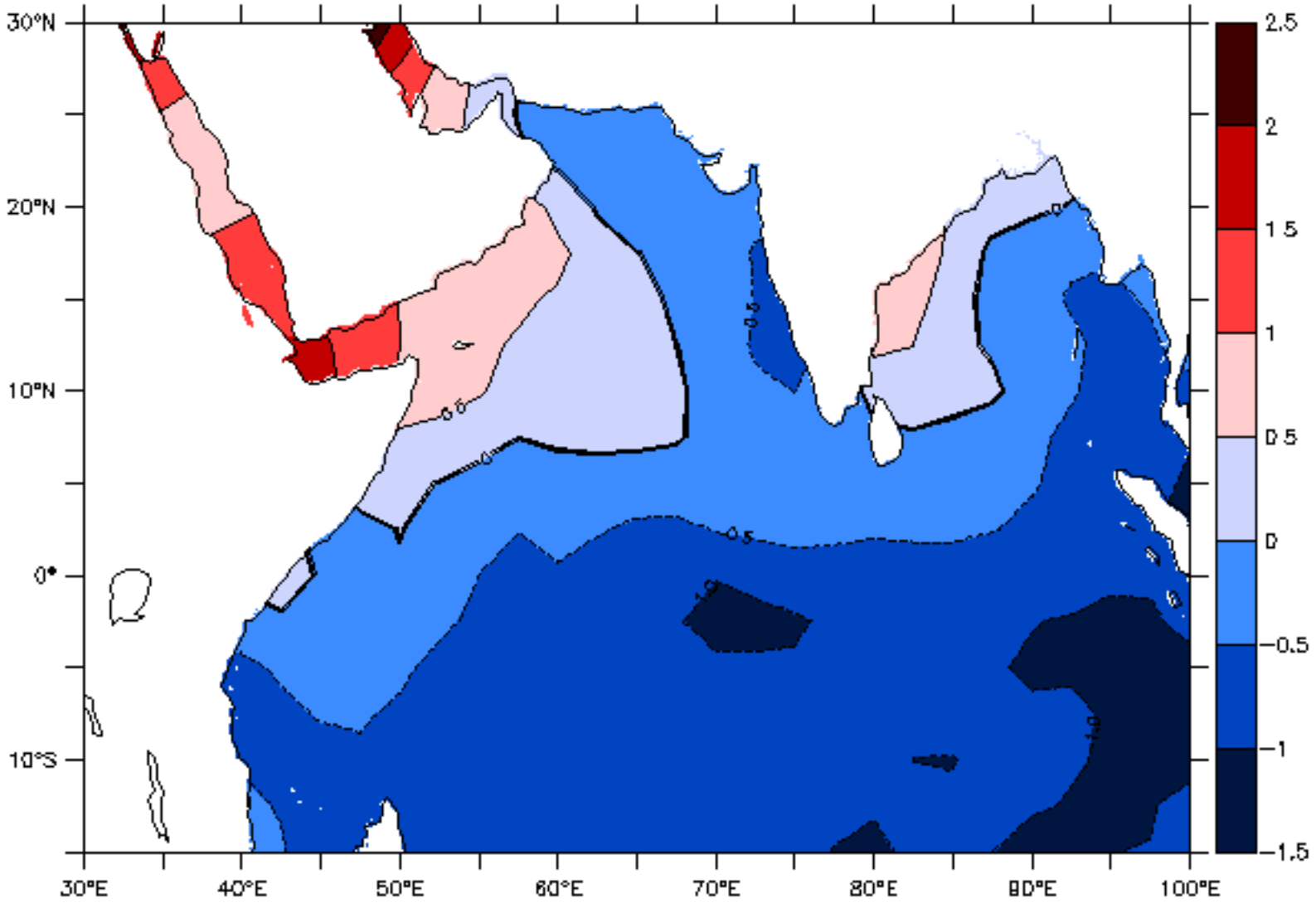


CHART No. 3.7 AIR–SEA TEMPERATURE DIFFERENCE(°C) SEPTEMBER

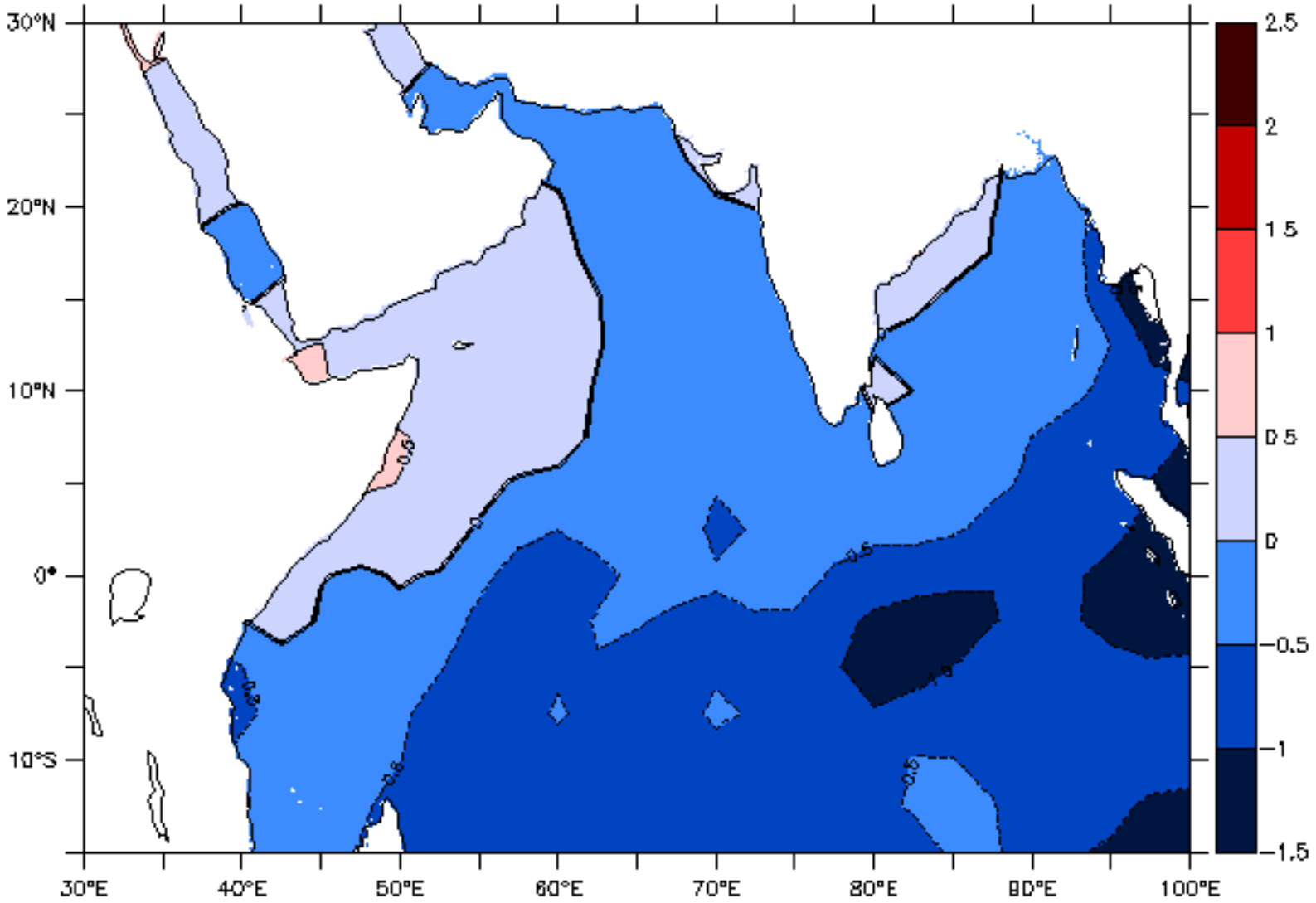


CHART No. 3.8 AIR–SEA TEMPERATURE DIFFERENCE(°C) AUGUST

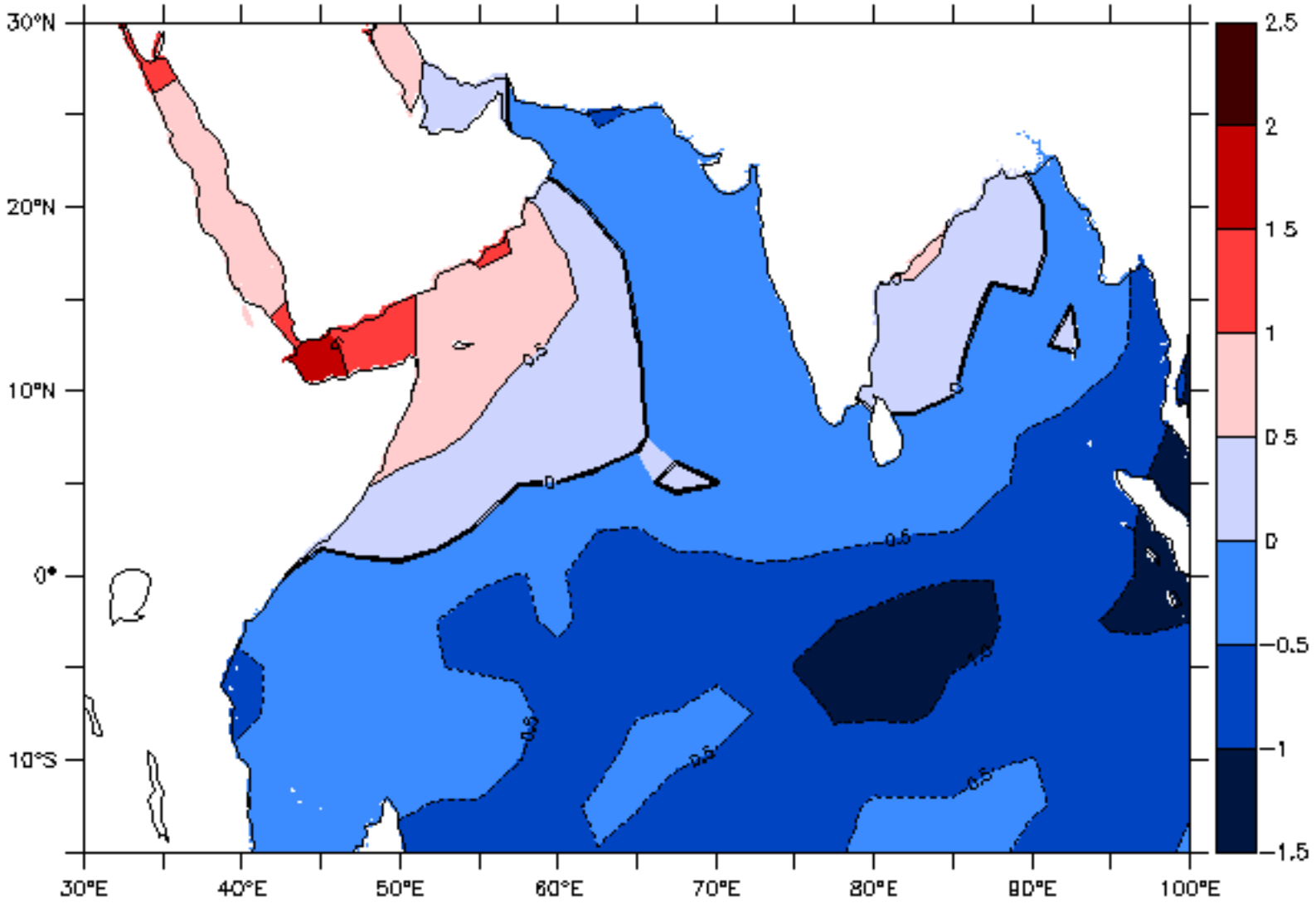


CHART No. 3.10 AIR–SEA TEMPERATURE DIFFERENCE(°C) OCTOBER

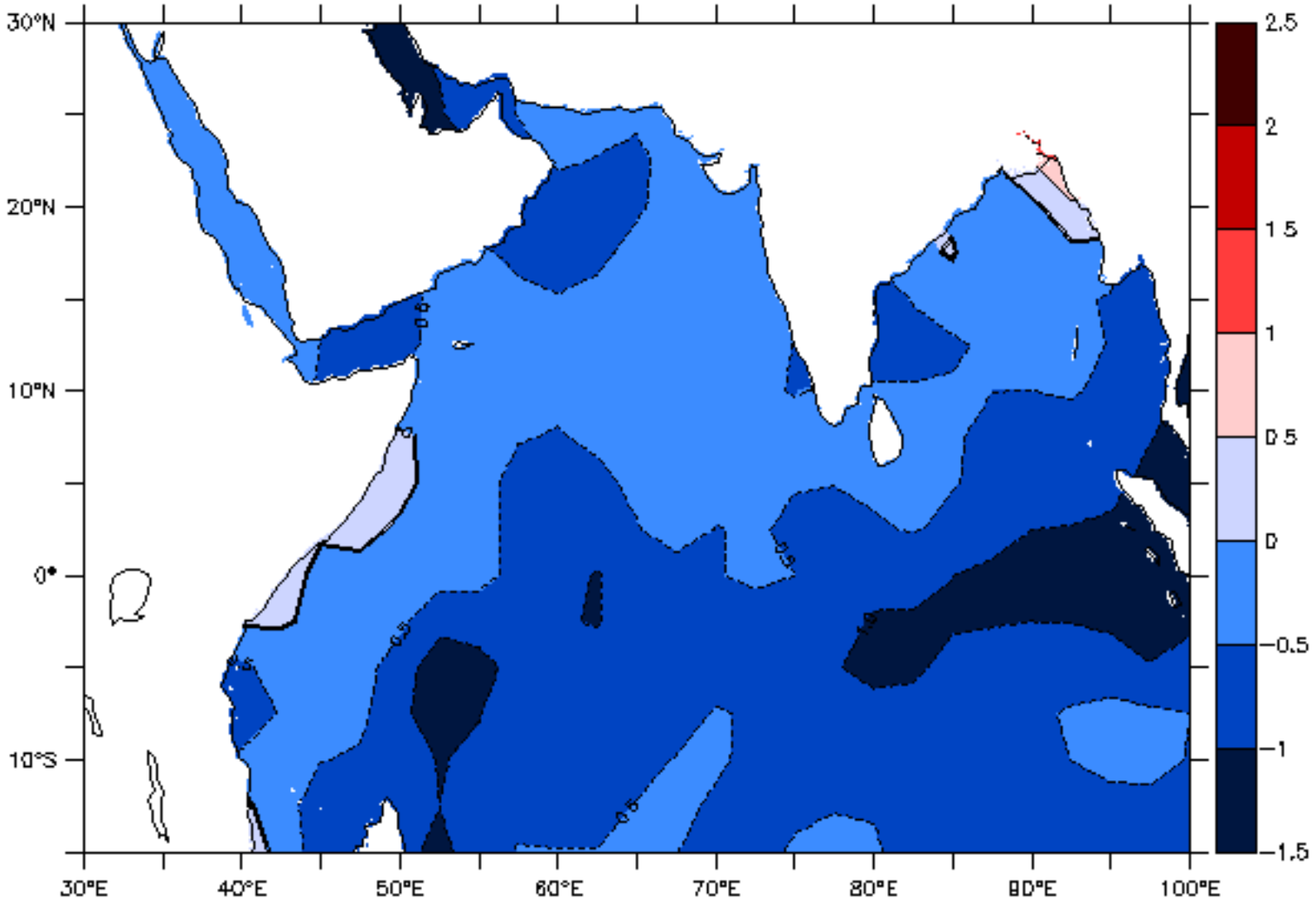


CHART No. 3.11 AIR–SEA TEMPERATURE DIFFERENCE(°C) NOVEMBER

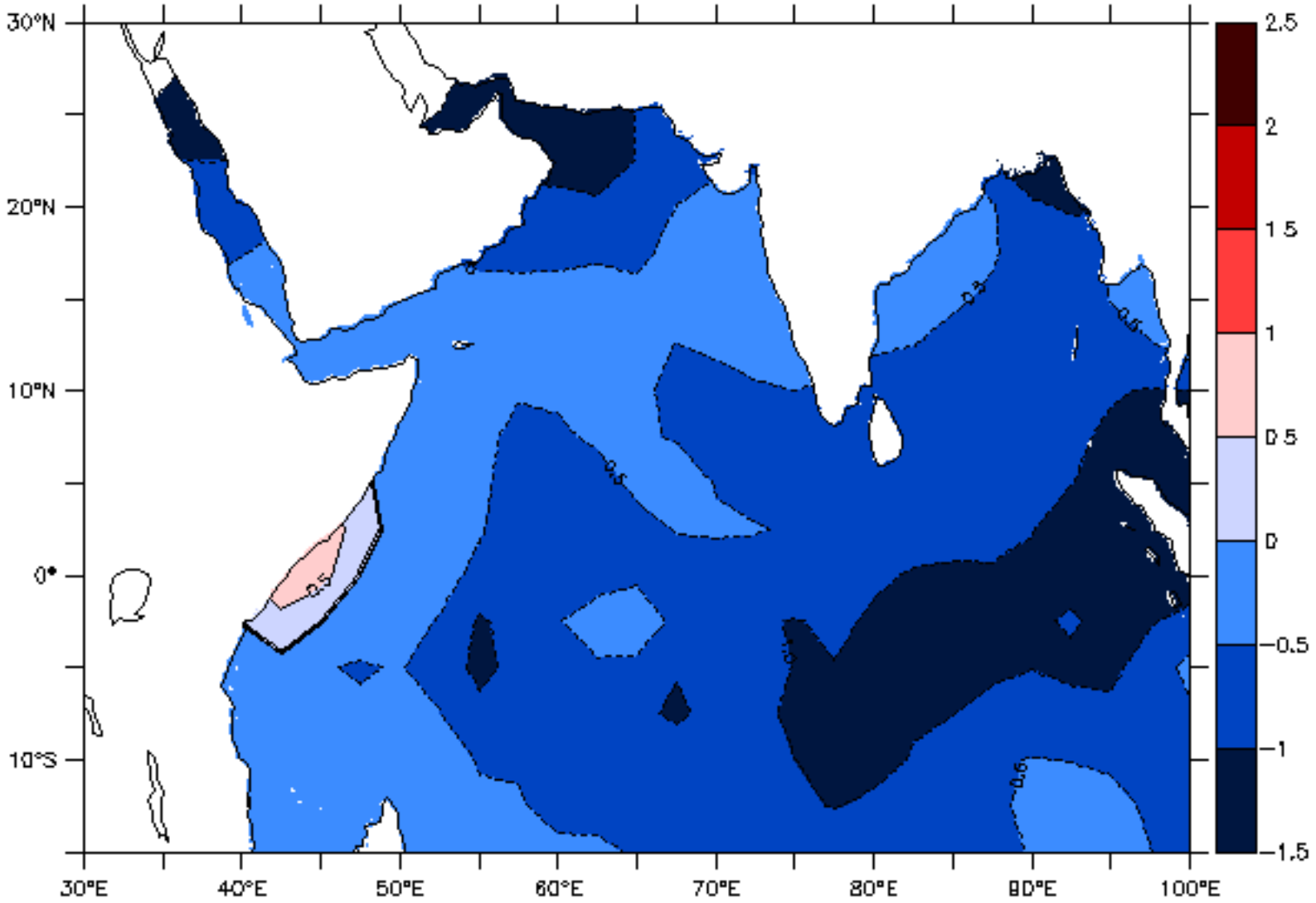


CHART No. 3.12 AIR–SEA TEMPERATURE DIFFERENCE(°C) DECEMBER

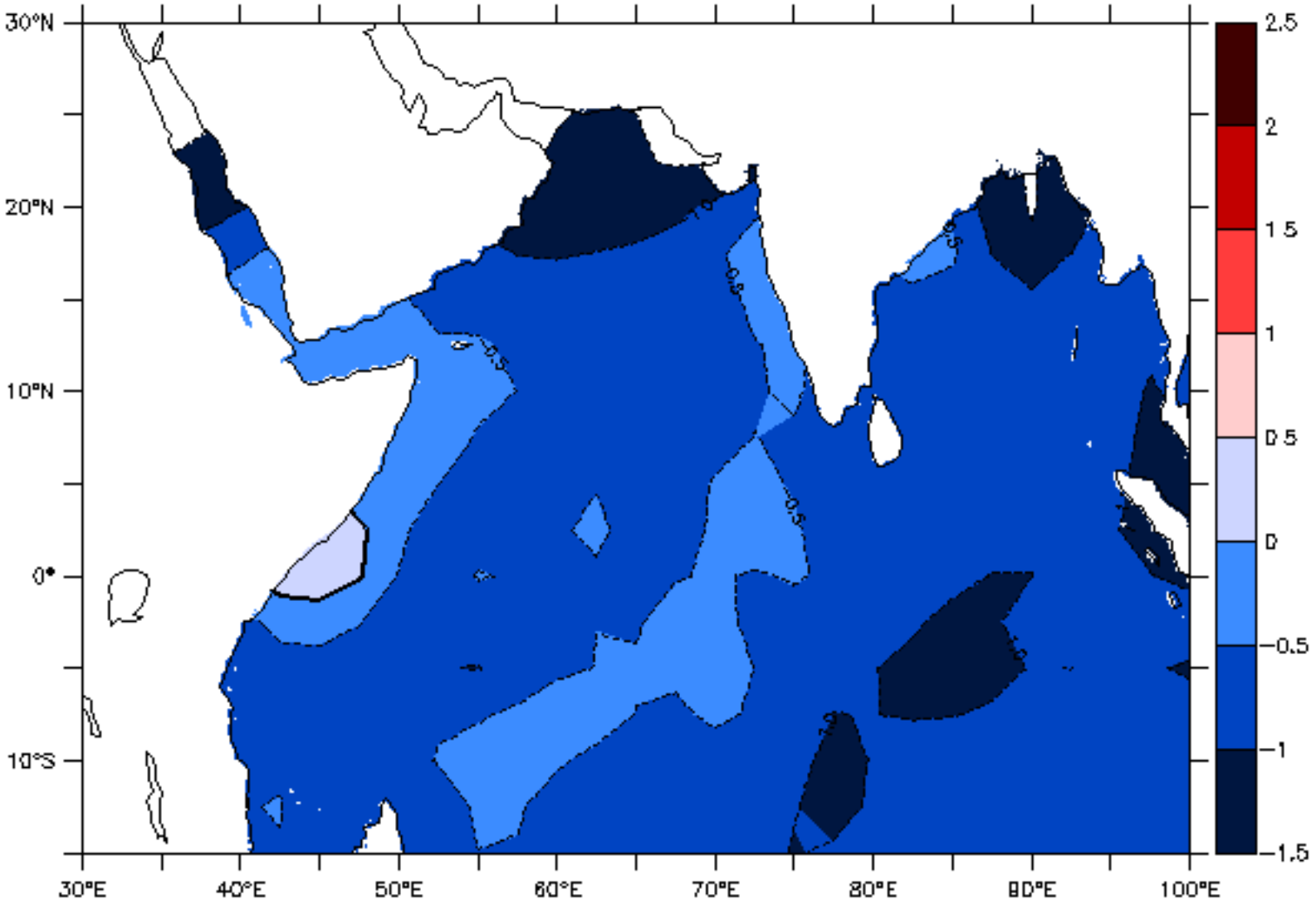


CHART No. 3.1 DEW POINT TEMPERATURE(°C) JANUARY

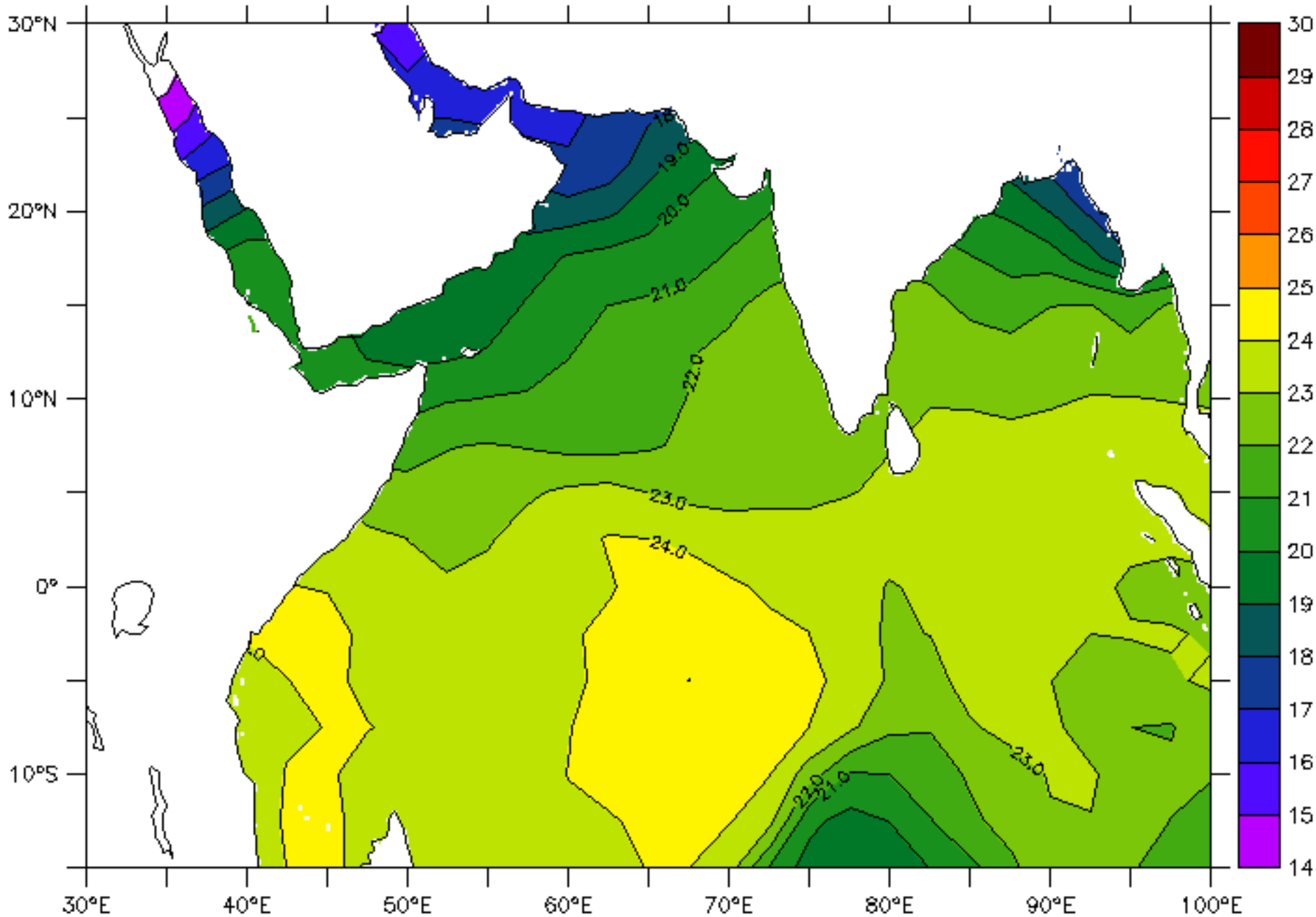


CHART No. 3.2 DEW POINT TEMPERATURE(°C) FEBRUARY

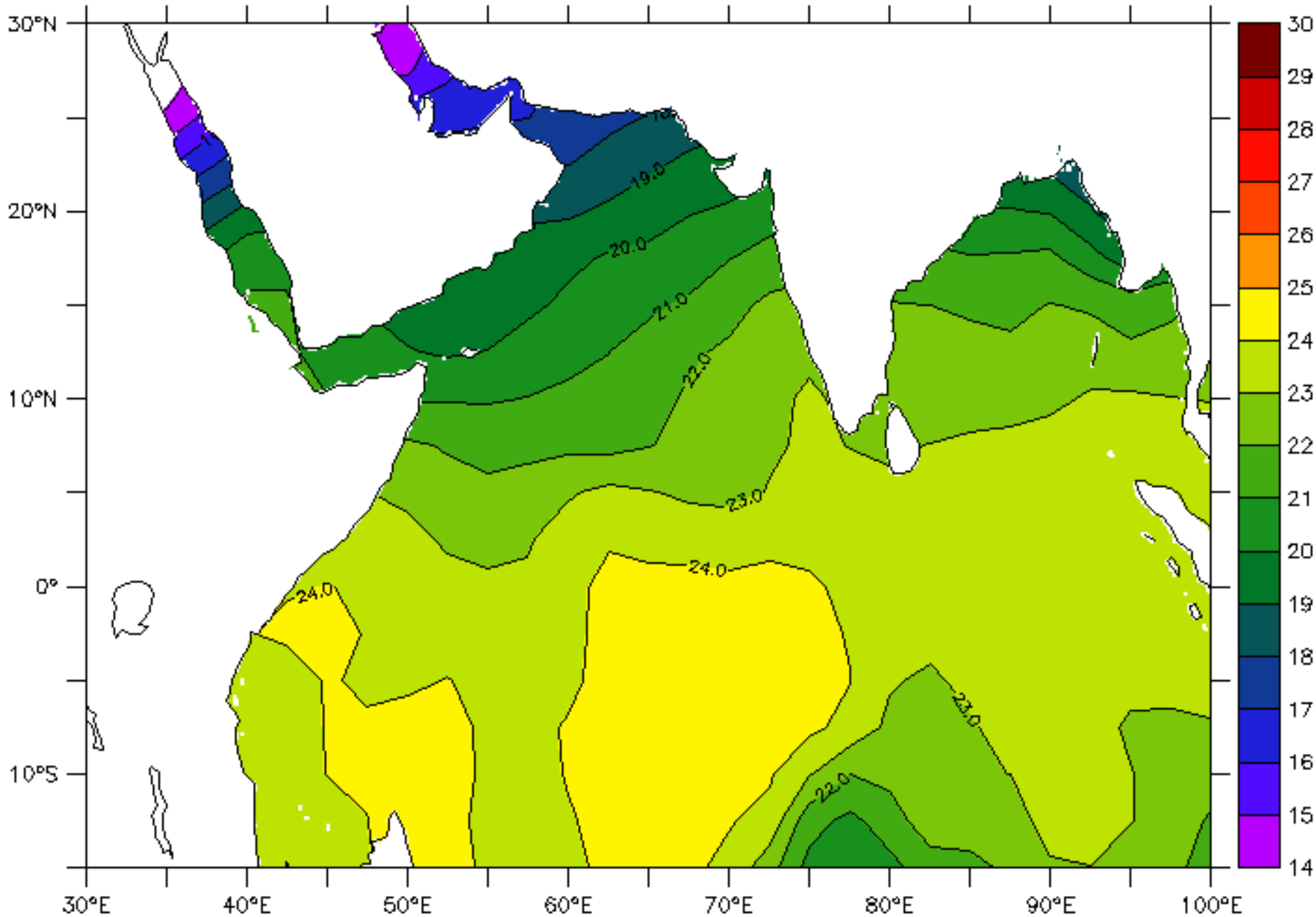


CHART No. 3.3 DEW POINT TEMPERATURE(°C) MARCH

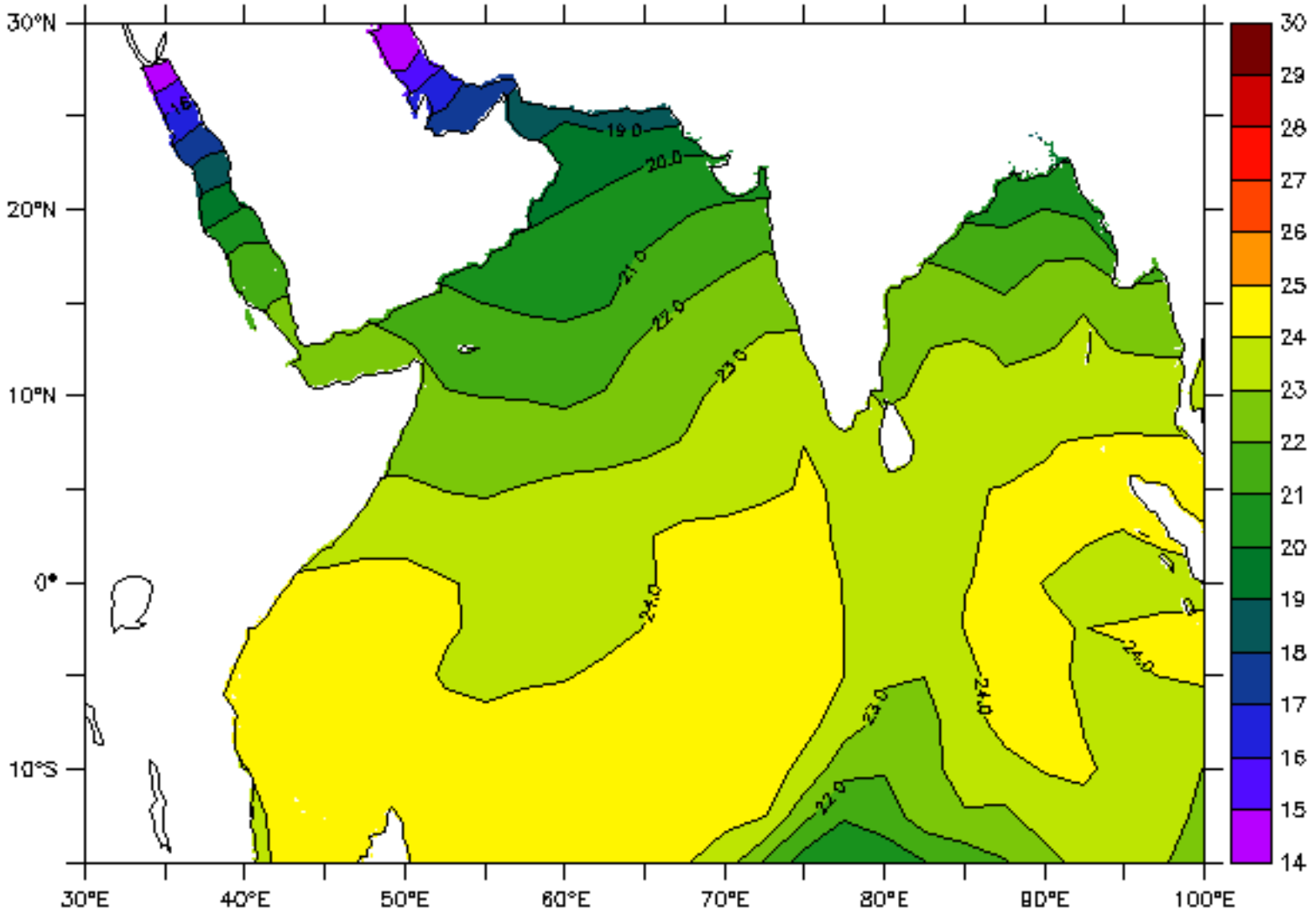


CHART No. 3.4 DEW POINT TEMPERATURE(°C) APRIL

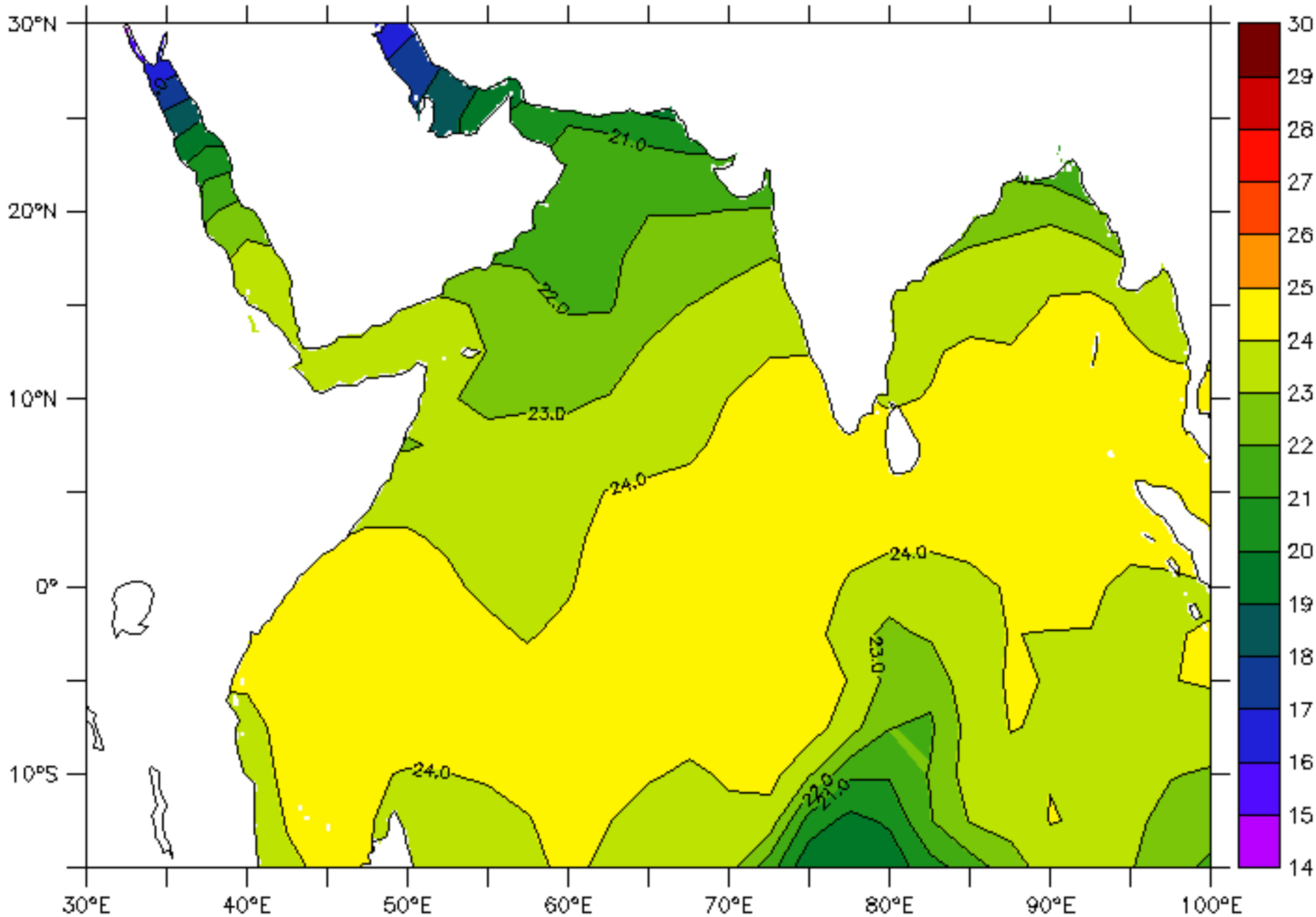


CHART No. 3.5 DEW POINT TEMPERATURE(°C) MAY

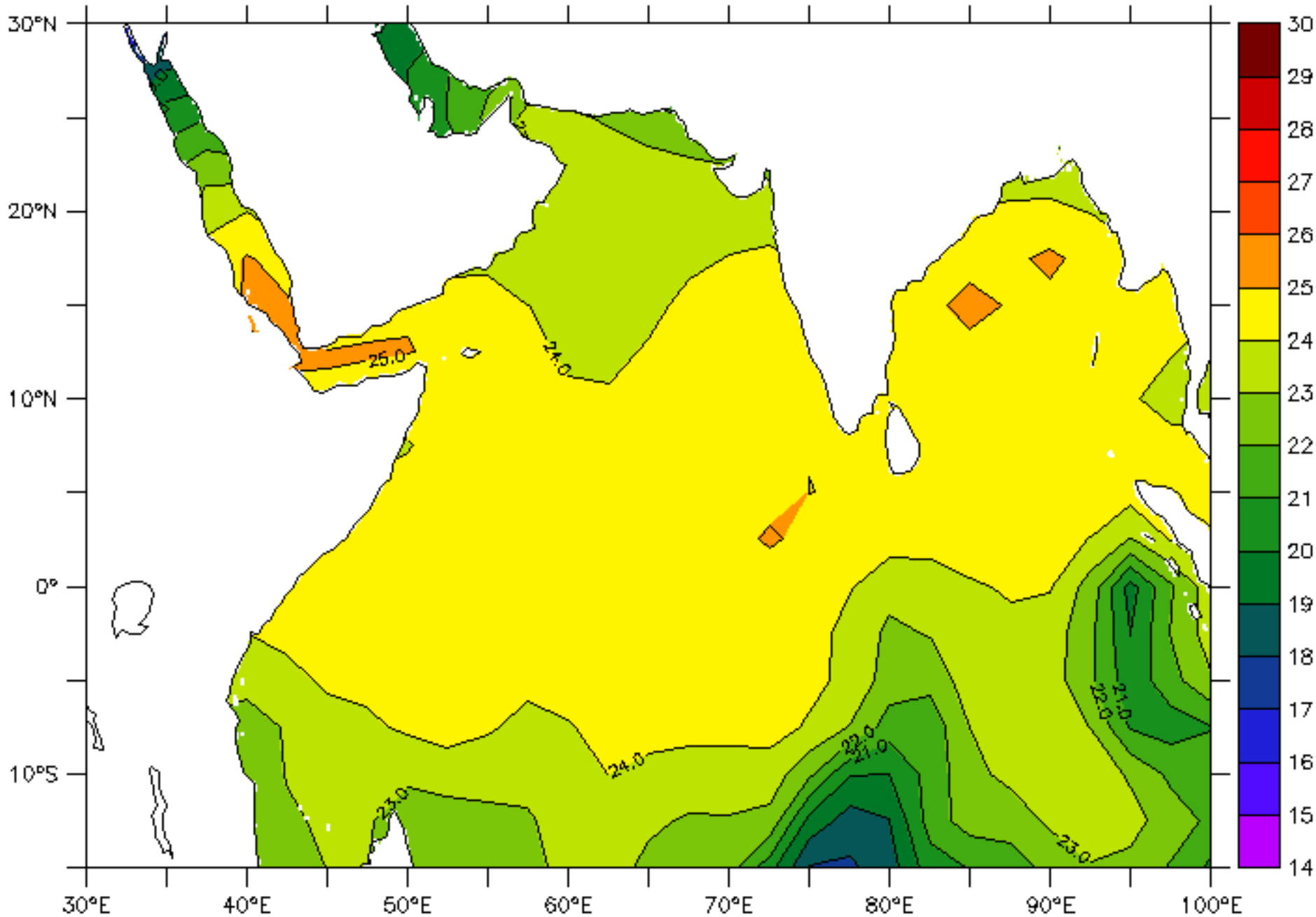


CHART No. 3.6 DEW POINT TEMPERATURE(°C) JUNE

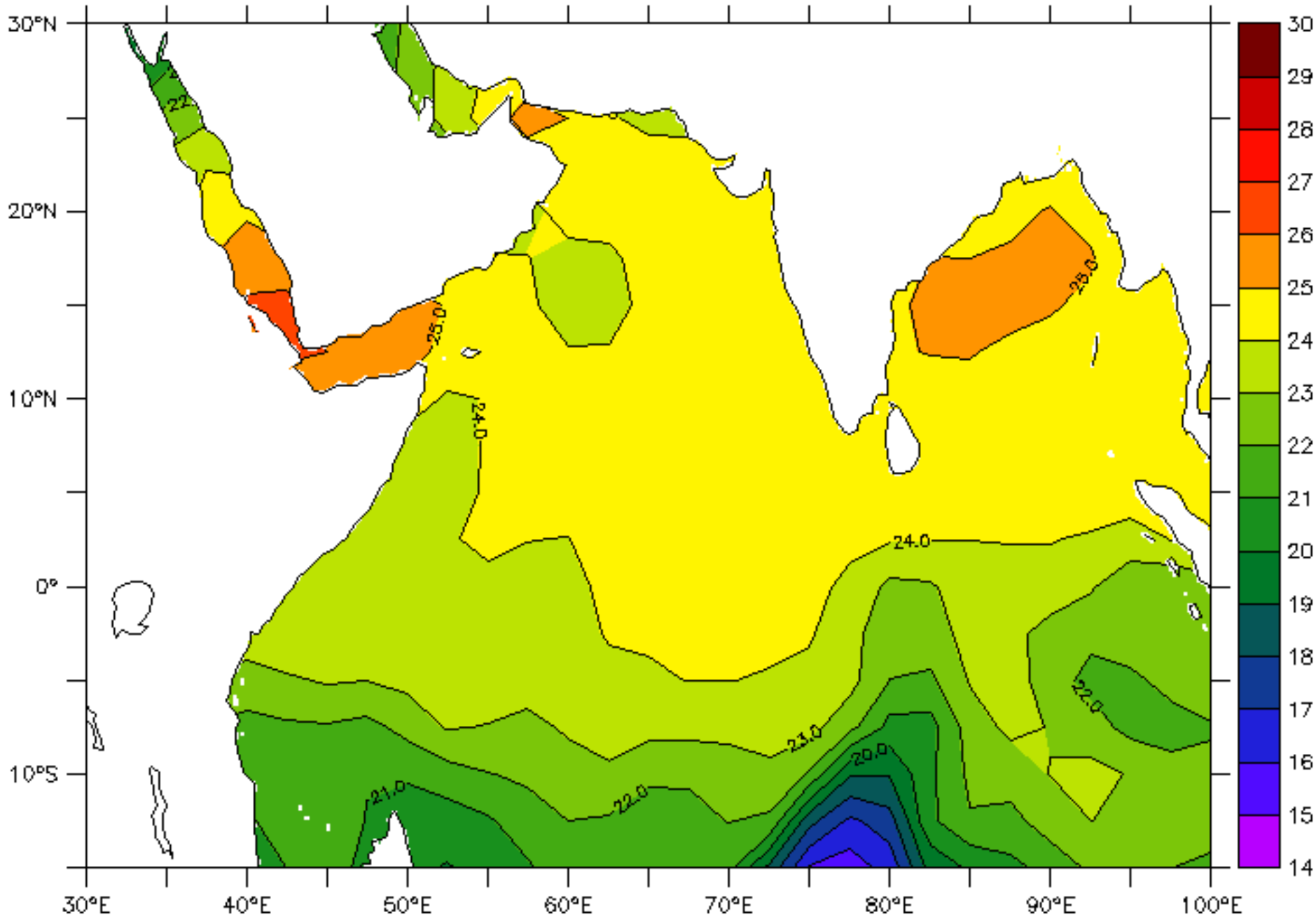


CHART No. 3.7 DEW POINT TEMPERATURE(°C) JULY

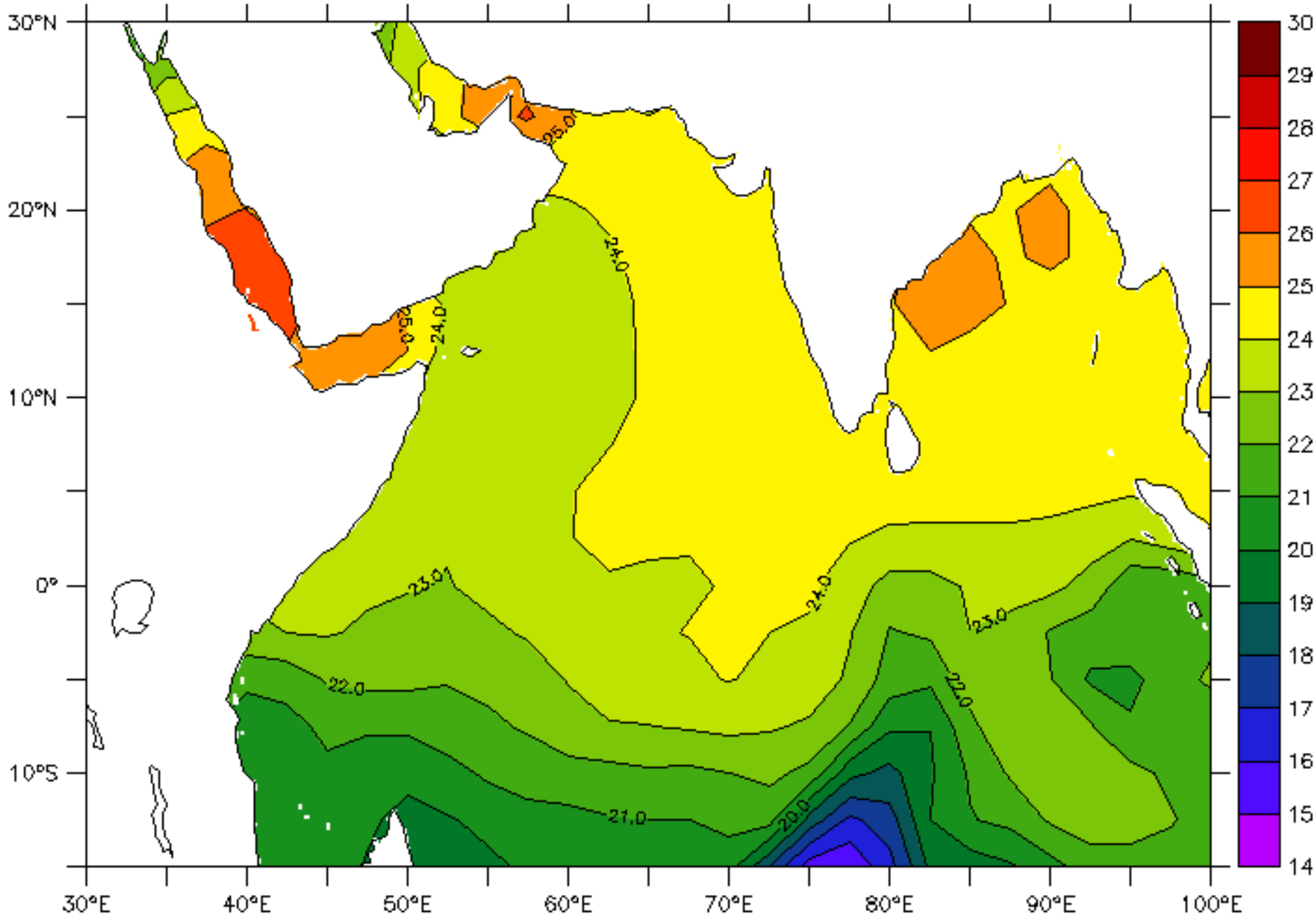


CHART No. 3.8 DEW POINT TEMPERATURE(°C) AUGUST

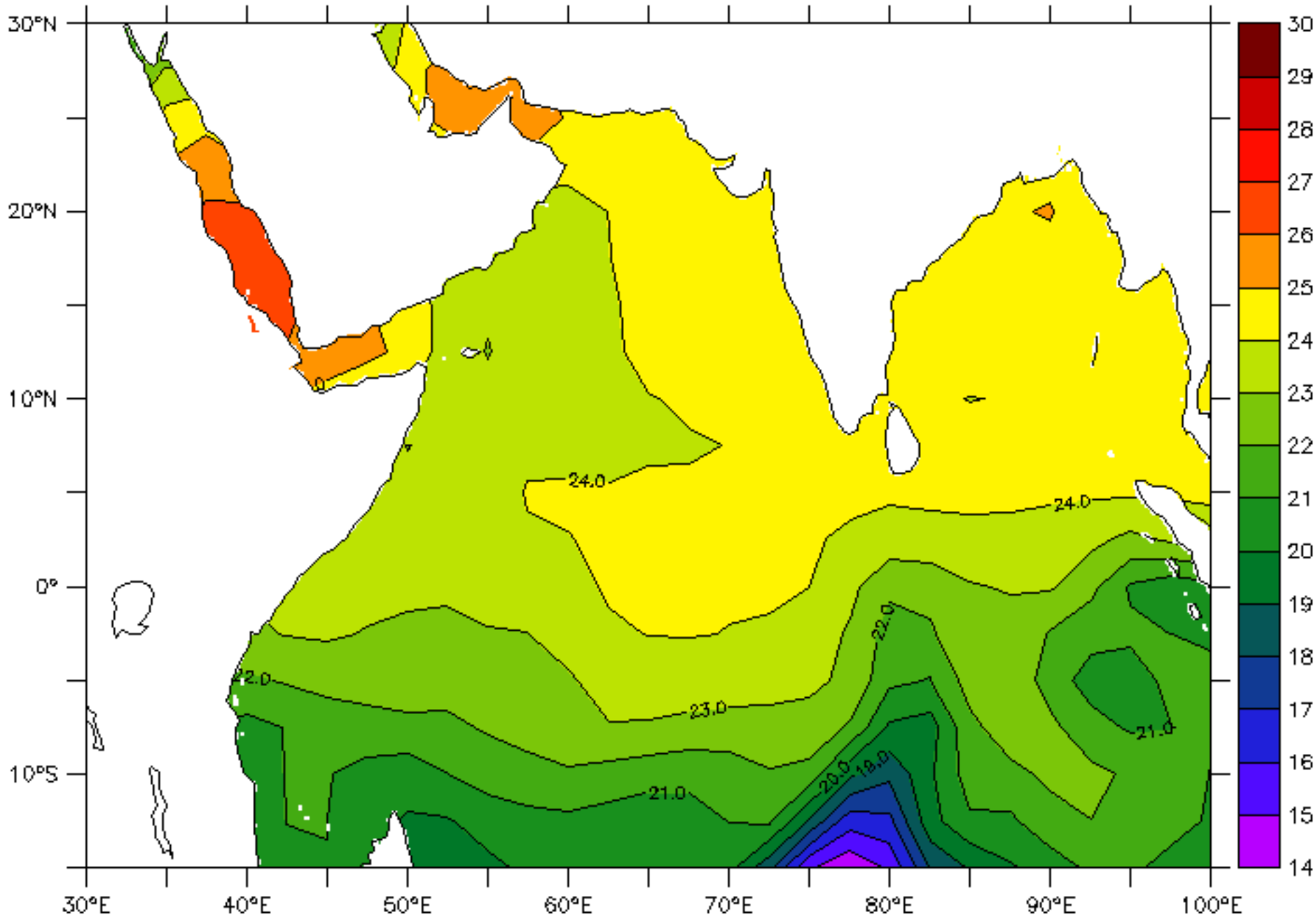


CHART No. 3.9 DEW POINT TEMPERATURE(°C) SEPTEMBER

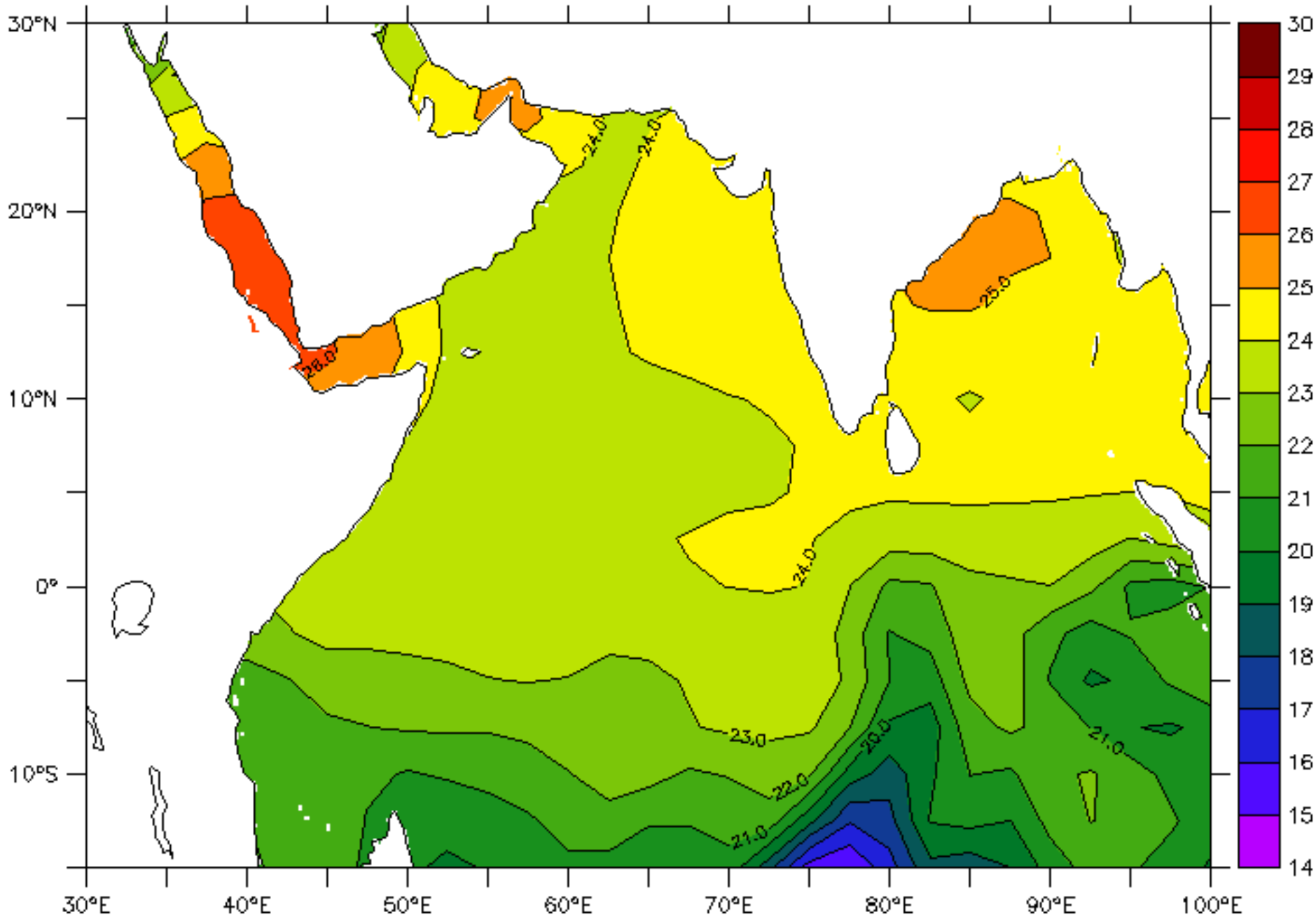


CHART No. 3.10 DEW POINT TEMPERATURE(°C) OCTOBER

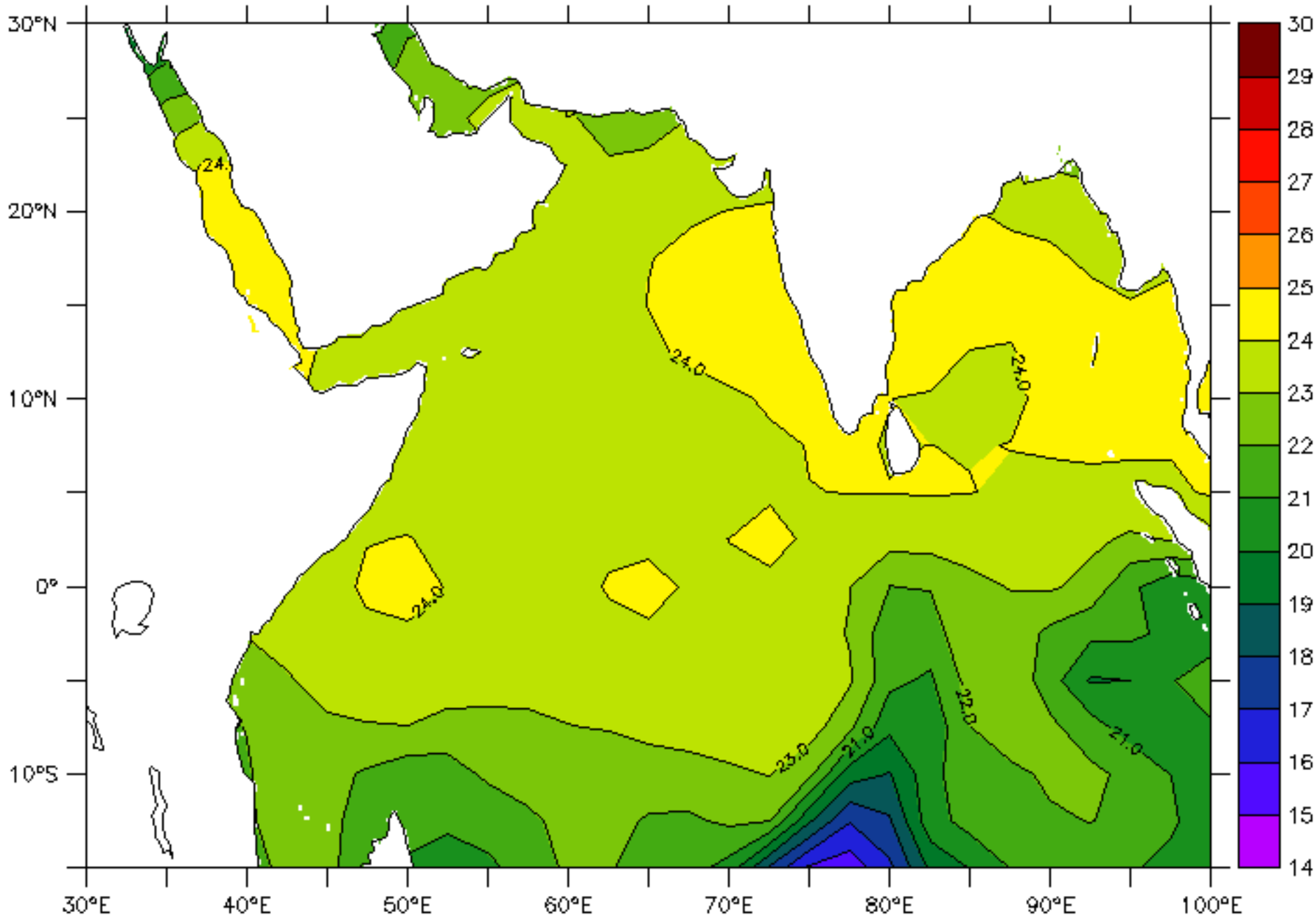


CHART No. 3.11 DEW POINT TEMPERATURE(°C) NOVEMBER

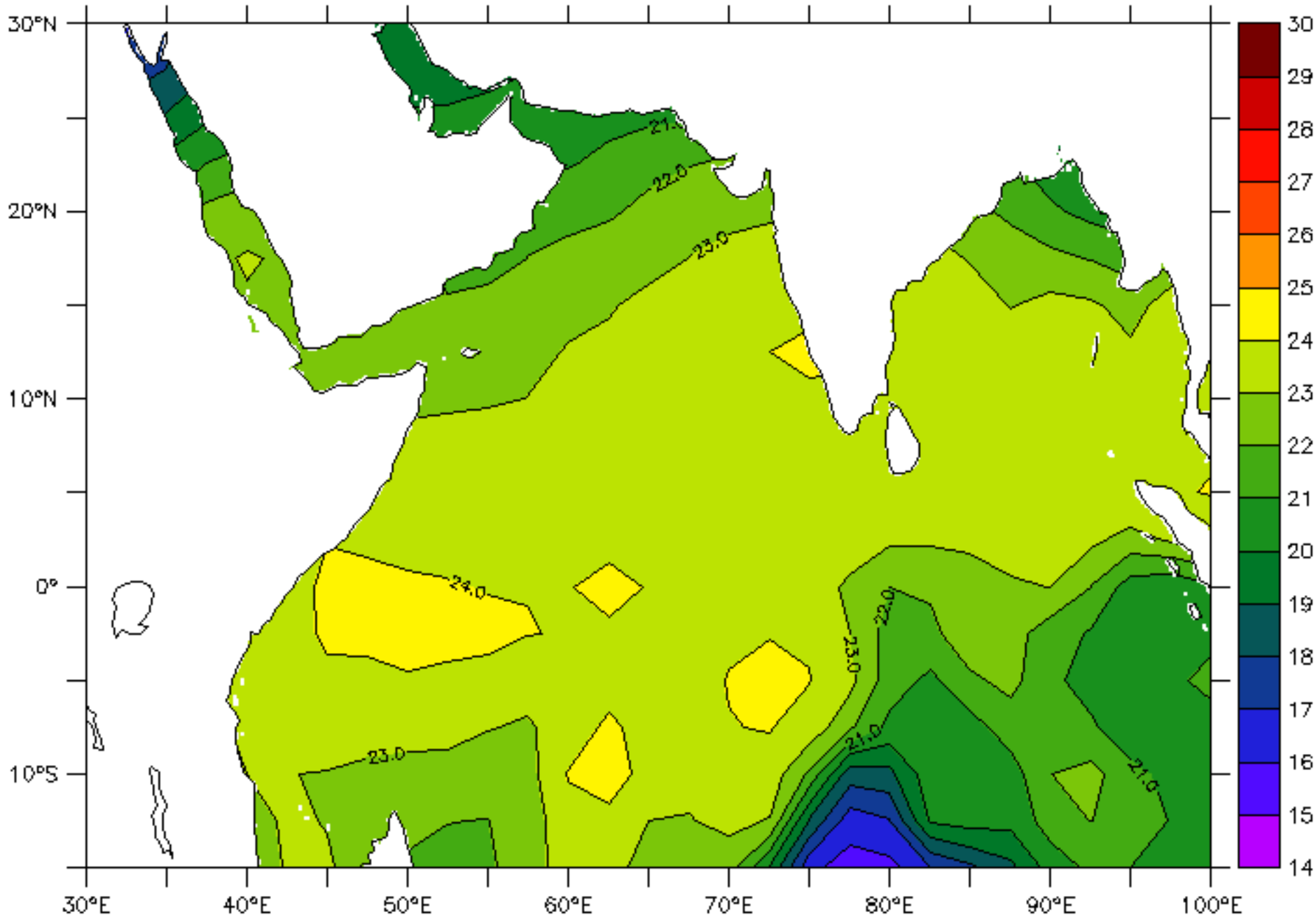


CHART No. 3.12 DEW POINT TEMPERATURE(°C) DECEMBER

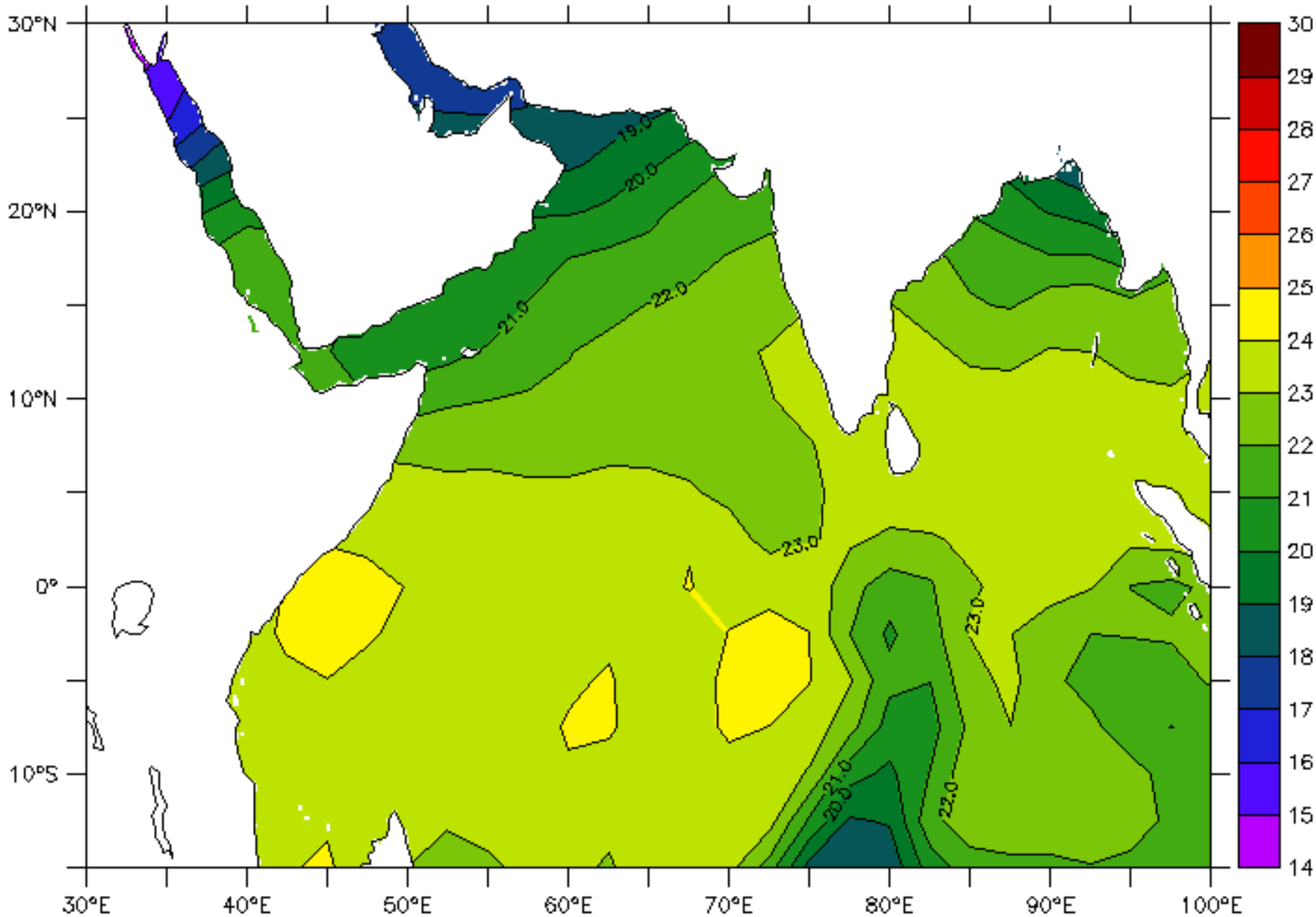


CHART No. 5.1 Sea Level Pressure(hPa) JANUARY

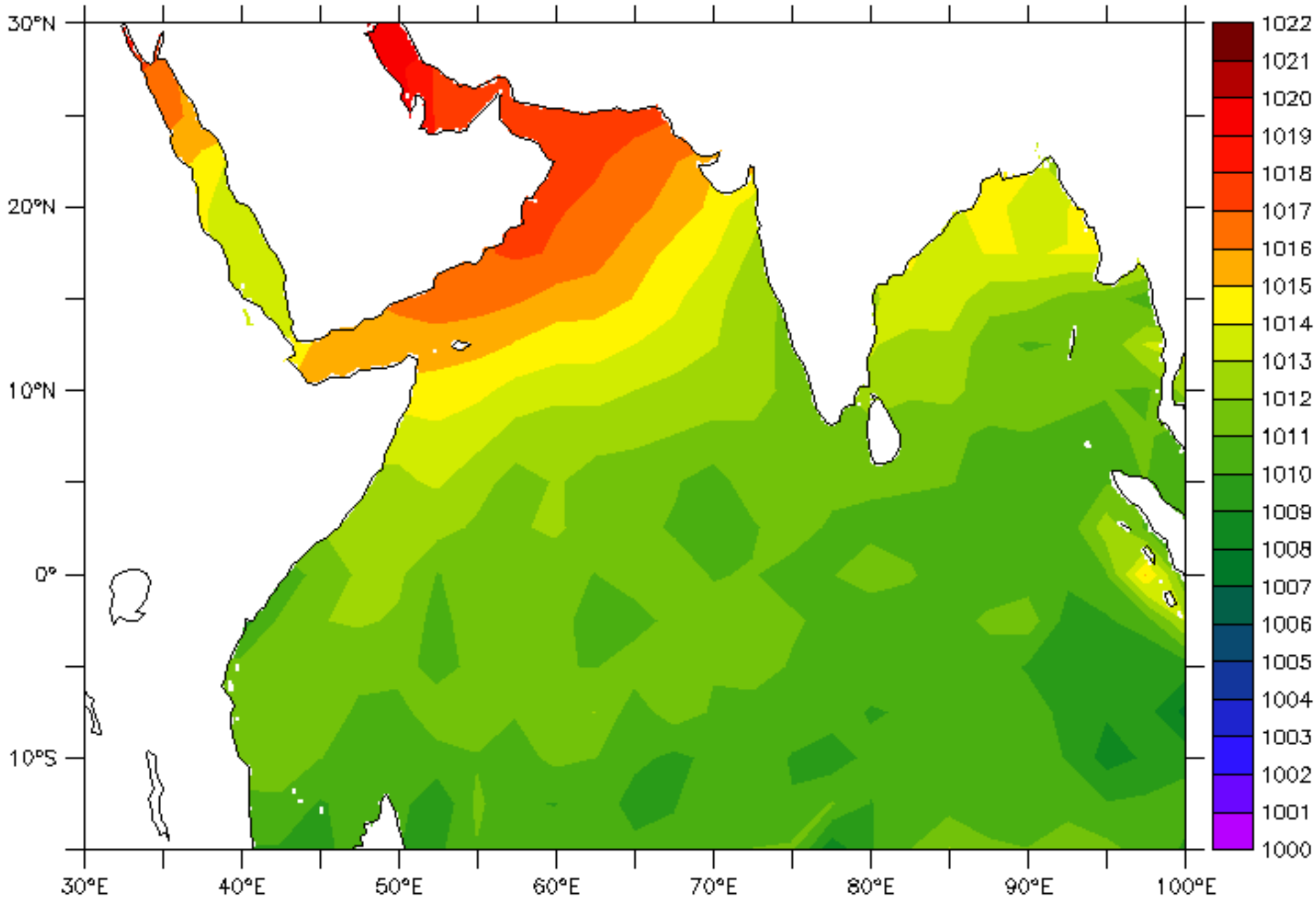


CHART No. 5.2 Sea Level Pressure(hPa) FEBRUARY

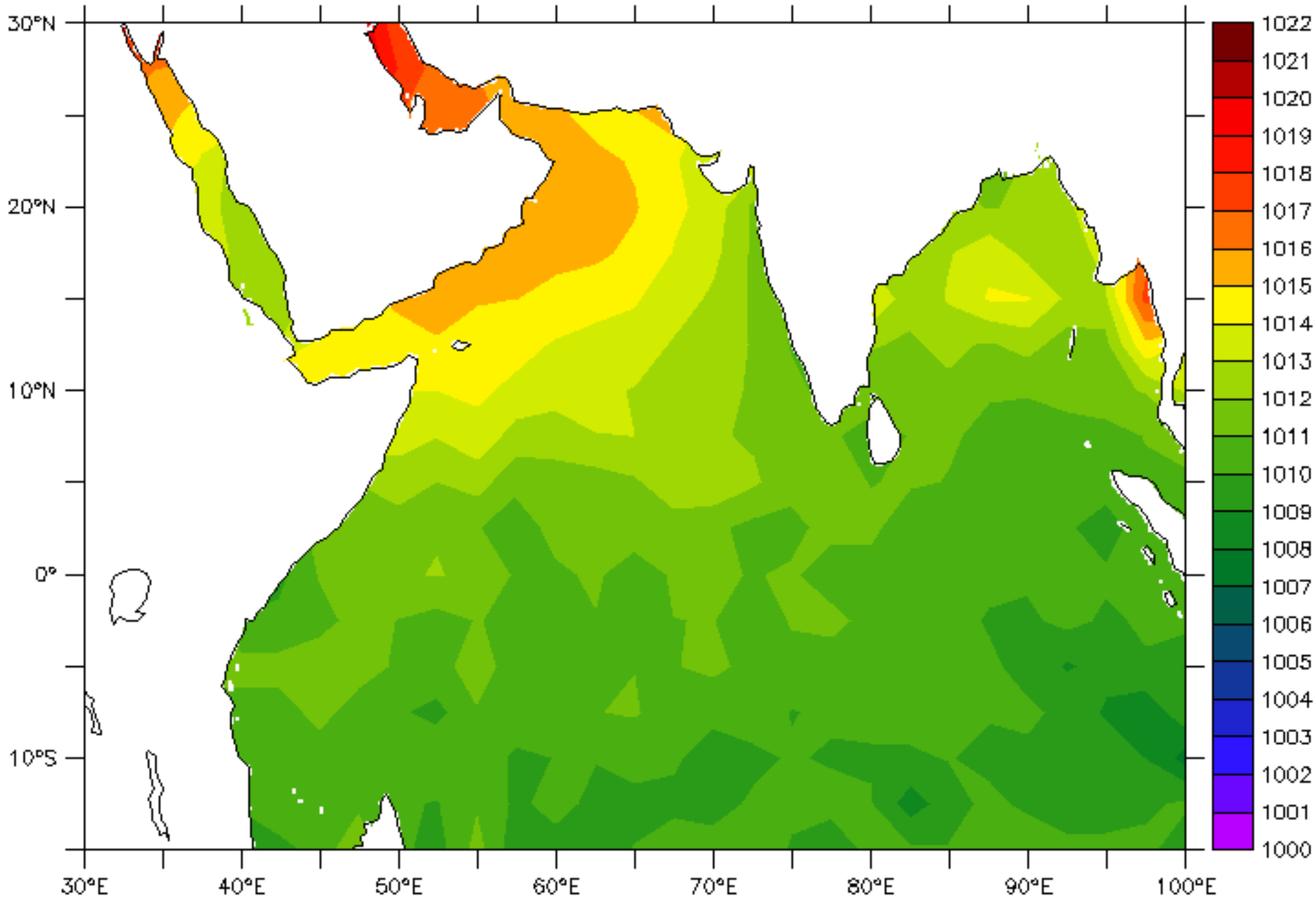


CHART No. 5.3 Sea Level Pressure(hPa) MARCH

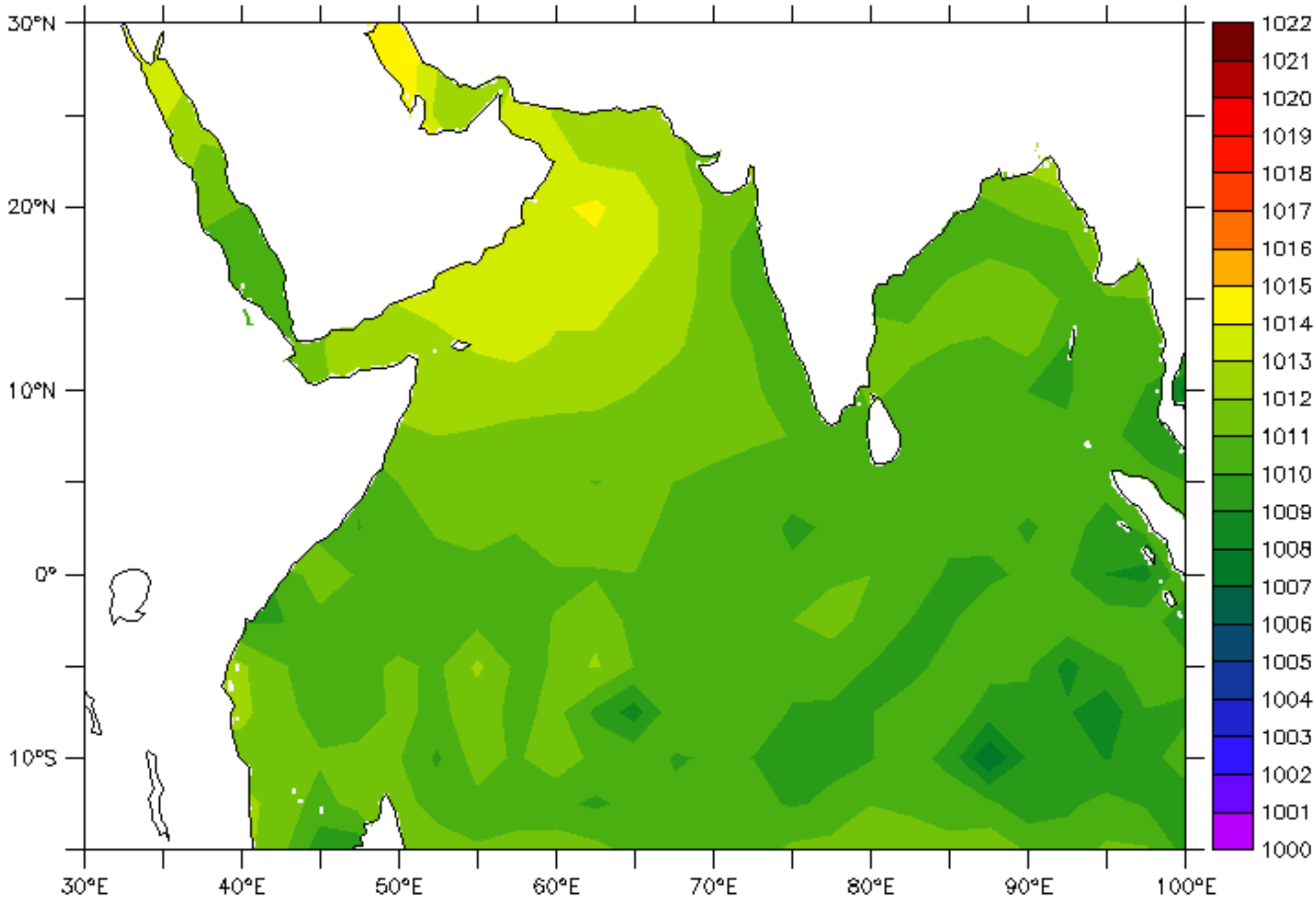


CHART No. 5.4 Sea Level Pressure(hPa) APRIL

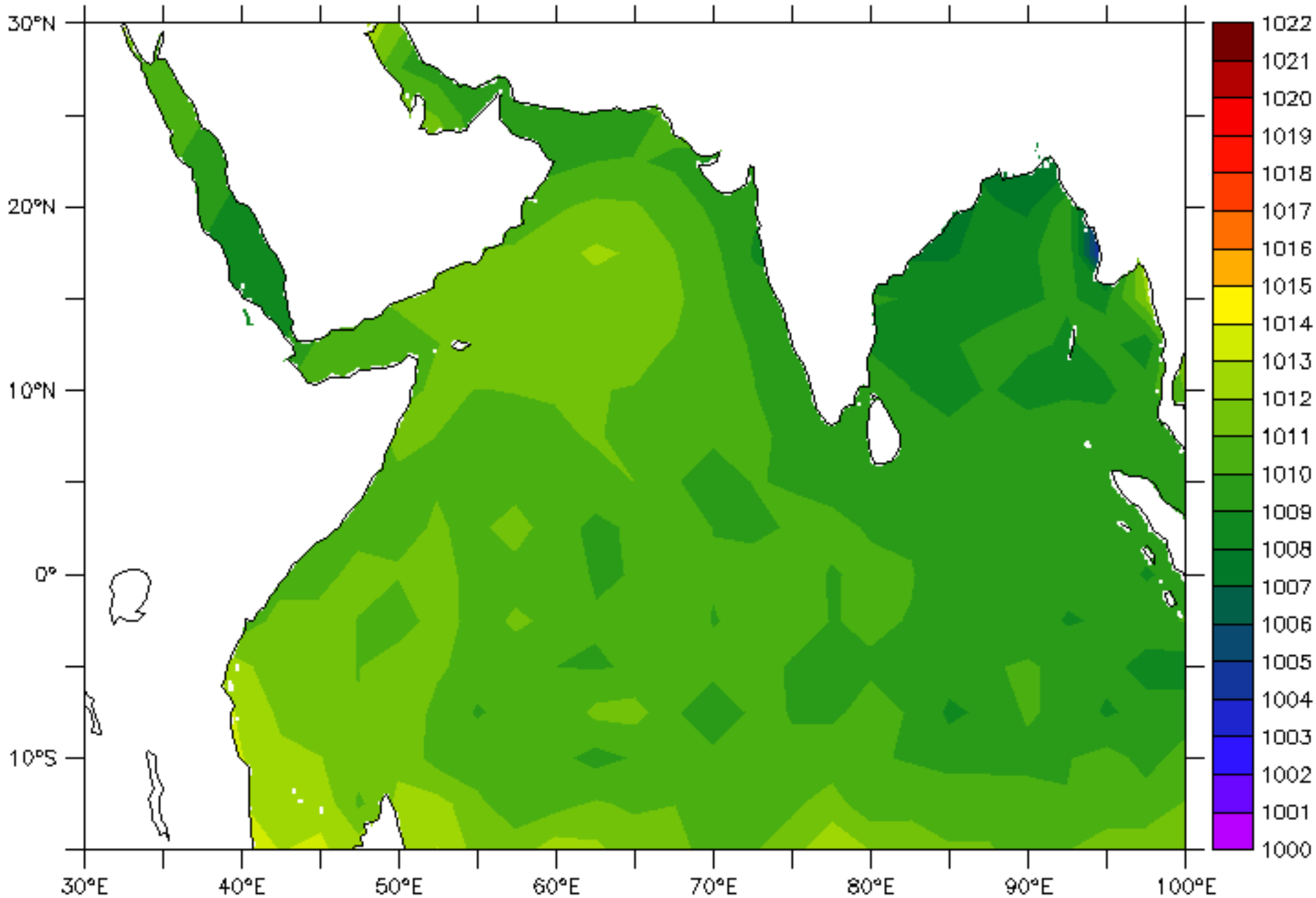


CHART No. 5.5 Sea Level Pressure(hPa) MAY

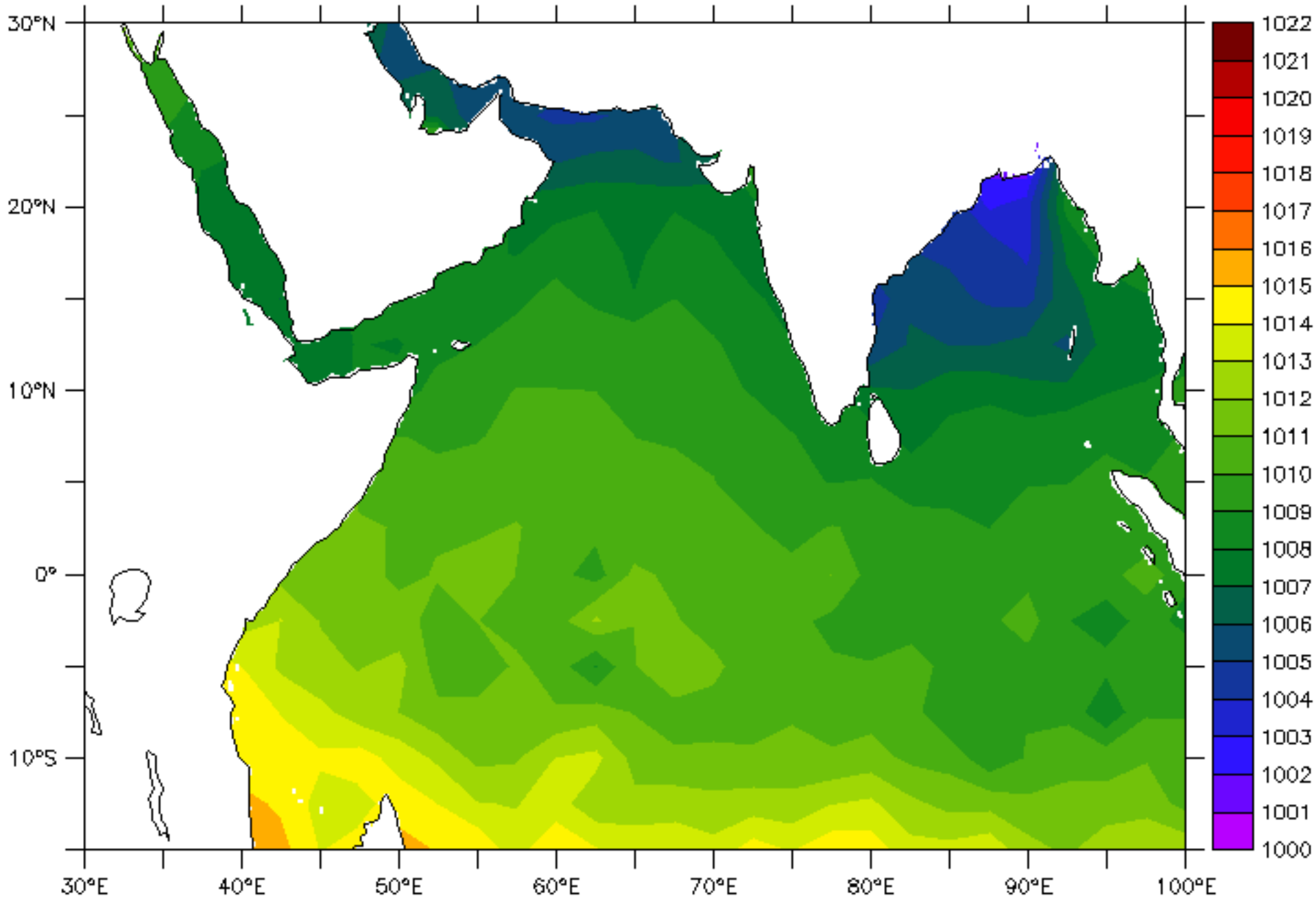


CHART No. 5.6 Sea Level Pressure(hPa) JUNE

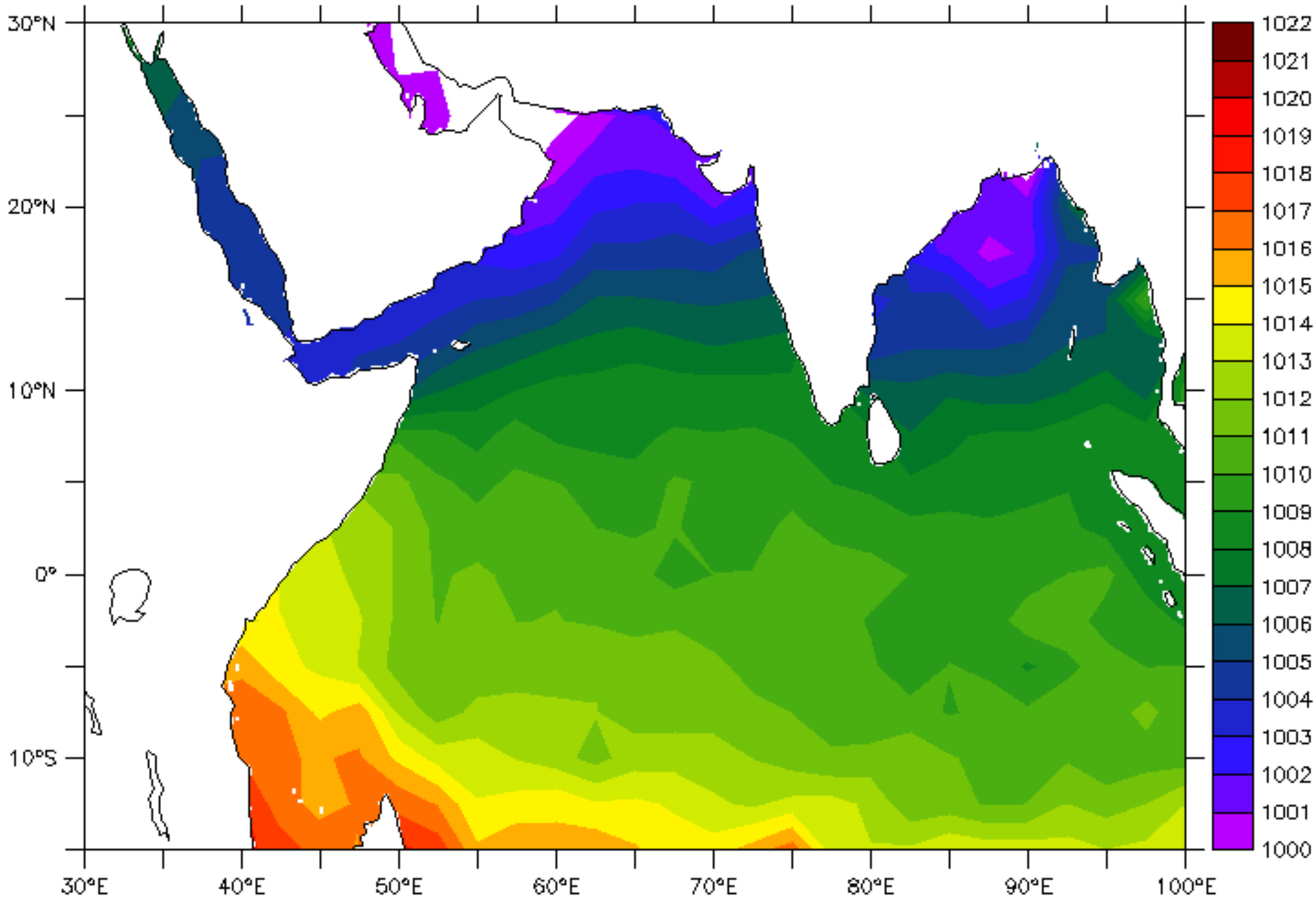


CHART No. 5.7 Sea Level Pressure(hPa) JULY

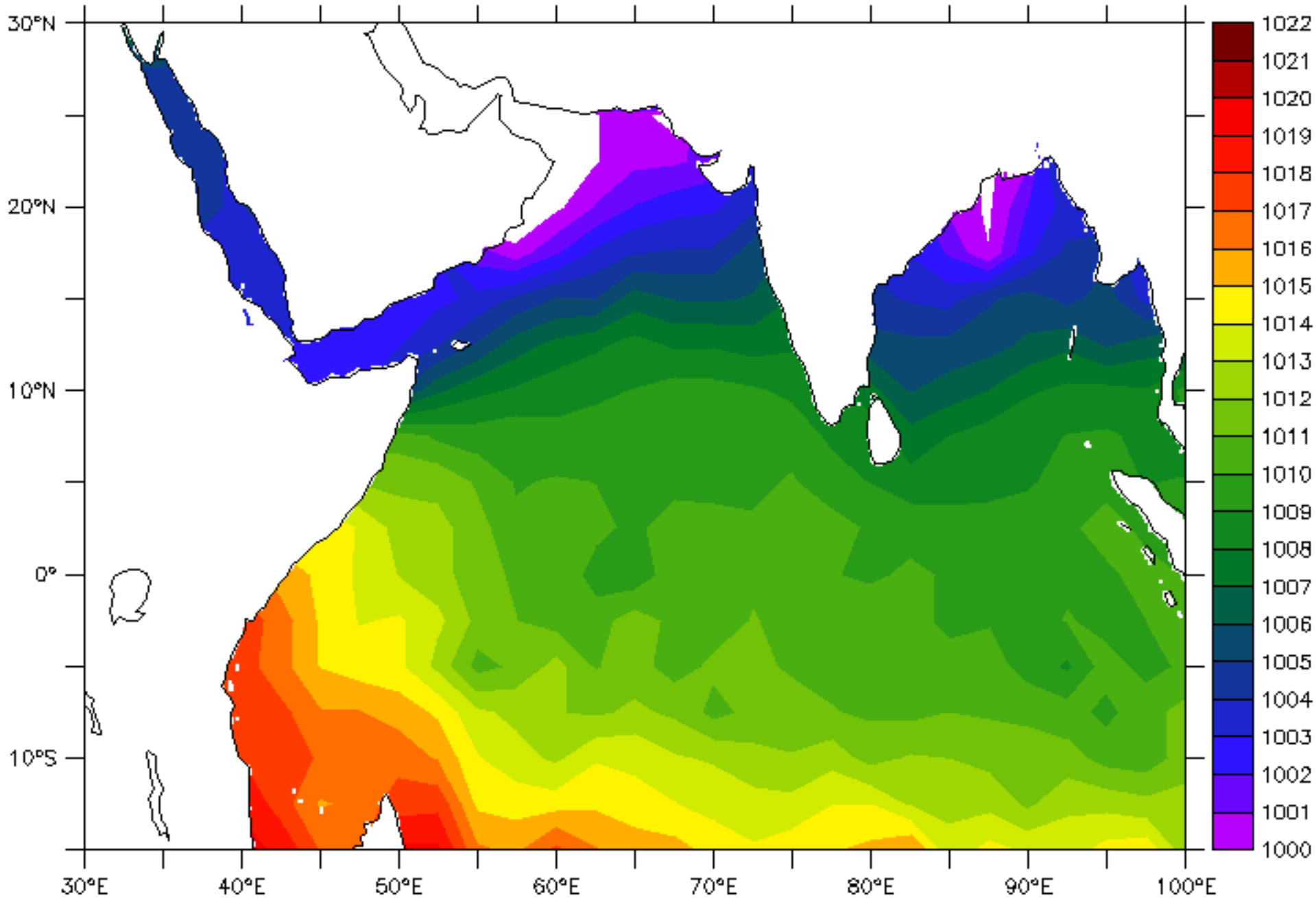


CHART No. 5.8 Sea Level Pressure(hPa) AUGUST

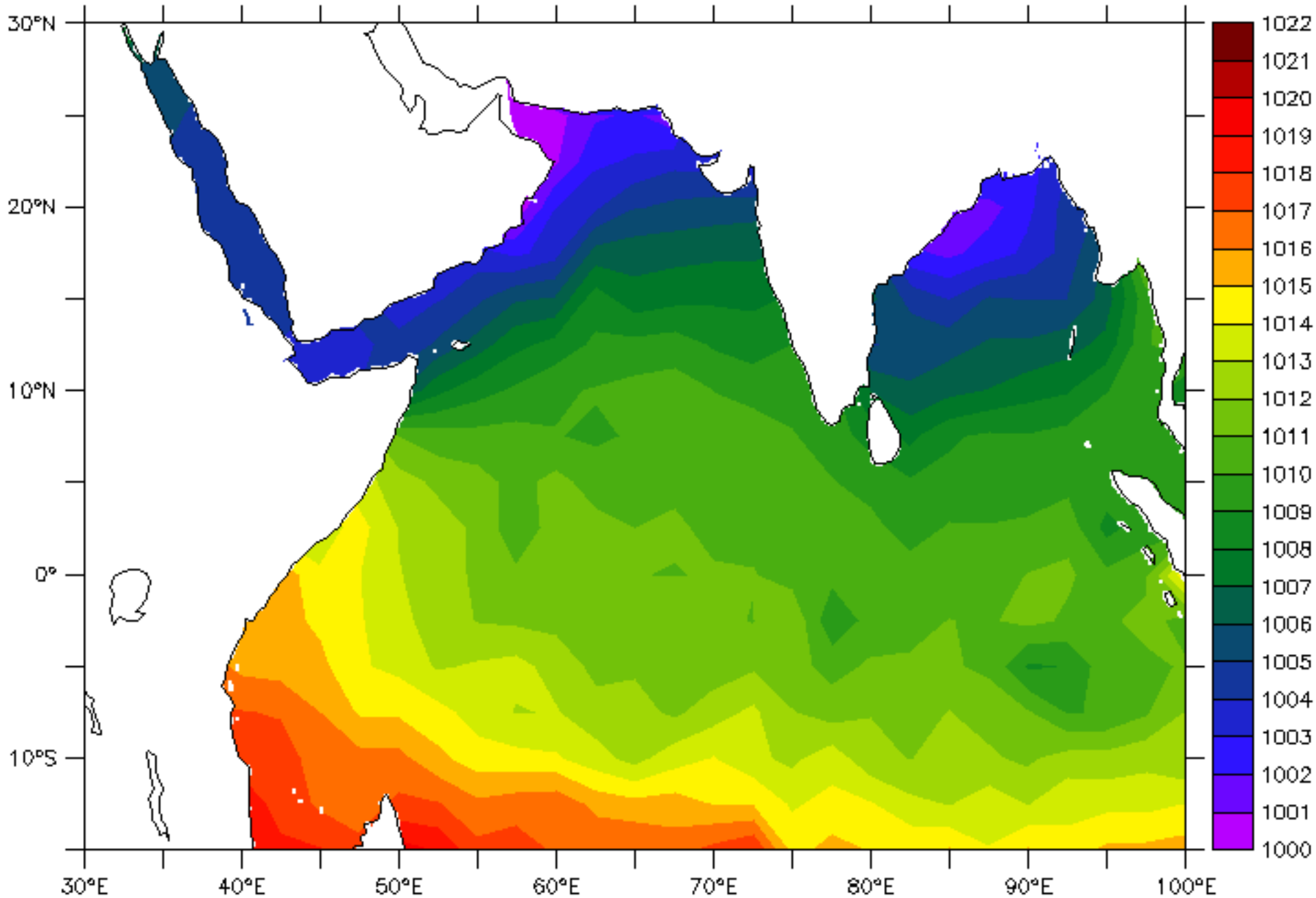


CHART No. 5.9 Sea Level Pressure(hPa) SEPTEMBER

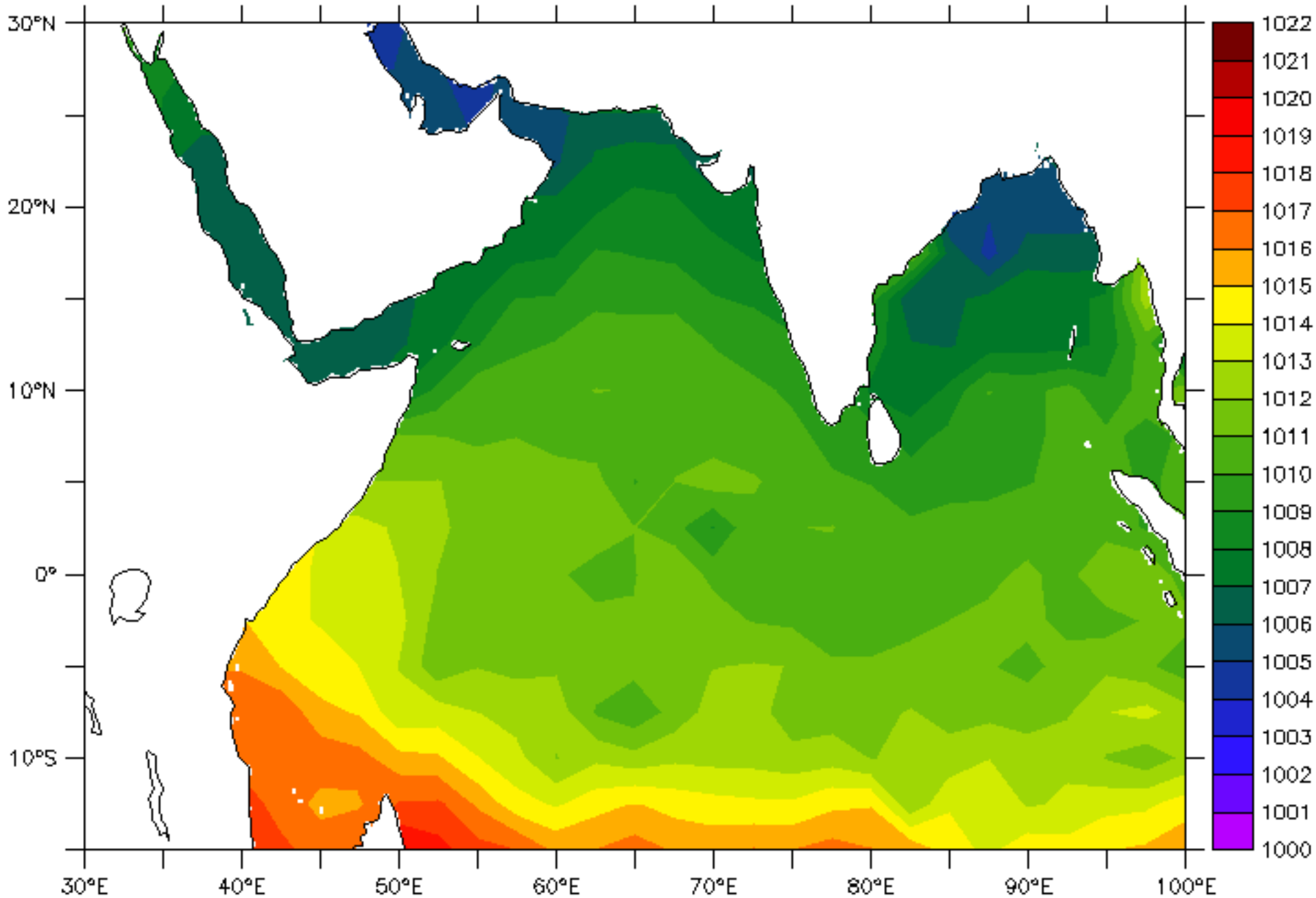


CHART No. 5.10 Sea Level Pressure(hPa) OCTOBER

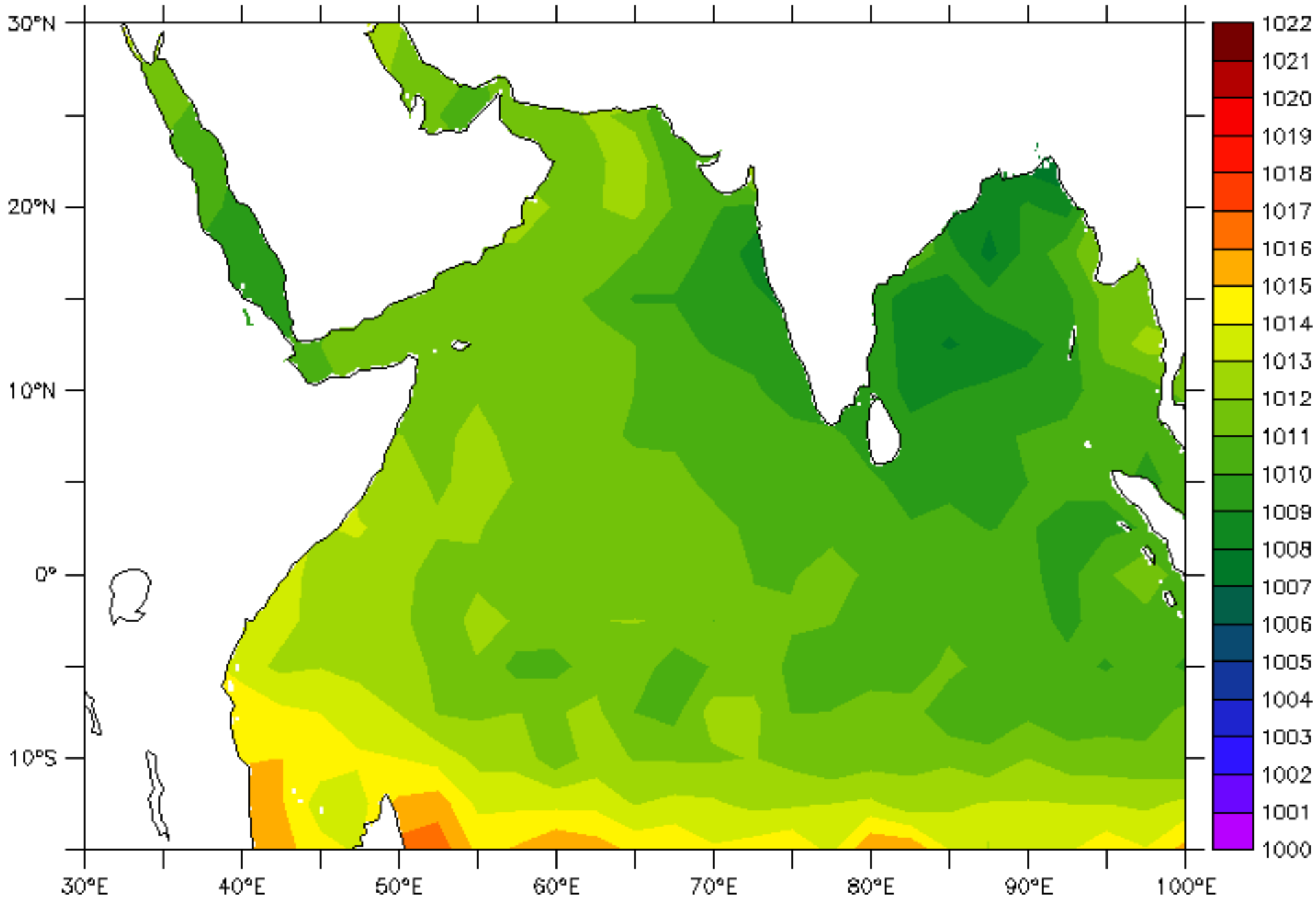


CHART No. 5.11 Sea Level Pressure(hPa) NOVEMBER

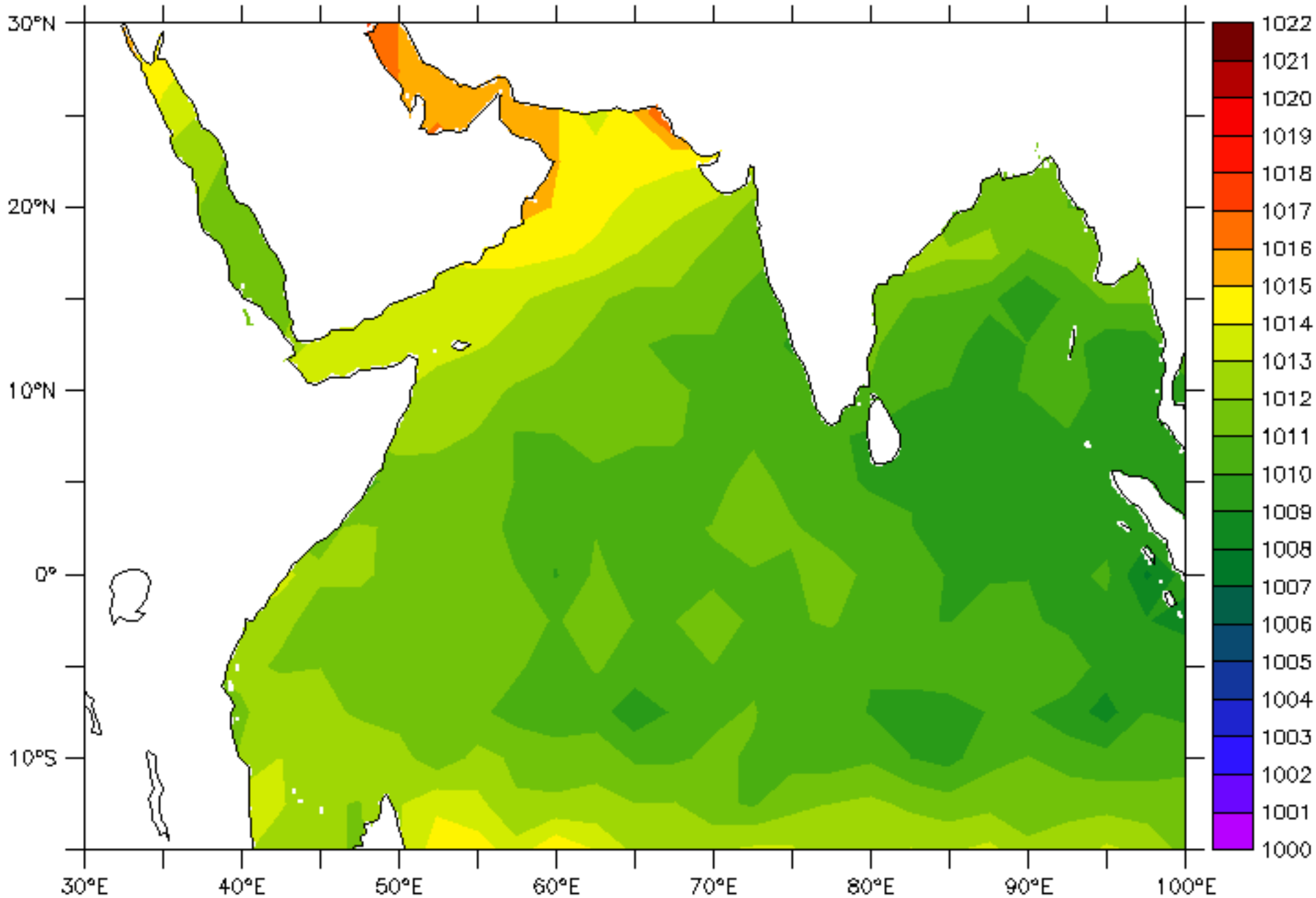


CHART No. 5.12 Sea Level Pressure(hPa) DECEMBER

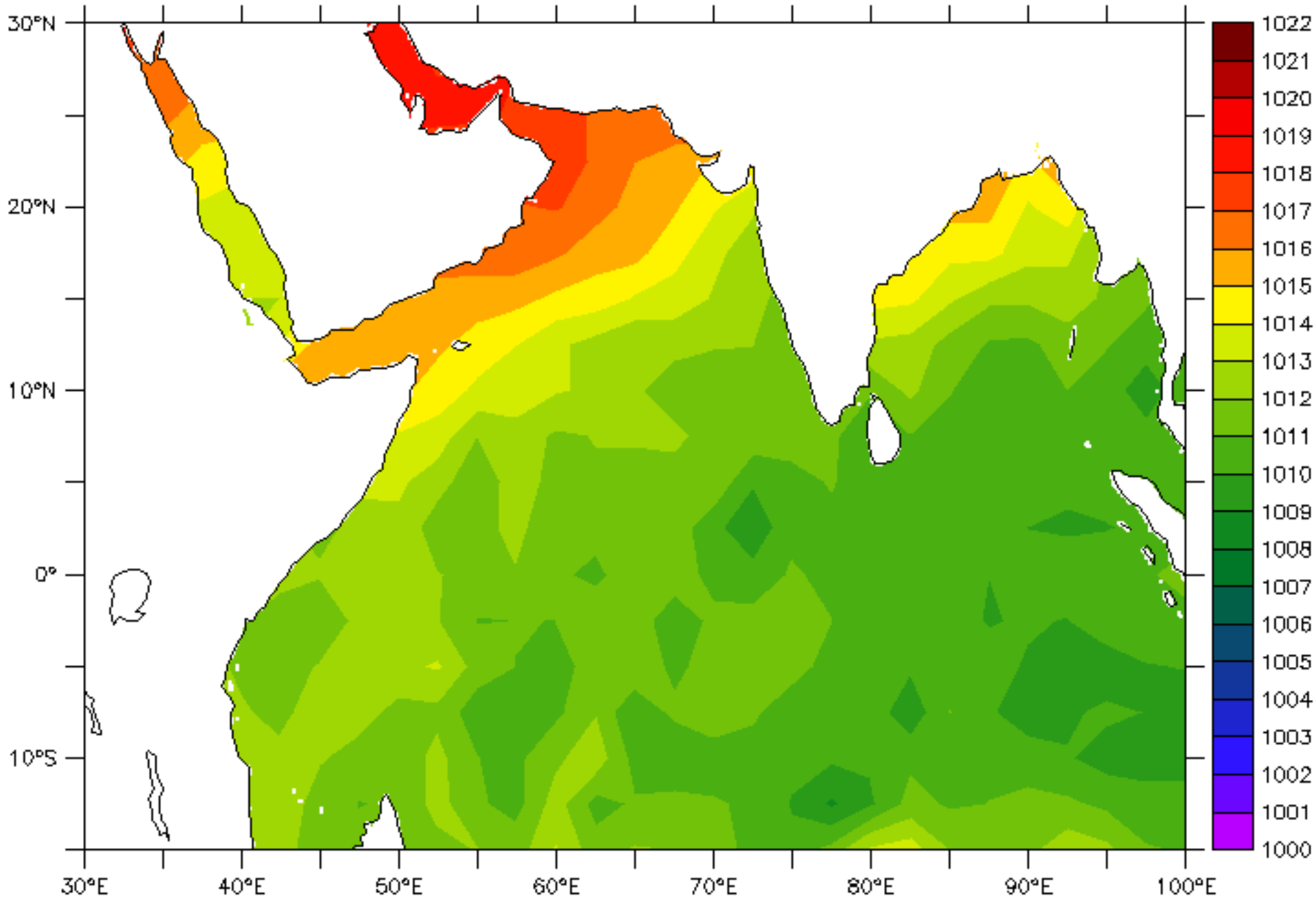


CHART No. 6.1 WIND SPEED(m/Sec) JANUARY

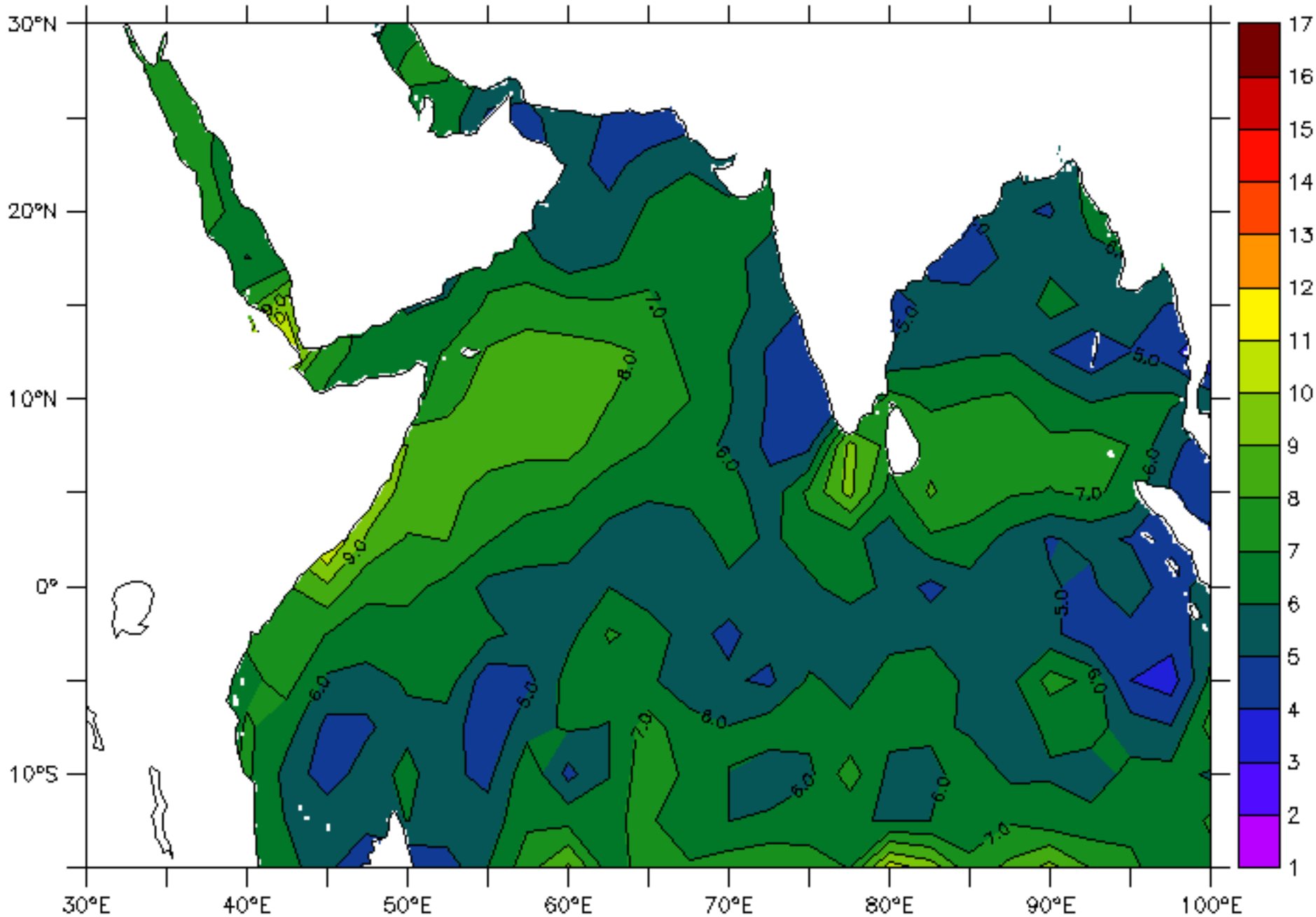


CHART No. 6.2 WIND SPEED(m/Sec) FEBRUARY

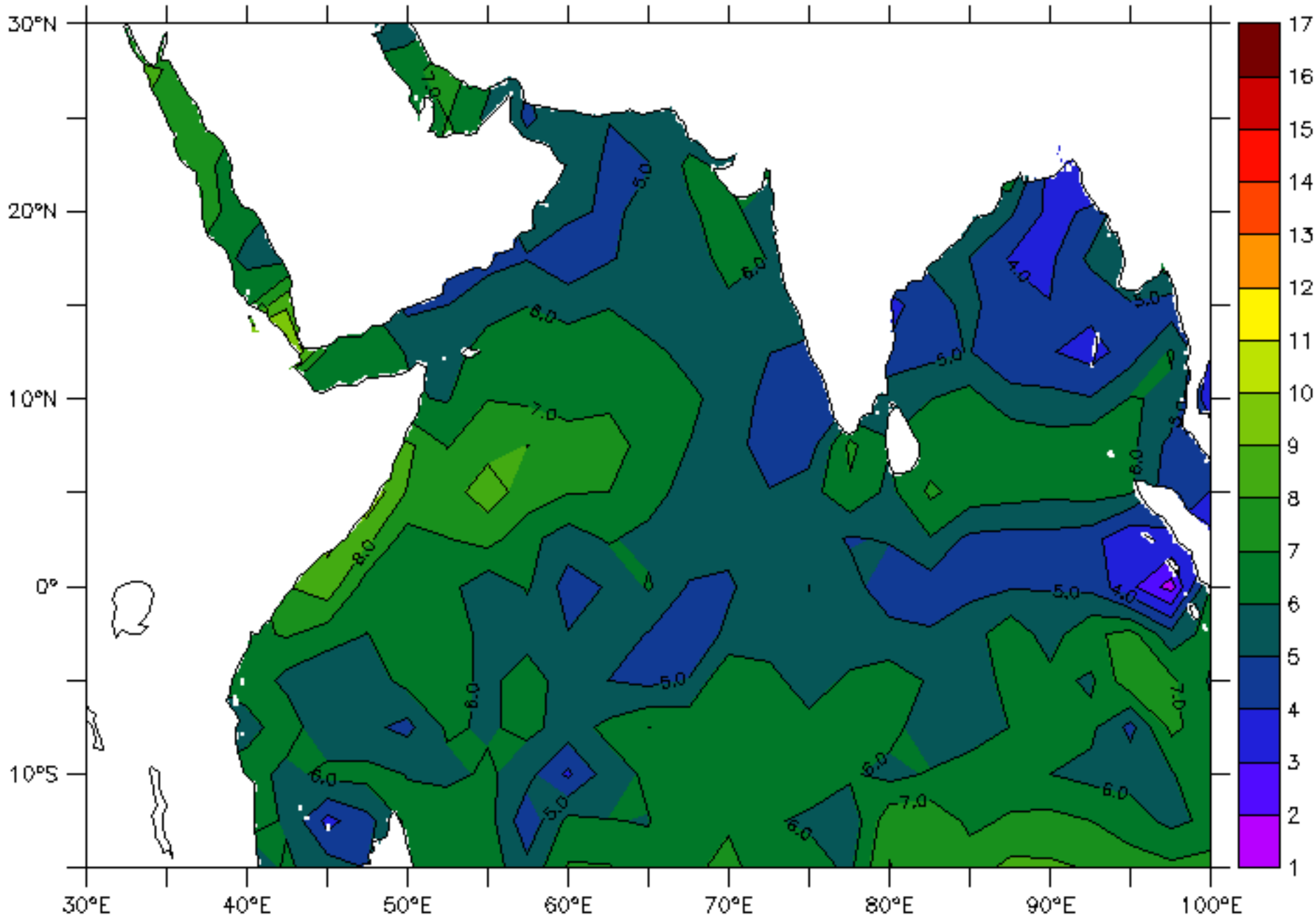


CHART No. 6.3 WIND SPEED(m/Sec) MARCH

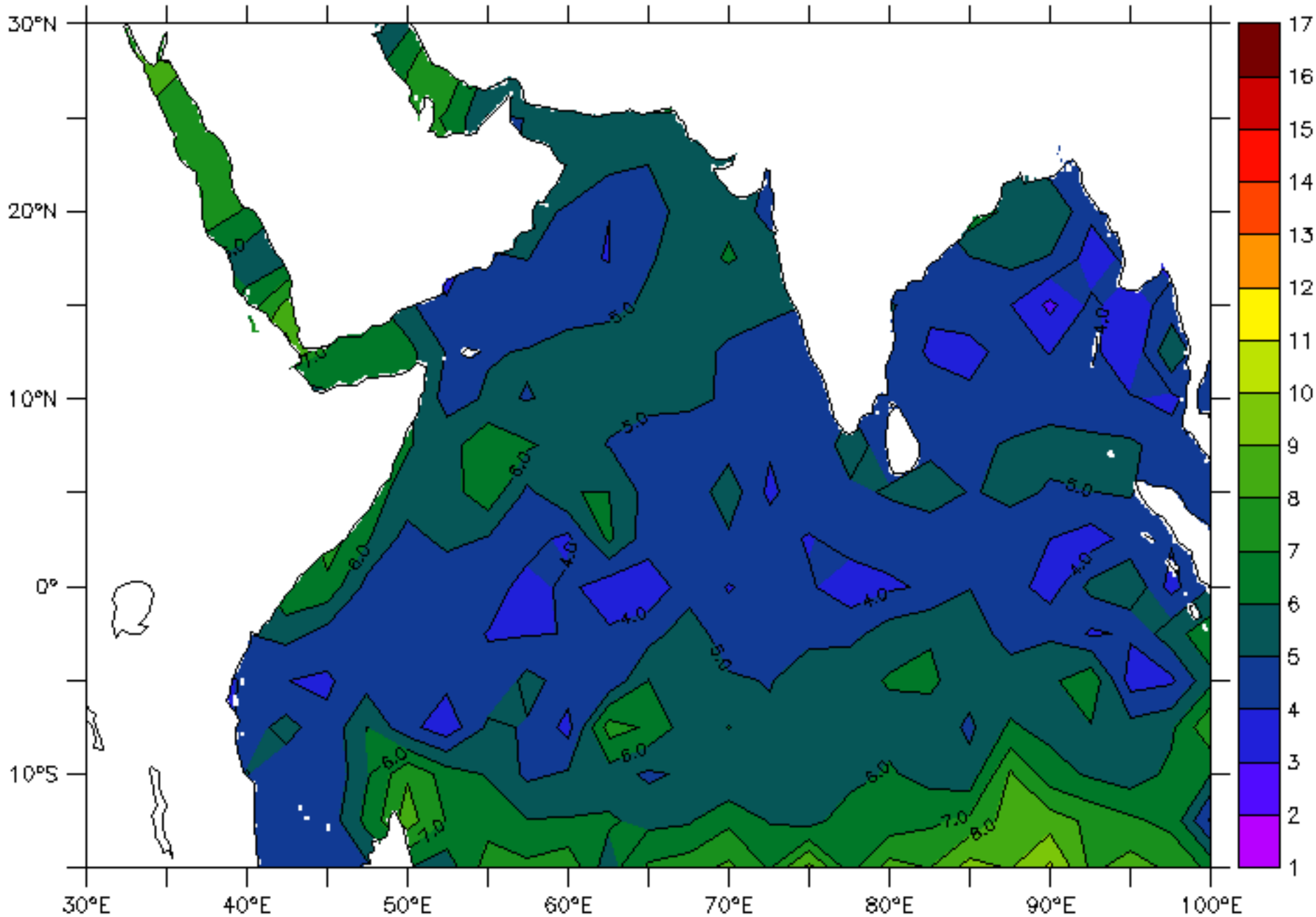


CHART No. 6.4 WIND SPEED(m/Sec) APRIL

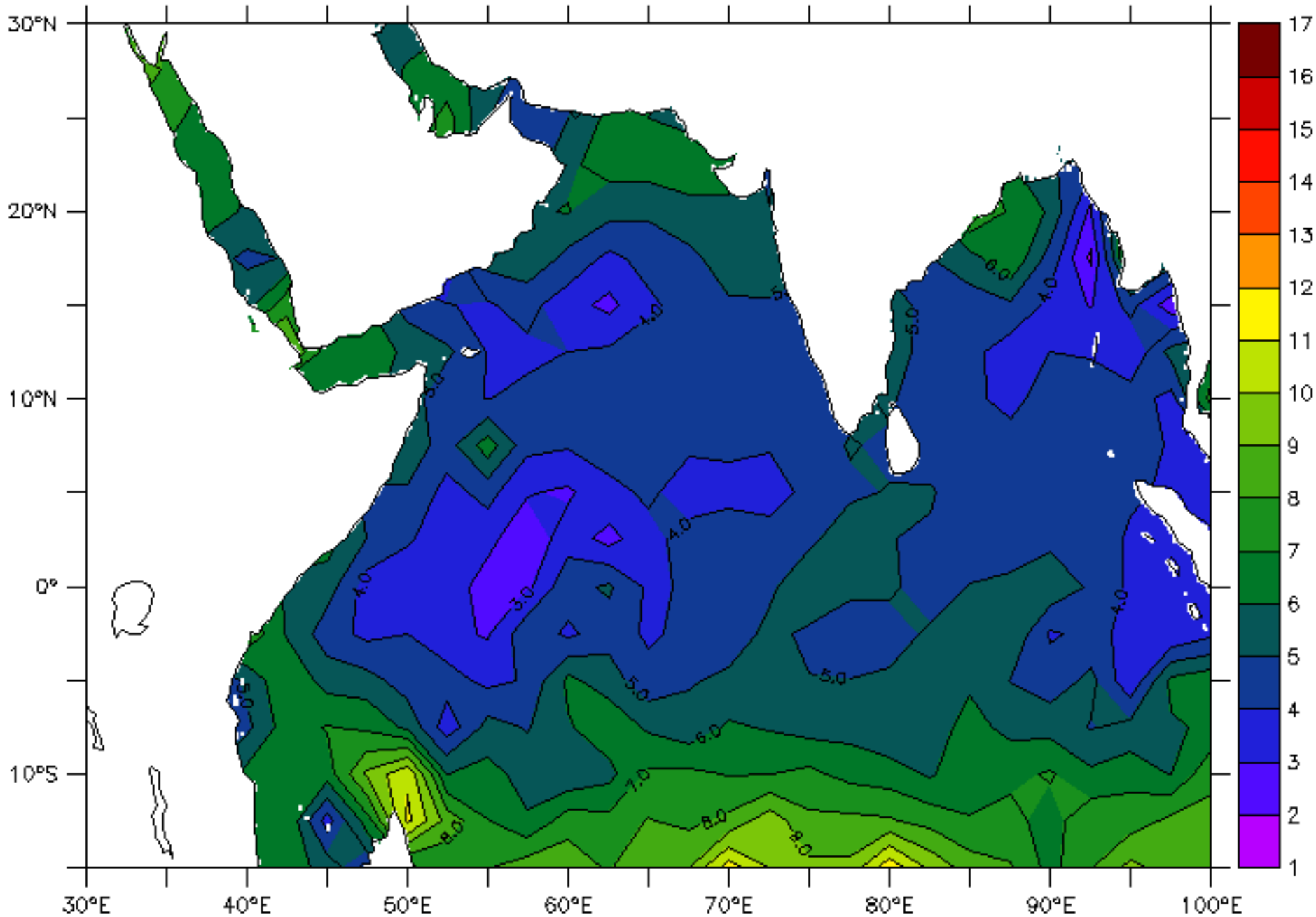


CHART No. 6.5 WIND SPEED(m/Sec) MAY

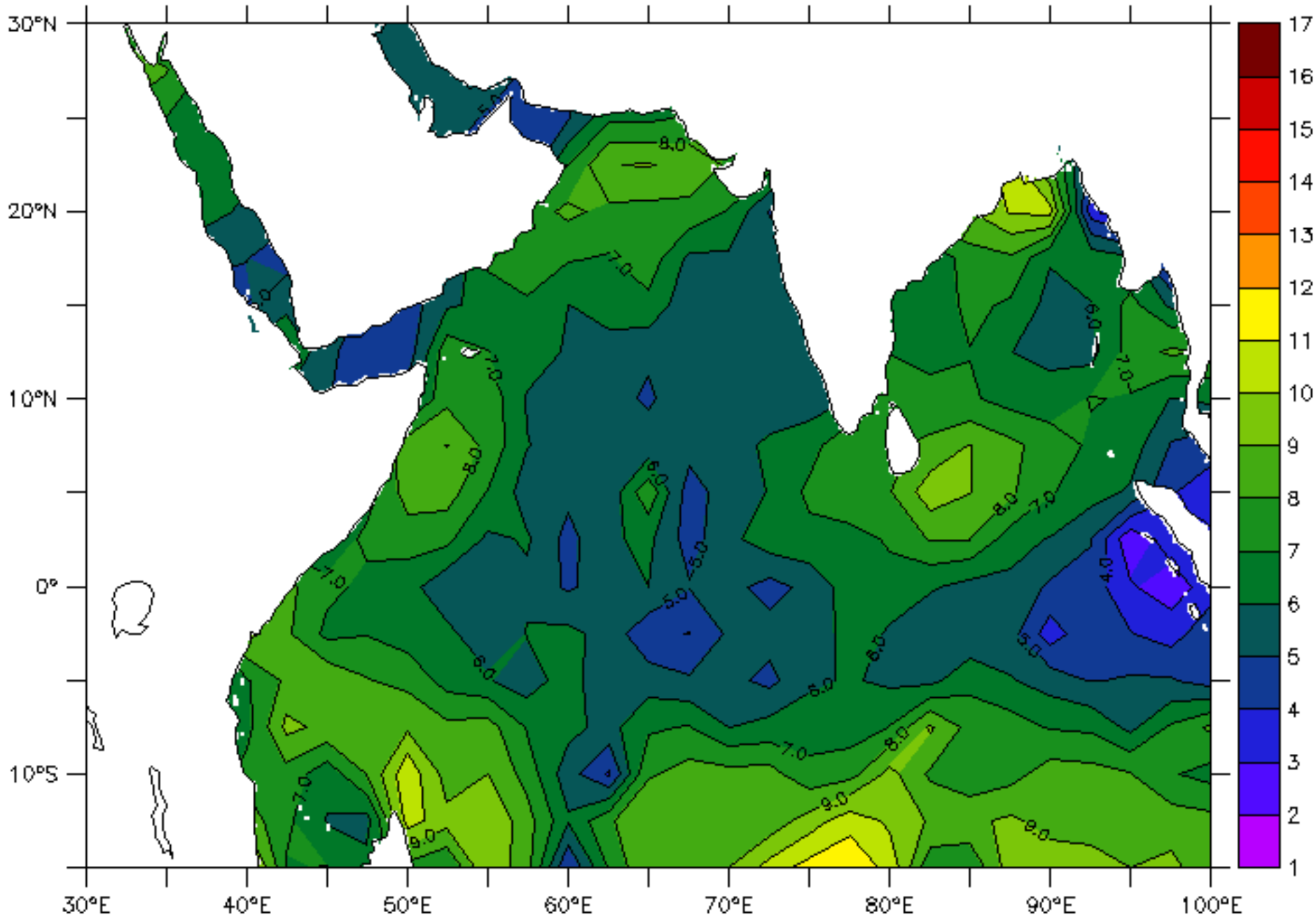


CHART No. 6.6 WIND SPEED(m/Sec) JUNE

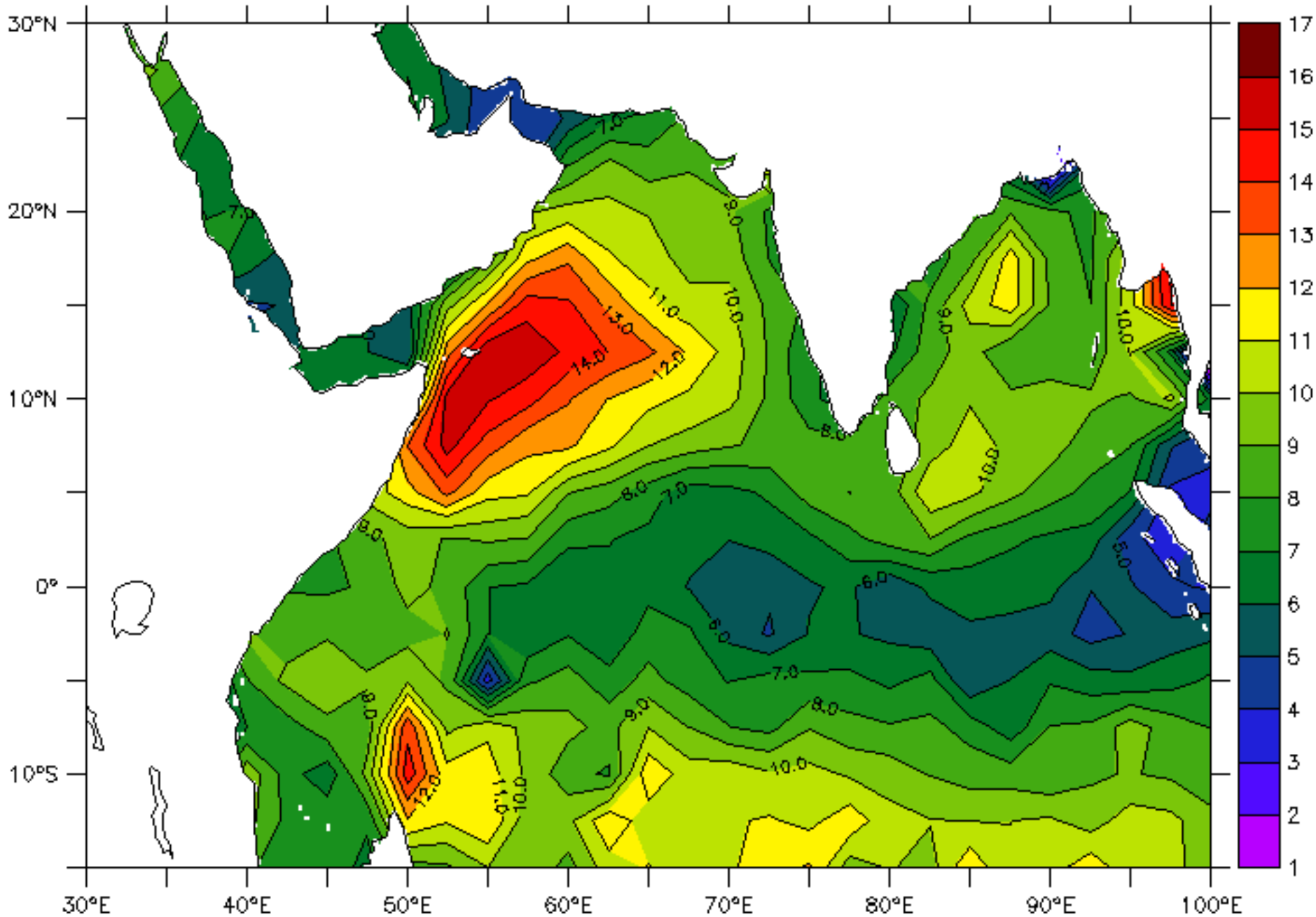


CHART No. 6.7 WIND SPEED(m/Sec) JULY

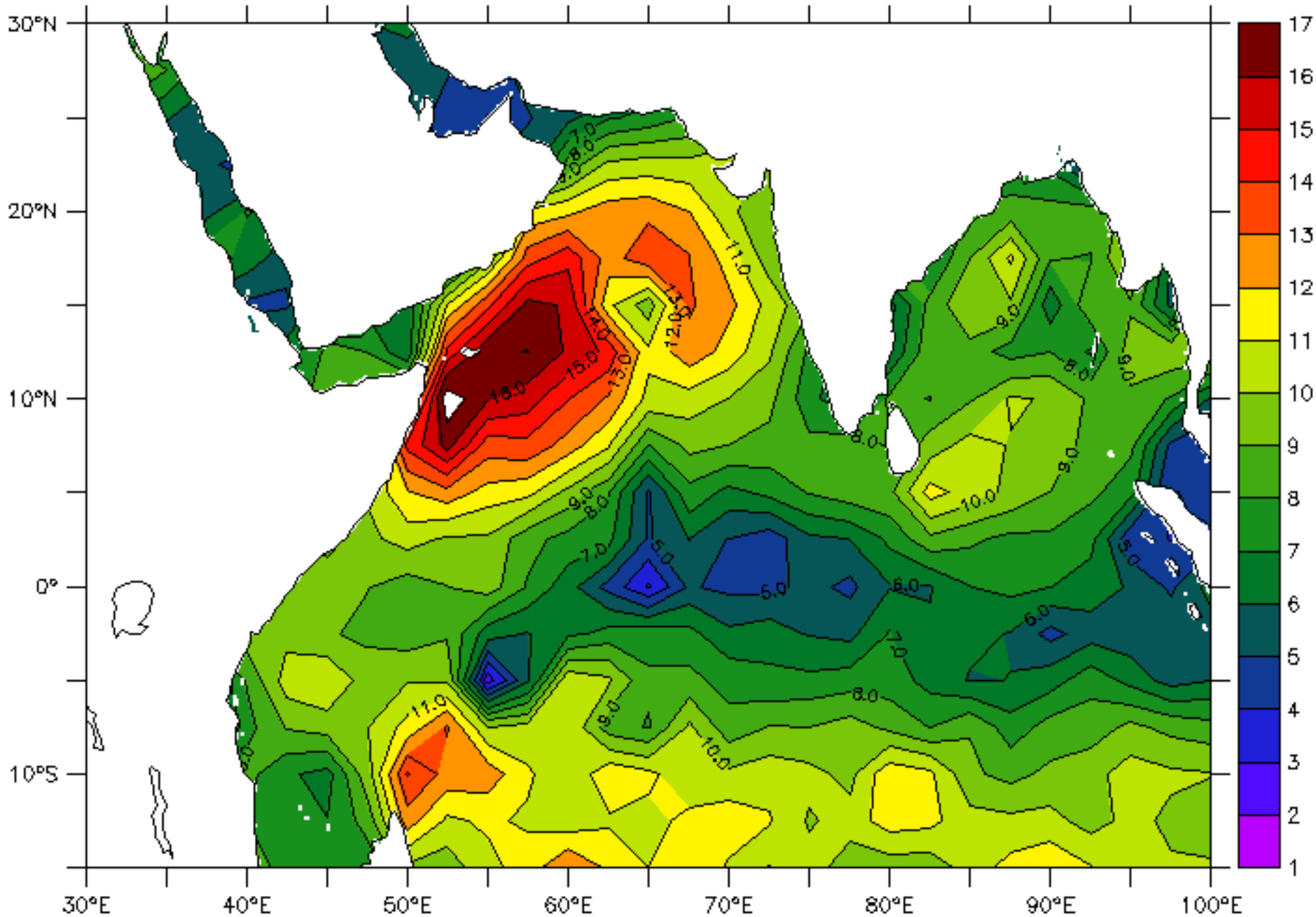


CHART No. 6.8 WIND SPEED(m/Sec) AUGUST

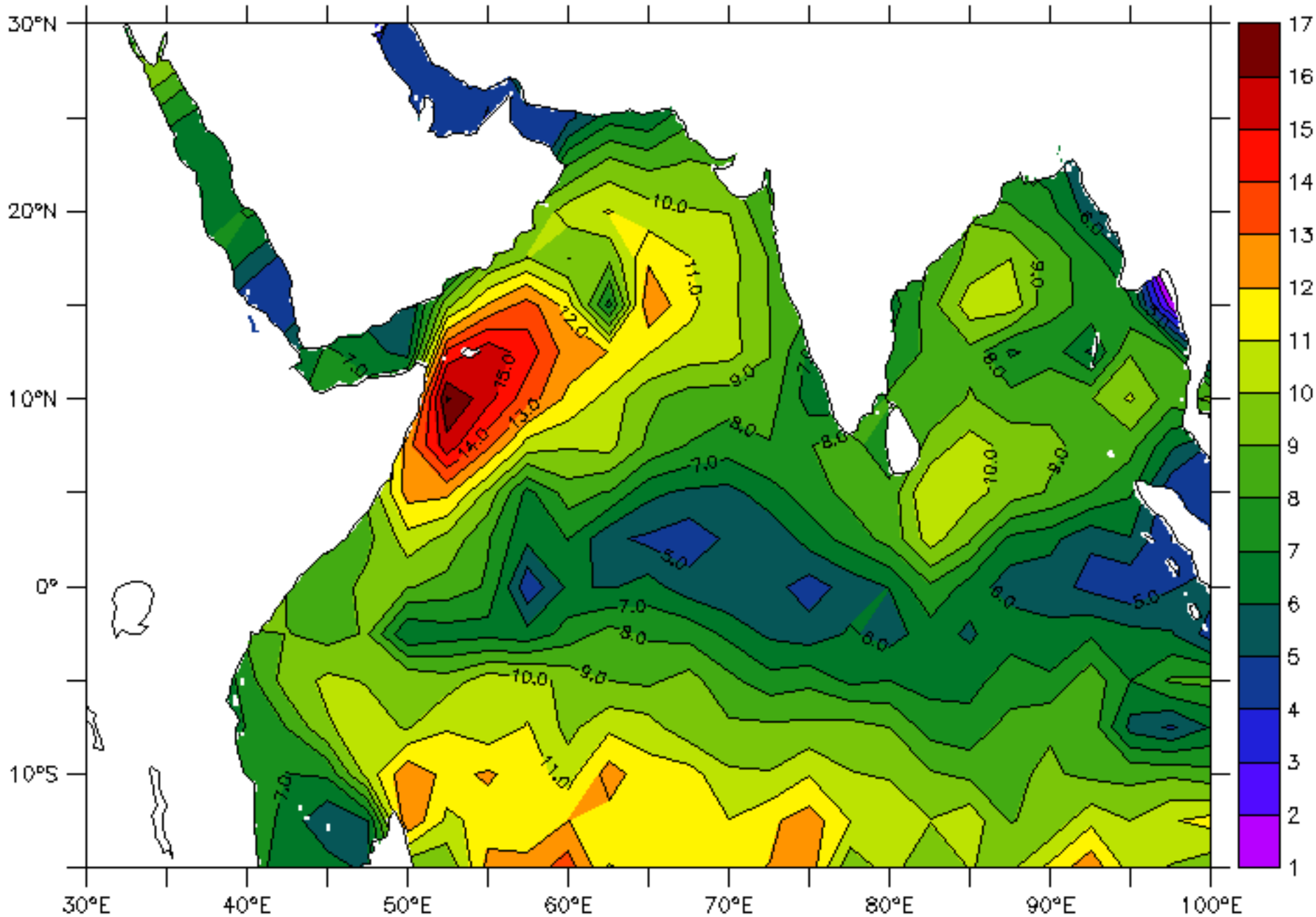


CHART No. 6.9 WIND SPEED(m/Sec) SEPTEMBER

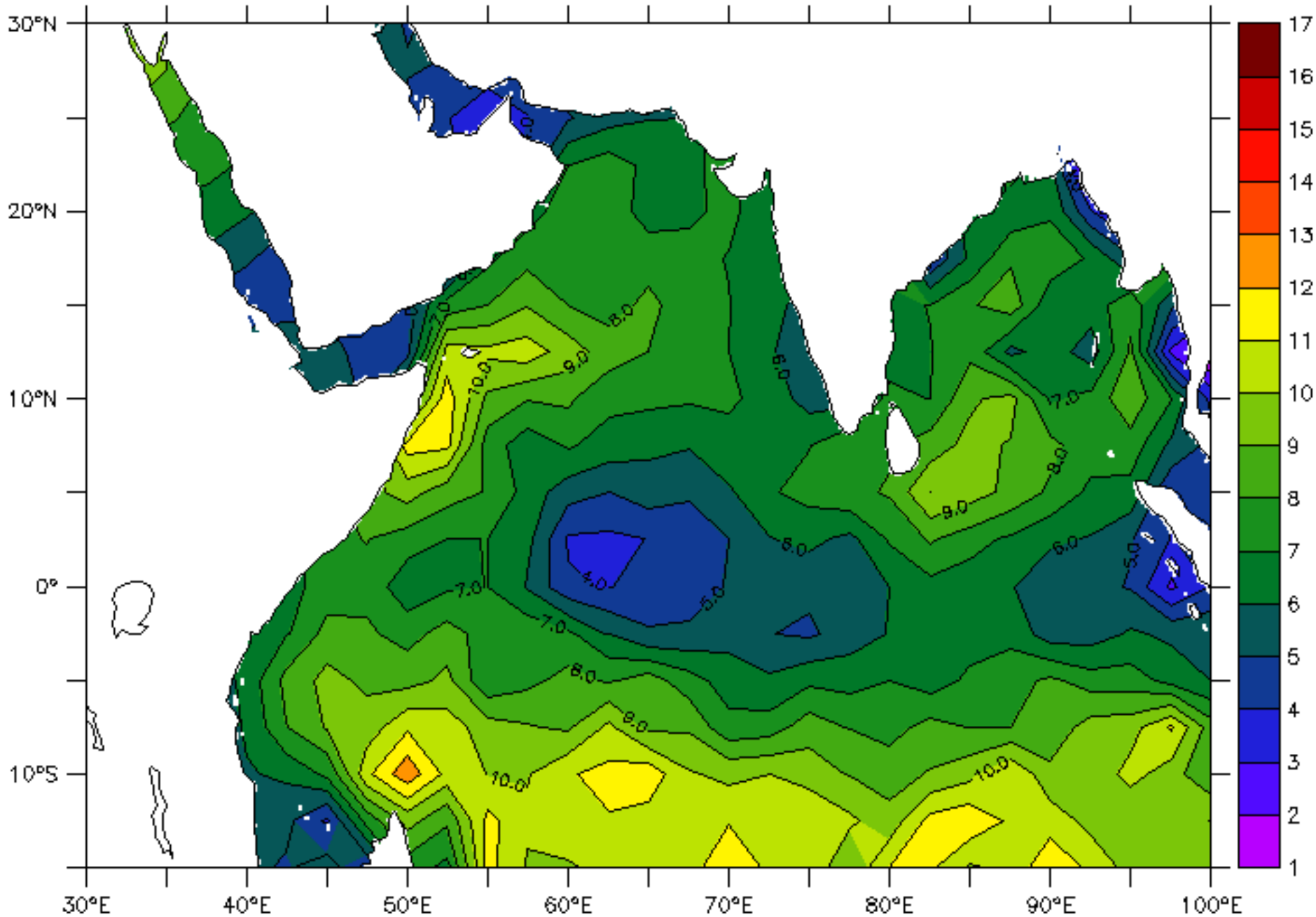


CHART No. 6.10 WIND SPEED(m/Sec) OCTOBER

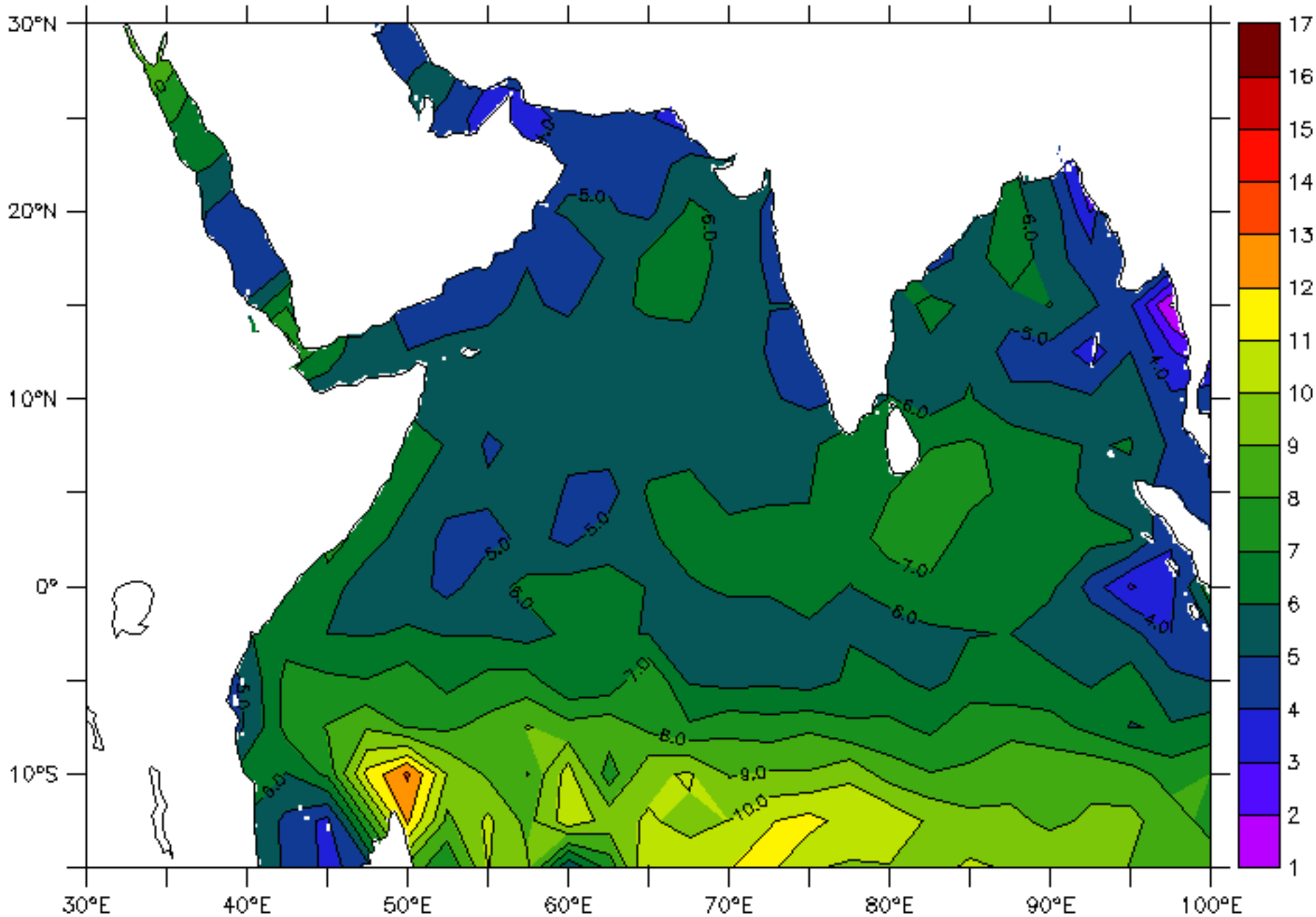


CHART No. 6.11 WIND SPEED(m/Sec) NOVEMBER

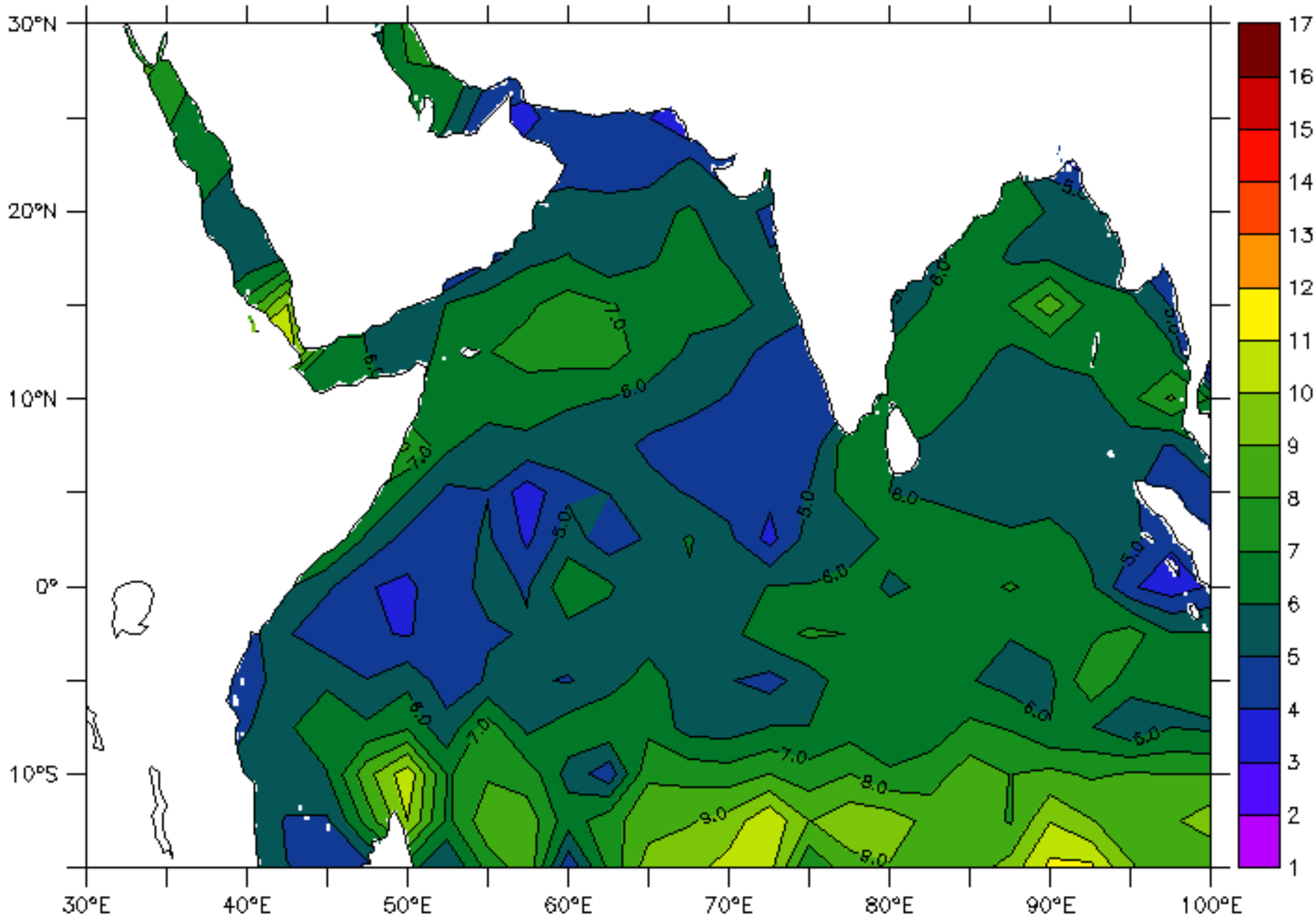


CHART No. 6.12 WIND SPEED(m/Sec) DECEMBER

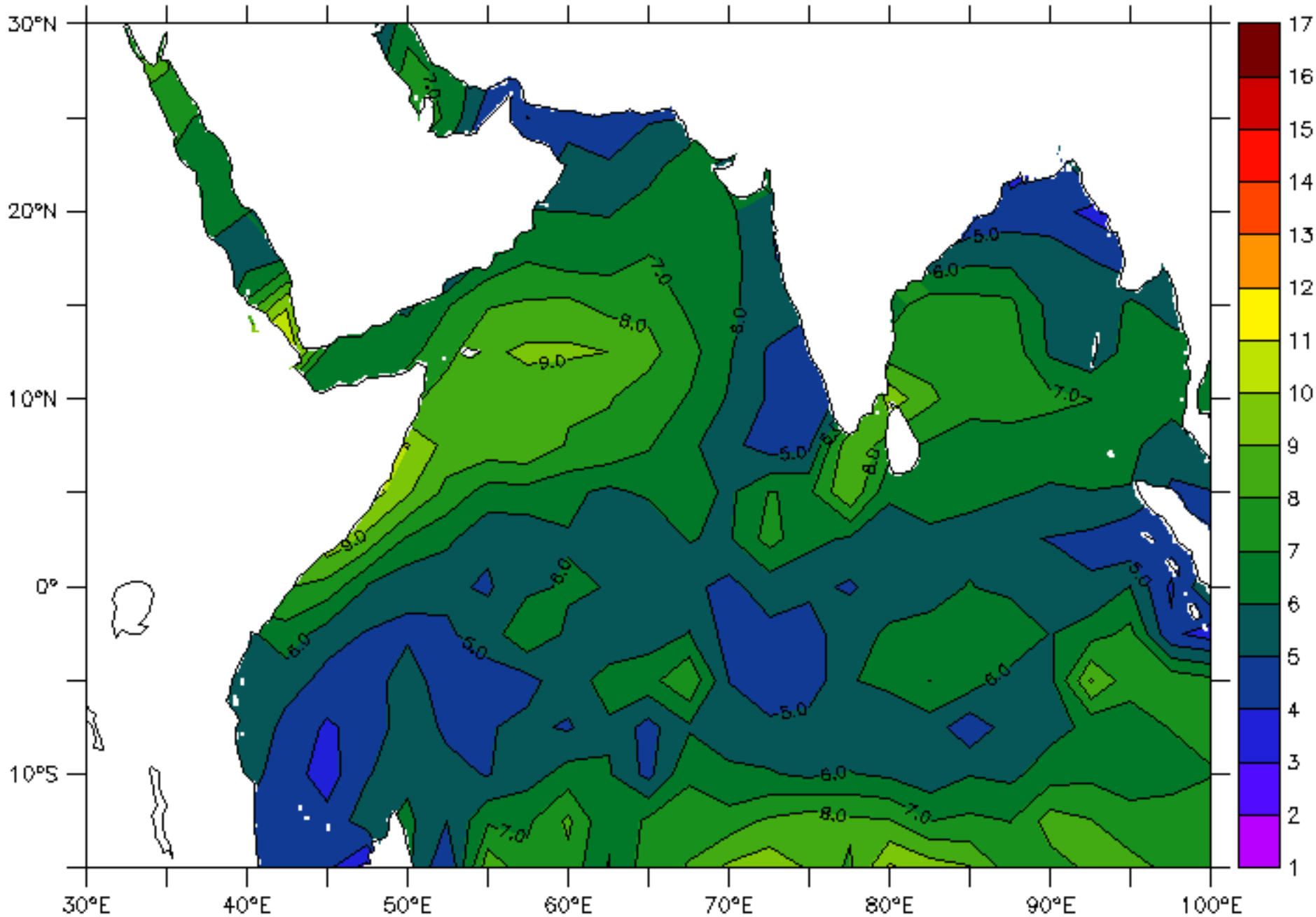


CHART 07.1 — WIND DIRECTION (DEGREES) — JANUARY

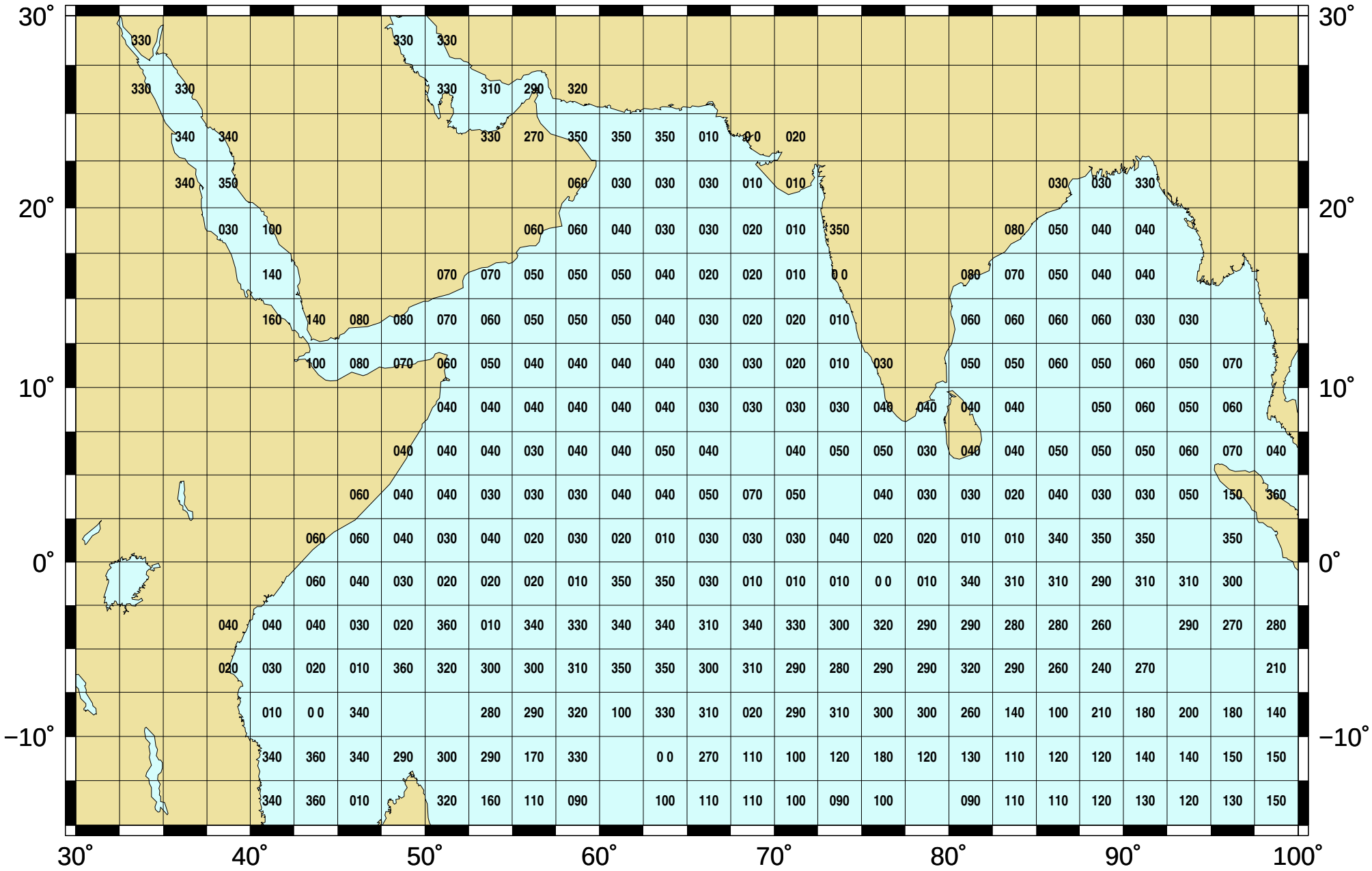


CHART 07.2 — WIND DIRECTION (DEGREES) — FEBRUARY

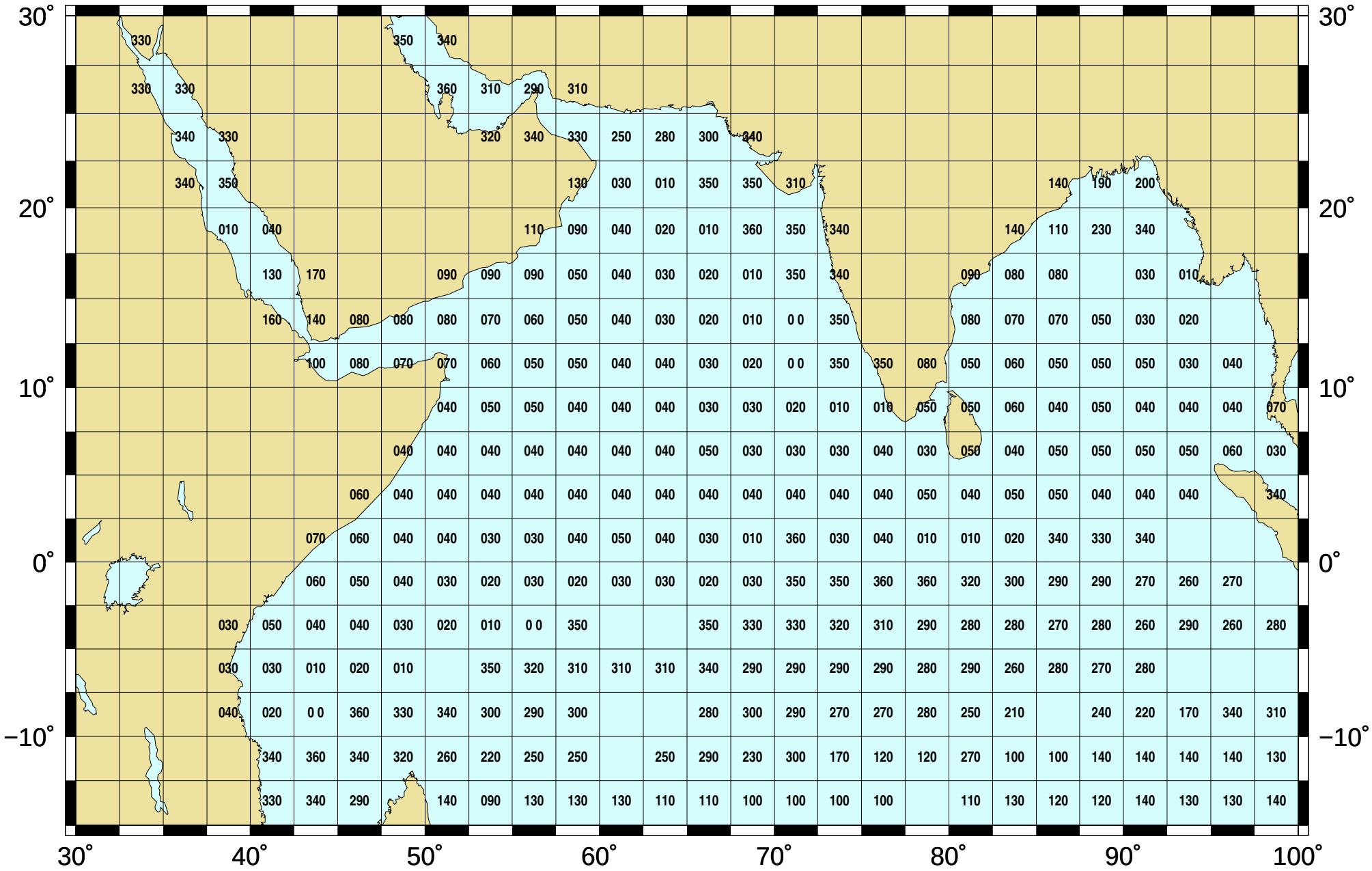


CHART 07.3 — WIND DIRECTION (DEGREES) — MARCH

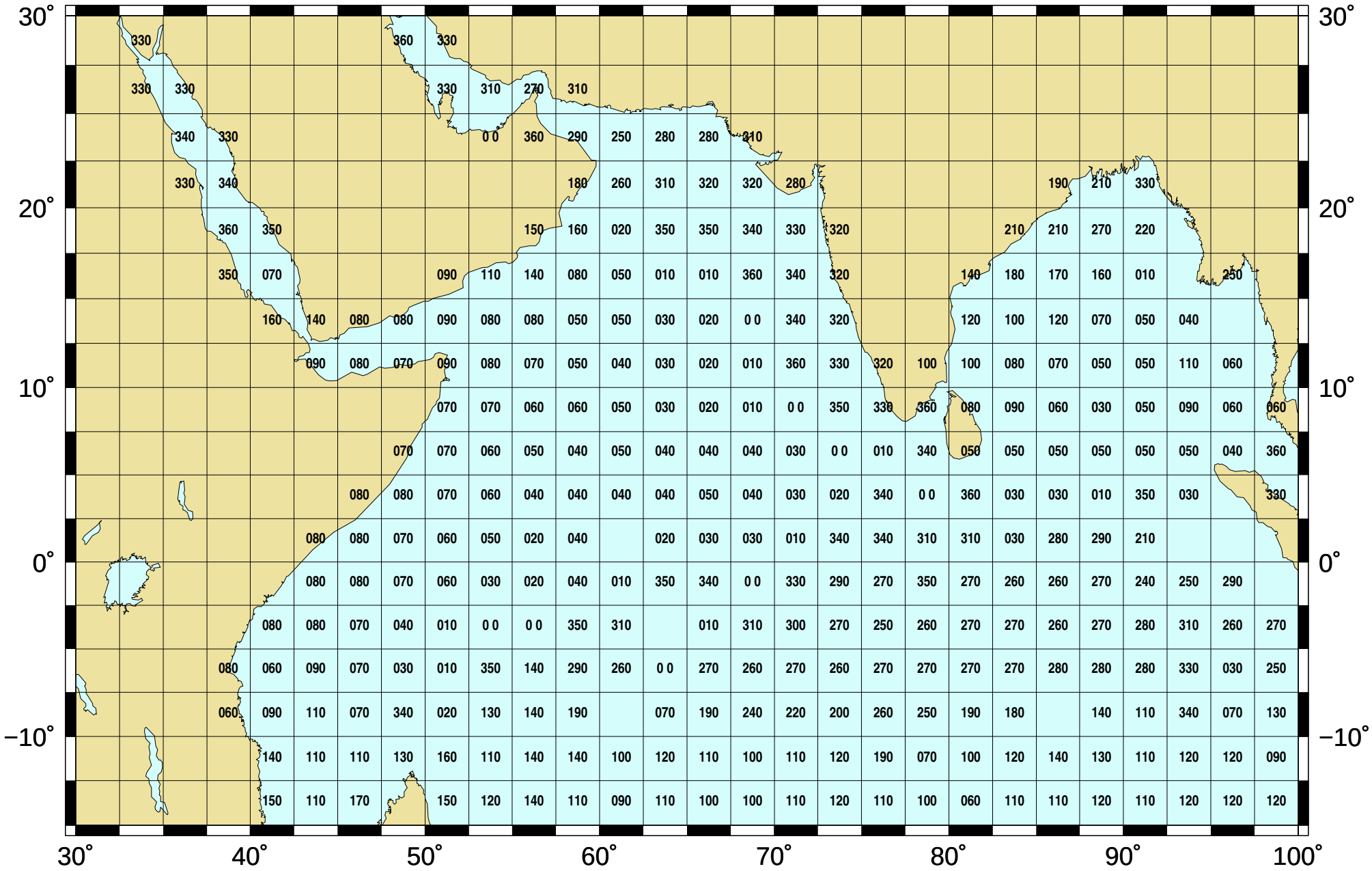


CHART 07.4 — WIND DIRECTION (DEGREES) — APRIL

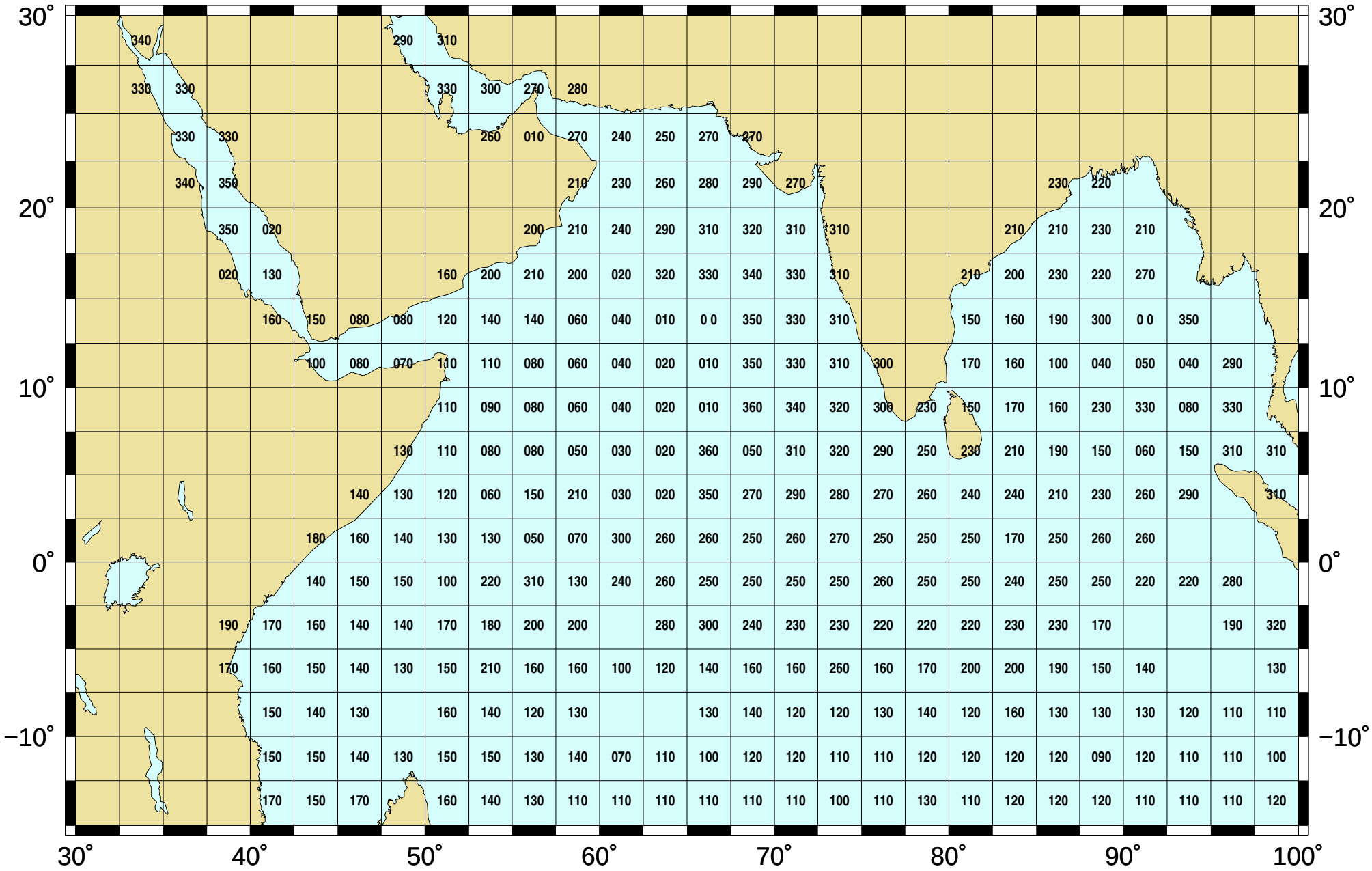


CHART 07.5 — WIND DIRECTION (DEGREES) — MAY

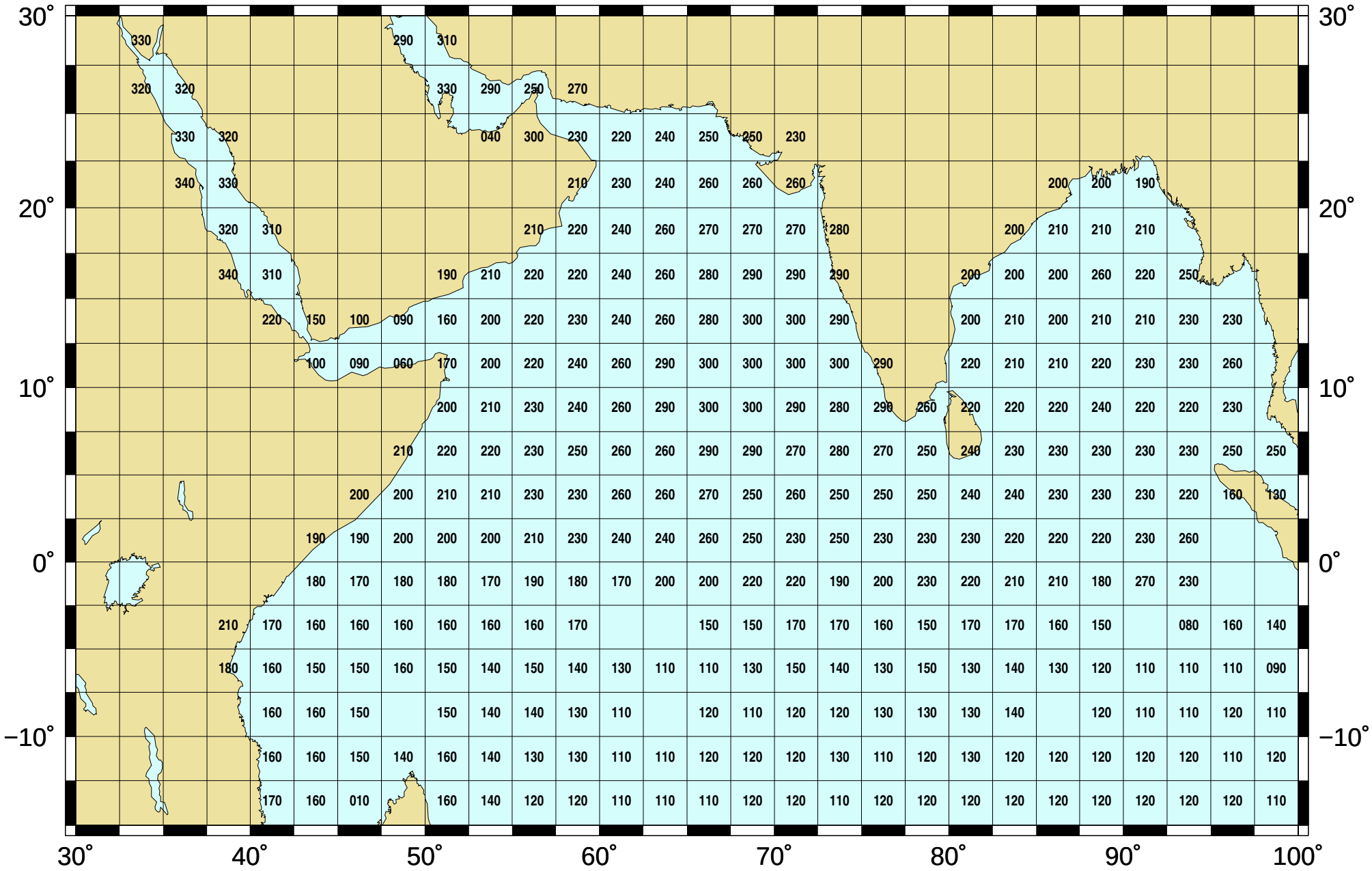


CHART 07.6 — WIND DIRECTION (DEGREES) — JUNE

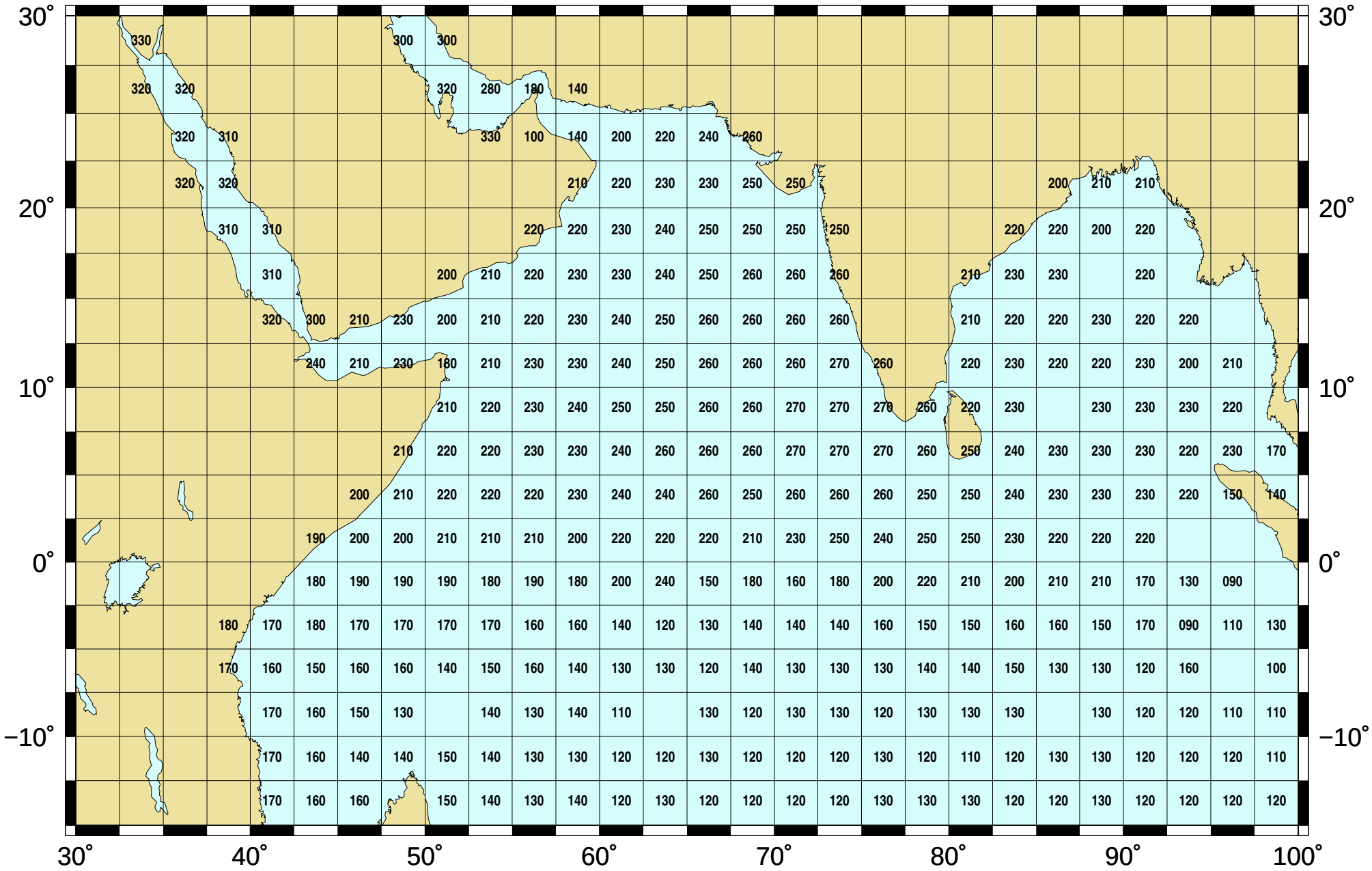


CHART 07.7 — WIND DIRECTION (DEGREES) — JULY

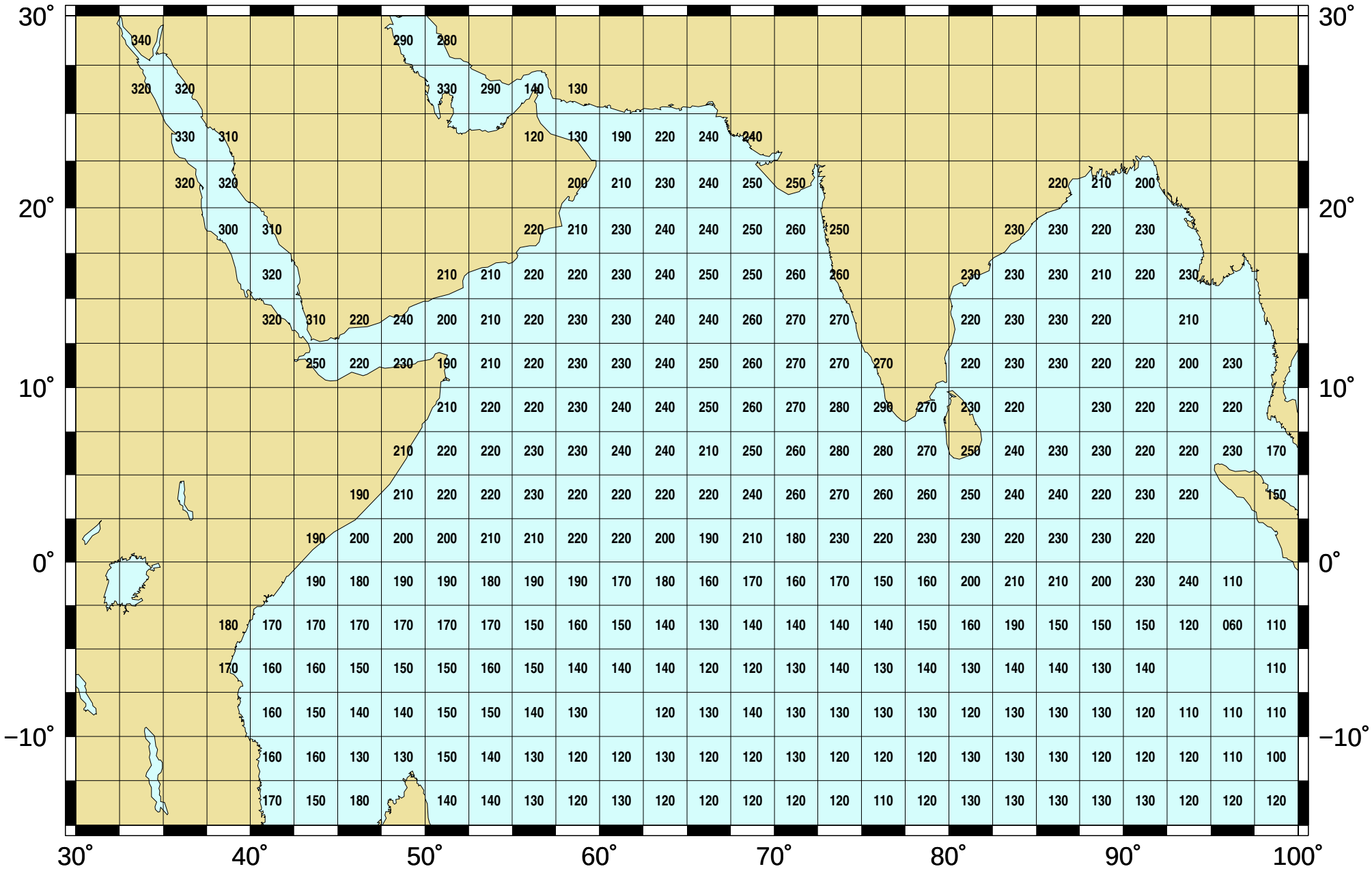


CHART 07.8 — WIND DIRECTION (DEGREES) — AUGUST

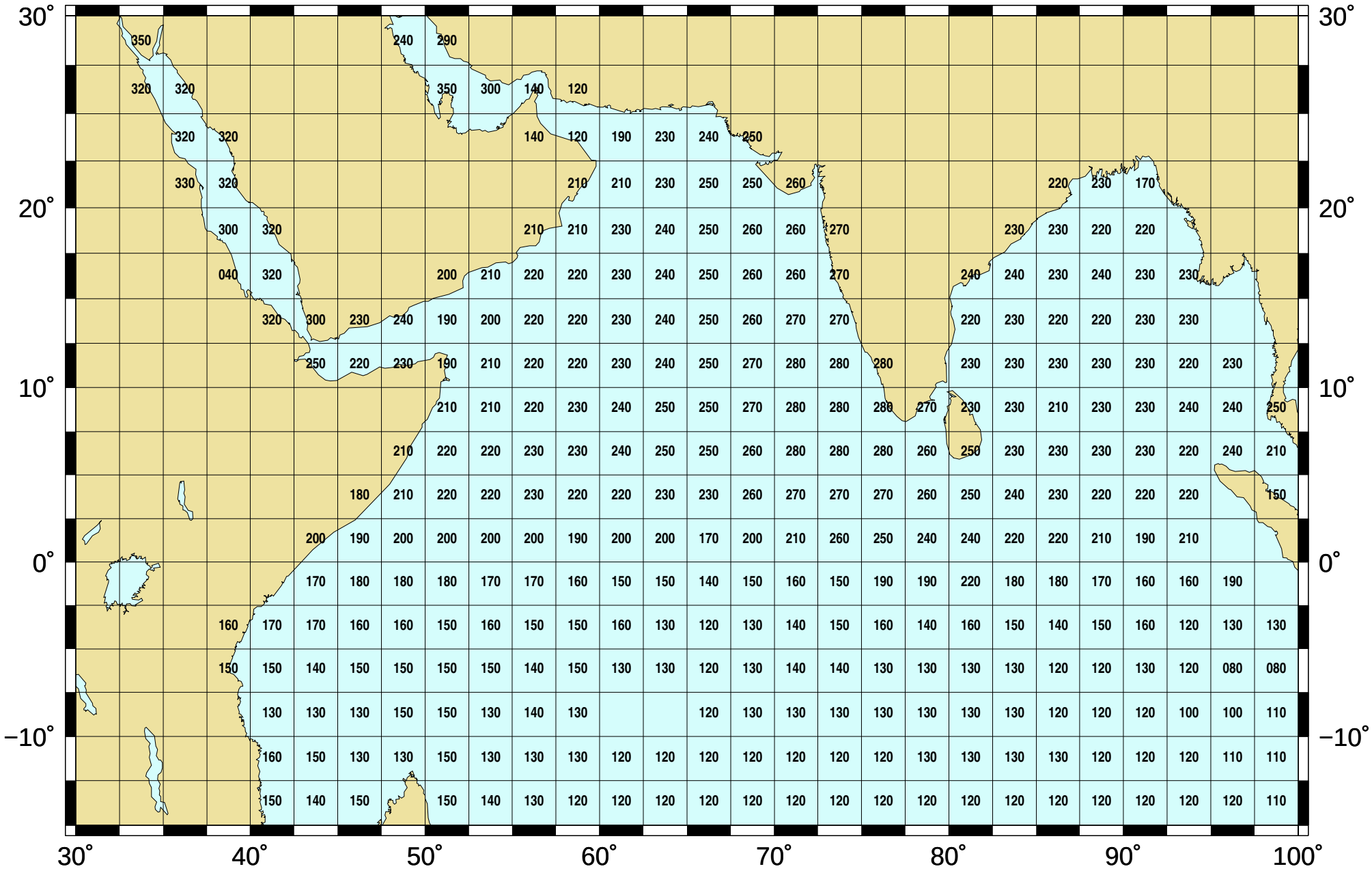


CHART 07.9 — WIND DIRECTION (DEGREES) — SEPTEMBER

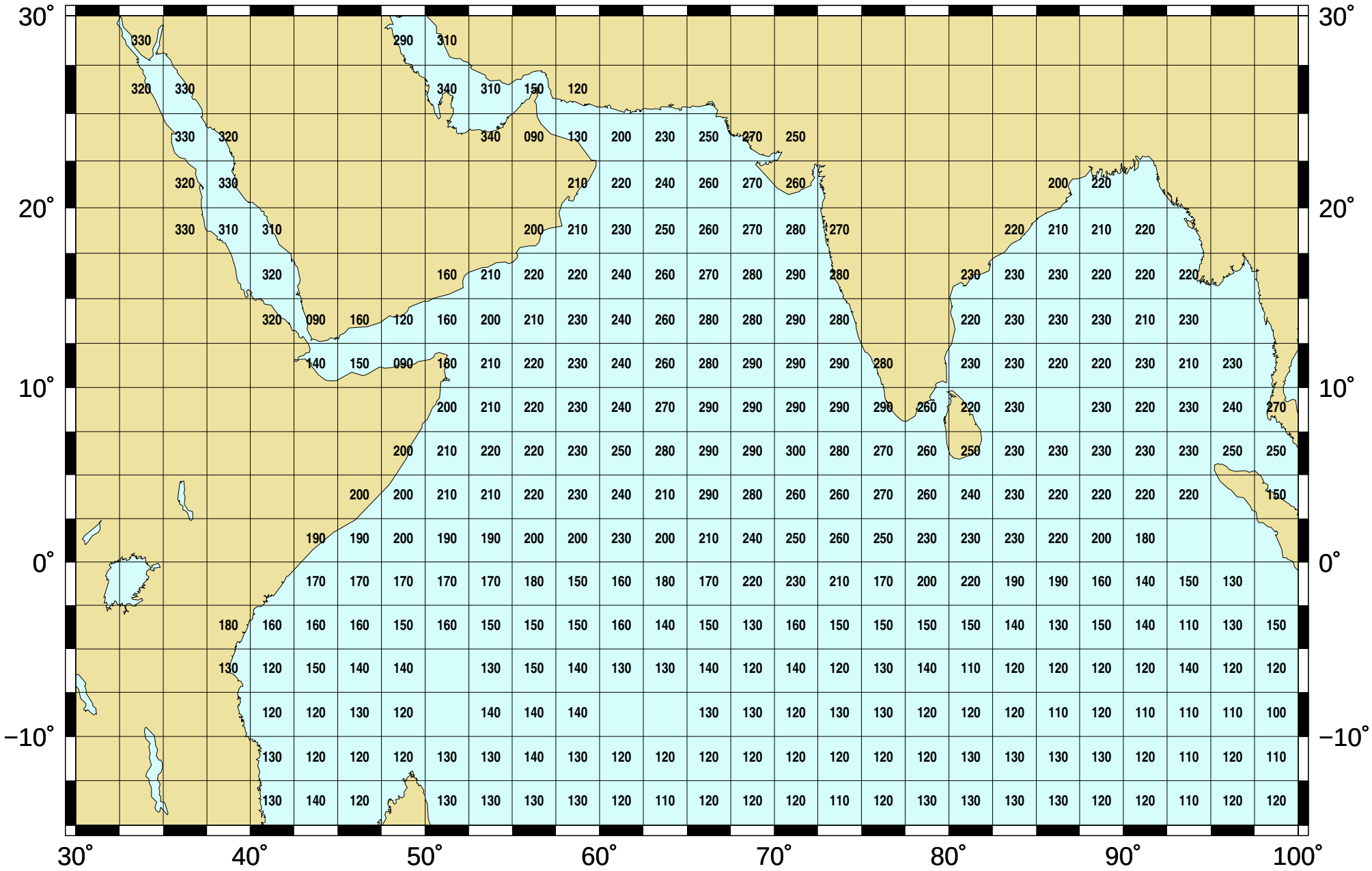


CHART 07.10 — WIND DIRECTION (DEGREES) — OCTOBER

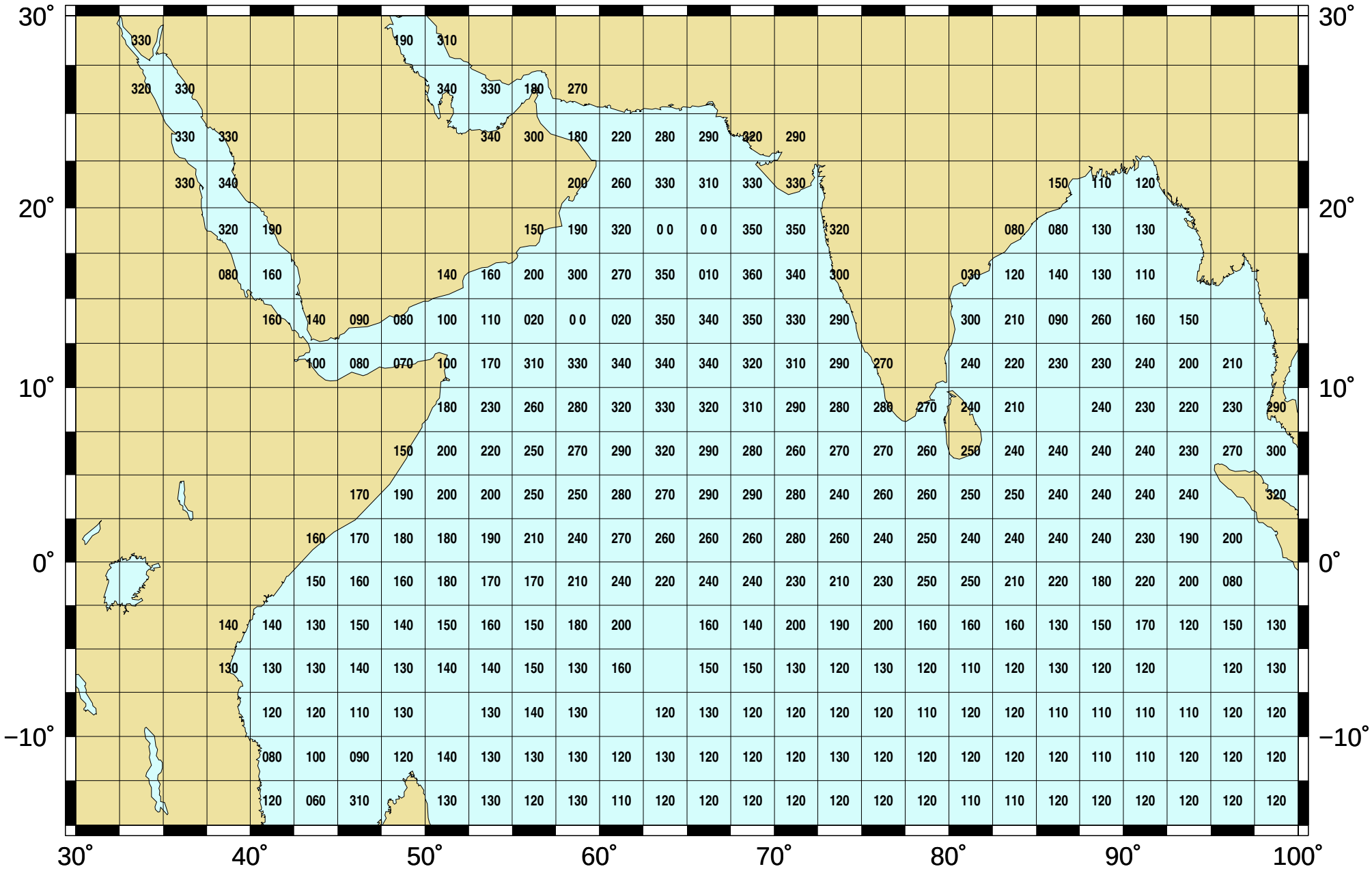


CHART 07.11 — WIND DIRECTION (DEGREES) — NOVEMBER

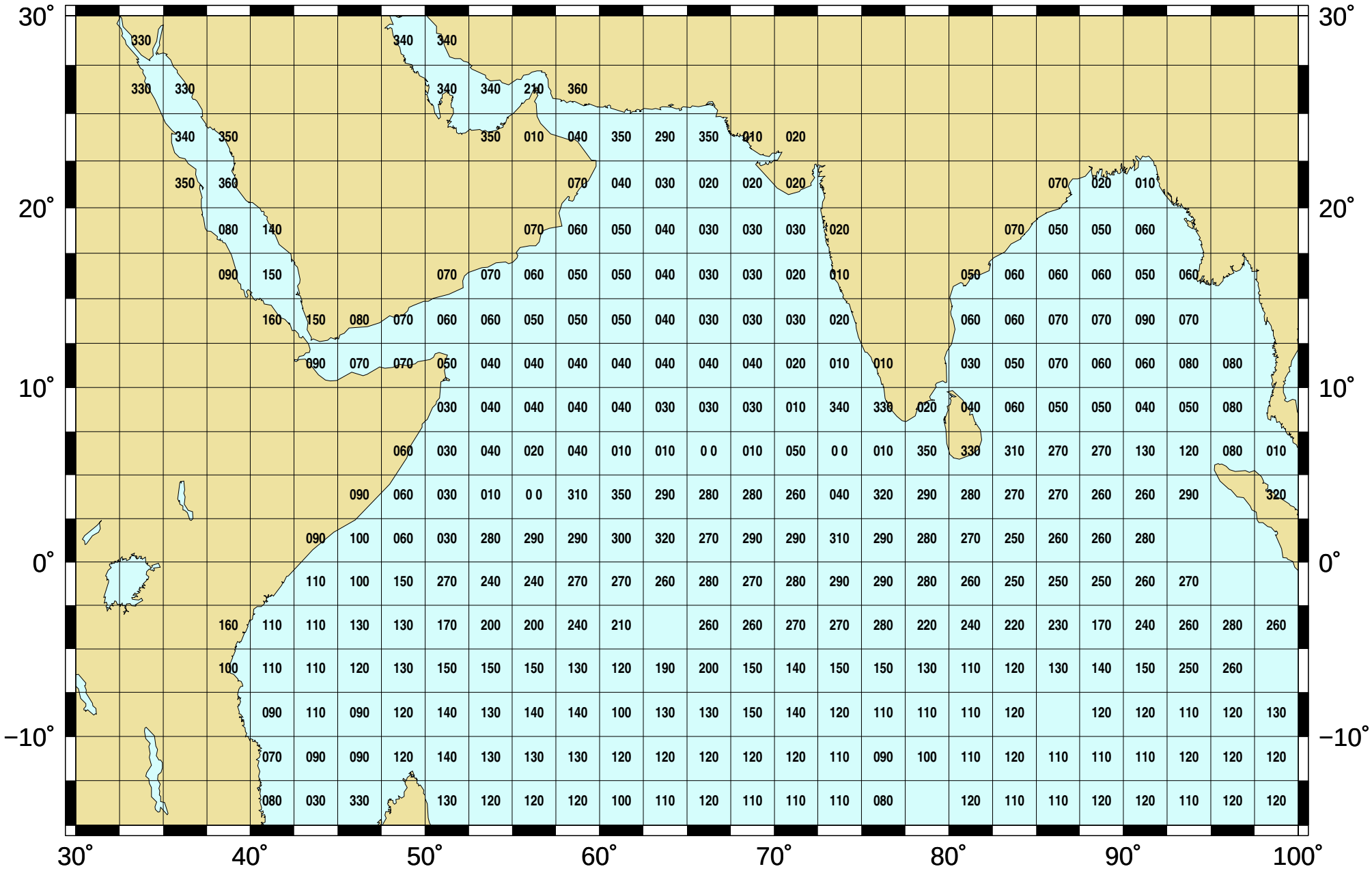


CHART 07.12 — WIND DIRECTION (DEGREES) — DECEMBER

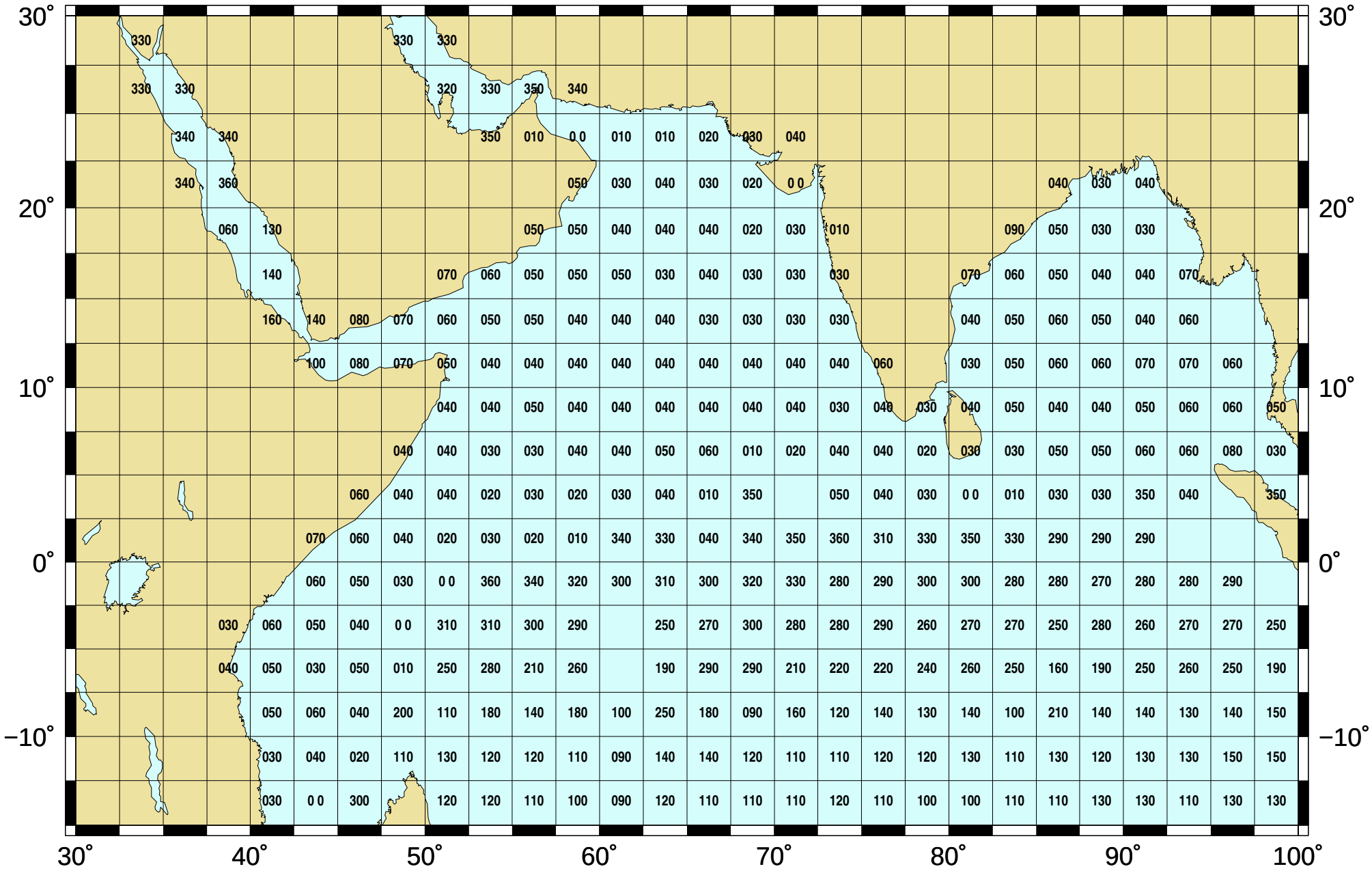


CHART No.8.1 GALE WIND(%) JANUARY

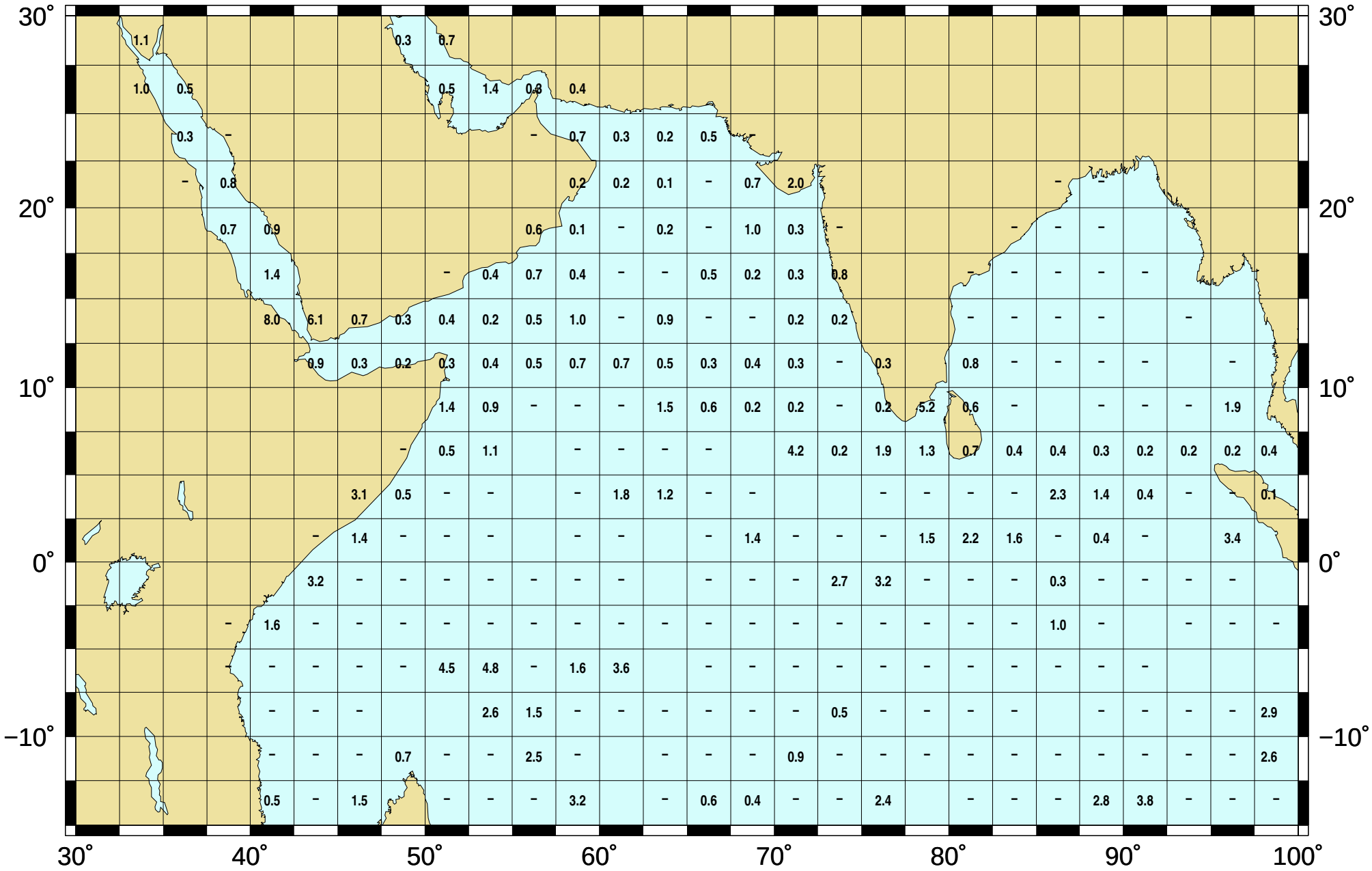


CHART No.8.2 GALE WIND(%) FEBRUARY

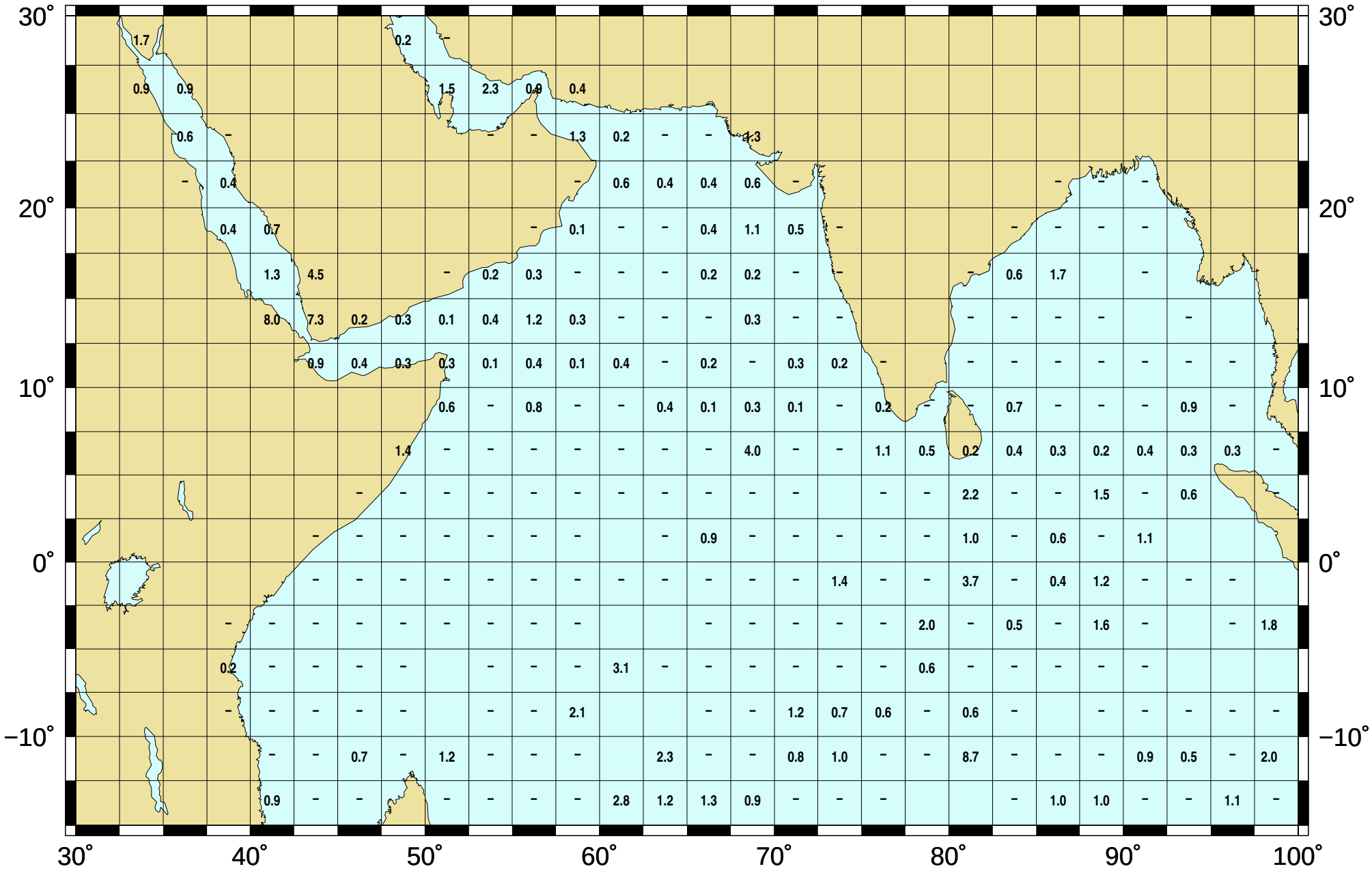


CHART No.8.3 GALE WIND(%) MARCH

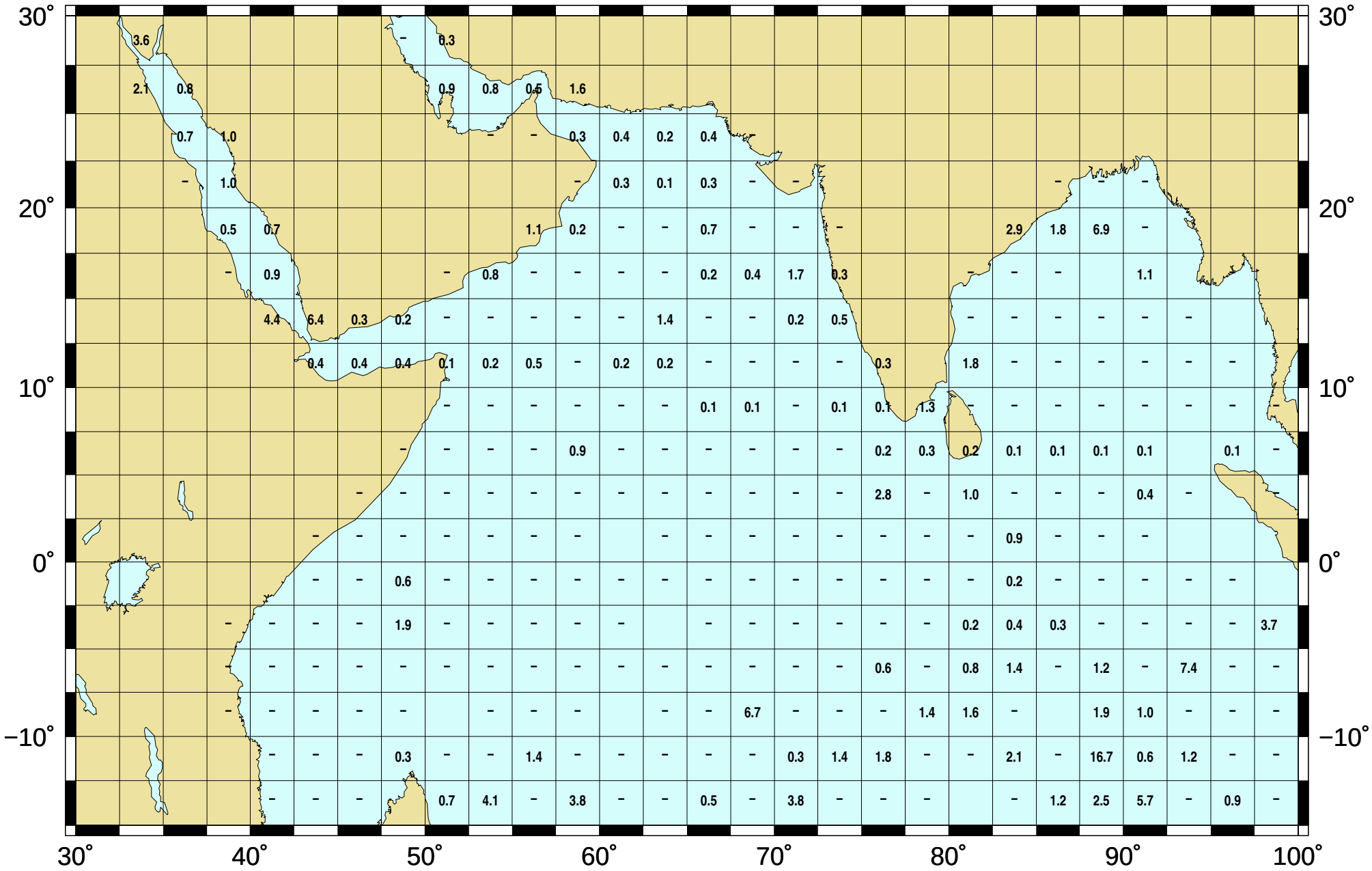


CHART No.8.4 GALE WIND(%) APRIL

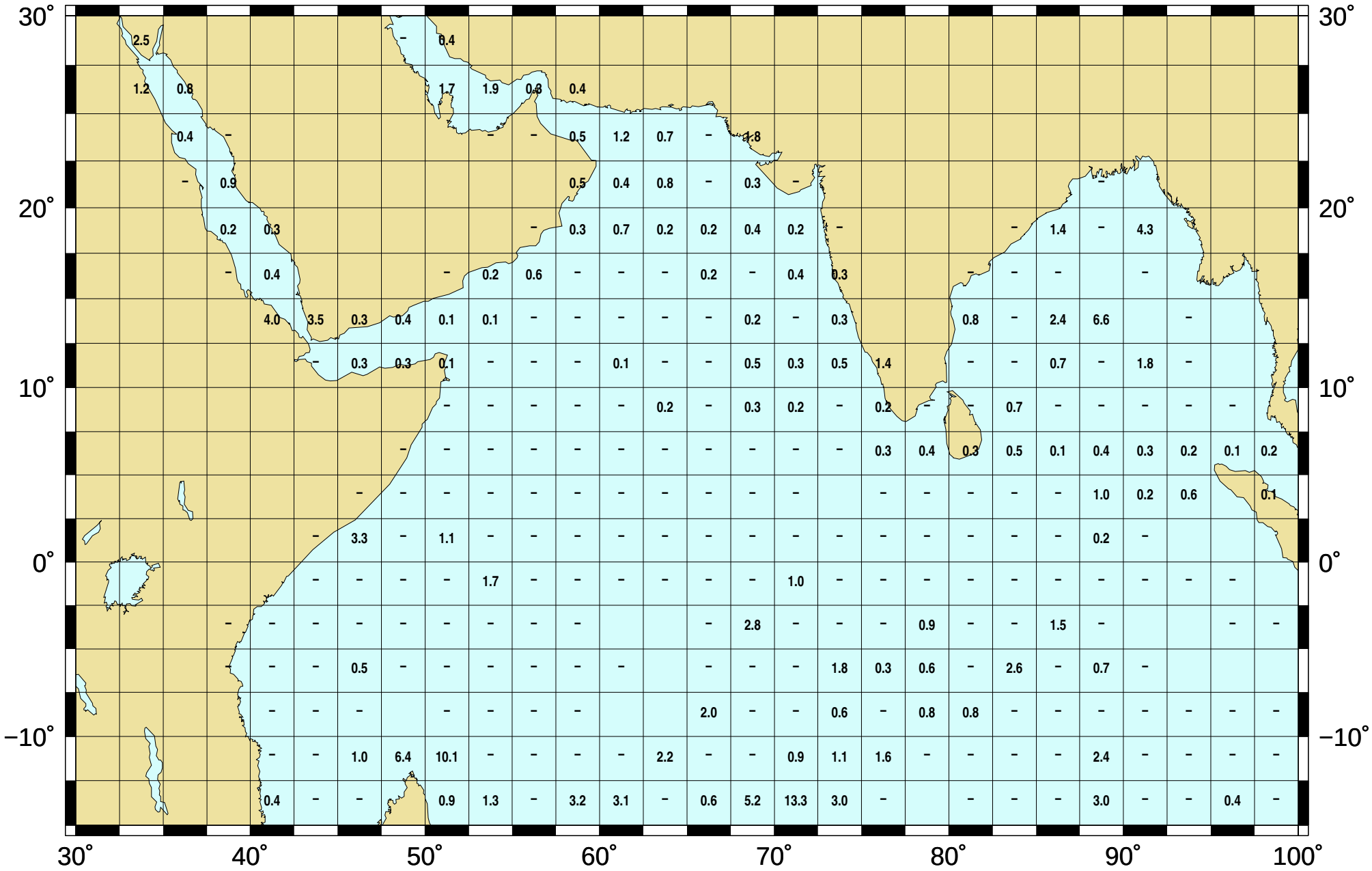


CHART No.8.5 GALE WIND(%) MAY

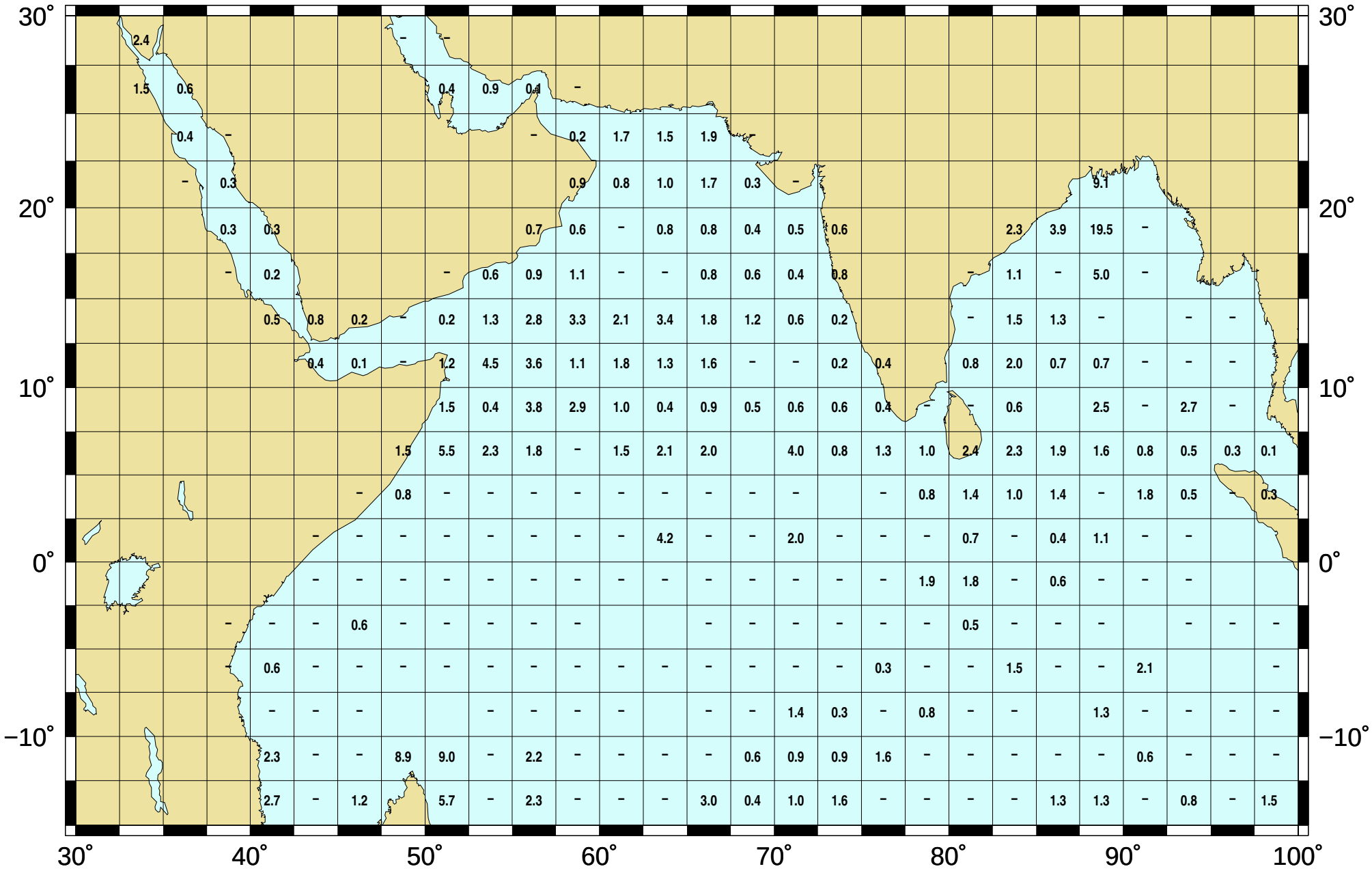


CHART No.8.6 GALE WIND(%) JUNE

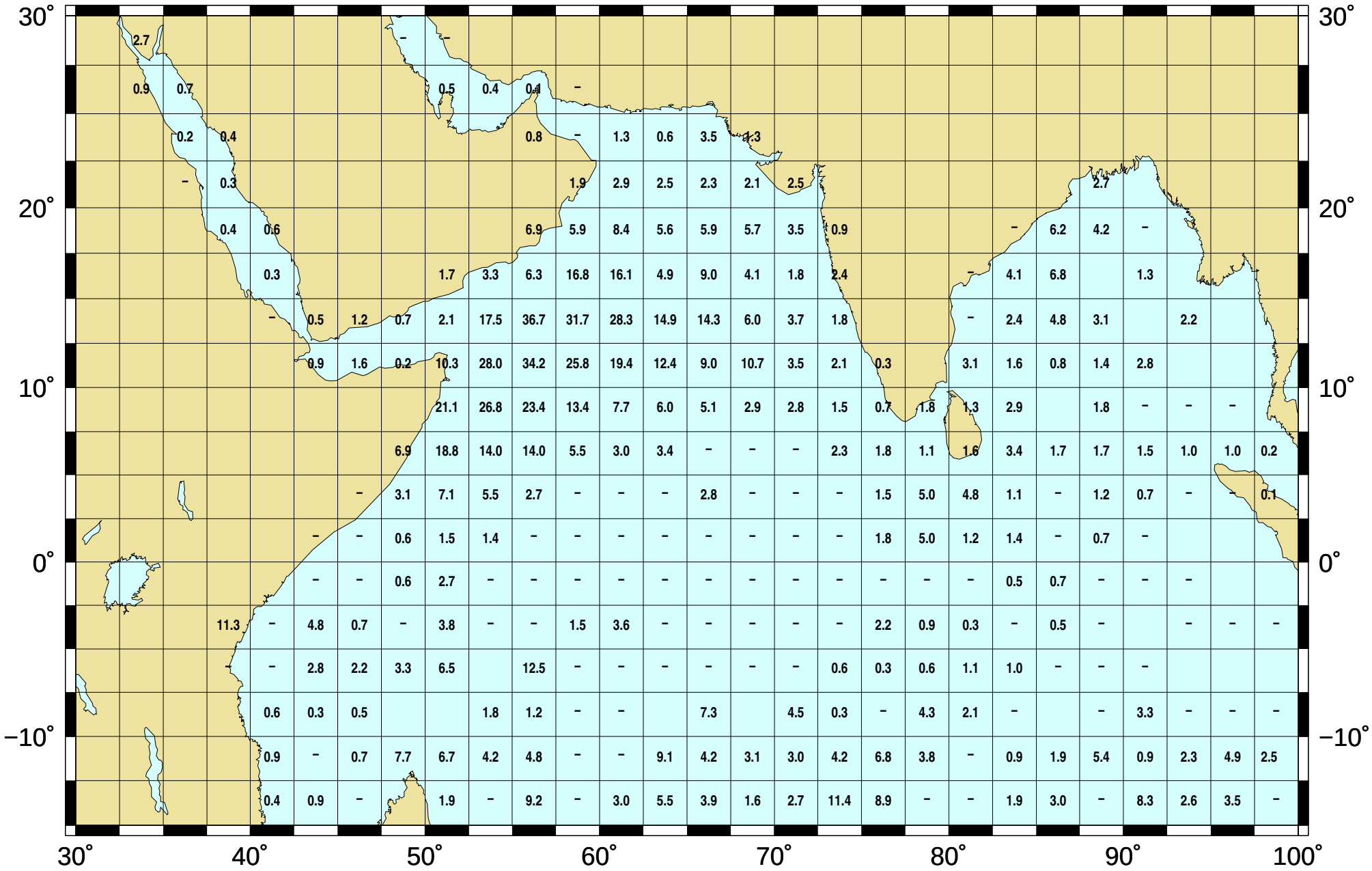


CHART No.8.7 GALE WIND(%) JULY

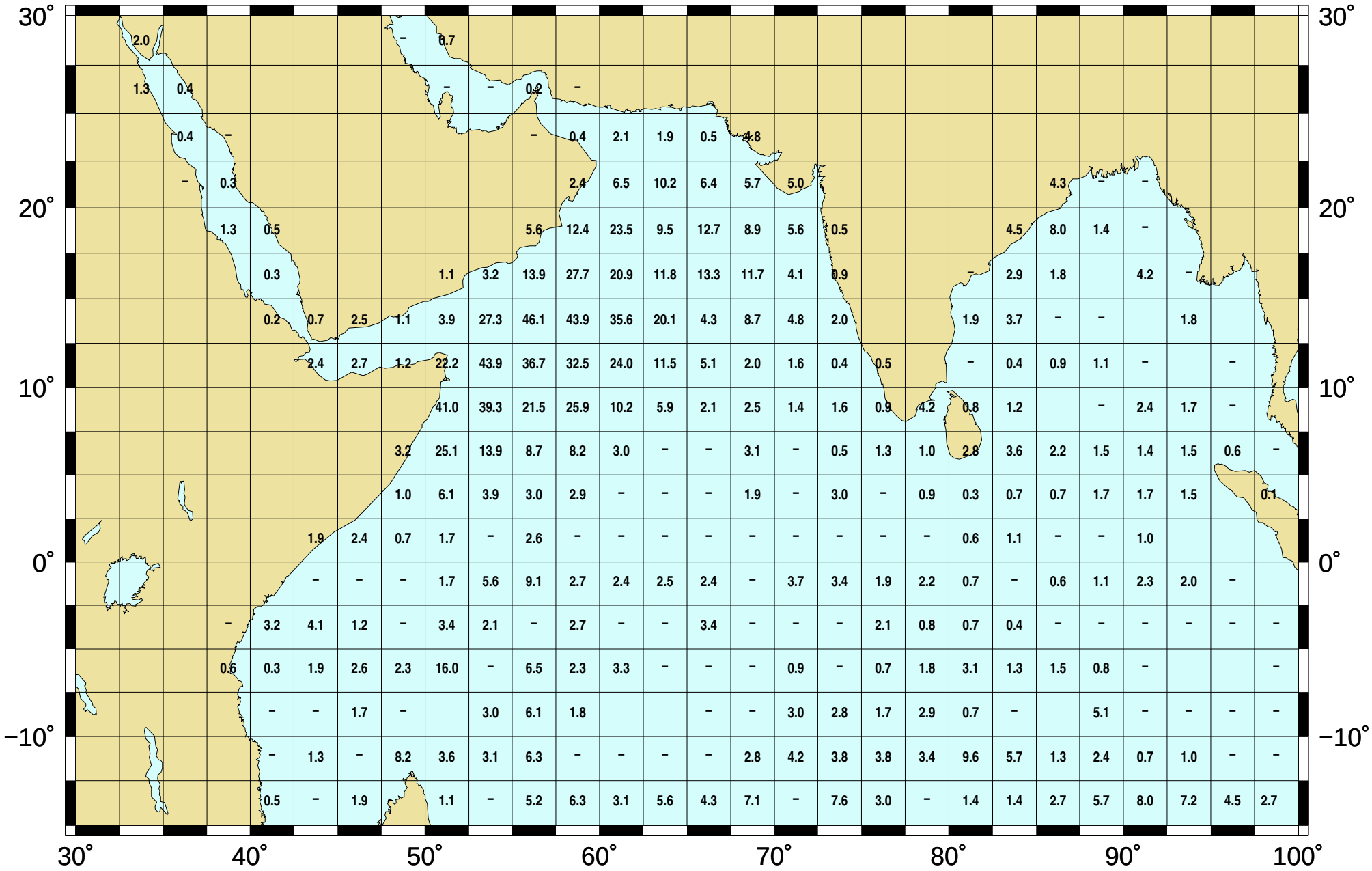


CHART No.8.8 GALE WIND(%) AUGUST

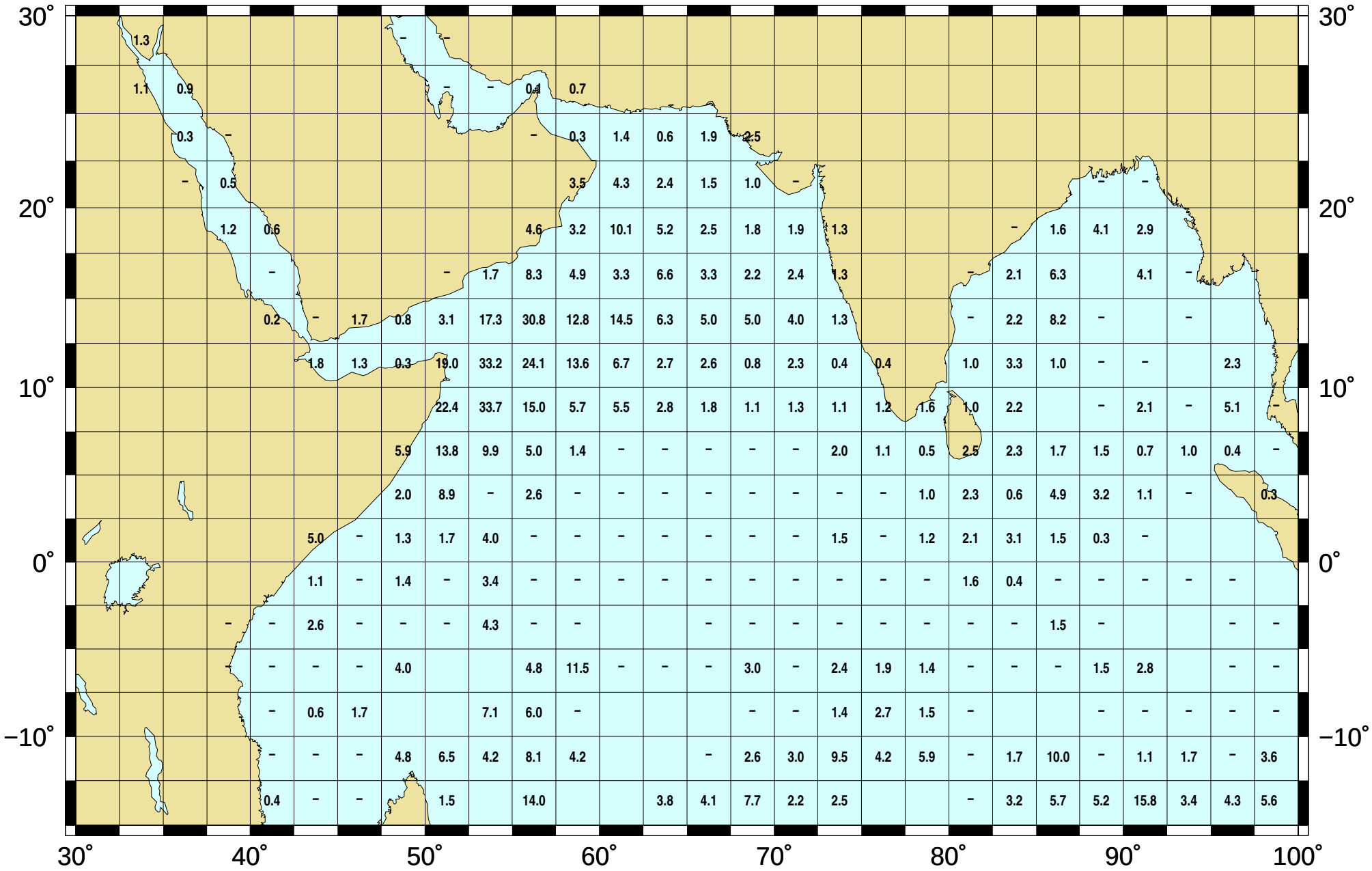


CHART No.8.9 GALE WIND(%) SEPTEMBER

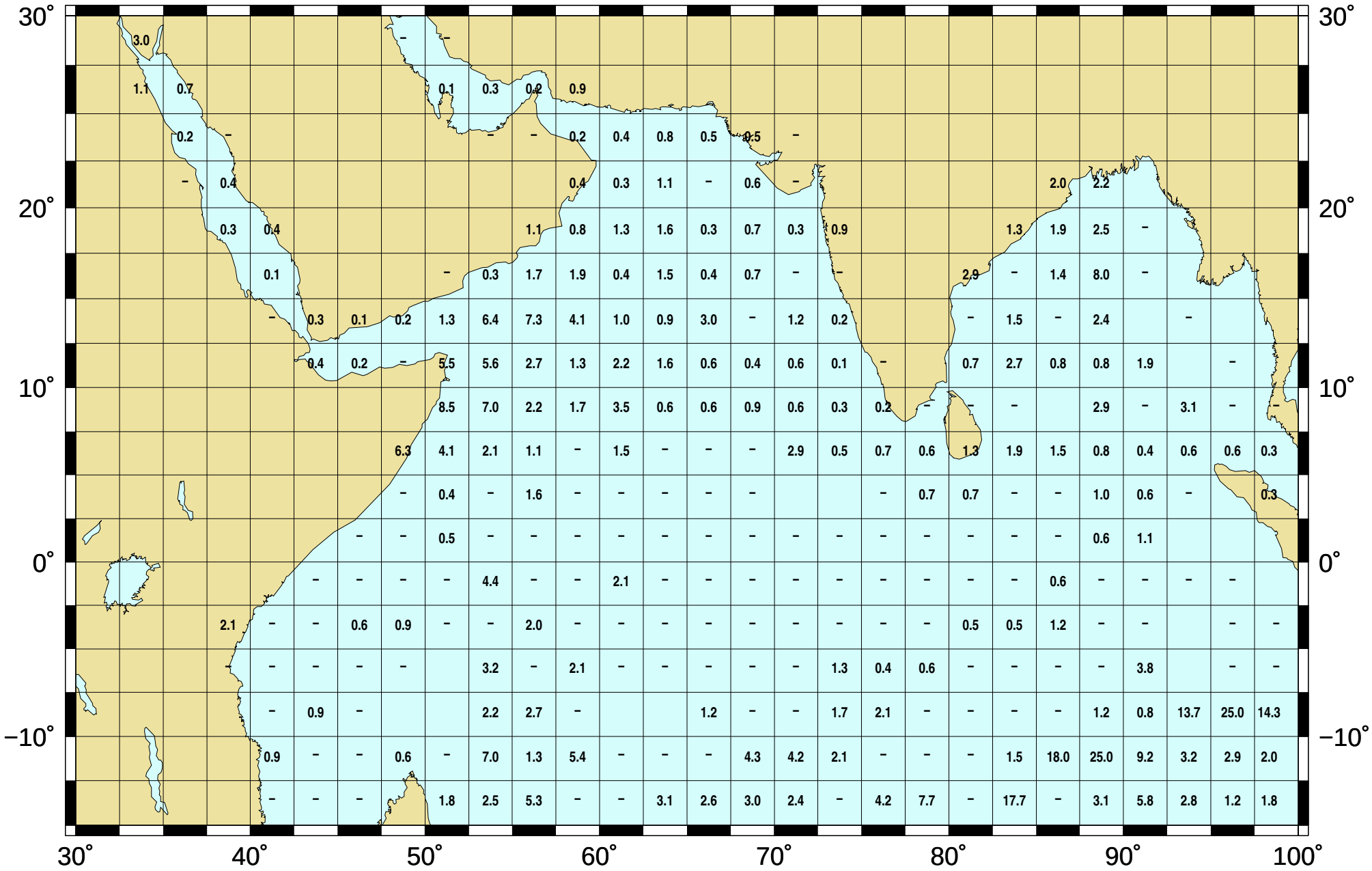


CHART No.8.10 GALE WIND(%) OCTOBER

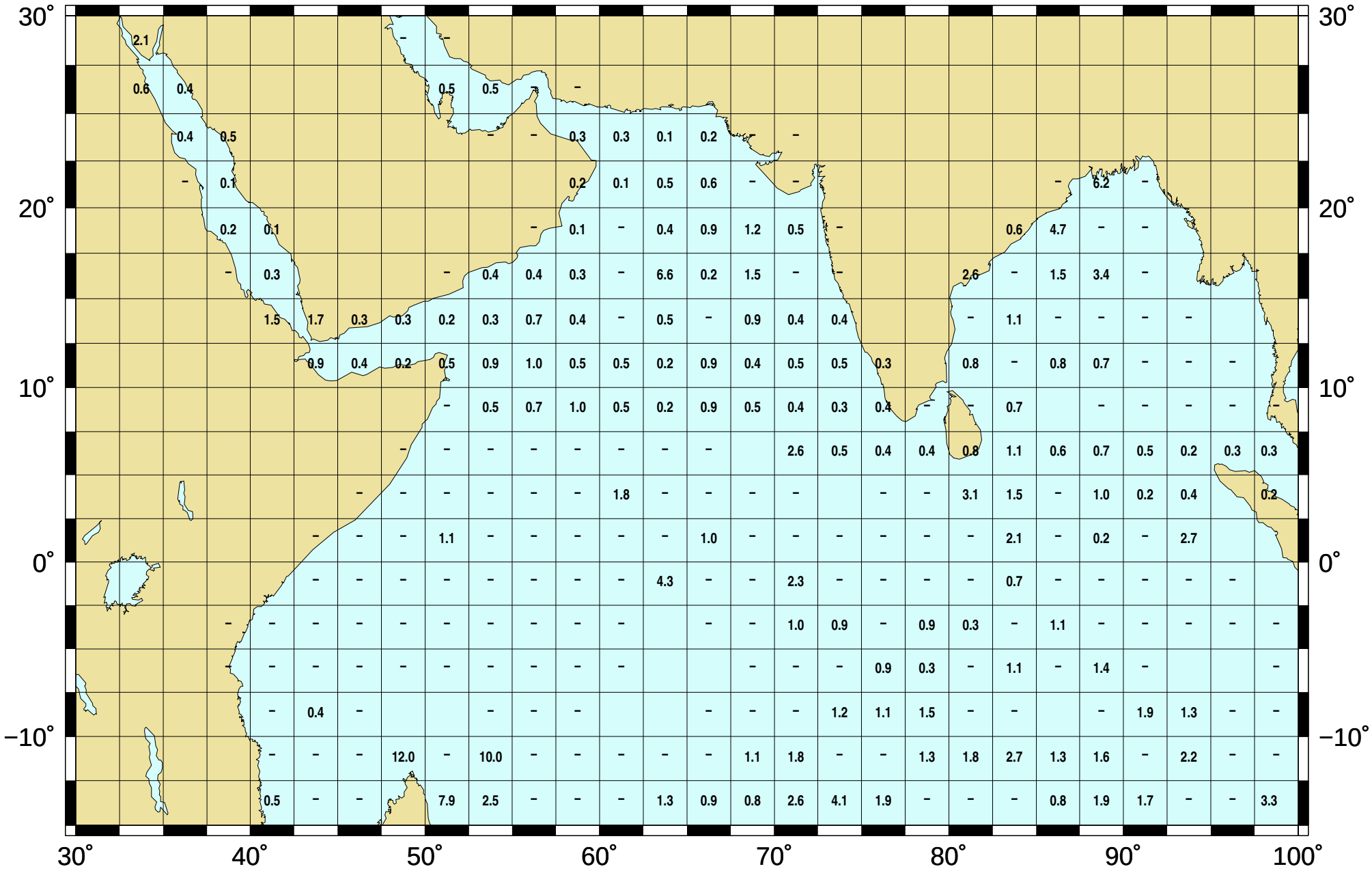


CHART No.8.11 *GALE WIND(%)* *NOVEMBER*

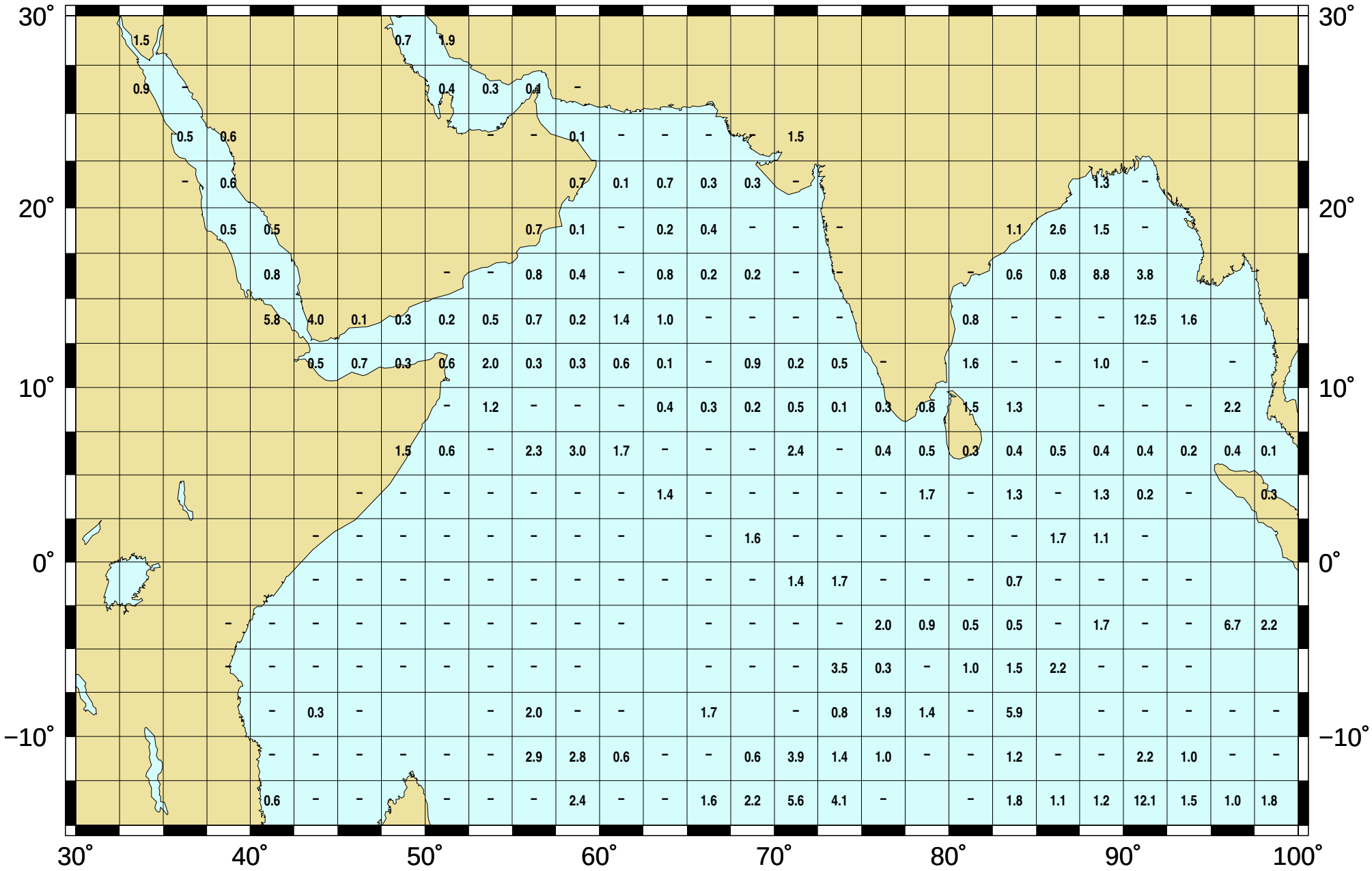


CHART No.8.12 GALE WIND(%) DECEMBER

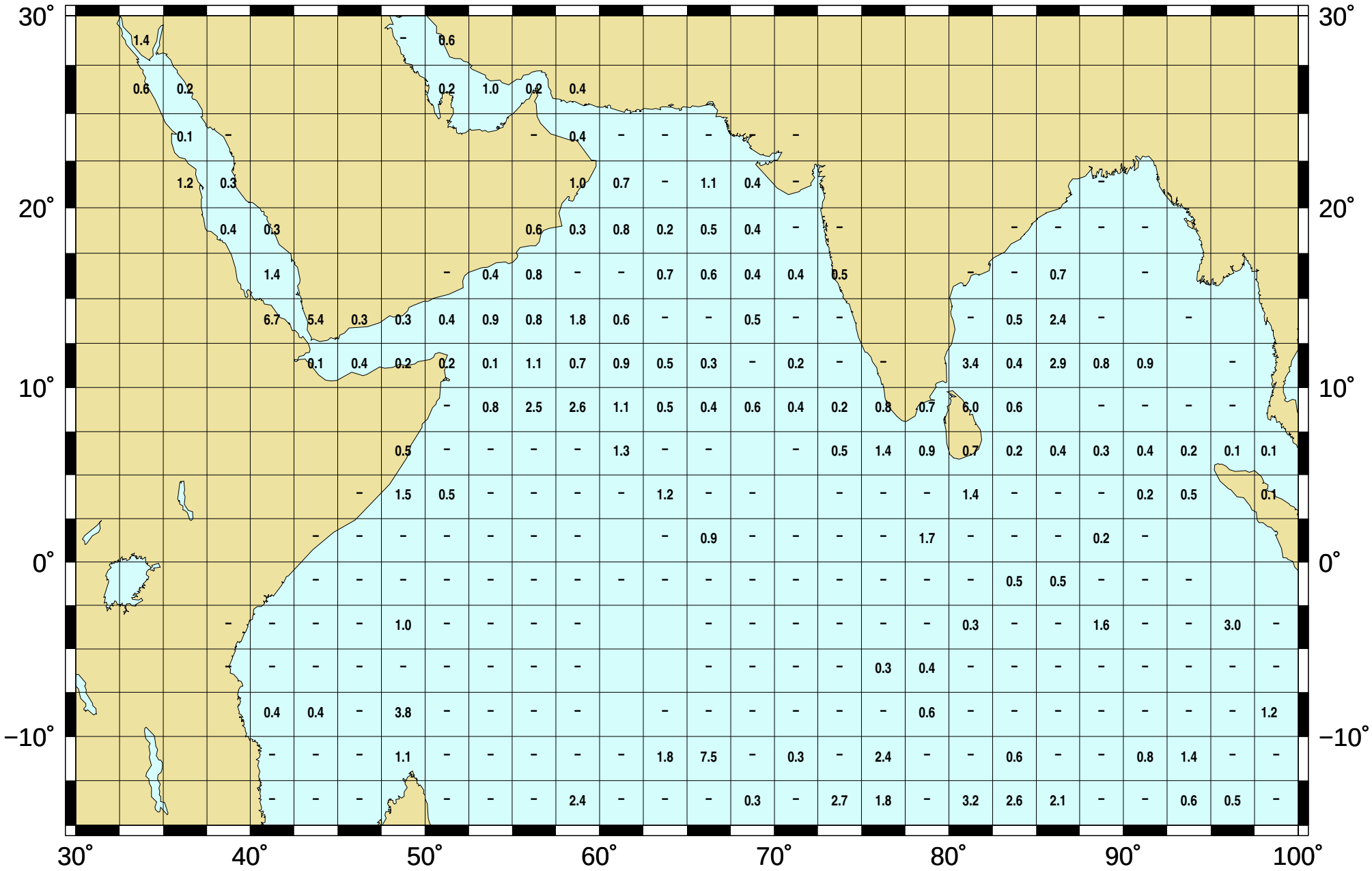


CHART No. 9.1 TOATL CLOUD AMOUNT(Percentage) JANUARY

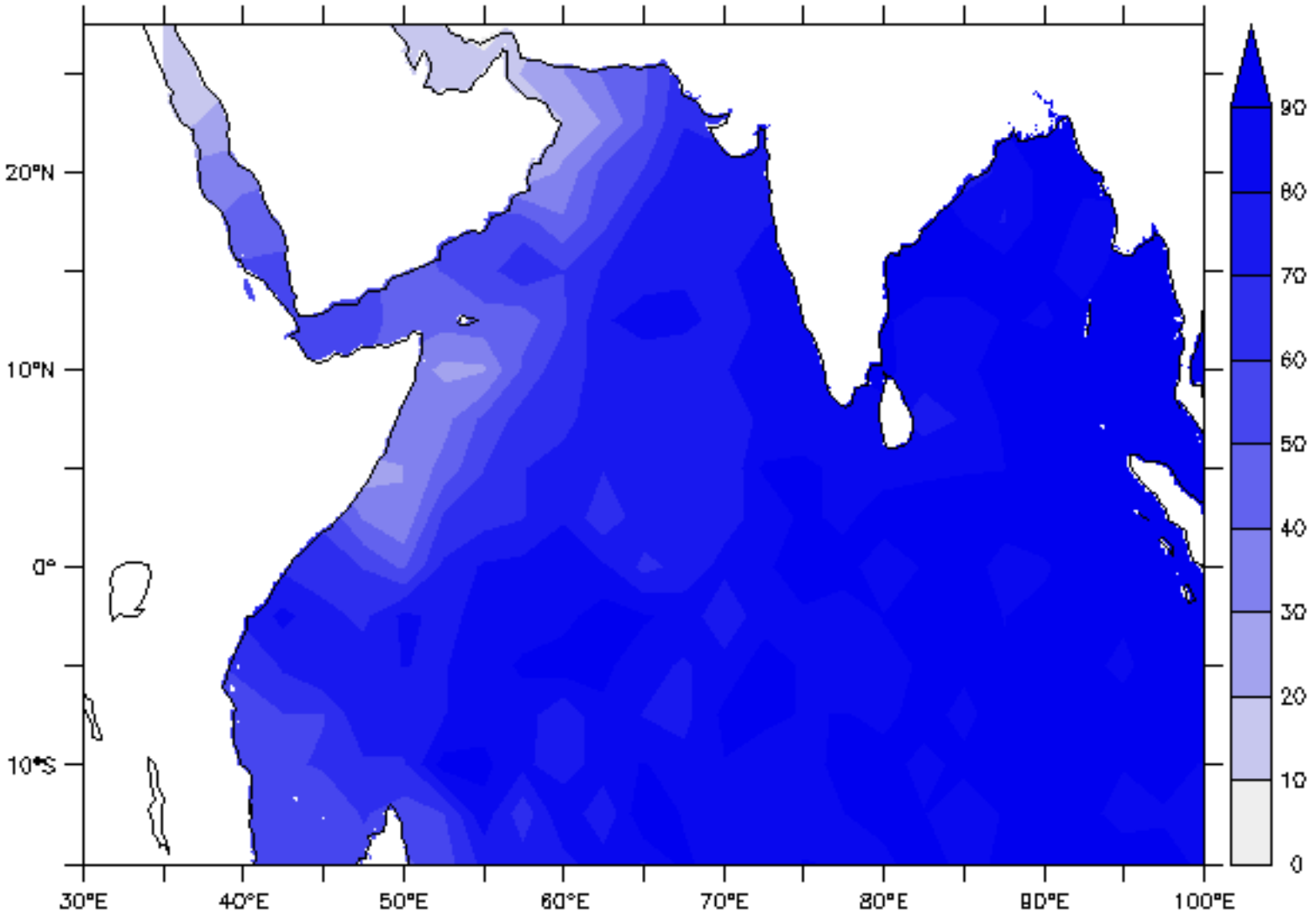


CHART No. 9.2 TOATL CLOUD AMOUNT(Percentage) FEBRUARY

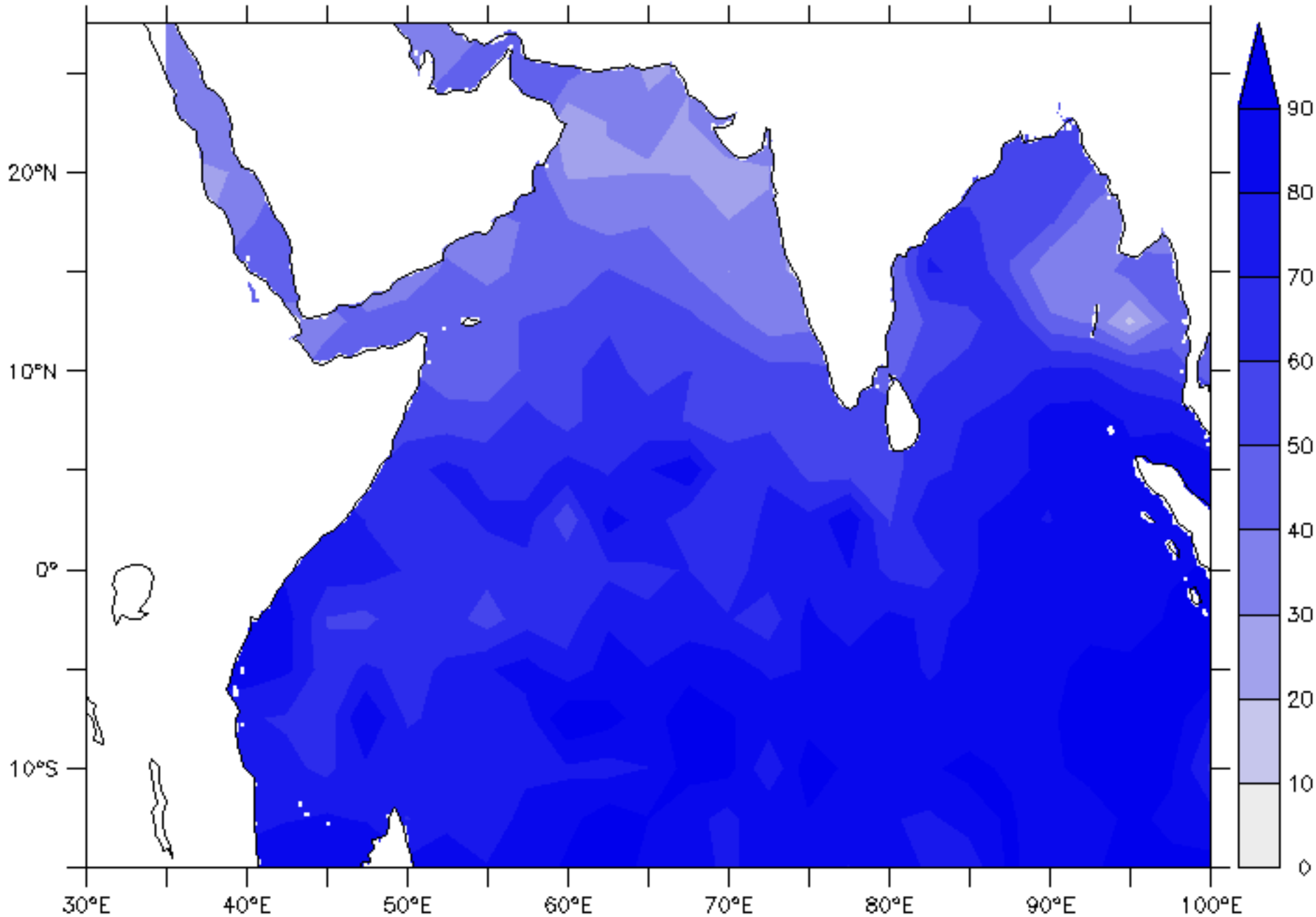


CHART No. 9.3 TOATL CLOUD AMOUNT(Percentage) MARCH

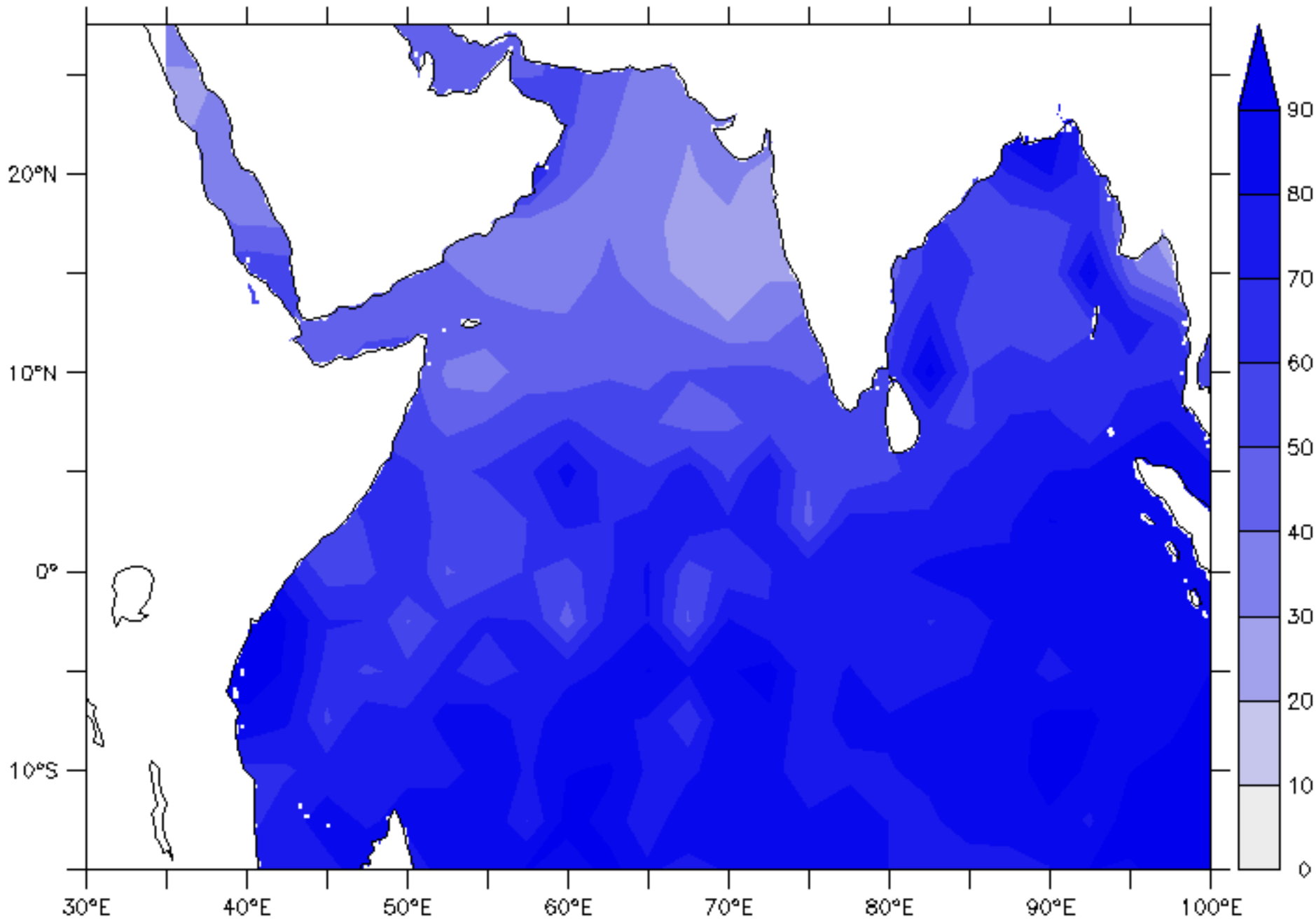


CHART No. 9.4 TOATL CLOUD AMOUNT(Percentage) APRIL

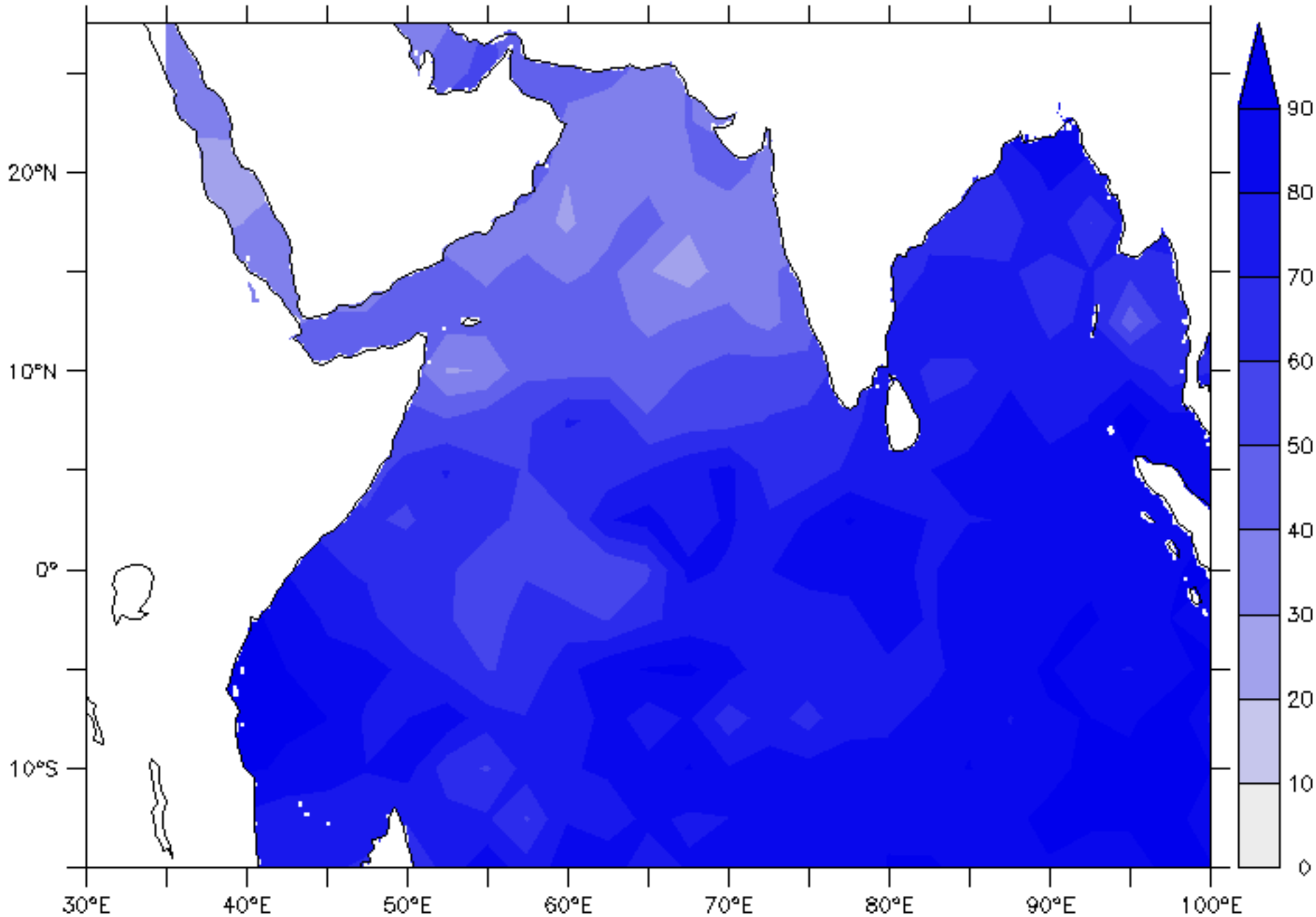


CHART No. 9.5 TOATL CLOUD AMOUNT(Percentage) MAY

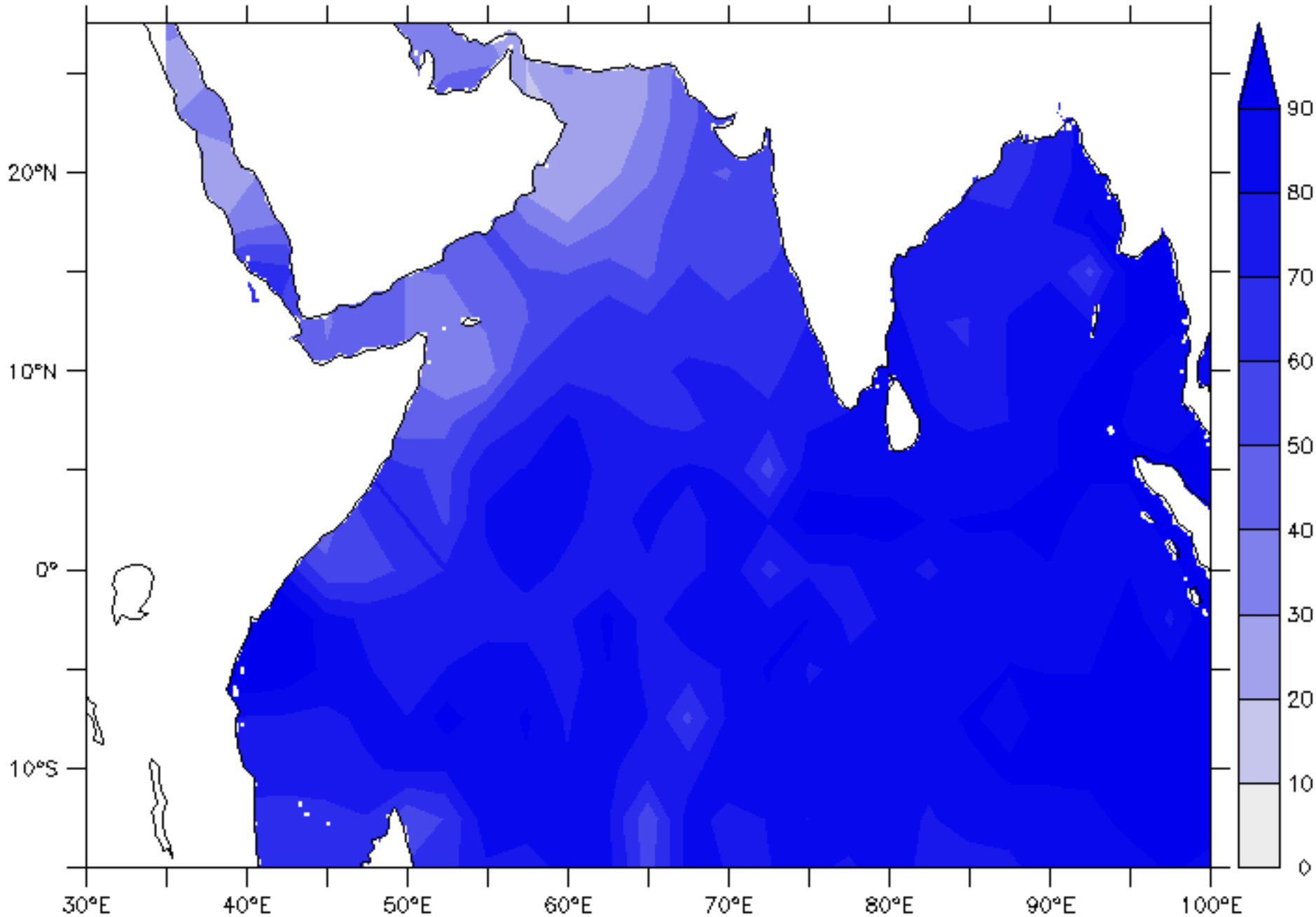


CHART No. 9.6 TOATL CLOUD AMOUNT(Percentage) JUNE

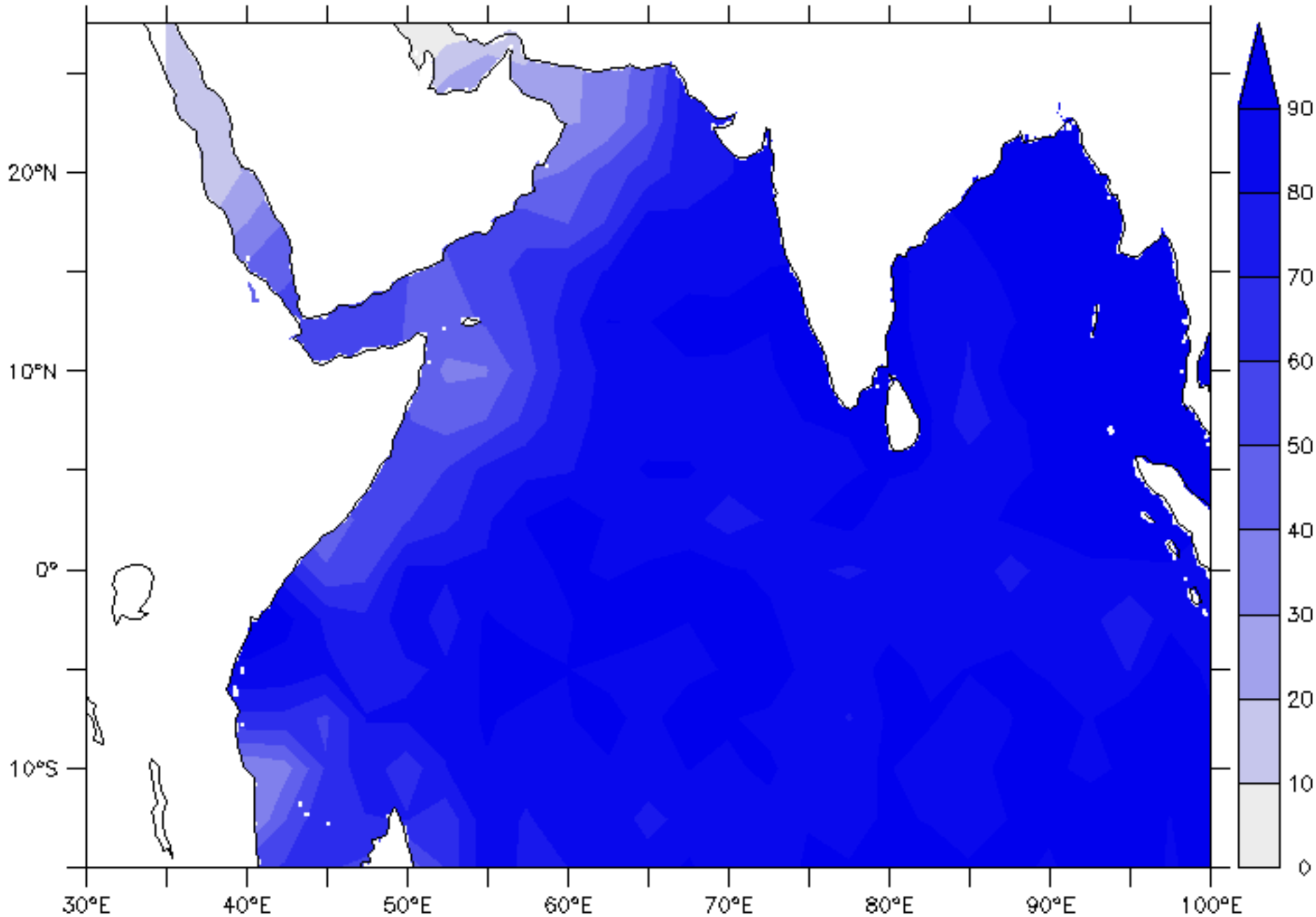


CHART No. 9.7 TOATL CLOUD AMOUNT(Percentage) JULY

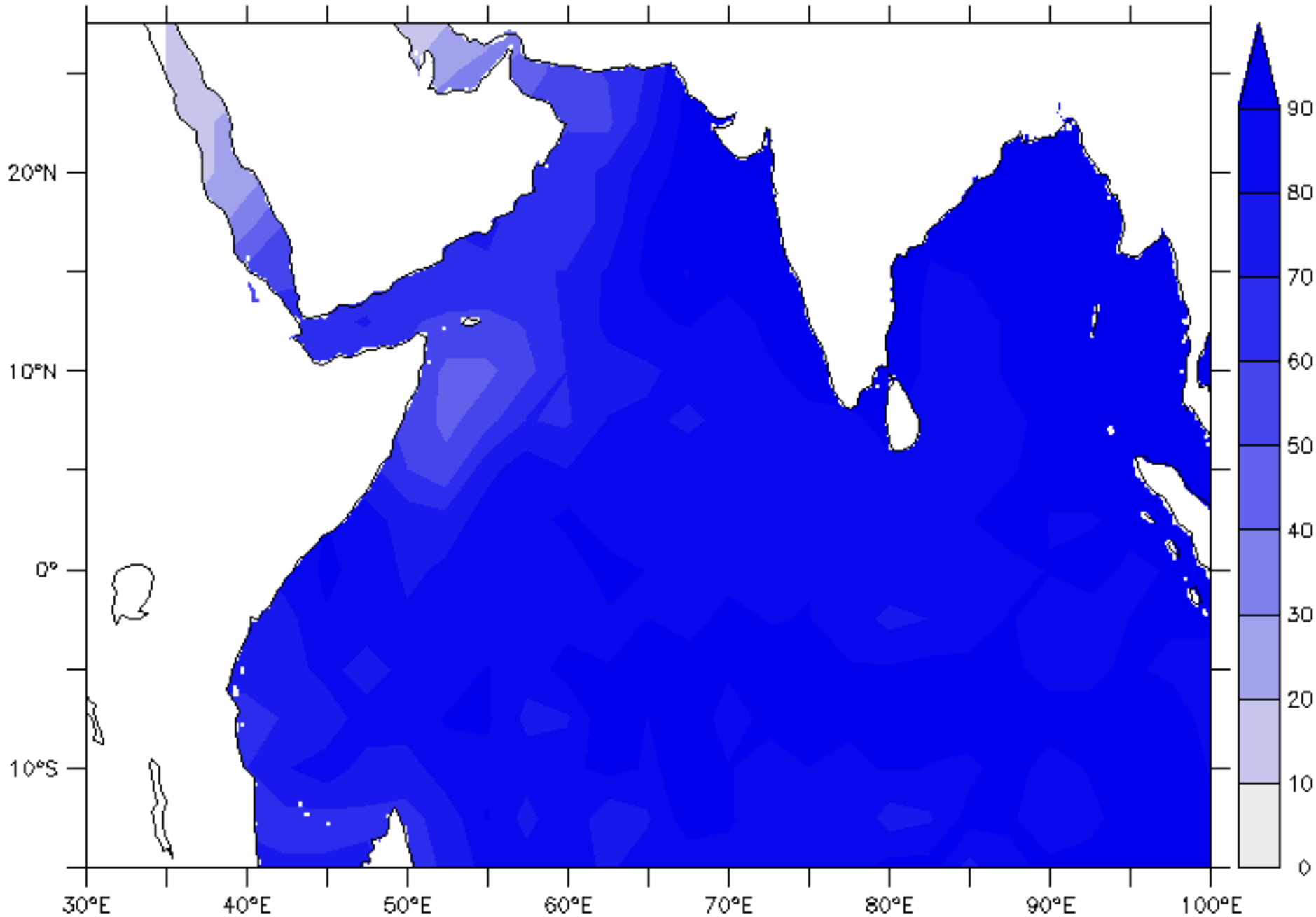


CHART No. 9.8 TOATL CLOUD AMOUNT(Percentage) AUGUST

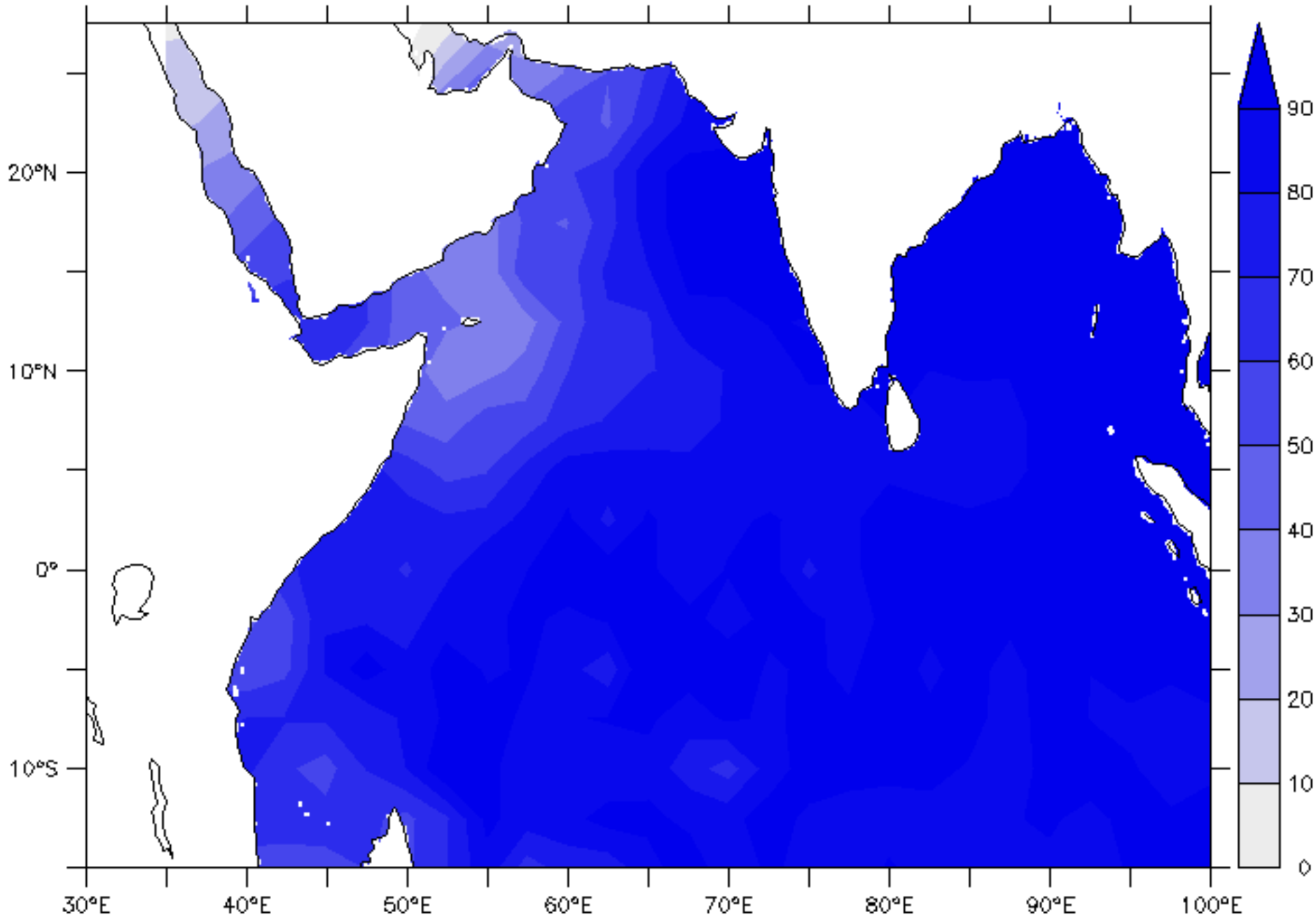


CHART No. 9.9 TOATL CLOUD AMOUNT(Percentage) SEPTEMBER

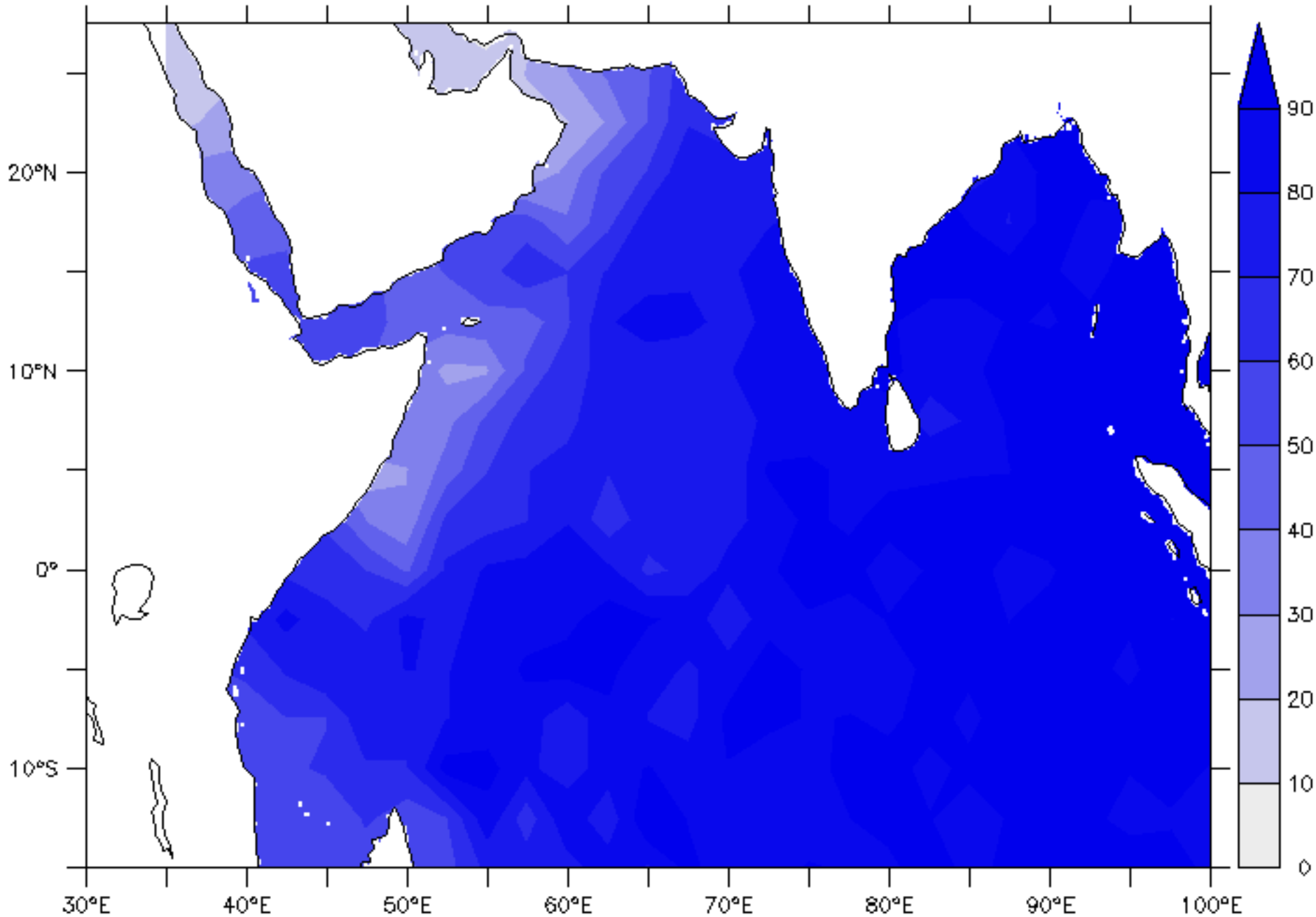


CHART No. 9.10 TOATL CLOUD AMOUNT(Percentage) OCTOBER

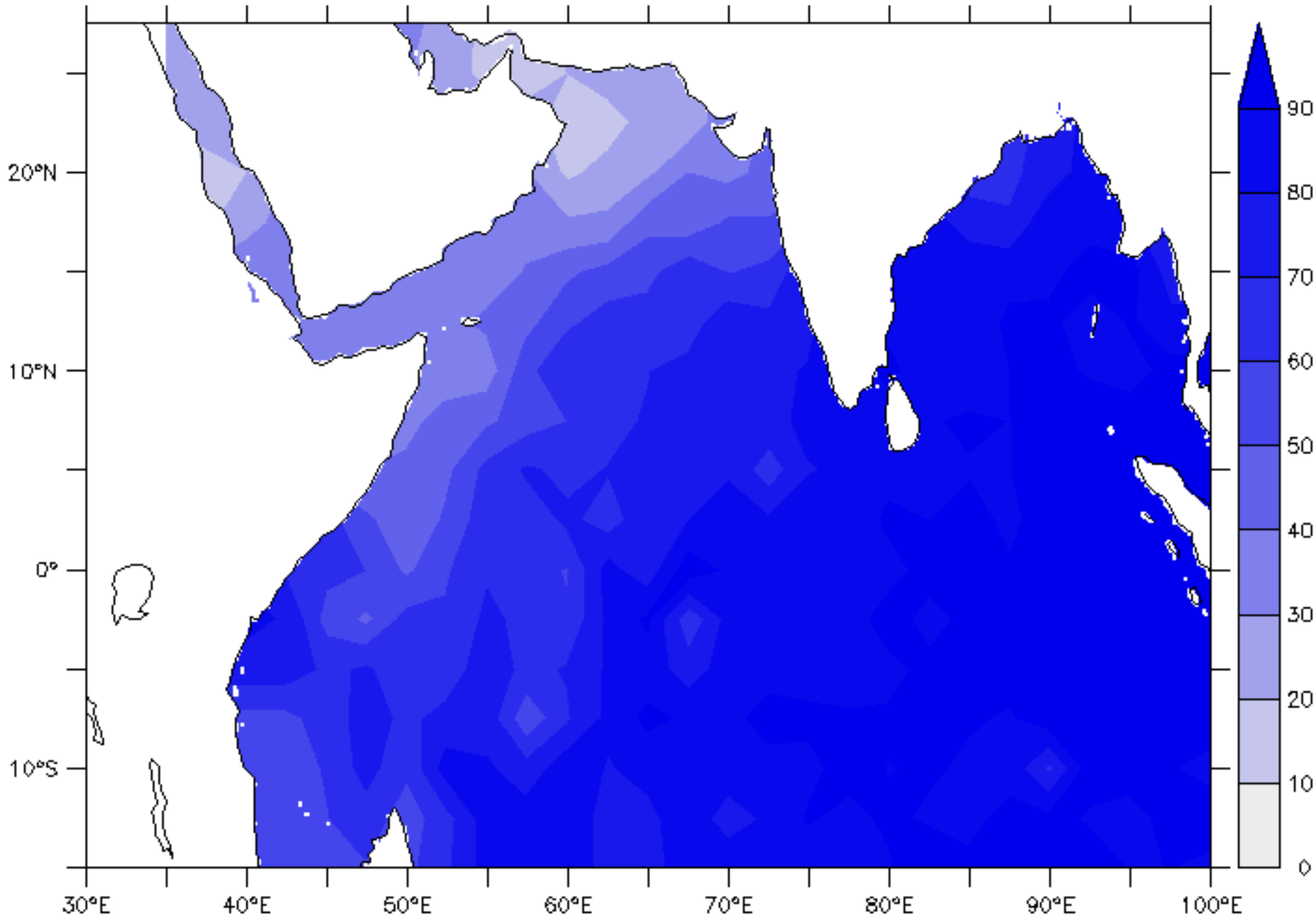


CHART No. 9.11 TOATL CLOUD AMOUNT(Percentage) NOVEMBER

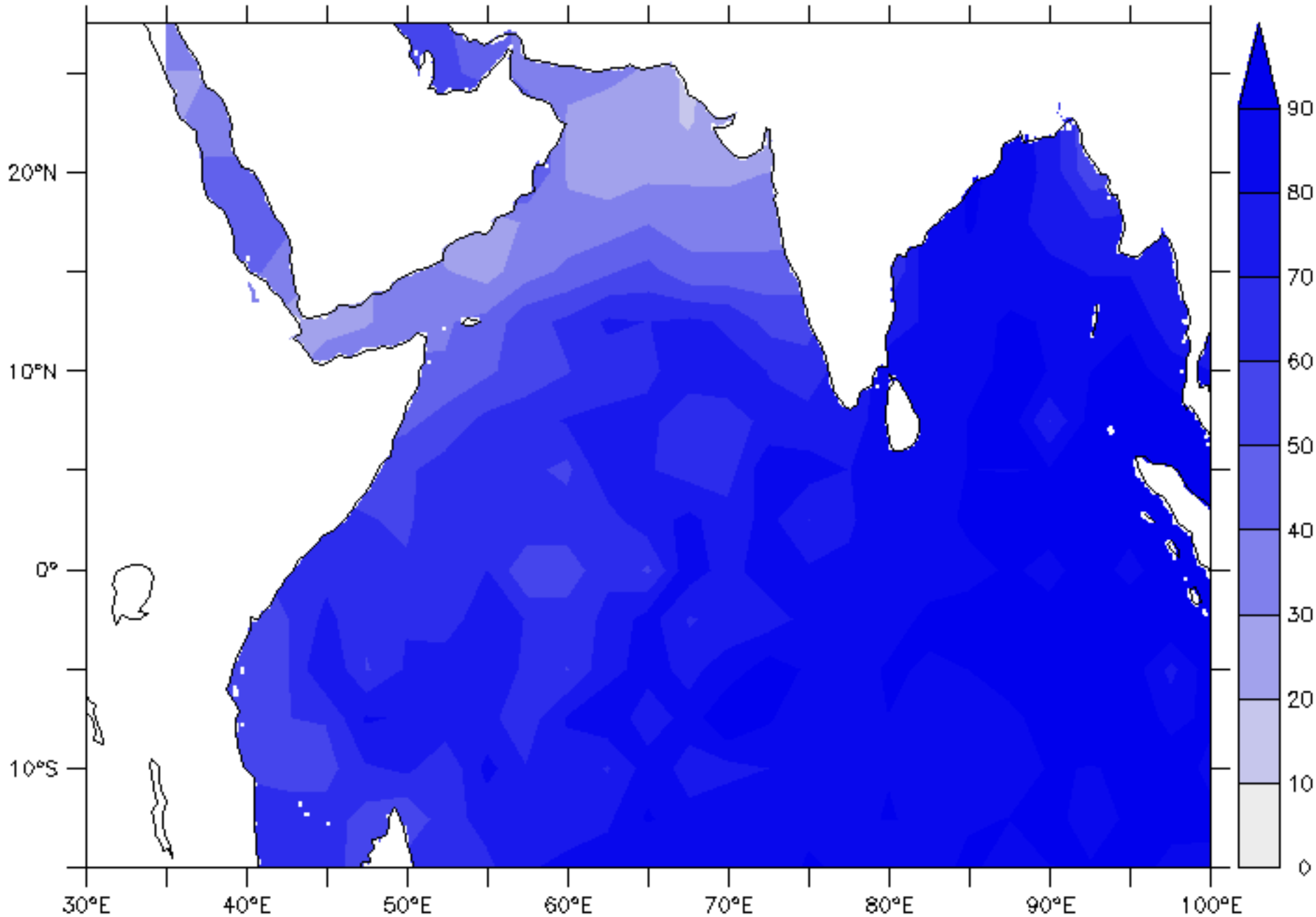


CHART No. 9.12 TOATL CLOUD AMOUNT(Percentage) DECEMBER

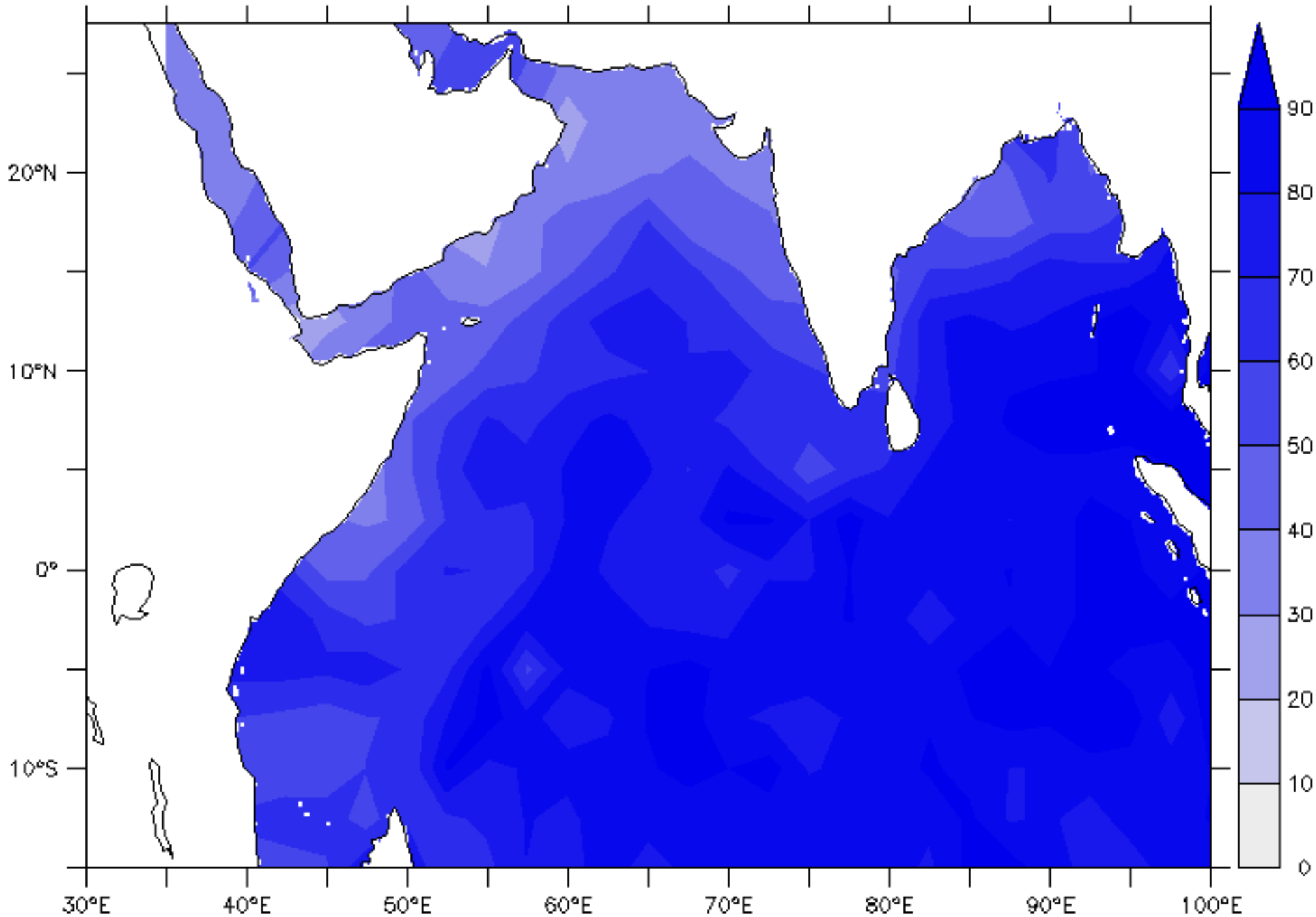


CHART No. 10.1 LOW CLOUD AMOUNT(Percentage) JANUARY

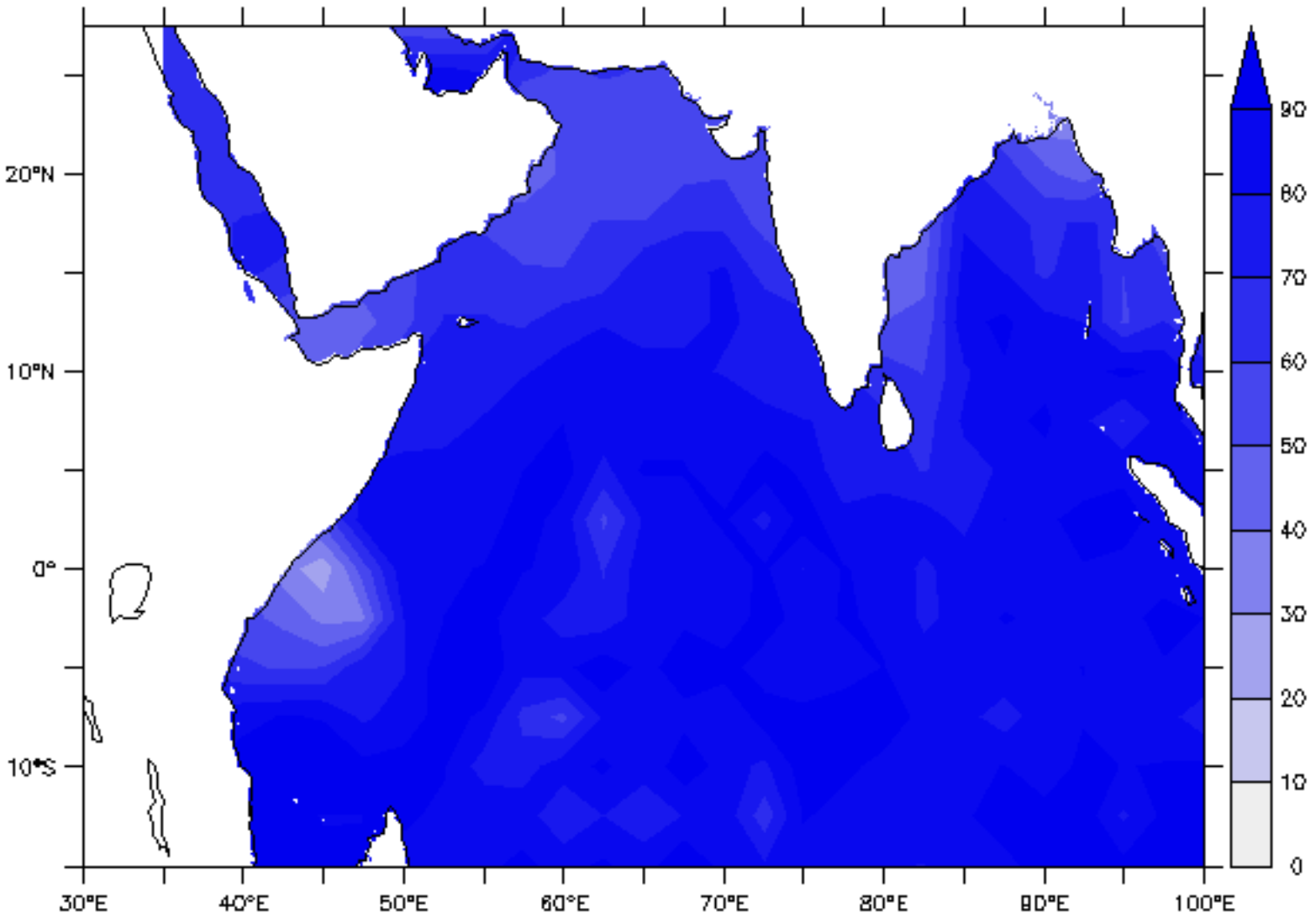


CHART No. 10.2 LOW CLOUD AMOUNT(Percentage) FEBRUARY

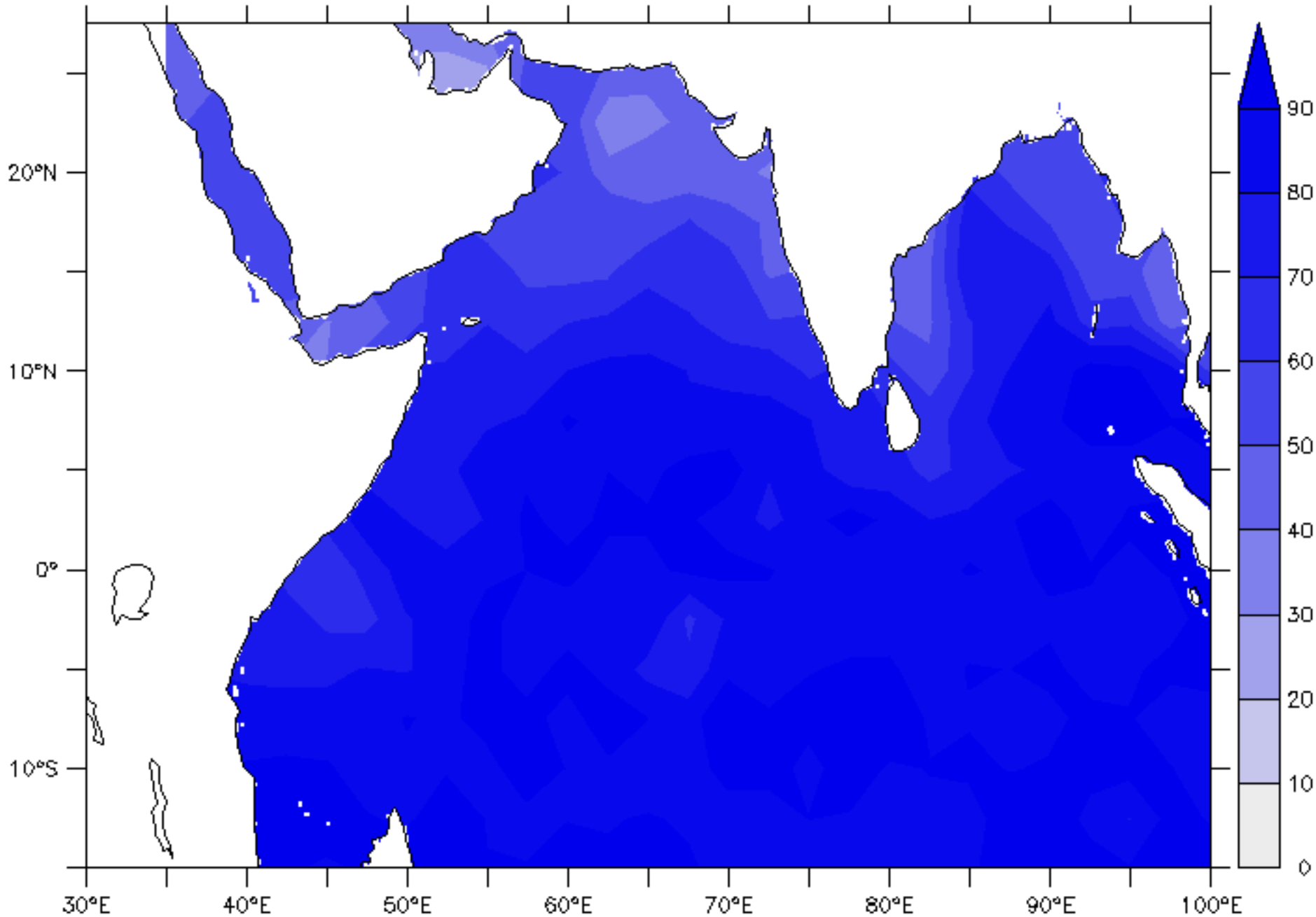


CHART No. 10.3 LOW CLOUD AMOUNT(Percentage) MARCH

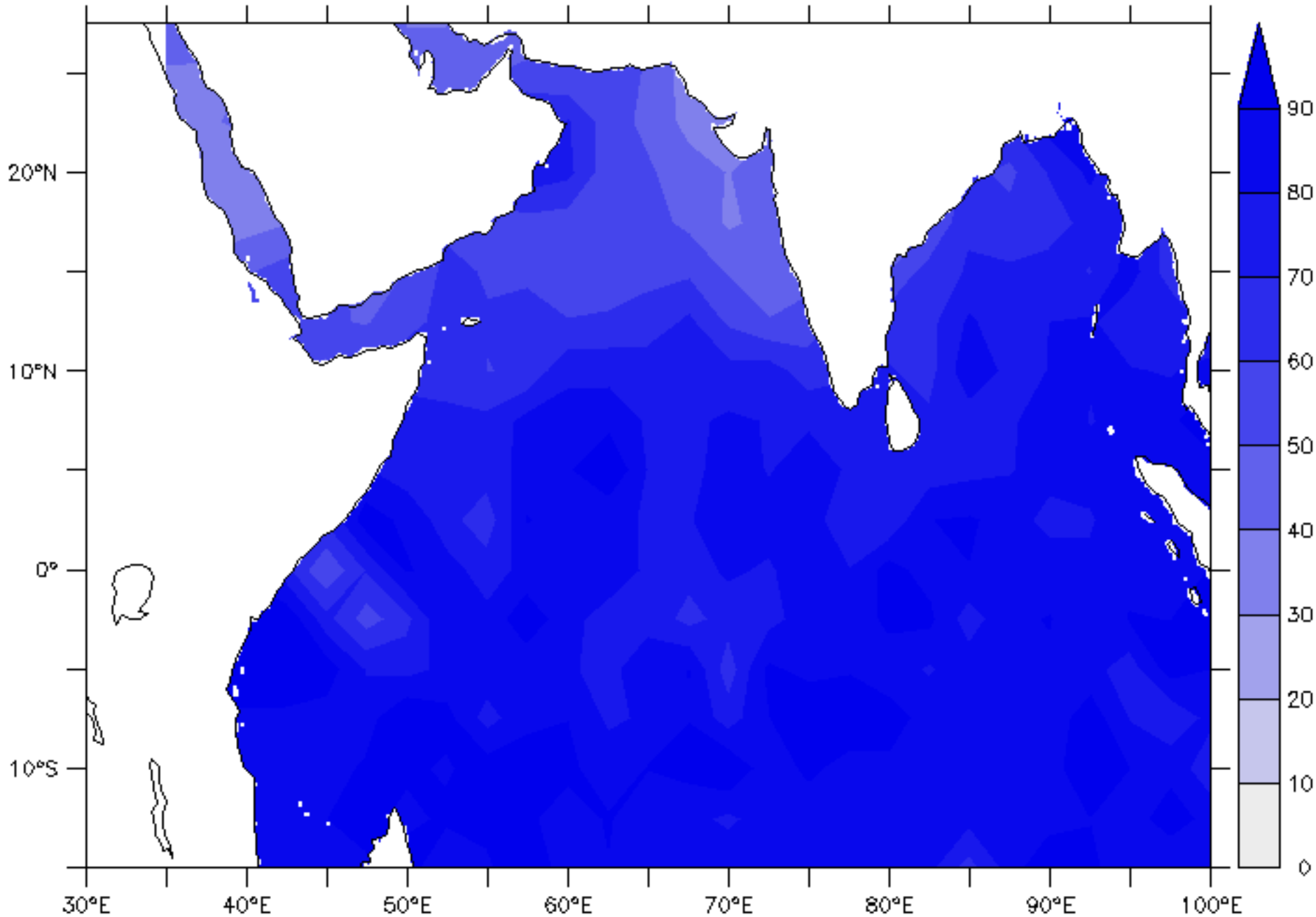


CHART No. 10.4 LOW CLOUD AMOUNT(Percentage) APRIL

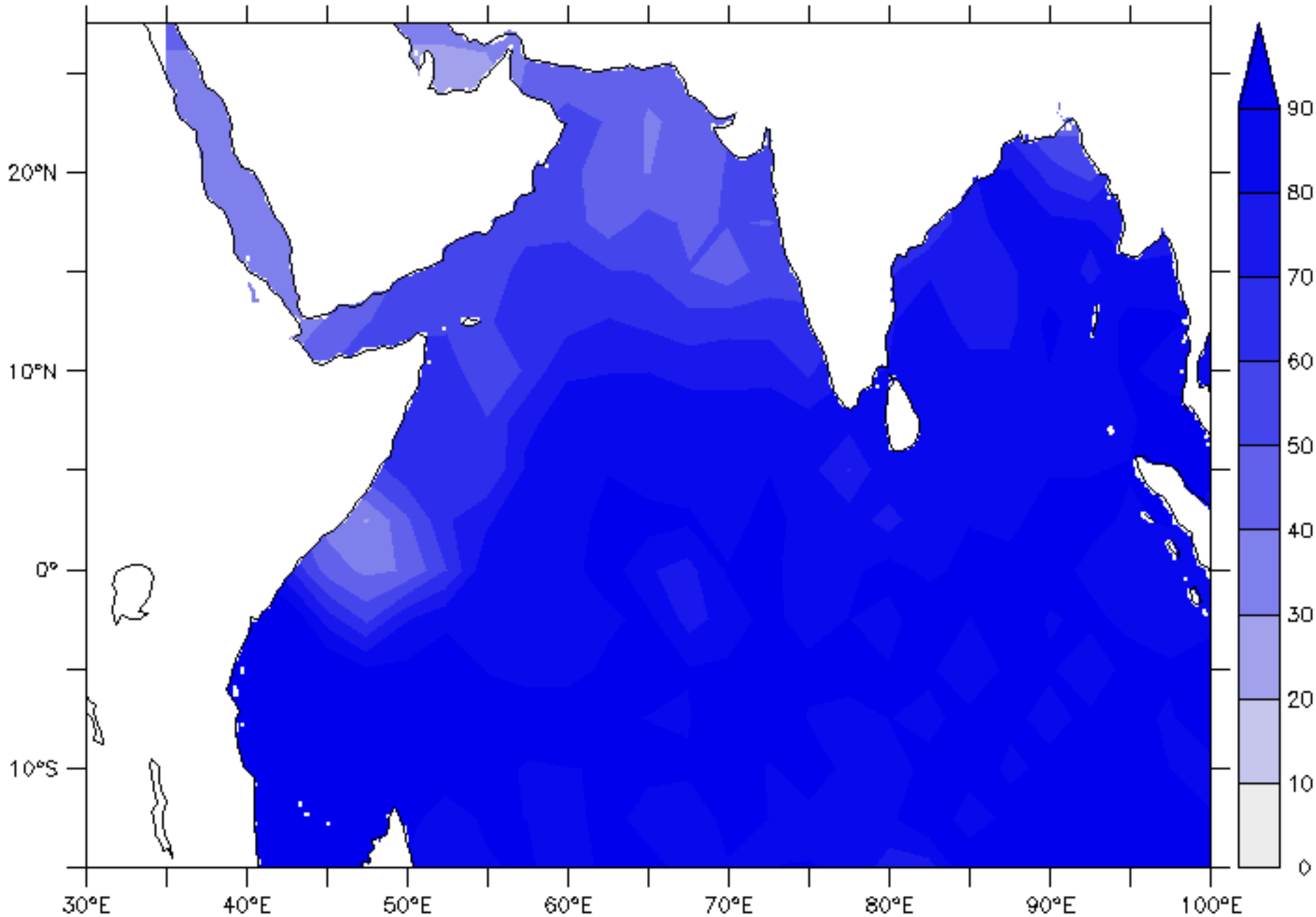


CHART No. 10.5 LOW CLOUD AMOUNT(Percentage) MAY

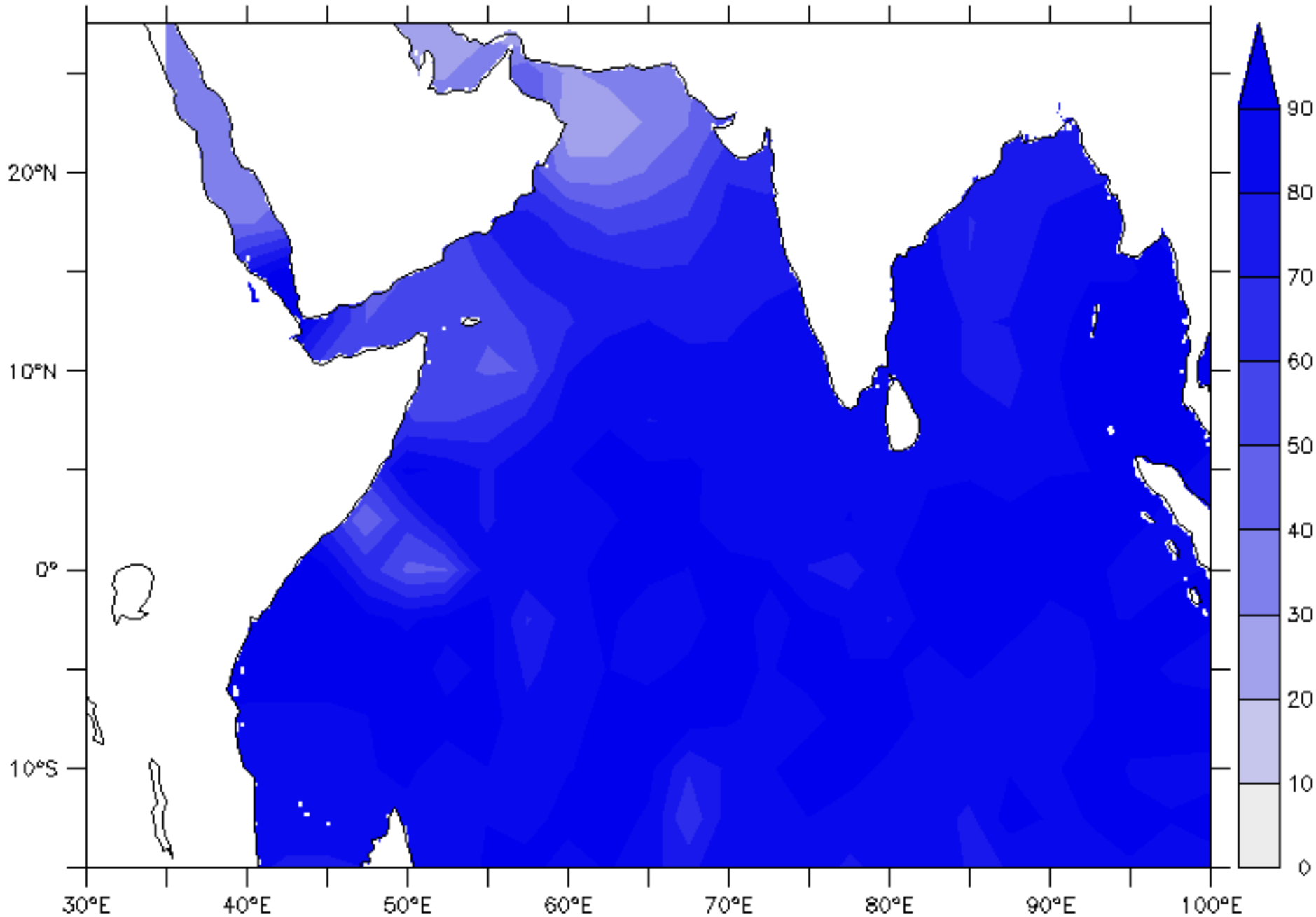


CHART No. 10.6 LOW CLOUD AMOUNT(Percentage) JUNE

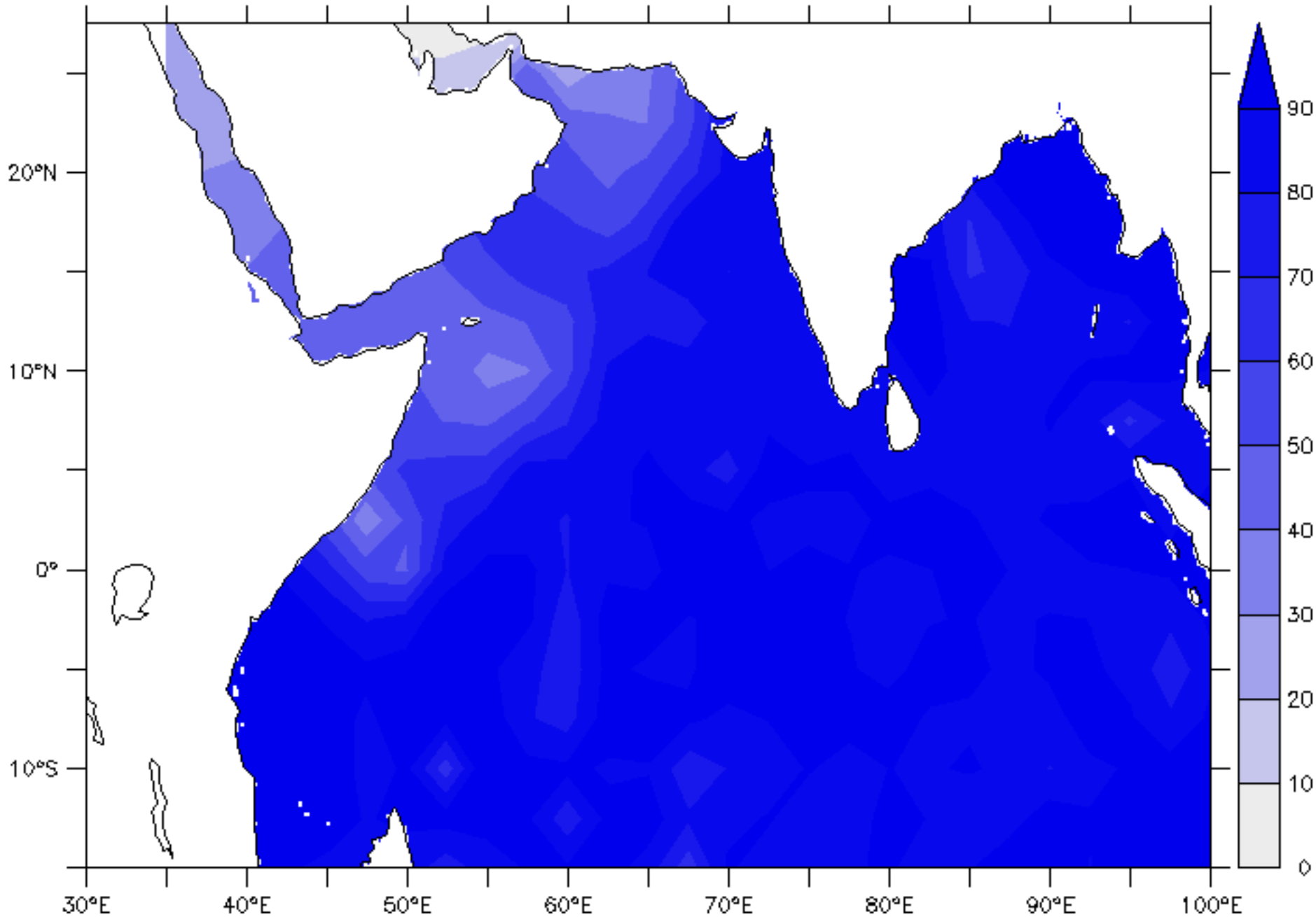


CHART No. 10.7 LOW CLOUD AMOUNT(Percentage) JULY

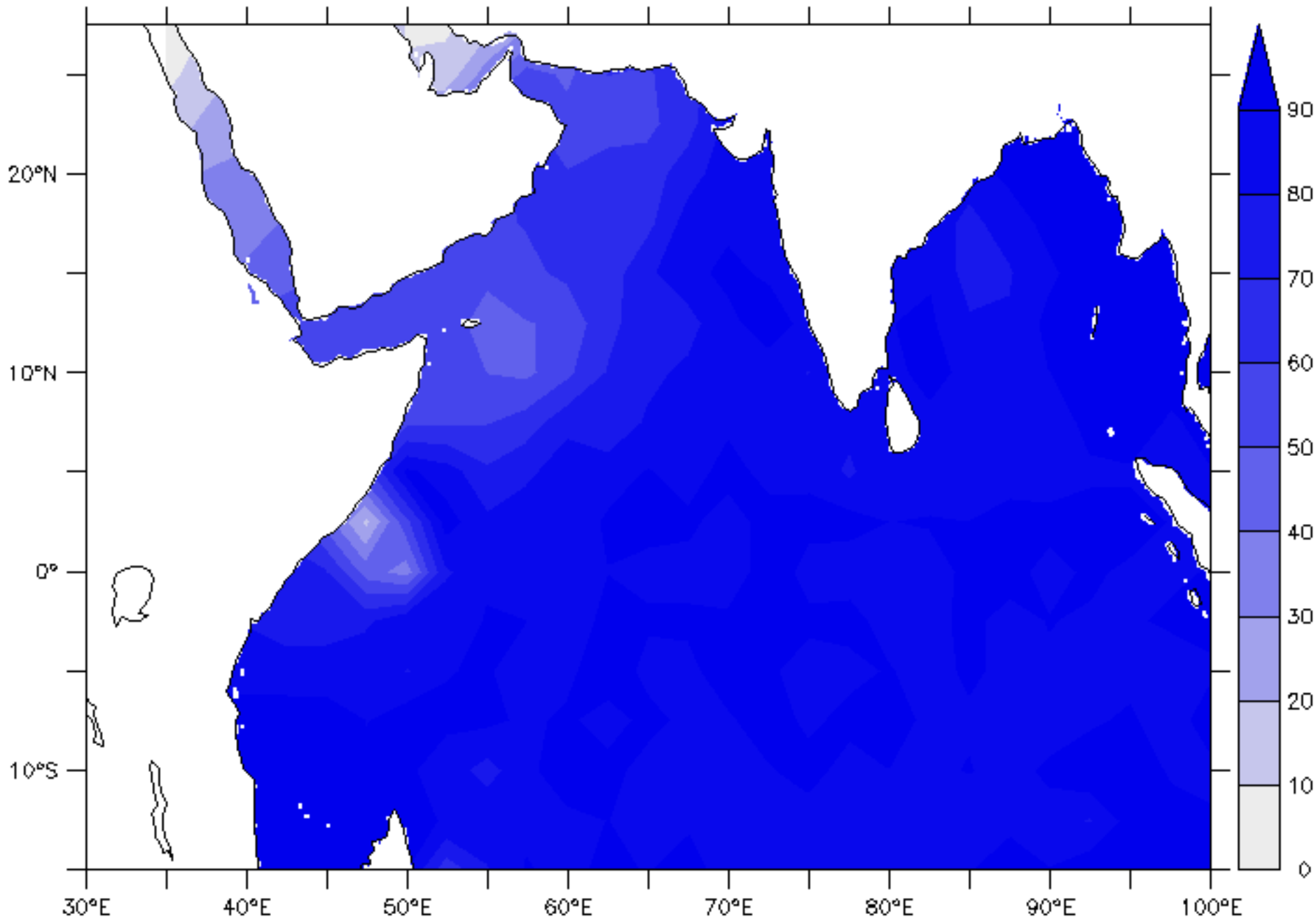


CHART No. 10.8 LOW CLOUD AMOUNT(Percentage) AUGUST

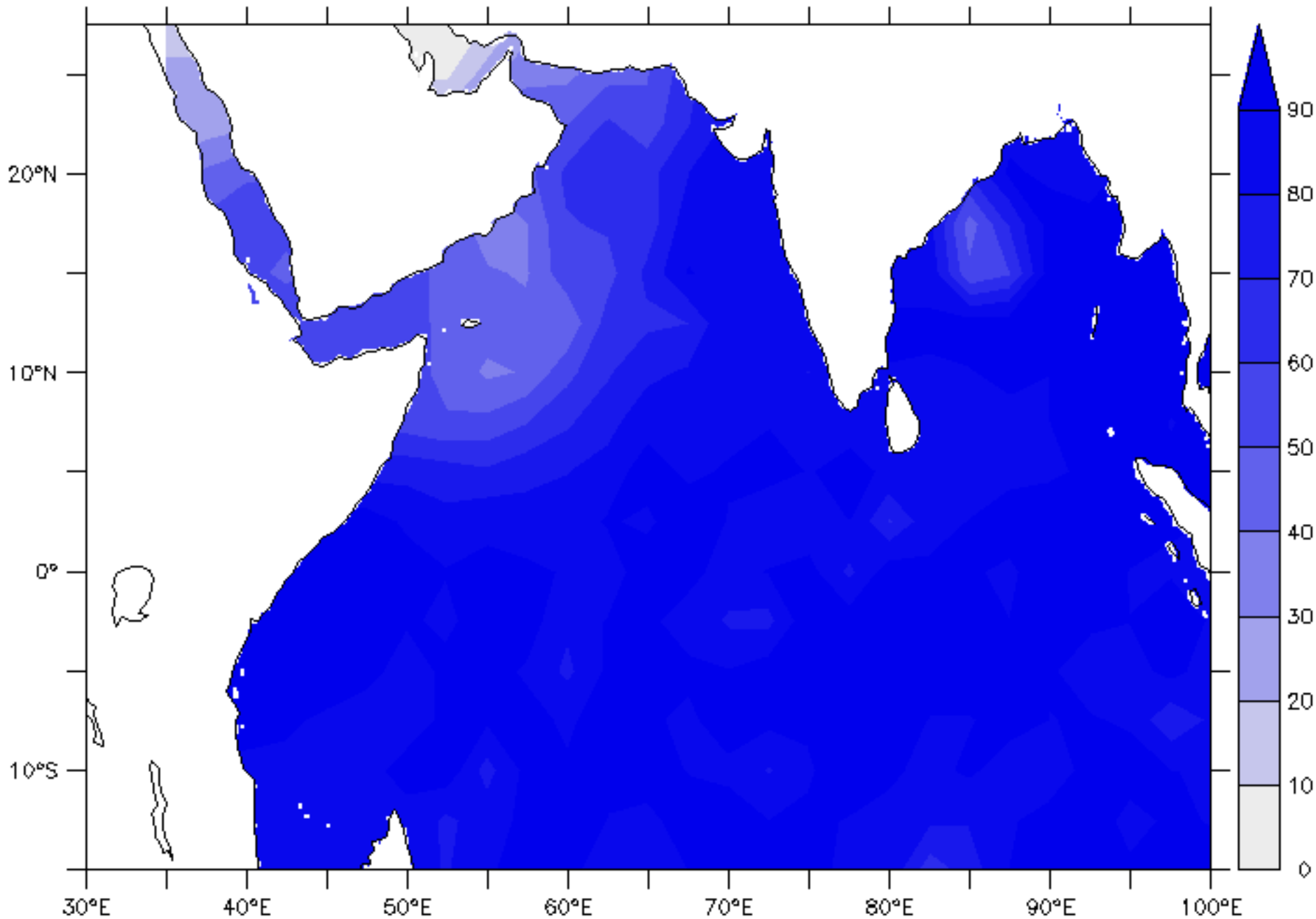


CHART No. 10.9 LOW CLOUD AMOUNT(Percentage) SEPTEMBER

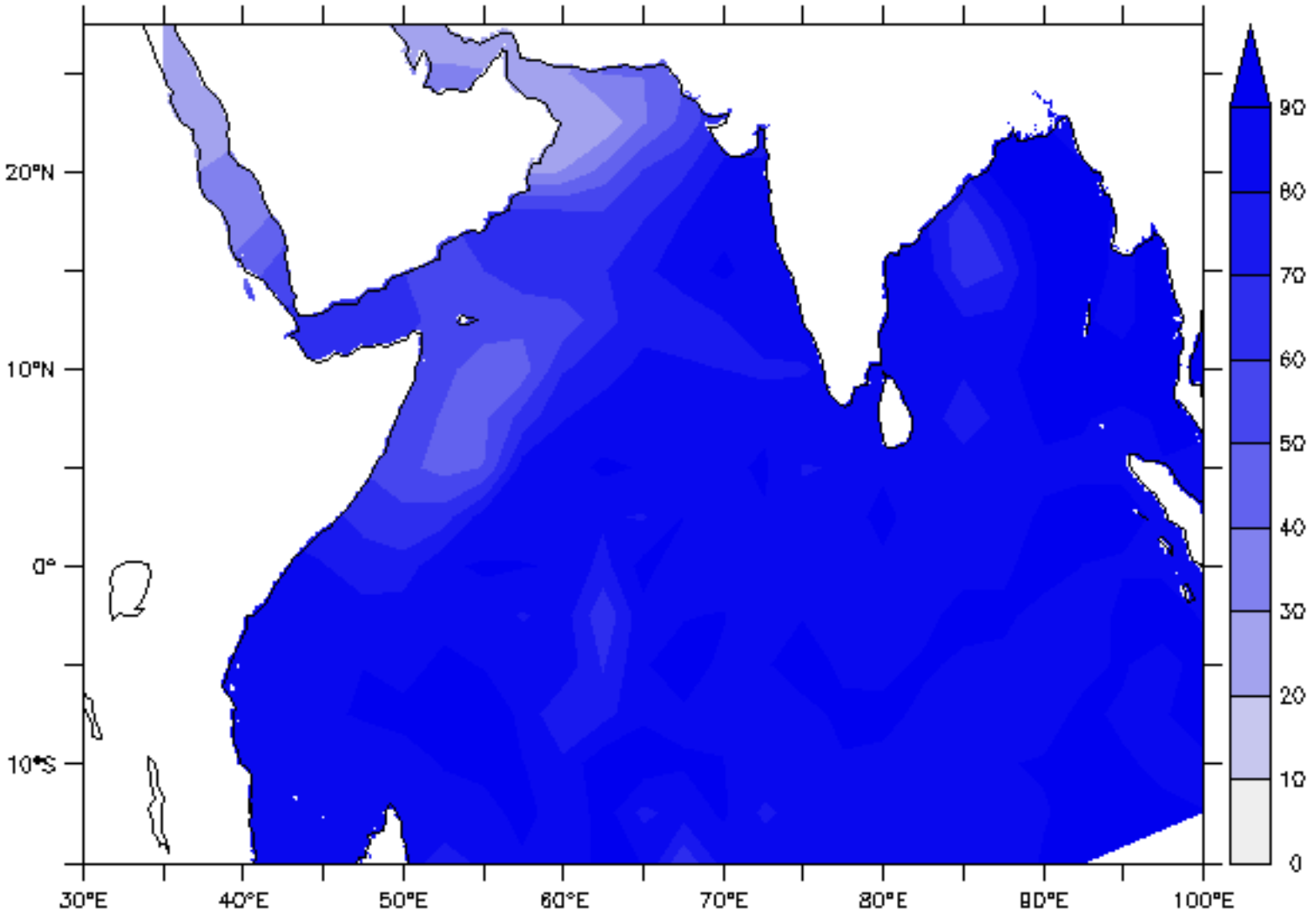


CHART No. 10.10 LOW CLOUD AMOUNT(Percentage) OCTOBER

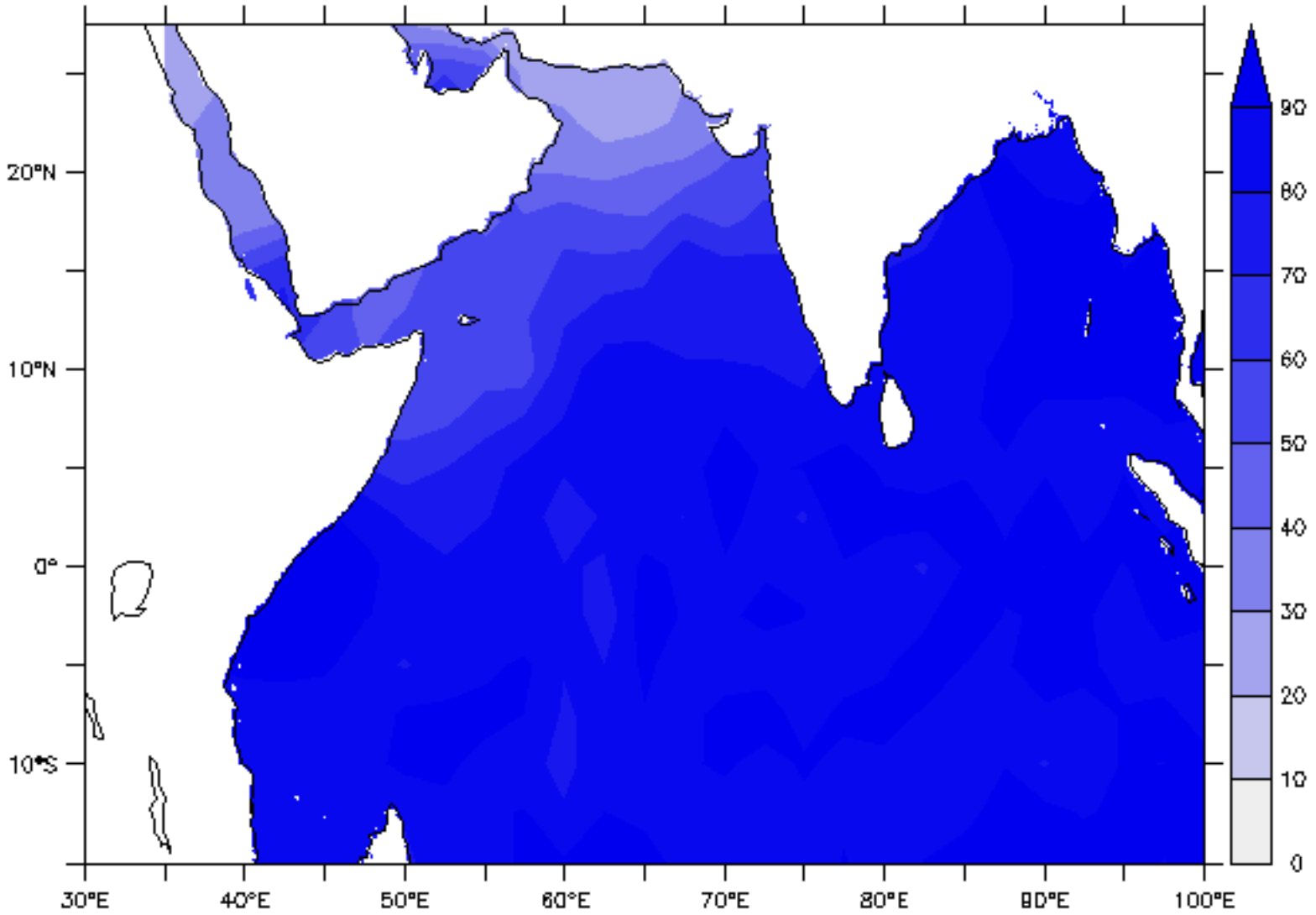


CHART No. 10.11 LOW CLOUD AMOUNT(Percentage) NOVEMBER

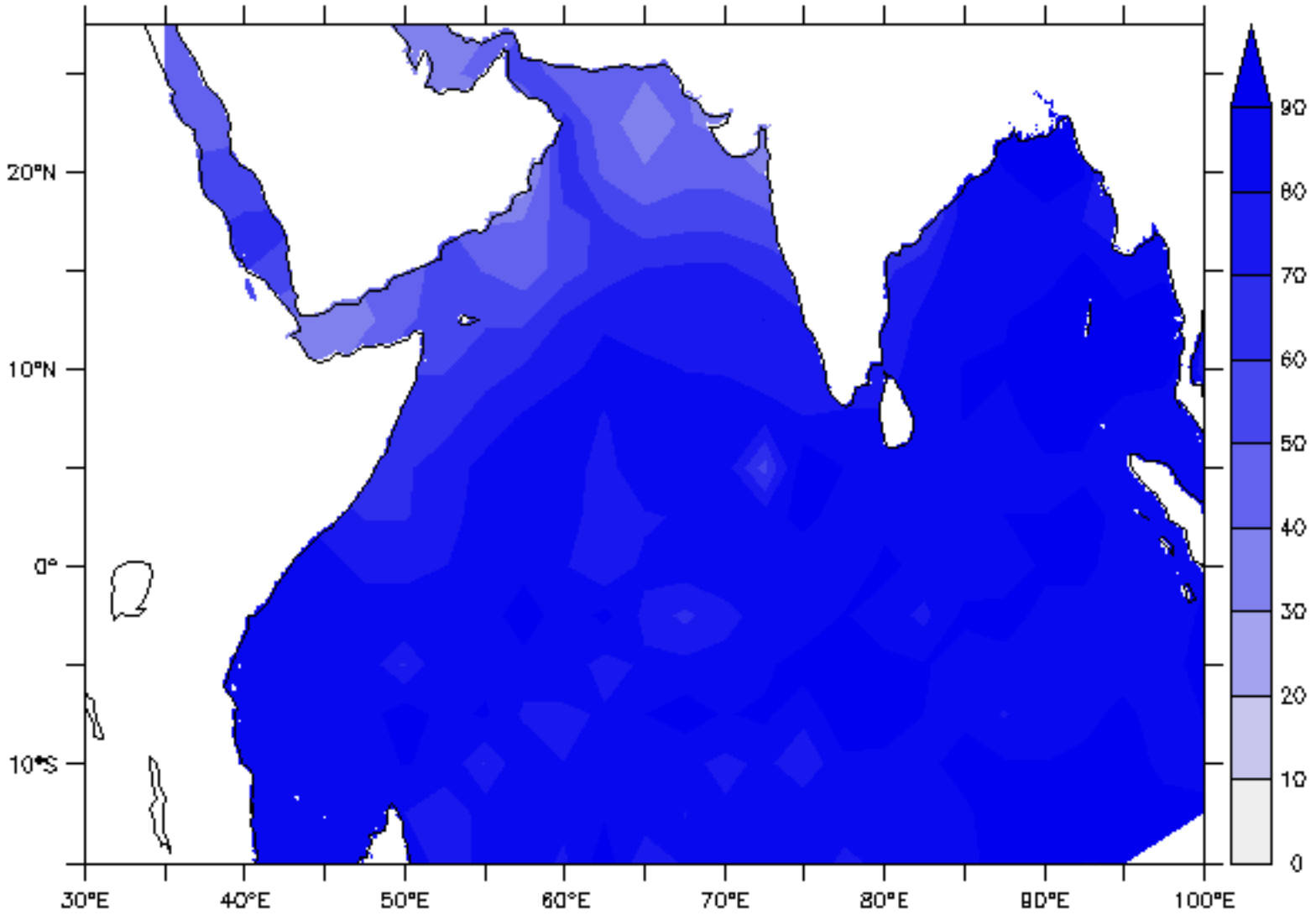


CHART No. 10.12 LOW CLOUD AMOUNT(Percentage) DECEMBER

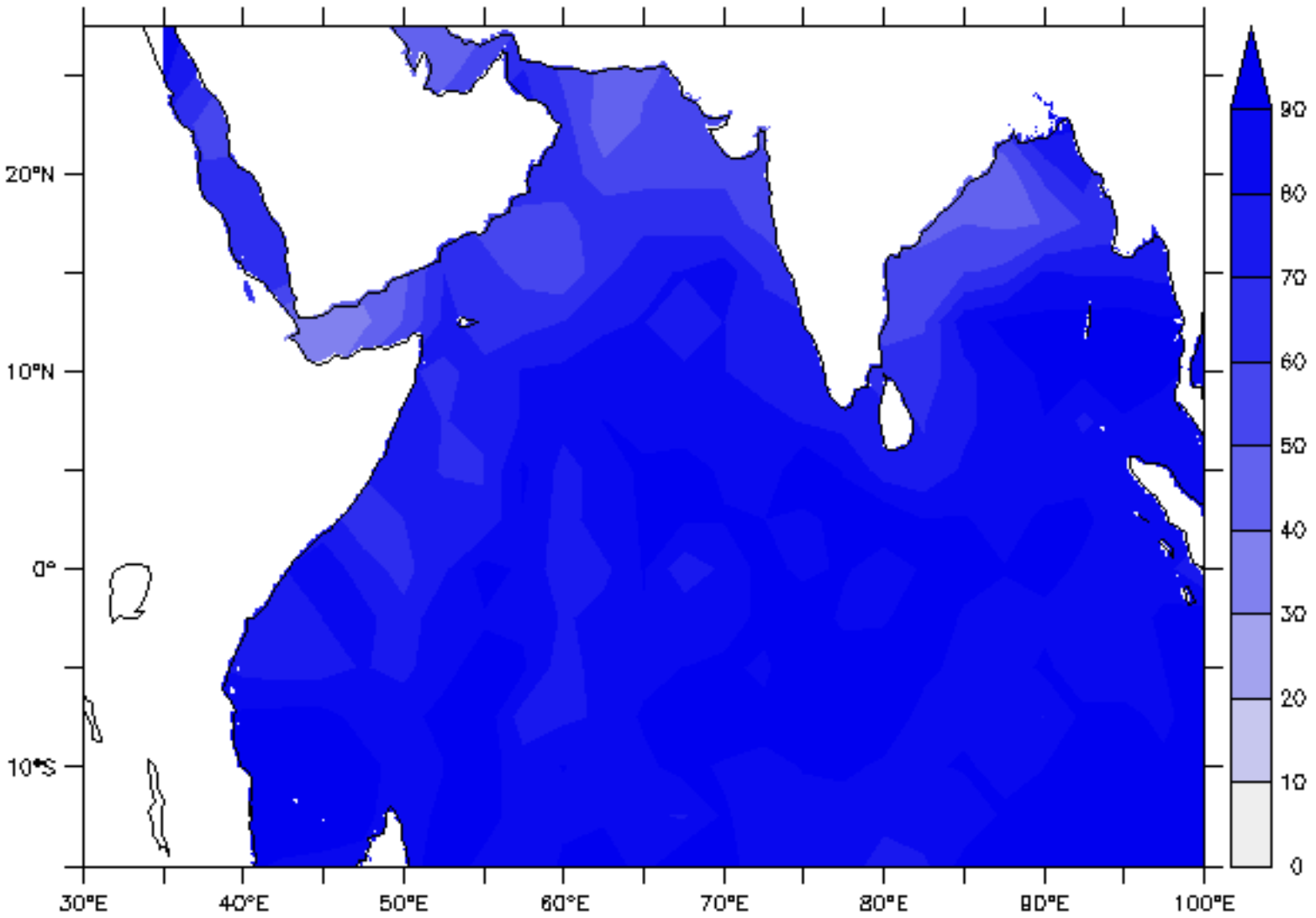


CHART No.11.1

MEAN WAVE HEIGHT(m)

JANUARY

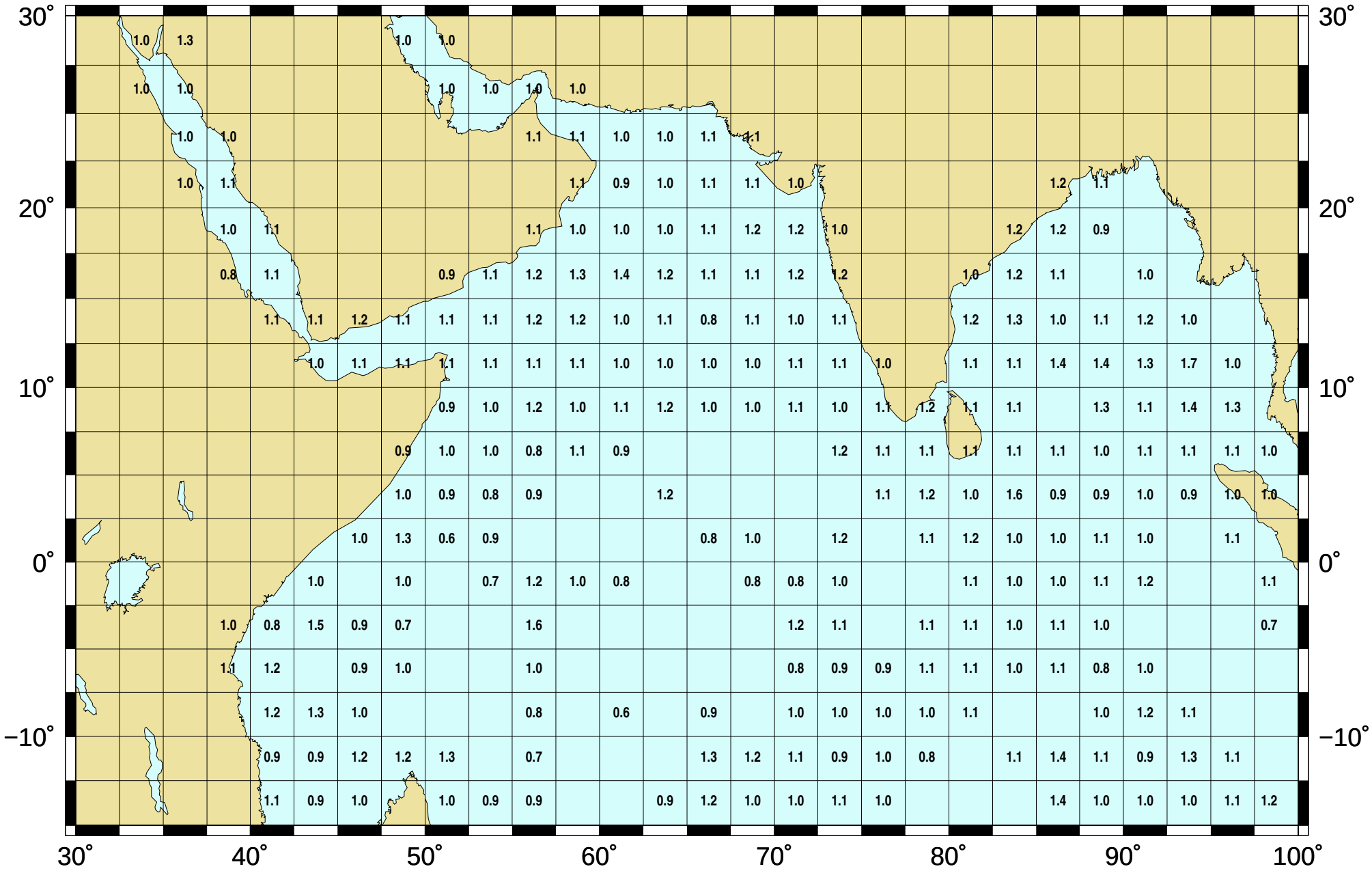


CHART No.11.2

MEAN WAVE HEIGHT(m)

FEBRUARY

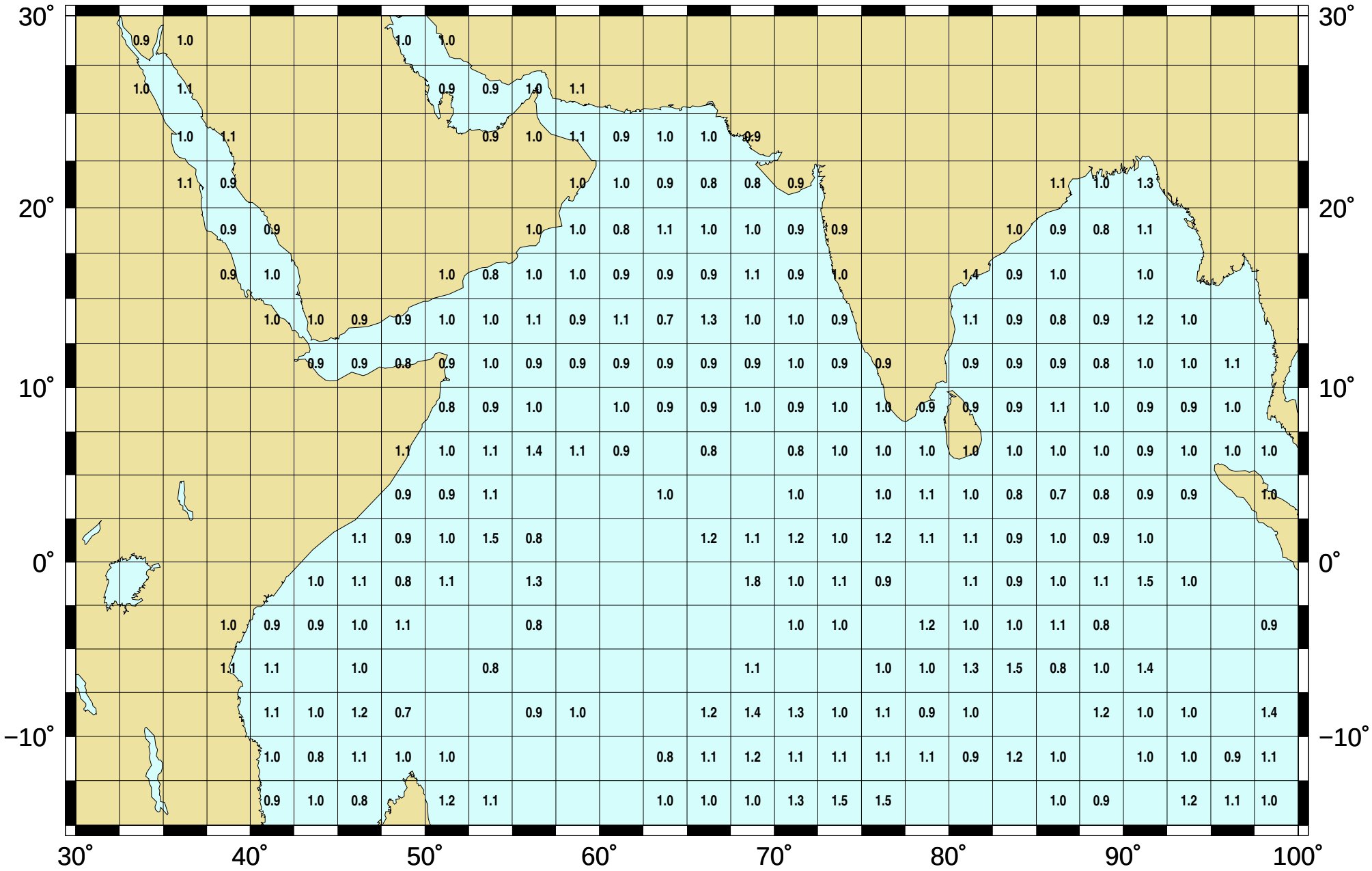


CHART No.11.3

MEAN WAVE HEIGHT(m)

MARCH

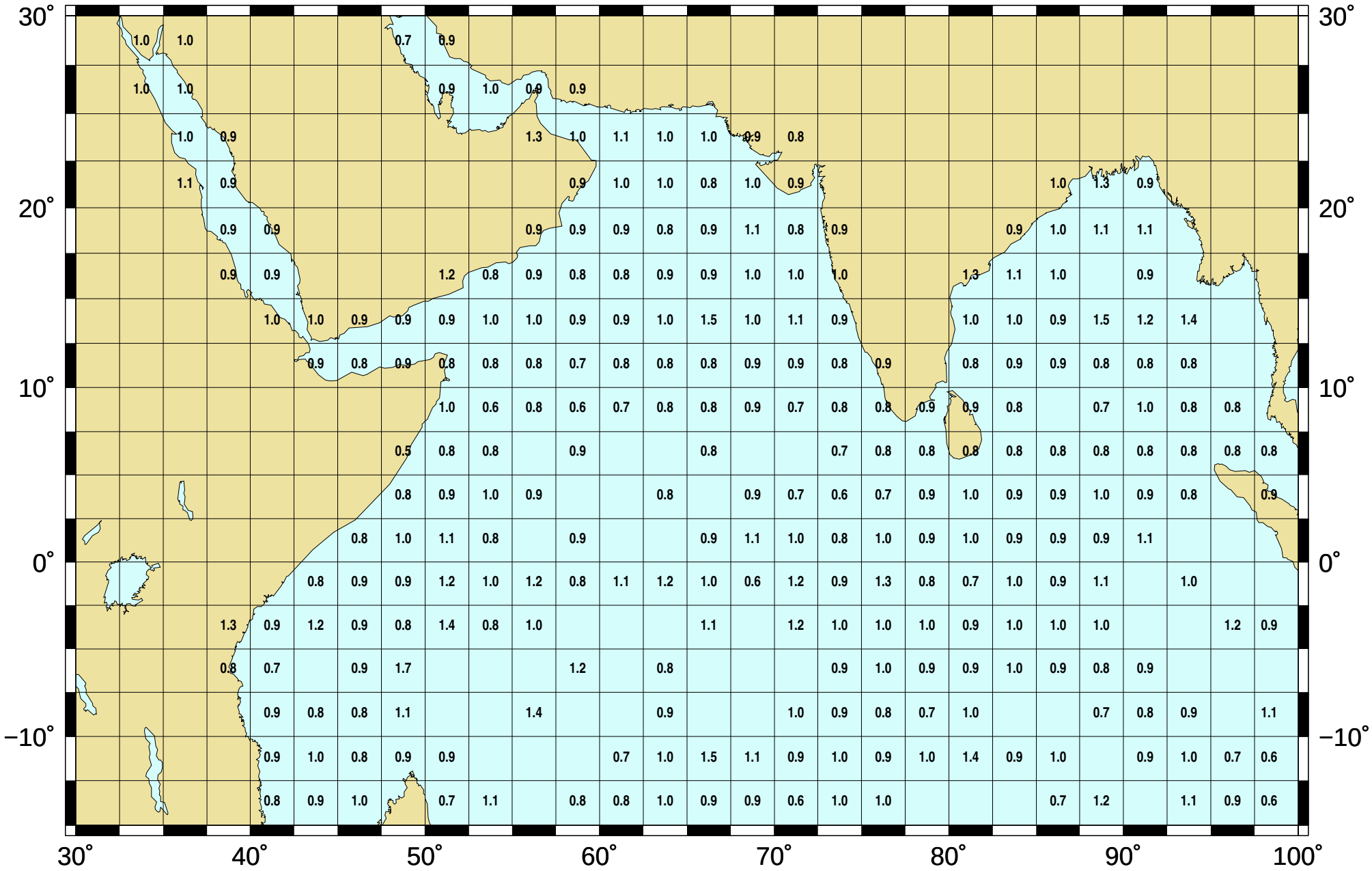


CHART No.11.4 MEAN WAVE HEIGHT(m) APRIL

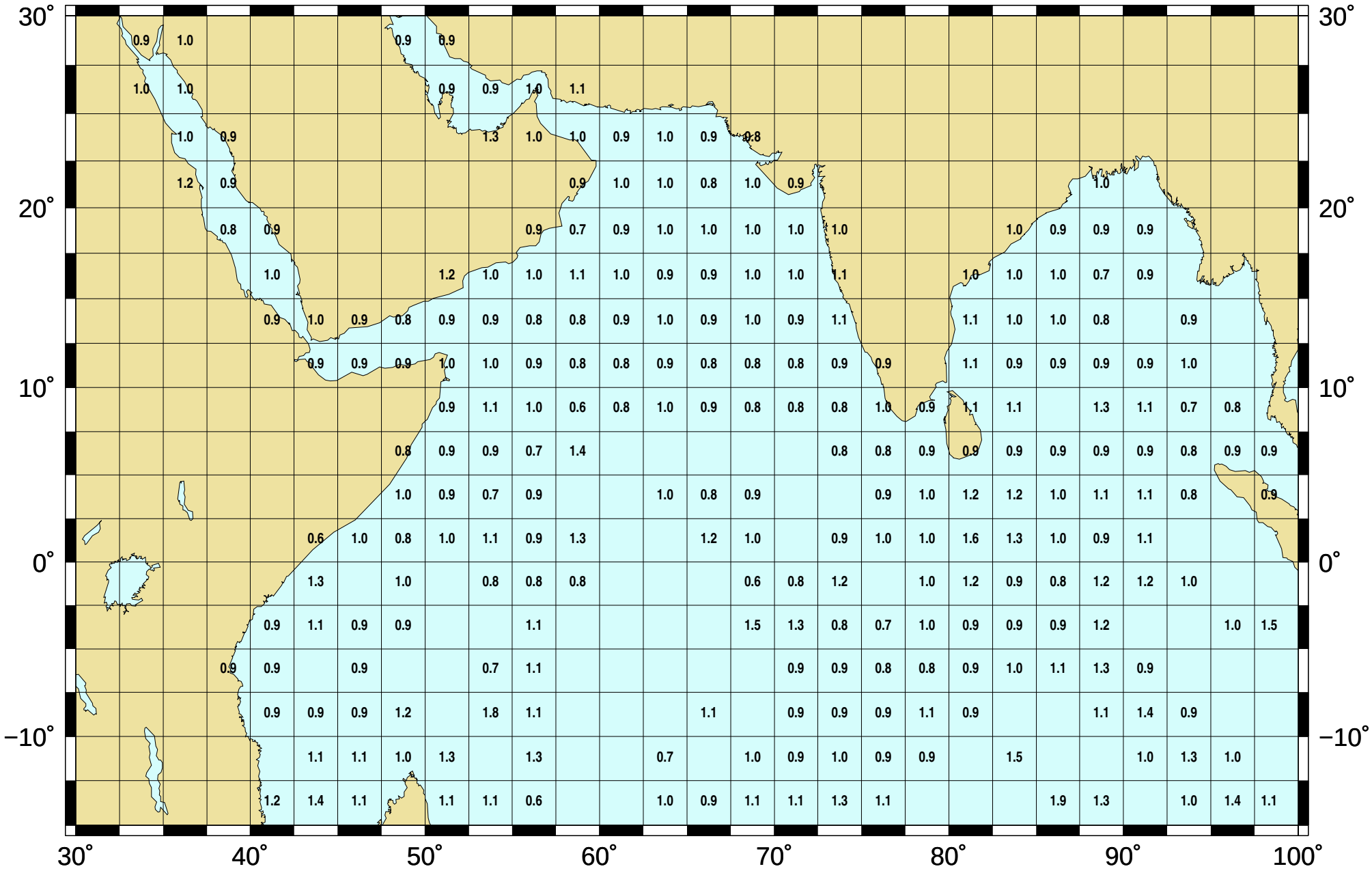


CHART No.11.5

MEAN WAVE HEIGHT(m)

MAY

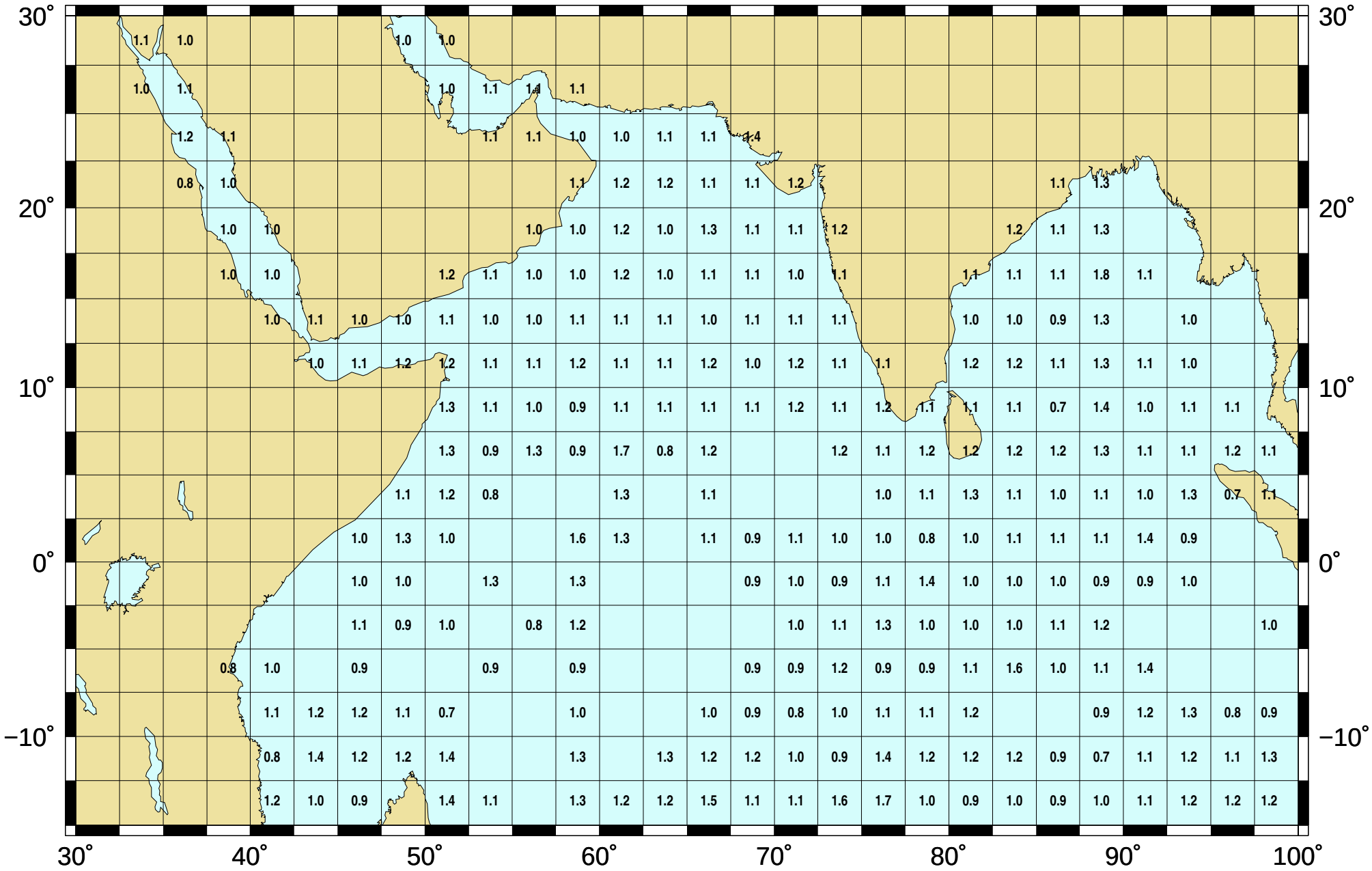


CHART No.11.6

MEAN WAVE HEIGHT(m)

JUNE

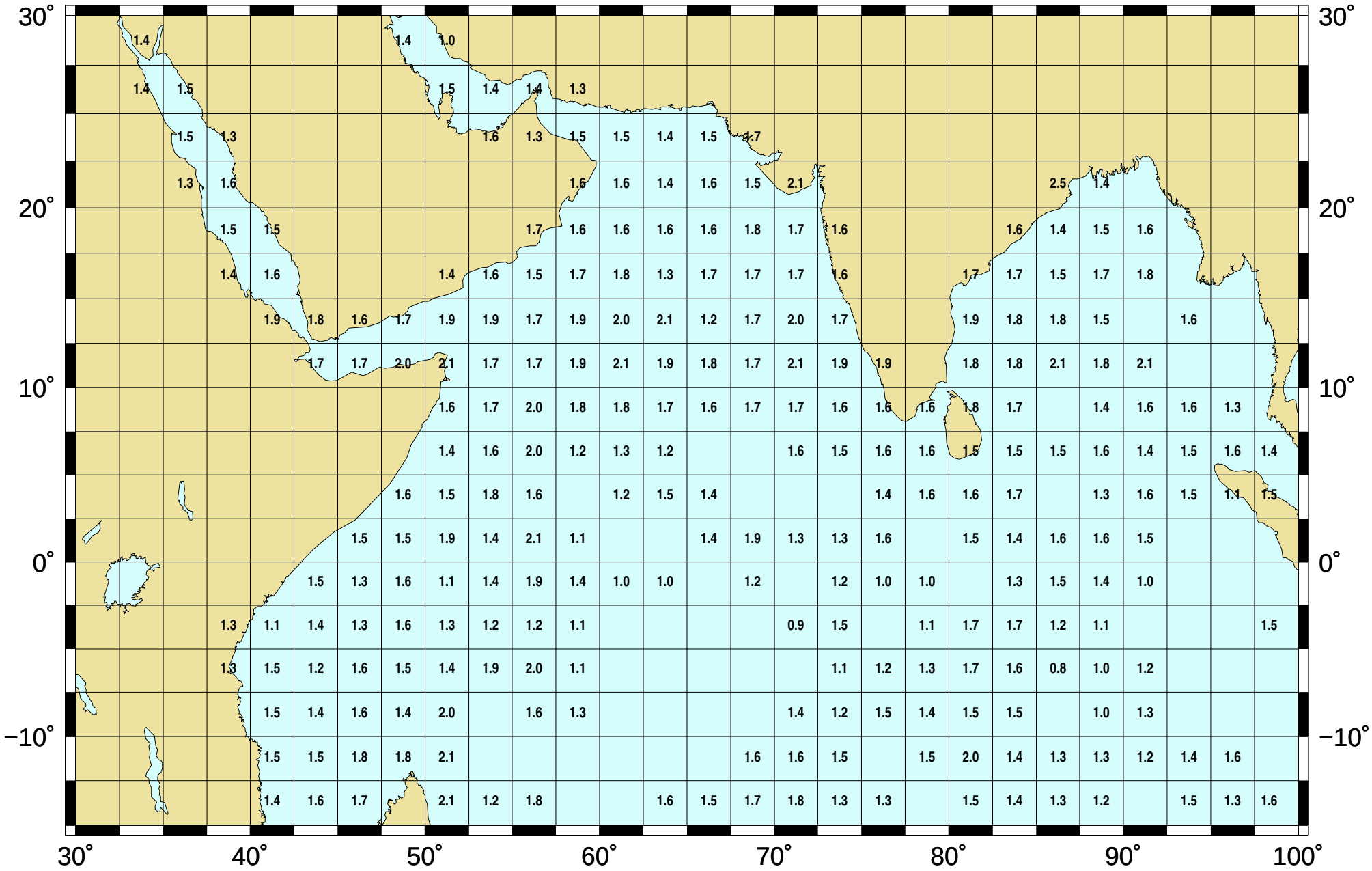


CHART No.11.7 *MEAN WAVE HEIGHT(m)* *JULY*

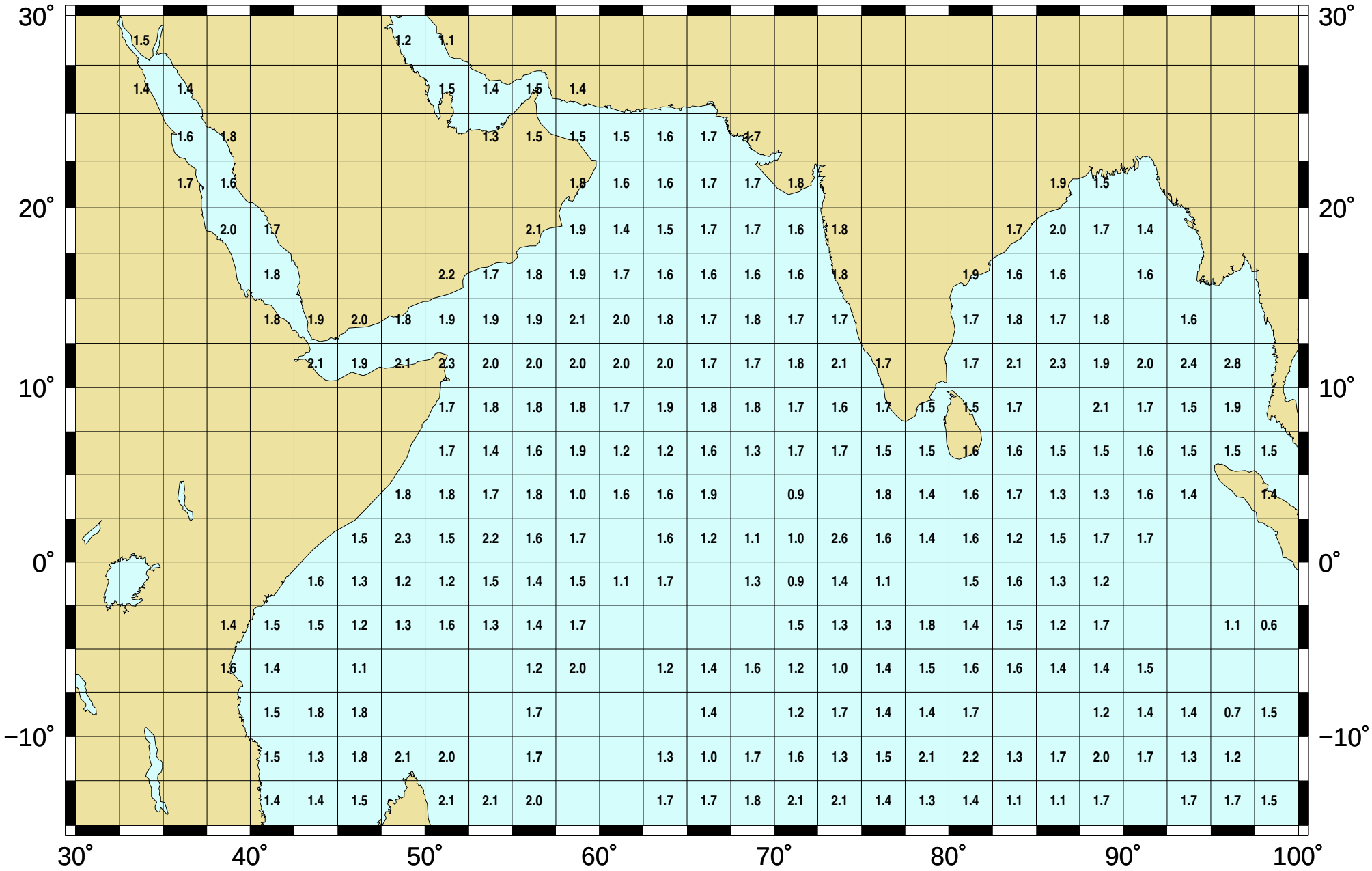


CHART No.11.8

MEAN WAVE HEIGHT(m)

AUGUST

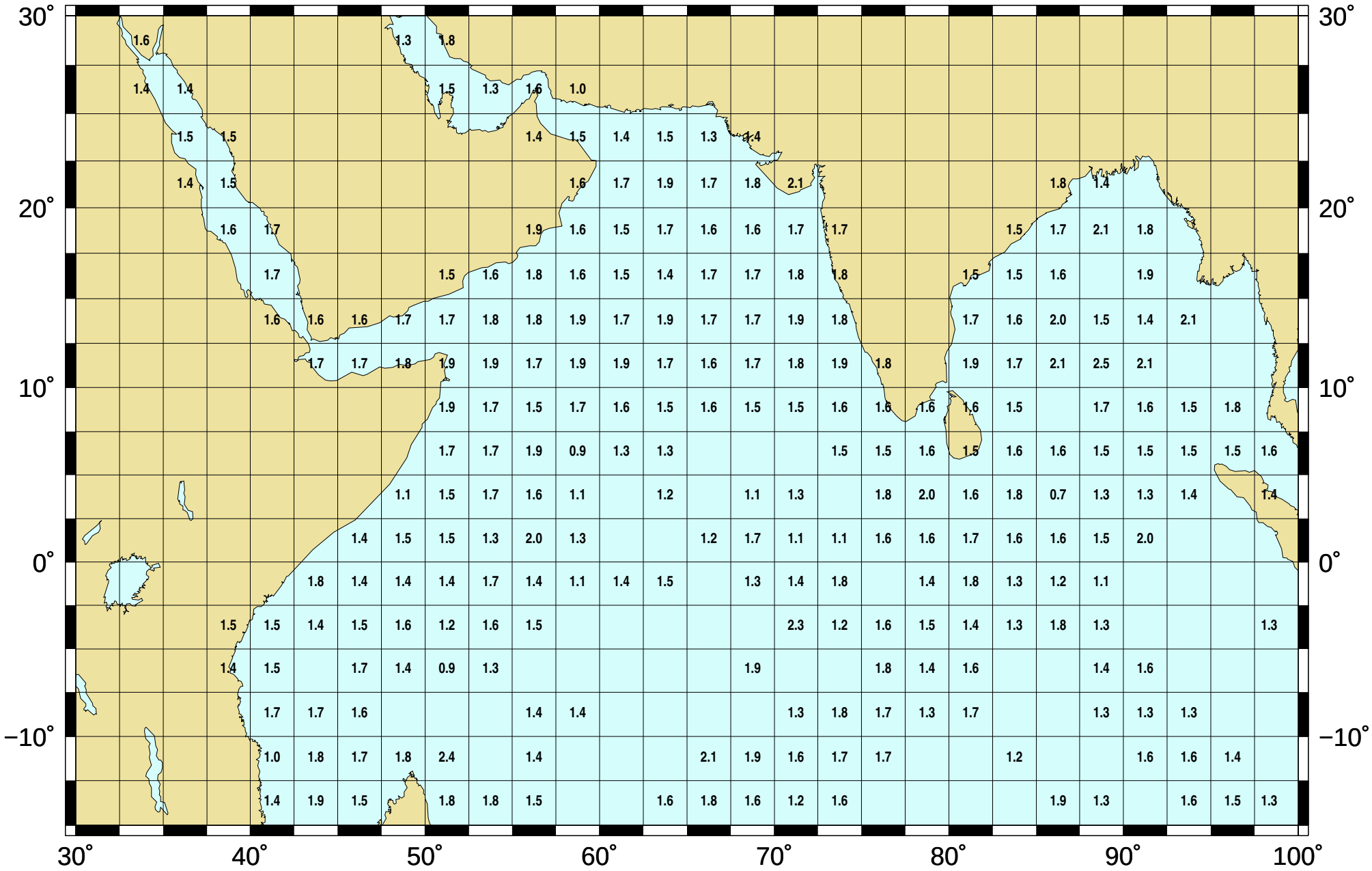


CHART No.11.9 **MEAN WAVE HEIGHT(m)** **SEPTEMBER**

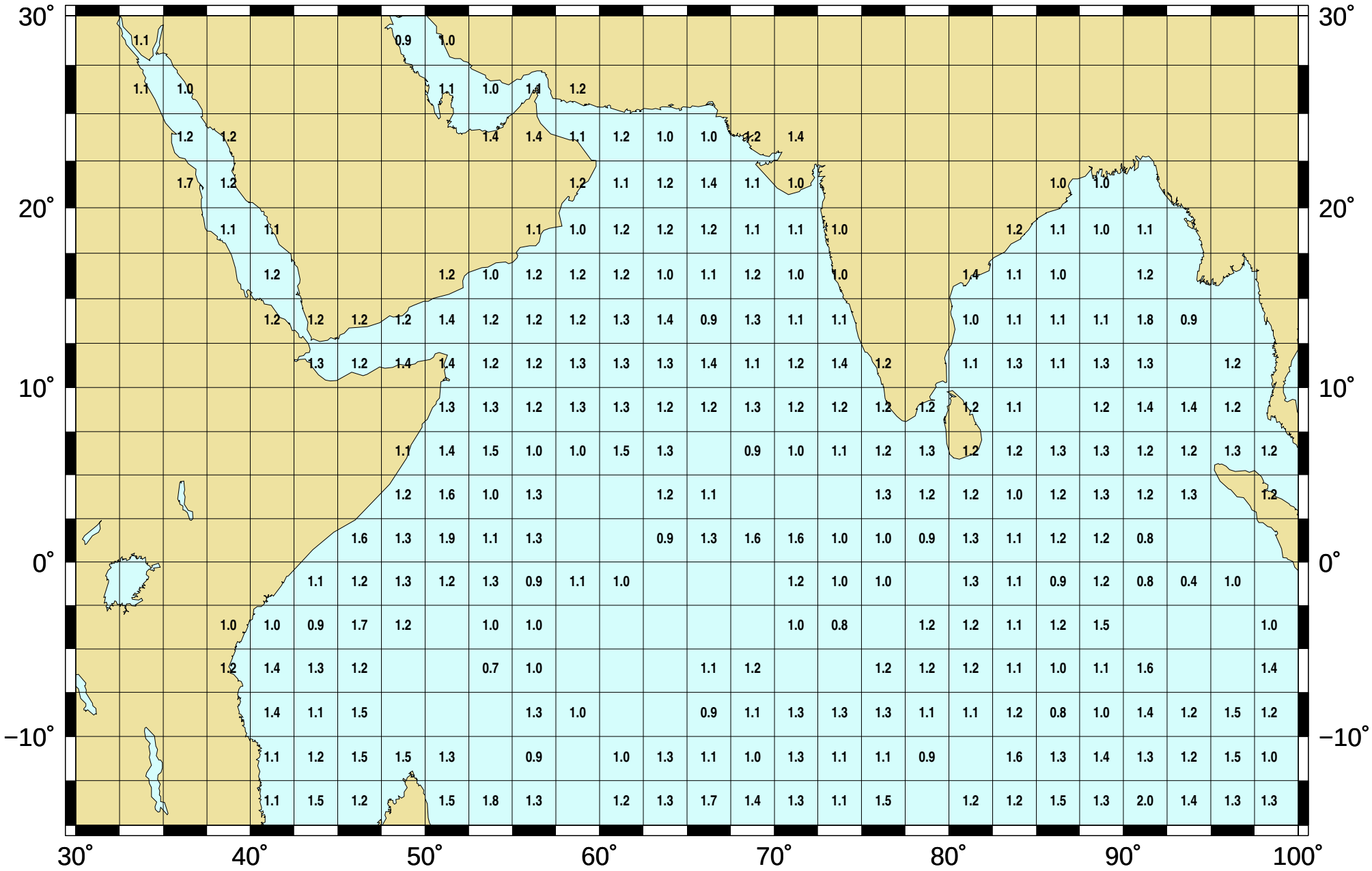


CHART No.11.10 **MEAN WAVE HEIGHT(m)** **OCTOBER**

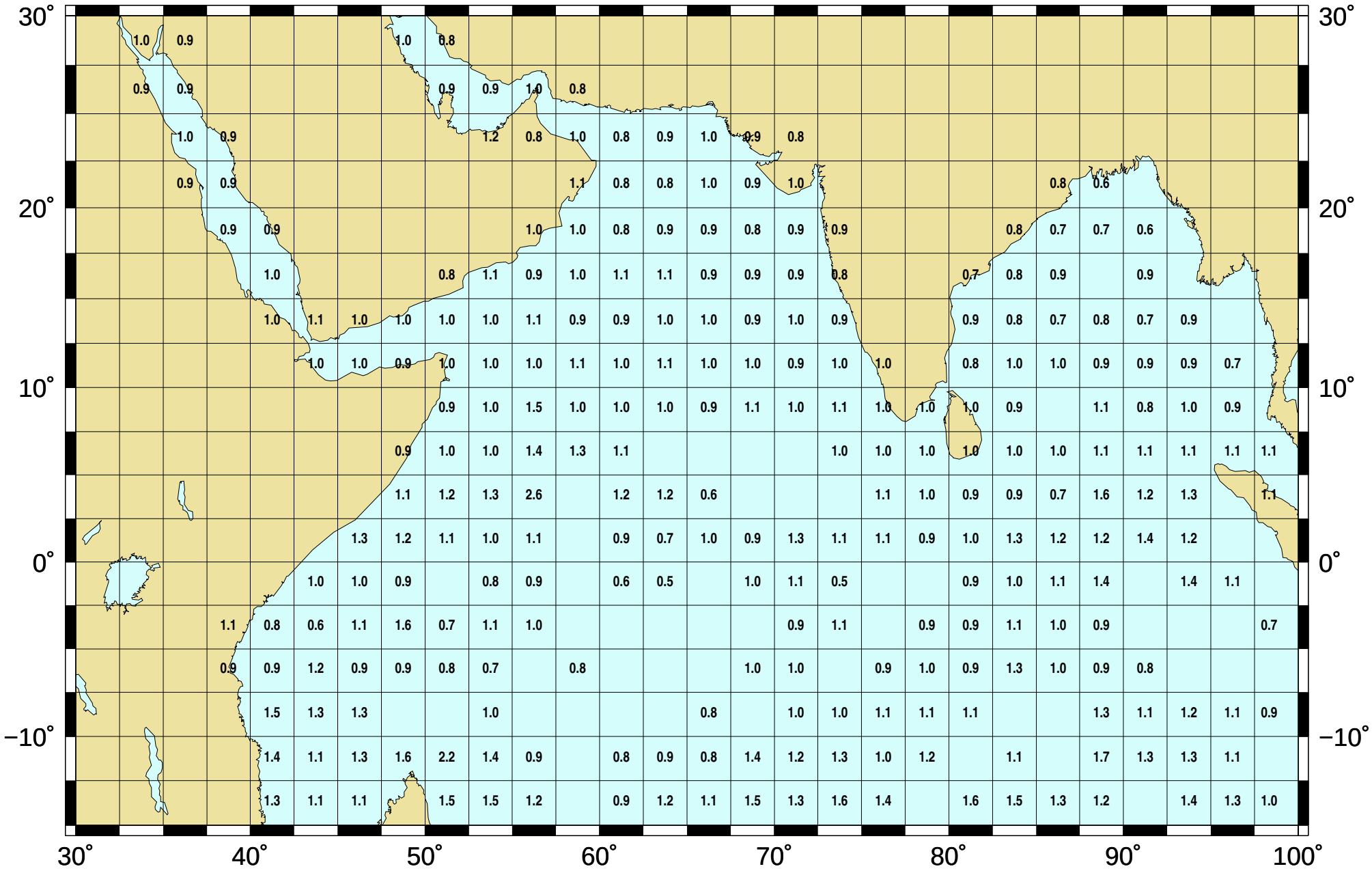


CHART No.11.11 **MEAN WAVE HEIGHT(m)** **NOVEMBER**

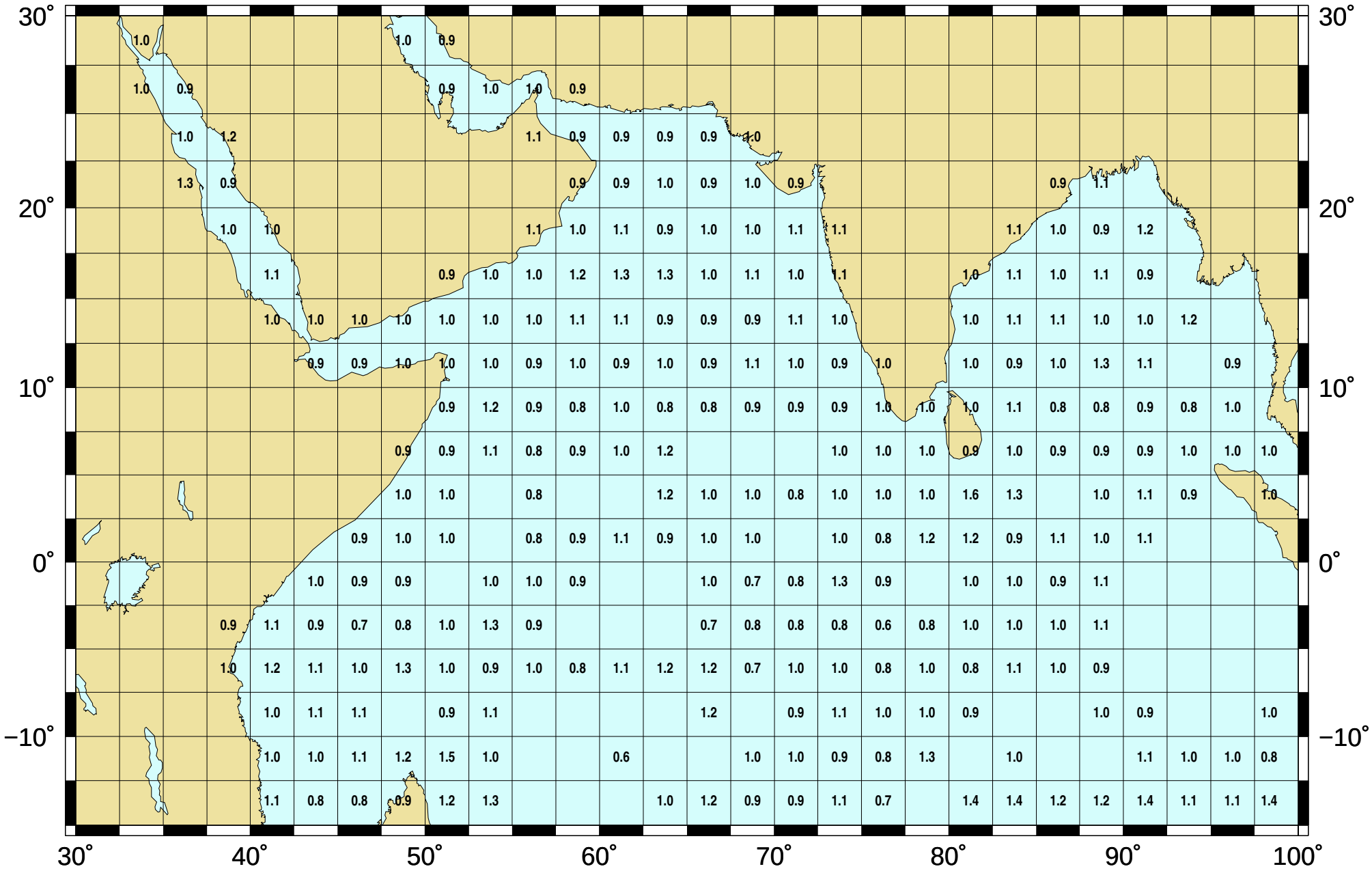


CHART No.11.12 **MEAN WAVE HEIGHT(m)** **DECEMBER**

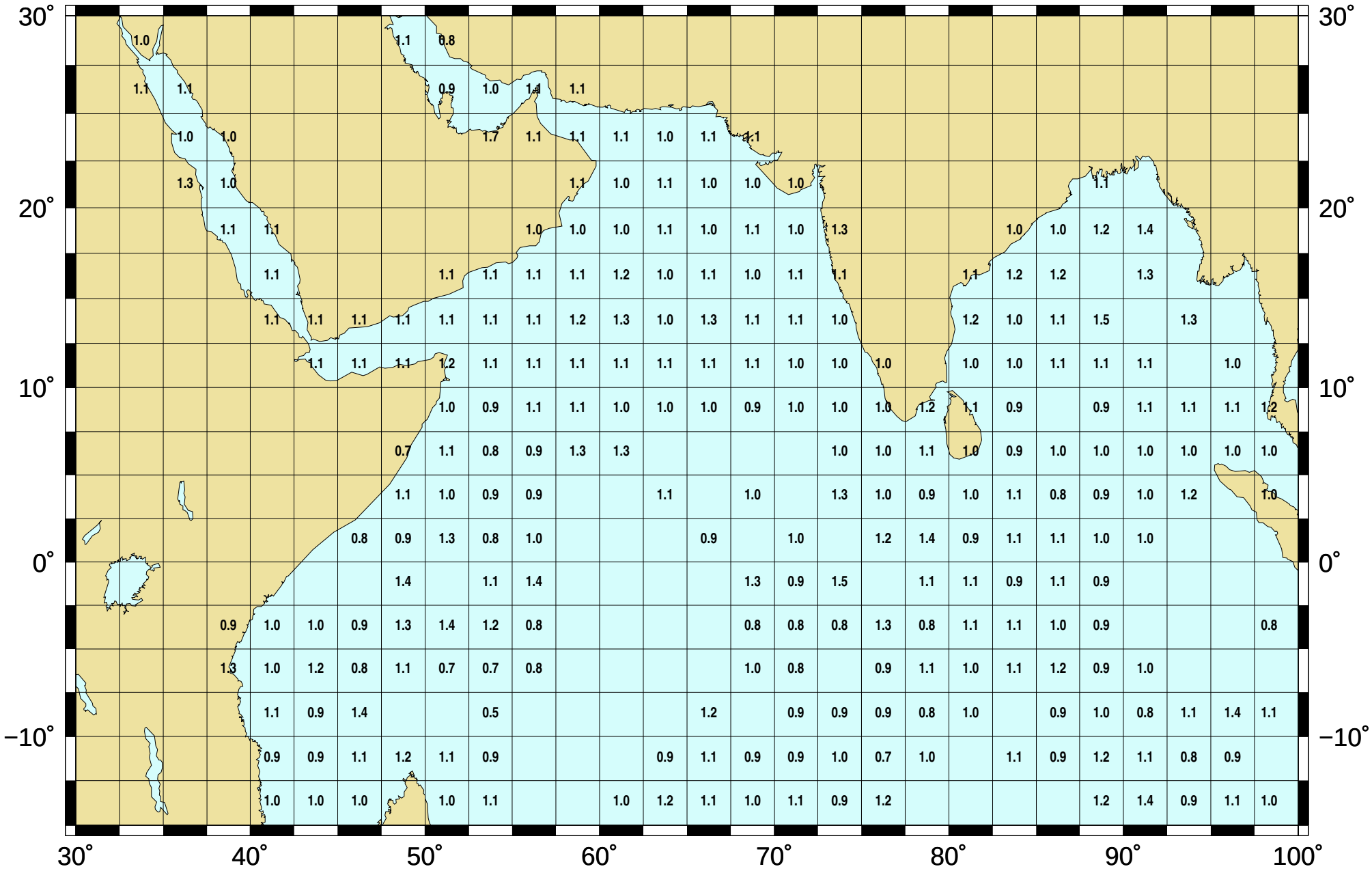


CHART No.12.1 **WAVE HEIGHT >4.0(%)** **JANUARY**

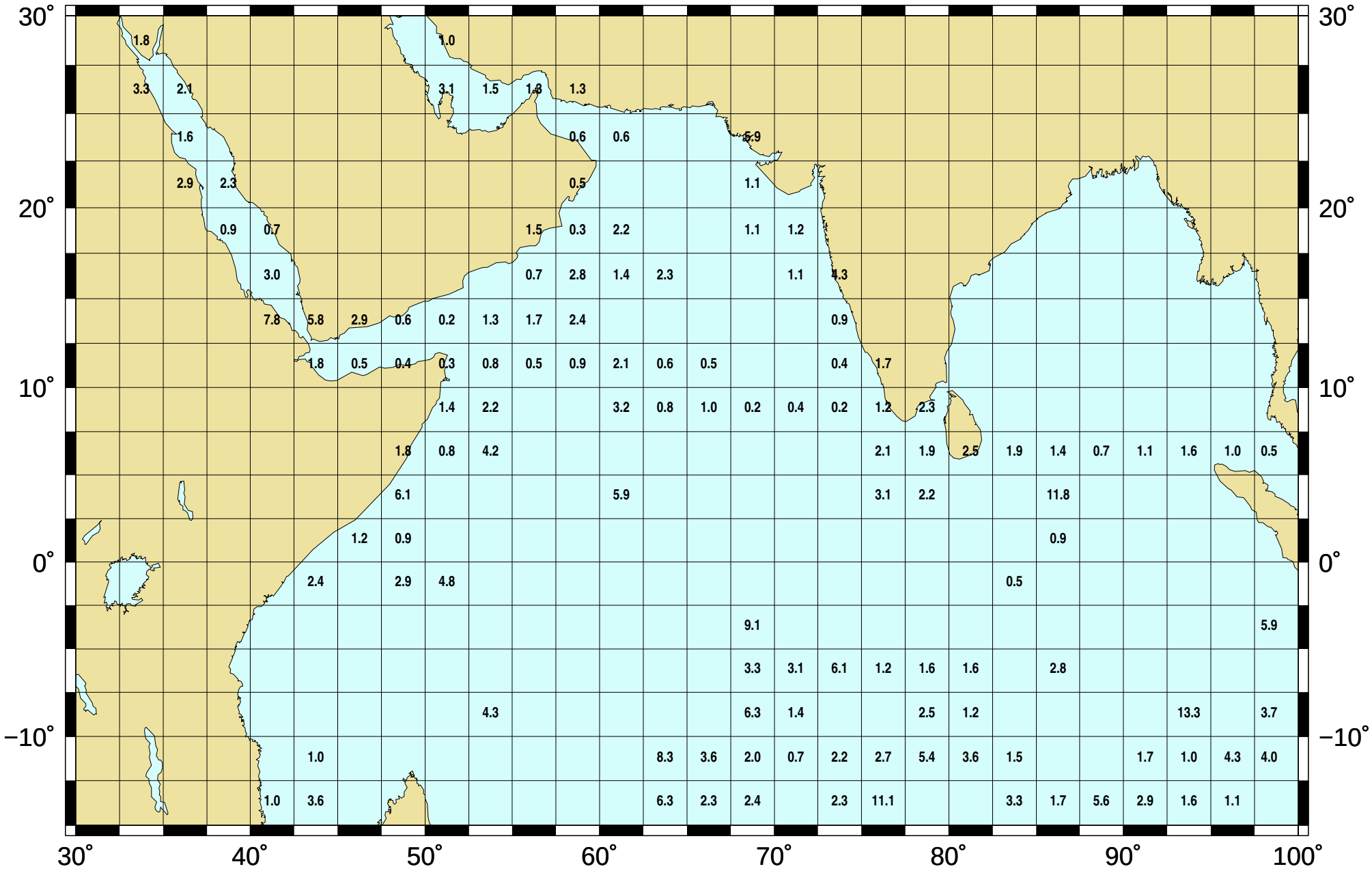


CHART No.12.2

WAVE HEIGHT >4.0(%)

FEBRUARY

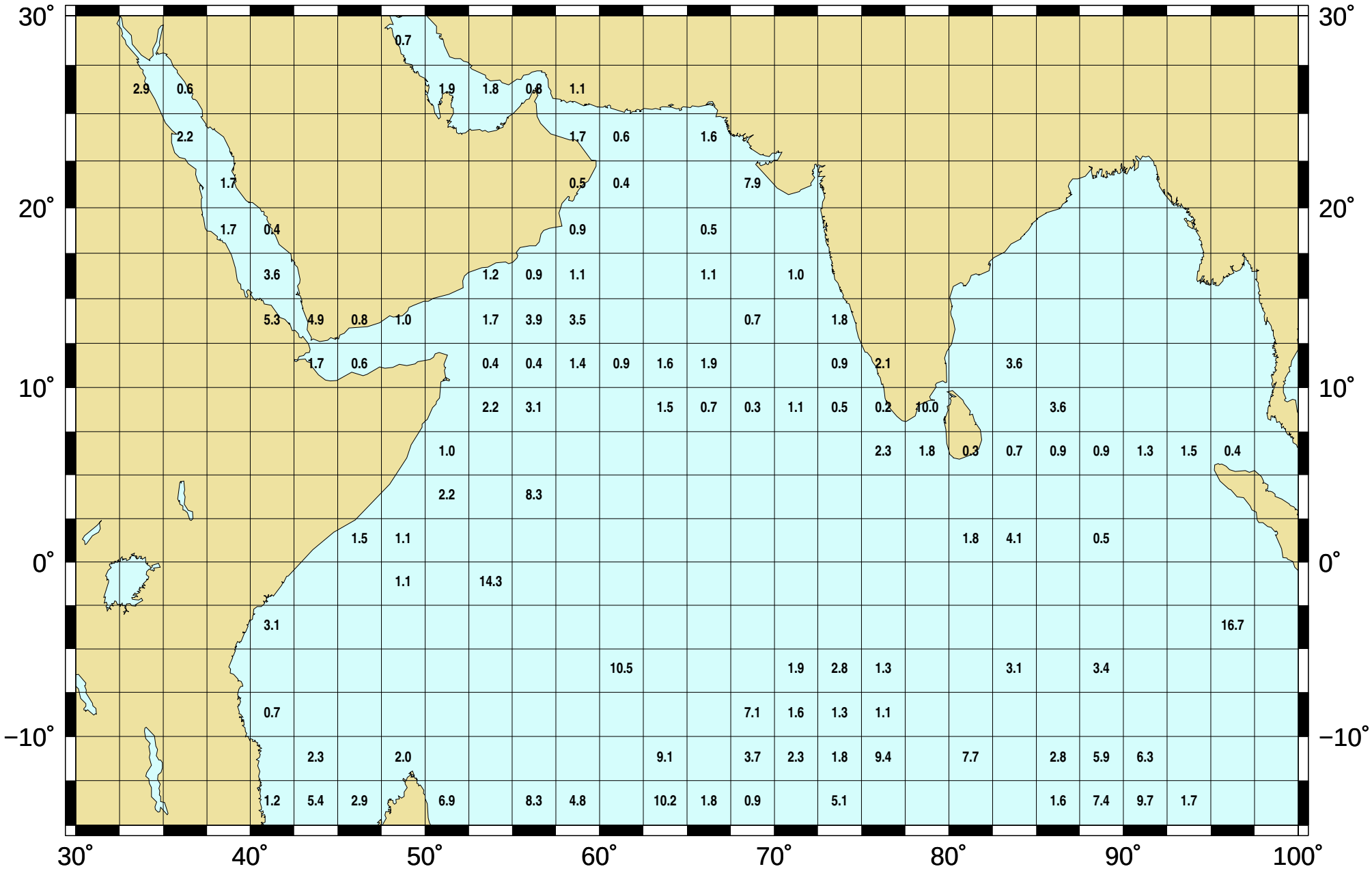


CHART No.12.3 **WAVE HEIGHT >4.0(%)** **MARCH**

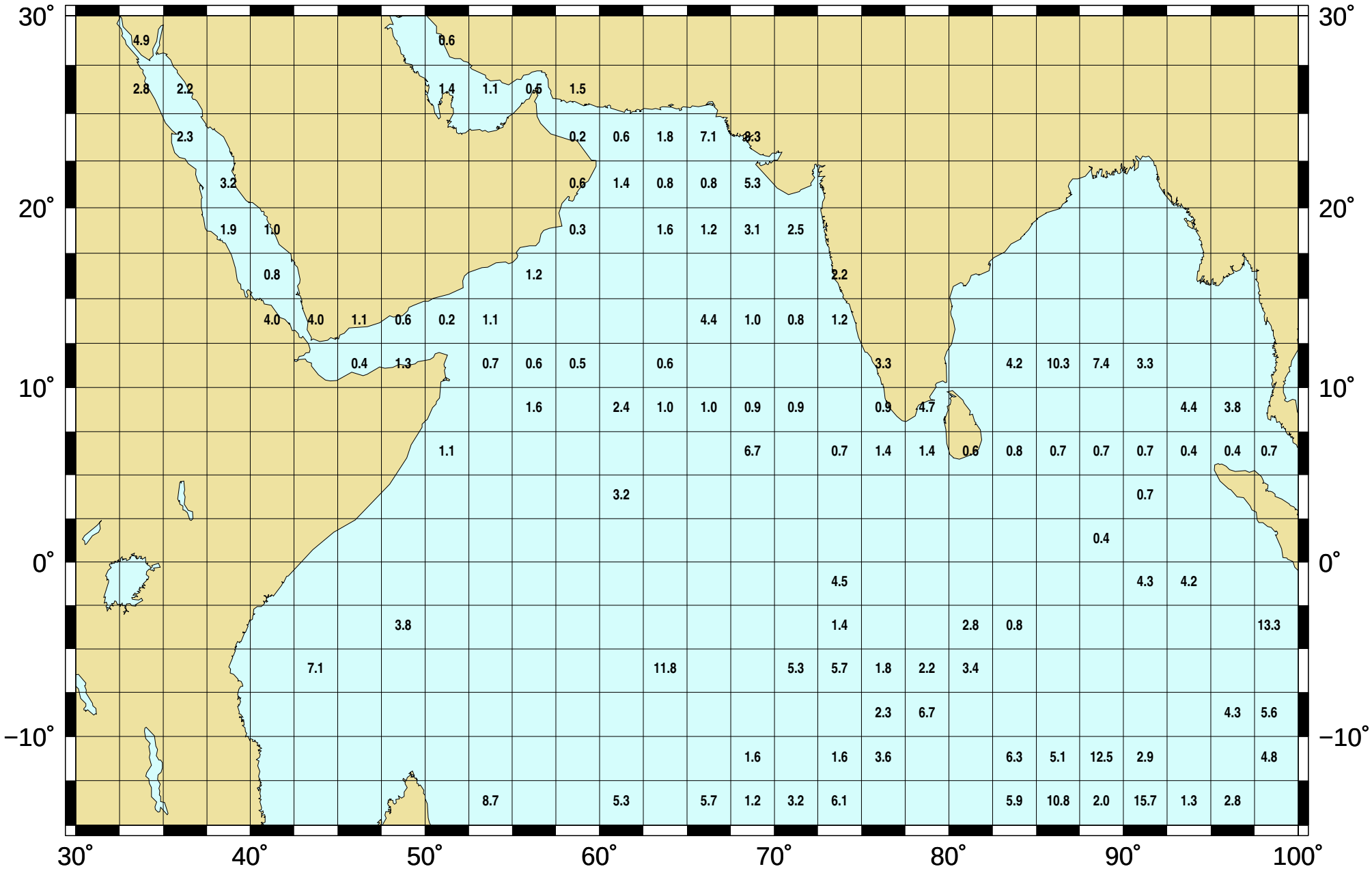


CHART No.12.4 WAVE HEIGHT >4.0(%) APRIL

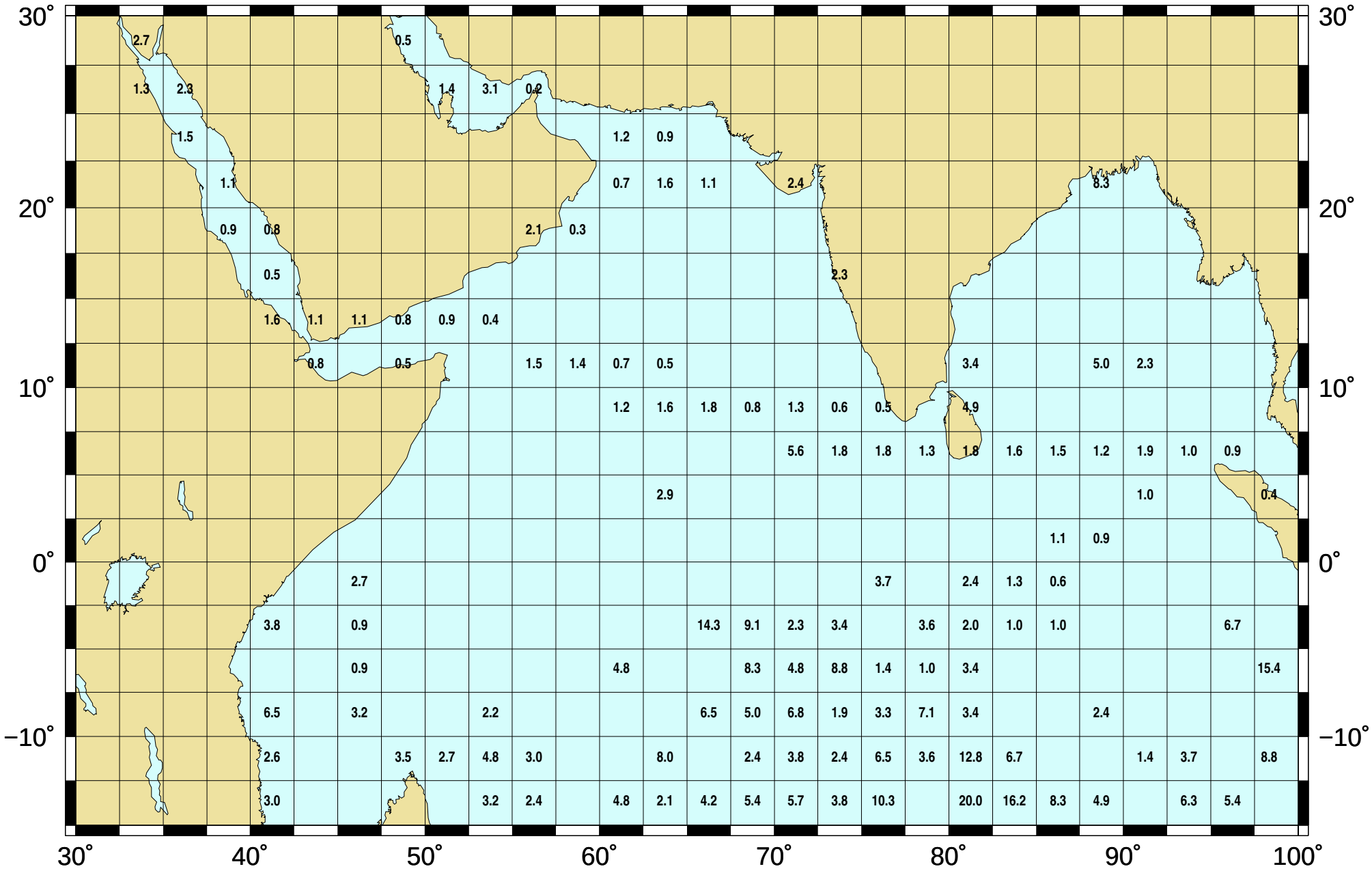


CHART No.12.5

WAVE HEIGHT >4.0(%)

MAY

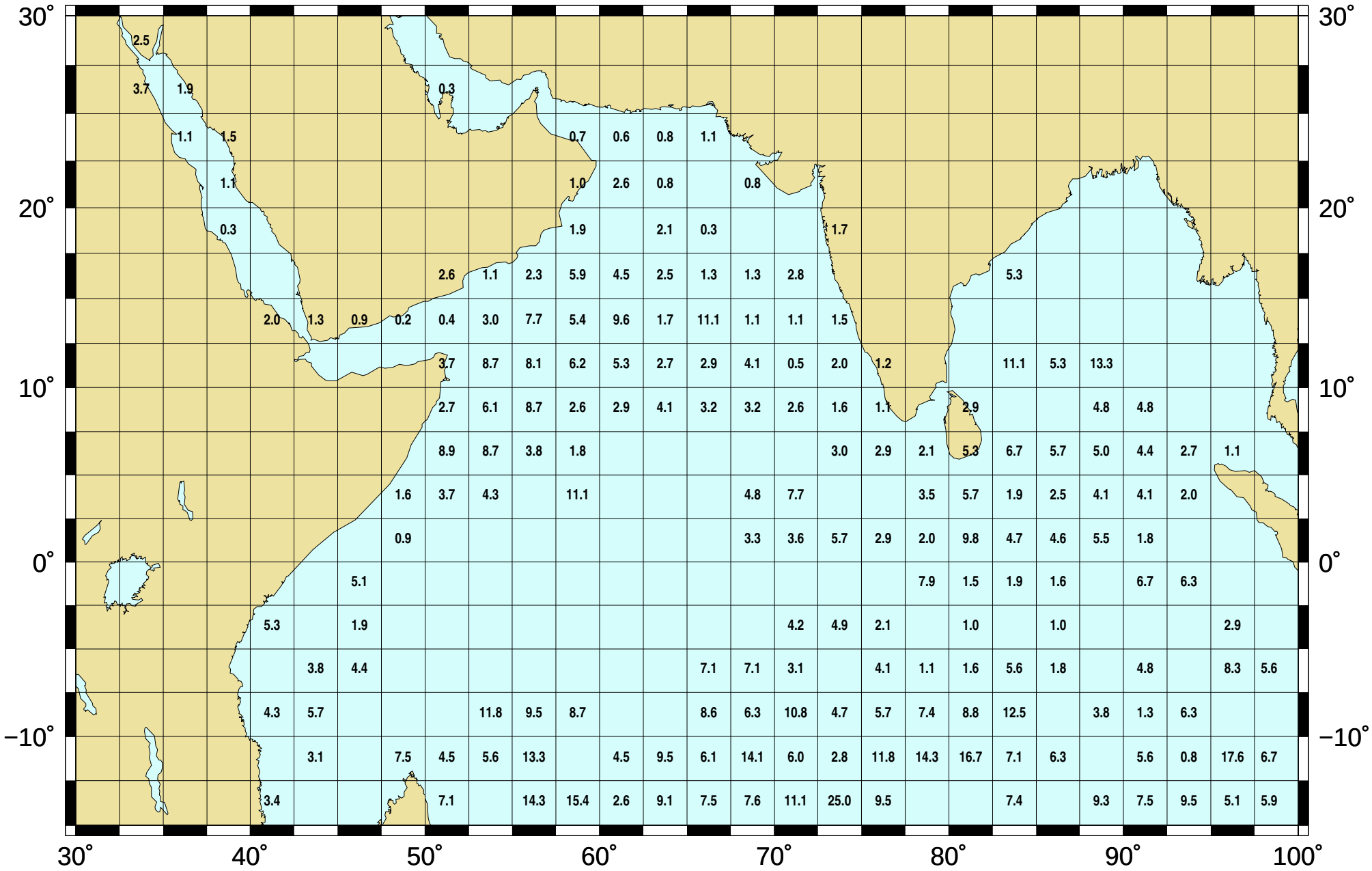


CHART No.12.6

WAVE HEIGHT >4.0(%)

JUNE

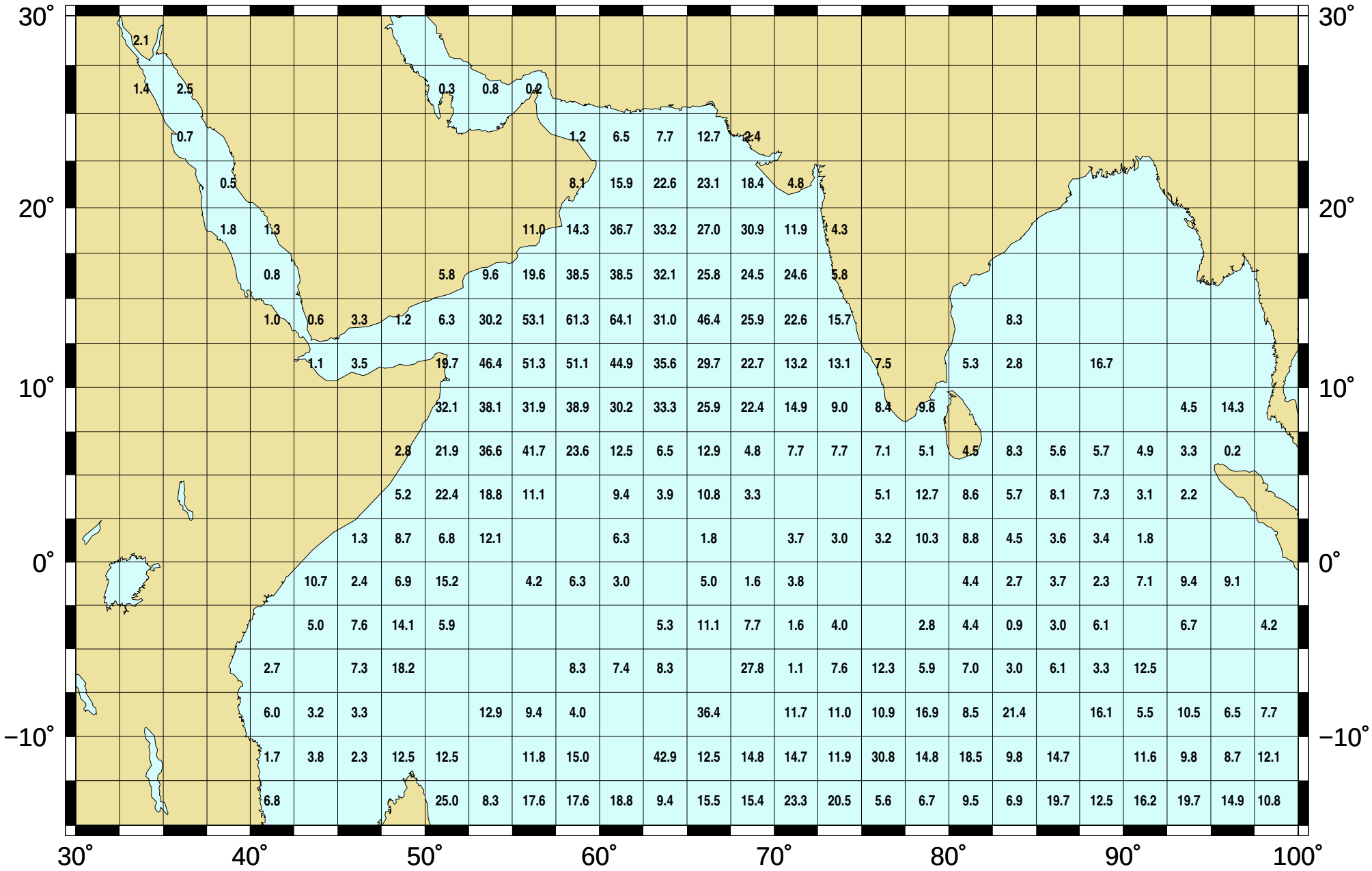


CHART No.12.7 WAVE HEIGHT >4.0(%) JULY

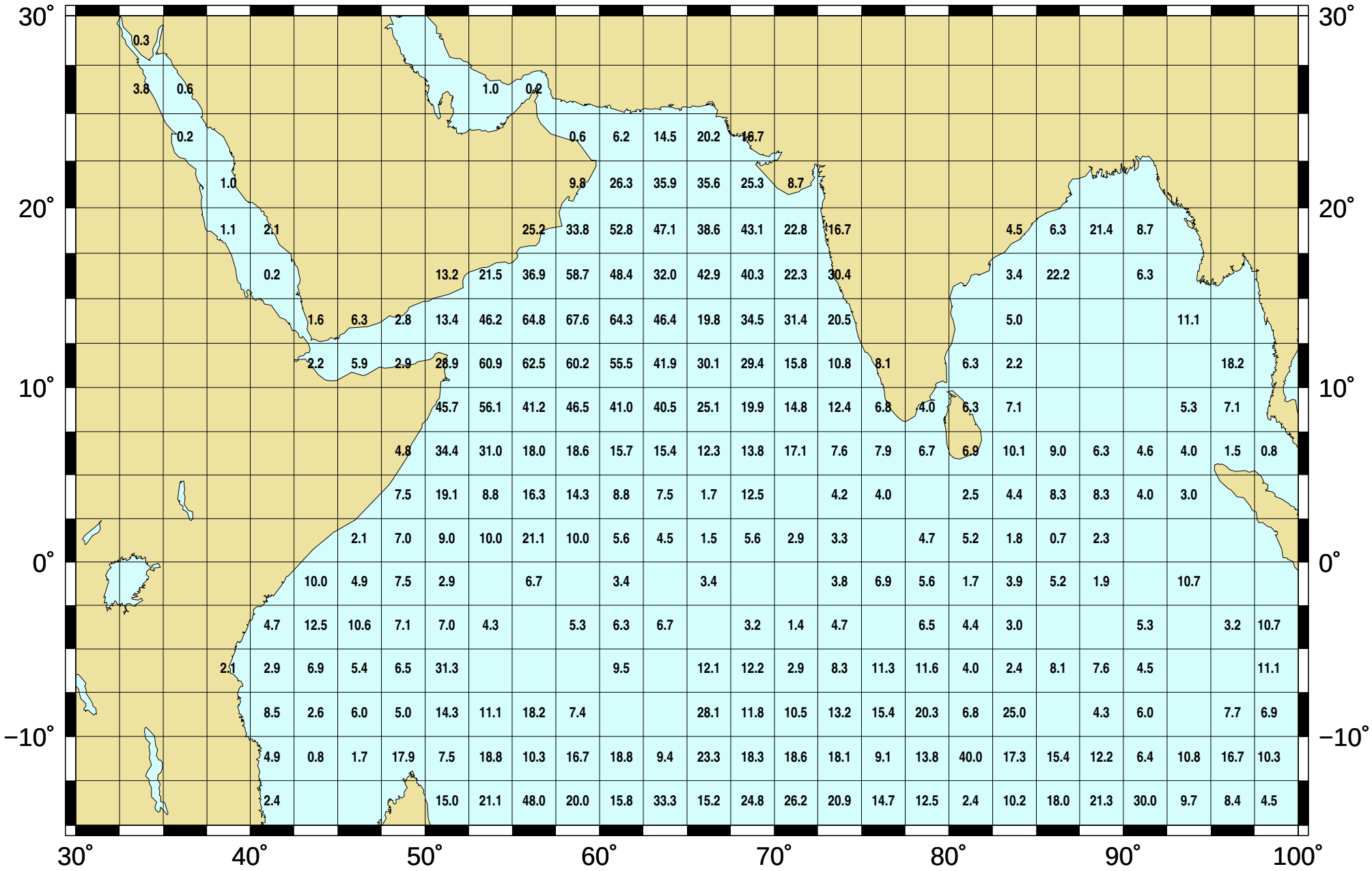


CHART No.12.8 **WAVE HEIGHT >4.0(%)** **AUGUST**

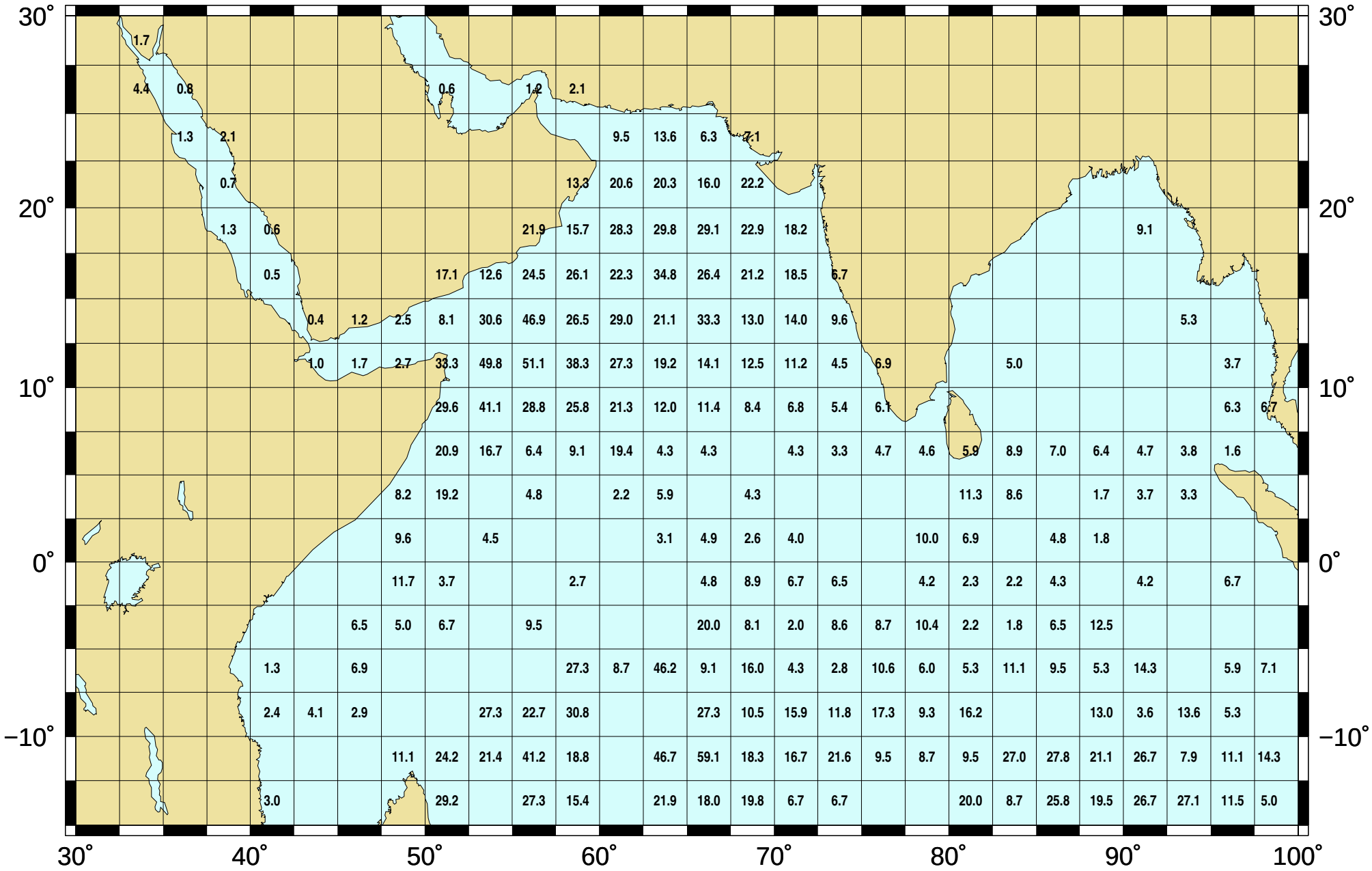


CHART No.12.9 WAVE HEIGHT >4.0(%) SEPTEMBER

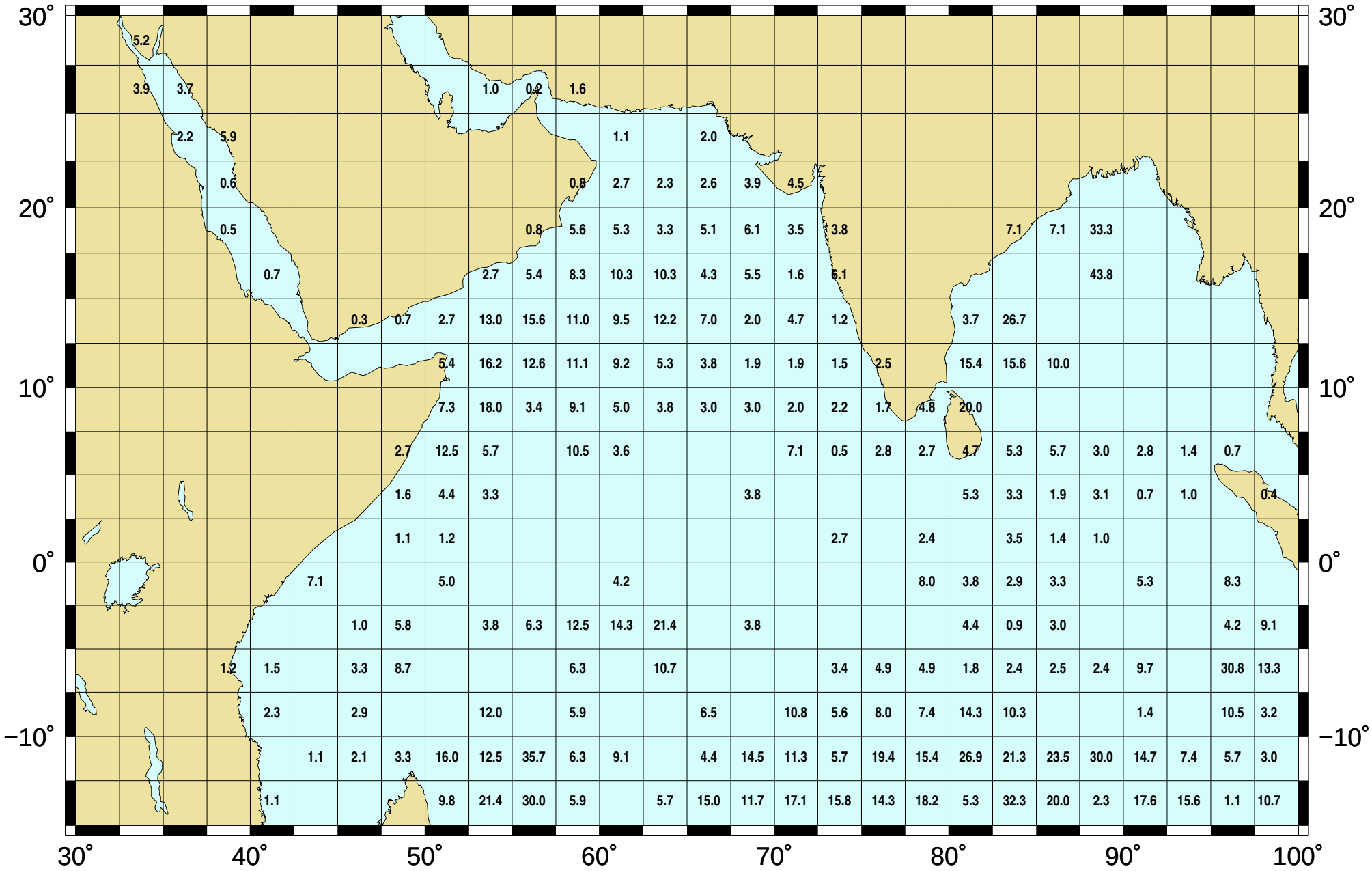


CHART No.12.10 **WAVE HEIGHT >4.0(%)** **OCTOBER**

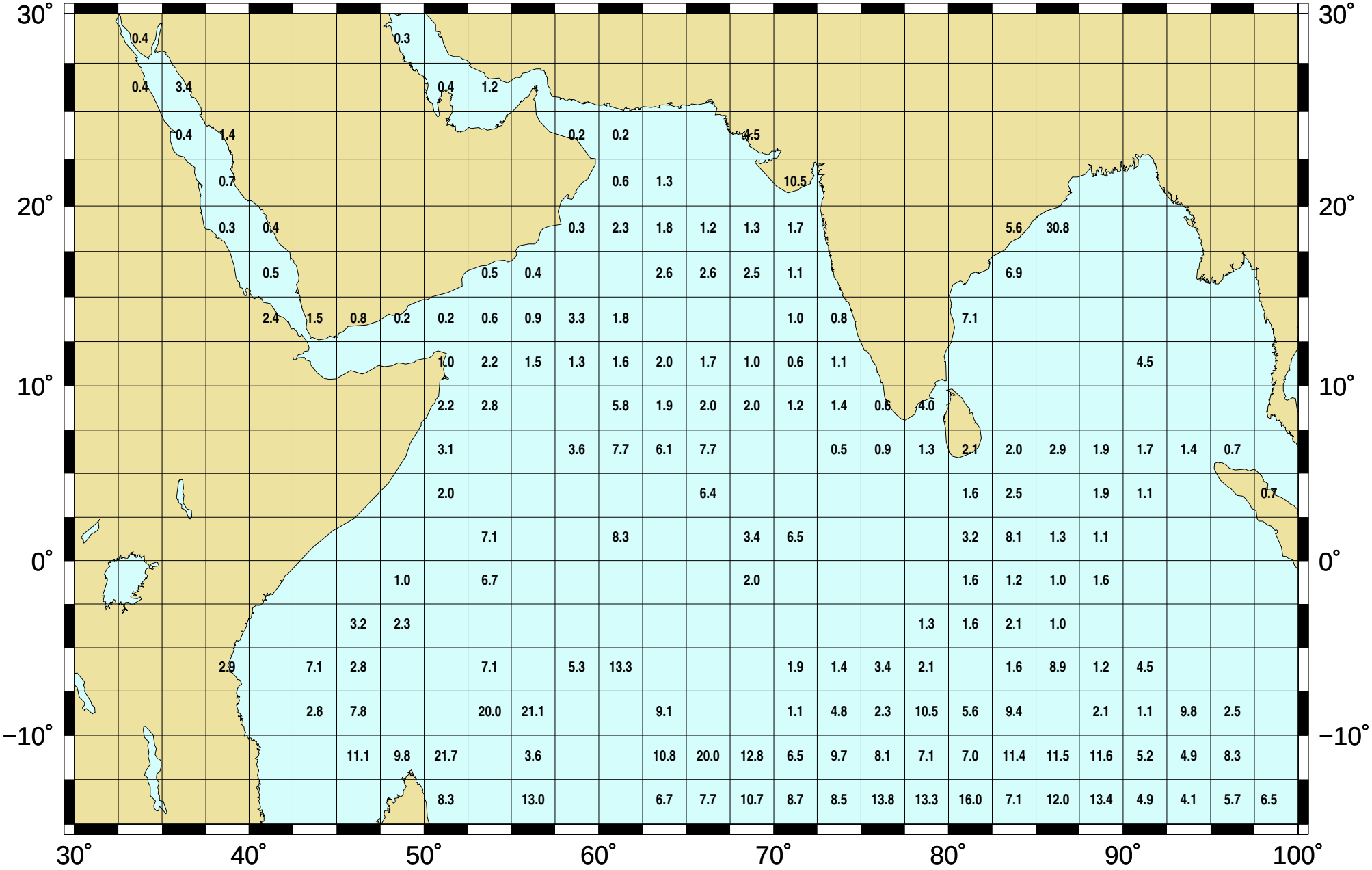


CHART No.12.11

WAVE HEIGHT >4.0(%)

NOVEMBER

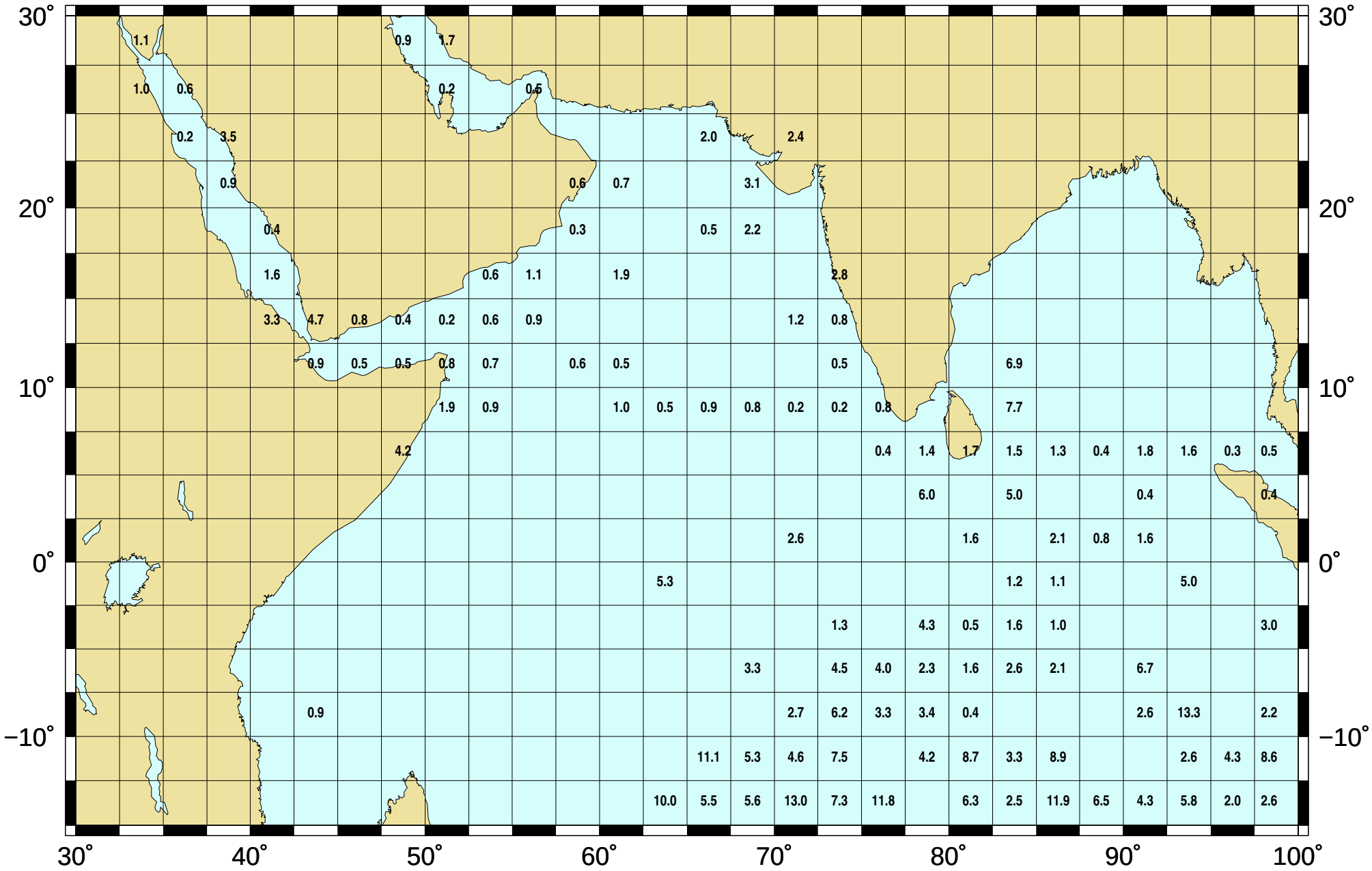


CHART No.12.12

WAVE HEIGHT >4.0(%)

DECEMBER

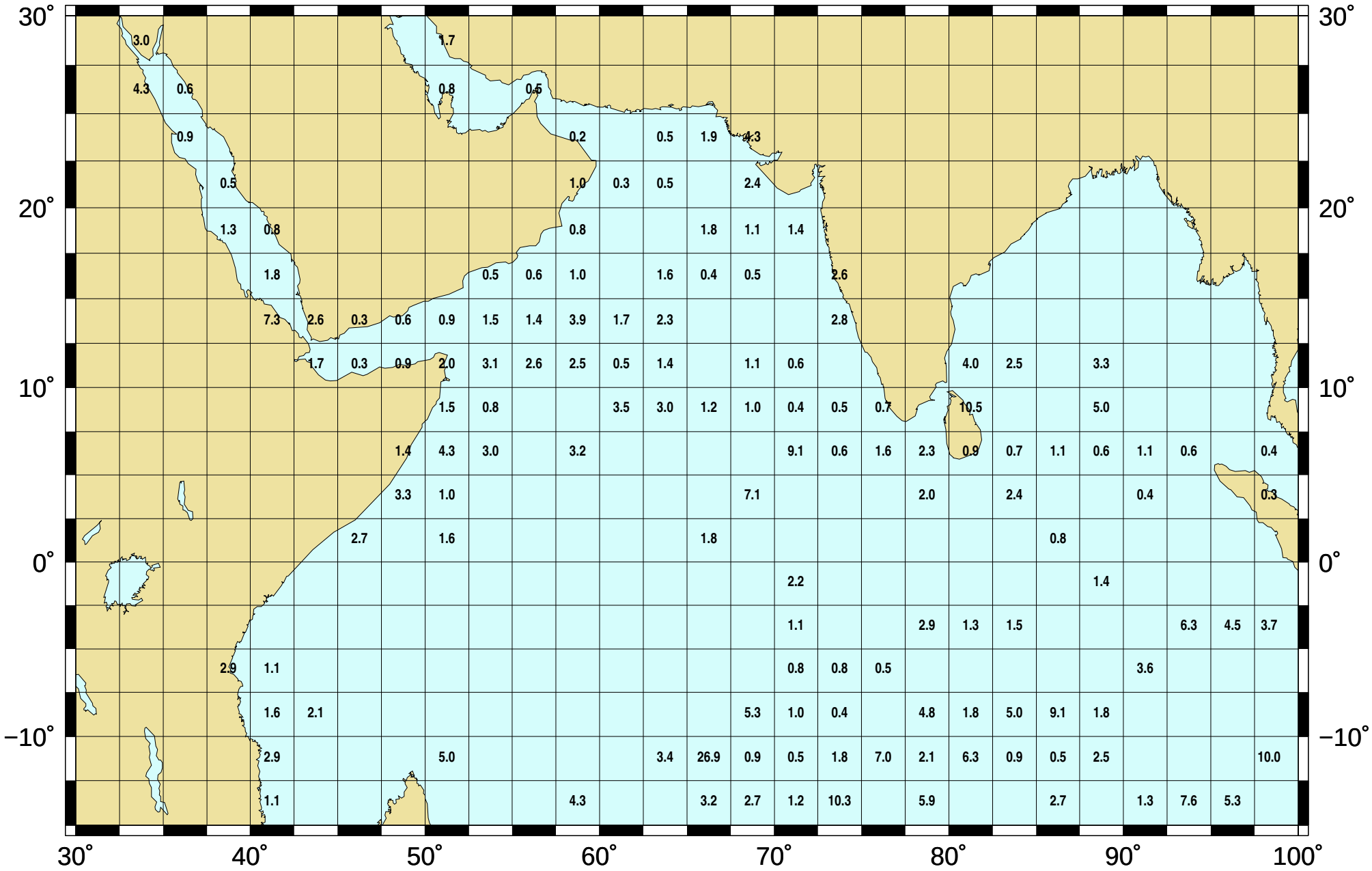


CHART No.13.1 **MAXIMUM WAVE HEIGHT(m)** **JANUARY**

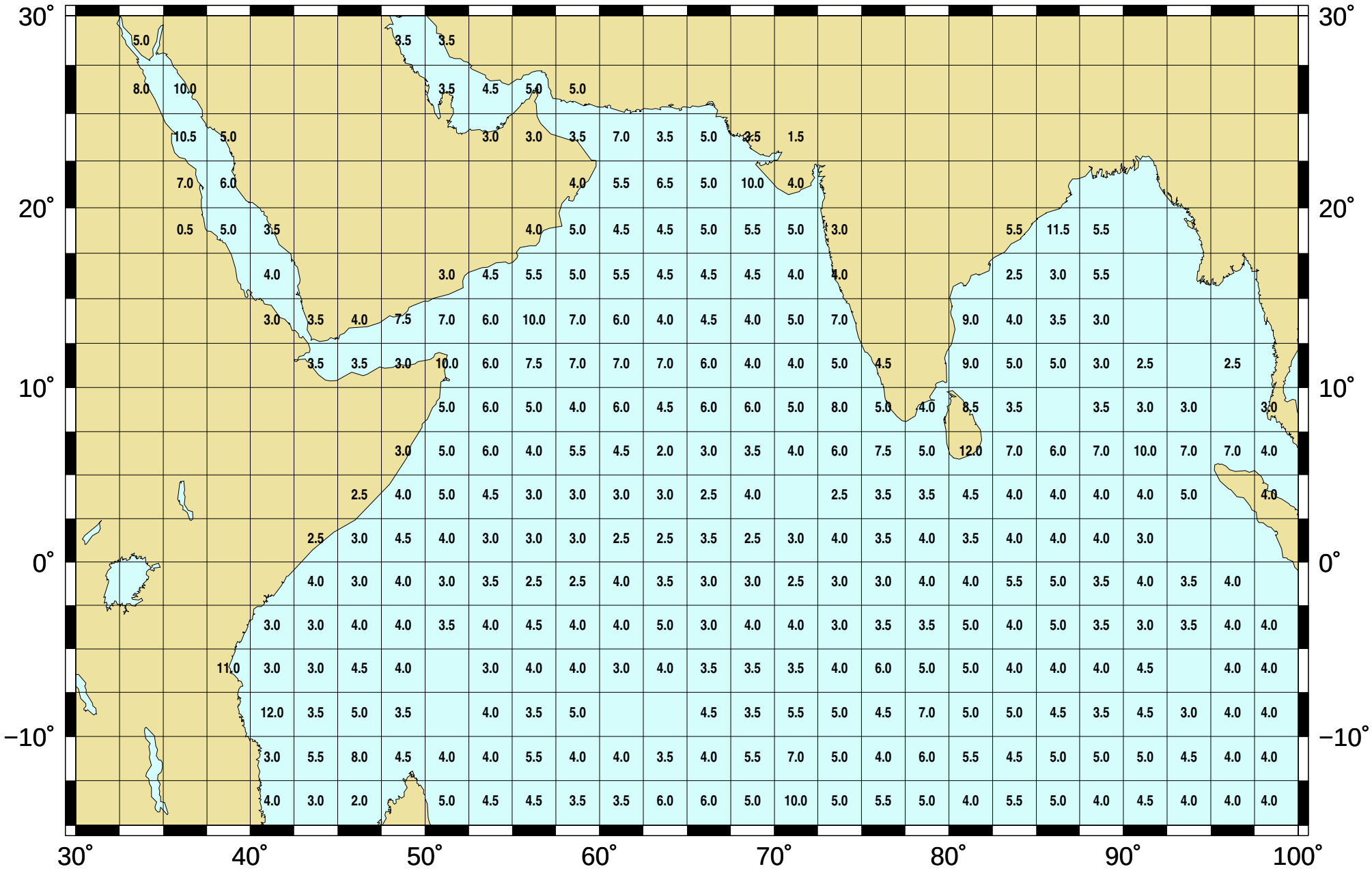


CHART No.13.2 MAXIMUM WAVE HEIGHT(m) FEBRUARY

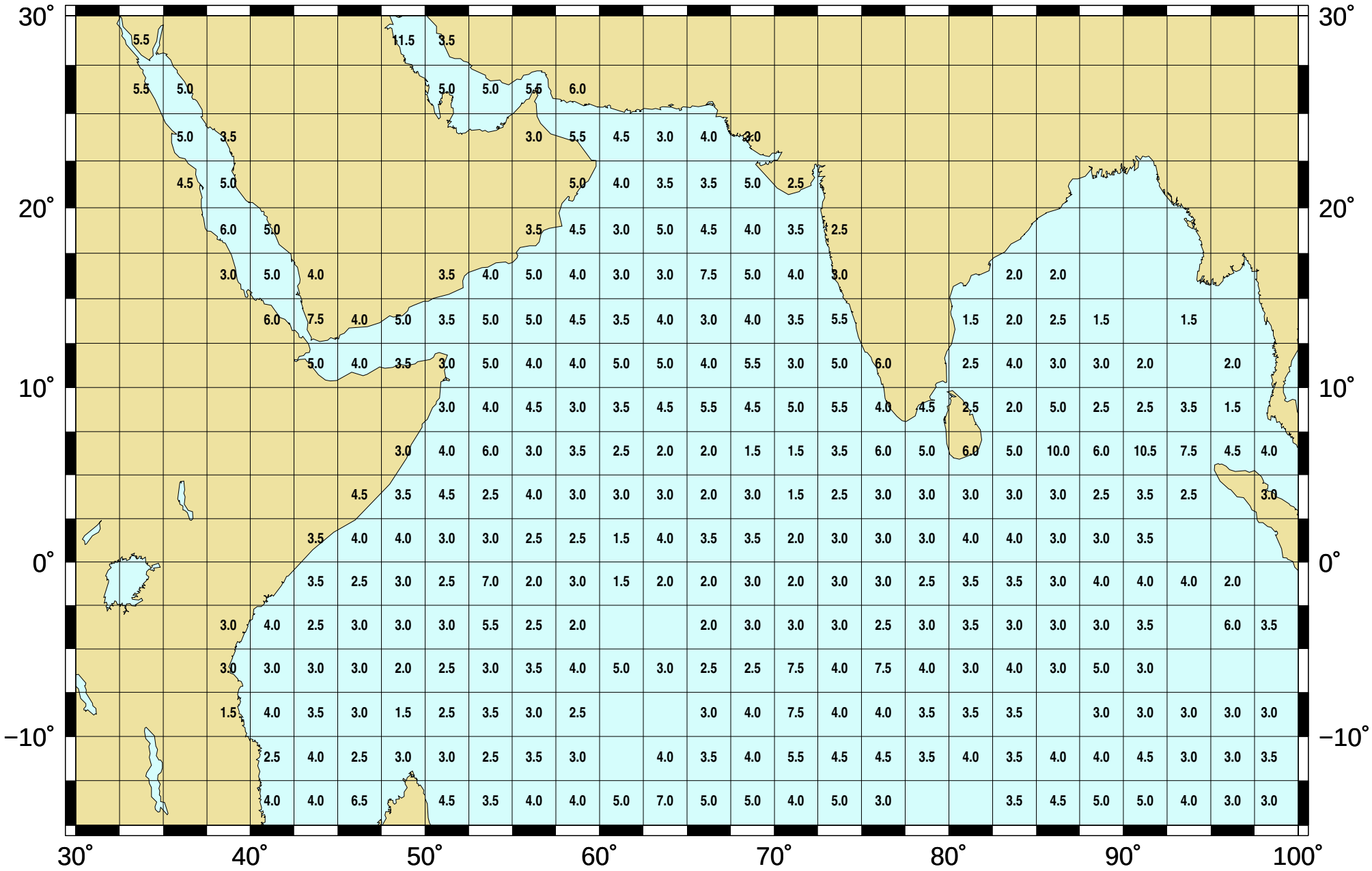


CHART No.13.3 **MAXIMUM WAVE HEIGHT(m)** **MARCH**

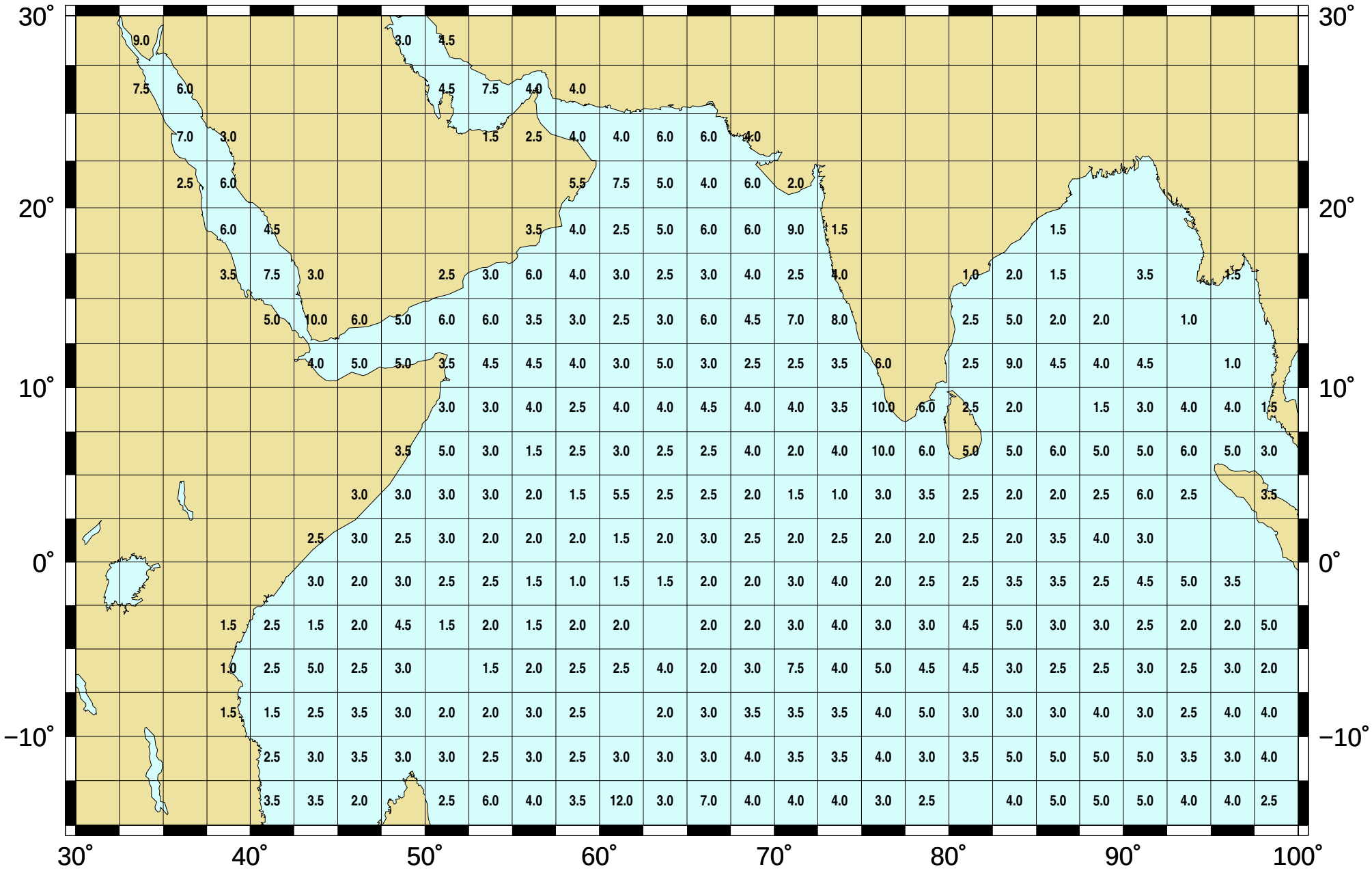


CHART No.13.4 MAXIMUM WAVE HEIGHT(m) APRIL

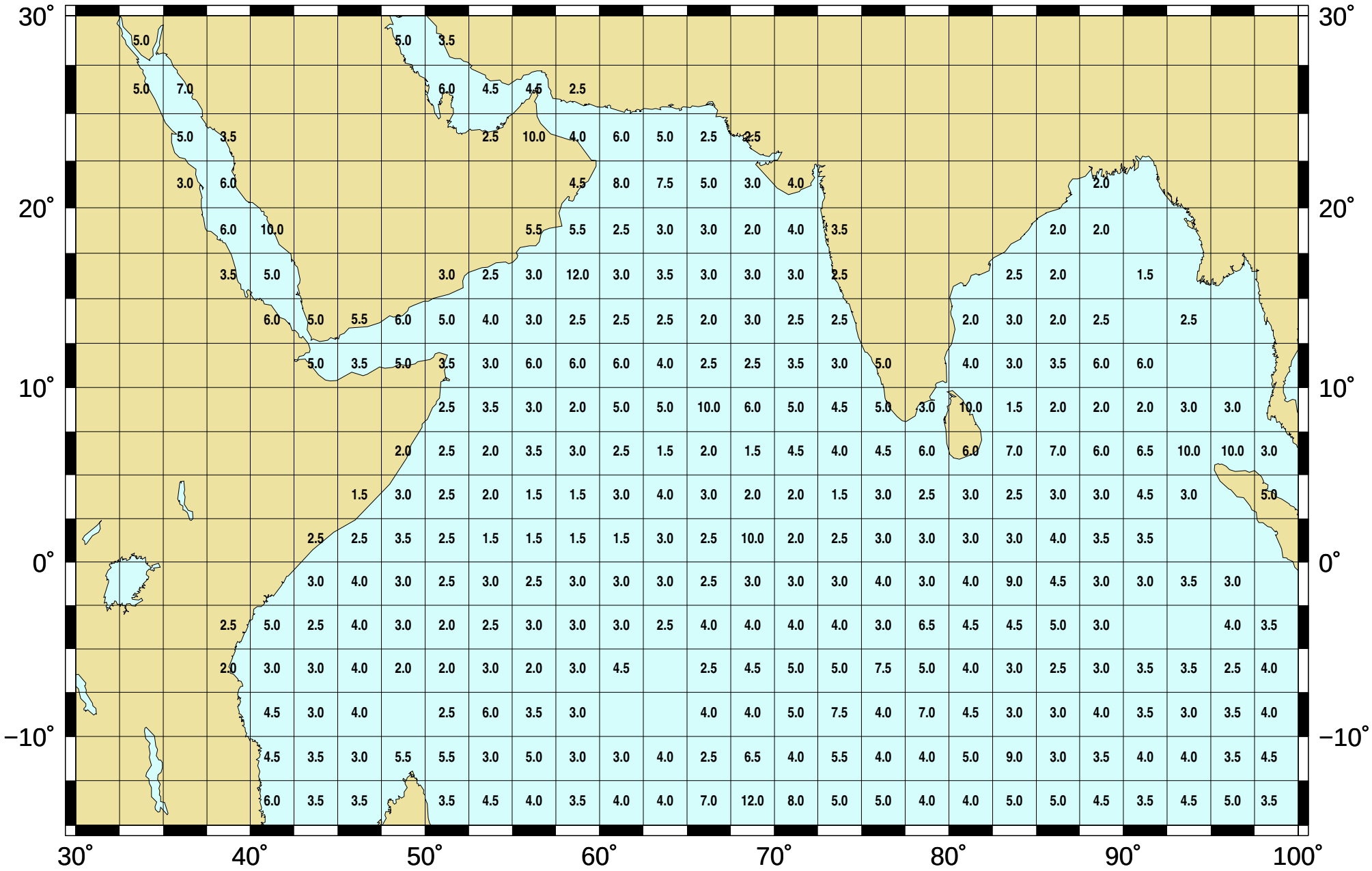


CHART No.13.5

MAXIMUM WAVE HEIGHT(m)

MAY

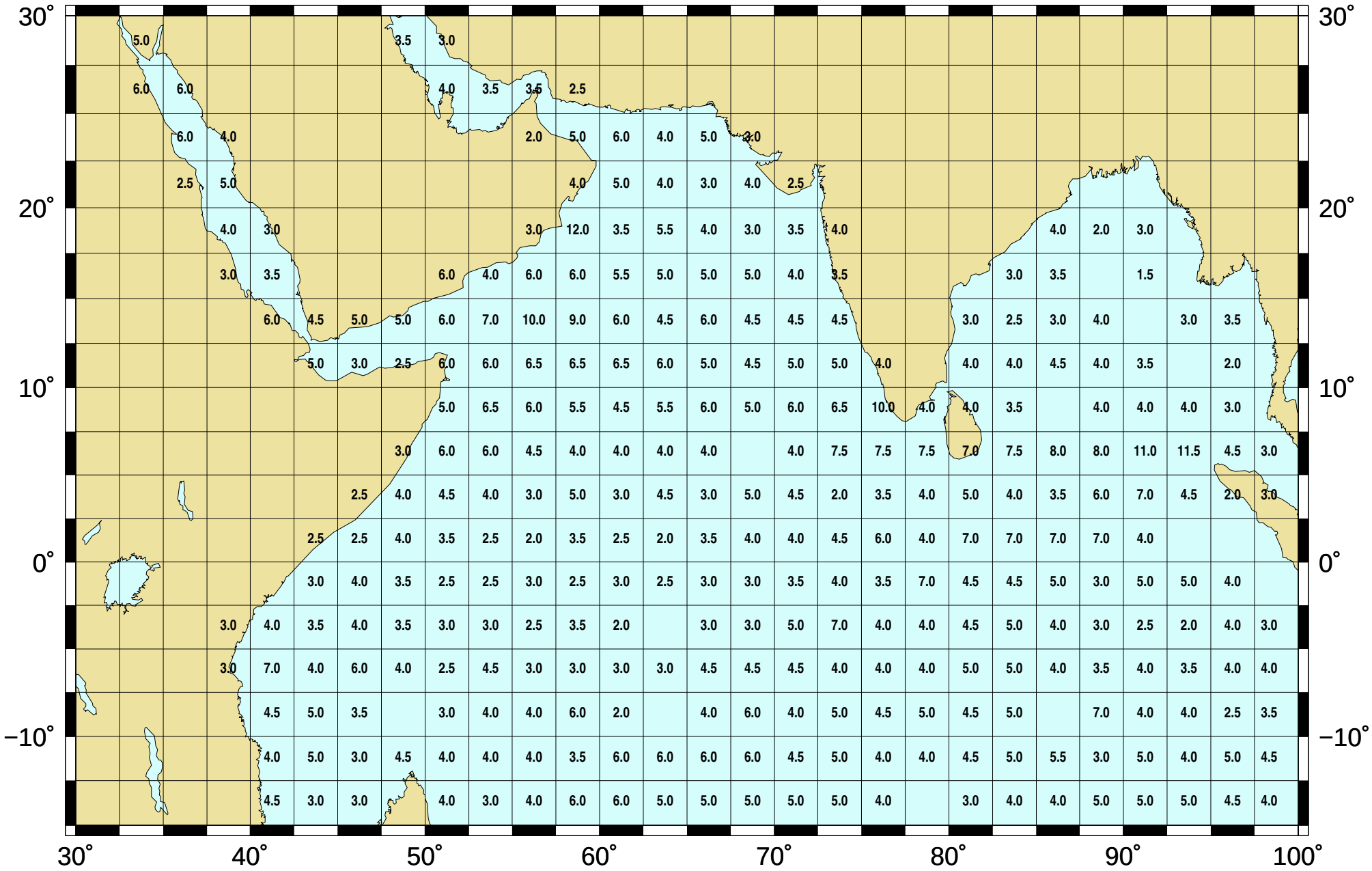


CHART No.13.6 MAXIMUM WAVE HEIGHT(m) JUNE

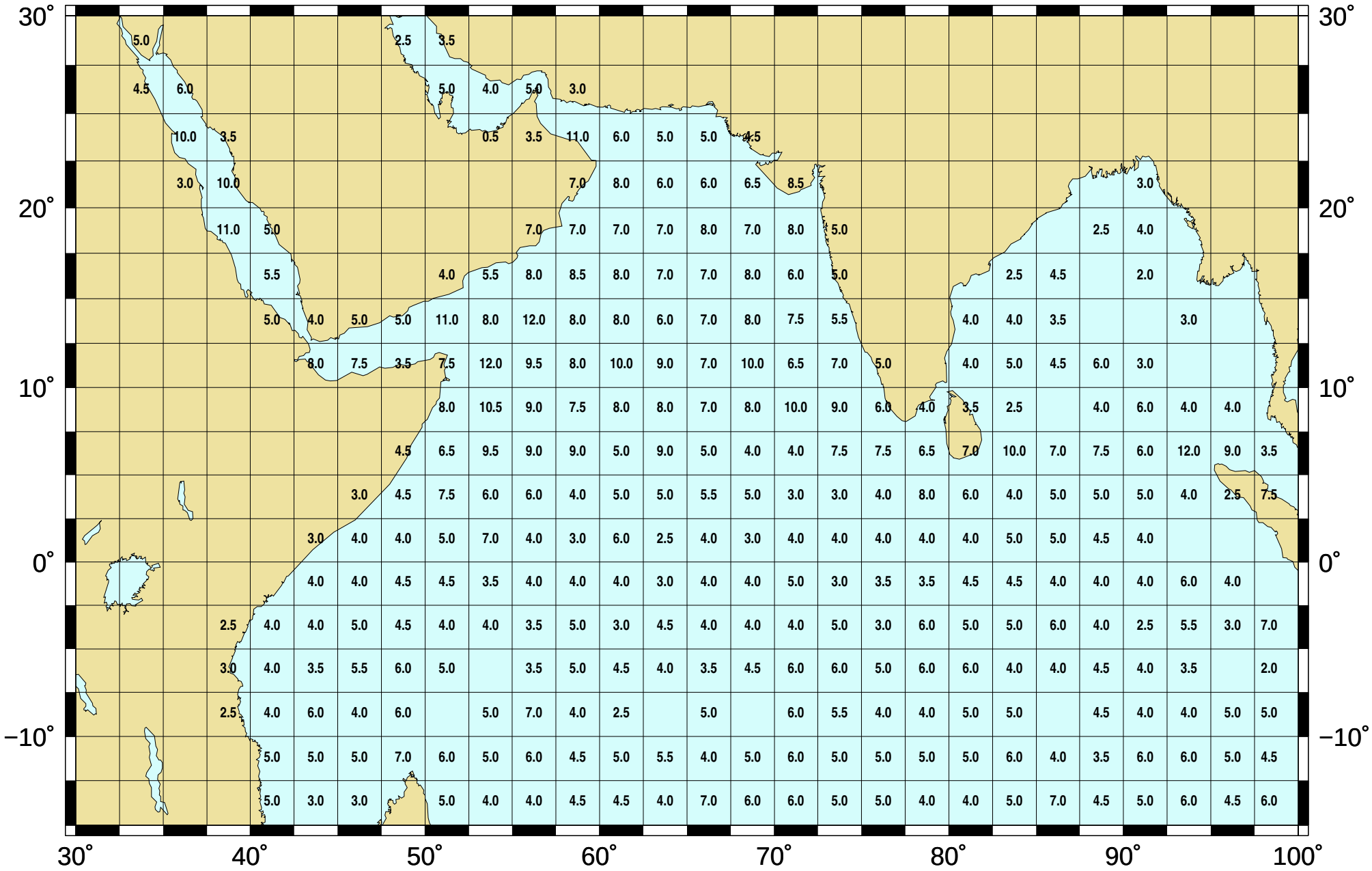


CHART No.13.7 — MAXIMUM WAVE HEIGHT(m) — JULY

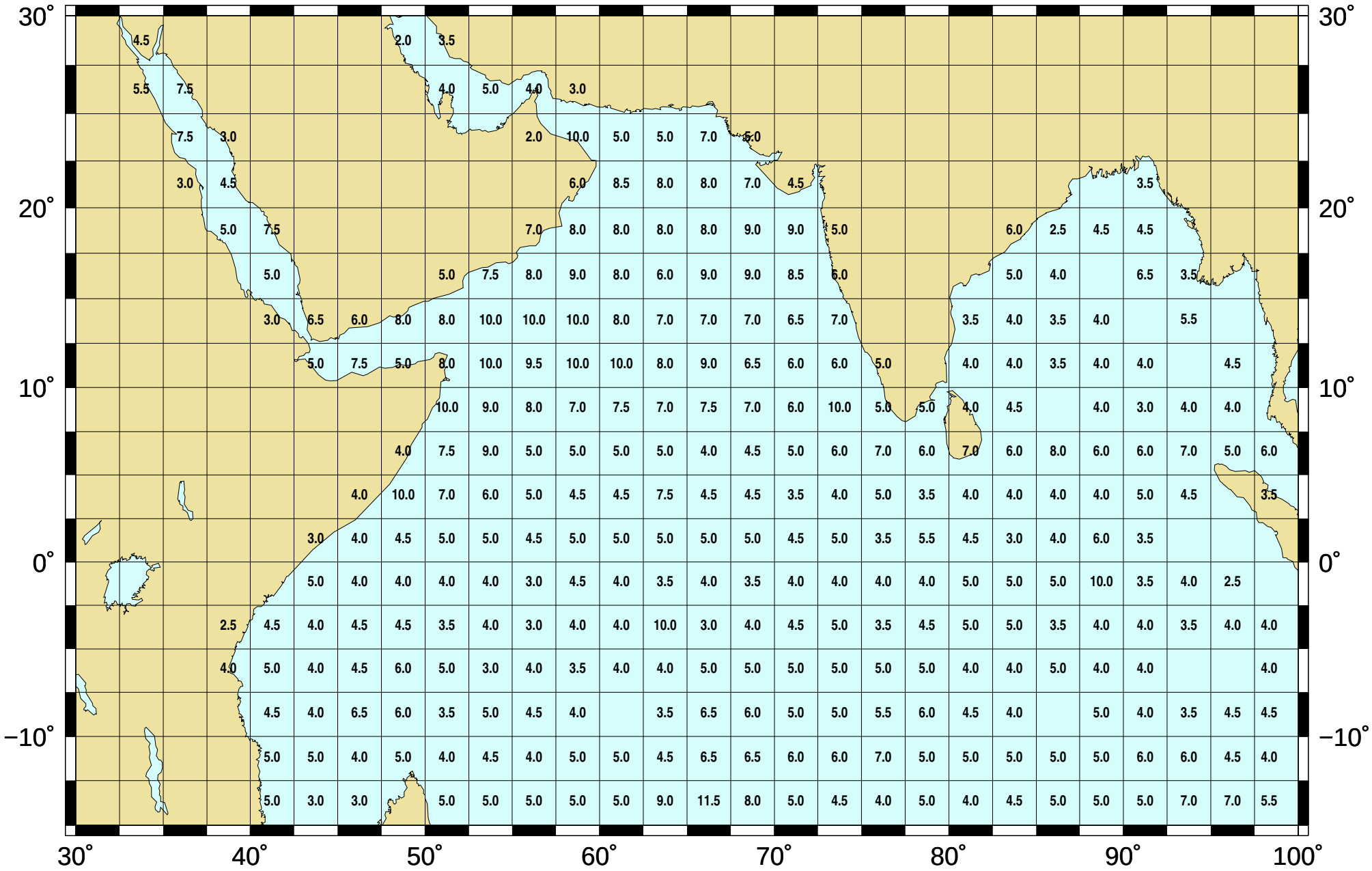


CHART No.13.8 MAXIMUM WAVE HEIGHT(m) AUGUST

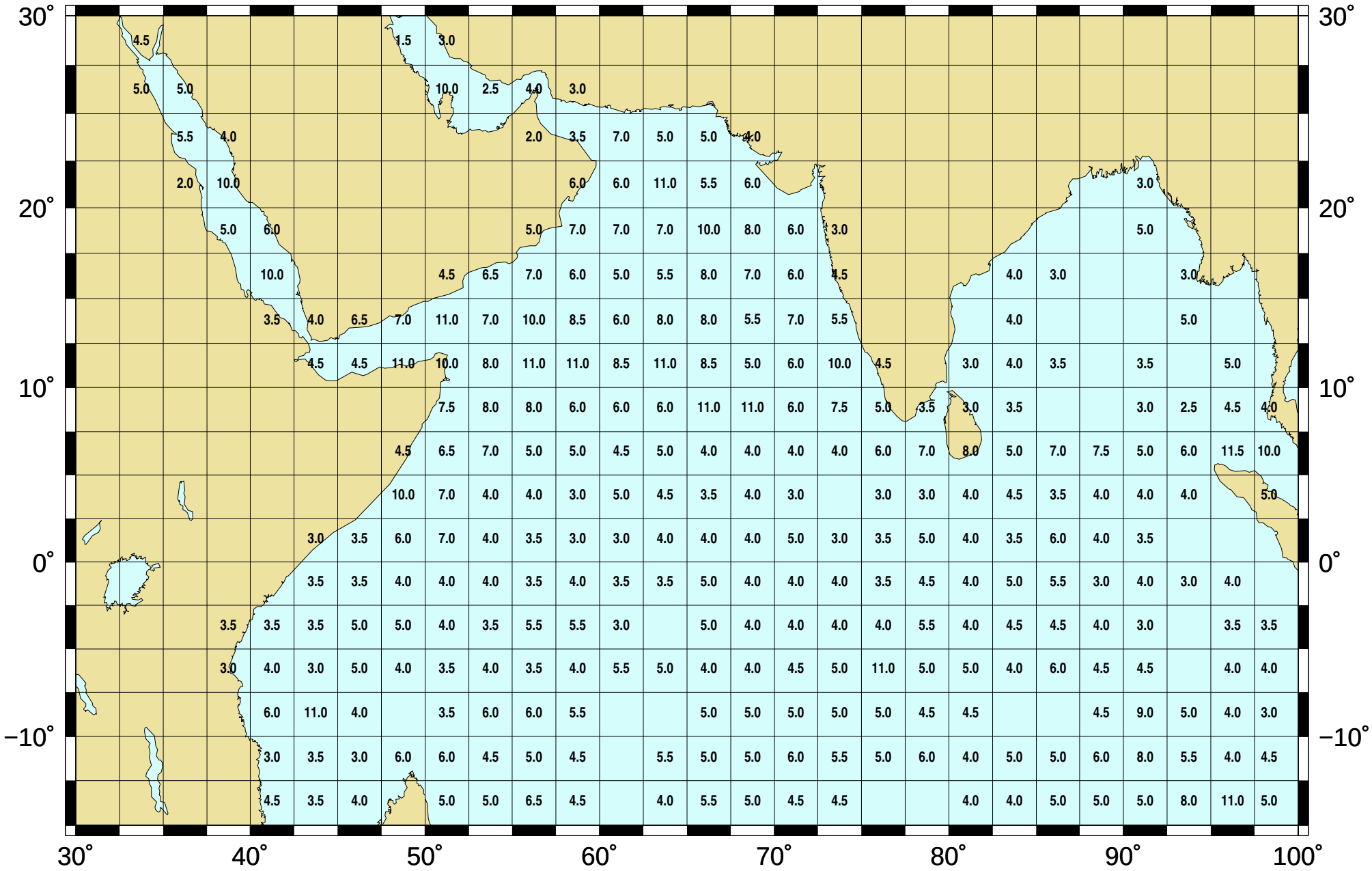


CHART No.13.9 MAXIMUM WAVE HEIGHT(m) SEPTEMBER

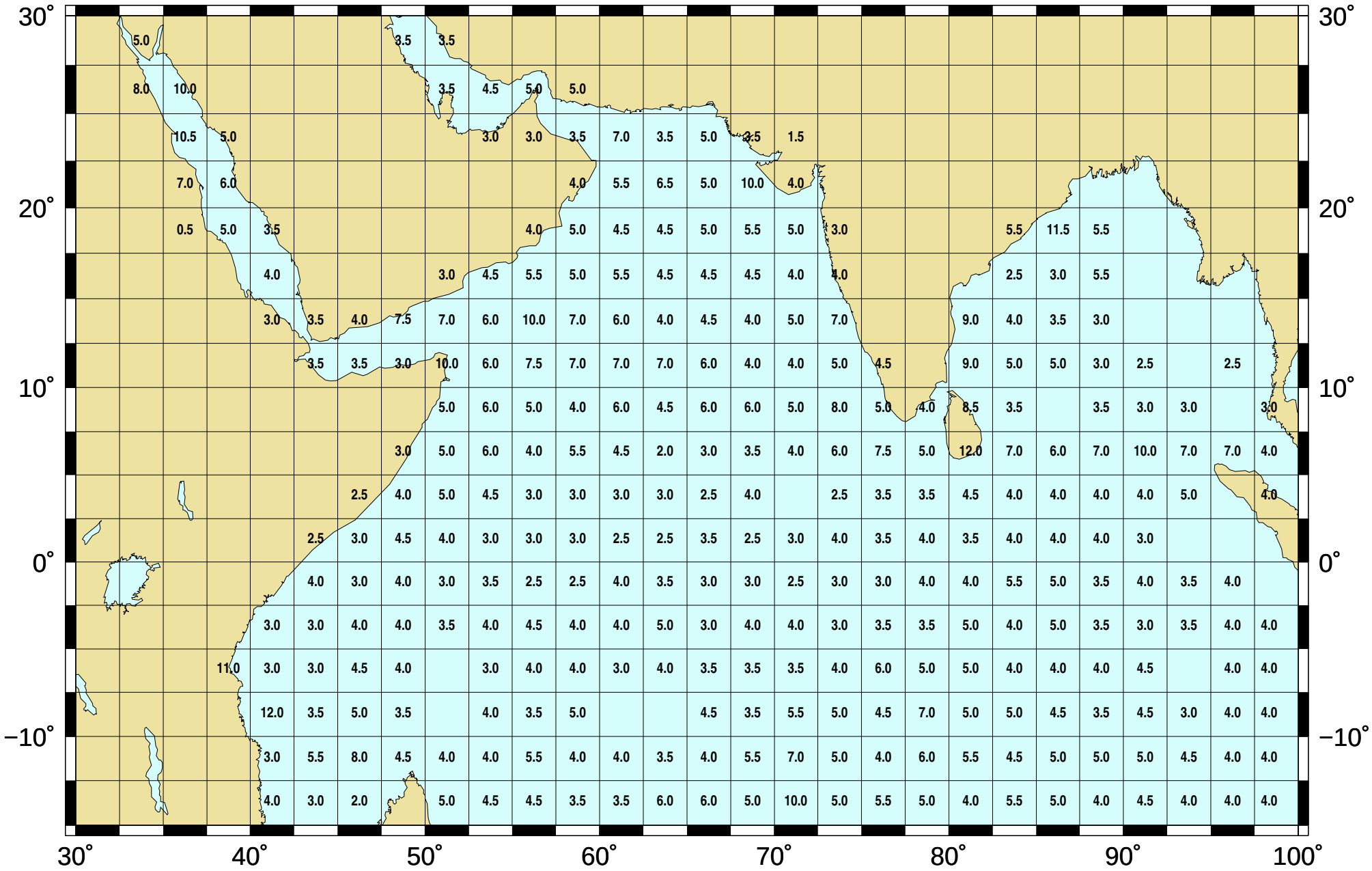


CHART No.13.10

MAXIMUM WAVE HEIGHT(m)

OCTOBER

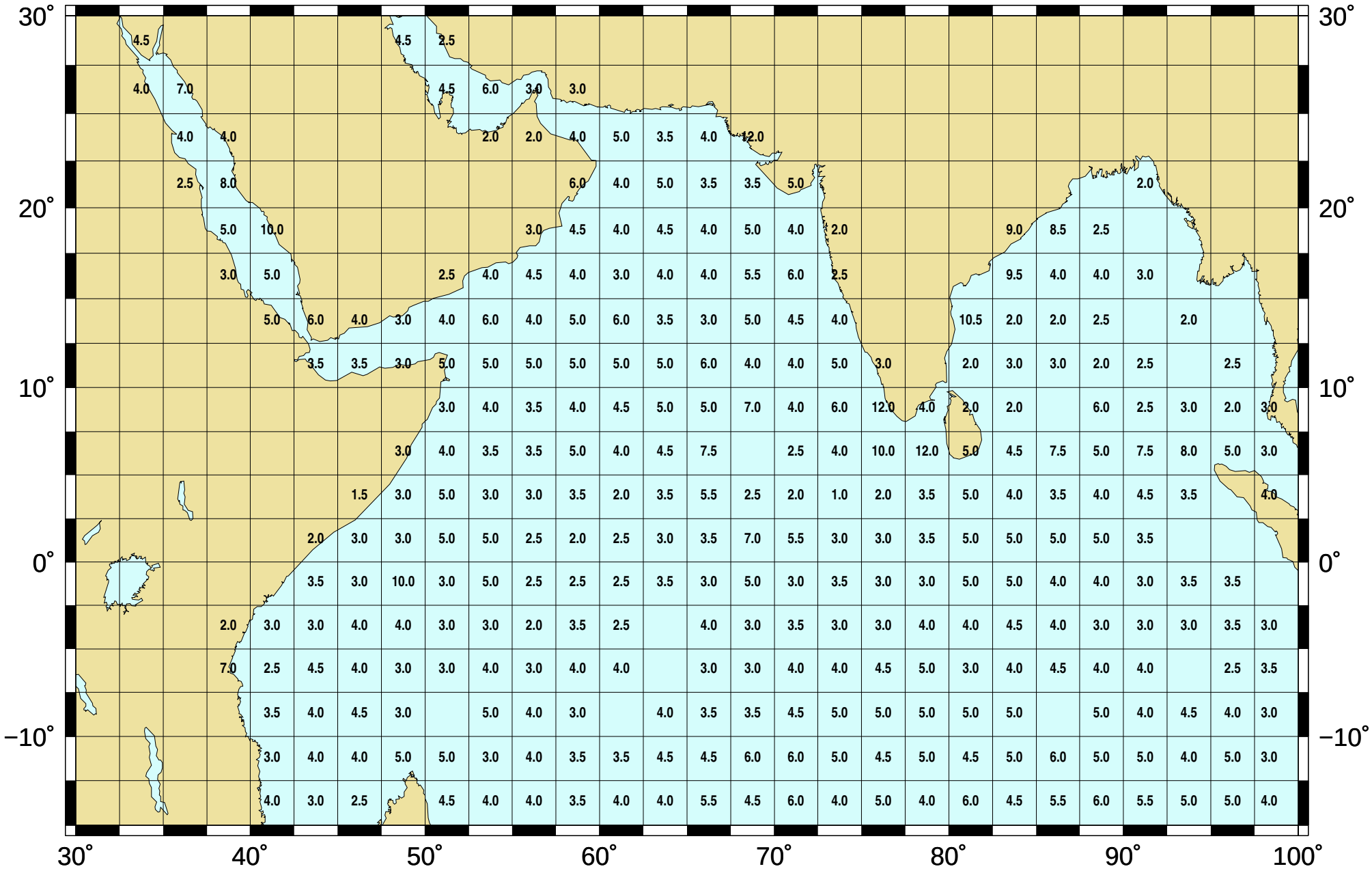


CHART No.13.11

MAXIMUM WAVE HEIGHT(m)

NOVEMBER

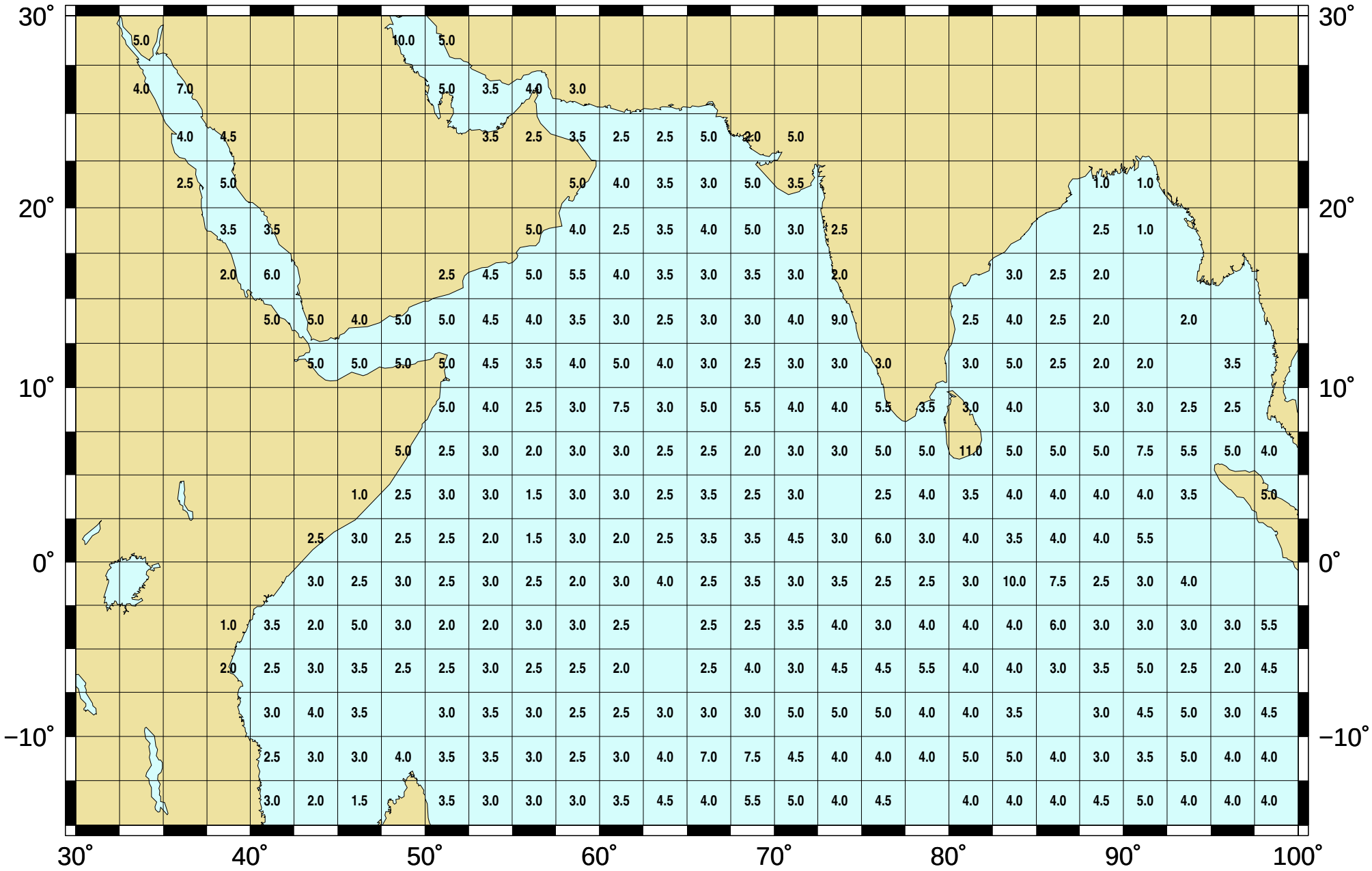


CHART No.13.12

MAXIMUM WAVE HEIGHT(m)

DECEMBER

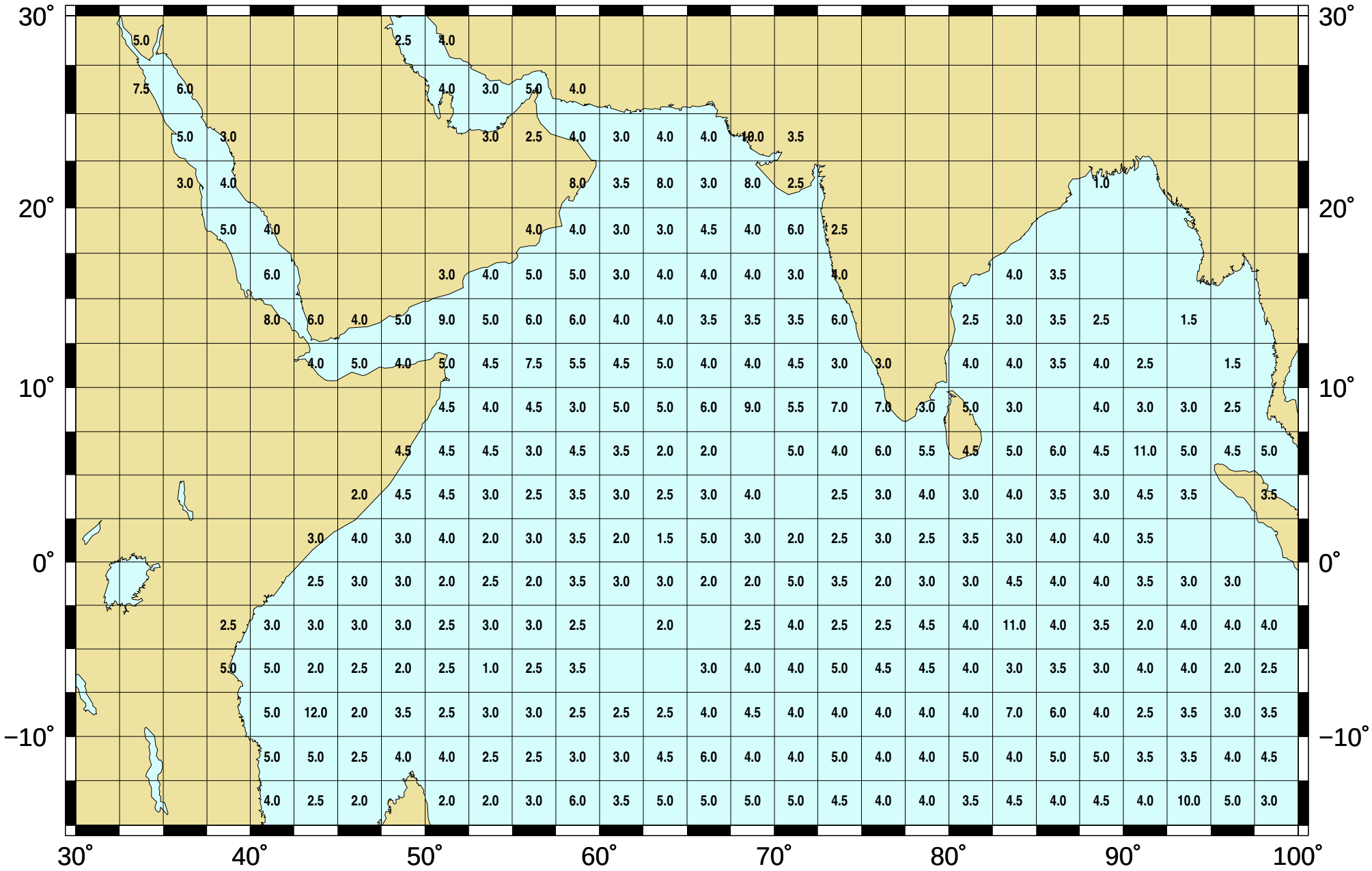


CHART No.14.1

MEAN WAVE PERIOD(sec)

JANUARY

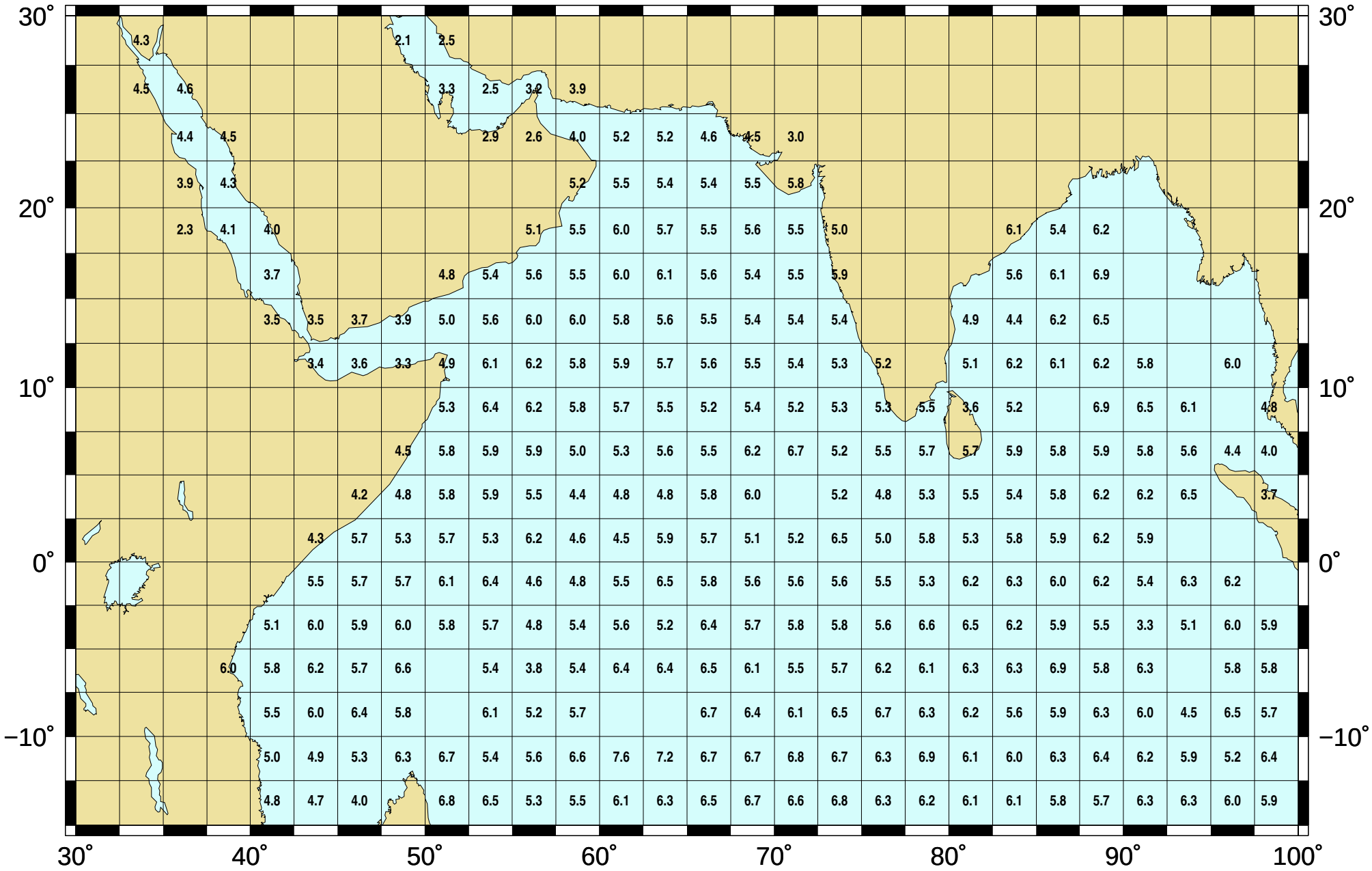


CHART No.14.2

MEAN WAVE PERIOD(sec)

FEBRUARY

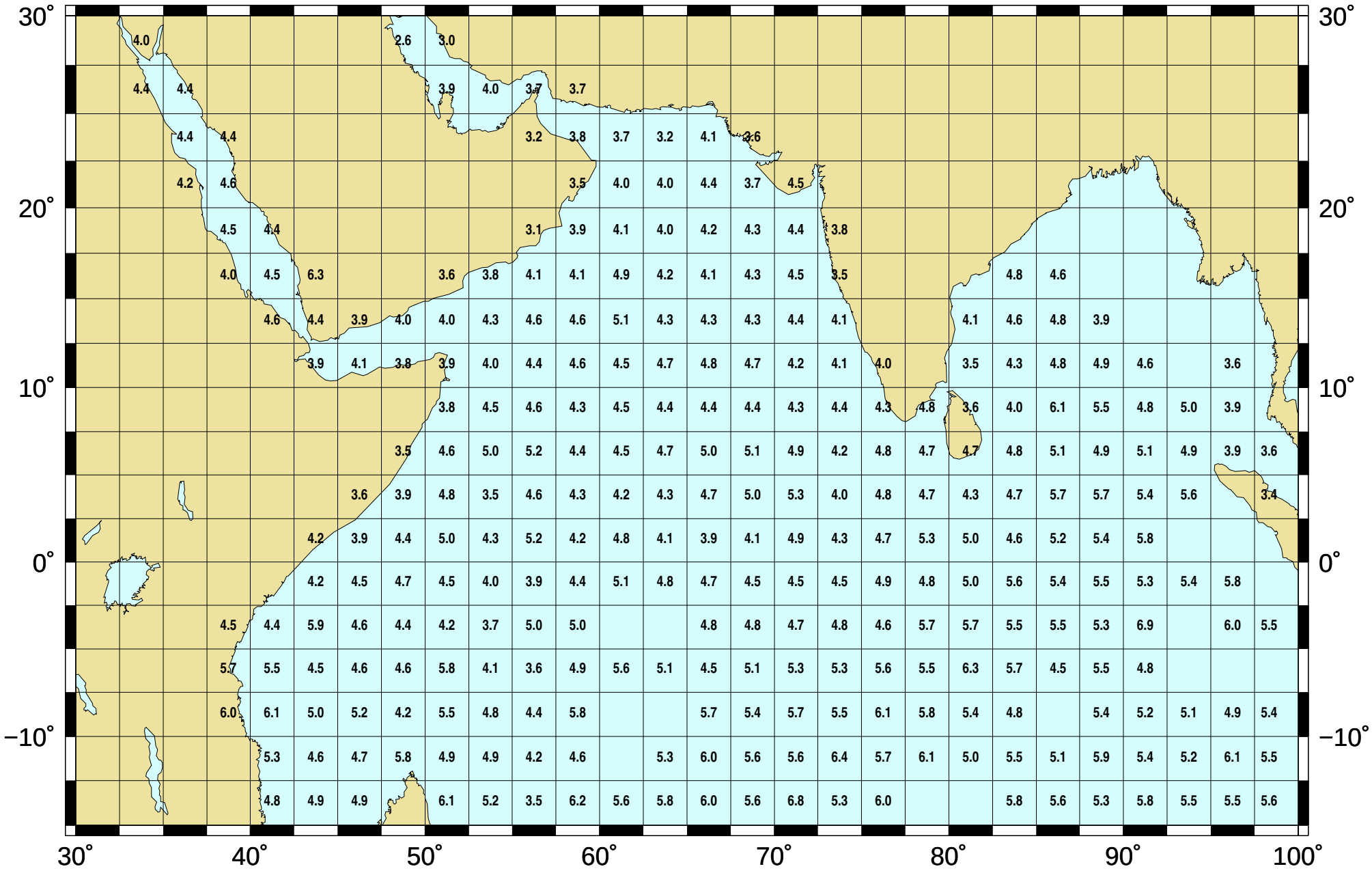


CHART No.14.3

MEAN WAVE PERIOD(sec)

MARCH

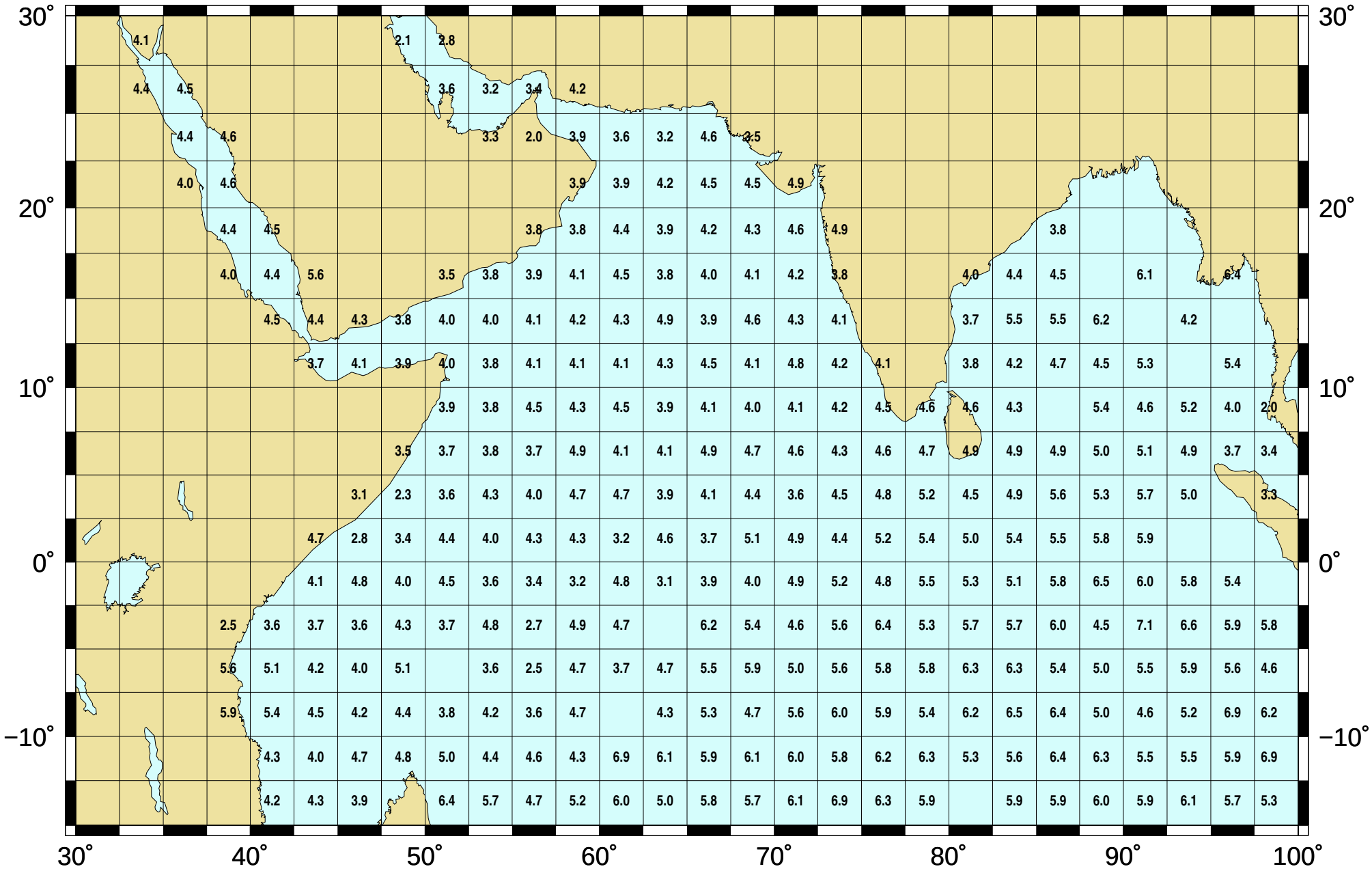


CHART No.14.4

MEAN WAVE PERIOD(sec)

APRIL

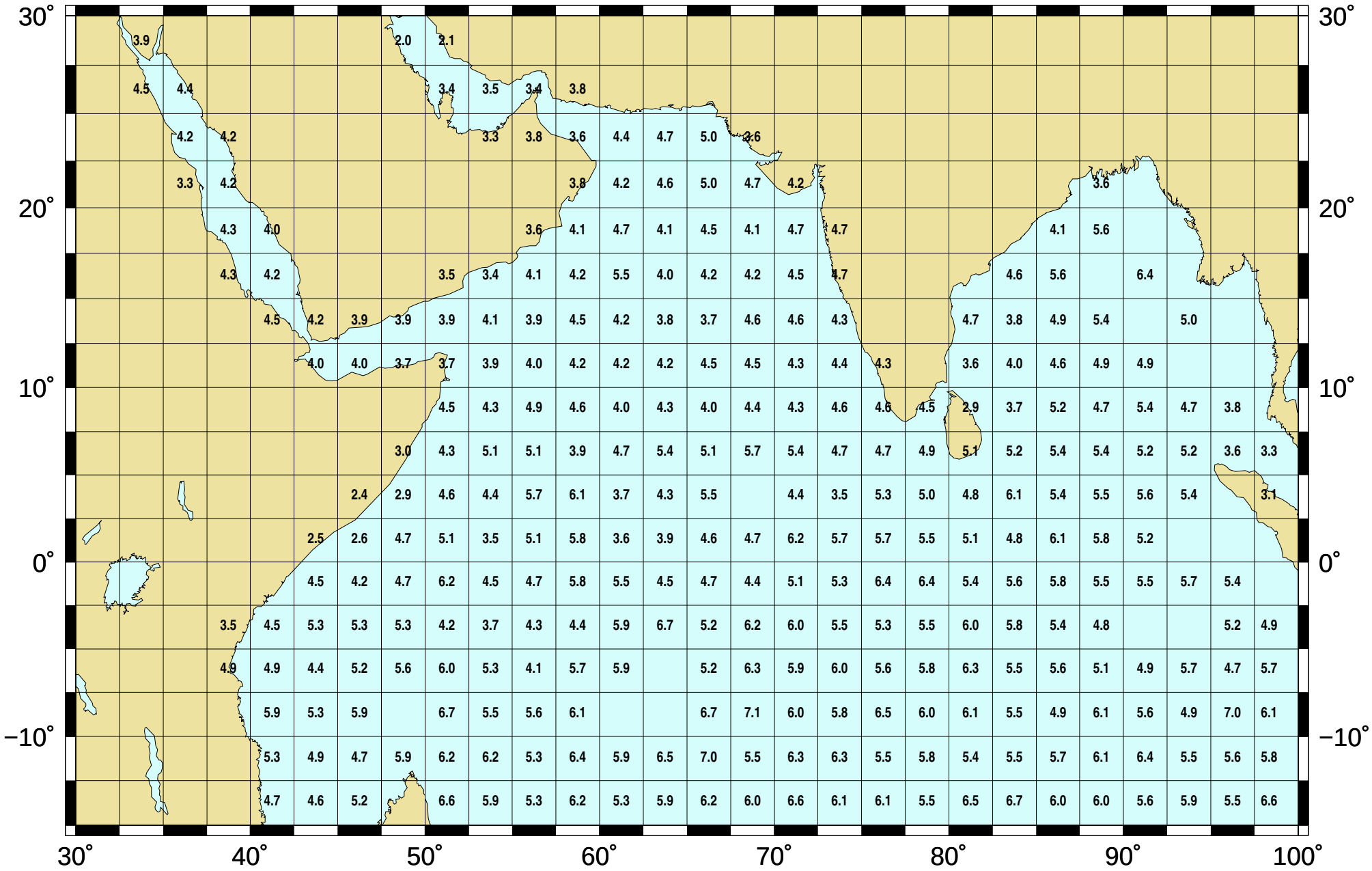


CHART No.14.5

MEAN WAVE PERIOD(sec)

MAY

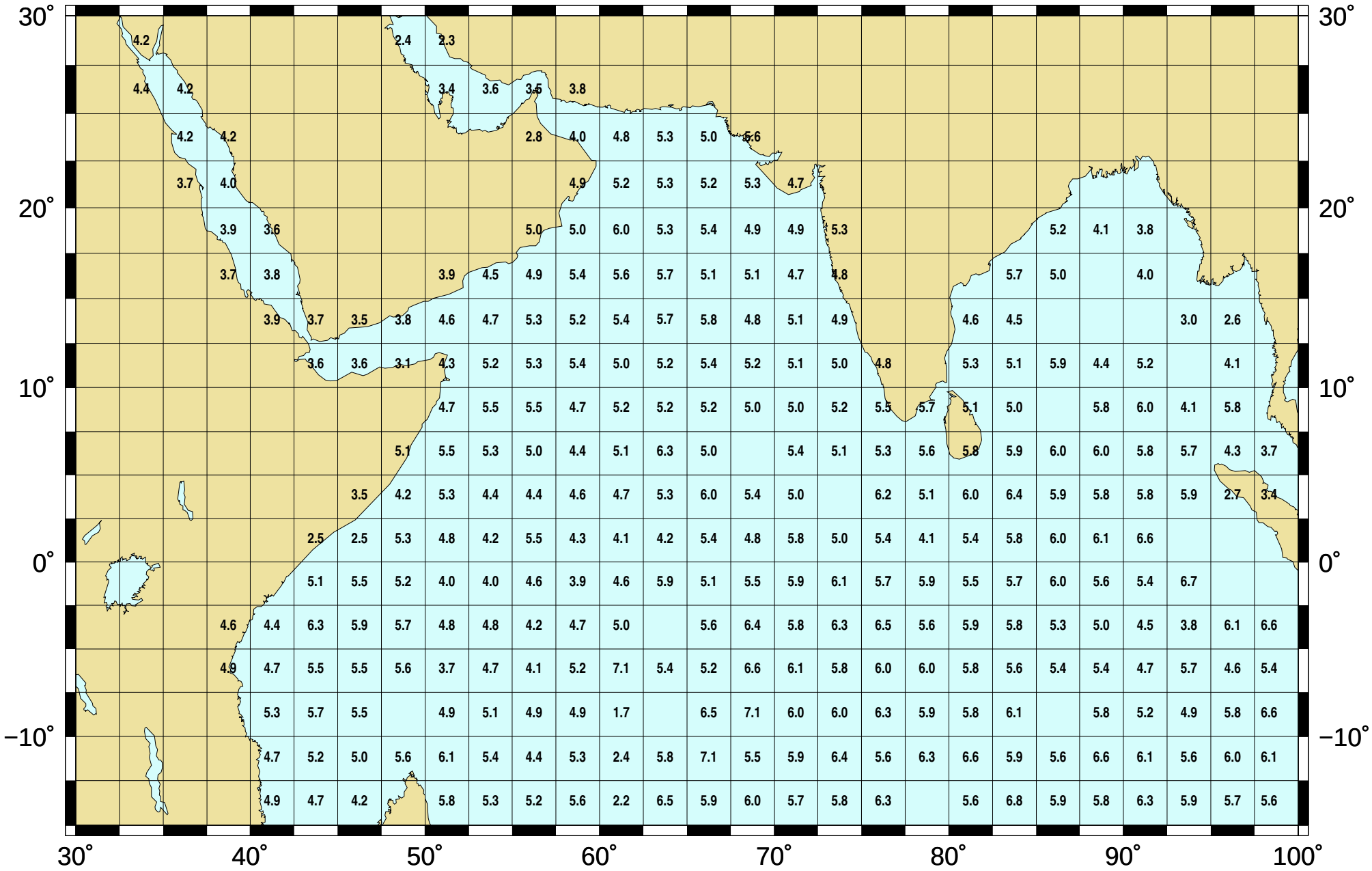


CHART No.14.6 MEAN WAVE PERIOD(sec) JUNE

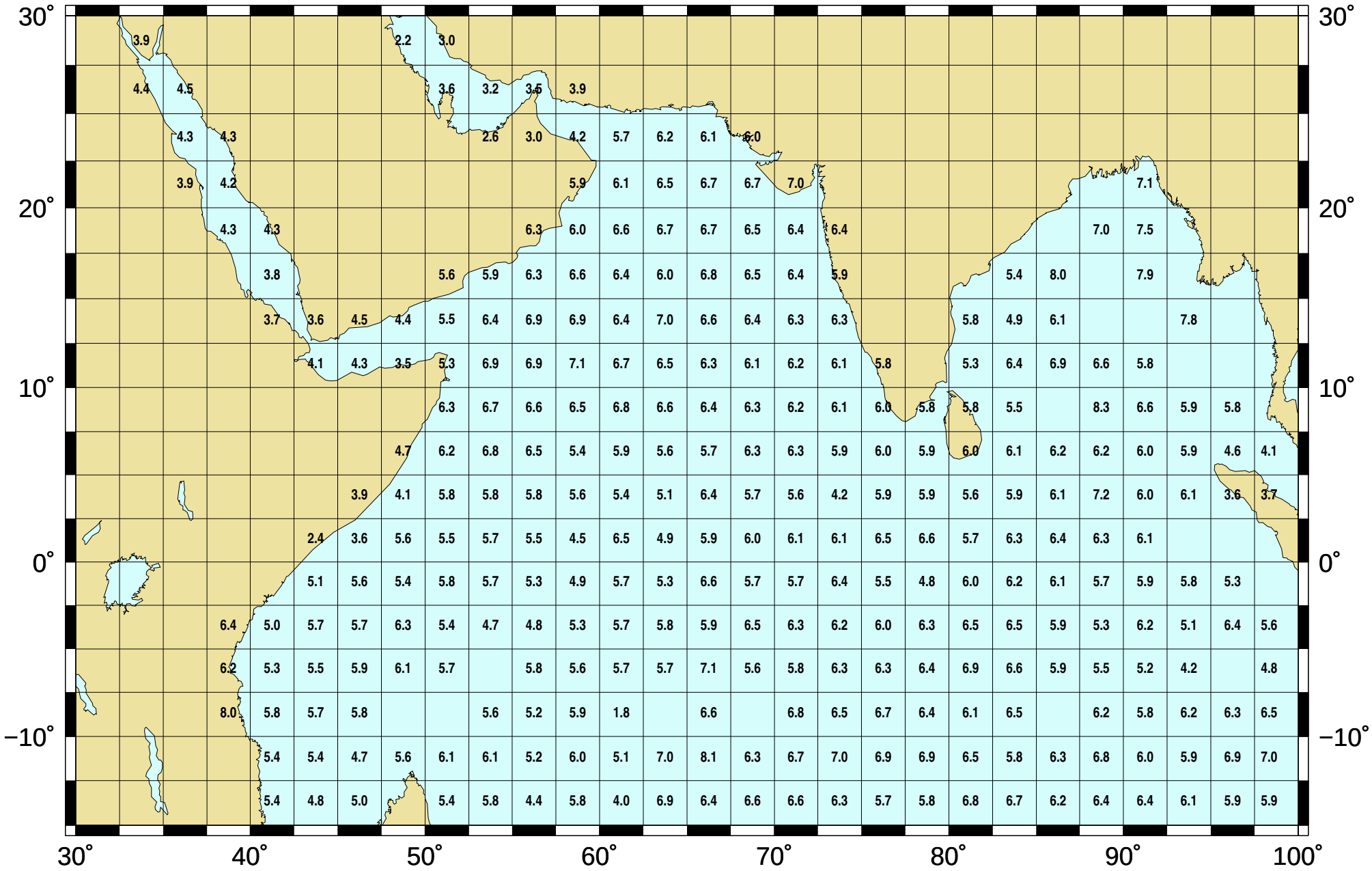


CHART No.14.7

MEAN WAVE PERIOD(sec)

JULY

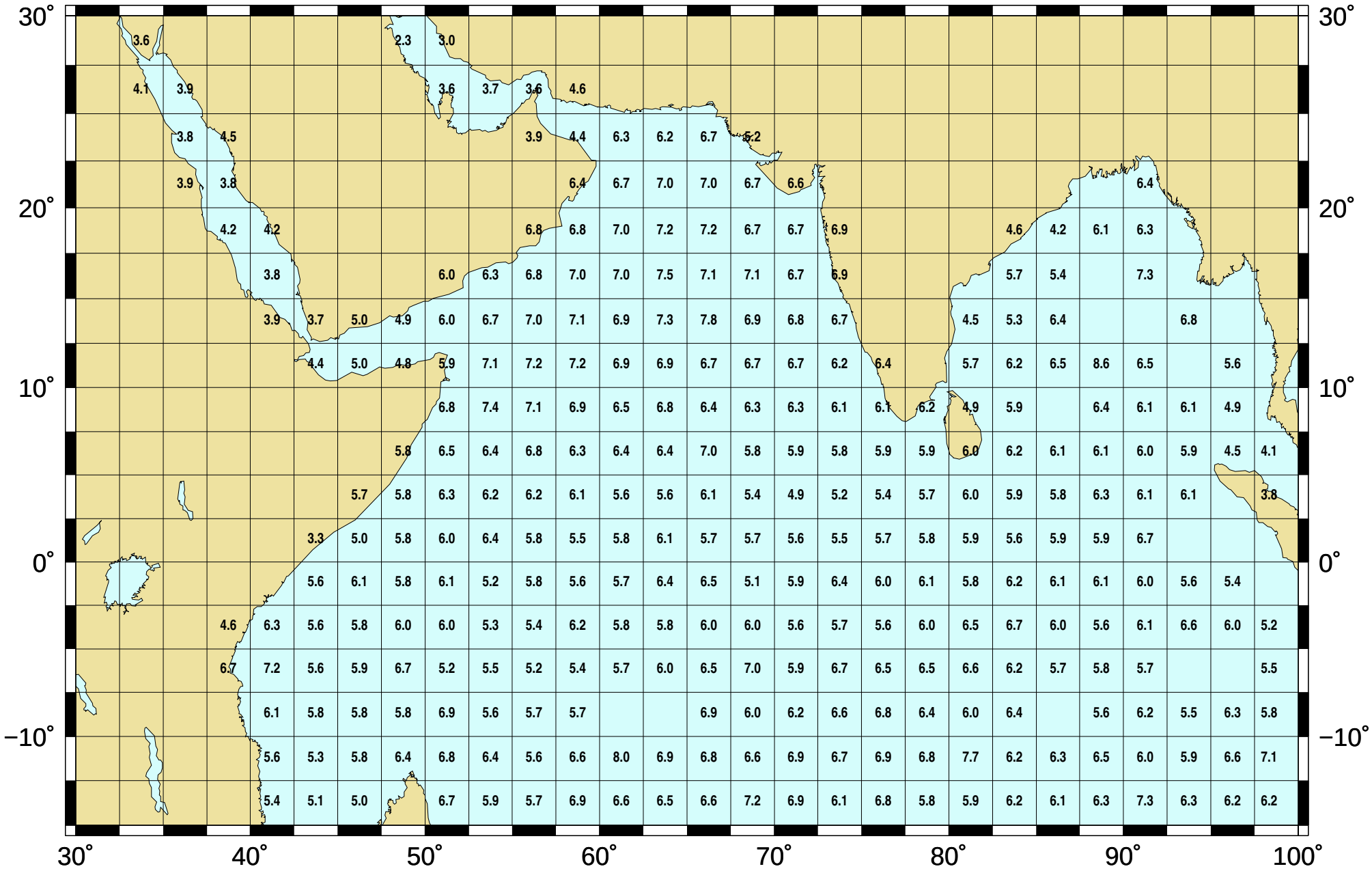


CHART No.14.8 **MEAN WAVE PERIOD(sec)** **AUGUST**

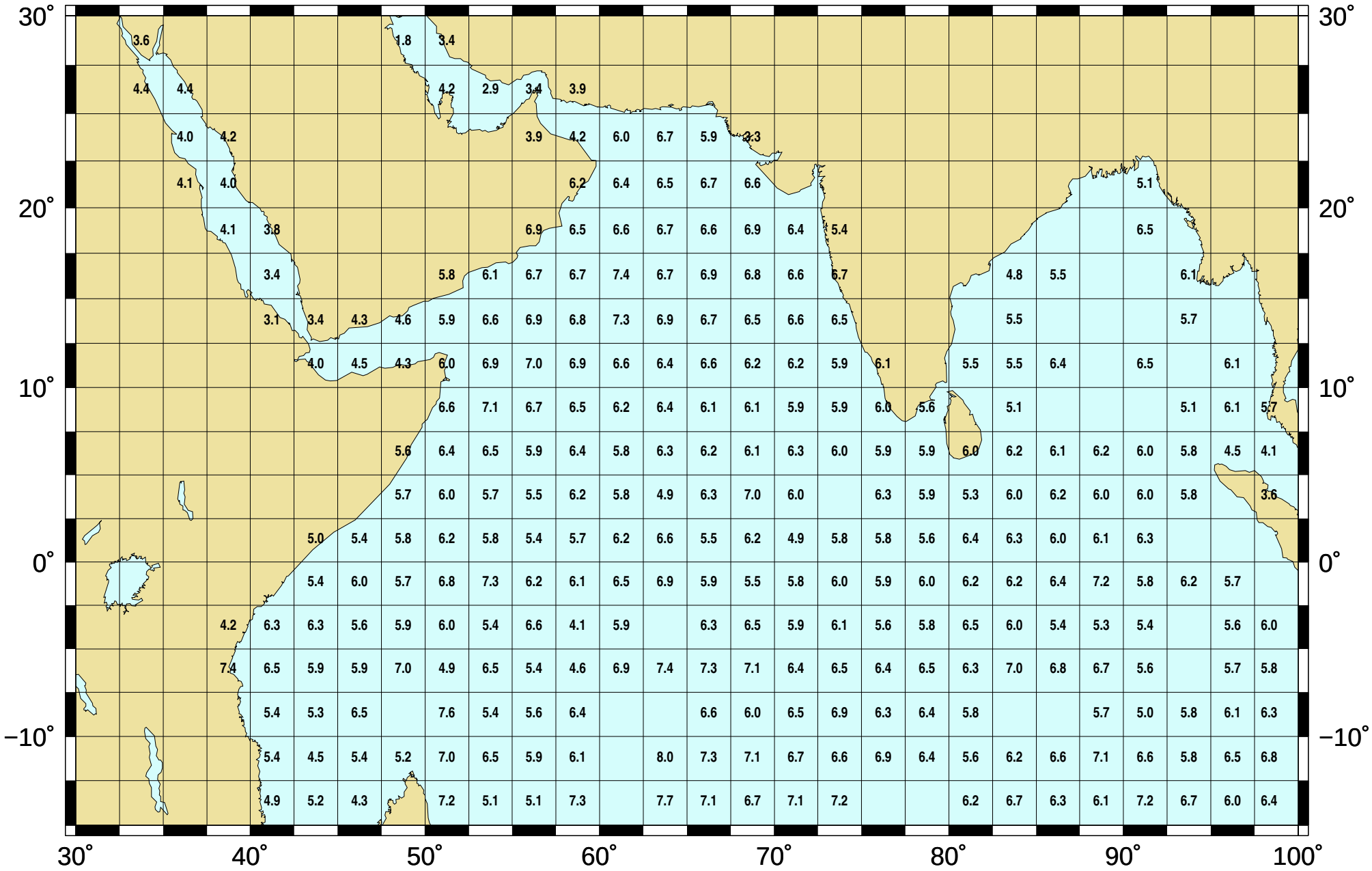


CHART No.14.9

MEAN WAVE PERIOD(sec)

SEPTEMBER

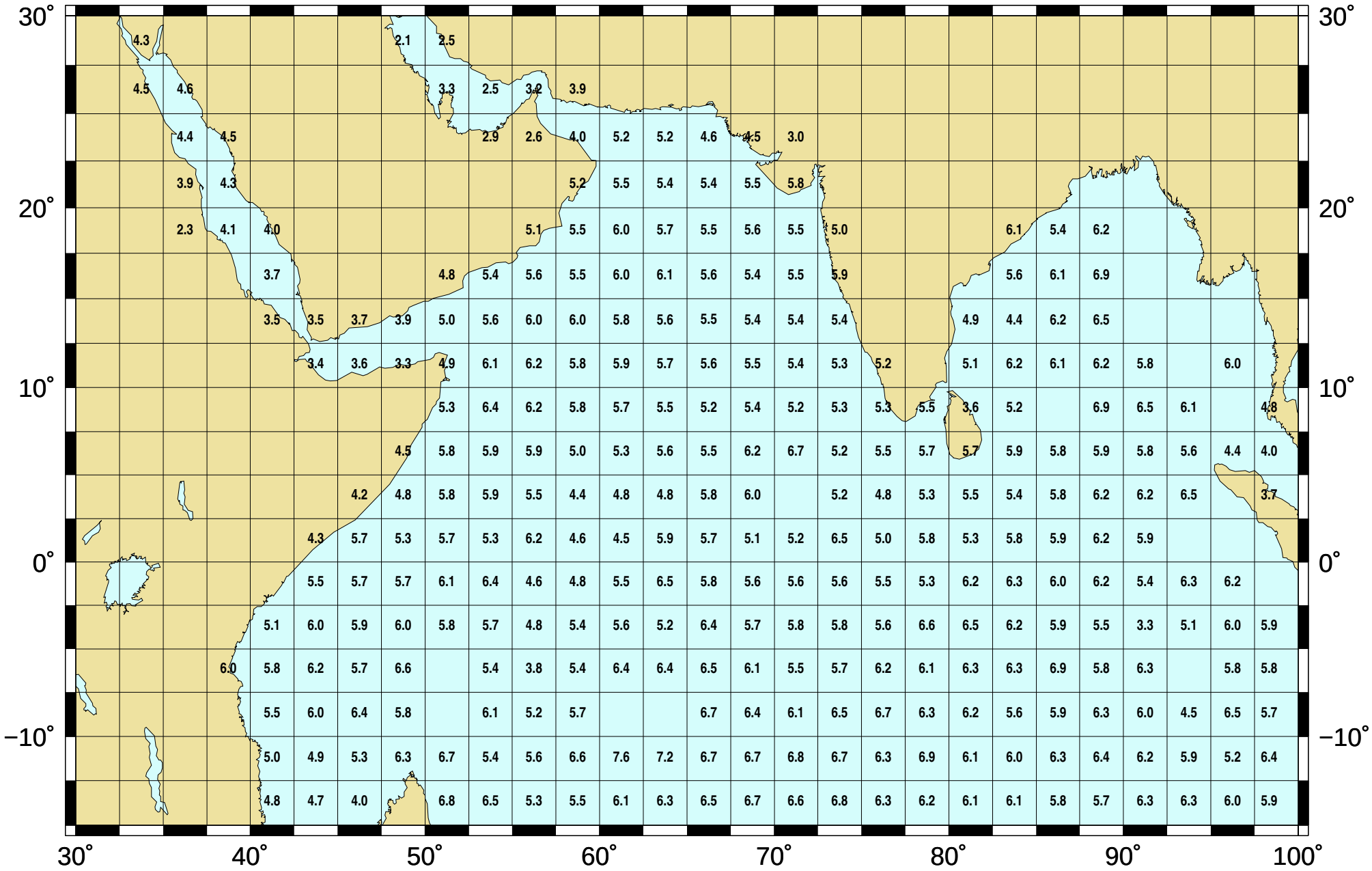


CHART No.14.10

MEAN WAVE PERIOD(sec)

OCTOBER

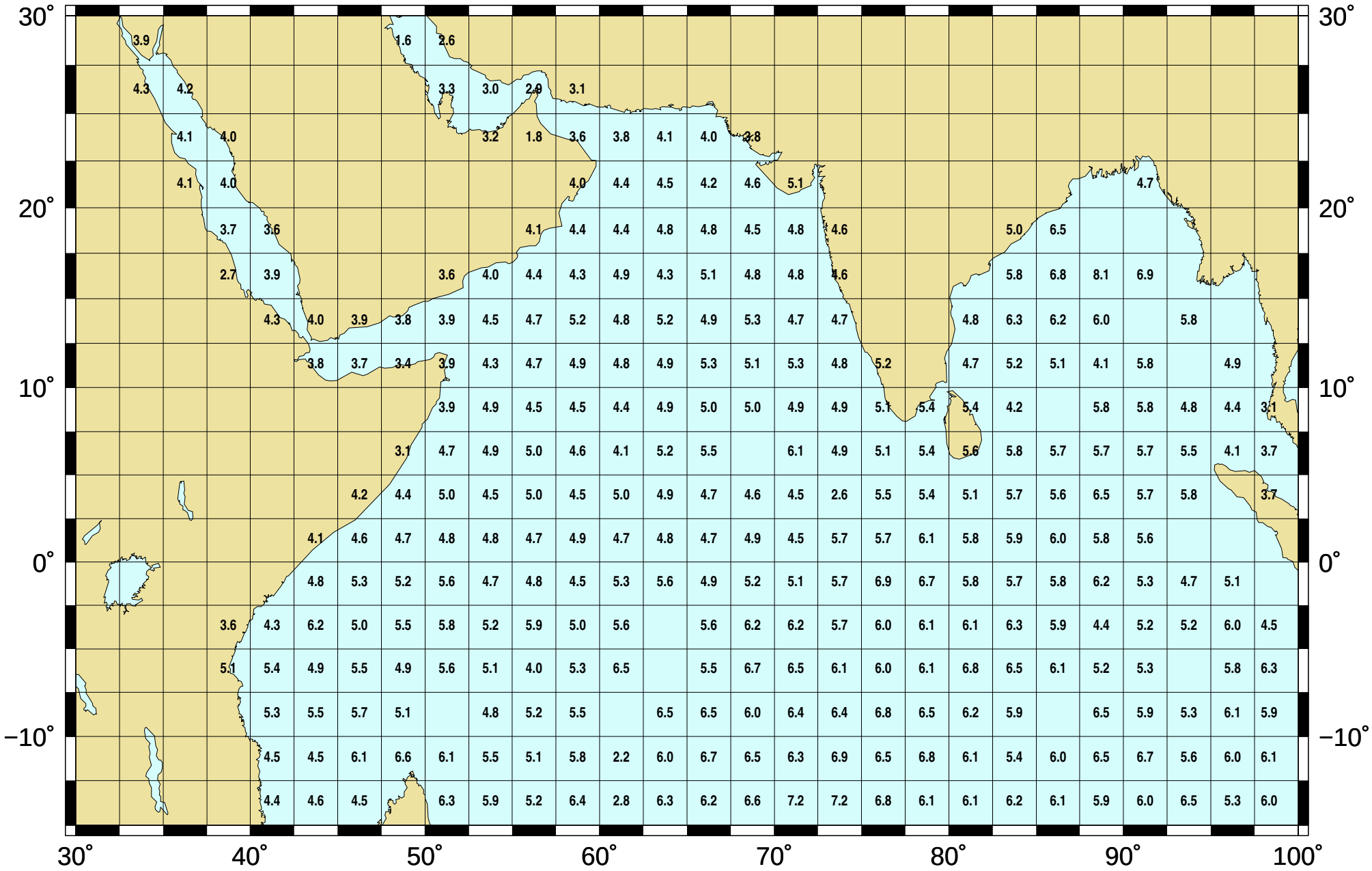


CHART No.14.11

MEAN WAVE PERIOD(sec)

NOVEMBER

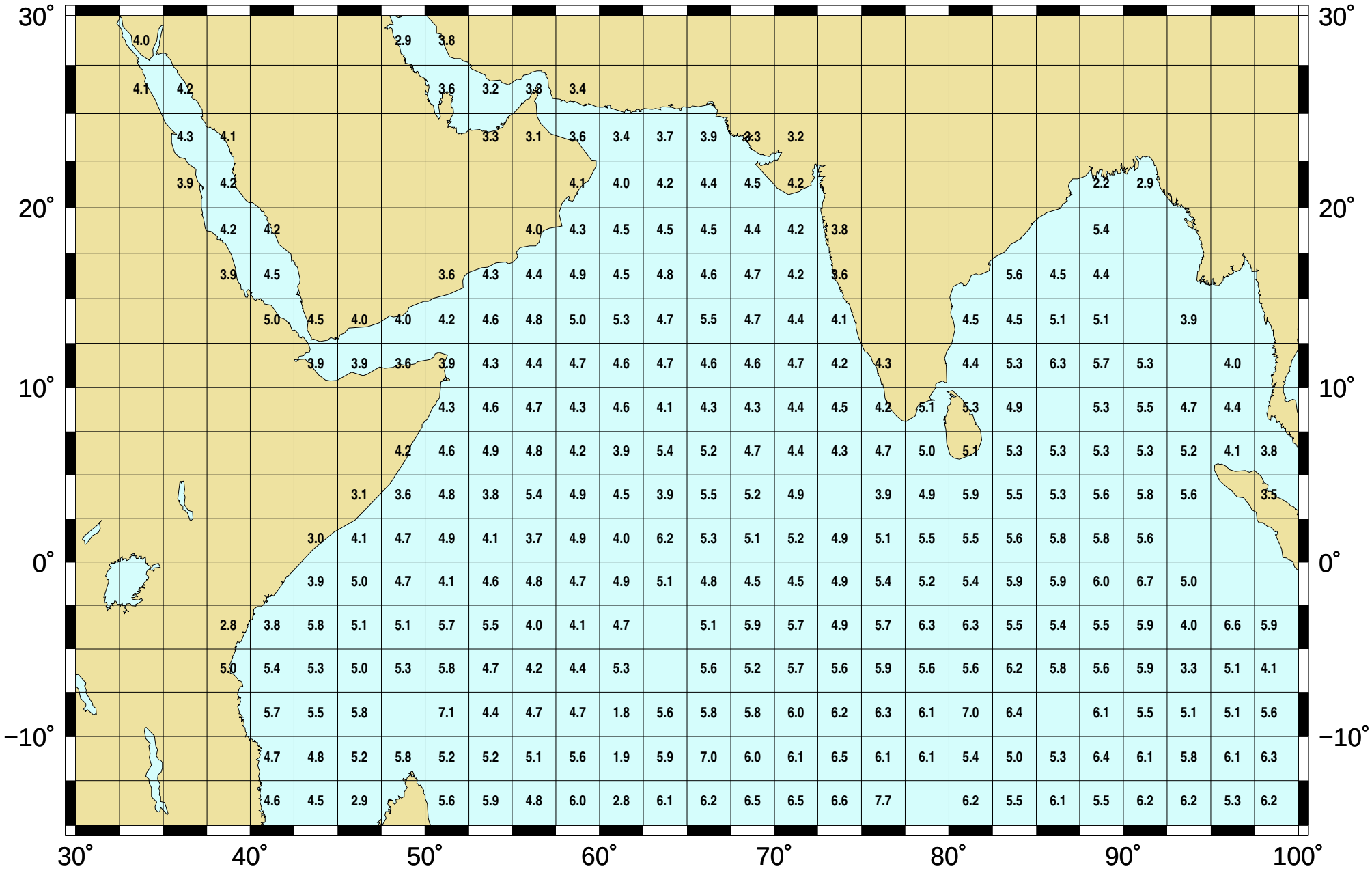


CHART No.14.12

MEAN WAVE PERIOD(sec)

DECEMBER

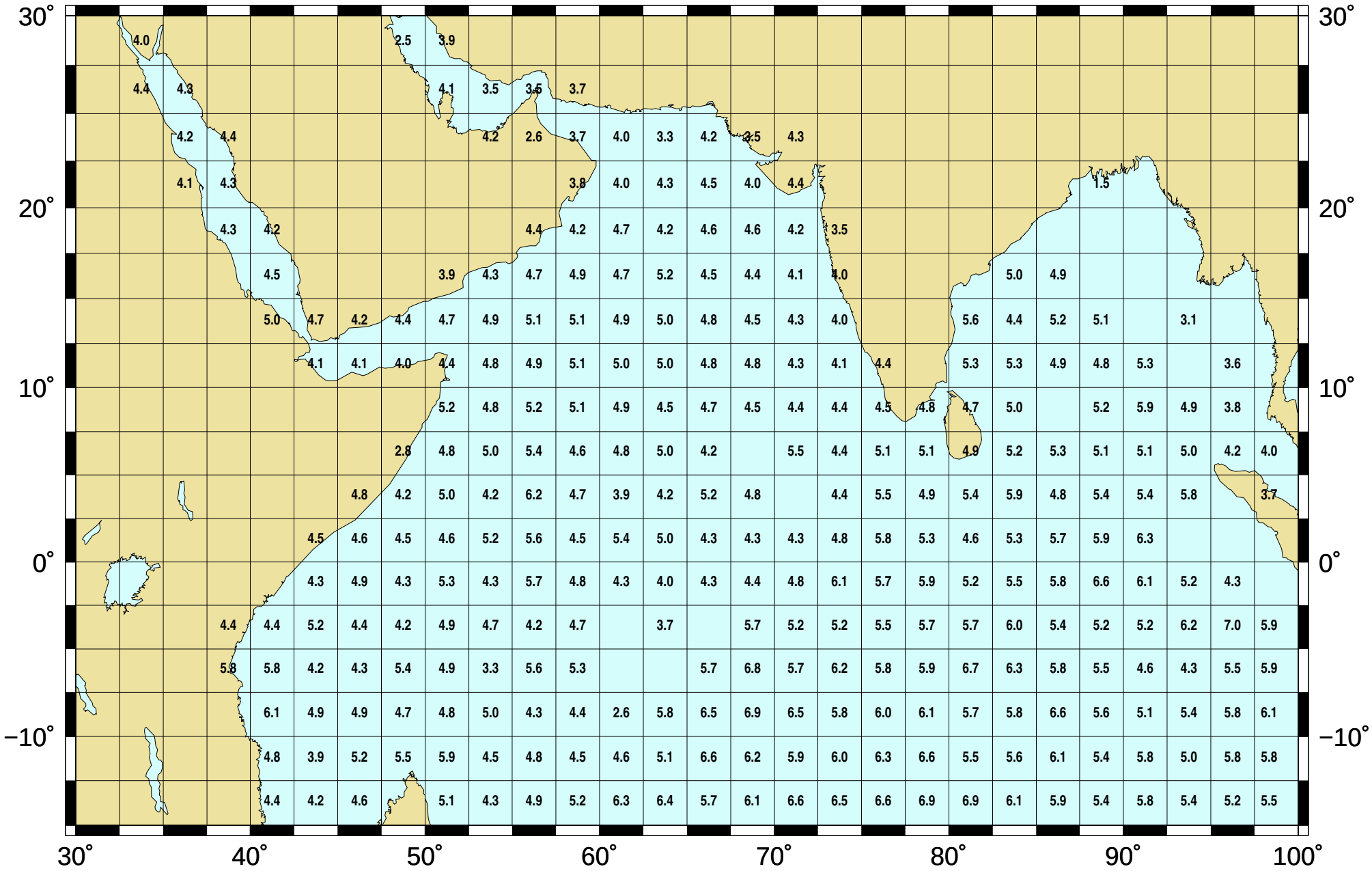


CHART No.15.1 VISIBILITY(> 10 Km)(%) JANUARY

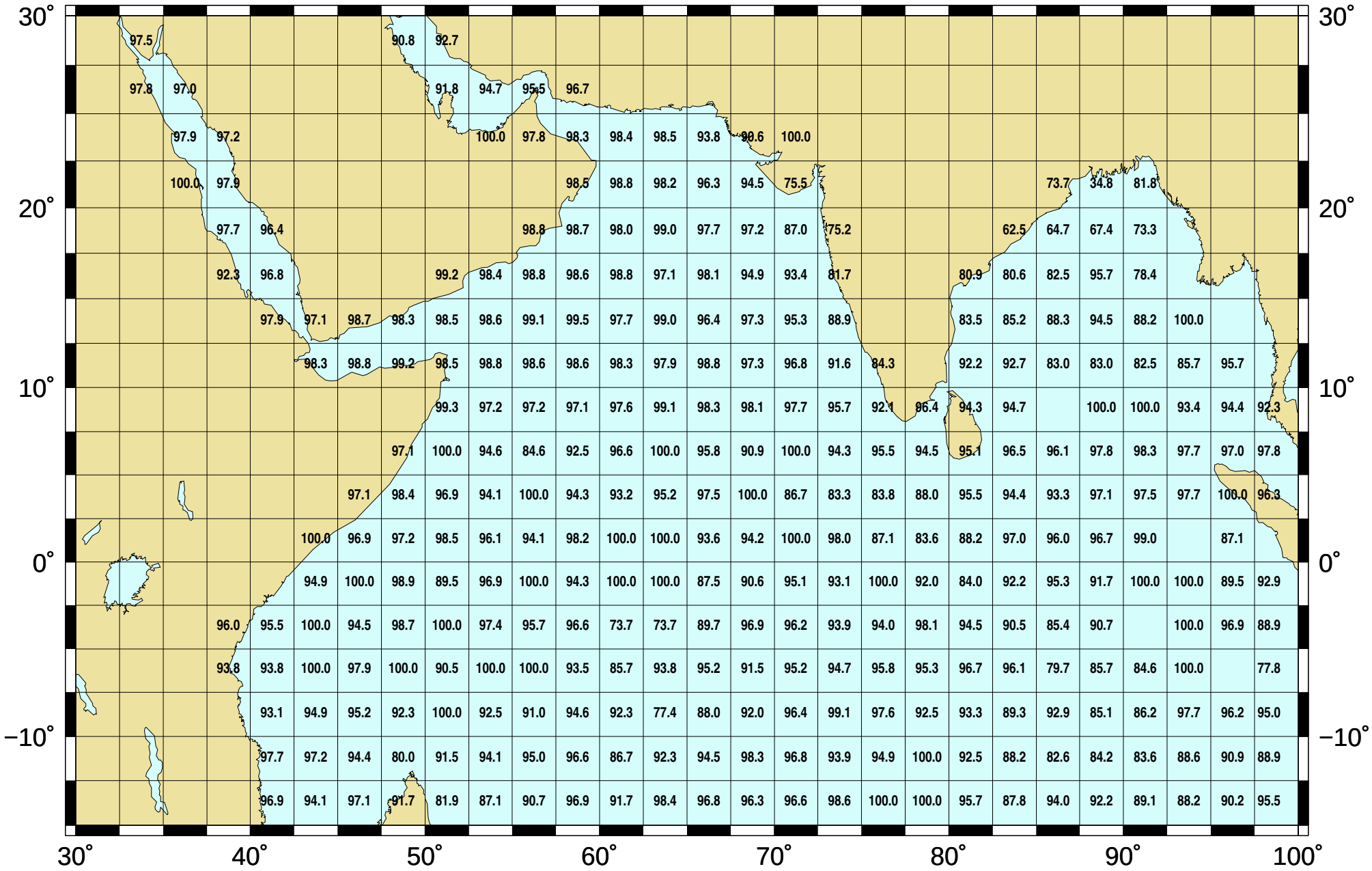


CHART No.15.2 VISIBILITY(> 10 Km)(%) FEBRUARY

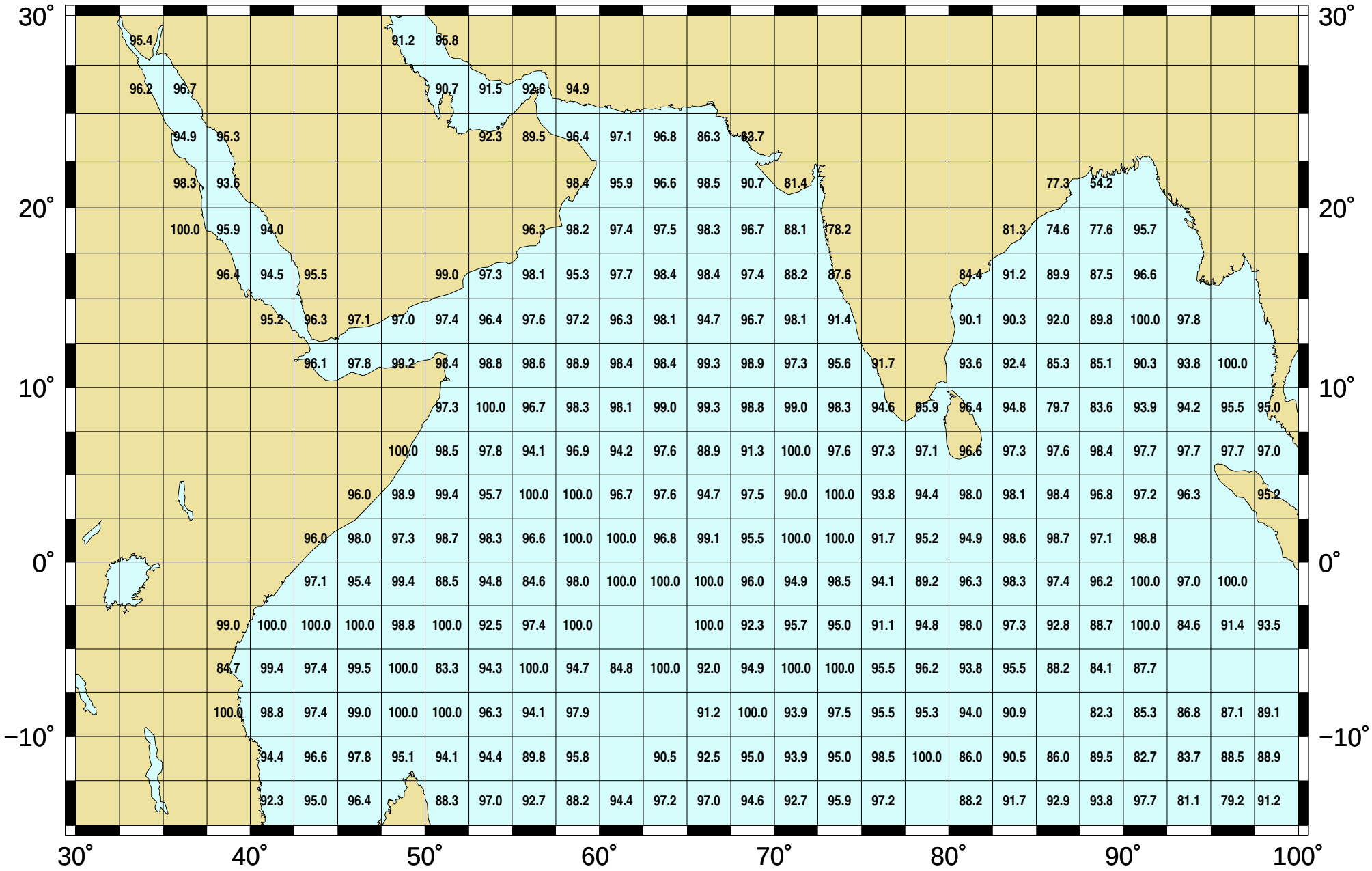


CHART No.15.3 VISIBILITY(> 10 Km)(%) MARCH

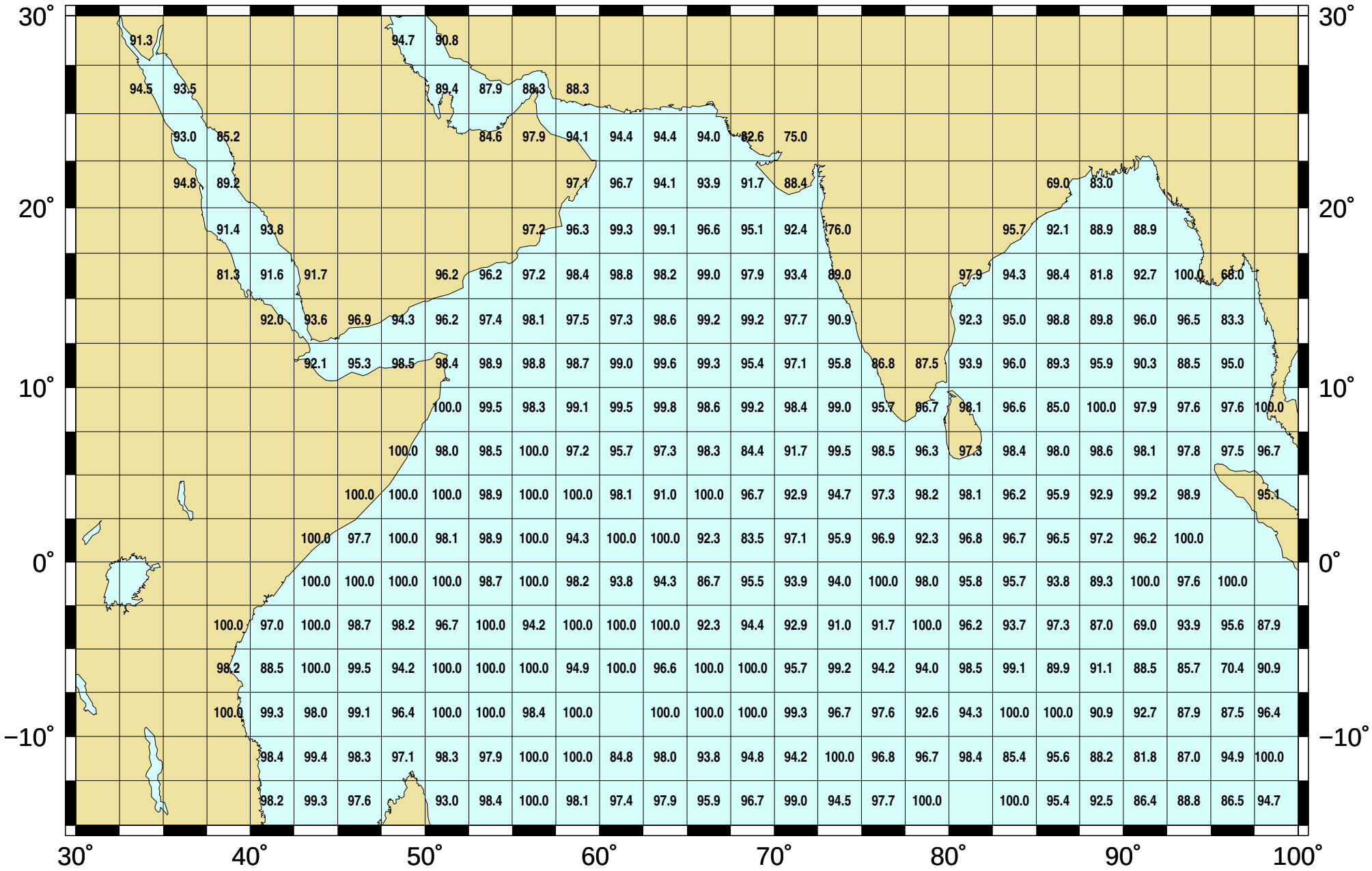


CHART No.15.4 VISIBILITY(> 10 Km)(%) APRIL

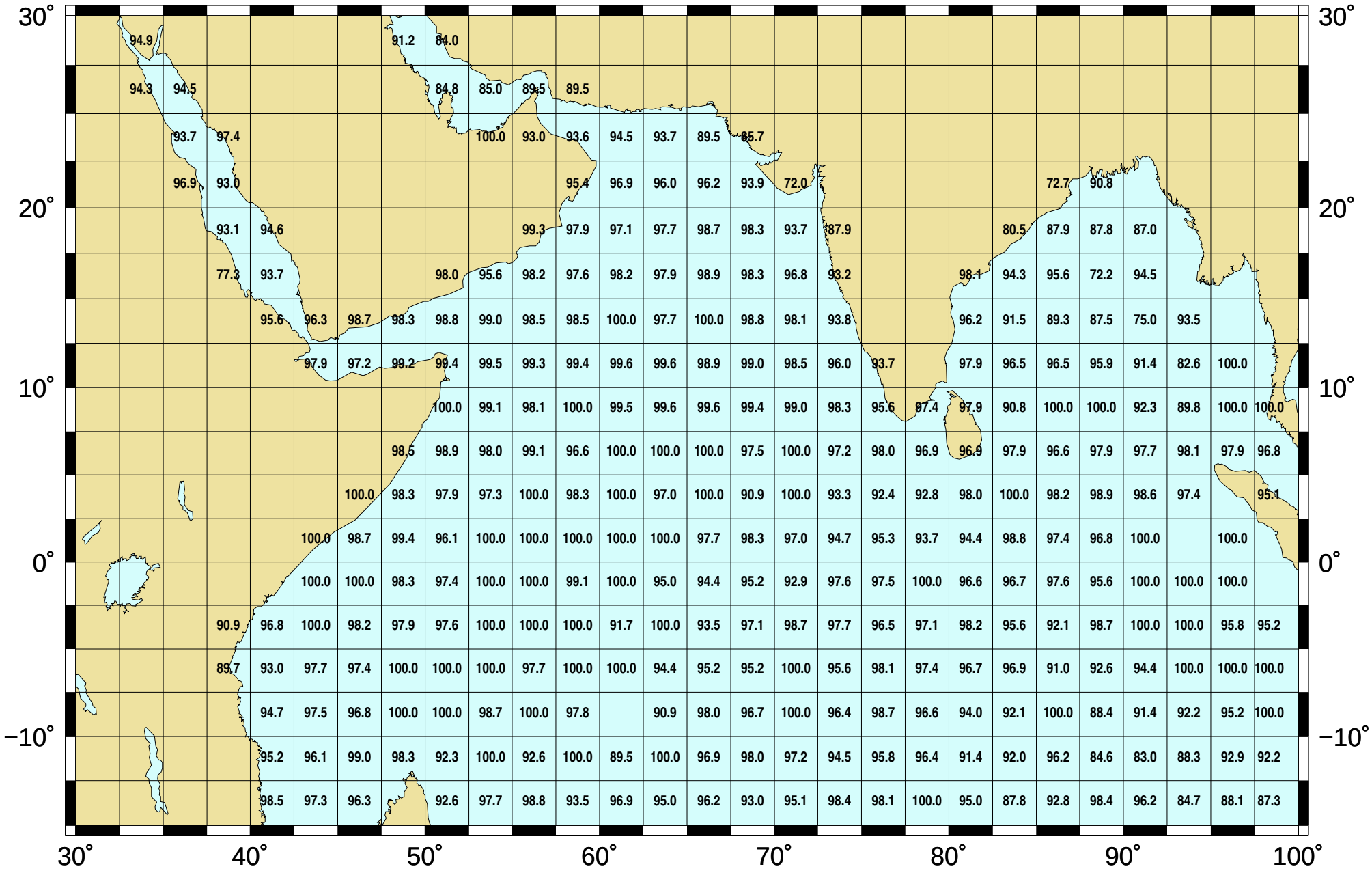


CHART No.15.5

VISIBILITY(> 10 Km)(%)

MAY

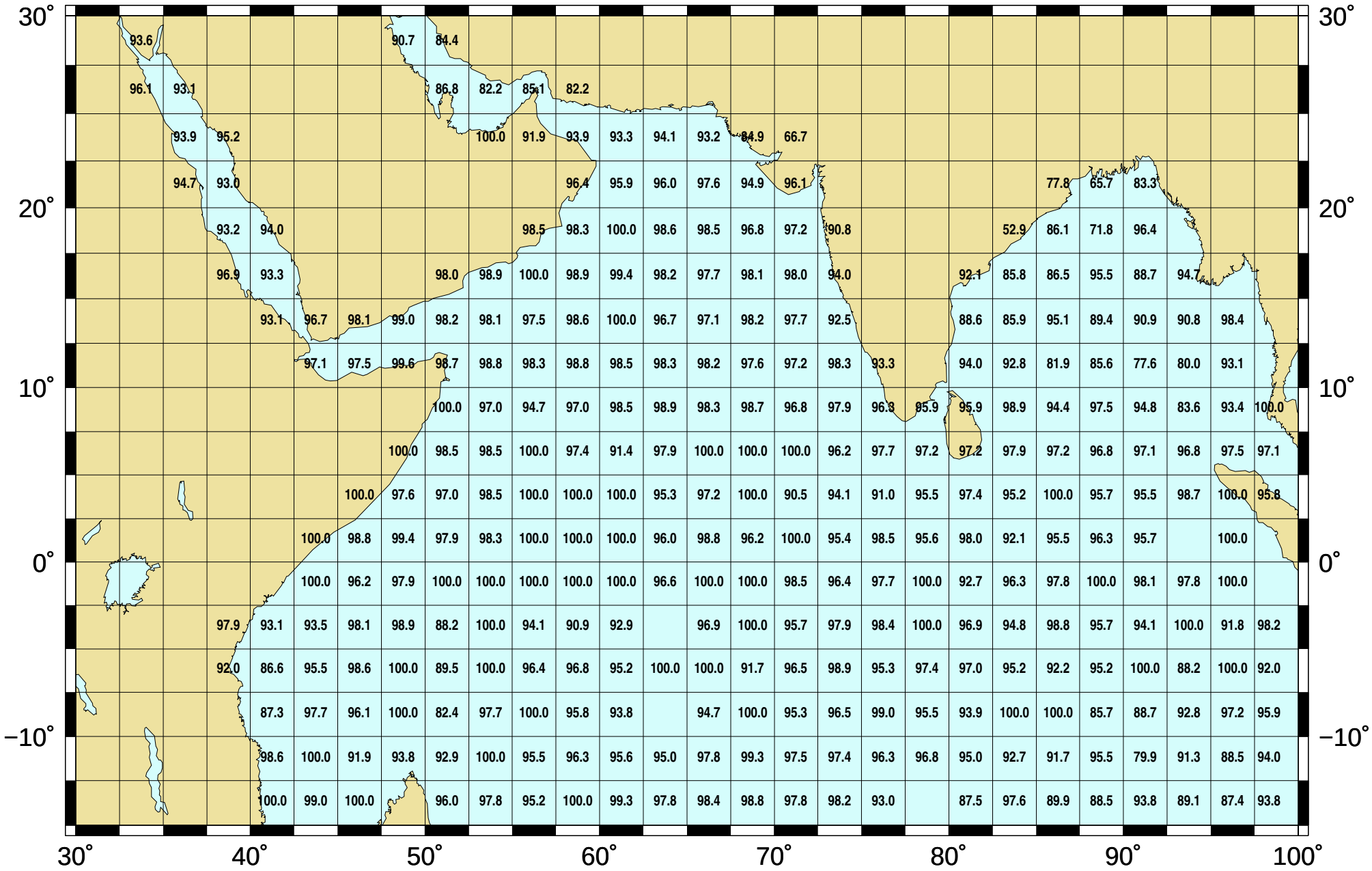


CHART No.15.6

VISIBILITY(> 10 Km)(%)

JUNE

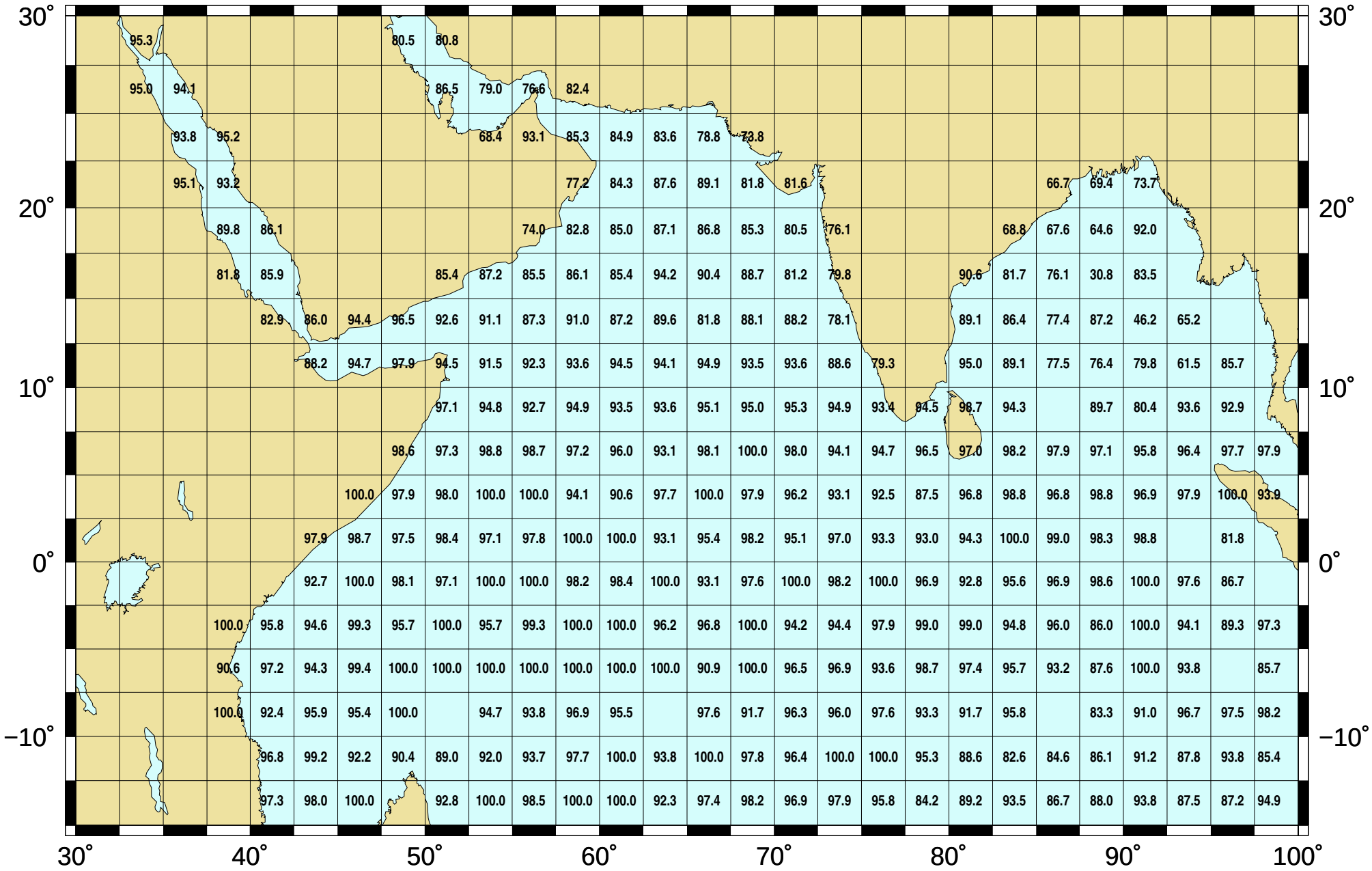


CHART No.15.7 VISIBILITY(> 10 Km)(%) JULY

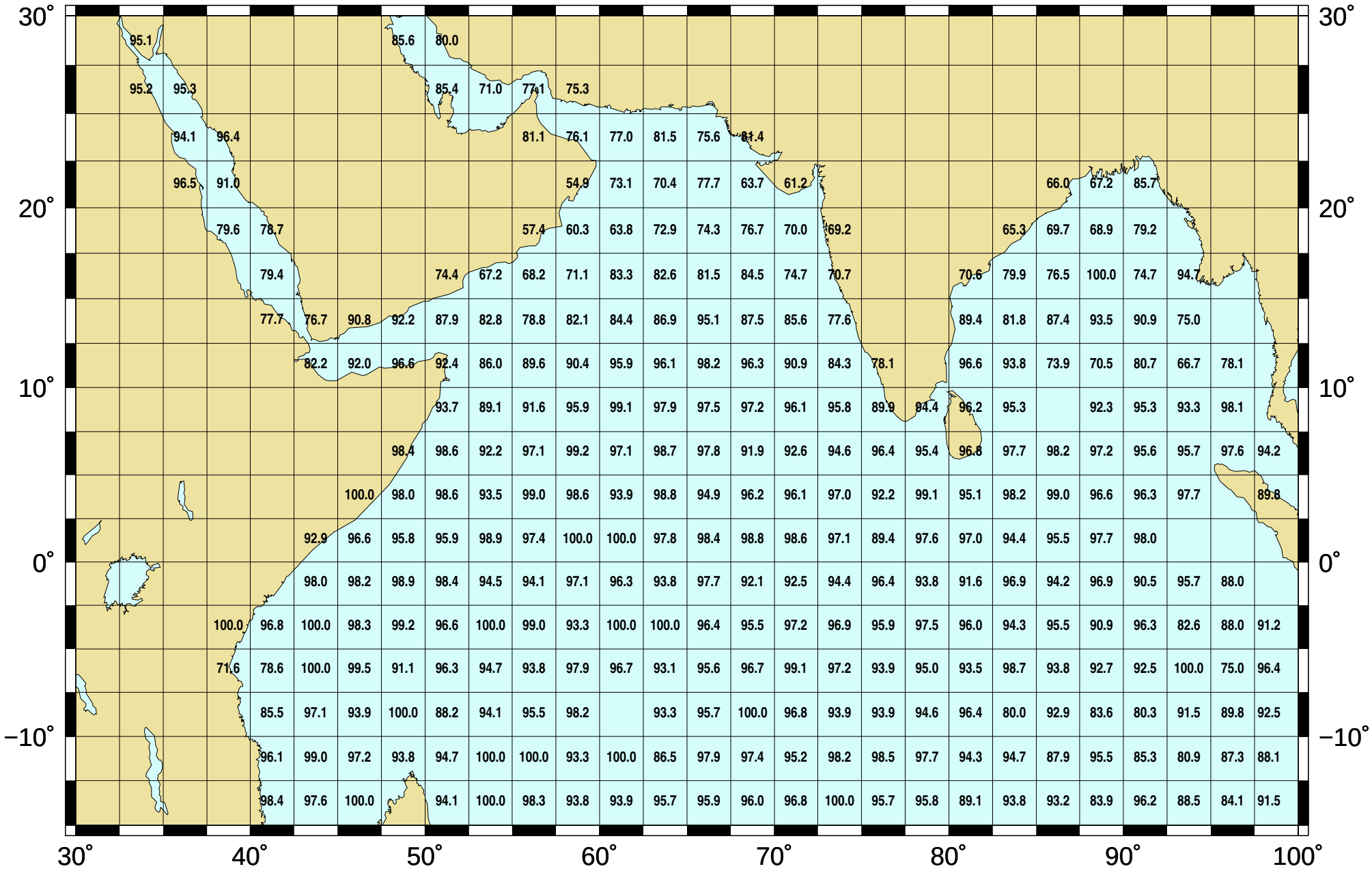


CHART No.15.8 VISIBILITY(> 10 Km)(%) AUGUST

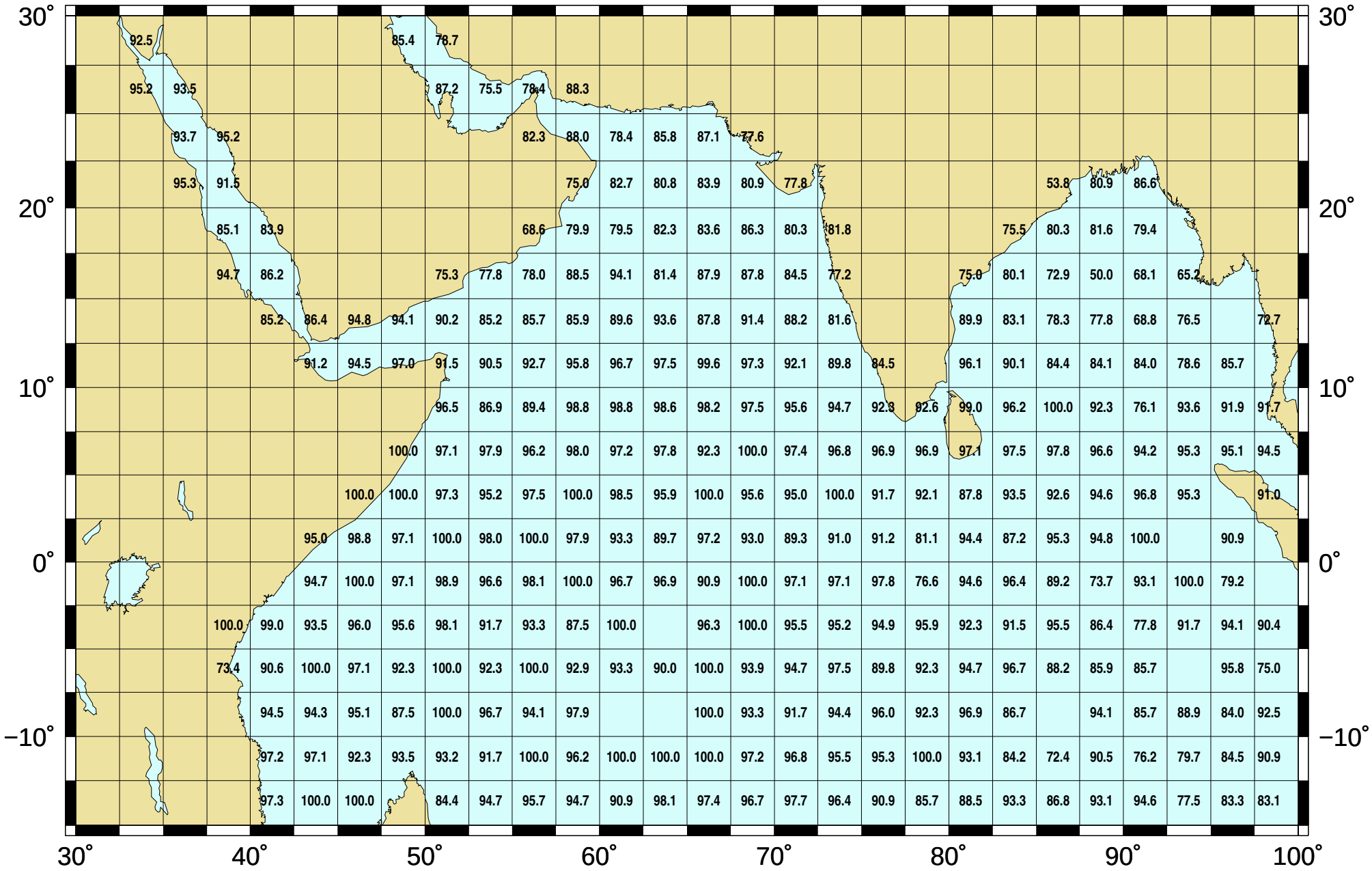


CHART No.15.9 VISIBILITY(> 10 Km)(%) SEPTEMBER

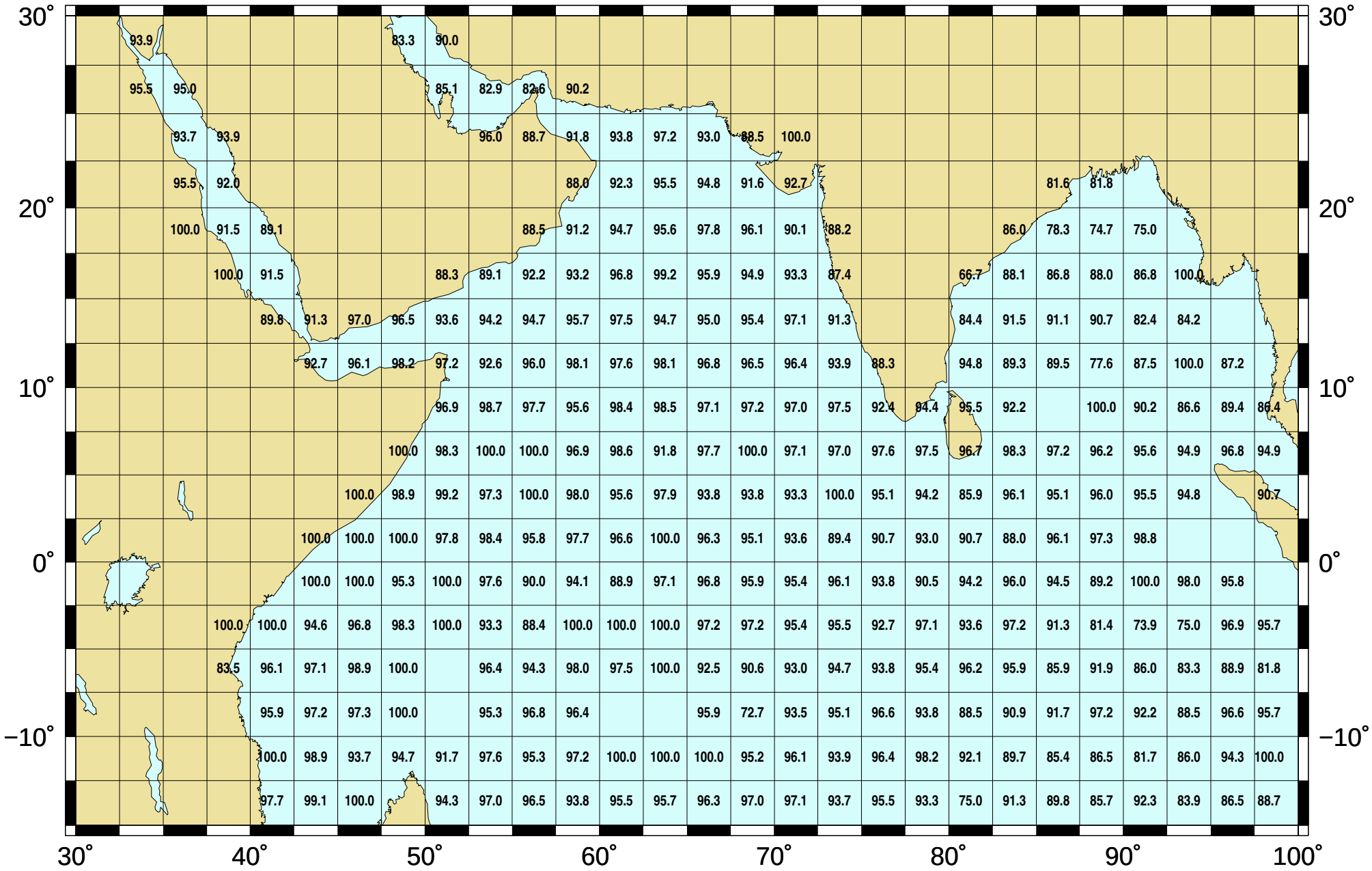


CHART No.15.10 **VISIBILITY(> 10 Km)(%)** **OCTOBER**

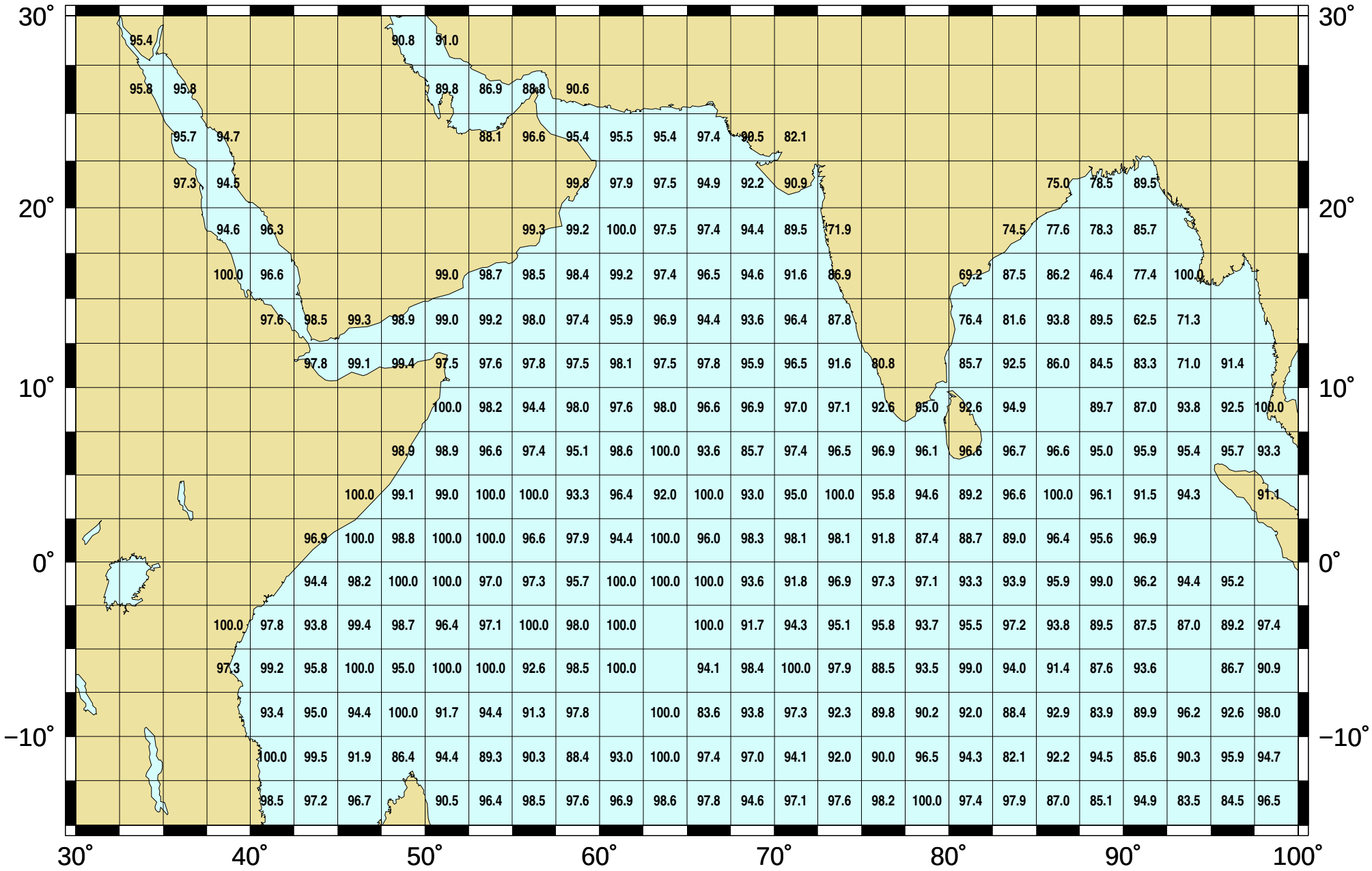


CHART No.15.11

VISIBILITY(> 10 Km)(%)

NOVEMBER

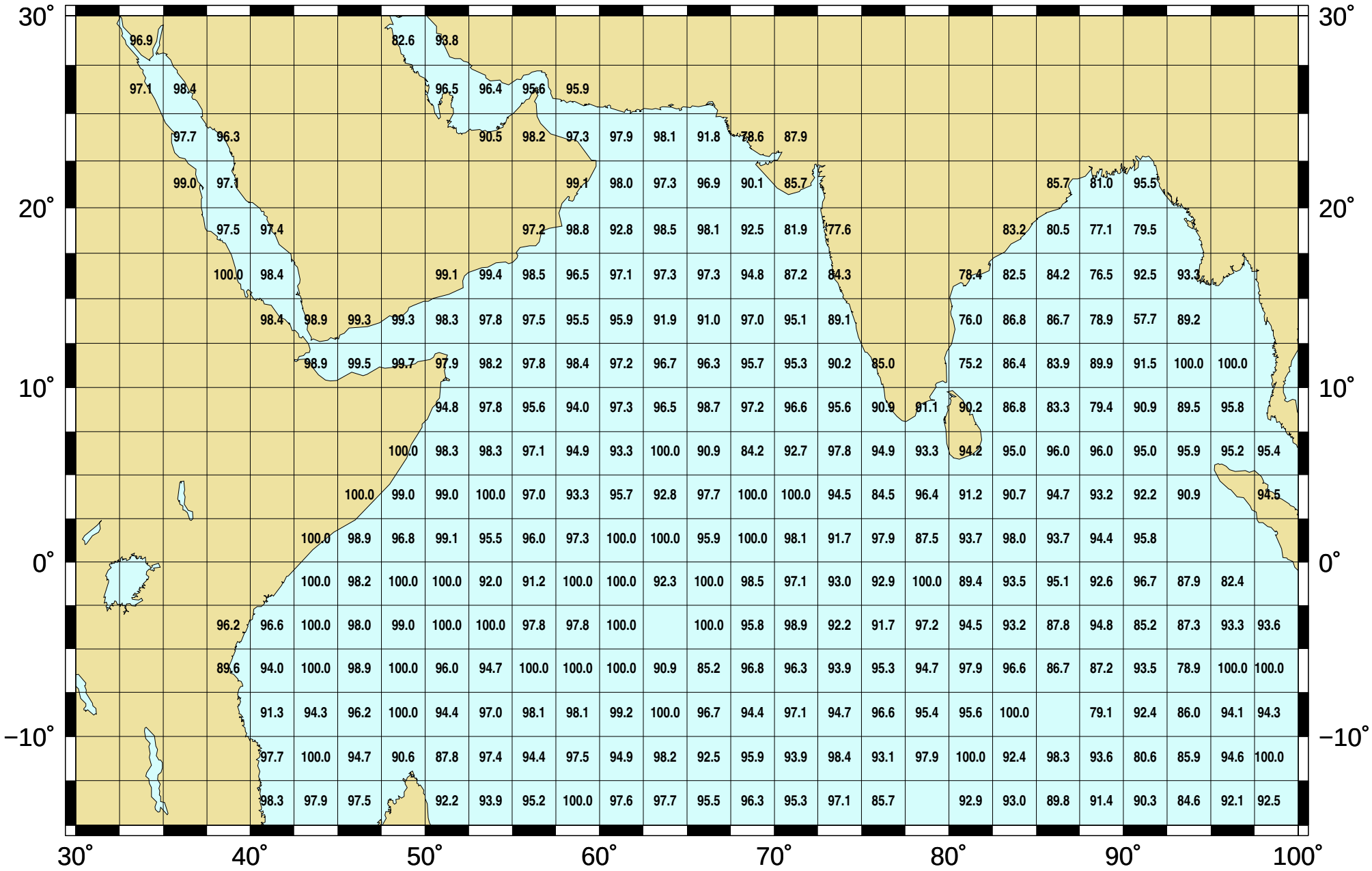
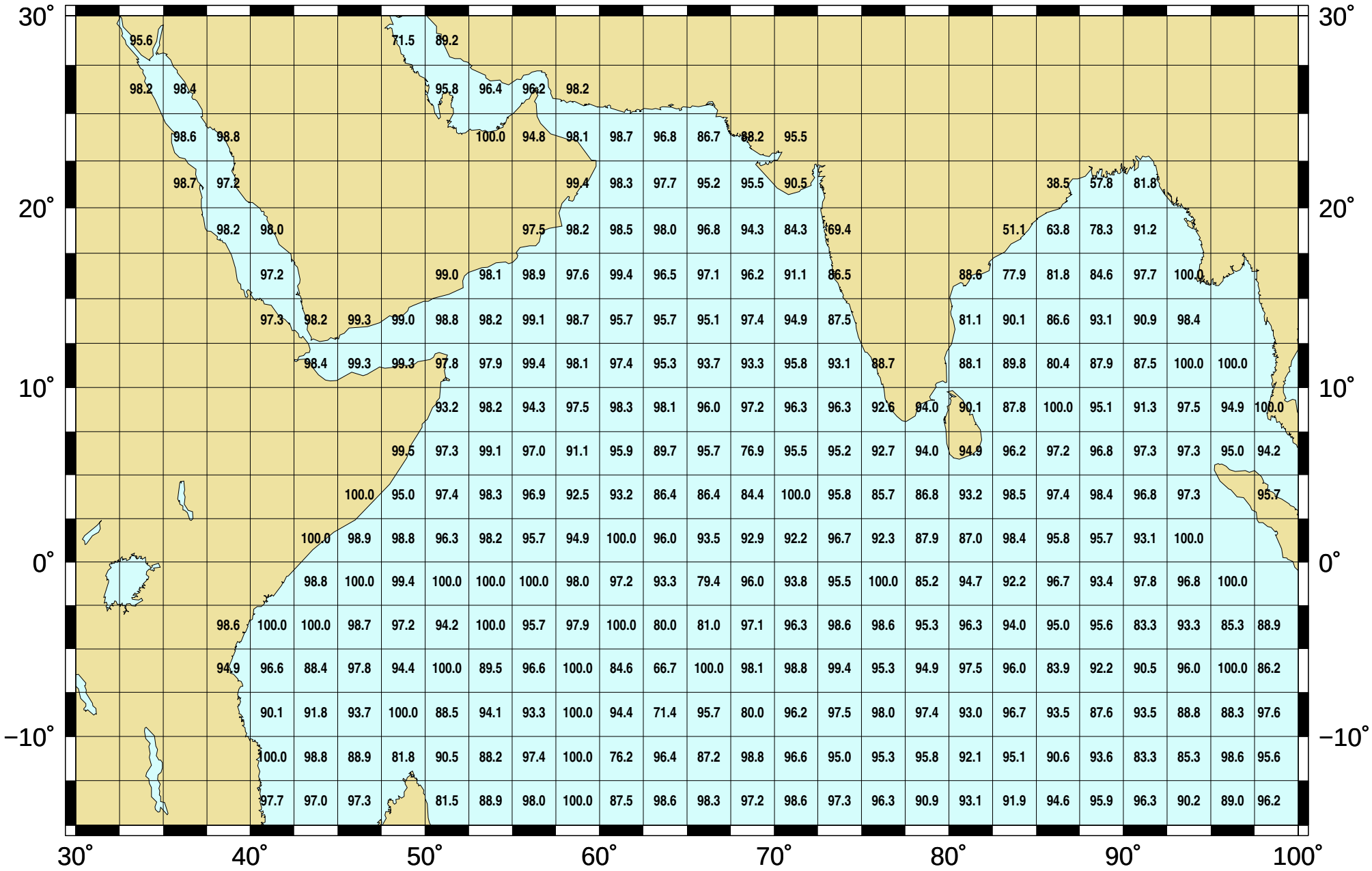


CHART No.15.12 VISIBILITY(> 10 Km)(%) DECEMBER



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