https://ntrs.nasa.gov/search.jsp?R=19900008804 2020-03-20T00:04:40+00:00Z

NASA Technical Memorandum 100747

An Atlas of ECMWF Analyses (1980-87)

Part I - First Moment Quantities

S. Schubert
Goddard Space Flight Center
Greenbelt, Maryland

S. Moorthi
University Space Research Association
Columbia, Maryland

C.-K. Park
Centel Federal Services Corp.
Reston, Virginia

M. Suarez
Goddard Space Flight Center
Greenbelt, Maryland

W. Higgins
National Academy of Sciences
National Research Council
Washington, D. C.

NASA
National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, MD

1990

TABLE OF CONTENTS

		PAGE
I.	INTRODUCTION	v
II.	LIST OF QUANTITIES	vi
III.	REFERENCES	ix
IV.	APPENDIX A: DATA PROCESSING	x
V.	APPENDIX B: SOURCES OF DIGITIZED DATA	xii
VI.	THE FIRST MOMENT FIELDS	
	A. MONTHLY AVERAGES	
	JANUARY	1
	FEBRUARY	15
	MARCH	29
	APRIL	43
	MAY	57
	JUNE	71
	JULY	85
	AUGUST	99
	SEPTEMBER	113
	OCTOBER	127
	NOVEMBER	141
	DECEMBER	155
	B. SEASONAL AVERAGES	
	DECEMBER, JANUARY, FEBRUARY	169
	MARCH, APRIL, MAY	183
	JUNE, JULY, AUGUST	197
	SEPTEMBER, OCTOBER, NOVEMBER	211
	C. ANNUAL AVERAGES	225
	D. THE SEASONAL CYCLE	239
	E. THE ANOMALIES	249

PRECEDING PAGE BLANK NOT FILMED

PAGE 11 INTENTIONALLY BLANK

I. INTRODUCTION

The Goddard Laboratory for Atmospheres (GLA) has over the past few years acquired a large data base of 00Z and 12Z initialized analyses (1980-87) from the European Center for Medium Range Weather Forecasts (ECMWF). In support of our ongoing research activities we have found it convenient to compile these analyses in the form of an atlas.

The original ECMWF/WMO data was obtained on a 2.5 ° latitude by 2.5 longitude grid in a packed format. This data was unpacked and interpolated to a 4 ° latitude by 5 ° longitude grid for the purpose of computing various statistics and plotting. Appendix A describes furthur details of the data and data processing. In part I of this atlas we present various first moment quantities for monthly, seasonal and annual averages on a global cylindrical projection as well as cross section maps of zonal averages. We also present the average seasonal cycle and anomalies during the 8 year period for selected quantities. Part II presents various second moment quantities including both transient and standing eddy components. This includes some time filtered quantities which separate the contributions of the band pass (2.5 - 6 days) and low pass (> 10 days) regions of the spectrum.

The ECMWF analysis system has undergone a number of changes during the period 1980-87. Trenberth and Olson (1988) have done an extensive study of the ECMWF analyses for 1979-86 and examined the impact of analysis system changes on data quality. (see their Table I and discussion). The change to diabatic nonlinear normal mode initialization in September of 1982 dramatically increased the strength of the tropical divergence. For quantities sensitive to the divergence we have limited the time averages to 1984-87. For these fields the shorter time-averaging period is clearly indicated. Otherwise the averages include all 8 years. It must be emphasized that many other changes occurred to the analysis system during this time period leading to inhomogeneities in the data. This is particularly true for the moisture fields (see eg. Trennberth and Olson, 198?). No attempt has been made to take this into account when performing the time averages.

We note that other recent compilations of assimilated data that may be useful for comparisons are those of Trenberth and Olson (1988) based on essentially the same data (1979-86) and Lau (1984) which examines the FGGE year based on analyses produced at GFDL.

In accordance with ECMWF conditions any publications making use of the figures and/or data in this atlas must acknowledge ECMWF as the data source.

PAGE IV INTENTIONALLY BL

PRECEDING PAGE BLANK NOT FILMED

II. LIST OF QUANTITIES

The following lists the quantities and units used for plotting. The contour intervals are easily seen from the plots themselves. The global maps consist primarily of the 850 and 200 mb fields. Exceptions to this are the height field which is presented at 300 mb, the vertical velocity which is presented at 500 mb and the moisture field which is shown only at 850 mb. The cross sections are based on all the levels obtained from ECMWF which are 1000, 850, 700, 500, 300, 200, and 100 mb. Plots are shown for monthly, seasonal and annual averages. Our organization of the fields follows essentially that of Lau (1984)

The basic quantities and units (for the plots) are

1) U	east/west component of wind	m/s
2) V	north/south component of wind	m/s
3) T	temperature	°K
4) Z	geopotential height	m
5) Z_e	eddy geopotential height (zonal mean removed)	m
6) Q	specific humidity[1]	g/kg
7) ω	vertical velocity	nanobars/s
8) ψ	stream function	$m^2/s \times 10^6$
9) χ	velocity potential	$m^2/s \times 10^6$
10) p_s	sea level pressure[2]	mb

The fields are grouped according to whether they are monthly, seasonal or annual averages. Within each group the global maps are presented first followed by the zonal averages denoted by brackets ([...]). The final maps present the seasonal cycle and anomalies (monthly deviations from the seasonal cycle) of selected zonal averaged fields. We indicate below the quantities and (for convenience) the relative positions of the plots in the atlas for each data group.

[1]The original field was relative humidity. See Appendix A for the conversion to specific humidity.
[2]See Appendix A for the sea level pressure calculation from the height and temperature field.

Quantity		Relative Position
U	850 mb	1
U	200 mb	1
V	850 mb	2
V	200 mb	2
T	850 mb	3
T	200 mb	3
Z	300 mb	4
Z_e	300 mb	4
Q	850 mb	5
ω	500 mb	5
ψ	850 mb	6
ψ	200 mb	6
χ	850 mb	7
χ	200 mb	7
p_s	sea level	8
[U]		9
[V]		9
[ω]	(1980-83)	10
[ω]	(1984-87)	10
[Q]		11
[T]		11

The following quantities describe the seasonal cycle which is the average over all years (1980-87). We also show the difference between the first and last 4 years (1984/87-1980/83). These quantities appear after the annual averages.

	Quantity		Relative Position
[U]	200 mb seasonal cycle		1
[U]	200 mb seasonal cycle	(1984/87-1980/83)	1
[U]	850 mb seasonal cycle		2
[U]	850 mb seasonal cycle	(1984/87-1980/83)	2
[V]	200 mb seasonal cycle		3
[V]	200 mb seasonal cycle	(1984/87-1980/83)	3
[V]	850 mb seasonal cycle		4
[V]	850 mb seasonal cycle	(1984/87-1980/83)	4
[T]	200 mb seasonal cycle		5
[T]	200 mb seasonal cycle	(1984/87-1980/83)	5
[T]	850 mb seasonal cycle		6
[T]	850 mb seasonal cycle	(1984/87-1980/83)	6
[Q]	850 mb seasonal cycle		7
[Q]	850 mb seasonal cycle	(1984/87-1980/83)	7
[ω]	500 mb seasonal cycle		8
[ω]	500 mb seasonal cycle	(1984/87-1980/83)	8

The anomalies are the monthly averaged deviations from the seasonal cycle. For [V], [ω], and [Q] we remove separately the seasonal cycle for 1980-83 and 1984-87.

	Quantity	Relative Position
[U]*	200 mb anomalies	1
[U]*	850 mb anomalies	2
[V]*	200 mb anomalies	3
[V]*	850 mb anomalies	4
[ω]*	500 mb anomalies	5
[T]*	200 mb anomalies	6
[T]*	850 mb anomalies	7
[Q]*	850 mb anomalies	8

Appendix B describes how to access these data sets on the Amdahl V7 and V6.

III. REFERENCES

Lau, N-C., 1984: Circulation statistics based on FGGE level III-B analyses pro. uced at GFDL. **NOAA Data Report ERL GFDL-5**.

Trennberth, K.E., 1981: Seasonal variations in global sea level pressure and the total mass of the atmosphere. **J. Geophys. Rev., 86**, 5238-5246

Trennberth, K. E. and J. G. Olson, 1988: ECMWF Global Analyses 1979-198(: Circulation Statistics and Data Evaluation. **NCAR/TN-300+STR**, N(AR Technical Note, February, 1988, National Center for Atmospheric Rese: ch, Boulder, Colorado.

IV. APPENDIX A- THE DATA PROCESSING

The ECMWF analyses are the initialized fields provided to GLA (code 611) in an internal bit format. The data processing involves several steps including unpacking and converting to a 2 X 2.5 degree grid. During this step the relative humidity is converted to specific humidity and the sea level pressure is computed. Then an interpolatiion is made to a 4 X 5 degree grid. The stream function and velocity potential are computed from the lower resolution monthly-averaged fields. Both resolutions of the basic parameters are available on tape but all plotting is done from the lower resolution fields. Further details of the data are provided below.

ORIGINAL PACKED DATA AS RECEIVED FROM ECMWF:

2.5° latitude by 2.5° longitude in internal bit format
1000, 850, 700, 500, 300, 200, 100 hPa
separate 00Z and 12Z tapes

DATA (IM,JNP)

IM= 1, .. , 144 starting at 177.5 W and going east to 180 E
JNP = 1, .. , 73 starting at North Pole

(1) geopotential height (m)
(2) temperature (°K)
(3) u (m/s)
(4) v (m/s)
(5) relative humidity (%)
(6) vertical velocity (Pa/s)

UNPACKED ECMWF DATA (Version 8 format)

2° latitude by 2.5° longitude or 4° latitude by 5 ° longitude
In version 8 format (see documentation- VERSION 8 I/O utilities)
1000, 850, 700, 500, 300, 200, 100 hPa
00Z and 12Z combined for each tape

DATA(IM,JNP)

IM=1, .. , 144 (72) starting at 180° W and going east to 177.5° E (175° E)
JNP= 1, .. , 91 (46) starting at South Pole

Quantity

(1) sea level pressure (hPa)
(2) geopotential height (m)
(3) temperature (°K)
(4) u (m/s)
(5) v (m/s)
(6) specific humidity (g/g)
(7) vertical velocity (Pa/s)
(8) divergence

The specific humidity (q) is computed from the relative humidity

$$q = q_s * RH * 0.01$$

where

$$q_s = 0.622 * e_s / (p - .378\ e_s)$$

and e_s is the saturation vapor pressure determined from the empirical formulae

6.1078 * EXP { 21.8747 * (T- 273.16) / (T - 7.66) } for T ≤ 273. 6
6.1078 * EXP { 17.269 * (T- 273.16) / (T - 35.86) } for T > 273 16

The computation of sea level pressure (p_{sl}) is based on the hypsometric equation nd an assumed lapse rate (see eg. Trenberth , JGR, 86, C6) so that

$$p_{sl} = 1000 * EXP (9.81* Z / R\ T_v)$$

where Z is the height of the 1000 hPa surface and the mean virtual tempe ature (T_v) is given by

$$T_v = T * (1 + 0.61 * q) + 0.5 * (0.0065 * Z)$$

V. APPENDIX B- SOURCES OF DIGITIZED DATA

The data fields (for Part I of this Atlas) are currently stored in the MVS partitioned data set (PDS), W3CKP ECMWF ATLAS and are meant for use by NASA scientists with access to the Amdahl mainframe. This file will also be made available on the IBM 3081. We also anticipate that these fields will be made available on floppy disks for both IBM compatible and Macintosh personal computers in the near future. For further information concerning the use of this data contact

Siegfried Schubert
NASA/GSFC Code 611
Greenbelt, MD 20771
(301) 286-3441

1. MVS JCL and CMS EXEC

a) //FT11F001 DD DSN=W3CKP.ECMWF.ATLAS(xxxxxx),DISP=SHR
b) FI 11 * DSN W3CKP ECMWF ATLAS (MEMBER xxxxxx

Here, xxxxx is the PDS member name.

2. Read format and PDS member names

Longitude/Latitude Fields

MEMBERS:

SLP	sea level pressure (mb)	
U200	u-wind at 200 mb (m/s)	
U850	u-wind at 850 mb (m/s)	
V200	v-wind at 200 mb (m/s)	
V850	v-wind at 850 mb (m/s)	
Z300	geopotential height at 300 mb (m)	
T200	temperature at 200 mb (°K)	
T850	temperature at 850 mb (°K)	
Q850	specific humidity at 850 mb (g/g)	
W500	omega at 500 mb (Pa/s)	(1984-87 average)
VEL200	velocity potential at 200 mb (m^2/s)	(1984-87 average)
VEL850	velocity potential at 200 mb (m^2/s)	(1984-87 average)
STF850	stream function at 850 mb (m^2/s)	
STF200	stream function at 200 mb (m^2/s)	

```
      REAL  FLD(72,46)
      DO 100 IMON = 1, 12
100   READ(n) I, FLD                    : MONTHLY MEAN (JAN-DEC)
      DO 200 ISN  = 1, 4
200   READ(n) INDEX, FLD                : SEASONAL MEAN (DJF-SON)
      READ(n) INDEX, FLD                : ANNUAL MEAN
```

FLD(I,J) J= 1 is at the South Pole and I=1 is at 180° W (increasing eastward to 175 E)

Latitude/Pressure Sections

MEMBERS:

LTPQ	zonally-averaged specific humidity (g/g) (1980-87)
LTPT	zonally-averaged temperature (°K) (1980-87)
LTPU	zonally-averaged u-wind (m/s) (1980-87)
LTPV	zonally-averaged v-wind (m/s) (1984-87)
LTPW1	zonally-averaged vertical velocity (Pa/s) (1980-83)
LTPW2	zonally-averaged vertical velocity (Pa/s) (1984-87)

```
      DIMENSION LTP(46,7)
      DO 100 IMON = 1, 12
100   READ(n) INDEX, LTP                  : MONTHLY MEAN (JAN-DEC)
      DO 200 ISN  = 1, 4
200   READ(n) INDEX, LTP                  : SEASONAL MEAN (DJF-SON)
      READ(n) INDEX, LTP                  : ANNUAL MEAN
```

LTP(J,L) J= 1 is at the South Pole and L=1 is at 1000 mb. The other pressure levels are 850mb, 700mb, 500mb, 300mb, 200mb, 100mb.

Seasonal cycle climatology

MEMBERS : CLI8087, CLI8083, CLI8487

```
      DIMENSION CLI(12,46)
      DO 100 IV = 1, 8
      READ(n) INDEX, CLI
100   CONTINUE
```

CLI(K,J) J= 1 is at the South Pole and K=1 is January.

IV	Quantity
1	zonally-averaged u-wind at 200 mb (m/s)
2	zonally-averaged u-wind at 850 mb (m/s)
3	zonally-averaged v-wind at 200 mb (m/s)
4	zonally-averaged v-wind at 850 mb (m/s)
5	zonally-averaged temperature at 200 mb (°K)
6	zonally-averaged temperature at 850 mb (°K)
7	zonally-averaged specific humidity (g/g)
8	zonally-averaged vertical velocity (Pa/s)

Departure from seasonal cycle

MEMBER : DEP8087

```
      DIMENSION DEP(96,46)
      DO 100 IV = 1, 8
      READ(n) INDEX, DEP
100   CONTINUE
```

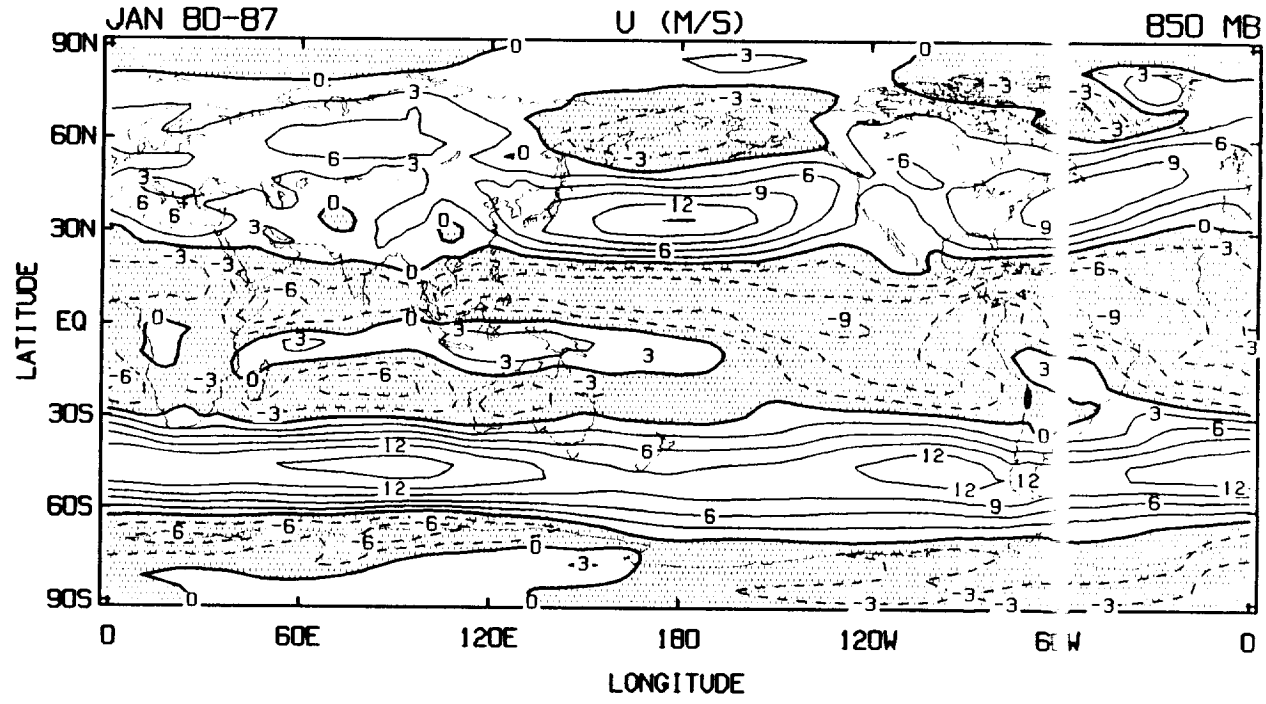
DEP(K,J) J= 1 is at the South Pole and K=1 is January, 1980.

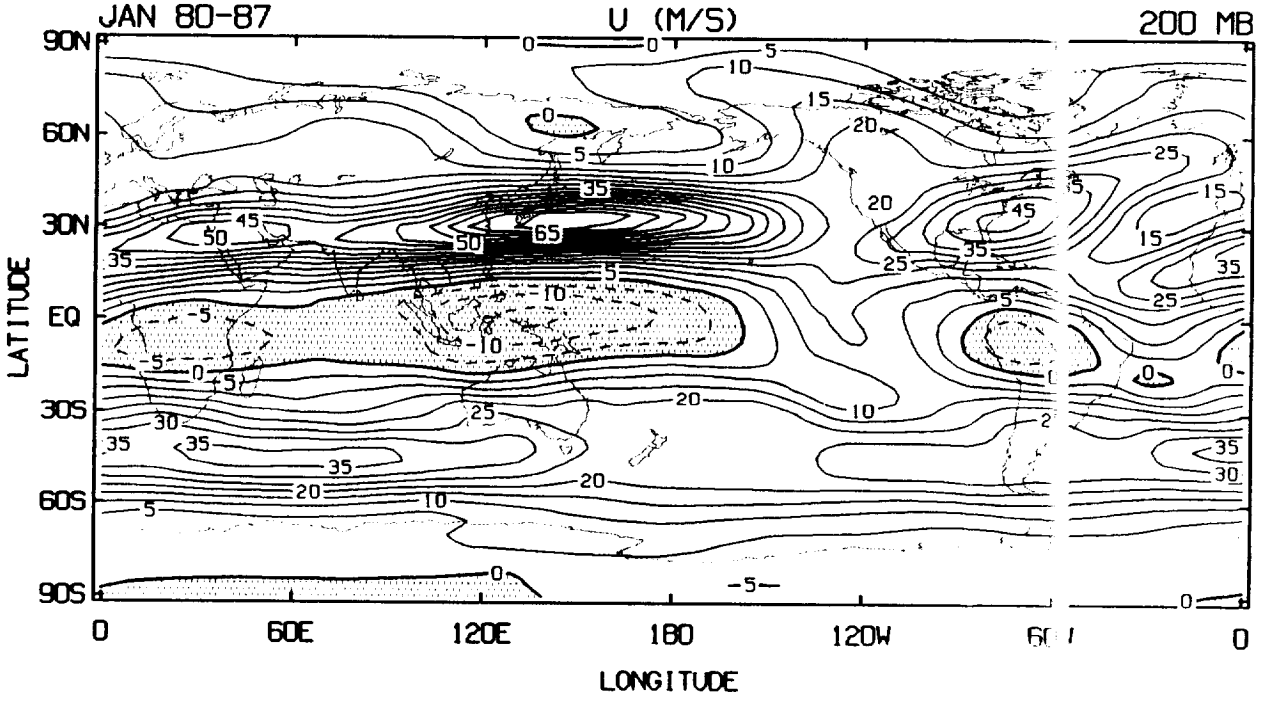
IV	Quantity
1	zonally-averaged u-wind at 200 mb (m/s)
2	zonally-averaged u-wind at 850 mb (m/s)
3	zonally-averaged v-wind* at 200 mb (m/s)
4	zonally-averaged v-wind* at 850 mb (m/s)
5	zonally-averaged temperature at 200 mb (°K)
6	zonally-averaged temperature at 850 mb (°K)
7	zonally-averaged specific humidity* (g/g)
8	zonally-averaged vertical velocity* (Pa/s)

* These anomaly fields are based on separate climatologies for 1980-83 and 1984-87.

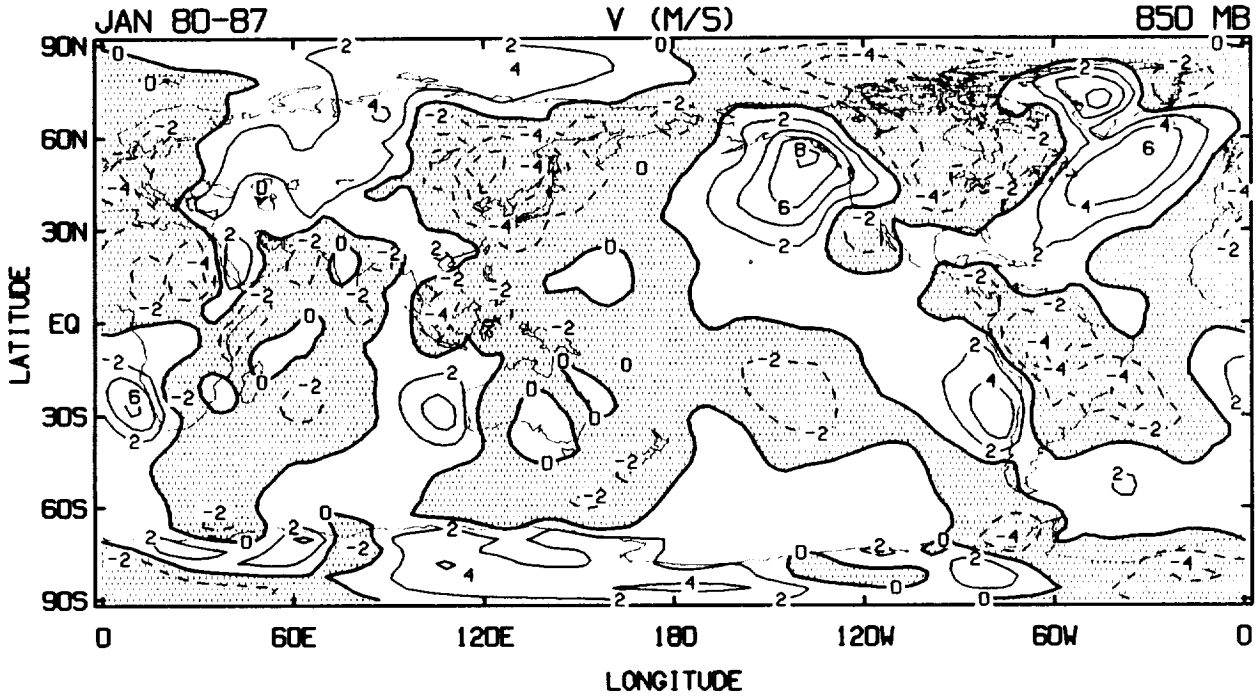
VI. THE FIRST MOMENT FIELDS

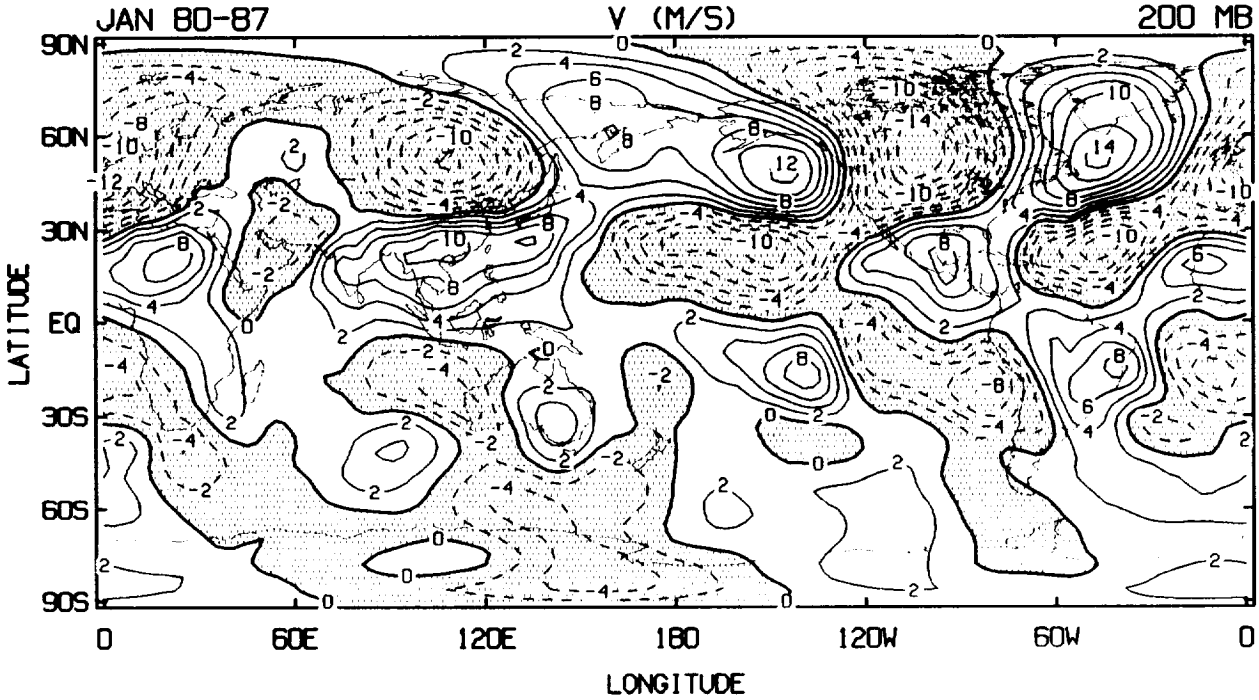
JANUARY

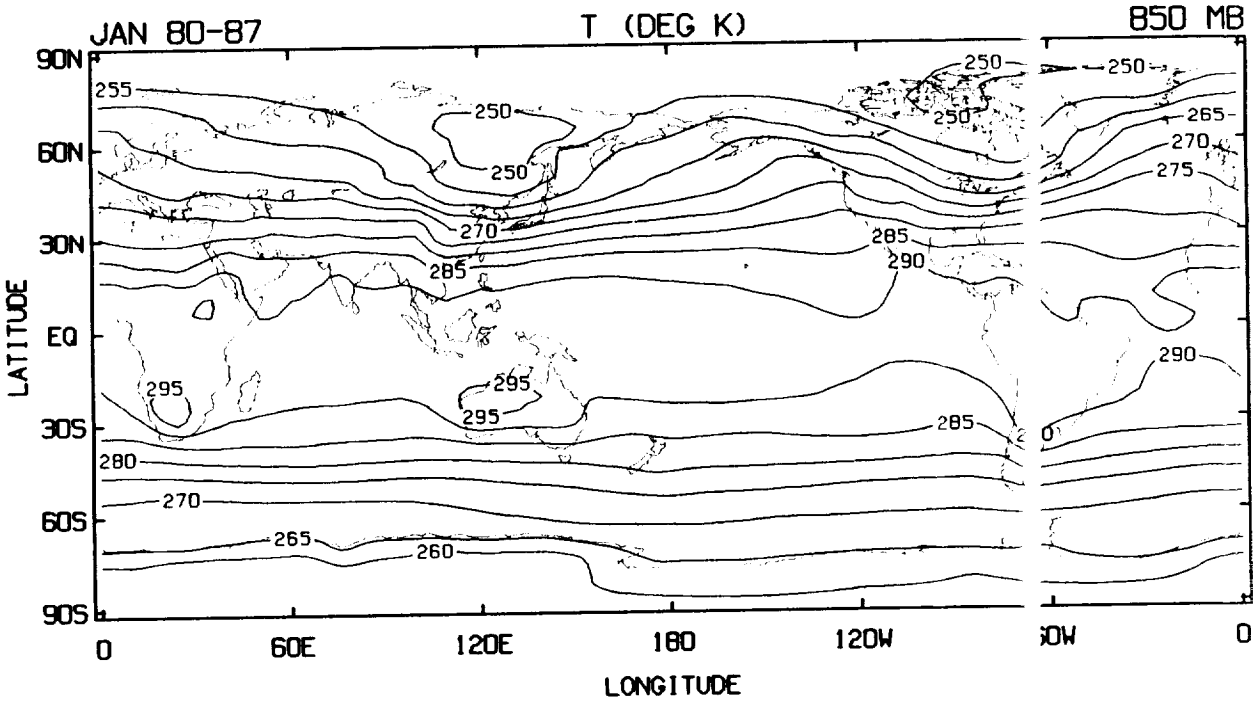


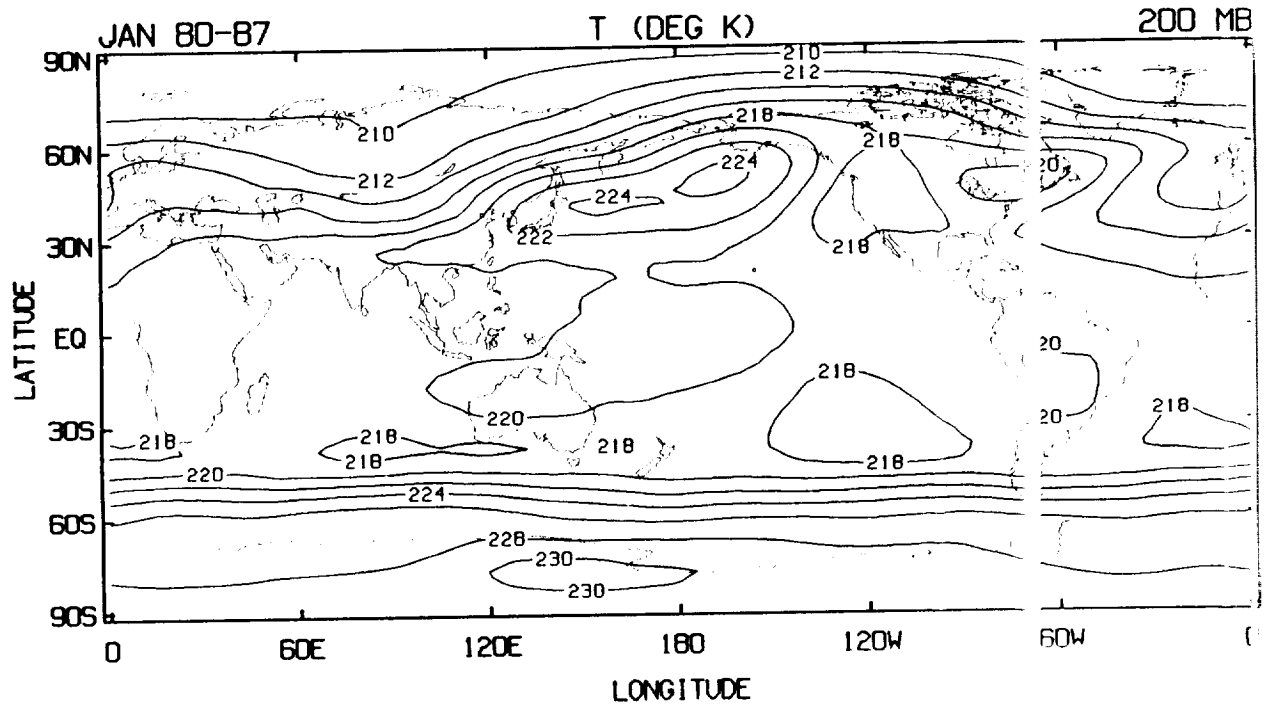


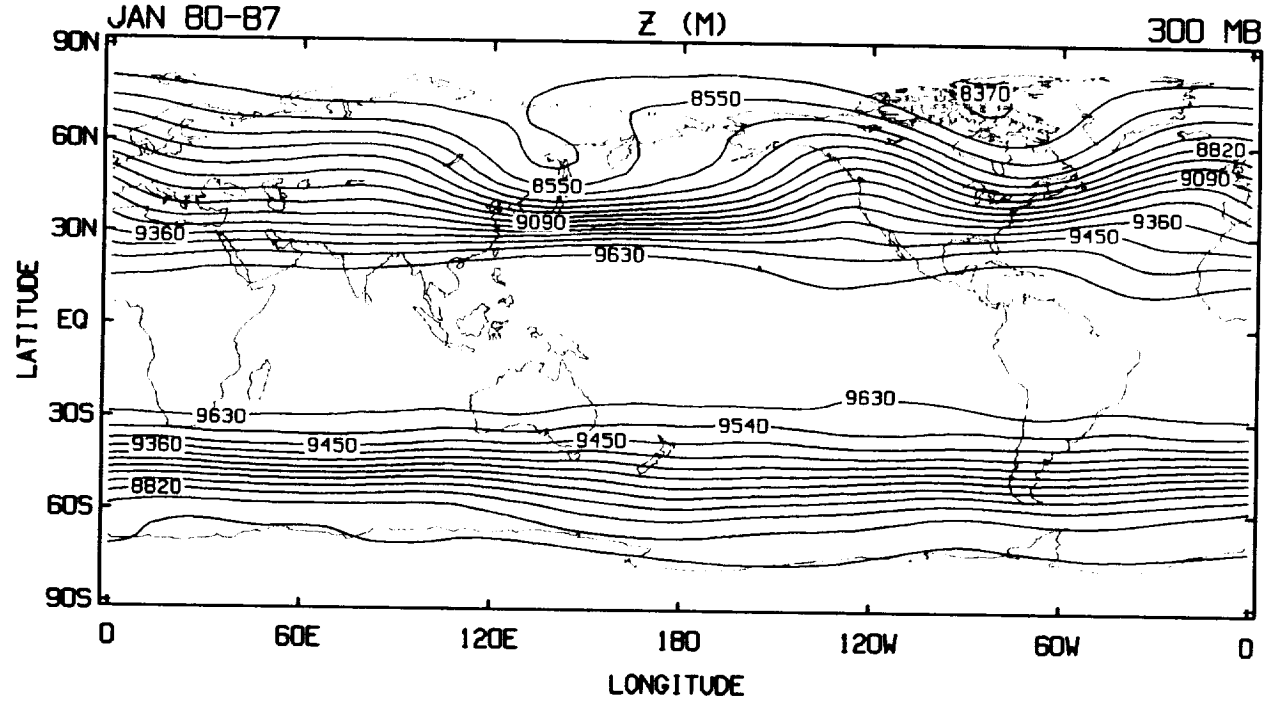
PAGE 2 INTENTIONALLY BLANK

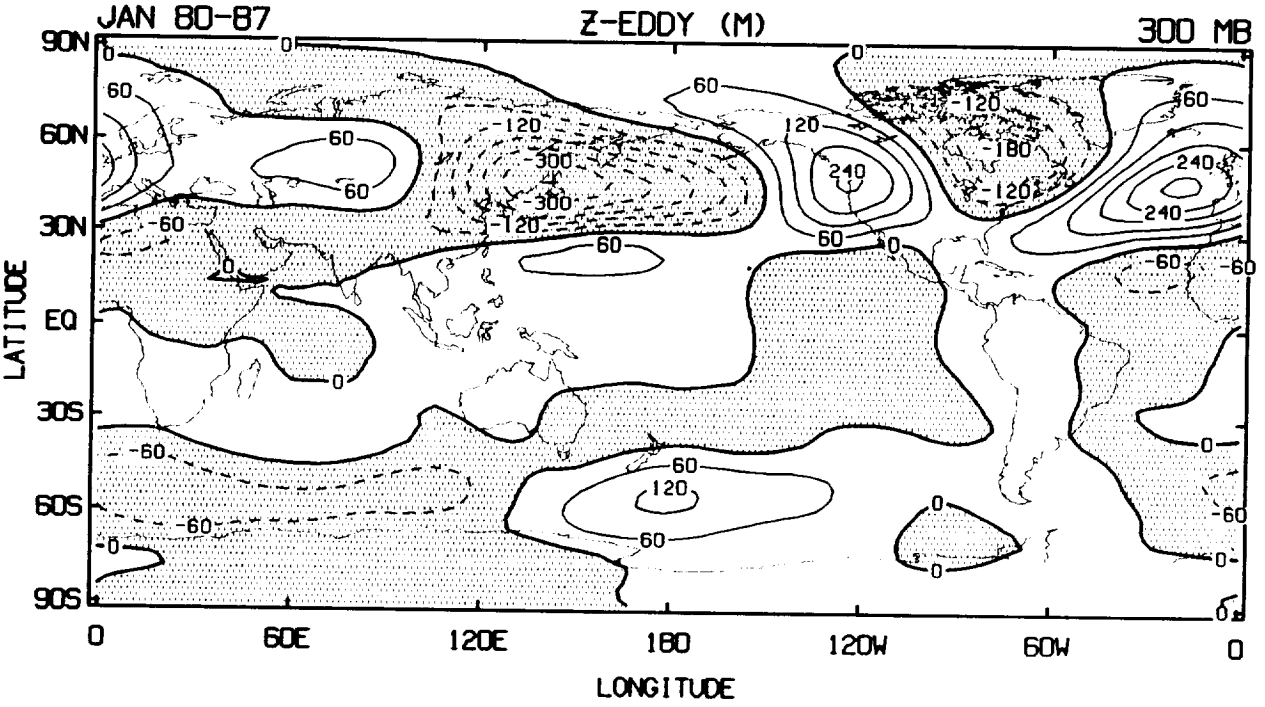

JAN 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

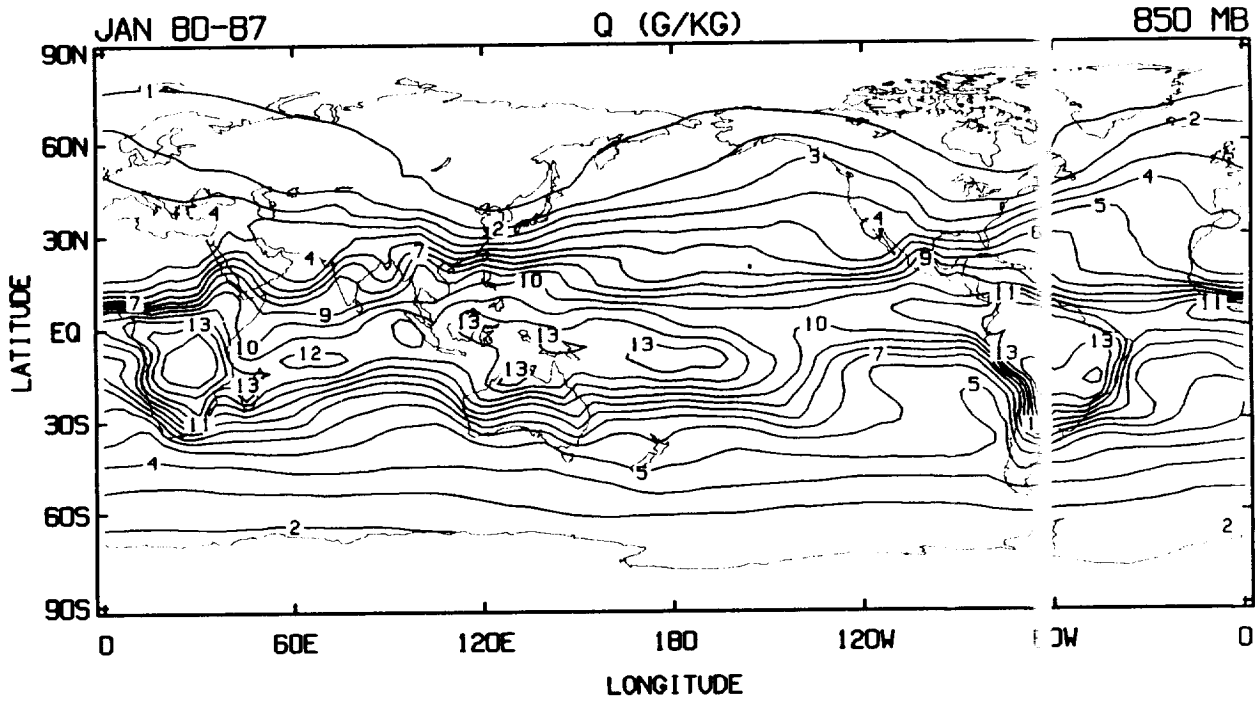

JAN 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

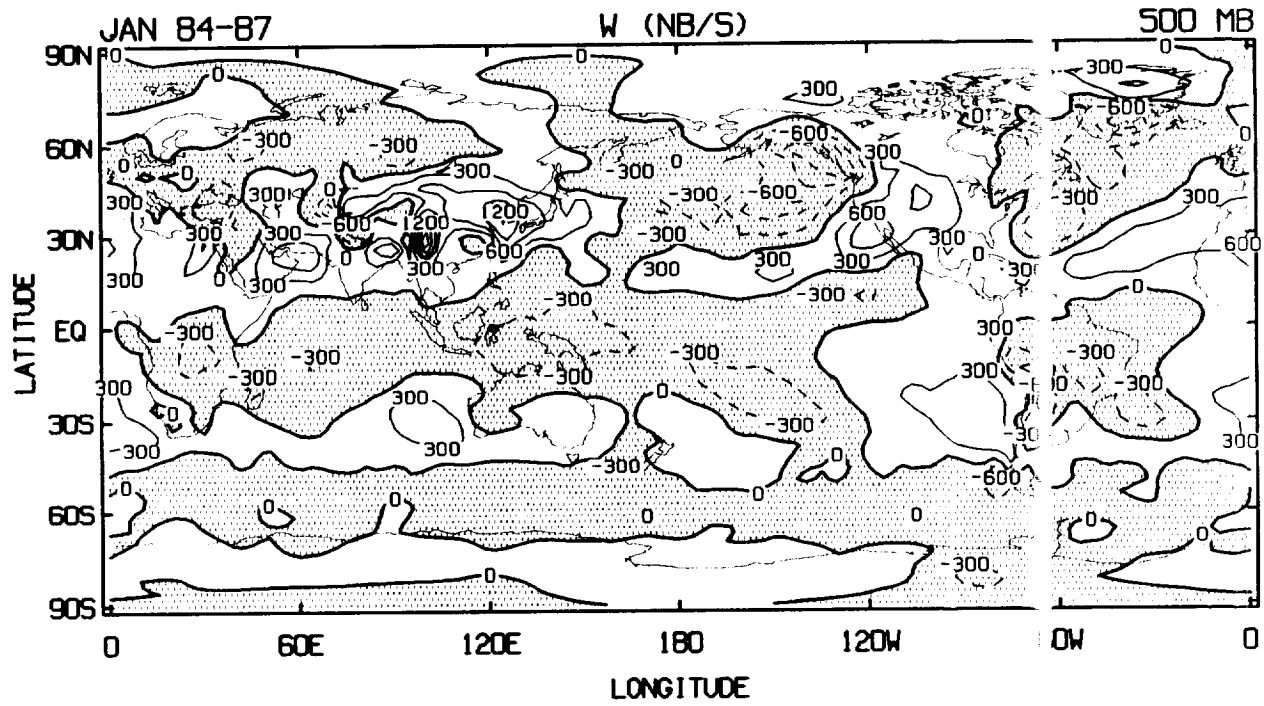

JAN 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
255
250
250
250
250
250
265
270
275
270
285
290
285
290
295
295
295
285
280
270
265
260
0
60E
120E
180
120W
60W
0
LONGITUDE

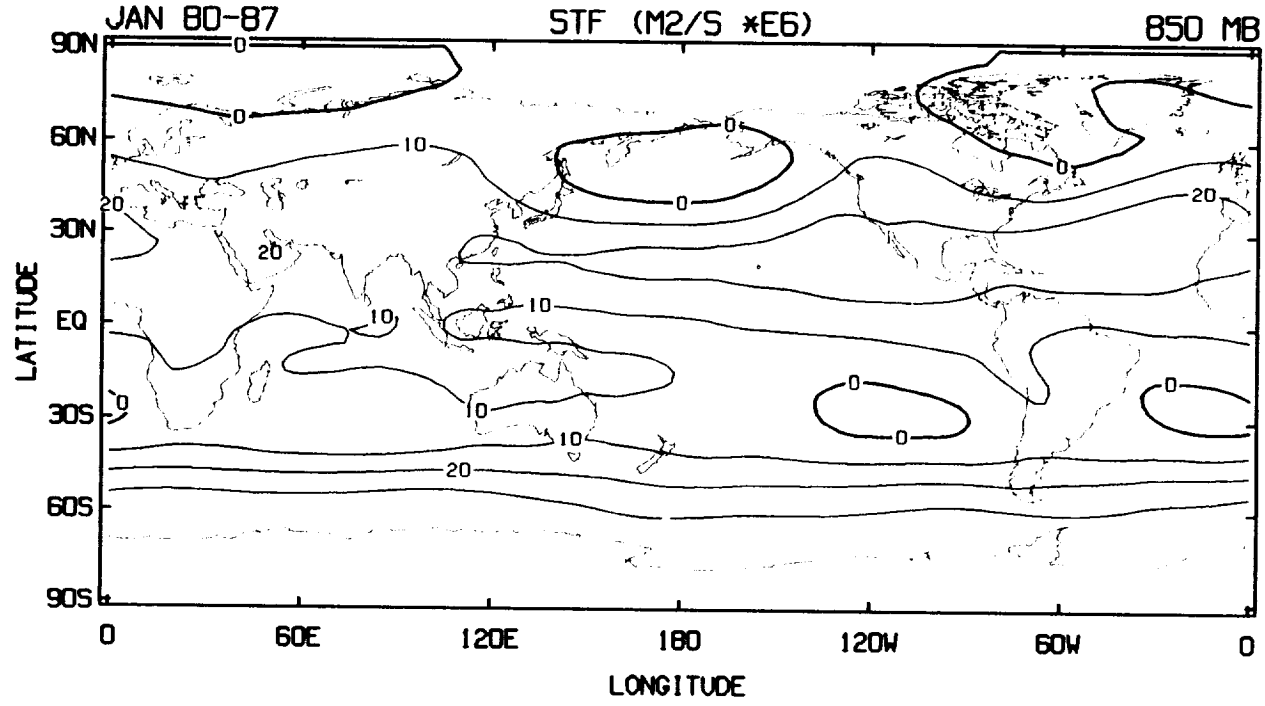

JAN 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
210
212
218
218
210
212
224
224
222
218
218
220
218
218
218
218
220
224
228
230
230
0
60E
120E
180
120W
60W
LONGITUDE

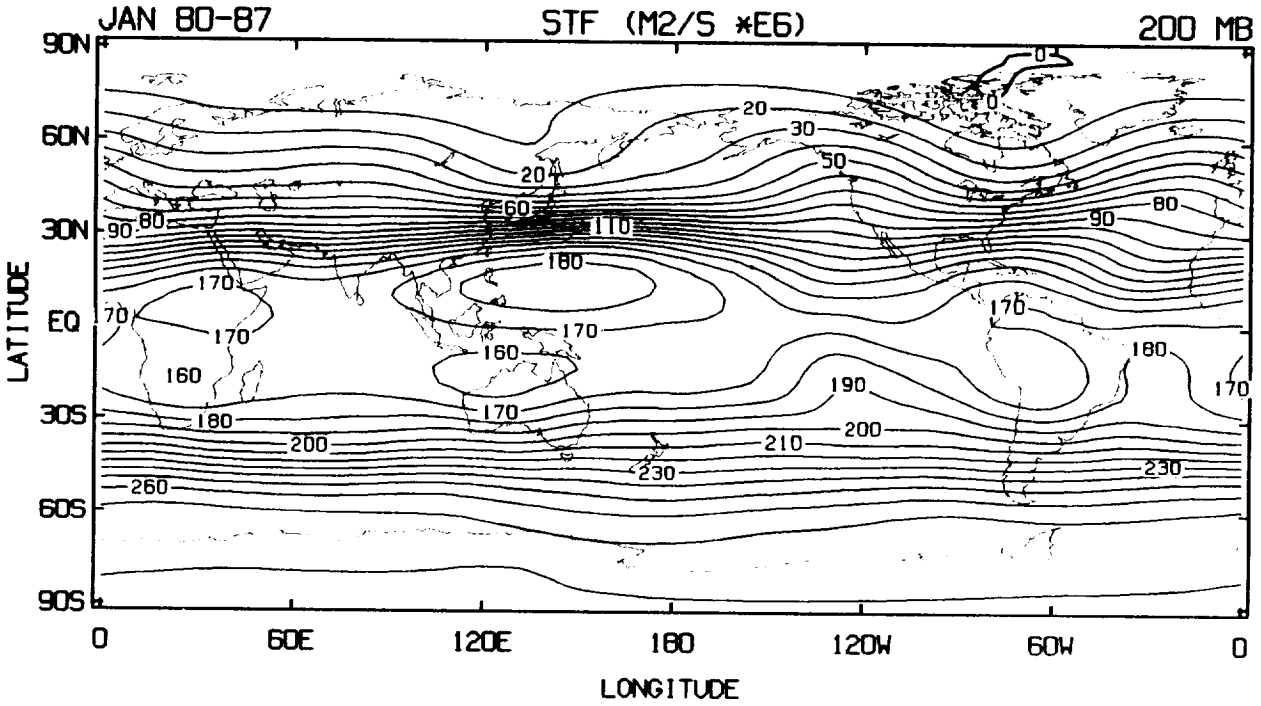

JAN 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
8550
8370
8820
9090
9360
9450
9630
9540
0
60E
120E
180
120W
60W
LONGITUDE

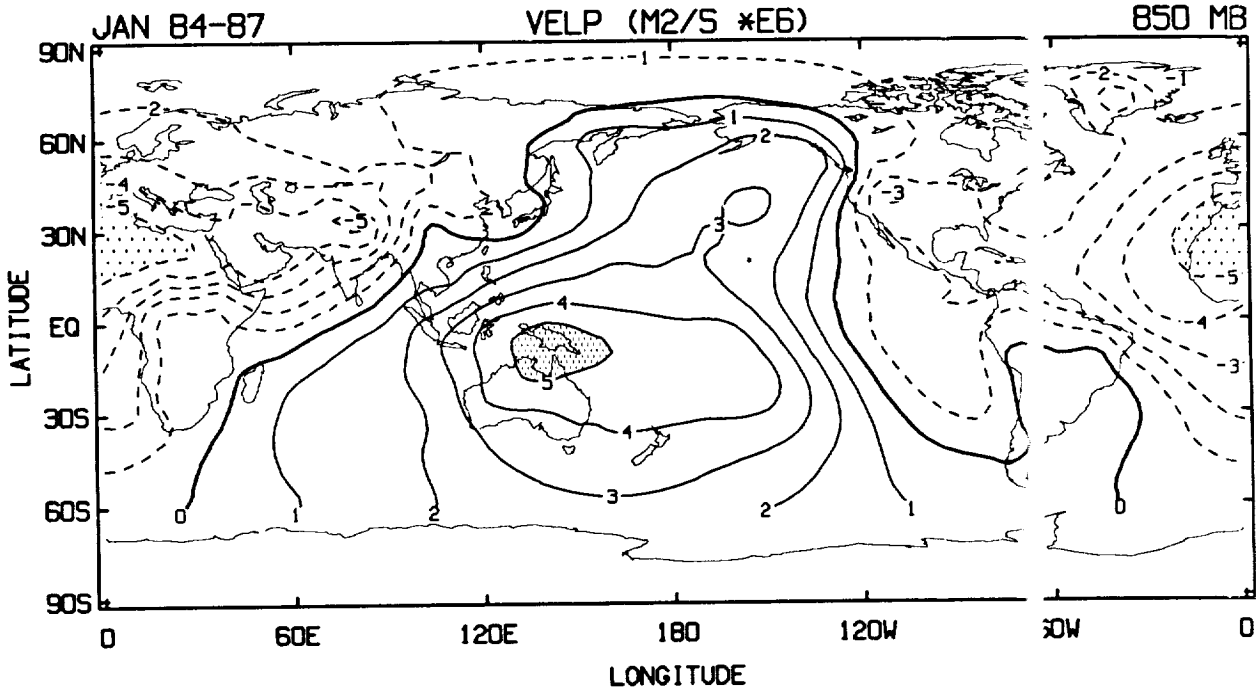

JAN 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60
120
180
240
300
-60
-120
0
60E
120E
180
120W
60W
LONGITUDE

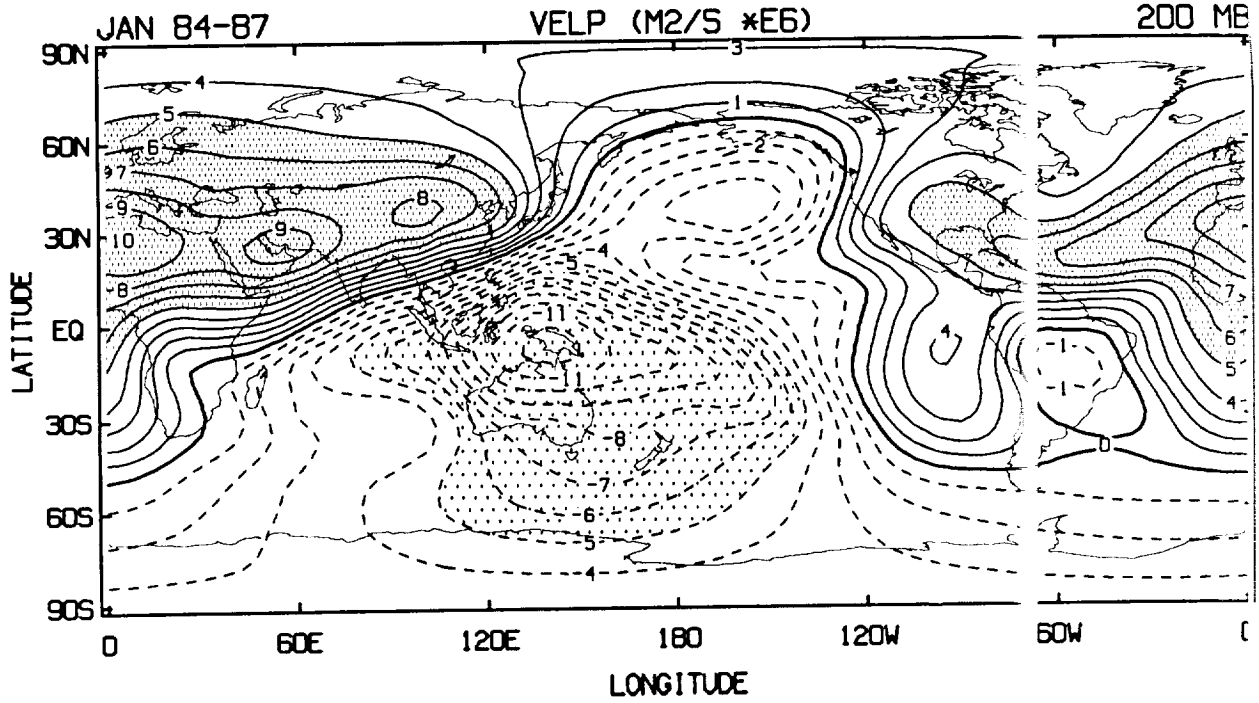

JAN 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

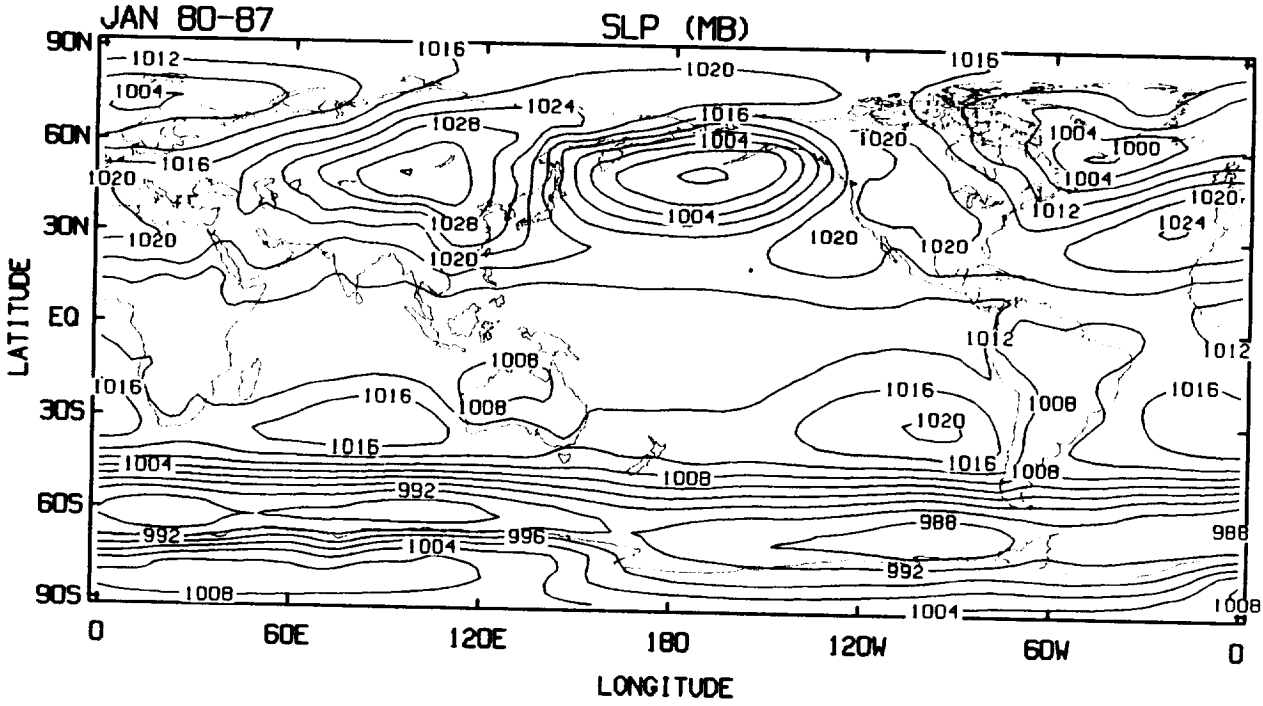

JAN 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

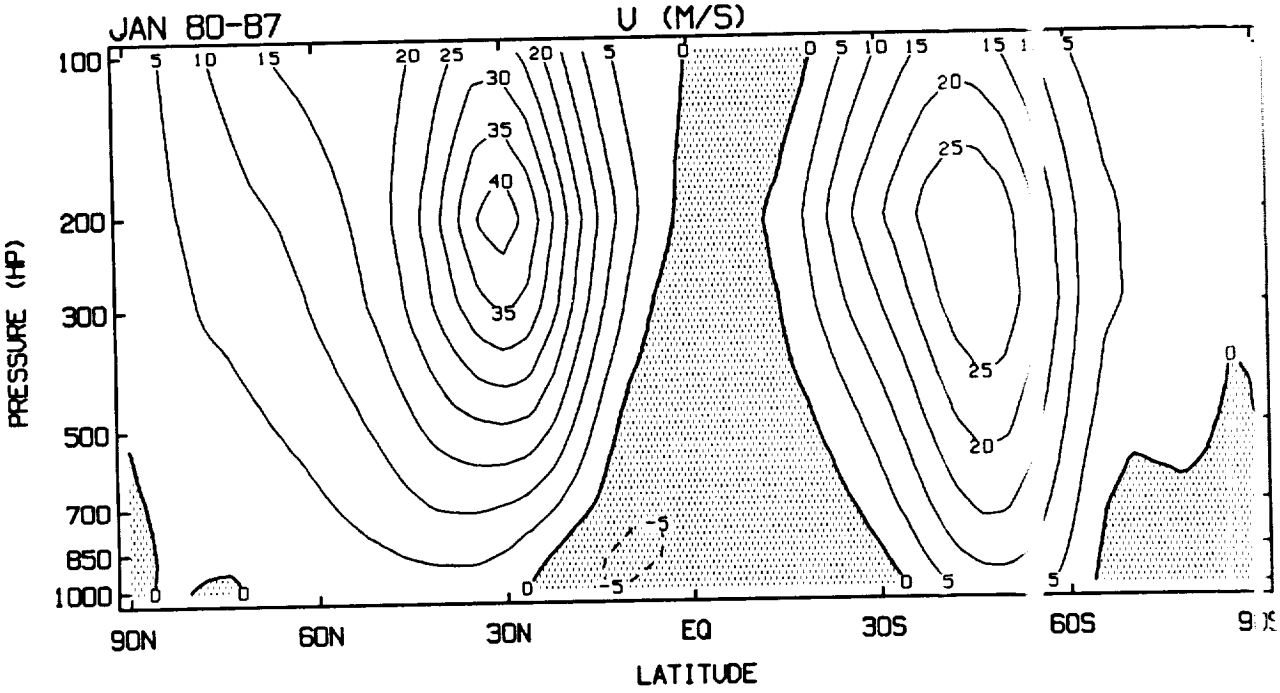

JAN 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

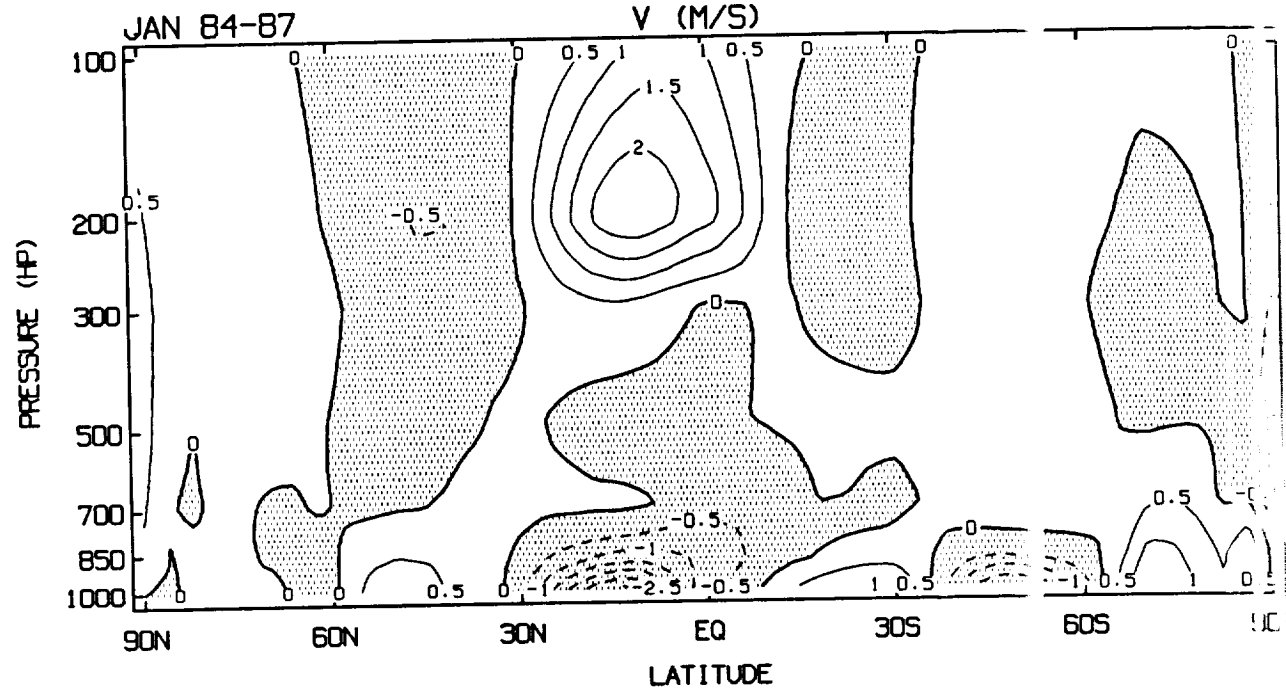

JAN 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

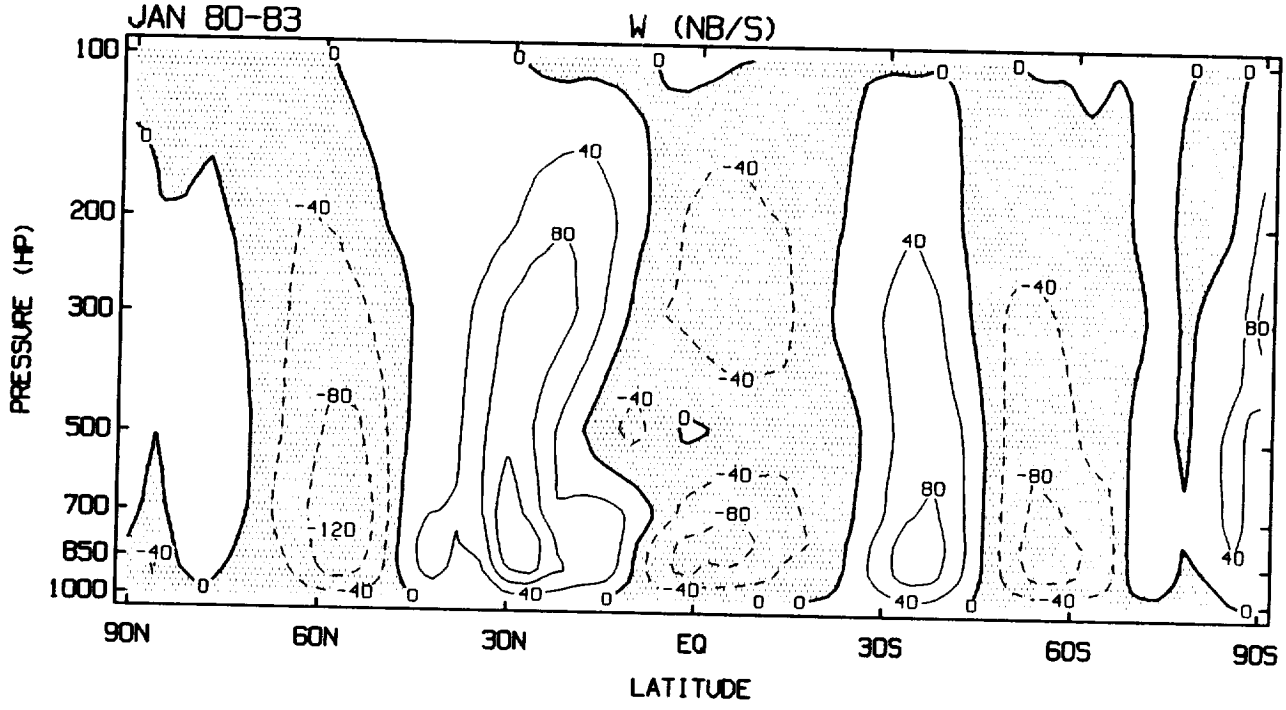

JAN 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

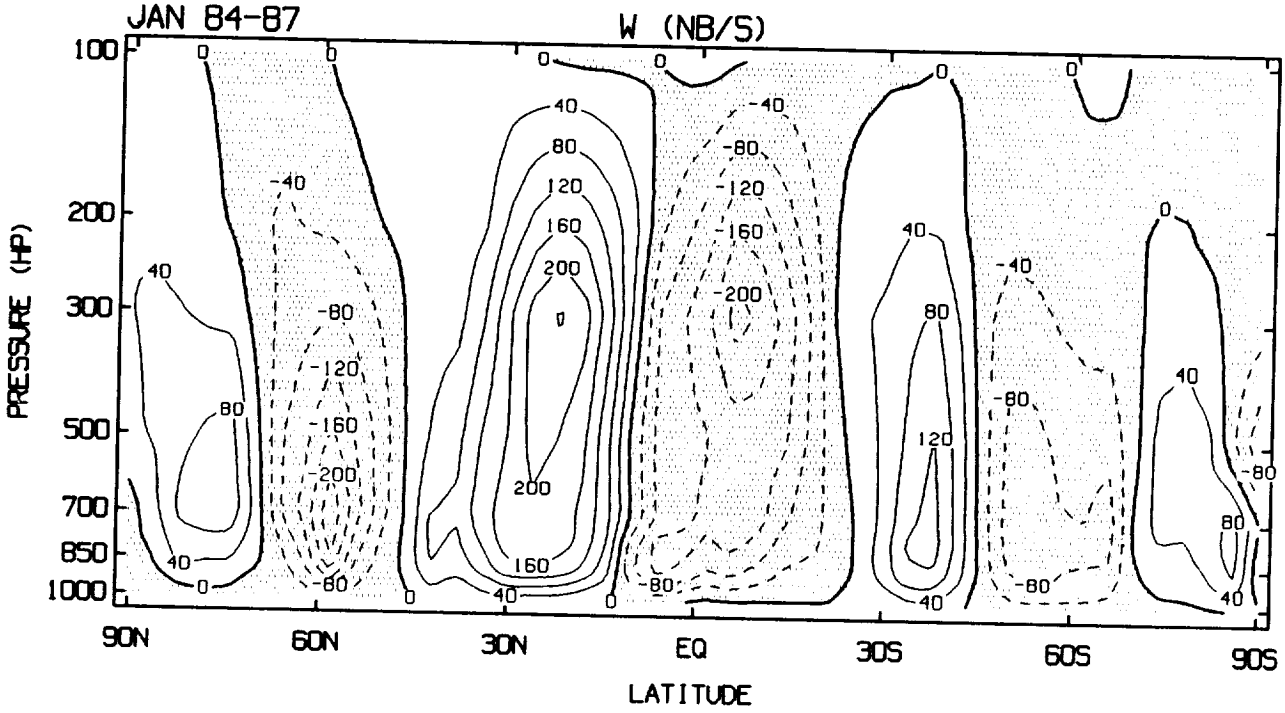

JAN 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

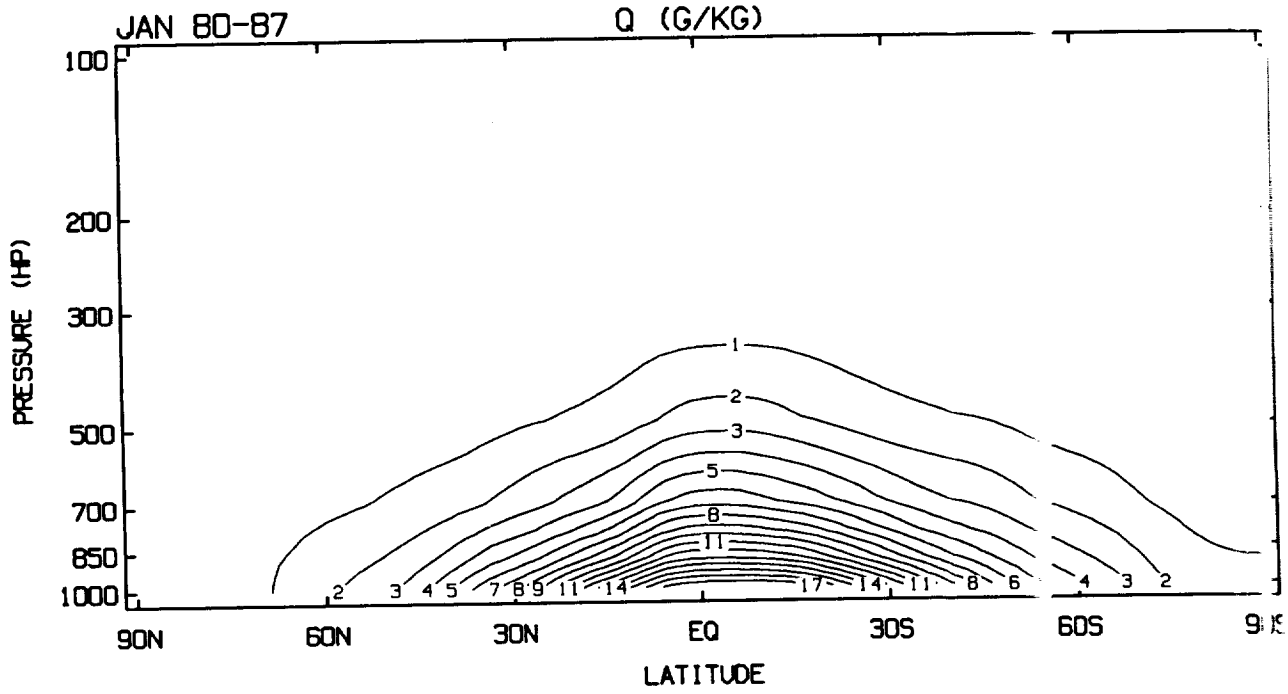

JAN 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1012
1016
1020
1004
1024
1028
1000
1008
992
996
988

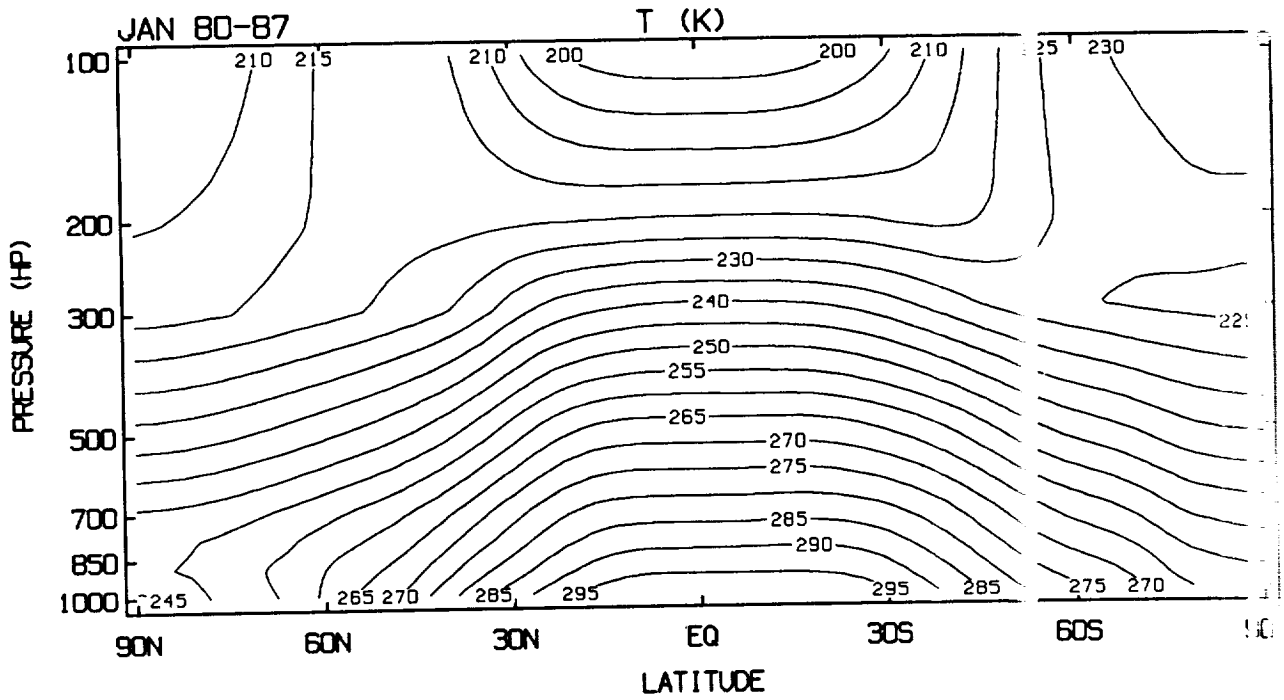

JAN 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


JAN 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


JAN 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


JAN 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

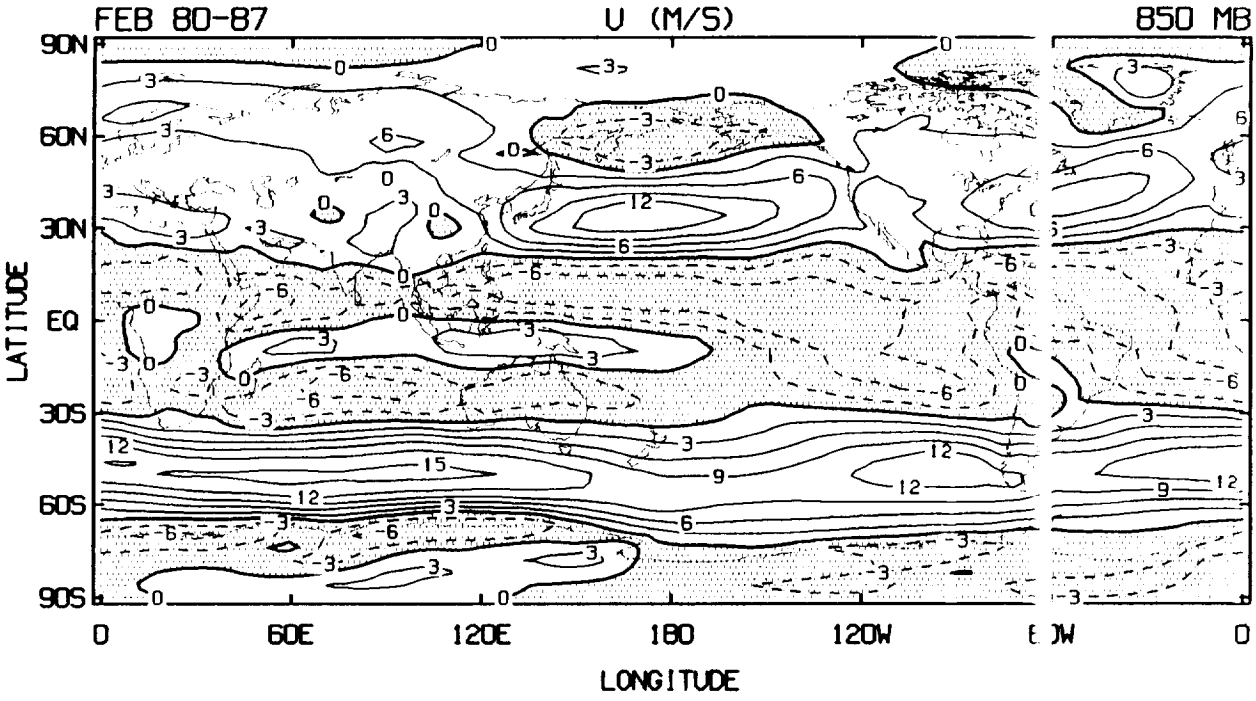

JAN 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE

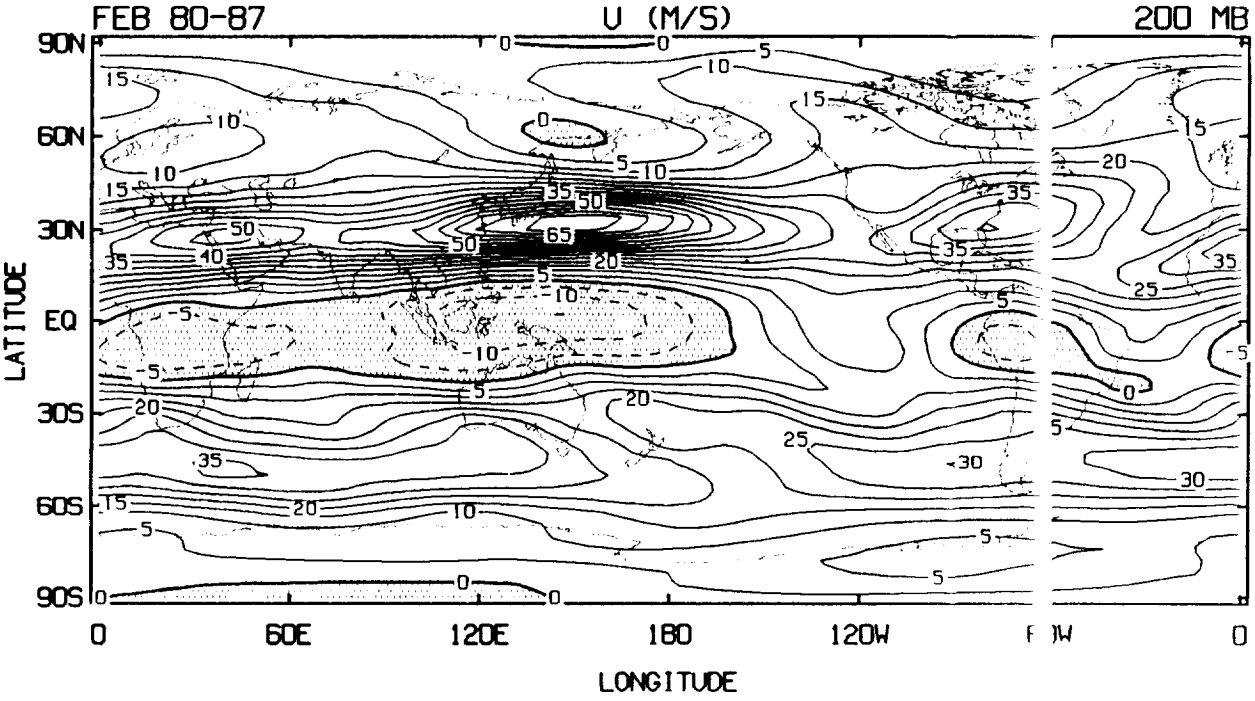

JAN 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE

FEBRUARY

PAGE 14 INTENTIONALLY BLANK

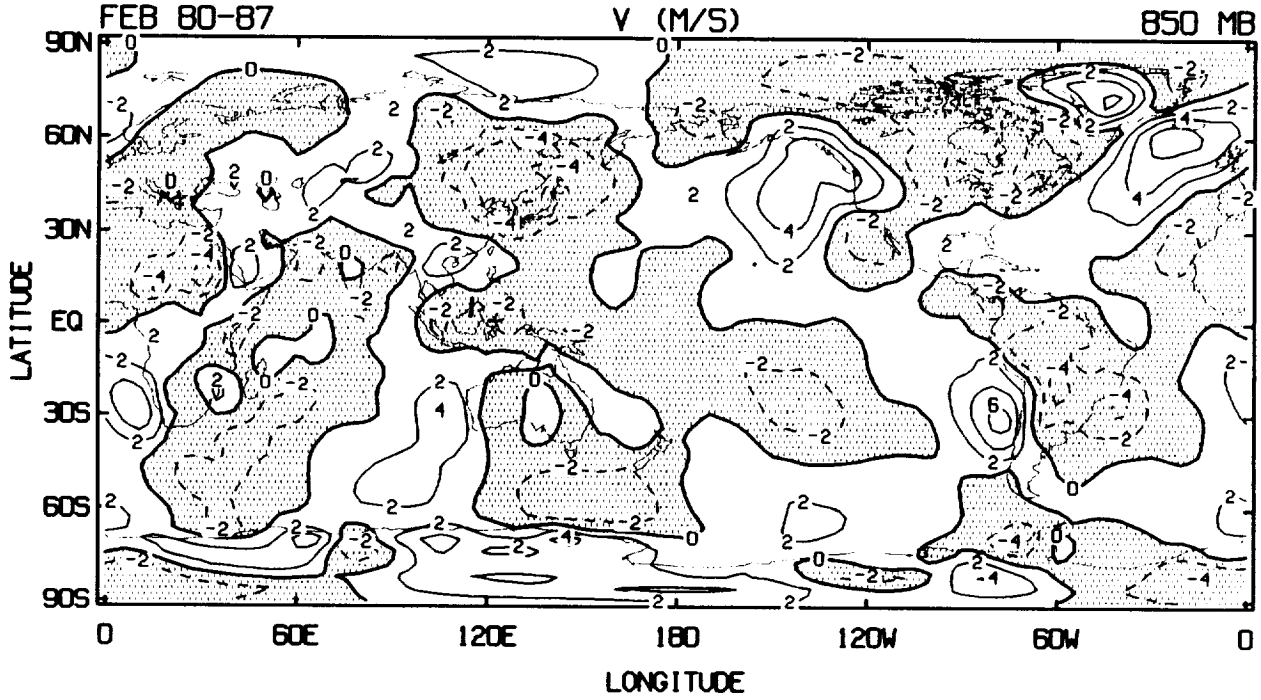
PRECEDING PAGE BLANK NOT FILMED

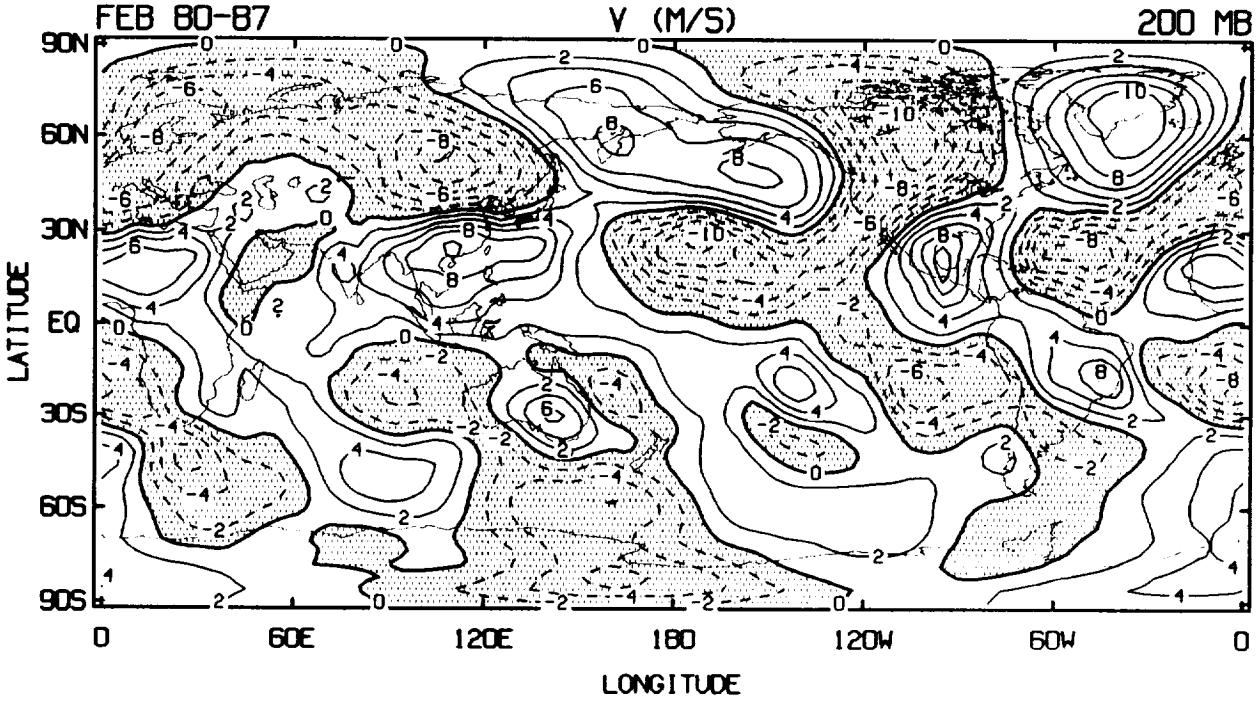


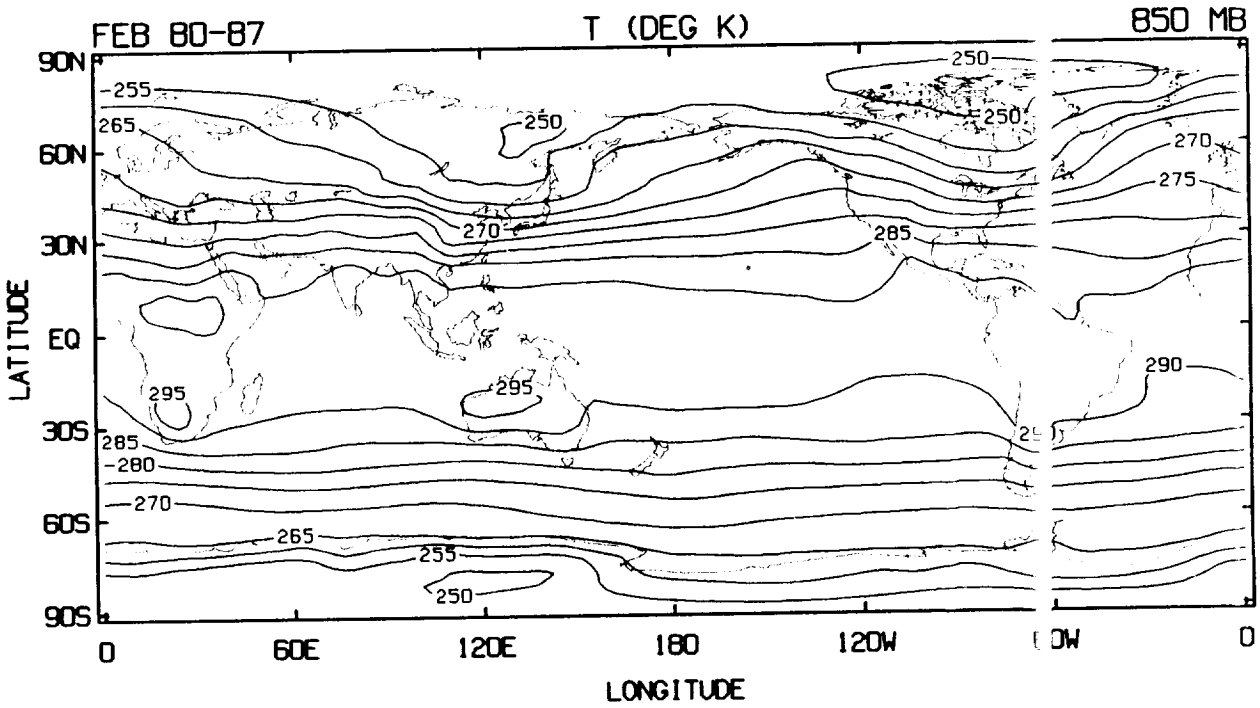


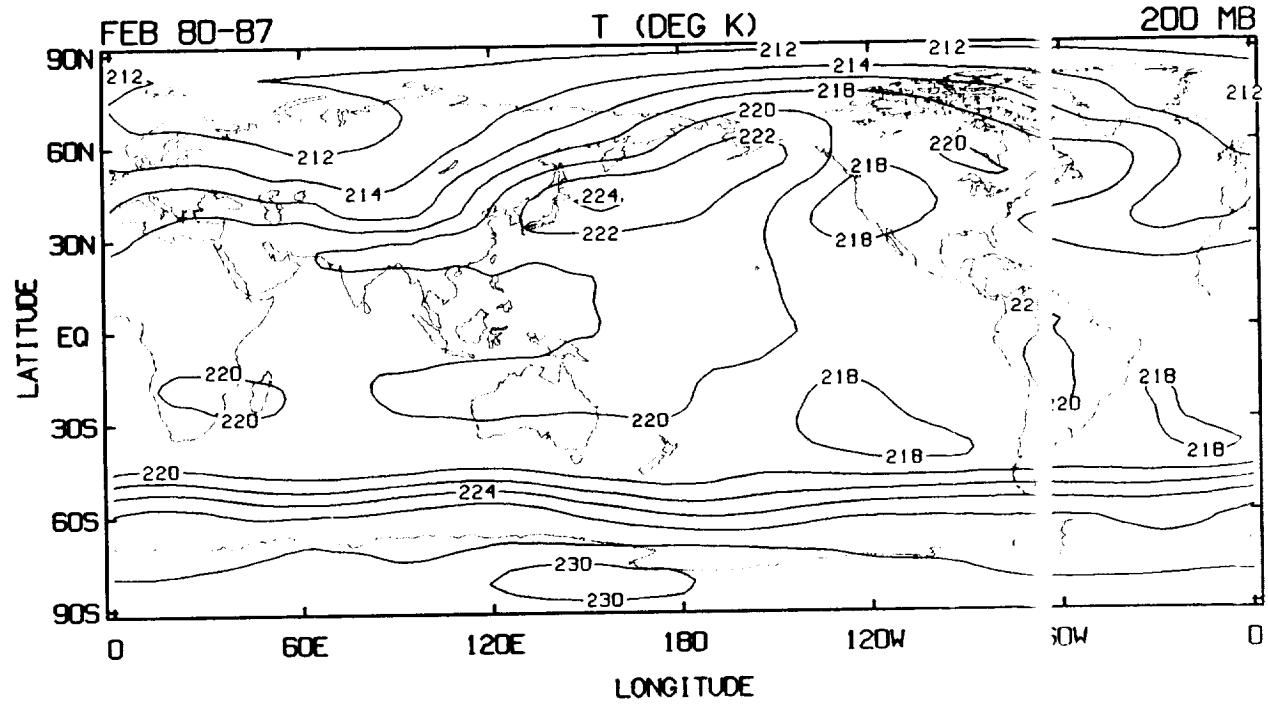
PRECEDING PAGE BLANK NOT FILMED

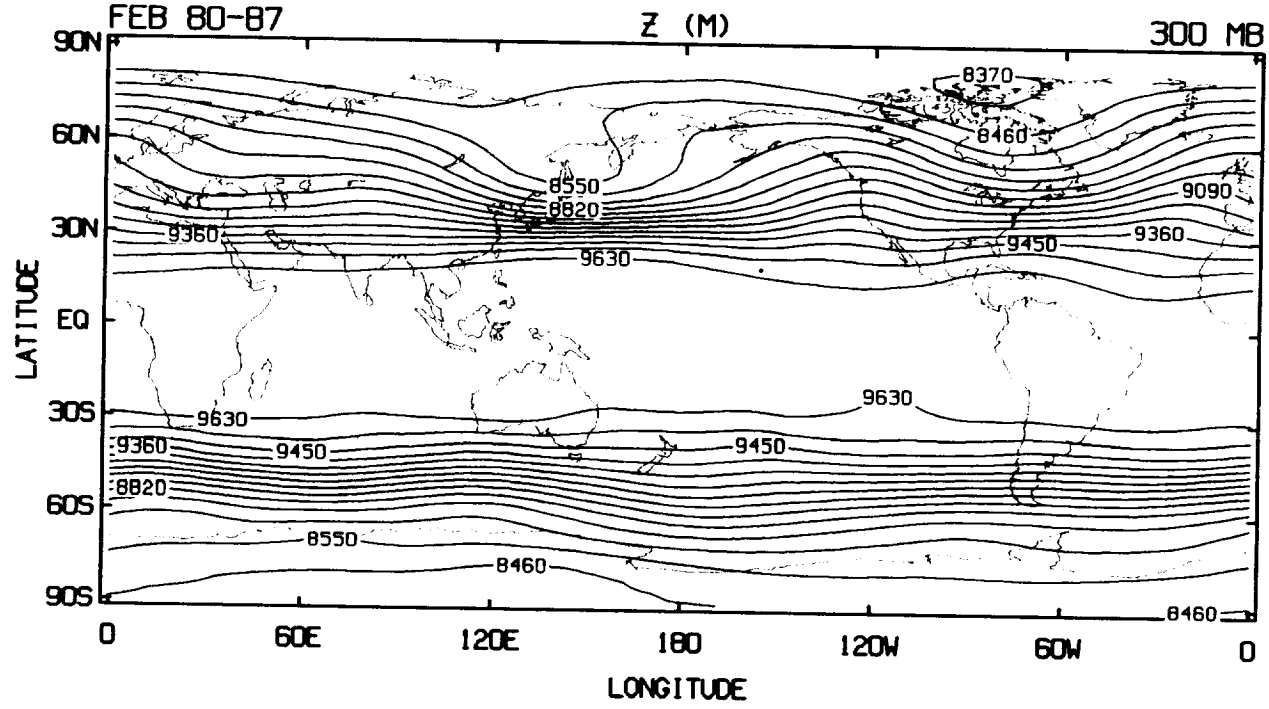
PAGE 16 INTENTIONALLY BLANK

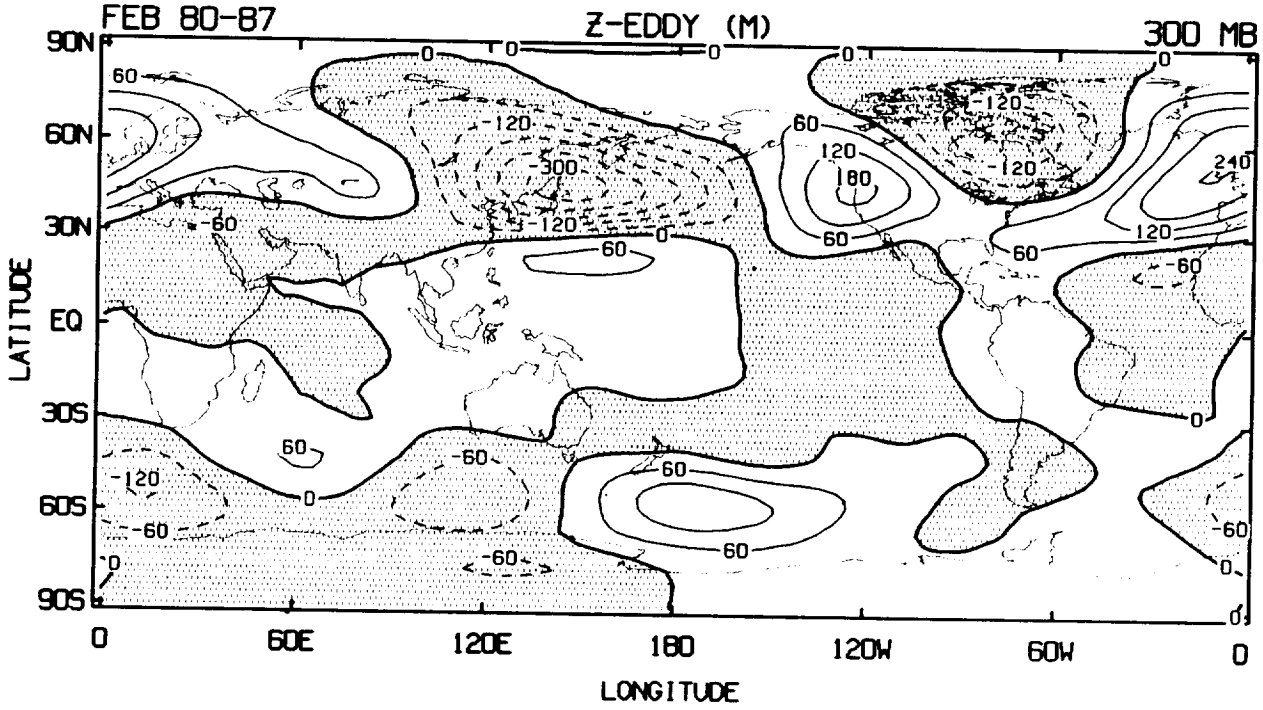

FEB 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

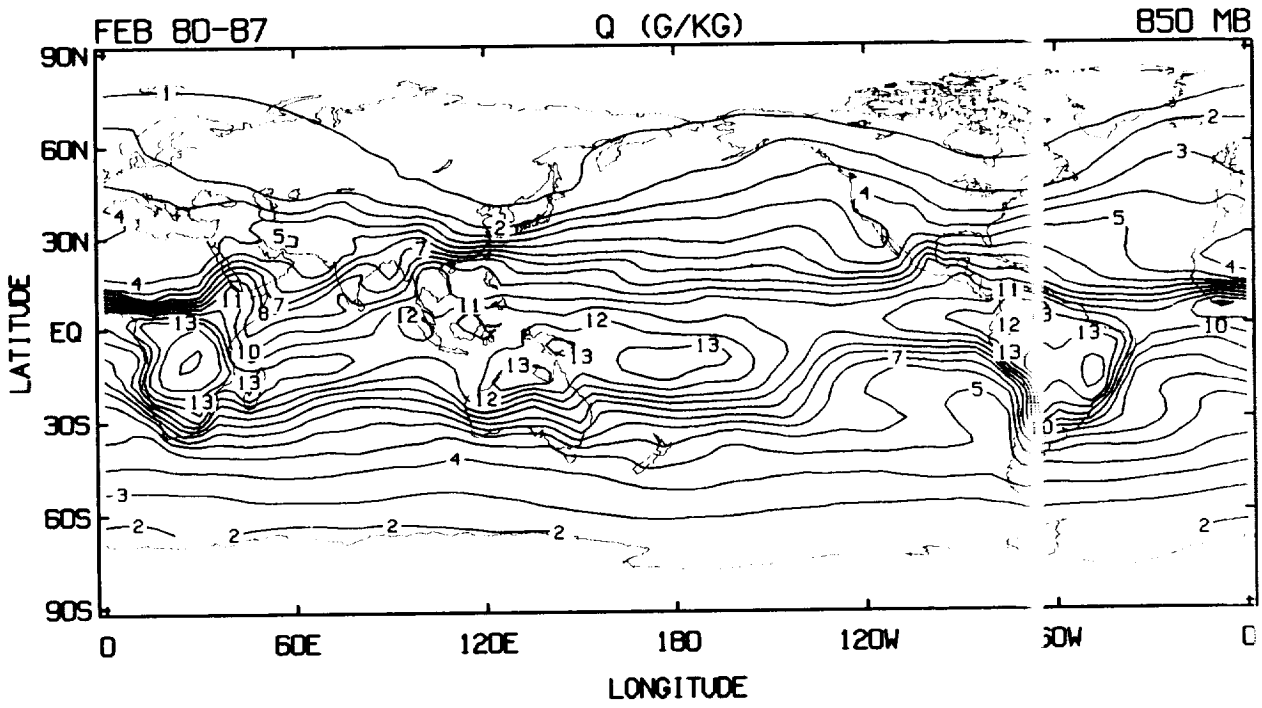

FEB 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

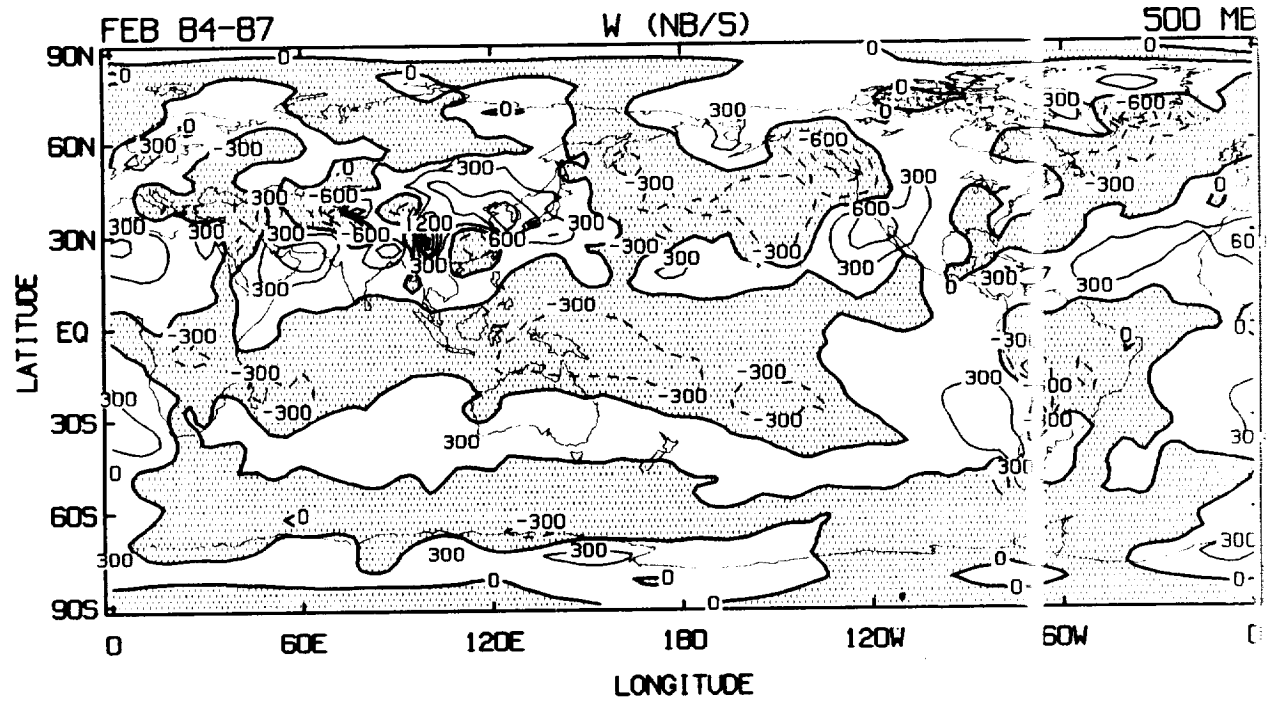

FEB 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE
250
255
265
270
275
285
290
295
280

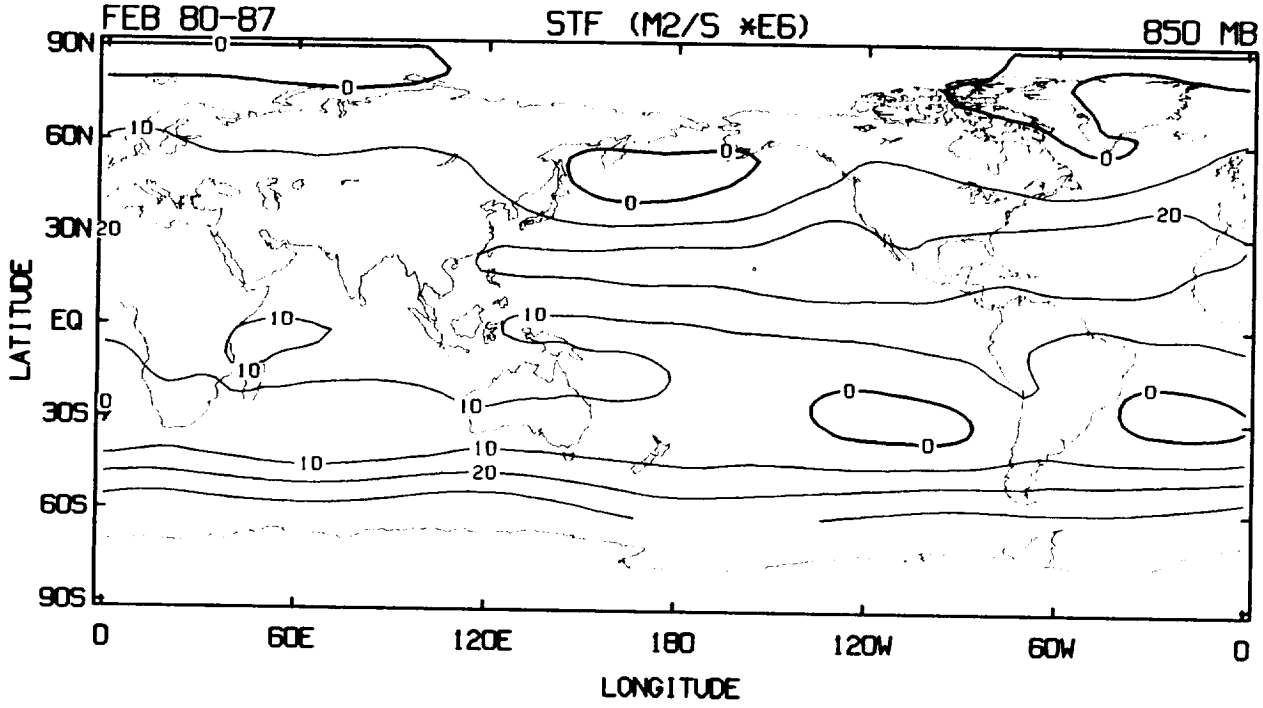

FEB 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE
212
214
218
220
222
224
230

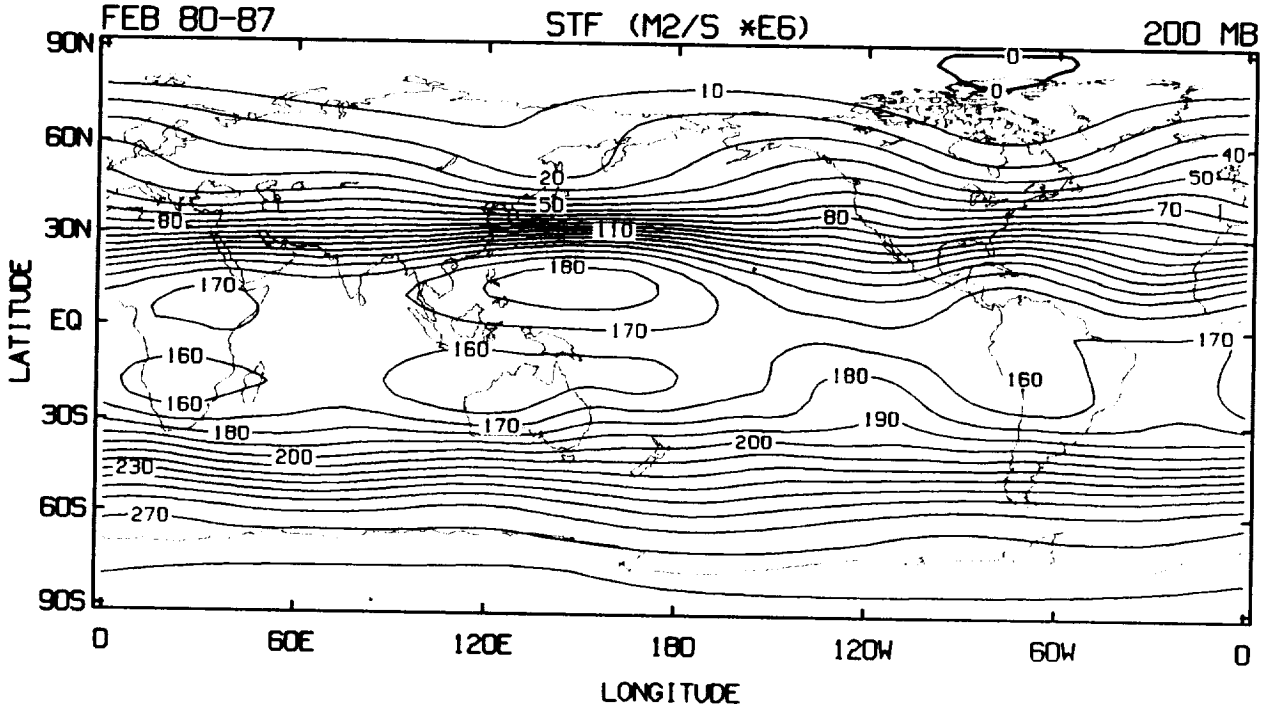

FEB 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
8370
8460
8550
8820
9090
9360
9450
9630
8460

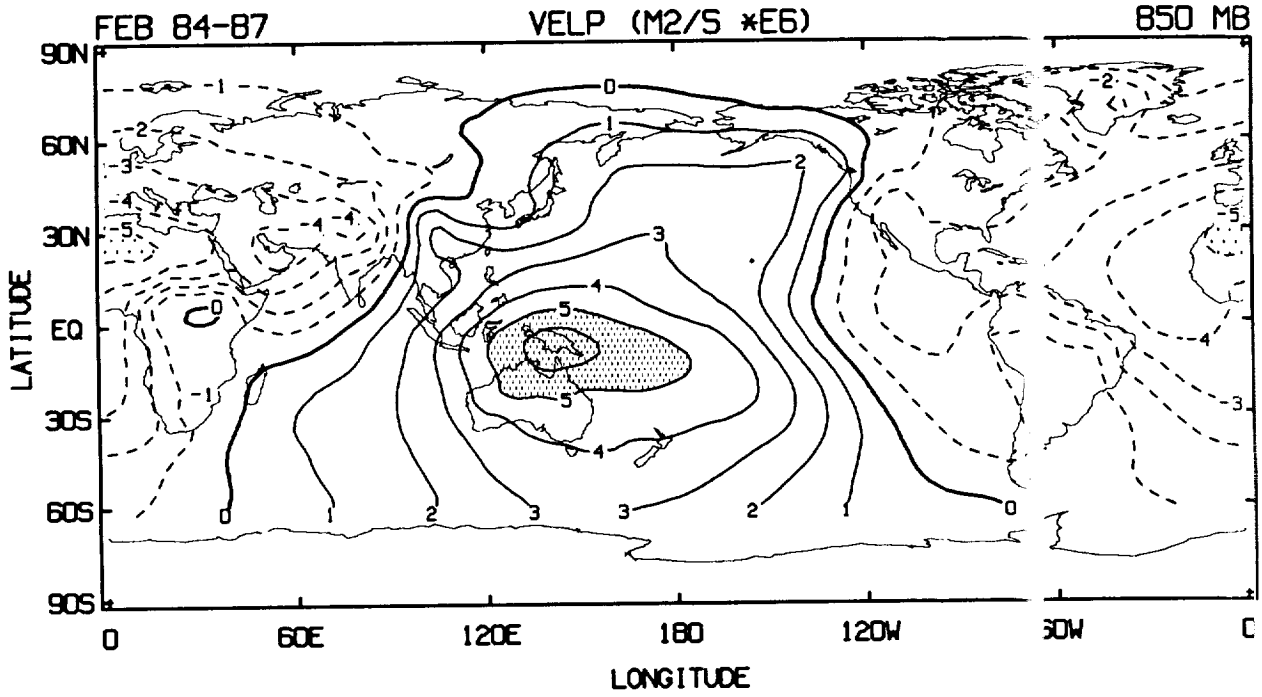

FEB 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

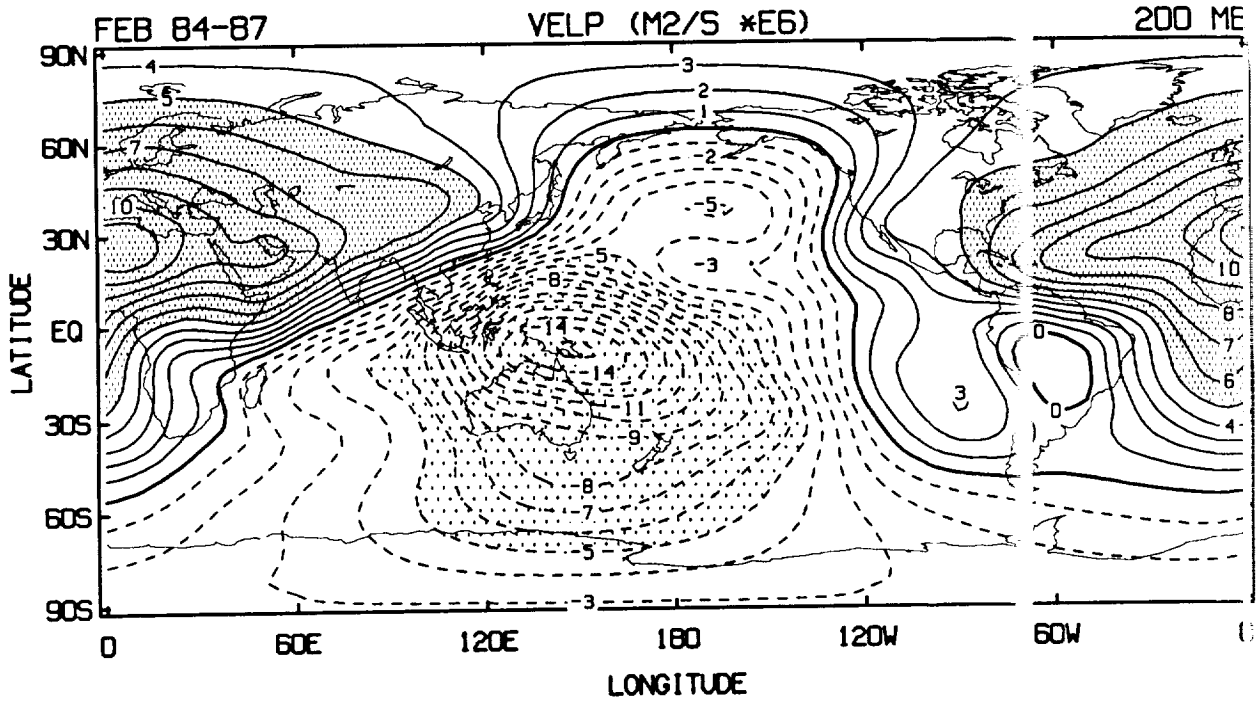

FEB 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
LONGITUDE

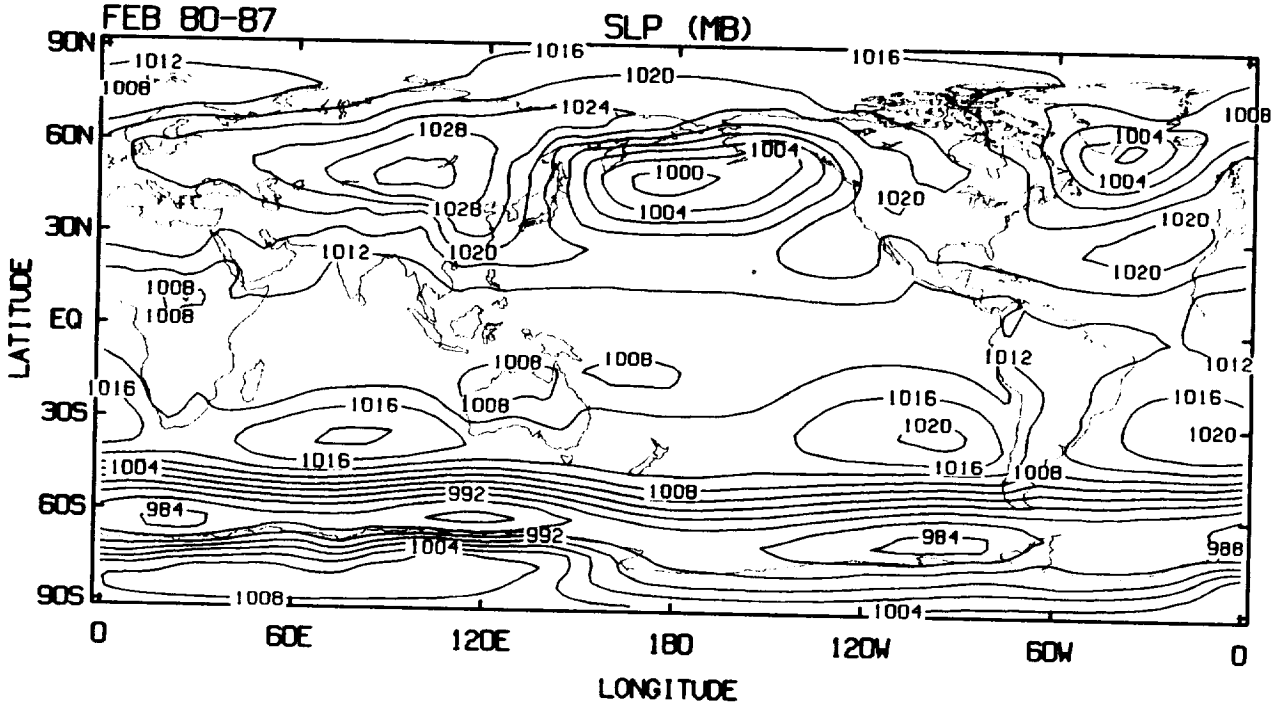

FEB 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
LONGITUDE

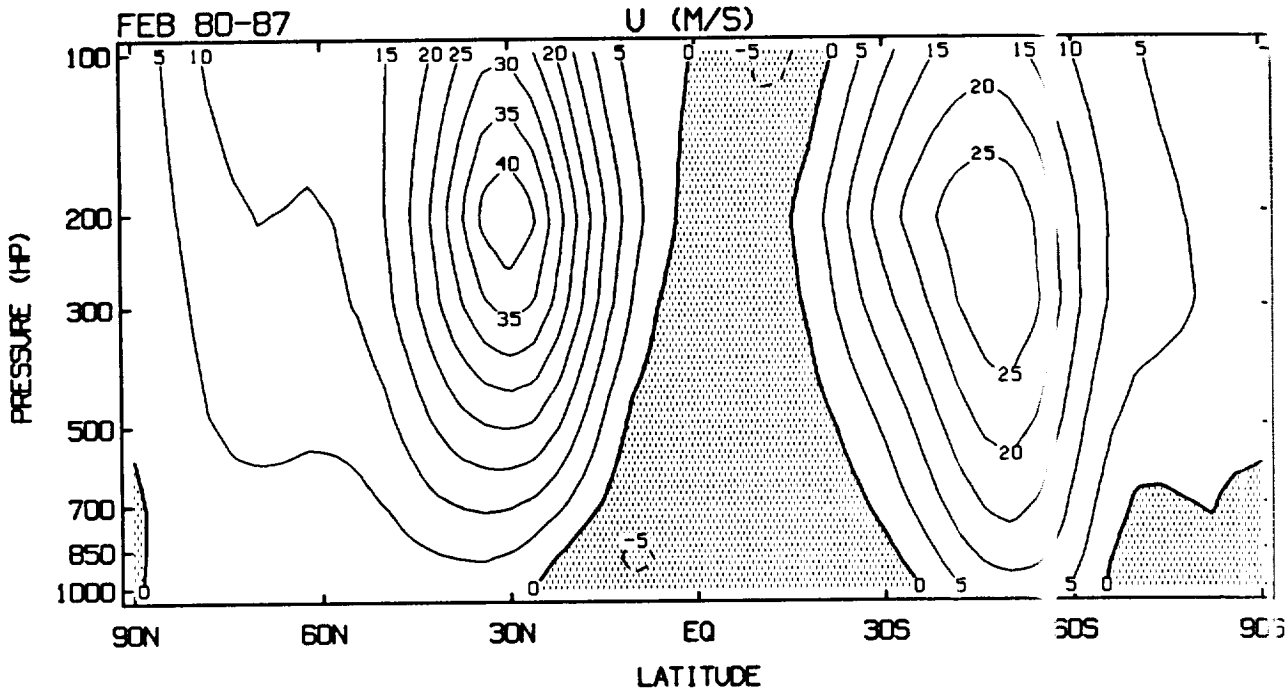

FEB 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

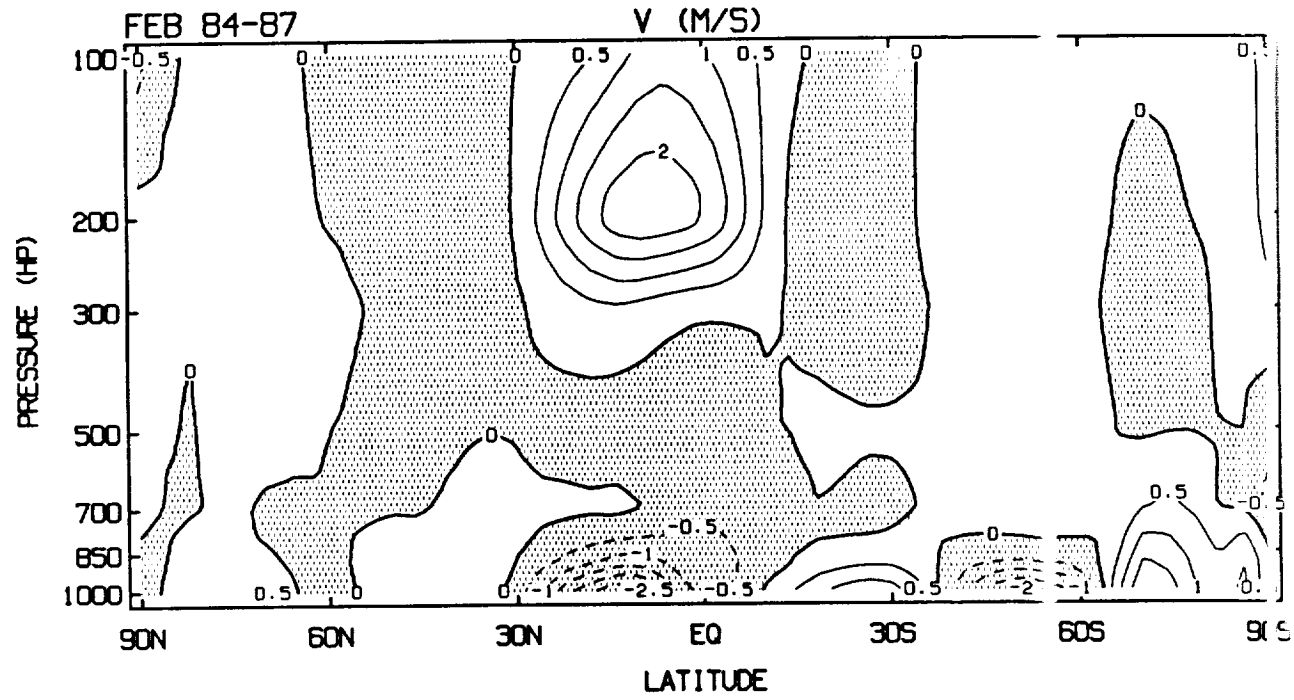

FEB 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

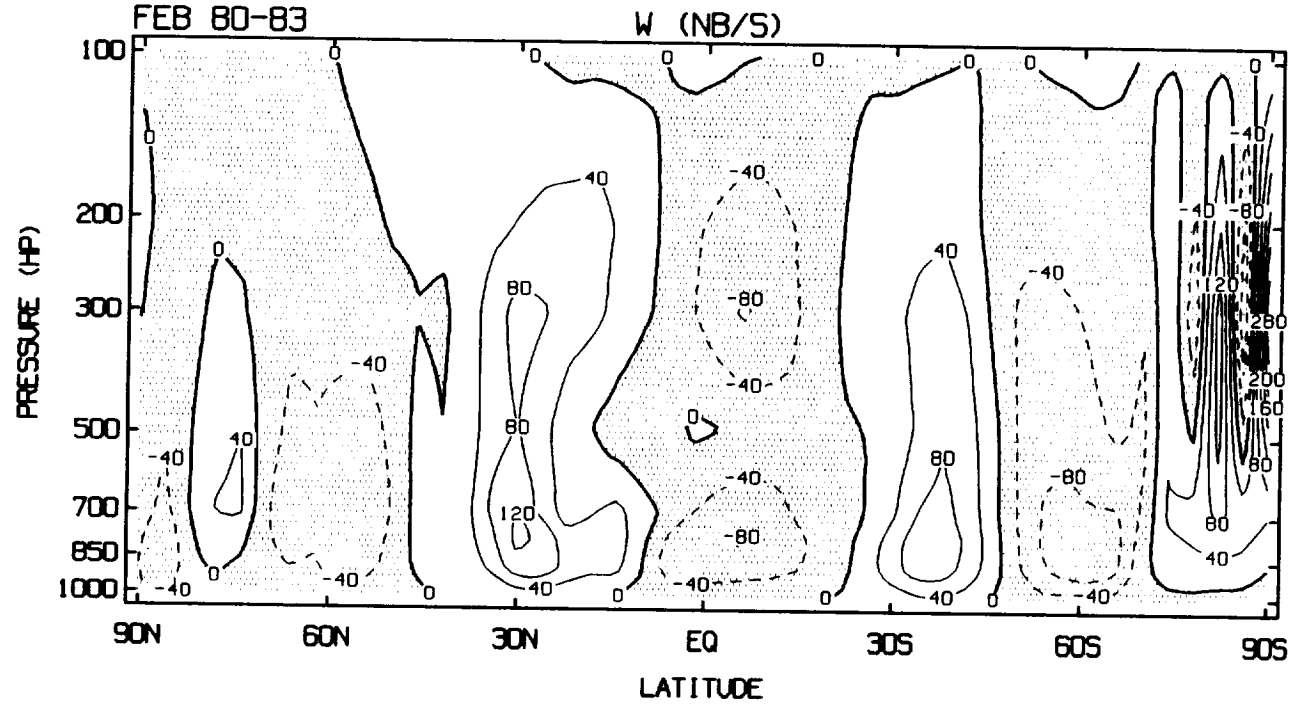

FEB 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

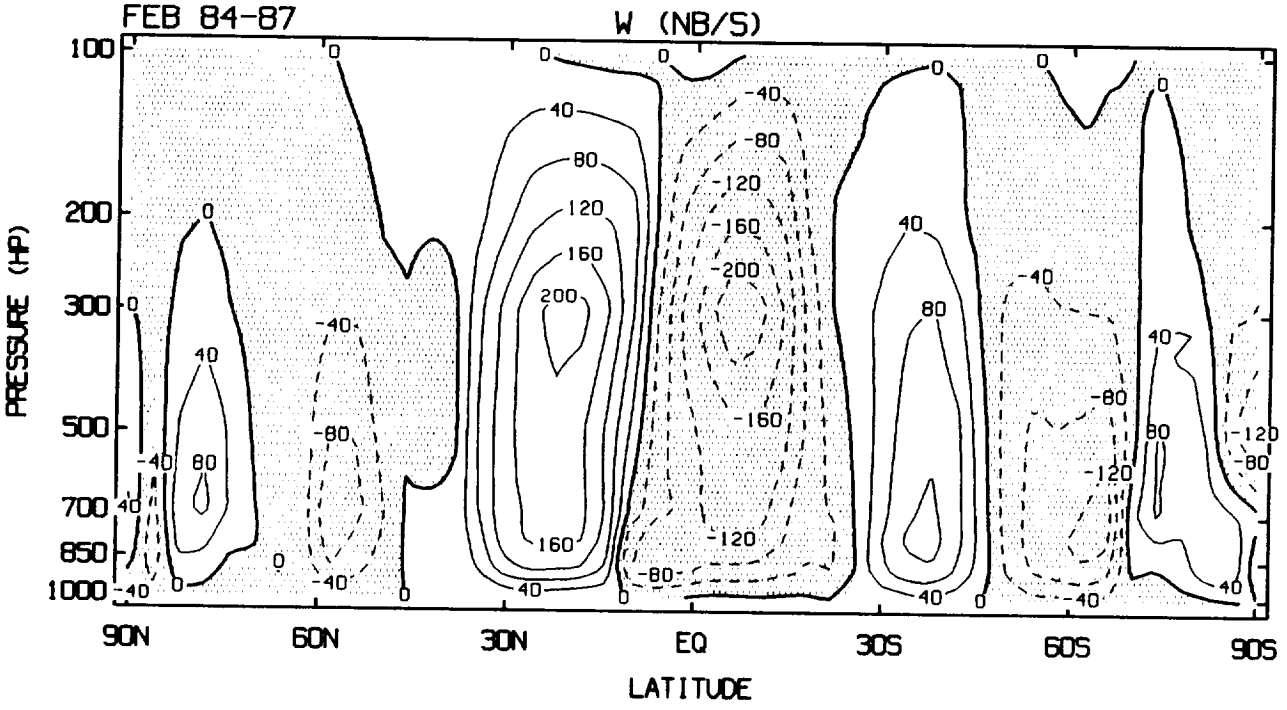

FEB 84-87
VELP (M2/S *E6)
200 ME
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

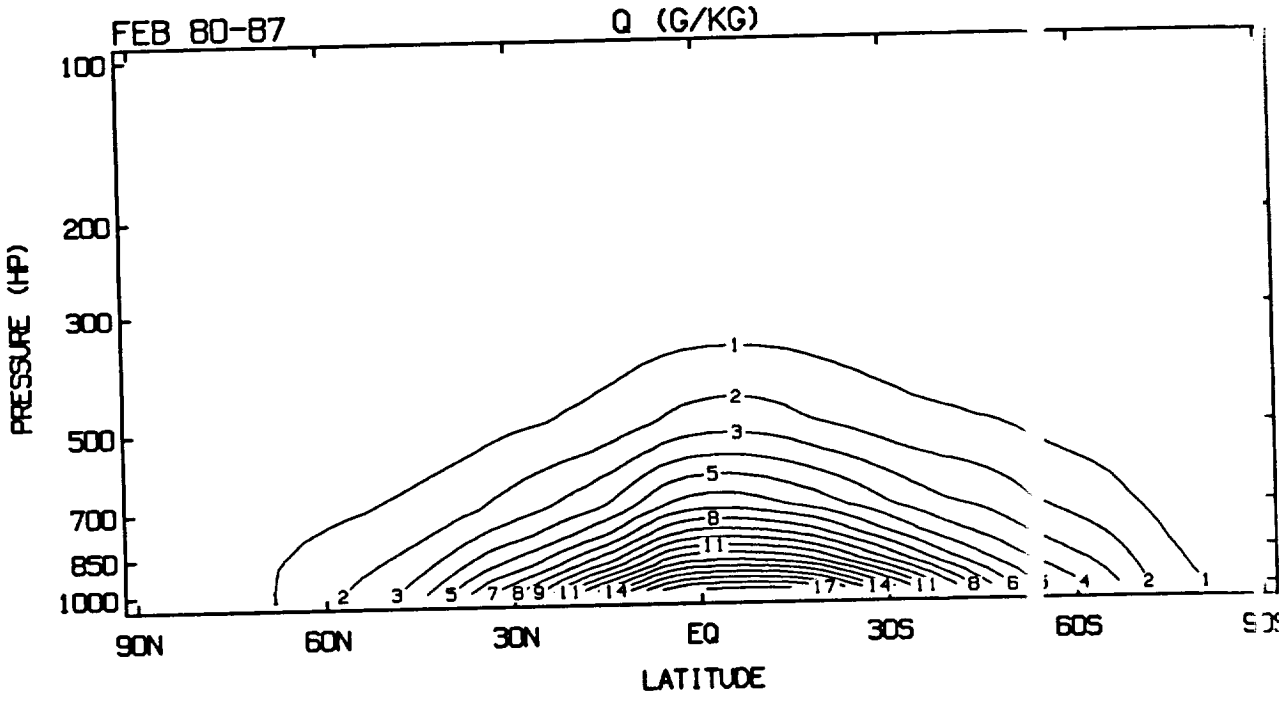

FEB 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1012
1016
1008
1020
1024
1028
1000
1004
992
984
988

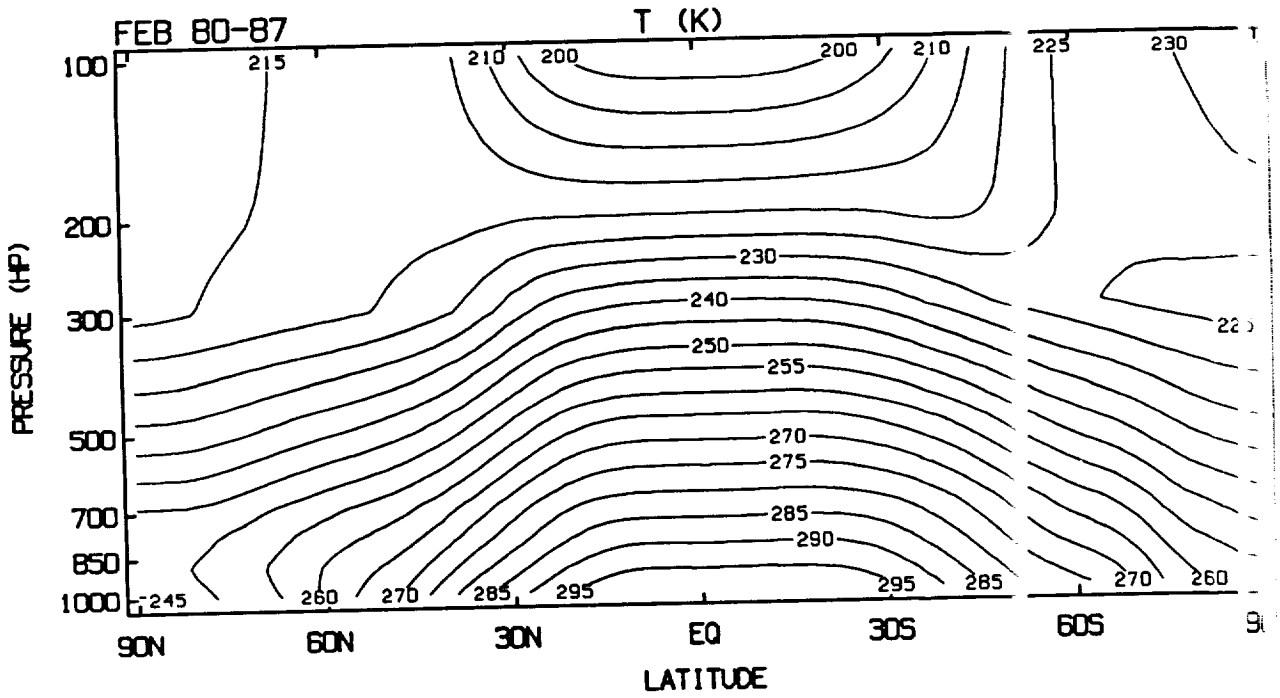

FEB 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


FEB 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


FEB 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


FEB 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

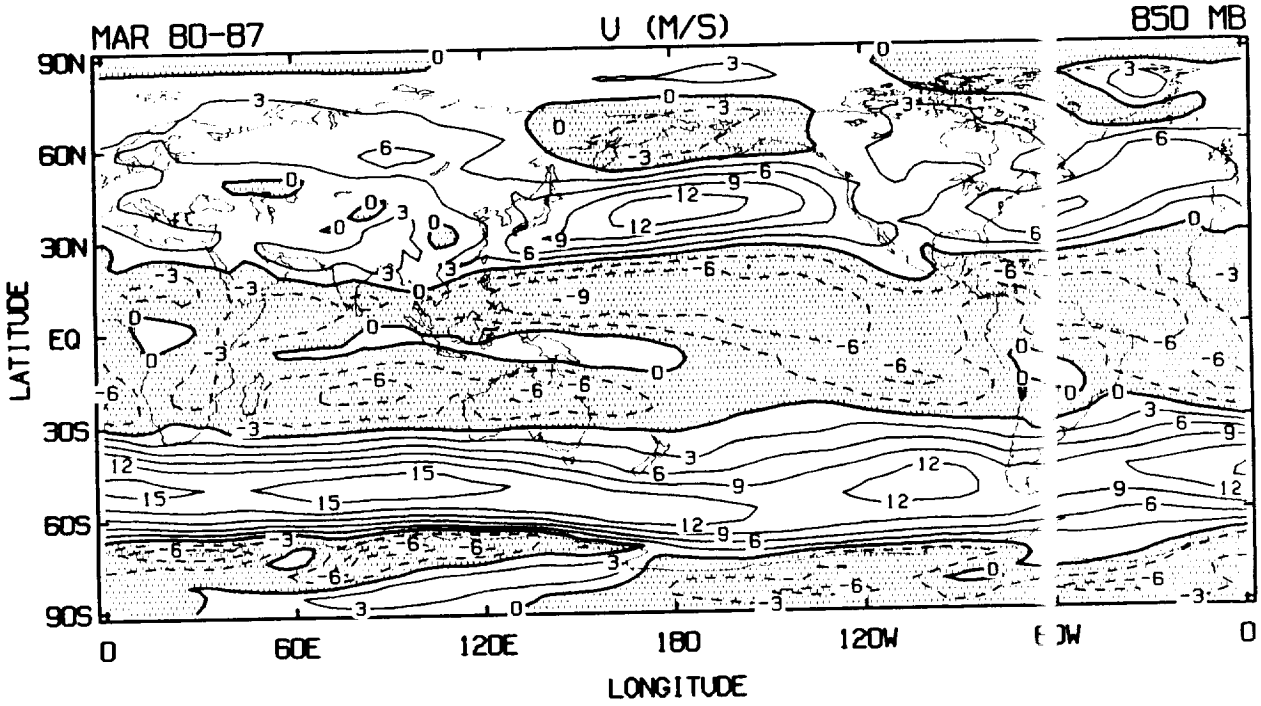

FEB 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE
1
2
3
5
8
11
17
14
11
8
6
4
2
1

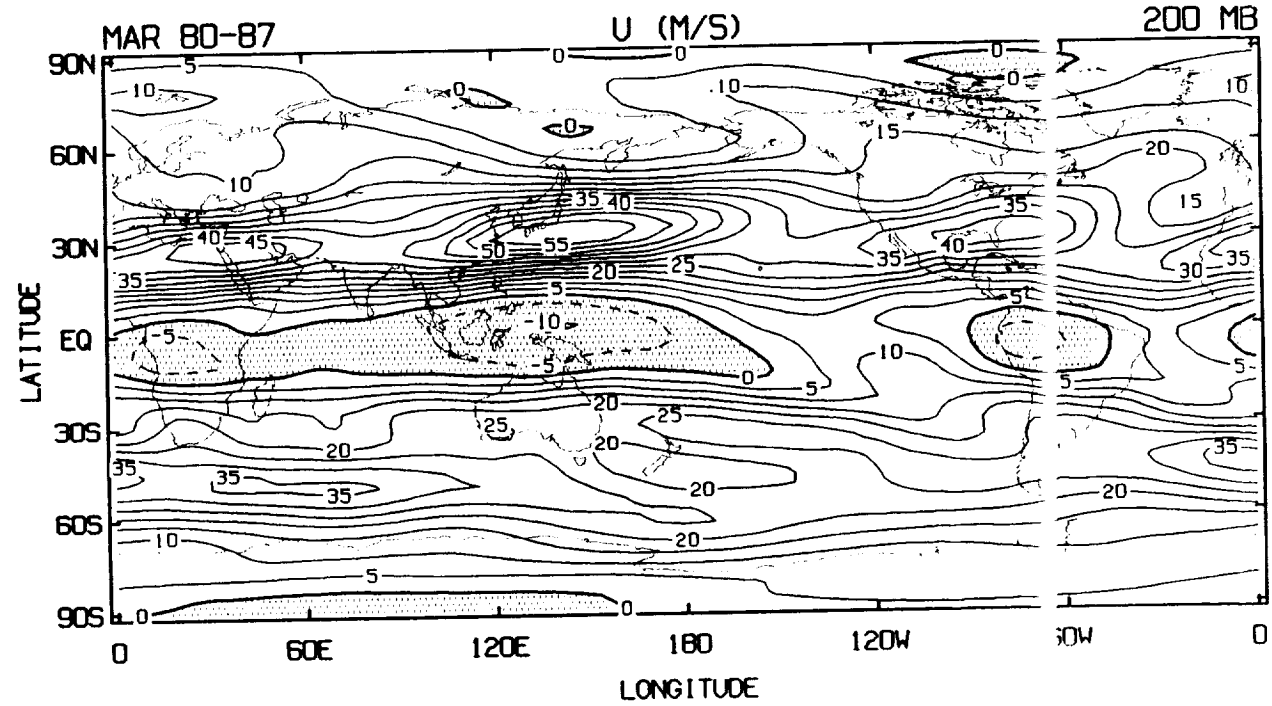

FEB 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE
215
210
200
200
210
225
230
230
240
250
255
270
275
285
290
295
295
285
270
260
245
260
270
285
295

MARCH

PAGE 28 INTENTIONALLY BL

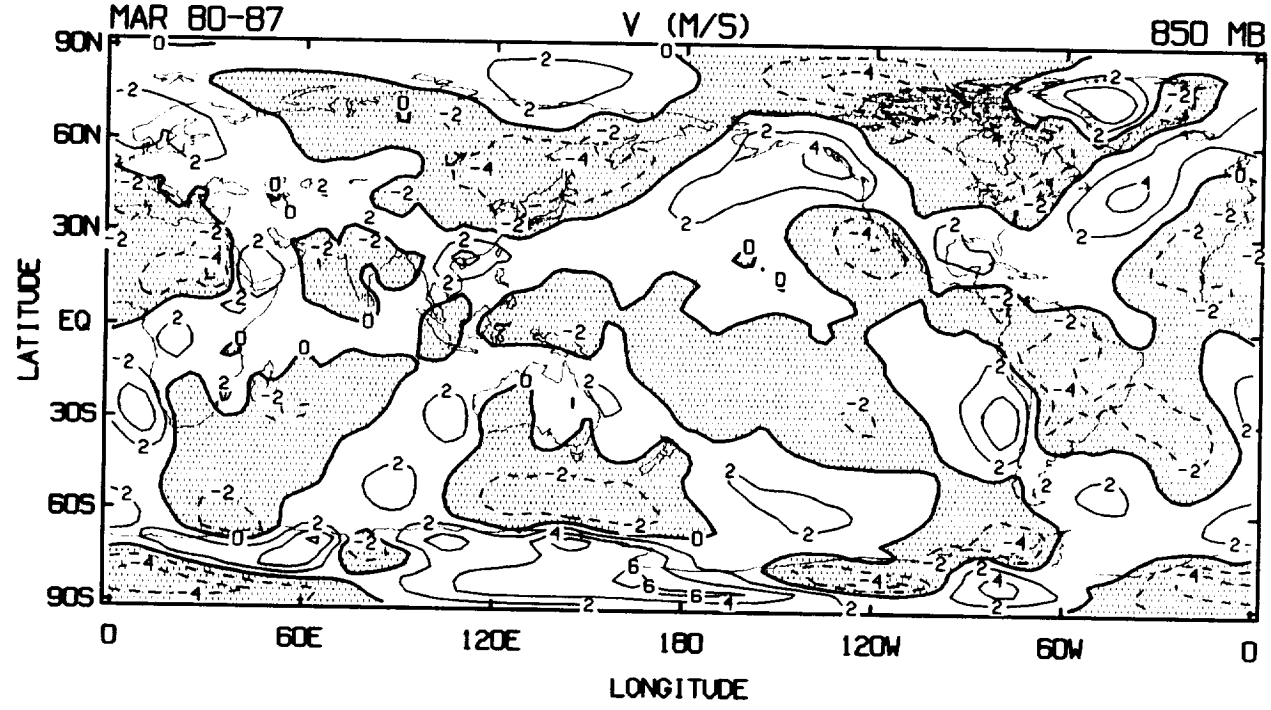
PRECEDING PAGE BLANK NOT FILMED

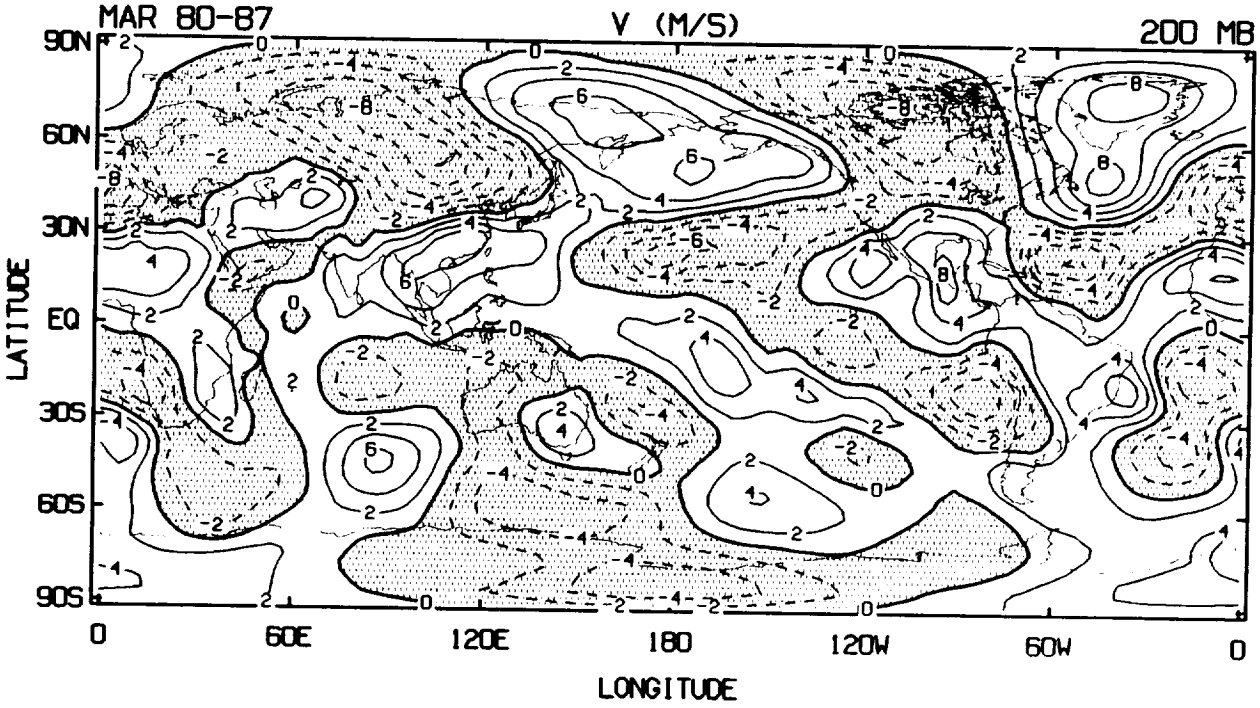


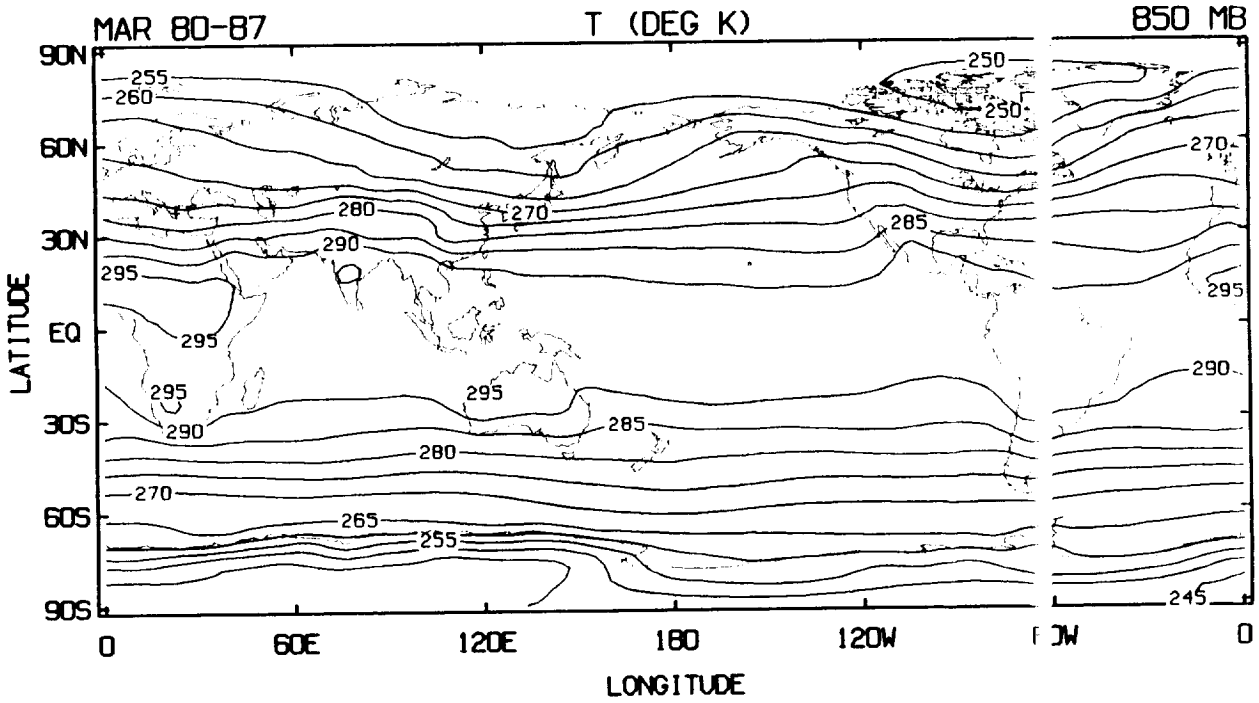


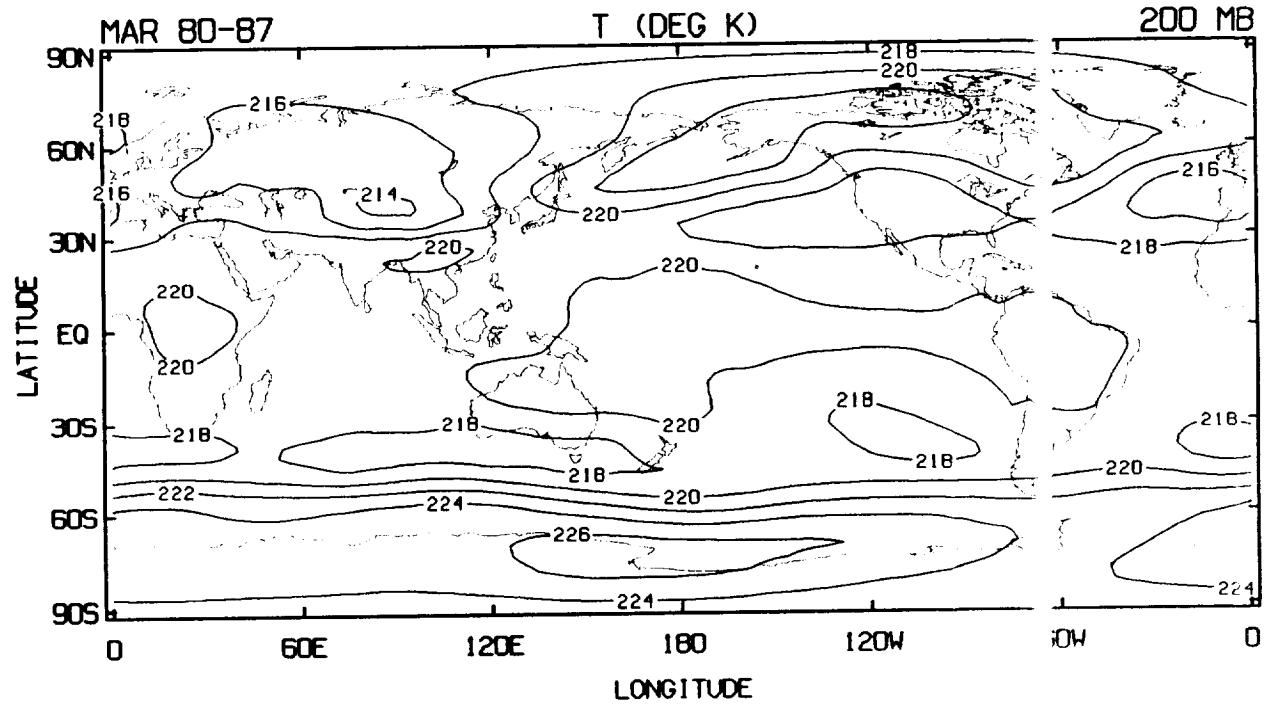
PRECEDING PAGE BLANK NOT FILMED

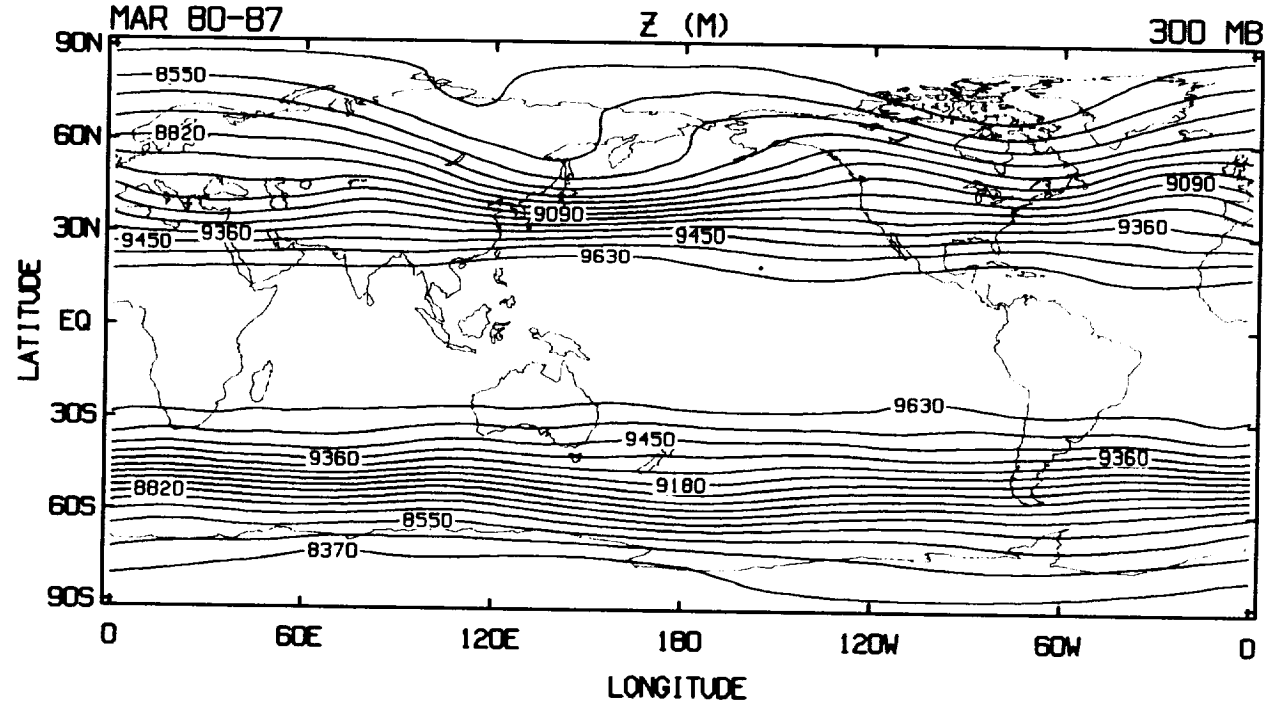
PAGE 30 INTENTIONALLY B

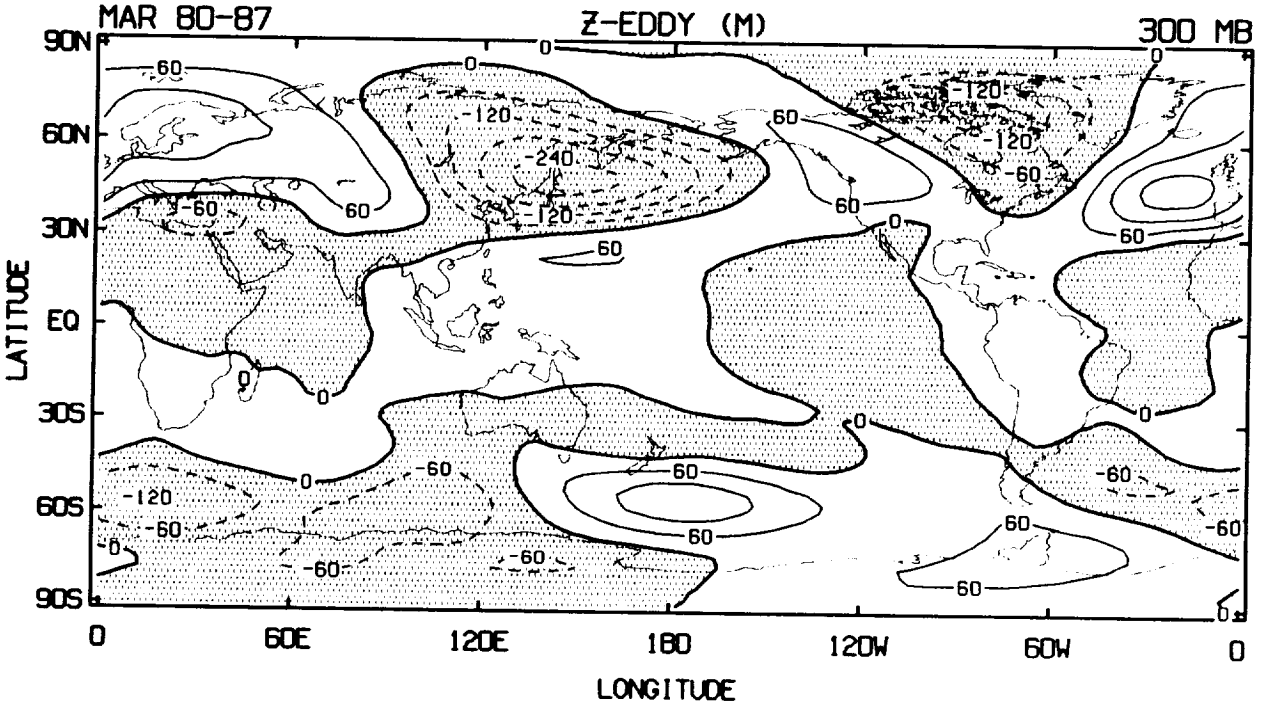

MAR 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

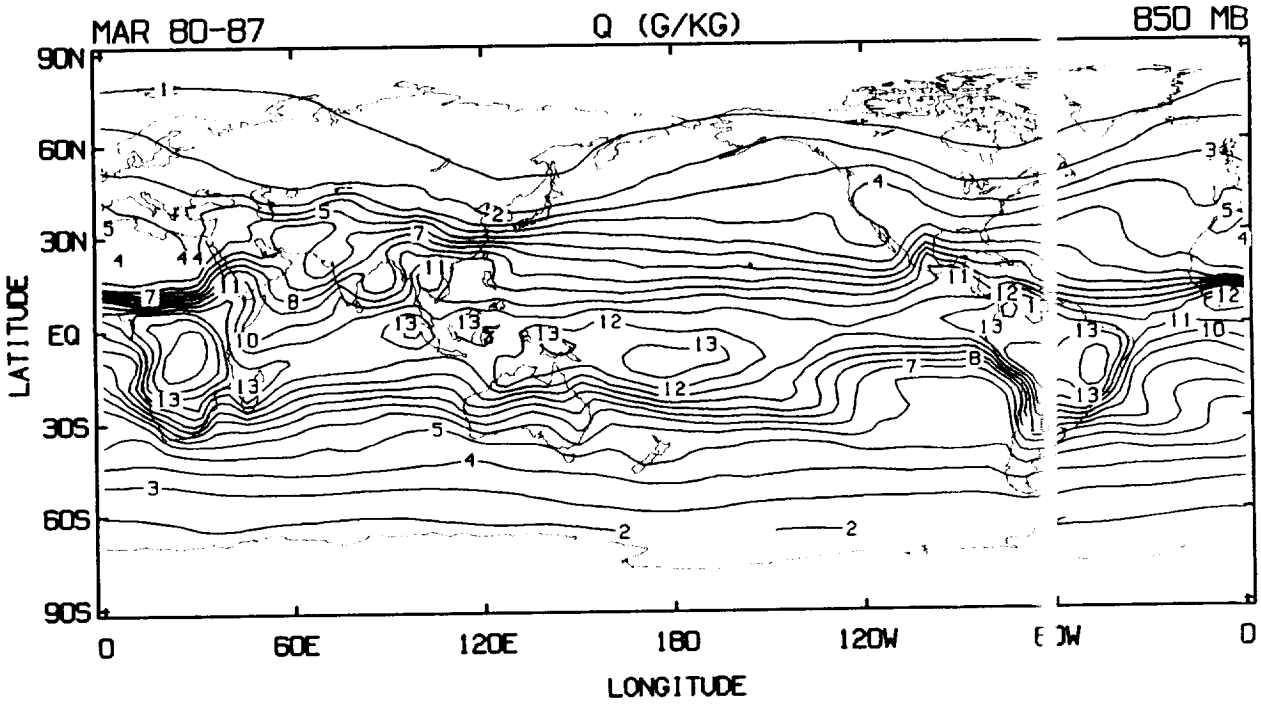

MAR 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

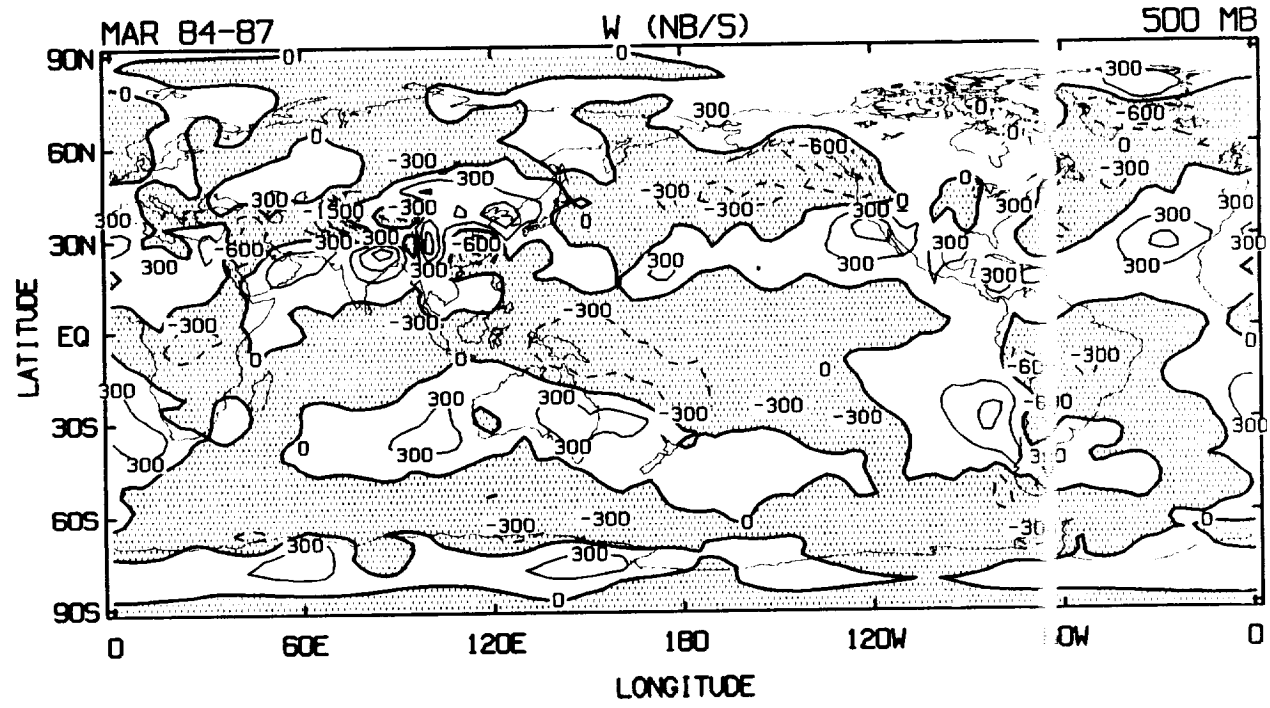

MAR 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE
255
260
250
270
280
285
290
295
265

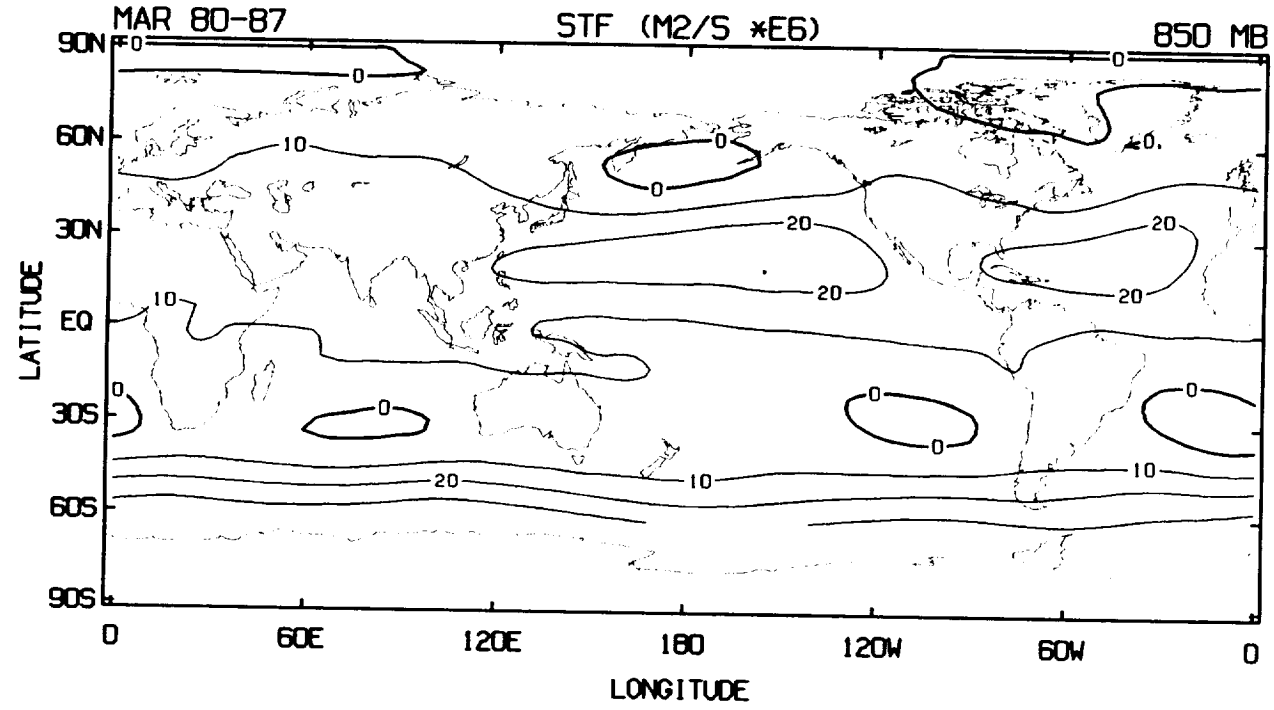

MAR 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE
216
218
220
214
222
224
226

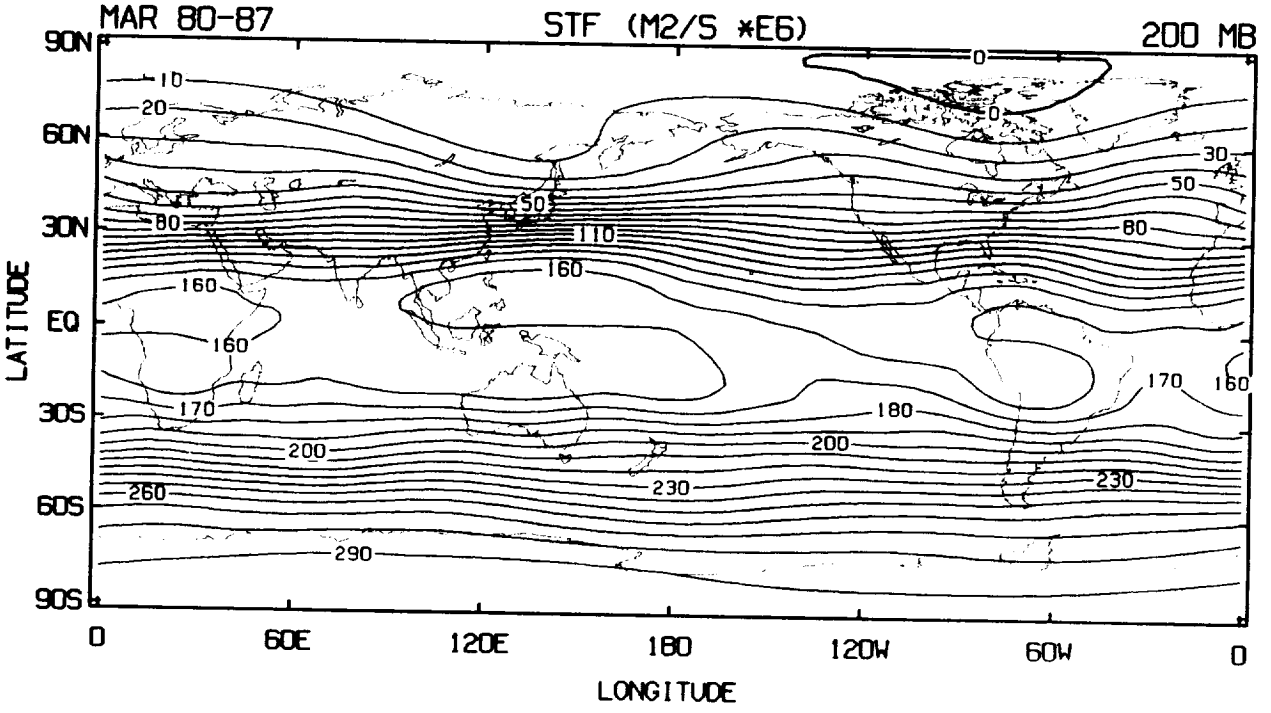

MAR 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
8550
8820
9090
9450
9360
9630
9180
8370
0
60E
120E
180
120W
60W
LONGITUDE

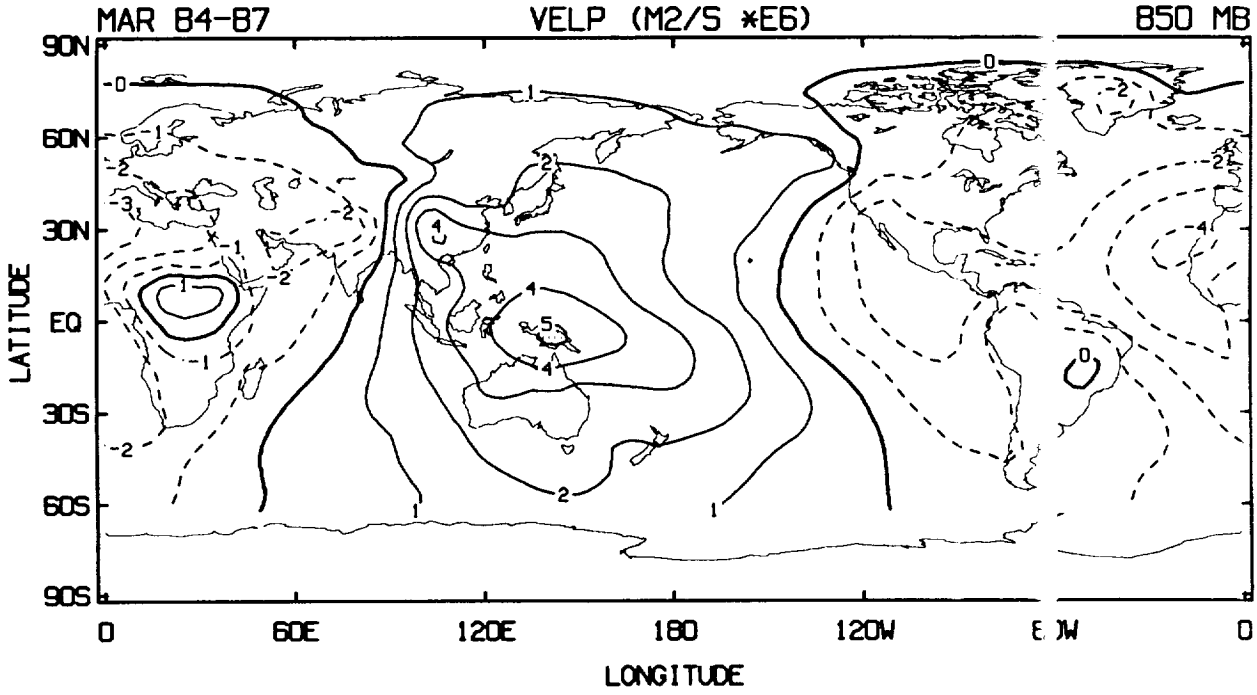

MAR 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

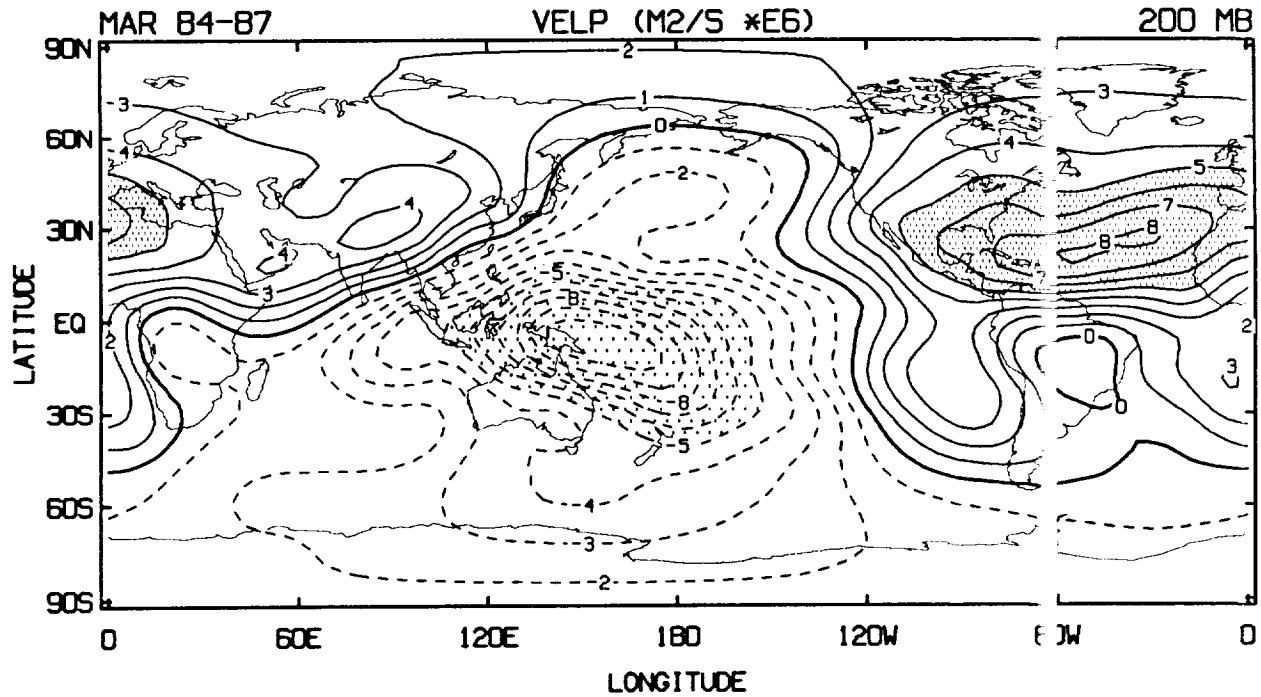

MAR 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

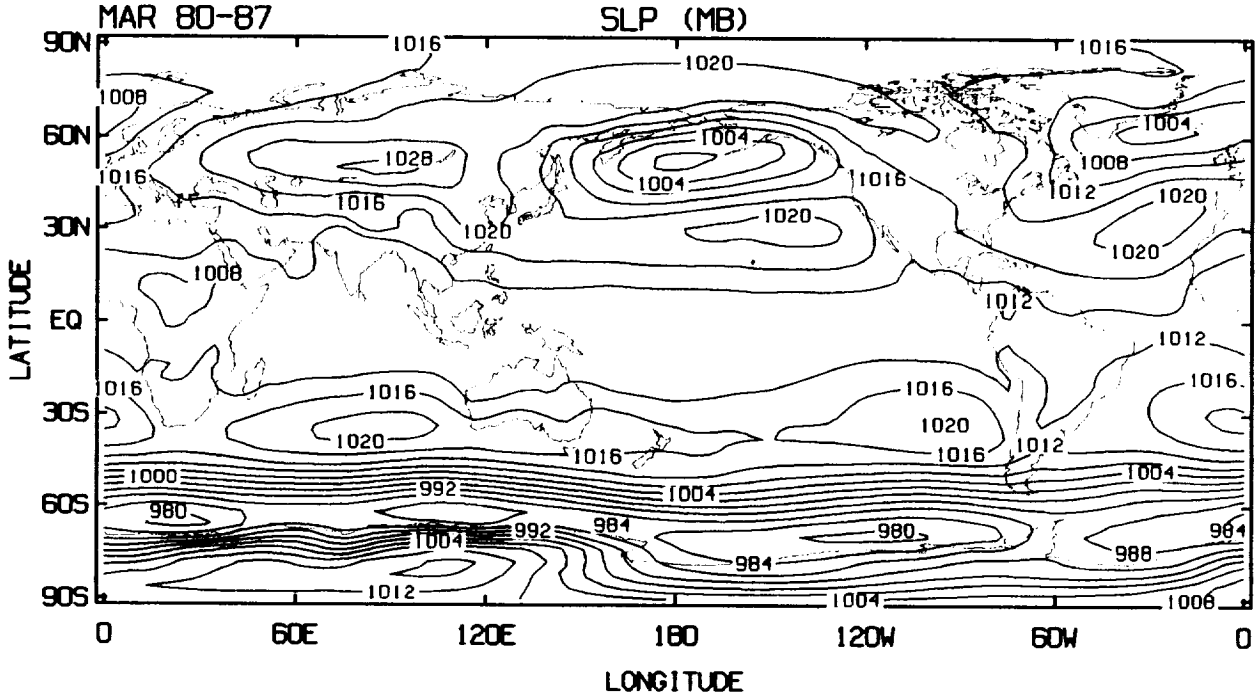

MAR 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

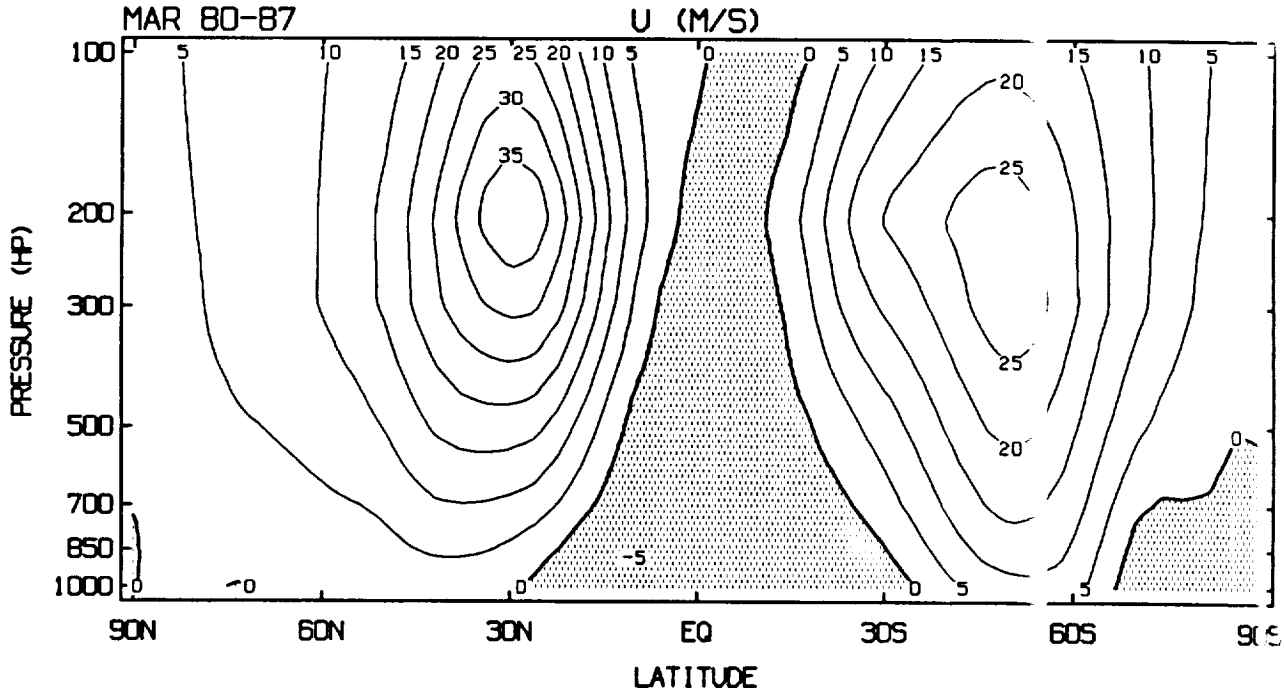

MAR 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

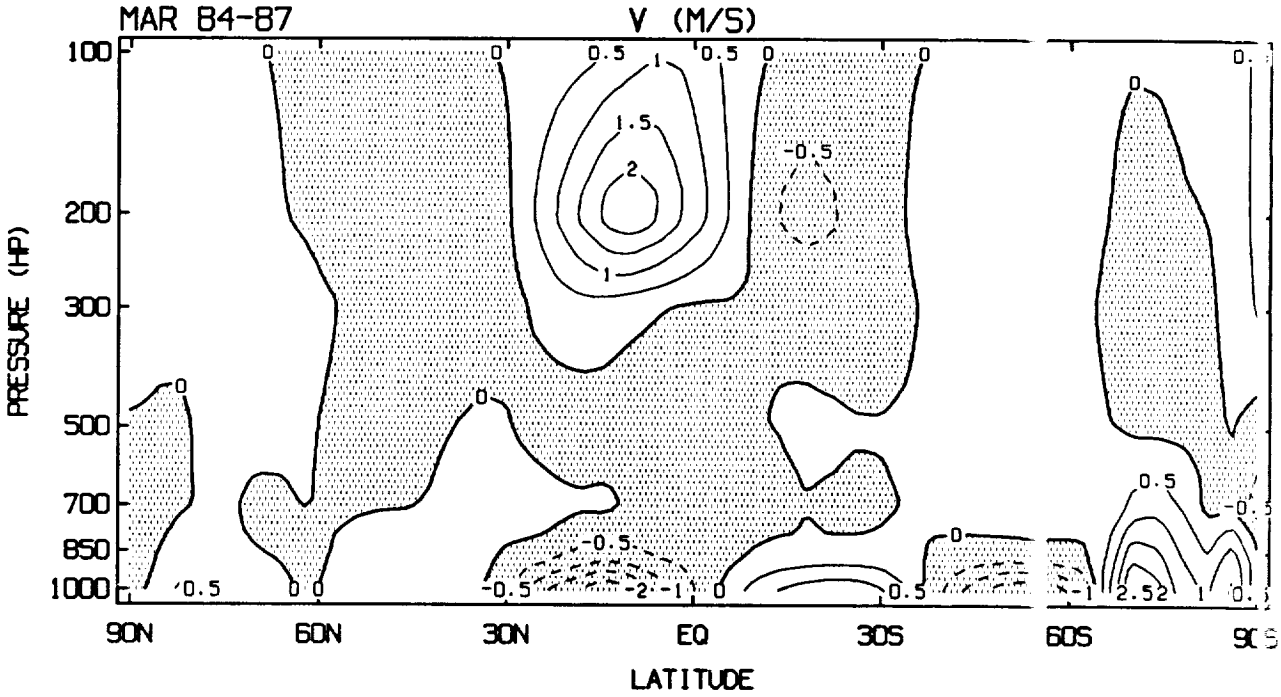

MAR 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

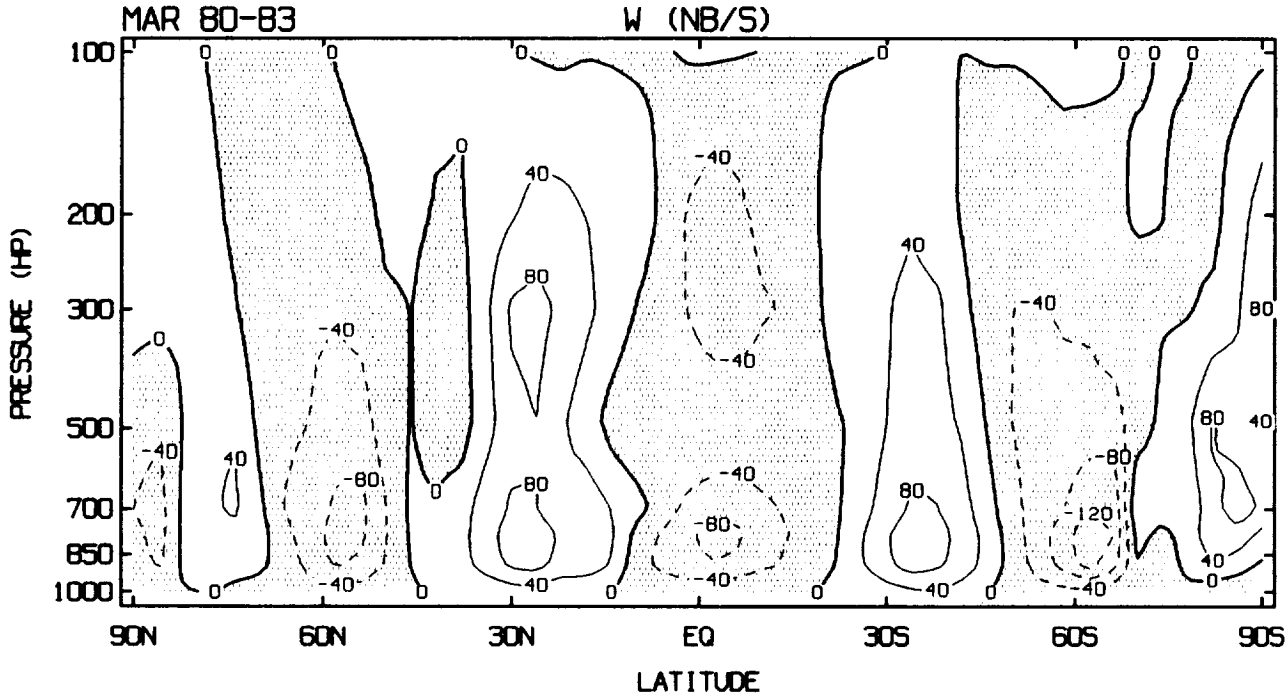

MAR 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

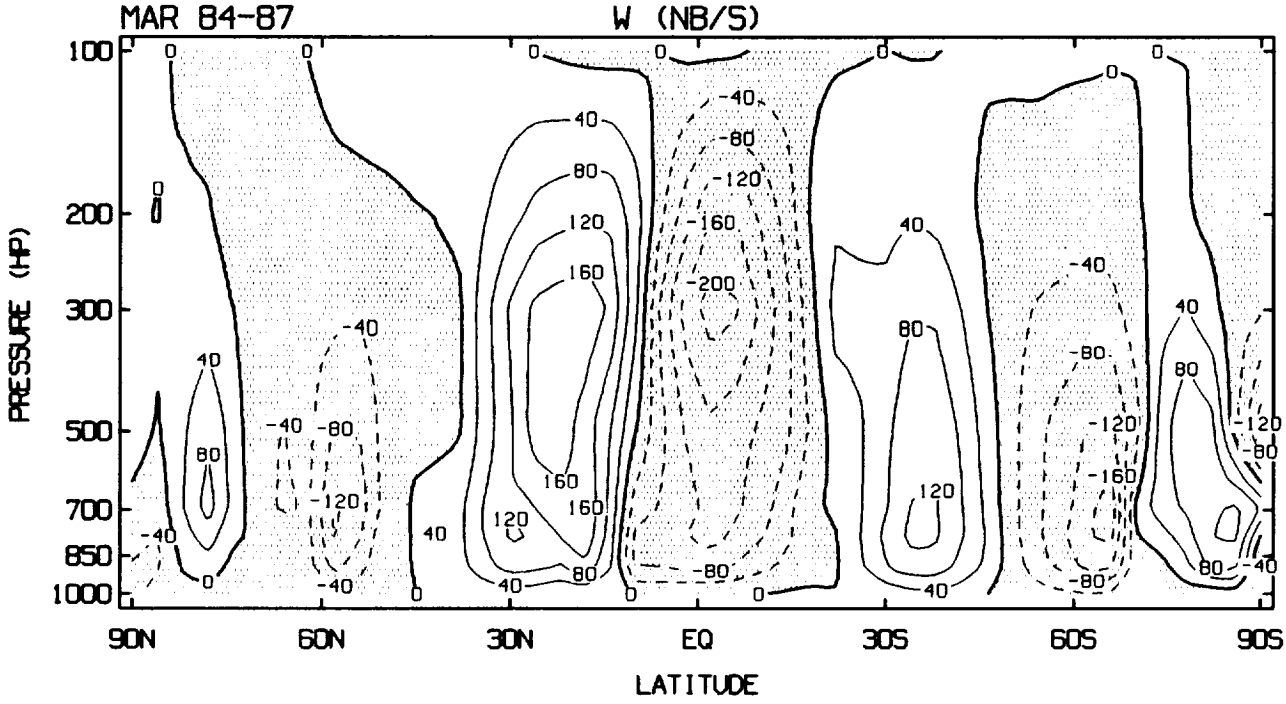

MAR 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

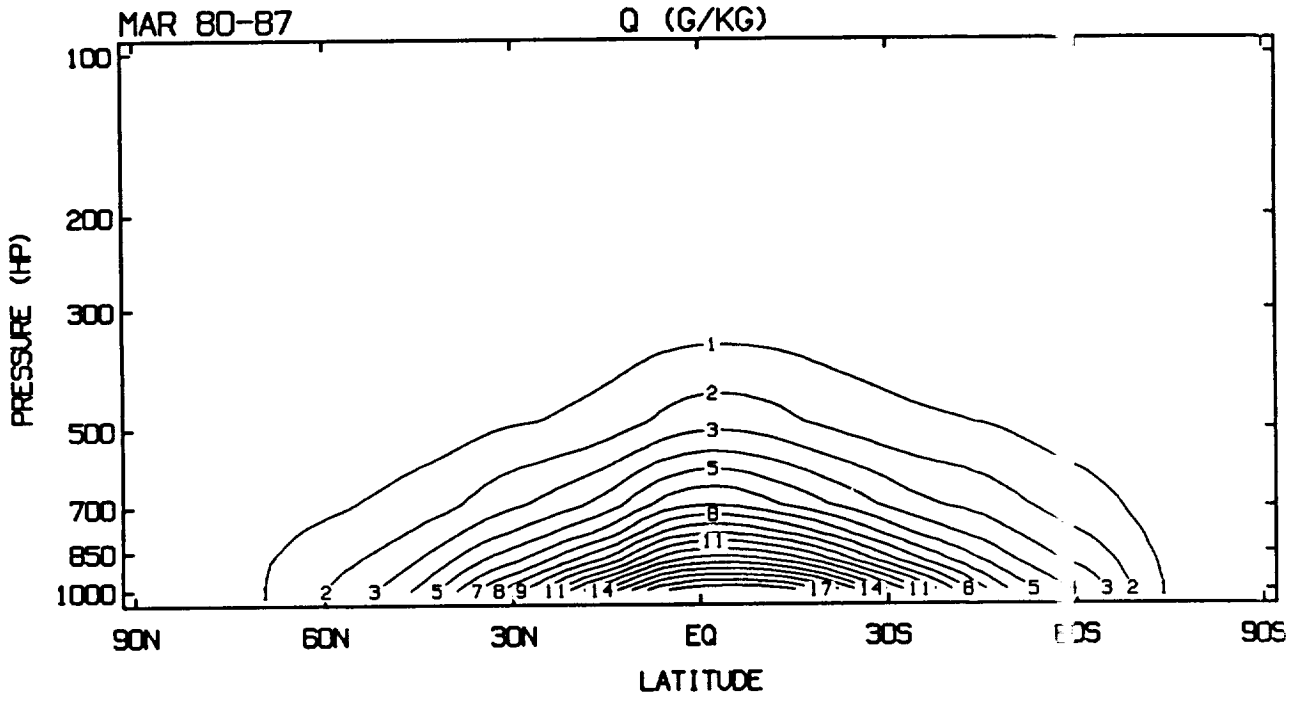

MAR 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1016
1020
1008
1004
1028
1012
1000
992
980
984
988
1006

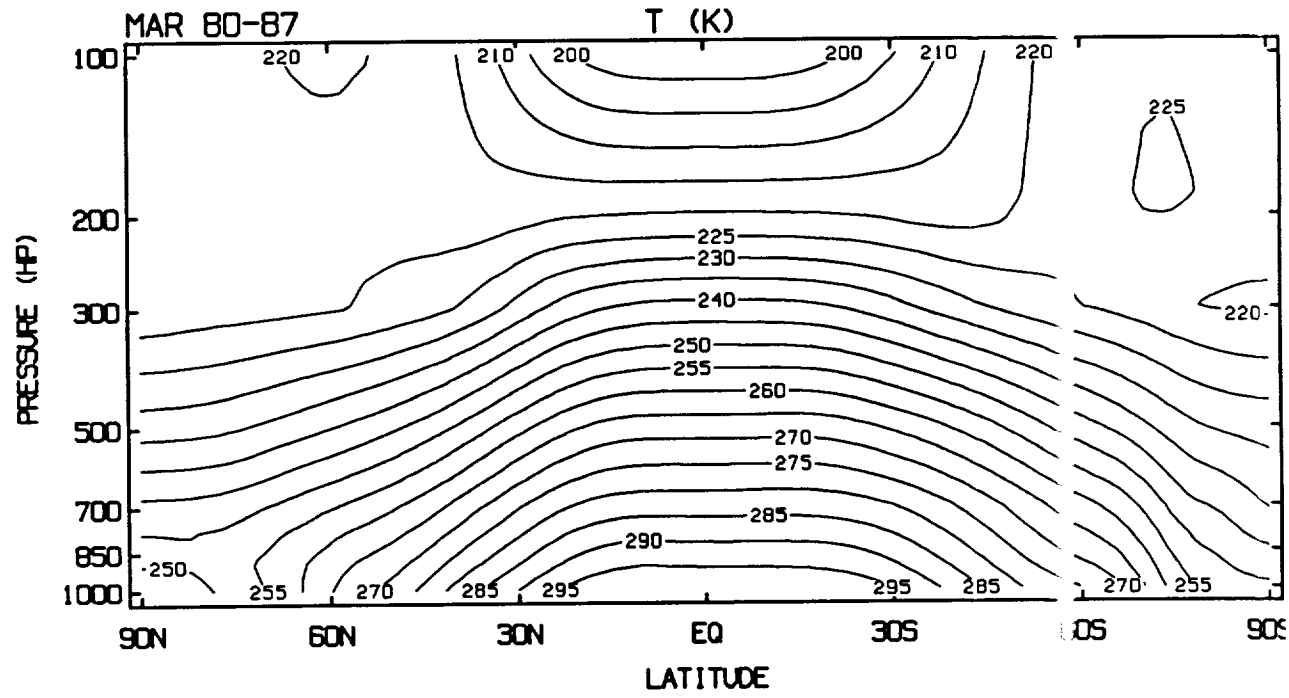

MAR 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


MAR 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


MAR 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


MAR 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

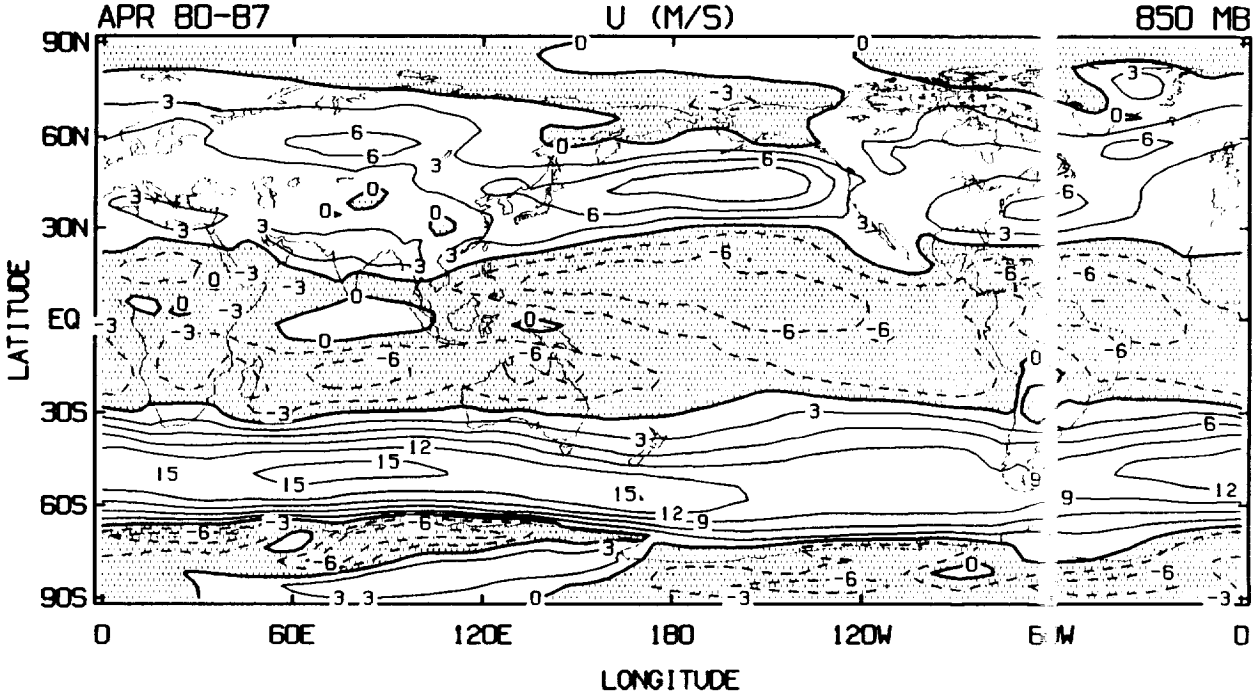

MAR 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
1
2
3
5
8
11
2 3 5 7 8 9 11 14 17 14 11 8 5 3 2 1
90N
60N
30N
EQ
30S
90S
LATITUDE

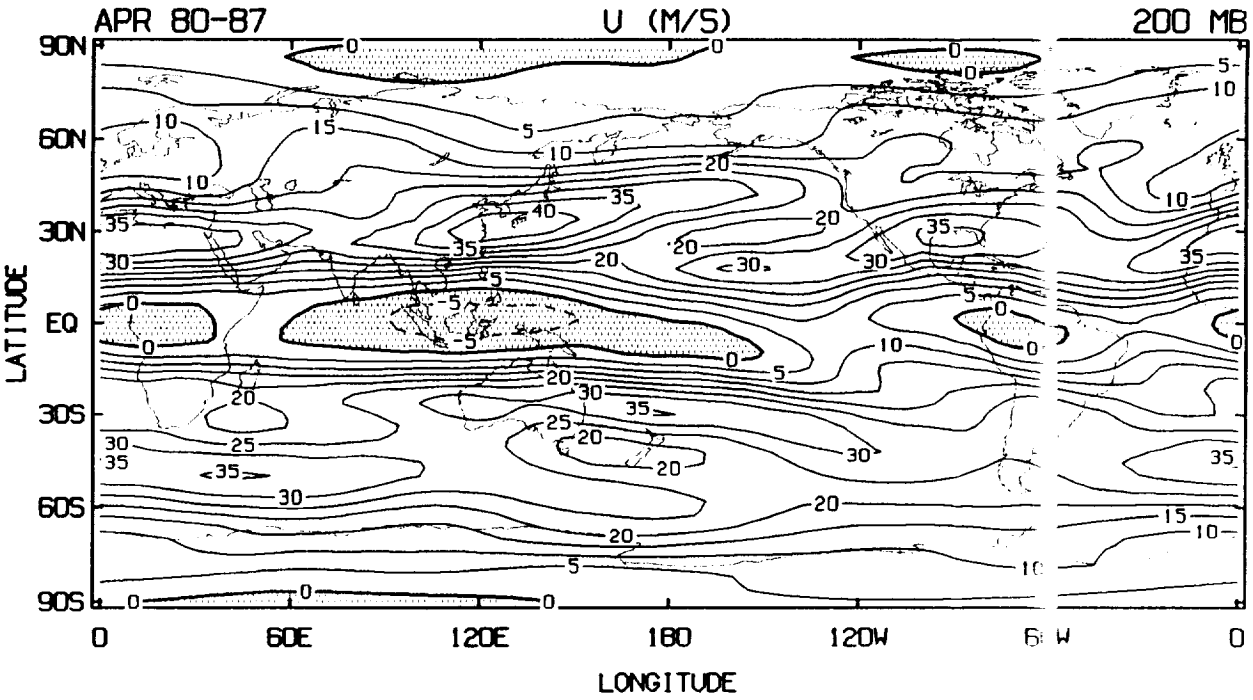

MAR 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
220
210
200
200
210
220
225
225
230
240
250
255
260
270
275
285
290
250
255
270
285
295
295
285
270
255
220
90N
60N
30N
EQ
30S
90S
LATITUDE

APRIL

PRECEDING PAGE BLANK NOT FILMED

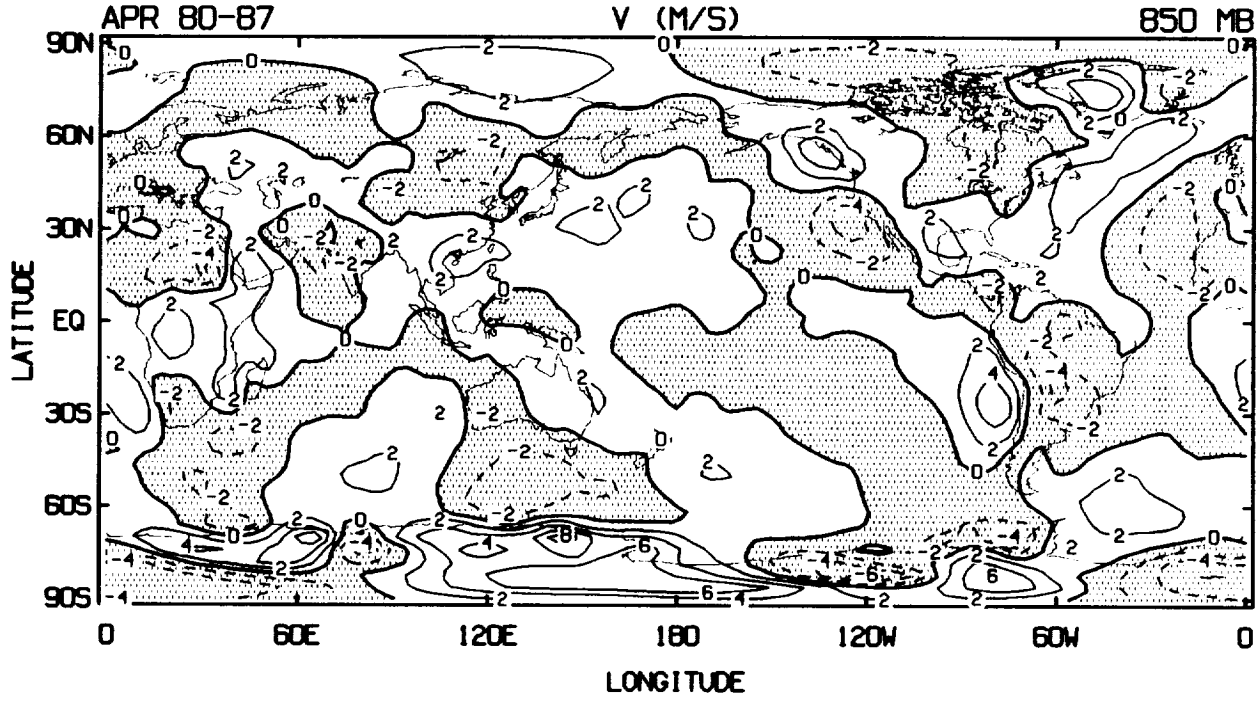
PAGE 42 INTENTIONALLY BLANK

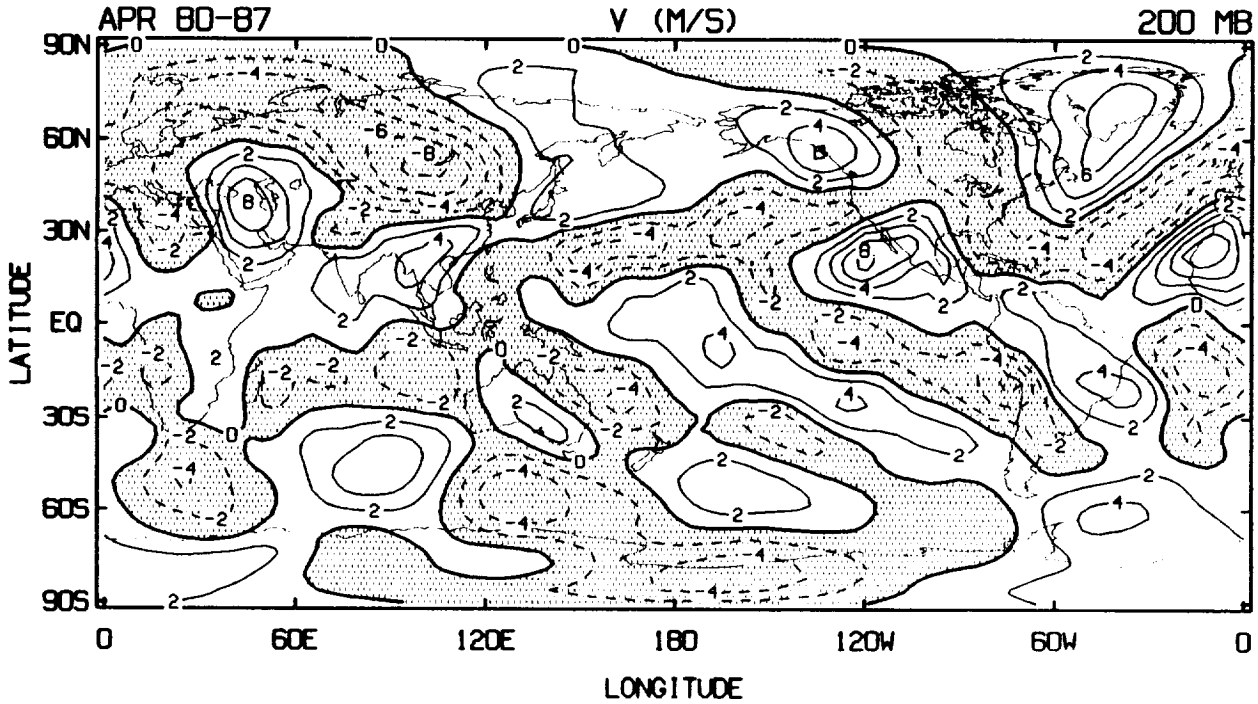


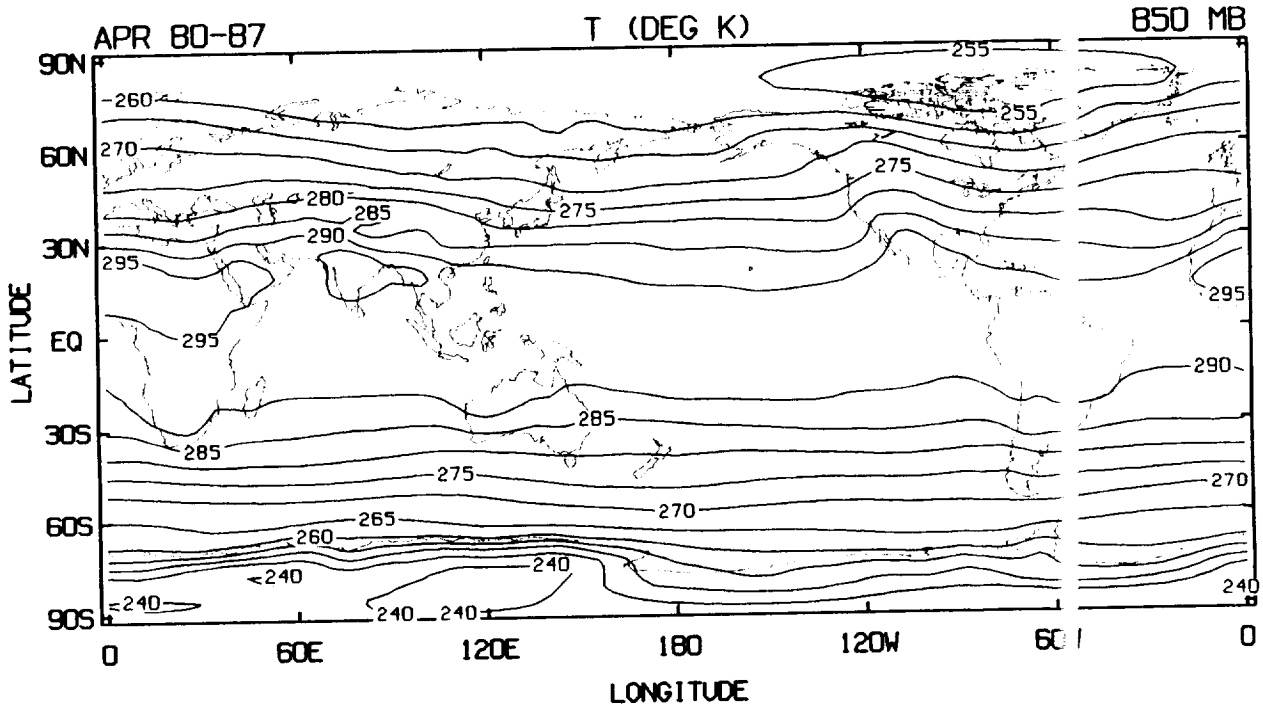


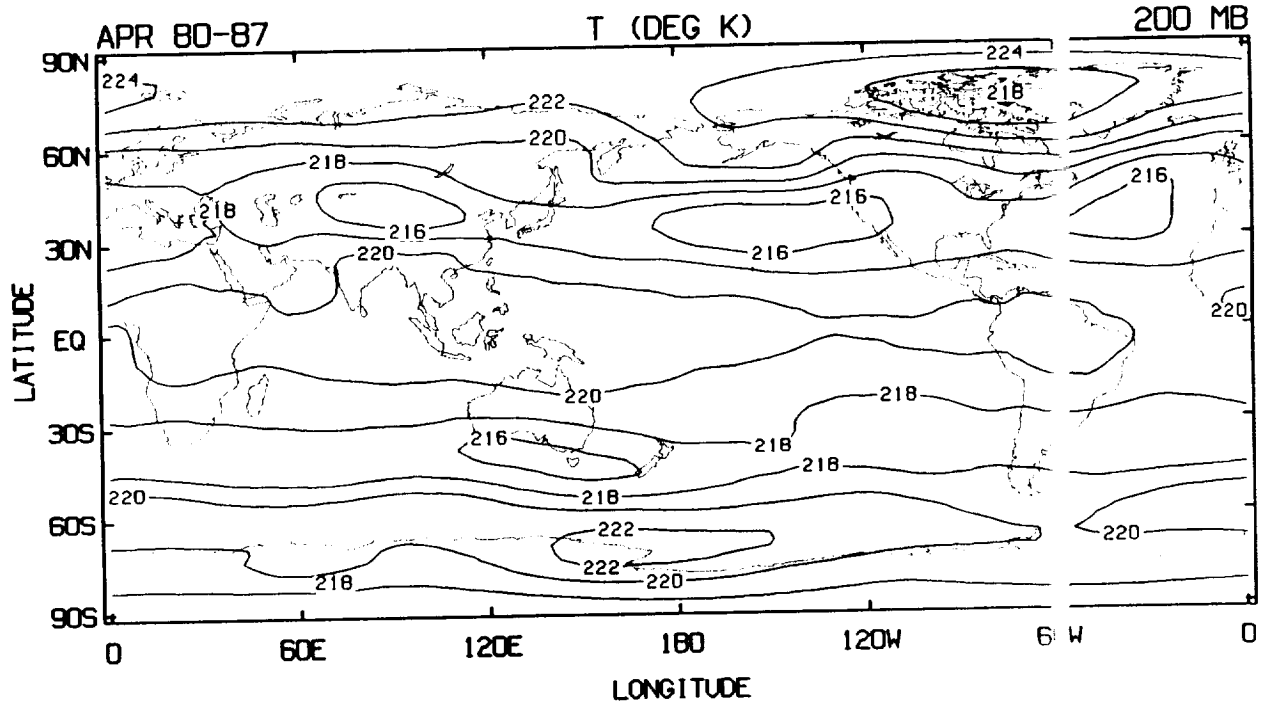
PRECEDING PAGE BLANK NOT FILMED

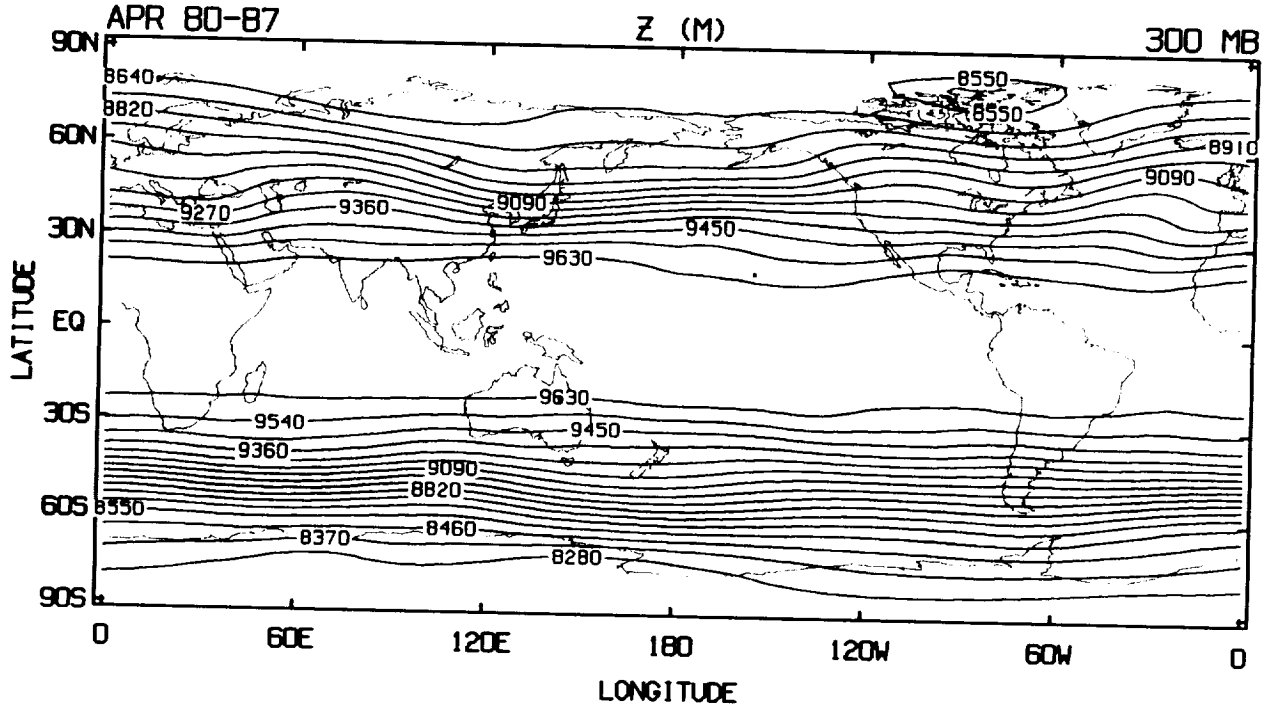
PAGE 44 INTENTIONALLY BLANK

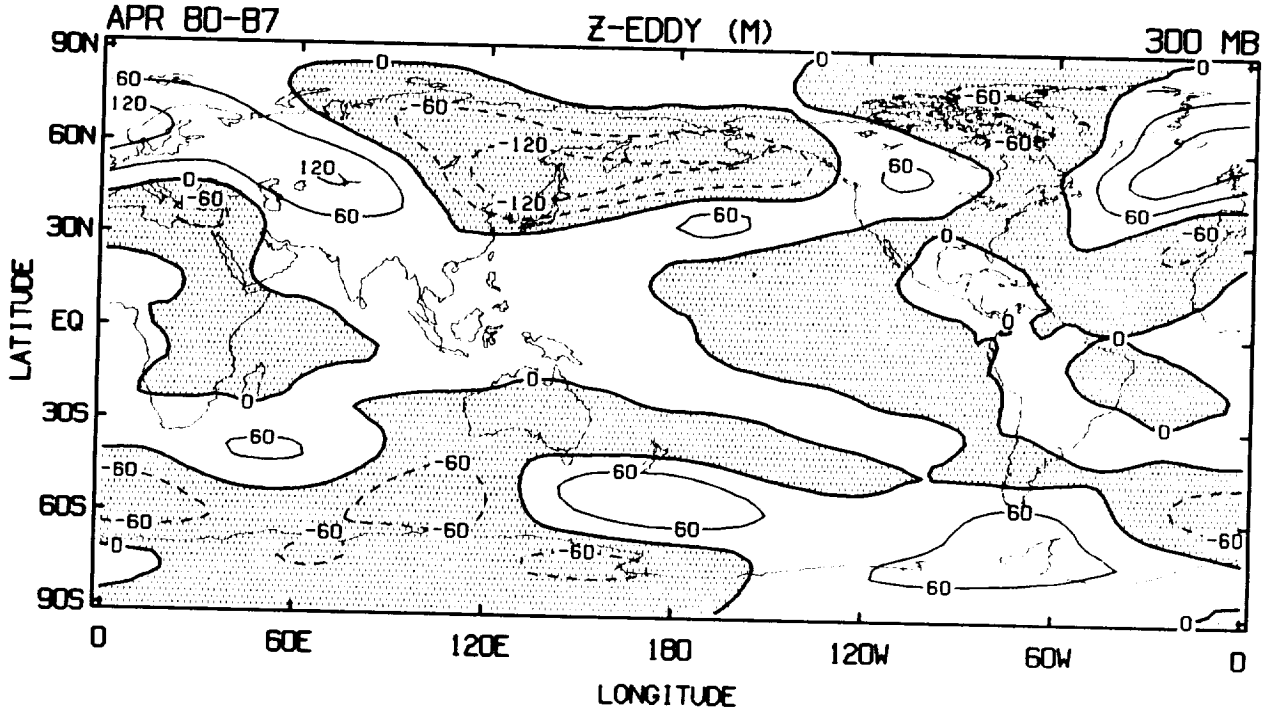

APR 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

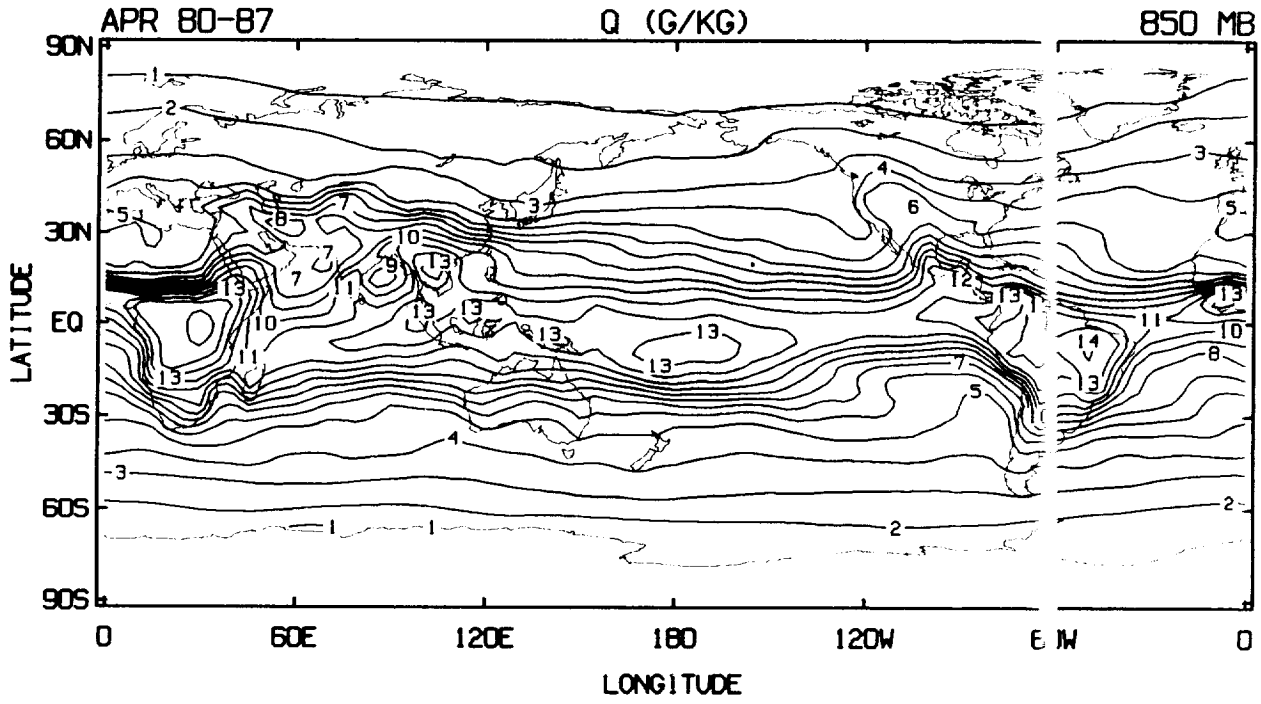

APR 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

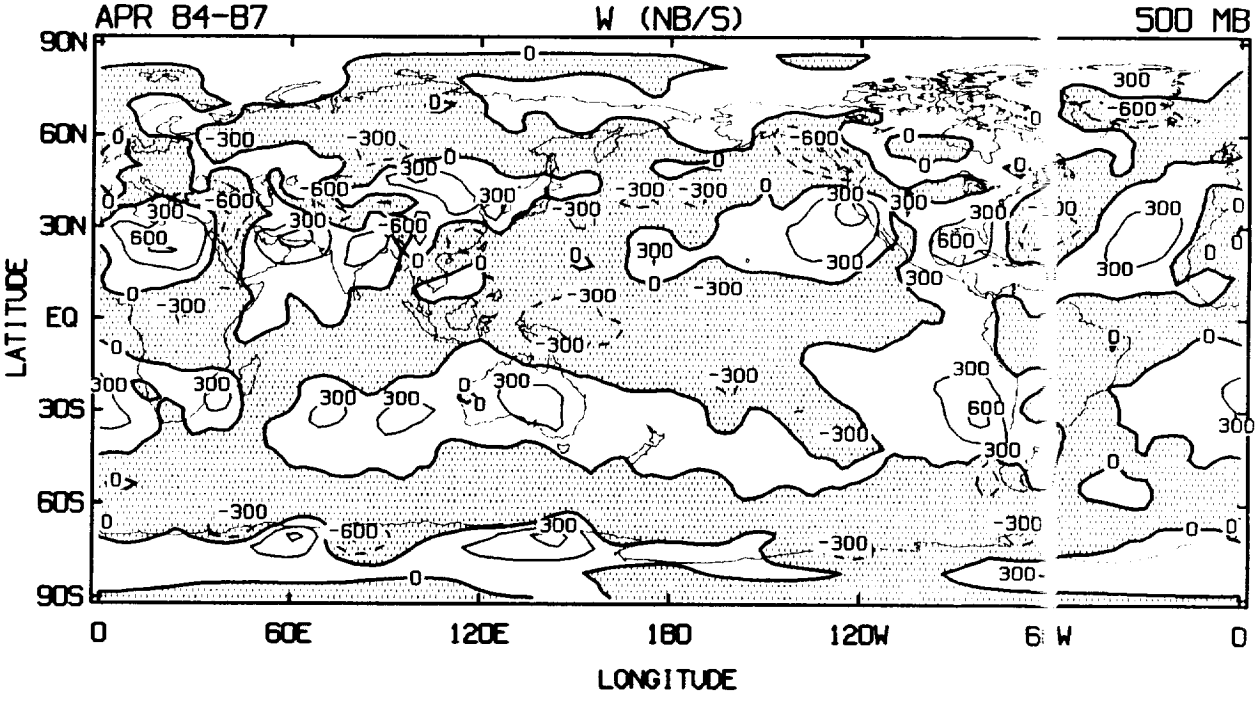

APR 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
255
260
270
275
280
285
290
295
265
240

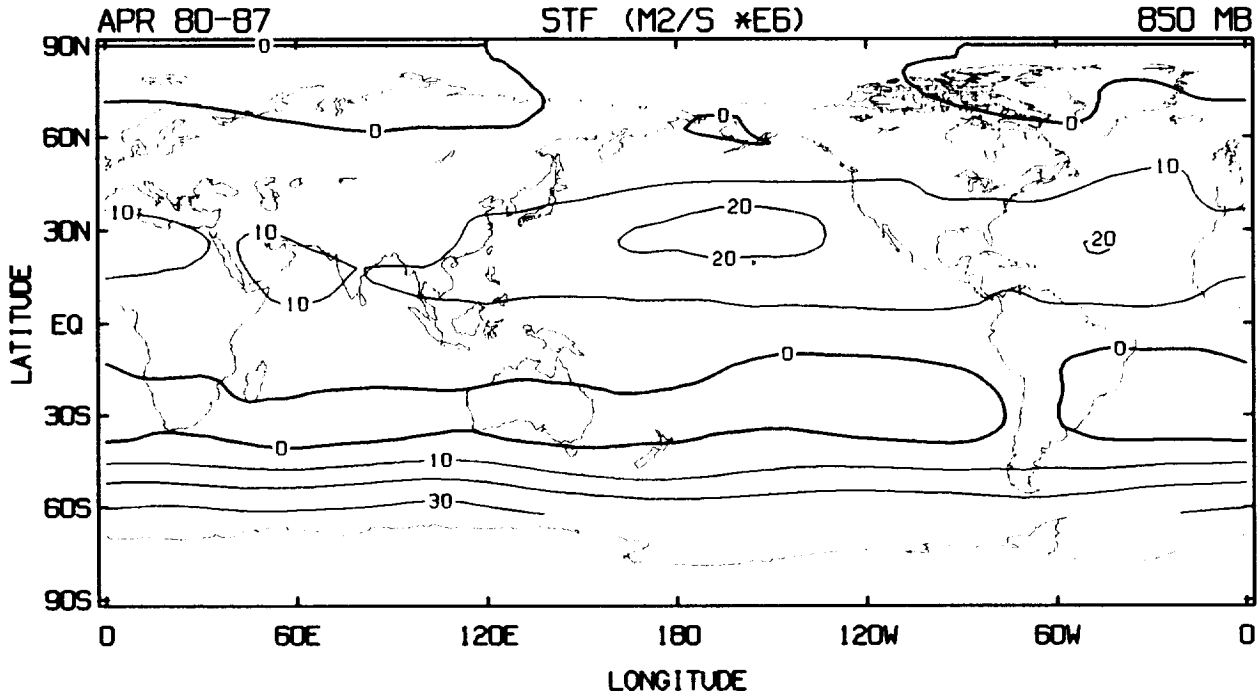

APR 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
224
222
220
218
216

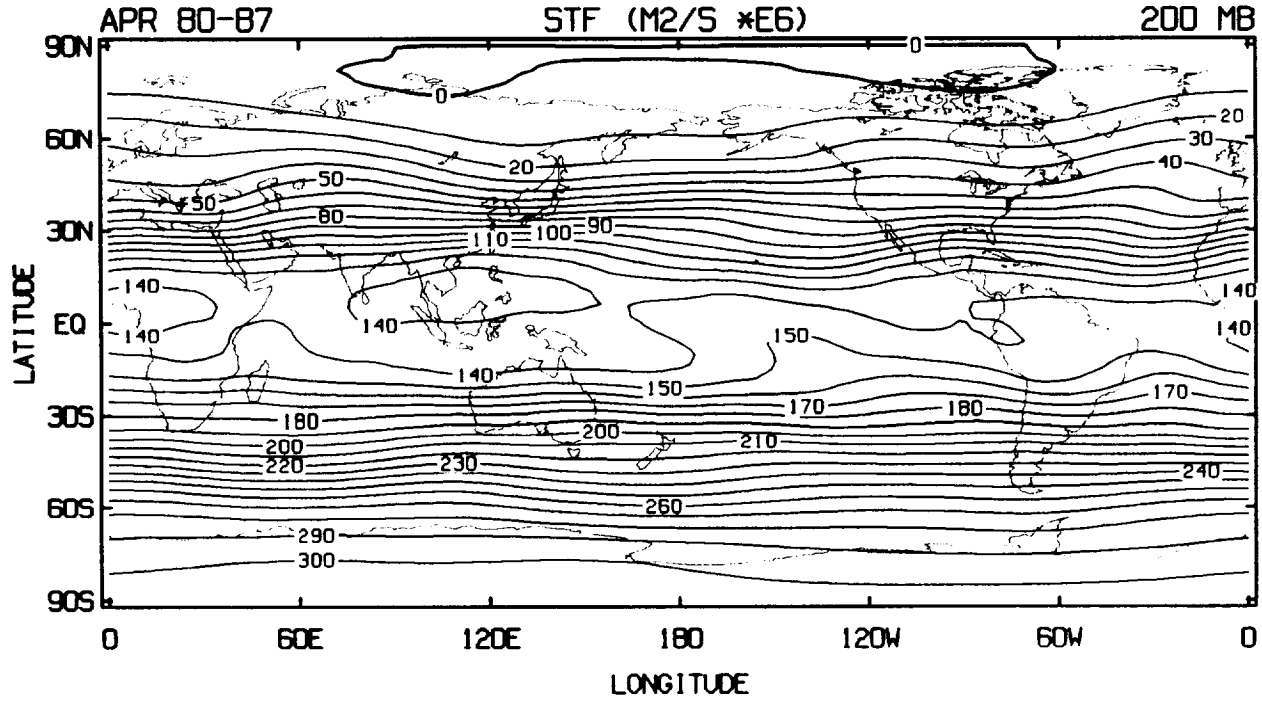

APR 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
8640
8820
9270
9360
9090
9450
9630
8550
8910
9540
8370
8460
8280

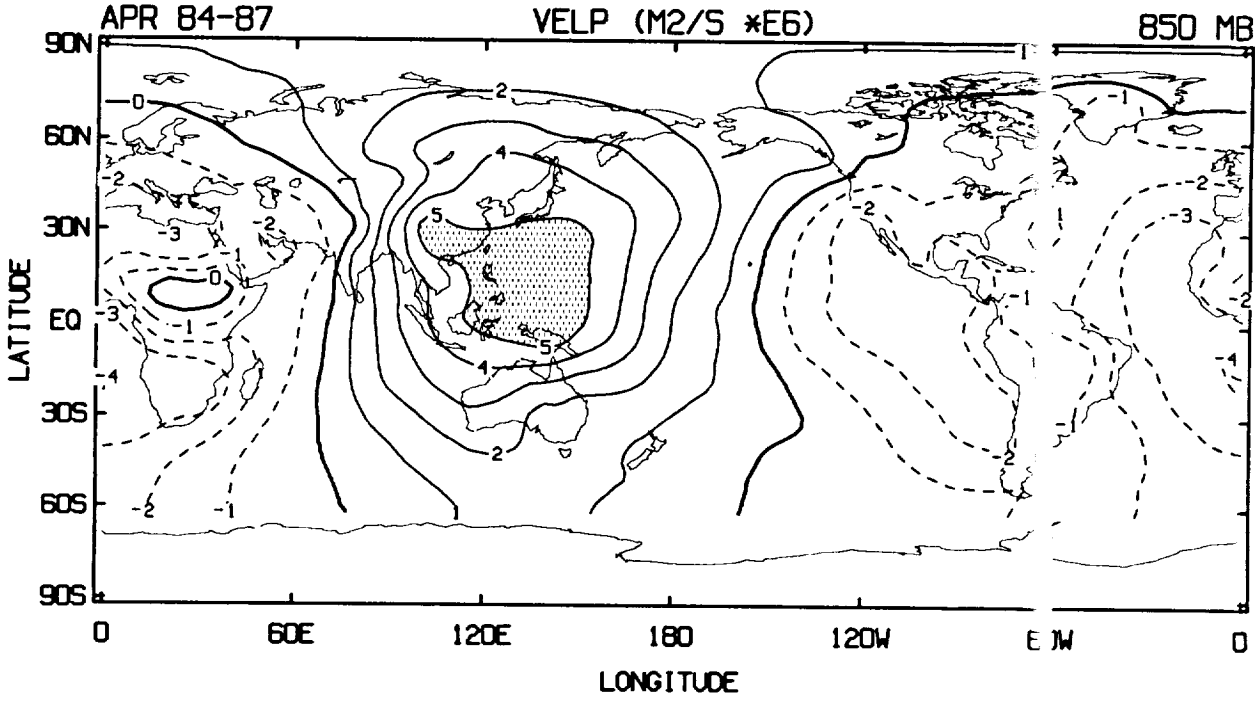

APR 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
60
120
-60
-120

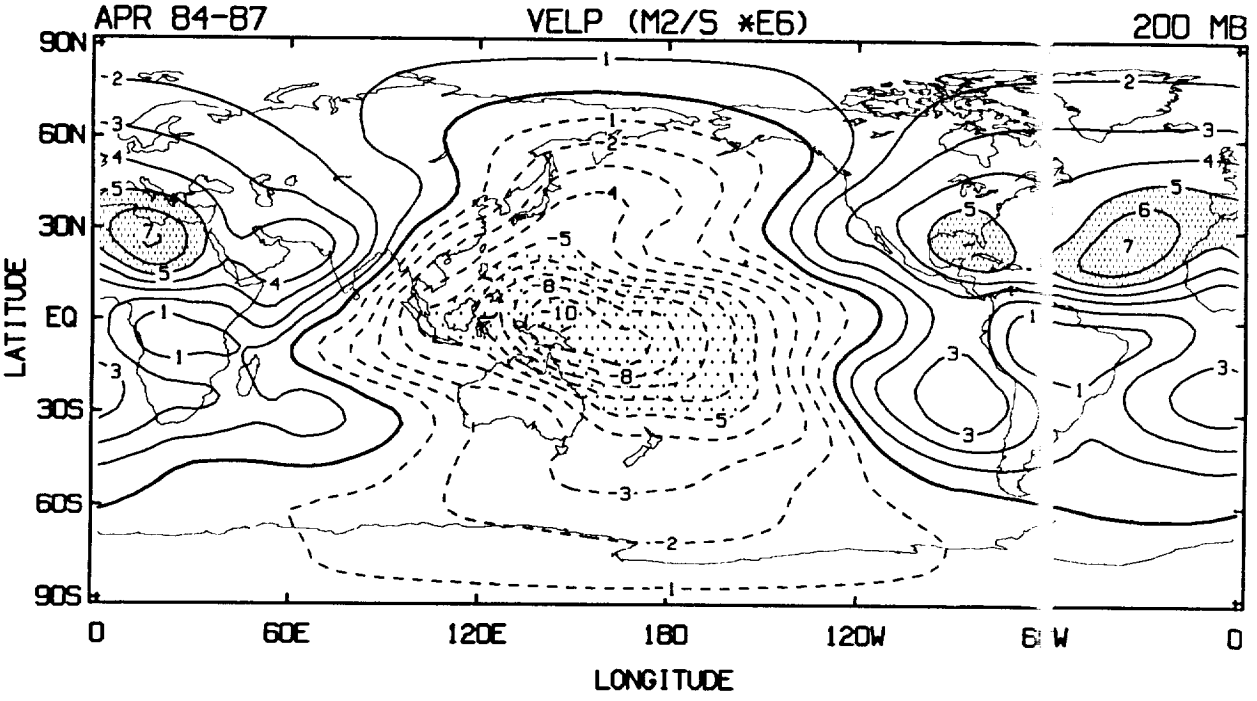

APR 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

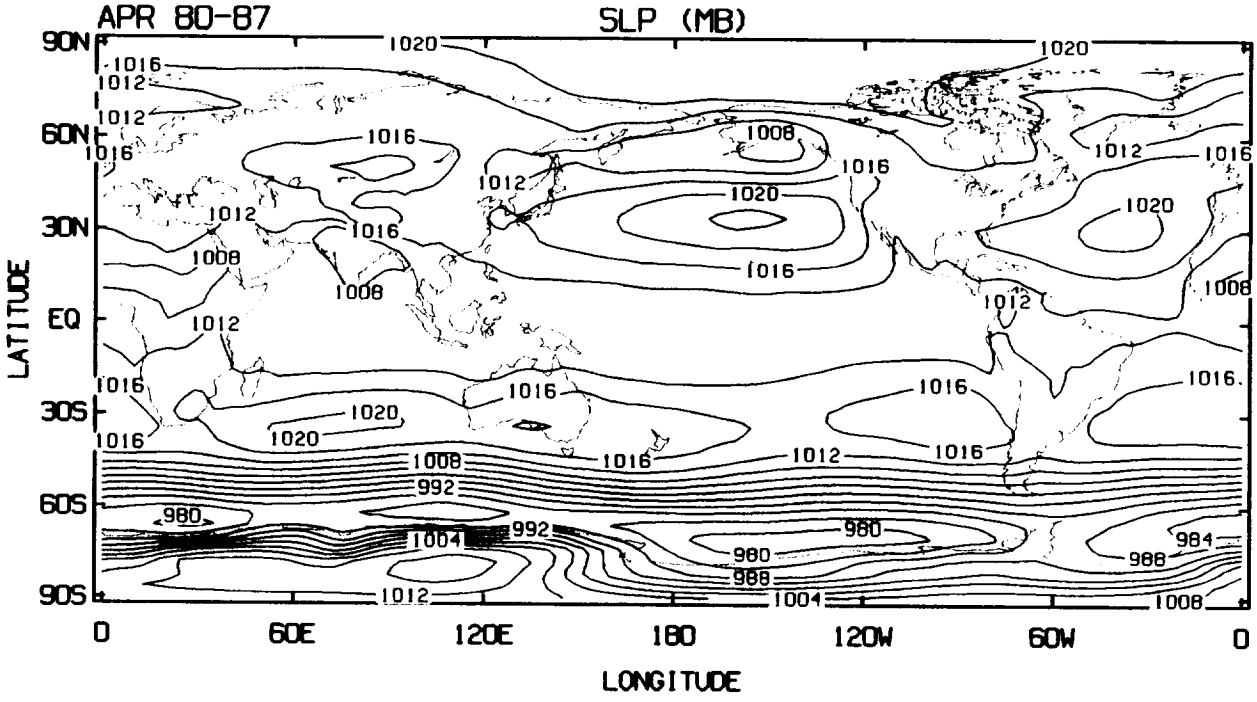

APR 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

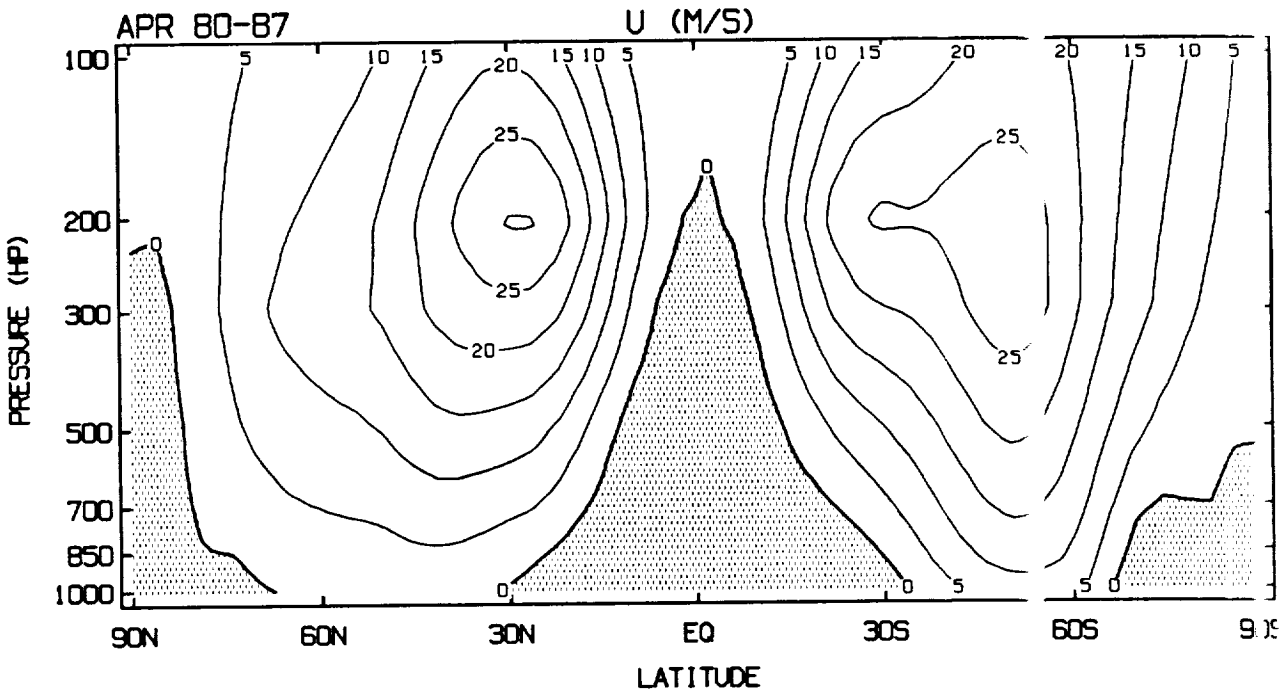

APR 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

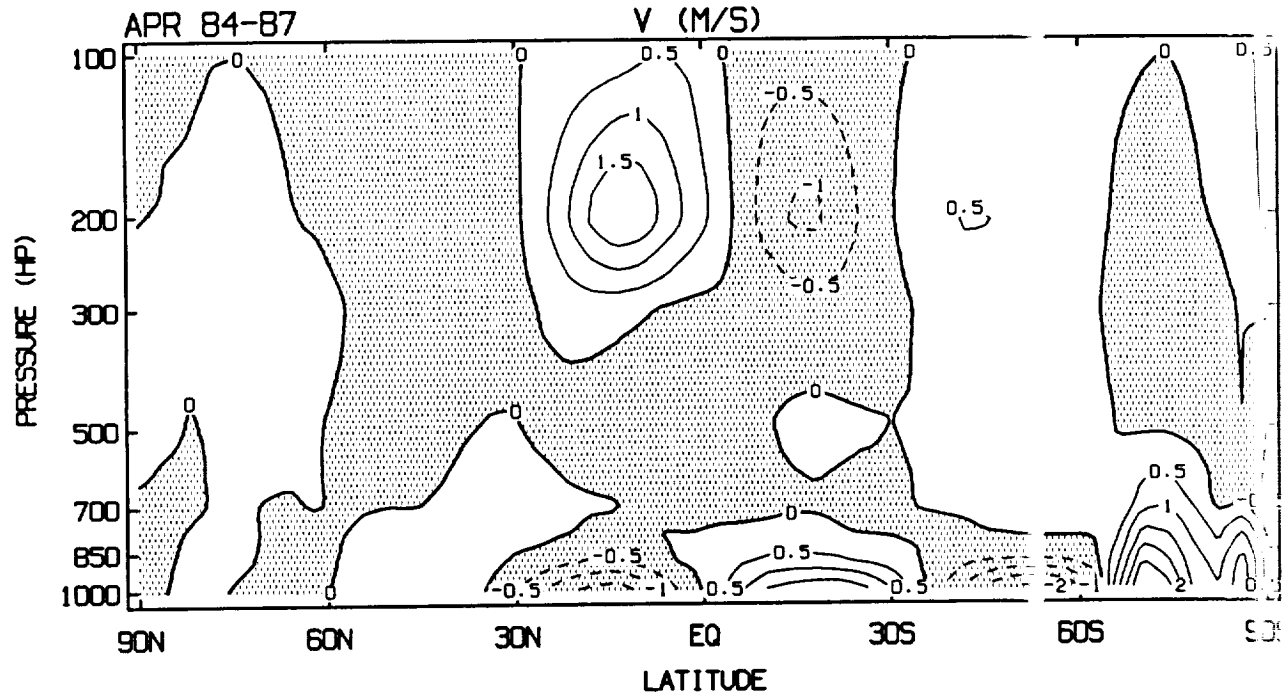

APR 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

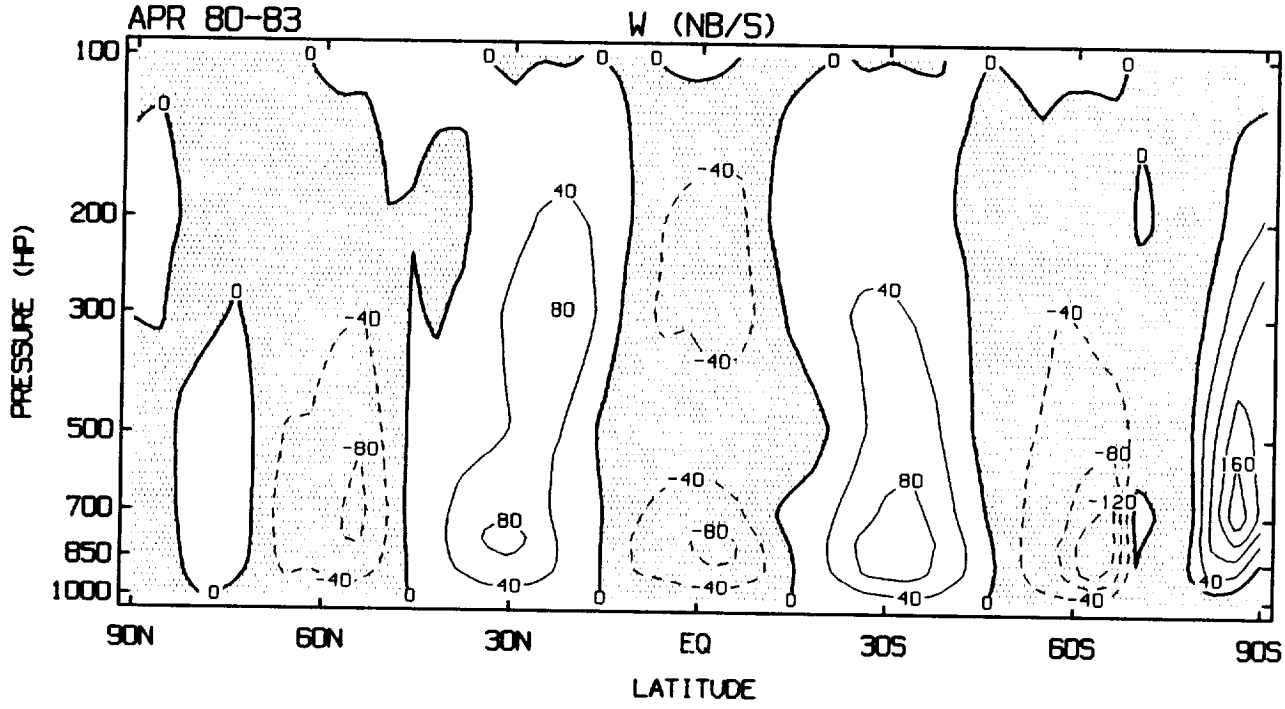

APR 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

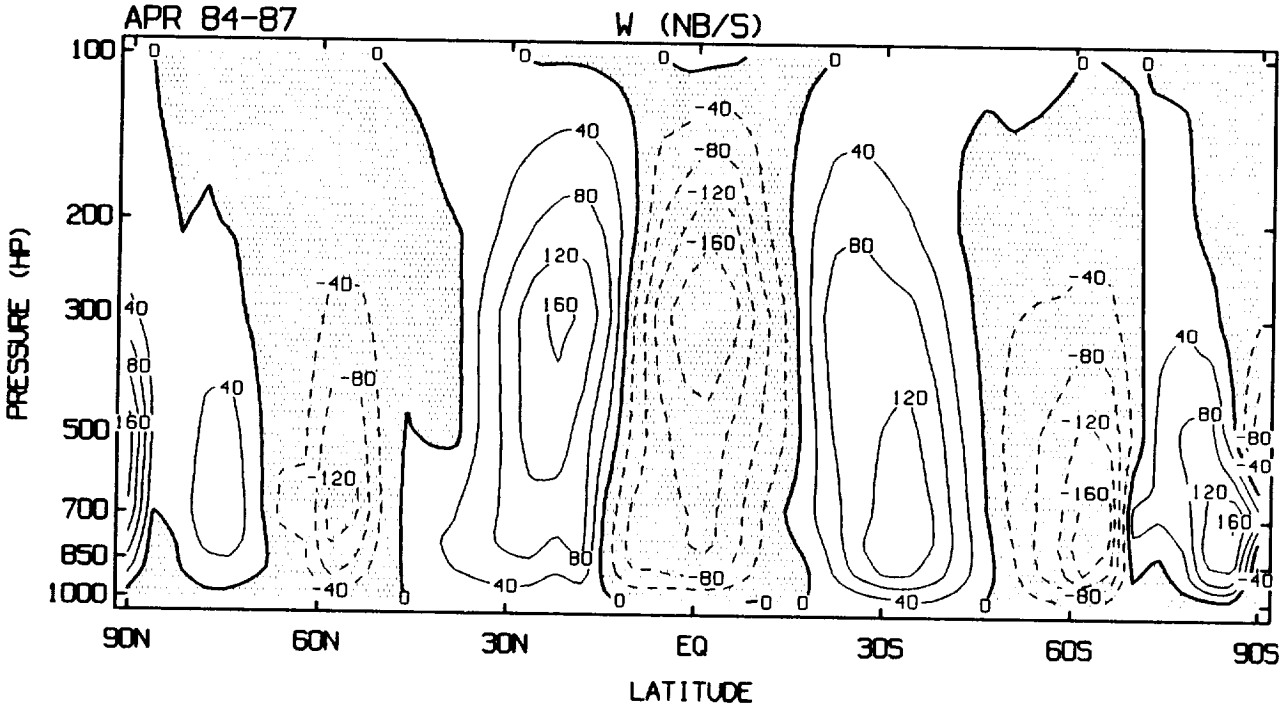

APR 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

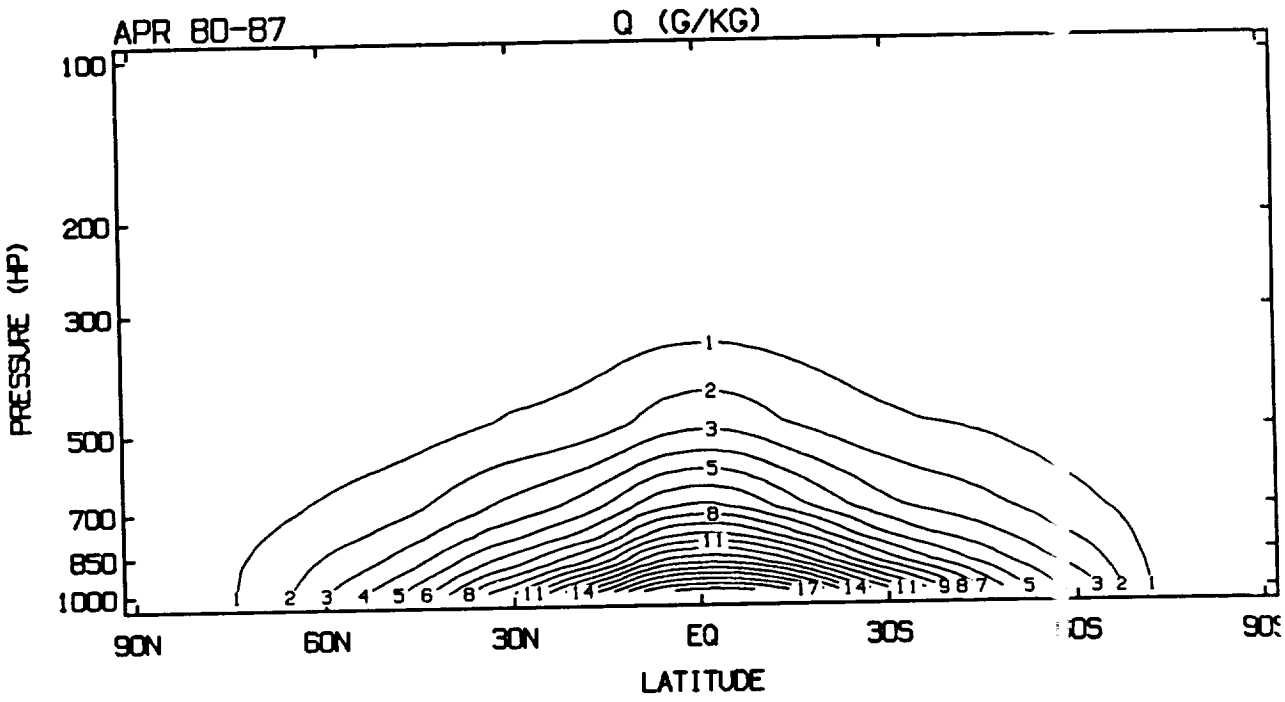

APR 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1020
1016
1012
1008
1004
1000
992
988
984
980

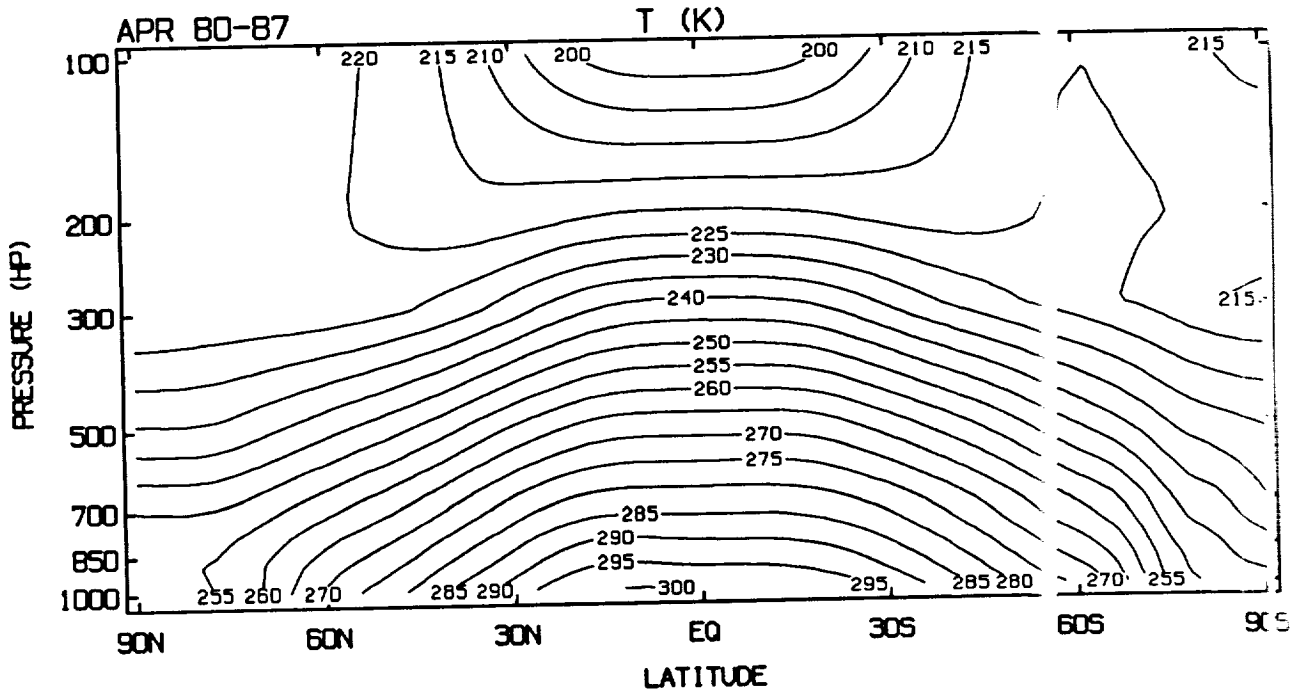

APR 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


APR 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


APR 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


APR 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

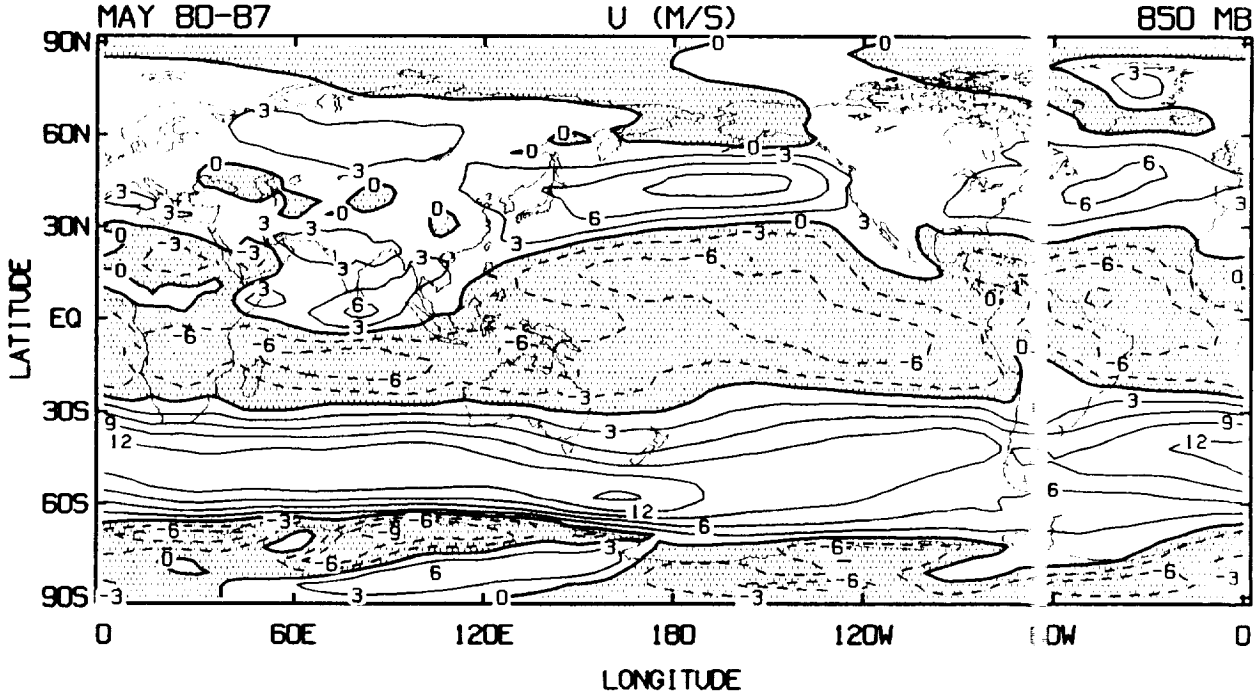

APR 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
LATITUDE

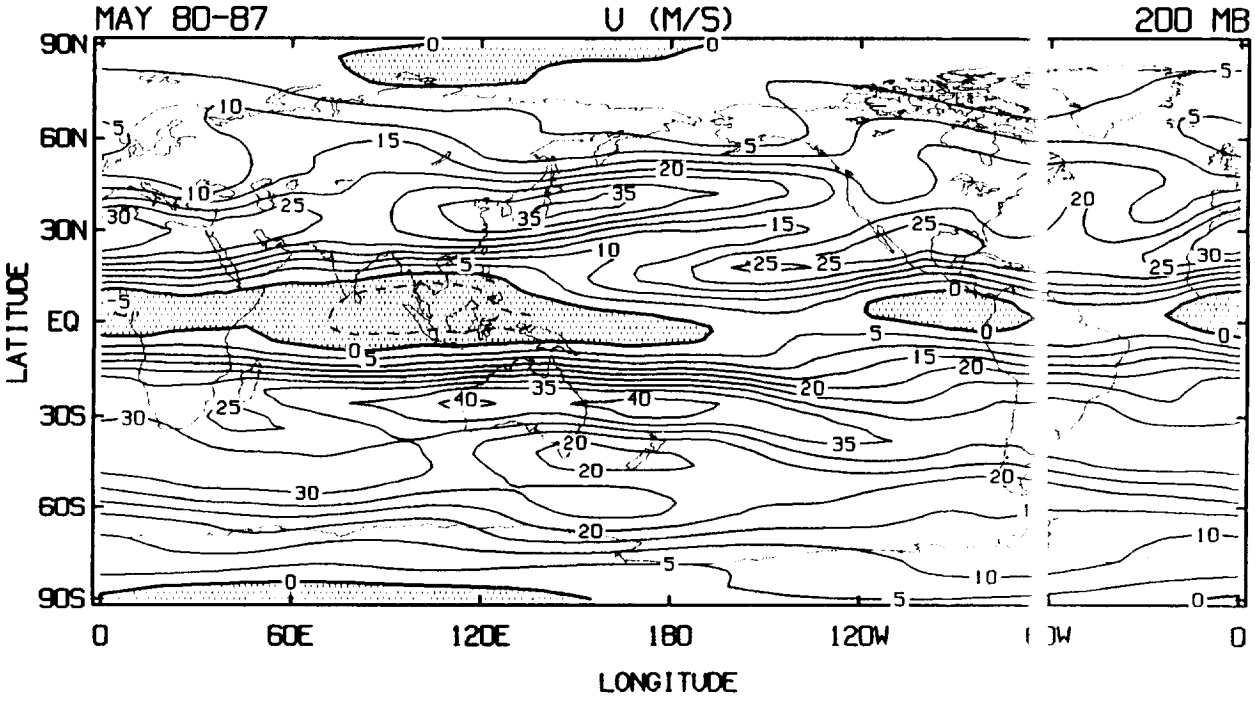

APR 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE

MAY

PRECEDING PAGE BLANK NOT FILMED

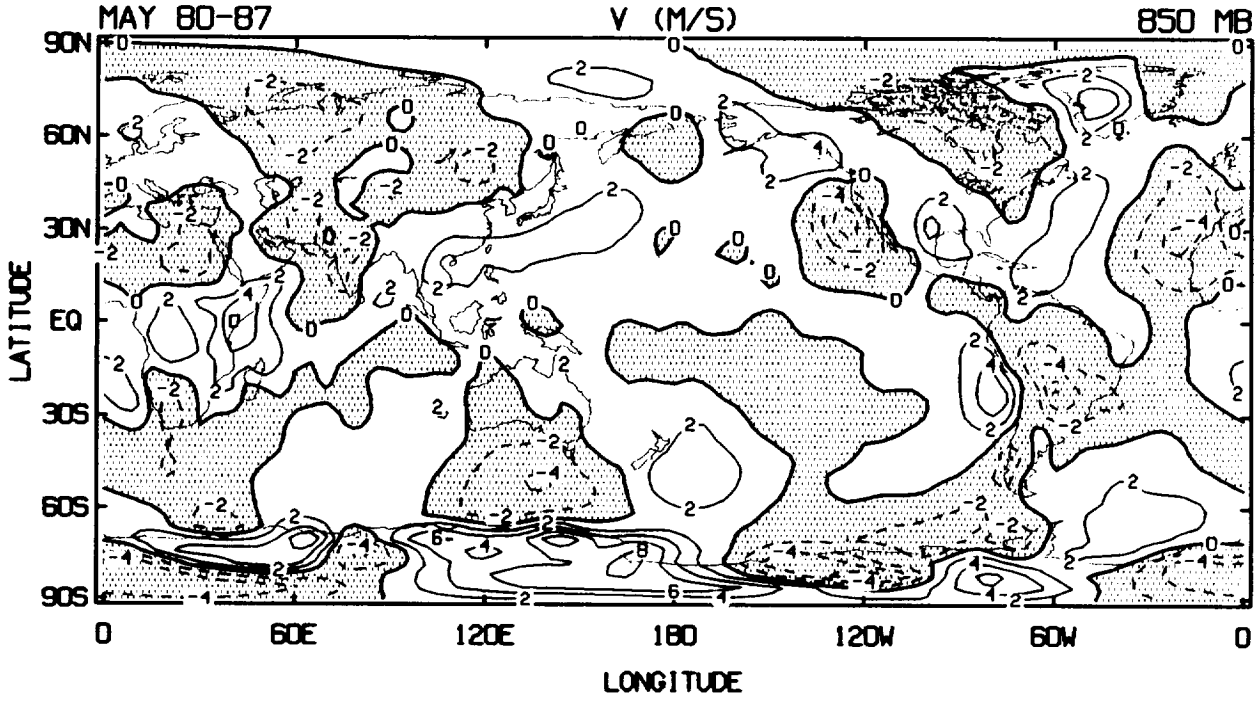
PAGE 56 IN ENTIONALLY BLAN(

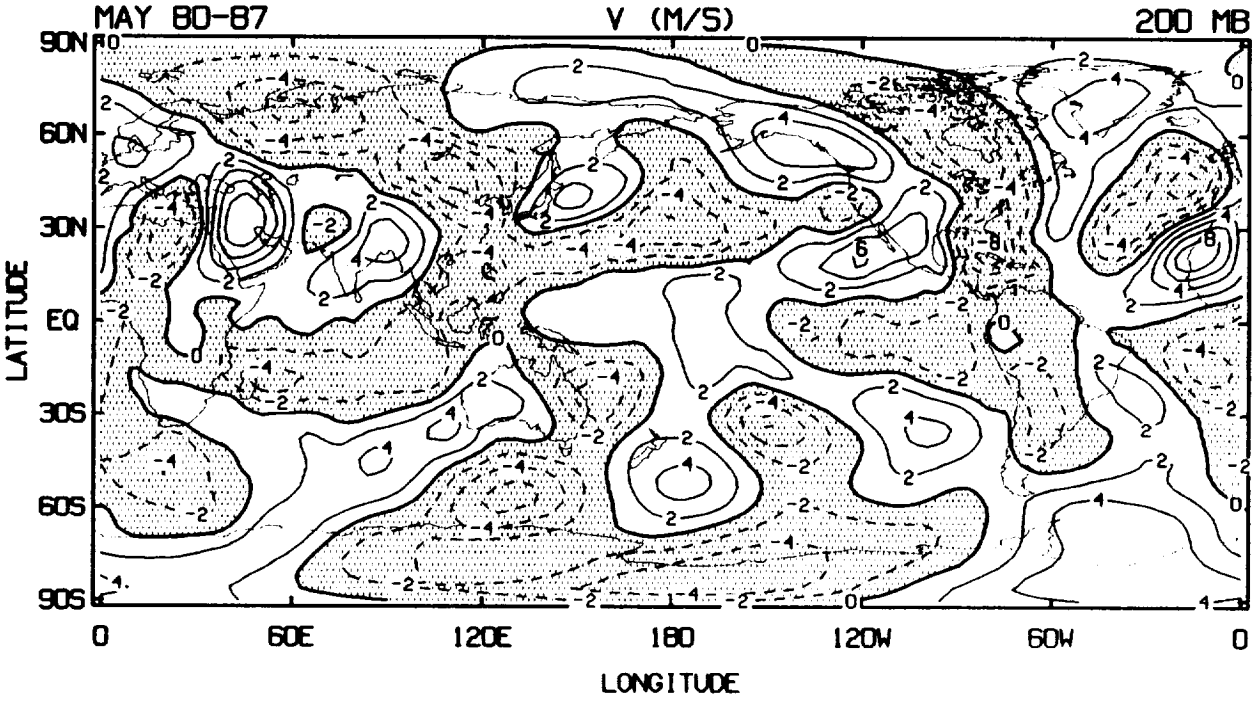


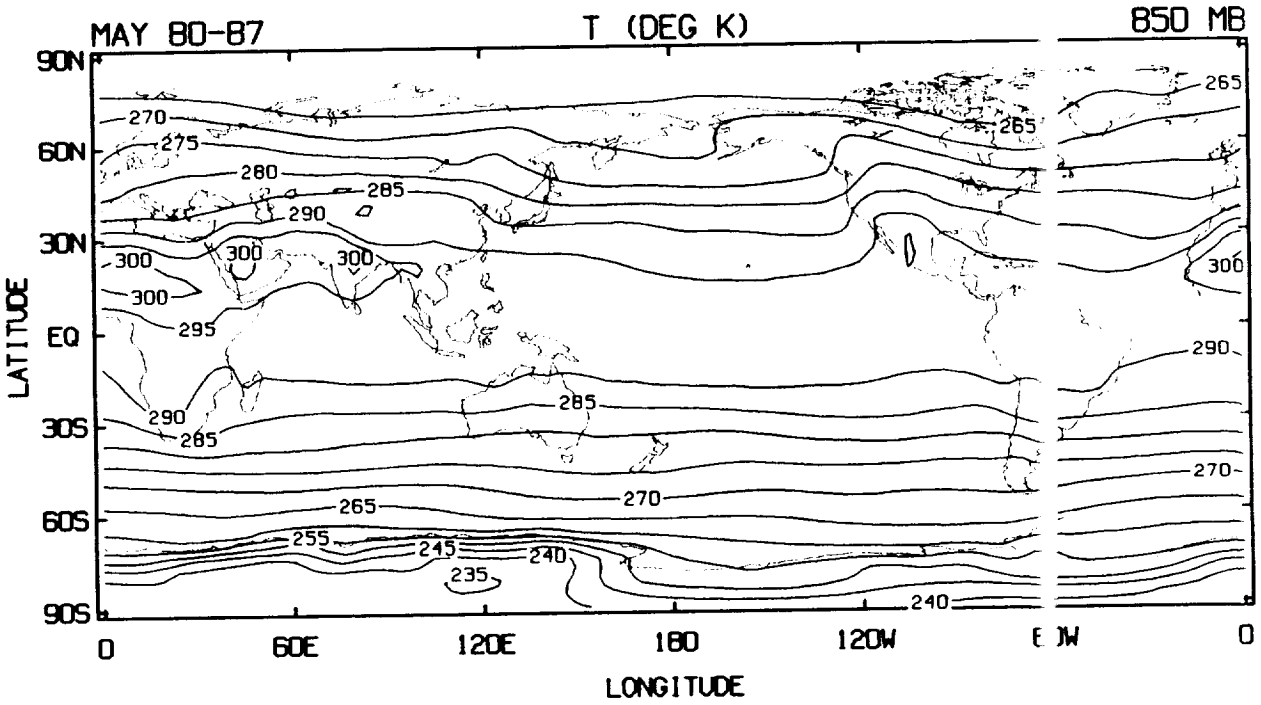


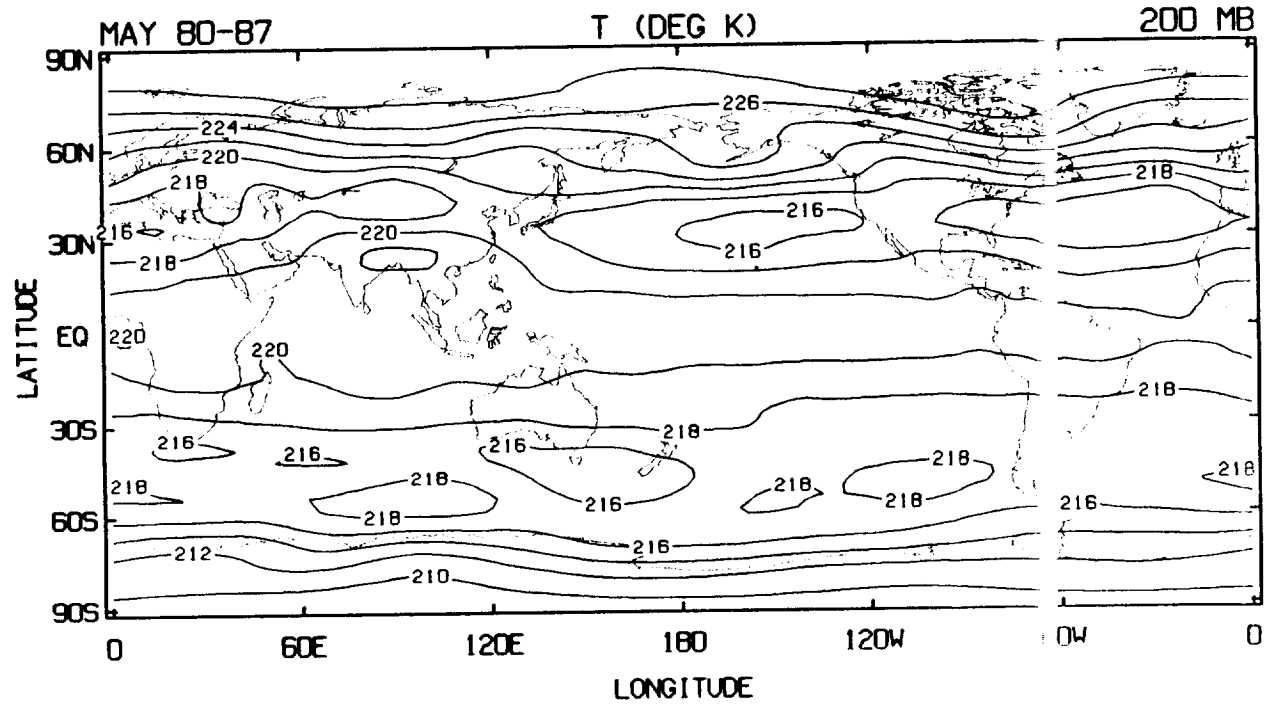
PRECEDING PAGE BLANK NOT FILMED

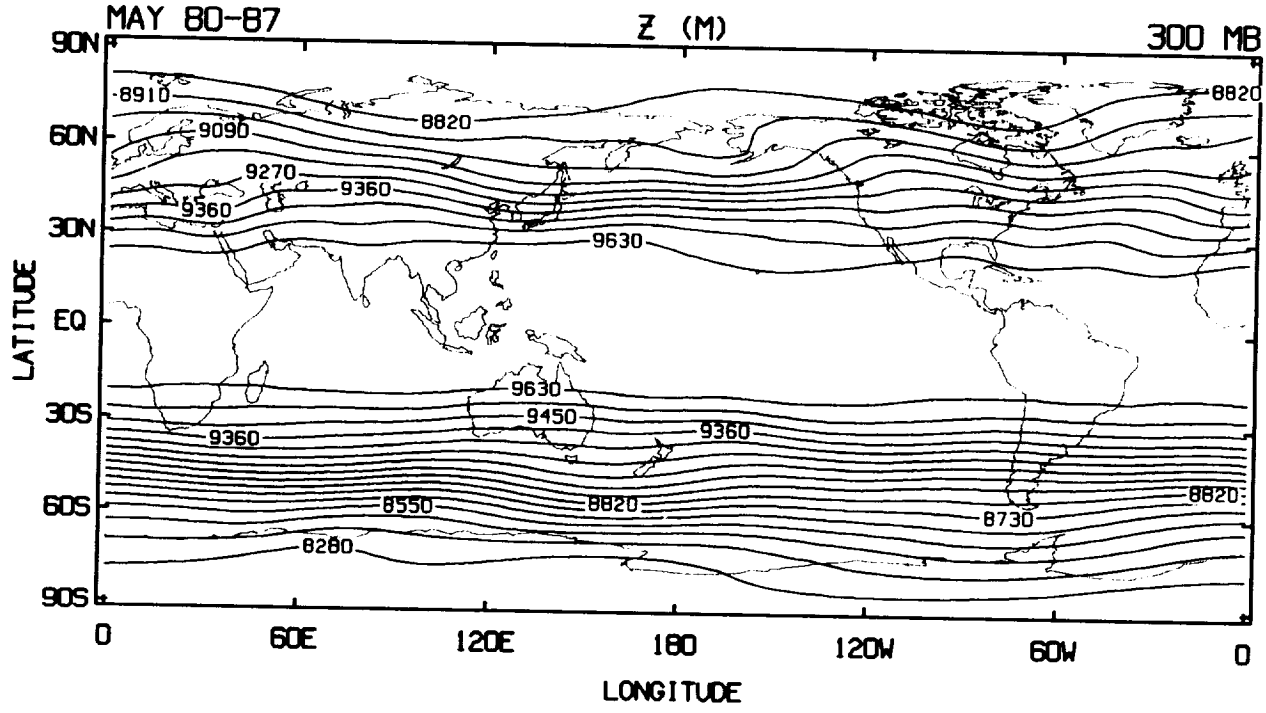
PAGE 58 INTENTIONALLY BL

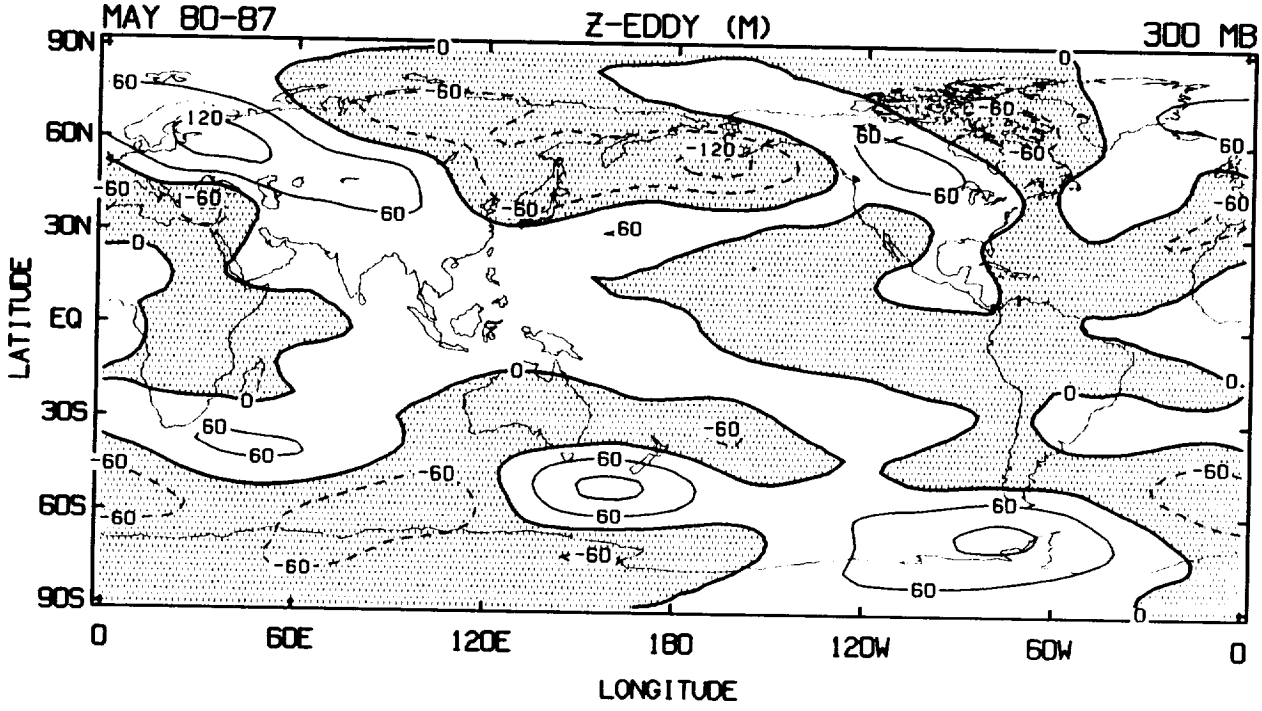

MAY 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

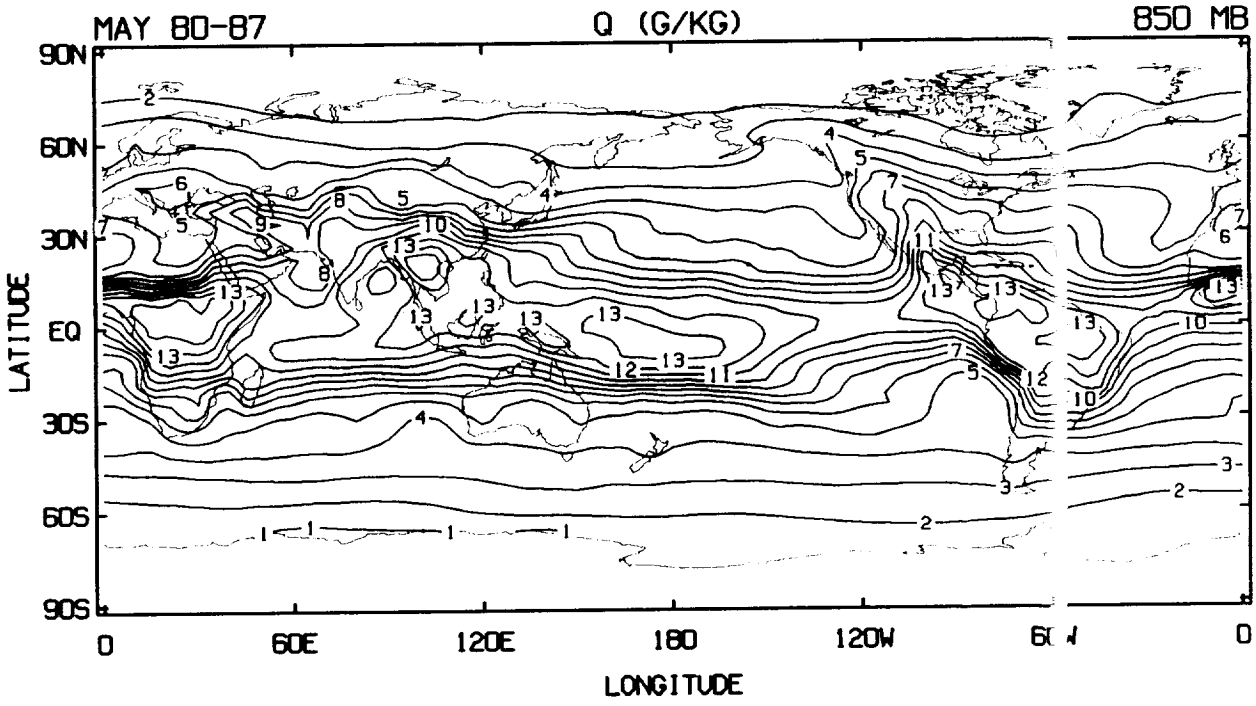

MAY 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

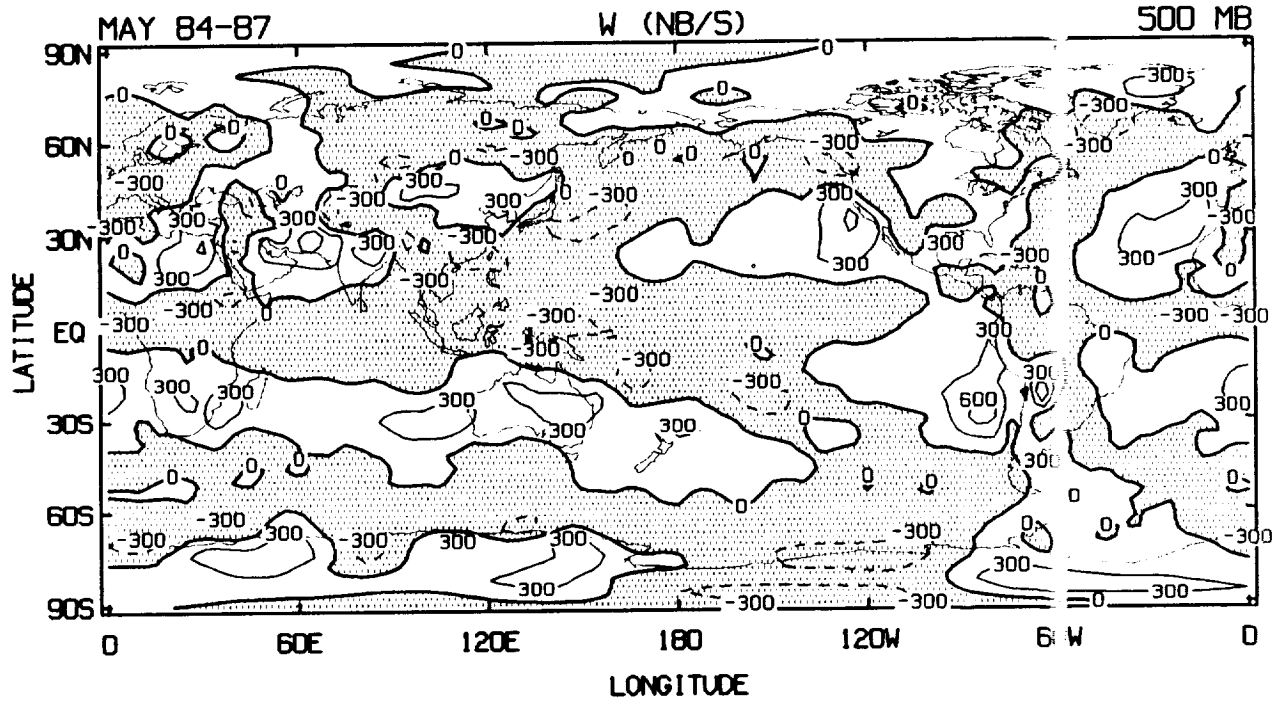

MAY 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE
265
270
275
280
285
290
300
295
255
245
240
235

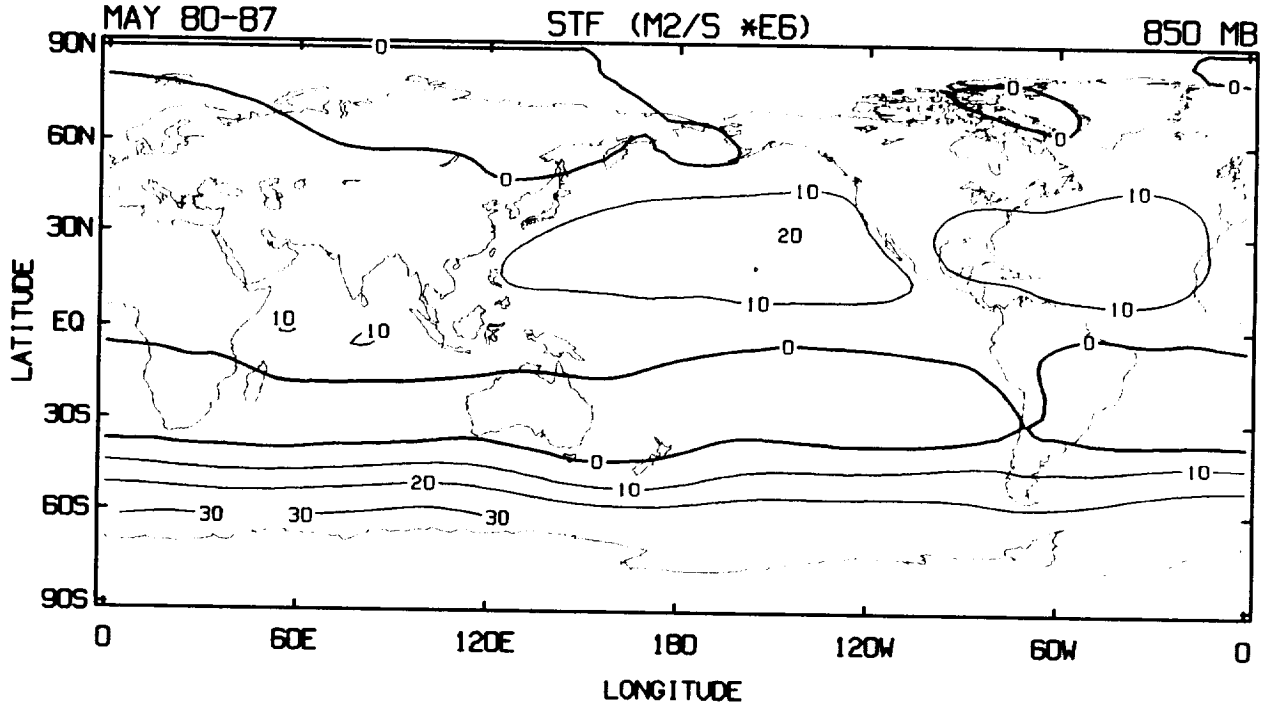

MAY 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE
226
224
220
218
216
212
210

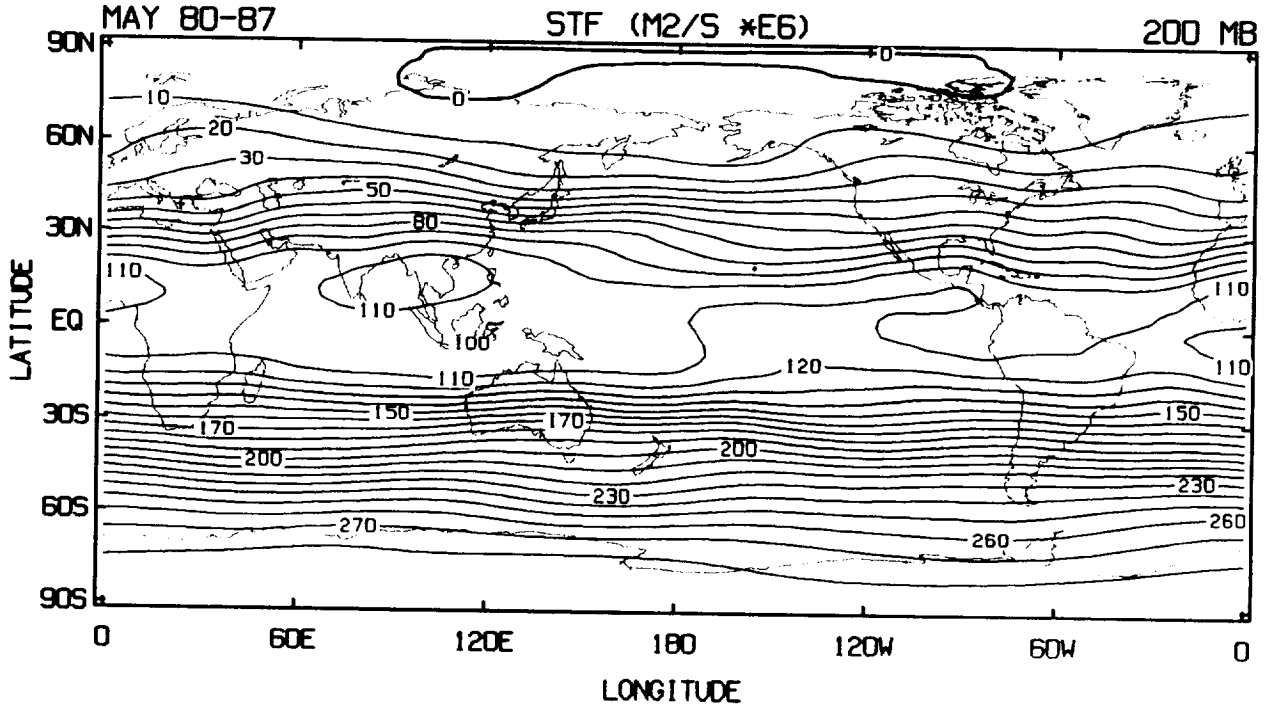

MAY 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
8910
8820
9090
9270
9360
9630
9450
8550
8730
8280

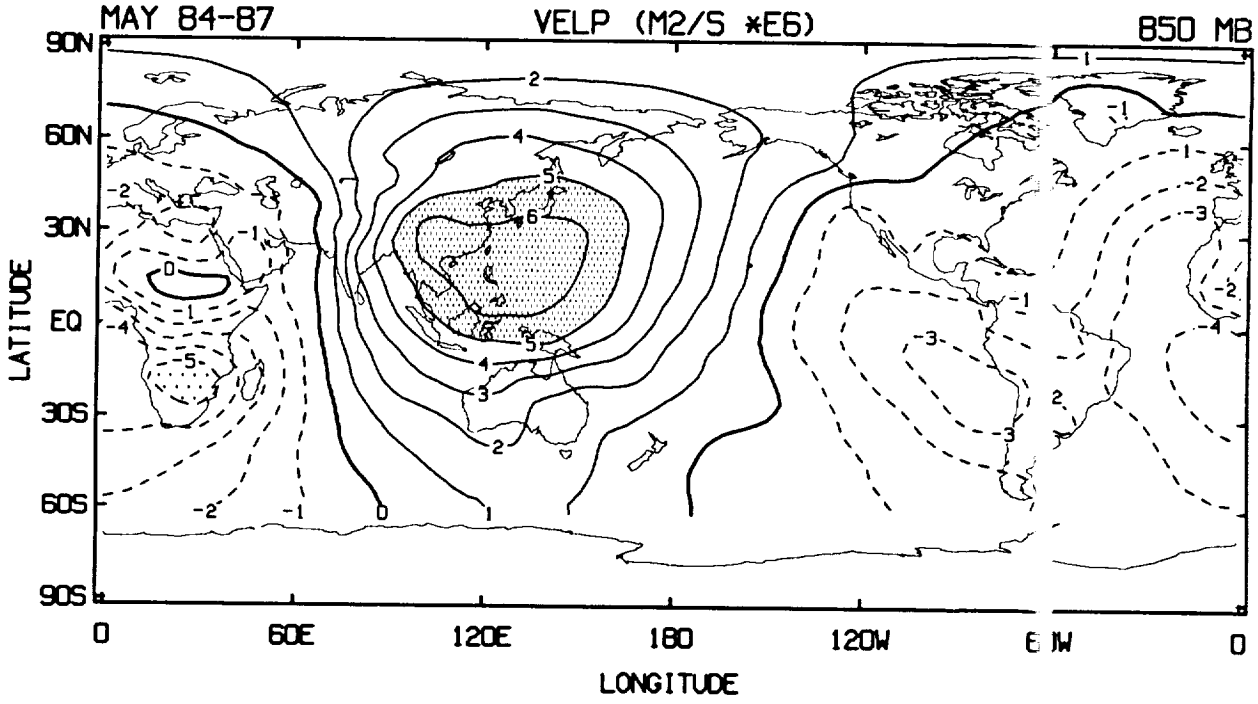

MAY 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
60
120
-60
-120
0

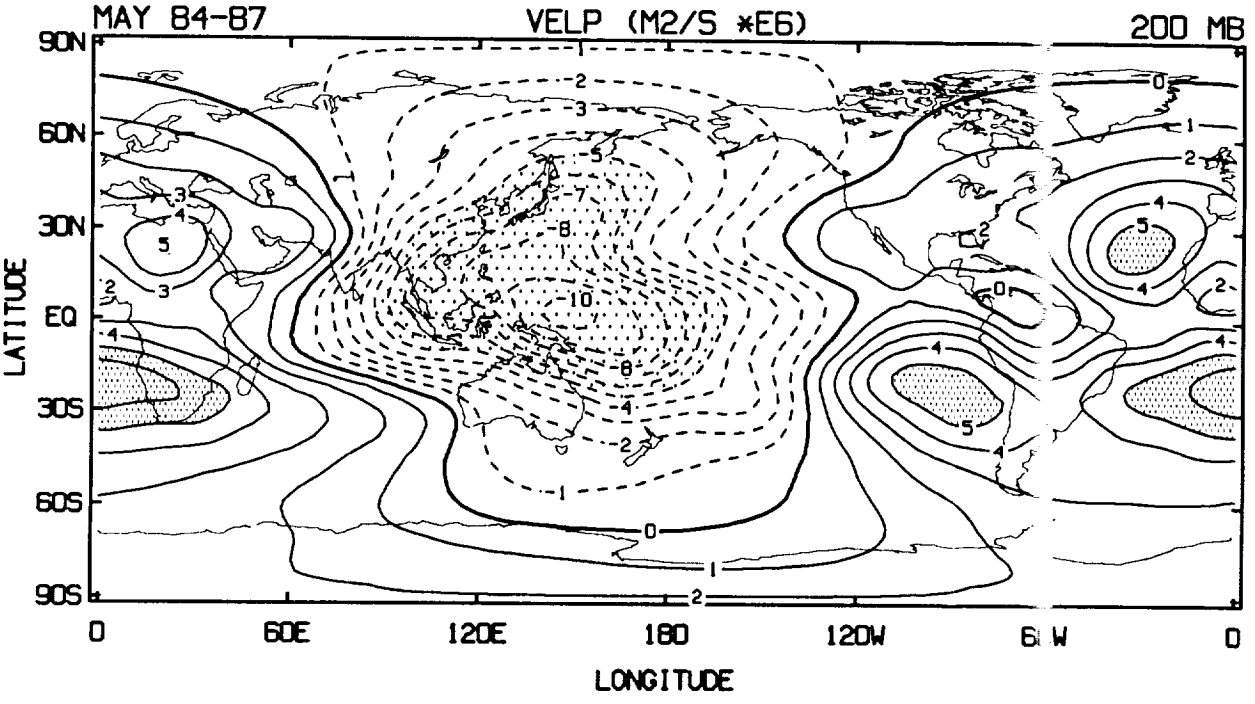

MAY 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

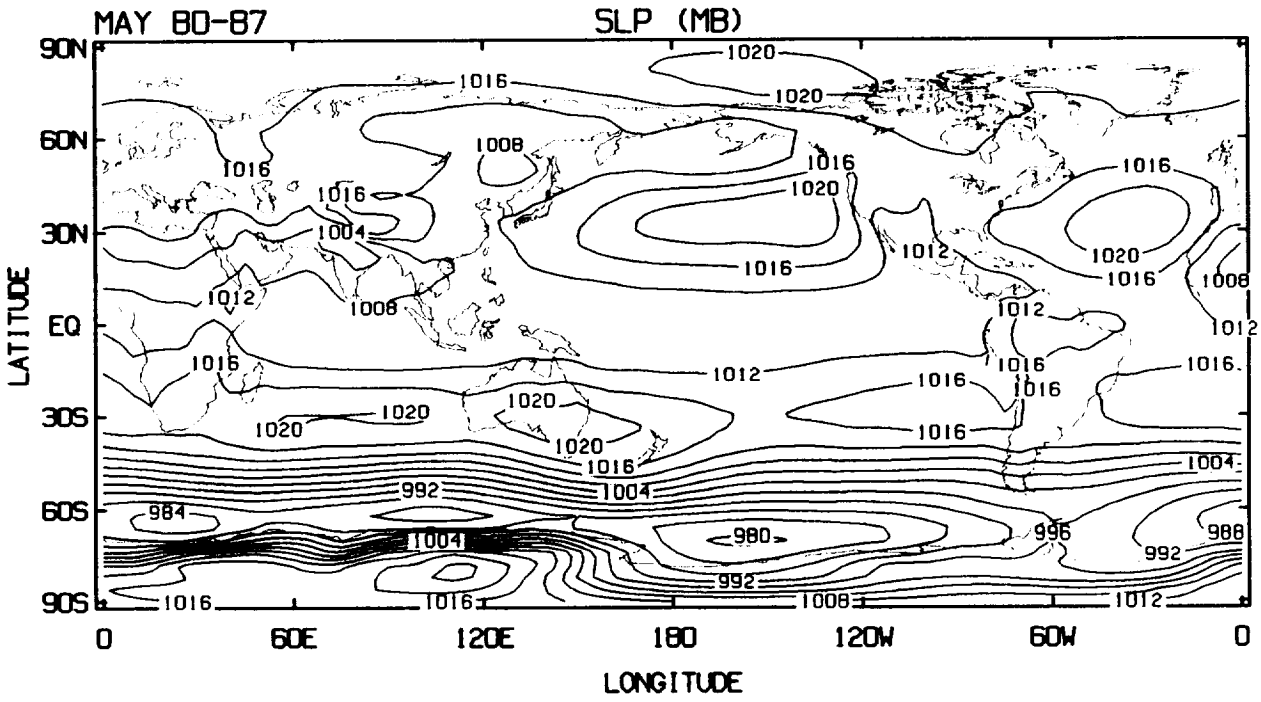

MAY 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

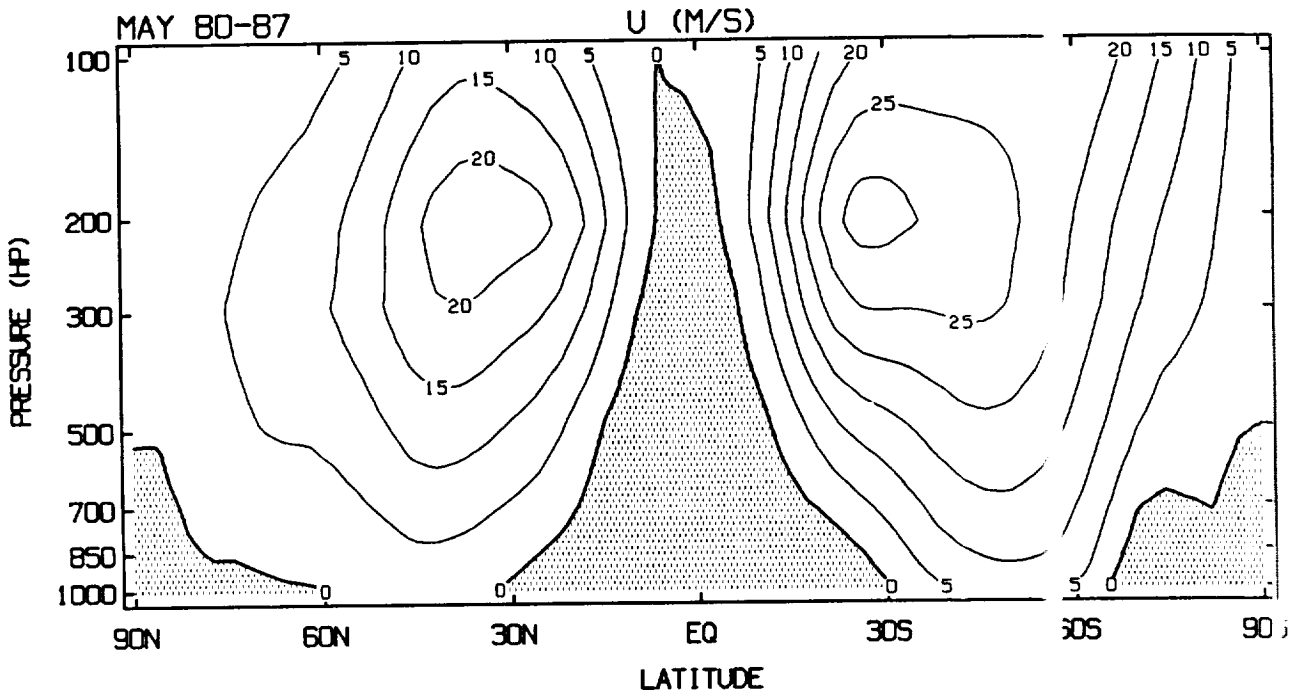

MAY 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

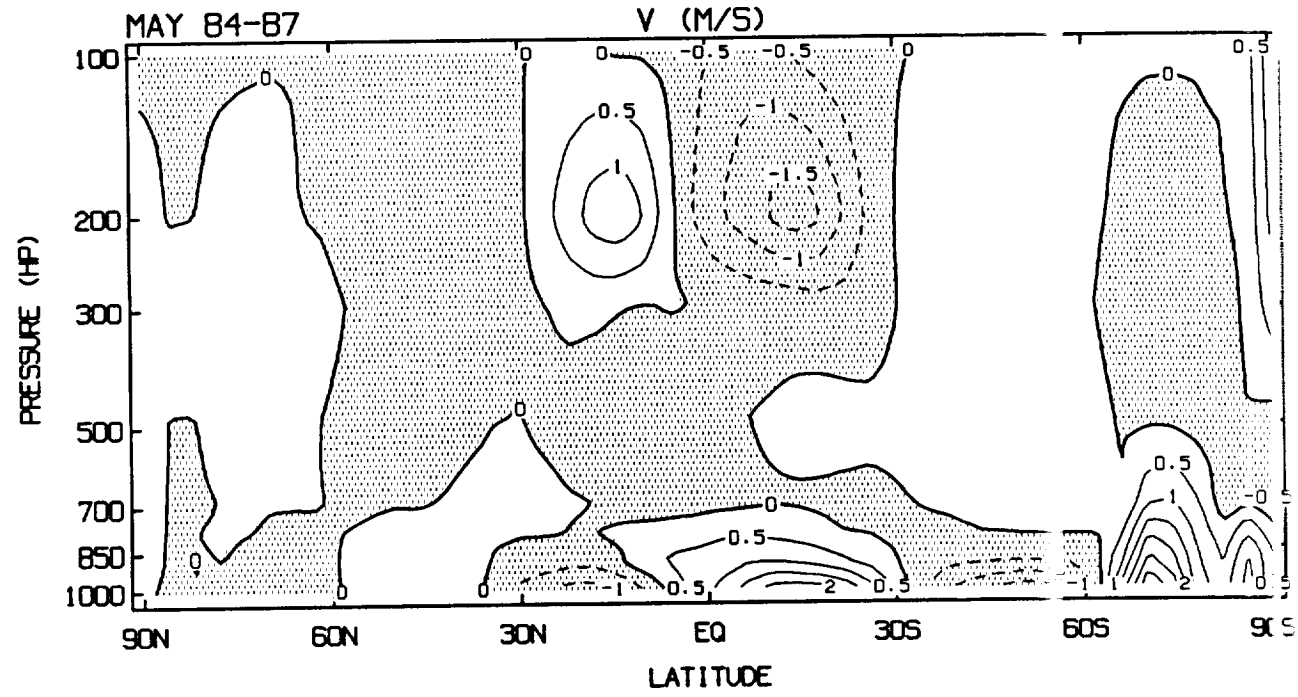

MAY 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

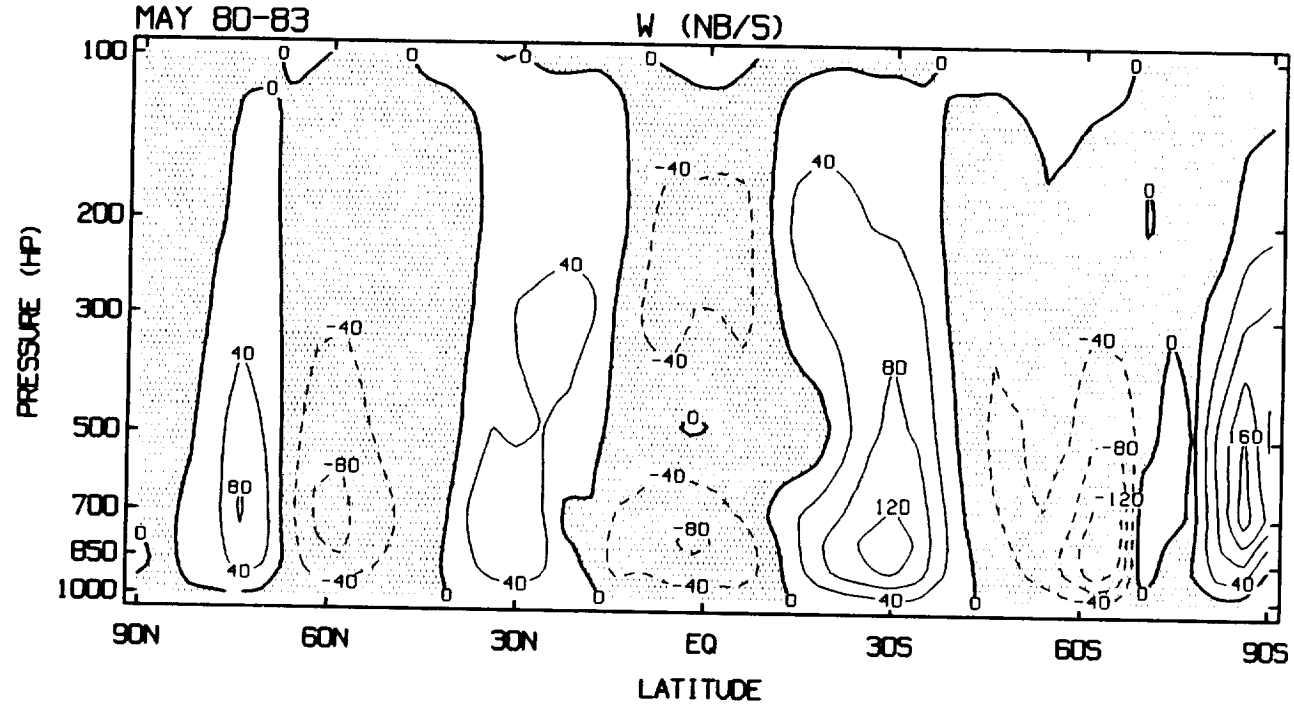

MAY 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

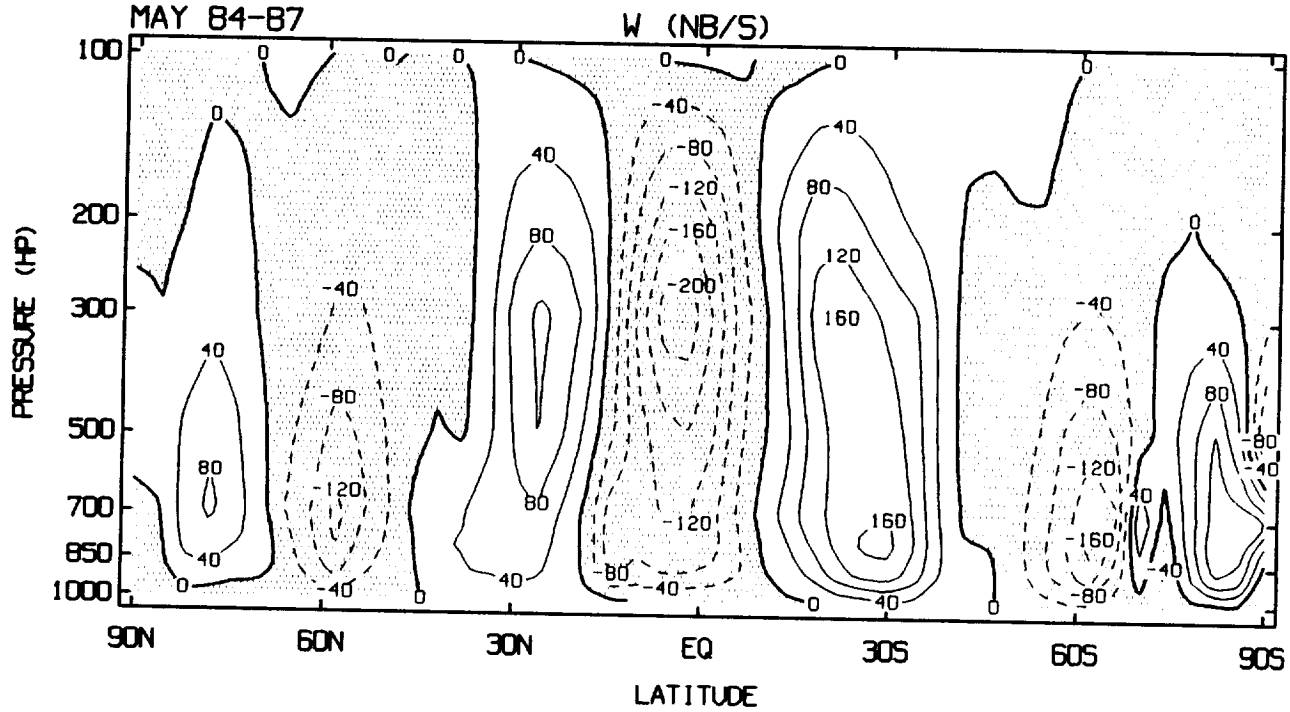

MAY 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

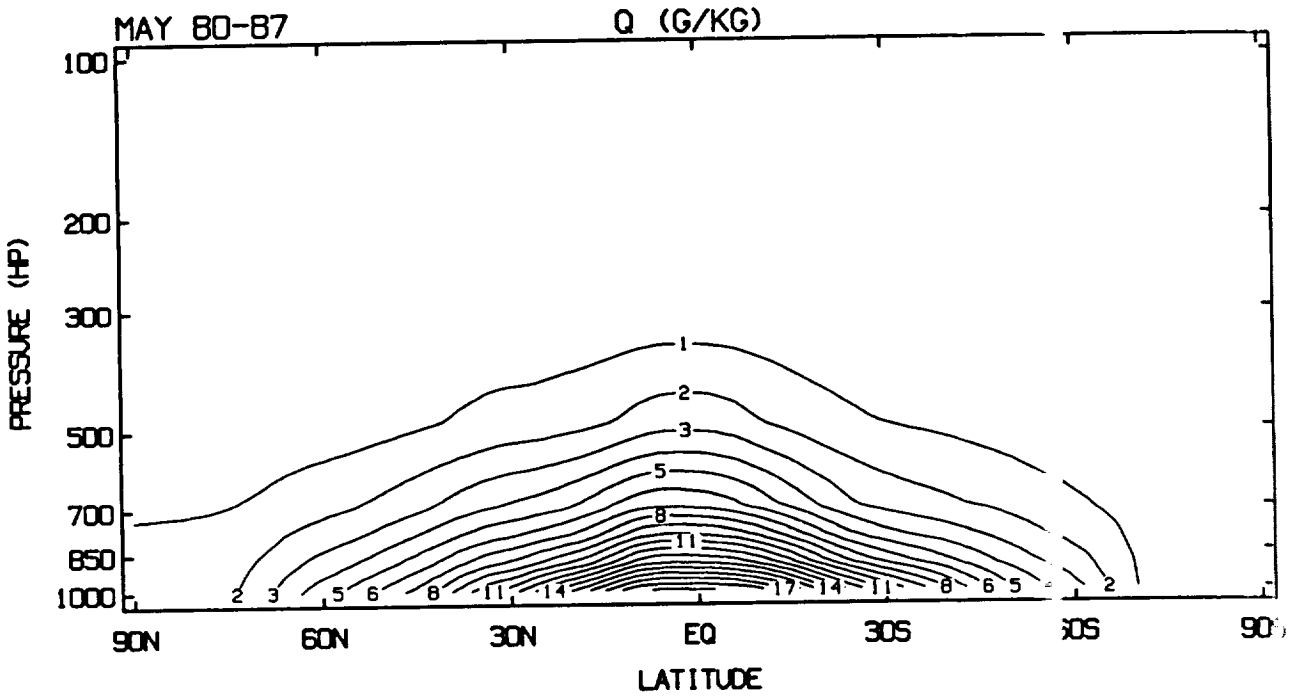

MAY 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1020
1016
1008
1004
1012
992
984
980
996
988

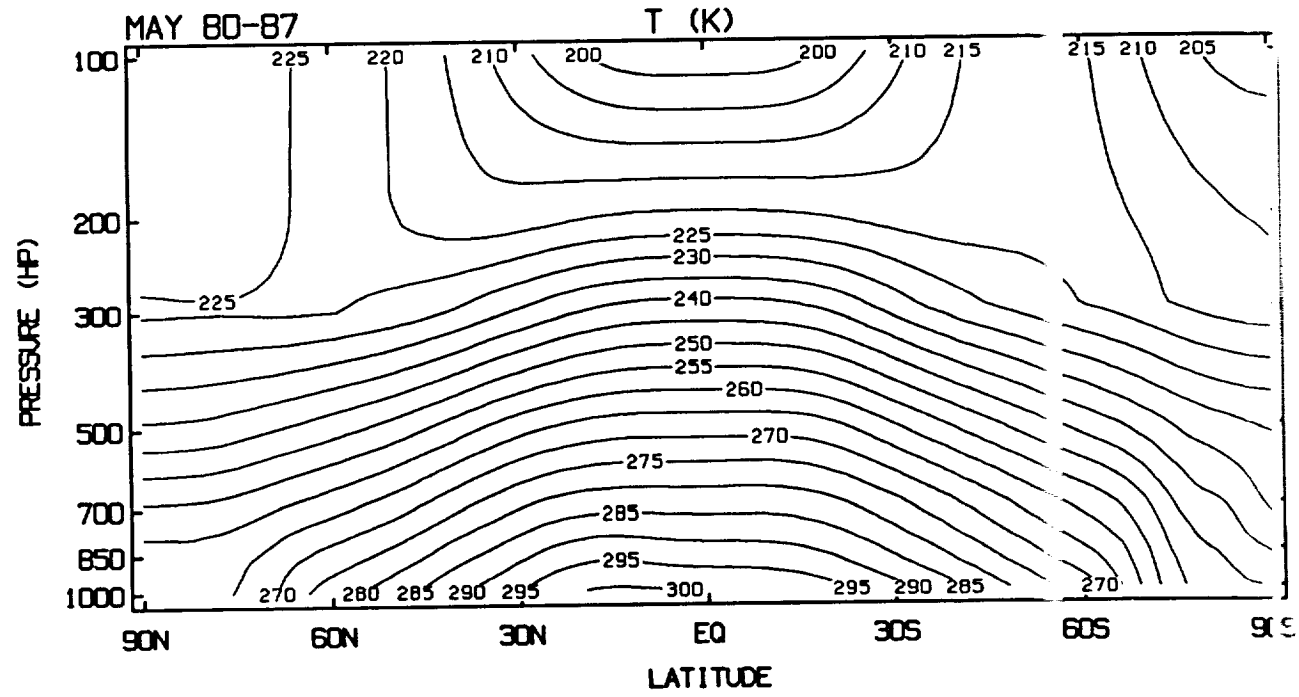

MAY 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
LATITUDE


MAY 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


MAY 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


MAY 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

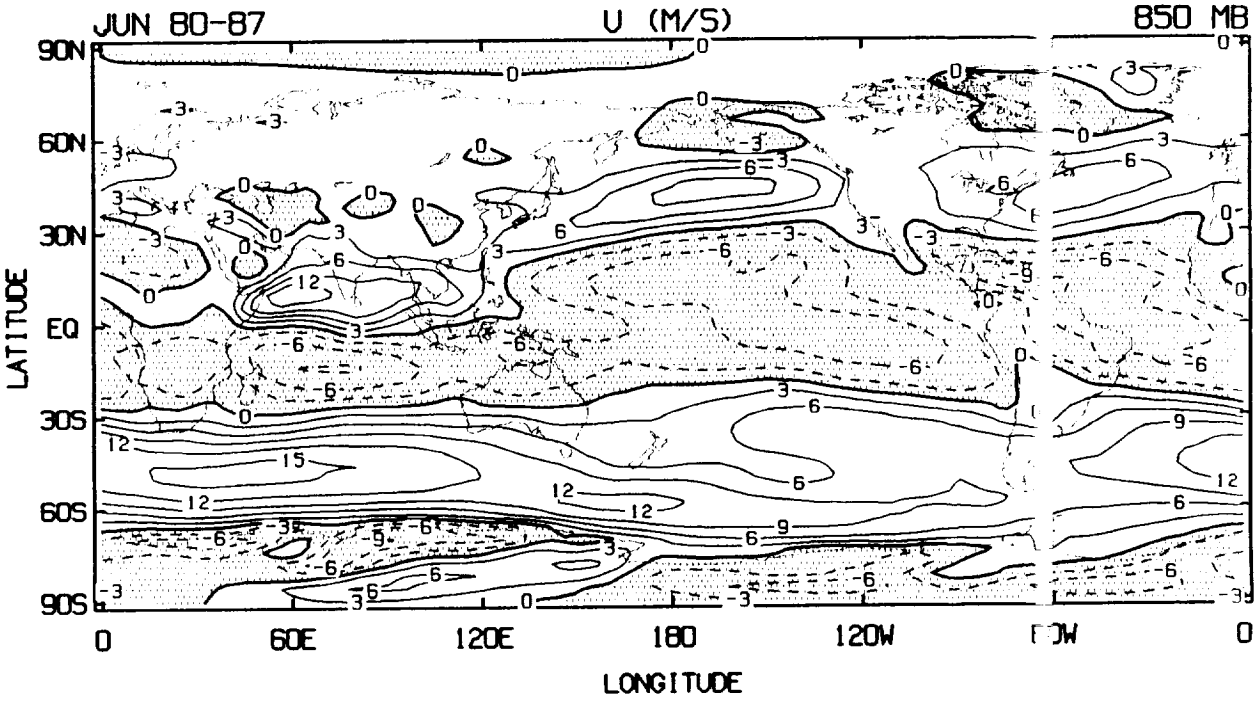

MAY 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
LATITUDE

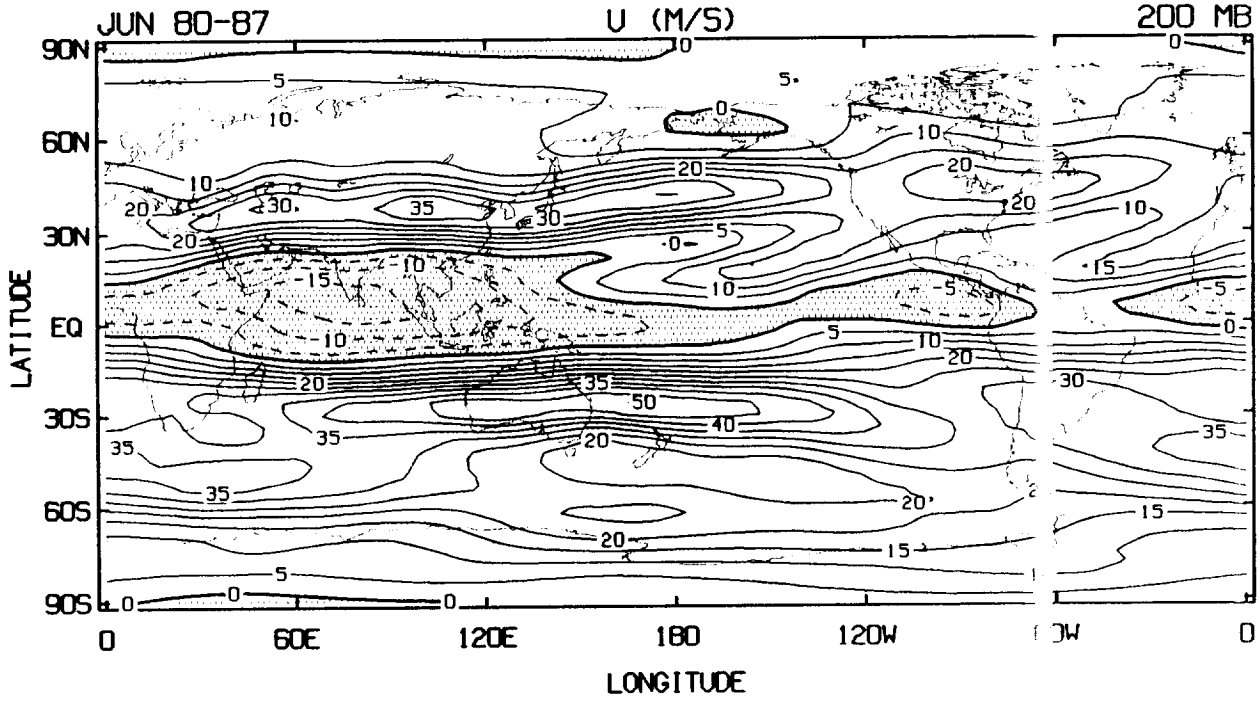

MAY 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE

JUNE

PRECEDING PAGE BLANK NOT FILMED

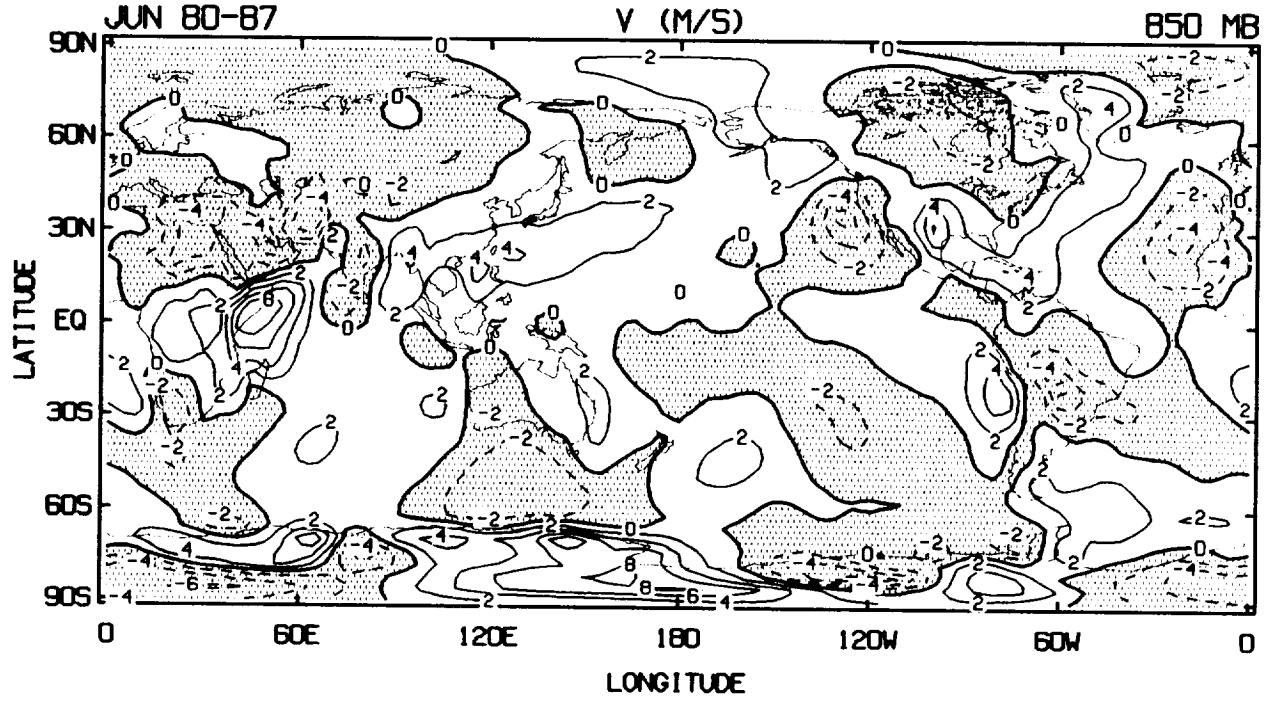
PAGE 70 NTENTIONALLY BL

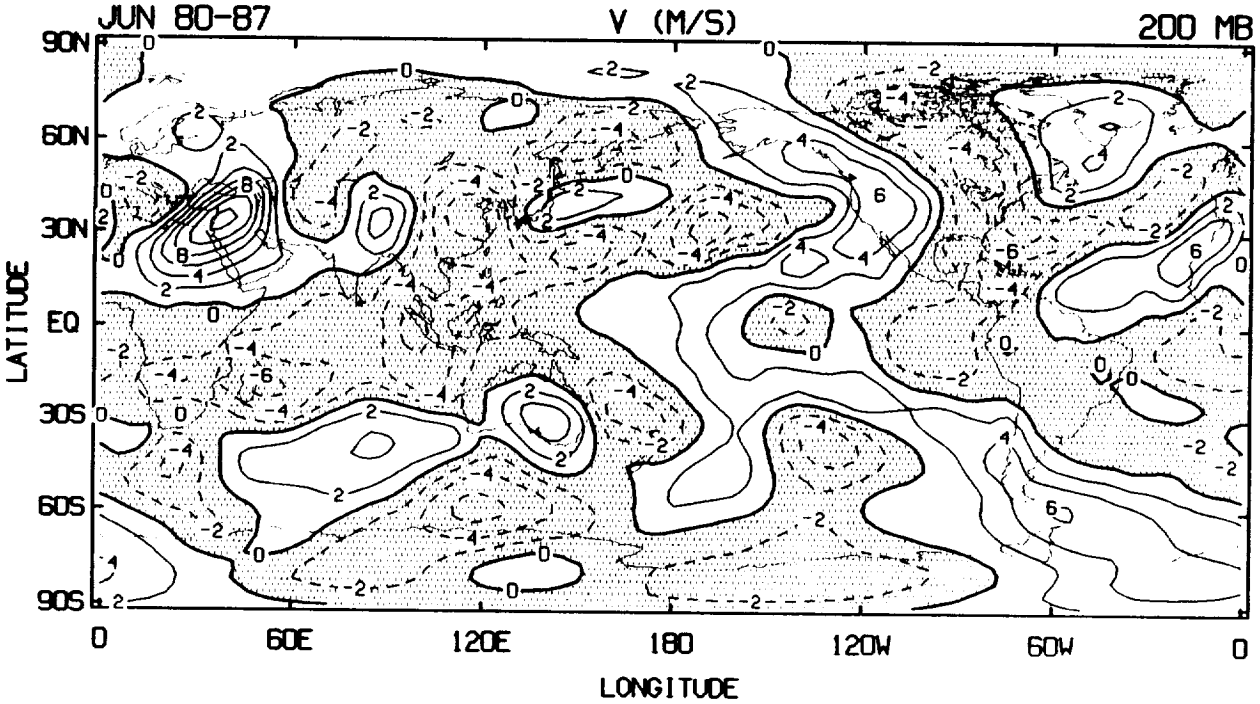


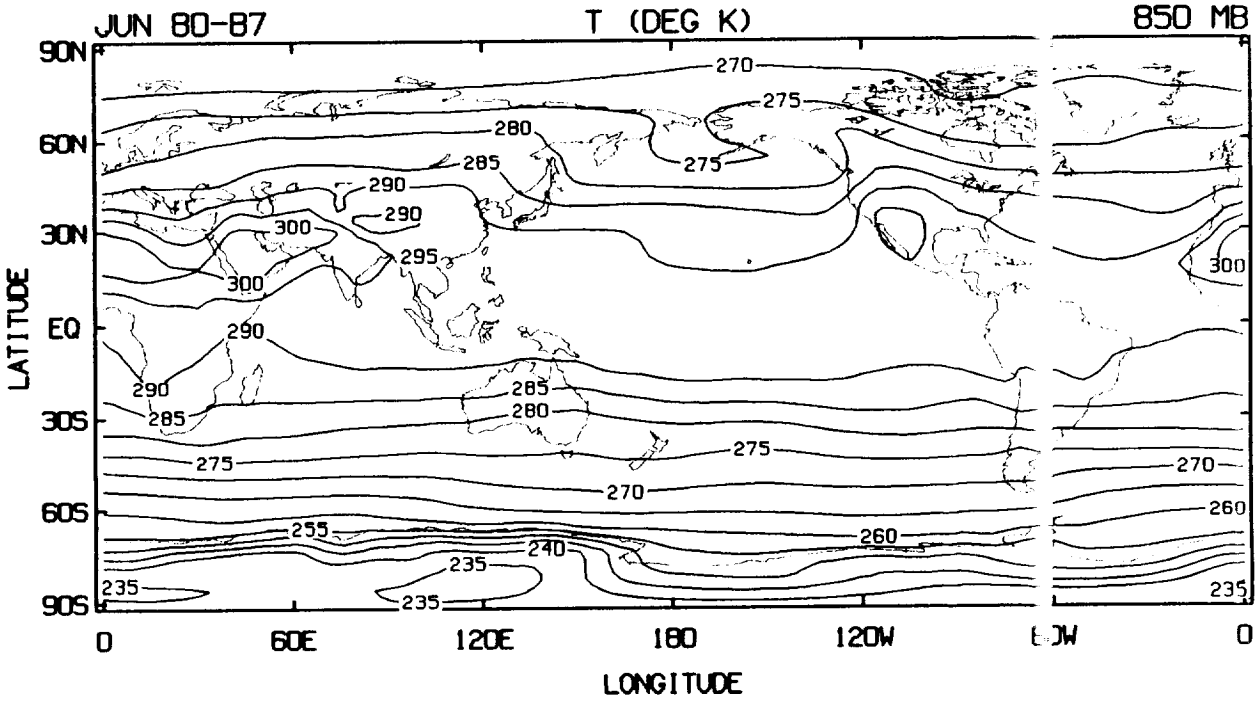


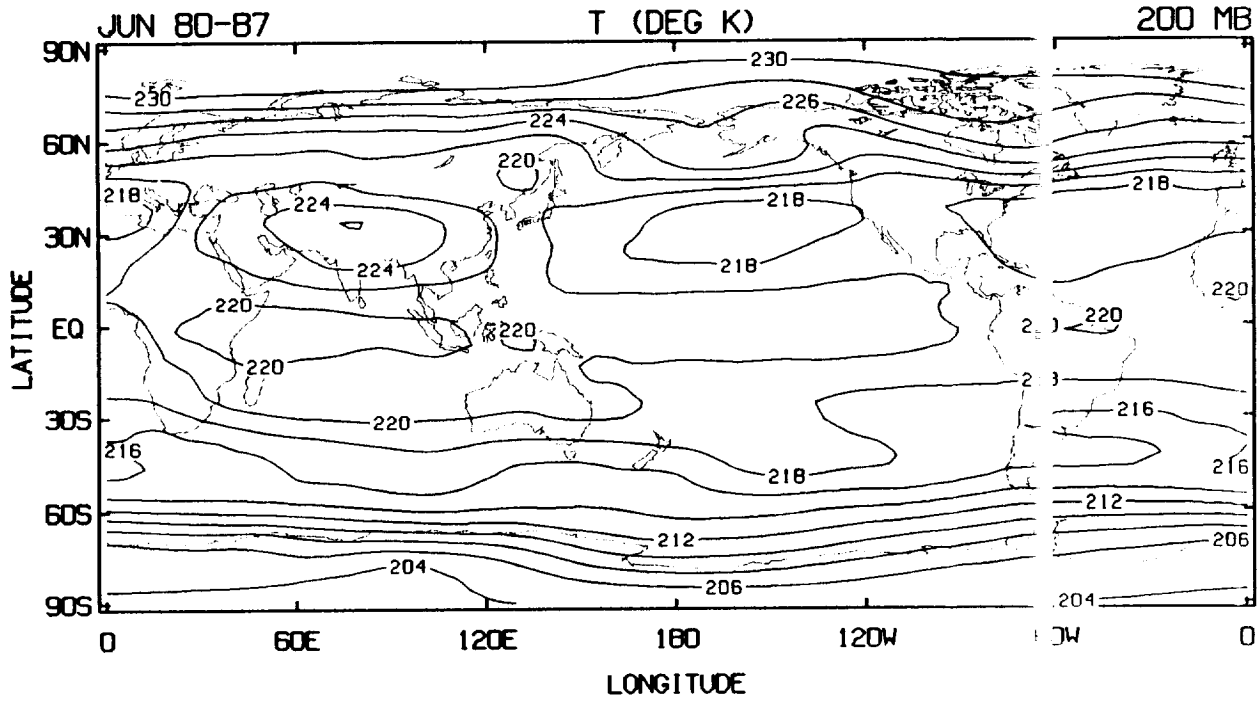
PRECEDING PAGE BLANK NOT FILMED

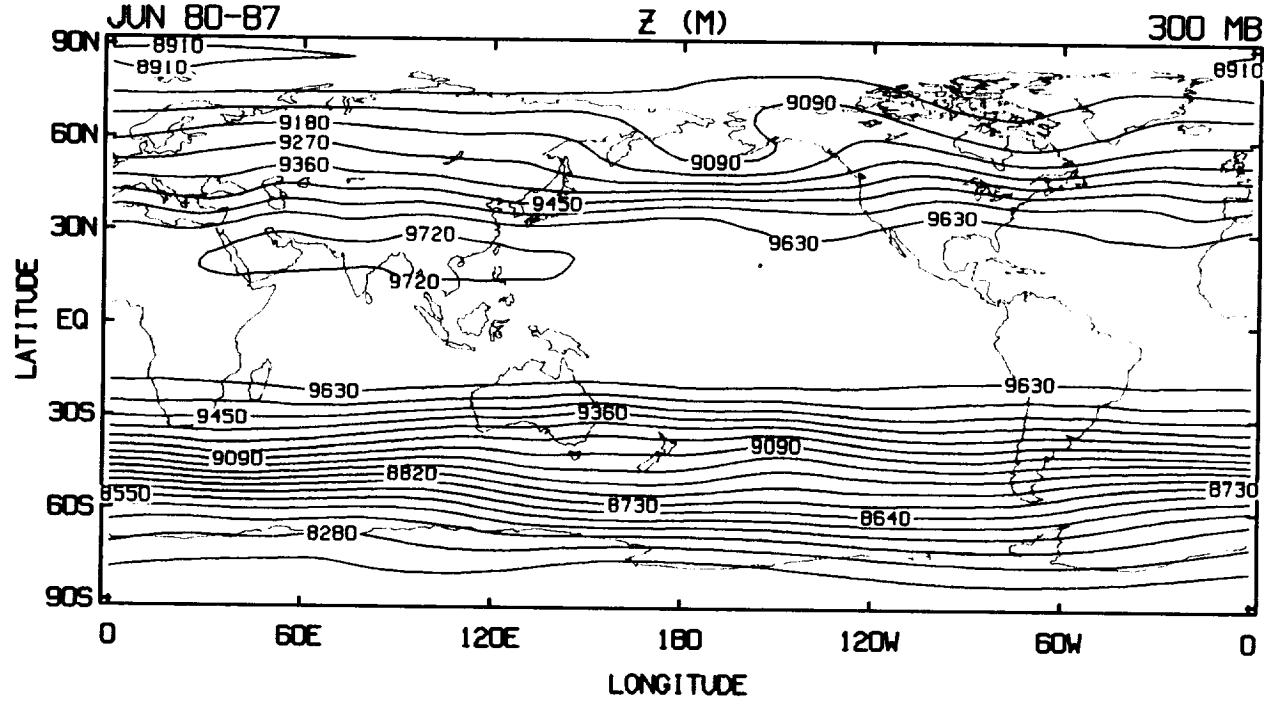
PAGE 72 INTENTIONALLY

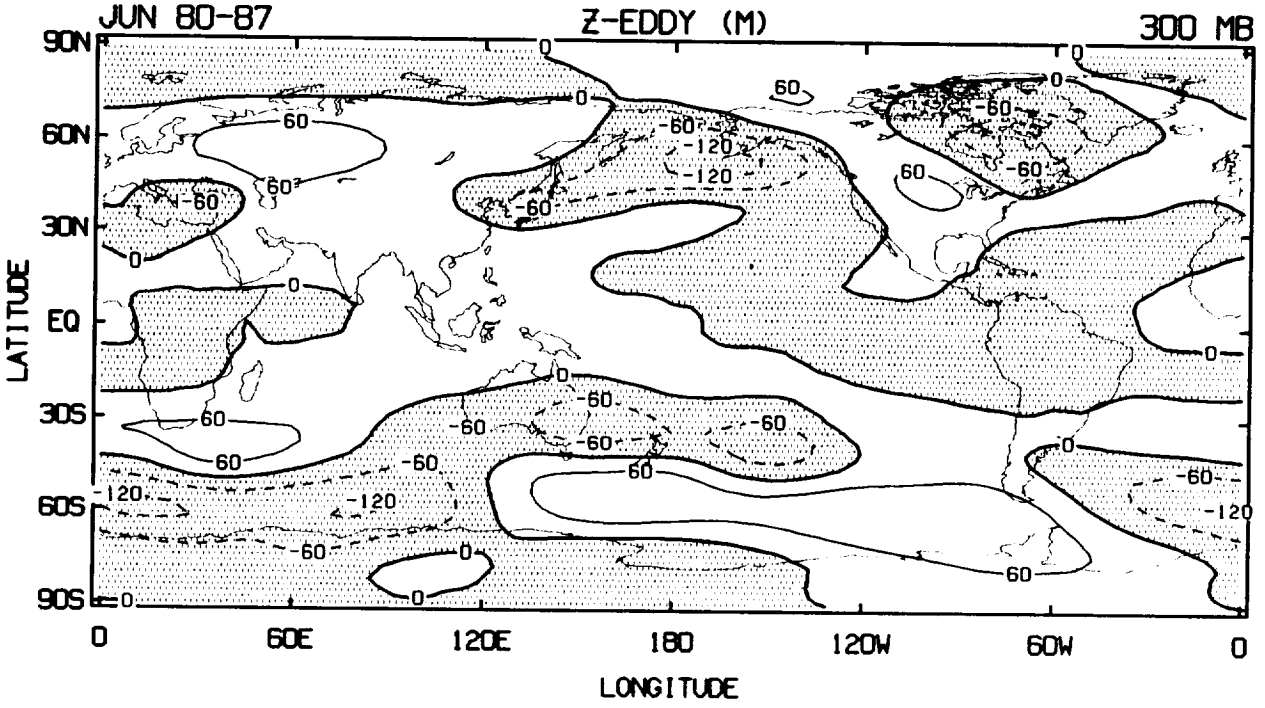

JUN 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

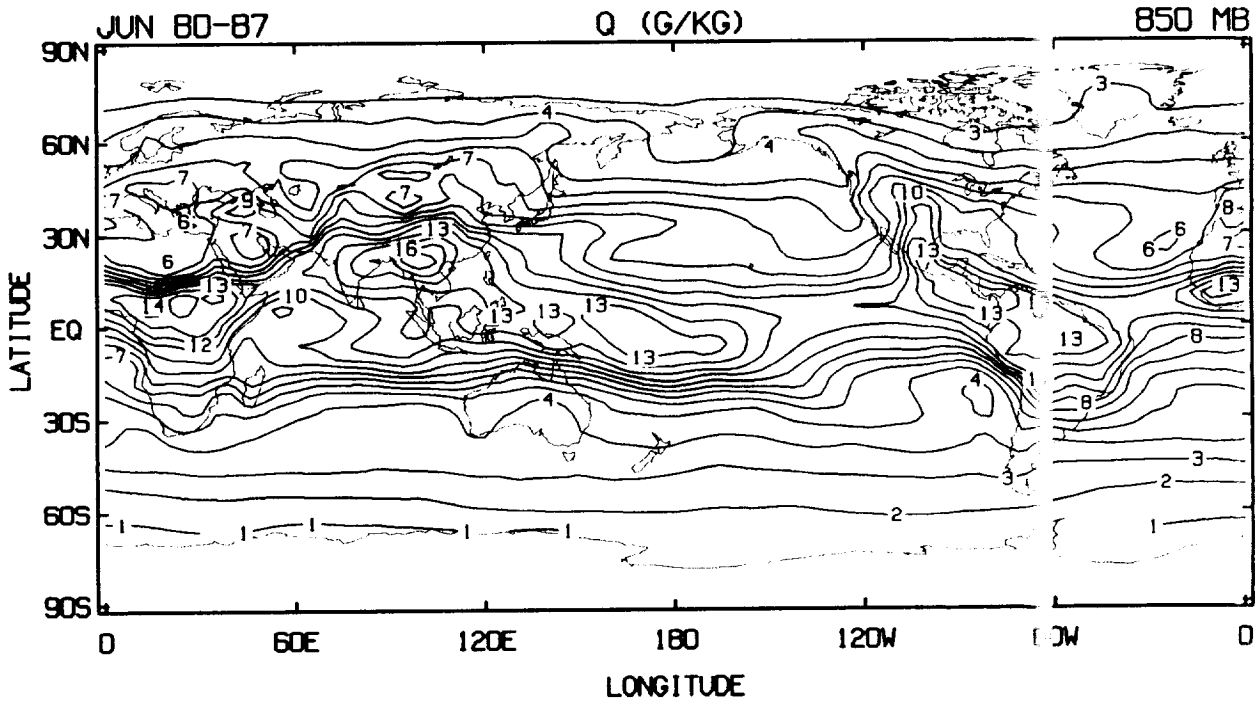

JUN 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

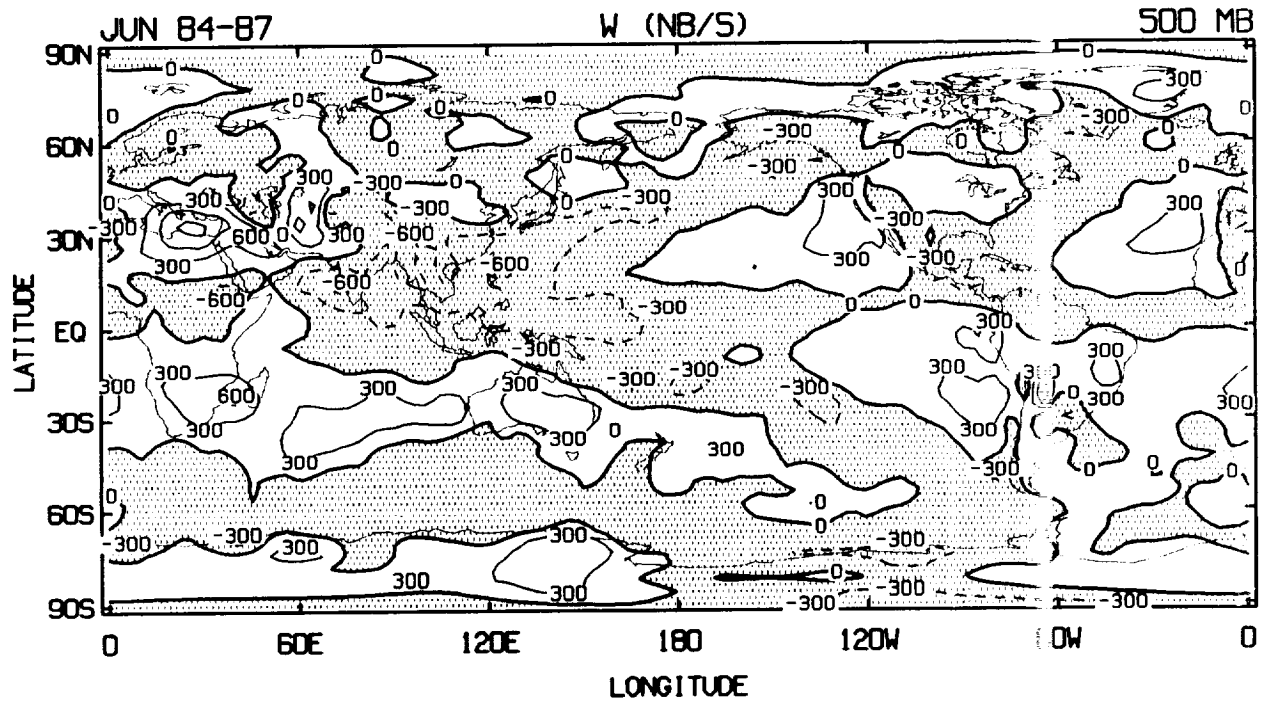

JUN 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
270
275
280
285
290
295
300
255
260
240
235
0
60E
120E
180
120W
LONGITUDE

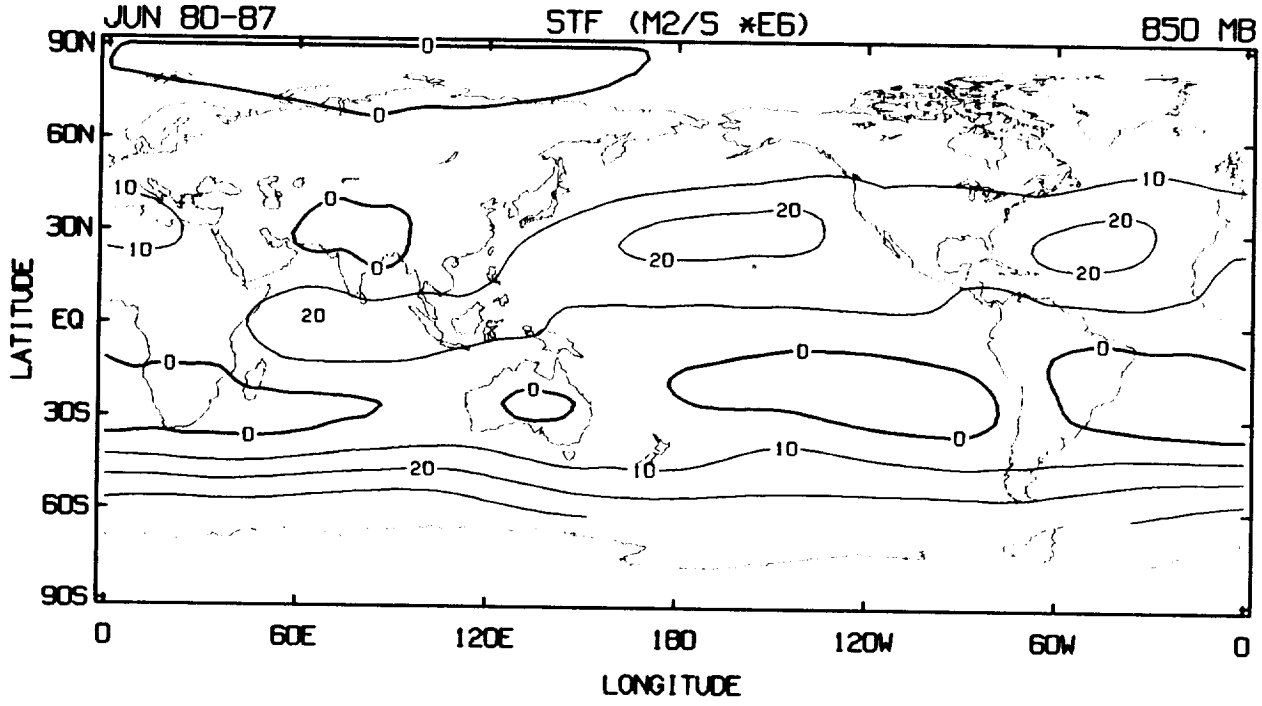

JUN 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
230
226
224
220
218
216
212
206
204
0
60E
120E
180
120W
LONGITUDE

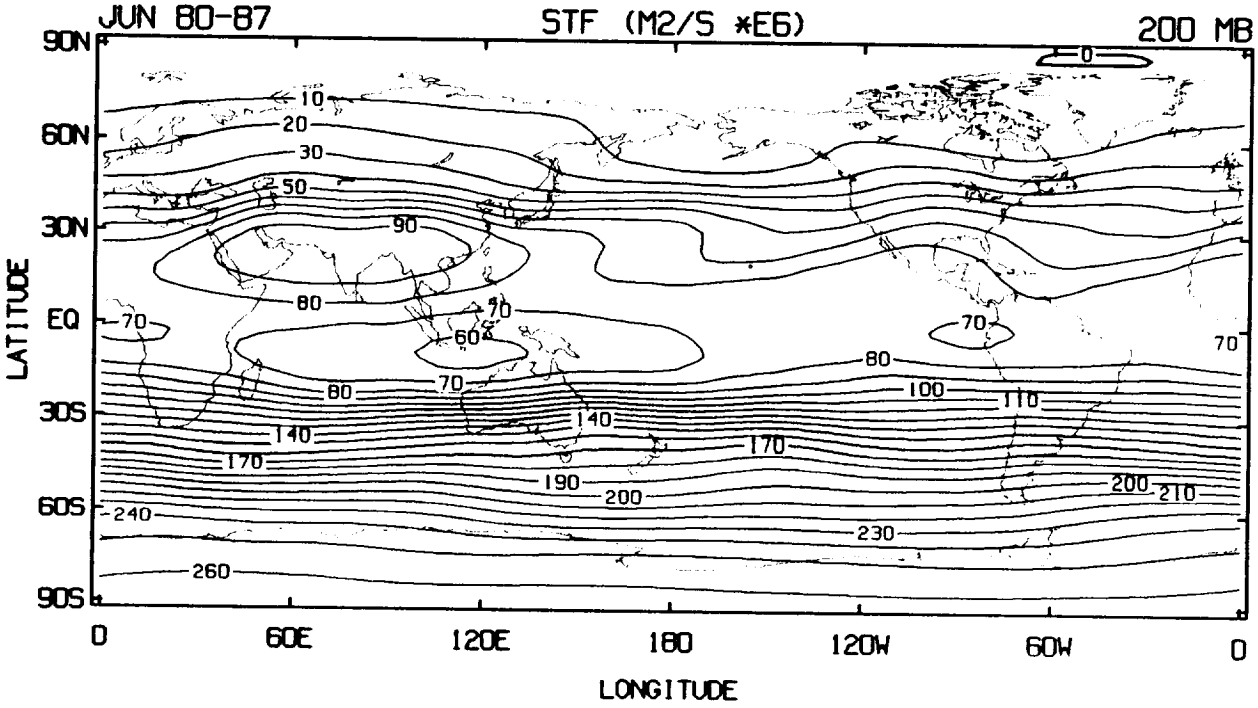

JUN 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
8910
9180
9270
9360
9450
9720
9090
9630
8820
8730
8640
8550
8280
0
60E
120E
180
120W
60W
LONGITUDE

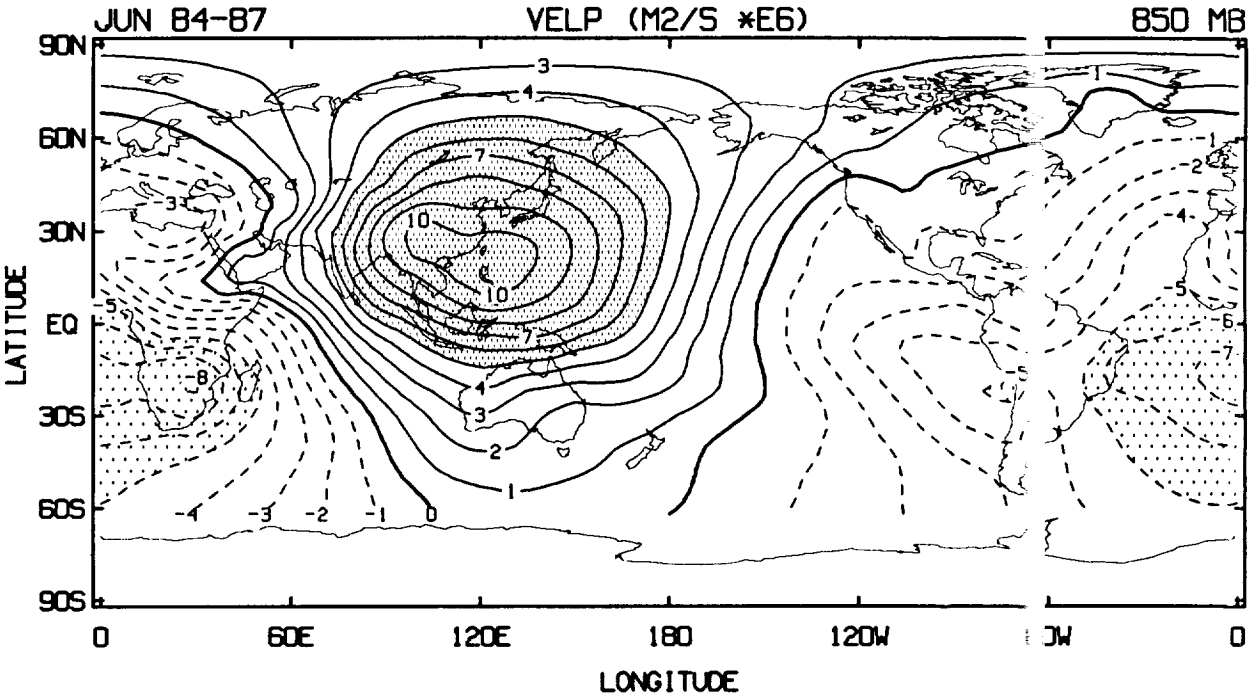

JUN 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60
-60
-120
0
60E
120E
180
120W
60W
LONGITUDE

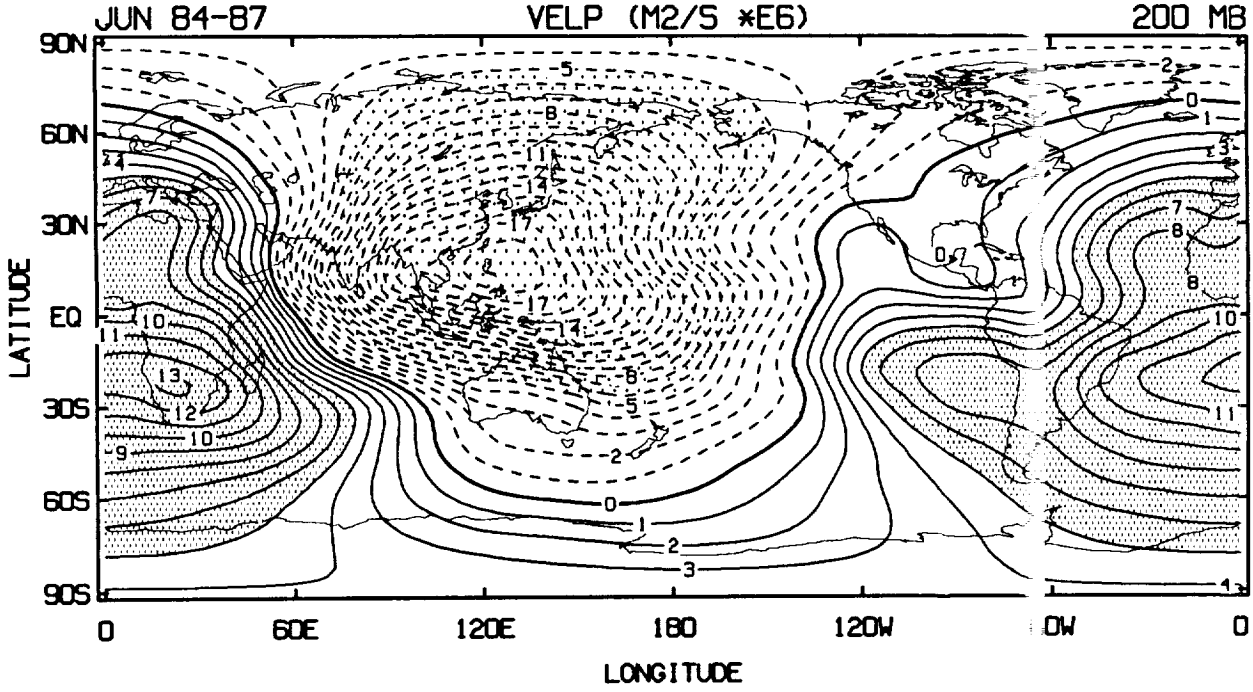

JUN 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

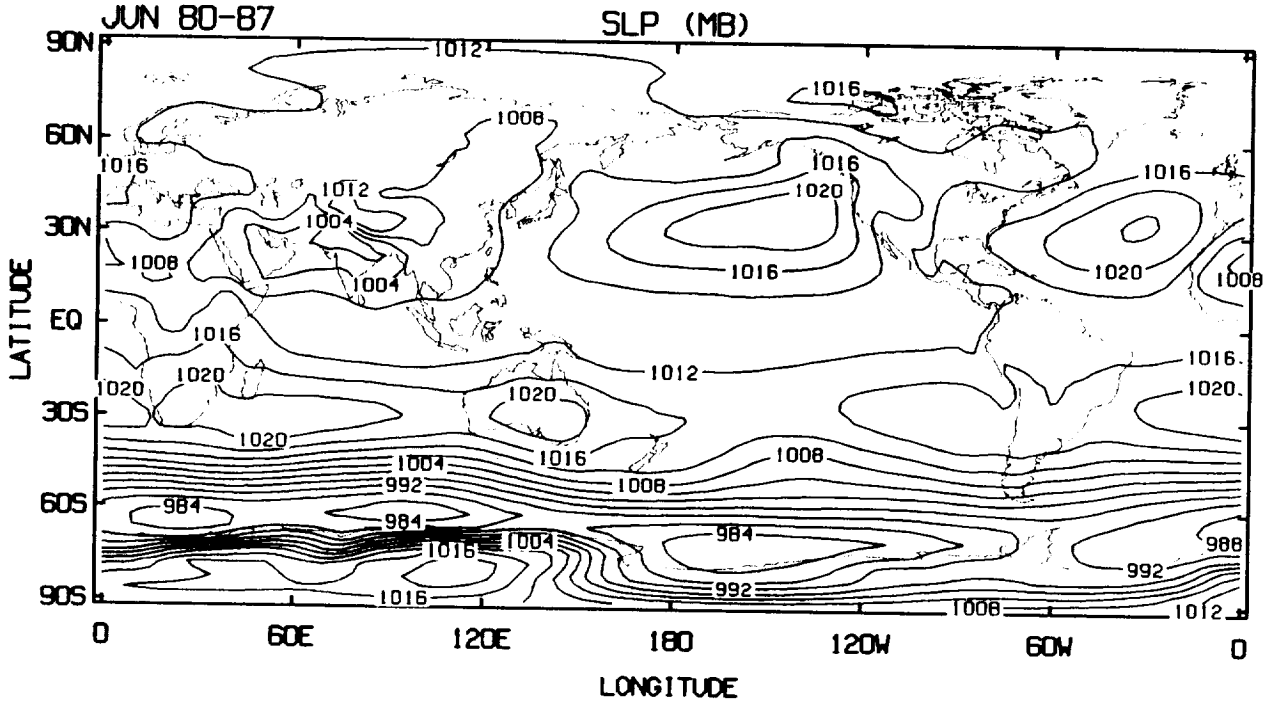

JUN 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

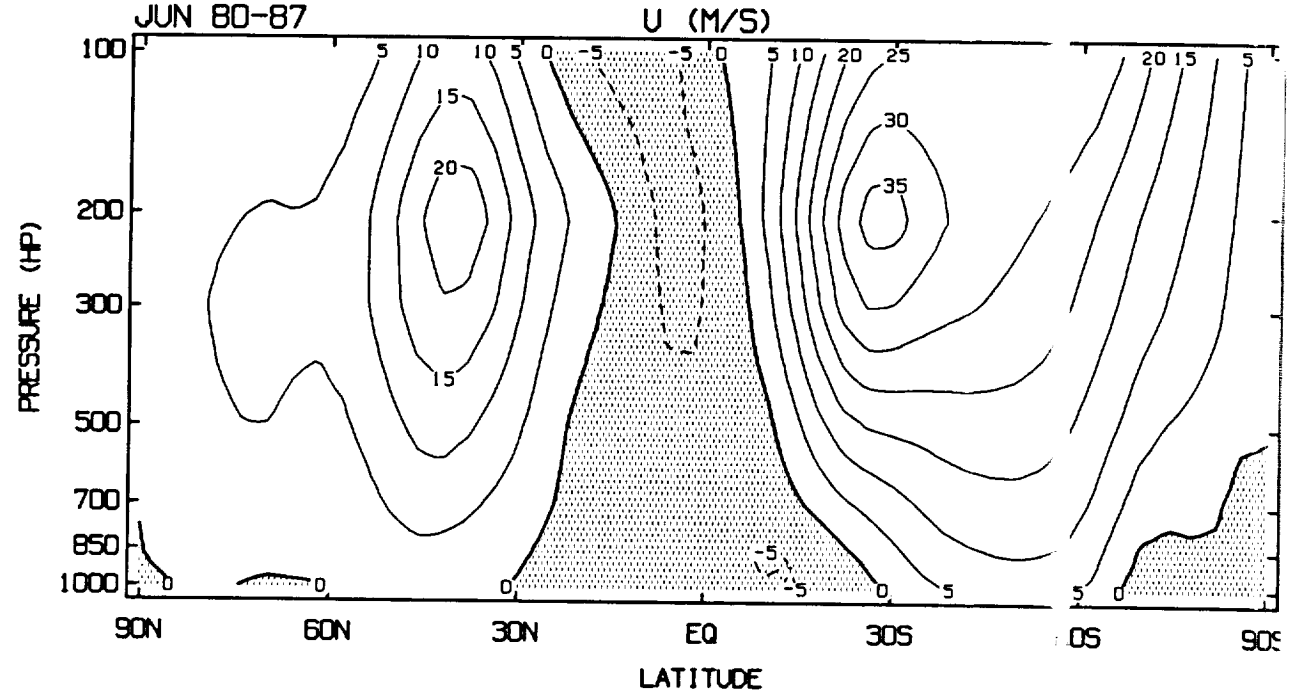

JUN 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

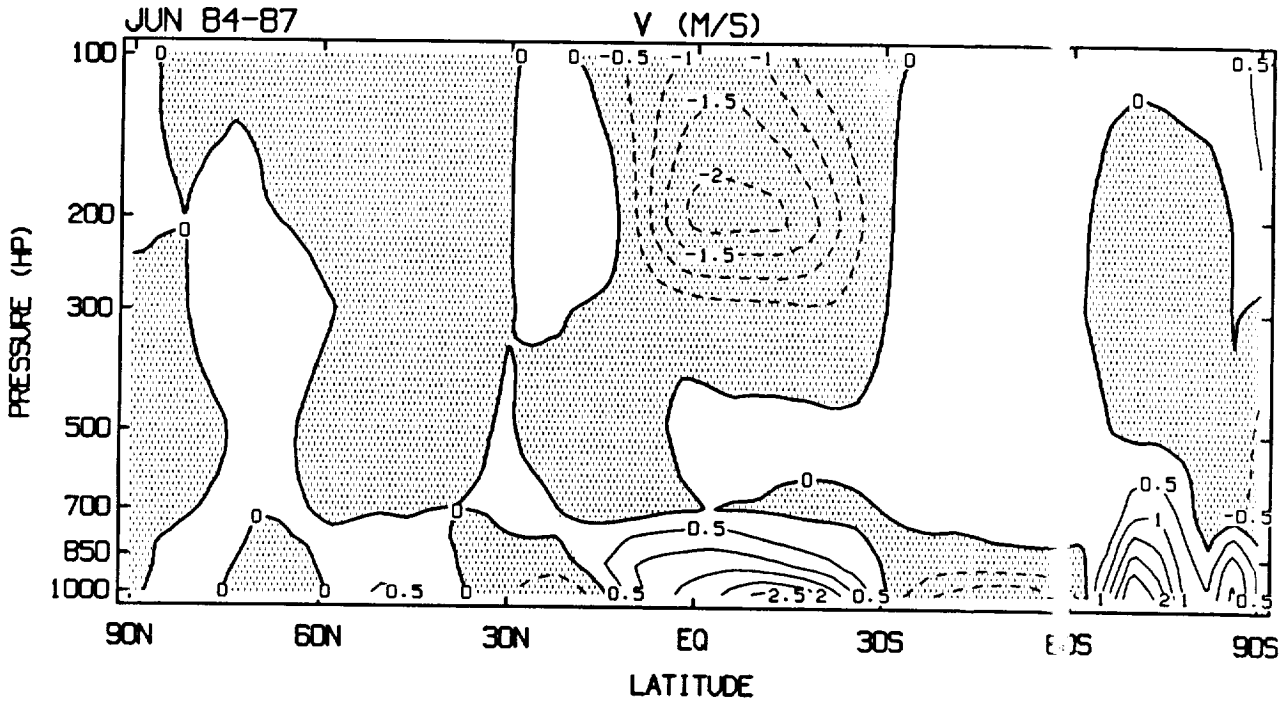

JUN 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

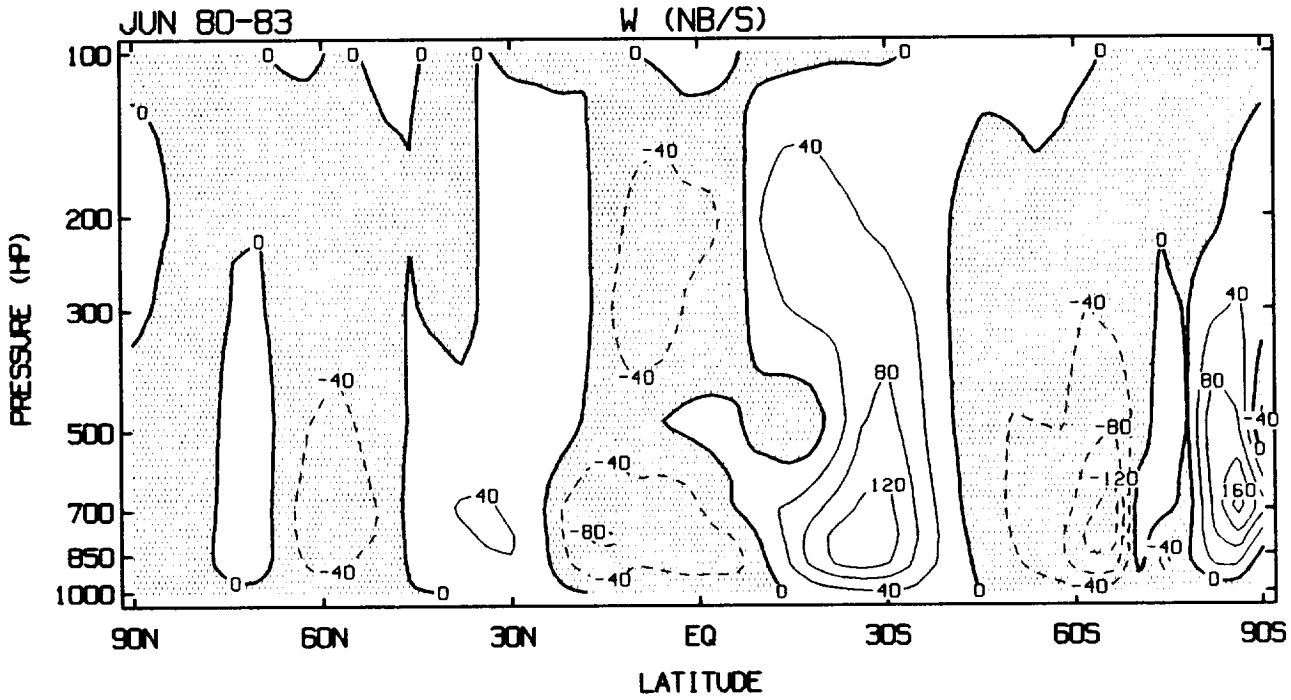

JUN 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

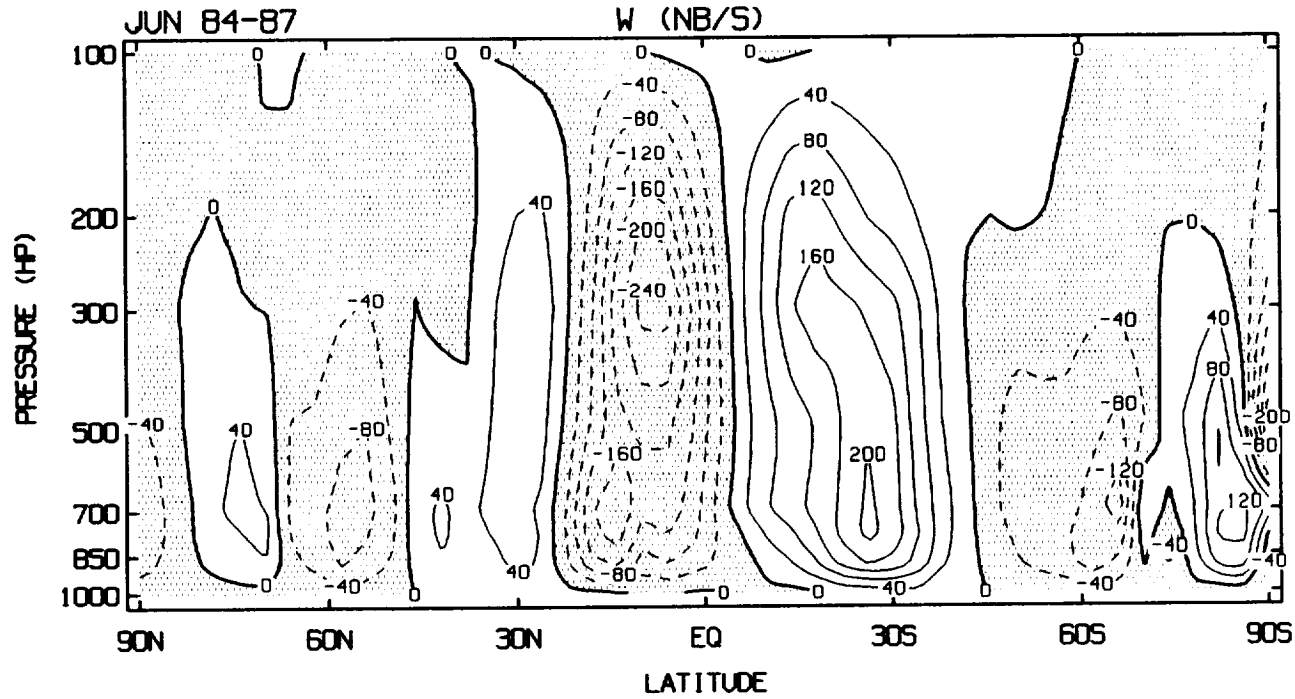

JUN 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

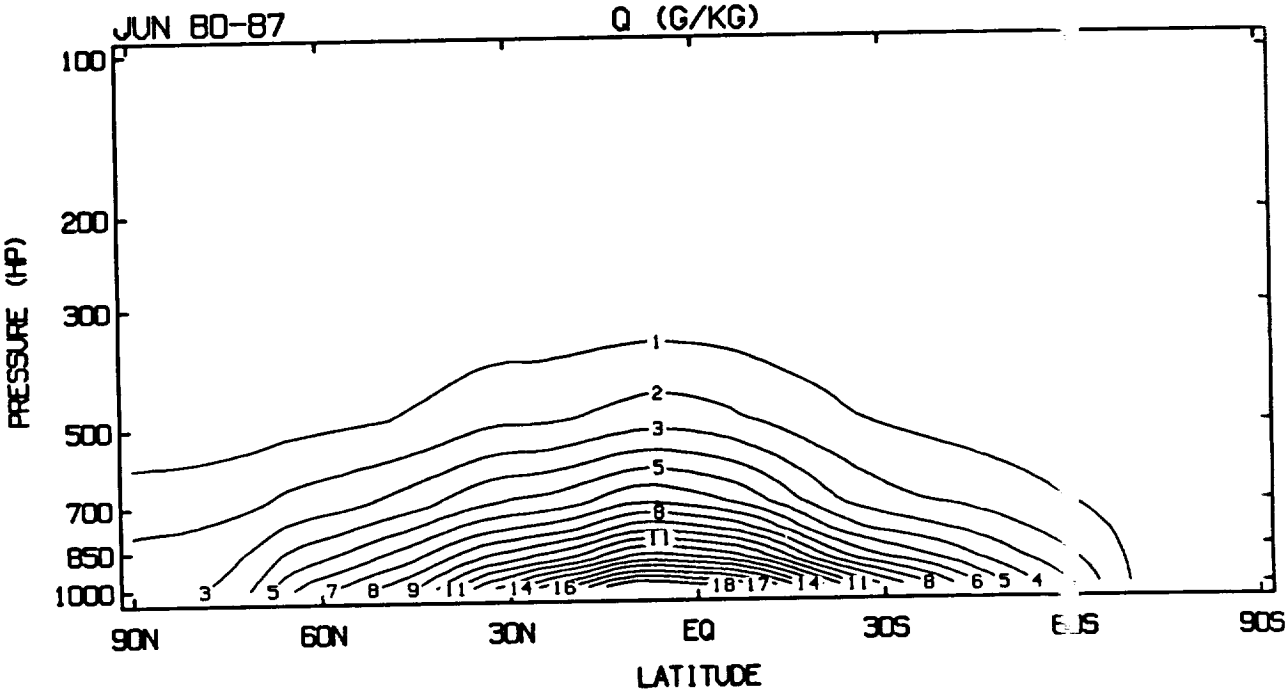

JUN 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1012
1016
1008
1004
1020
992
984
988

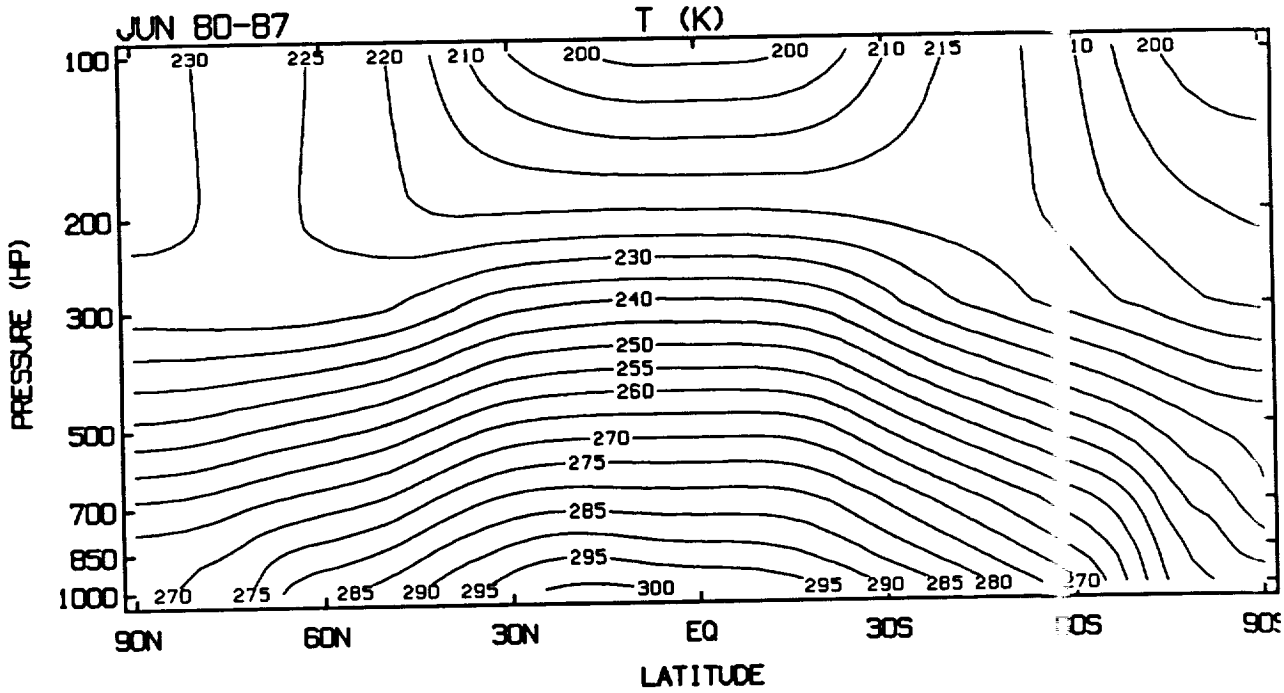

JUN 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE


JUN 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE


JUN 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


JUN 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

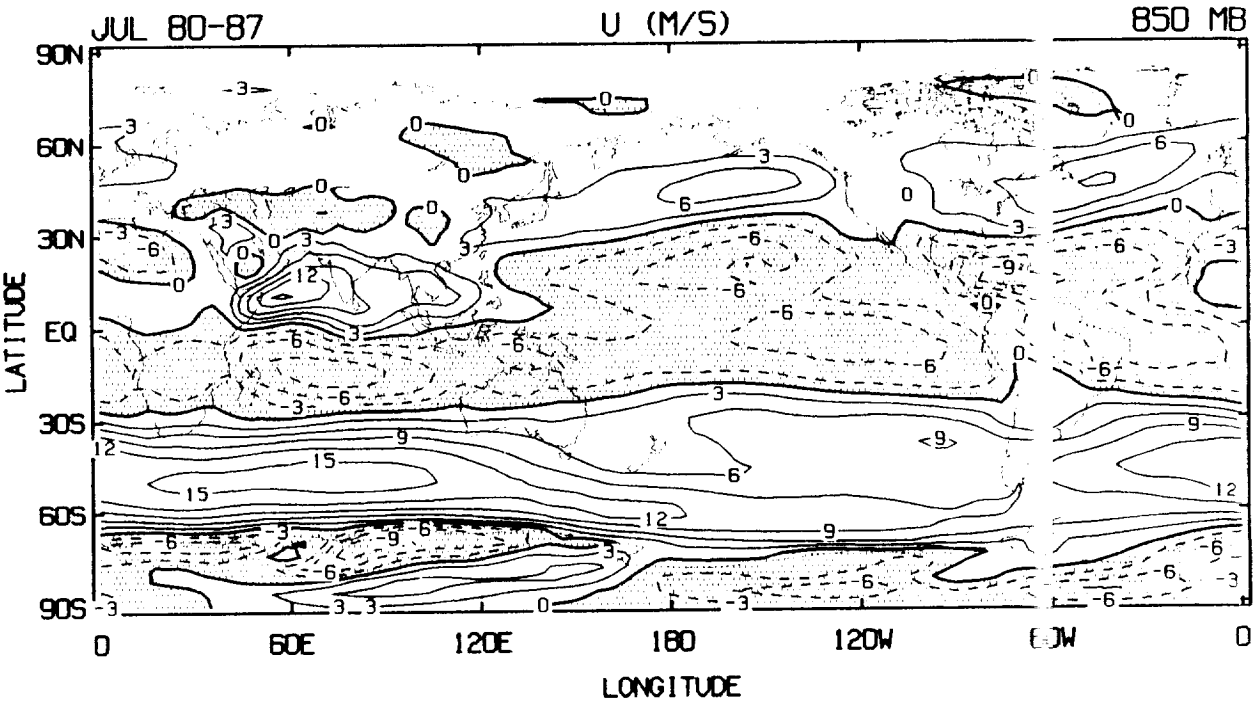

JUN 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE

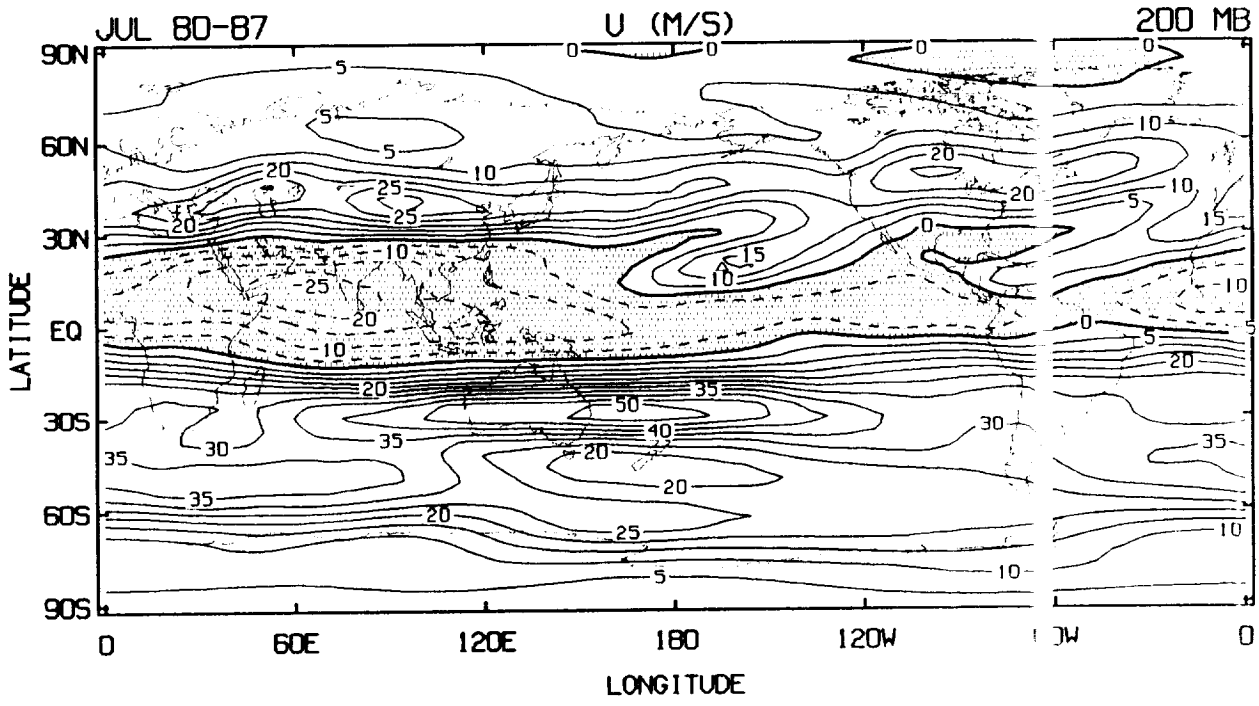

JUN 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
LATITUDE

JULY

PRECEDING PAGE BLANK NOT FILMED

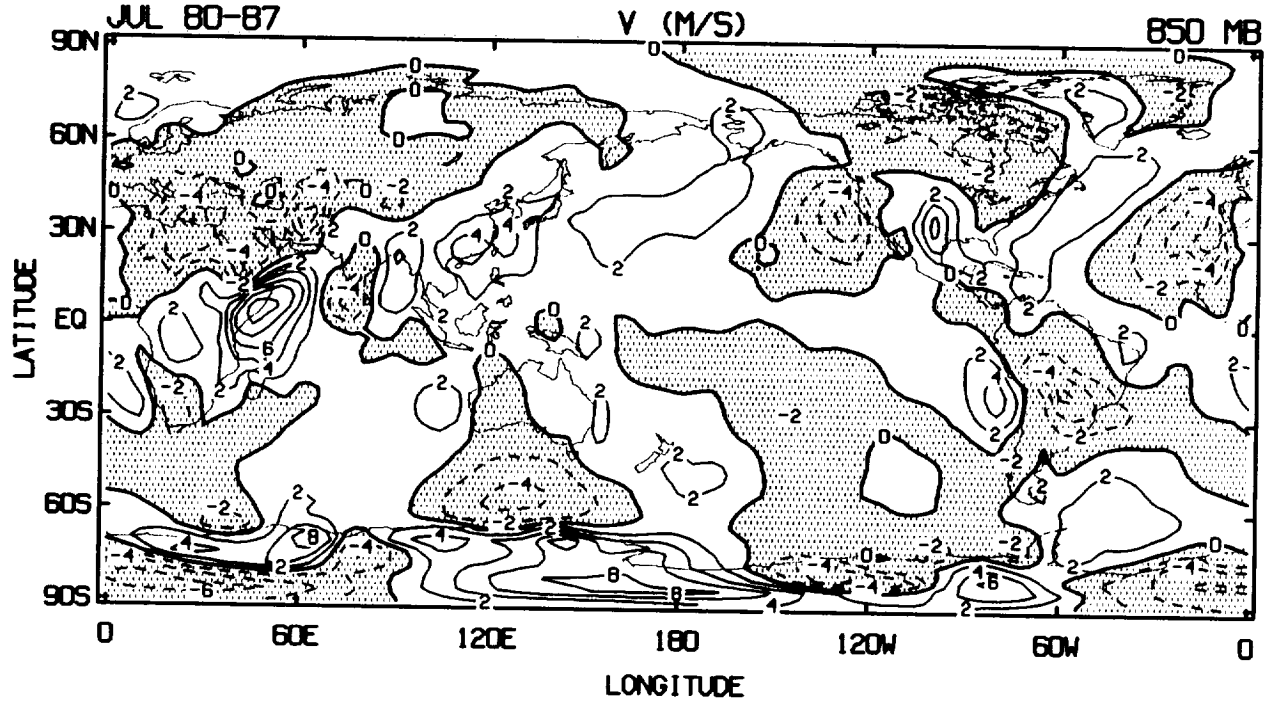
PAGE 84 INTENTIONALLY BLANK

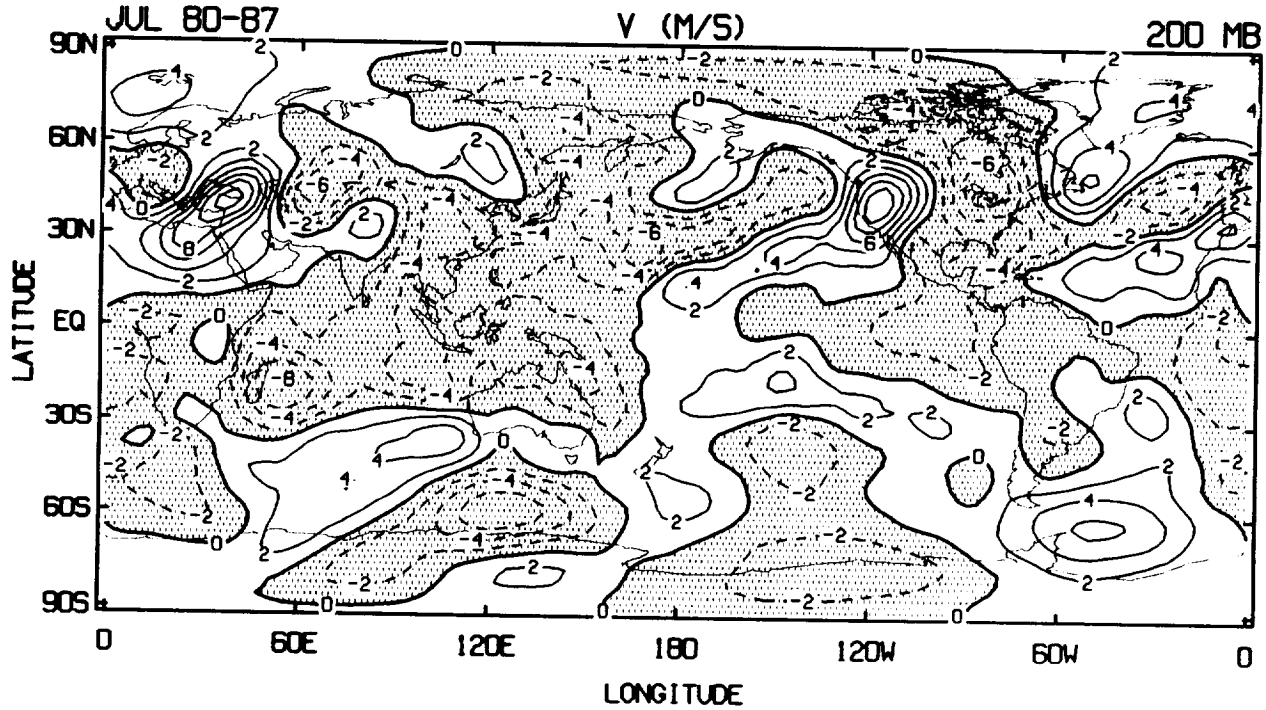


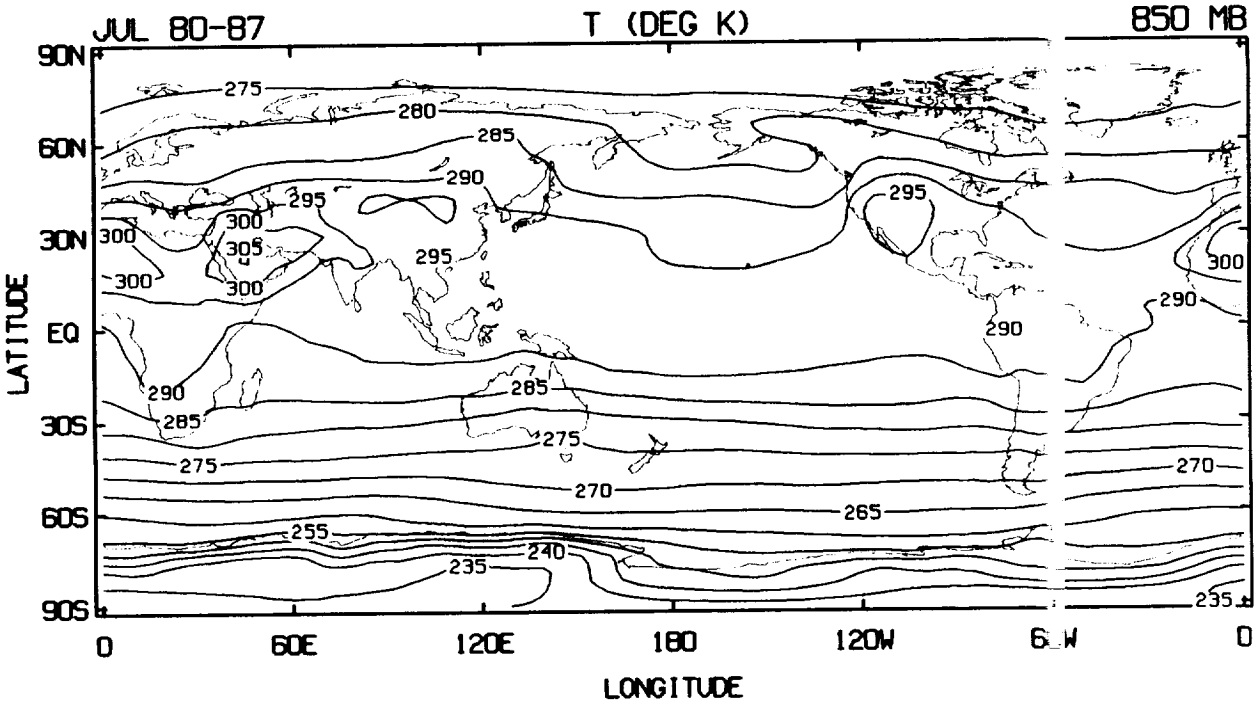


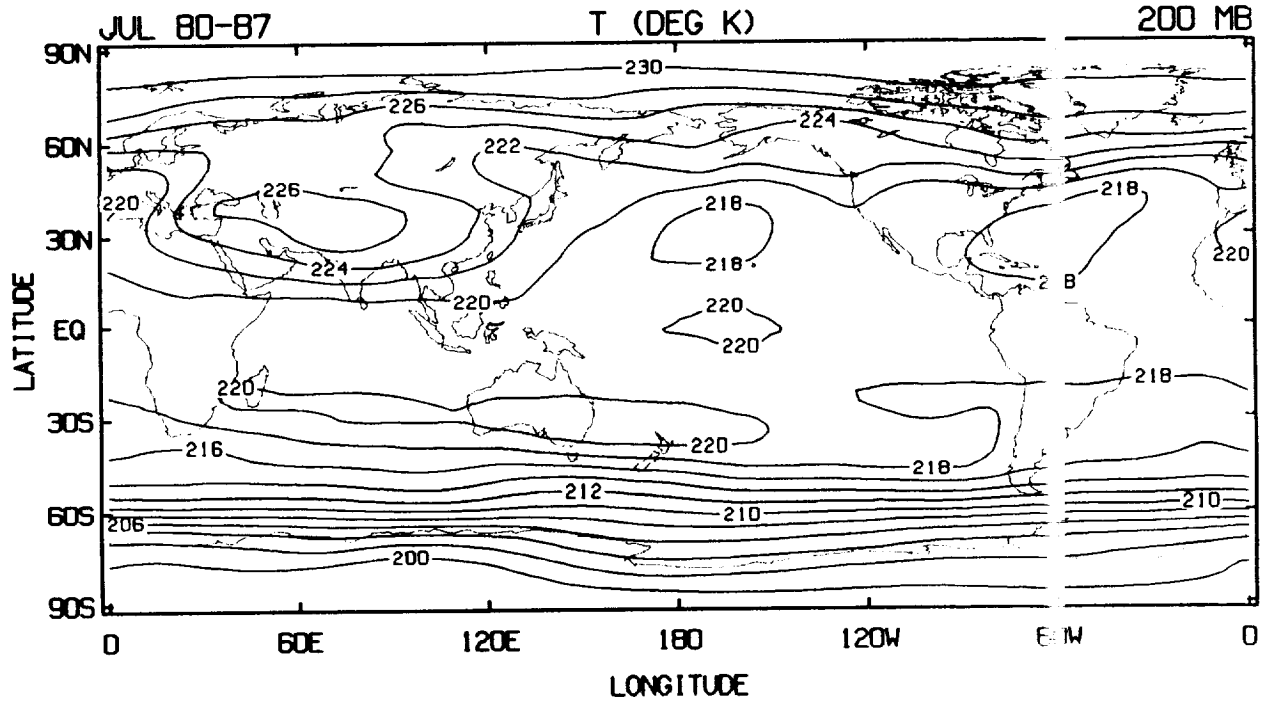
PRECEDING PAGE BLANK NOT FILMED

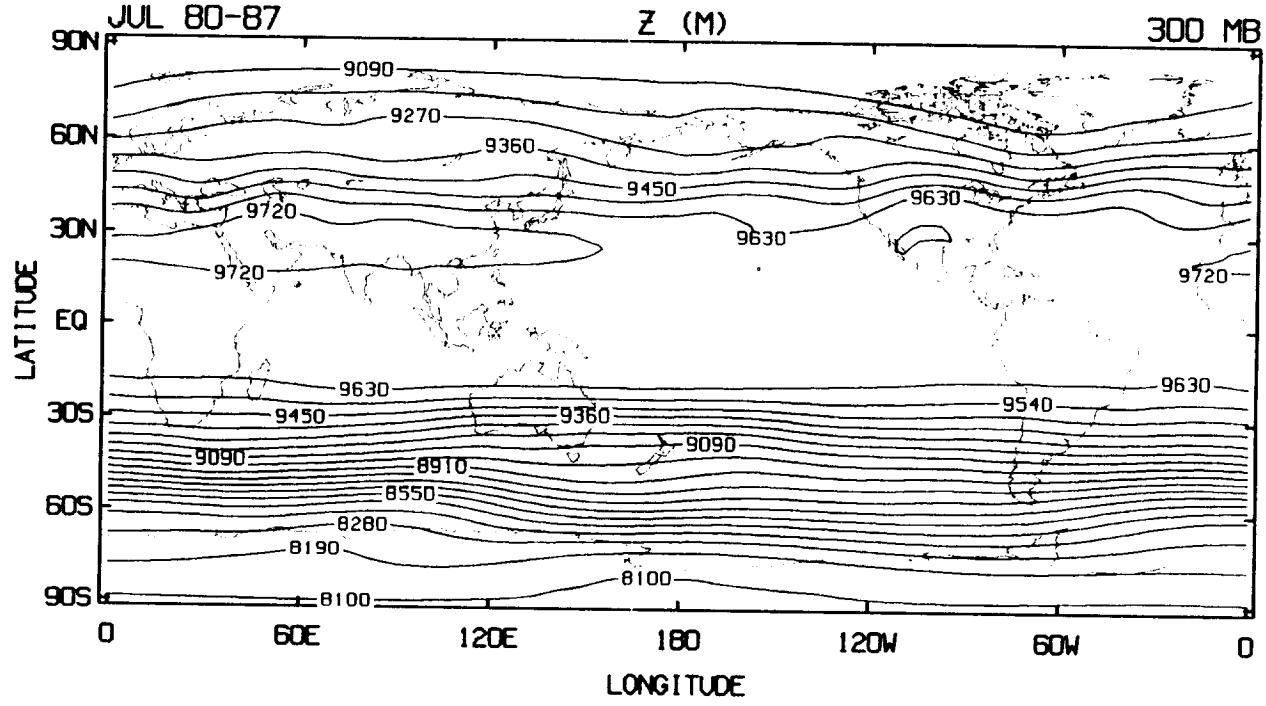
PAGE 86 INTENTIONALLY B

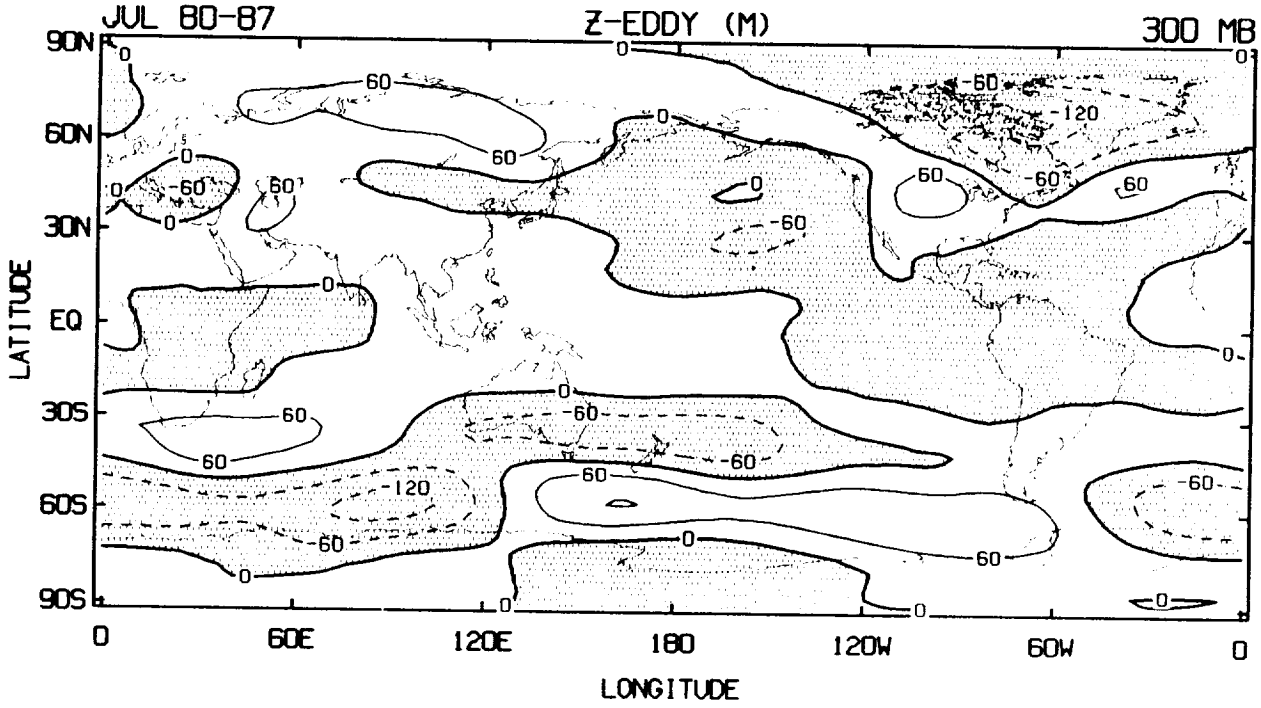

JUL 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

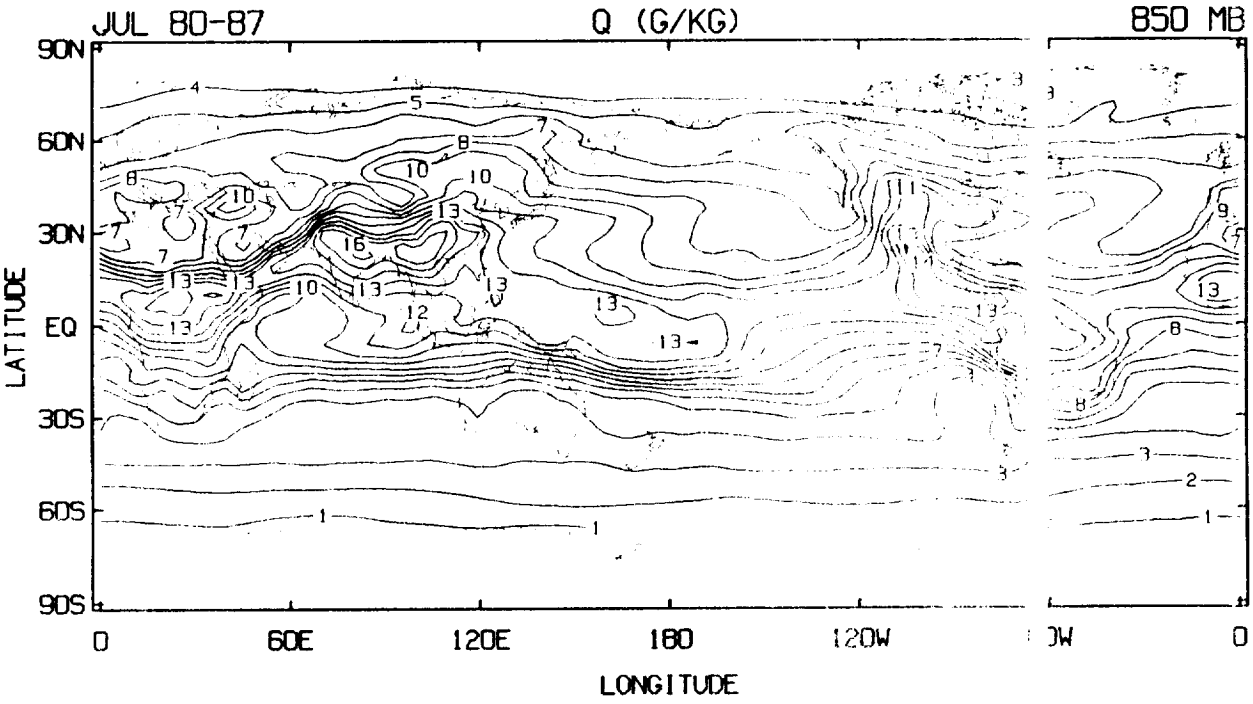

JUL 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

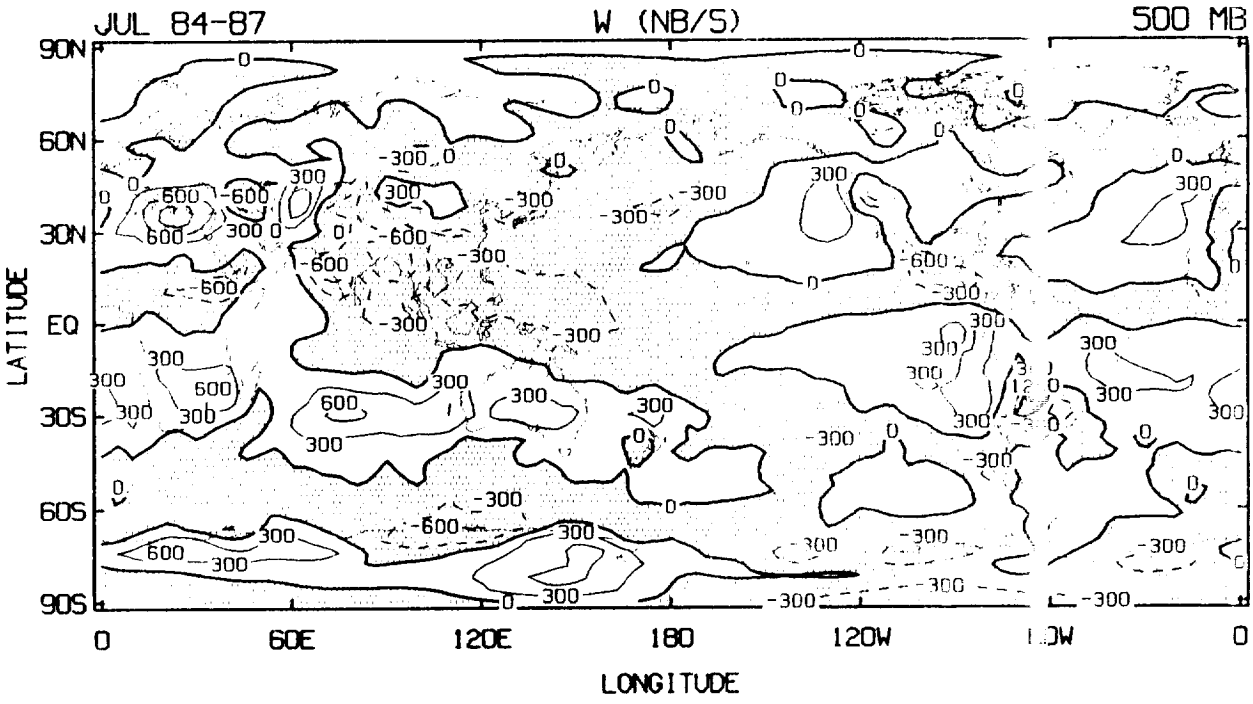

JUL 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
275
280
285
290
295
300
305
270
265
255
240
235

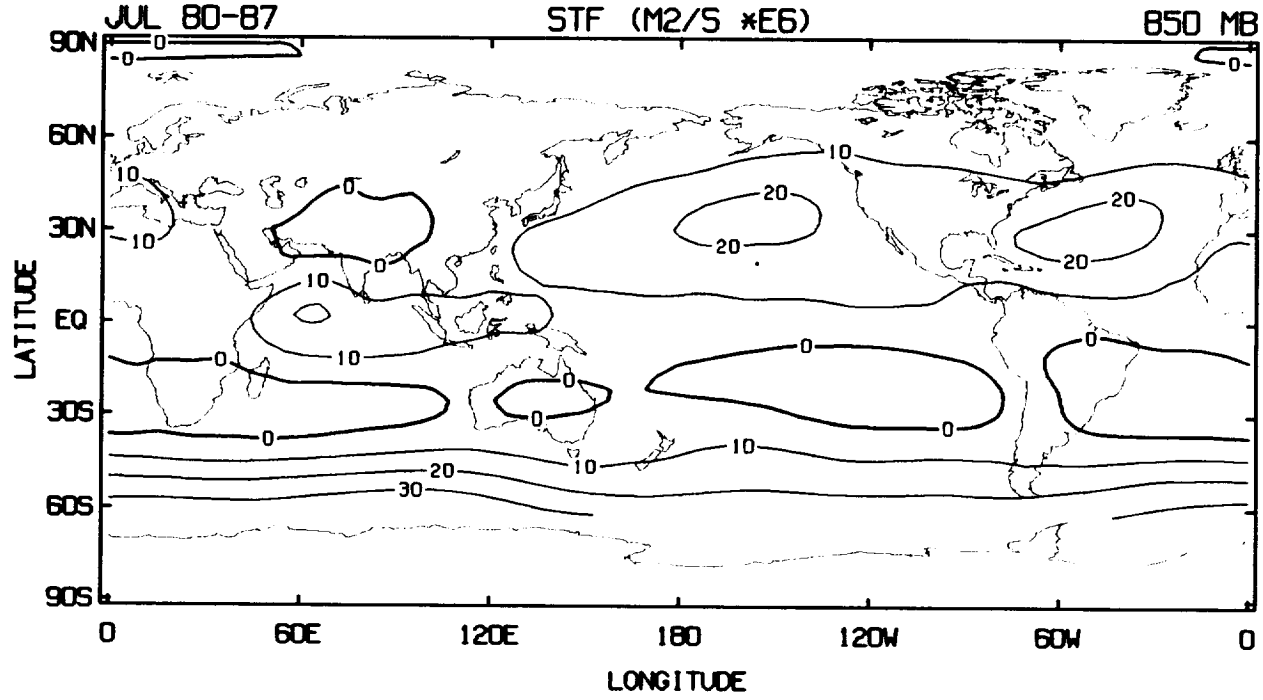

JUL 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
230
226
224
222
220
218
216
212
210
206
200

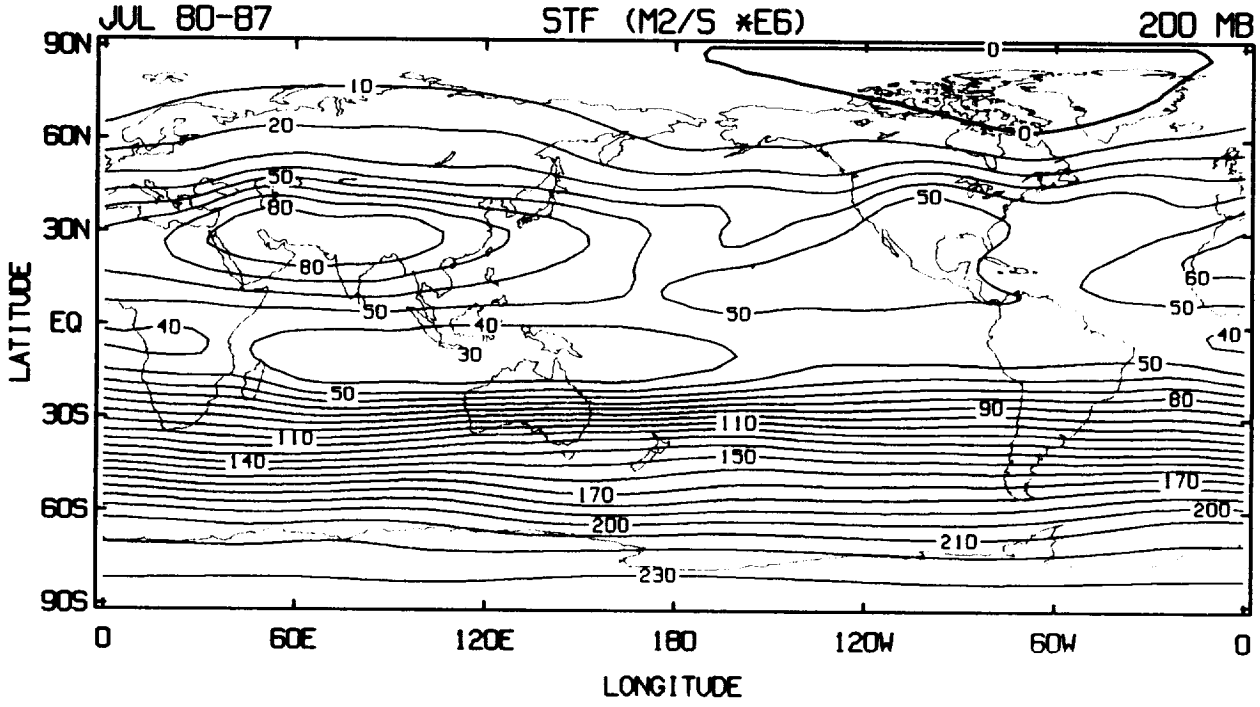

JUL 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
9090
9270
9360
9450
9720
9630
9540
8910
8550
8280
8190
8100
0
60E
120E
180
120W
60W
LONGITUDE

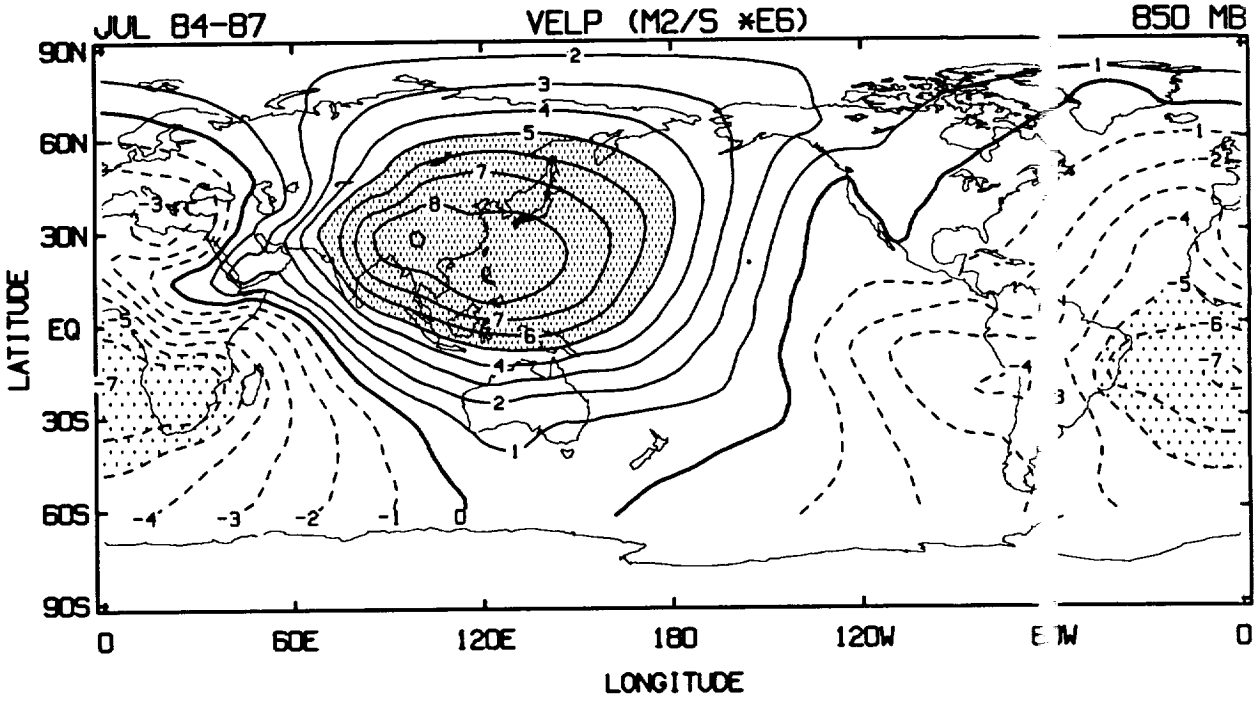

JUL 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60
-60
120
-120
60E
120E
180
120W
60W
LONGITUDE

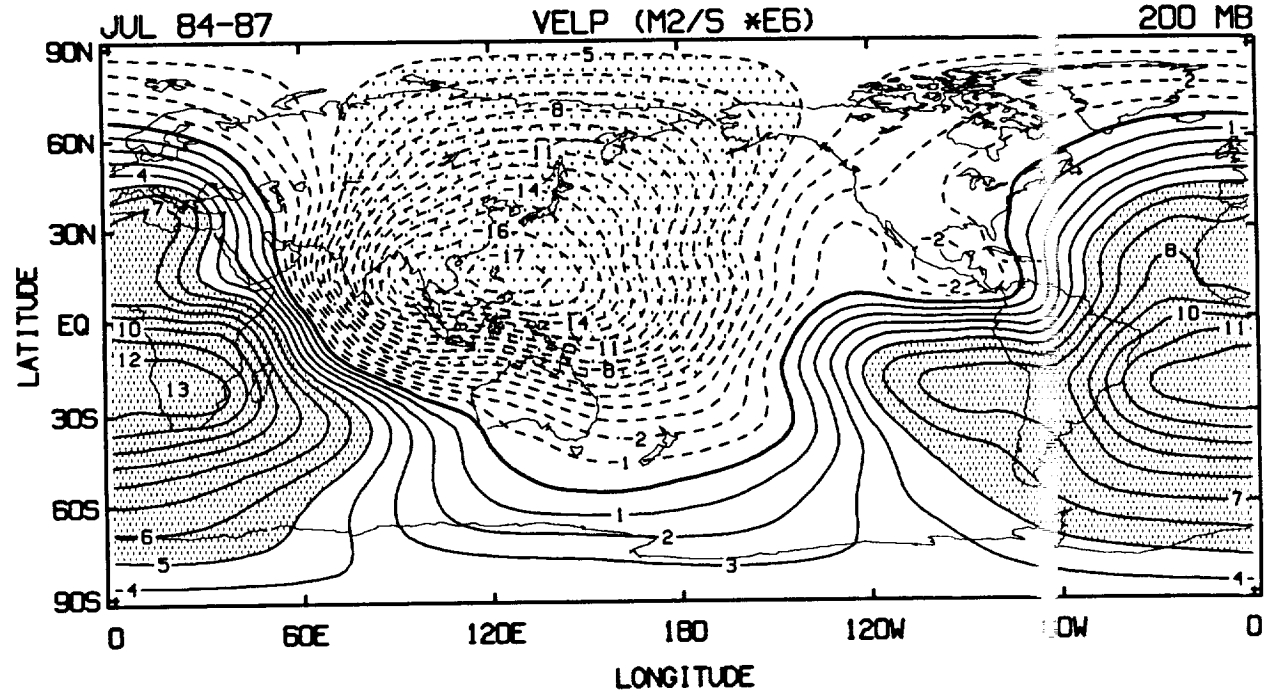

JUL 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

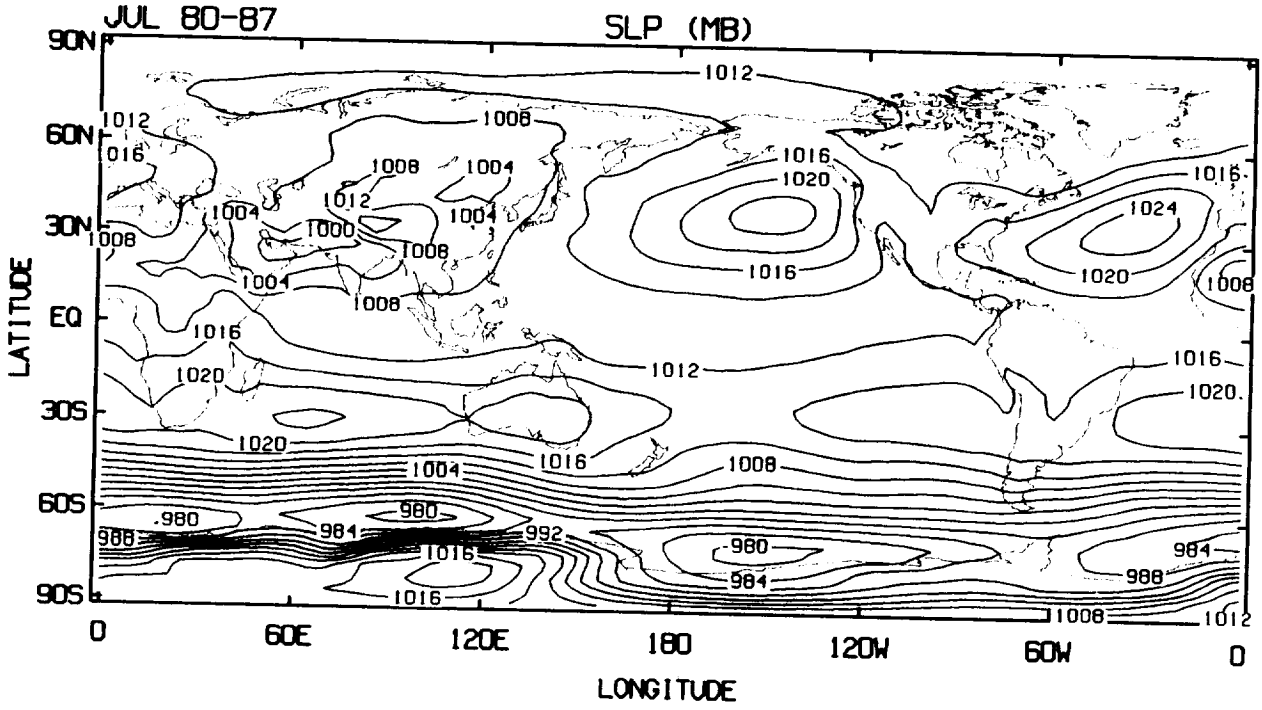

JUL 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

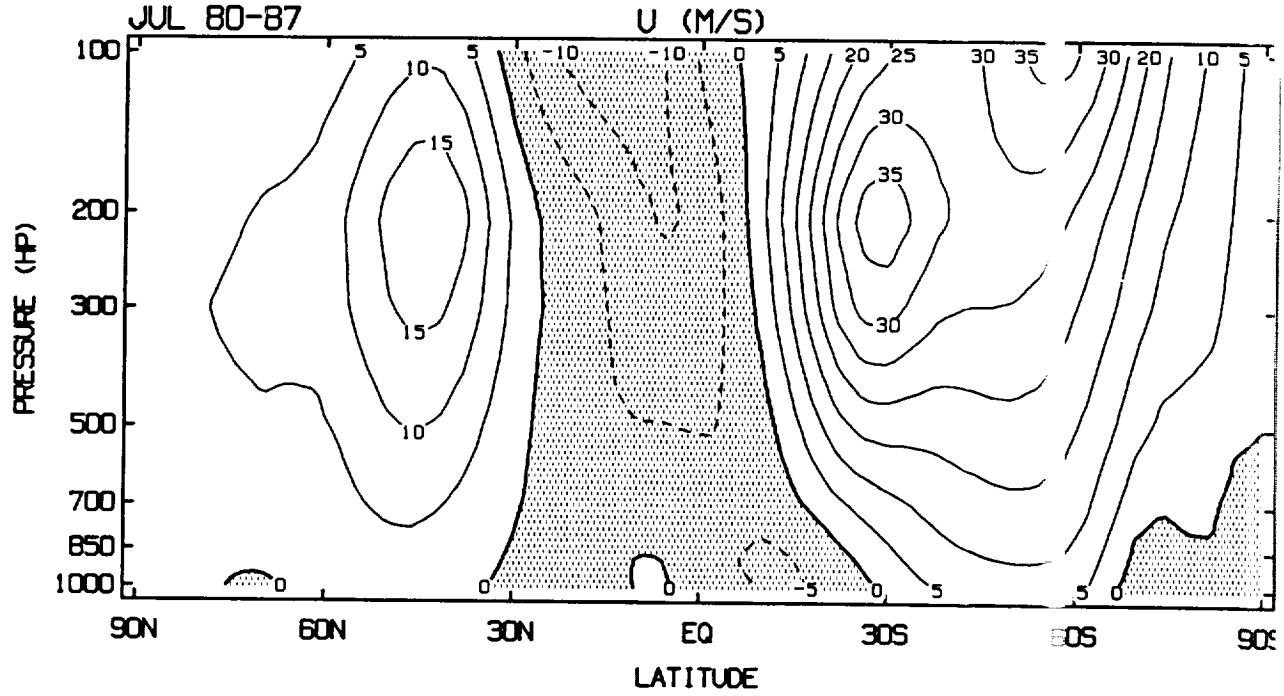

JUL 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

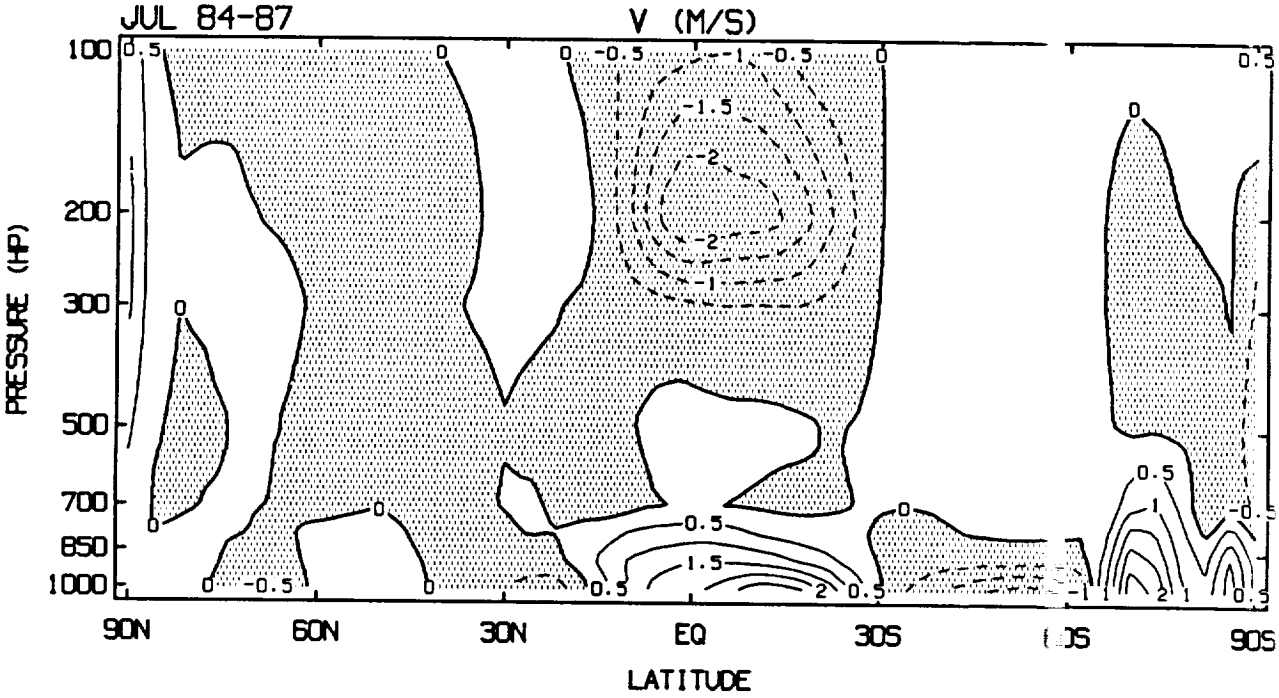

JUL 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

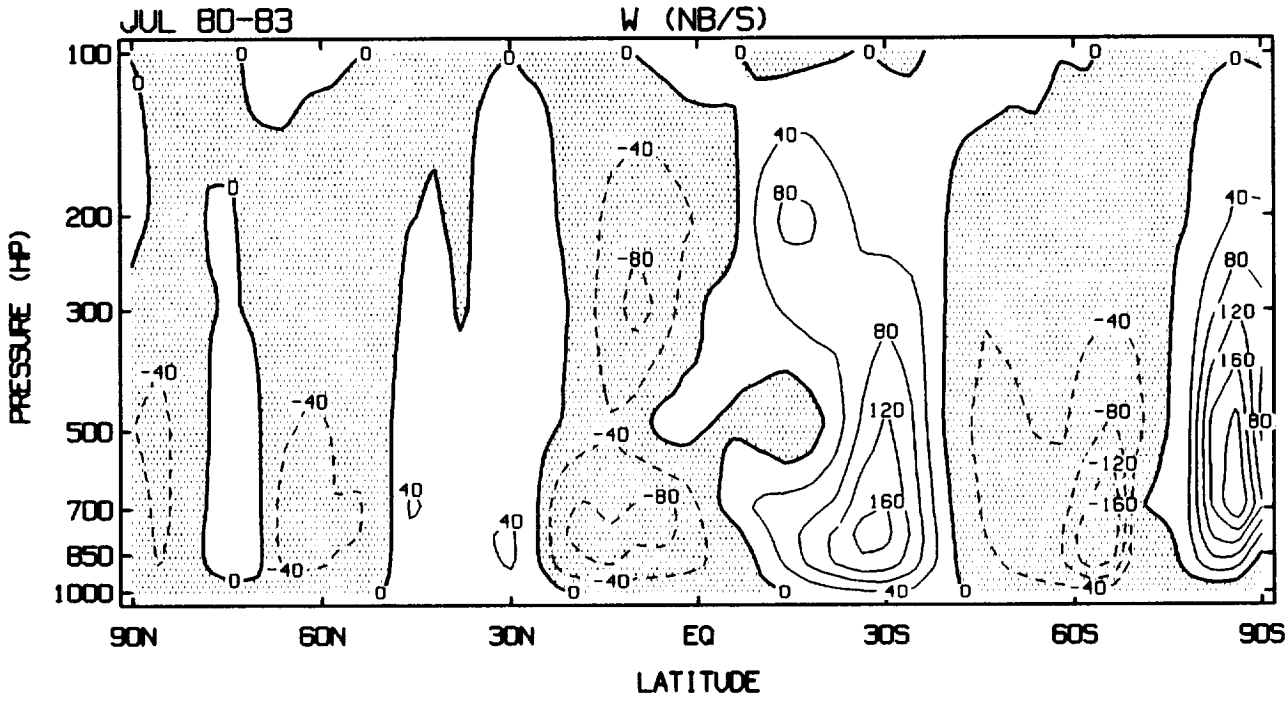

JUL 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

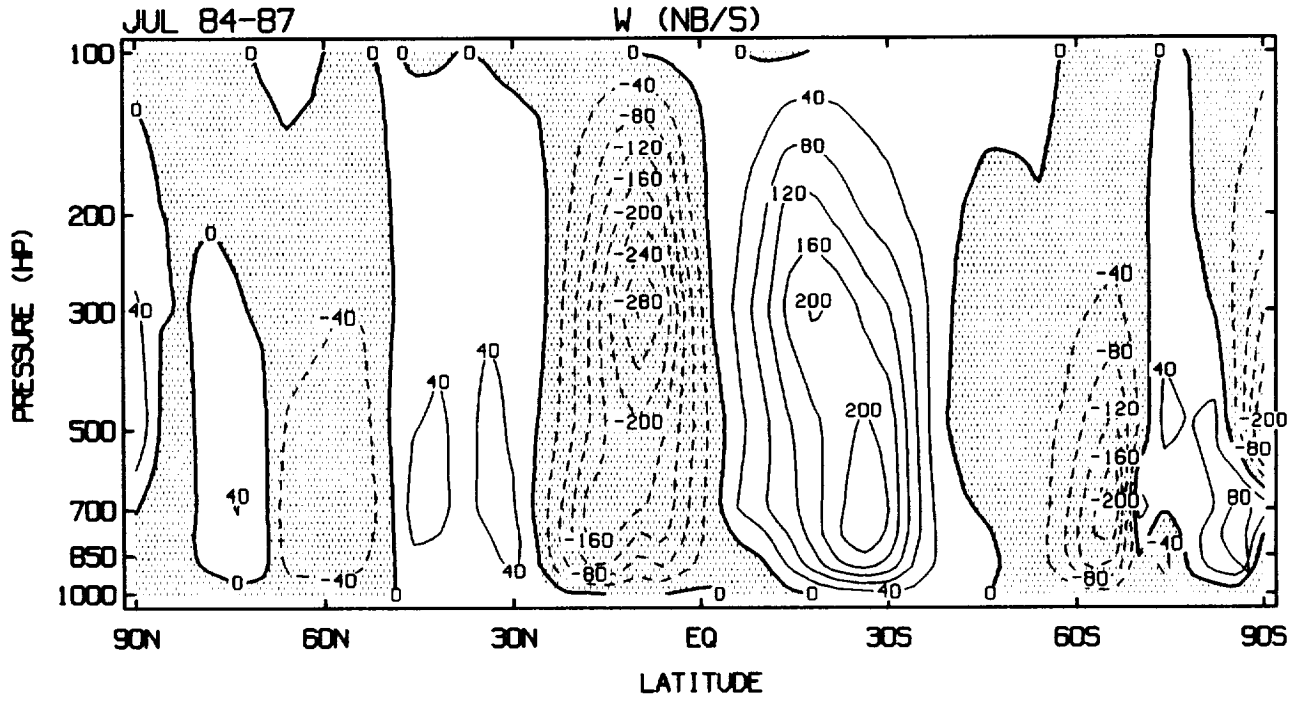

JUL 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

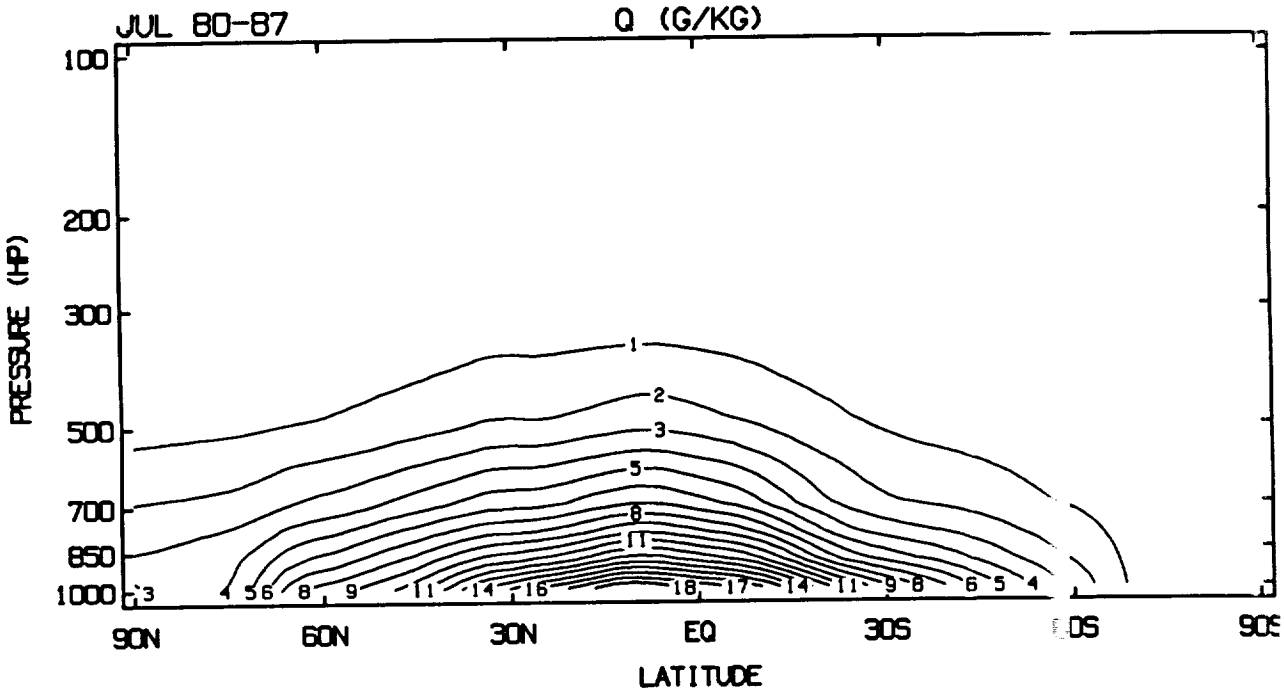

JUL 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1012
1008
1004
1000
1016
1020
1024
980
984
988
992

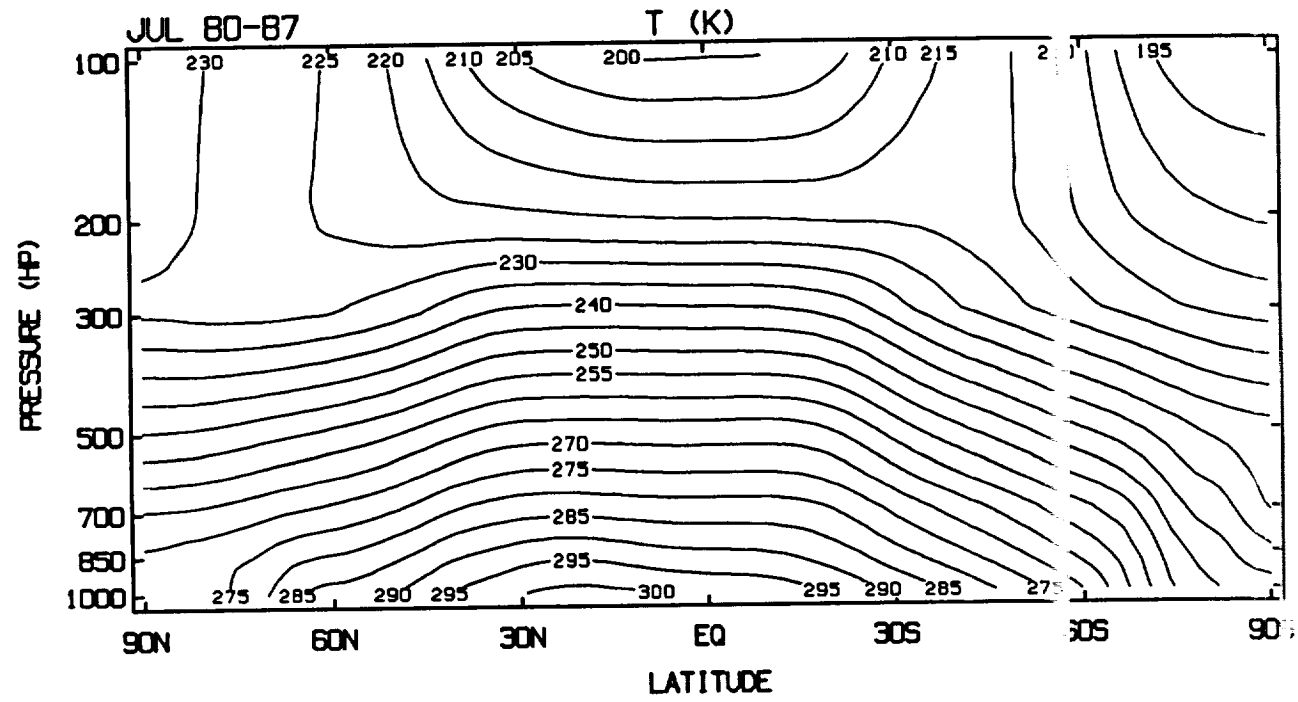

JUL 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE


JUL 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE


JUL 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


JUL 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

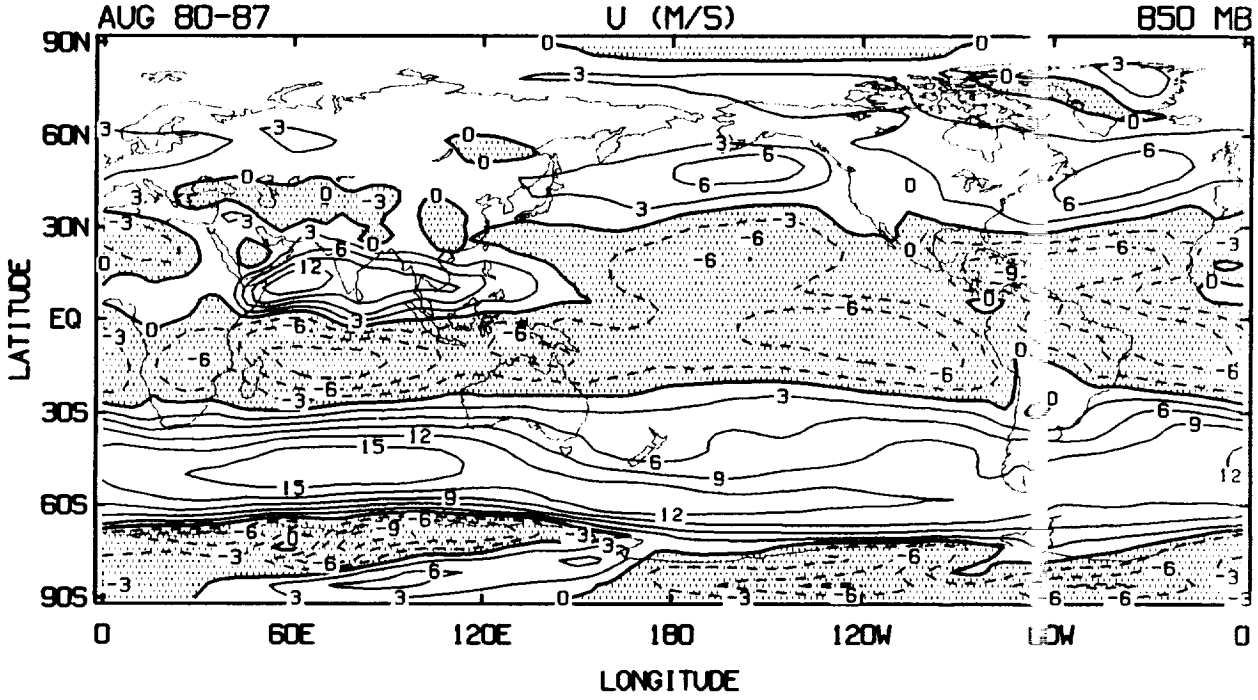

JUL 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
1
2
3
5
8
11
3 4 5 6 8 9 11 14 16 18 17 14 11 9 8 6 5 4
90N
60N
30N
EQ
30S
90S
LATITUDE

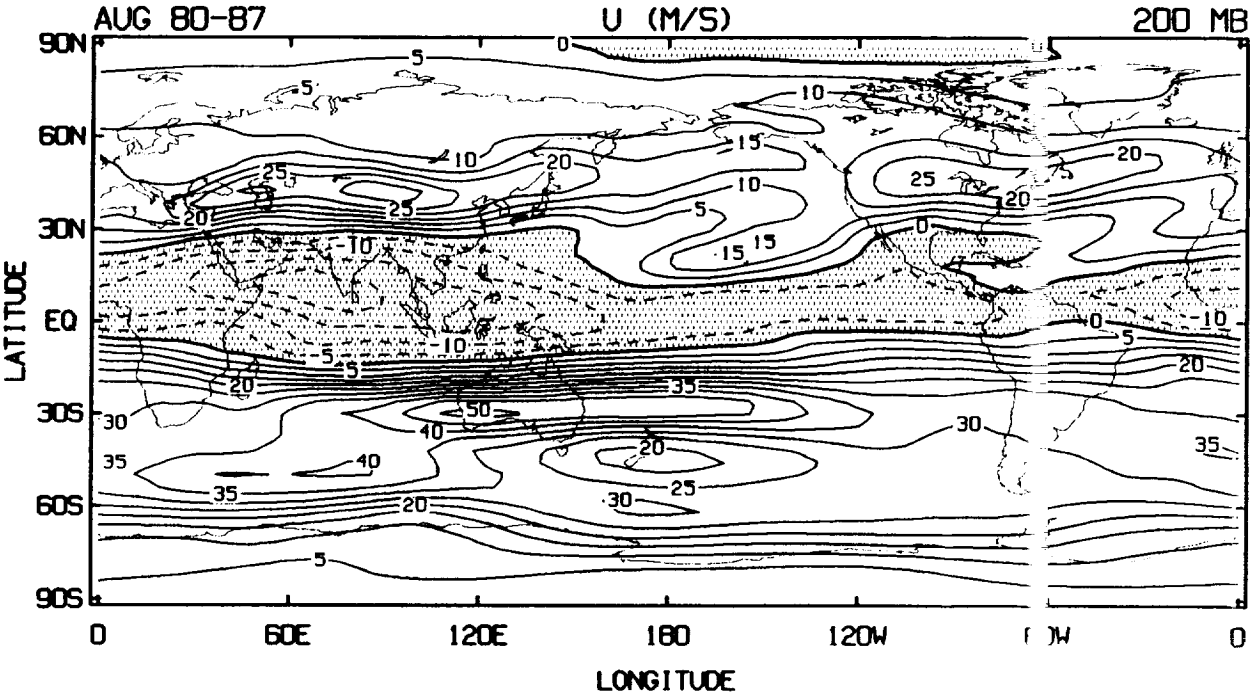

JUL 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
230 225 220 210 205 200 210 215 195
230
240
250
255
270
275
285
295
300
275 285 290 295 295 290 285 275
90N
60N
30N
EQ
30S
90S
LATITUDE

AUGUST

PRECEDING PAGE BLANK NOT FILMED

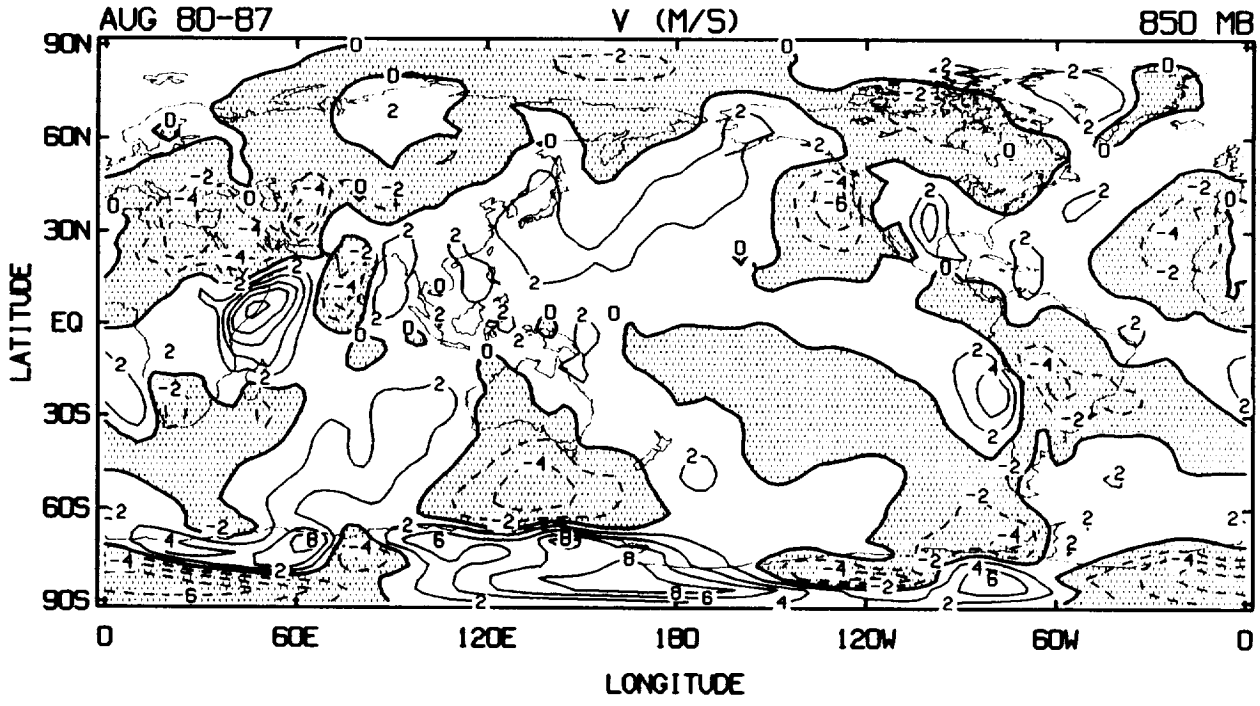
PAGE 98 INTENTIONALLY BLANK

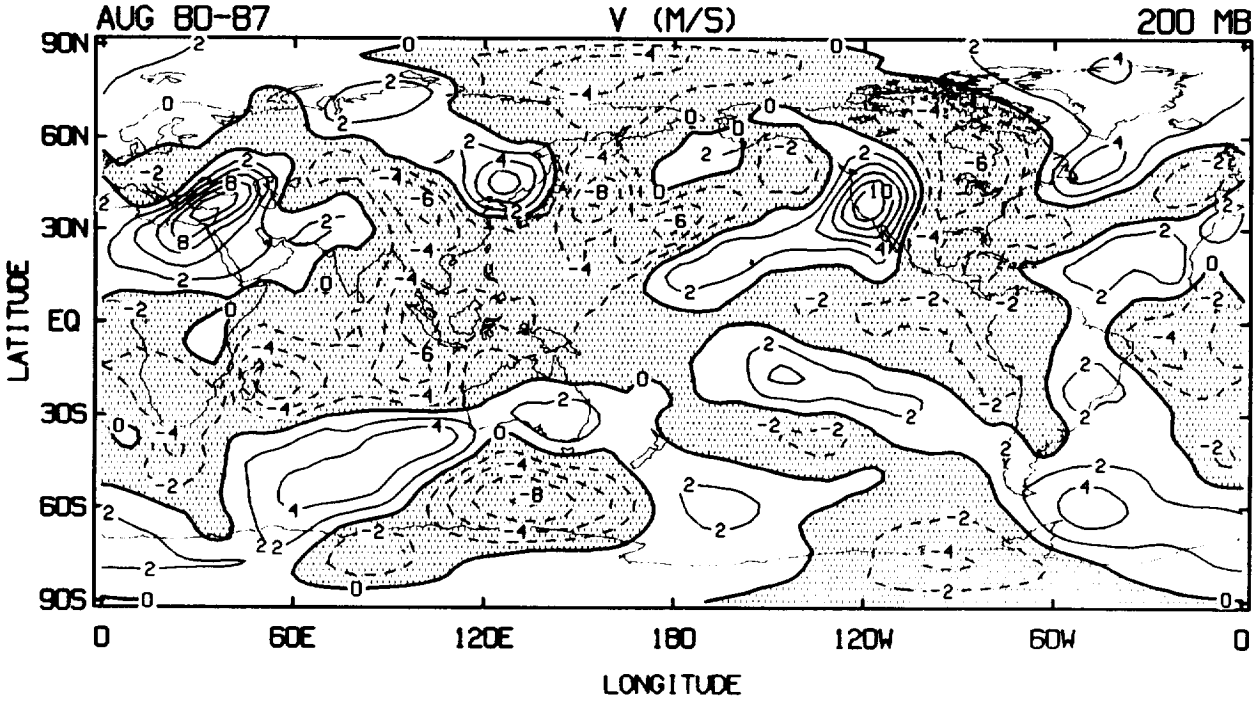


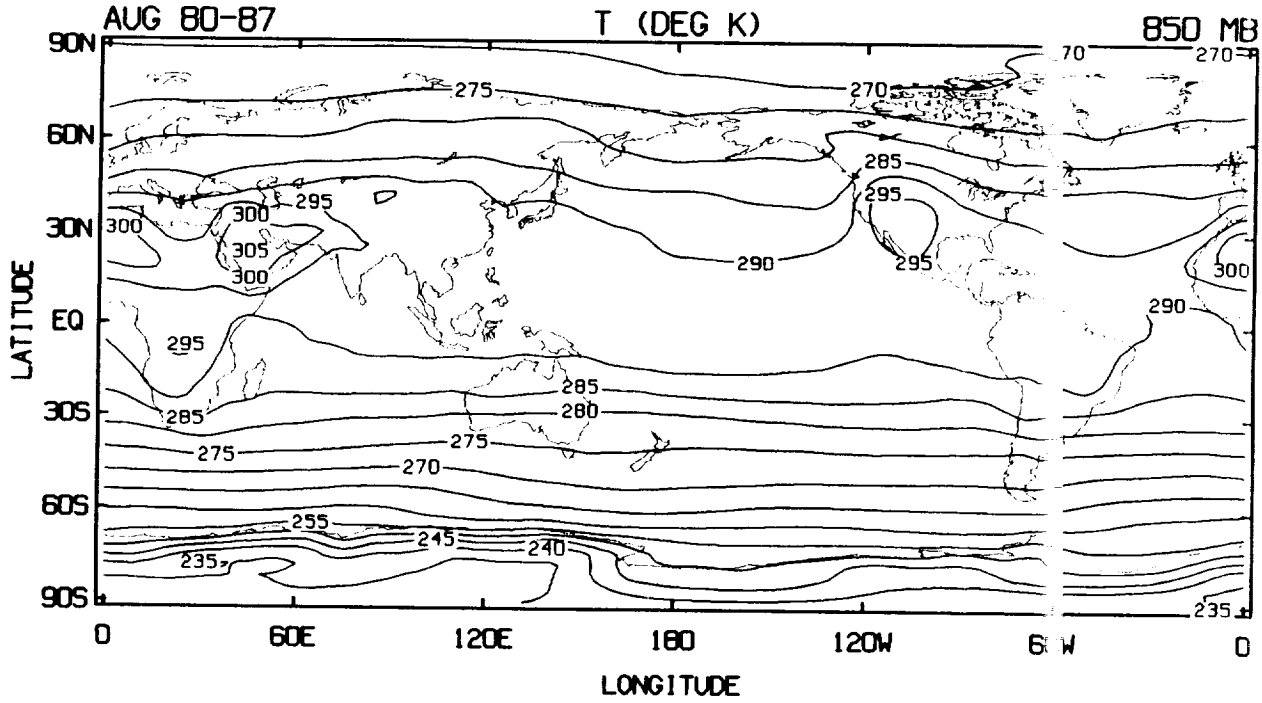


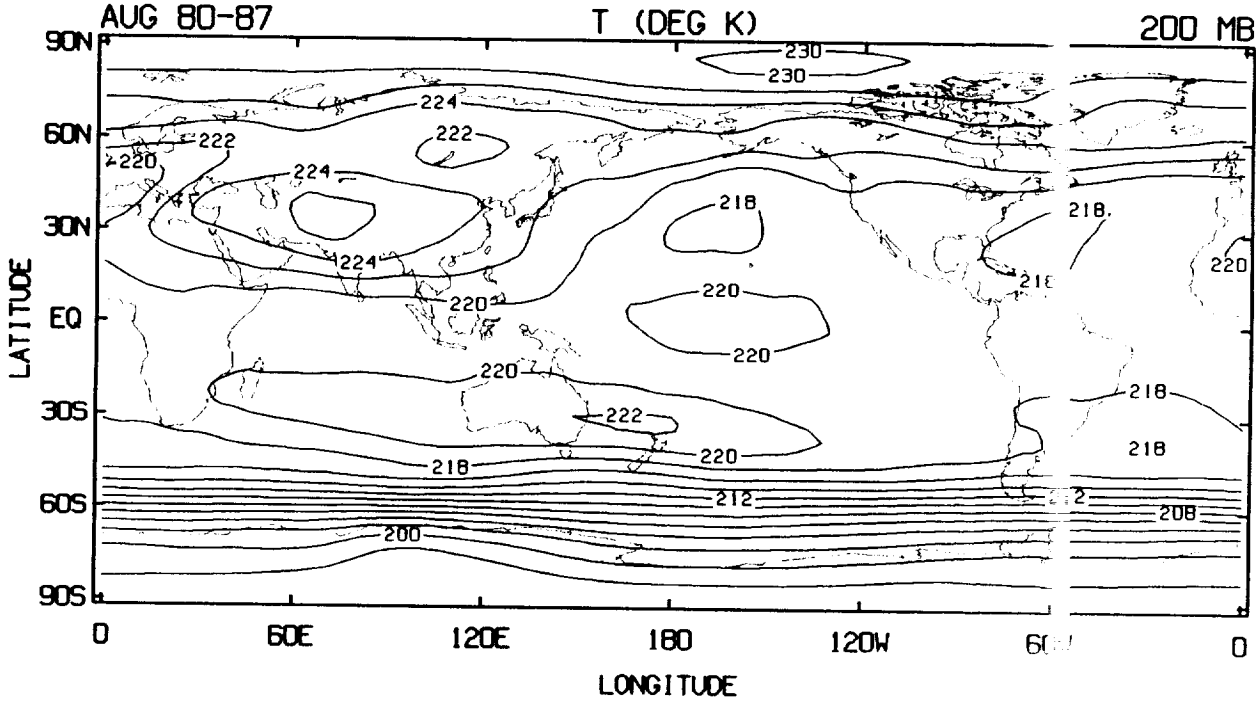
PRECEDING PAGE BLANK NOT FILMED

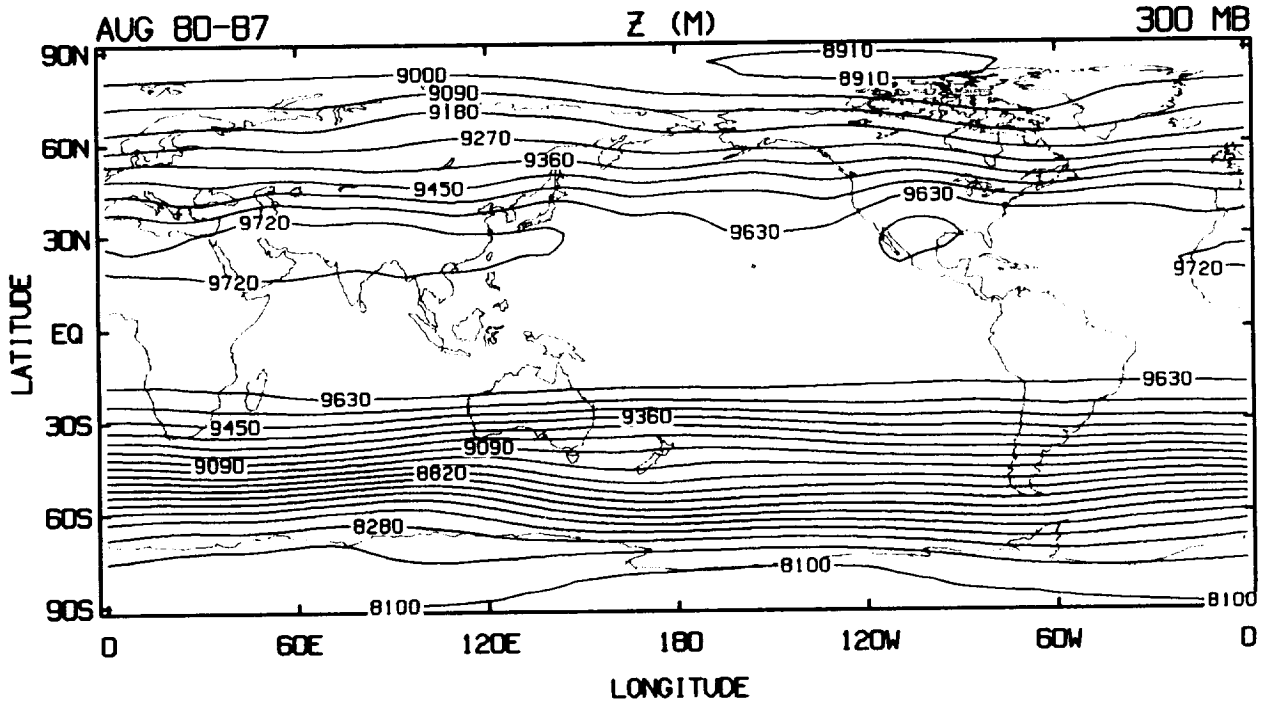
PAGE 100 INTENTIONALLY BLANK

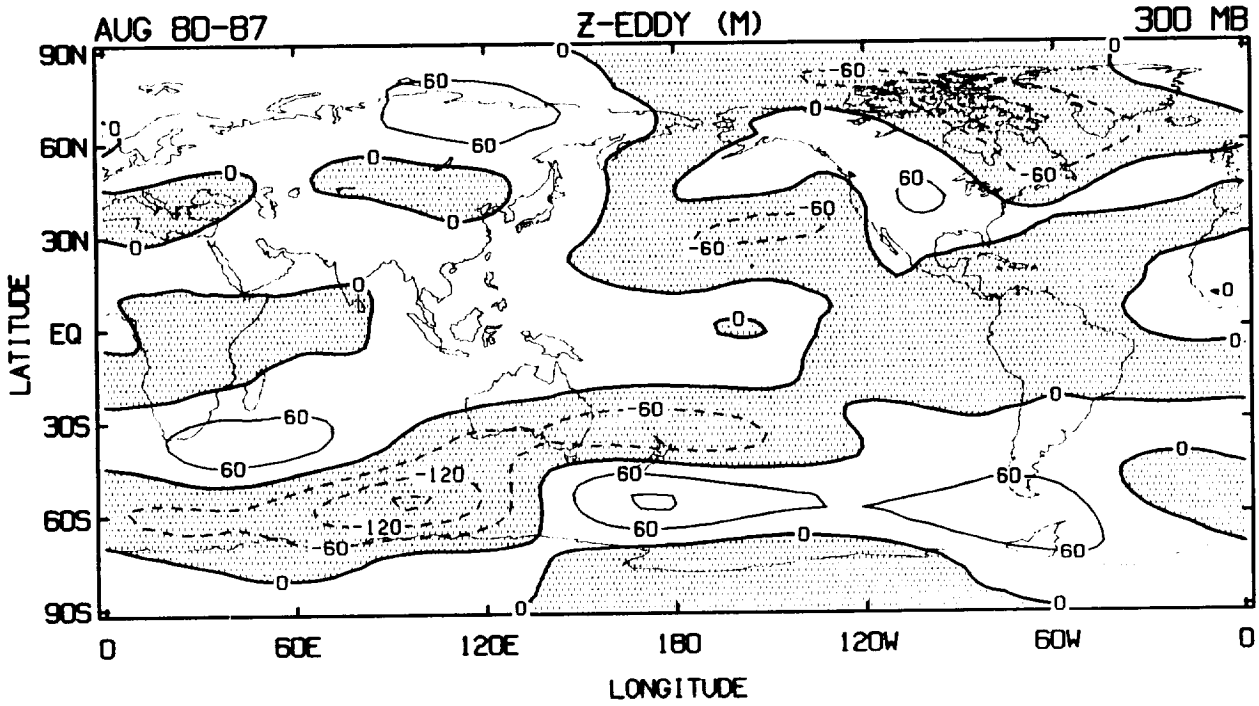

AUG 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

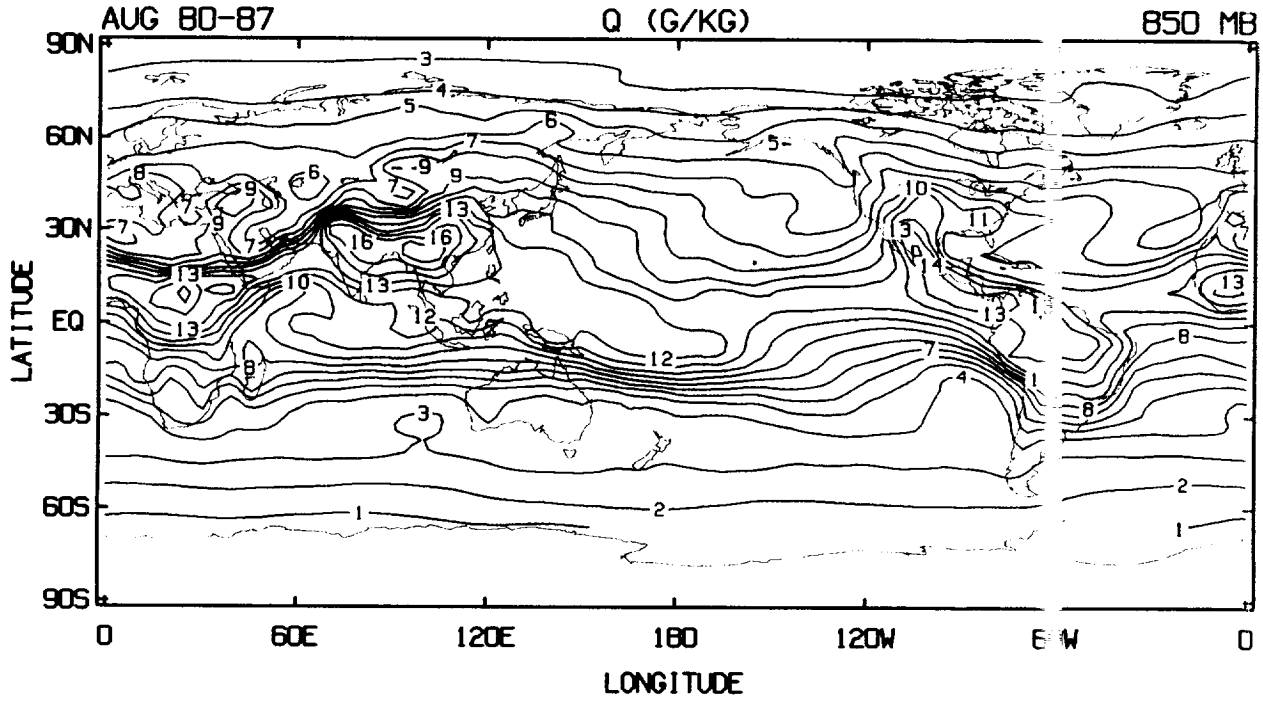

AUG 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

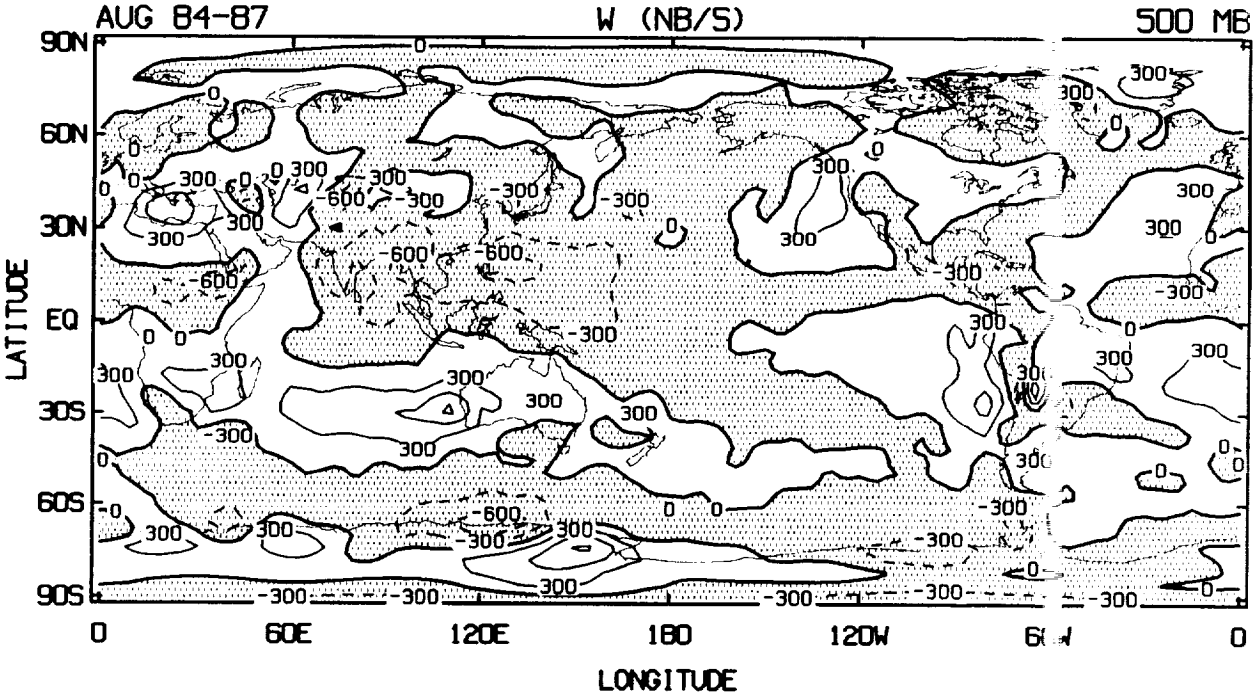

AUG 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
275
270
285
295
300
305
290
280
255
245
240
235
70

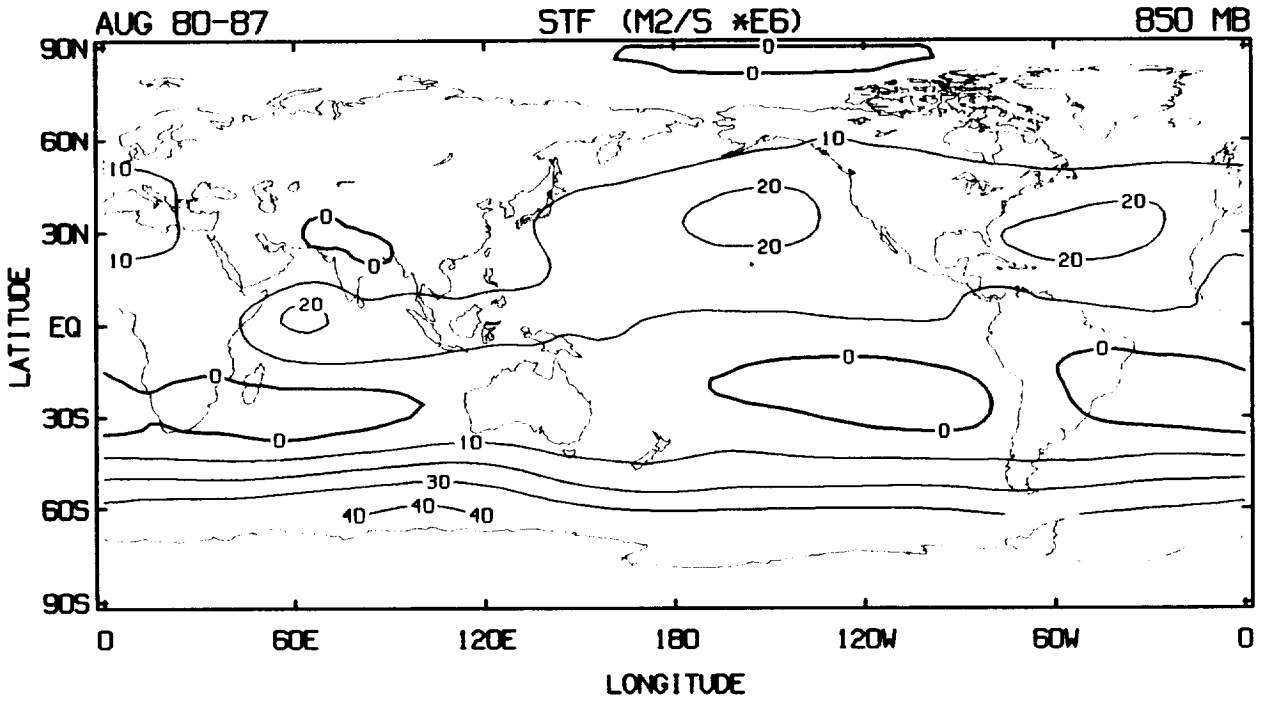

AUG 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
230
224
222
220
218
212
208
200

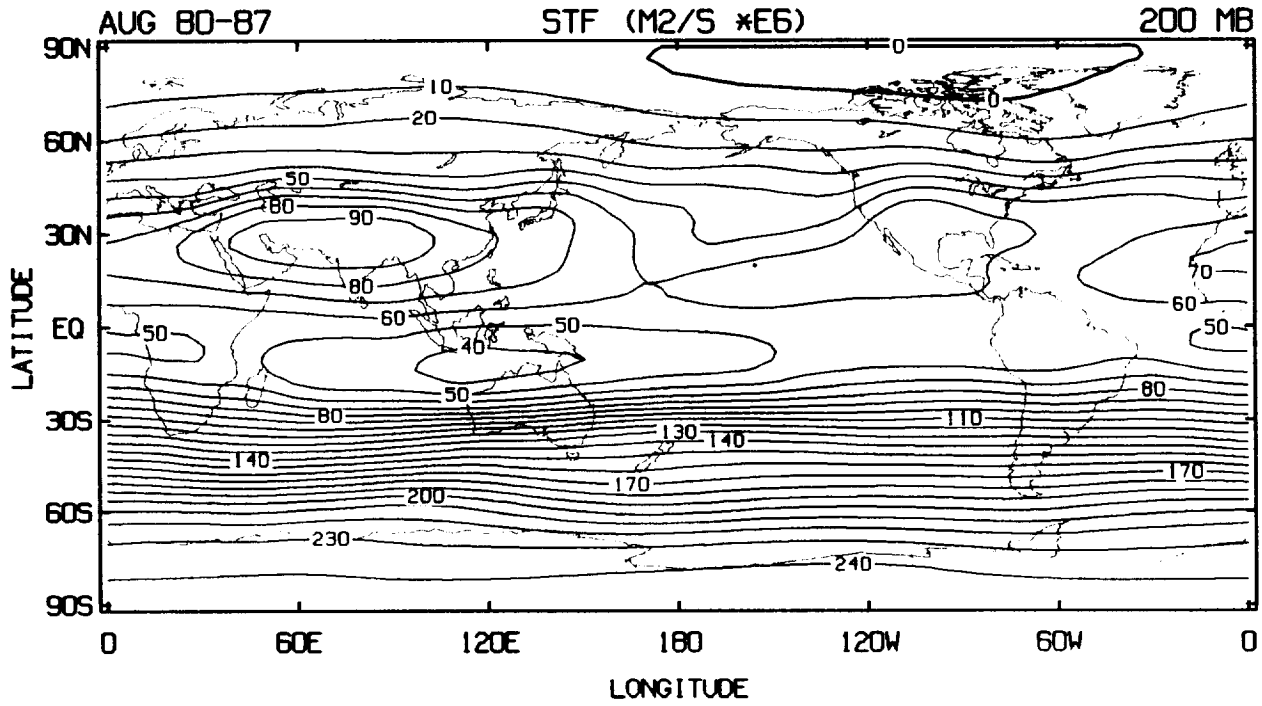

AUG 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
8910
9000
9090
9180
9270
9360
9450
9630
9720
8820
8280
8100
0
60E
120E
180
120W
60W
LONGITUDE

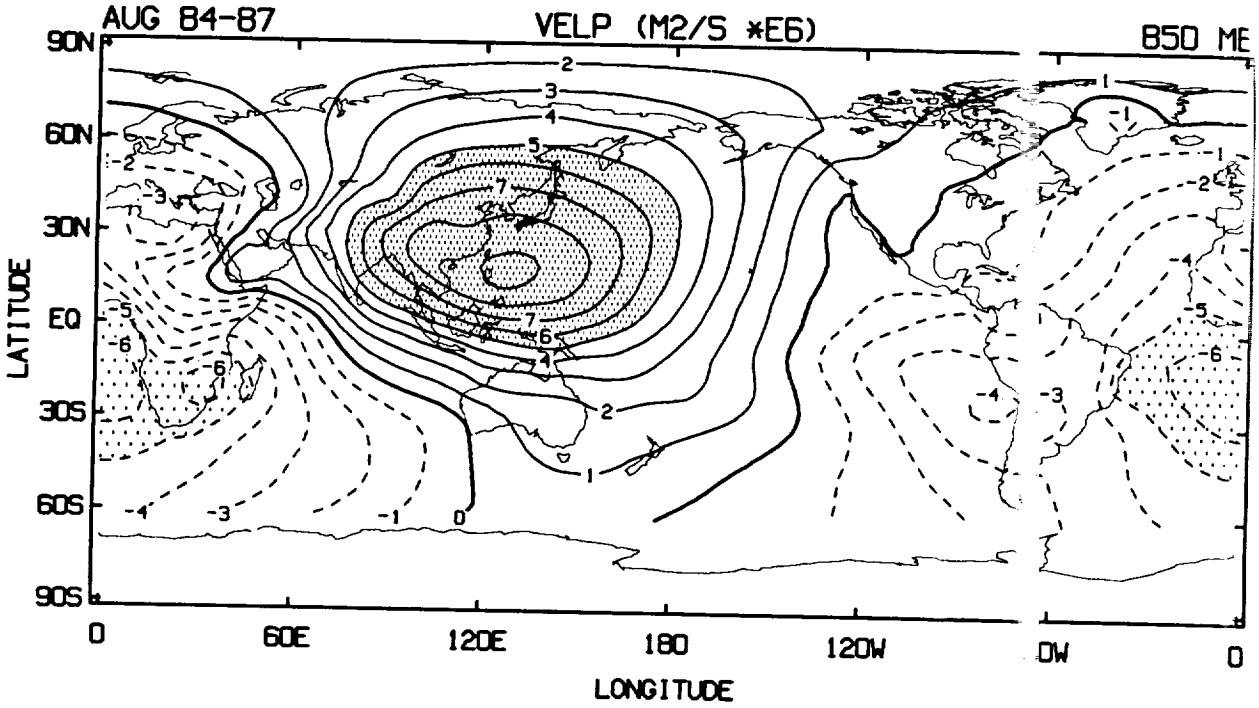

AUG 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60
-60
120
-120
0
60E
120E
180
120W
60W
LONGITUDE

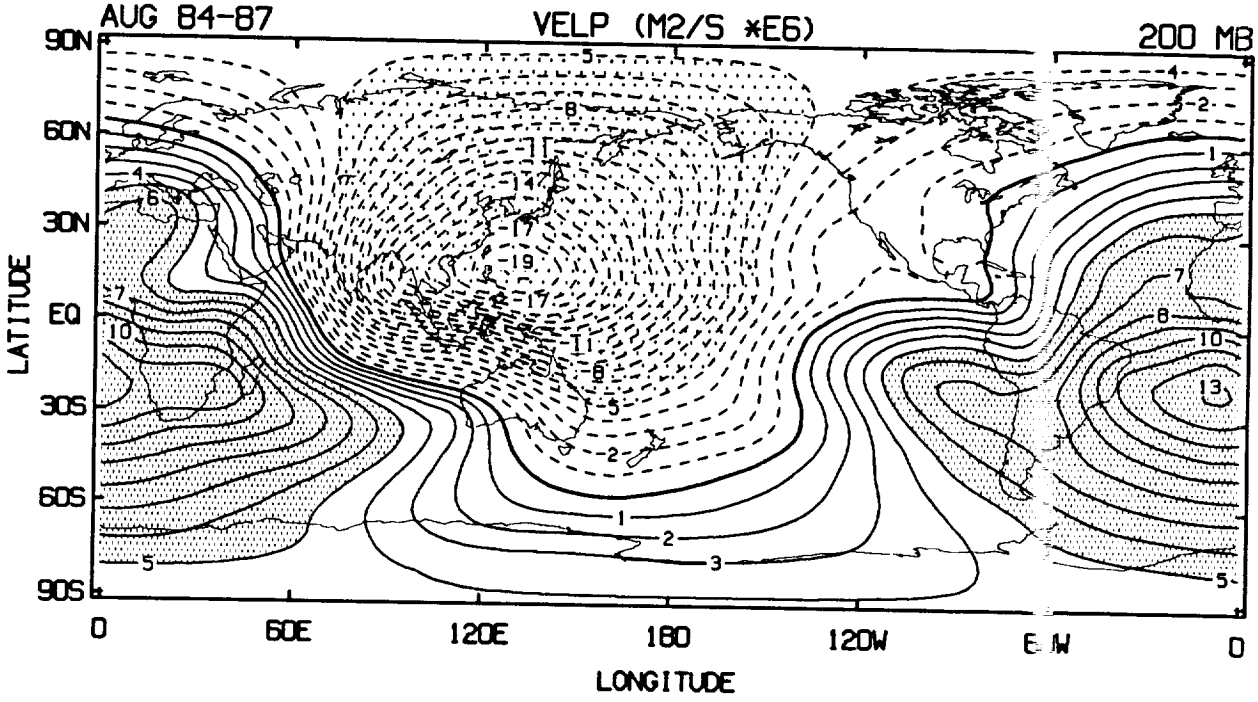

AUG 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

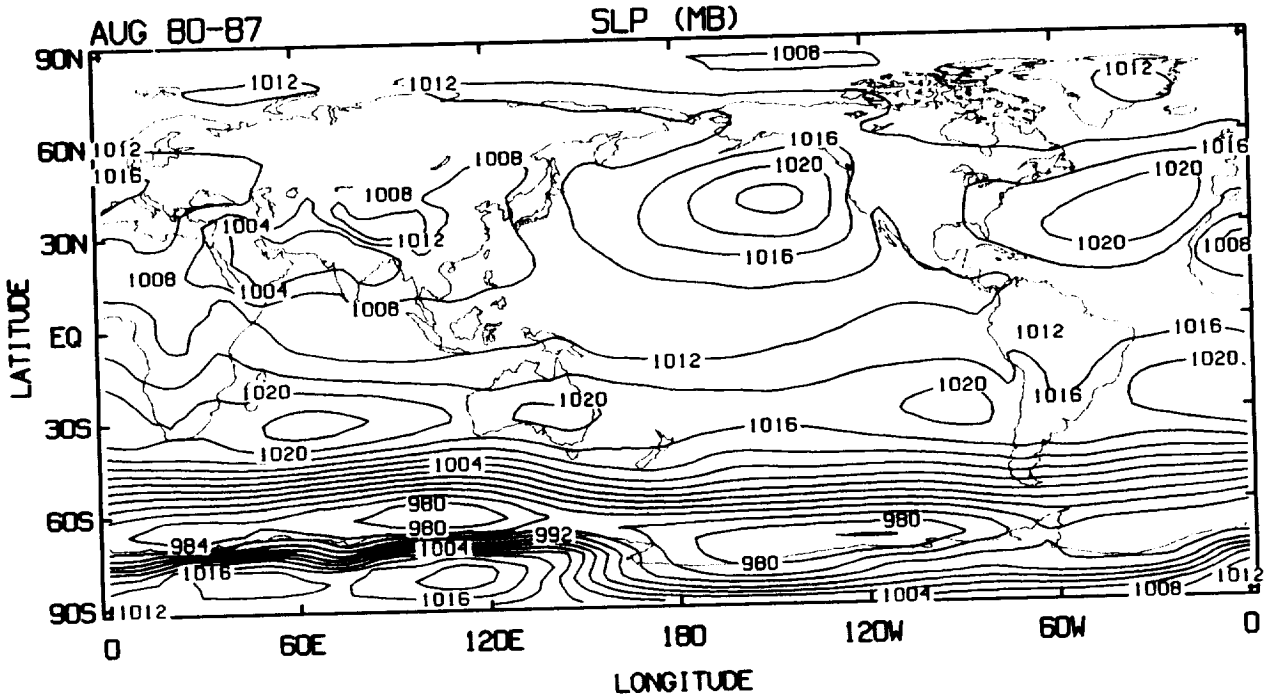

AUG 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

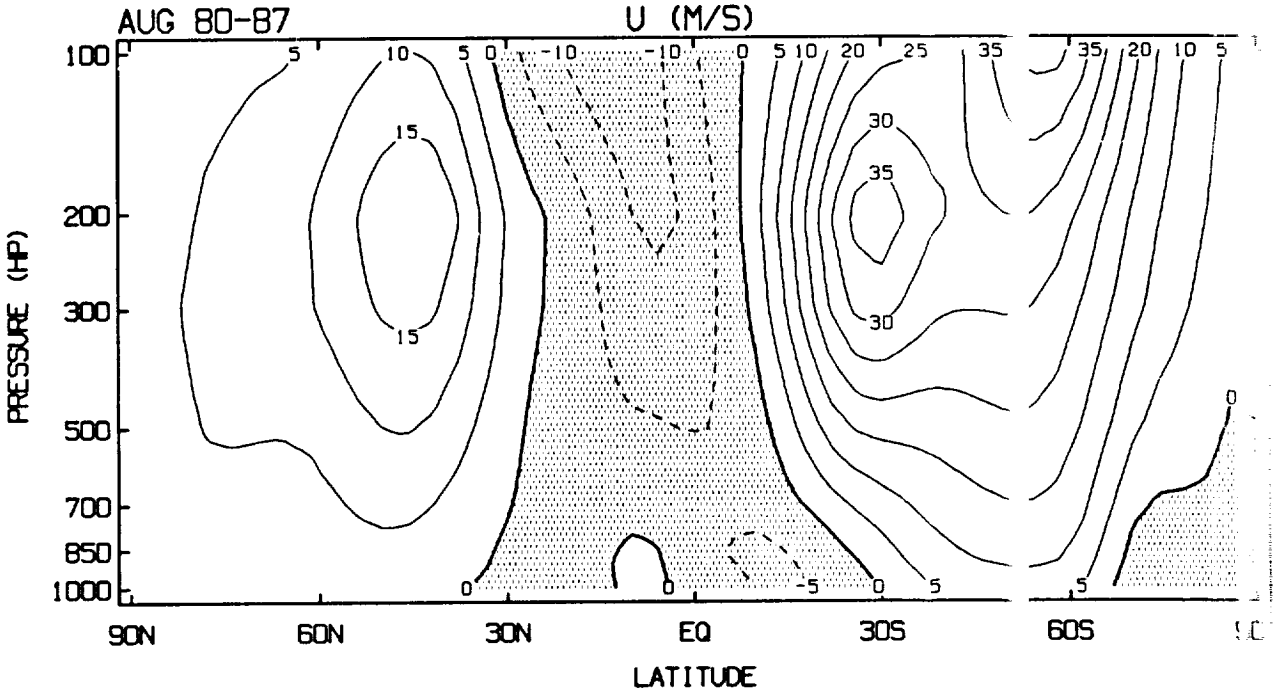

AUG 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

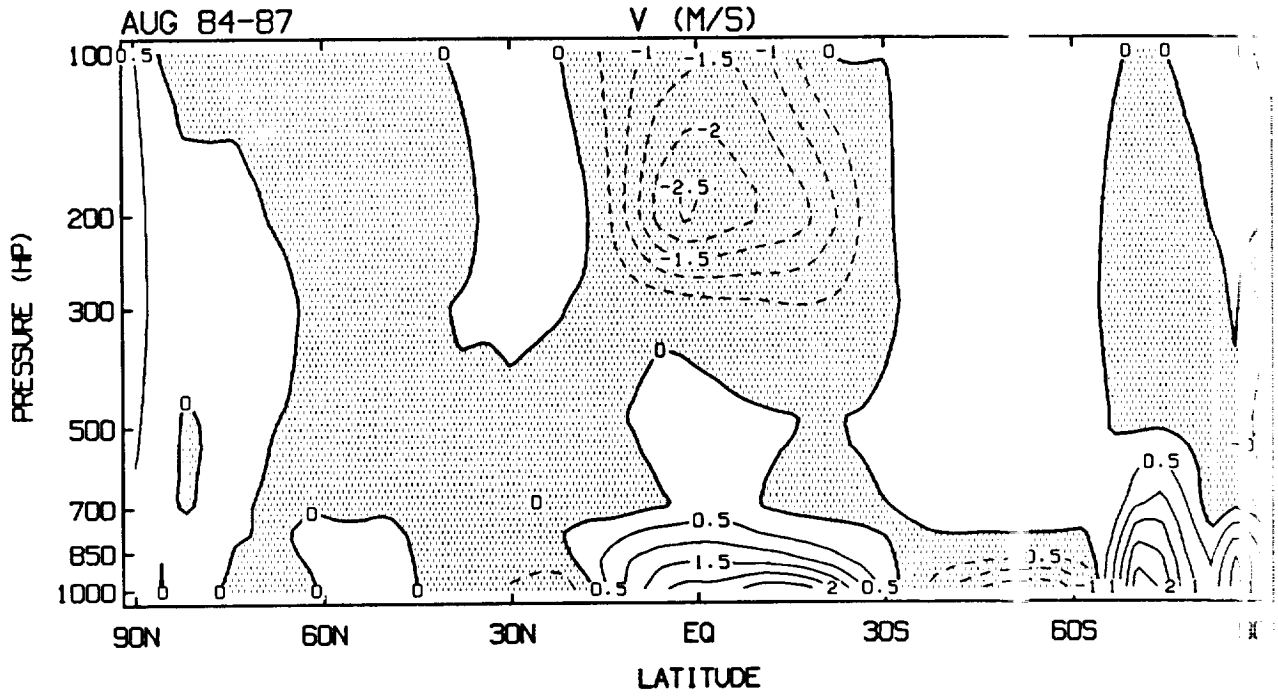

AUG 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

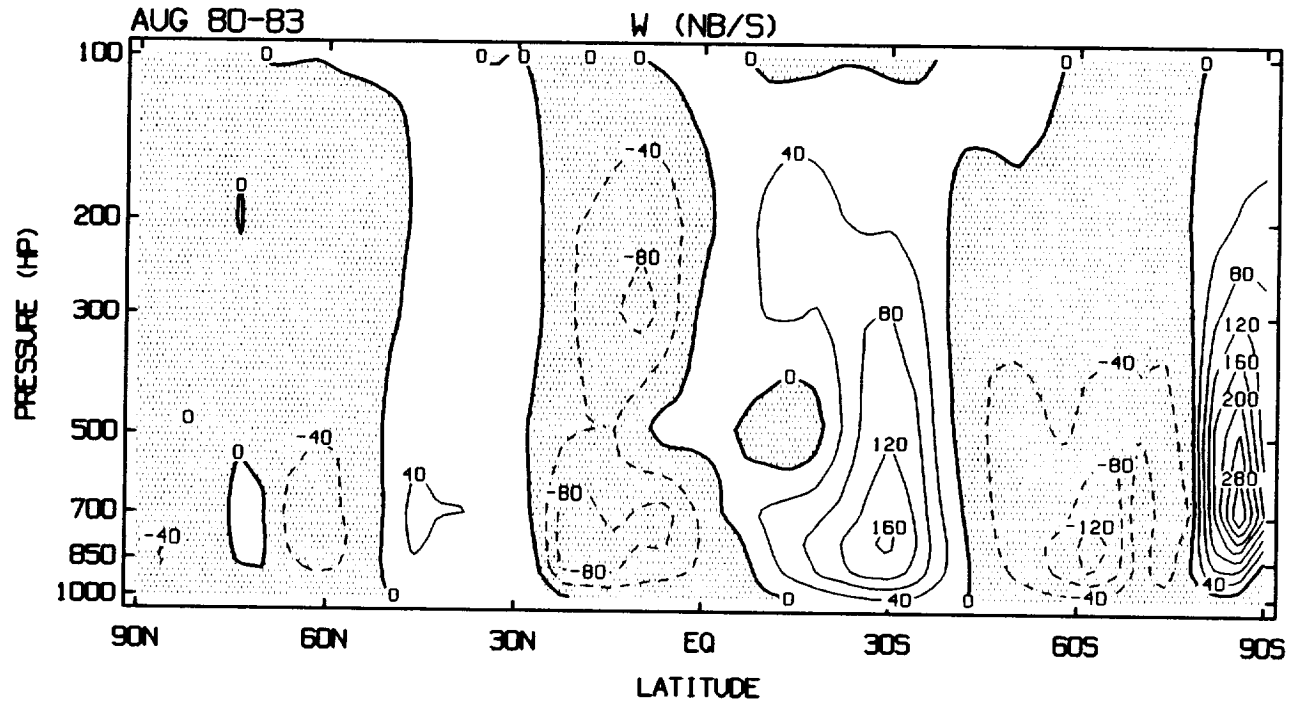

AUG 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0W
0
LONGITUDE

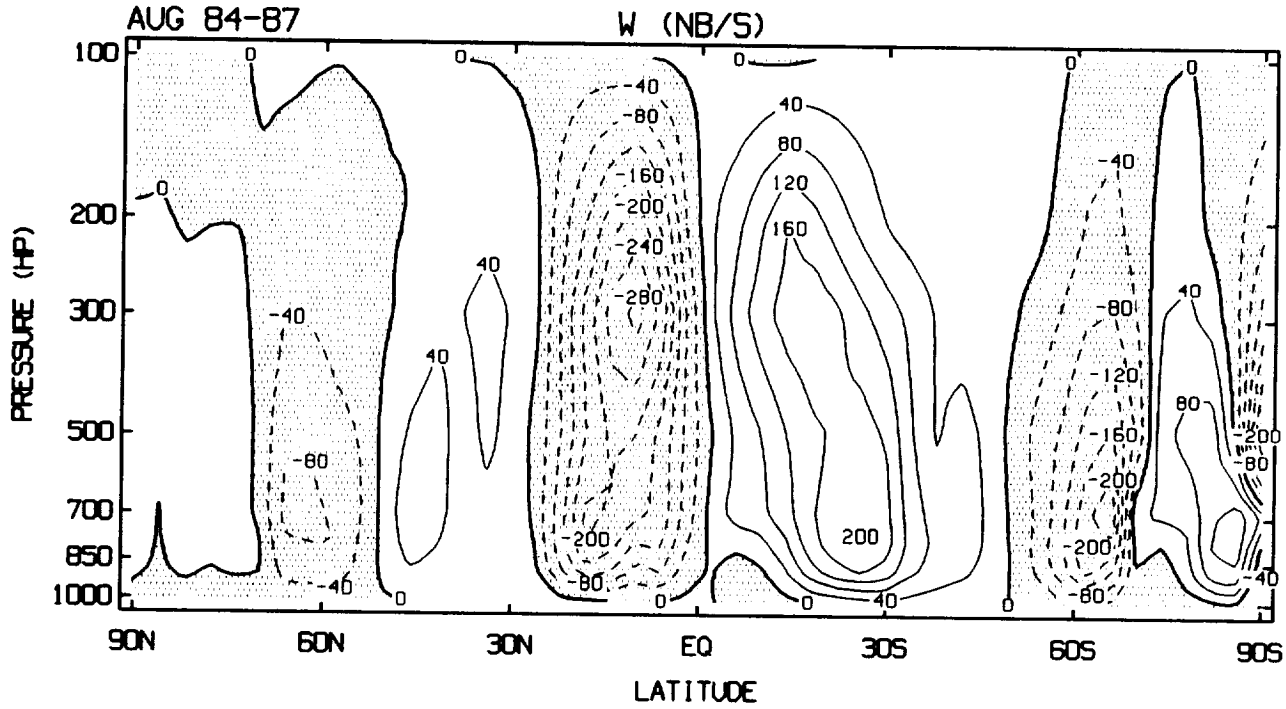

AUG 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
E-W
0
LONGITUDE

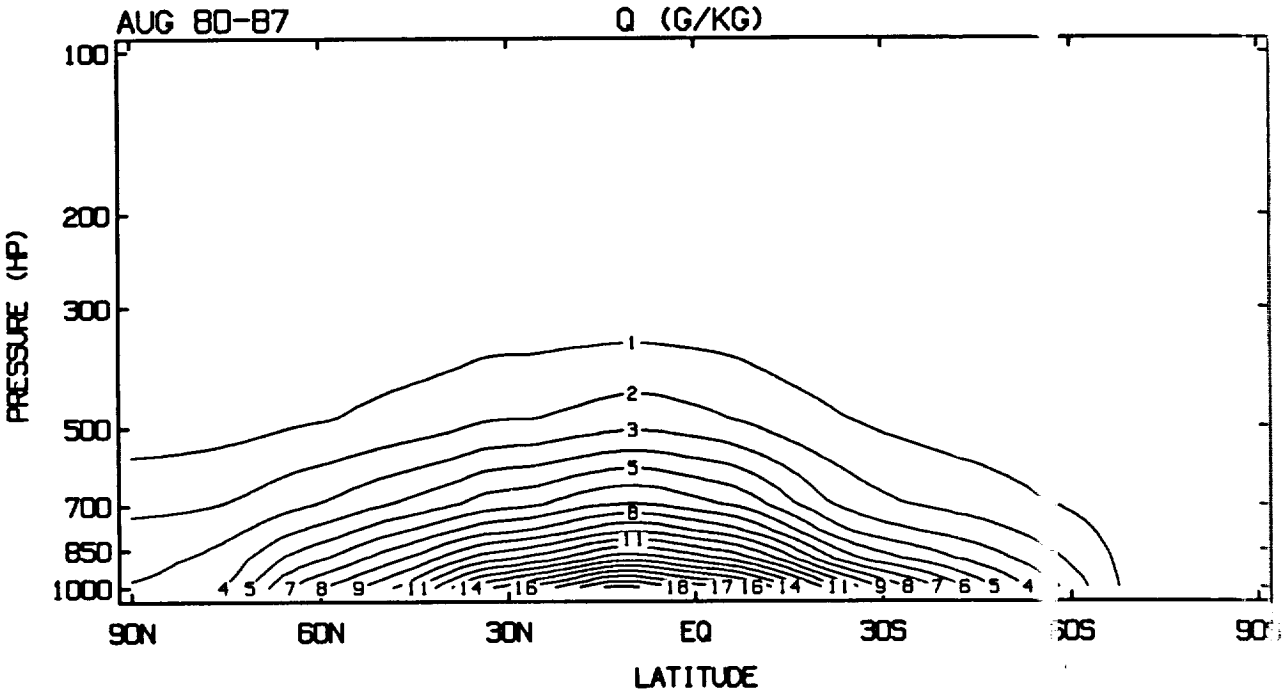

AUG 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1008
1012
1016
1020
1004
1000
980
992
984

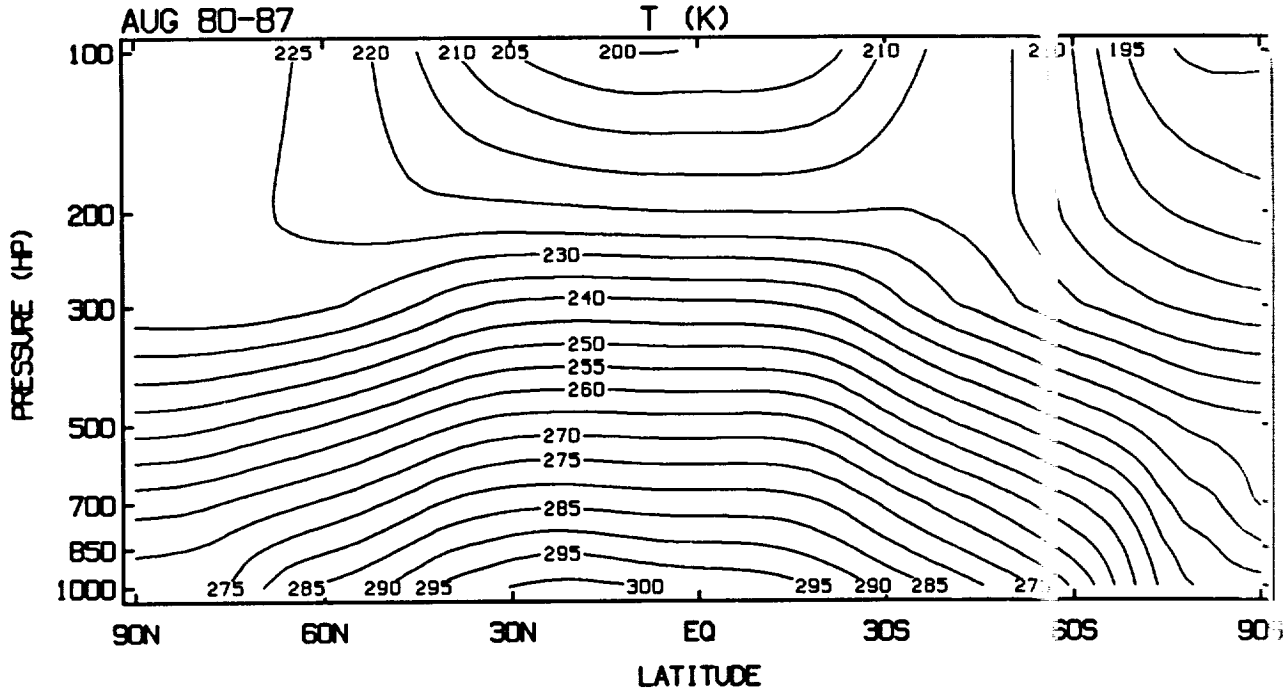

AUG 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


AUG 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


AUG 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


AUG 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

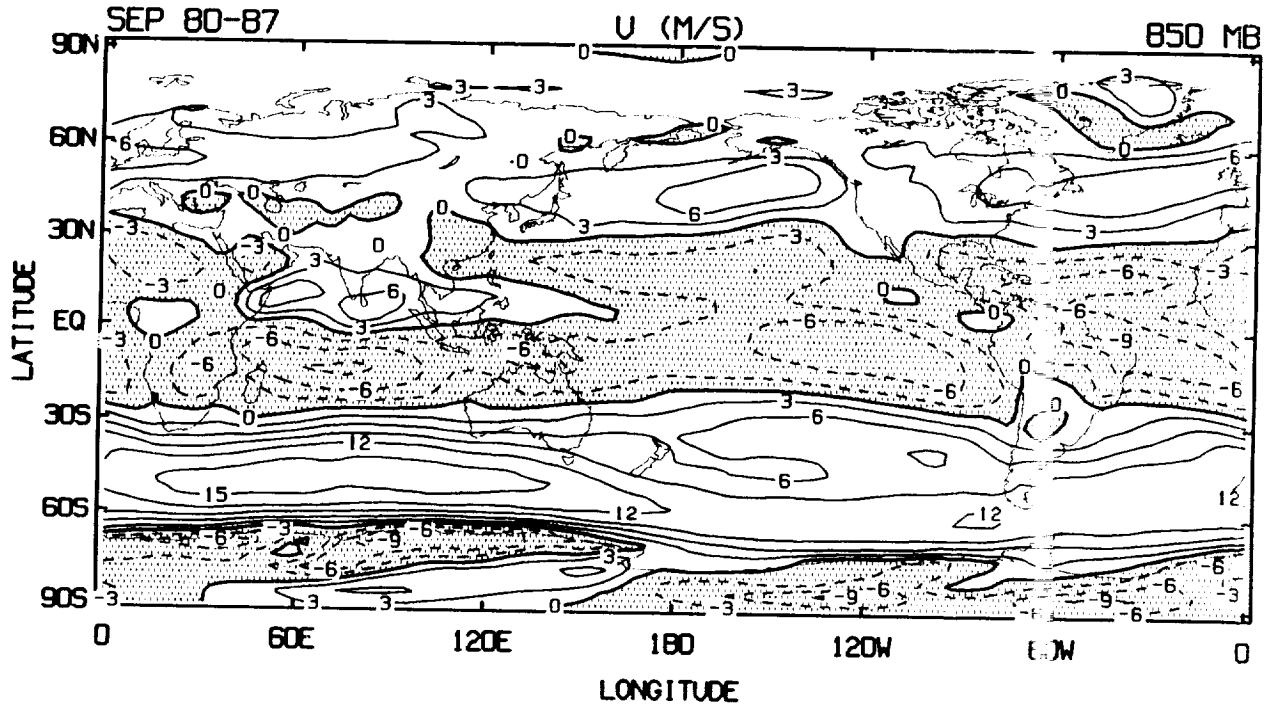

AUG 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
1
2
3
5
8
11
4 5 7 8 9 11 14 16 18 17 16 14 11 9 8 7 6 5 4
90N
60N
30N
EQ
30S
90
LATITUDE

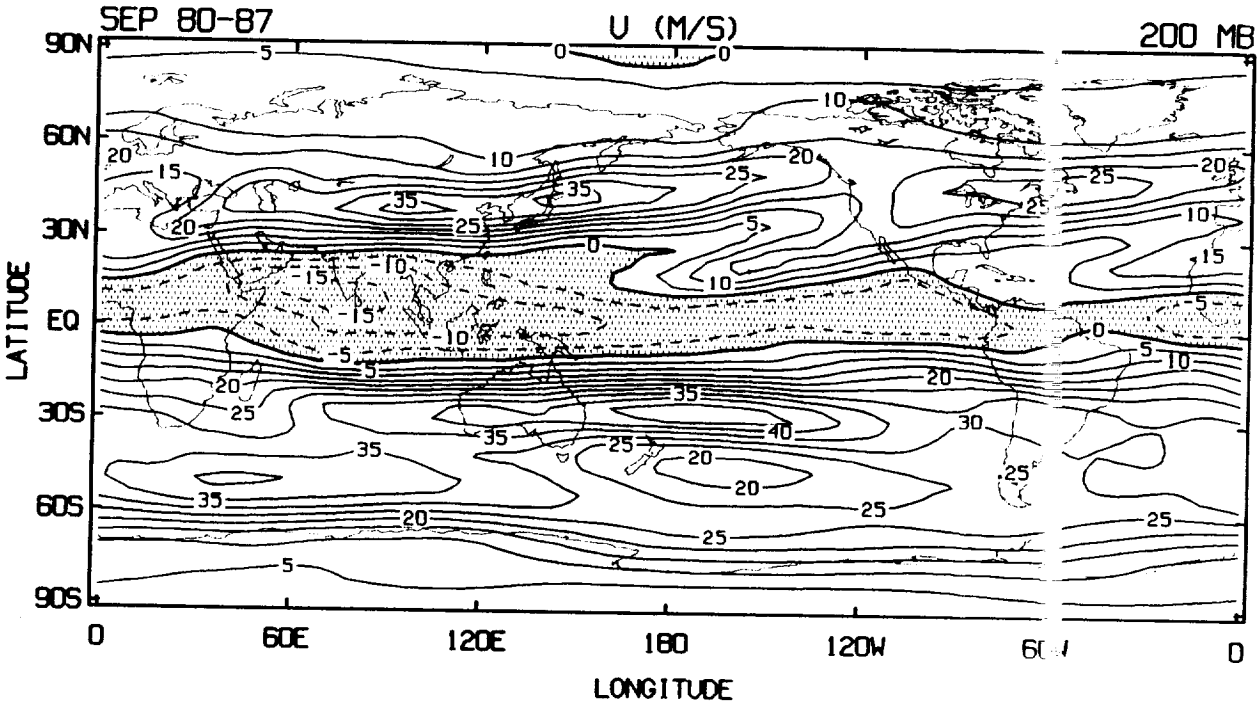

AUG 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
225
220
210
205
200
210
195
230
240
250
255
260
270
275
285
295
275
285
290
295
300
295
290
285
90N
60N
30N
EQ
30S
90
LATITUDE

SEPTEMBER

PRECEDING PAGE BLANK NOT FILMED

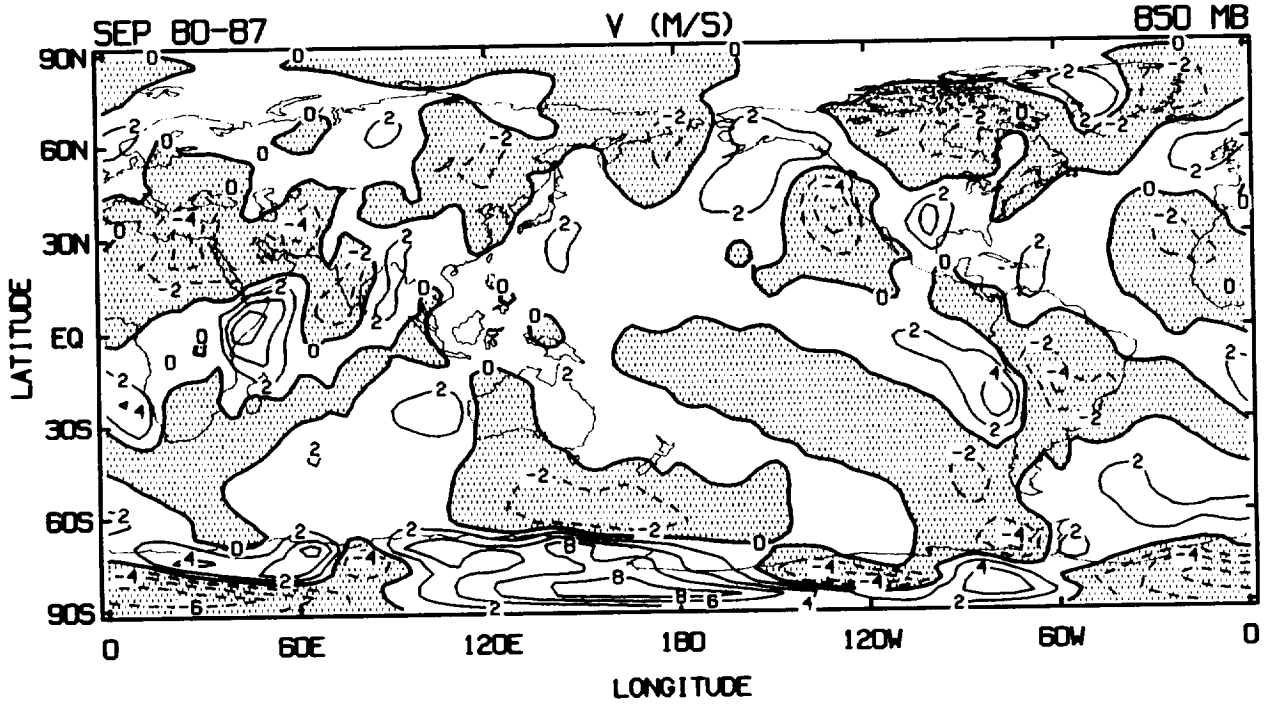
PAGE 112 INTENTIONALLY BLANK

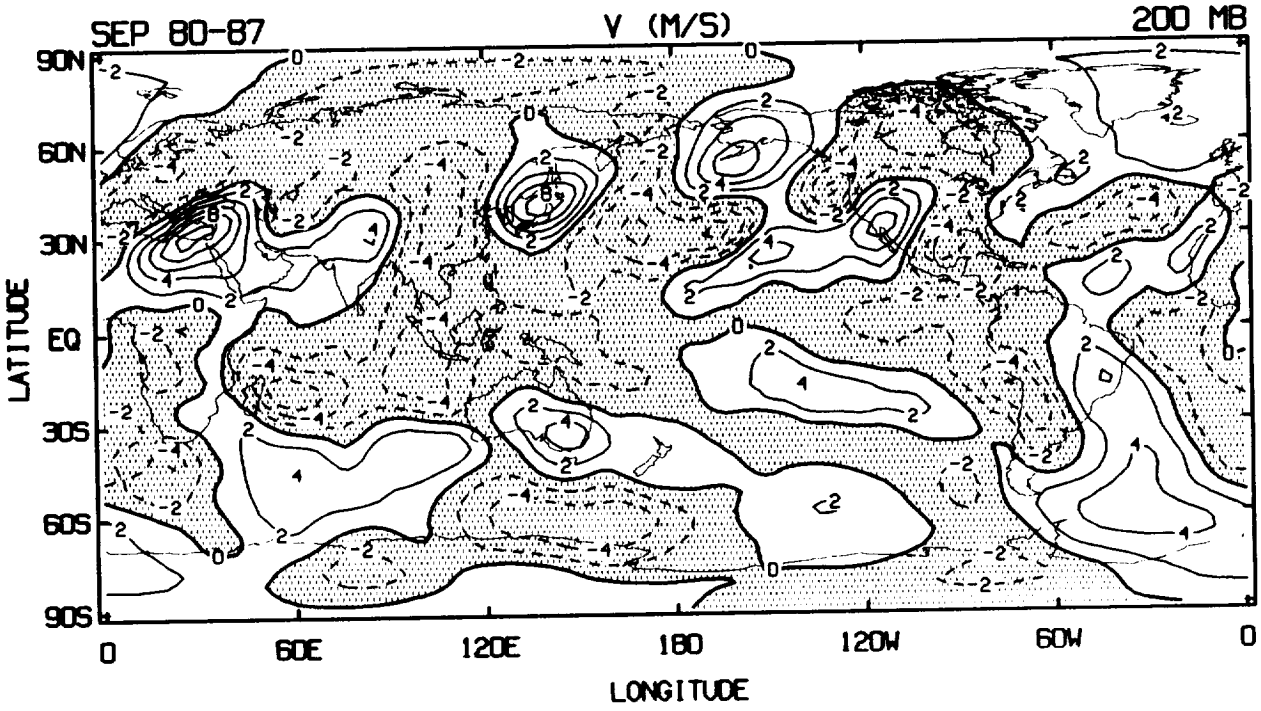


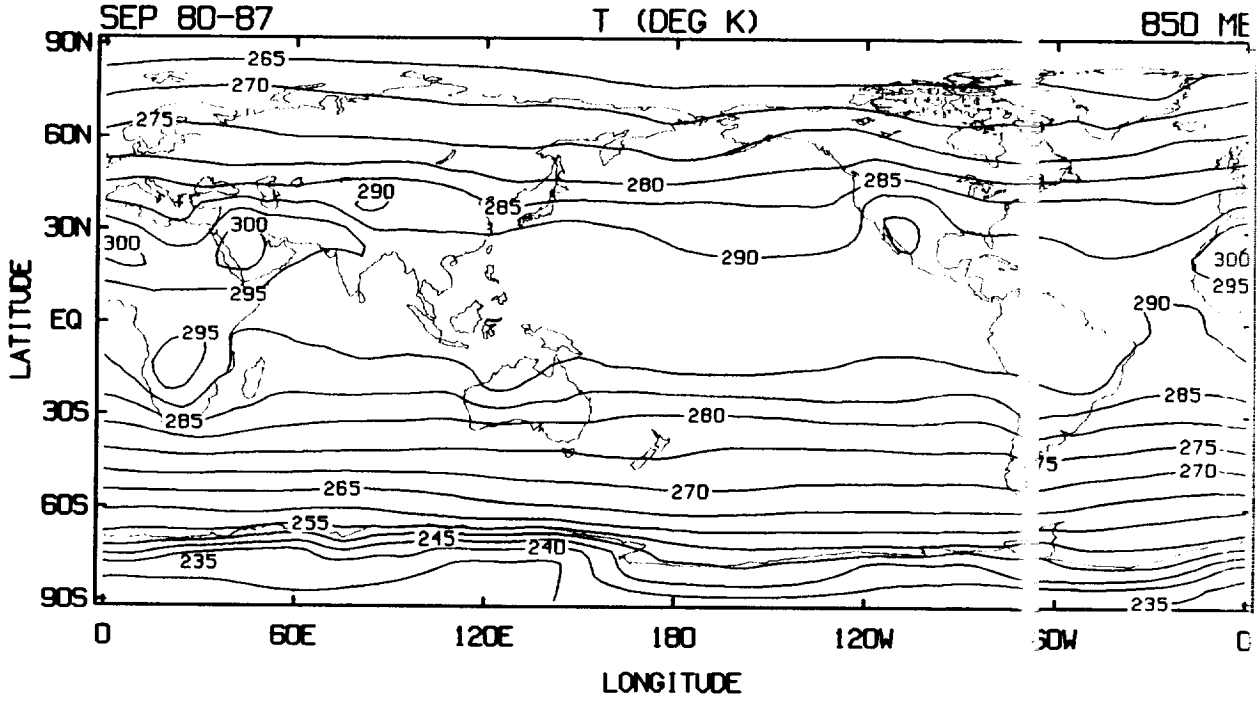


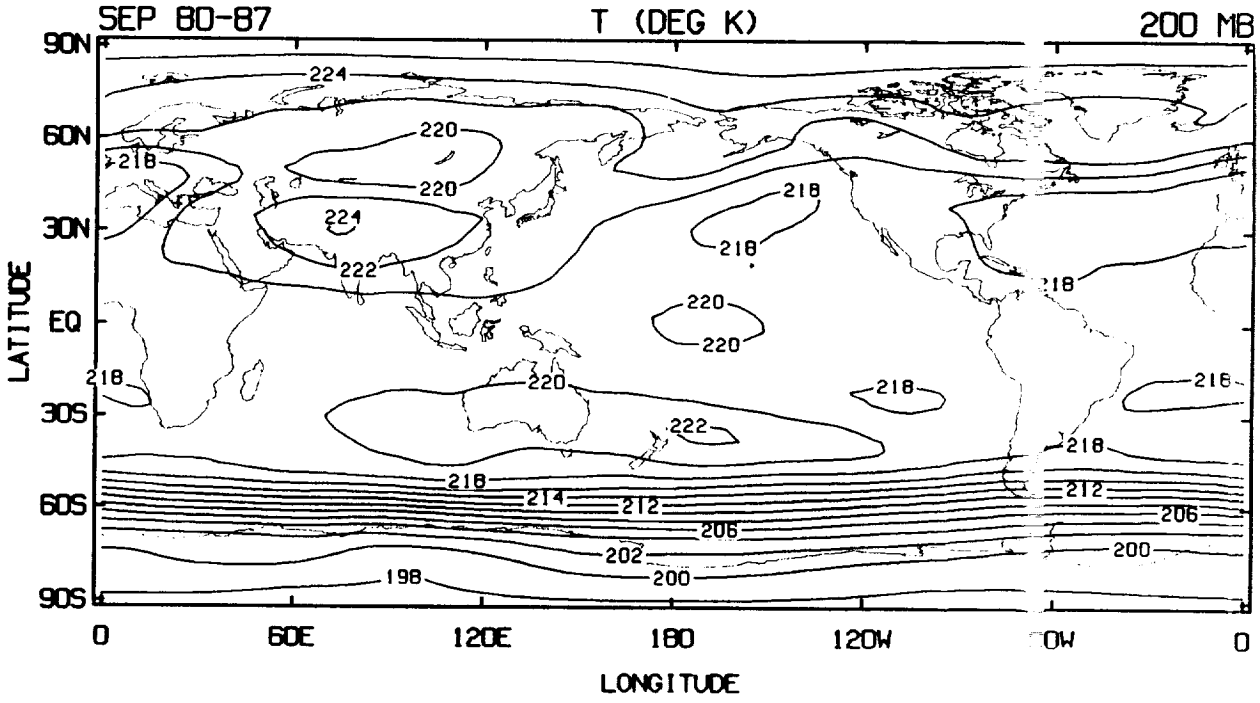
PRECEDING PAGE BLANK NOT FILMED

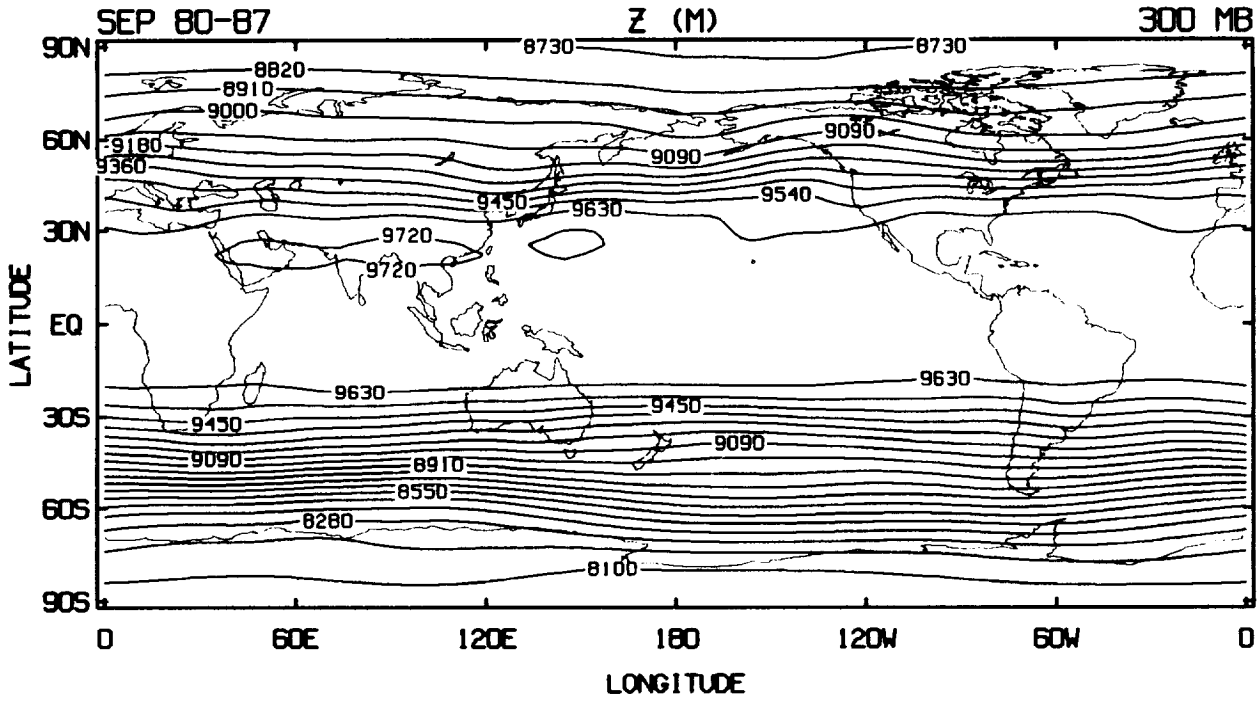
PAGE 114 INTENTIONALLY BLANK

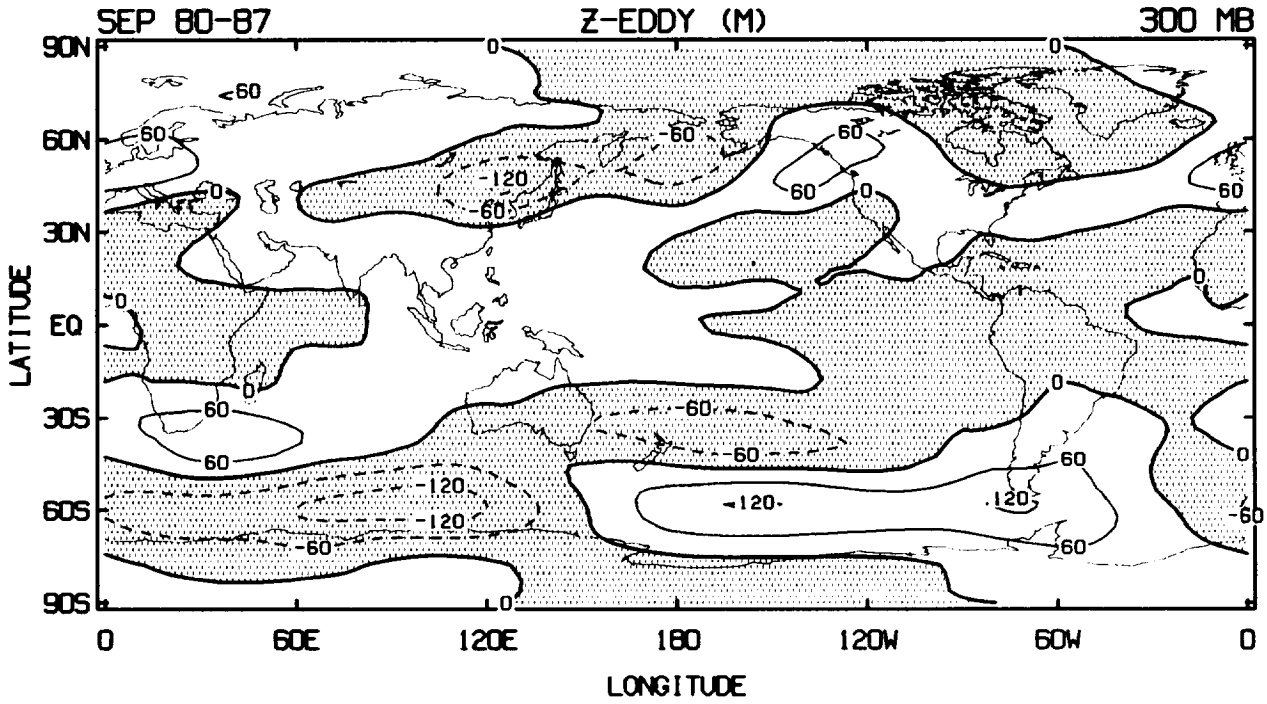

SEP 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

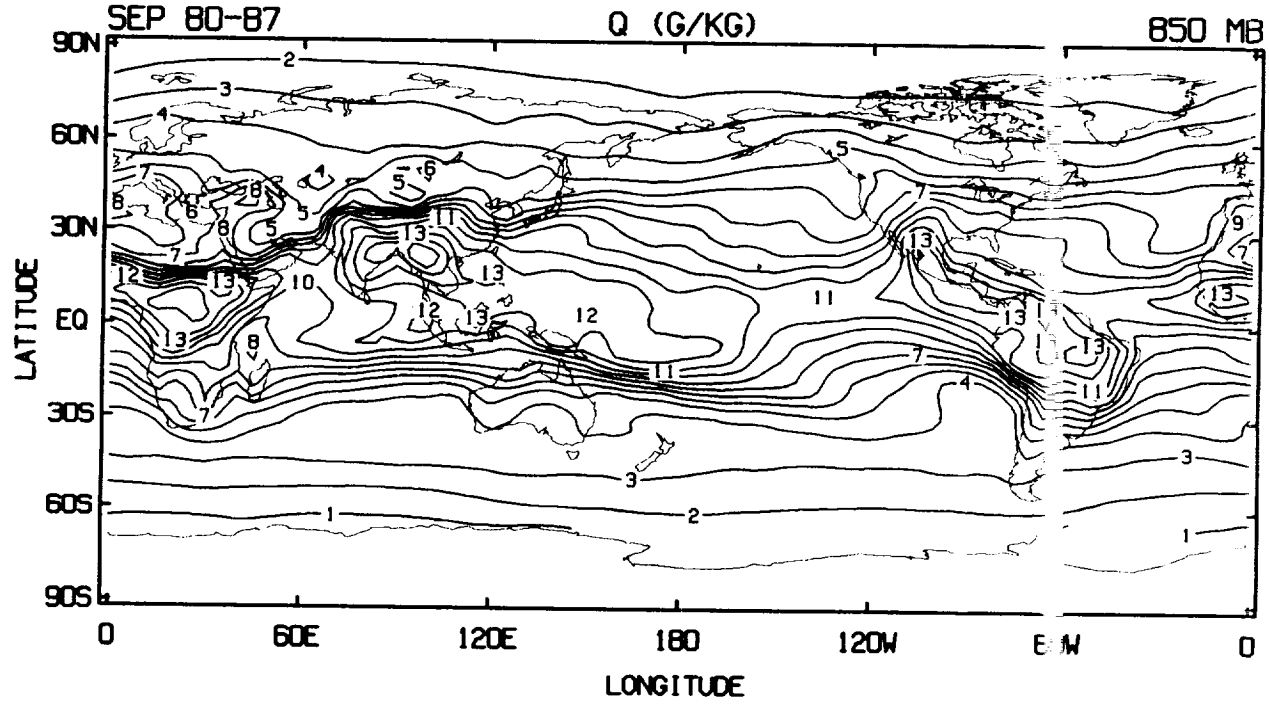

SEP 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

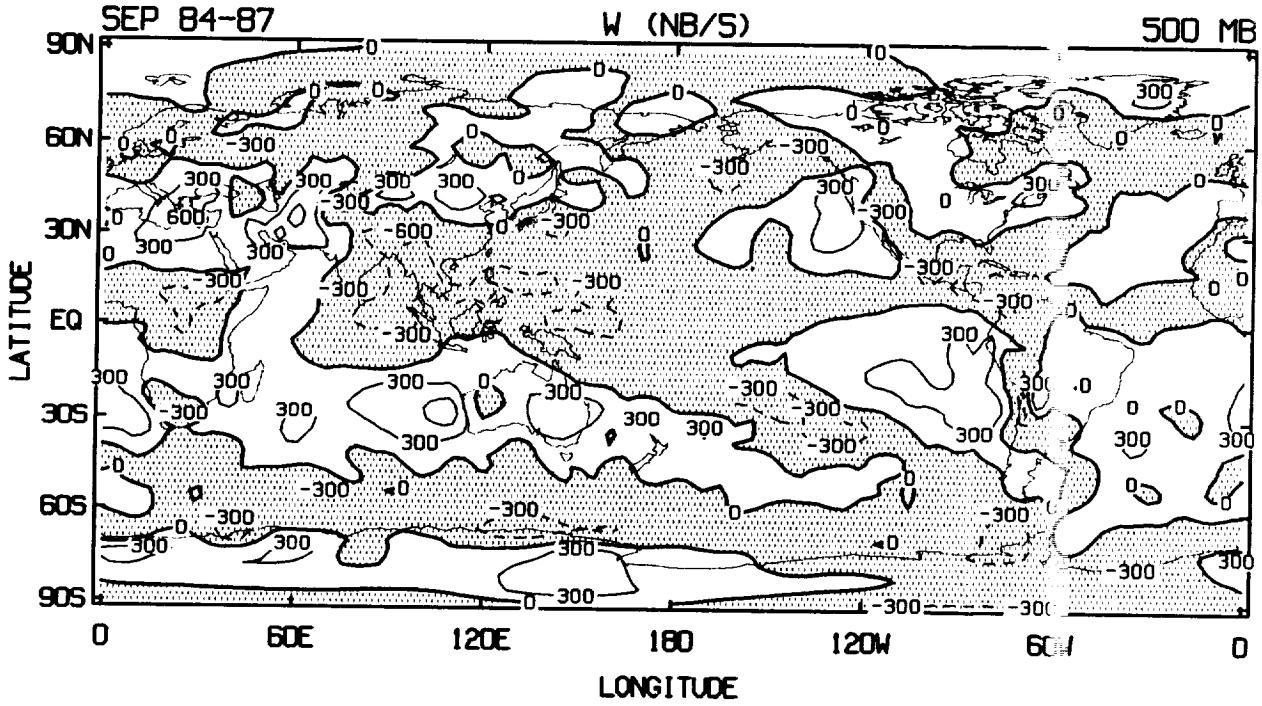

SEP 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
265
270
275
280
285
290
295
300
255
245
240
235
0
60E
120E
180
120W
LONGITUDE

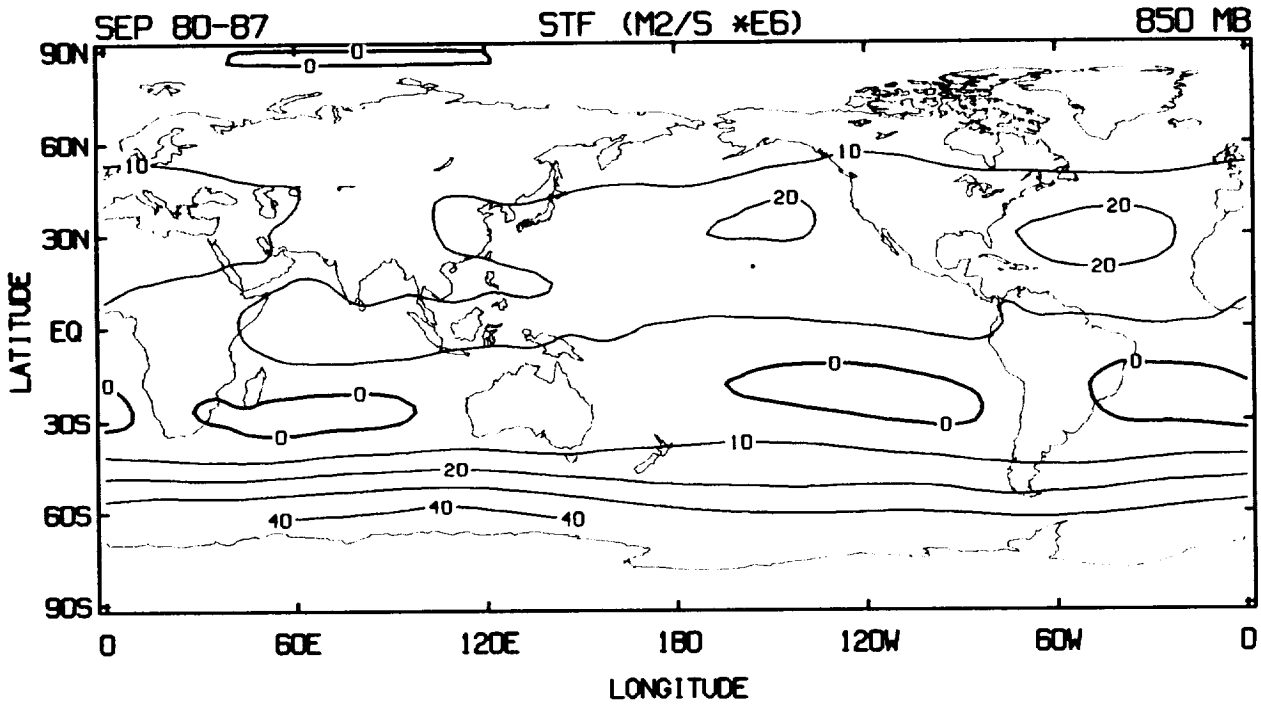

SEP 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
224
220
218
222
214
212
206
202
200
198
0
60E
120E
180
120W
LONGITUDE

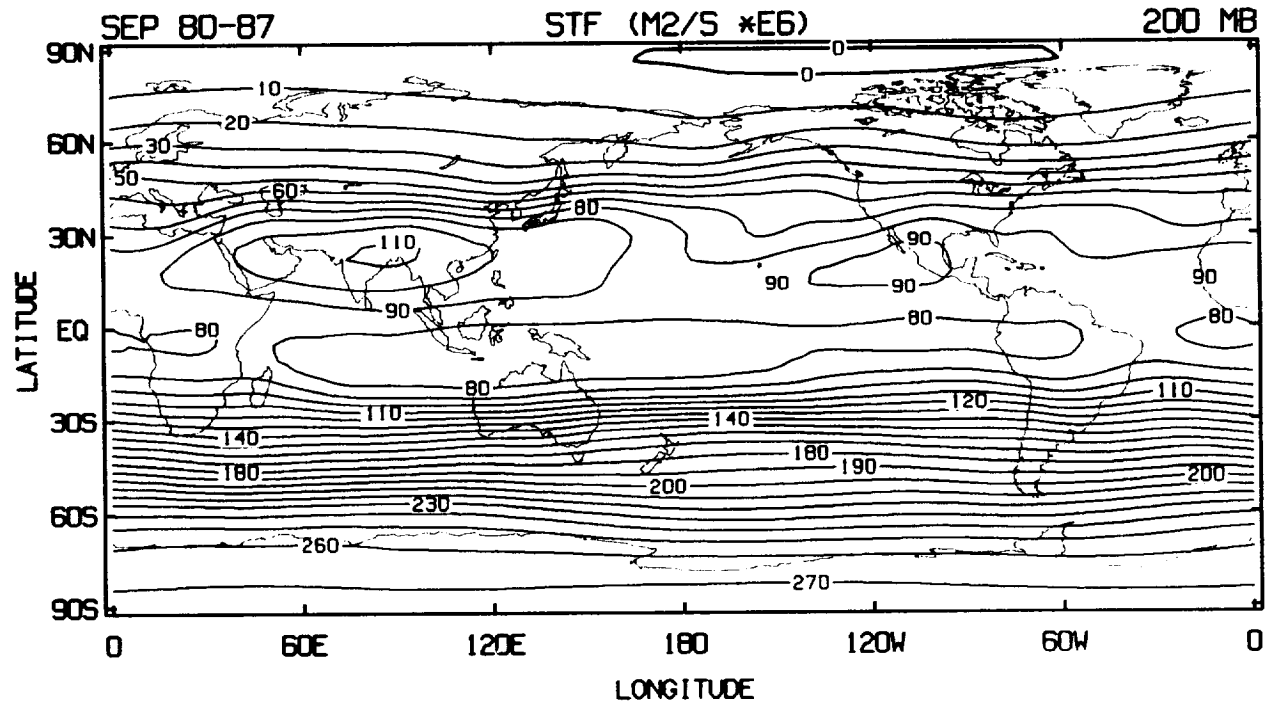

SEP 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
8730
8820
8910
9000
9180
9360
9090
9450
9630
9540
9720
8550
8280
8100

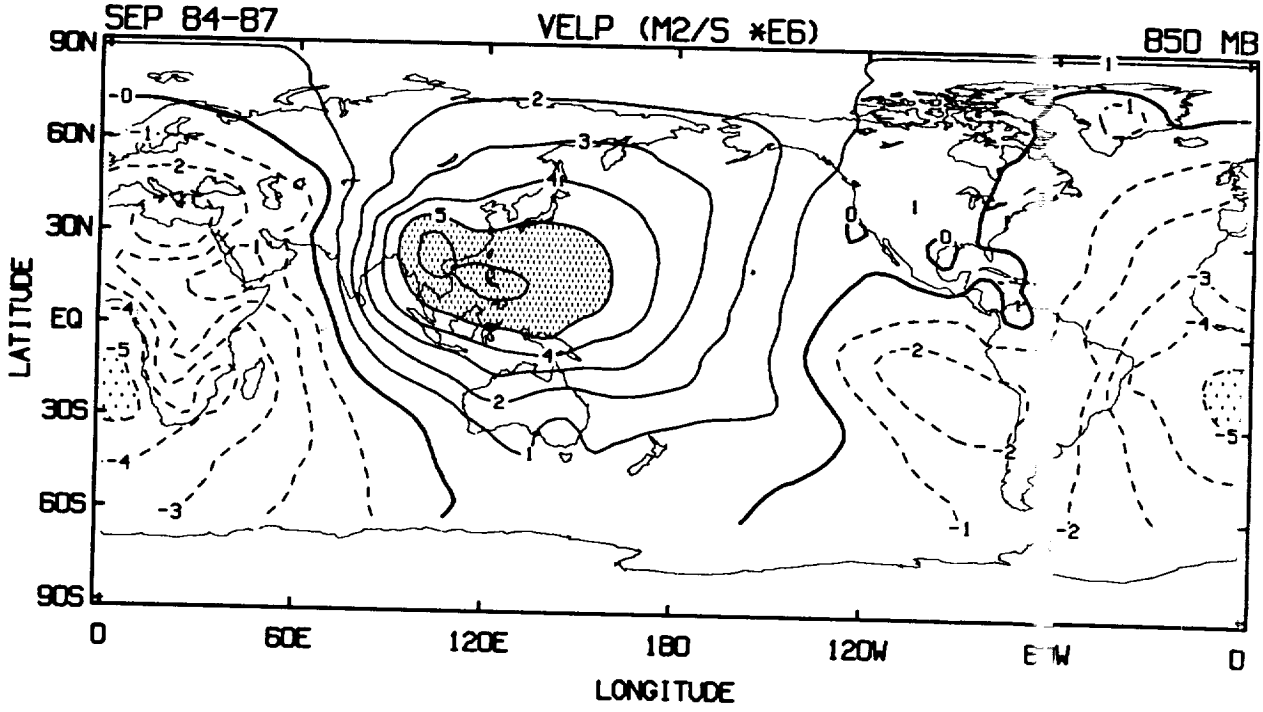

SEP 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
60
-60
120
-120

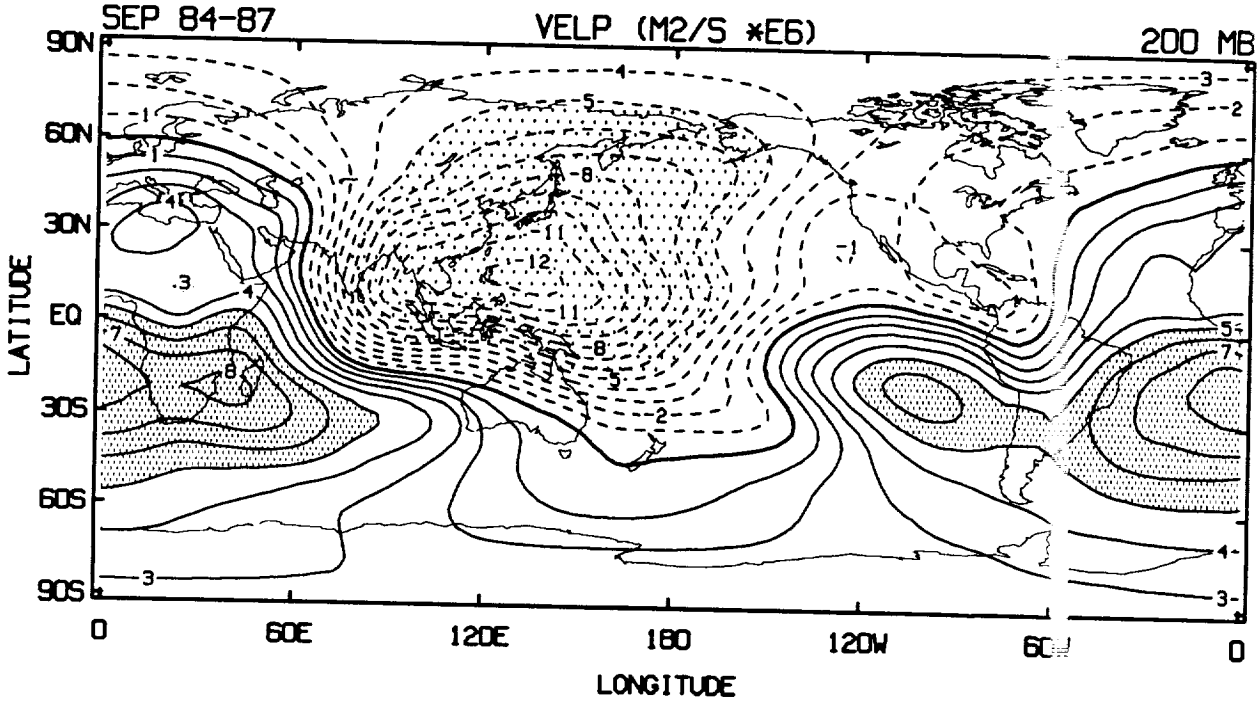

SEP 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

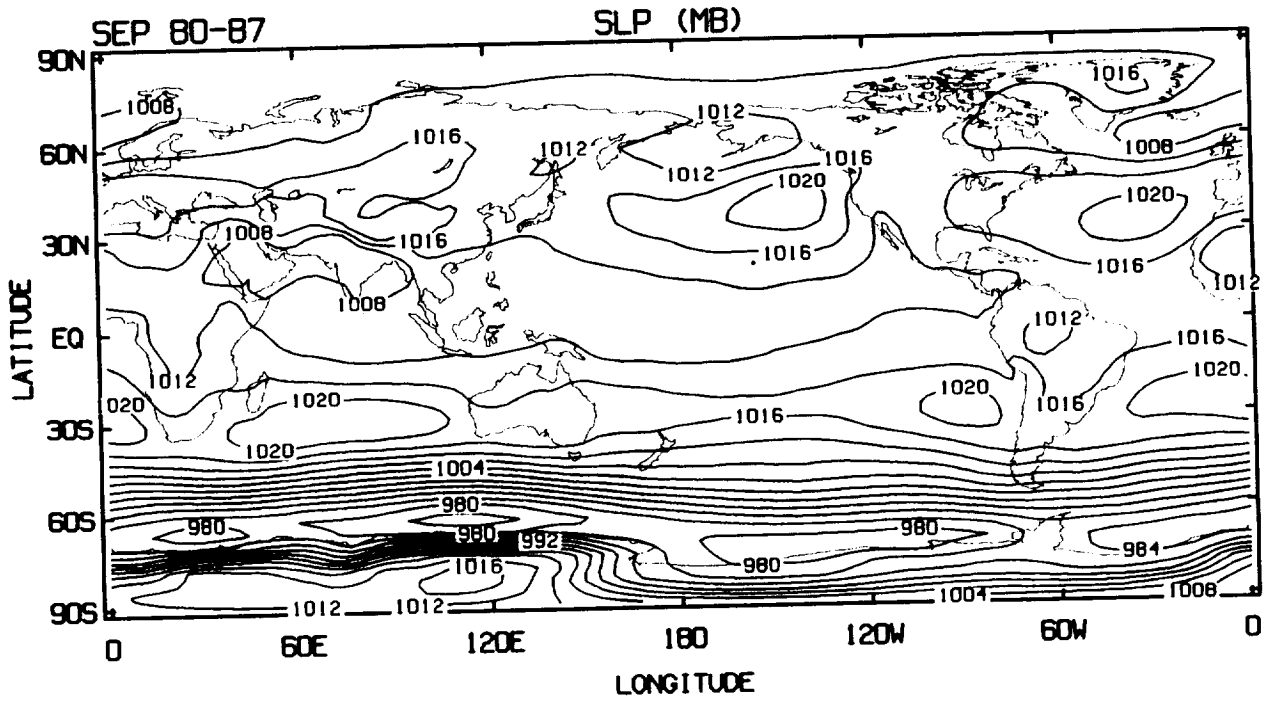

SEP 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

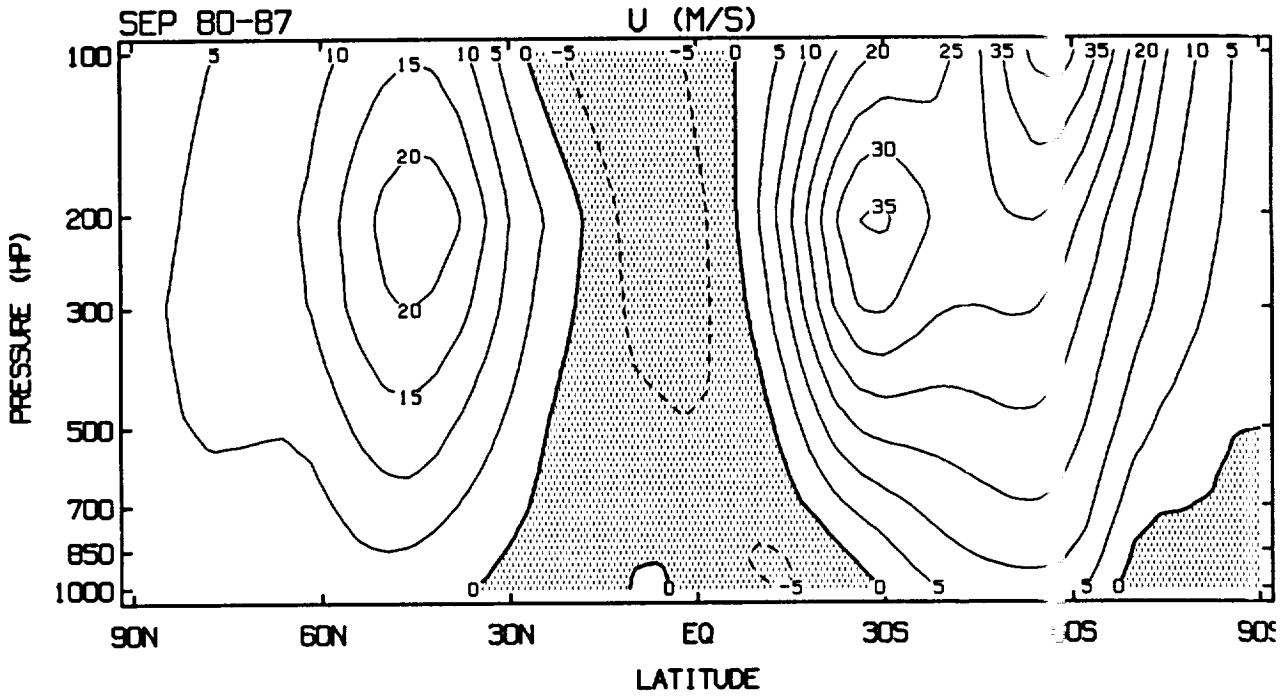

SEP 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

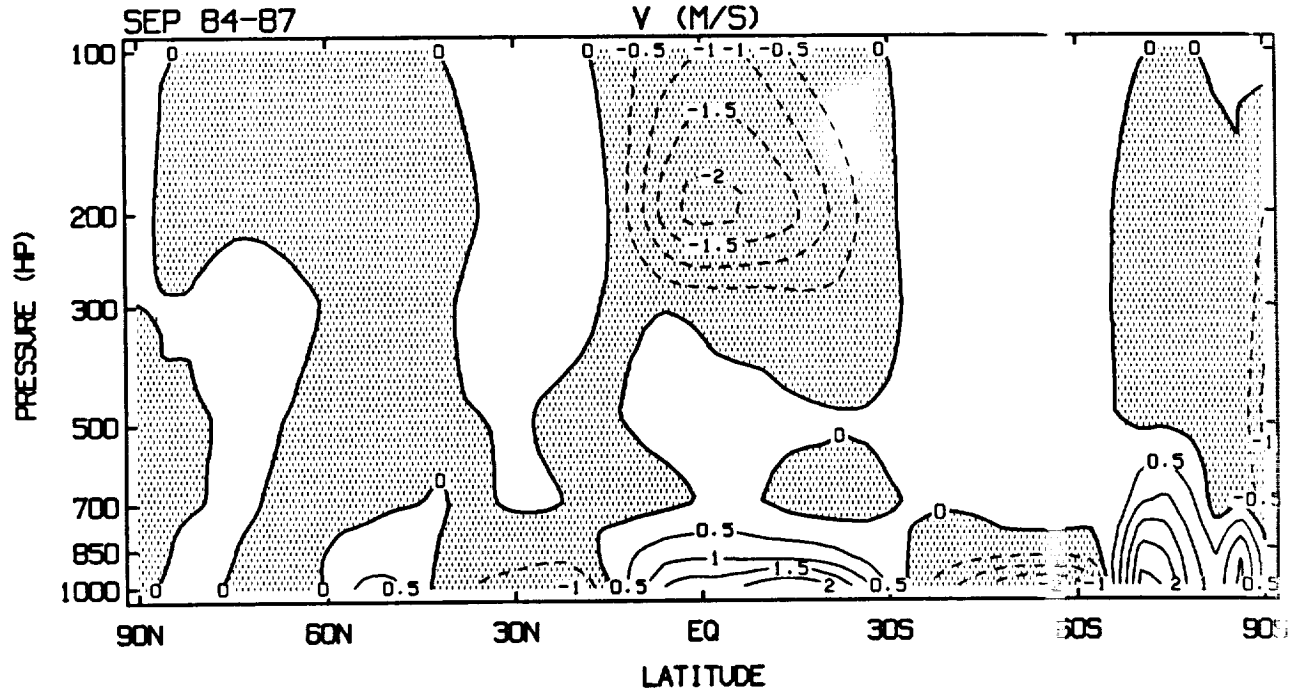

SEP 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

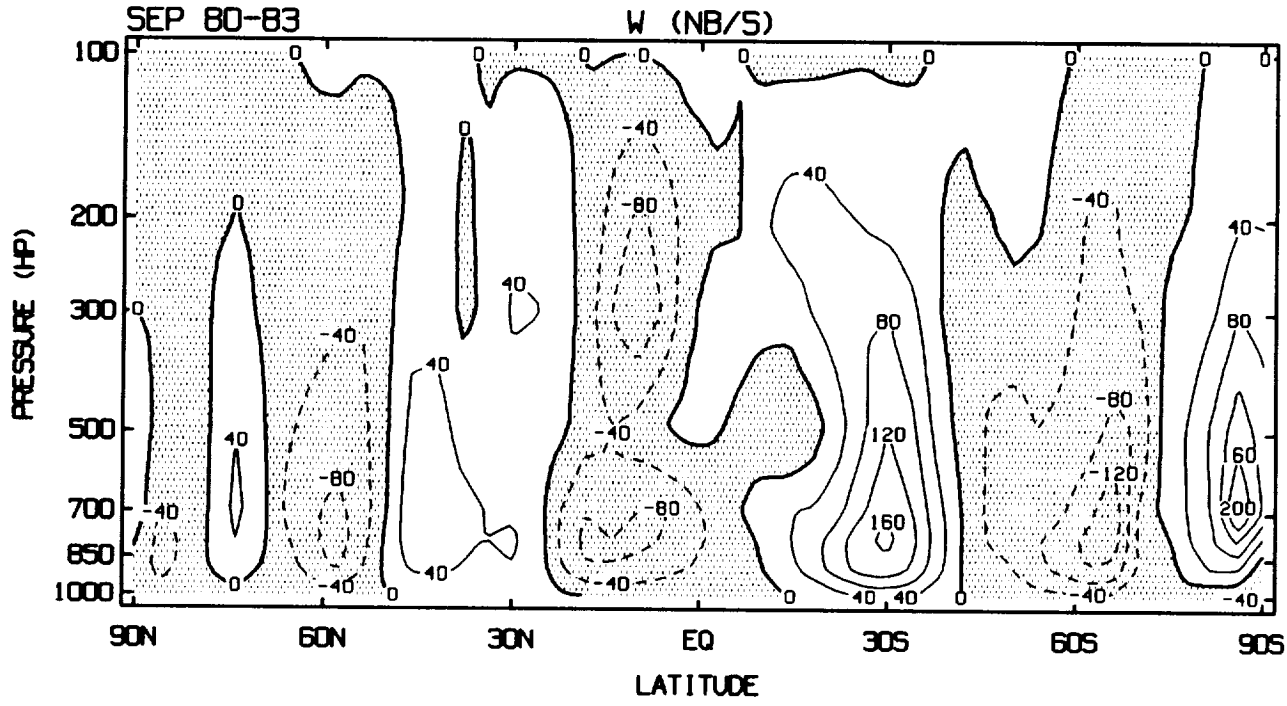

SEP 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
E TW
0
LONGITUDE

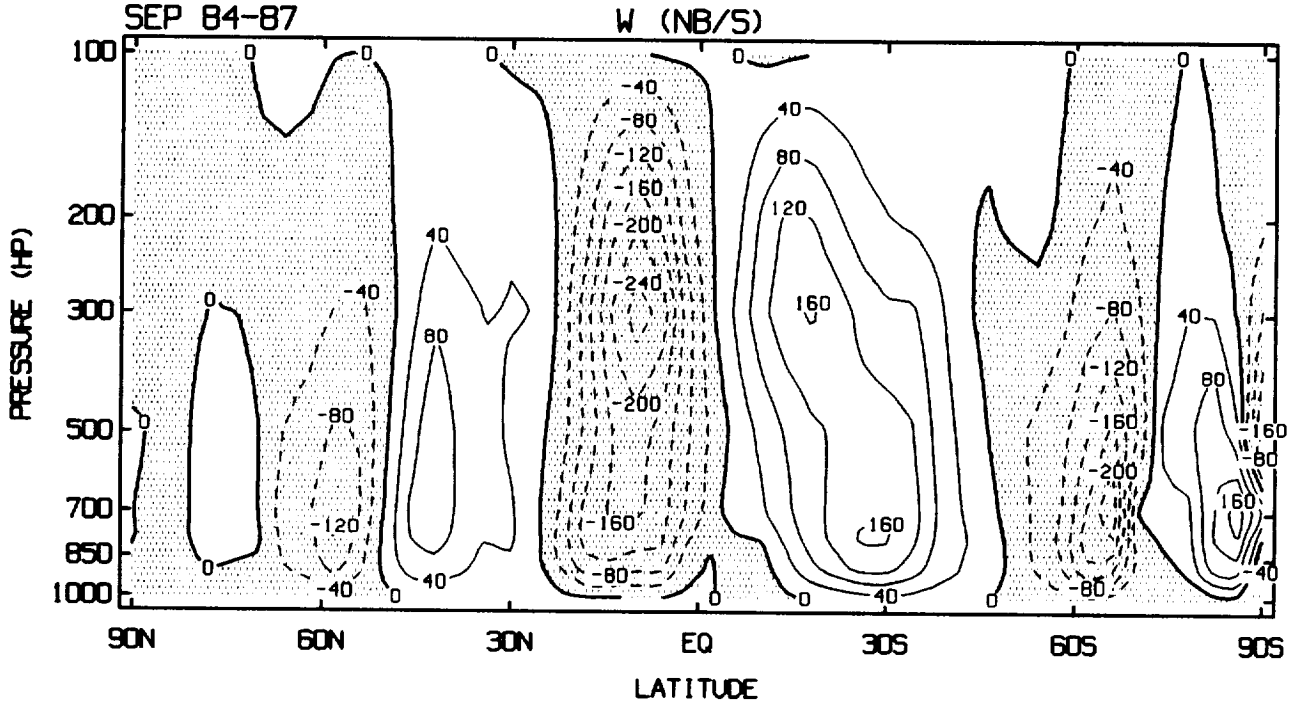

SEP 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

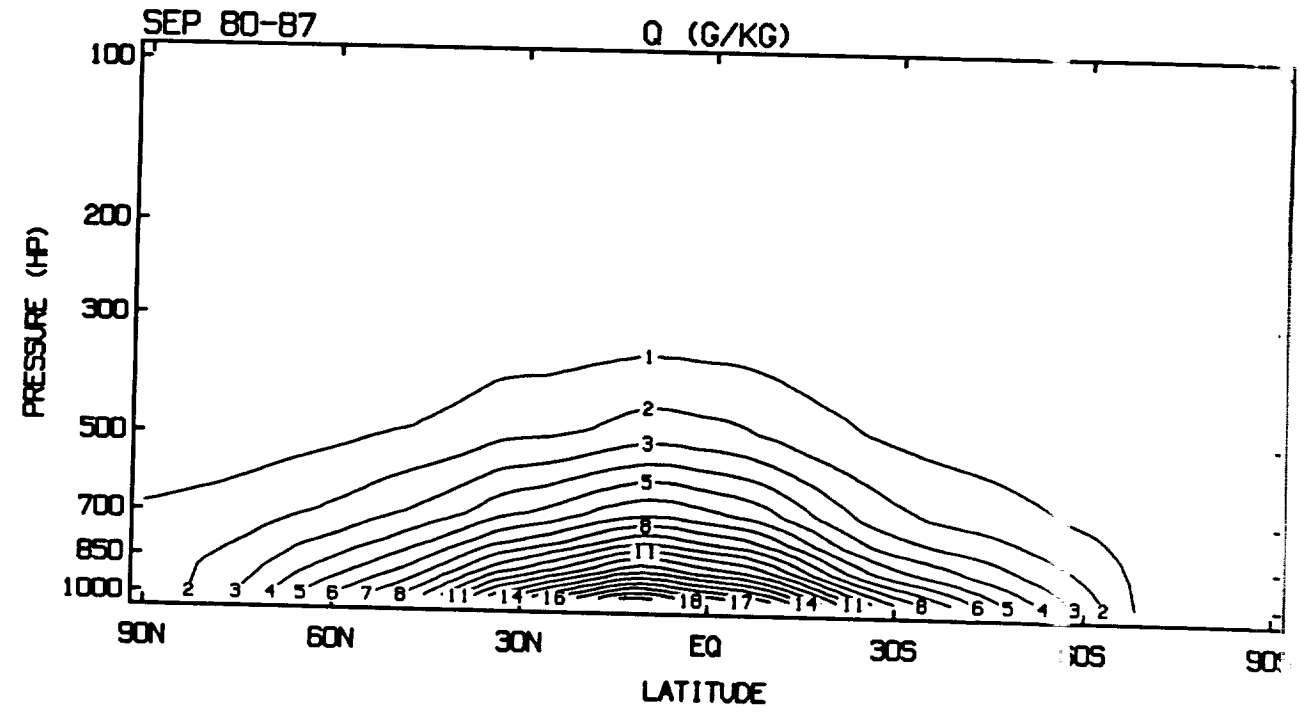

SEP 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1008
1016
1012
1020
1004
980
992
984

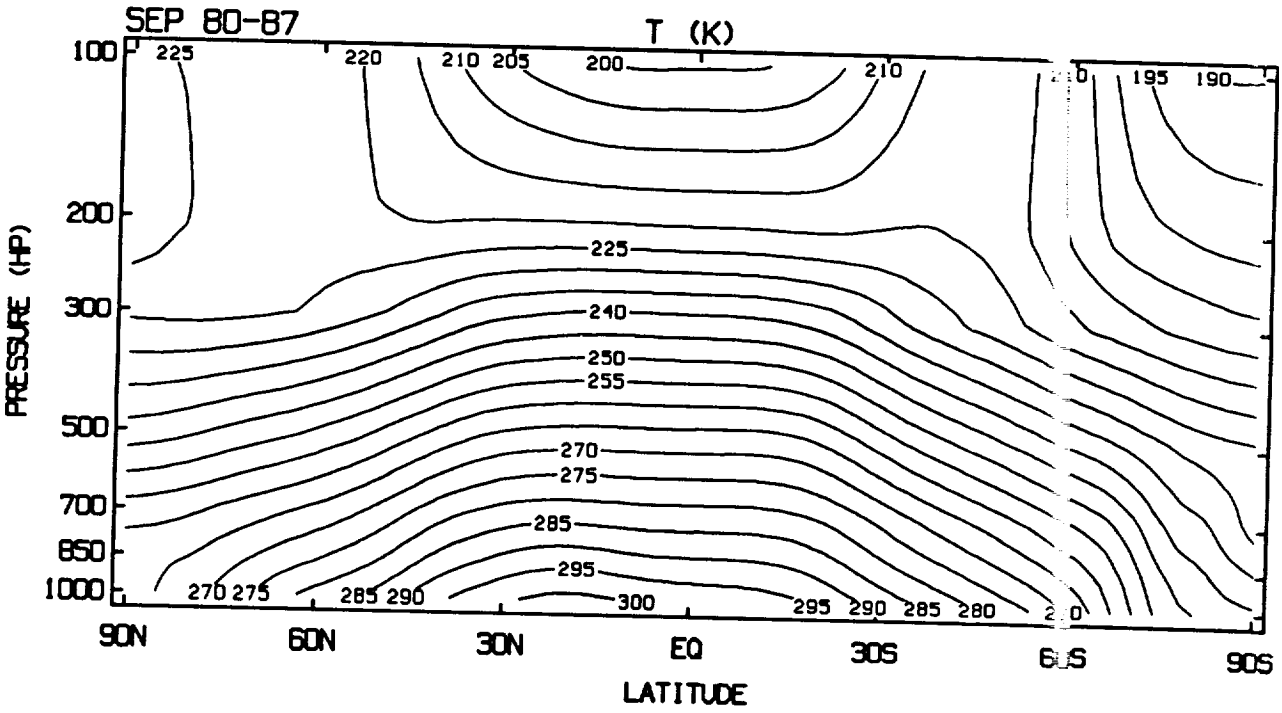

SEP 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
LATITUDE


SEP 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
LATITUDE


SEP 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


SEP 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

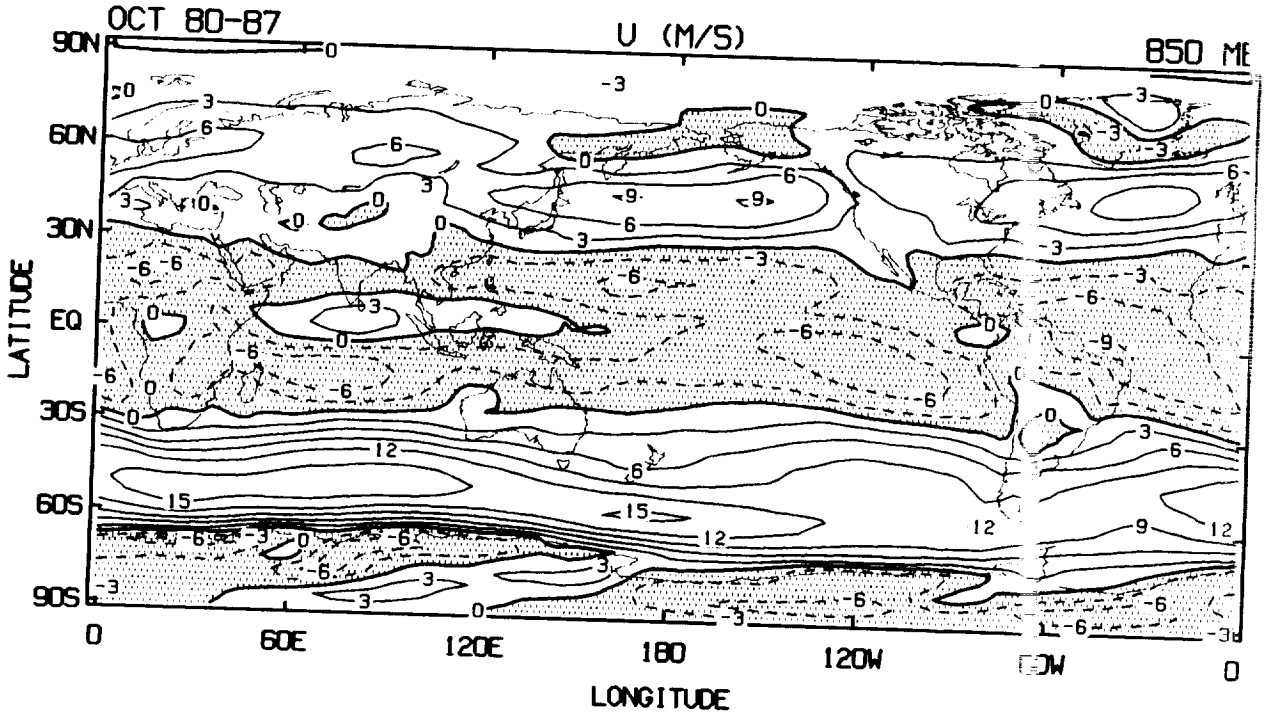

SEP 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
1
2
3
5
8
11
2 3 4 5 6 7 8 11 14 16 18 17 14 11 8 6 5 4 3 2
90N
60N
30N
EQ
30S
90S
LATITUDE

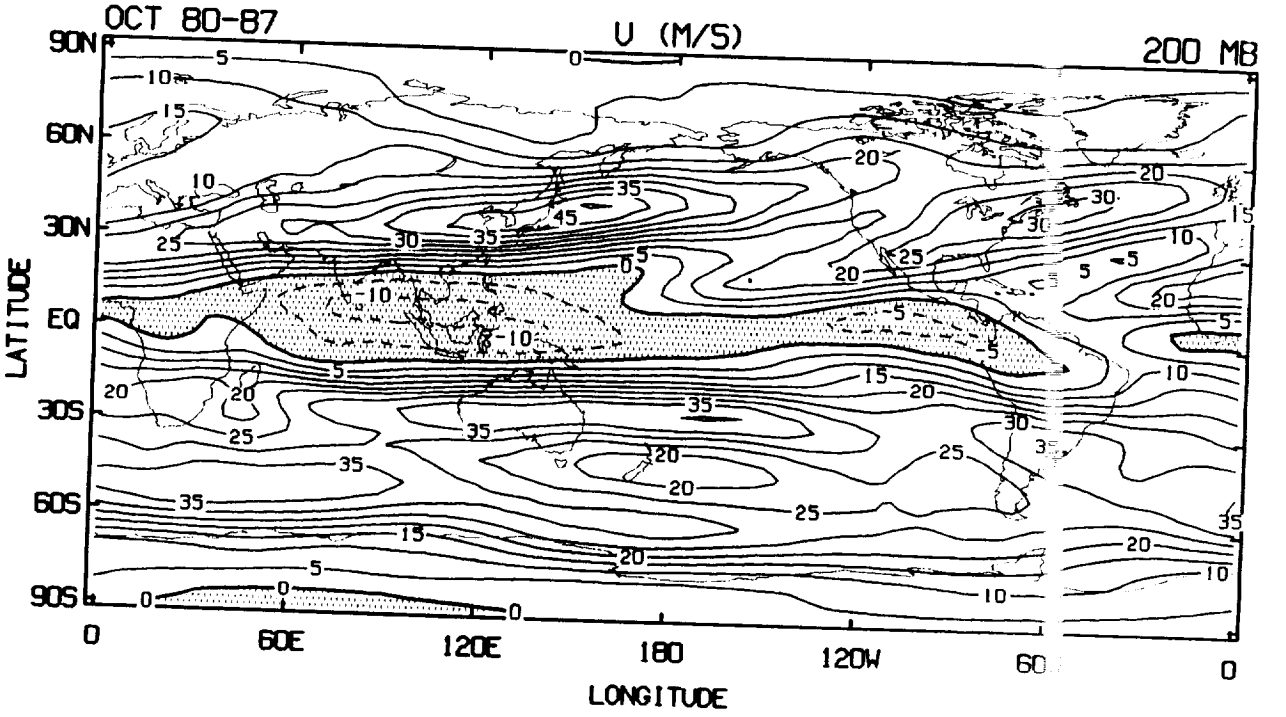

SEP 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
225
220
210 205
200
210
195 190
225
240
250
255
270
275
285
295
300
270 275
285 290
295 290 285 280
90N
60N
30N
EQ
30S
90S
LATITUDE

OCTOBER

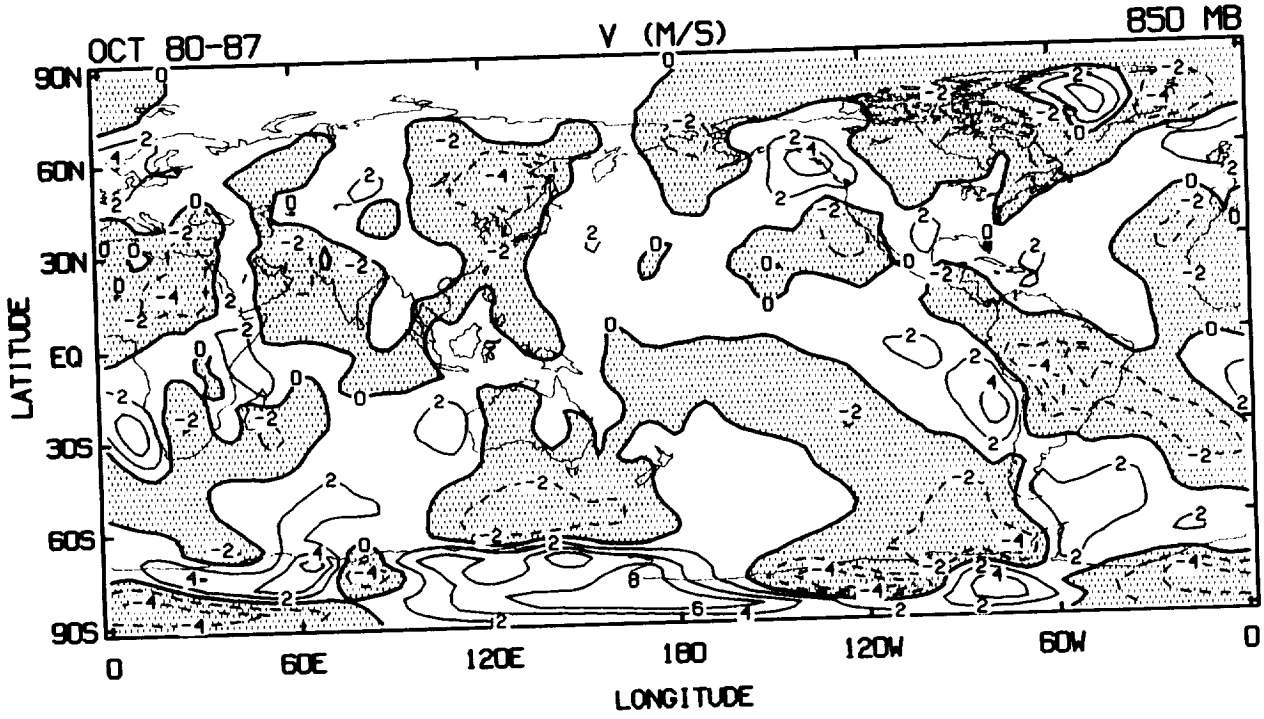
PRECEDING PAGE BLANK NOT FILMED

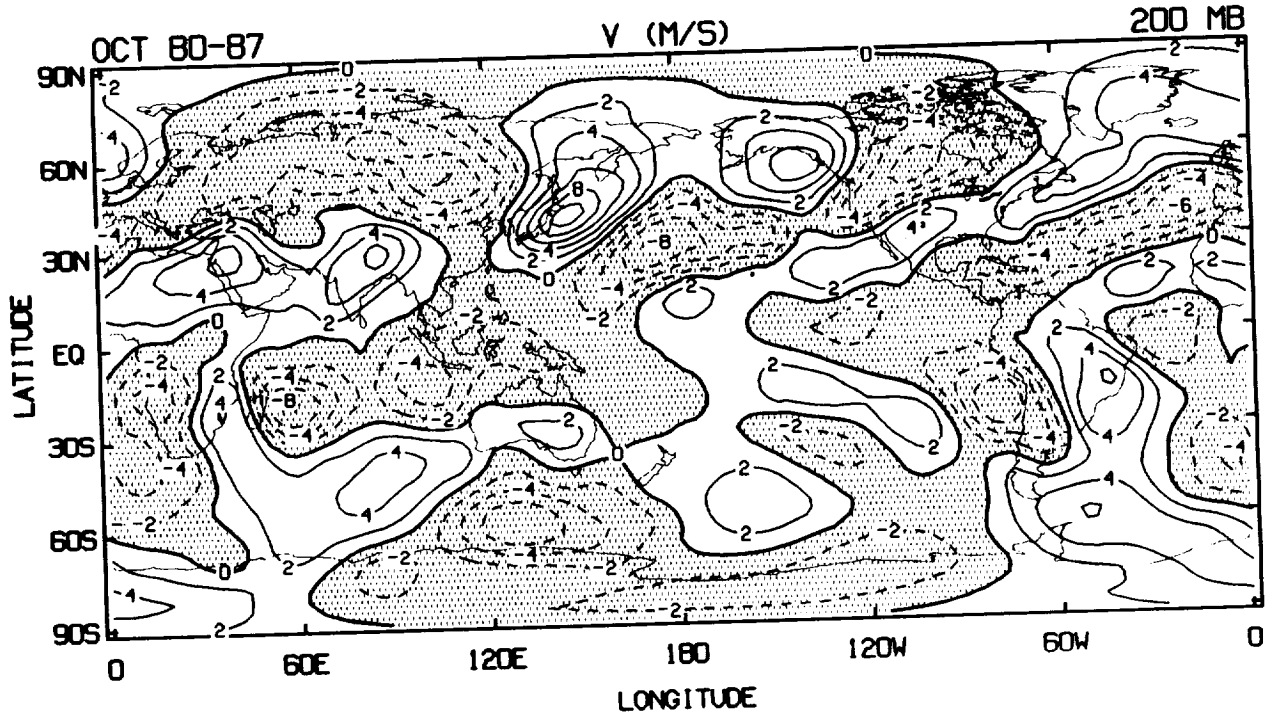
PAGE 126 INTENTIONALLY BLANK

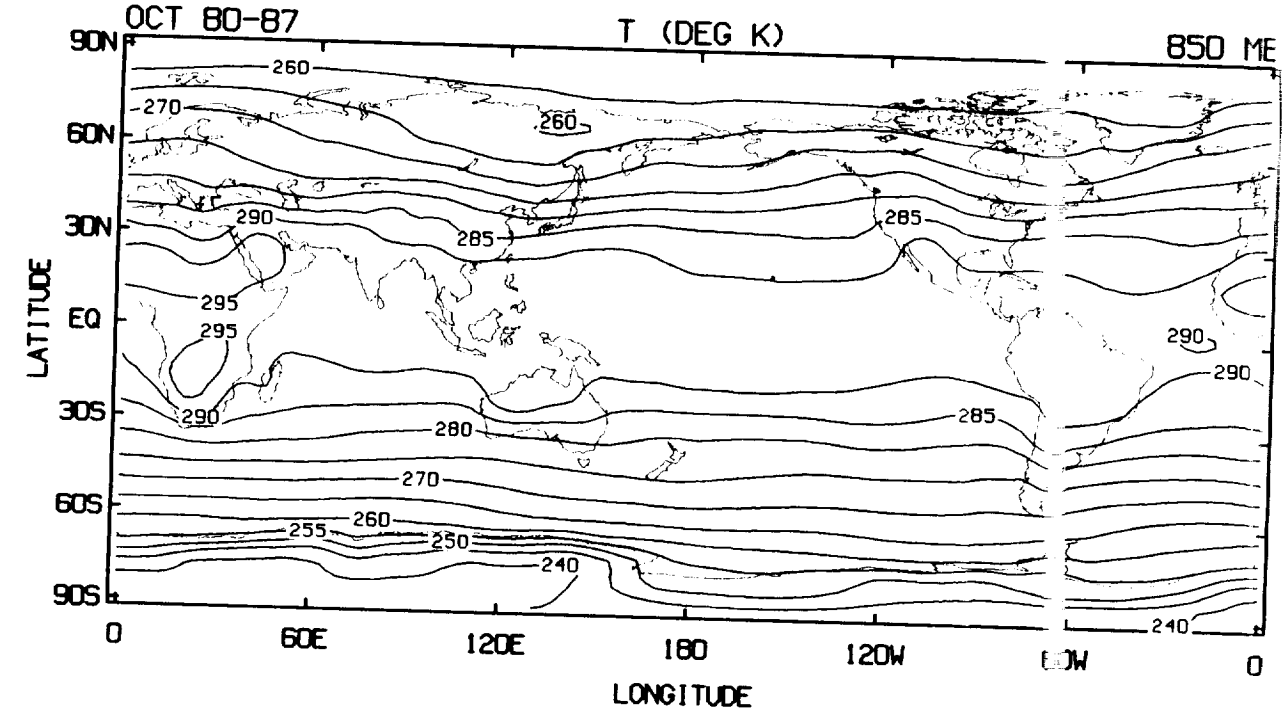


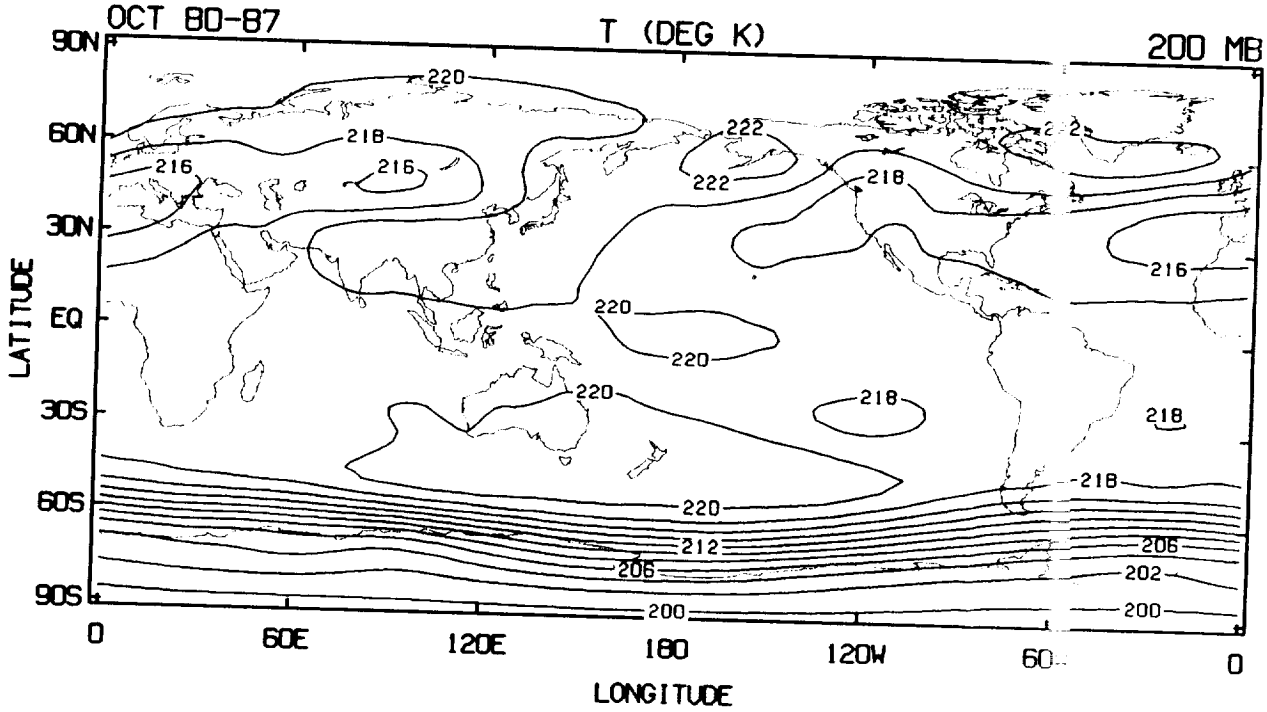


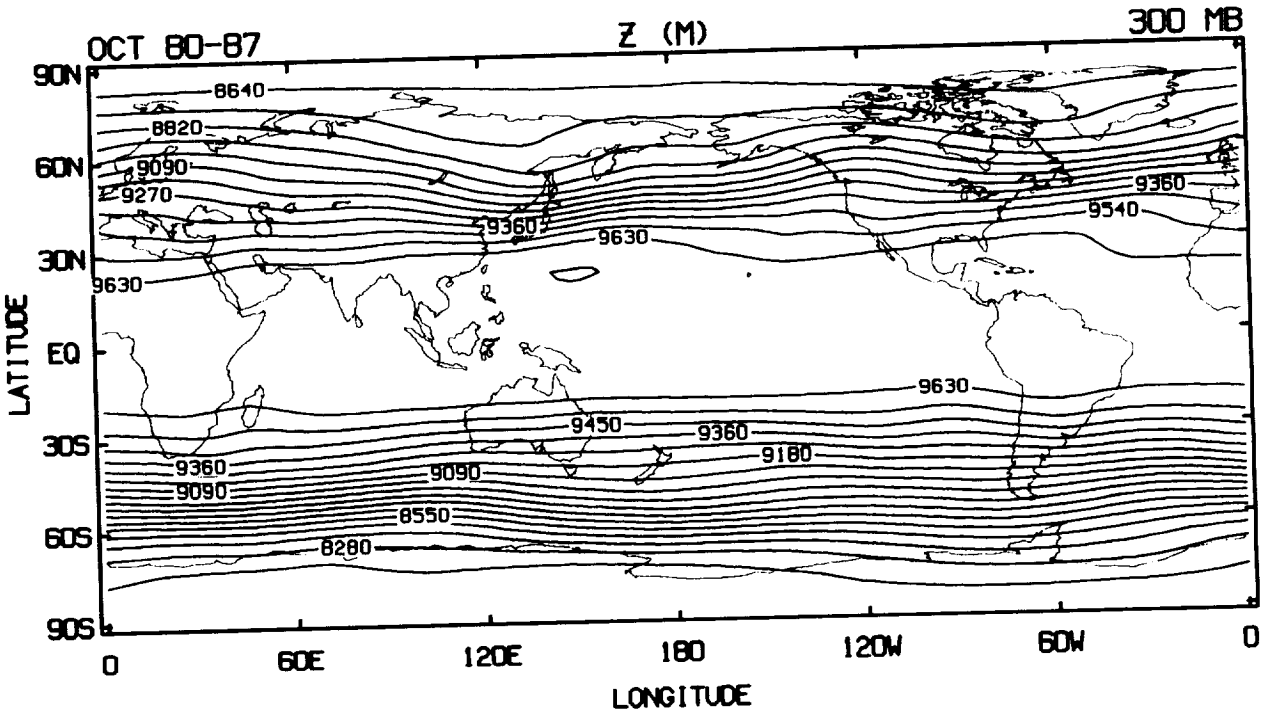
PAGE 128 INTENTIONALLY BLANK

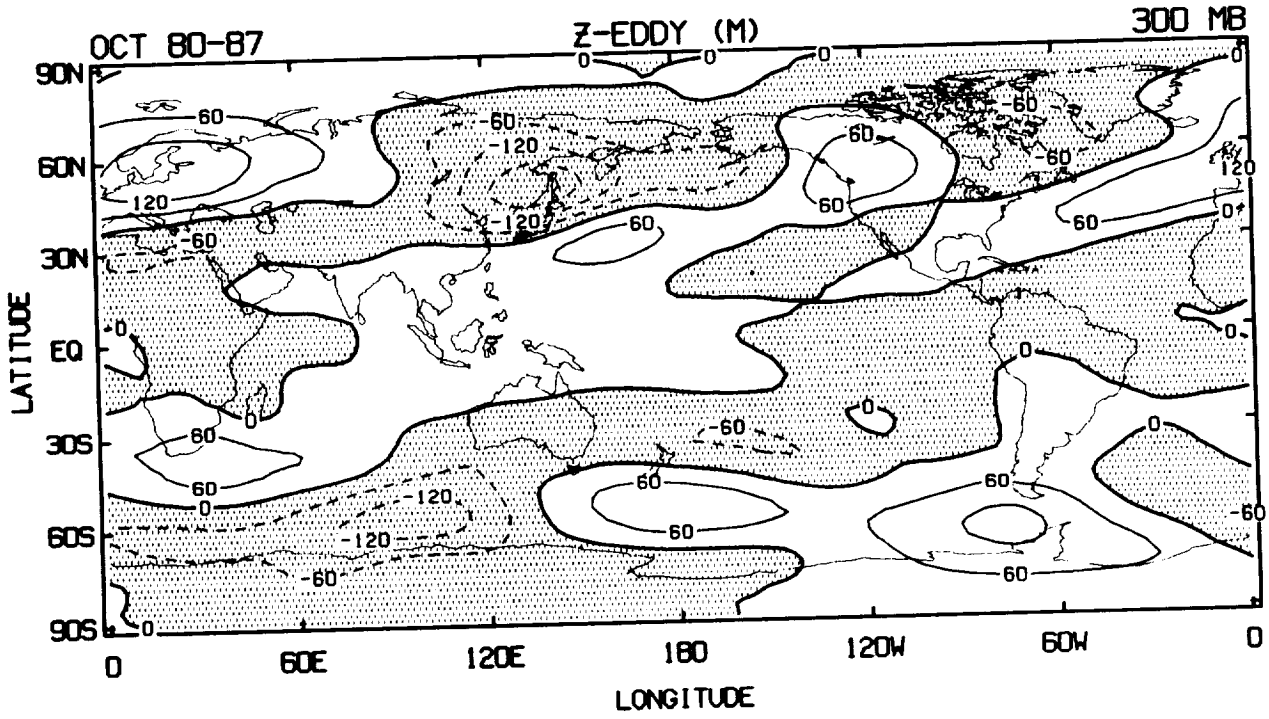

OCT 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

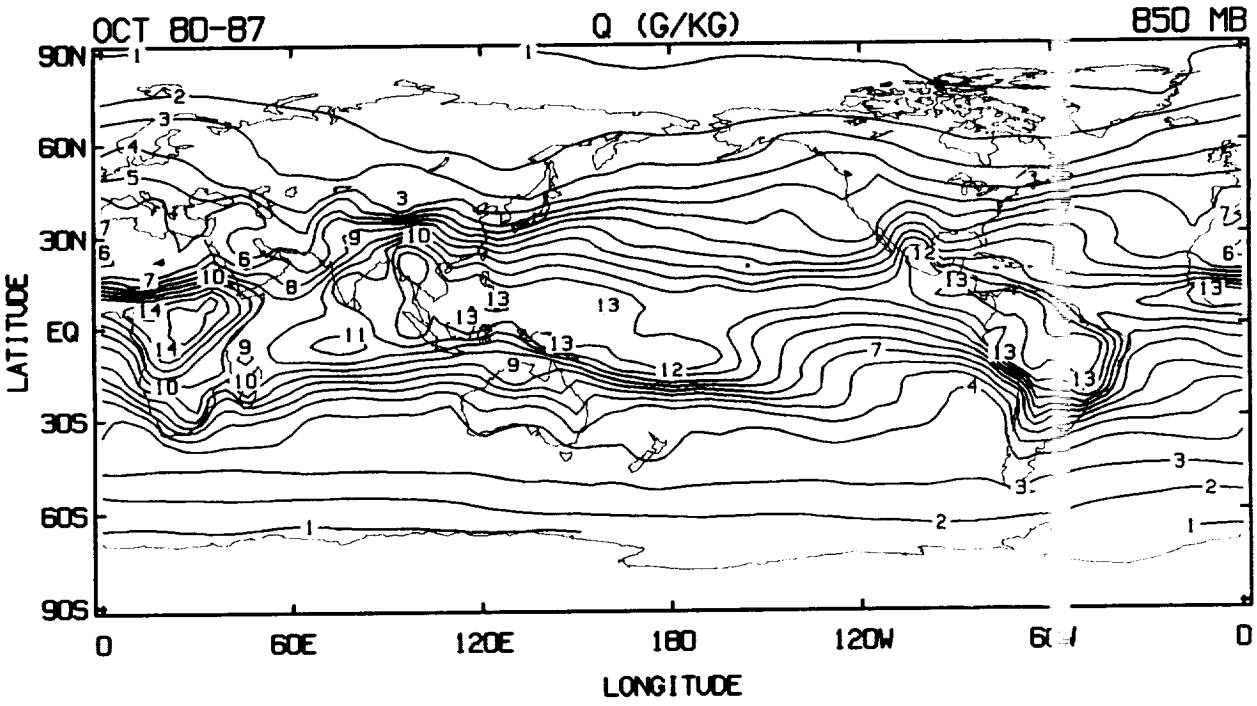

OCT 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

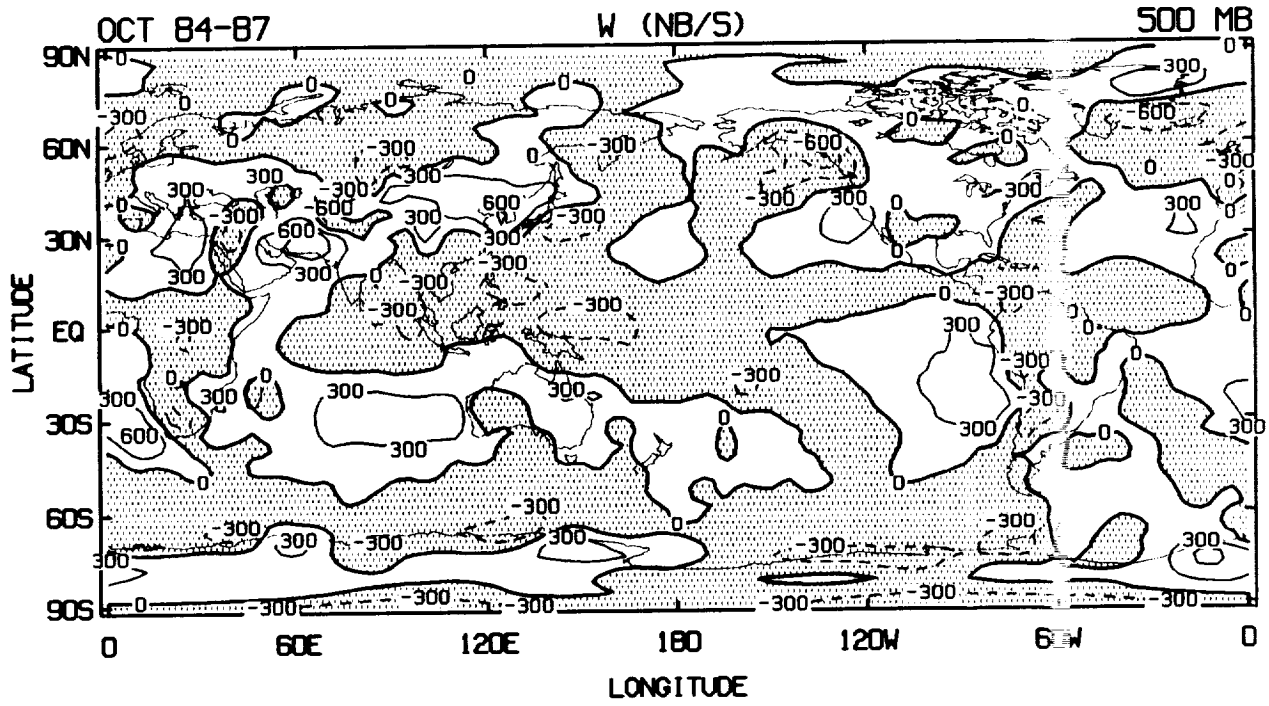

OCT 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
260
270
260
290
285
285
295
295
290
290
290
280
285
270
255
260
250
240
240
0
60E
120E
180
120W
0
LONGITUDE

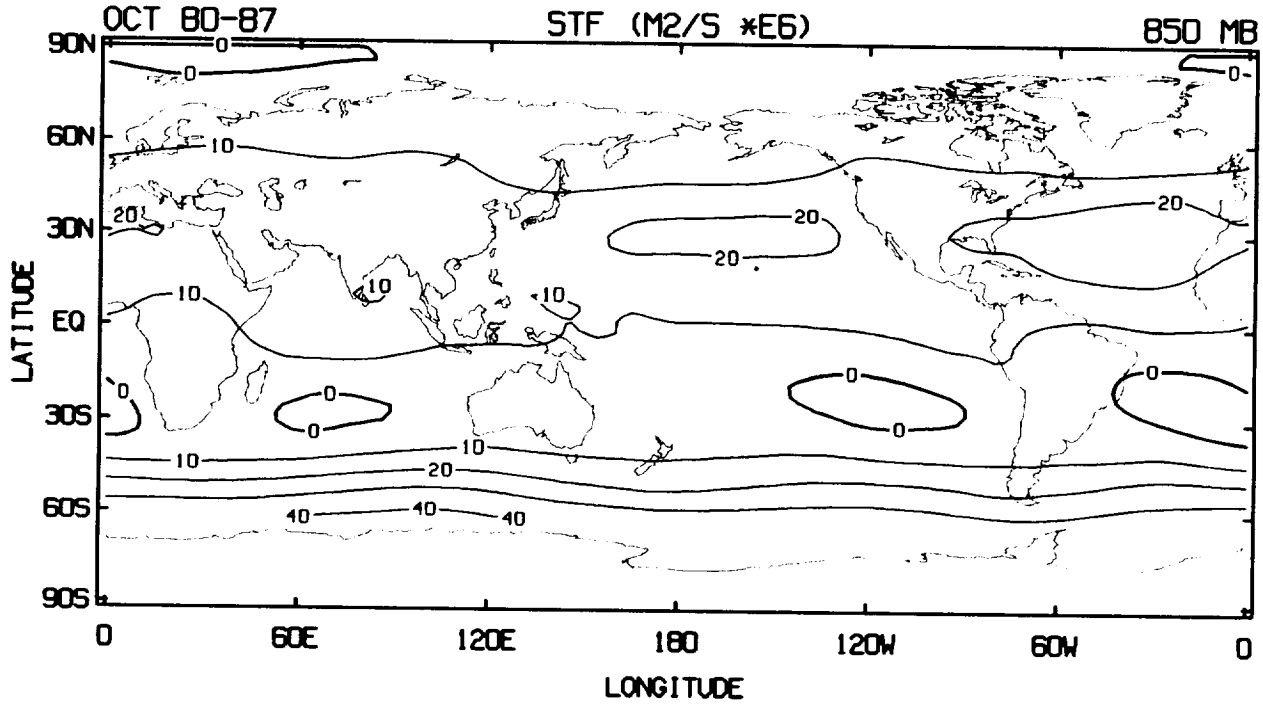

OCT 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
220
218
216
216
222
222
218
216
220
220
220
218
218
220
218
212
206
206
202
200
200
0
60E
120E
180
120W
0
LONGITUDE

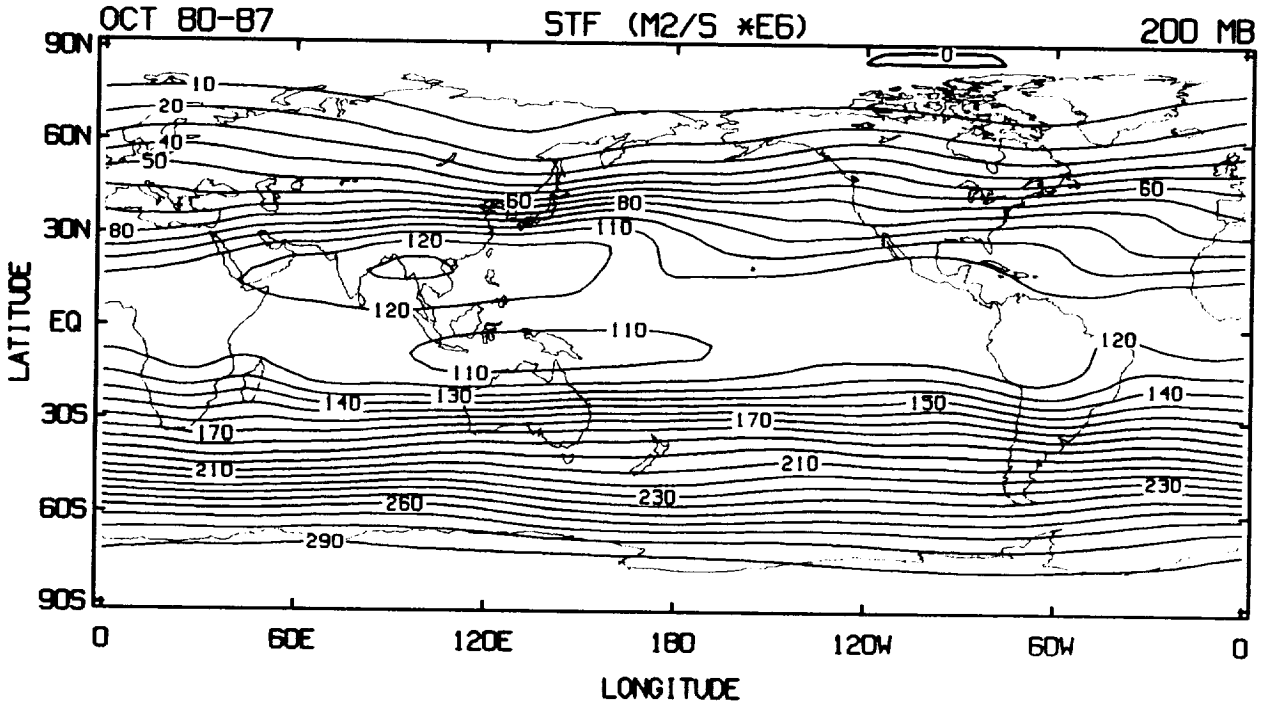

OCT 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
8640
8820
9090
9270
9360
9540
9630
9450
9180
8550
8280
0
60E
120E
180
120W
60W
LONGITUDE

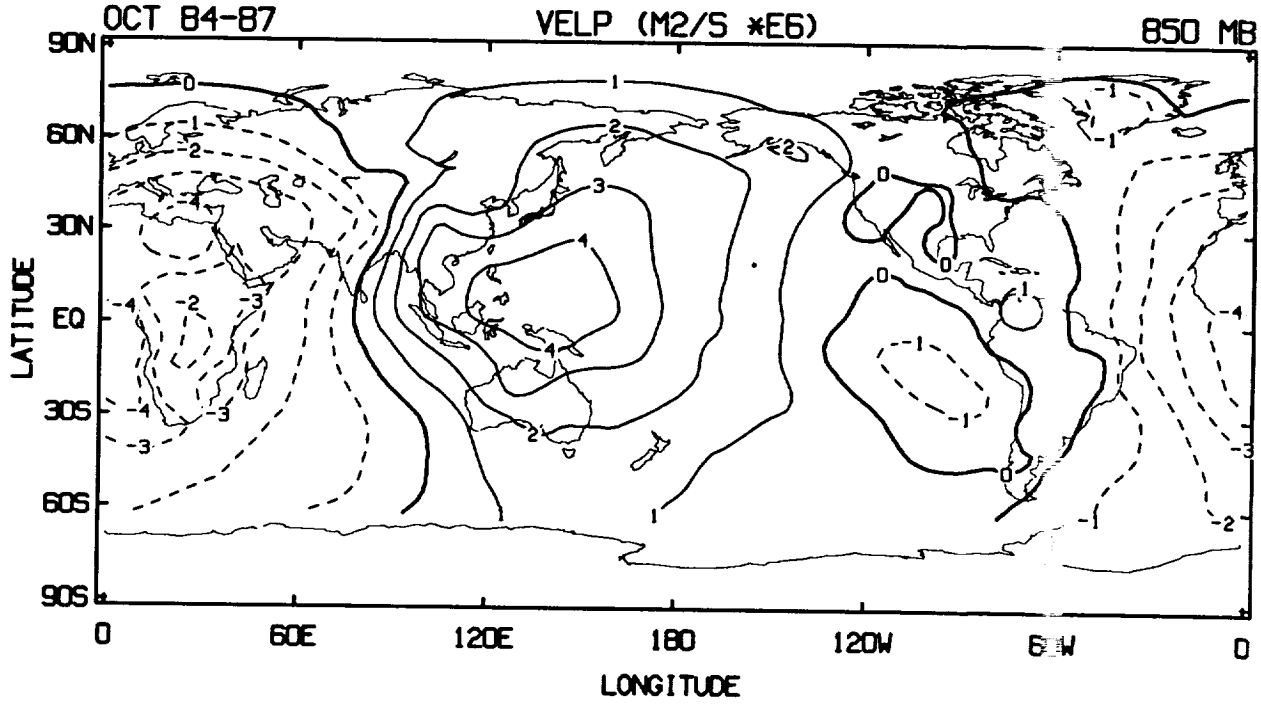

OCT 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
60
-60
120
-120
0
0
60E
120E
180
120W
60W
LONGITUDE

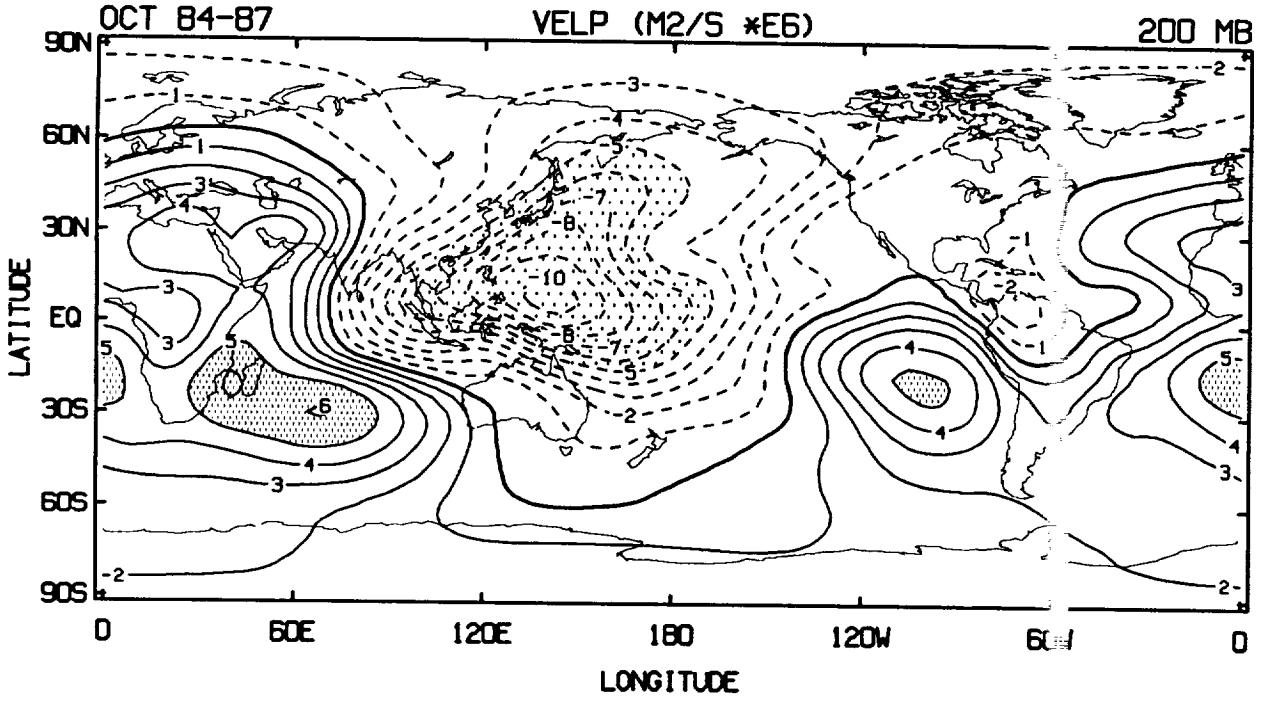

OCT 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

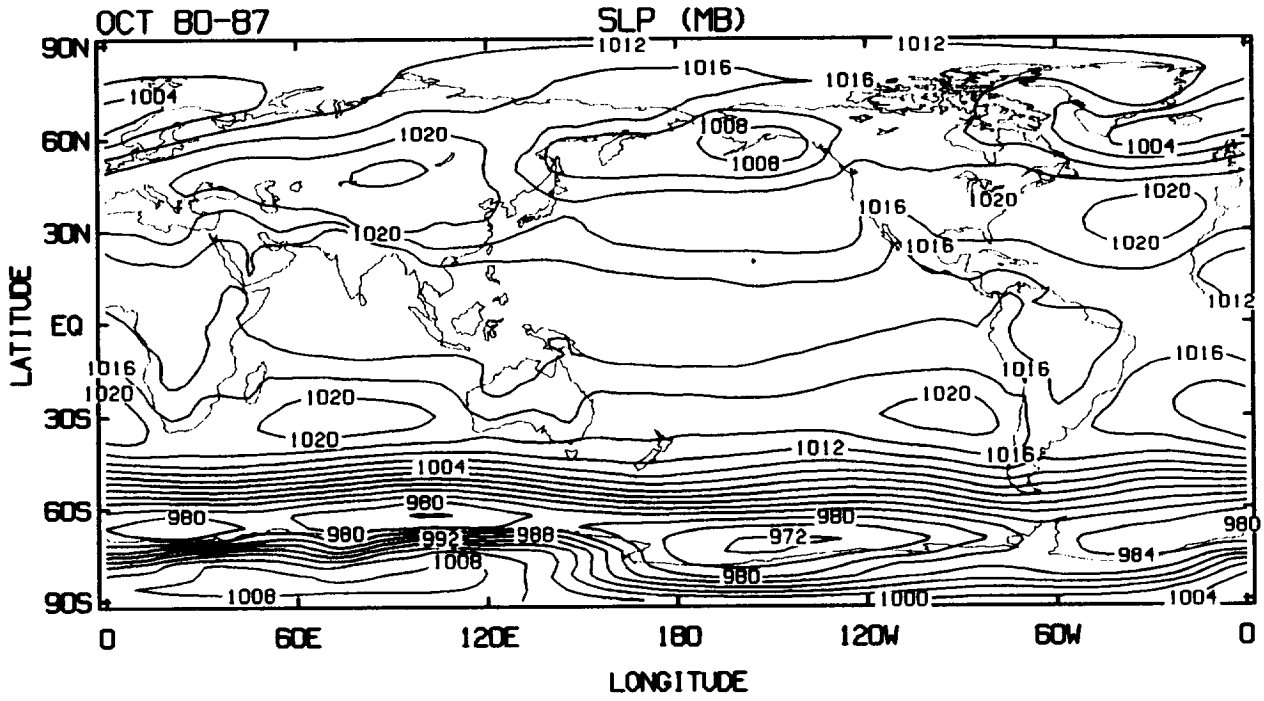

OCT 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

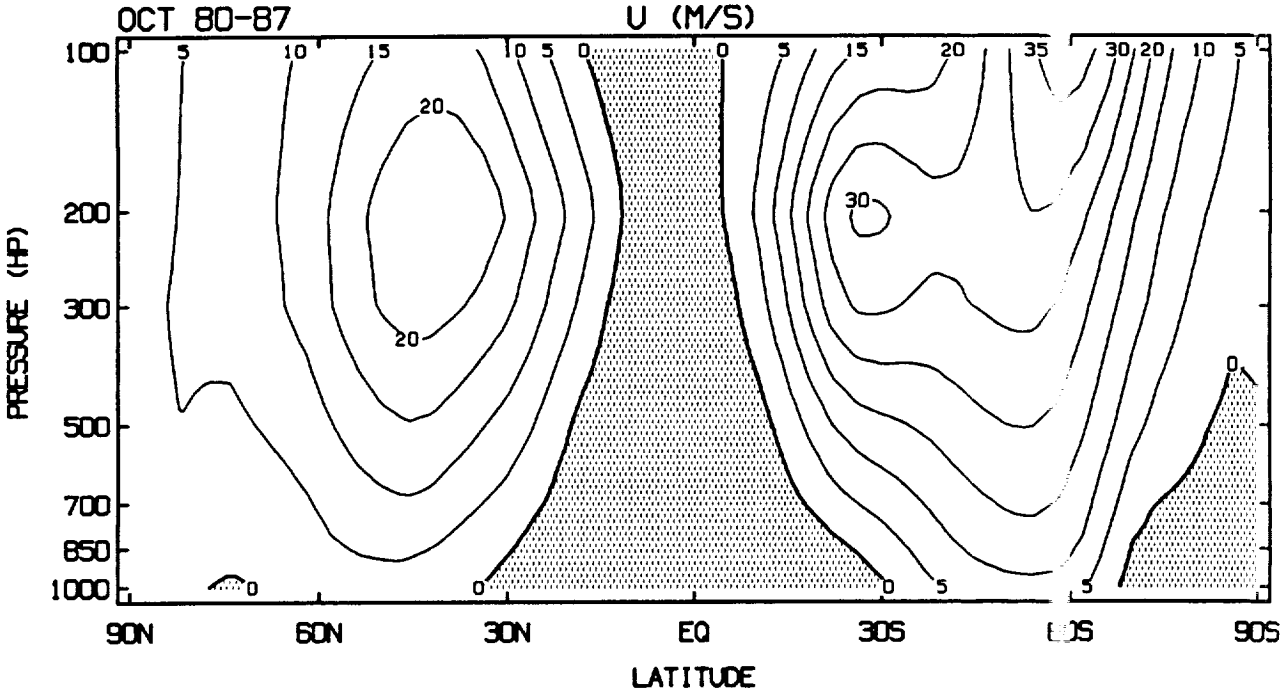

OCT 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

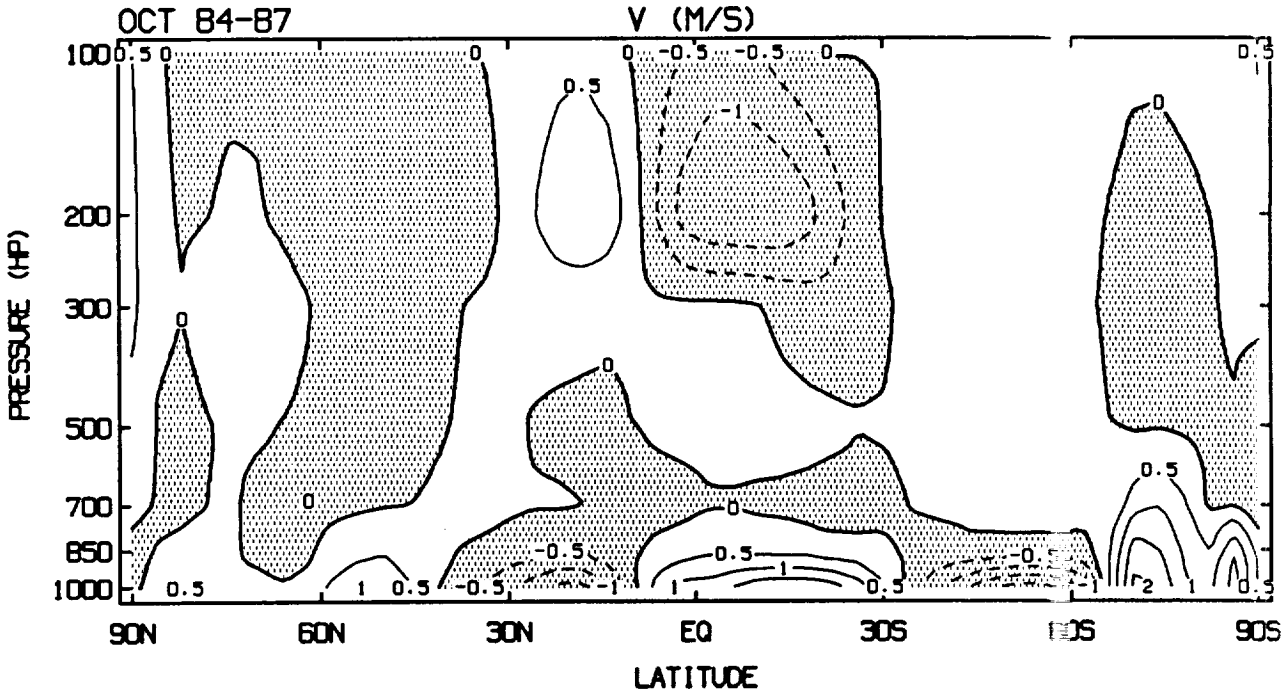

OCT 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

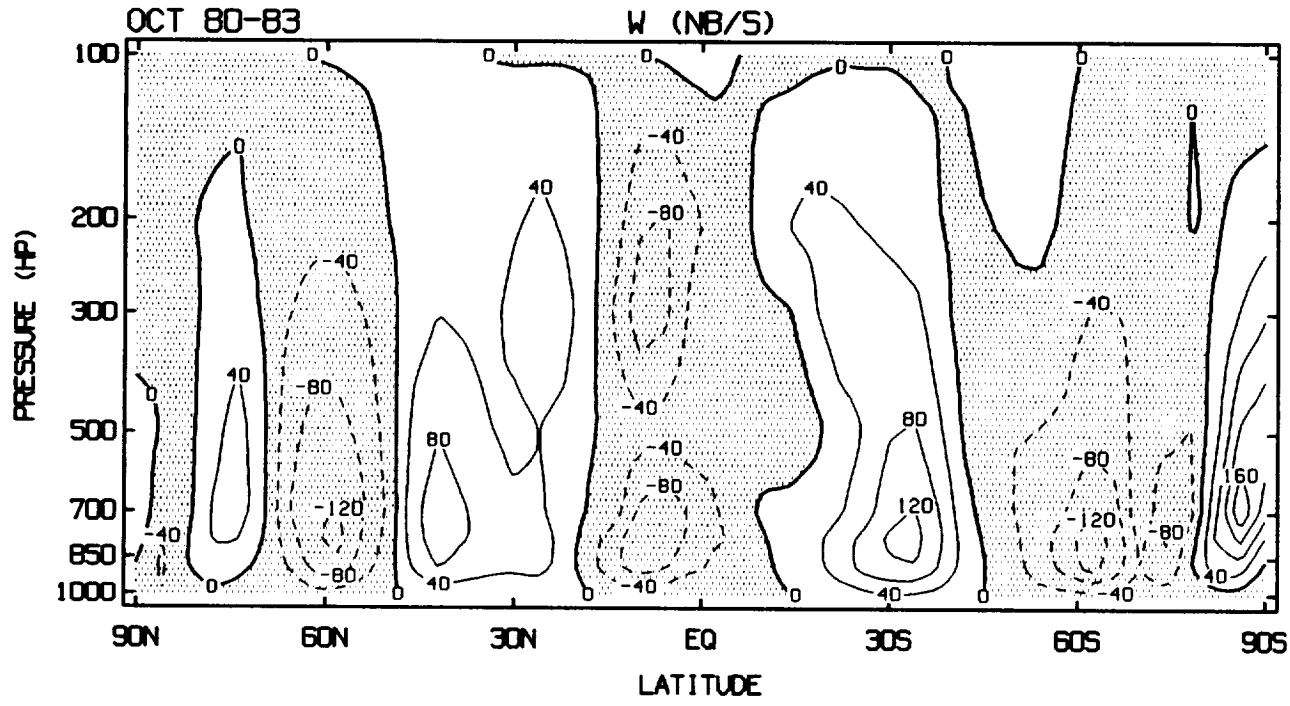

OCT 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

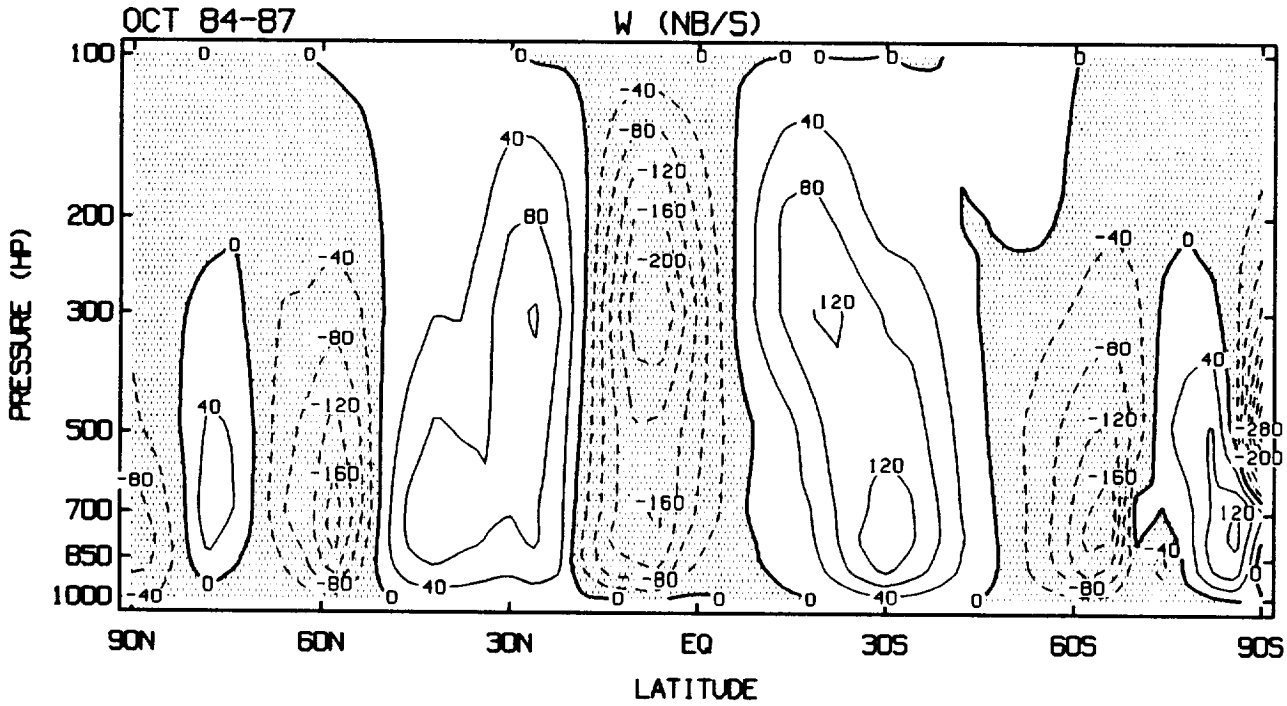

OCT 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

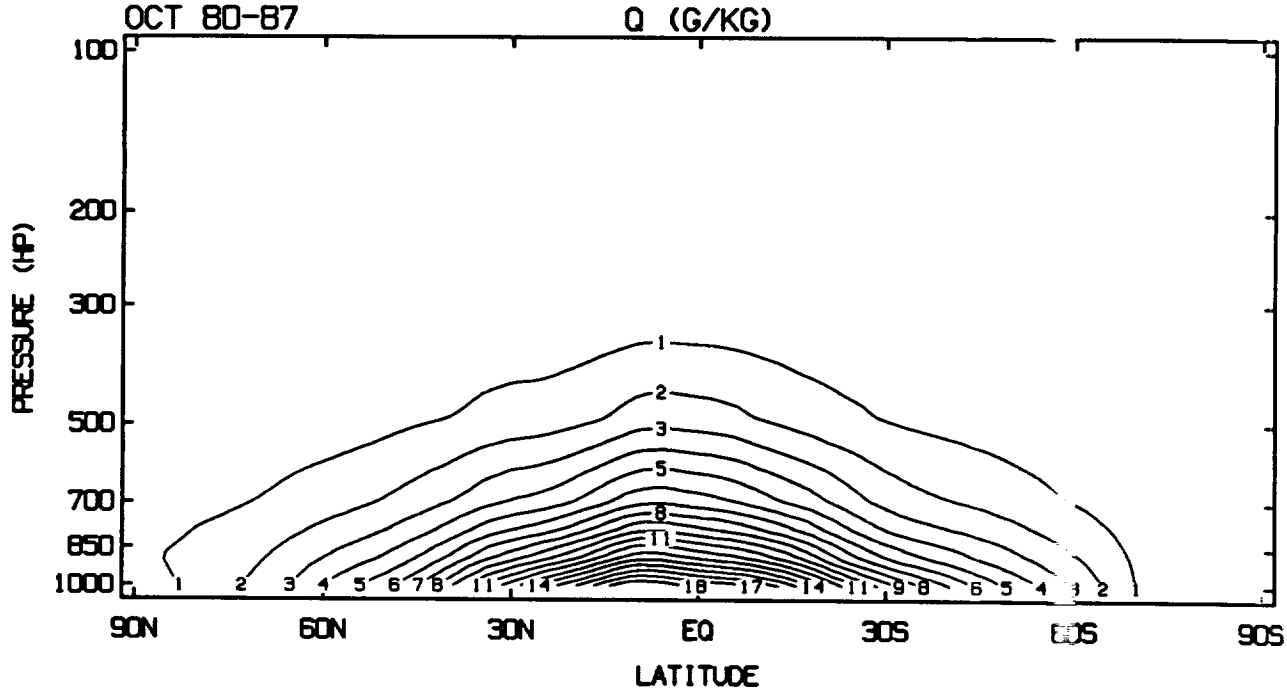

OCT 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1012
1016
1004
1020
1008
1000
980
992
988
972
984

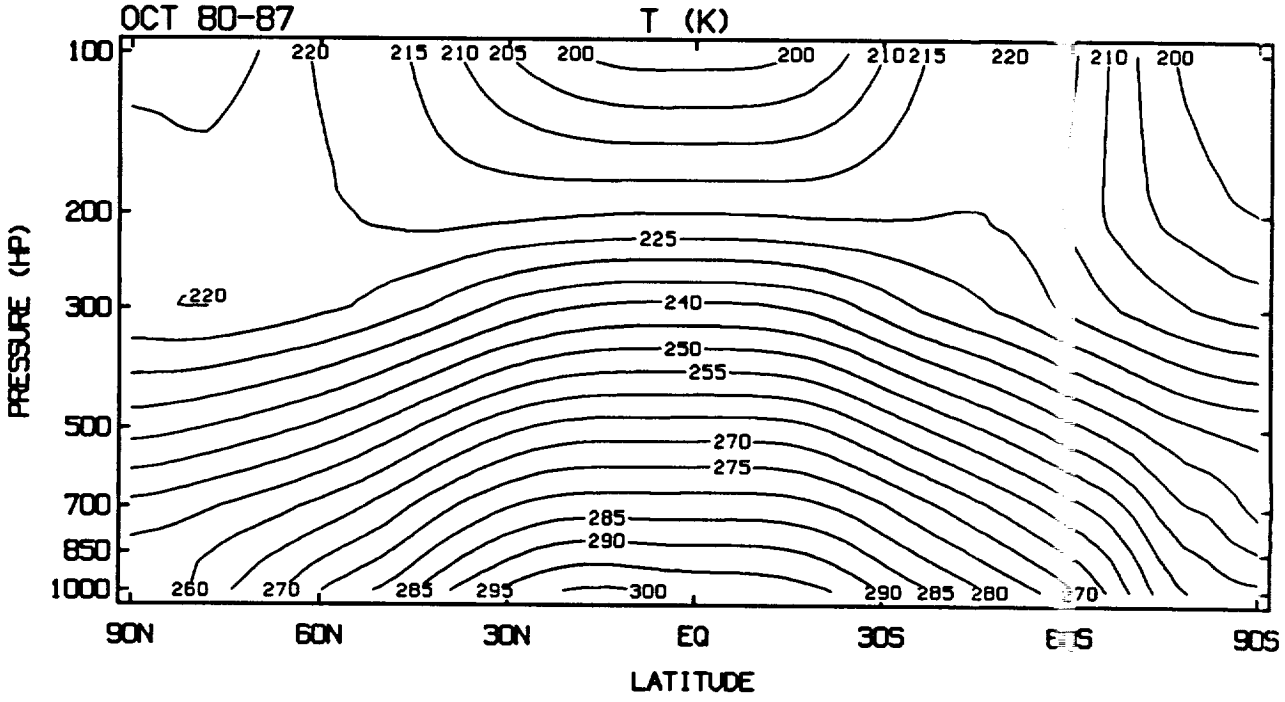

OCT 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE


OCT 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE


OCT 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

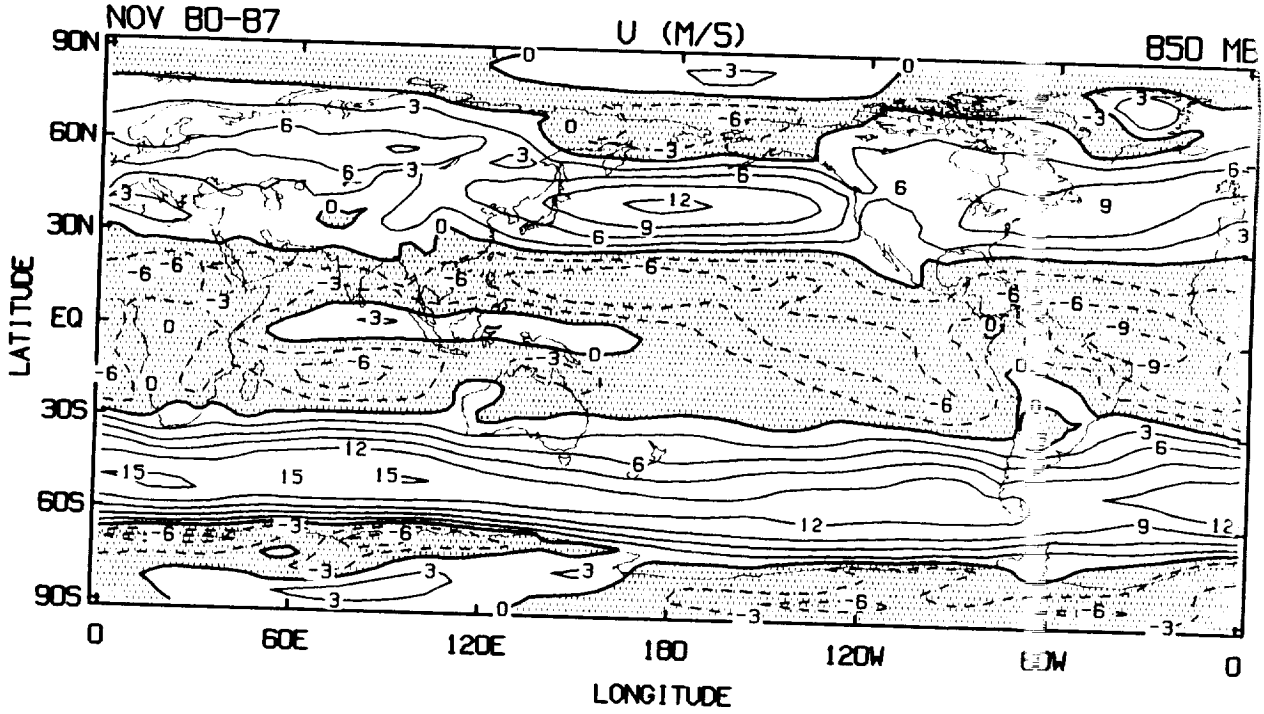

OCT 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

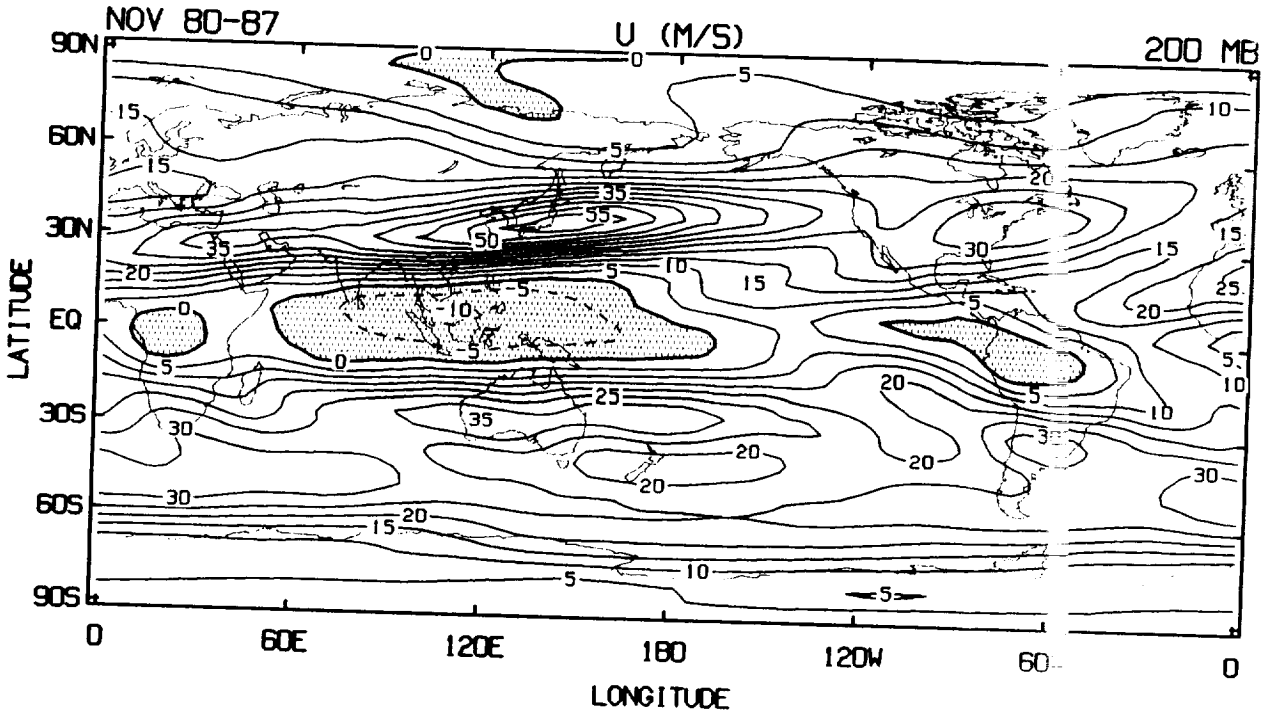

OCT 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


OCT 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

NOVEMBER

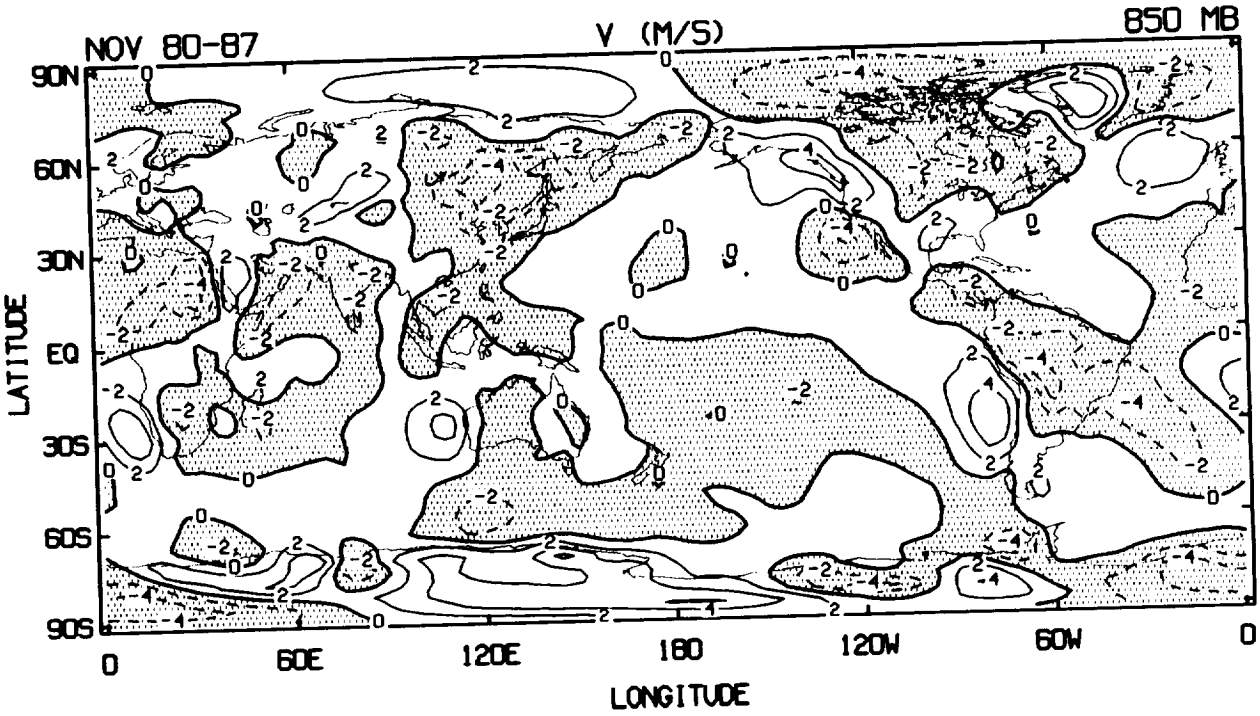
PRECEDING PAGE BLANK NOT FILMED PAGE 140 INTENTIONALLY BLANK

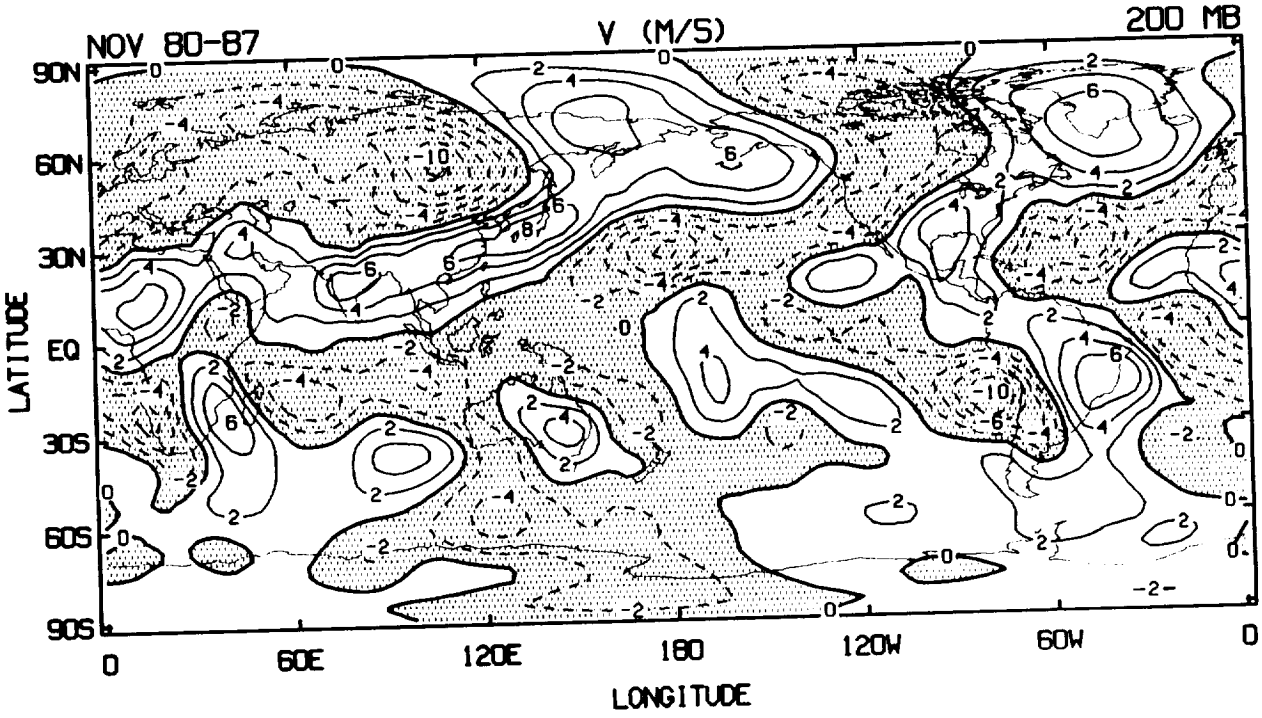


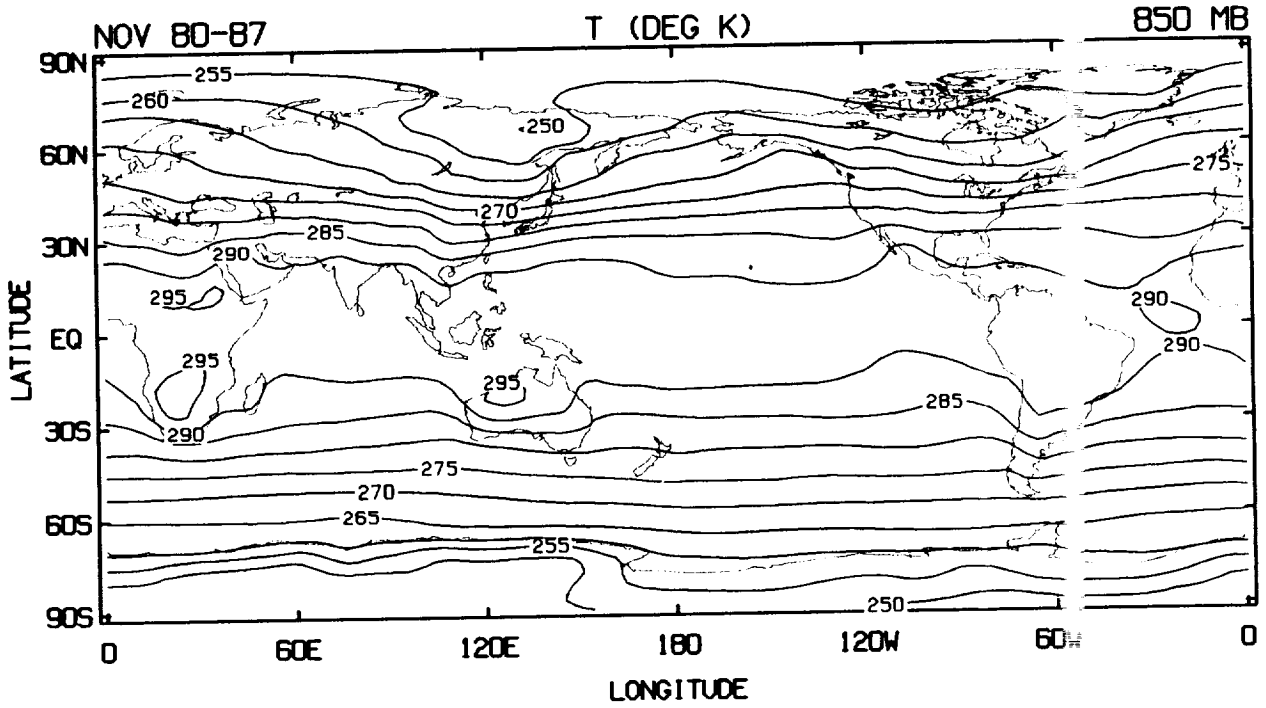


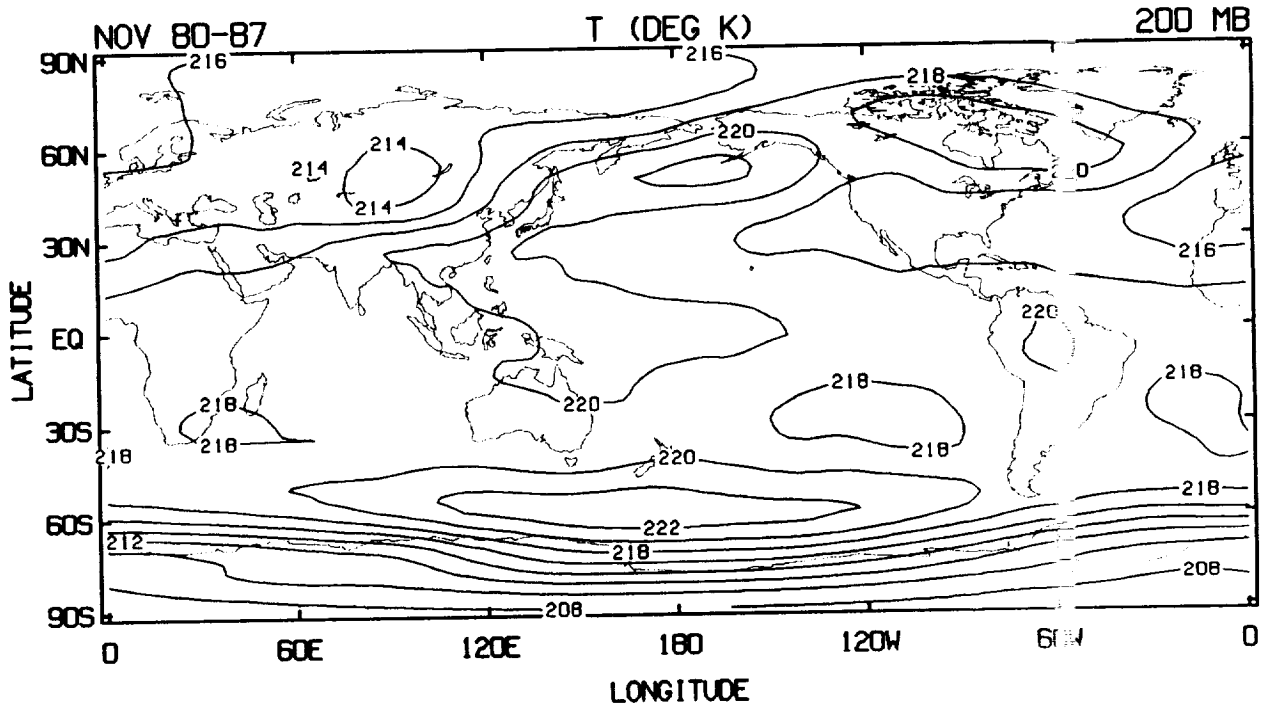
PRECEDING PAGE BLANK NOT FILMED

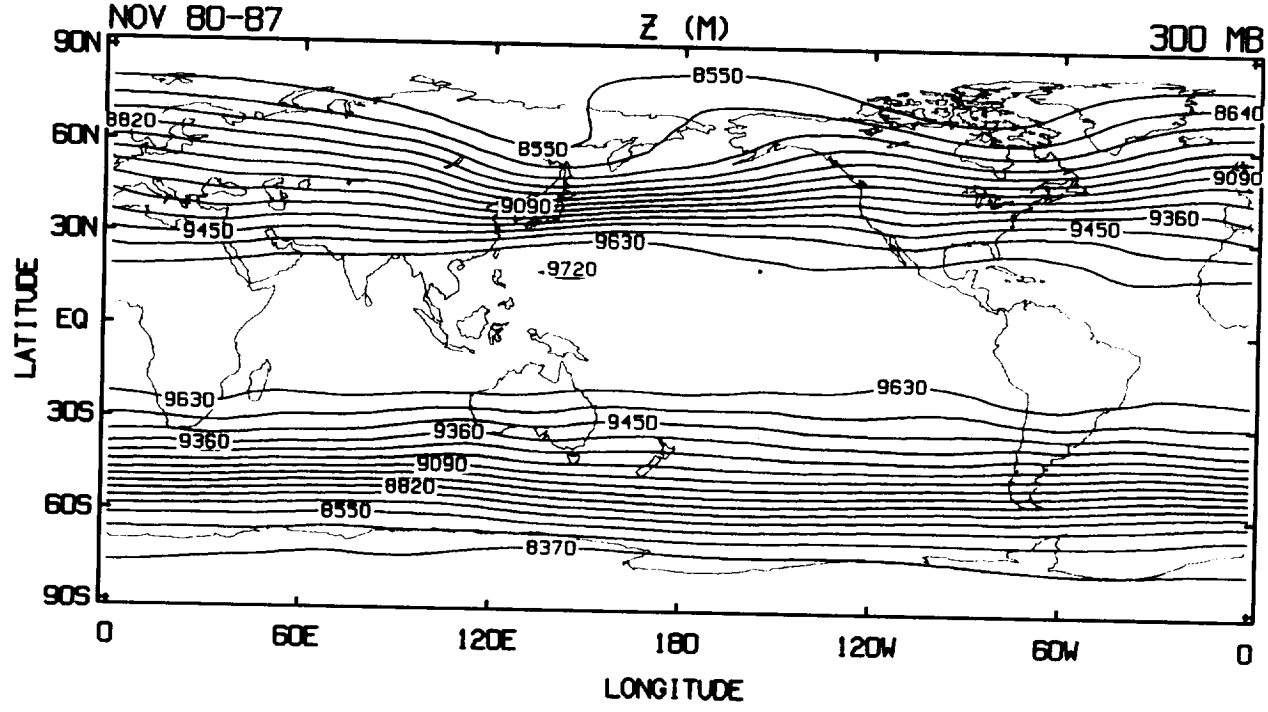
PAGE 142 INTENTIONALLY

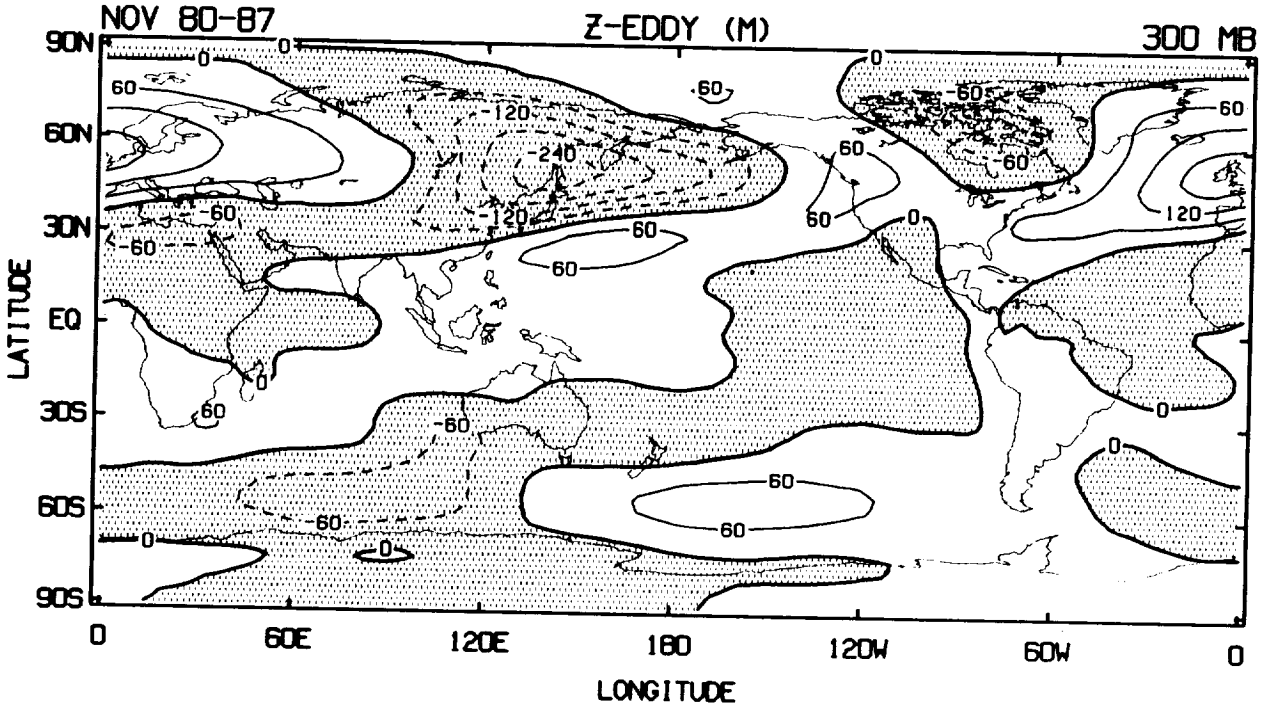

NOV 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

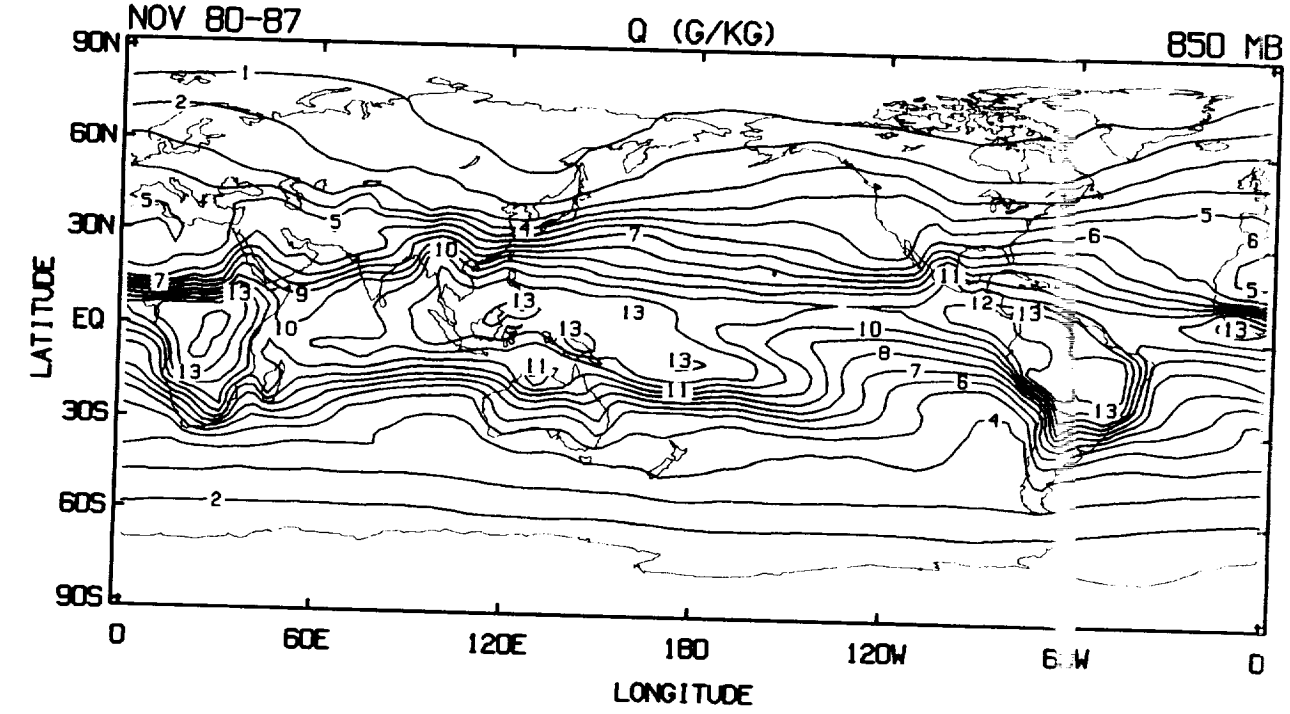

NOV 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

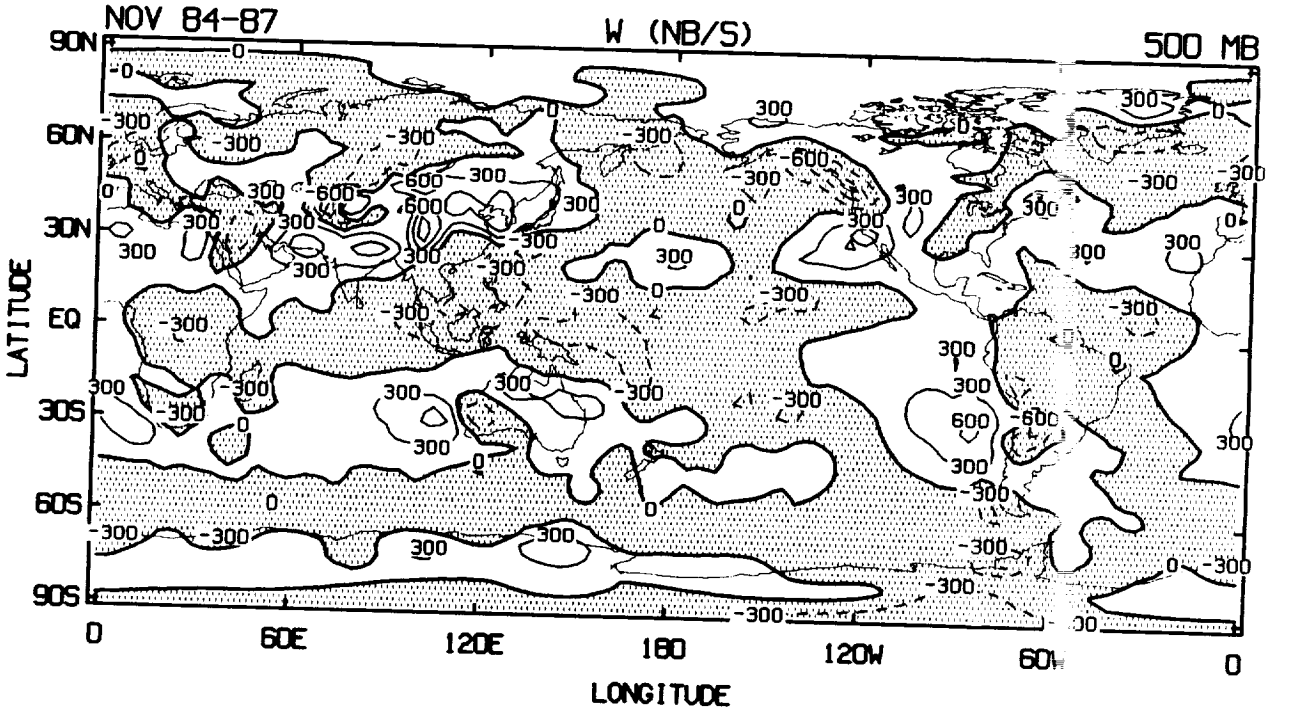

NOV 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE
255
260
250
270
275
285
290
295
265

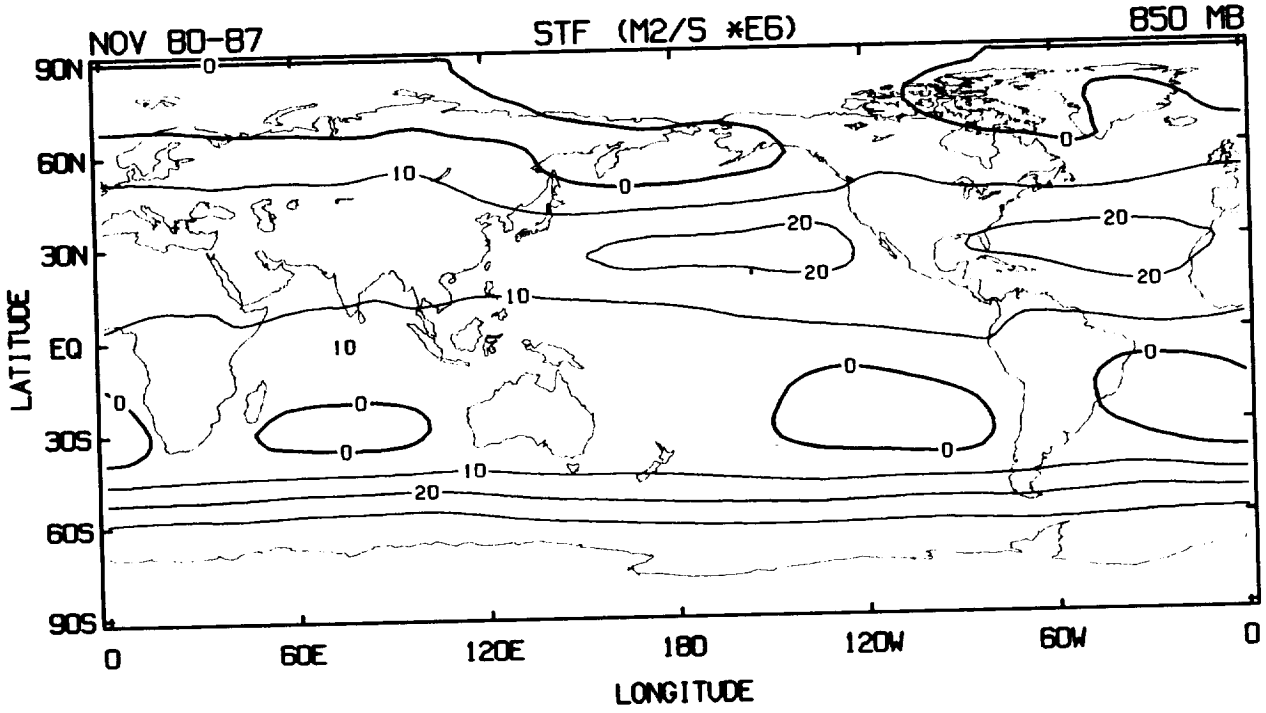

NOV 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE
216
214
218
220
222
212
208

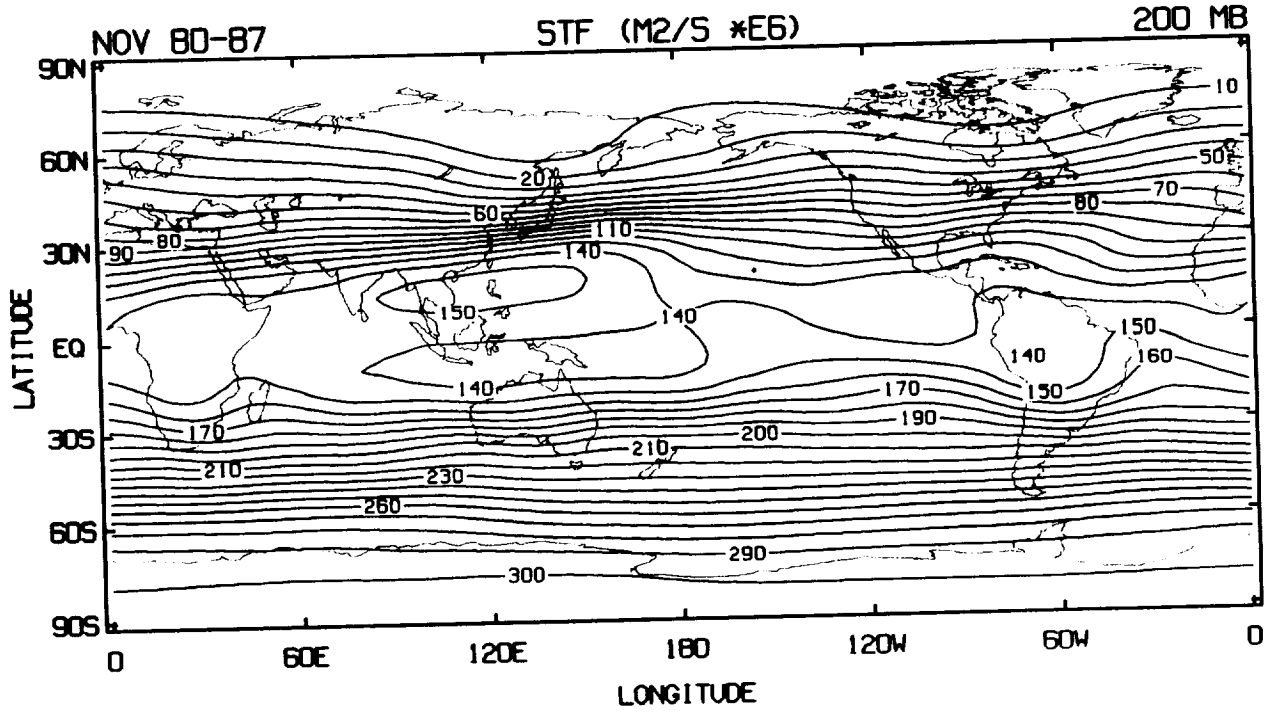

NOV 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
8550
8820
8640
9090
9450
9360
9630
9720
8370
0
60E
120E
180
120W
60W
LONGITUDE

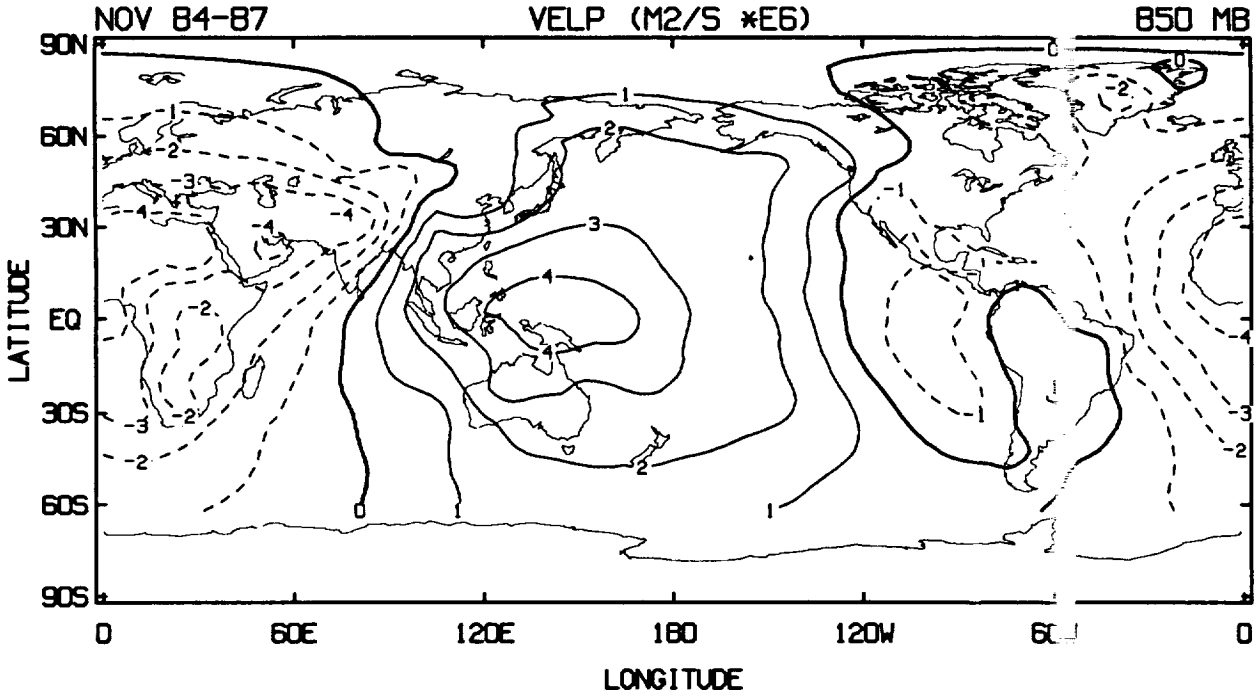

NOV 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60
-60
120
-120
240
-240
0
60E
120E
180
120W
60W
LONGITUDE

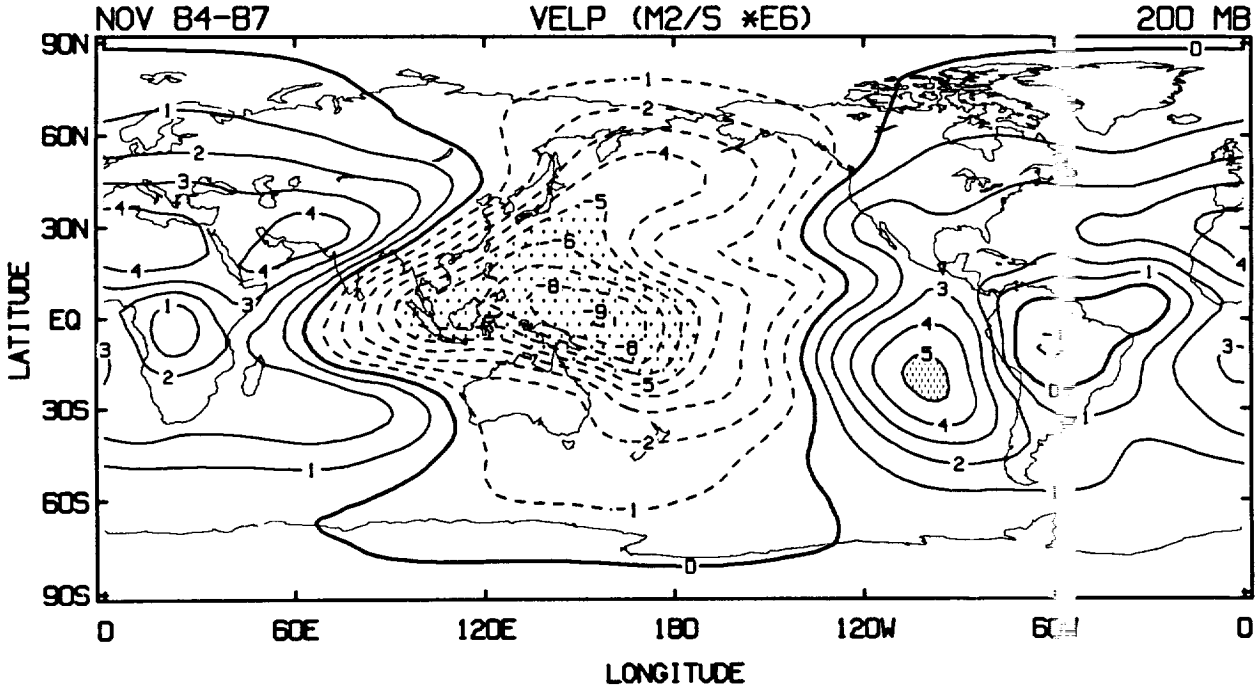

NOV 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

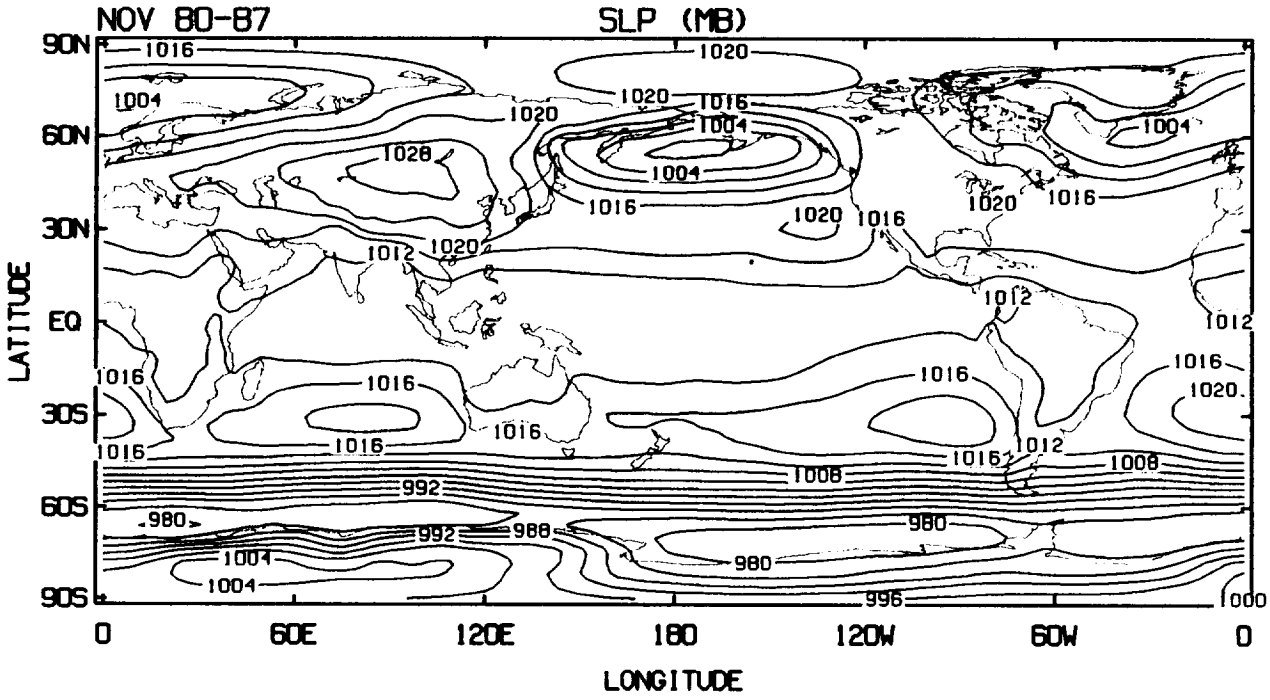

NOV 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

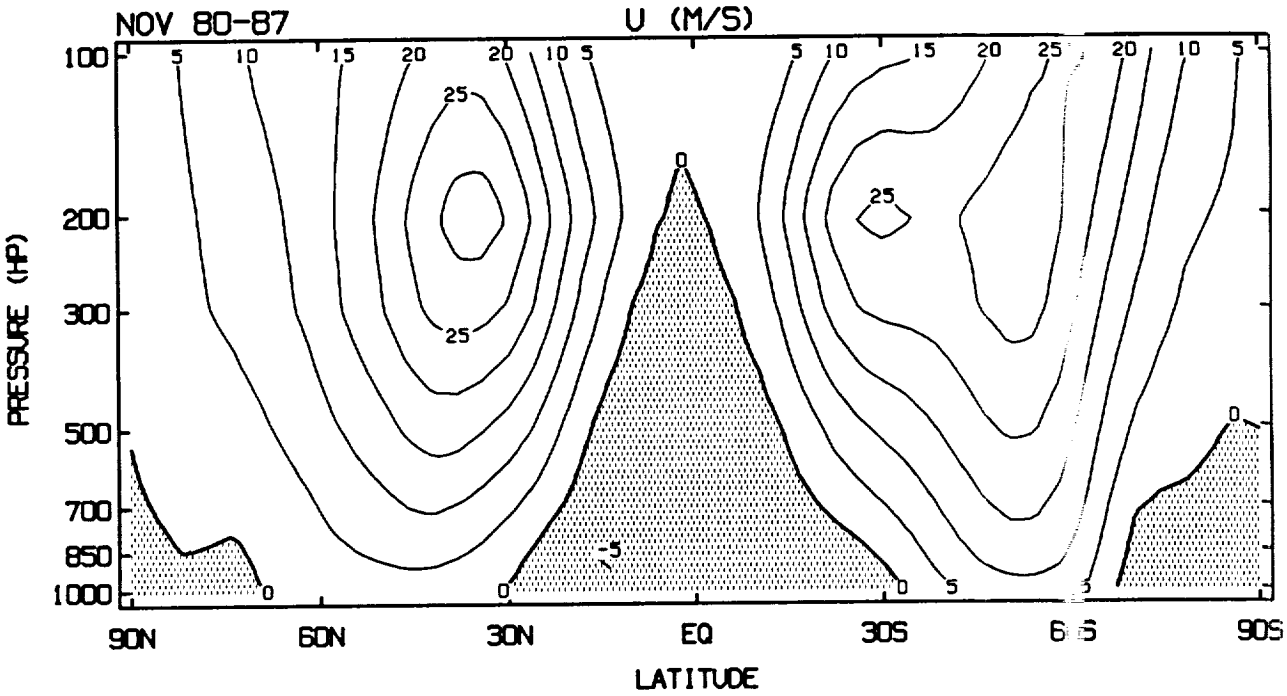

NOV 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

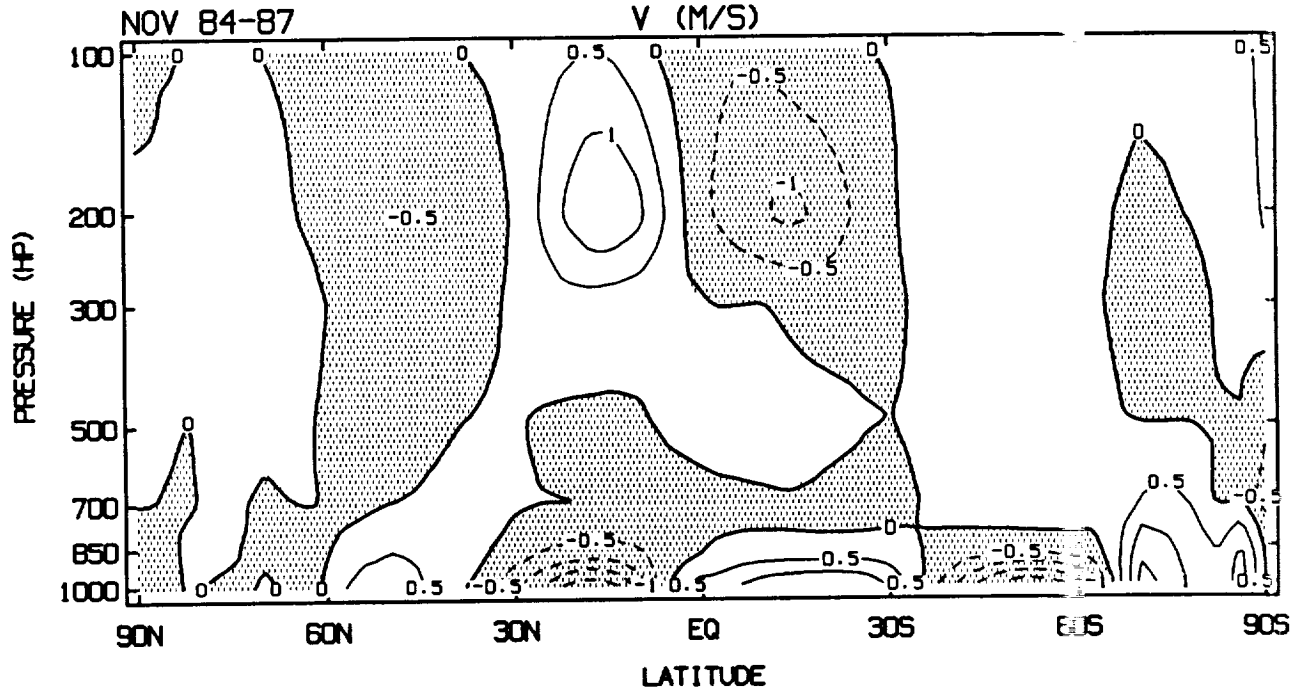

NOV 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

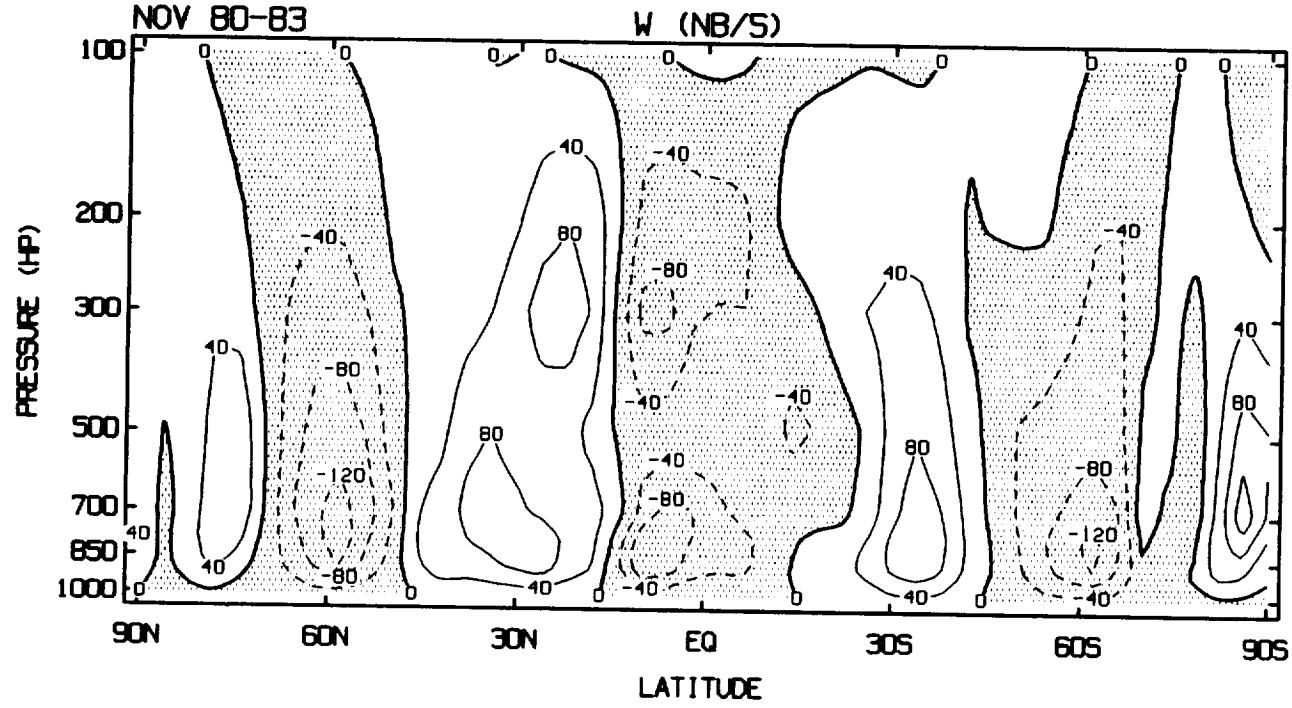

NOV 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

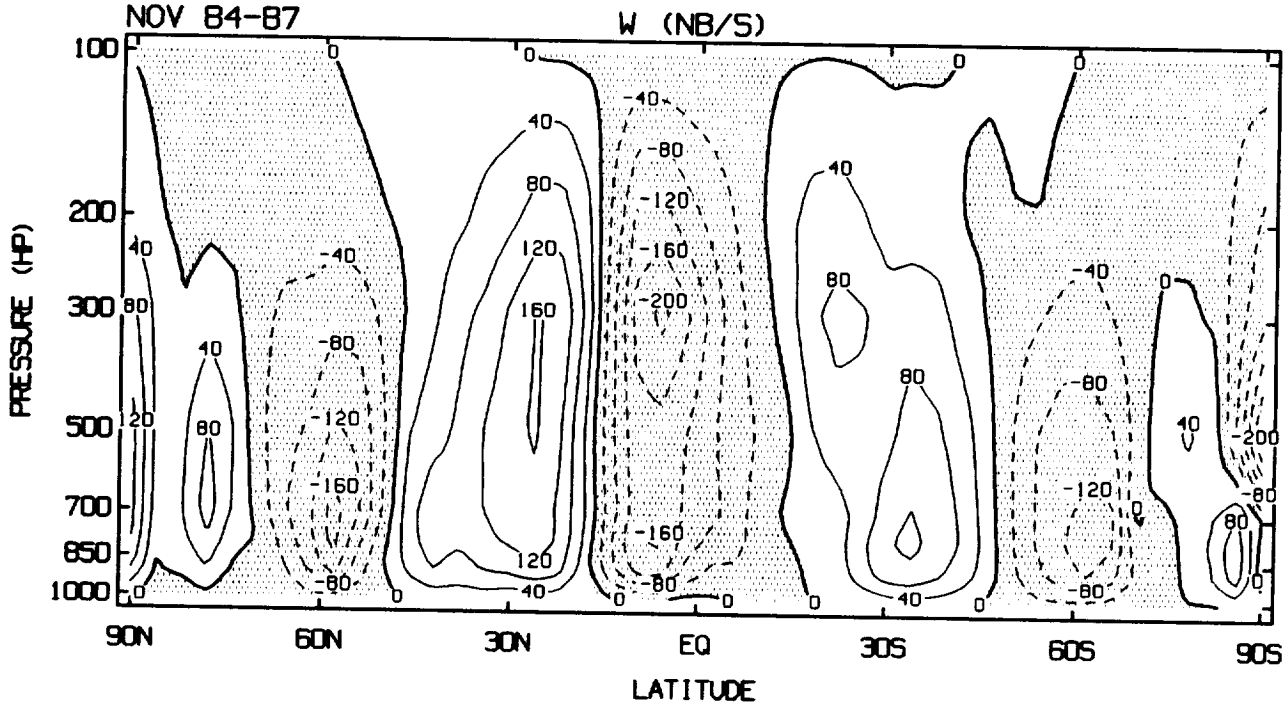

NOV 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

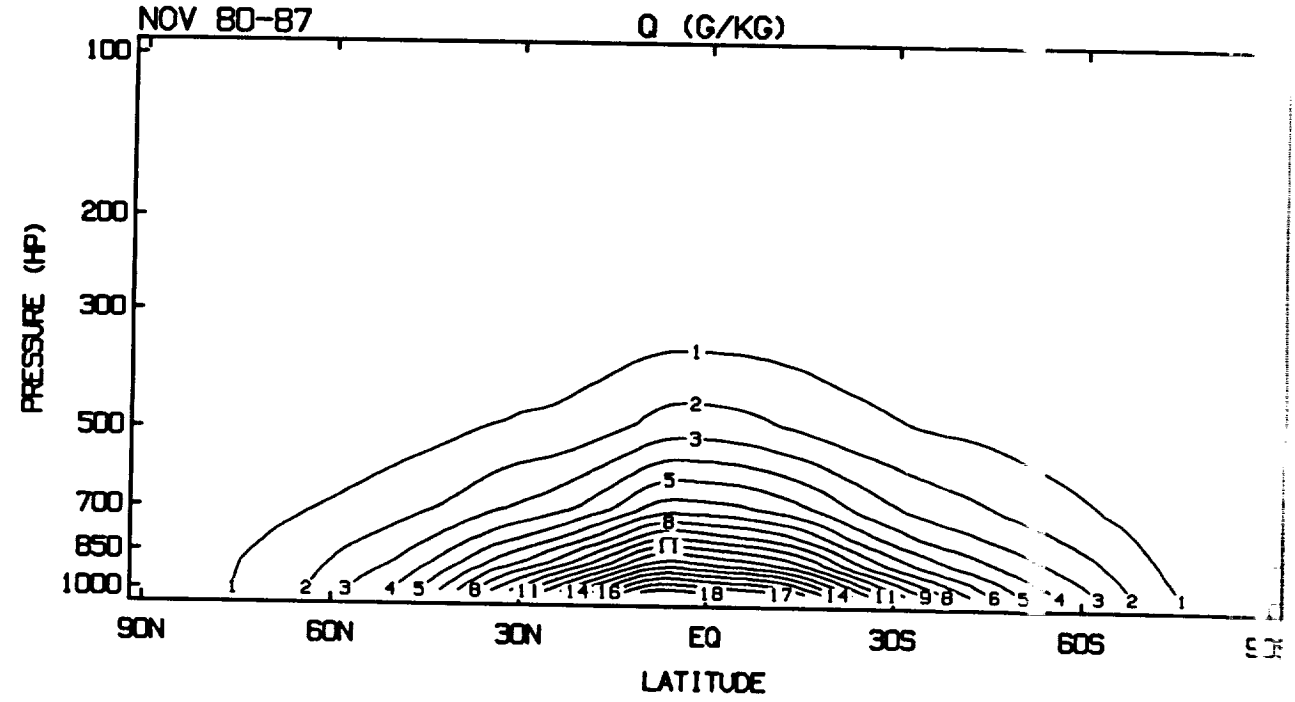

NOV 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1016
1020
1004
1028
1012
992
980
996
1000
1008

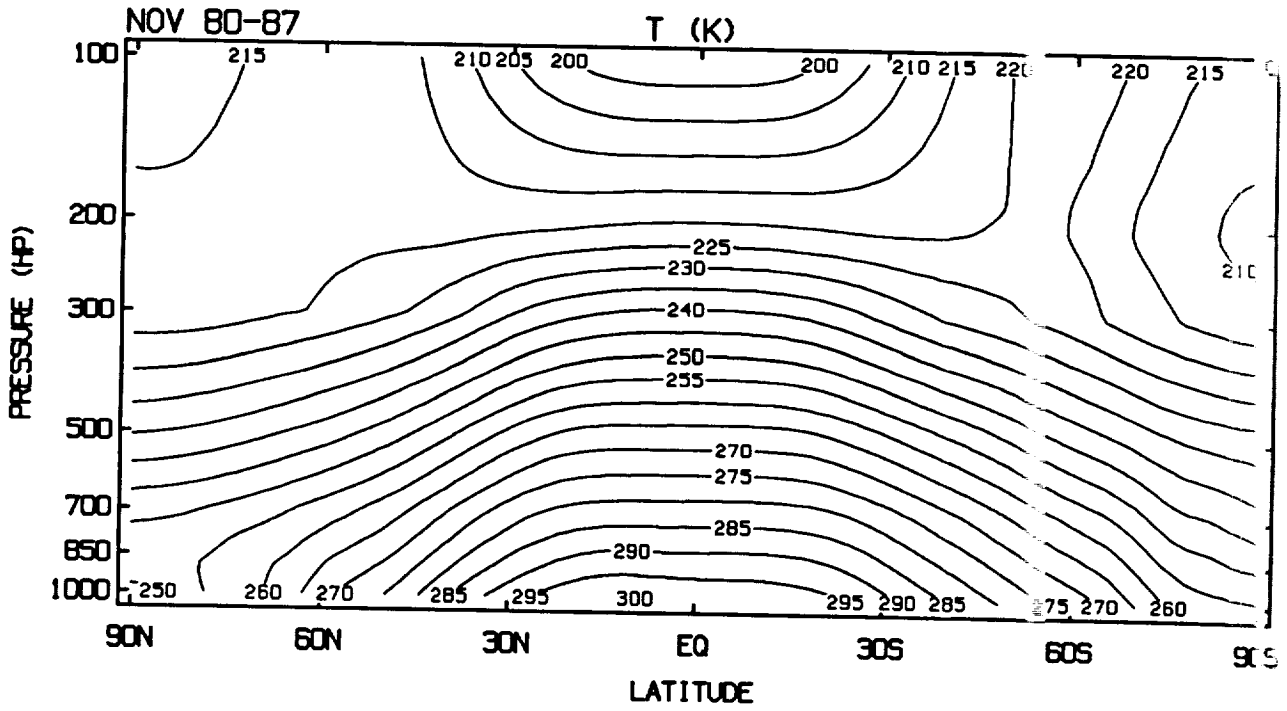

NOV 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


NOV 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


NOV 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


NOV 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

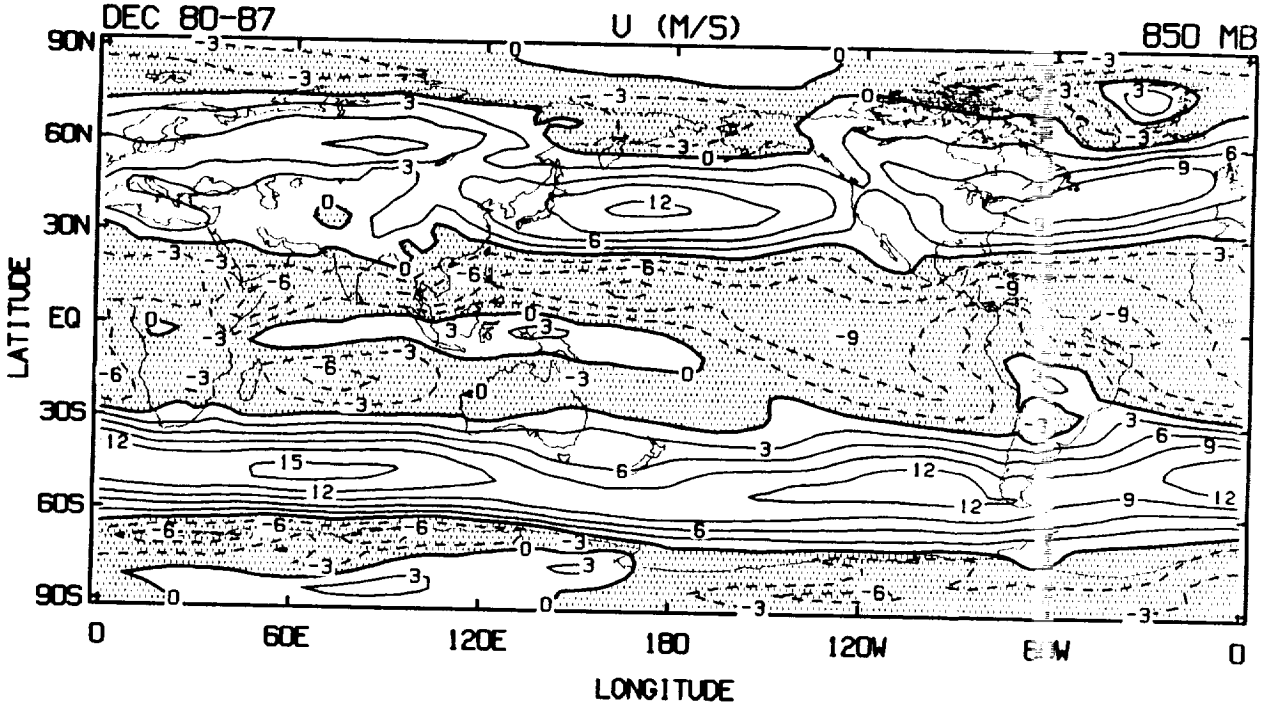

NOV 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE

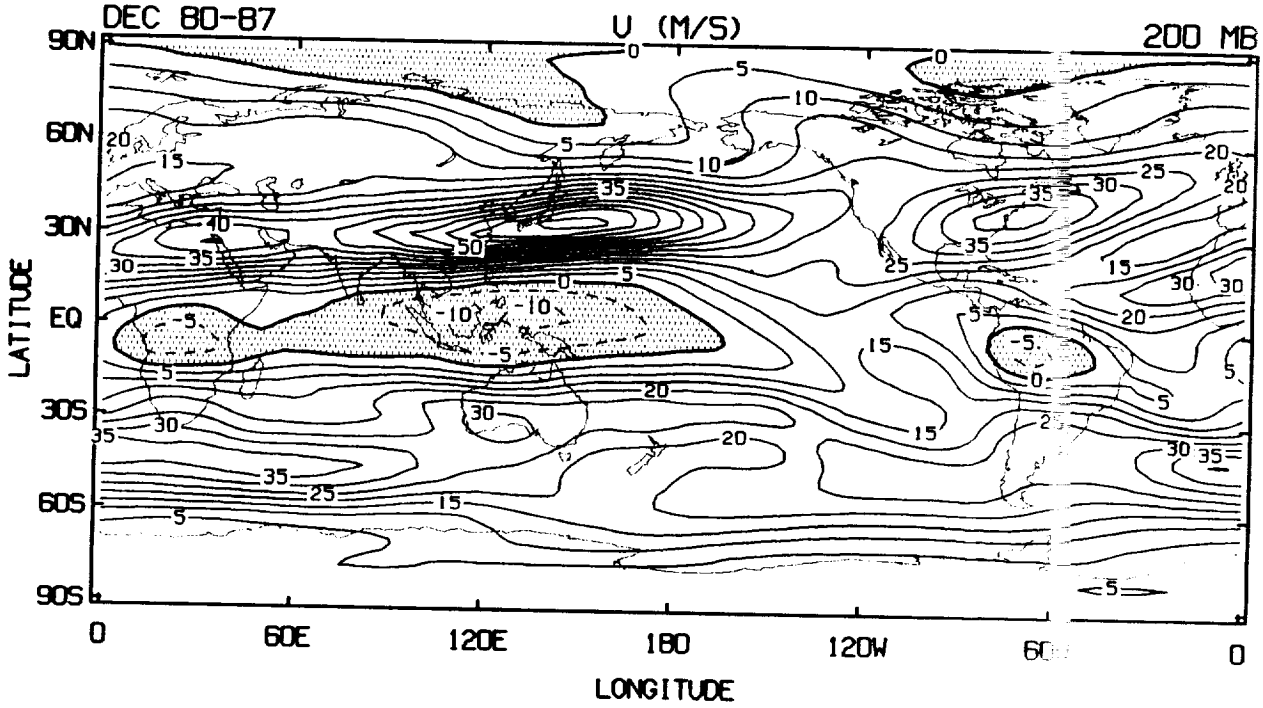

NOV 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE

DECEMBER

PRECEDING PAGE BLANK NOT FILMED

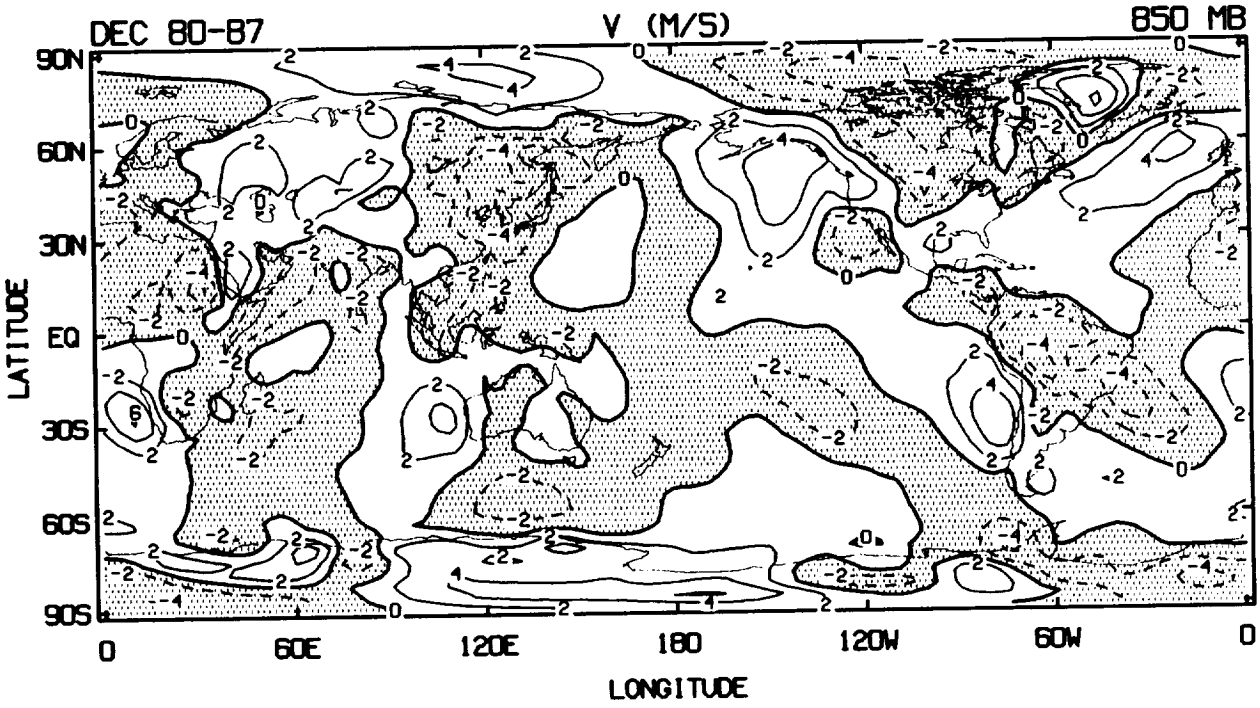
PAGE 154 INTENTIONALLY BLANK

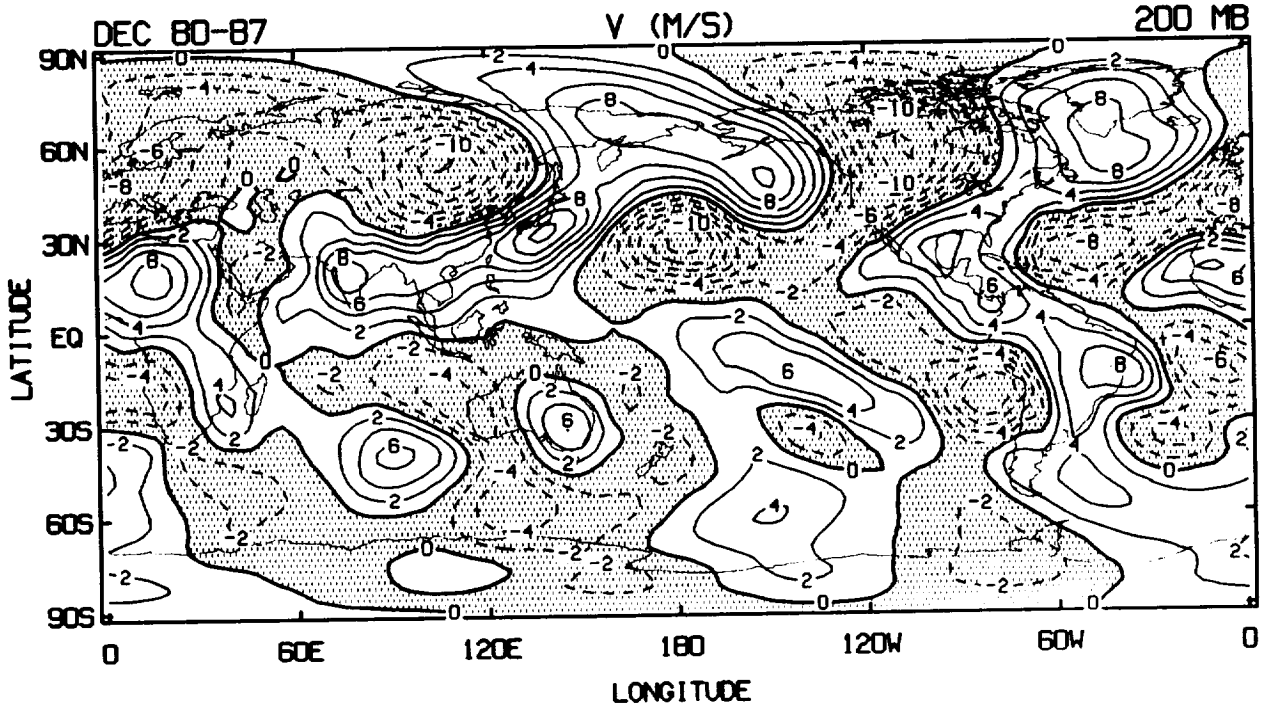


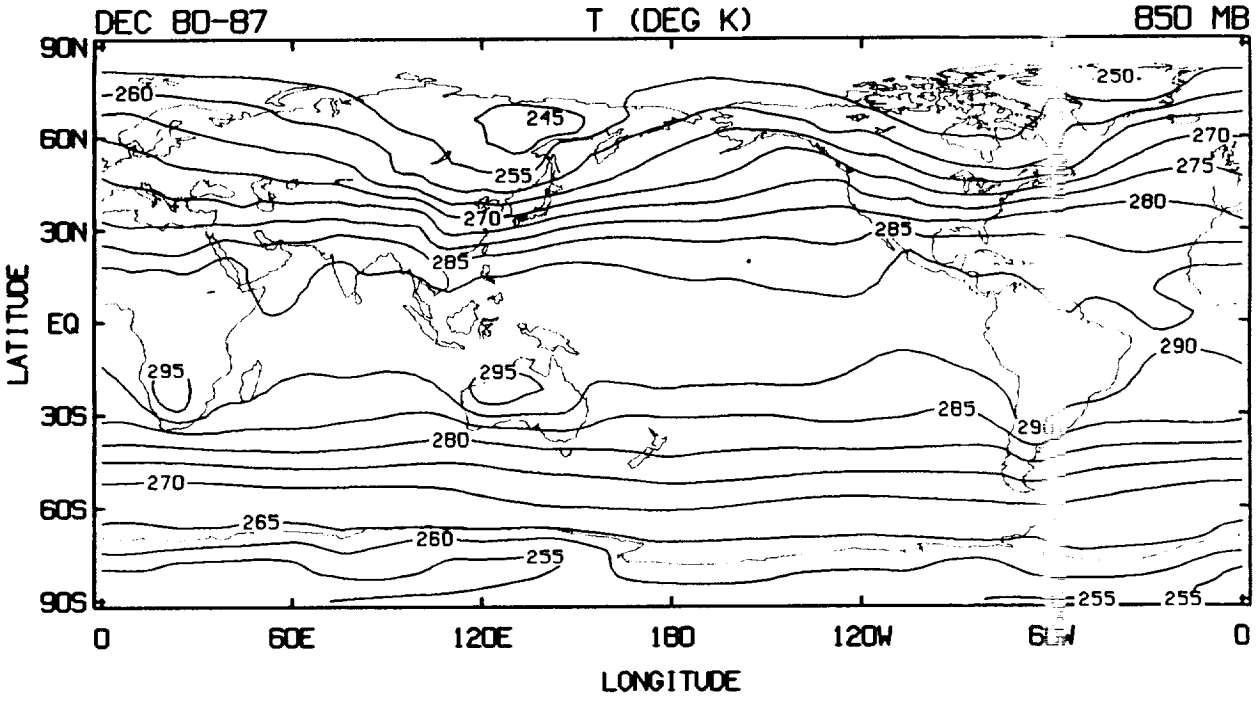


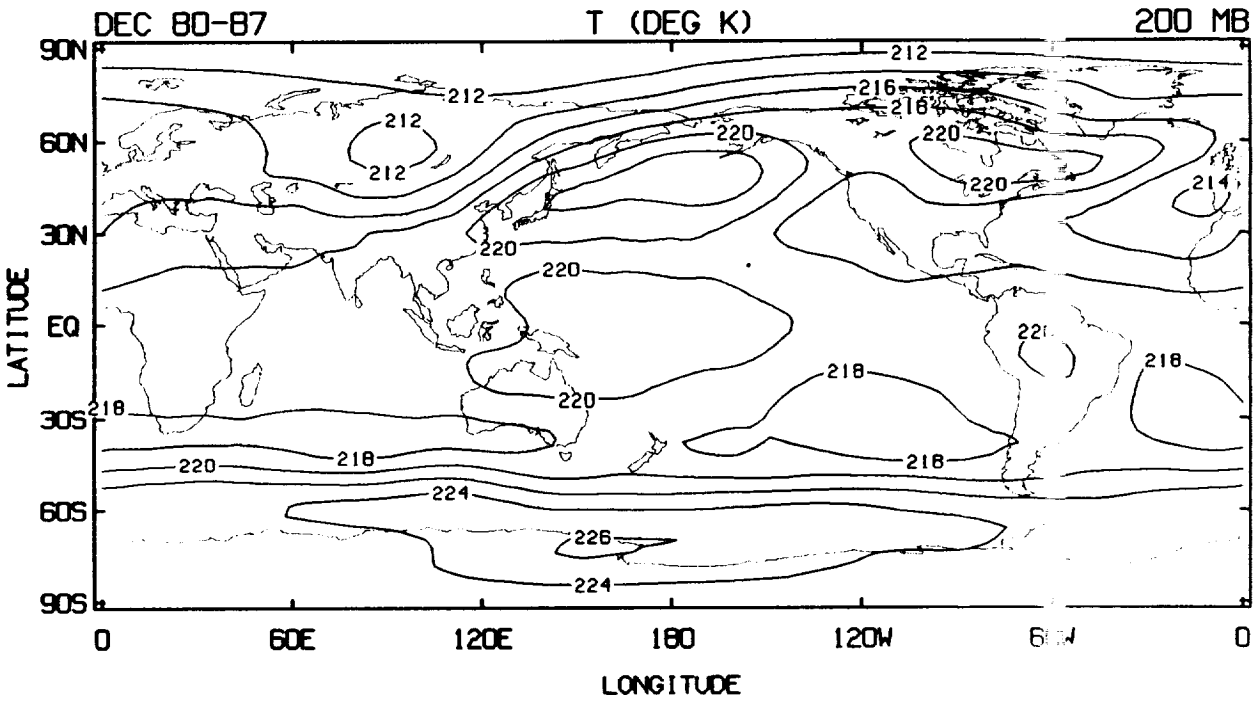
PRECEDING PAGE BLANK NOT FILMED

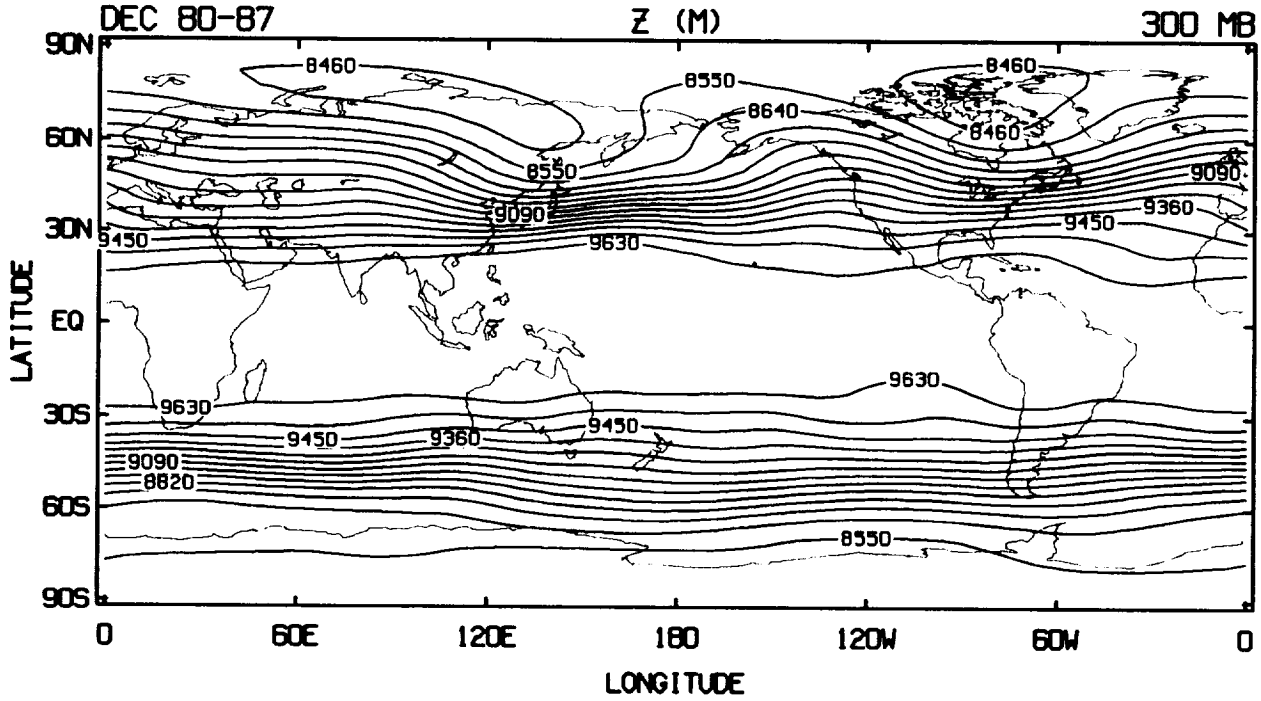
PAGE 156 INTENTIONALLY B

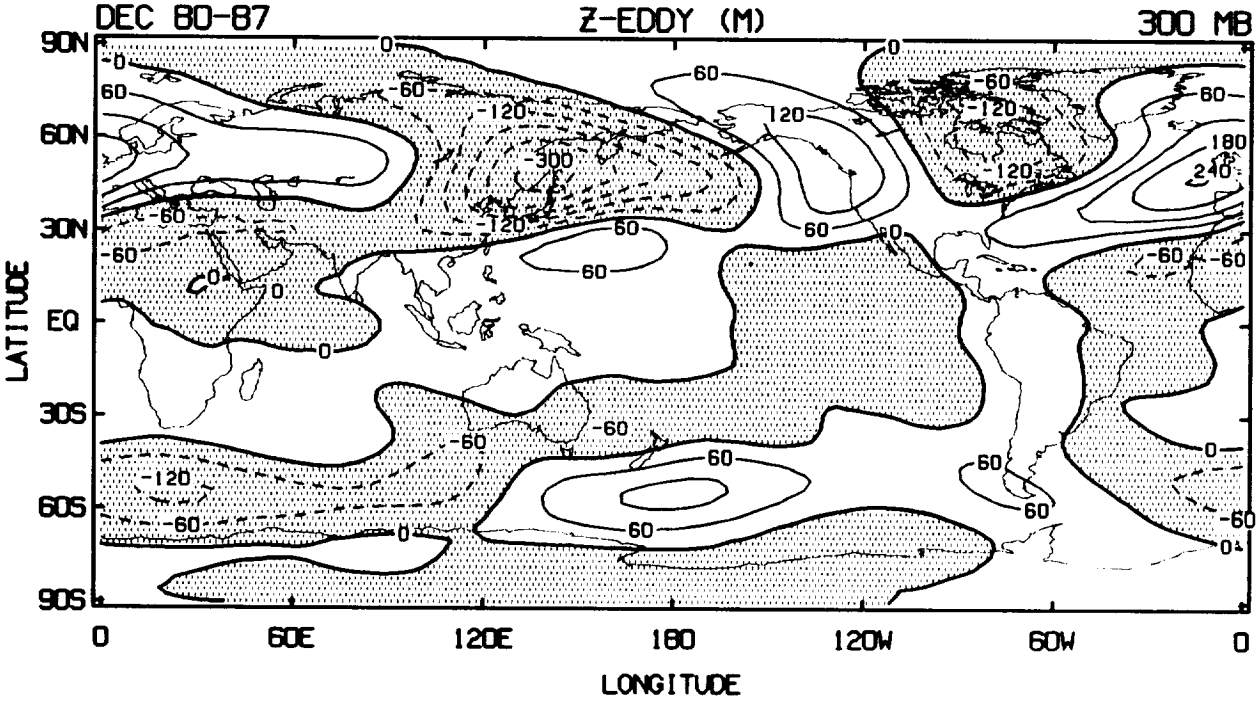

DEC 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

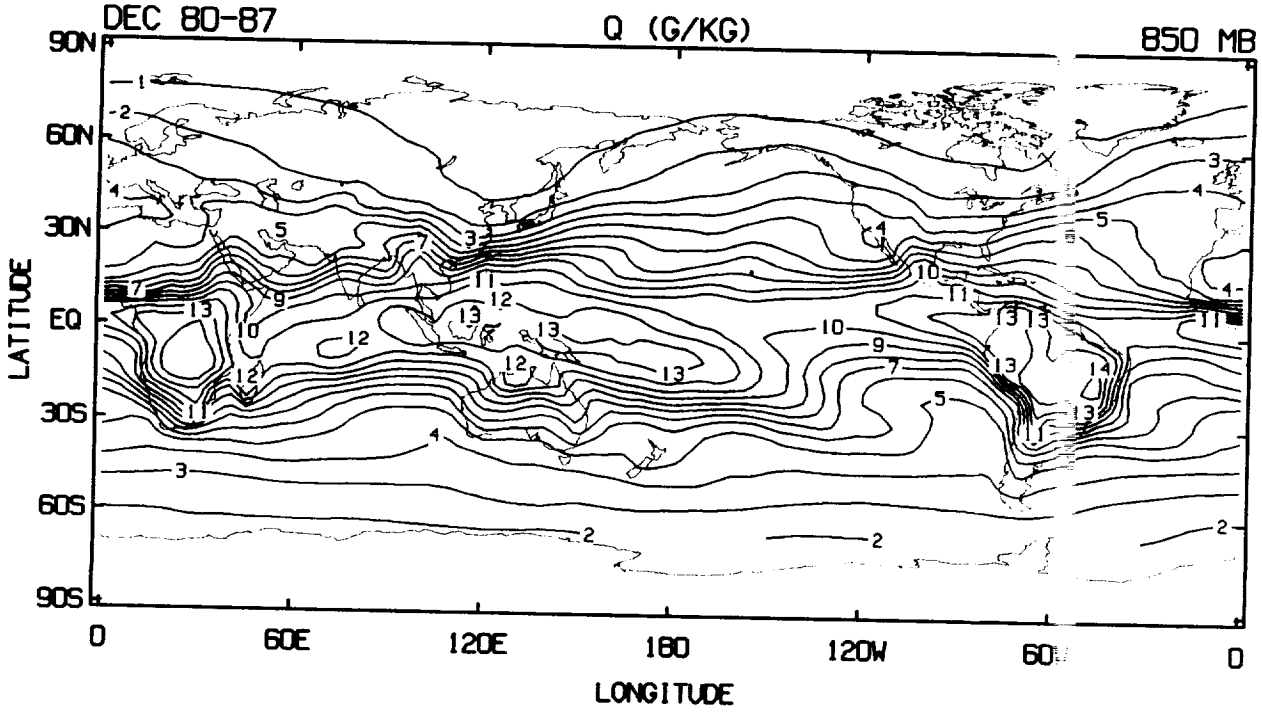

DEC 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

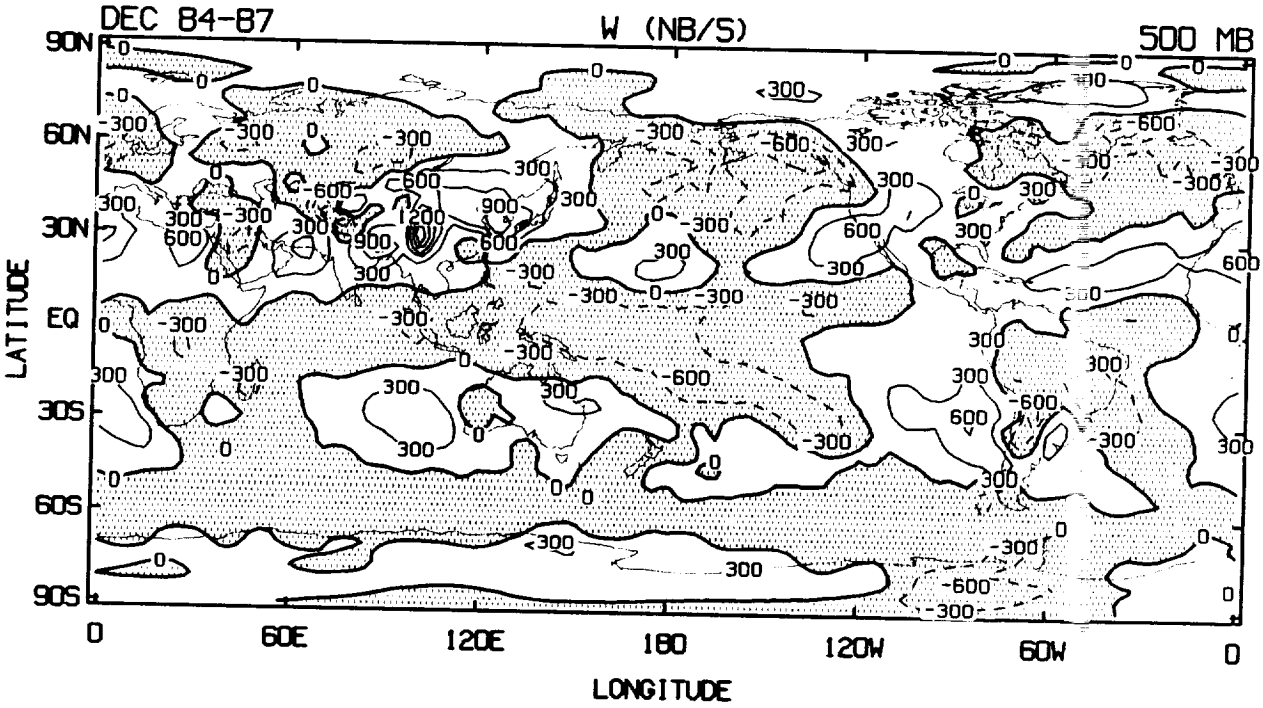

DEC 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
250
245
255
260
270
275
280
285
290
295
265

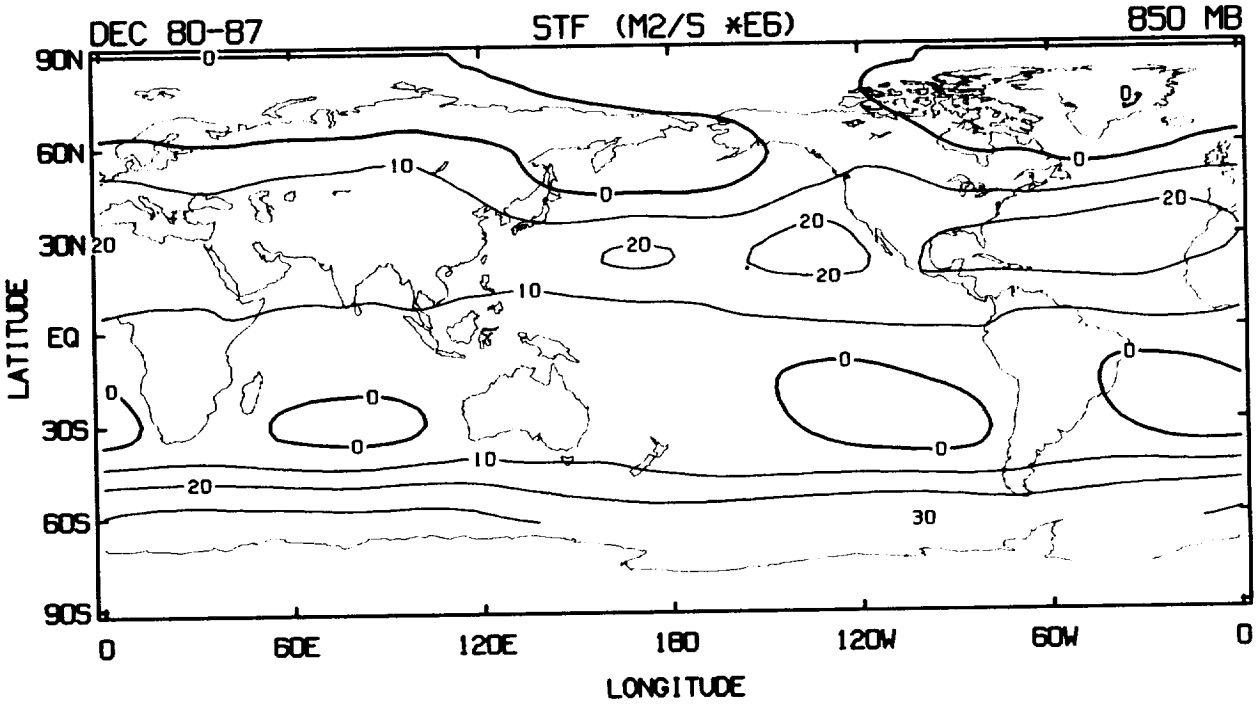

DEC 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
212
214
216
218
220
224
226

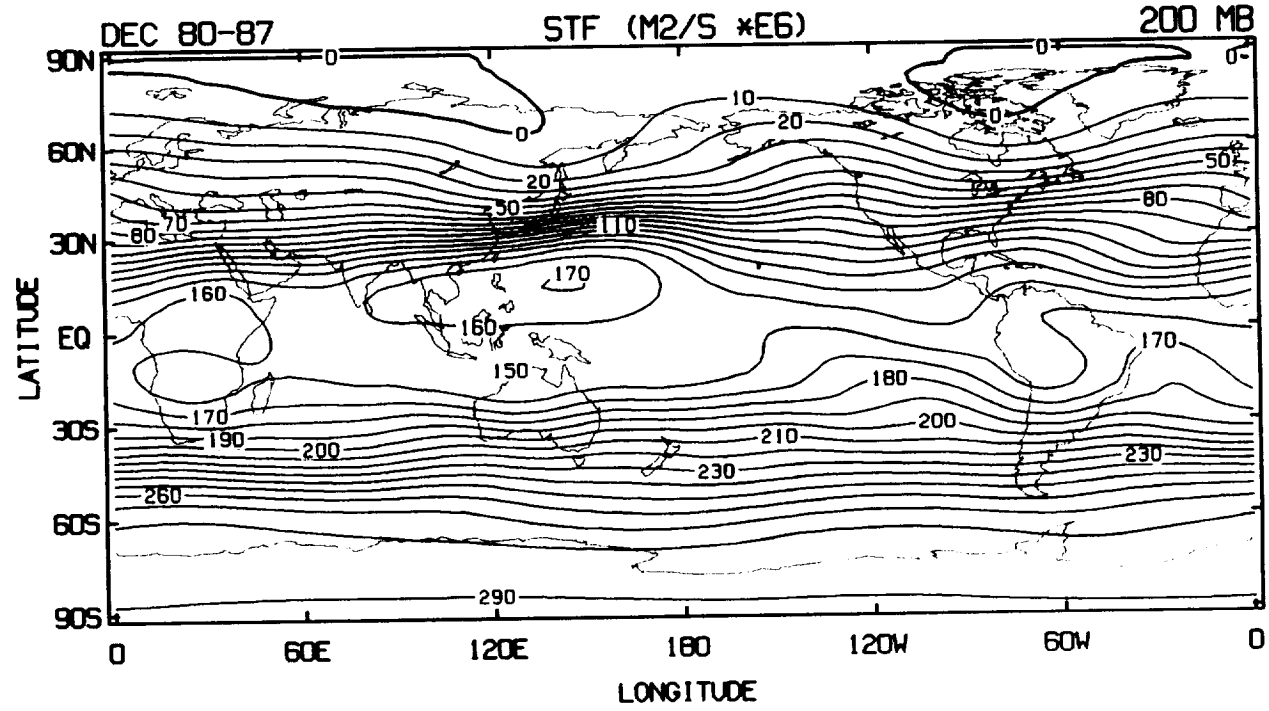

DEC 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
8460
8550
8640
9090
9450
9630
9360
8820

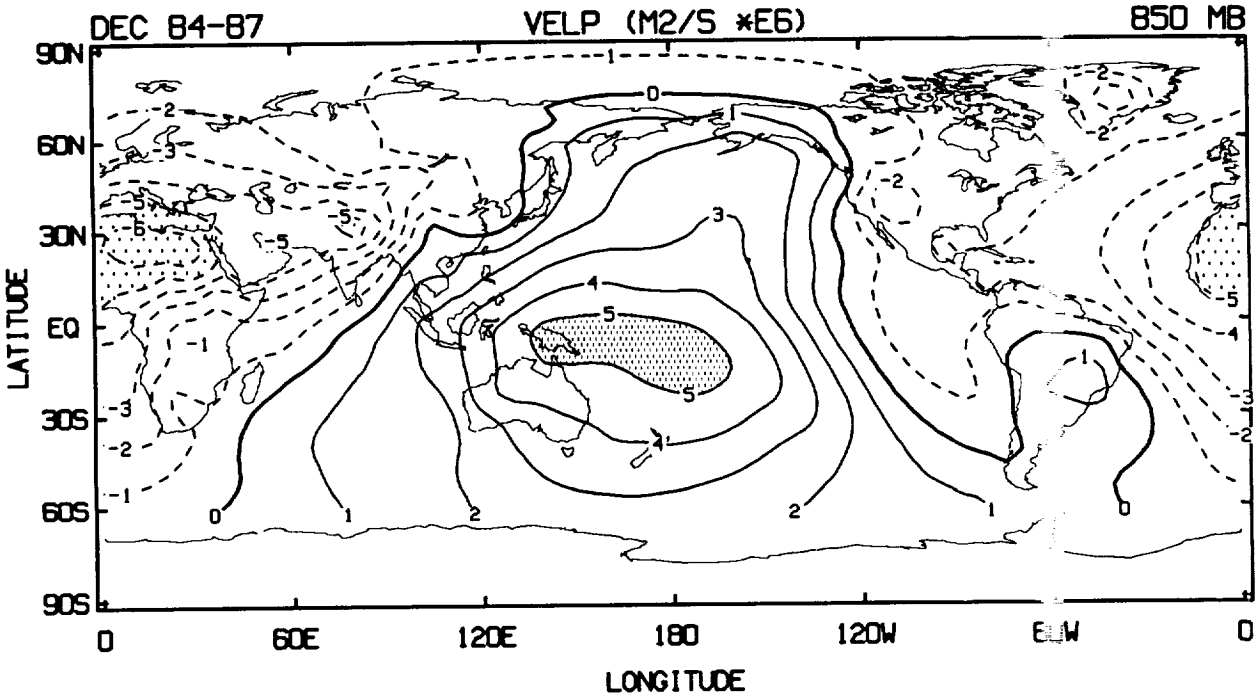

DEC 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
-60
-120
-300
60
120
180
240

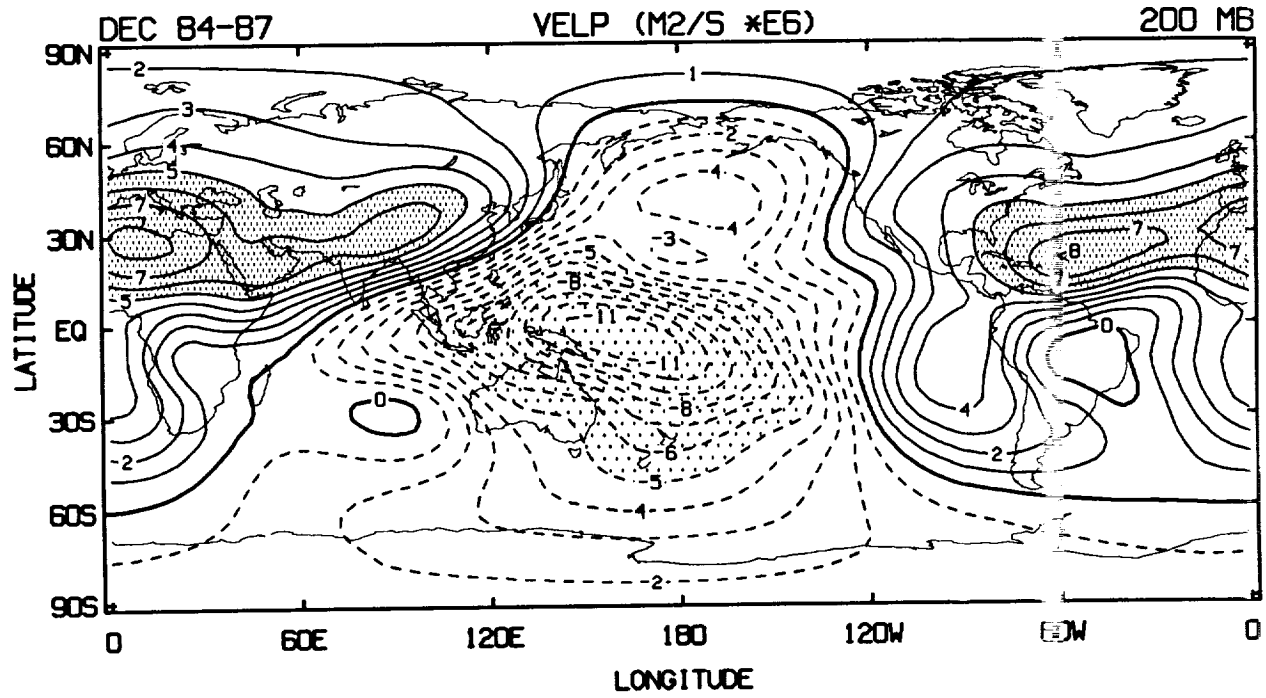

DEC 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

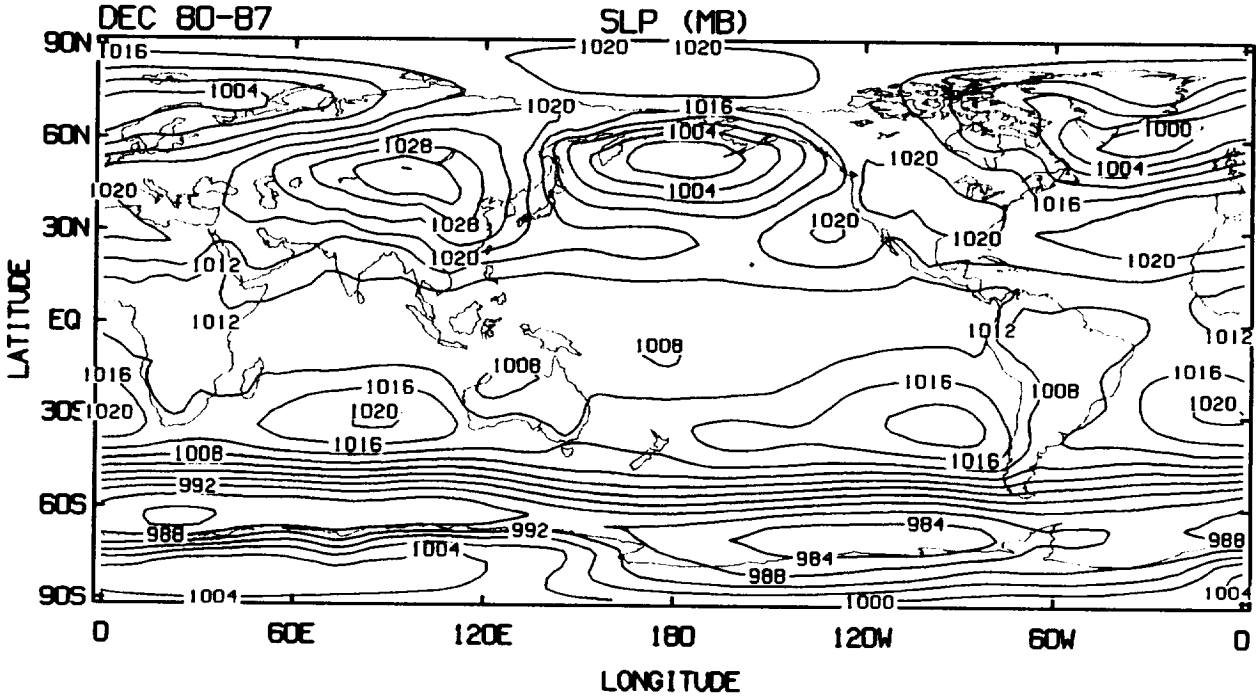

DEC 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

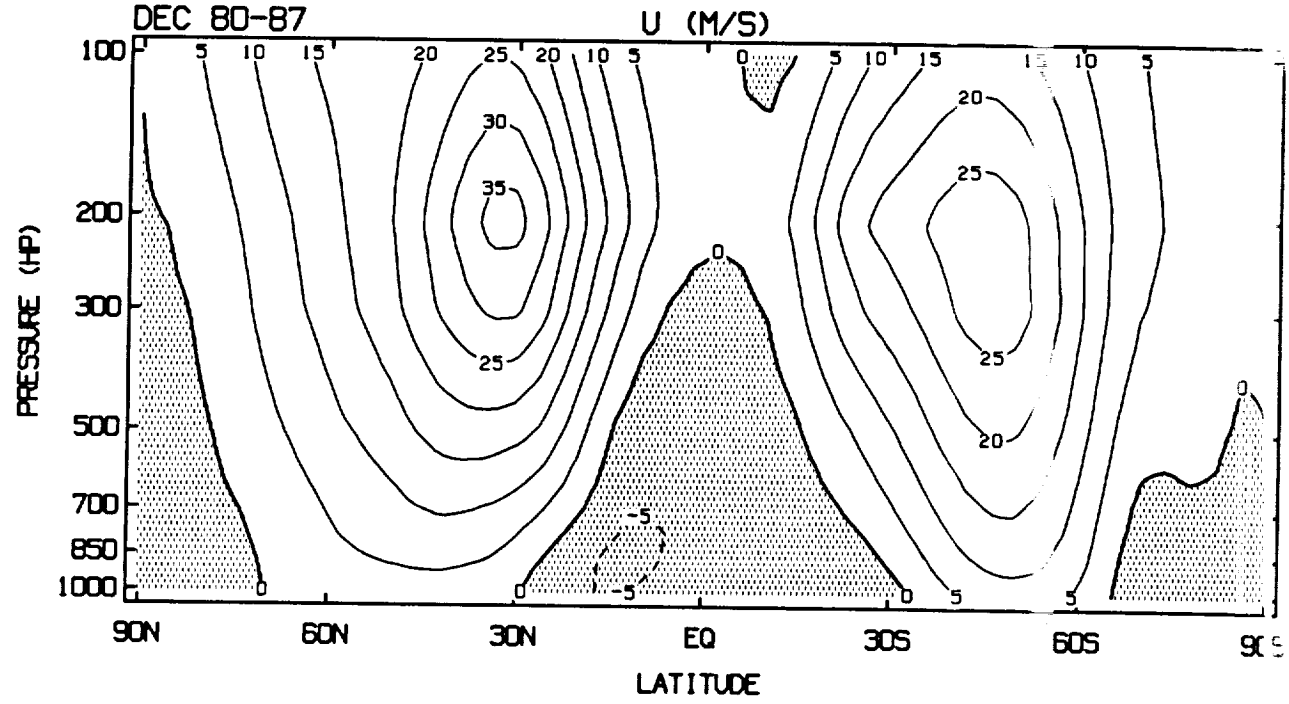

DEC 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

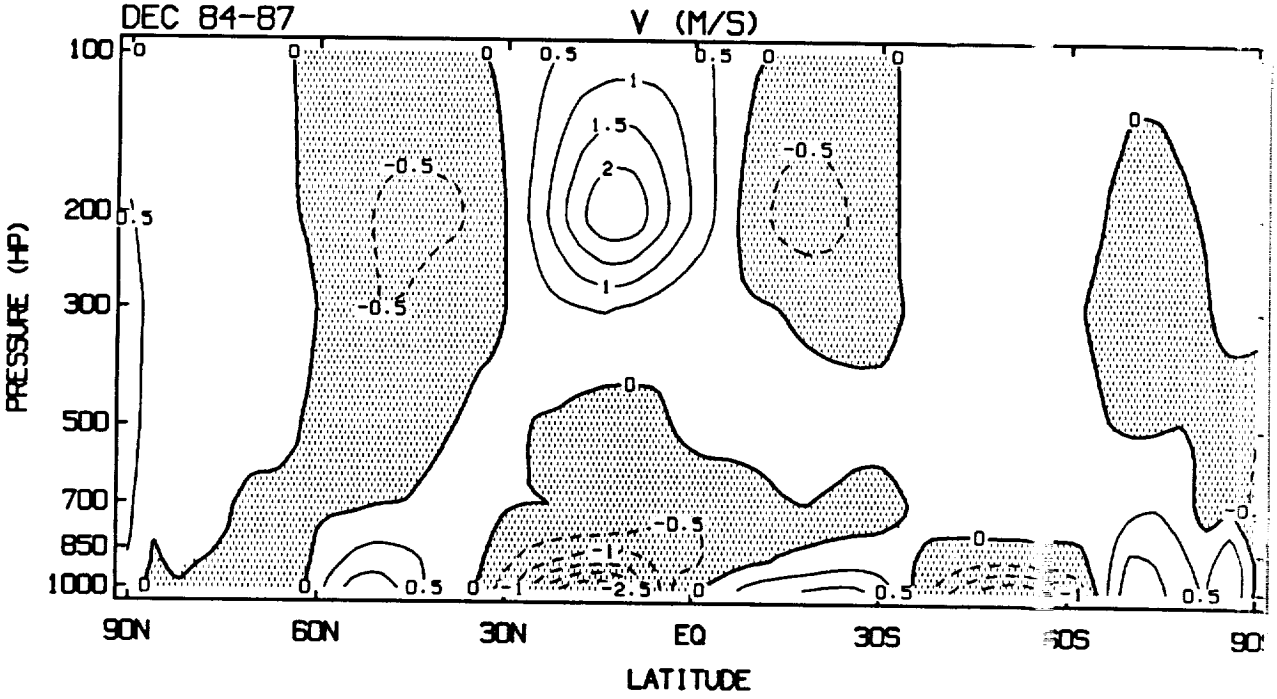

DEC 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

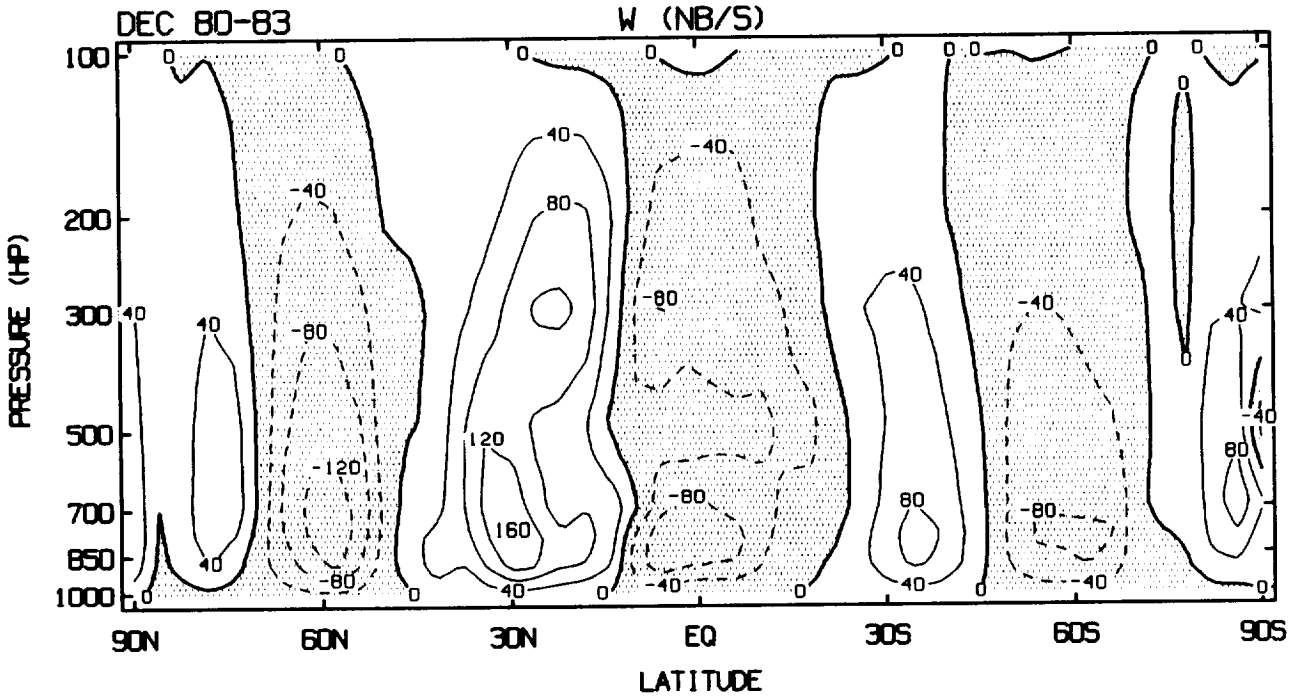

DEC 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

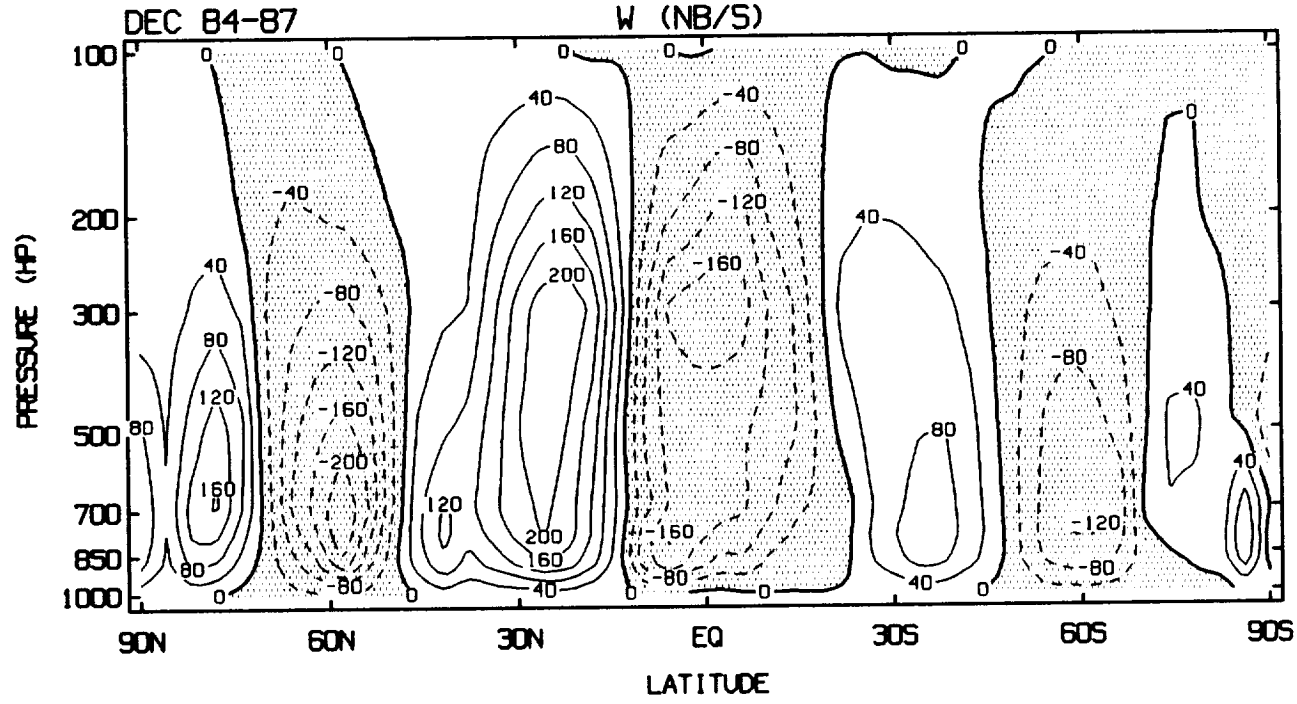

DEC 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

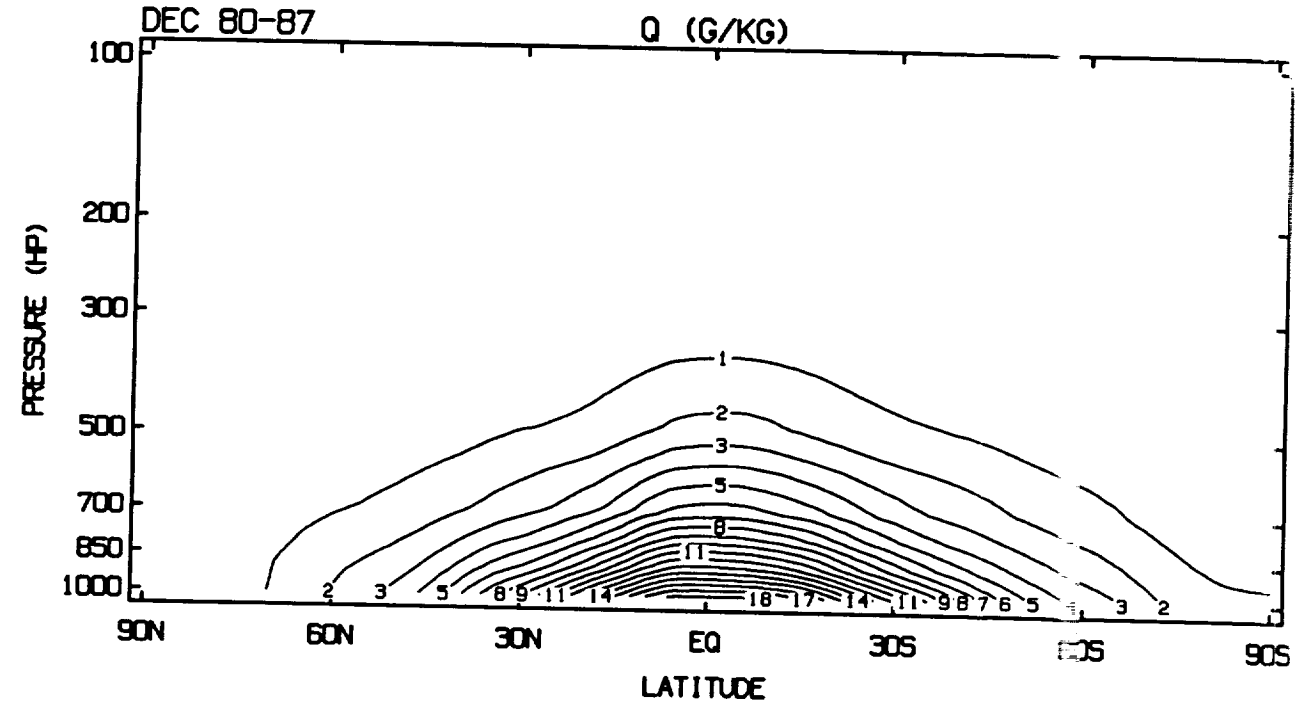

DEC 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1016
1020
1004
1028
1012
1008
992
988
1000
984

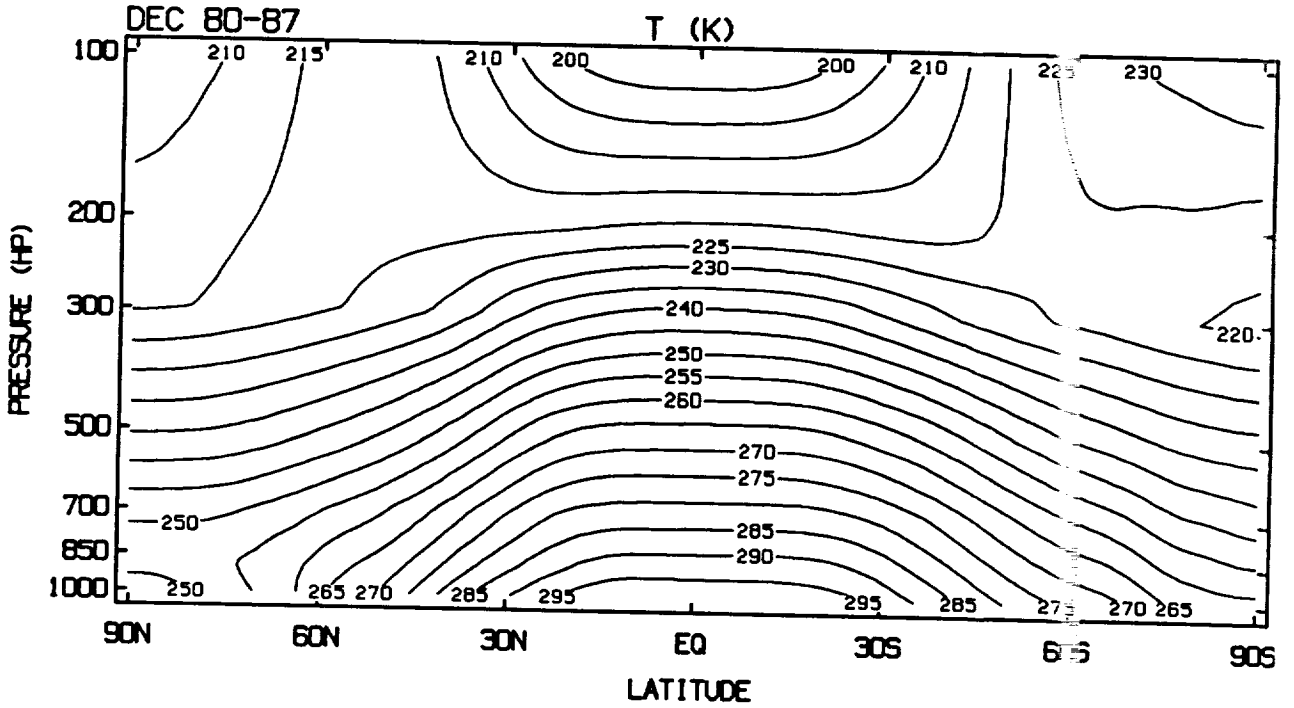

DEC 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


DEC 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


DEC 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


DEC 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

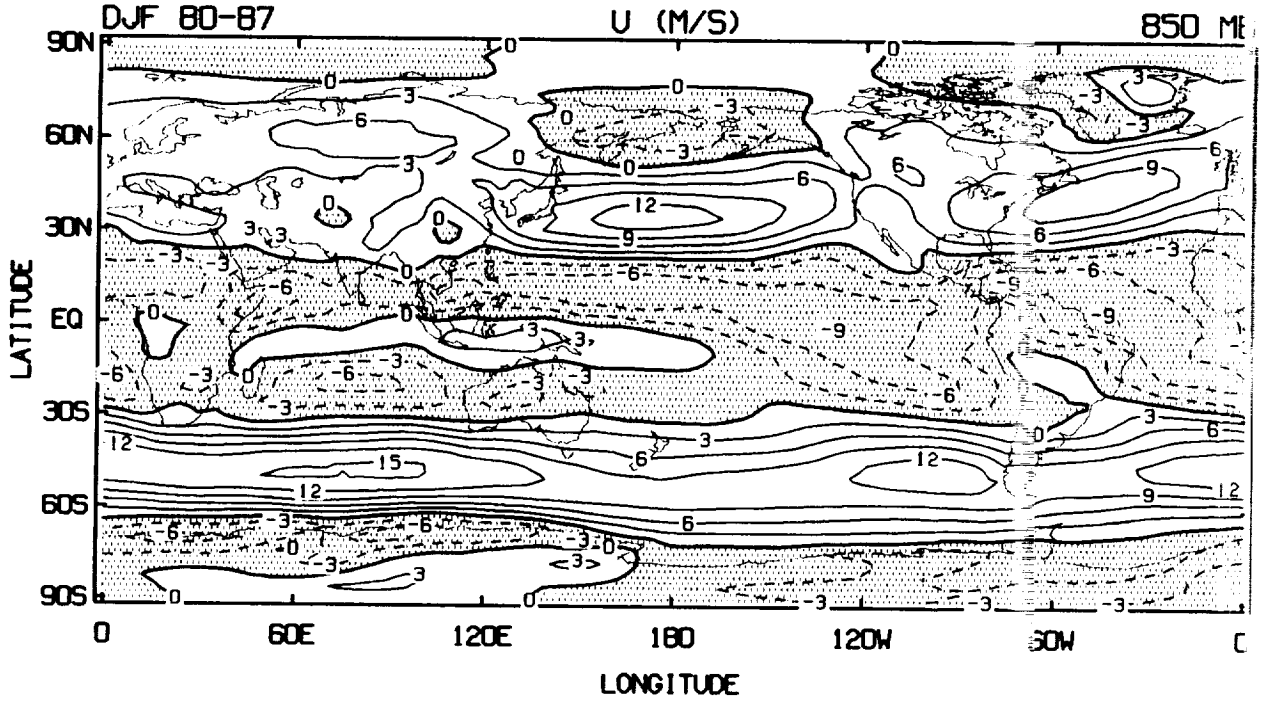

DEC 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE

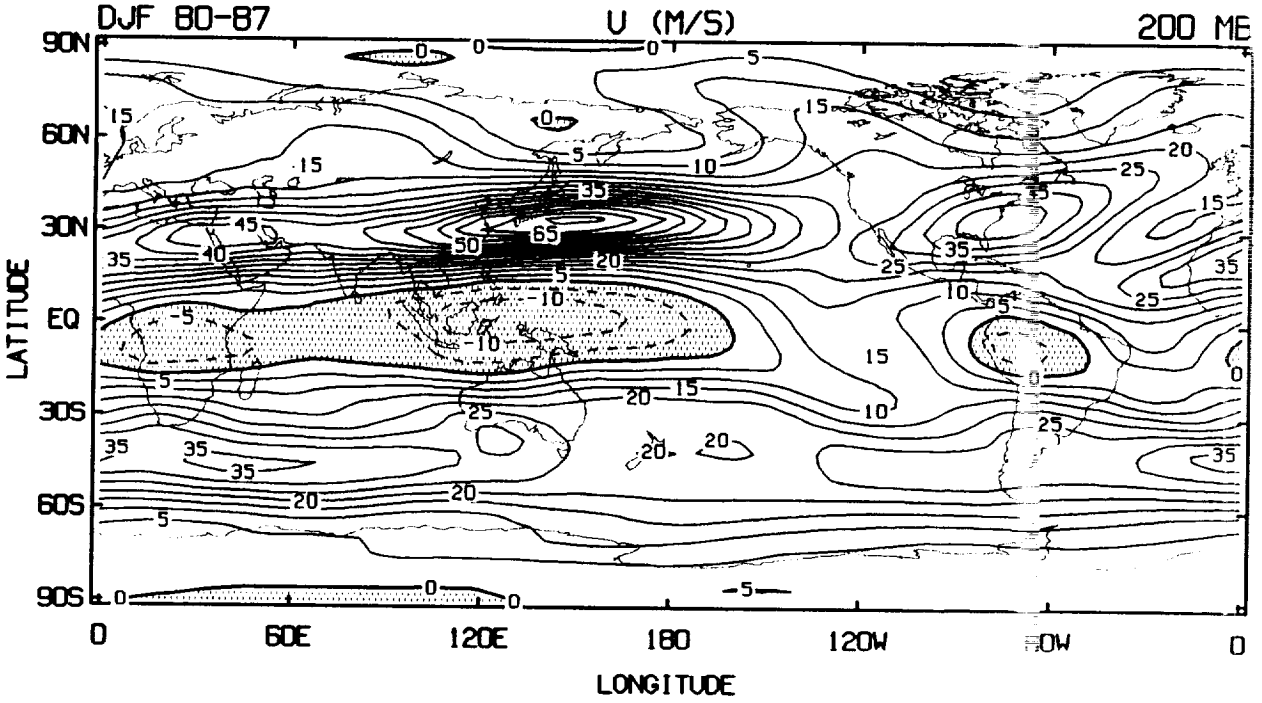

DEC 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE

DECEMBER
JANUARY
FEBRUARY

PAGE 168 INTENTIONALLY BLANK

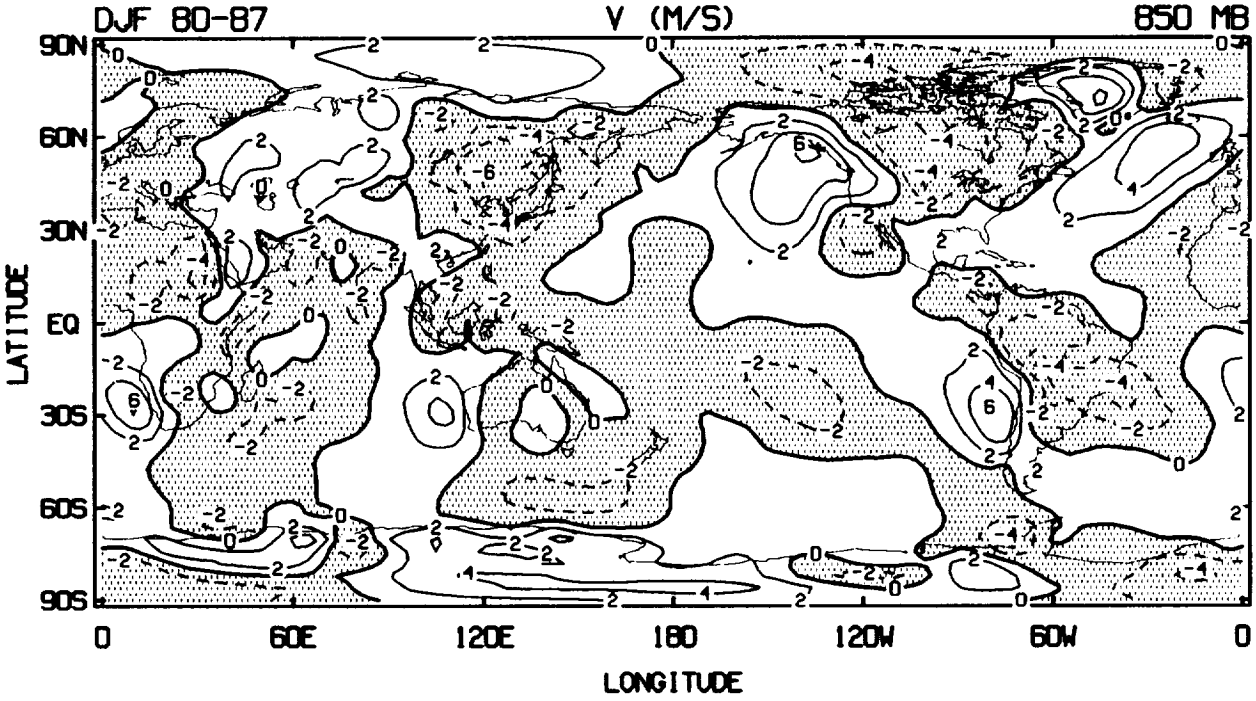
PRECEDING PAGE BLANK NOT FILMED

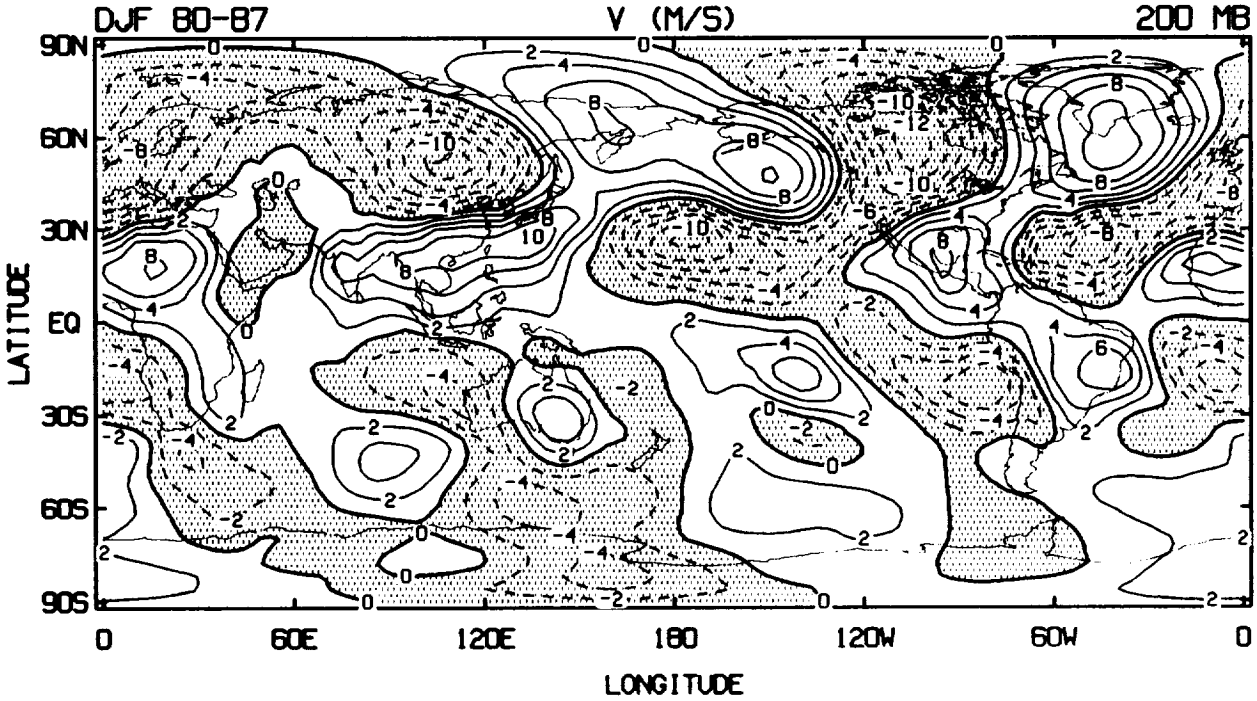


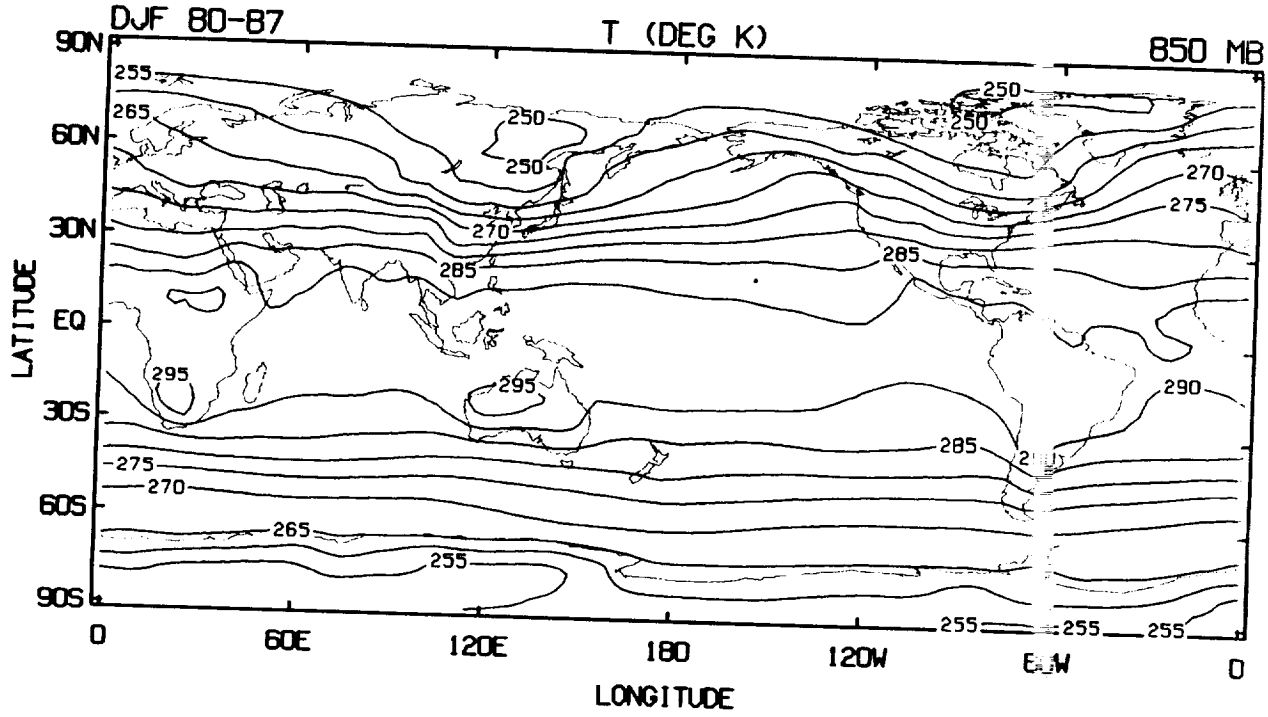


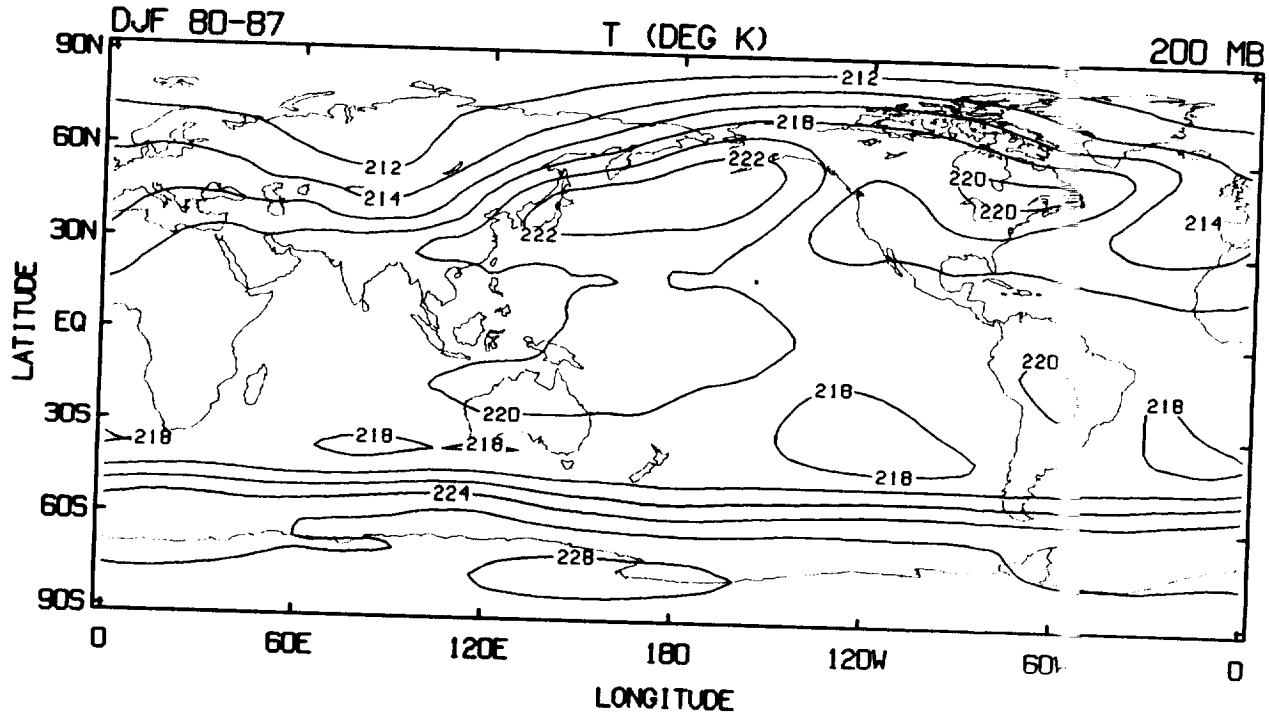
PRECEDING PAGE BLANK NOT FILMED

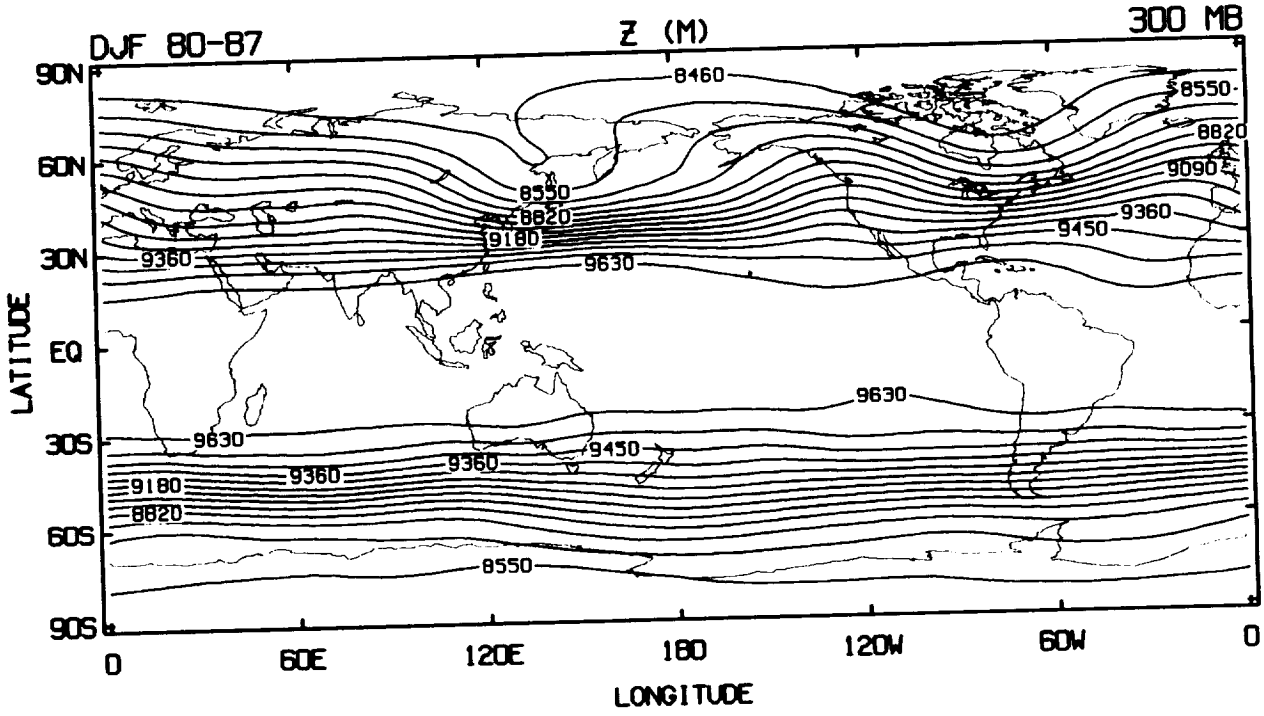
PAGE 170 INTENTIONALLY BLA

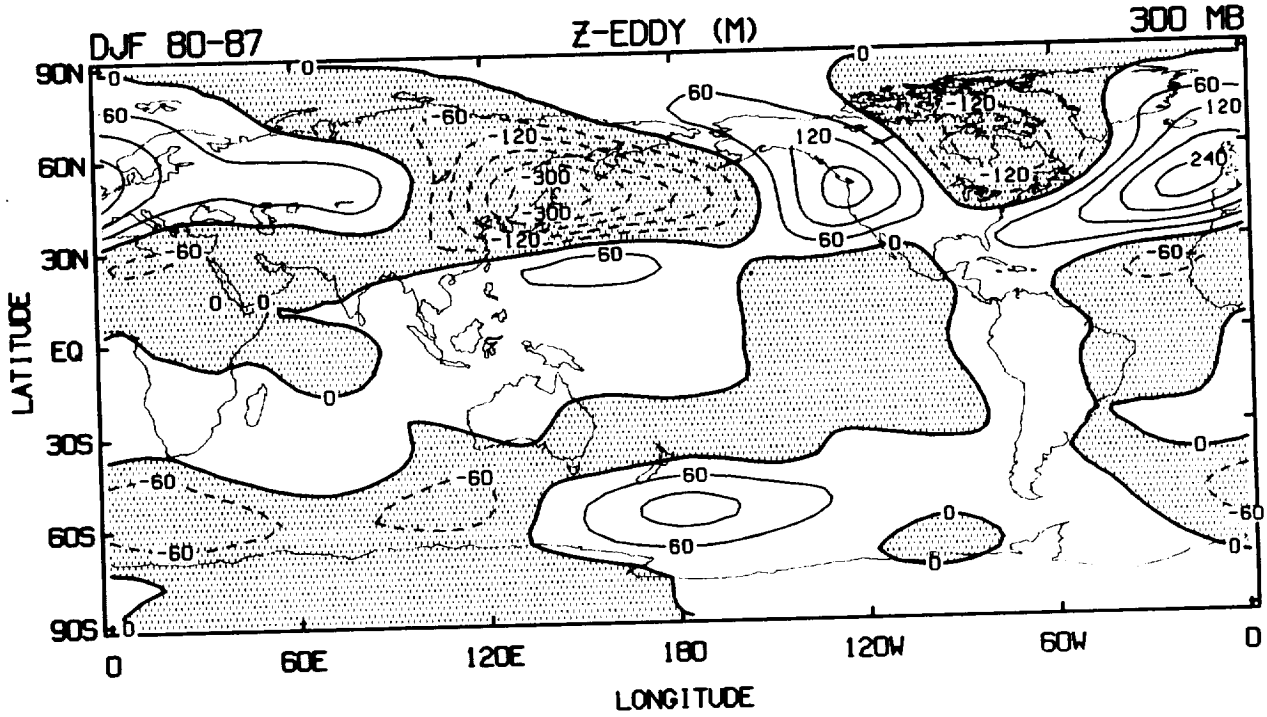

DJF 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

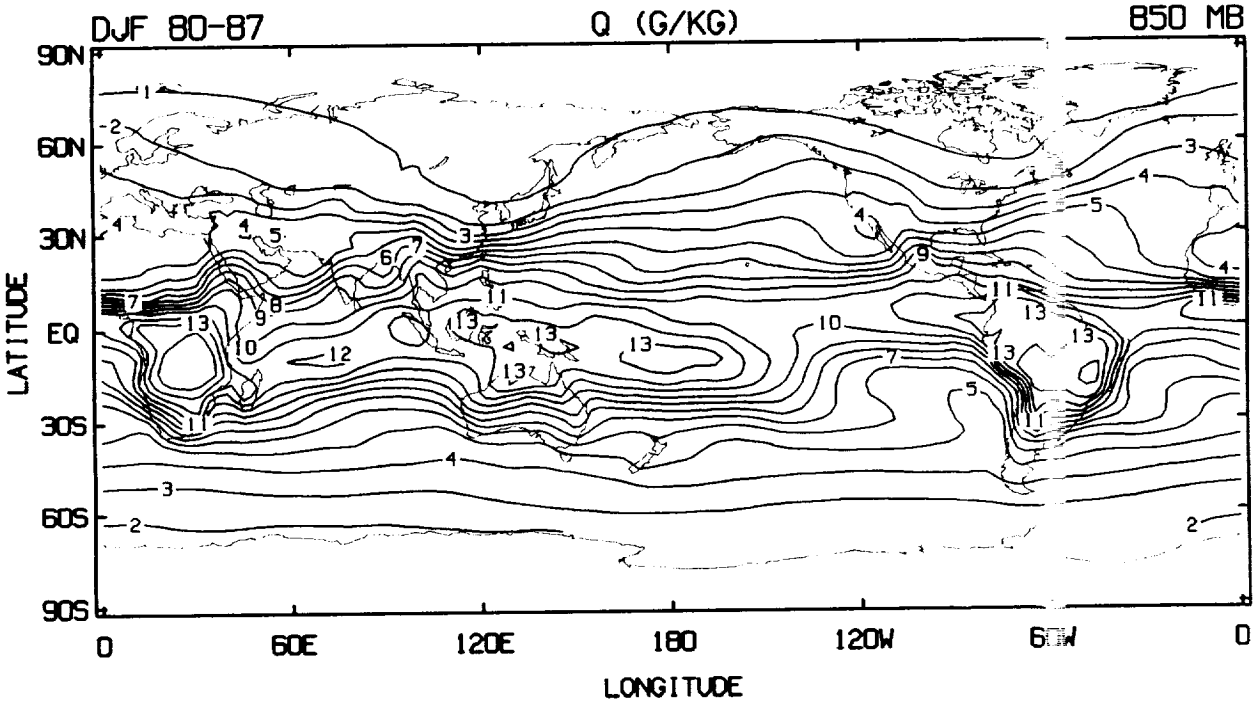

DJF 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

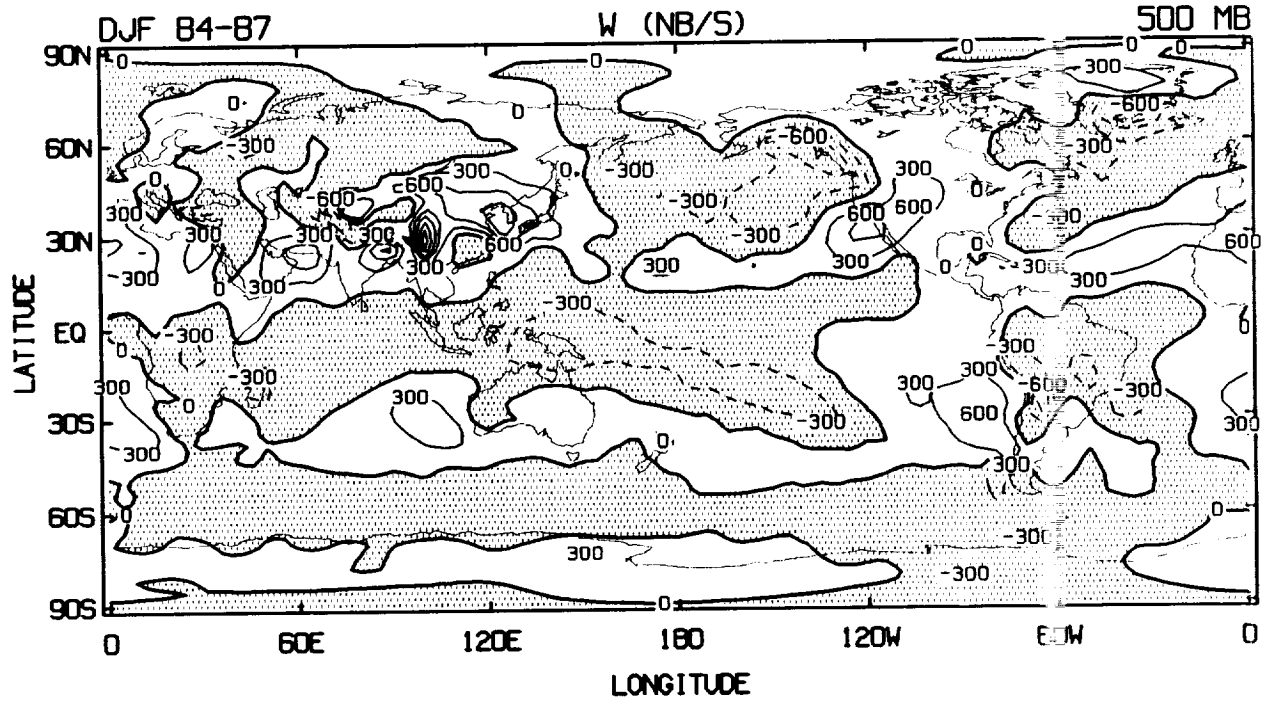

DJF 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE
255
265
250
270
275
285
295
290

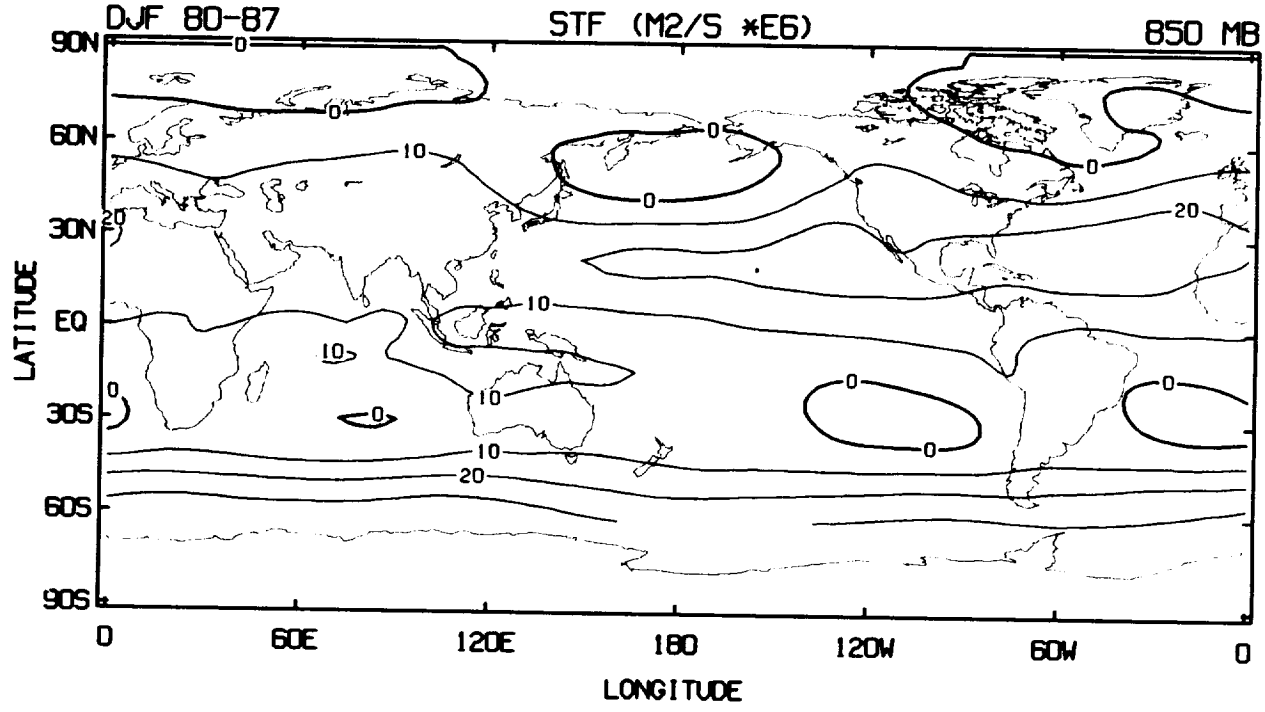

DJF 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE
212
214
218
220
222
224
228

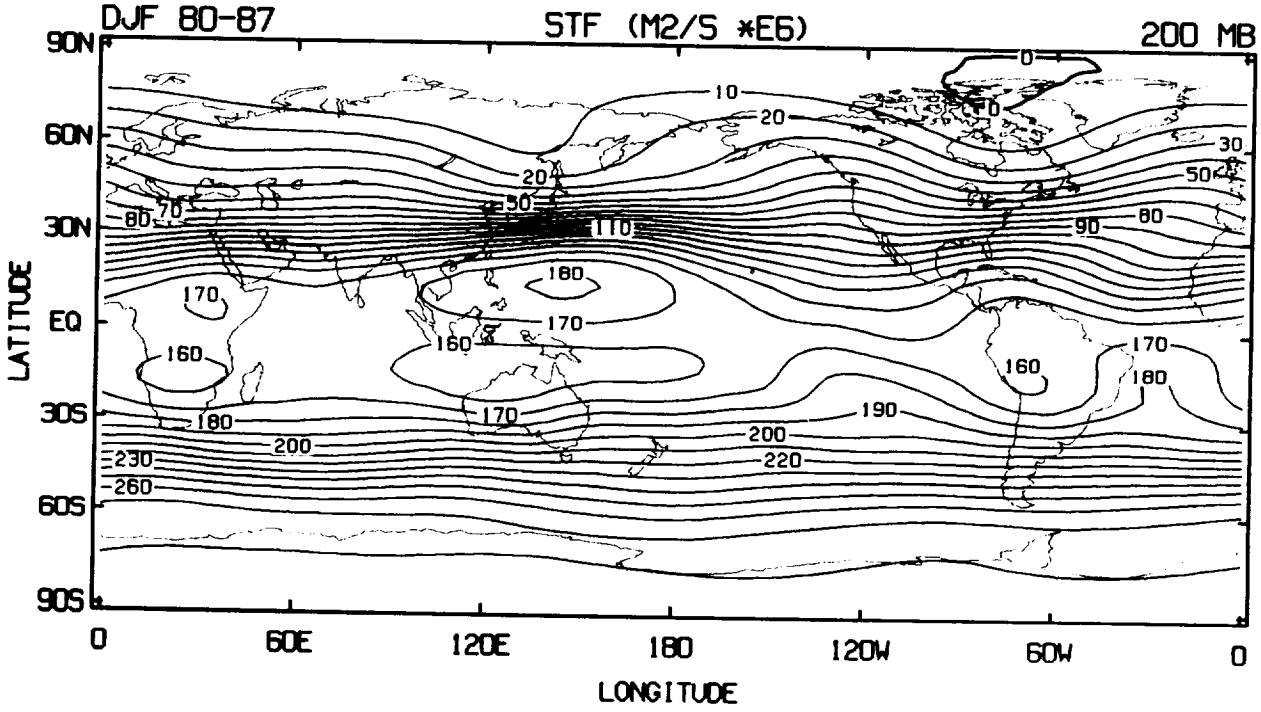

DJF 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
8460
8550
8820
9090
9360
9450
9180
9630
0
60E
120E
180
120W
60W
LONGITUDE

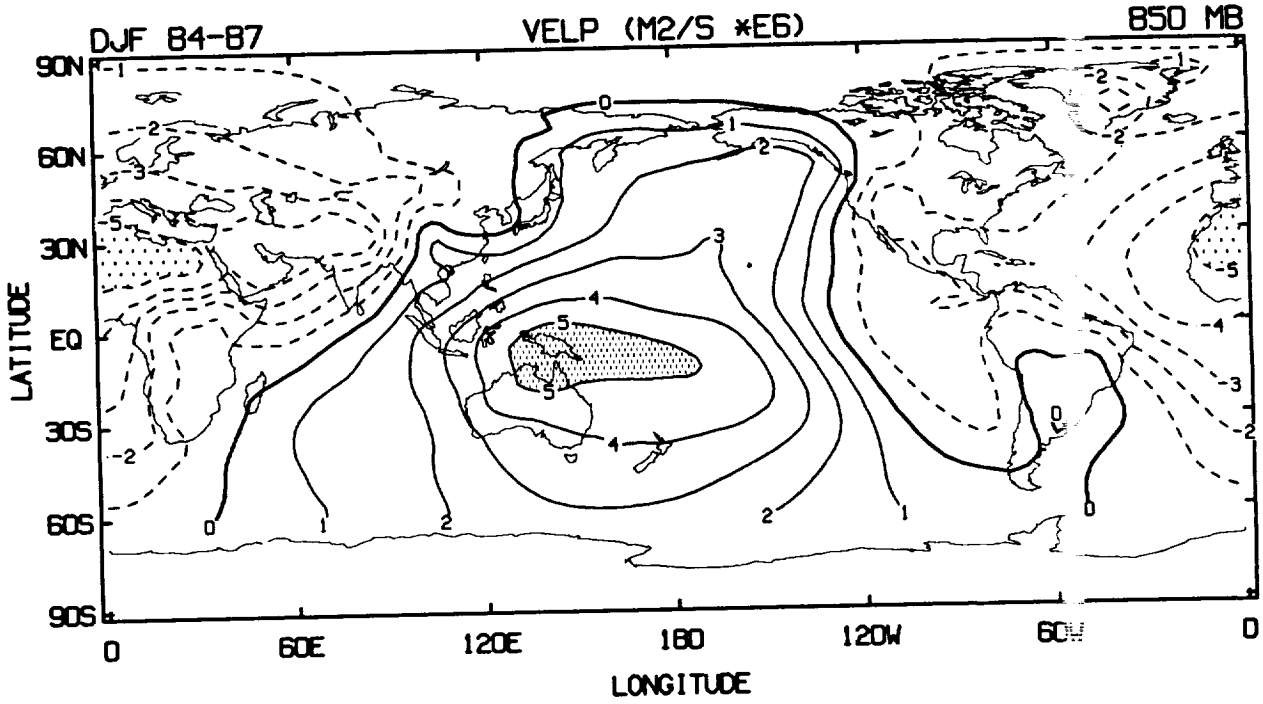

DJF 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60
120
240
-60
-120
-300
0
60E
120E
180
120W
60W
LONGITUDE

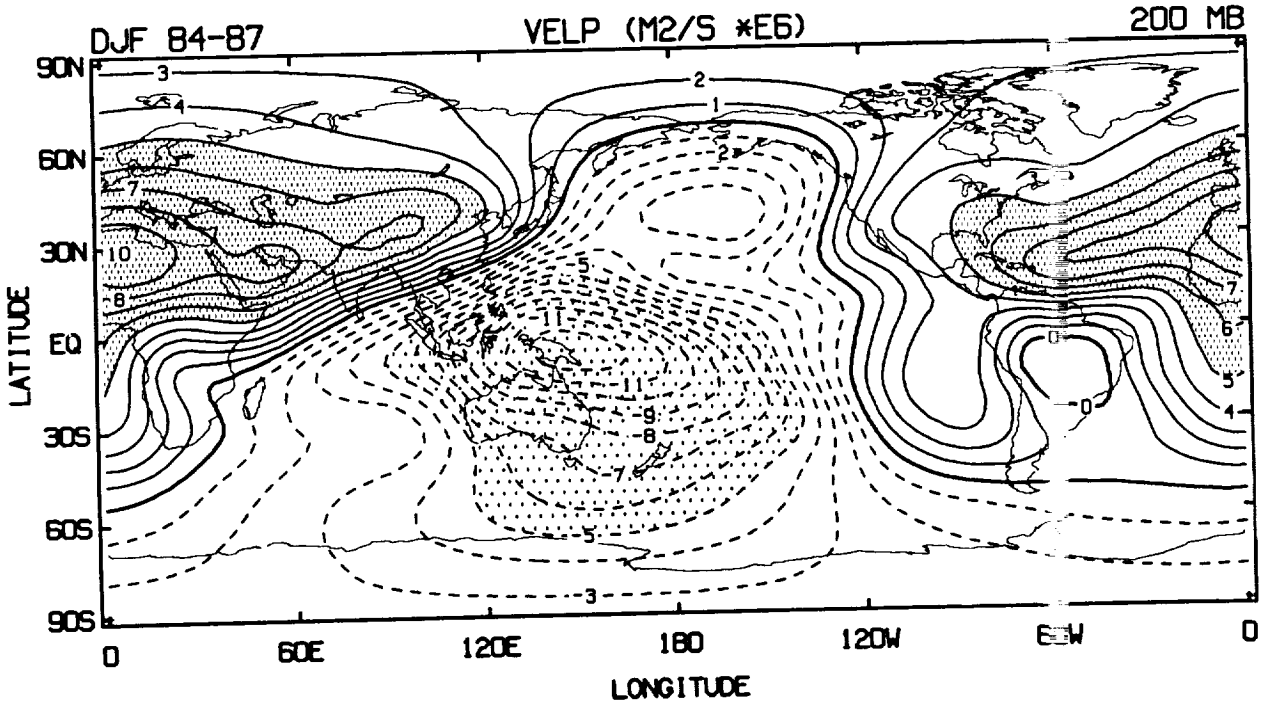

DJF 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

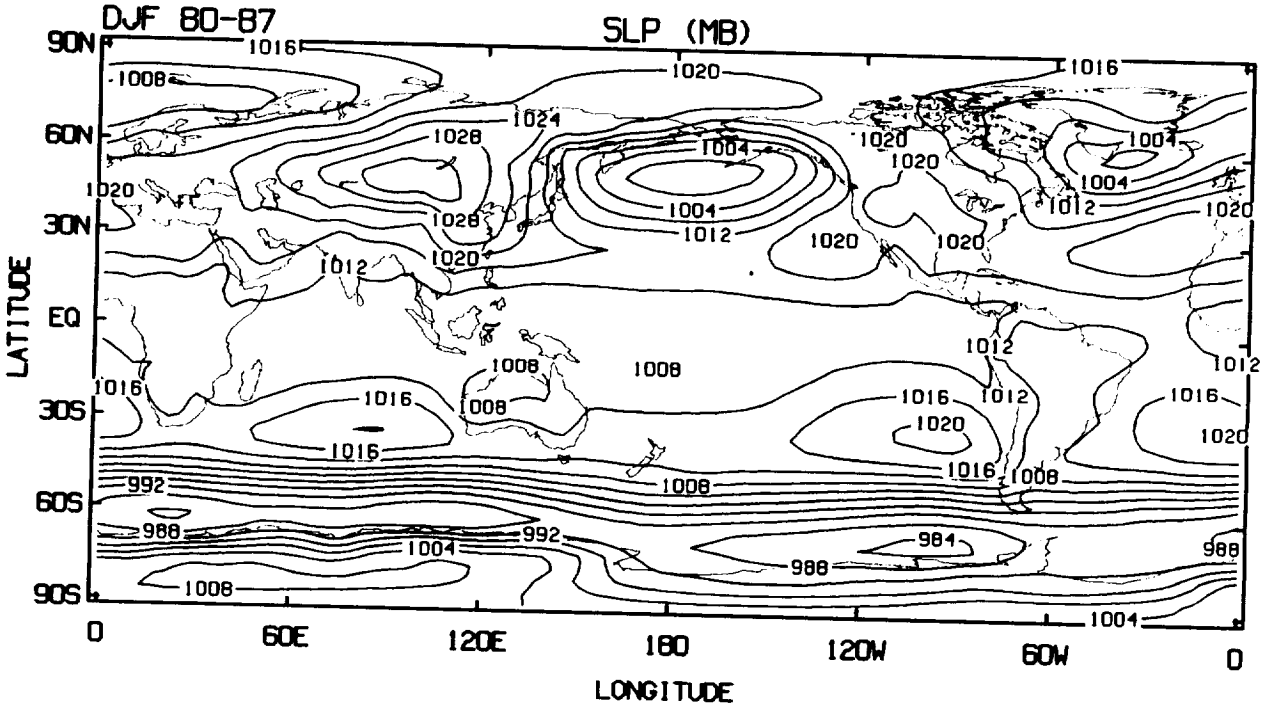

DJF 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

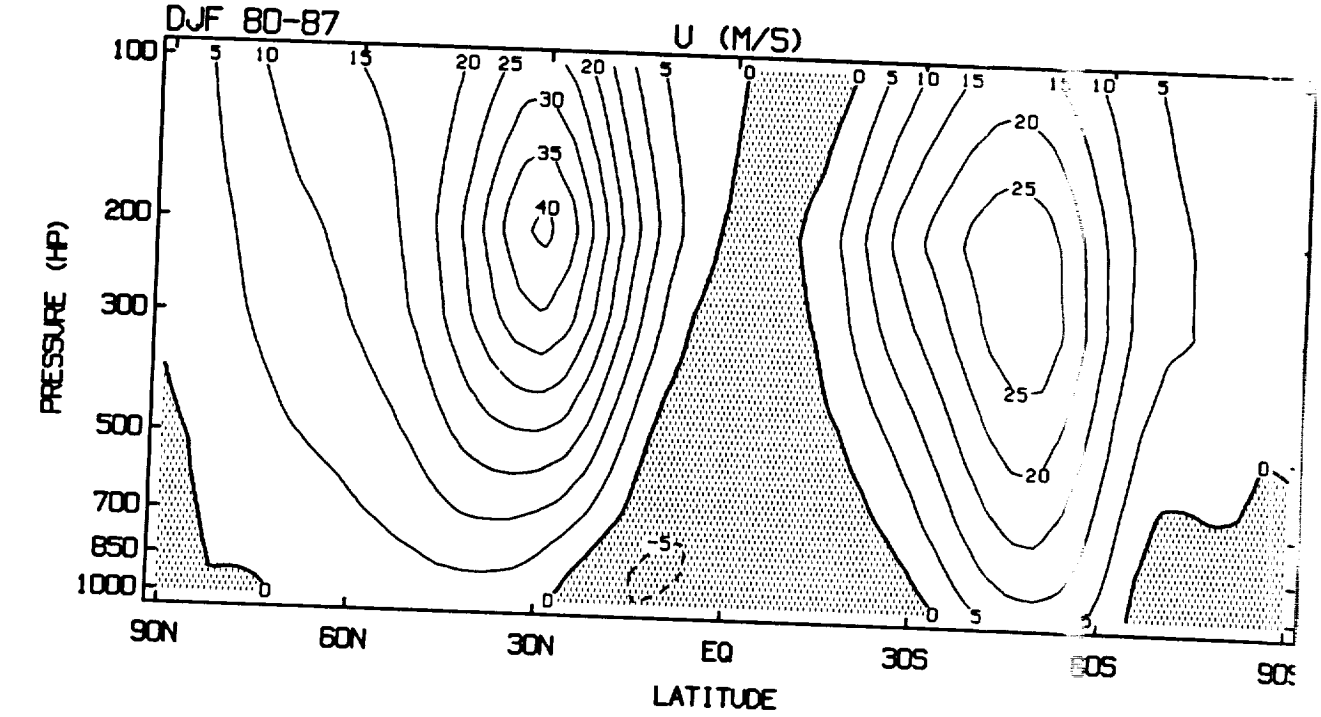

DJF 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

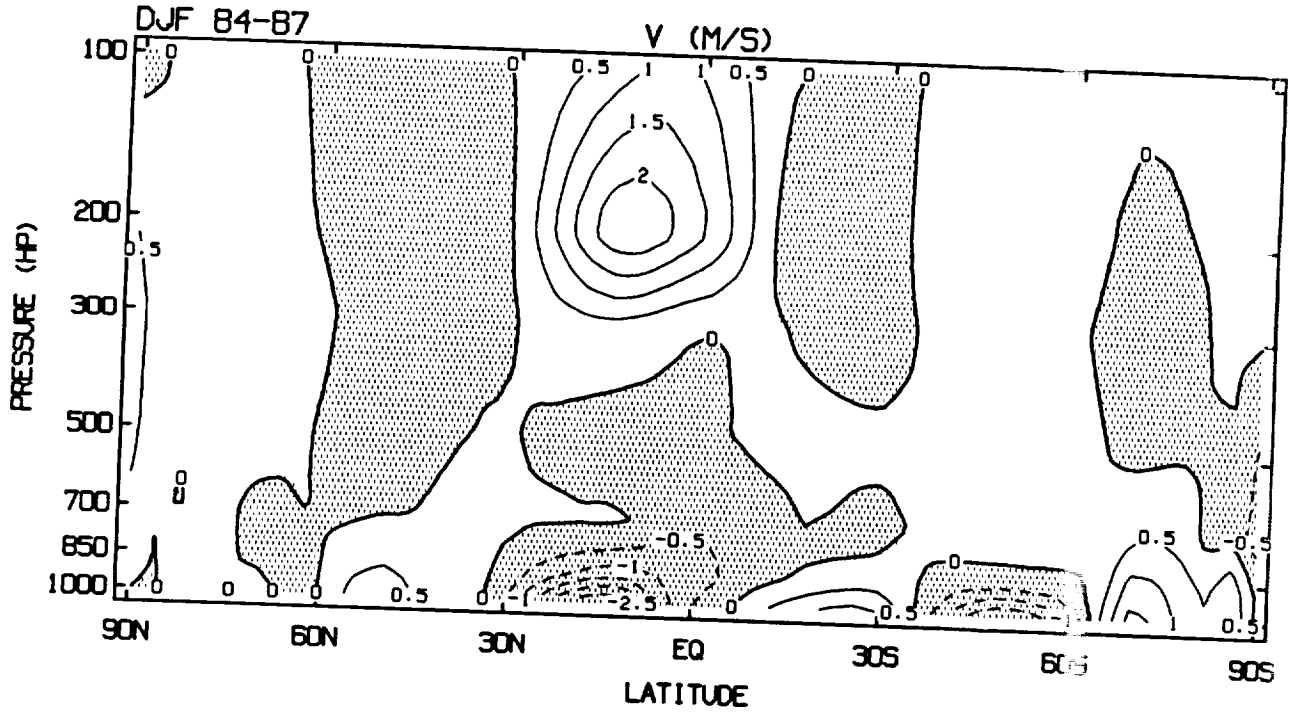

DJF 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

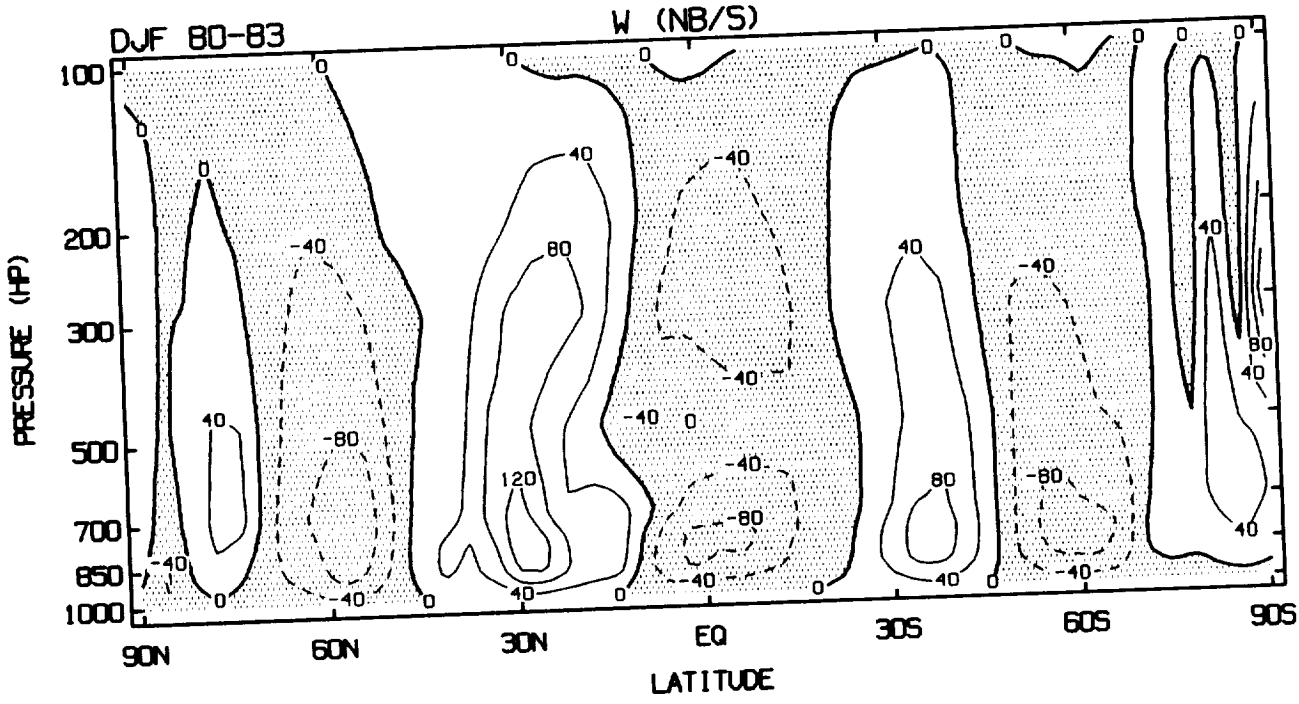

DJF 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

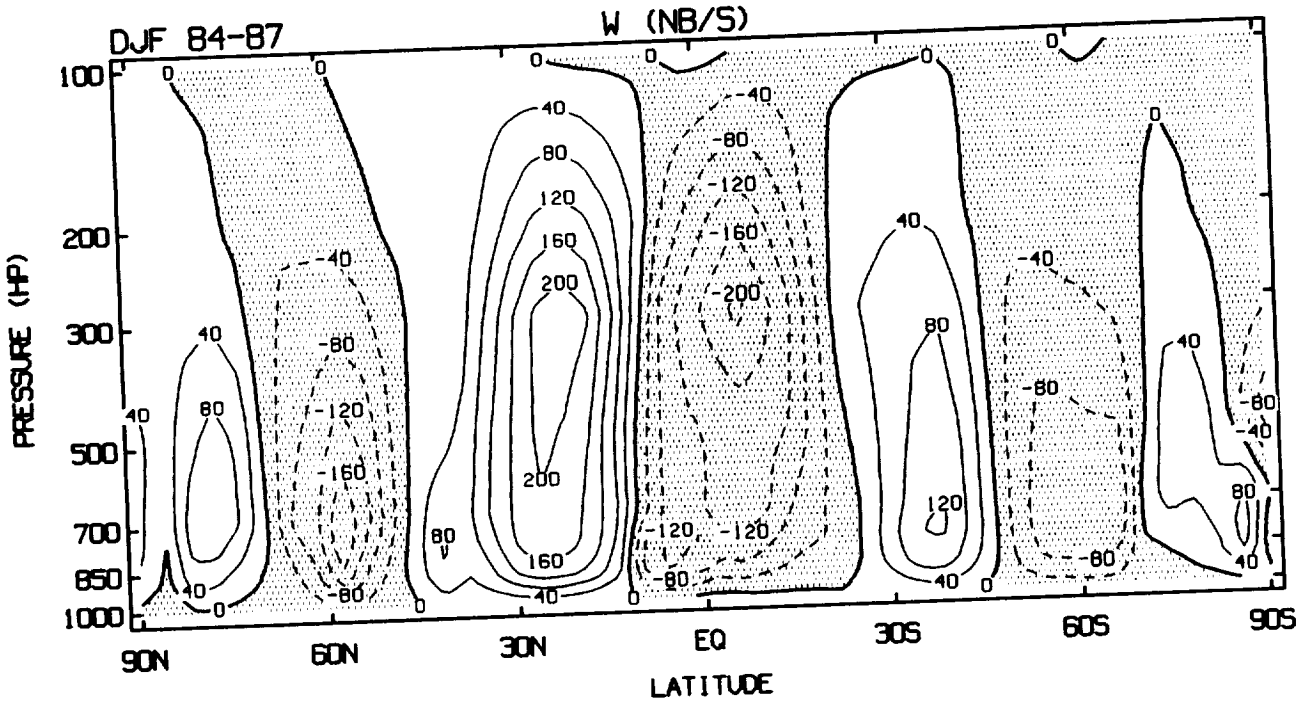

DJF 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

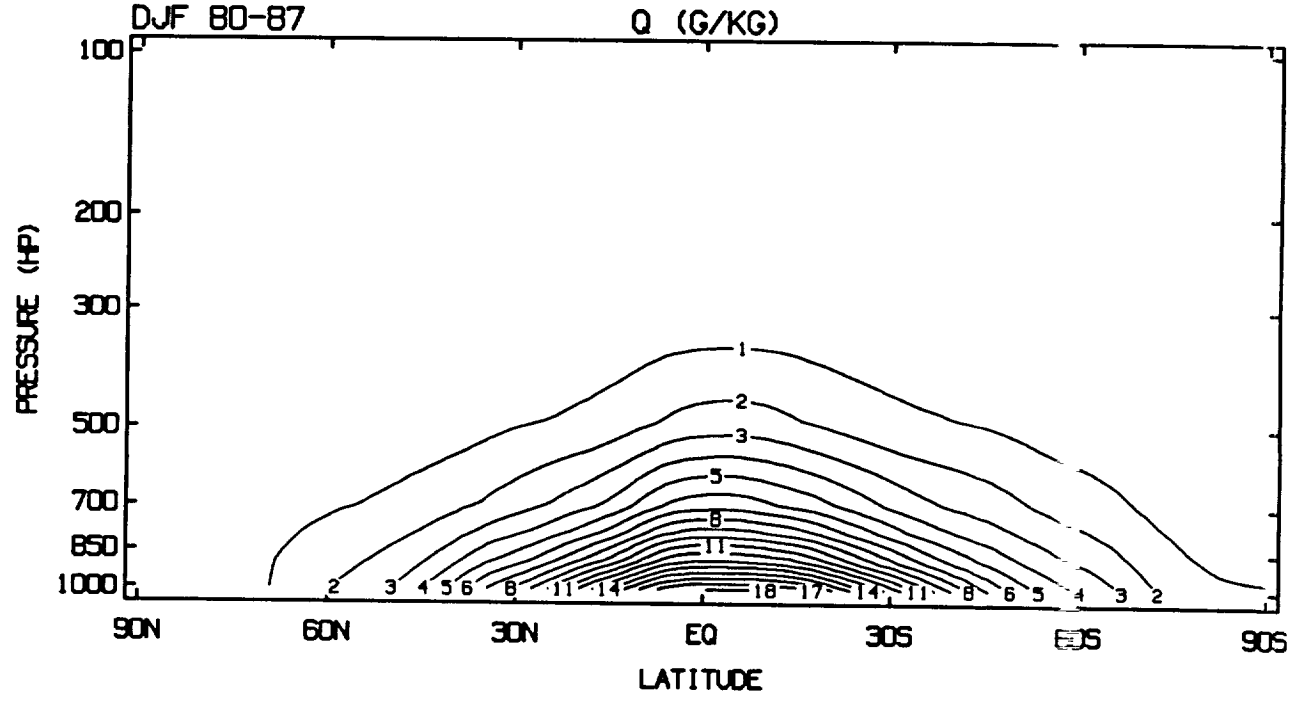

DJF 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1016
1008
1020
1024
1028
1004
1012
992
988
984

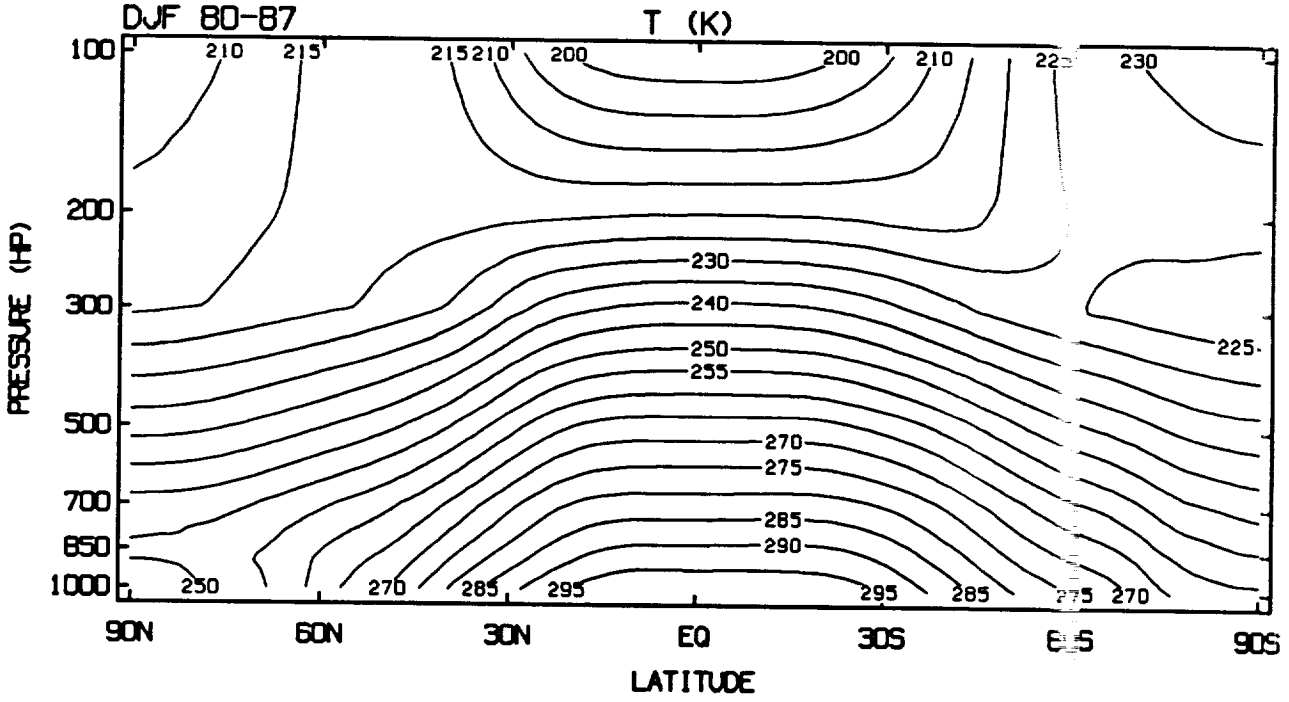

DJF 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
LATITUDE


DJF 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE


DJF 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


DJF 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

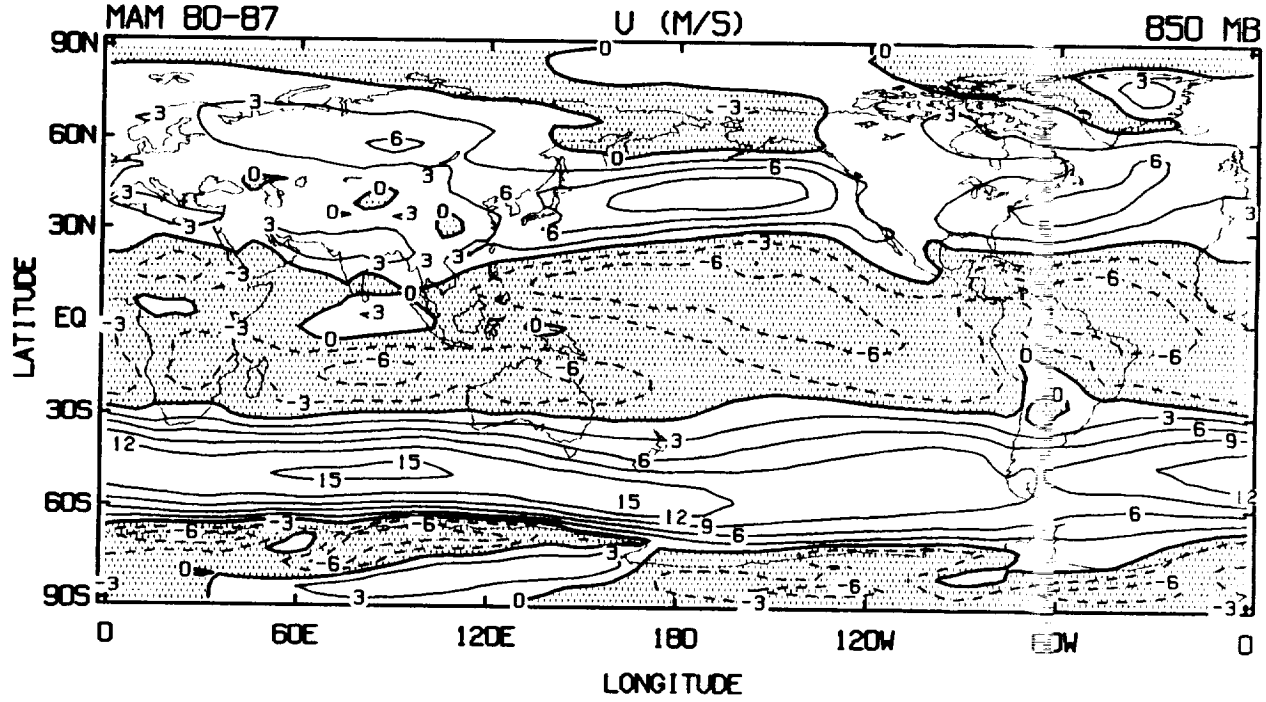

DJF 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

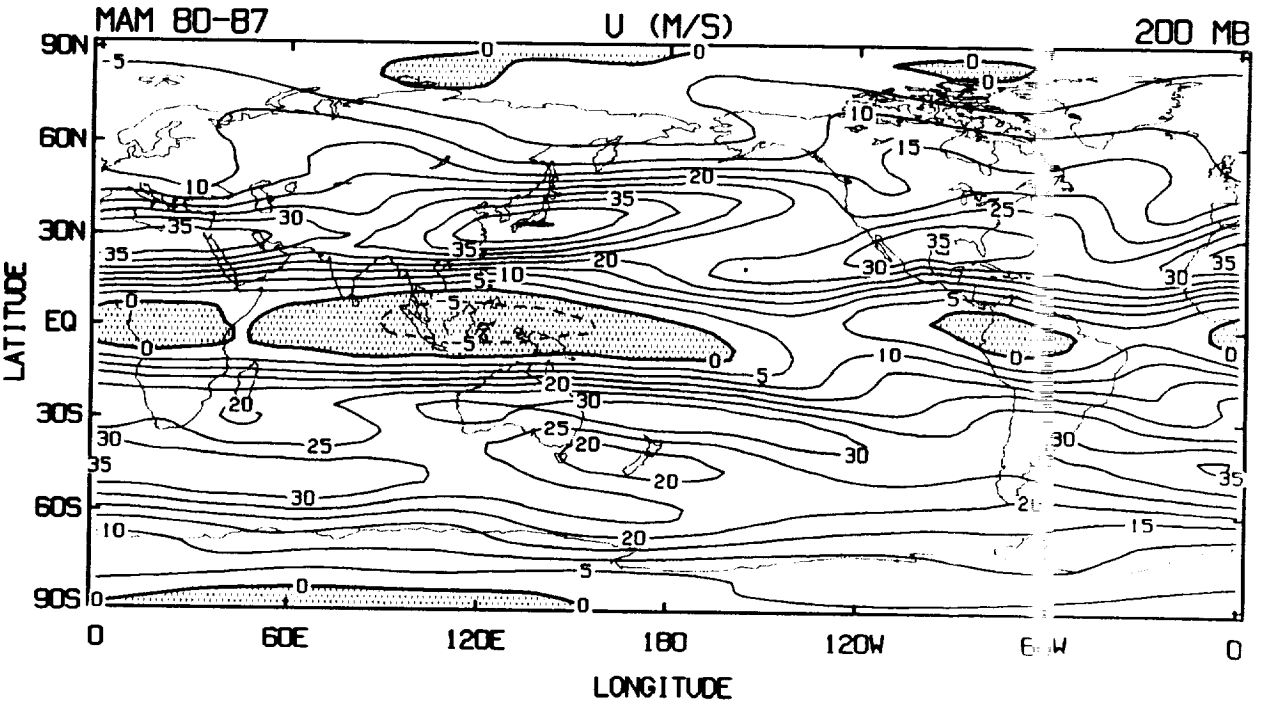

DJF 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

MARCH
APRIL
MAY

PRECEDING PAGE BLANK NOT FILMED

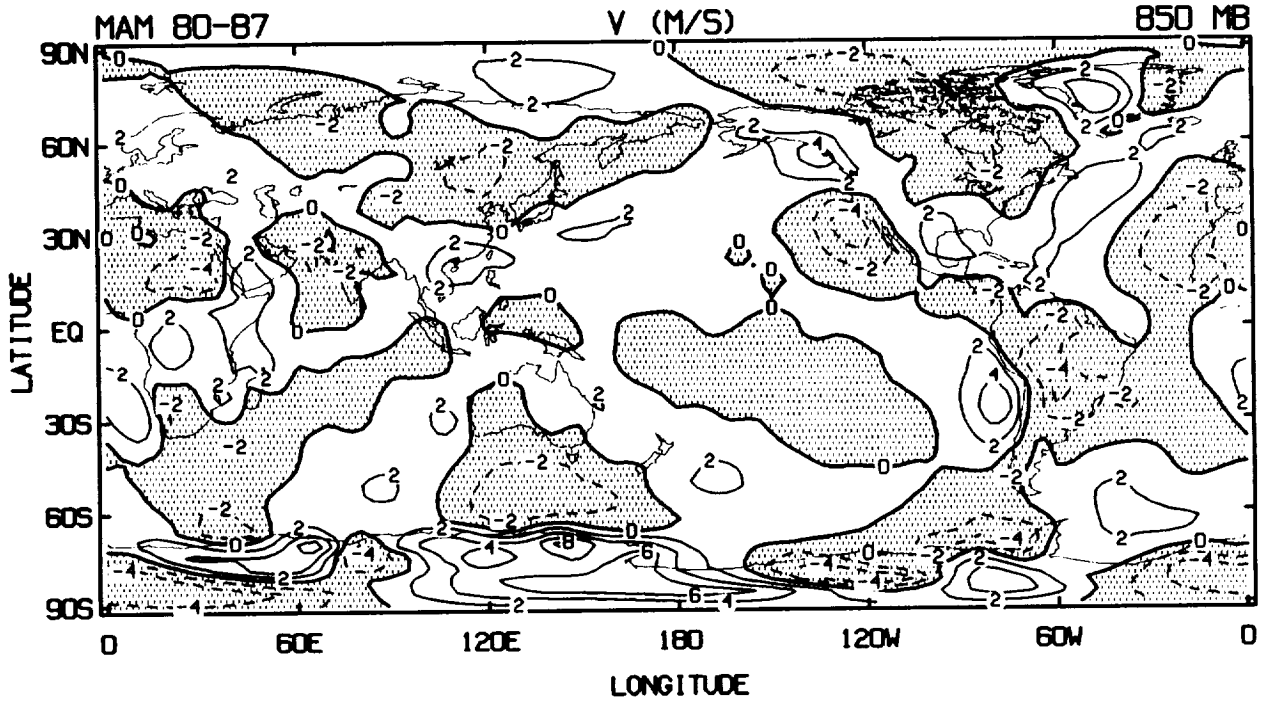
PAGE 182 INTENTIONALLY BLANK

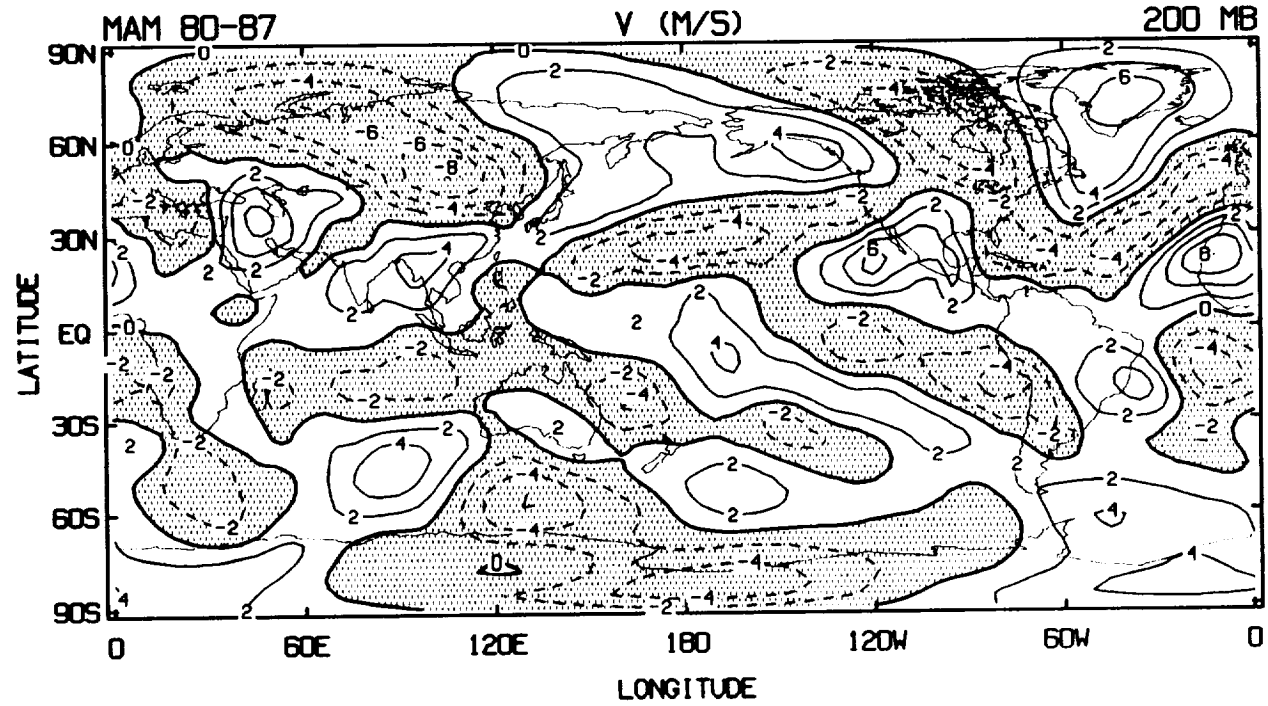


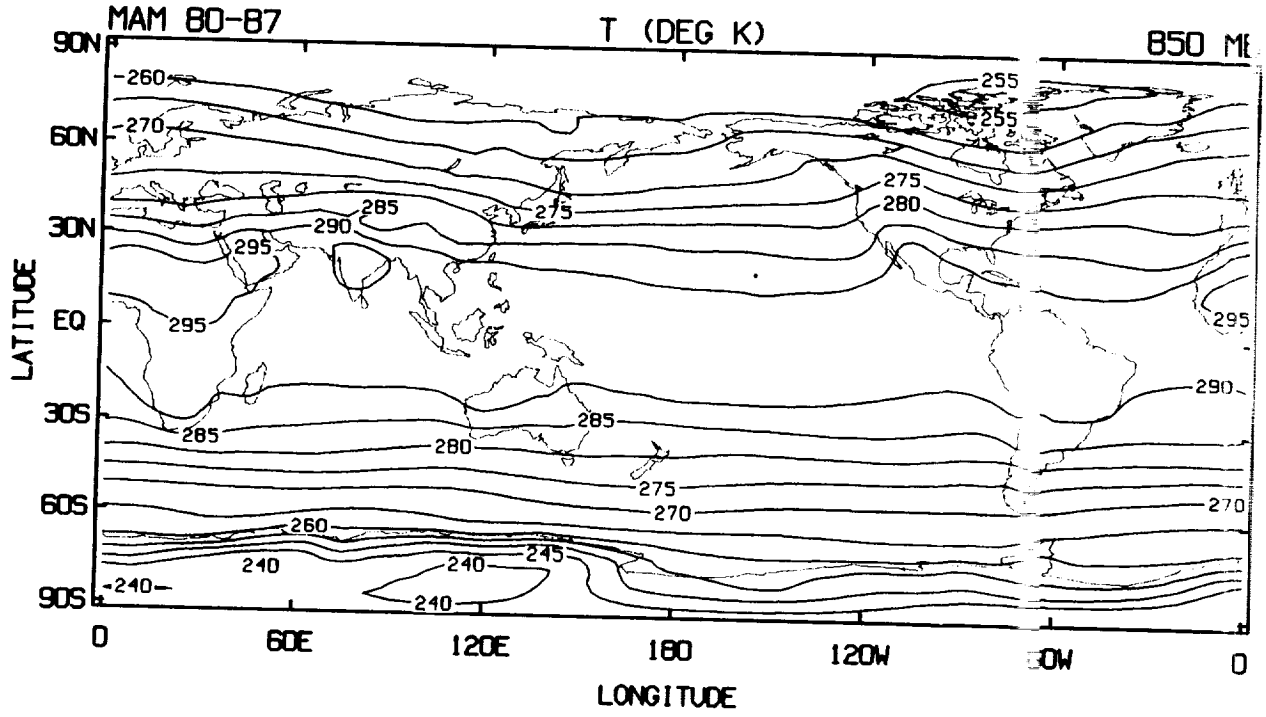


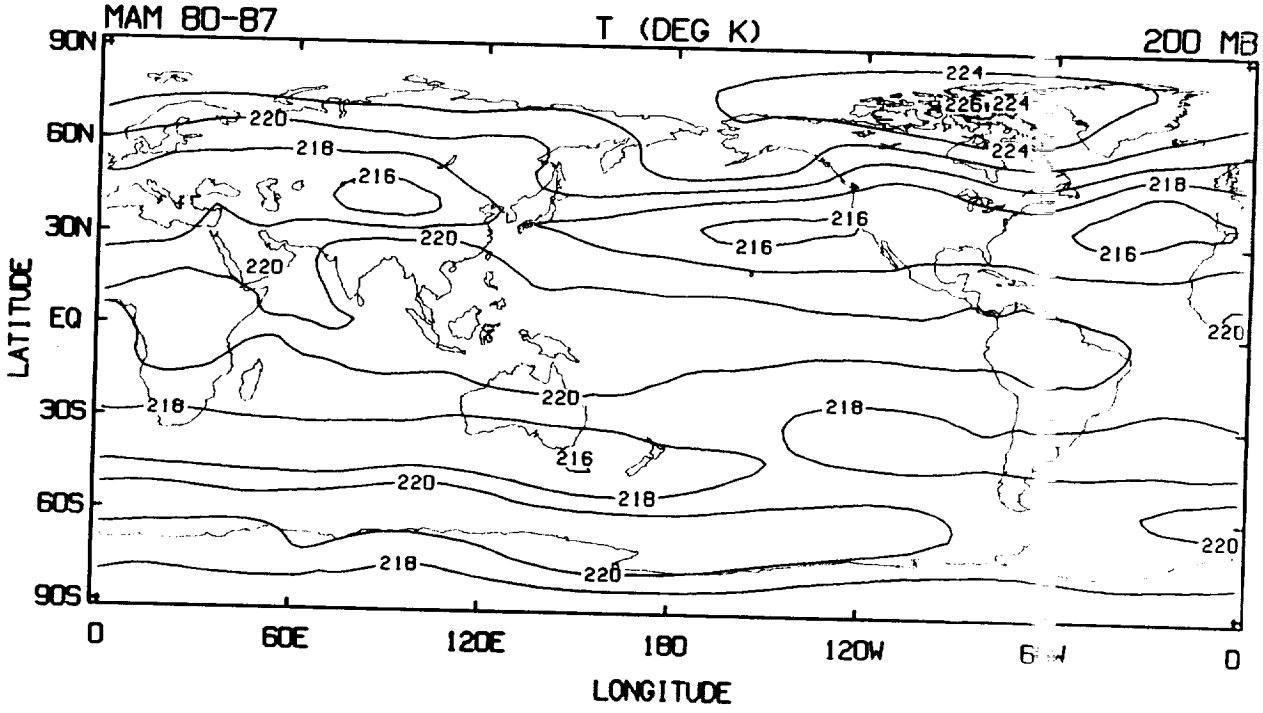
PRECEDING PAGE BLANK NOT FILMED

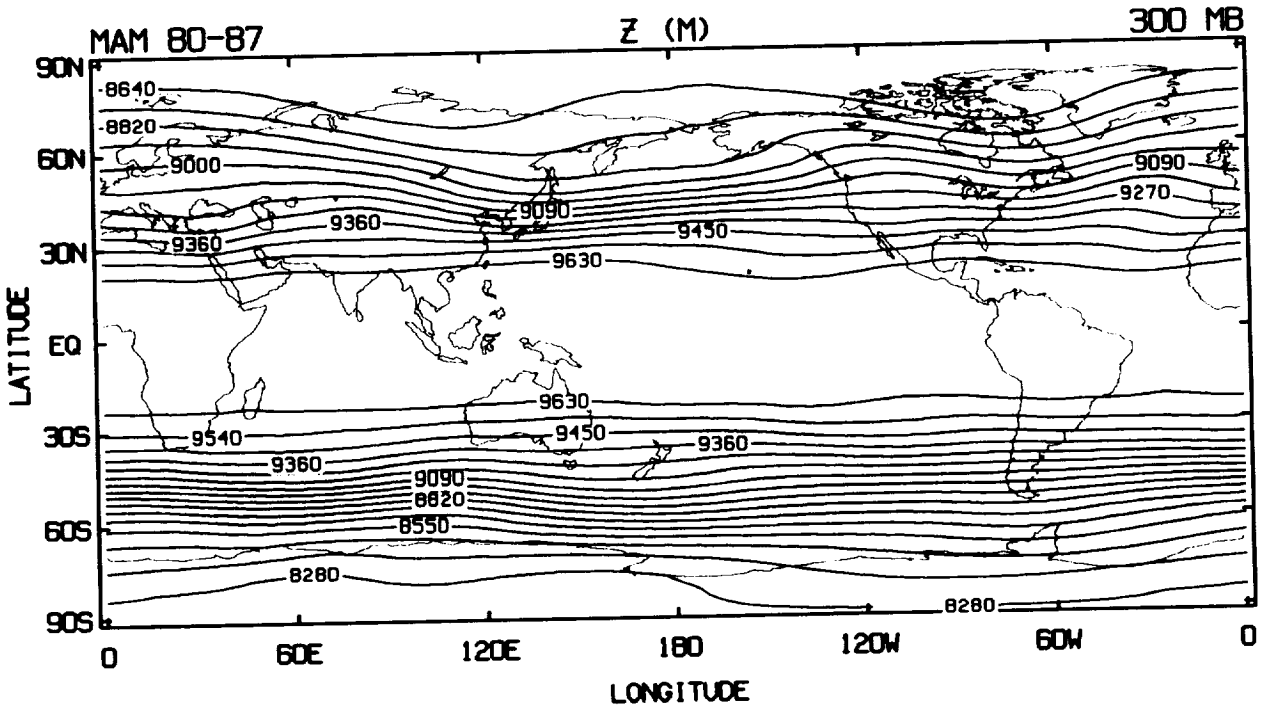
PAGE 184 INTENTIONALLY BLANK

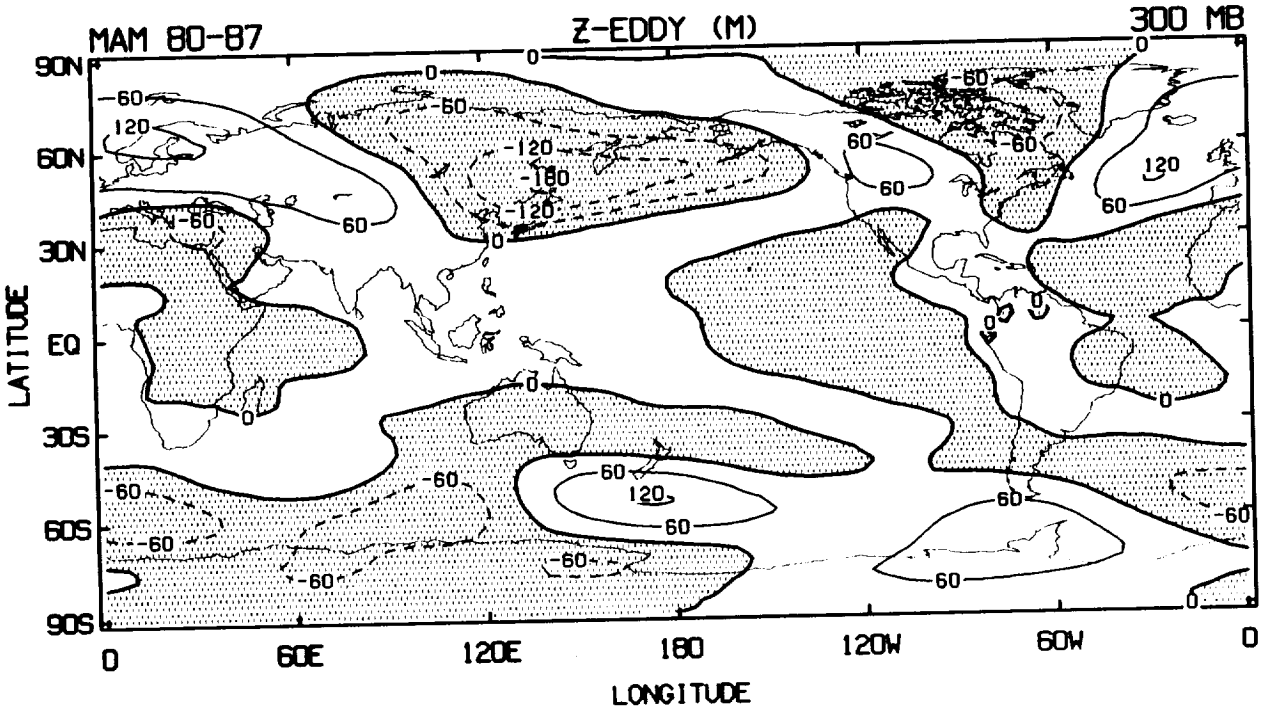

MAM 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

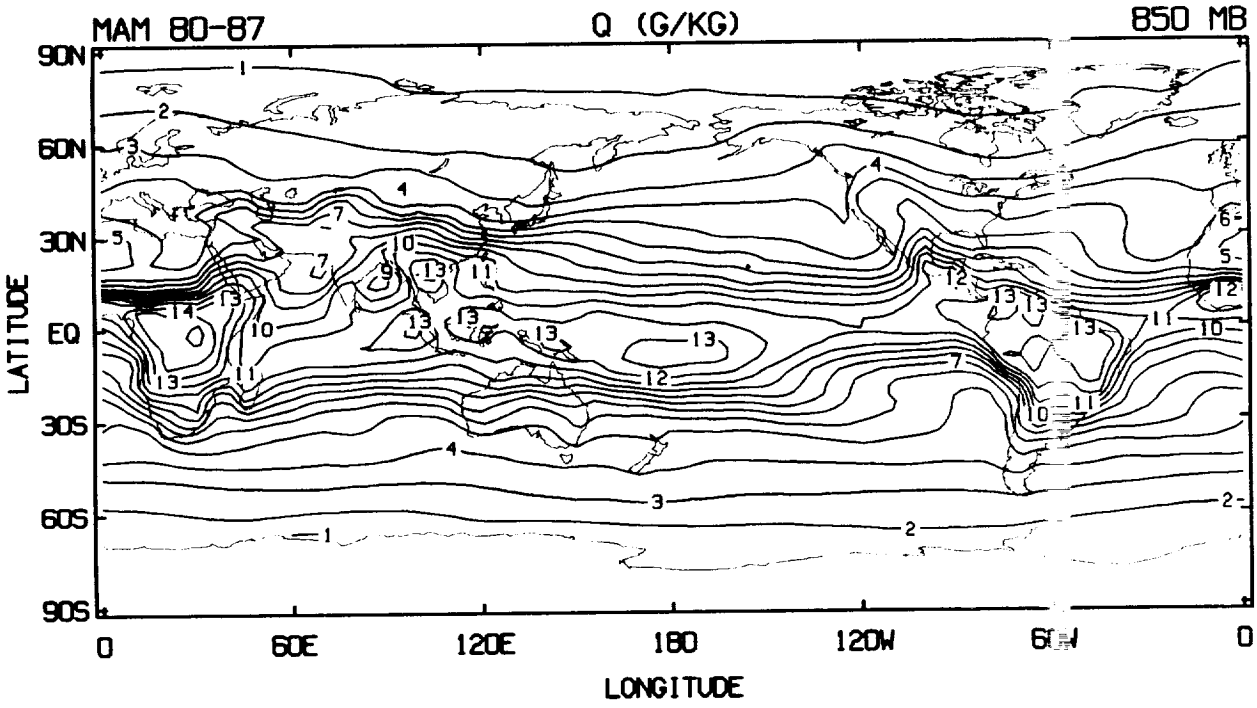

MAM 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

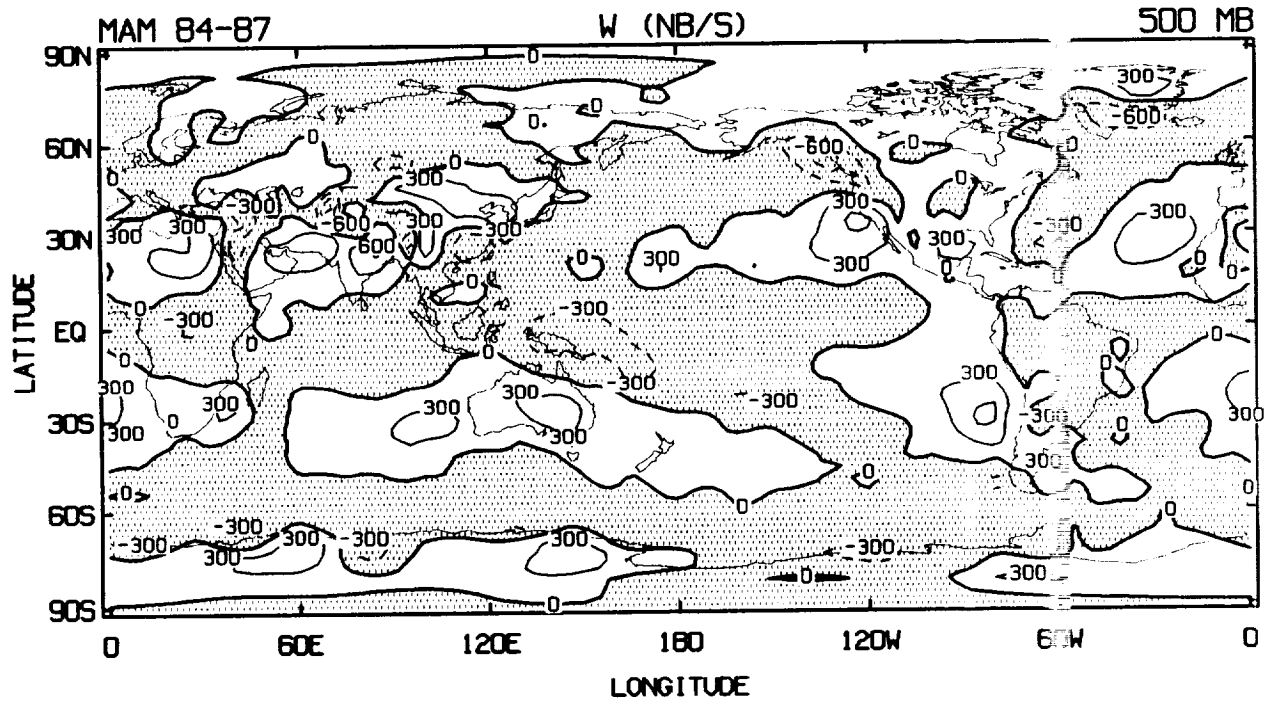

MAM 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

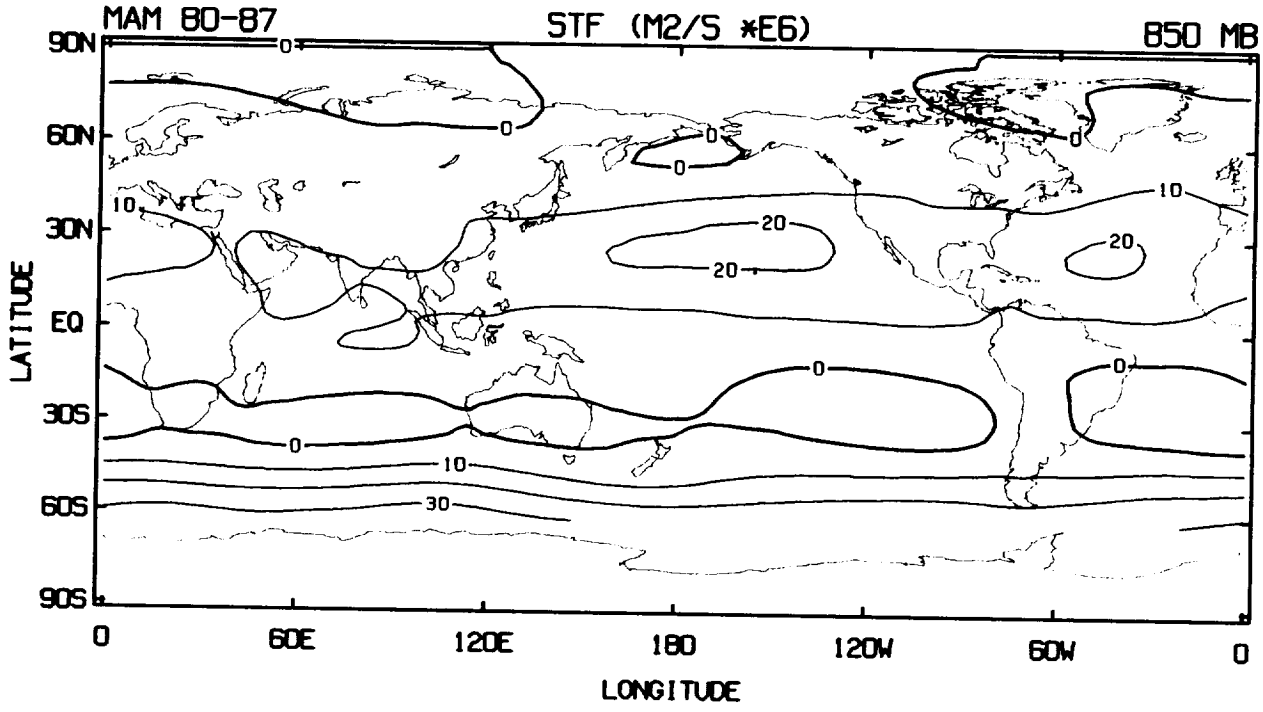

MAM 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

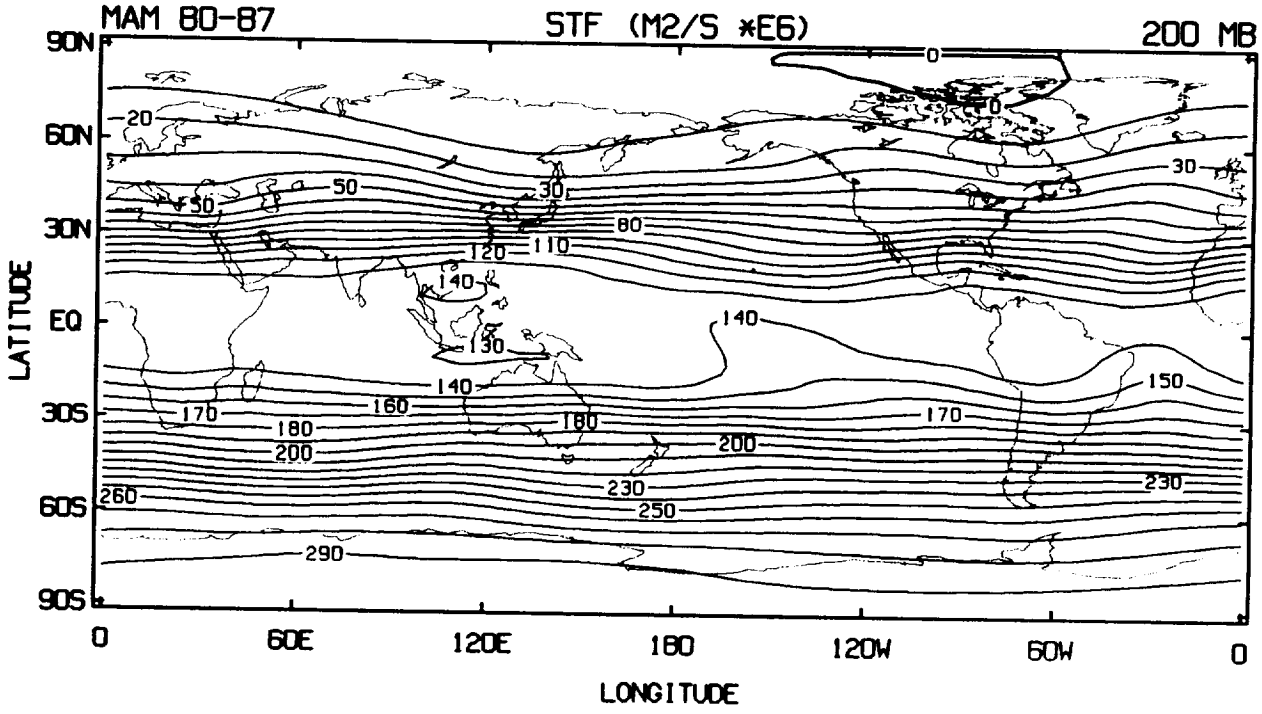

MAM 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
8640
8820
9000
9090
9270
9360
9450
9630
9540
8550
8280
0
60E
120E
180
120W
60W
LONGITUDE

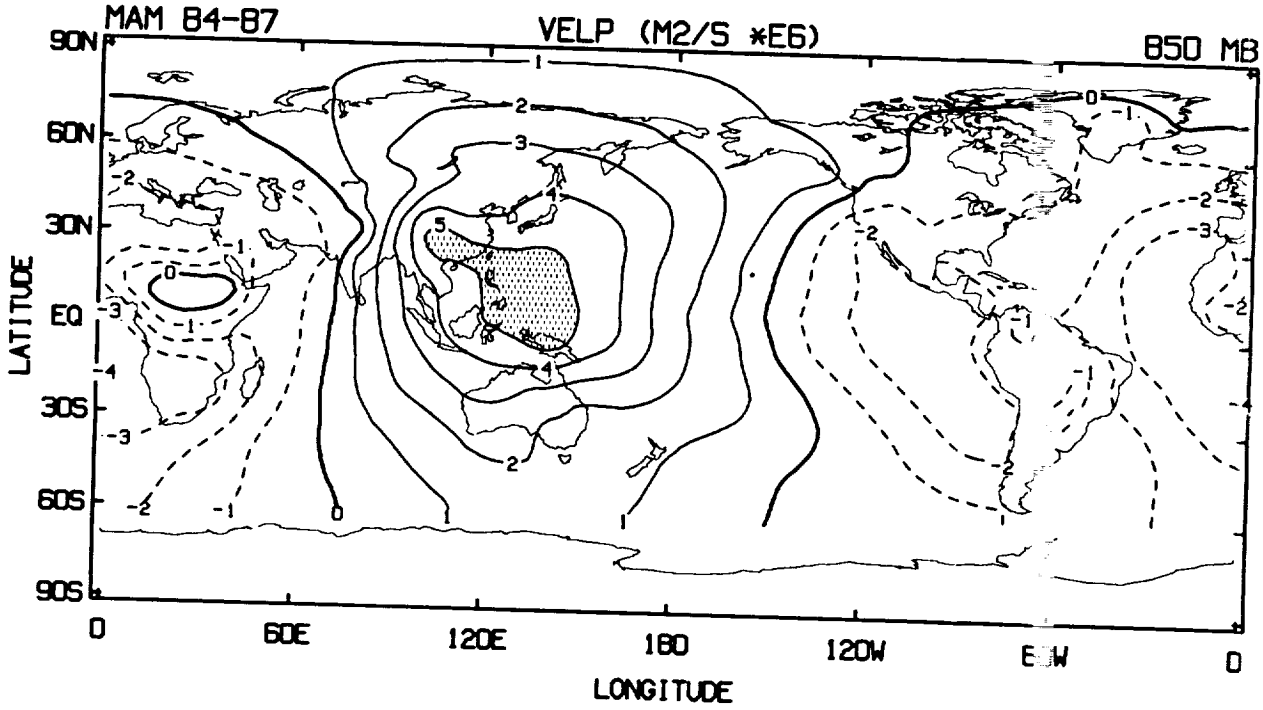

MAM 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60
120
-60
-120
-180
0
60E
120E
180
120W
60W
LONGITUDE

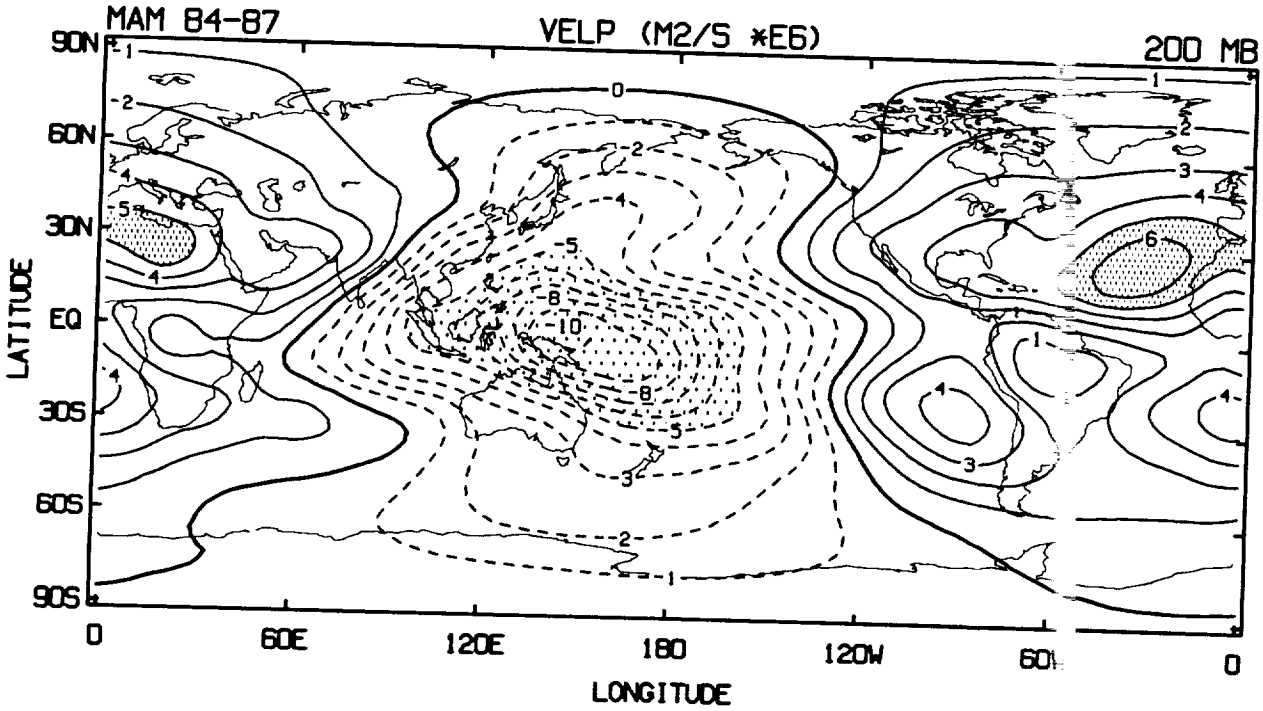

MAM 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

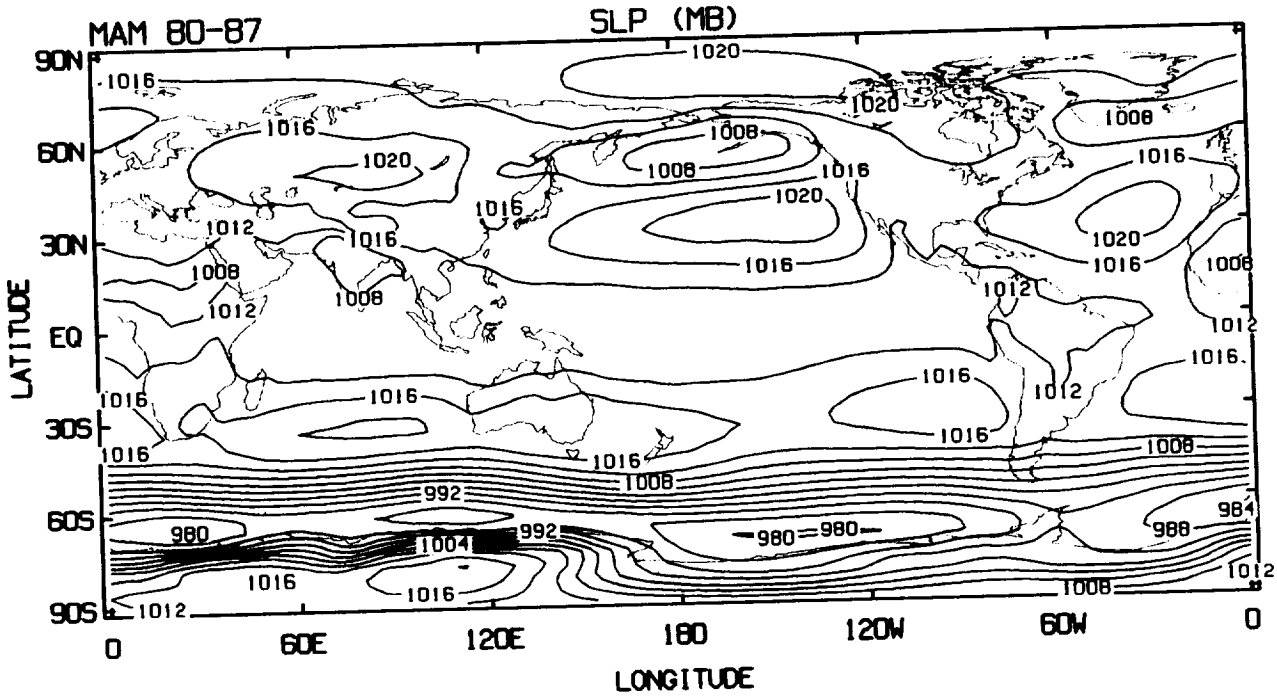

MAM 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

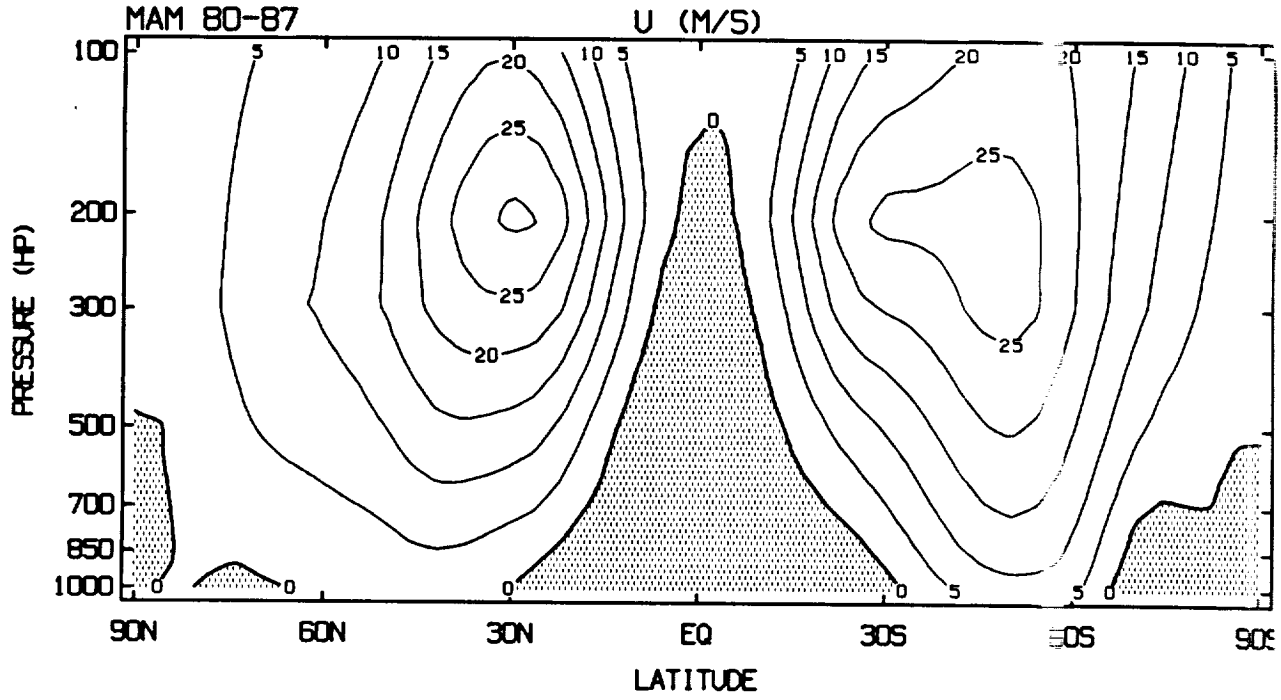

MAM 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

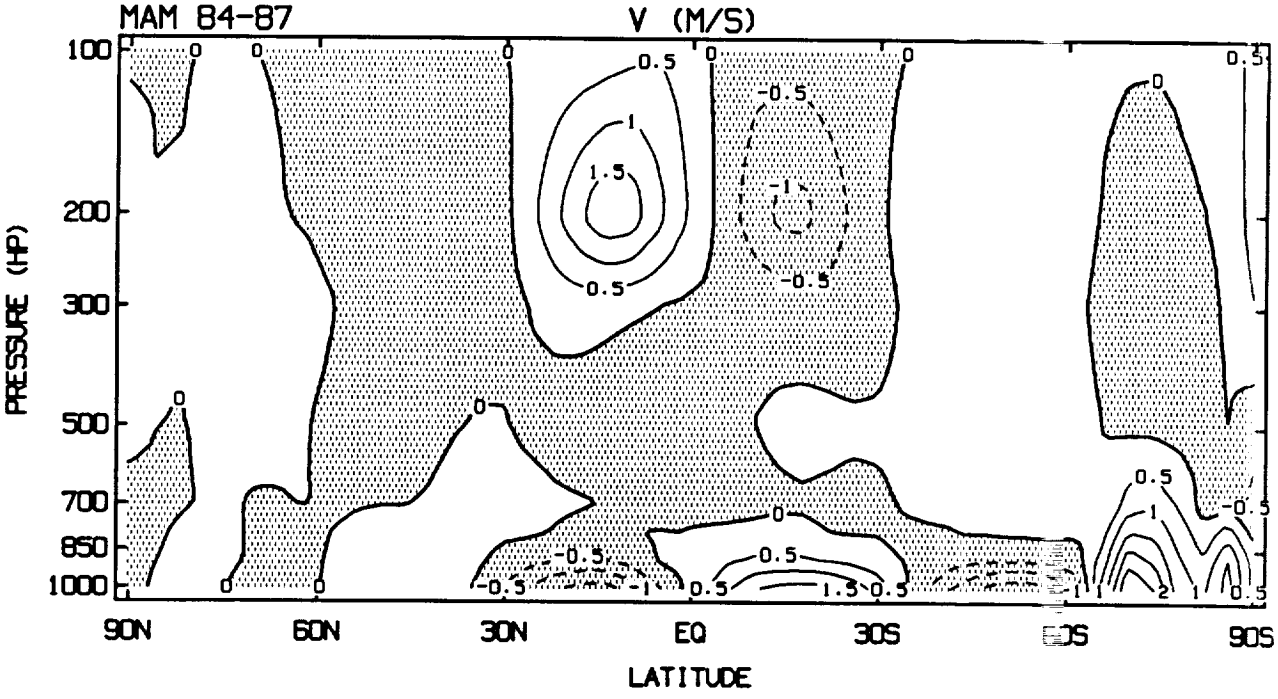

MAM 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

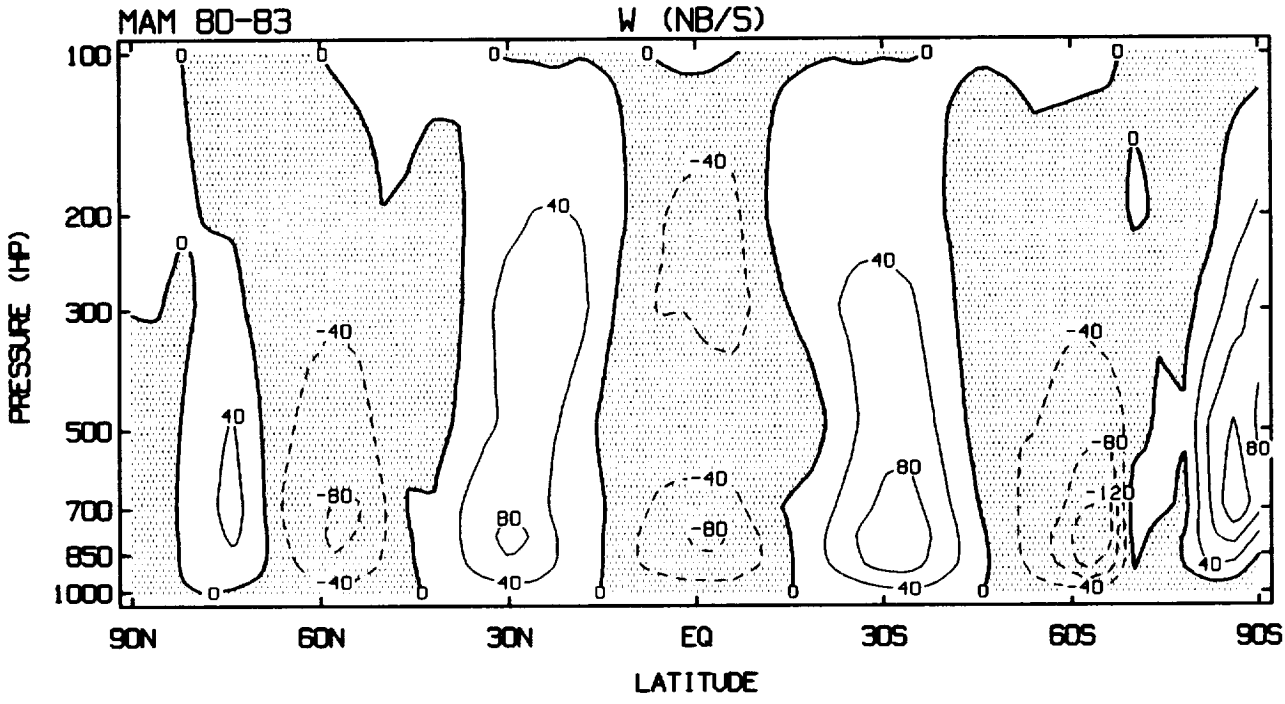

MAM 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
E W
0
LONGITUDE

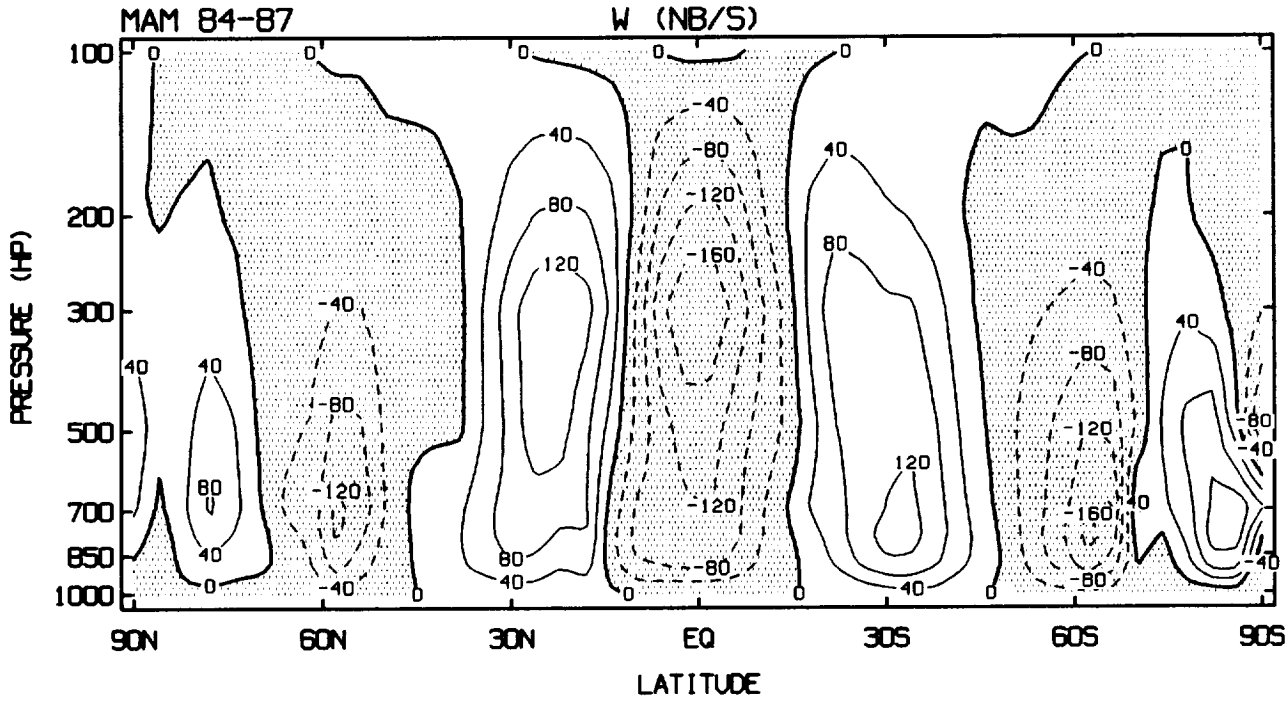

MAM 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60
0
LONGITUDE

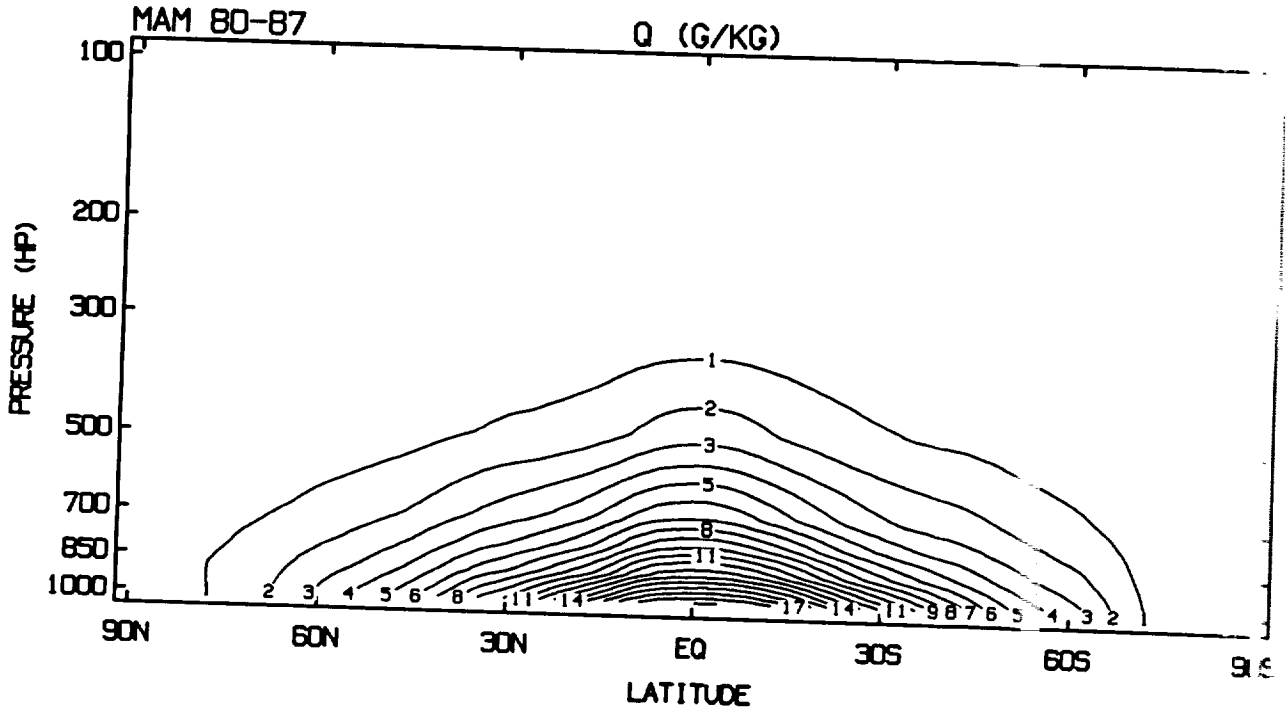

MAM 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1020
1016
1008
1012
1004
992
988
984
980

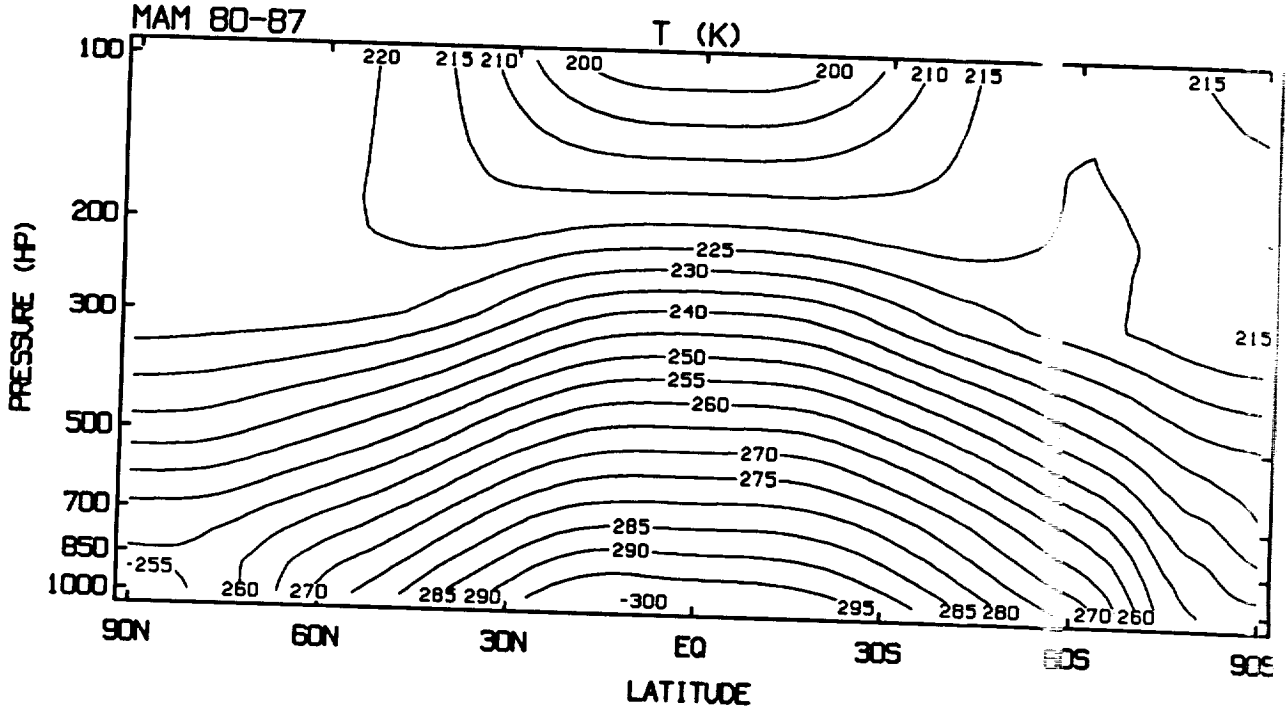

MAM 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
LATITUDE


MAM 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE


MAM 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


MAM 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

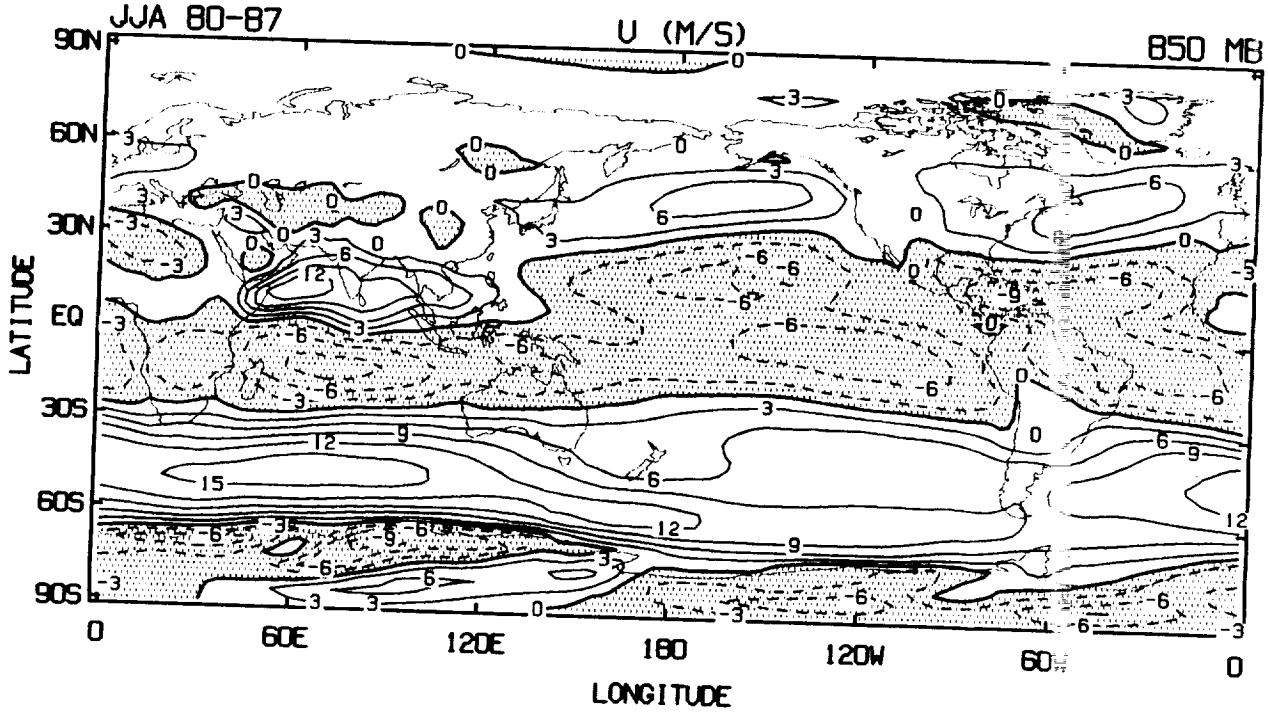

MAM 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE

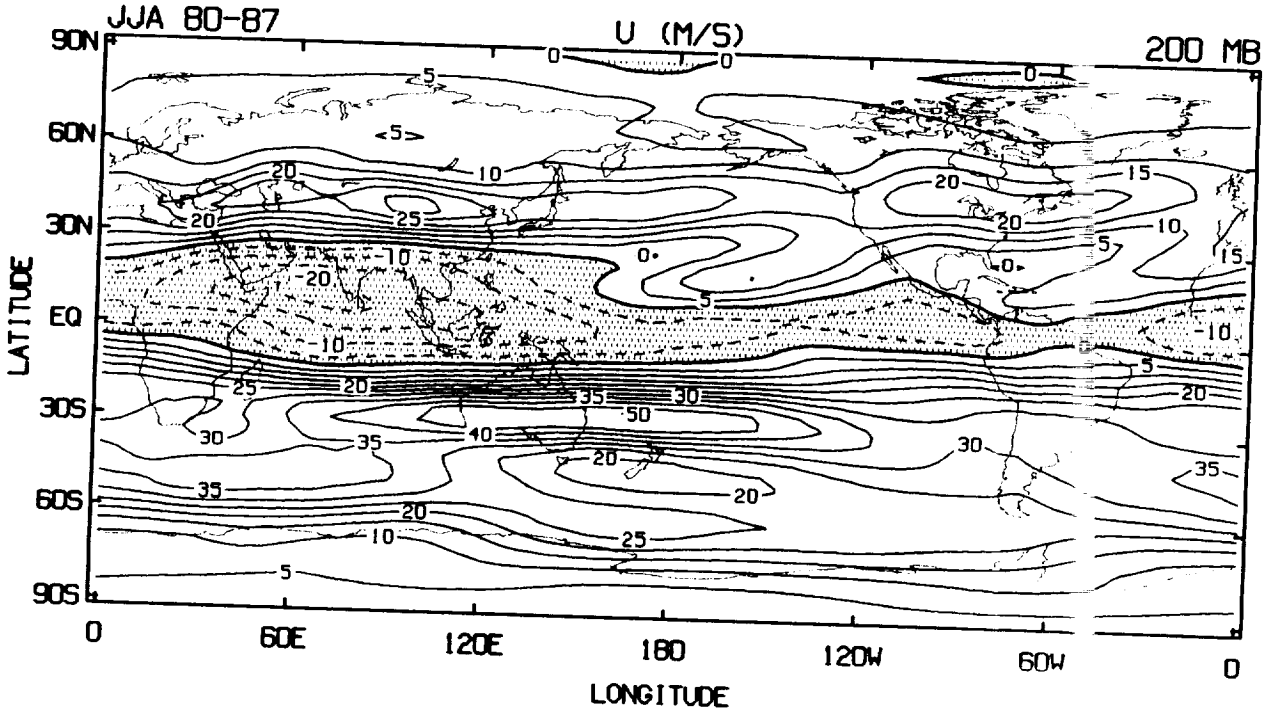

MAM 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
LATITUDE

JUNE
JULY
AUGUST

PRECEDING PAGE BLANK NOT FILMED

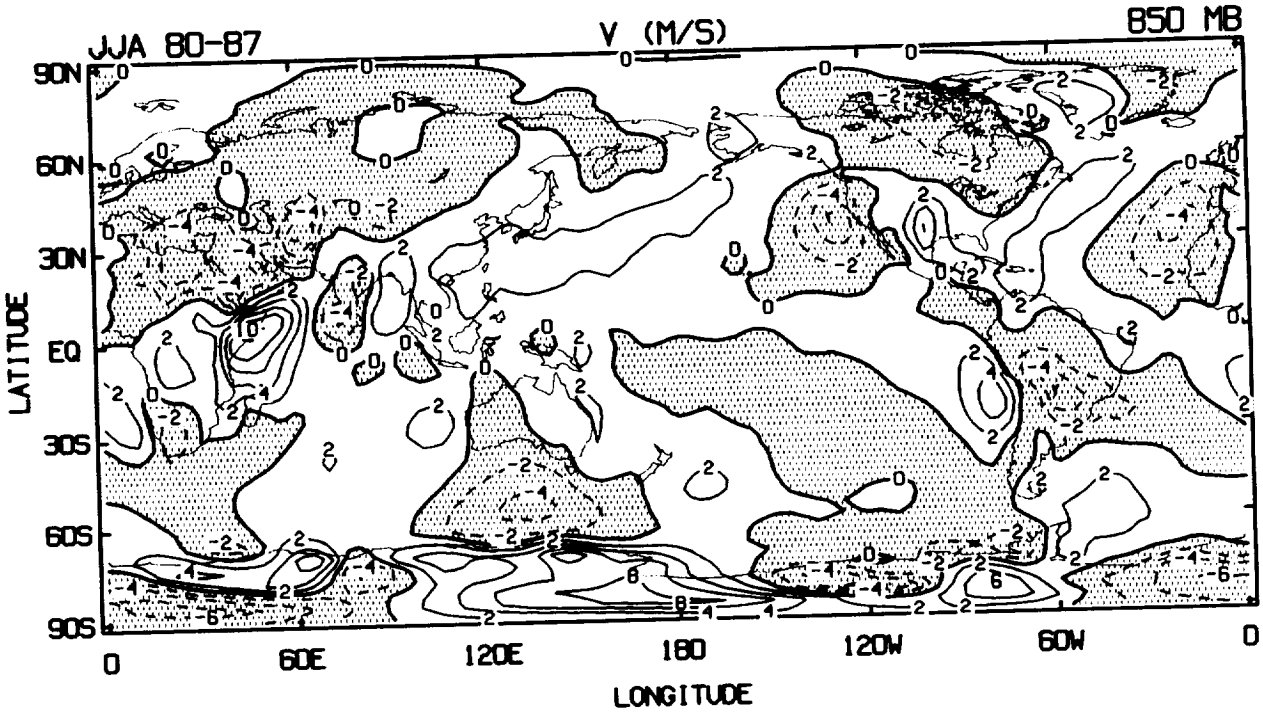
PAGE 196 INTENTIONALLY BLANK

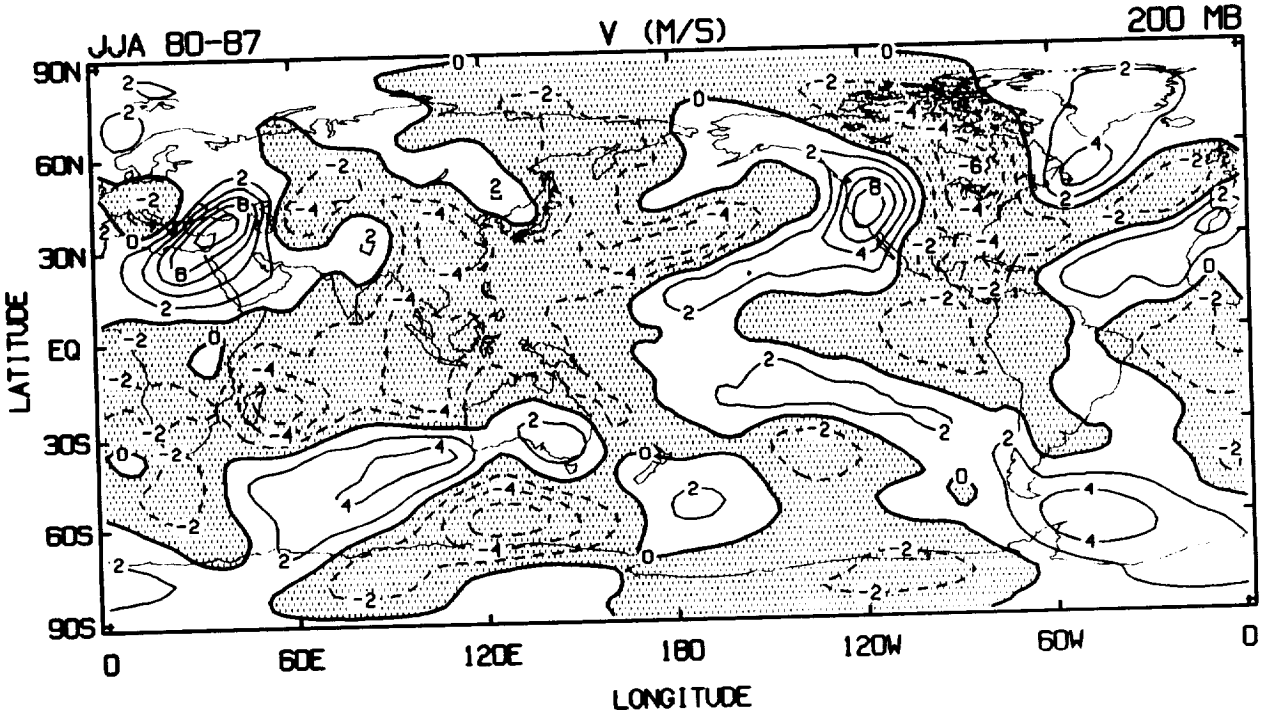


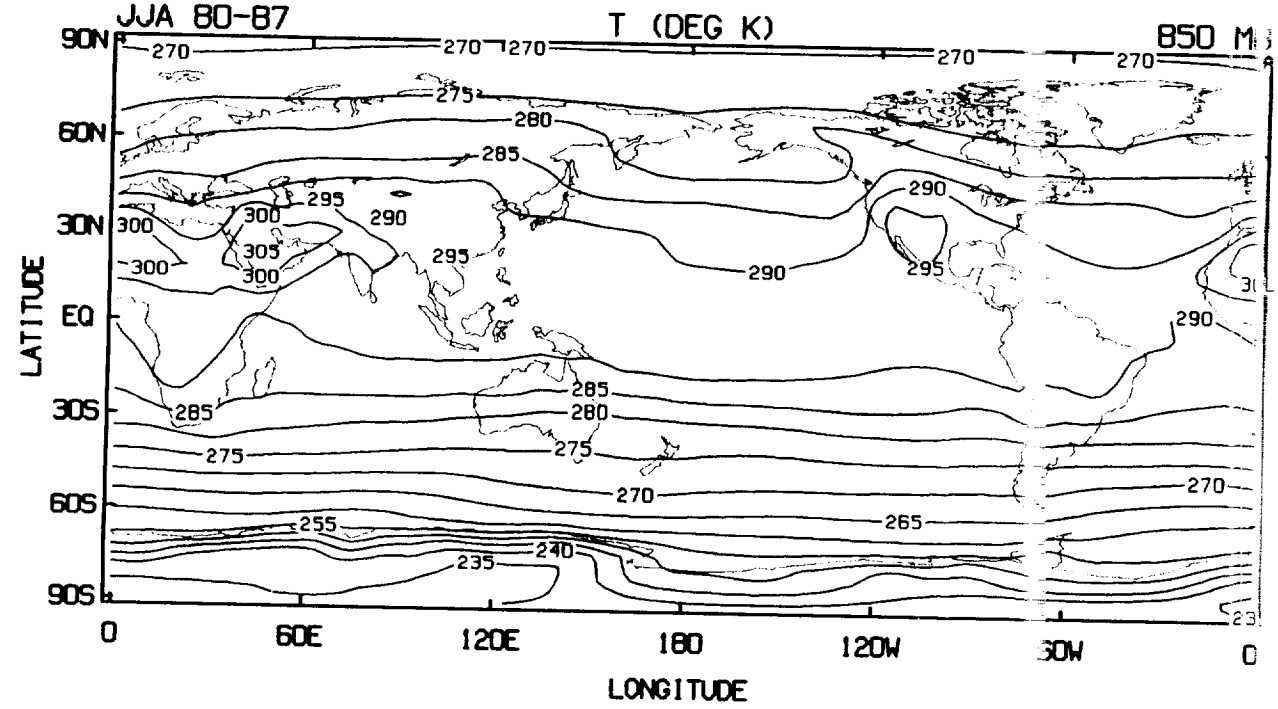


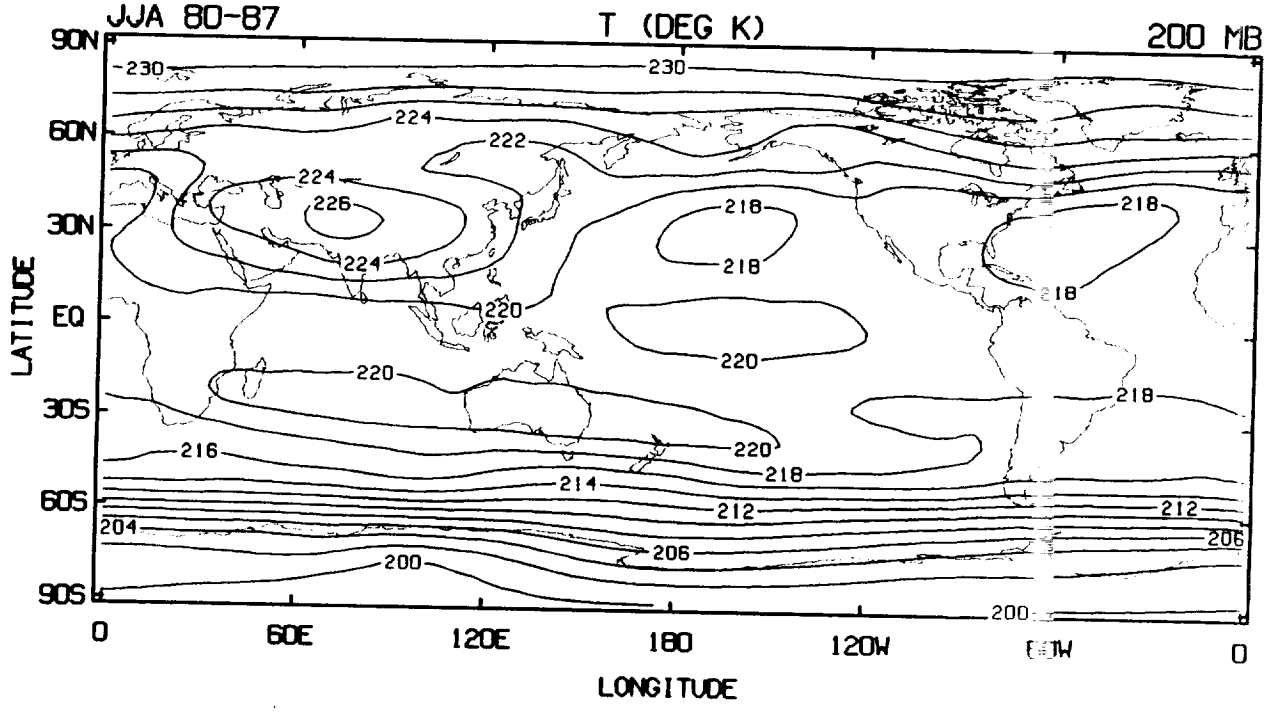
PRECEDING PAGE BLANK NOT FILMED

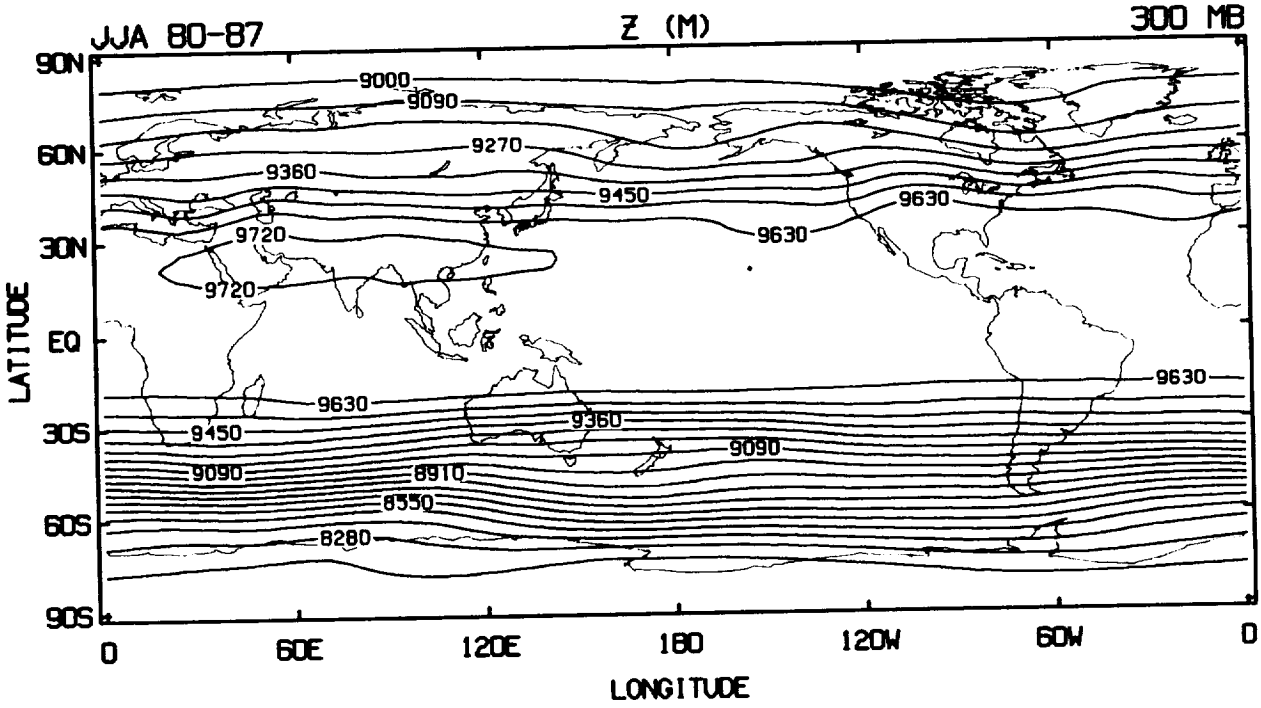
PAGE 198 INTENTIONALLY BLANK

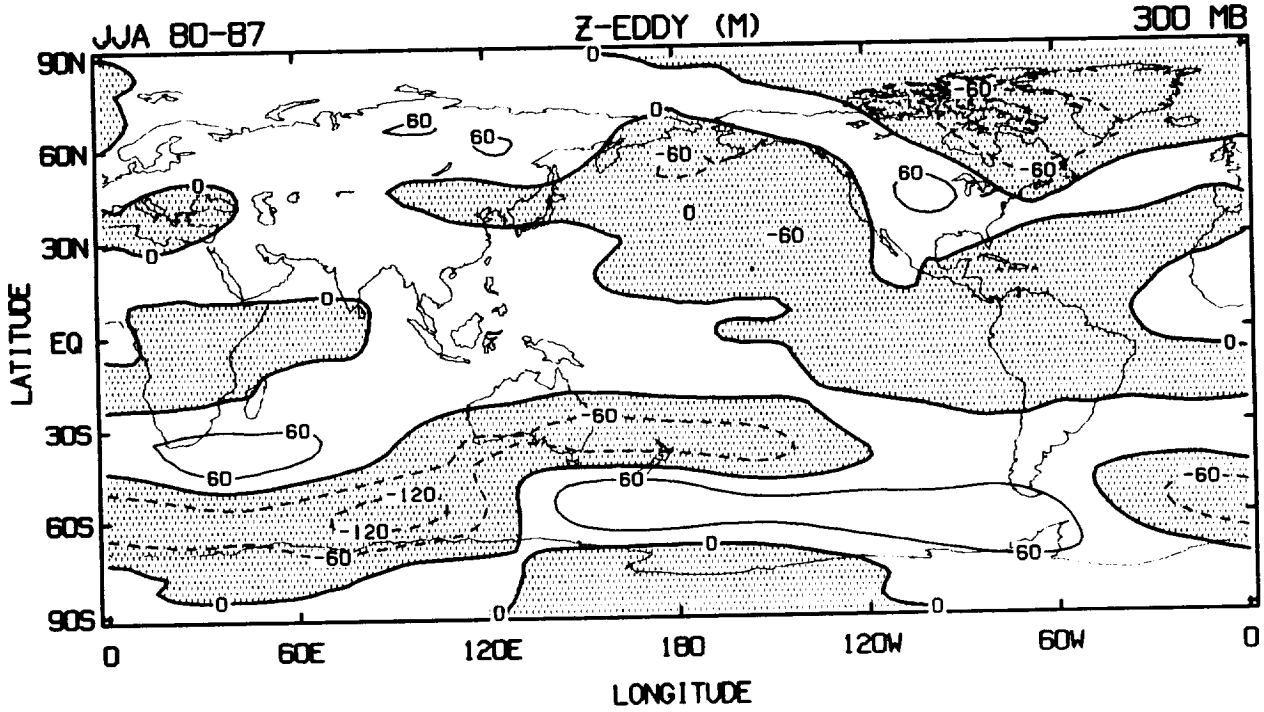

JJA 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

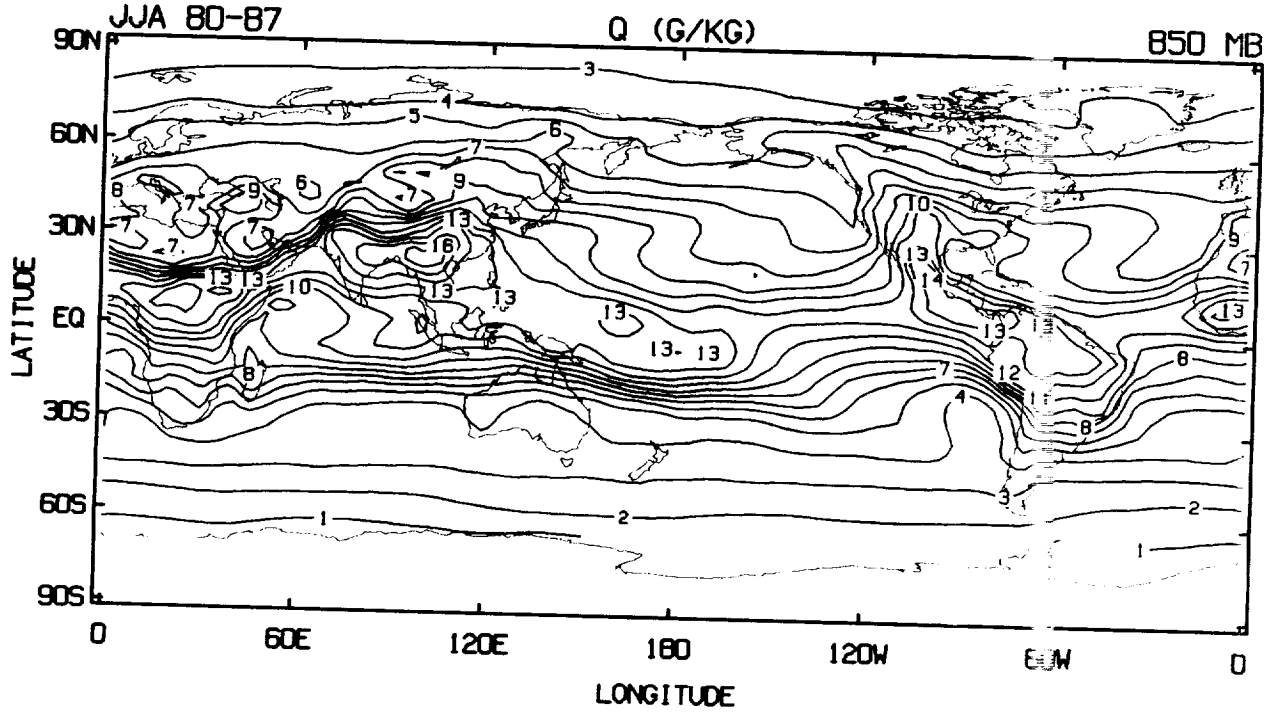

JJA 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

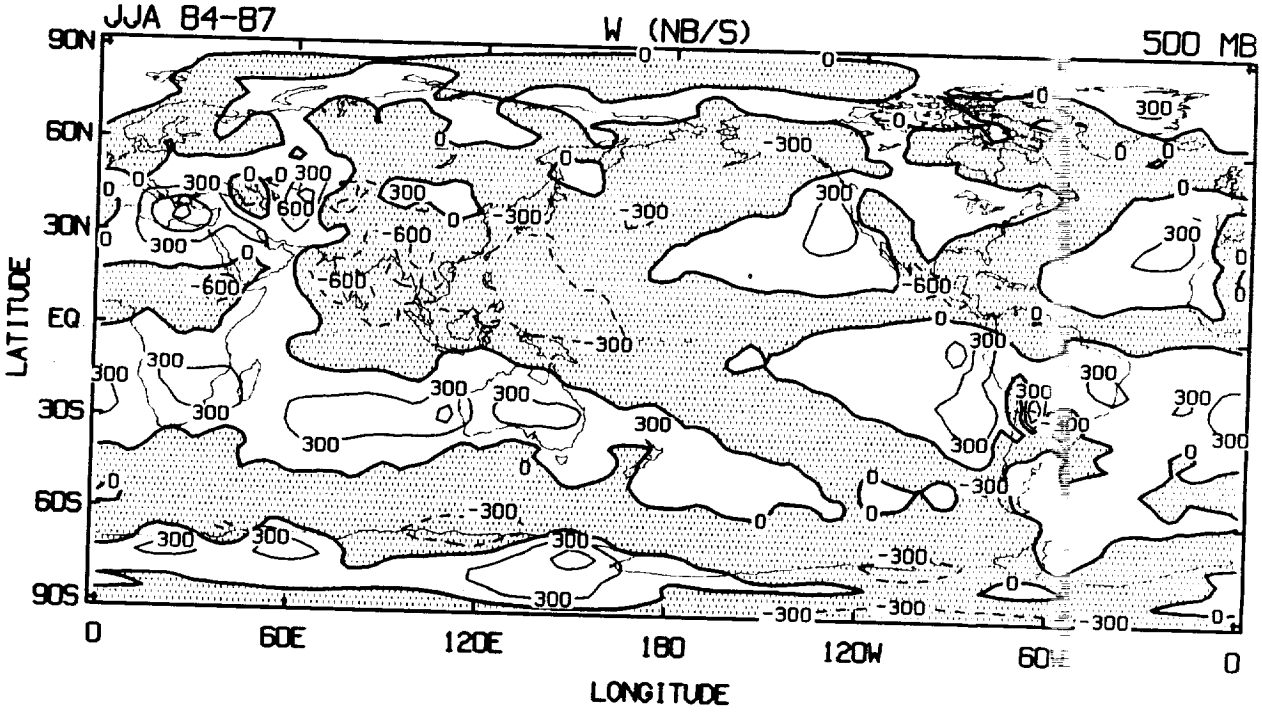

JJA 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

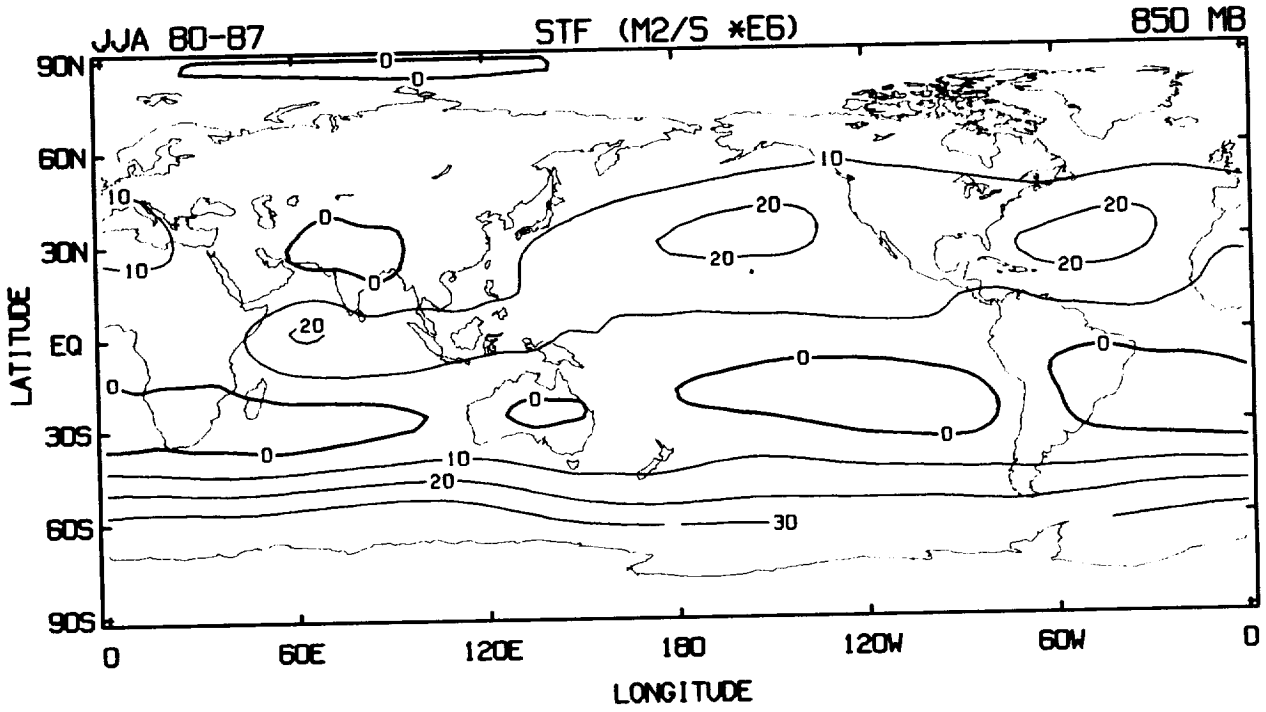

JJA 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

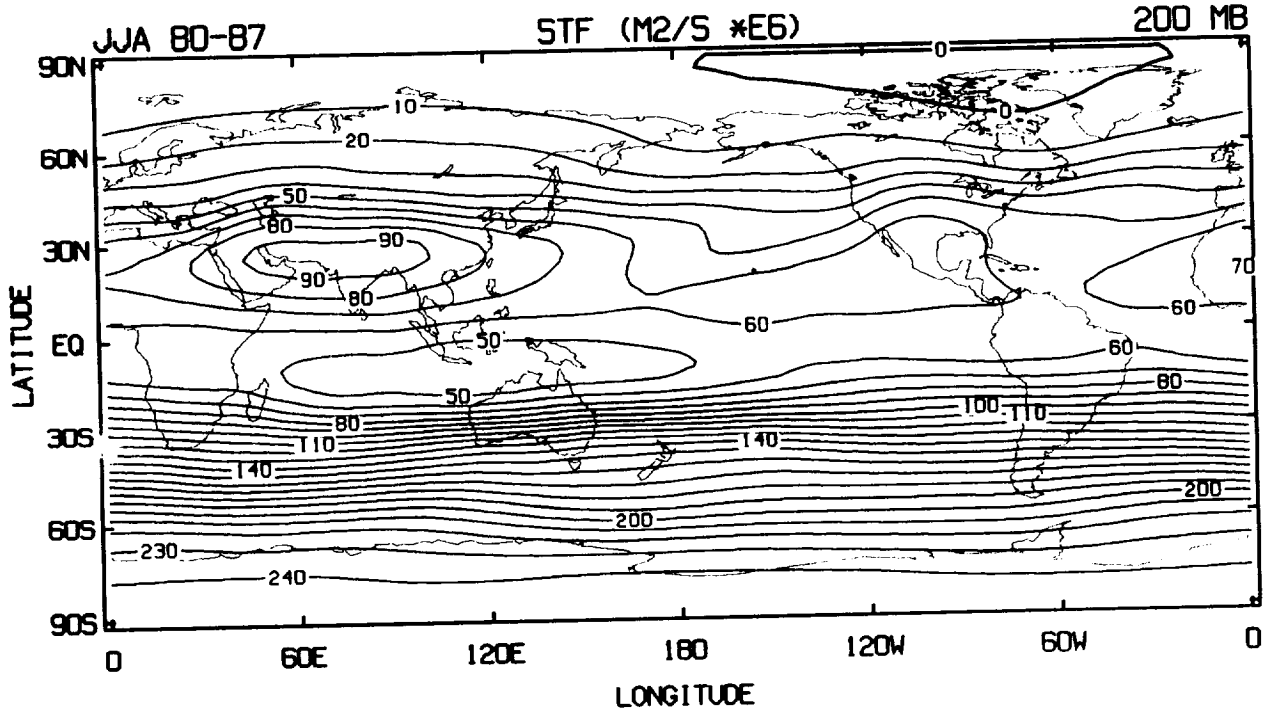

JJA 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
9000
9090
9270
9360
9450
9630
9720
8910
8550
8280
0
60E
120E
180
120W
60W
LONGITUDE

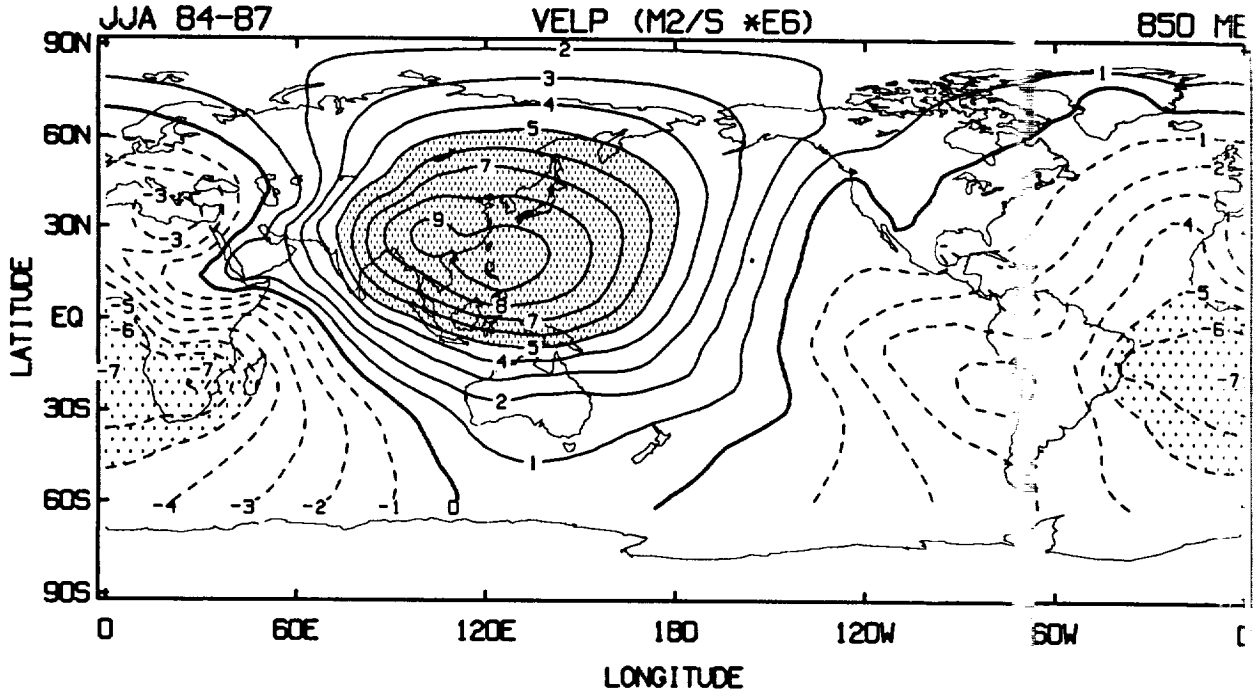

JJA 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60
-60
120
-120
0
60E
120E
180
120W
60W
LONGITUDE

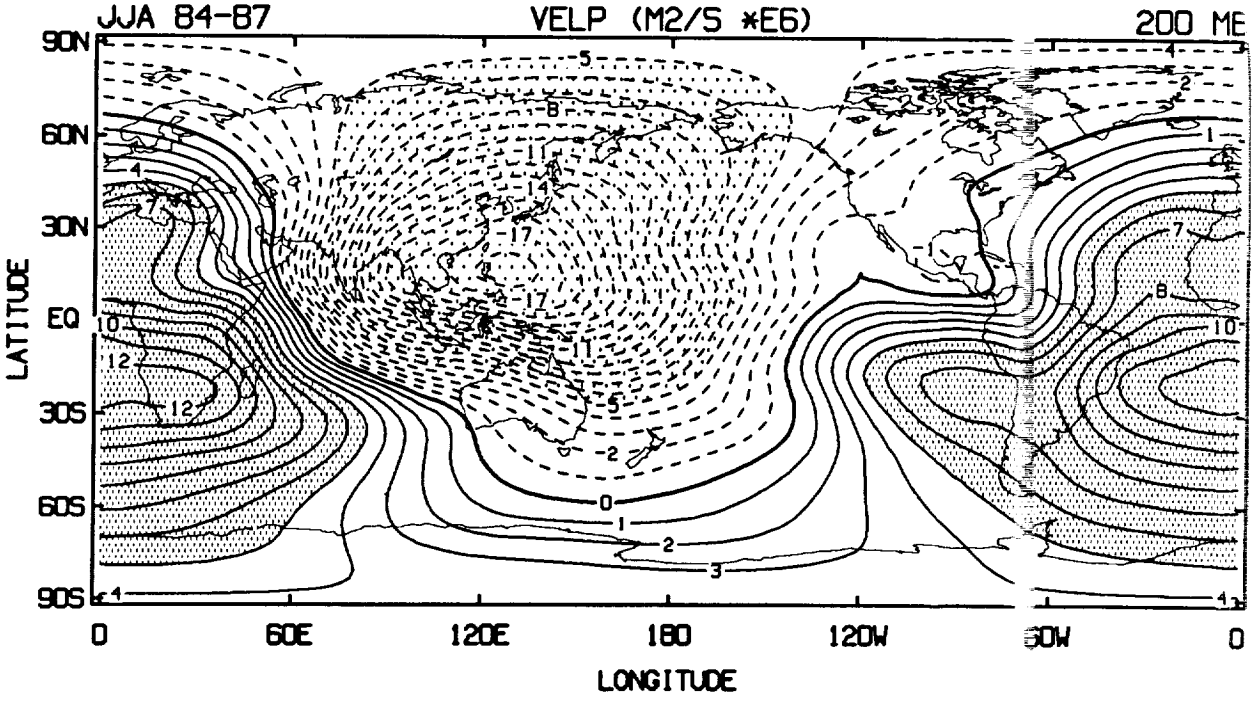

JJA 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

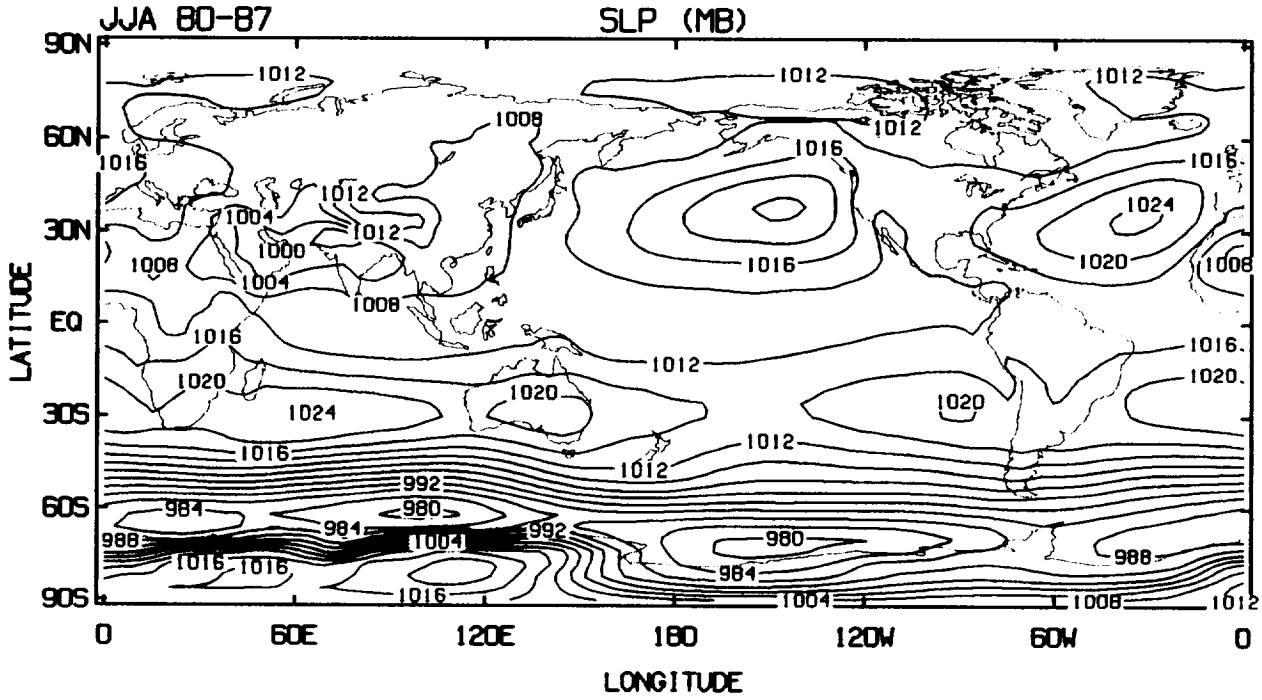

JJA 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

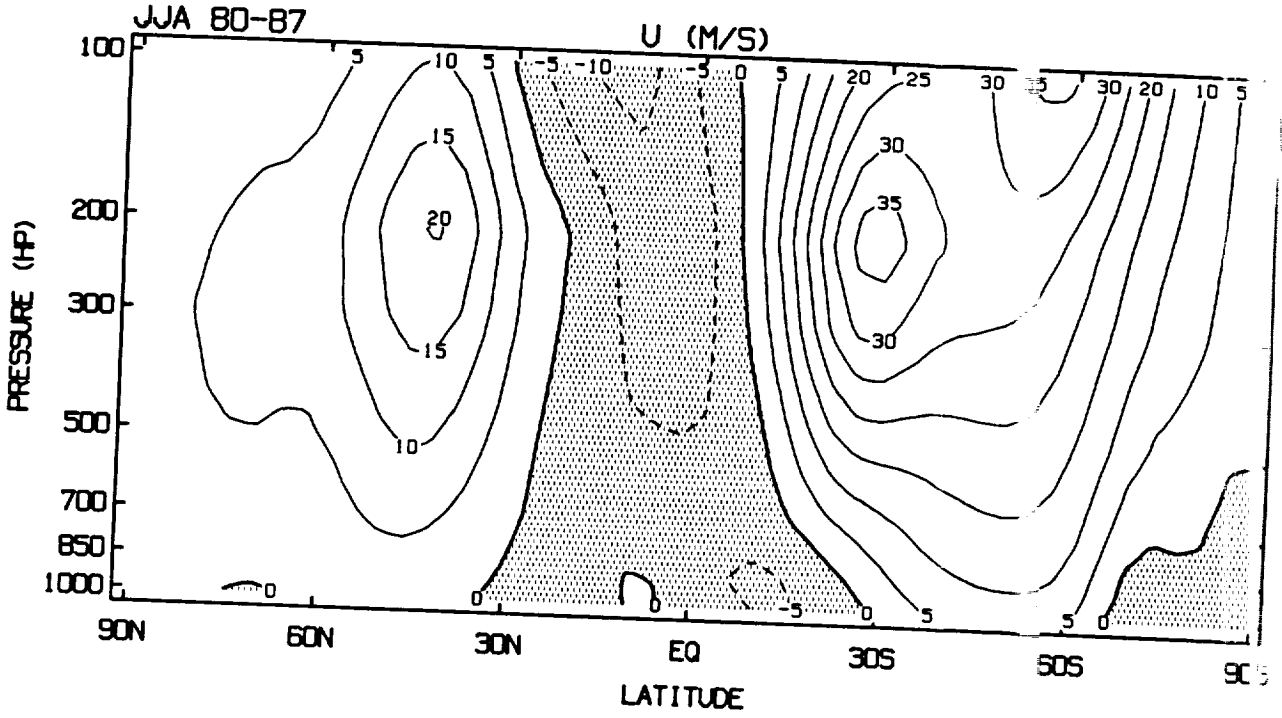

JJA 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

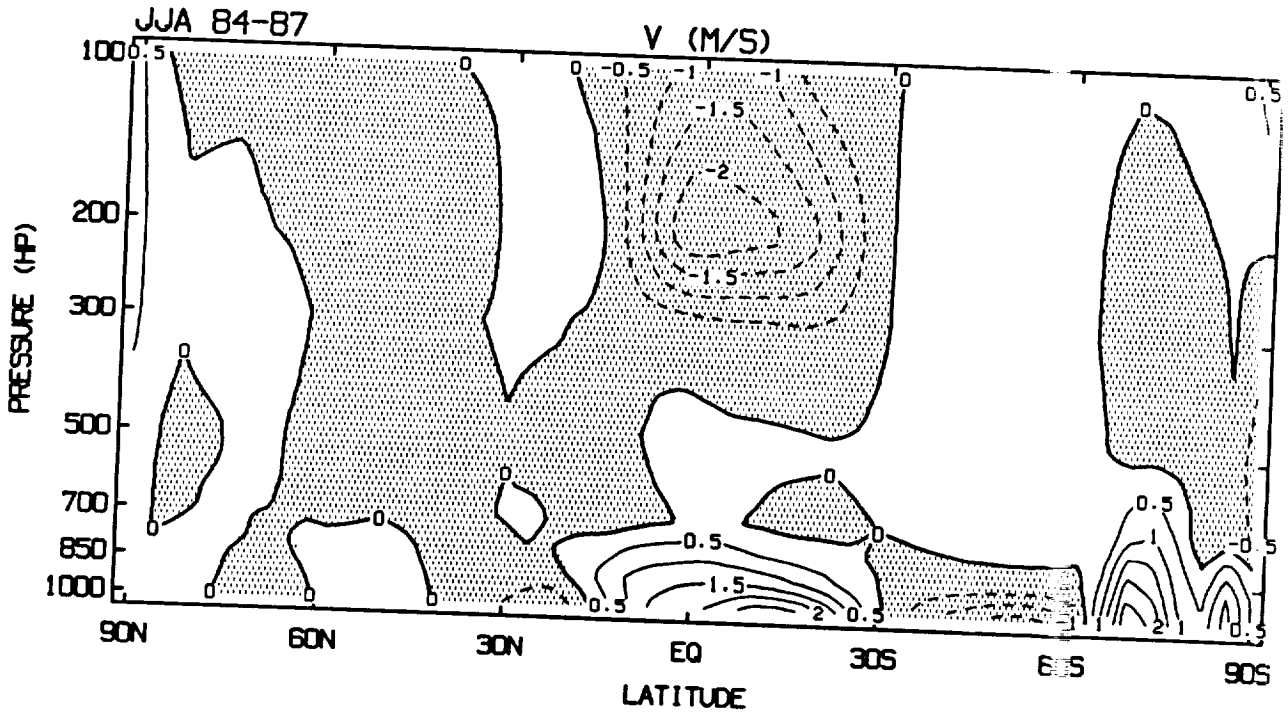

JJA 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

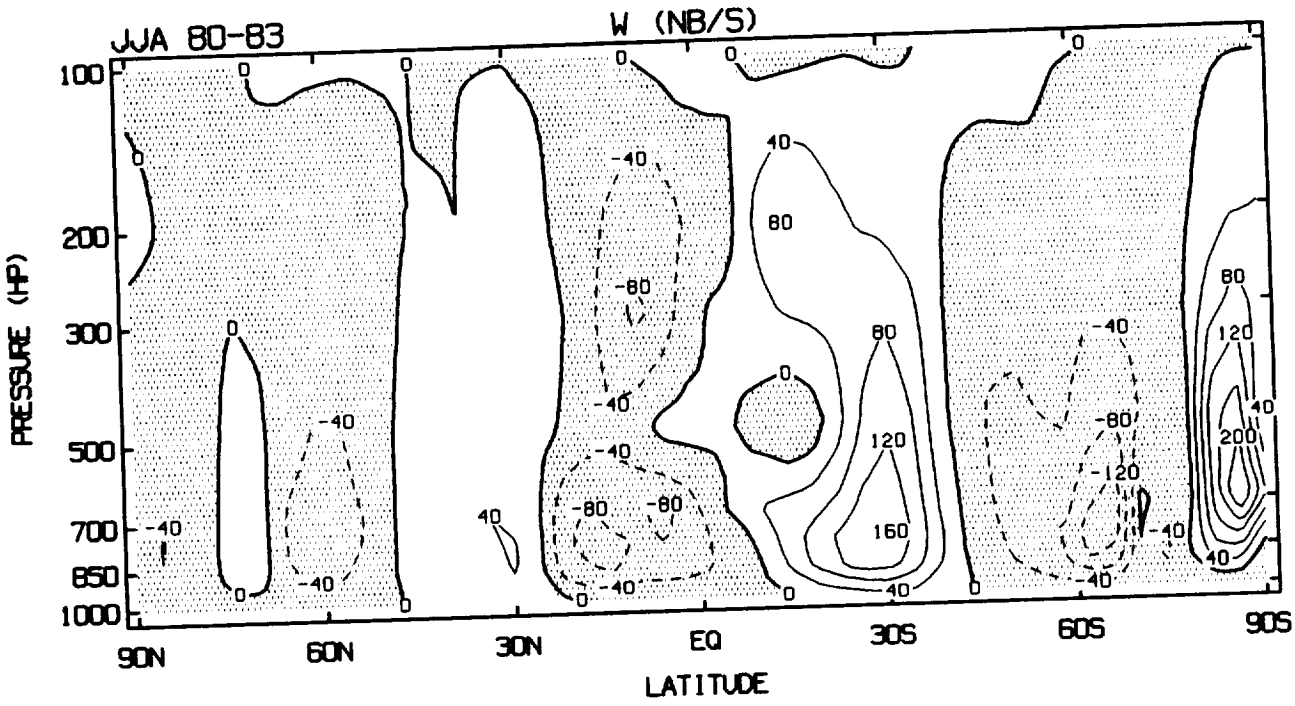

JJA 84-87
VELP (M2/S *E6)
850 ME
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

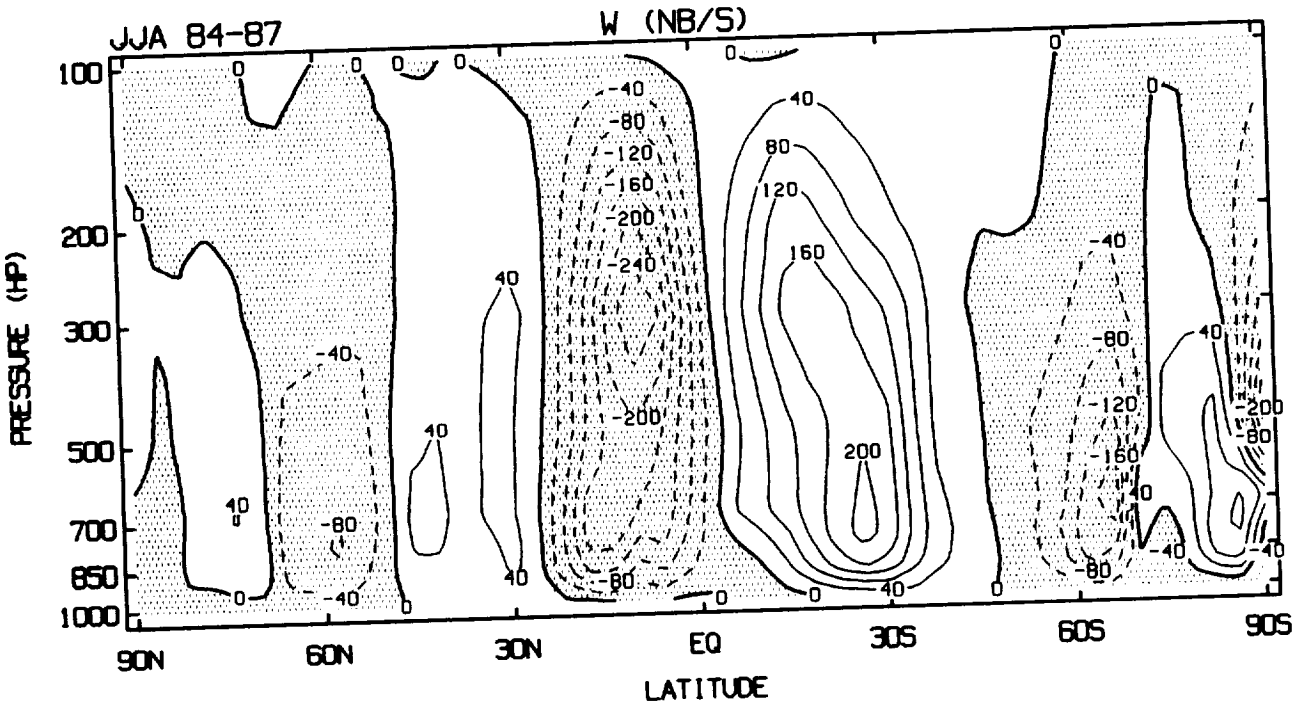

JJA 84-87
VELP (M2/S *E6)
200 ME
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

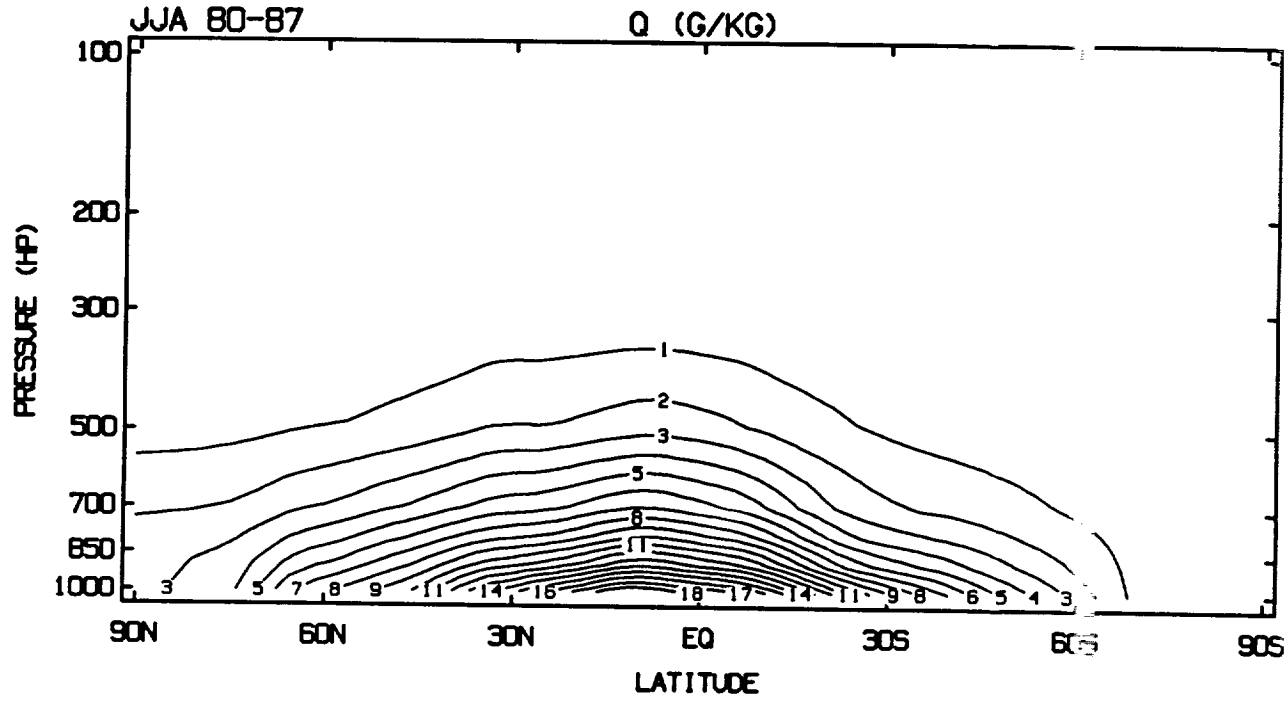

JJA 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1012
1008
1016
1004
1000
1024
1020
992
984
980
988

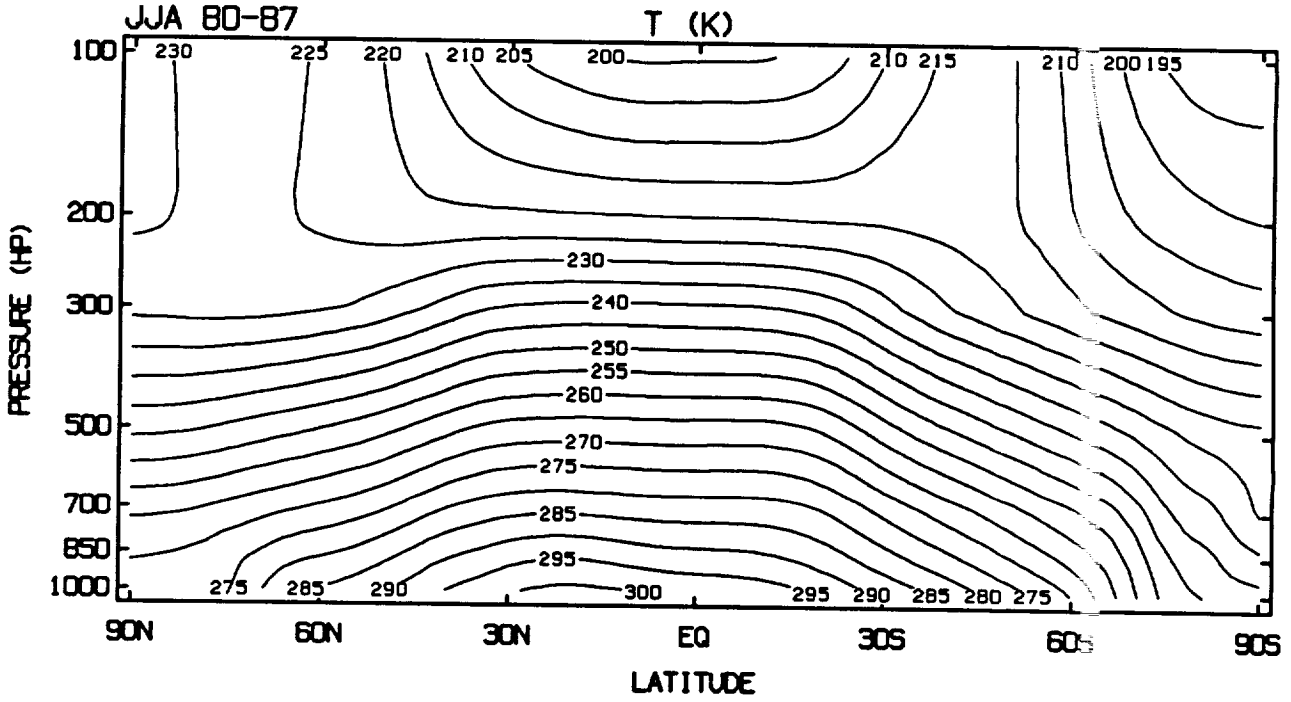

JJA 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


JJA 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE


JJA 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


JJA 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

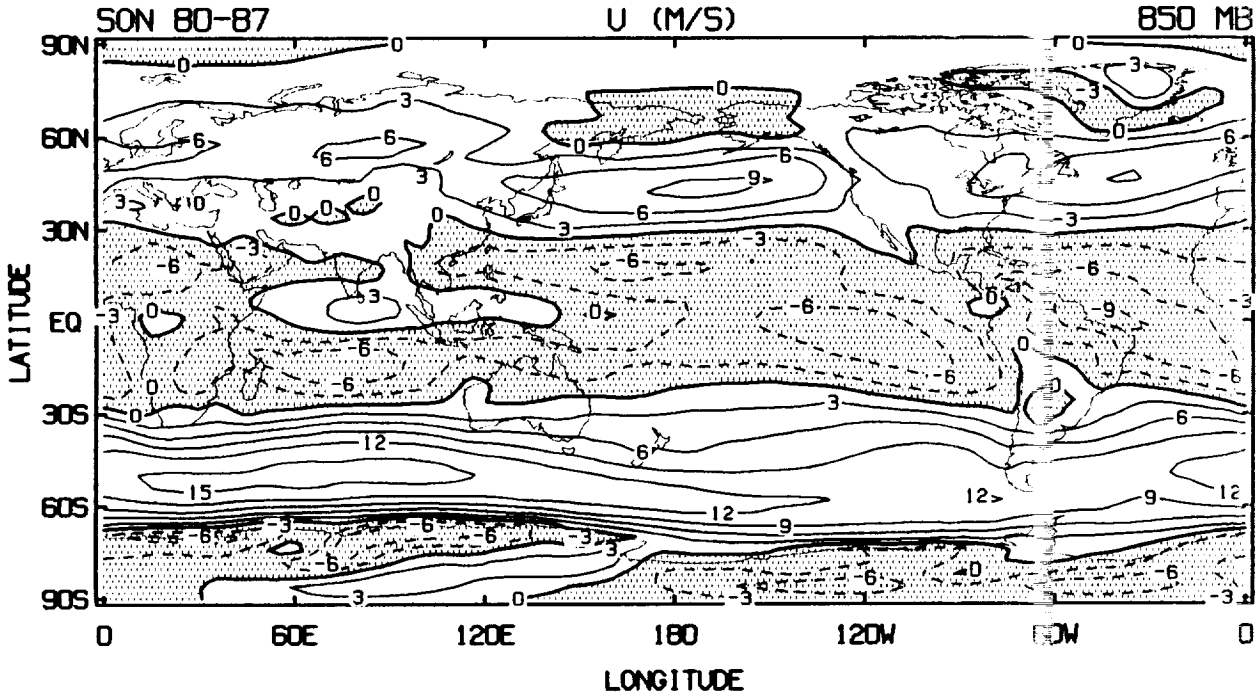

JJA 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
1
2
3
5
8
11
3
5 7 8 9 11 14 16 18 17 14 11 9 8 6 5 4 3
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

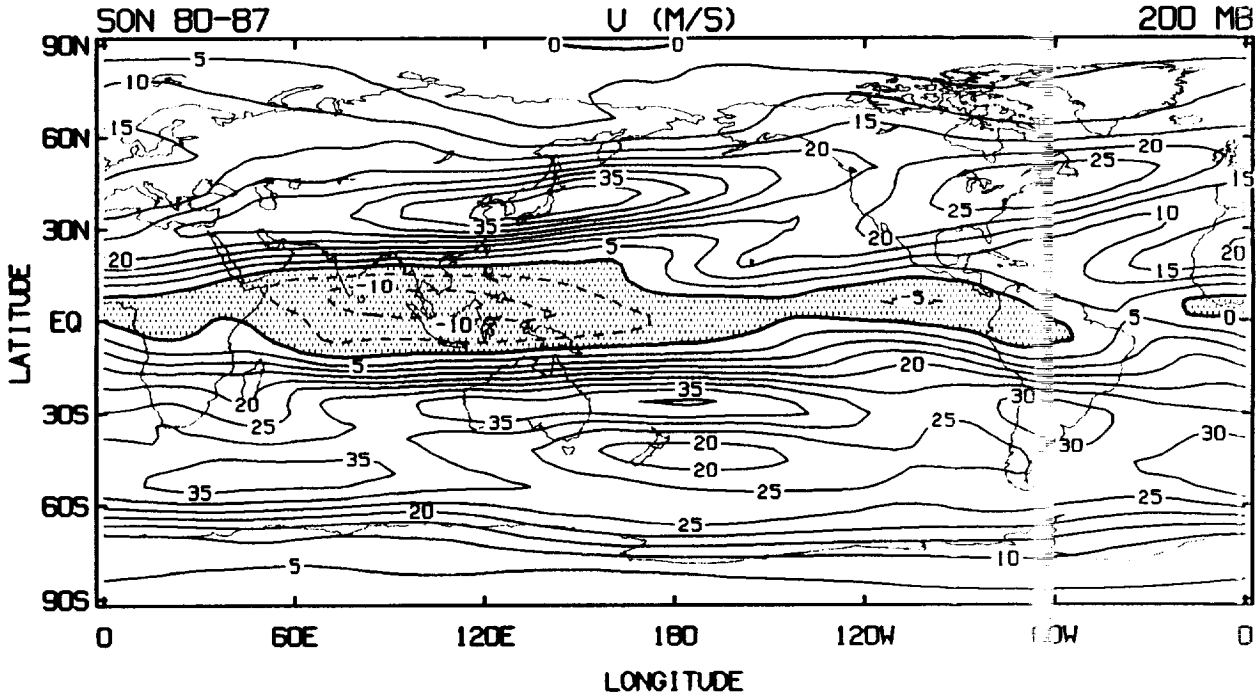

JJA 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
230
225
220
210 205
200
210 215
210
200 195
230
240
250
255
260
270
275
285
295
275
285
290
300
295 290 285 280 275
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

SEPTEMBER
OCTOBER
NOVEMBER

PRECEDING PAGE BLANK NOT FILMED

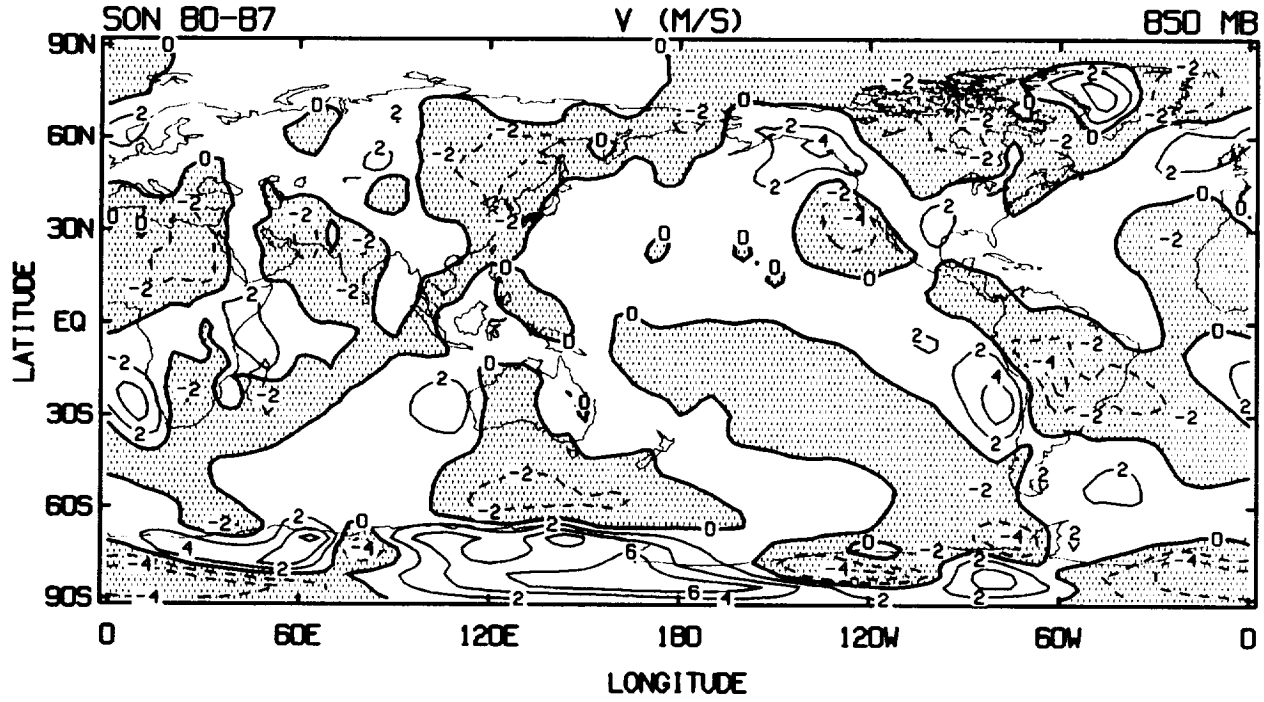
PAGE 210 INTENTIONALLY BLANK

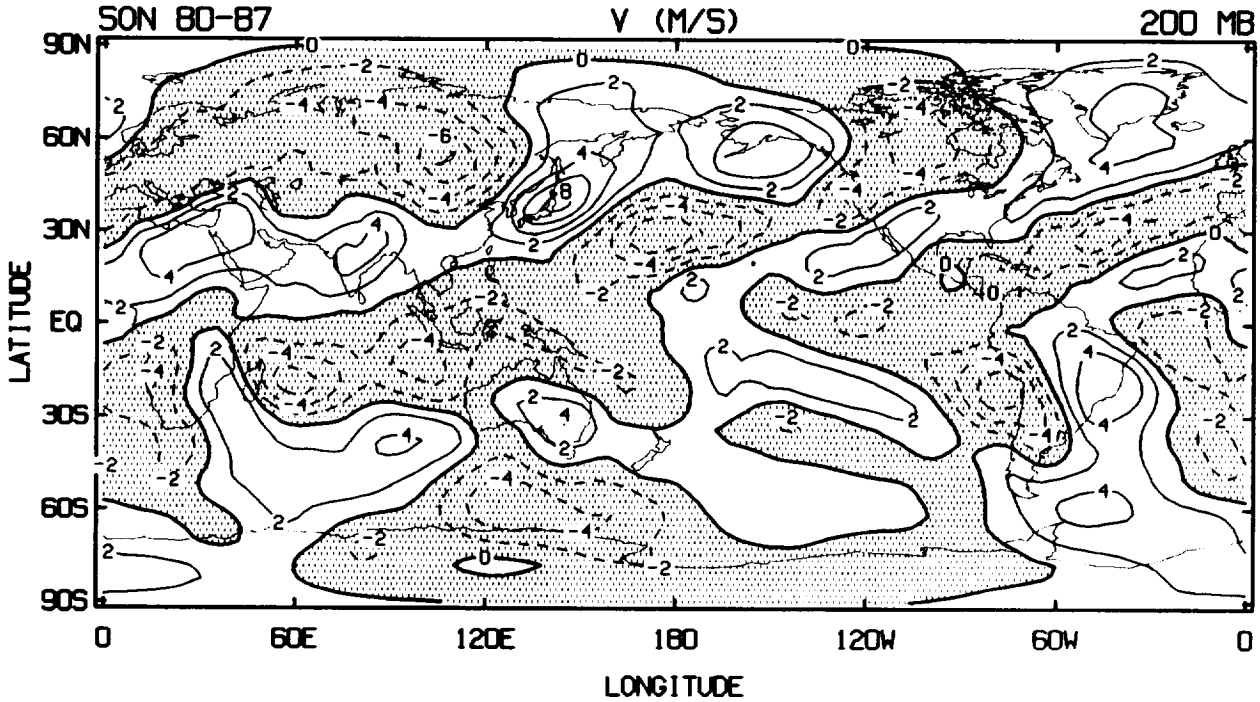


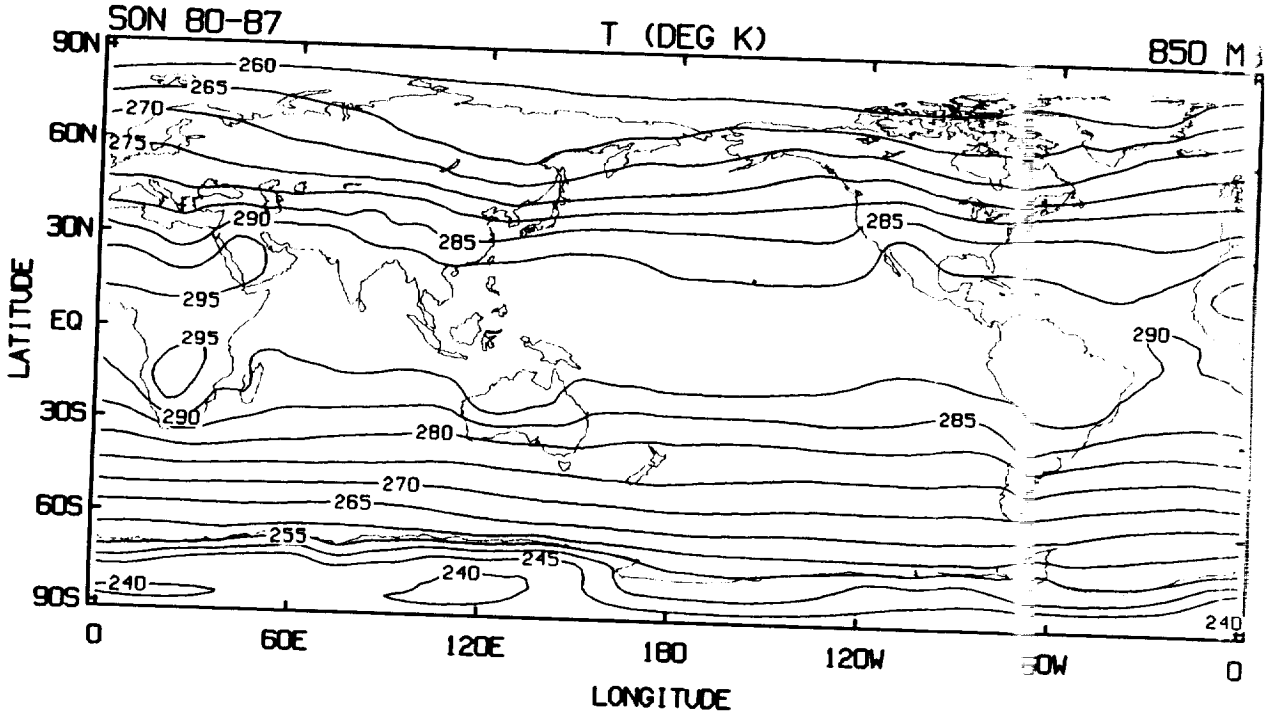


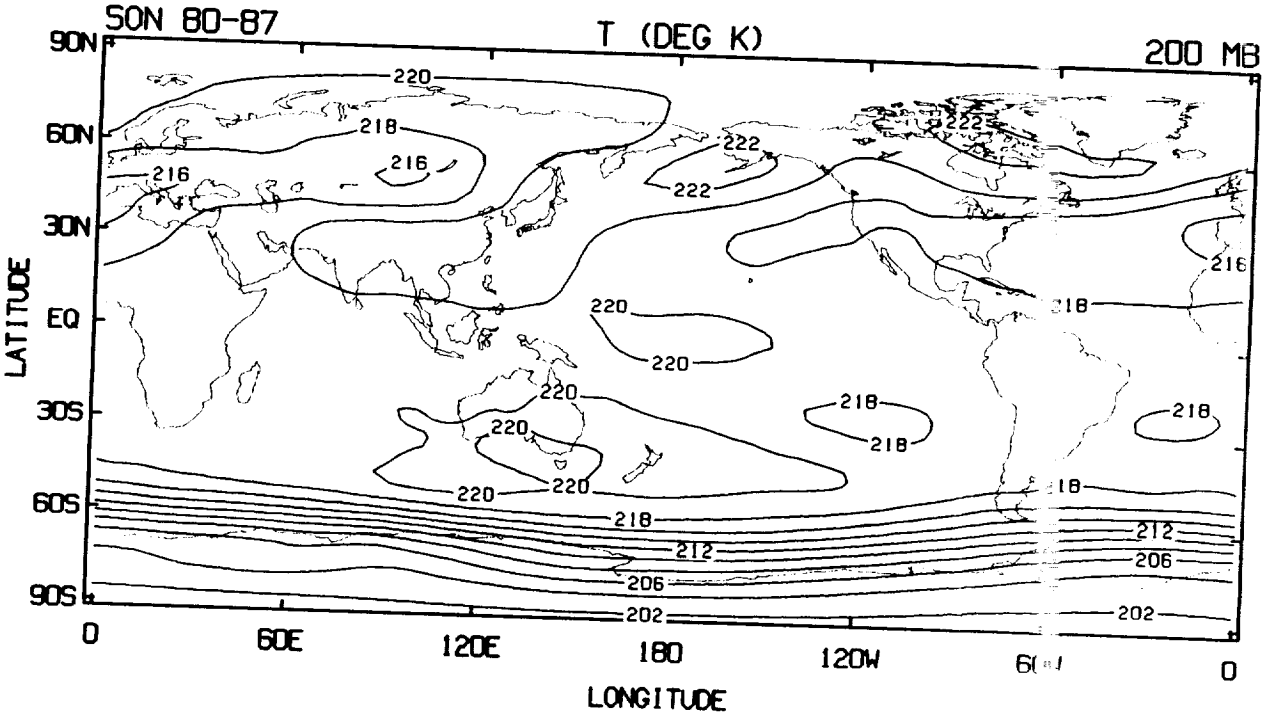
C-3

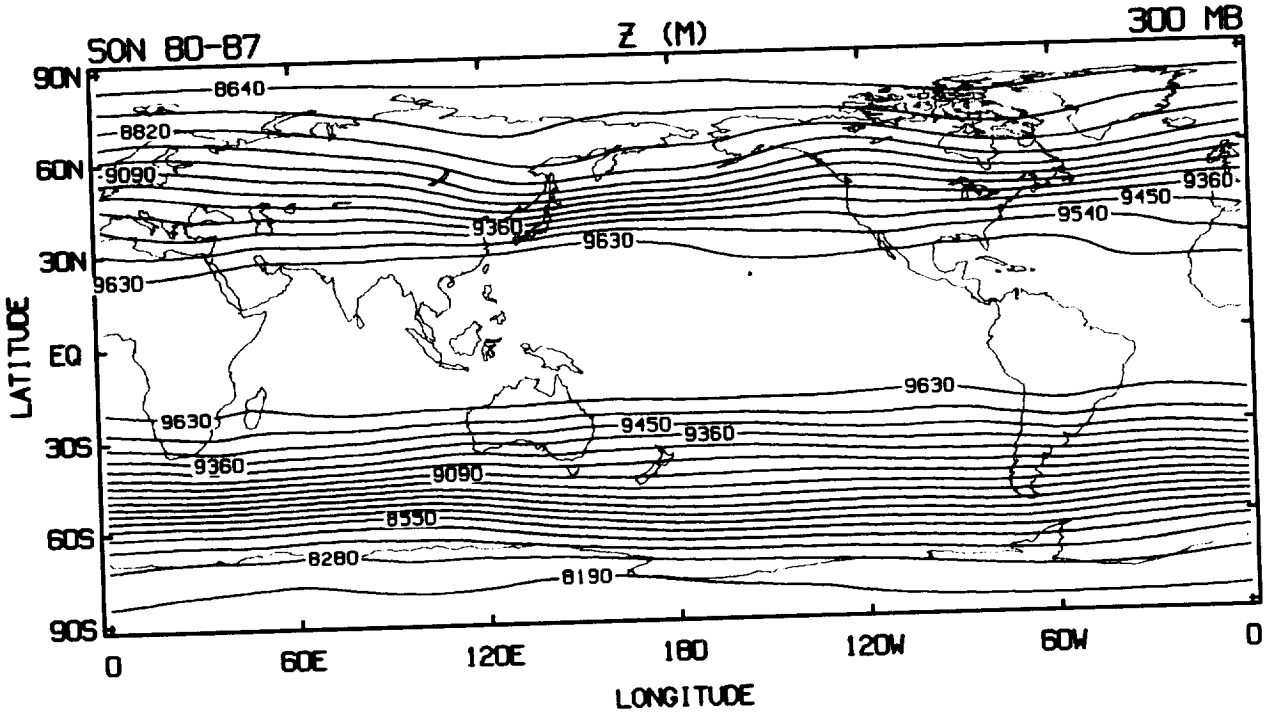
PAGE 212 INTENTIONALLY BLANK

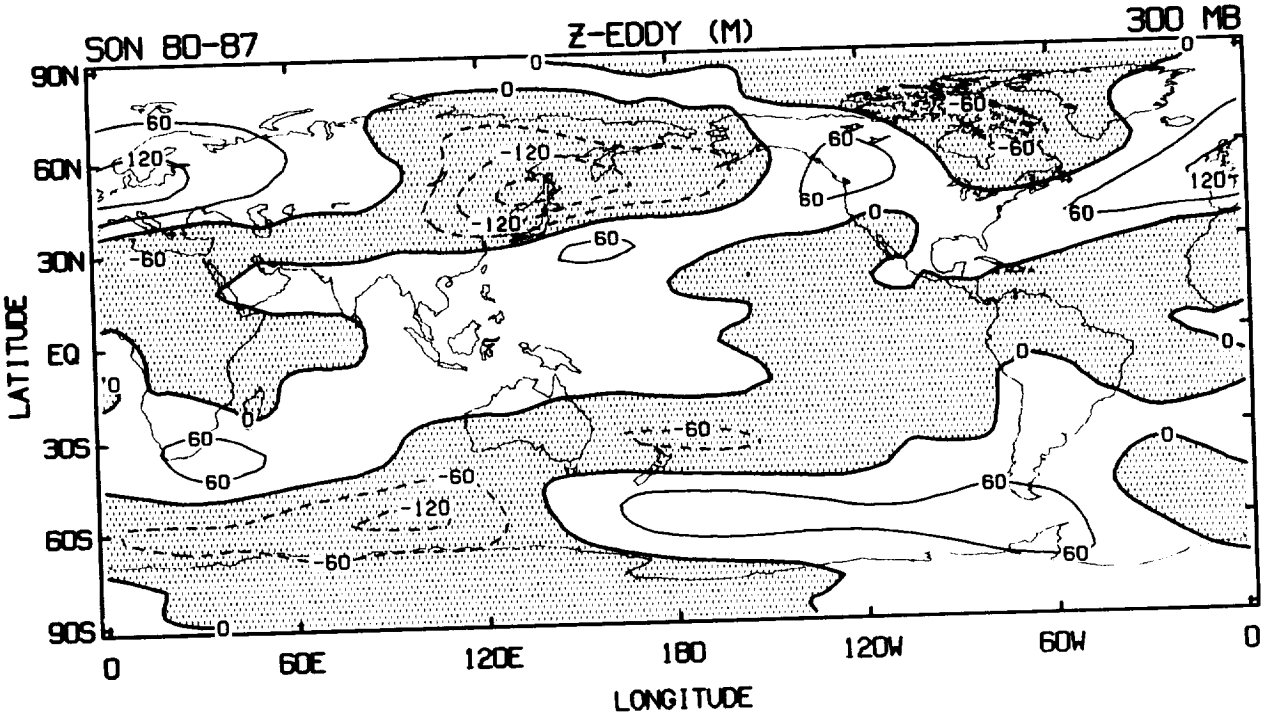

SON 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

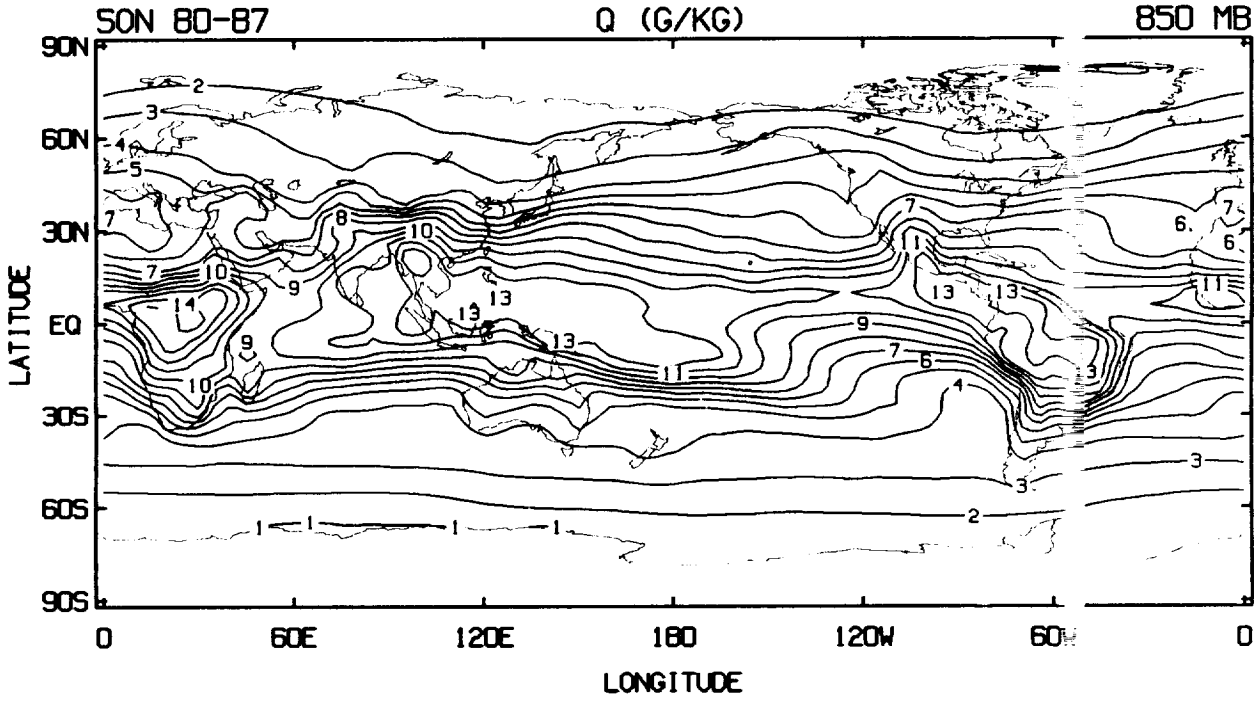

SON 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

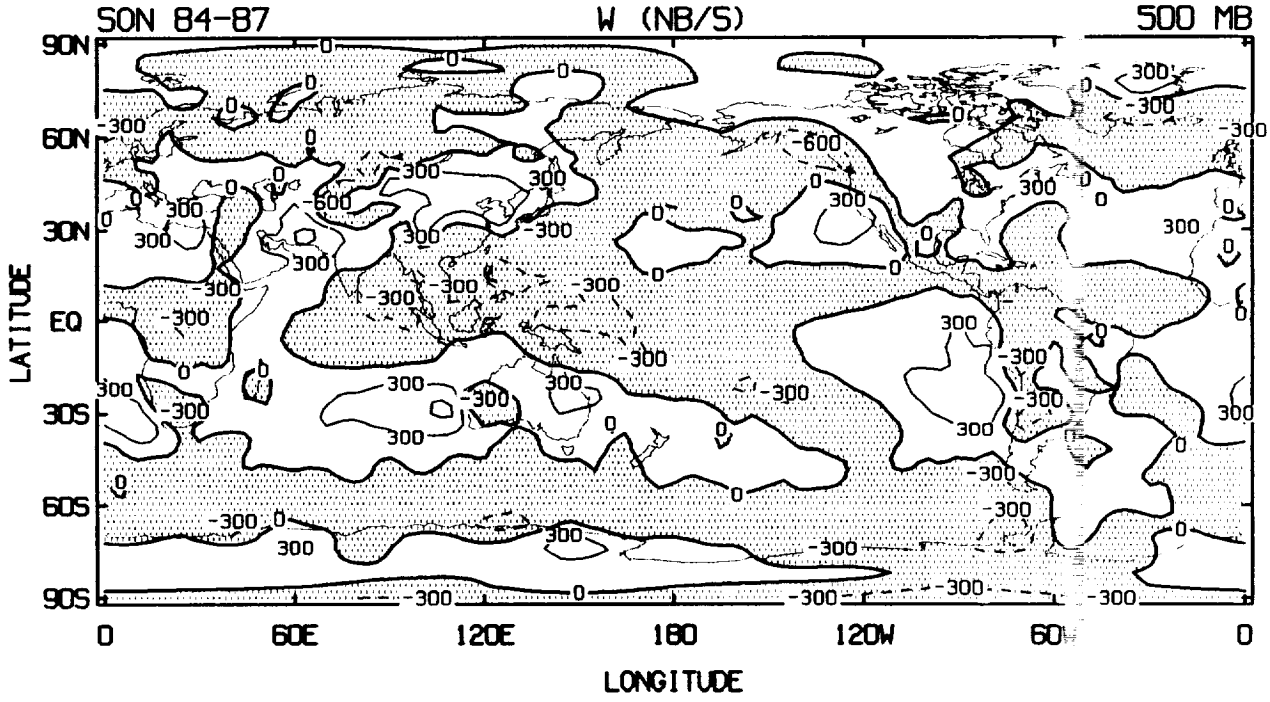

SON 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
260
265
270
275
290
285
295
280
255
240
245
0
60E
120E
180
120W
LONGITUDE

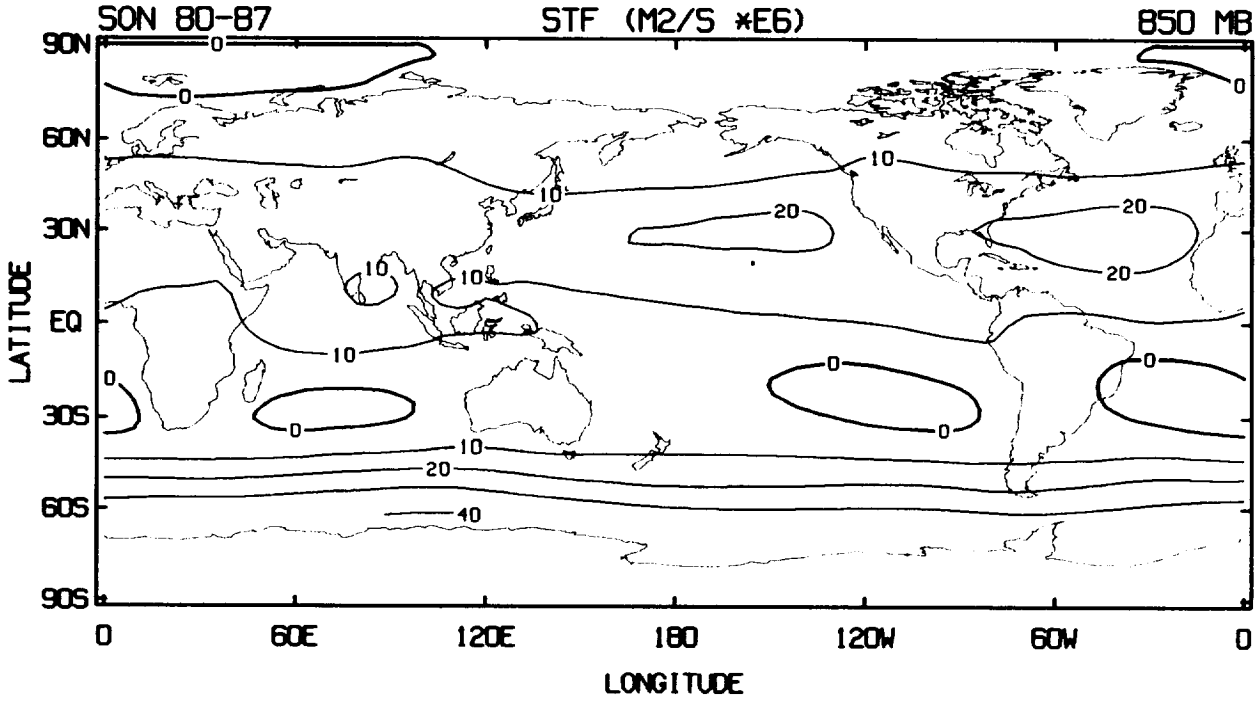

SON 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
220
218
216
222
212
206
202
0
60E
120E
180
120W
LONGITUDE

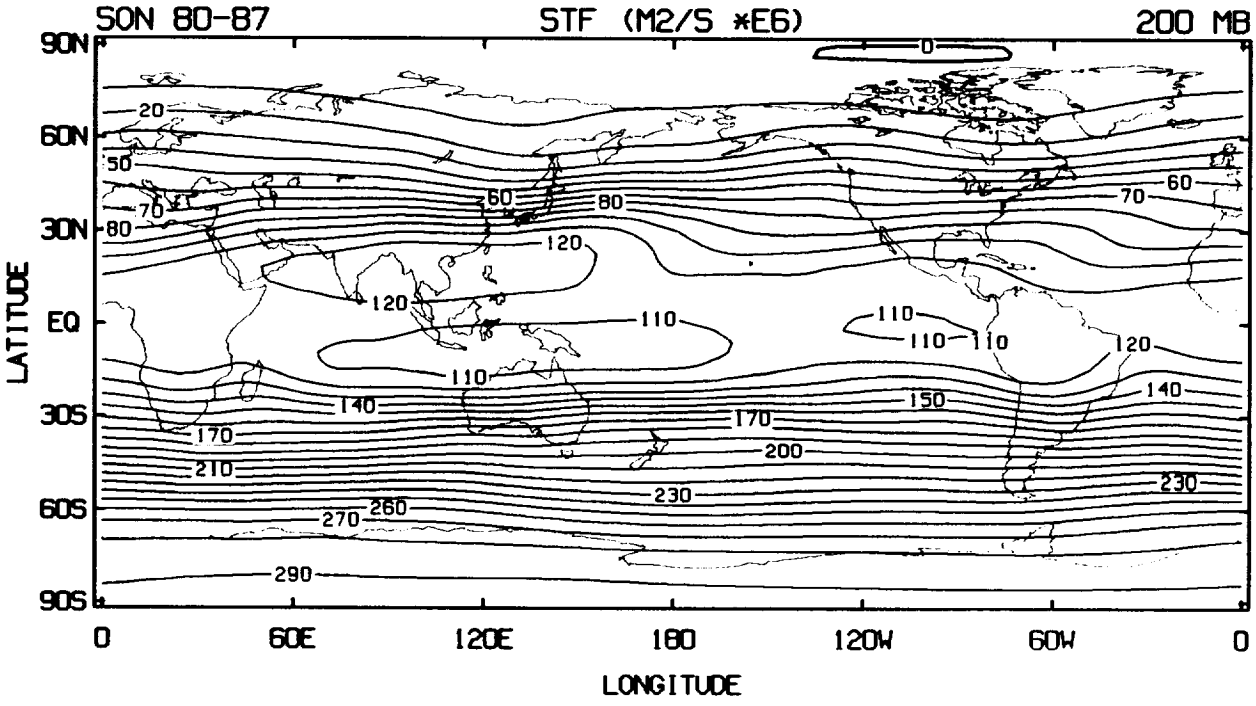

SON 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
8640
8820
9090
9360
9630
9450
9540
8550
8280
8190
0
60E
120E
180
120W
60W
LONGITUDE

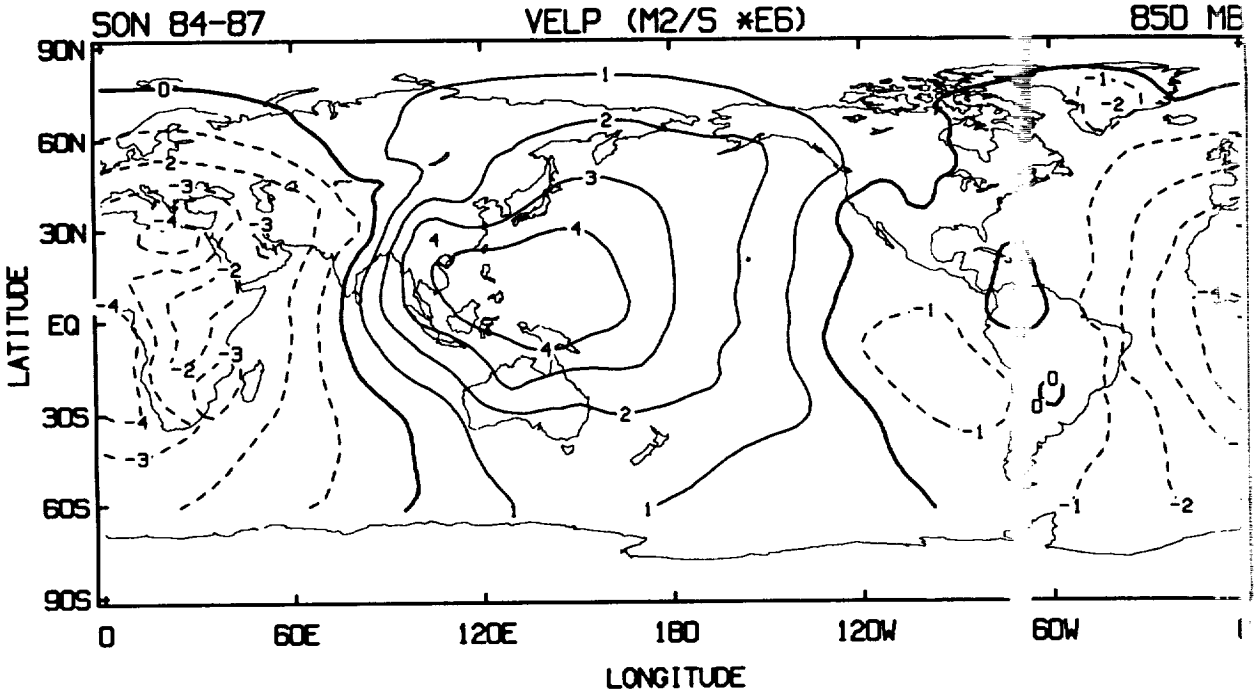

SON 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60
120
-60
-120
0
60E
120E
180
120W
60W
LONGITUDE

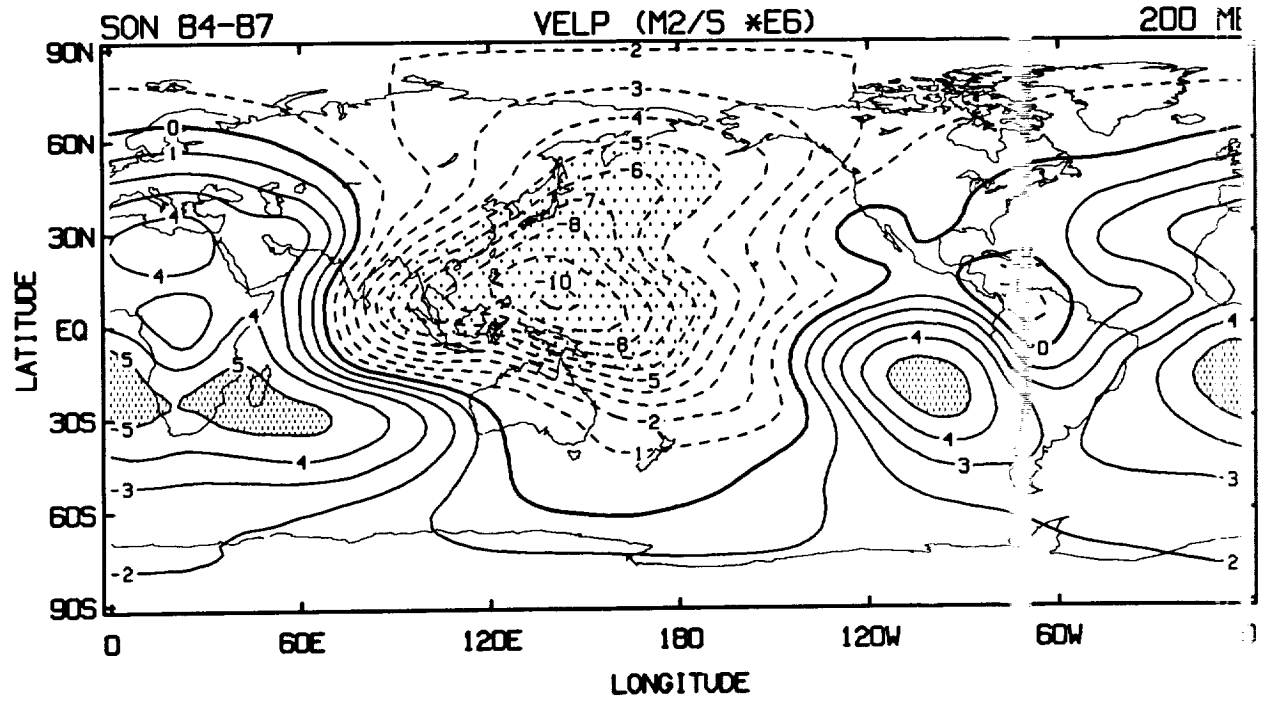

SON 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

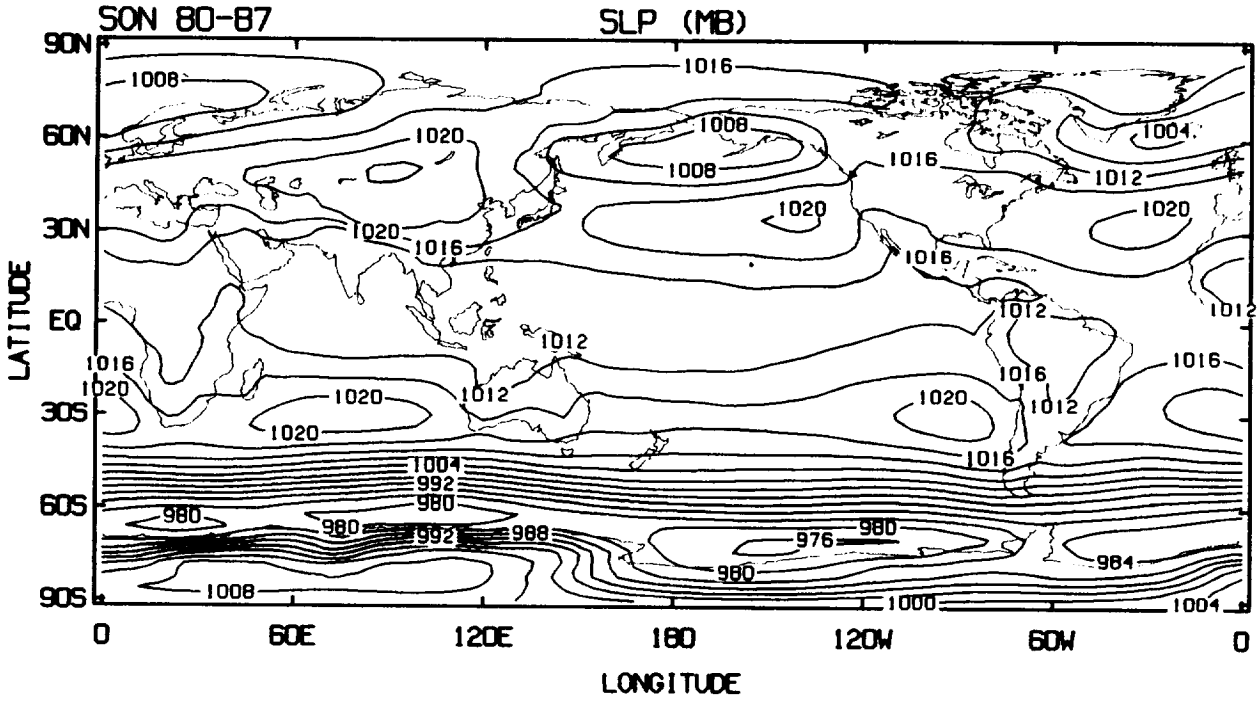

SON 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

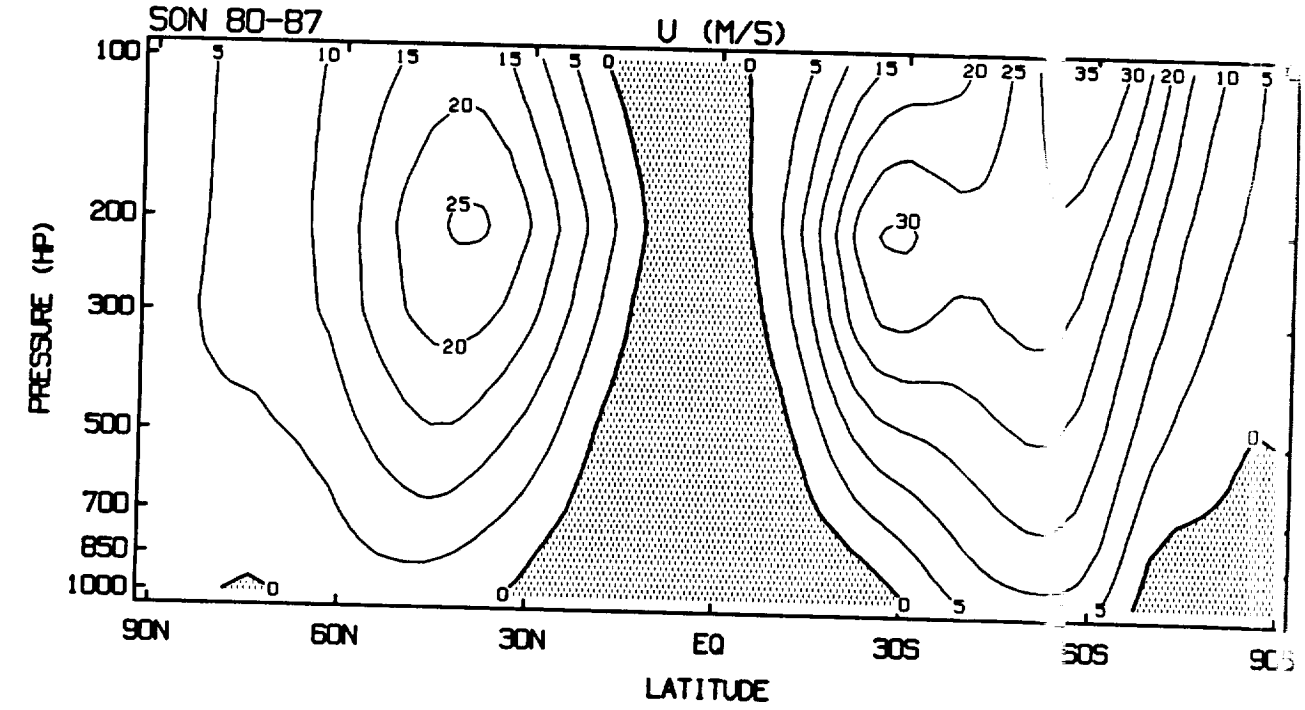

SON 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

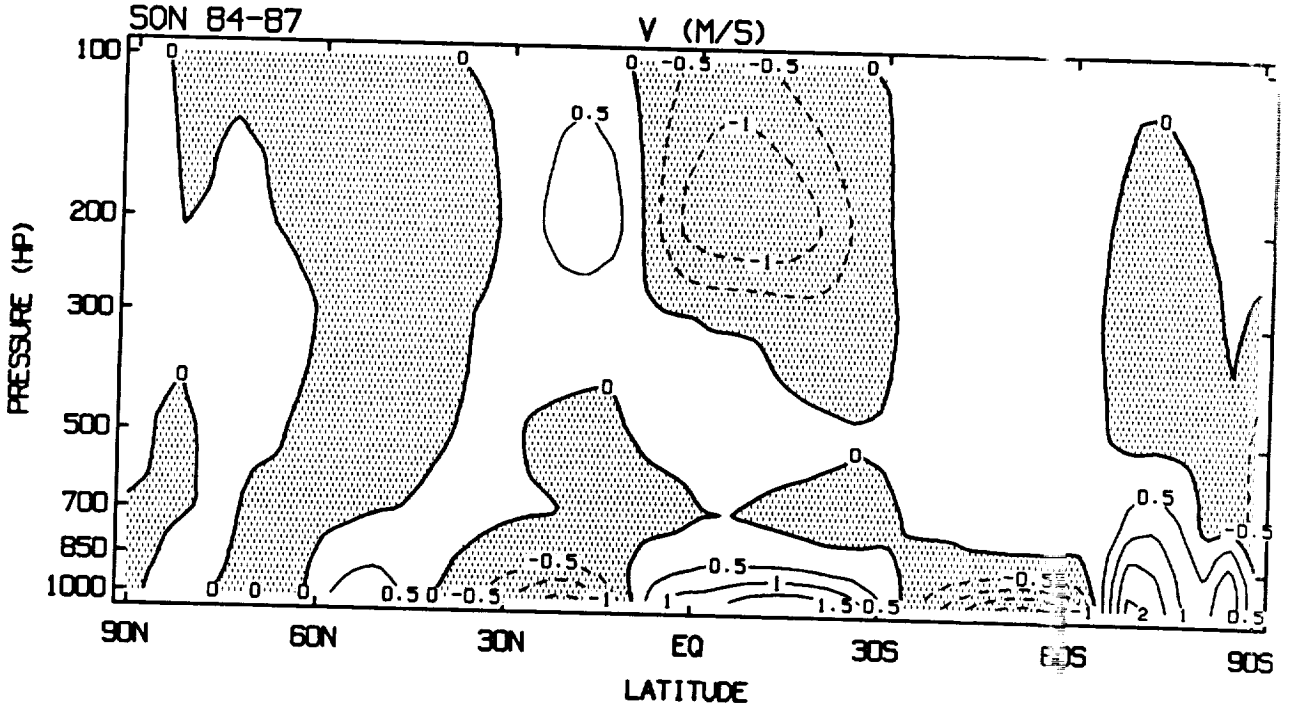

SON 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

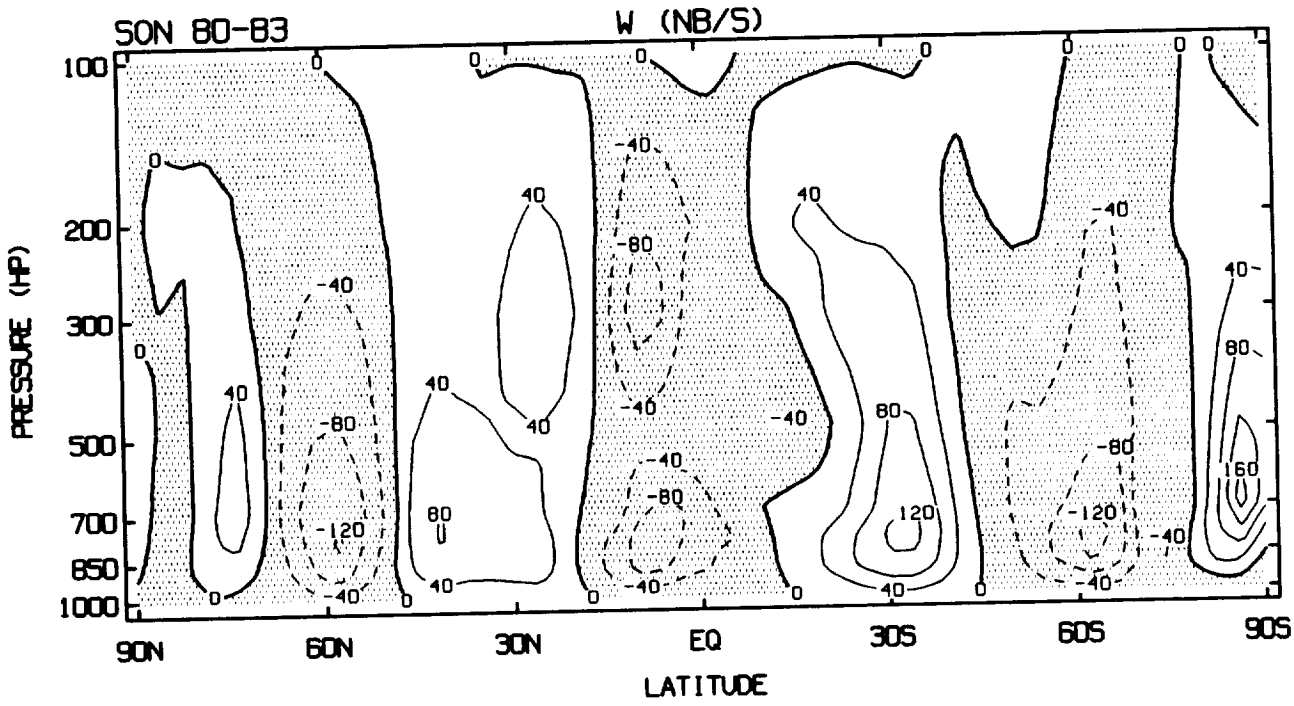

SON 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

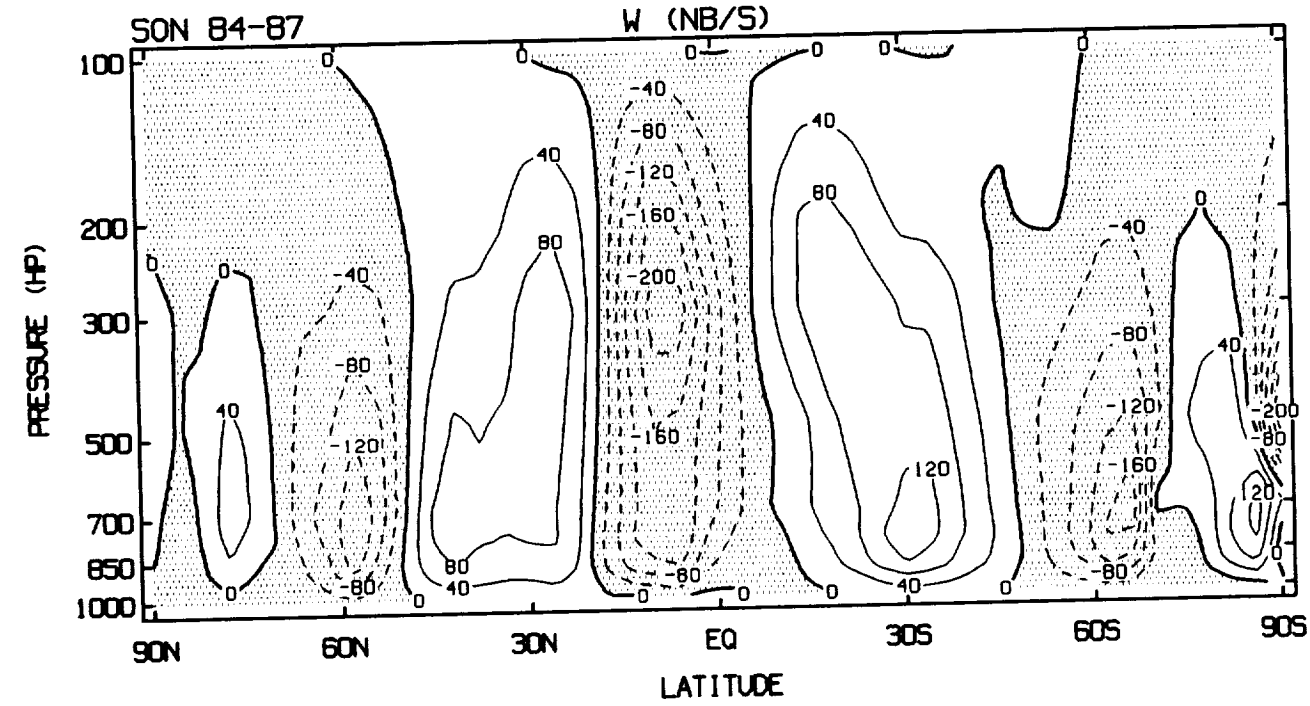

SON 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

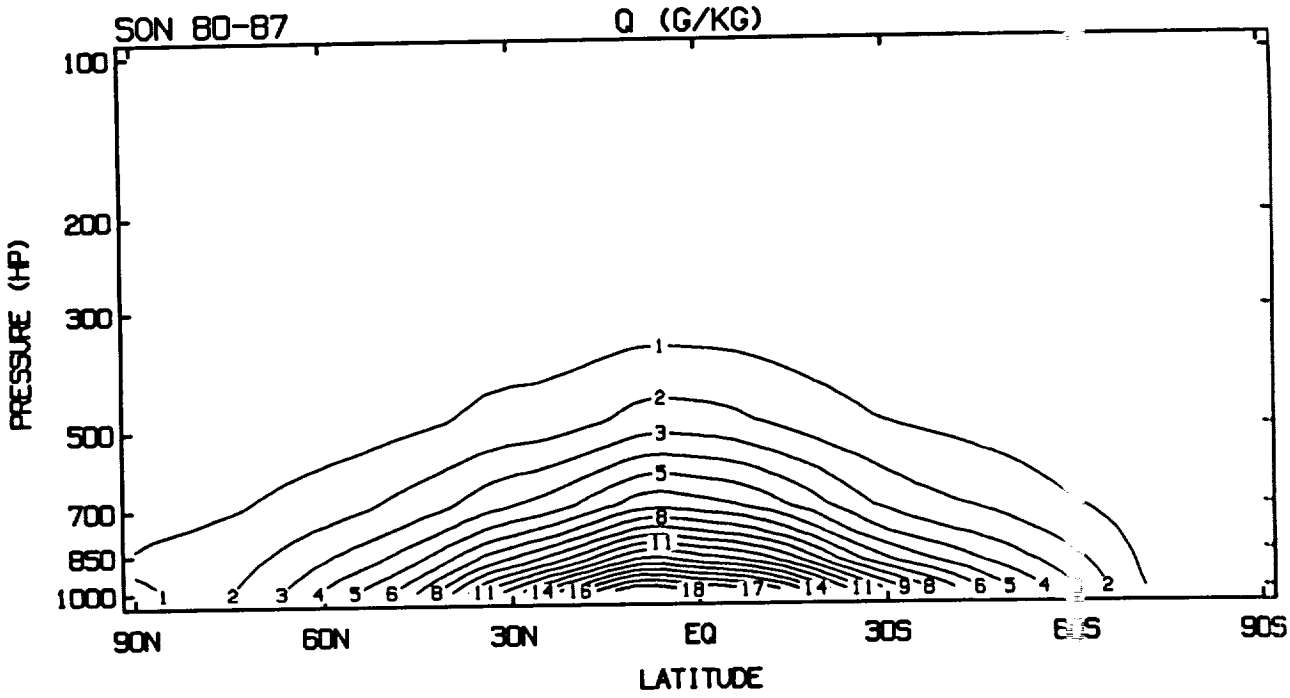

SON 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1016
1008
1020
1012
1004
1000
992
988
984
980
976

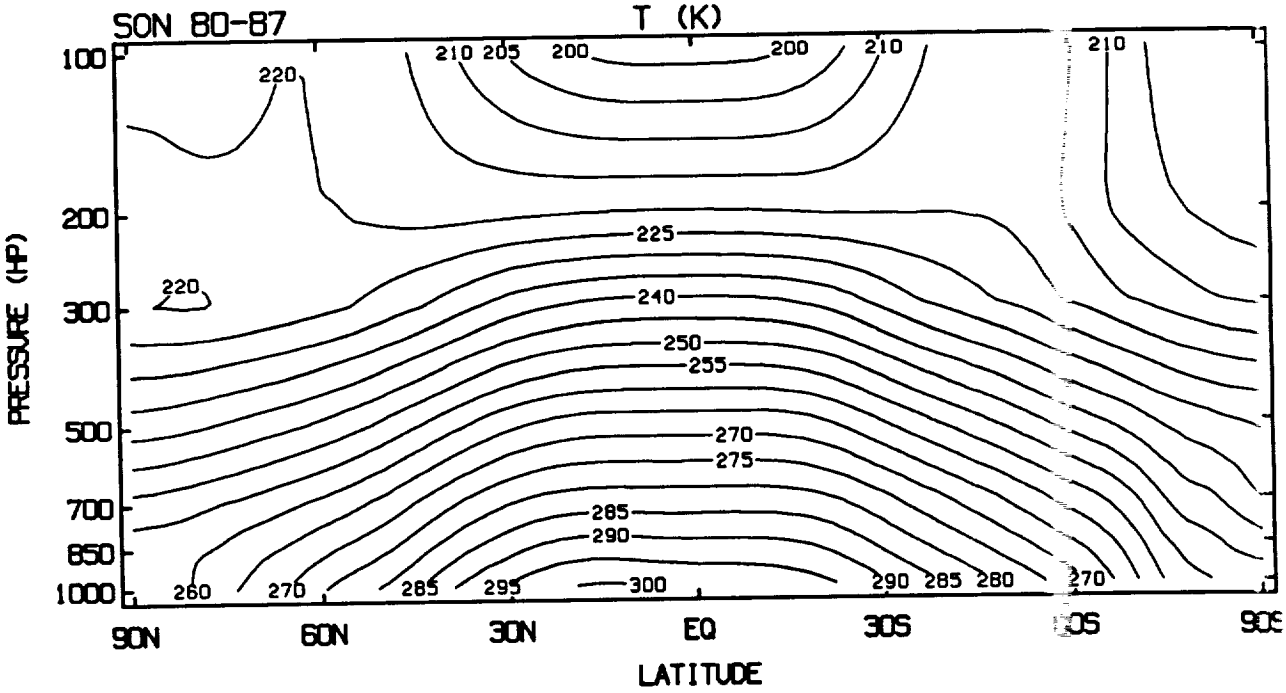

SON 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


SON 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE


SON 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


SON 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

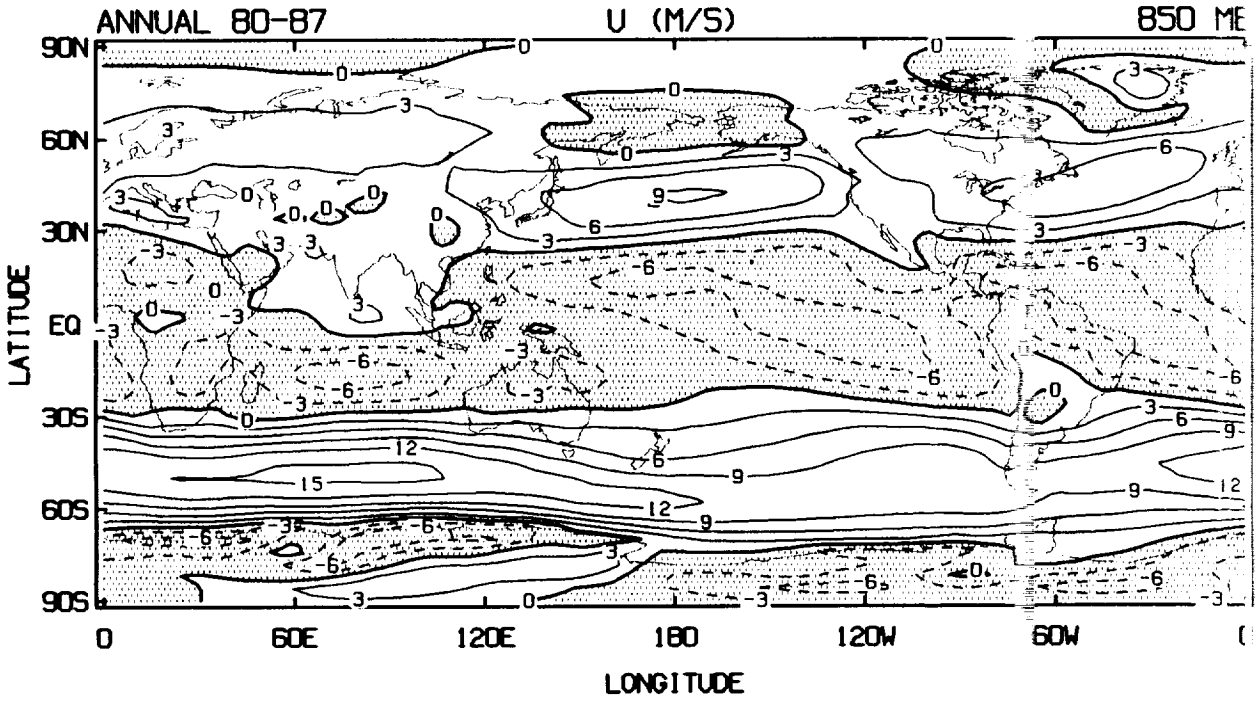

SON 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE

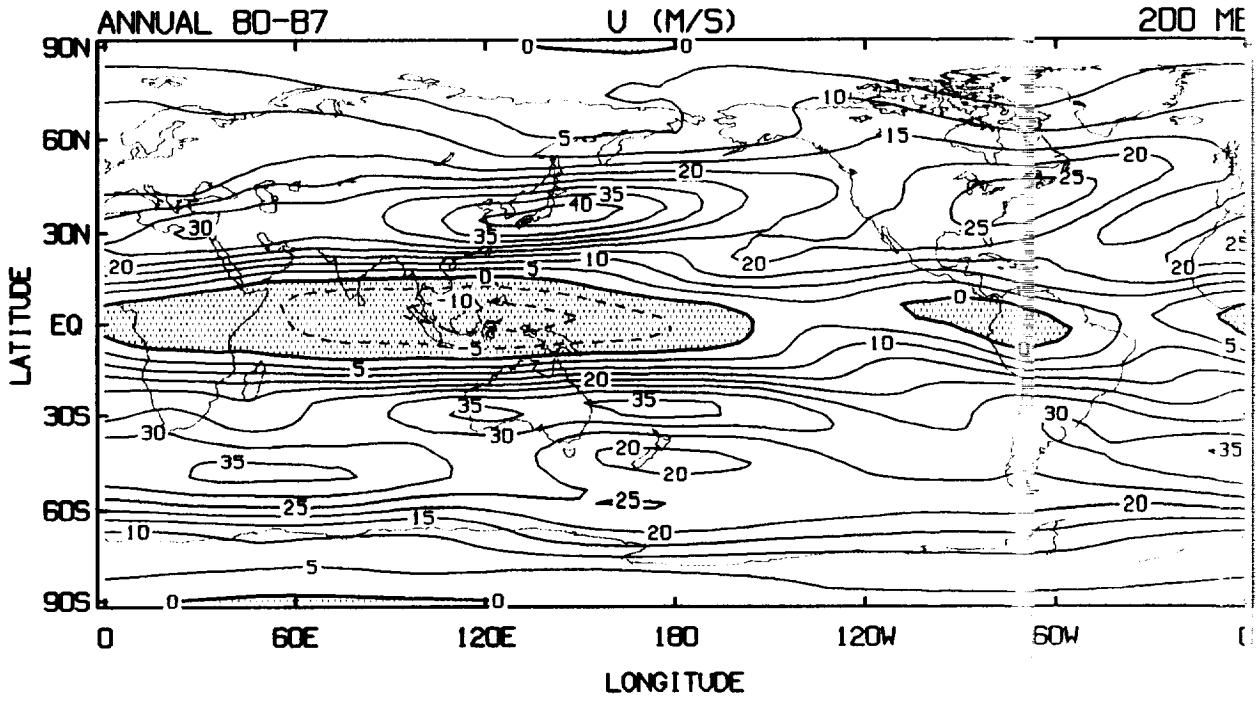

SON 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
90S
LATITUDE

ANNUAL

PRECEDING PAGE BLANK NOT FILMED

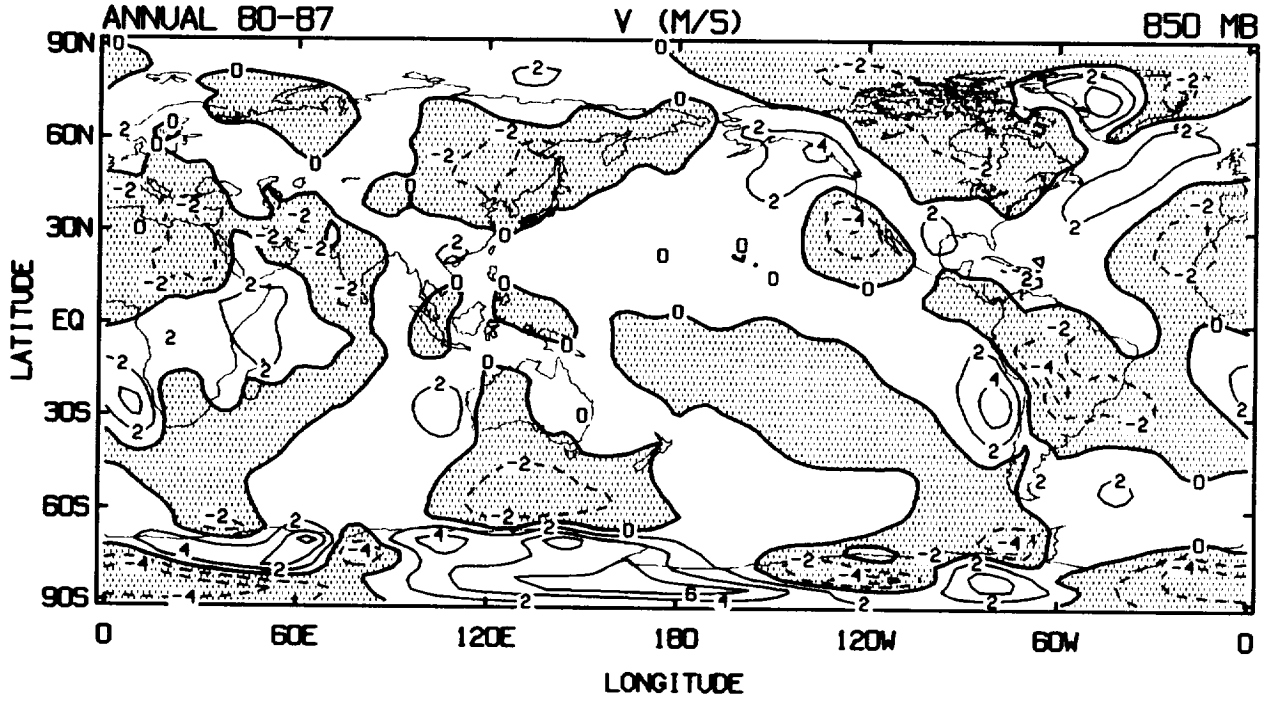
PAGE 224 INTENTIONALLY B

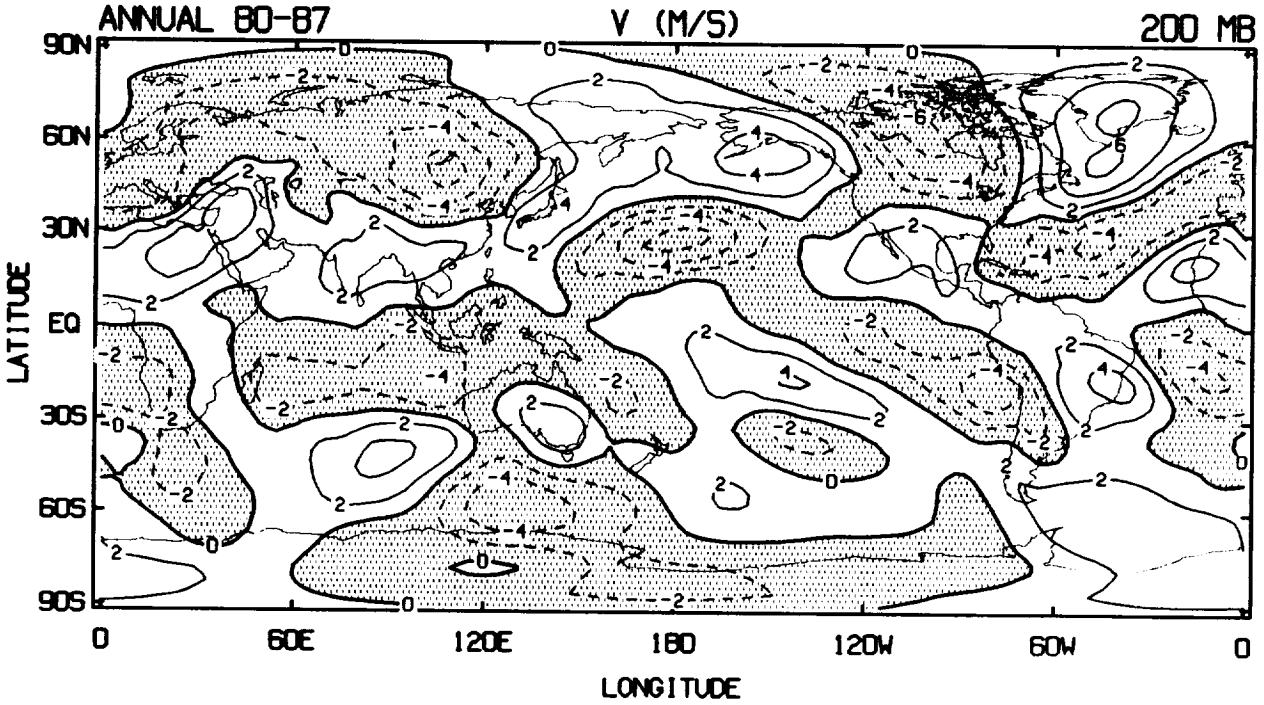


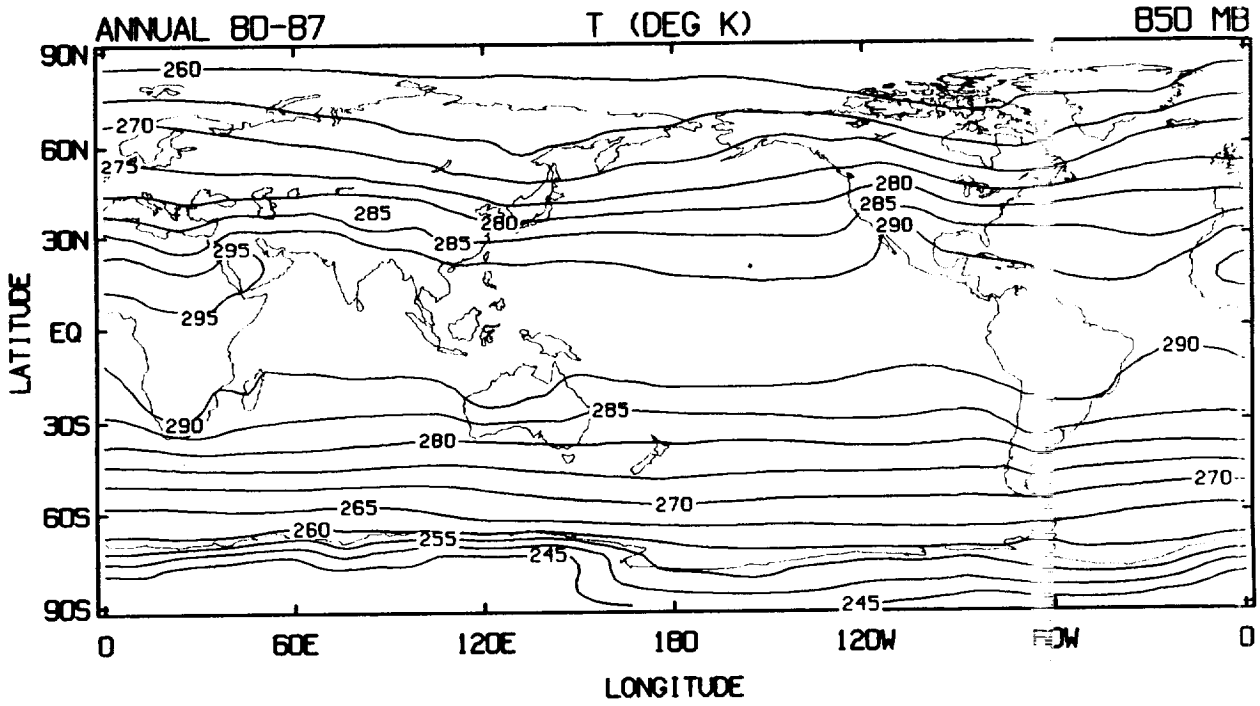


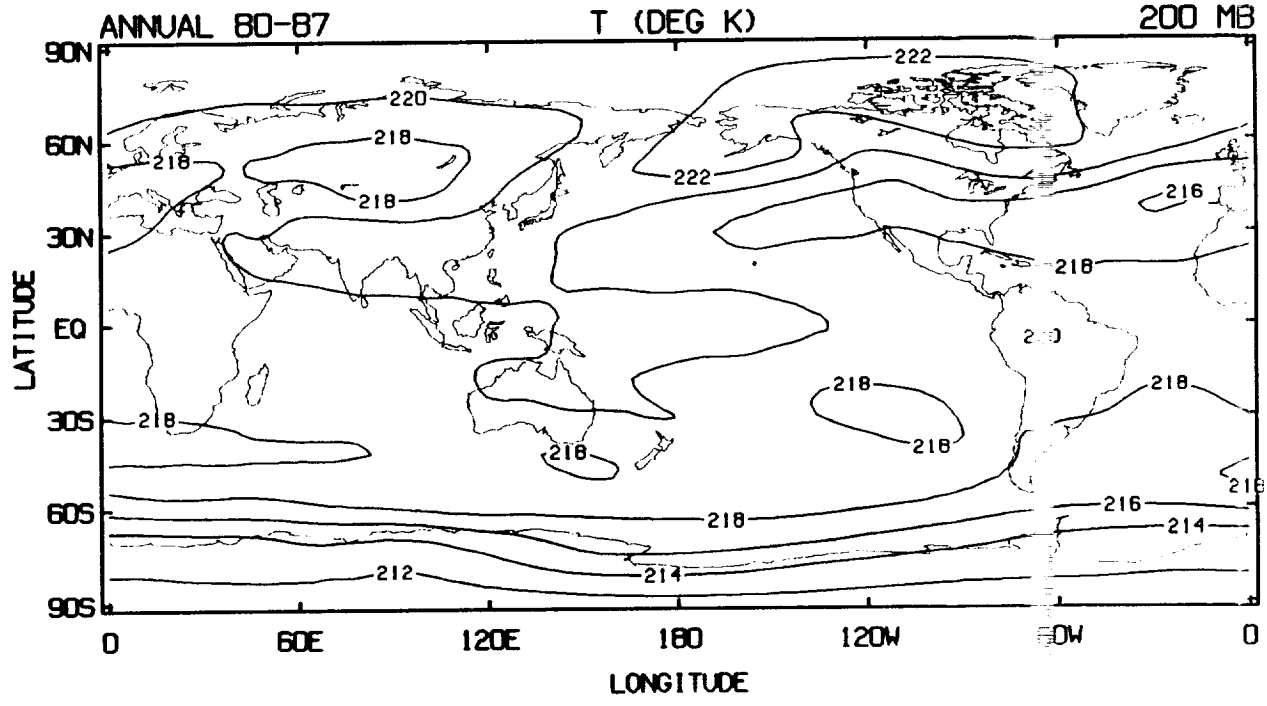
PRECEDING PAGE BLANK NOT FILMED

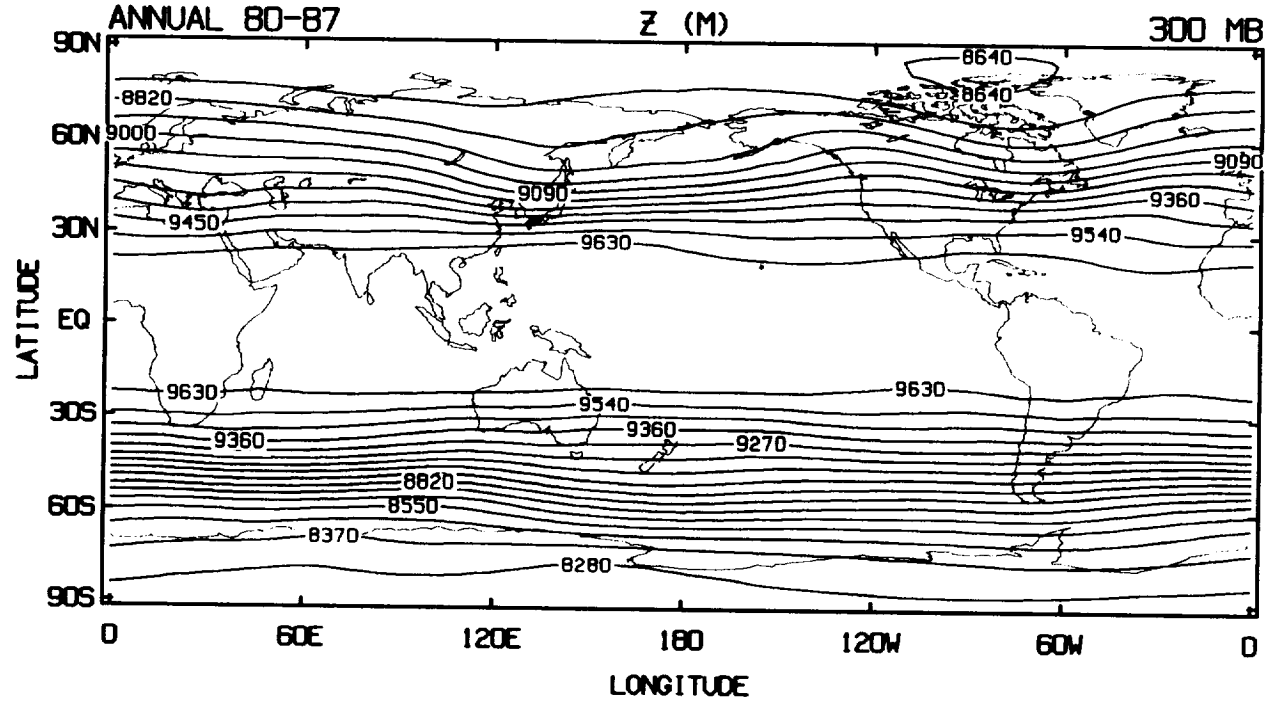
PAGE 226 INTENTIONALLY

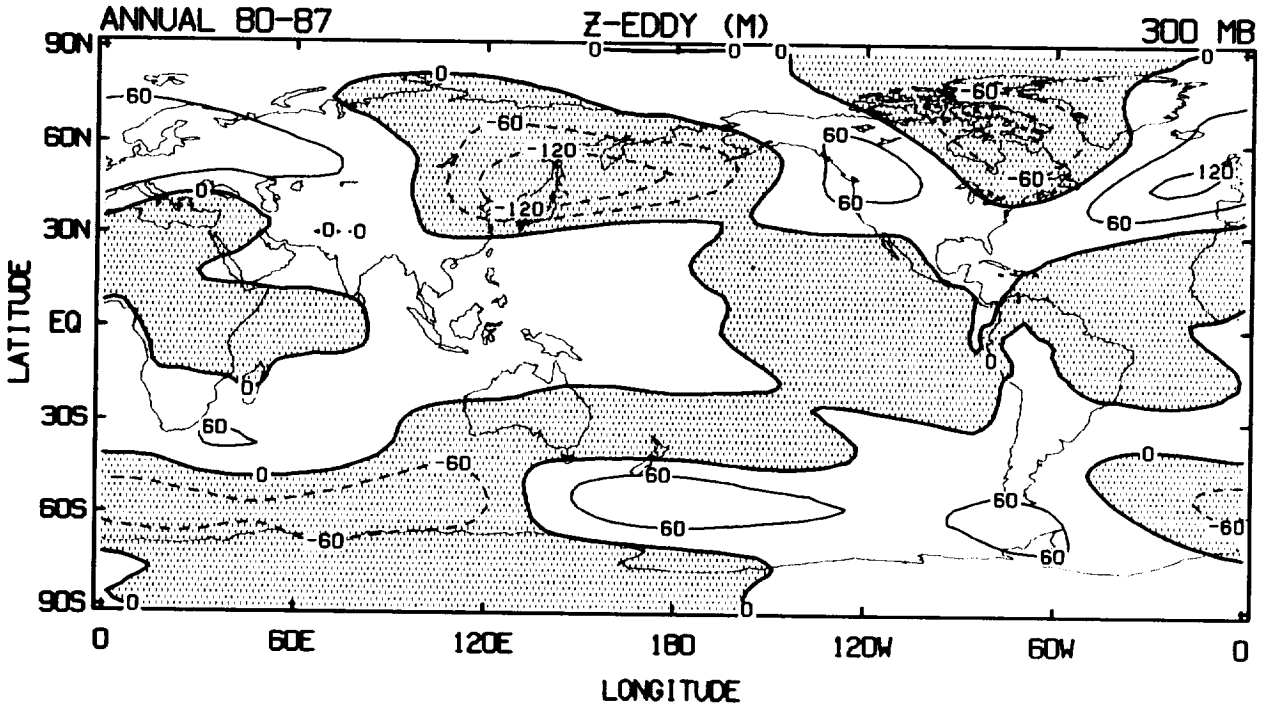

ANNUAL 80-87
V (M/S)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

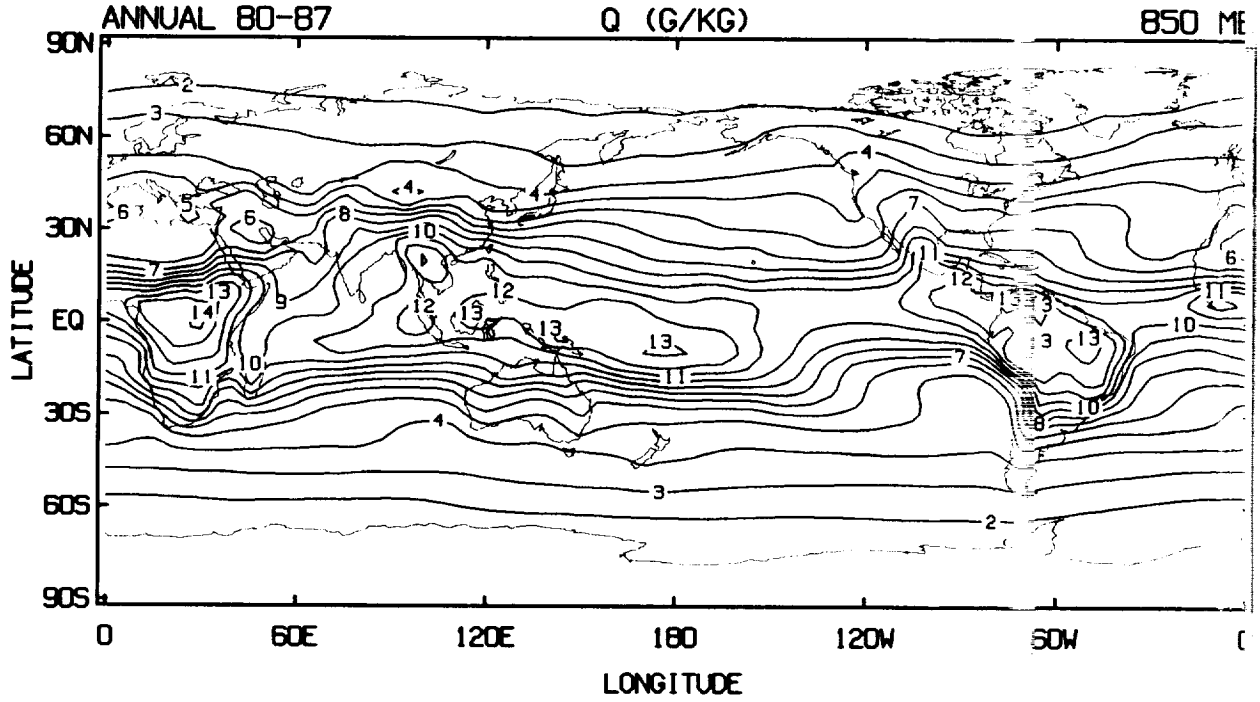

ANNUAL 80-87
V (M/S)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

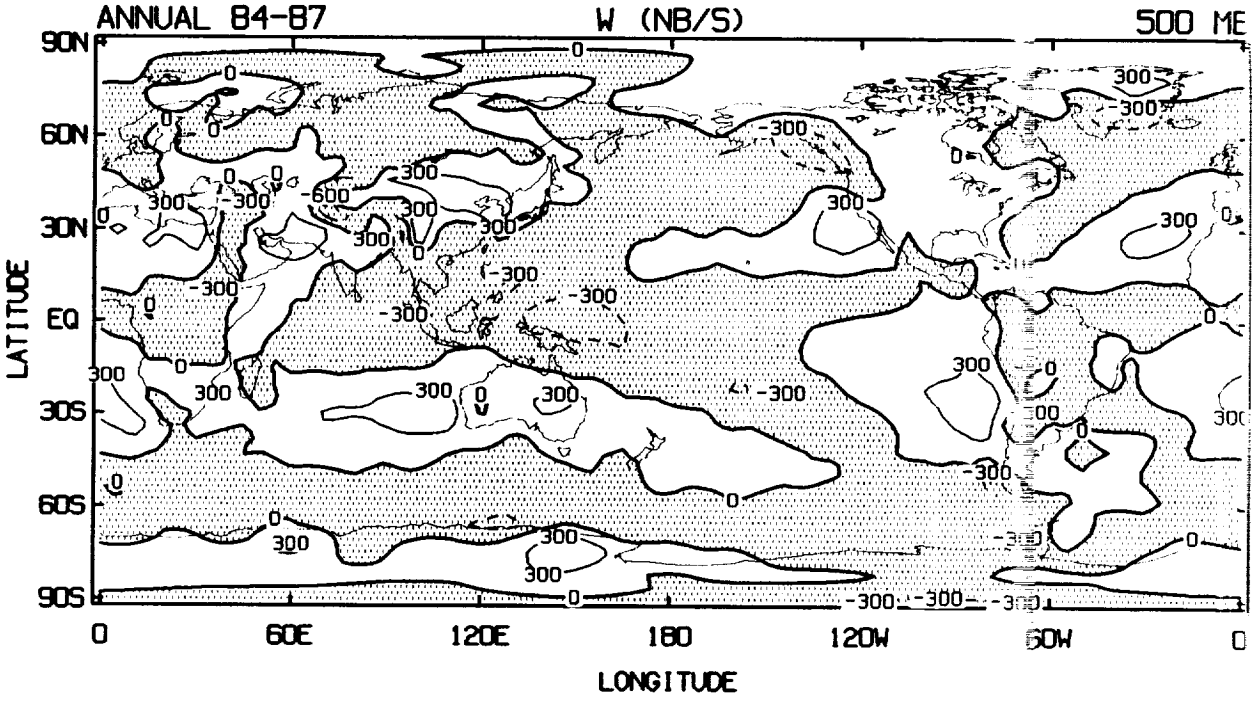

ANNUAL 80-87
T (DEG K)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
260
270
275
285
280
285
290
295
285
295
290
285
280
270
265
260
255
245
245
290
0
60E
120E
180
120W
0
LONGITUDE

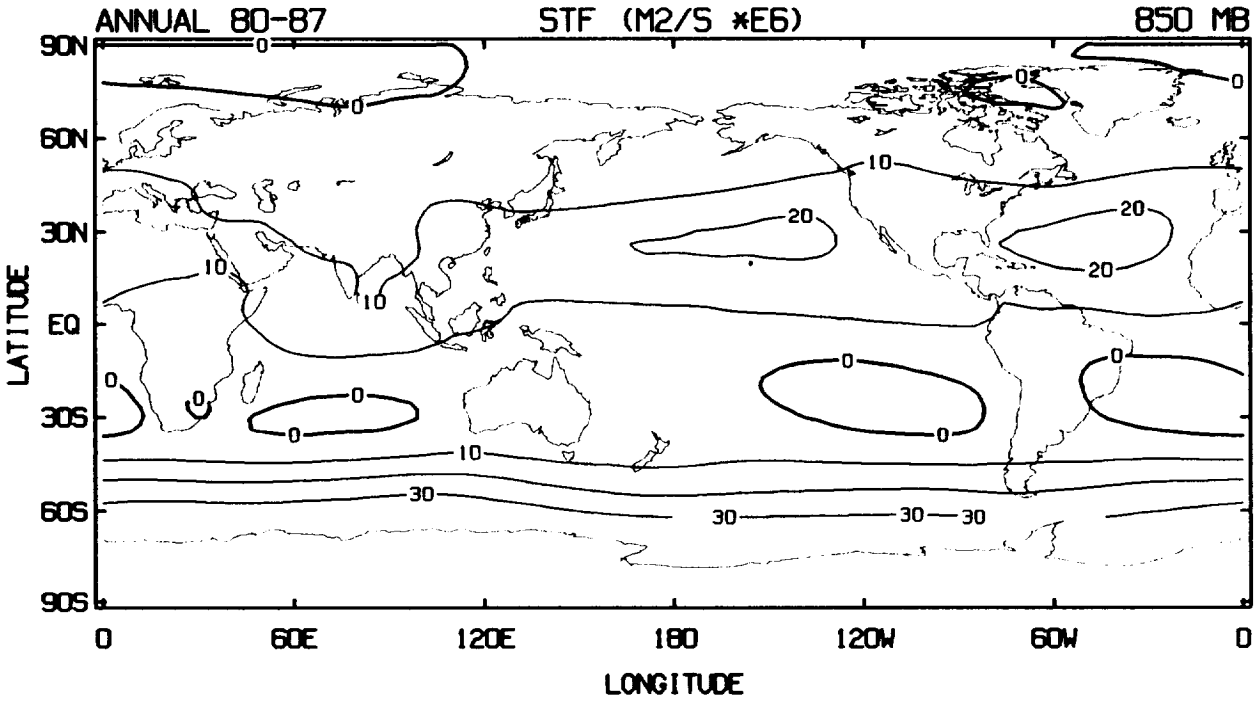

ANNUAL 80-87
T (DEG K)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
222
220
218
218
218
222
216
218
218
218
218
218
218
216
214
212
214
0
60E
120E
180
120W
0
LONGITUDE

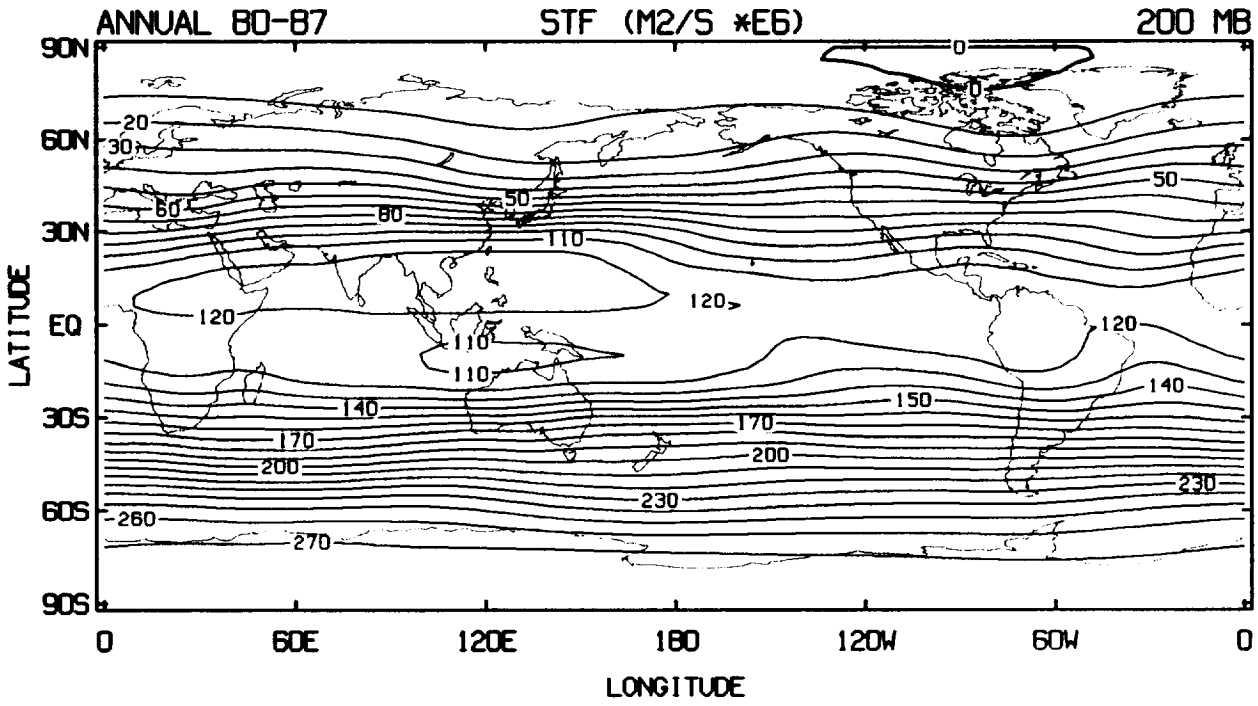

ANNUAL 80-87
Z (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
8640
8820
8640
9000
9090
9090
9360
9450
9540
9630
9630
9630
9540
9360
9270
8820
8550
8370
8280
0
60E
120E
180
120W
60W
0
LONGITUDE

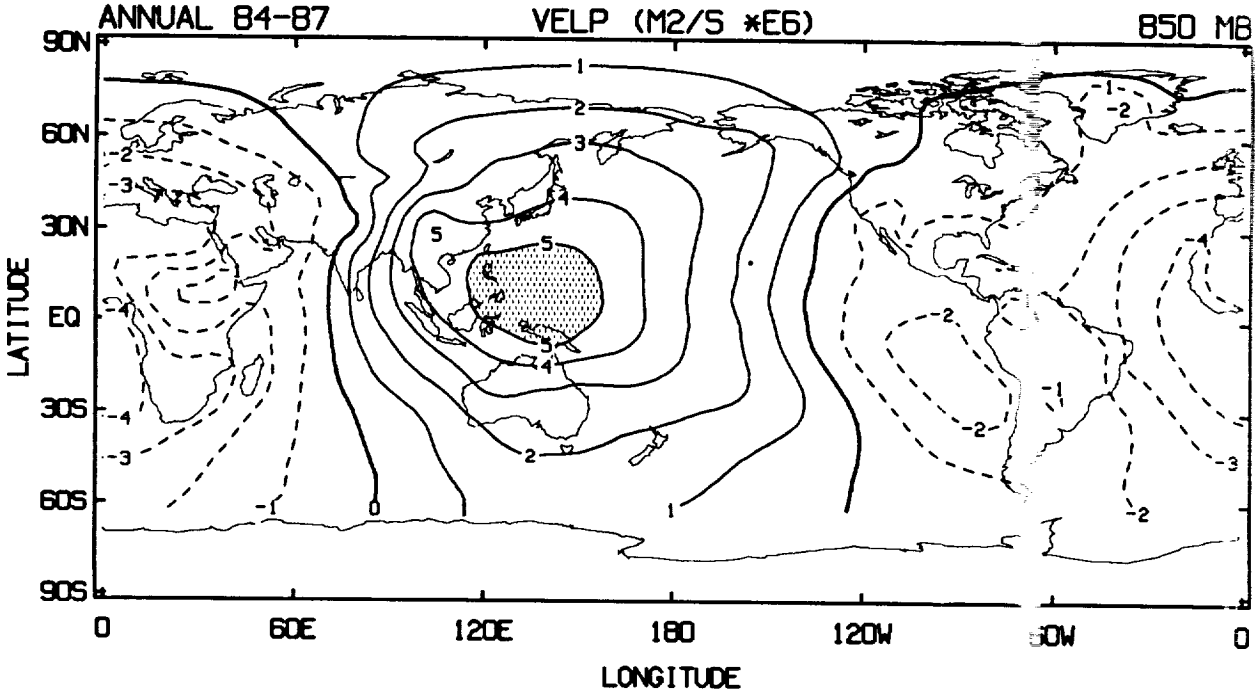

ANNUAL 80-87
Z-EDDY (M)
300 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60
120
-60
-120
0
60E
120E
180
120W
60W
0
LONGITUDE

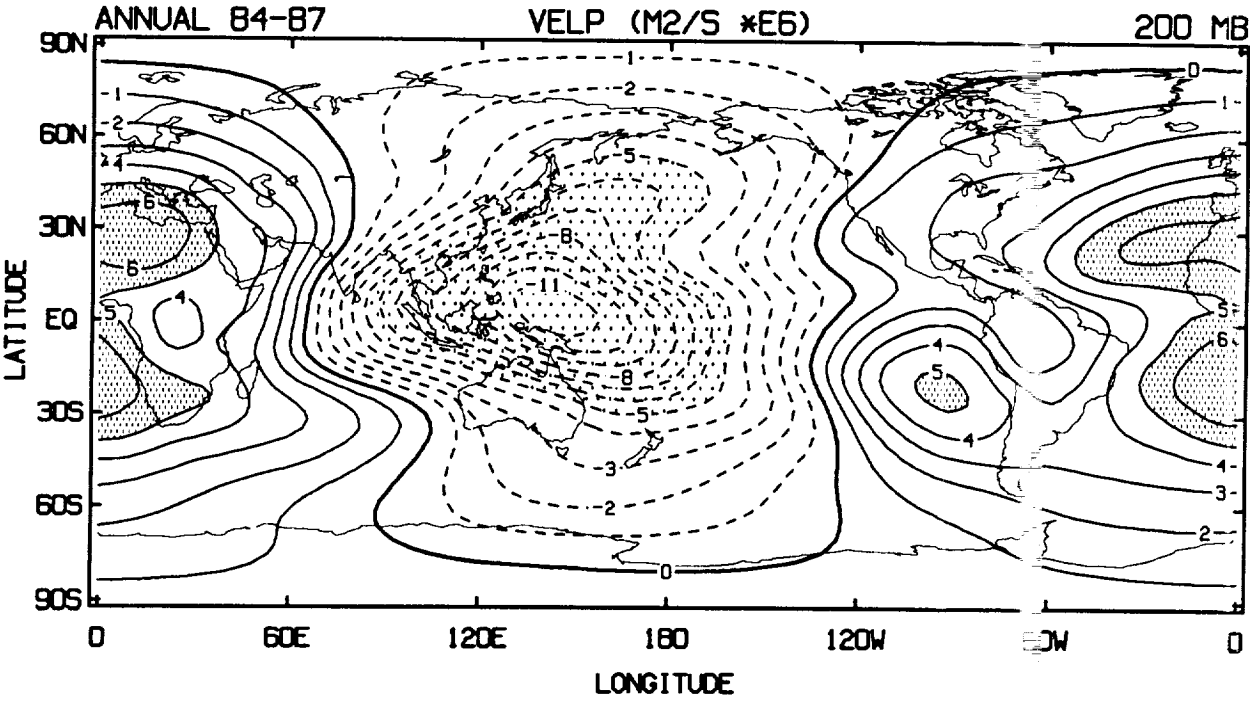

ANNUAL 80-87
Q (G/KG)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

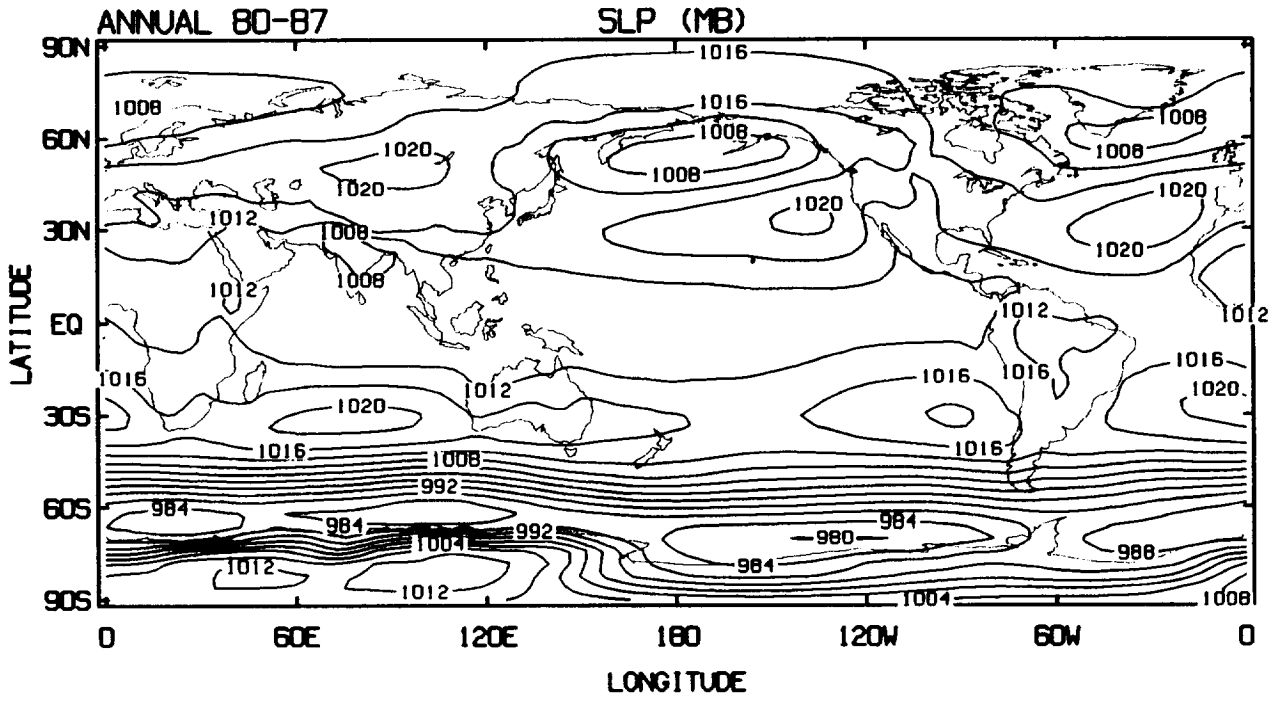

ANNUAL 84-87
W (NB/S)
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
LONGITUDE

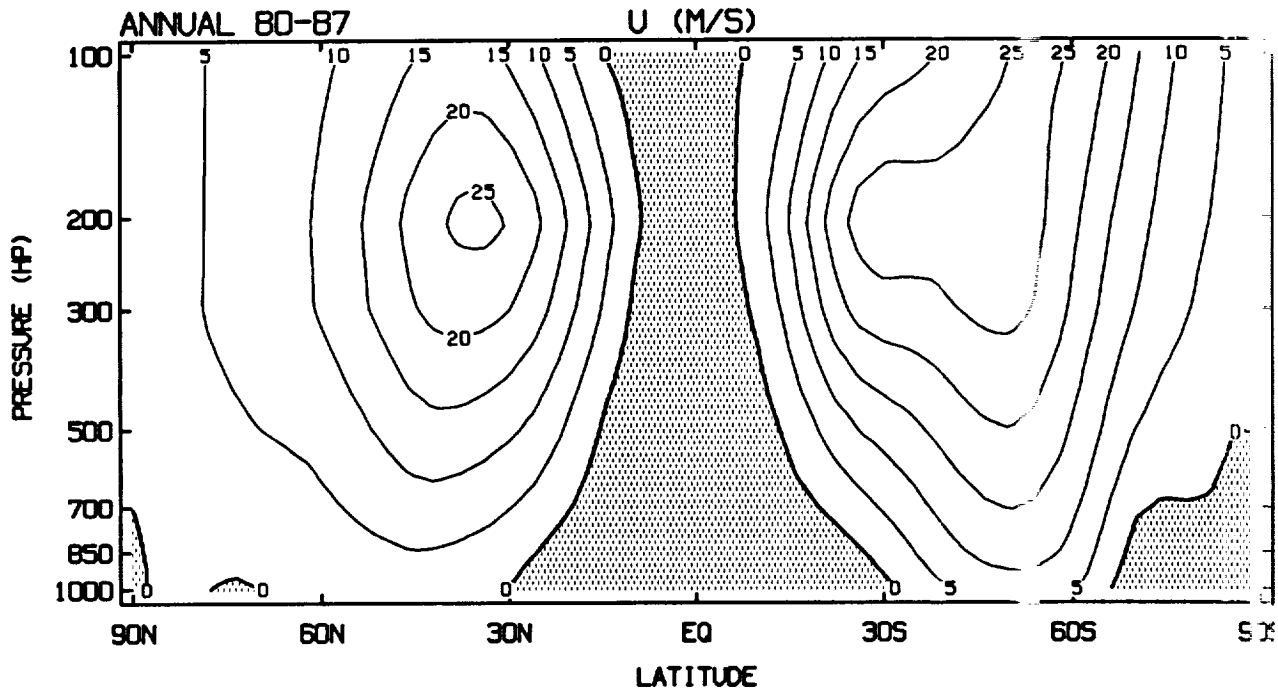

ANNUAL 80-87
STF (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

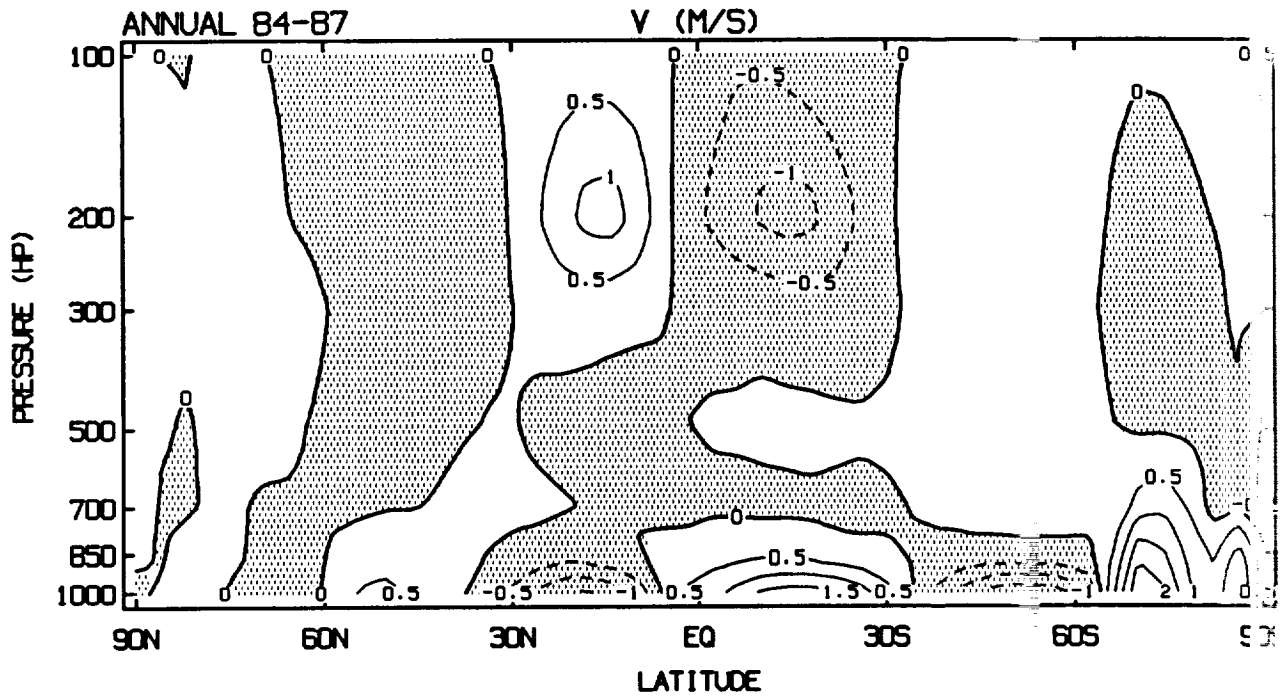

ANNUAL 80-87
STF (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE

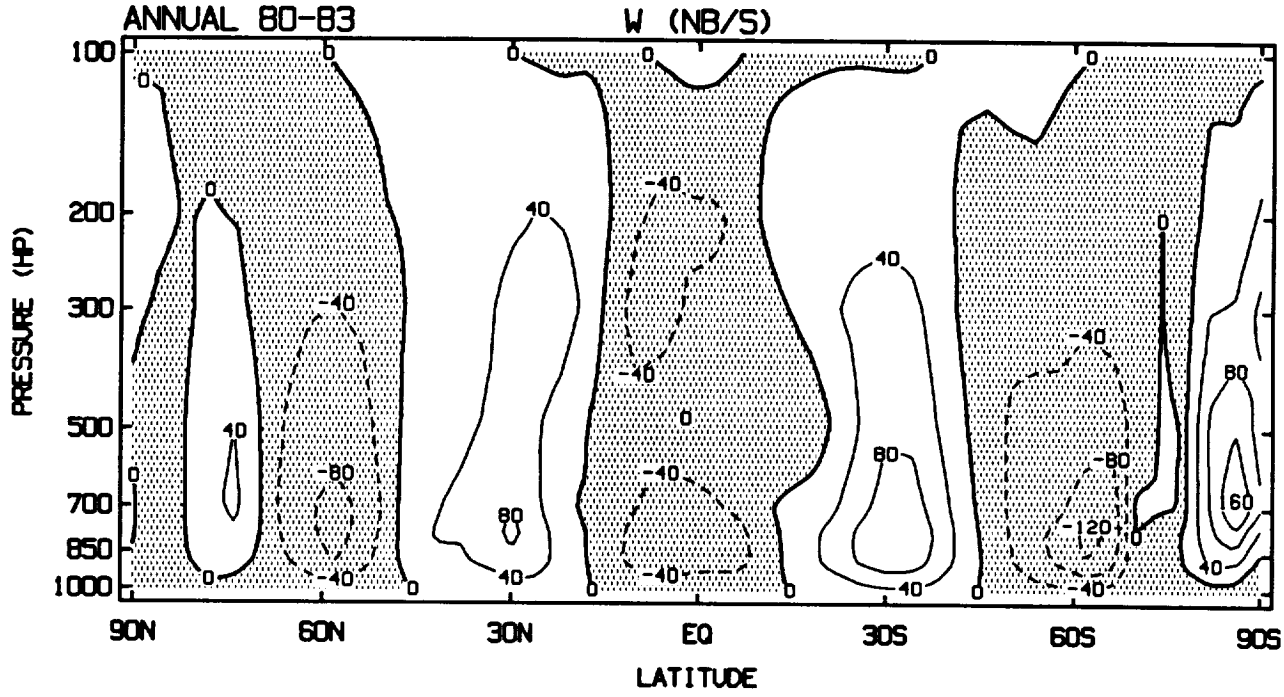

ANNUAL 84-87
VELP (M2/S *E6)
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

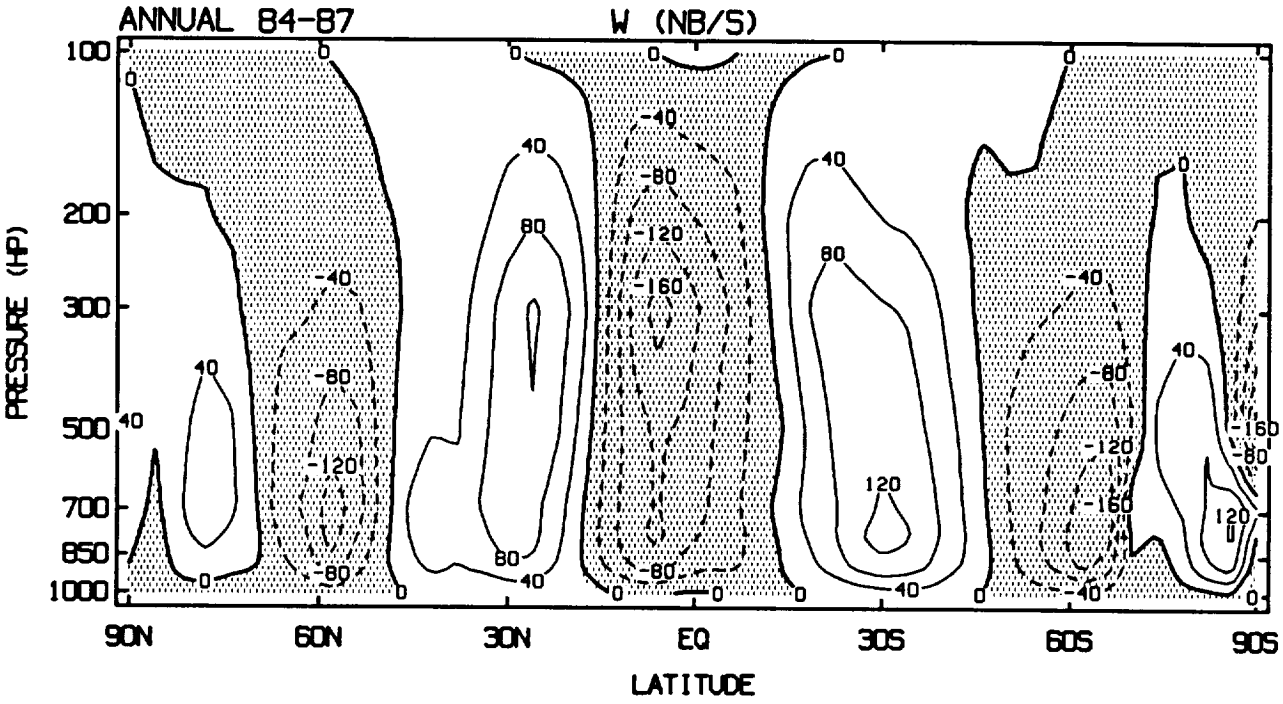

ANNUAL 84-87
VELP (M2/S *E6)
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
0
LONGITUDE

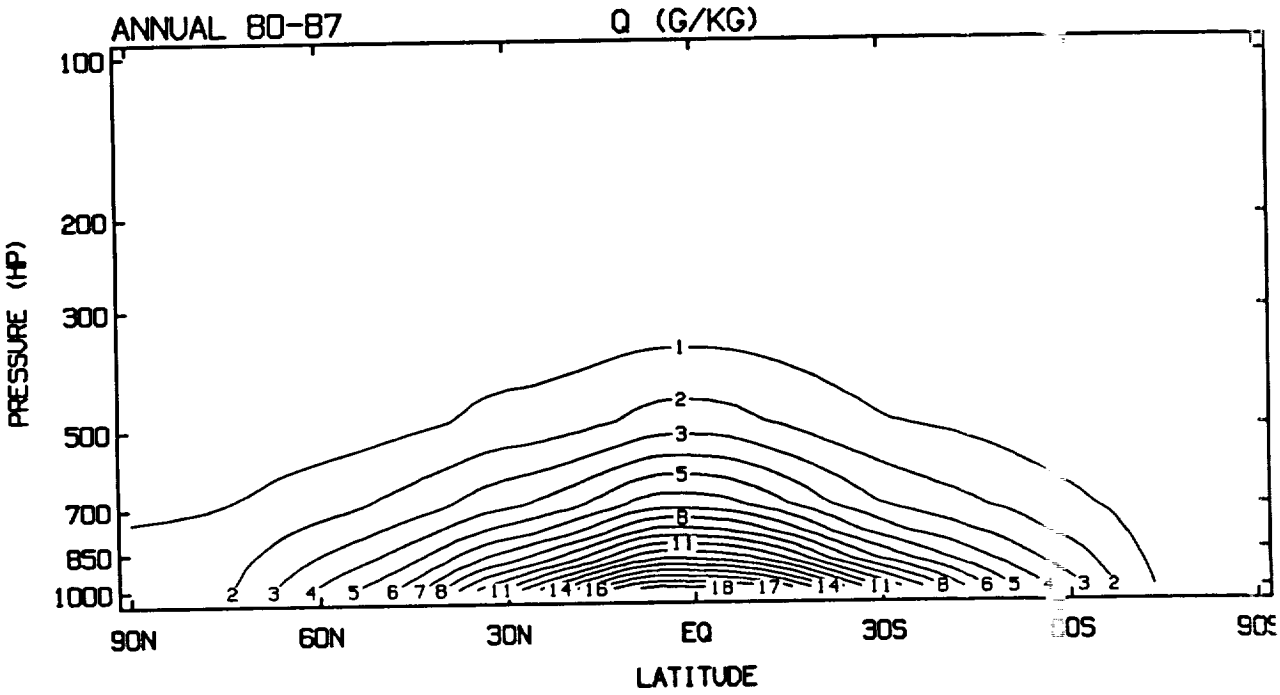

ANNUAL 80-87
SLP (MB)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
0
60E
120E
180
120W
60W
0
LONGITUDE
1016
1008
1020
1012
992
984
1004
980
988

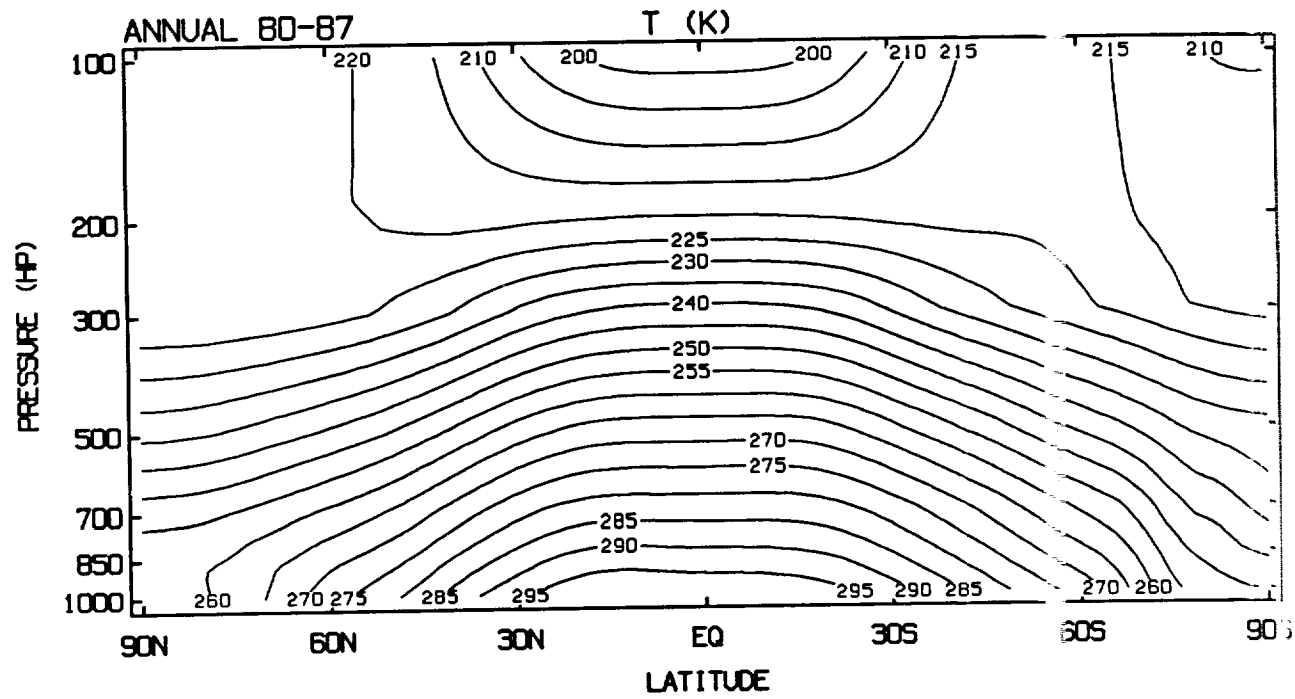

ANNUAL 80-87
U (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


ANNUAL 84-87
V (M/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
LATITUDE


ANNUAL 80-83
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE


ANNUAL 84-87
W (NB/S)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
60S
90S
LATITUDE

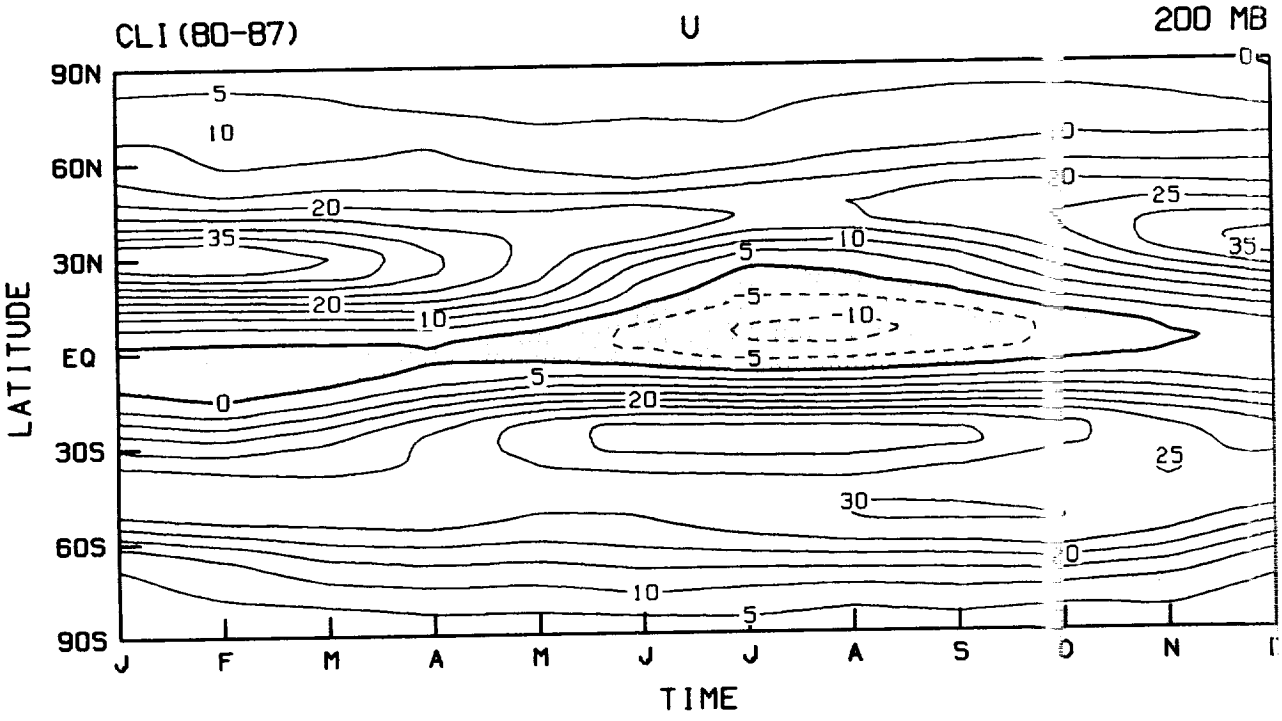

ANNUAL 80-87
Q (G/KG)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
LATITUDE

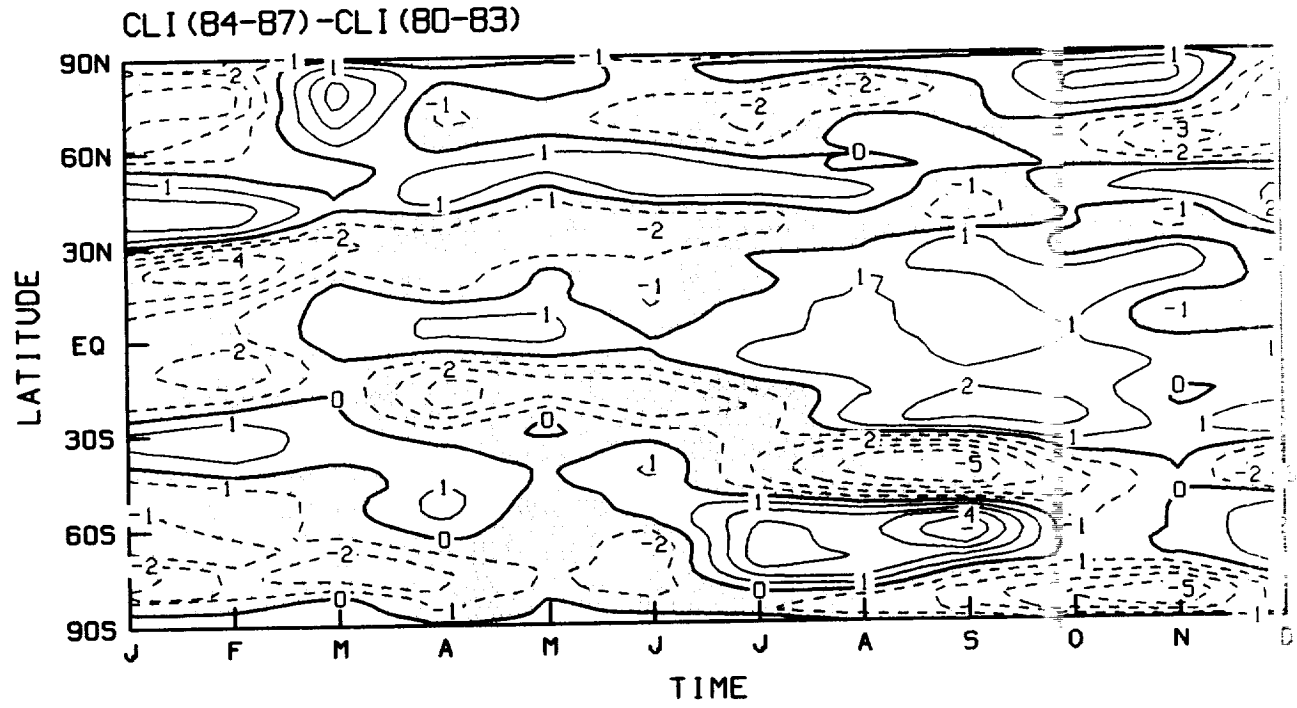

ANNUAL 80-87
T (K)
PRESSURE (HP)
100
200
300
500
700
850
1000
90N
60N
30N
EQ
30S
LATITUDE

SEASONAL CYCLE

PRECEDING PAGE BLANK NOT FILMED

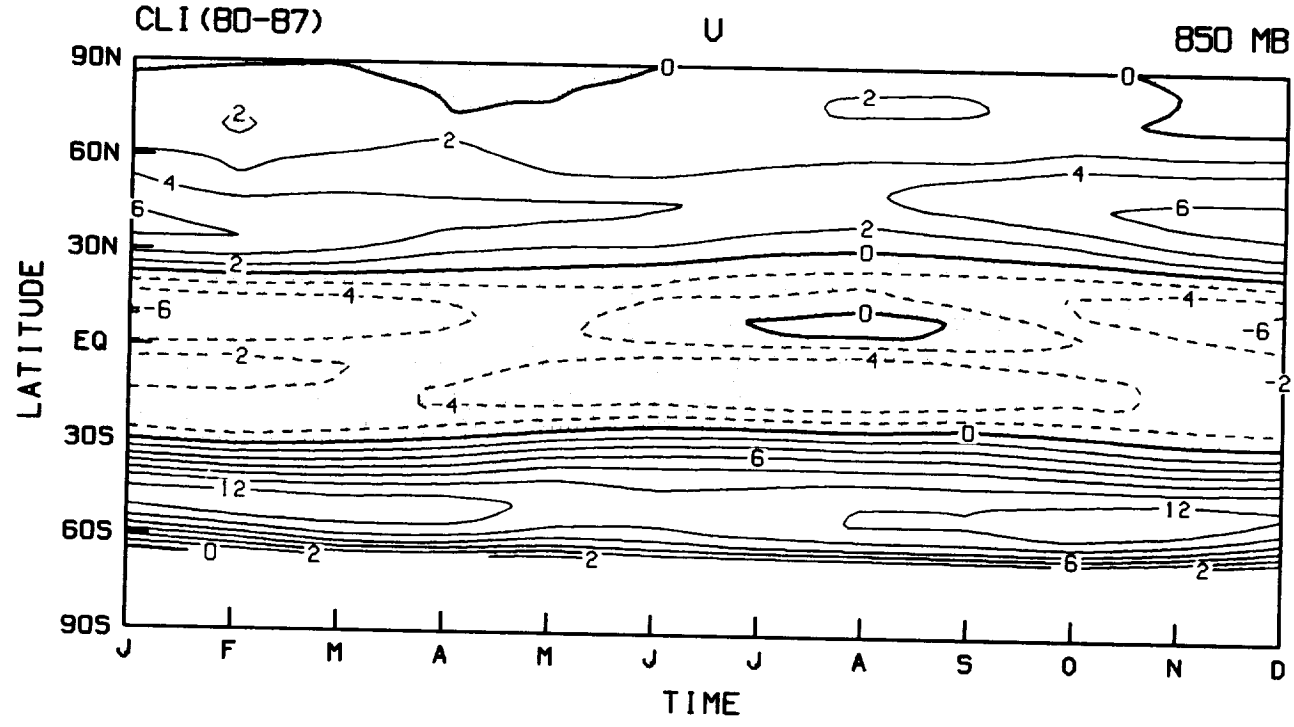
PAGE 238 INTENTIONALLY BLANK

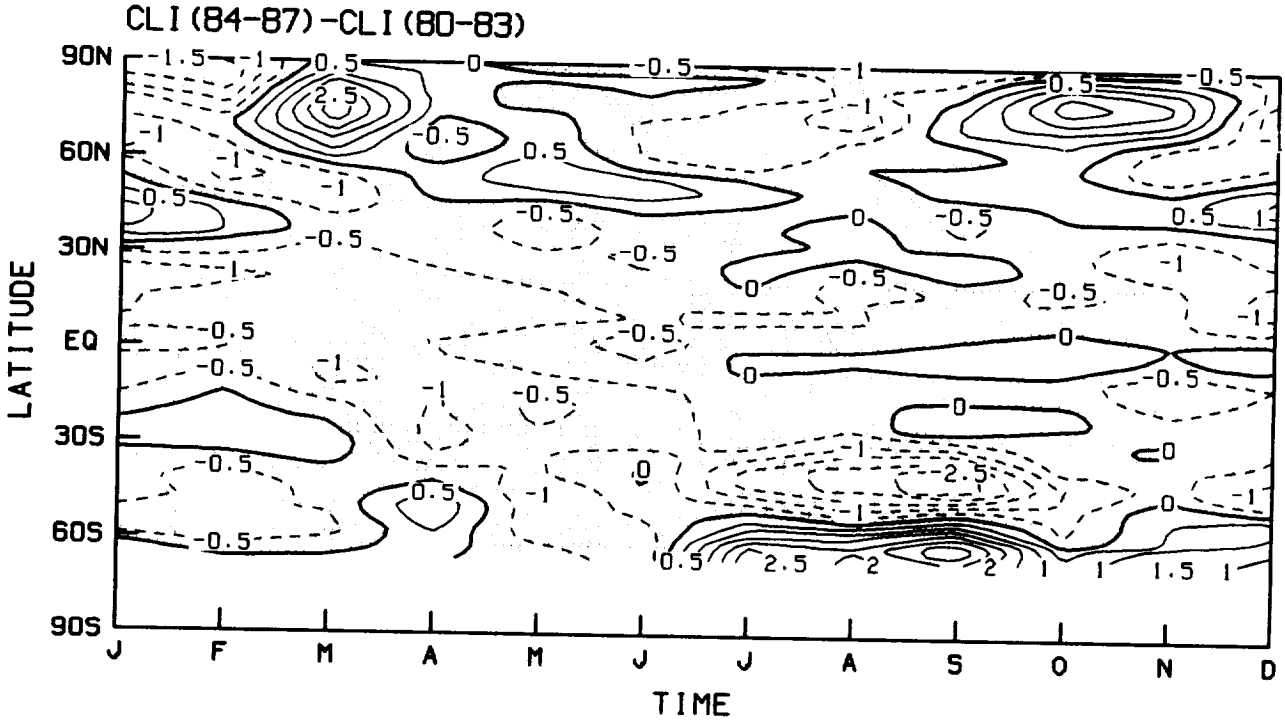


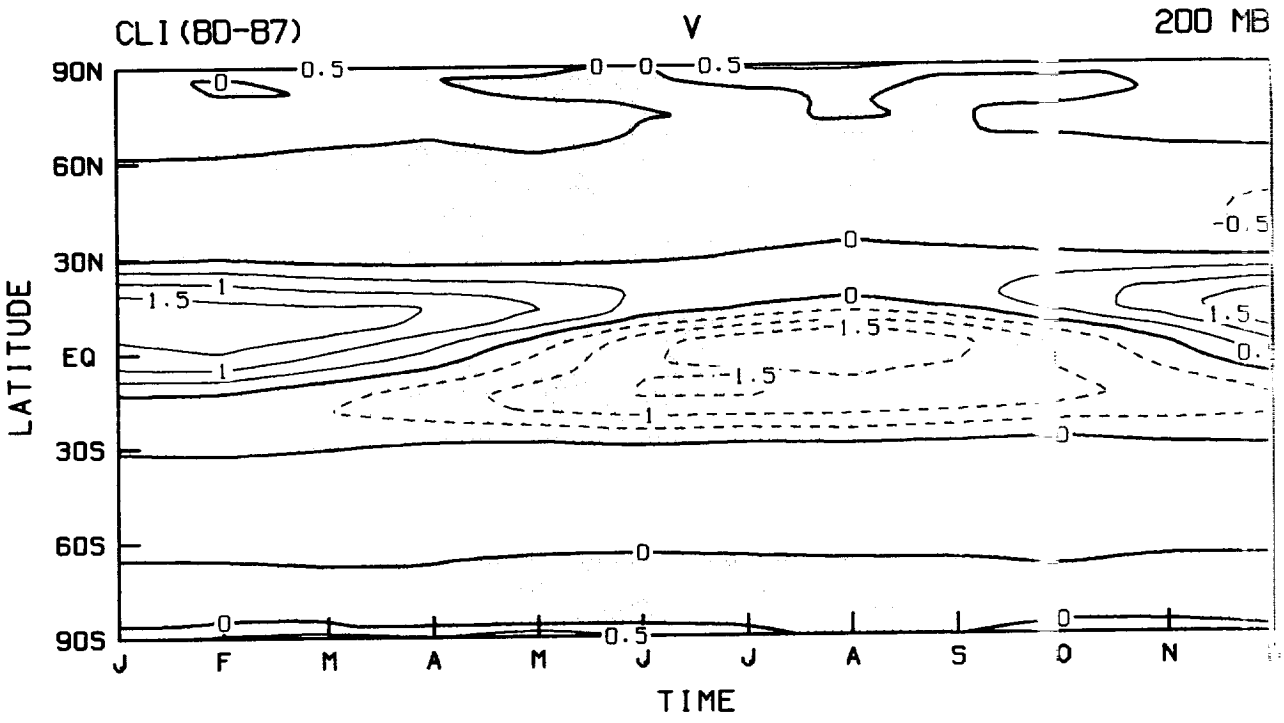


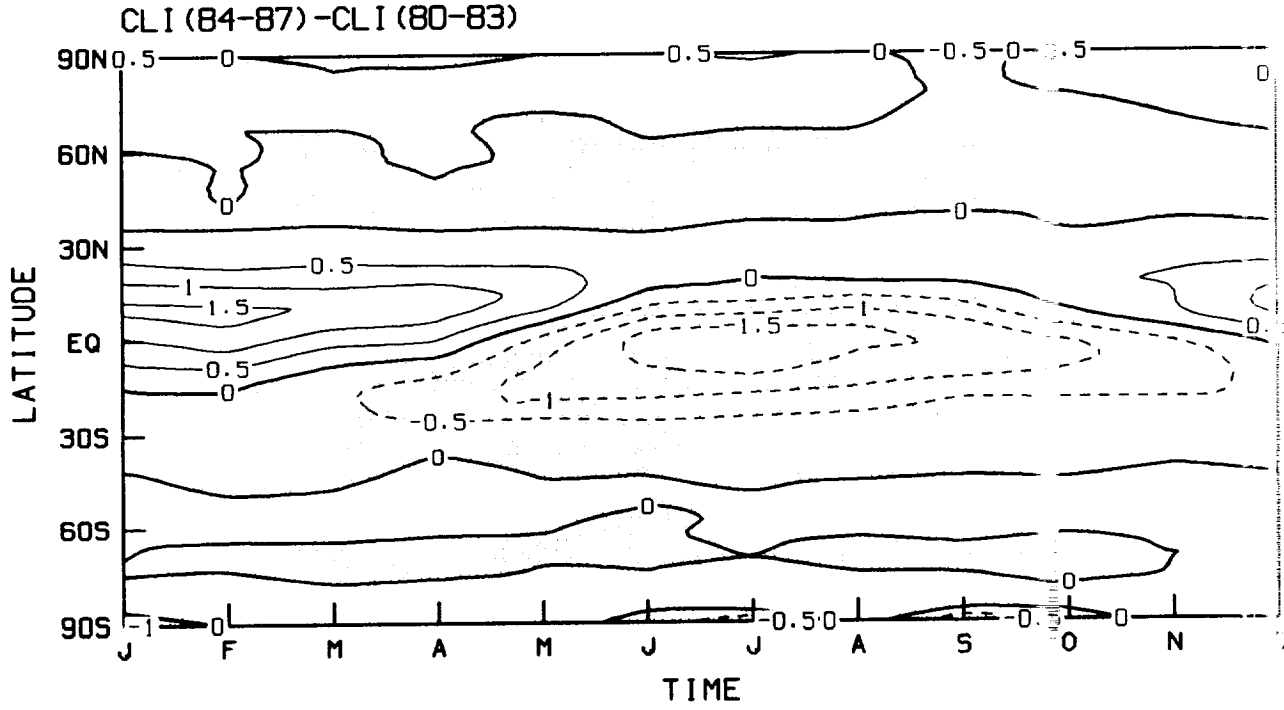
PRECEDING PAGE BLANK NOT FILMED

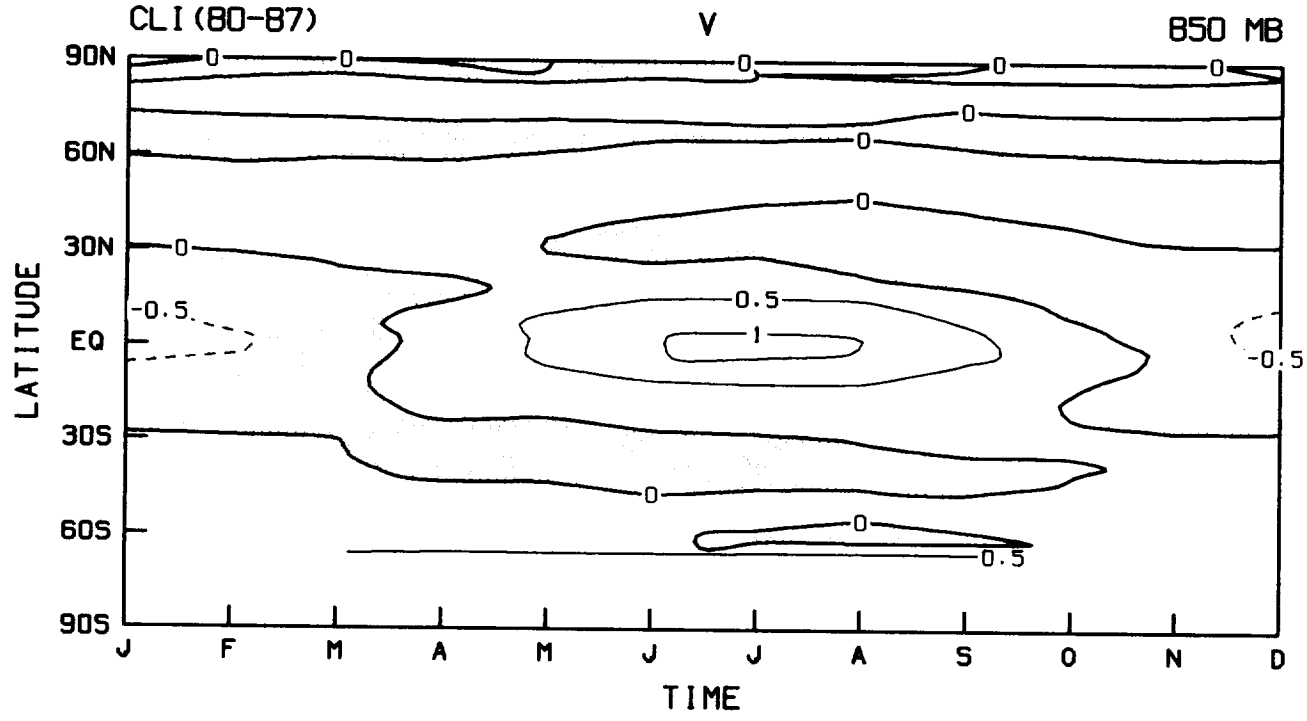
PAGE 240 INTENTIONALLY BL

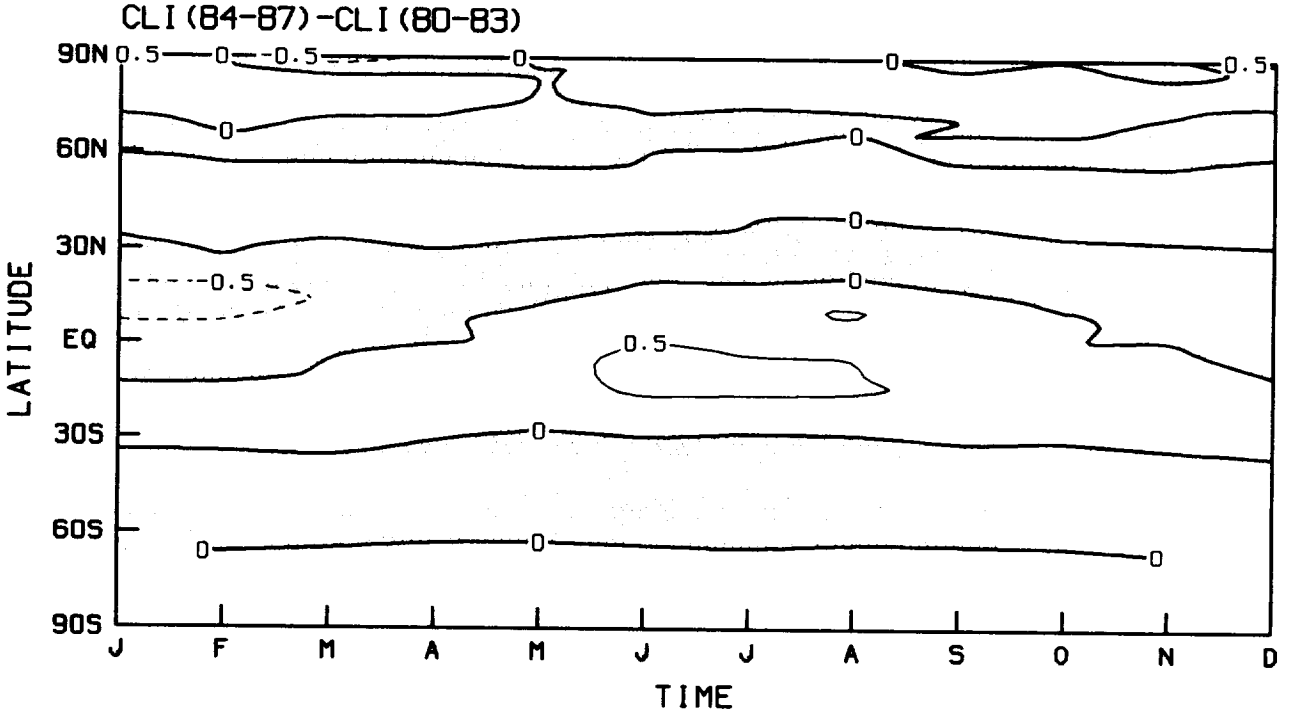

CLI (80-87)
U
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
J F M A M J J A S O N D
TIME

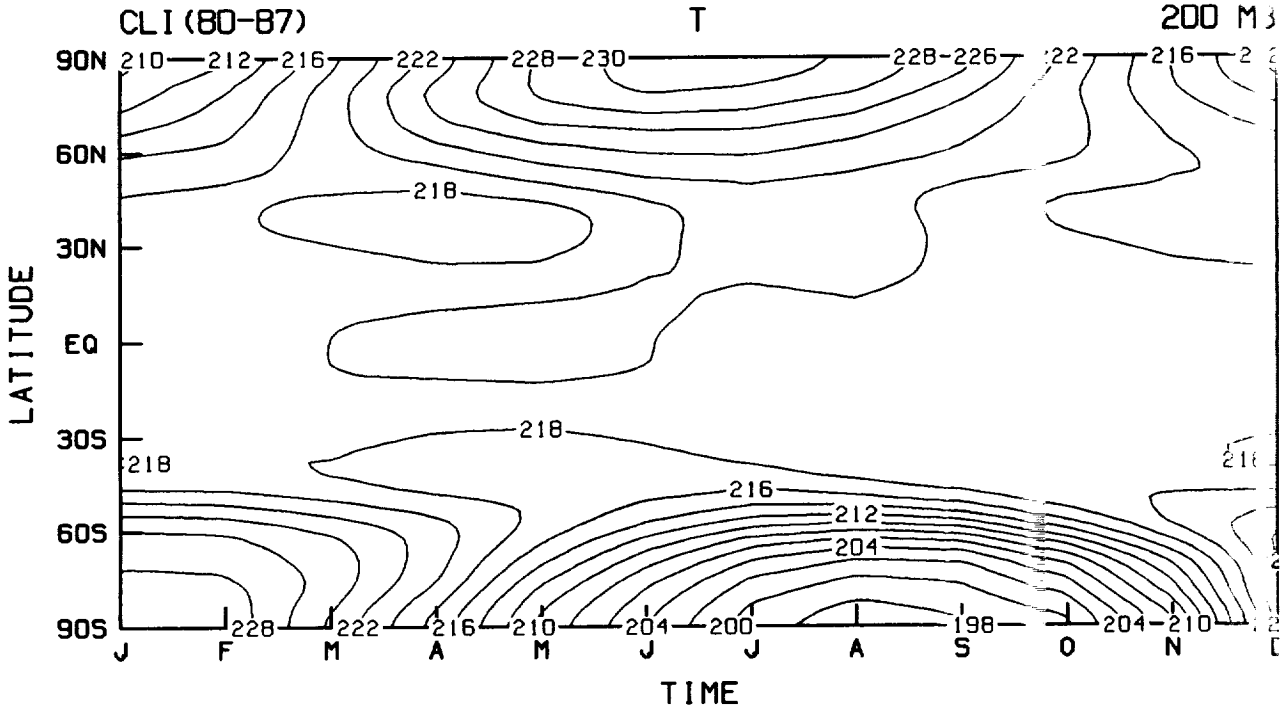

CLI (84-87) -CLI (80-83)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
J F M A M J J A S O N D
TIME

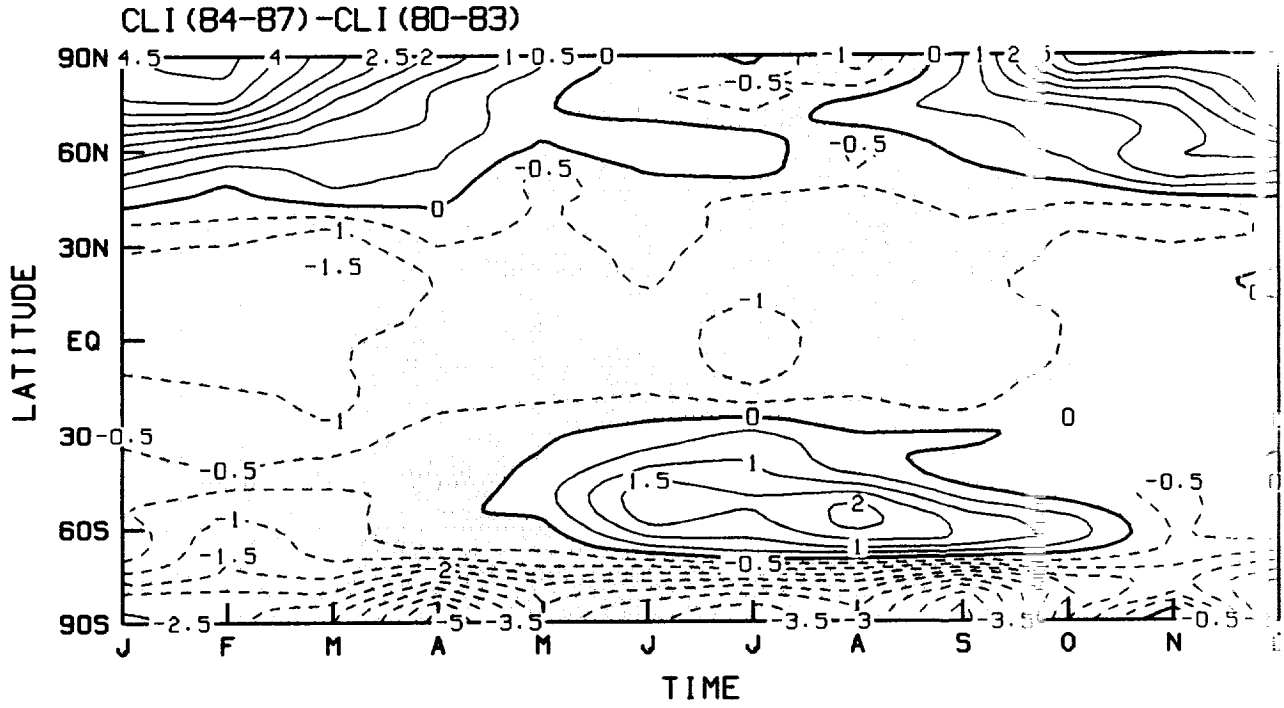

CLI (80-87)
V
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
J F M A M J J A S O N
TIME

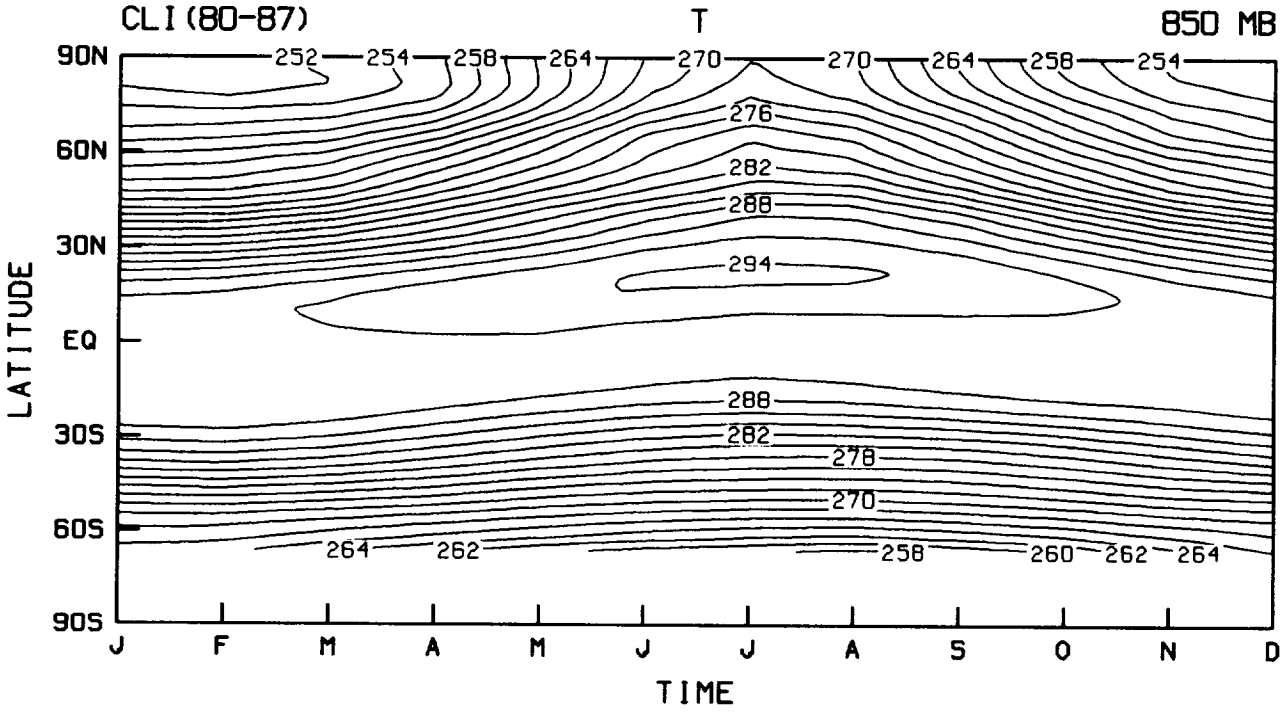

CLI (84-87) -CLI (80-83)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
J F M A M J J A S O N
TIME

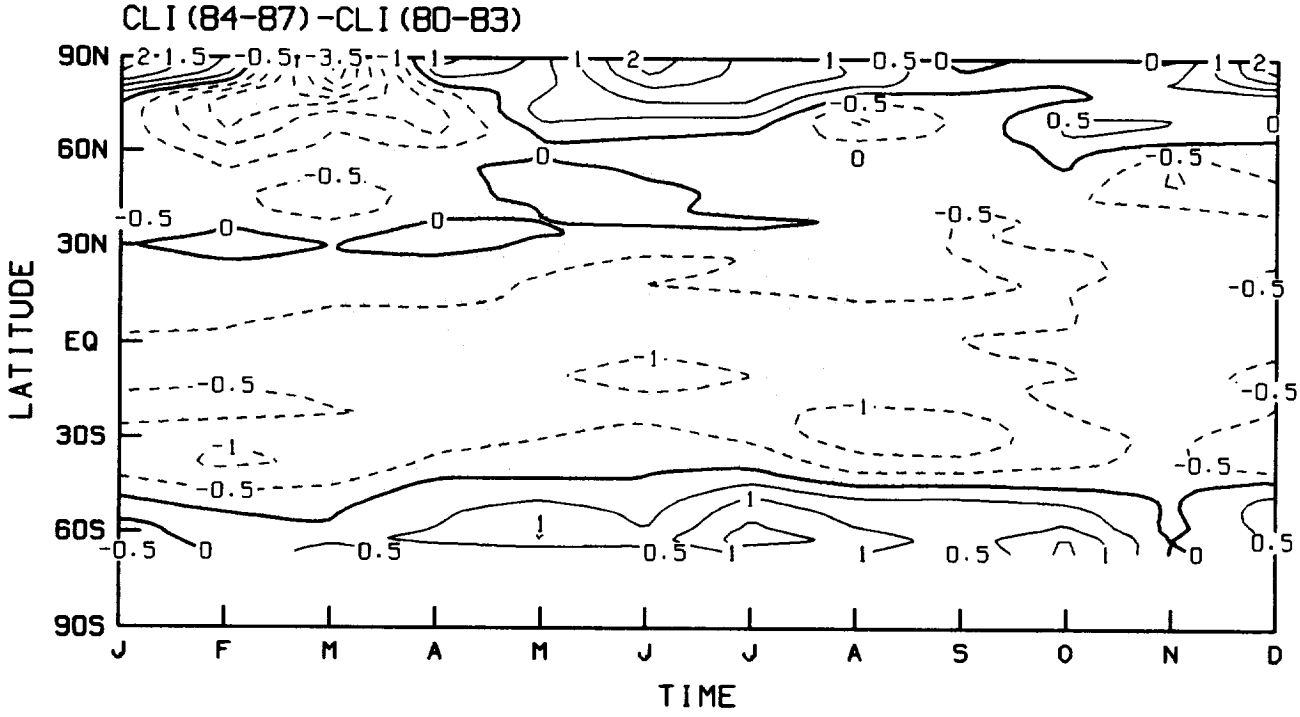

CLI (80-87)
V
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
J F M A M J J A S O N D
TIME
0
0.5
1
-0.5

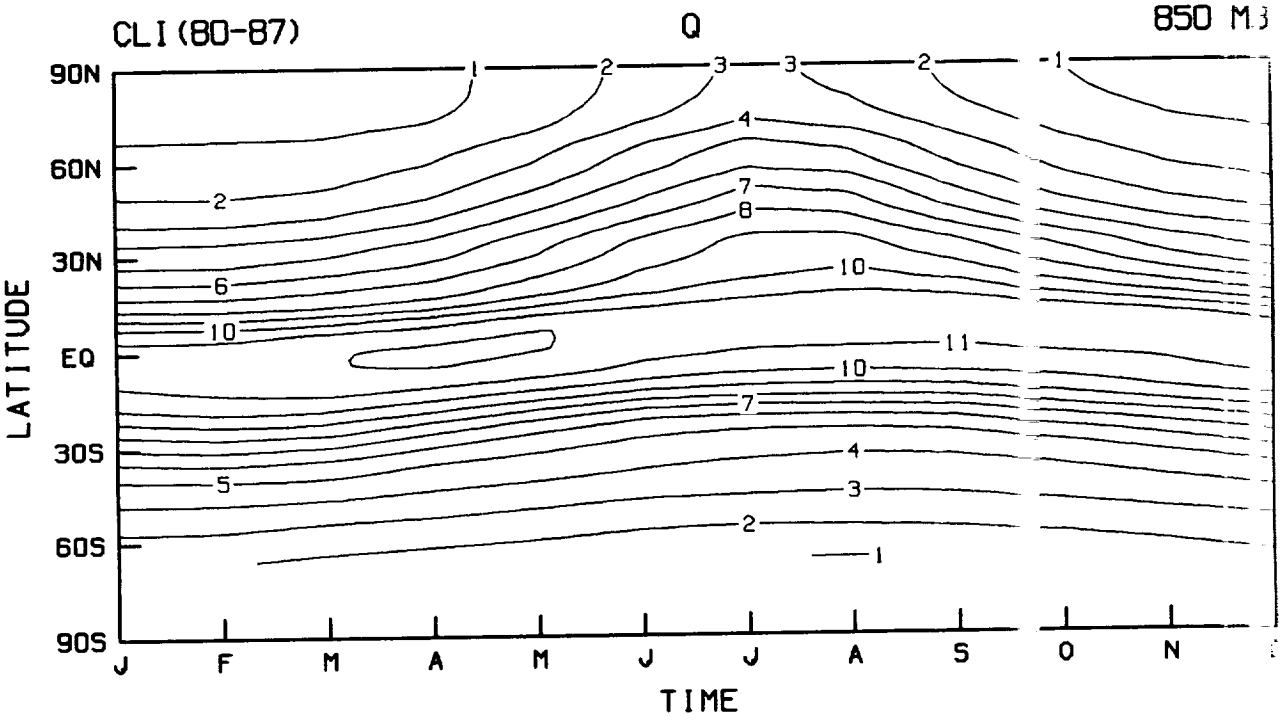

CLI (84-87) -CLI (80-83)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
J F M A M J J A S O N D
TIME
0
0.5
-0.5

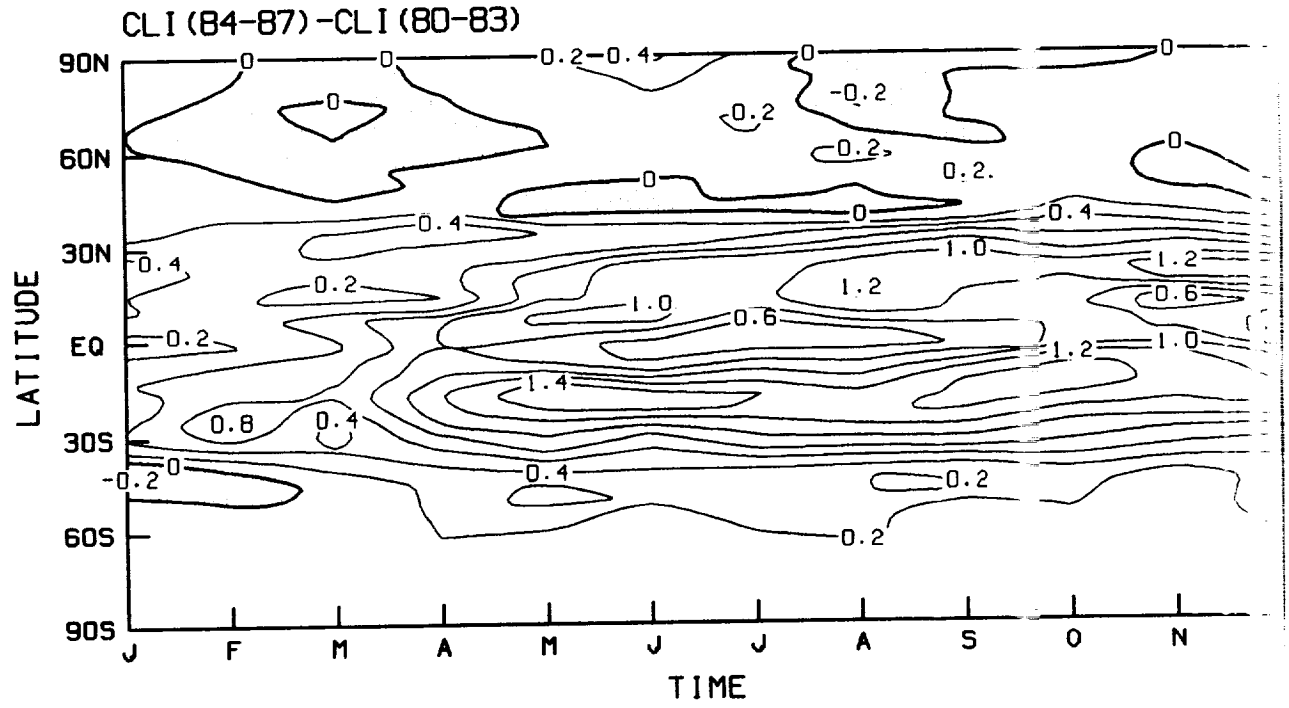

CLI (80-87)
T
200 M
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
210
212
216
222
228
230
226
218
204
200
198
J
F
M
A
M
J
J
A
S
O
N
TIME

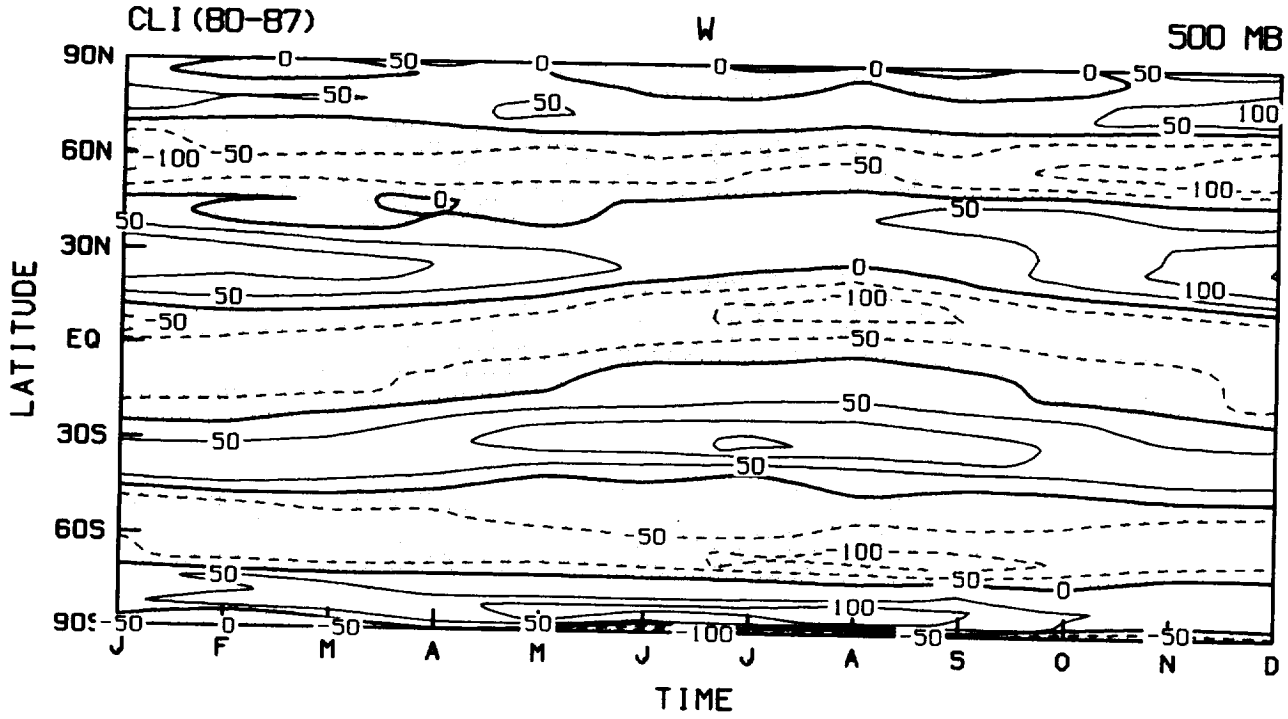

CLI (84-87) -CLI (80-83)
90N
60N
30N
EQ
30
60S
90S
LATITUDE
4.5
4
2.5
2
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
J
F
M
A
M
J
J
A
S
O
N
TIME

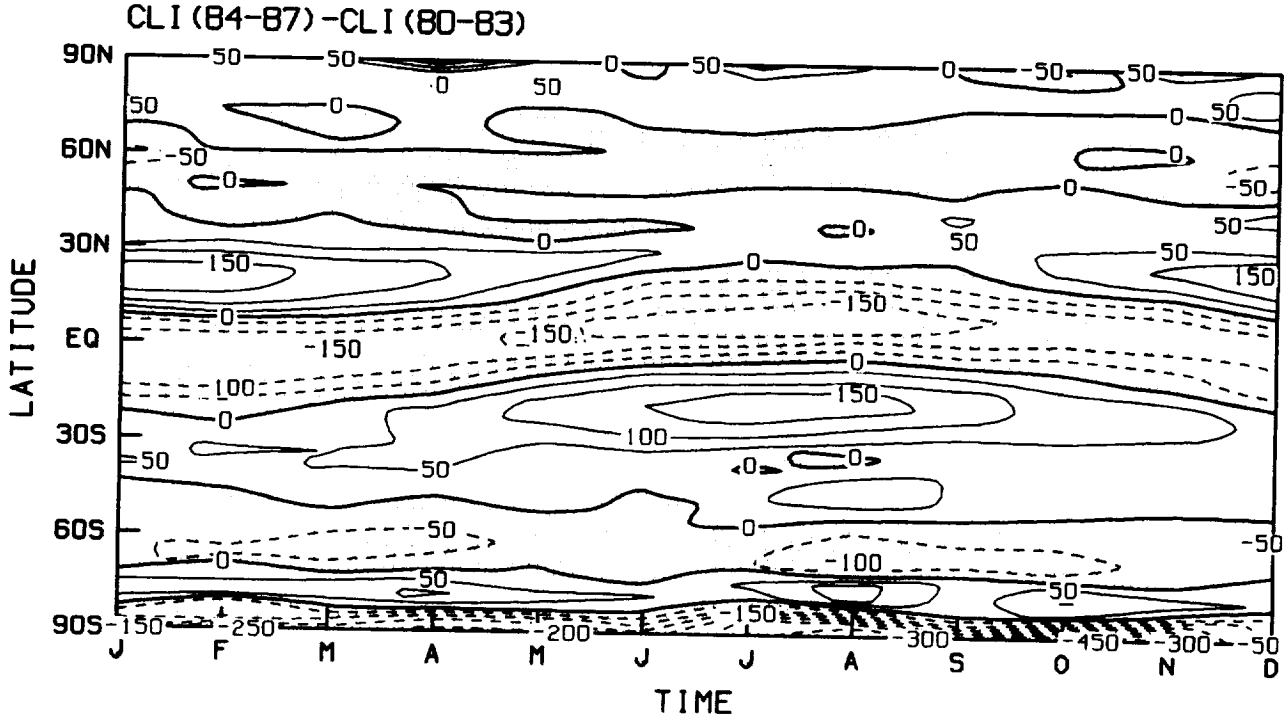

CLI (80-87)
T
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
252
254
258
264
270
270
264
258
254
276
282
288
294
288
282
278
270
264
262
258
260
262
264
J
F
M
A
M
J
J
A
S
O
N
D
TIME


CLI (84-87) -CLI (80-83)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
2
1.5
-0.5
-3.5
-1
1
1
2
1
0.5
0
0
1
2
-0.5
0.5
0
0
-0.5
-0.5
0
-0.5
0
0
-0.5
-0.5
-0.5
-1
-0.5
-0.5
-1
-1
-0.5
-0.5
-0.5
-0.5
1
1
-0.5
0
0.5
0.5
1
1
0.5
1
0
0.5
J
F
M
A
M
J
J
A
S
O
N
D
TIME

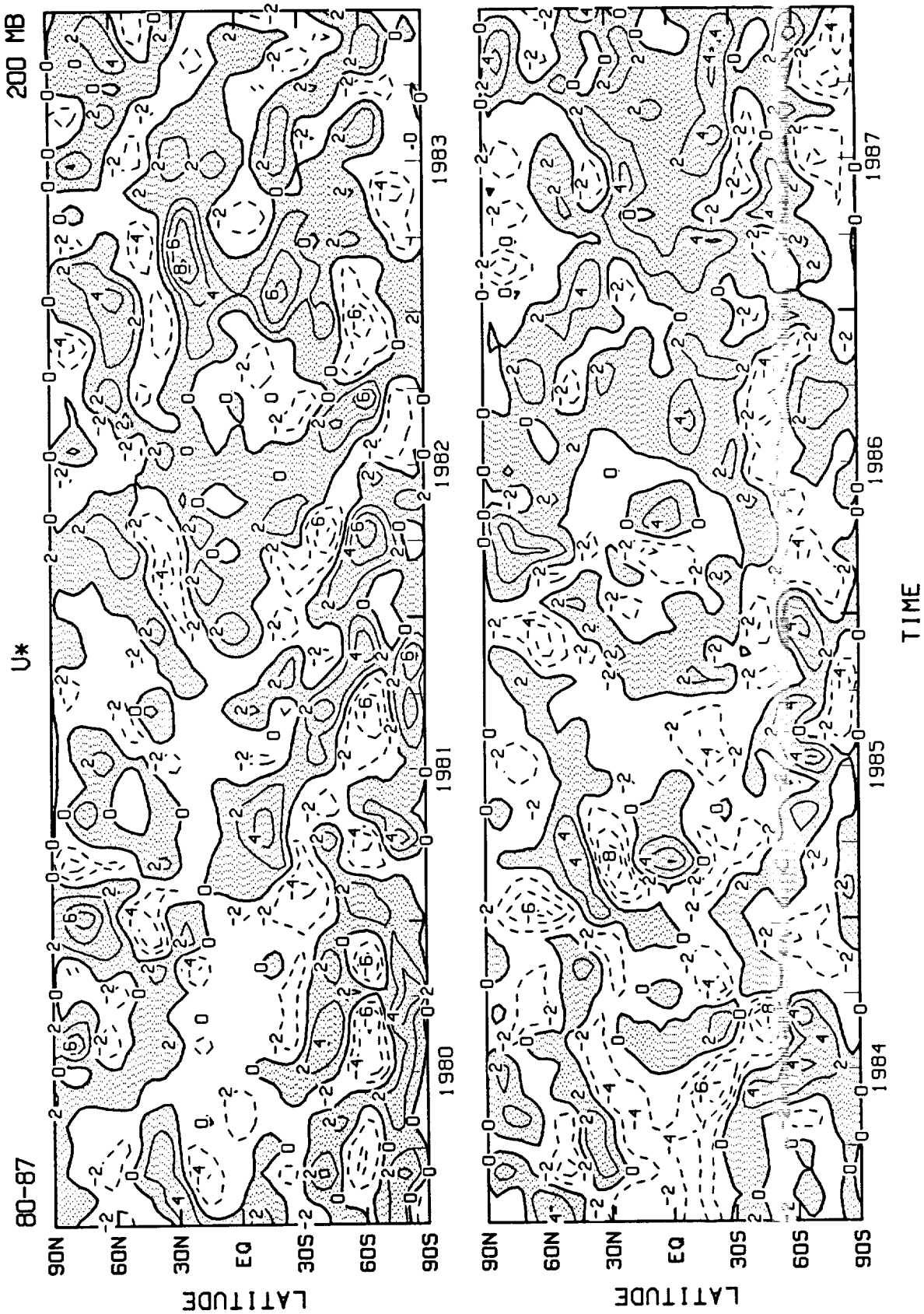

CLI (80-87)
Q
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
J F M A M J J A S O N
TIME


CLI (84-87) -CLI (80-83)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
J F M A M J J A S O N
TIME


CLI (80-87)
W
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
J F M A M J J A S O N D
TIME

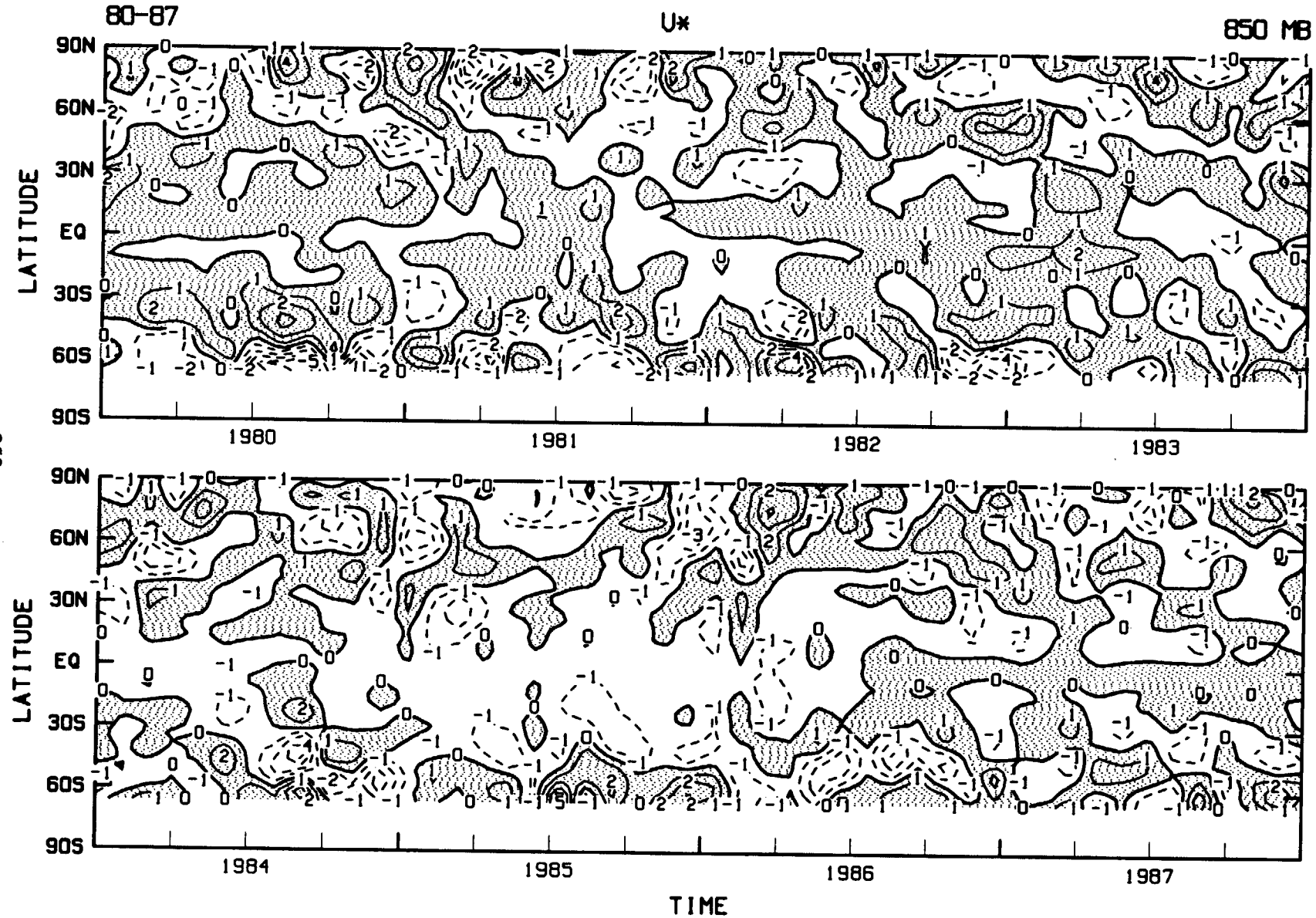

CLI (84-87) -CLI (80-83)
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
J F M A M J J A S O N D
TIME

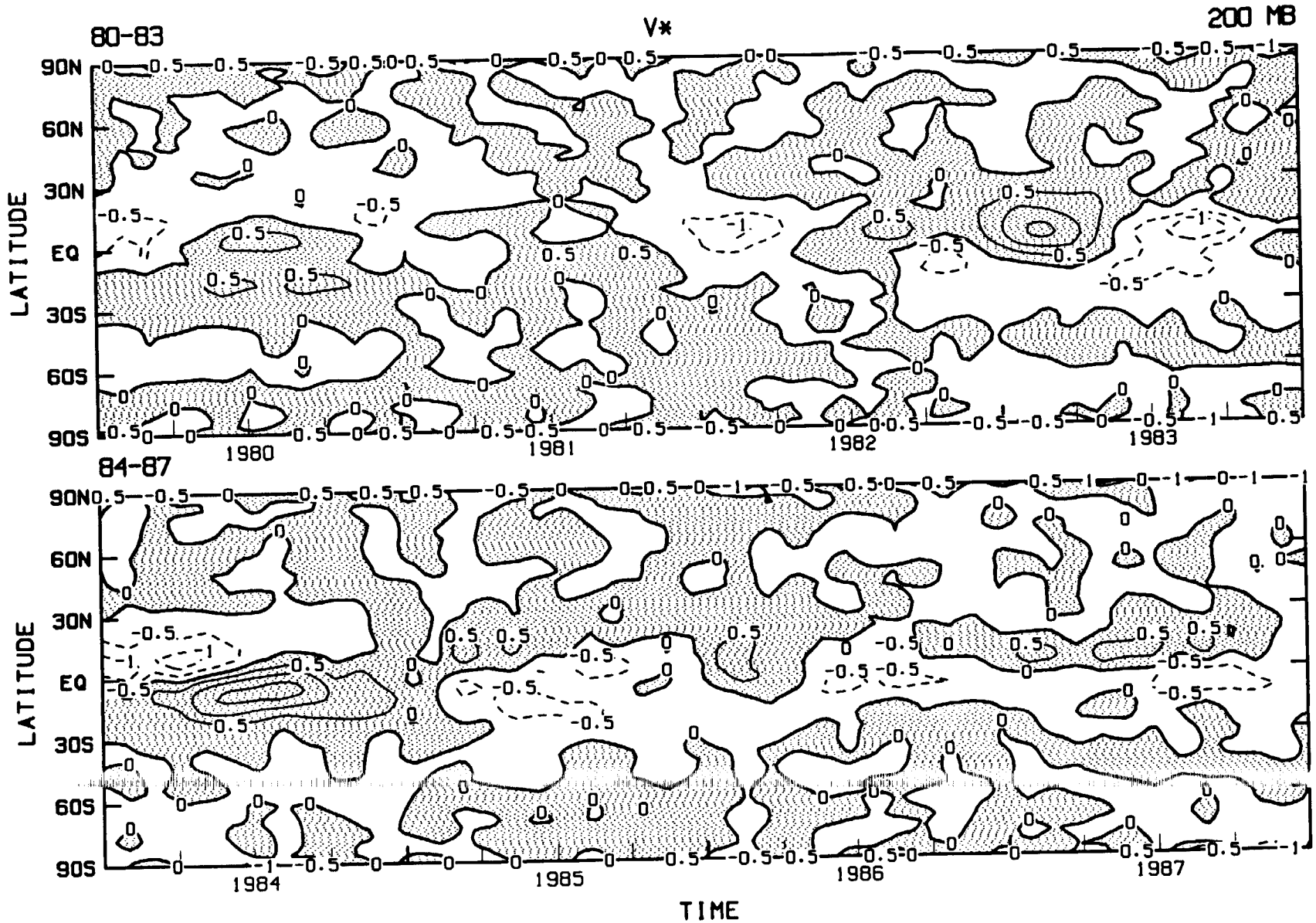
ANOMALIES

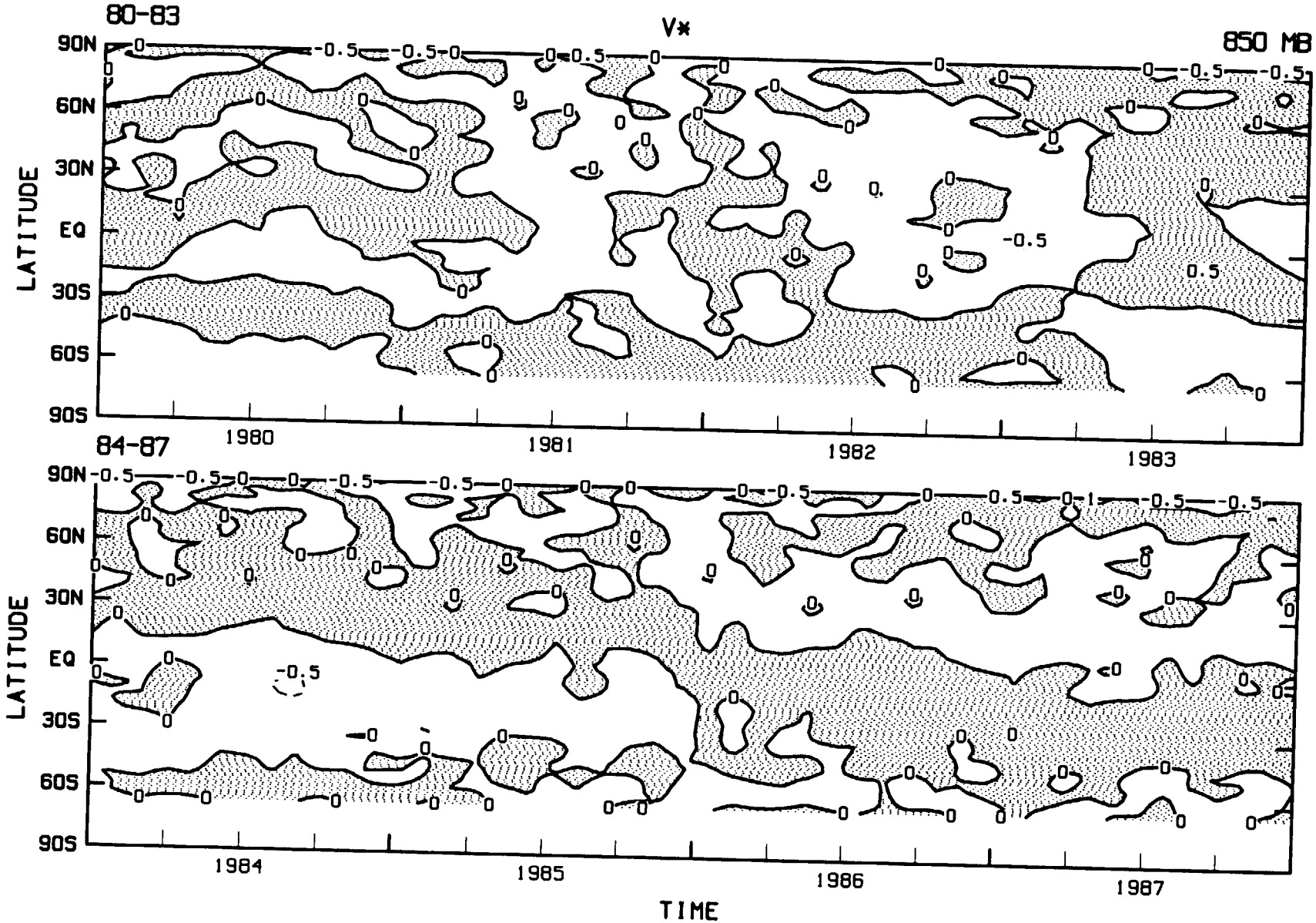


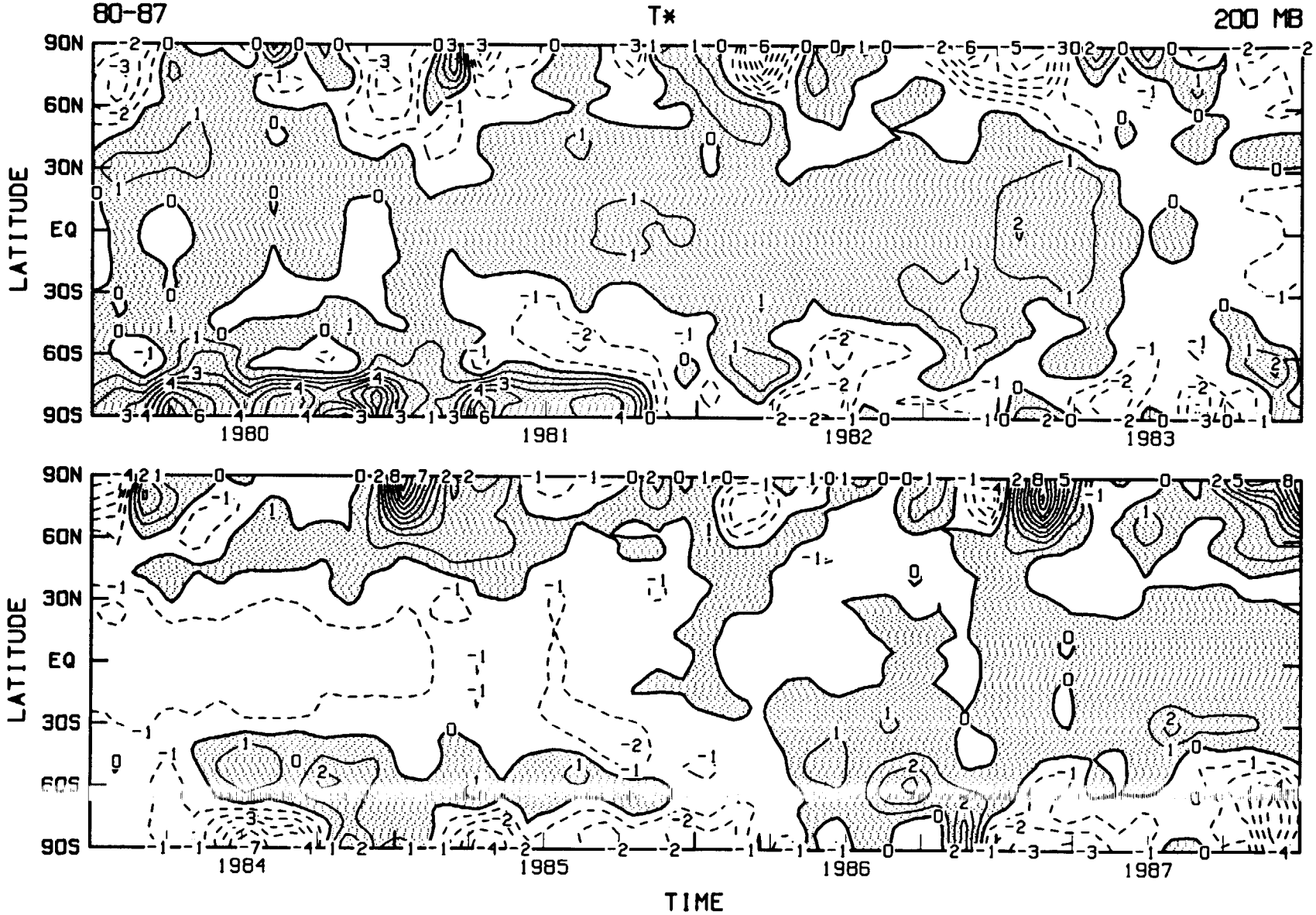
PRECEDING PAGE BLANK NOT FILMED

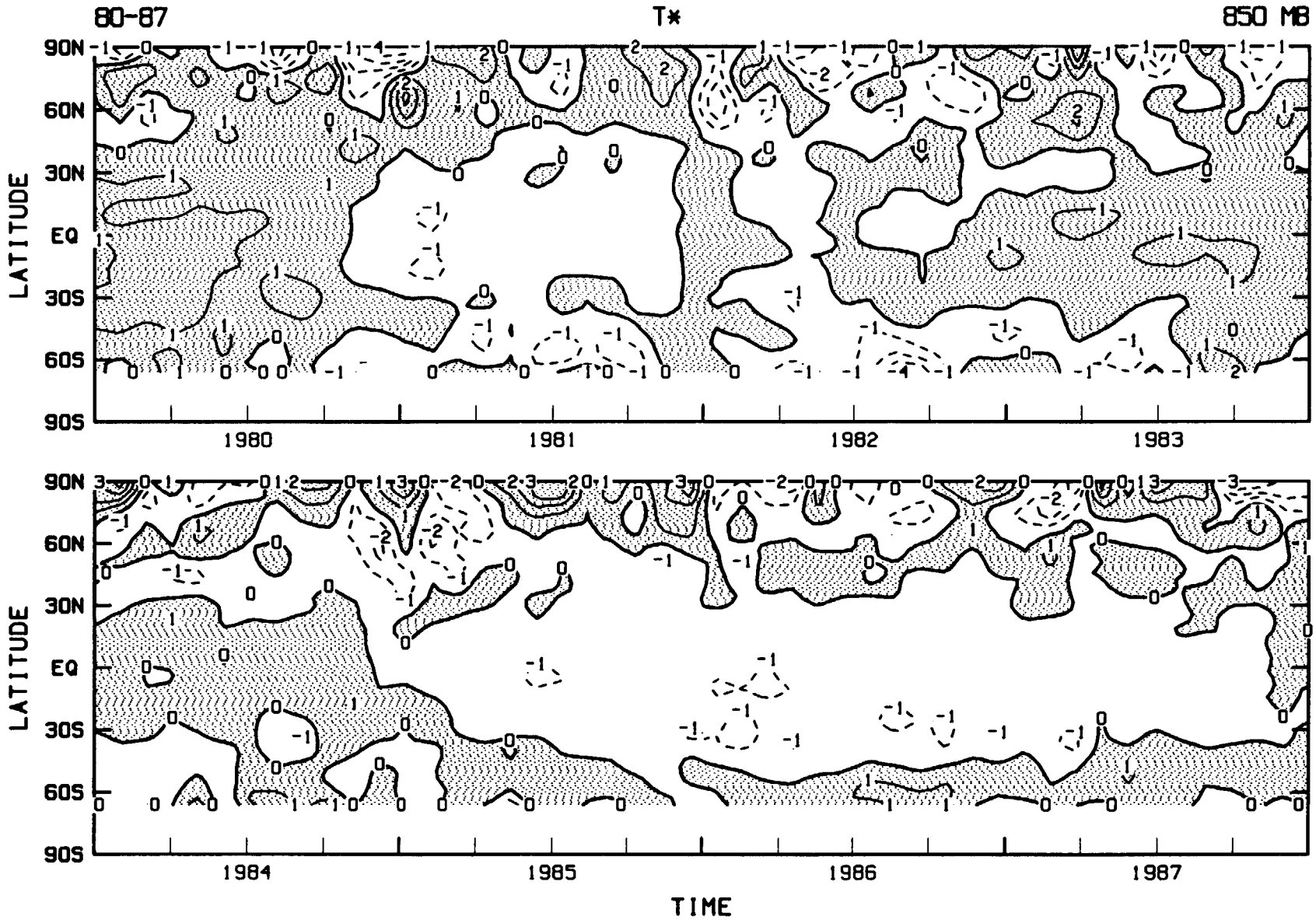
PAGE 250 INTENTIONALLY BL

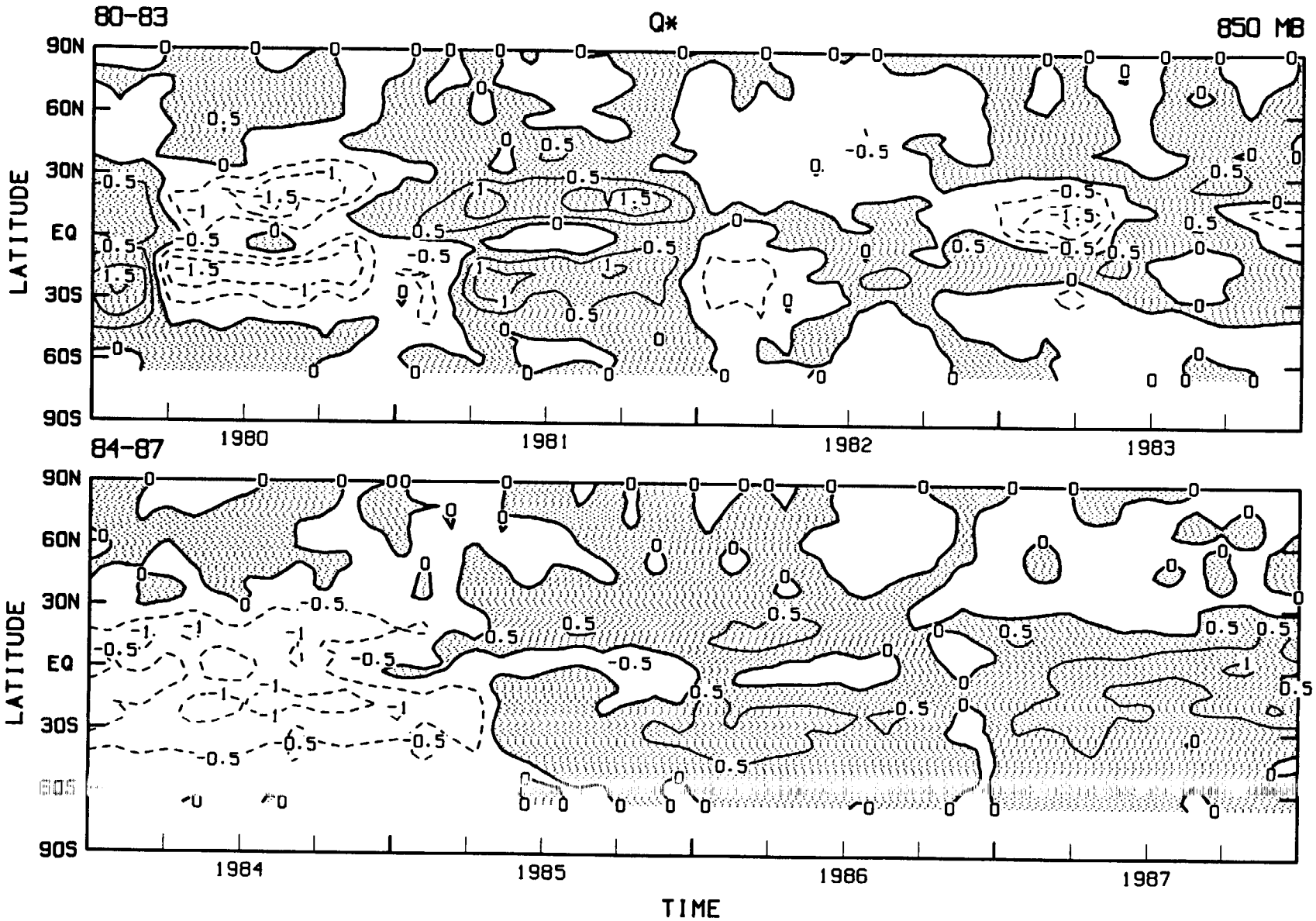

80-87
U*
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
1980
1981
1982
1983
1984
1985
1986
1987
TIME

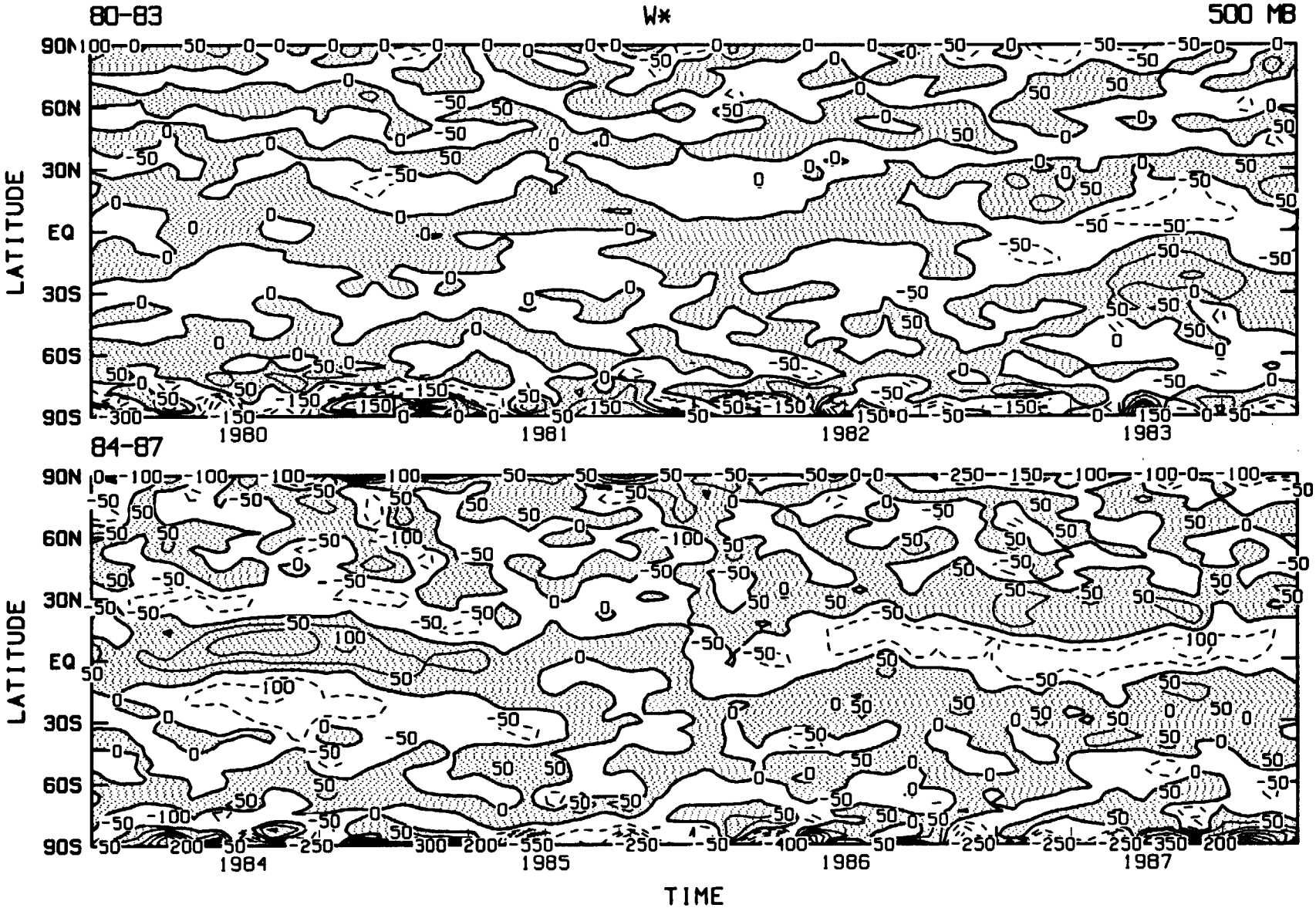

V*
200 MB
80-83
84-87
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
1980
1981
1982
1983
1984
1985
1986
1987
TIME


80-83
V*
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
1980
1981
1982
1983
84-87
1984
1985
1986
1987
TIME


80-87
T*
200 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
1980
1981
1982
1983
1984
1985
1986
1987
TIME


80-87
T*
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
1980
1981
1982
1983
1984
1985
1986
1987
TIME


80-83
Q*
850 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
1980
1981
1982
1983
84-87
1984
1985
1986
1987
TIME


80-83
W*
500 MB
90N
60N
30N
EQ
30S
60S
90S
LATITUDE
1980
1981
1982
1983
84-87
1984
1985
1986
1987
TIME

NASA
National Aeronautics and Space Administration

Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA TM-100747		

4. Title and Subtitle	5. Report Date
An Atlas of ECMWF Analyses (1980-87) Part I - First Moment Quantities	August 1989
	6. Performing Organization Code: 611
7. Author(s): S. Schubert, C.-K. Park, W. Higgins, S. Moorthi, and M. Suarez	8. Performing Organization Report No.: 89B00054
	10. Work Unit No.
9. Performing Organization Name and Address: Goddard Space Flight Center, Greenbelt, Maryland 20771	11. Contract or Grant No.: NAS5-30506
12. Sponsoring Agency Name and Address: National Aeronautics and Space Administration, Washington, D. C. 20546-0001	13. Type of Report and Period Covered: Technical Memorandum 1980-87
	14. Sponsoring Agency Code

15. Supplementary Notes

S. Schubert: Goddard Space Flight Center, Greenbelt, Maryland.
C-K. Park: Centel Federal Services Corporation, Reston, Virginia.
W. Higgins: National Academy of Sciences, National Research Council, Washington
S. Moorthi: University Space Research Association, Columbia, Maryland.
M. Suarez: Goddard Space Flight Center, Greenbelt, Maryland.

16. Abstract

This document is an atlas of European Center for Medium Range Weather Forecasts (ECMWF) initialized analyses for 1980-87. Various first moment quantities are presented for monthly, seasonal, and annual averages on a global cylindrical projection, as well as cross section maps of zonal averages. Global maps of winds, temperature, stream function, and velocity potential are presented at 850 and 200 mb. In addition, we include global maps of the 300-mb height field (total and eddy), the 500-mb vertical velocity, the 850-mb moisture field and sea level pressure. The average seasonal cycle and anomalies during the 8-year period are presented for selected quantities.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
ECMWF, analyses, atlas	Unclassified - Unlimited Subject Category 47

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of pages	22. Price
Unclassified	Unclassified	273	

NASA FORM 1626 OCT 86