

21.6	15.2	7.4	8.8	352.9	76.4	302.9	-28.4	14.3	4.6	7.5	58.0	111.9	349.9	2
40.0	8.4	10.2	3.7	157.0	234.0	292.9	-28.0	26.9	11.8	5.3	178.0	139.0	34.0	2
21.9	0	25.6	0	312.9	0	0	11.5	0	0	194.0	0	1		
17.4	24.5	25.4	4.0	130.0	217.9	110.1	-6.6	4.4	8.1	0.8	204.6	143.6	345.5	2
26.5	14.7	8.9	4.5	187.9	177.2	53.6	8.2	9.3	11.7	2.0	204.0	106.1	91.9	2
11.4	0	2.5	0	287.4	0	10.3	0	10.3	0	306.2	0	1		
-26.3	0	15.6	0	85.0	0	-25.8	0	8.7	0	146.0	0	1		
17.0	50.0	28.2	2.0	13.0	231.0	146.0	-34.7	7.7	14.4	5.4	250.0	97.0	77.0	2
-4.6	0	11.2	0	21.0	0	-6.1	0	9.1	0	516.9	0	1		
-2.6	3.9	3.6	1.7	335.9	276.6	287.9	-12.5	5.6	7.4	5.0	240.0	121.8	10.0	2
-4.5	8.2	3.0	9.6	273.9	322.4	10.0	-5.5	6.3	14.5	13.5	320.9	82.1	351.9	2
-94.4	0	106.1	0	0	152.0	0	-45.3	0	23.8	0	238.0	0	1	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-10.6	14.9	42.2	1.9	288.9	260.0	214.0	-31.7	14.3	20.0	2.6	260.0	226.0	138.0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-30.3	0	55.3	0	17.0	0	7.3	0	43.8	0	0	315.7	0	1	
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34.4	0	34.5	0	0	130.7	0	0	0	25.6	0	38.6	0	1	
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7.7	59.5	30.3	5.5	173.0	188.0	145.0	-23.1	31.0	12.8	10.3	174.0	134.0	28.0	2
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13.4	9.5	38.1	16.7	312.9	73.8	16.0	26.7	21.9	22.3	19.8	185.0	171.6	35.0	2
50.1	0	13.0	0	0	79.3	0	-1.8	0	16.5	0	16.1	0	1	
22.2	0	10.9	0	0	42.0	0	16.2	0	19.6	0	11.0	0	1	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-19.4	13.7	36.2	9.1	153.0	153.0	20.0	-36.3	30.9	27.6	12.4	206.0	90.0	321.9	2
-8.1	0	11.4	0	0	1.0	0	-11.2	0	45.6	0	266.0	0	1	
-19.1	34.2	39.4	25.5	164.0	77.6	329.9	-25.4	19.7	39.0	29.0	229.0	194.6	26.0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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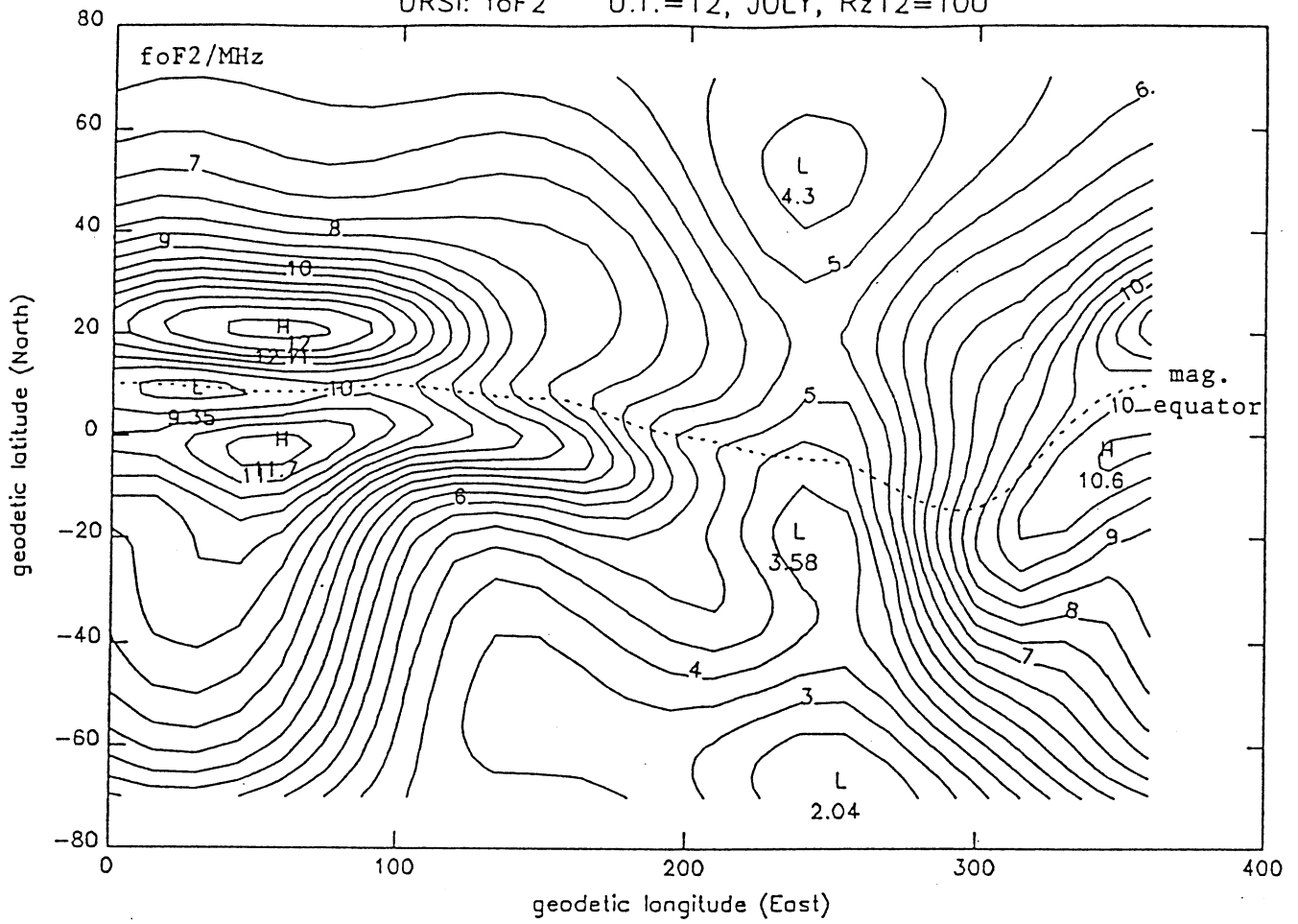
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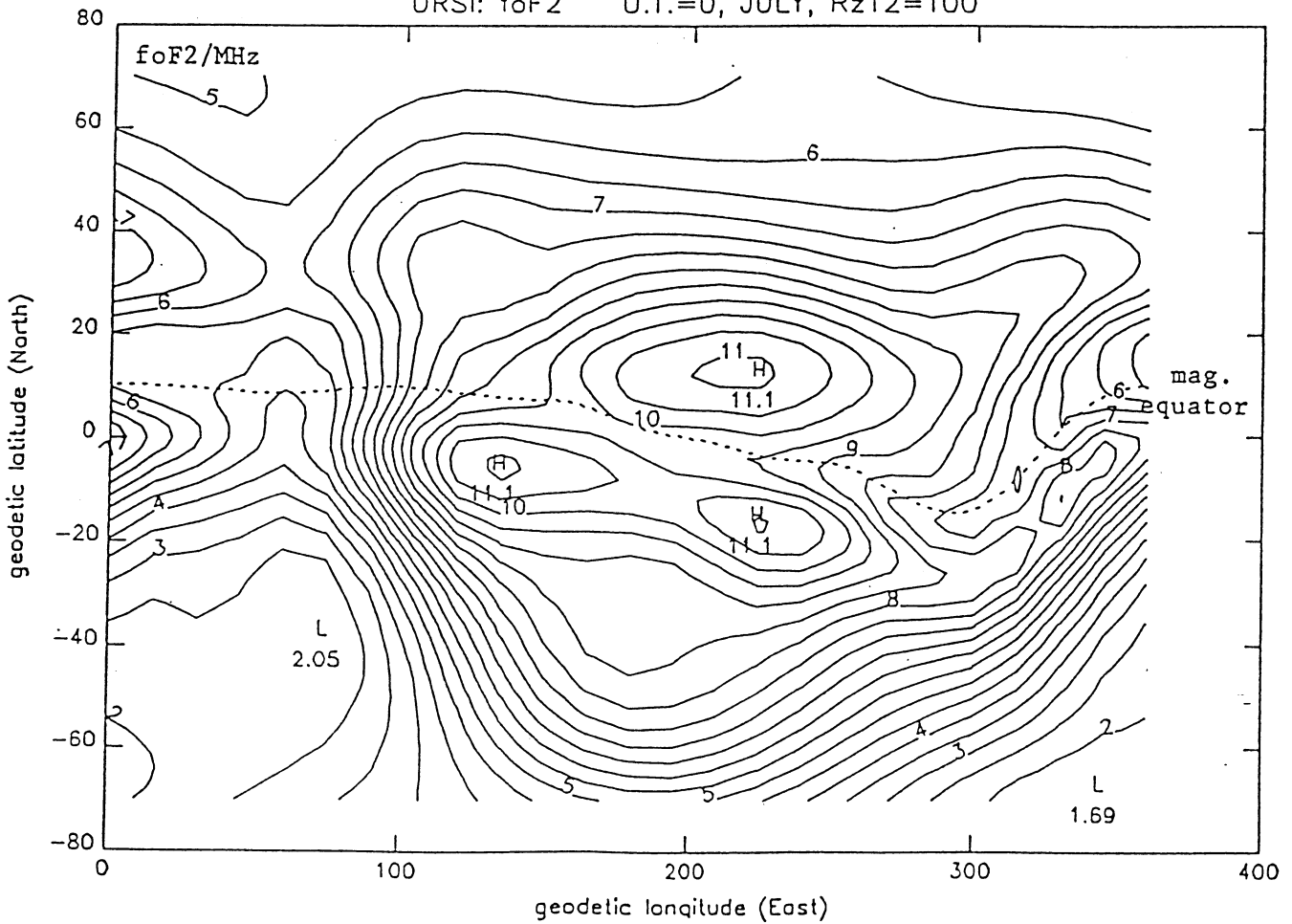
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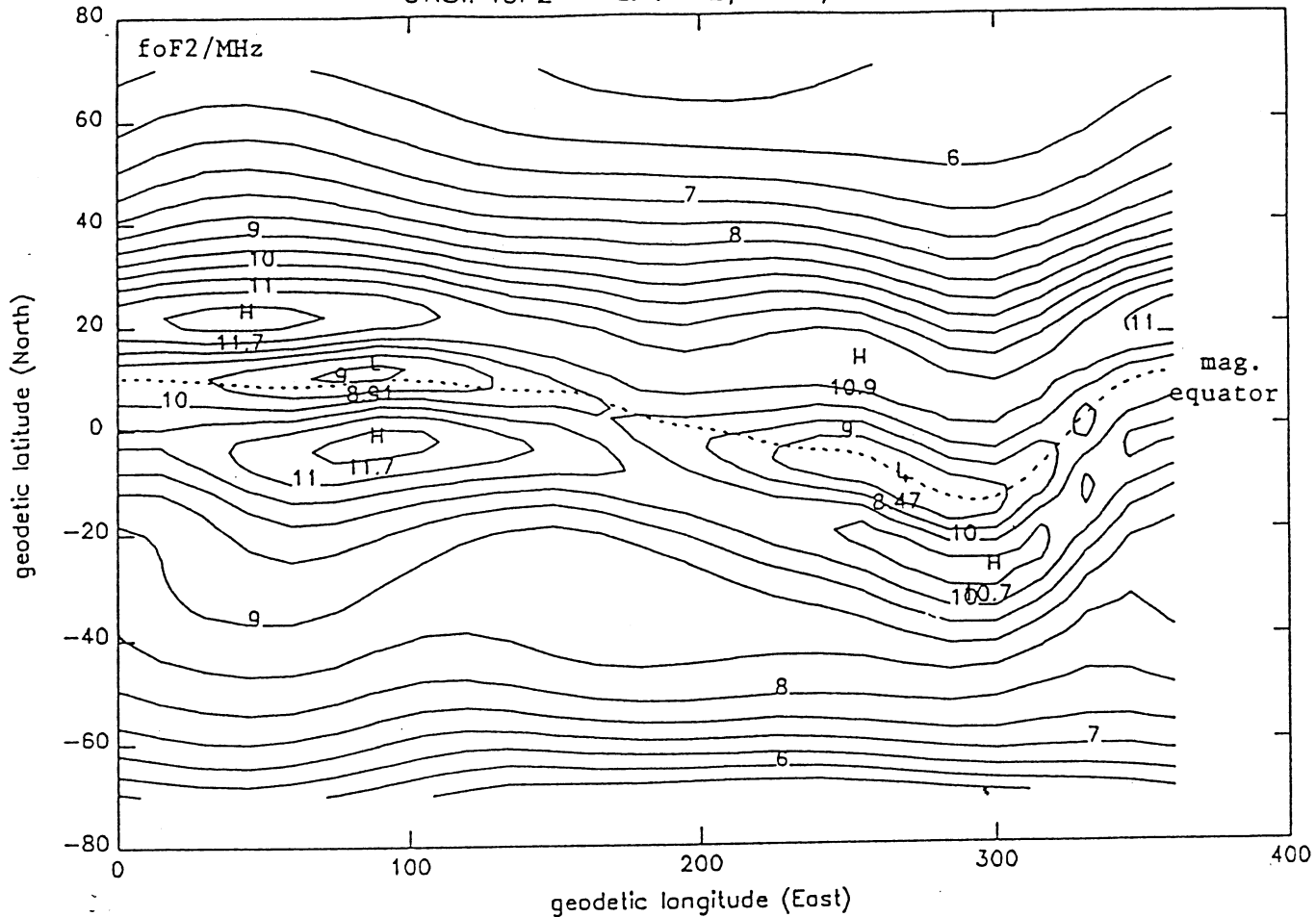
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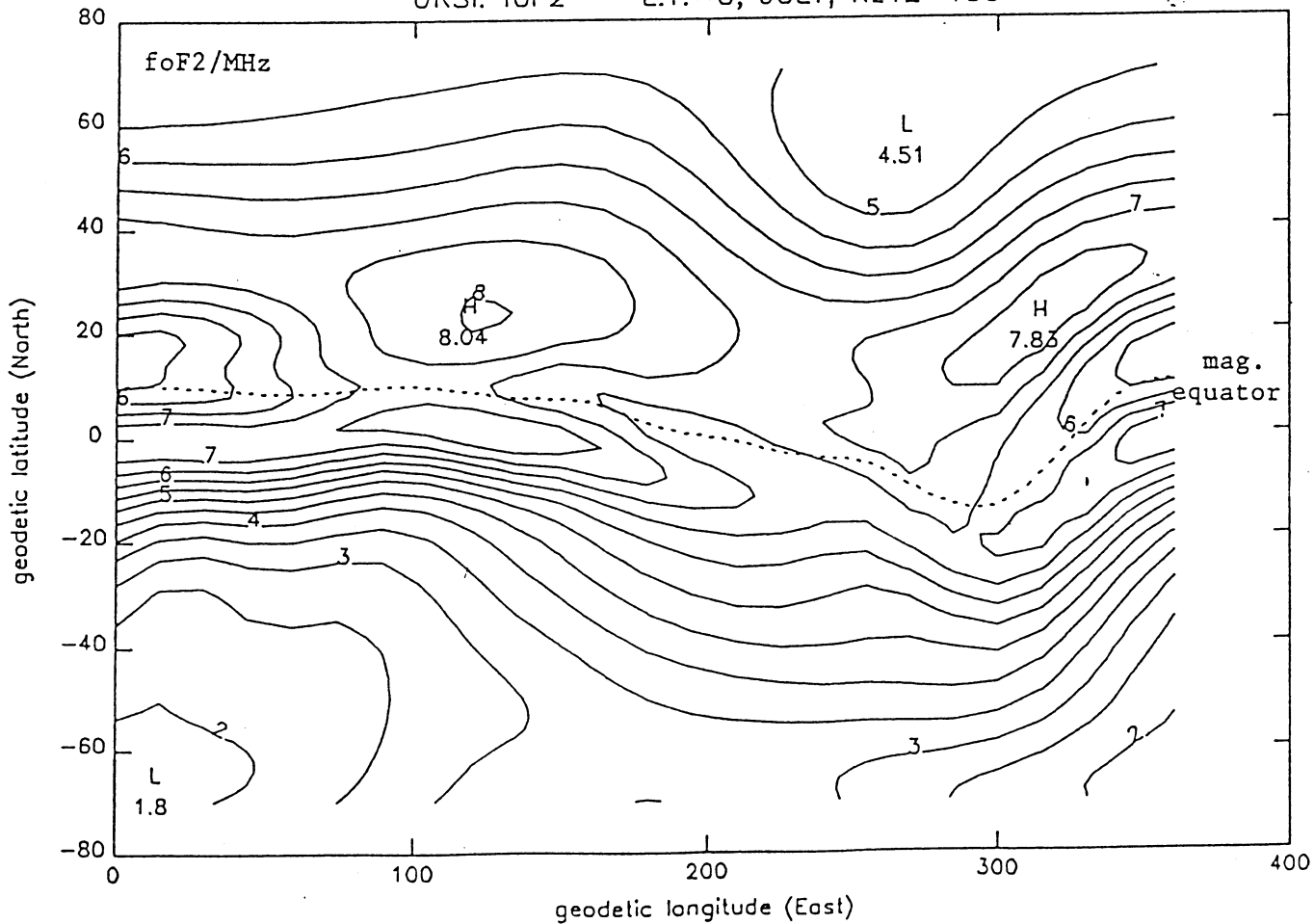
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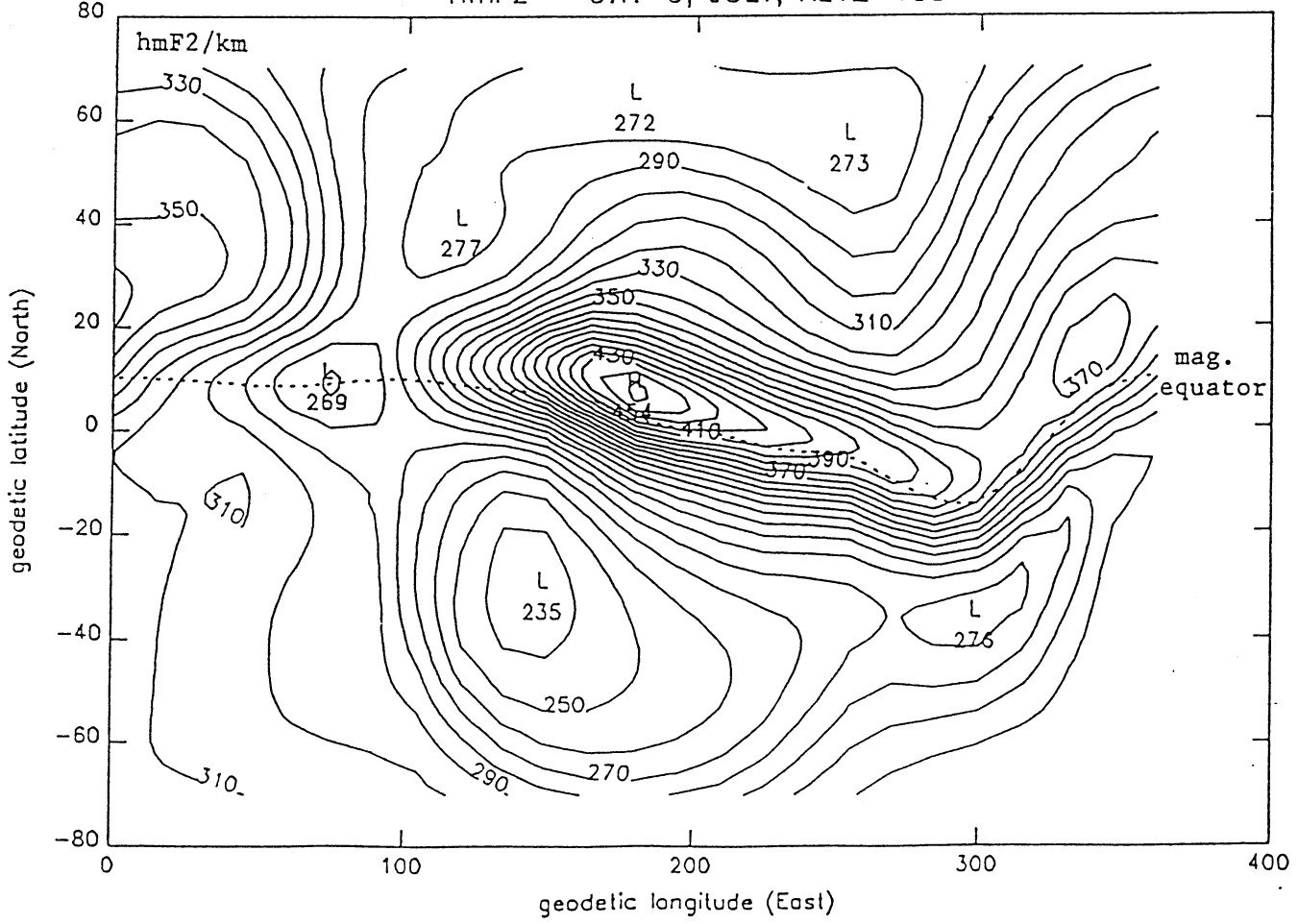
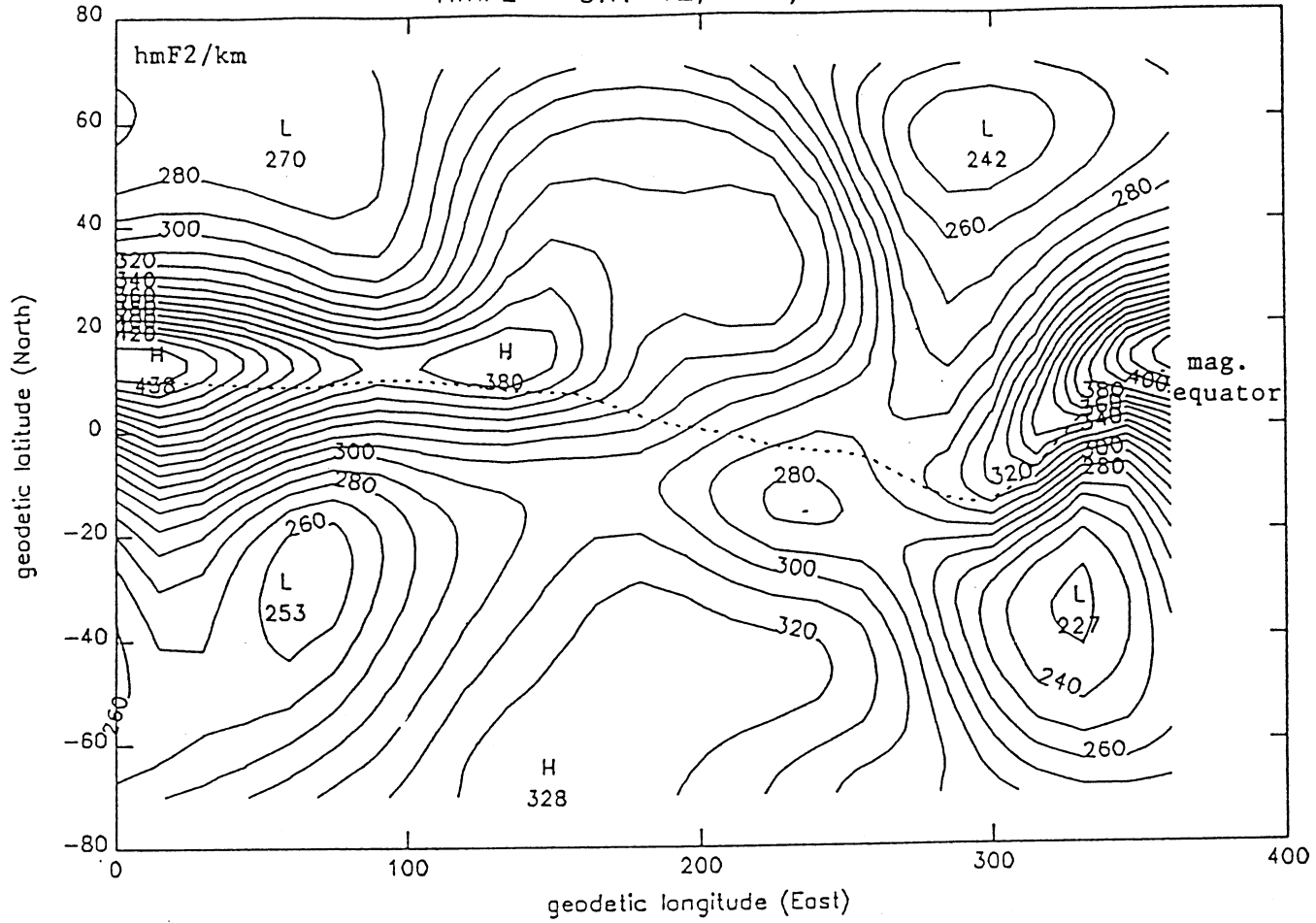


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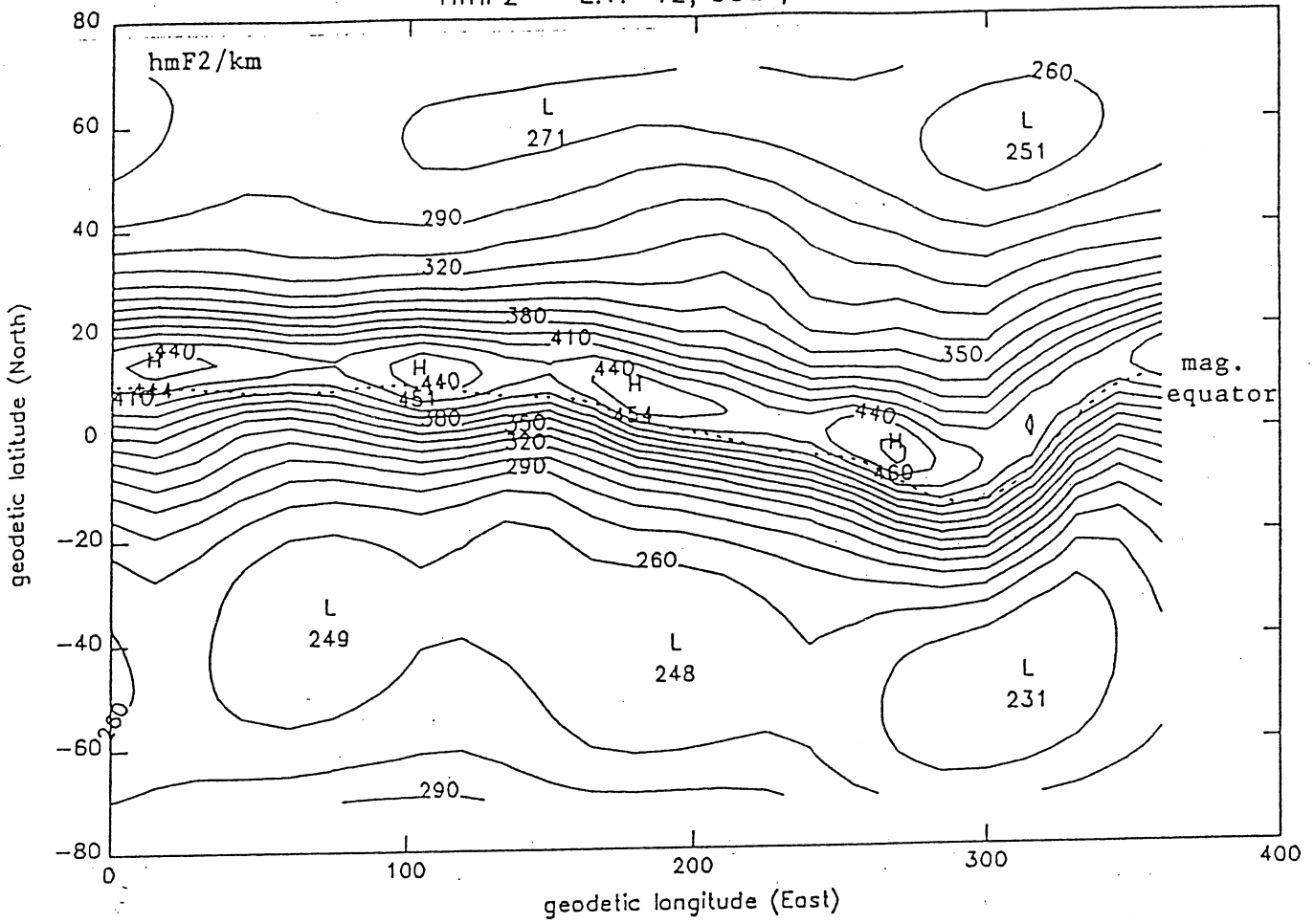


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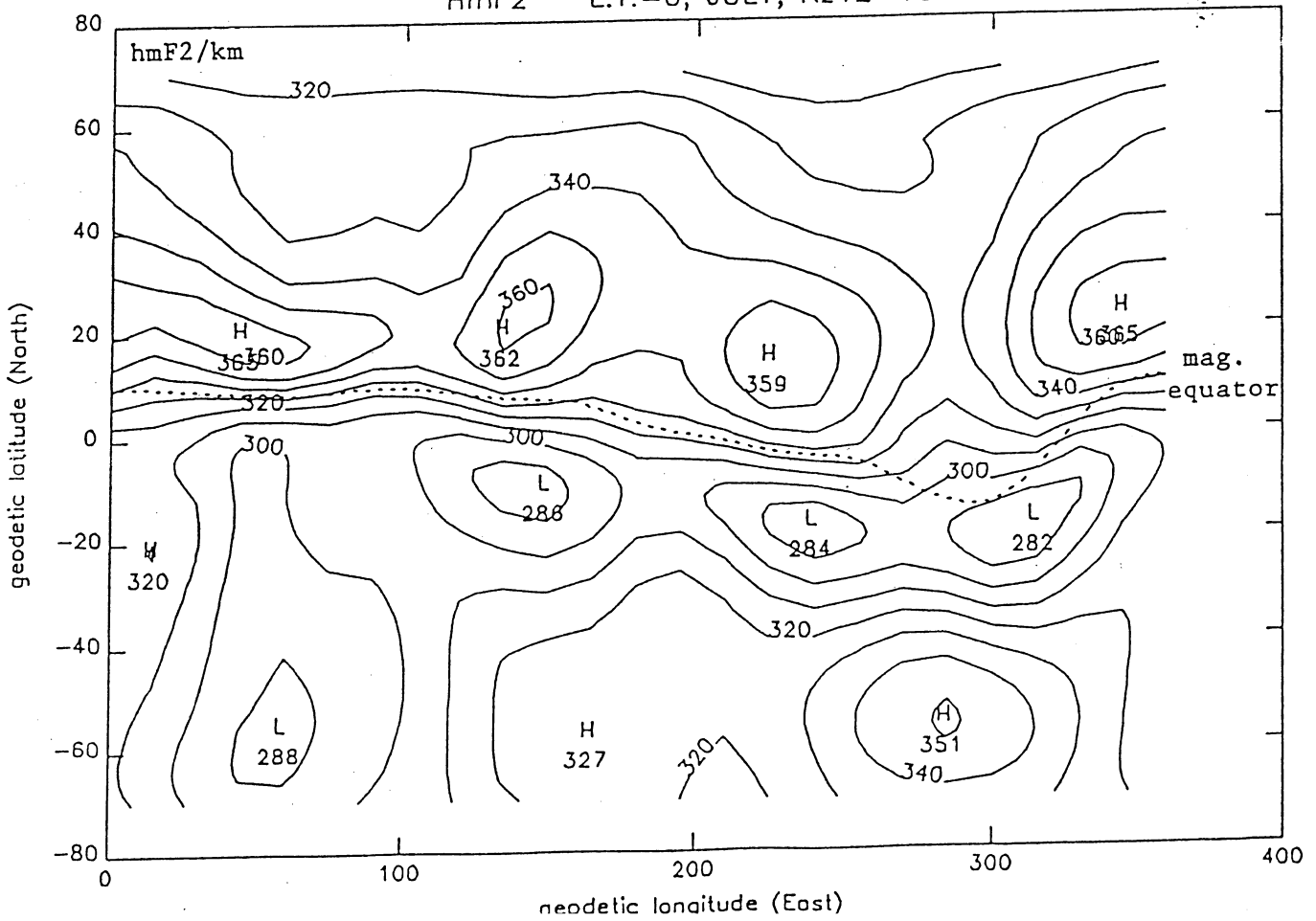




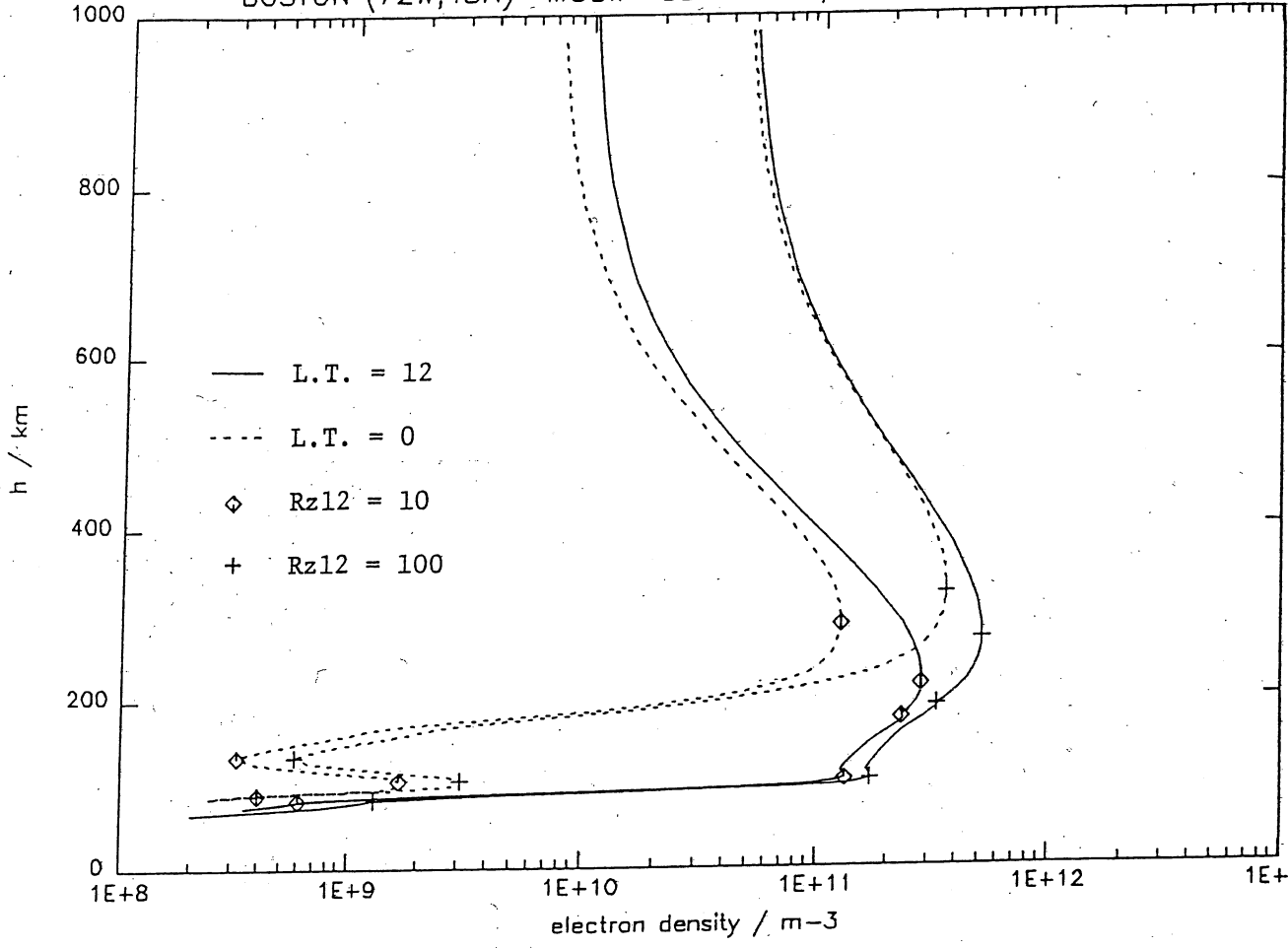
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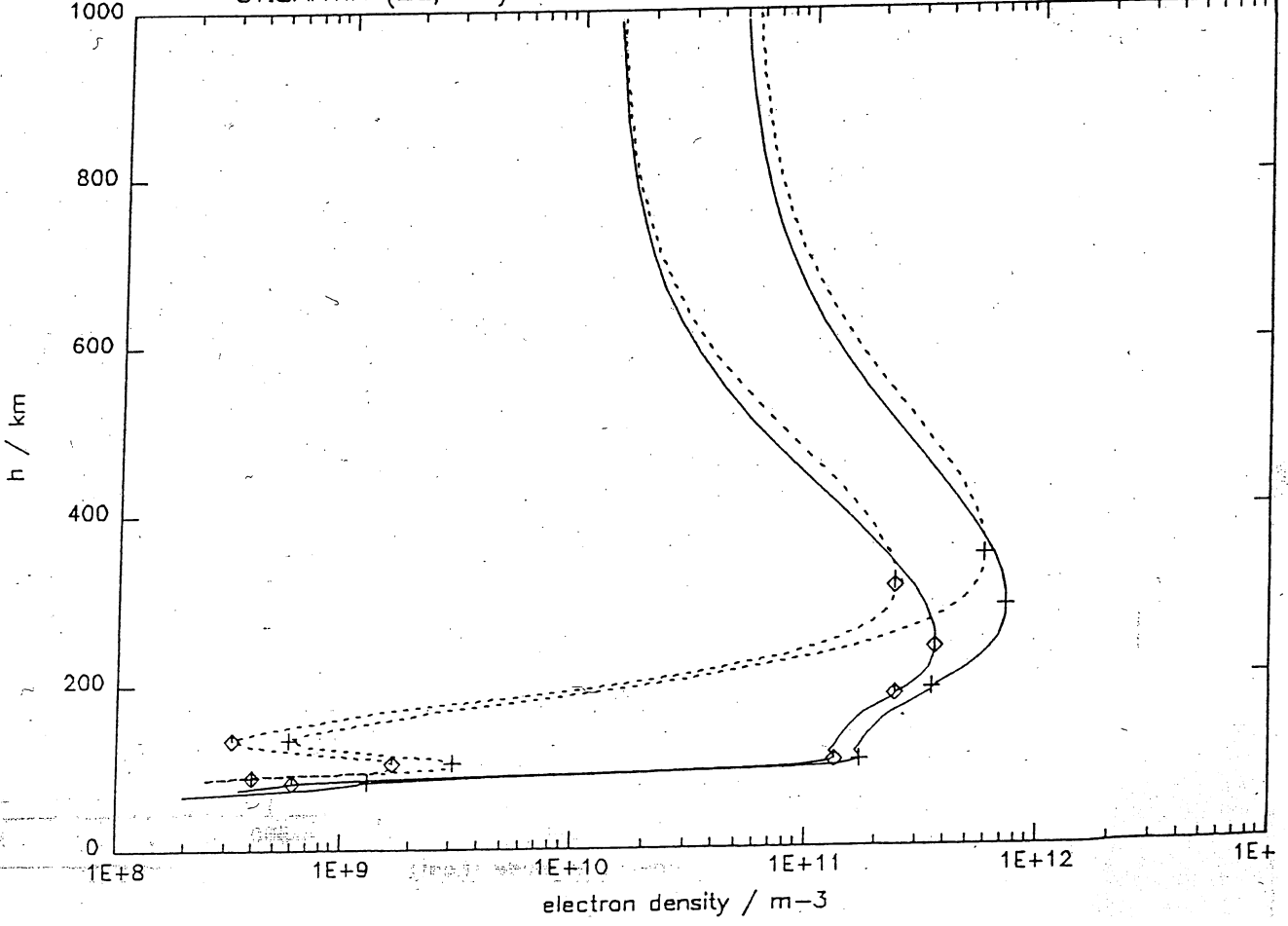
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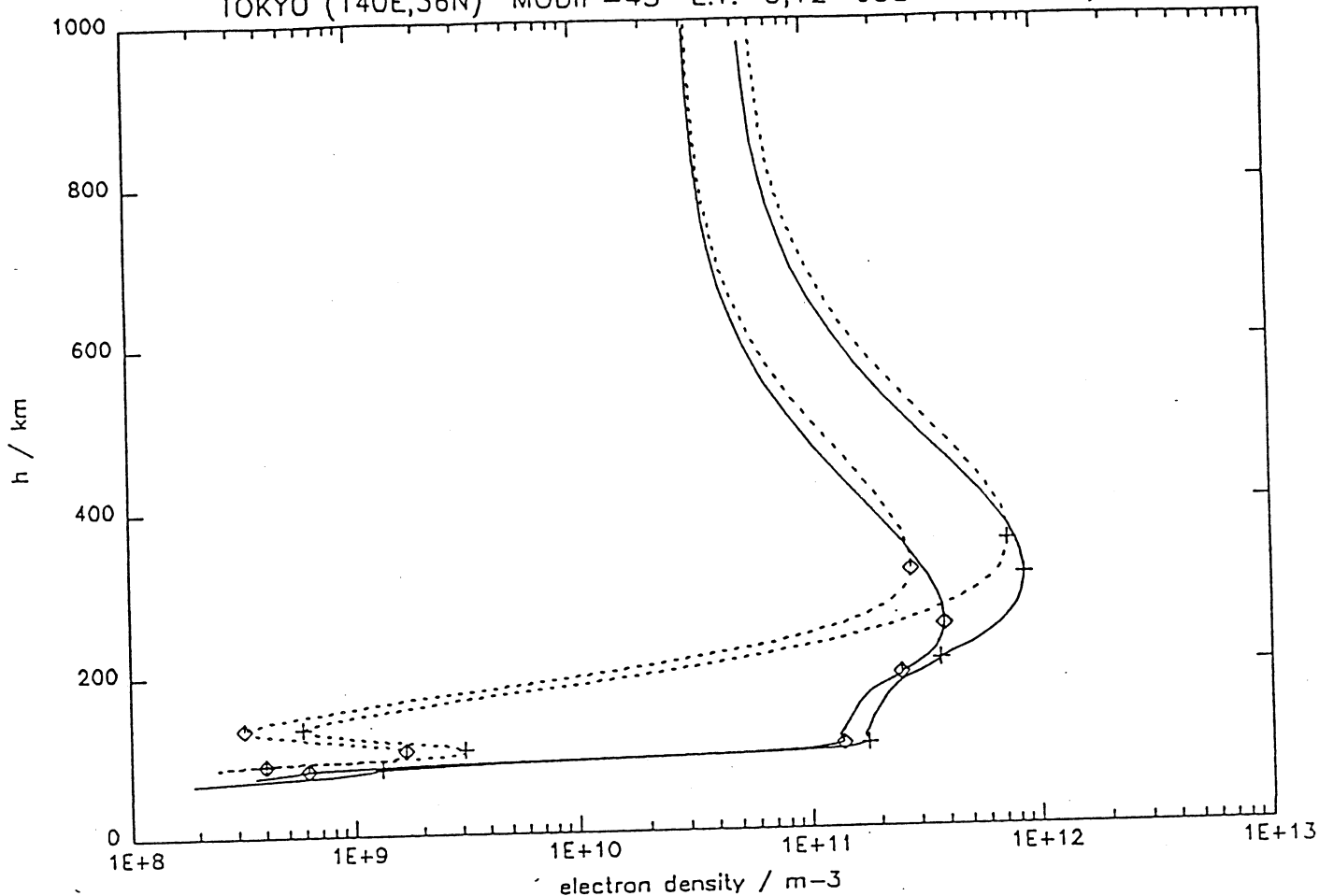


BOSTON (72W,43N) MODIP=55 L.T.=0,12 JULY Rz12=10,100



ST.SANTIN (2E,44N) MODIP=51 L.T.=0,12 JULY Rz12=10,100

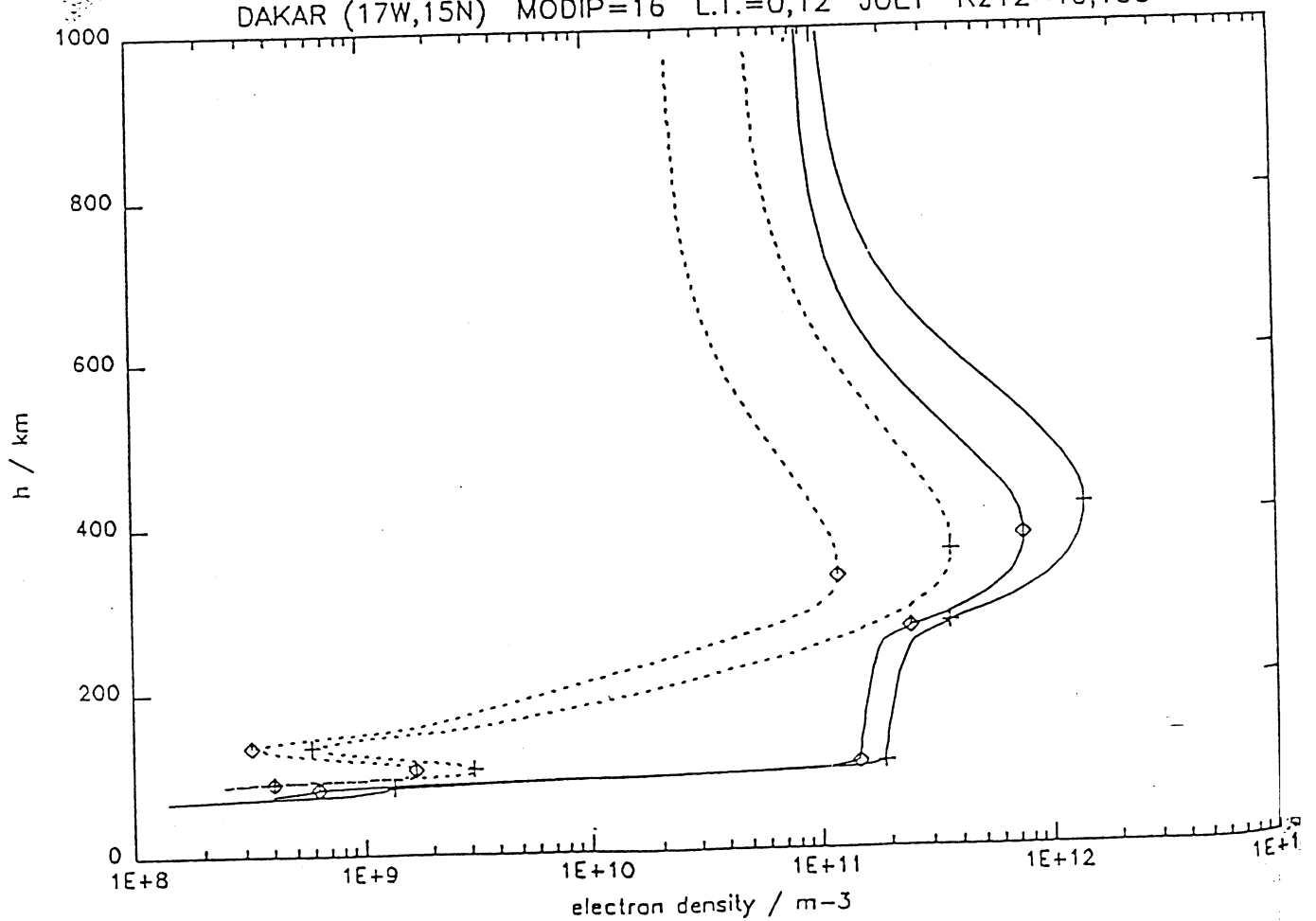
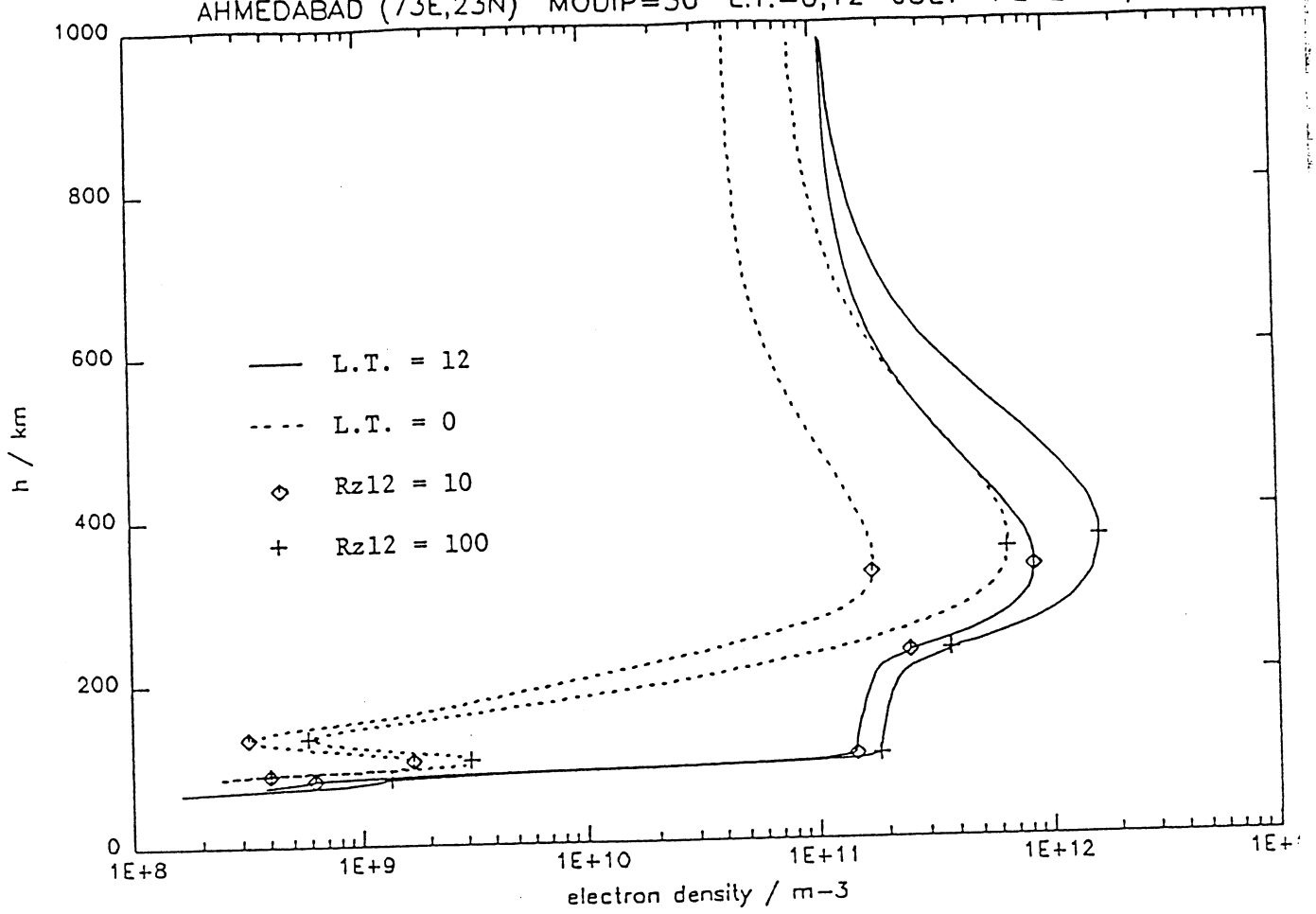


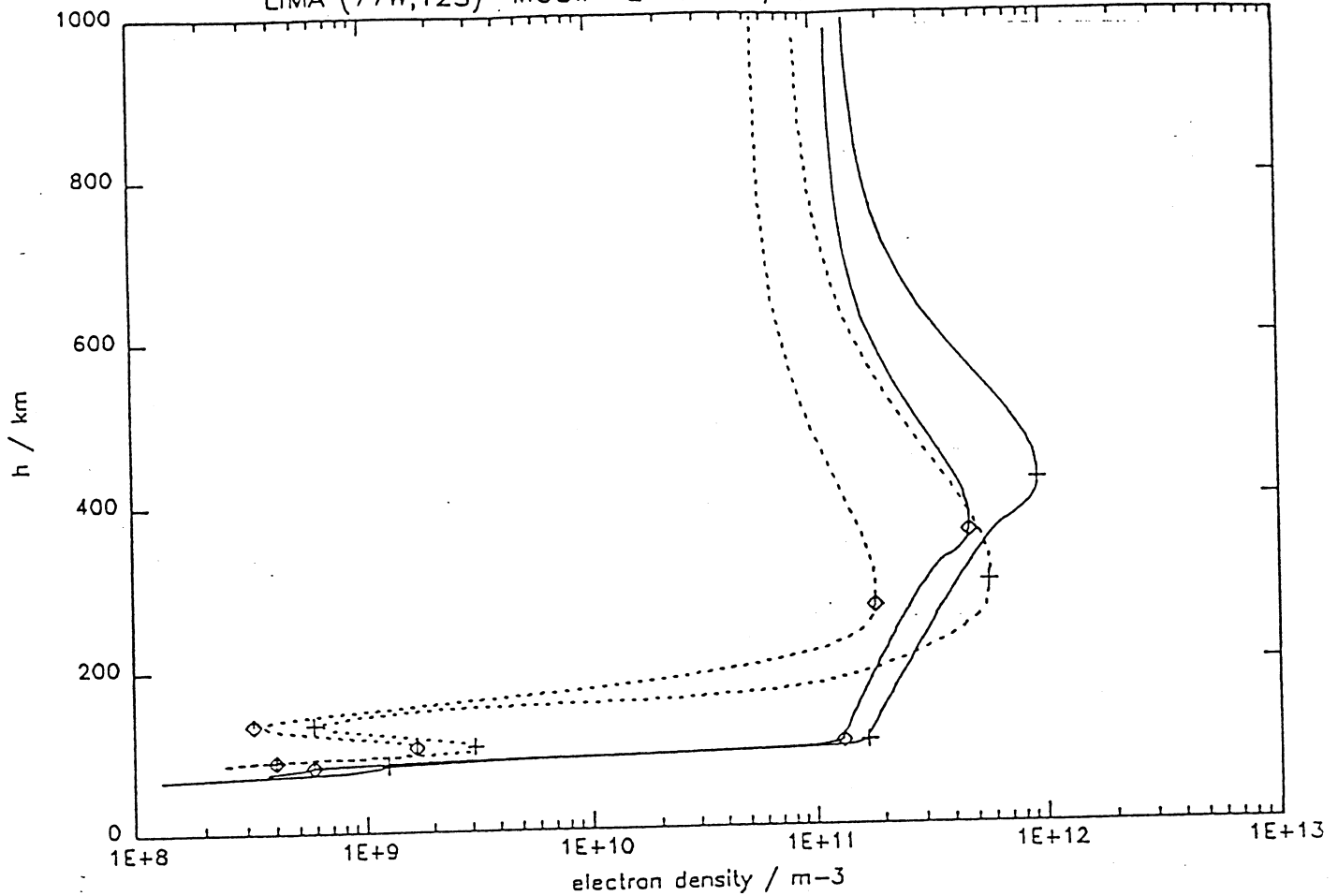


BOSTON	Rz12=10				Rz12=100			
	noon		midnight		noon		midnight	
	h/km	N/m-3	h/km	N/m-3	h/km	N/m-3	h/km	N/m-3
F2-peak	215.9	2.830E+11	286.8	1.250E+11	268.9	5.165E+11	322.6	3.567E+11
F1-peak	176.4	2.330E+11	0.0	0.000E+00	191.3	3.304E+11	0.0	0.000E+00
E-F-conn.	157.5	1.939E+11	229.8	9.176E+10	167.2	2.560E+11	247.4	2.407E+11
Valley-top	121.5	1.332E+11	170.4	1.707E+09	121.5	1.720E+11	170.4	3.090E+09
Valley-base	114.7	1.271E+11	133.0	3.244E+08	114.7	1.640E+11	133.0	5.871E+08
E-peak	105.0	1.332E+11	105.0	1.707E+09	105.0	1.720E+11	105.0	3.090E+09
D-point	81.0	6.141E+08	88.0	4.000E+08	81.0	1.316E+09	88.0	4.000E+08

ST. SANTIN	Rz12=10				Rz12=100			
	noon		midnight		noon		midnight	
	h/km	N/m-3	h/km	N/m-3	h/km	N/m-3	h/km	N/m-3
F2-peak	236.9	3.599E+11	308.9	2.407E+11	285.2	7.243E+11	347.0	5.844E+11
F1-peak	183.2	2.423E+11	0.0	0.000E+00	190.4	3.509E+11	0.0	0.000E+00
E-F-conn.	166.4	1.925E+11	239.2	1.094E+11	166.0	2.556E+11	262.7	3.046E+11
Valley-top	120.8	1.321E+11	169.6	1.707E+09	120.8	1.706E+11	169.6	3.090E+09
Valley-base	114.3	1.262E+11	133.0	3.244E+08	114.3	1.630E+11	133.0	5.871E+08
E-peak	105.0	1.321E+11	105.0	1.707E+09	105.0	1.706E+11	105.0	3.090E+09
D-point	81.0	6.117E+08	88.0	4.000E+08	81.0	1.311E+09	88.0	4.000E+08

TOKYO	Rz12=10				Rz12=100			
	noon		midnight		noon		midnight	
	h/km	N/m-3	h/km	N/m-3	h/km	N/m-3	h/km	N/m-3
F2-peak	250.0	3.822E+11	317.3	2.760E+11	310.9	8.454E+11	352.6	7.191E+11
F1-peak	191.7	2.506E+11	0.0	0.000E+00	208.3	3.663E+11	0.0	0.000E+00
E-F-conn.	174.7	1.987E+11	247.9	1.229E+11	184.1	2.637E+11	261.0	3.032E+11
Valley-top	119.1	1.373E+11	167.4	1.707E+09	119.1	1.772E+11	167.4	3.090E+09
Valley-base	113.3	1.319E+11	133.0	3.244E+08	113.3	1.702E+11	133.0	5.871E+08
E-peak	105.0	1.373E+11	105.0	1.707E+09	105.0	1.772E+11	105.0	3.090E+09
D-point	81.0	6.214E+08	88.0	4.000E+08	81.0	1.332E+09	88.0	4.000E+08

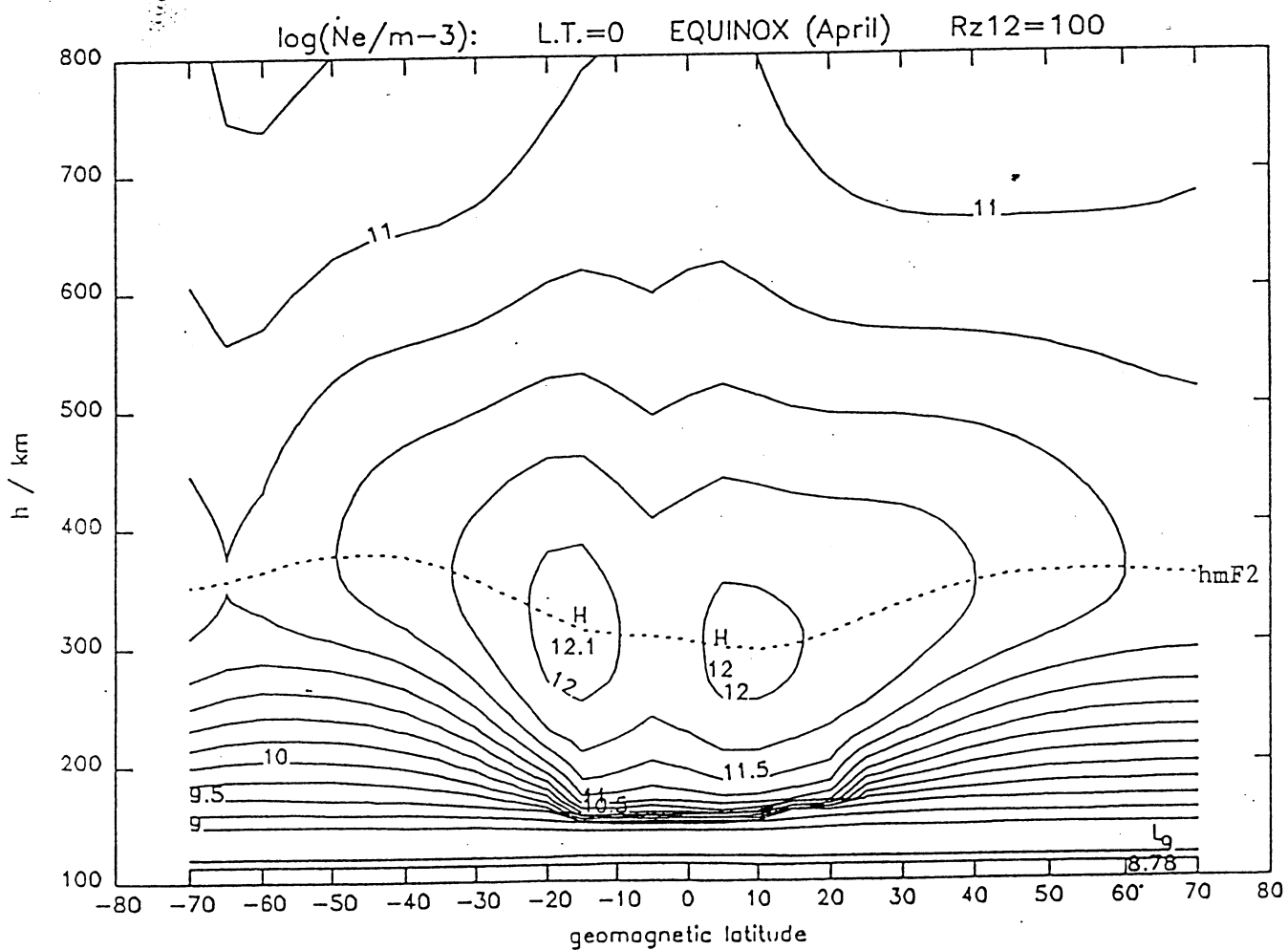
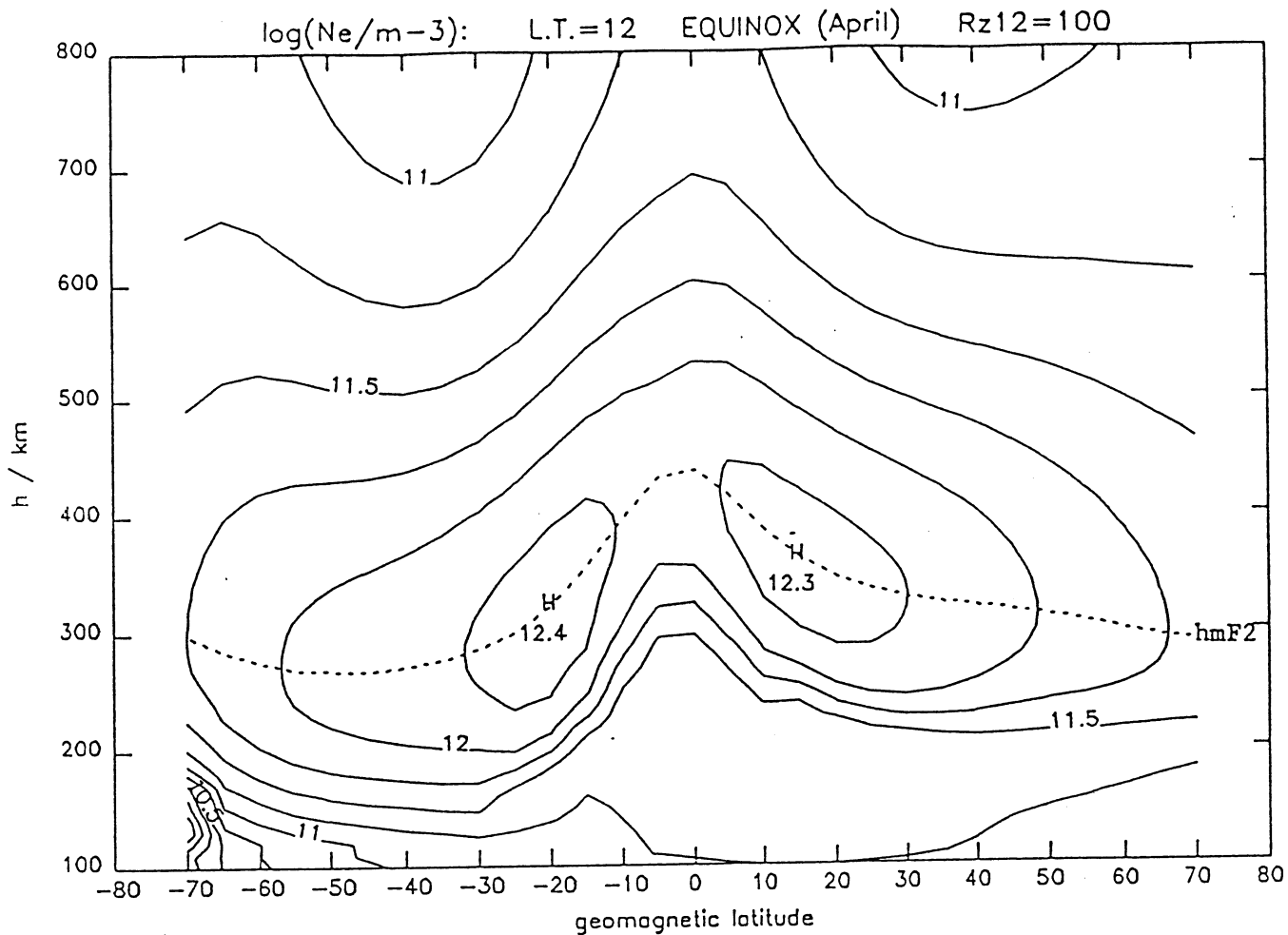


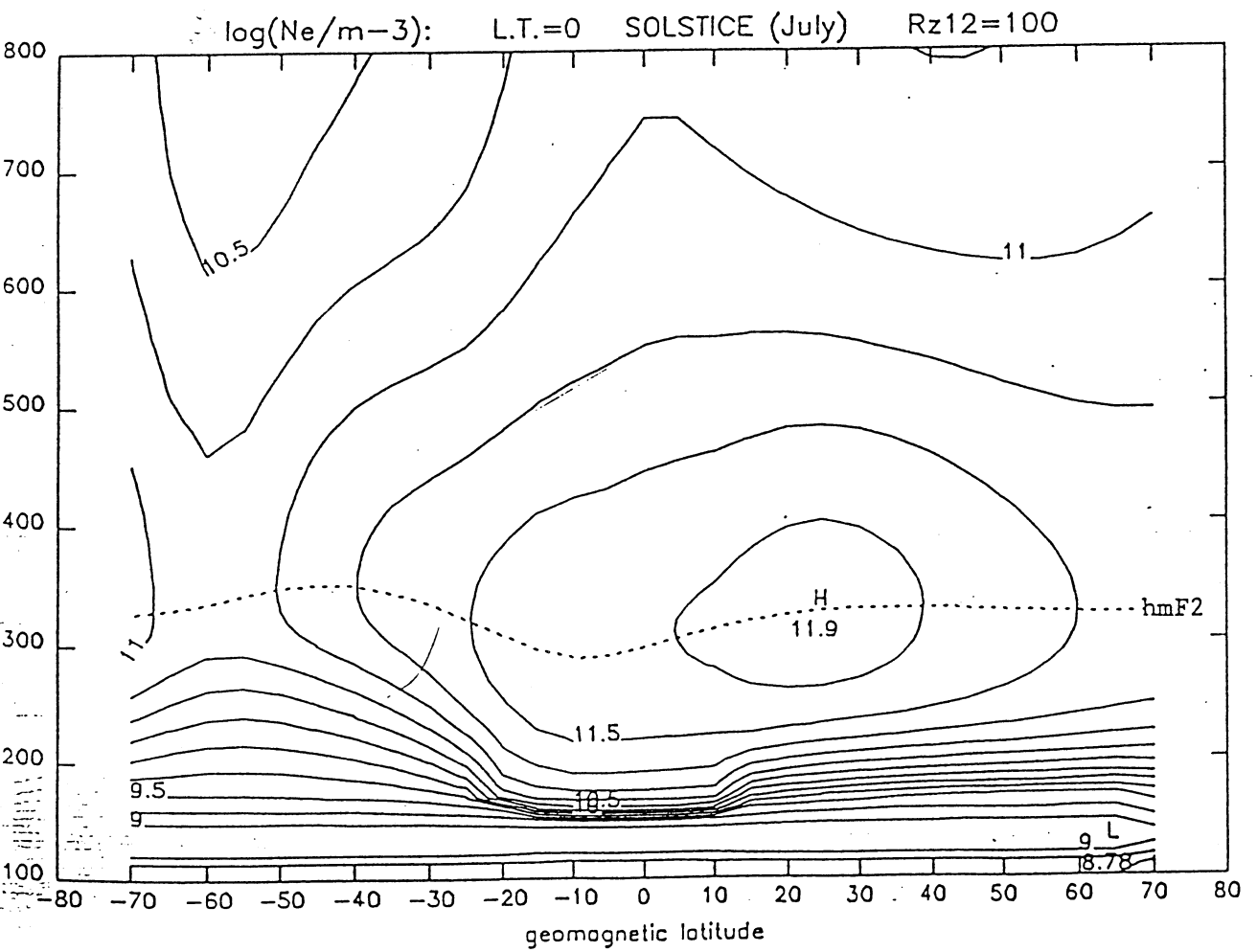
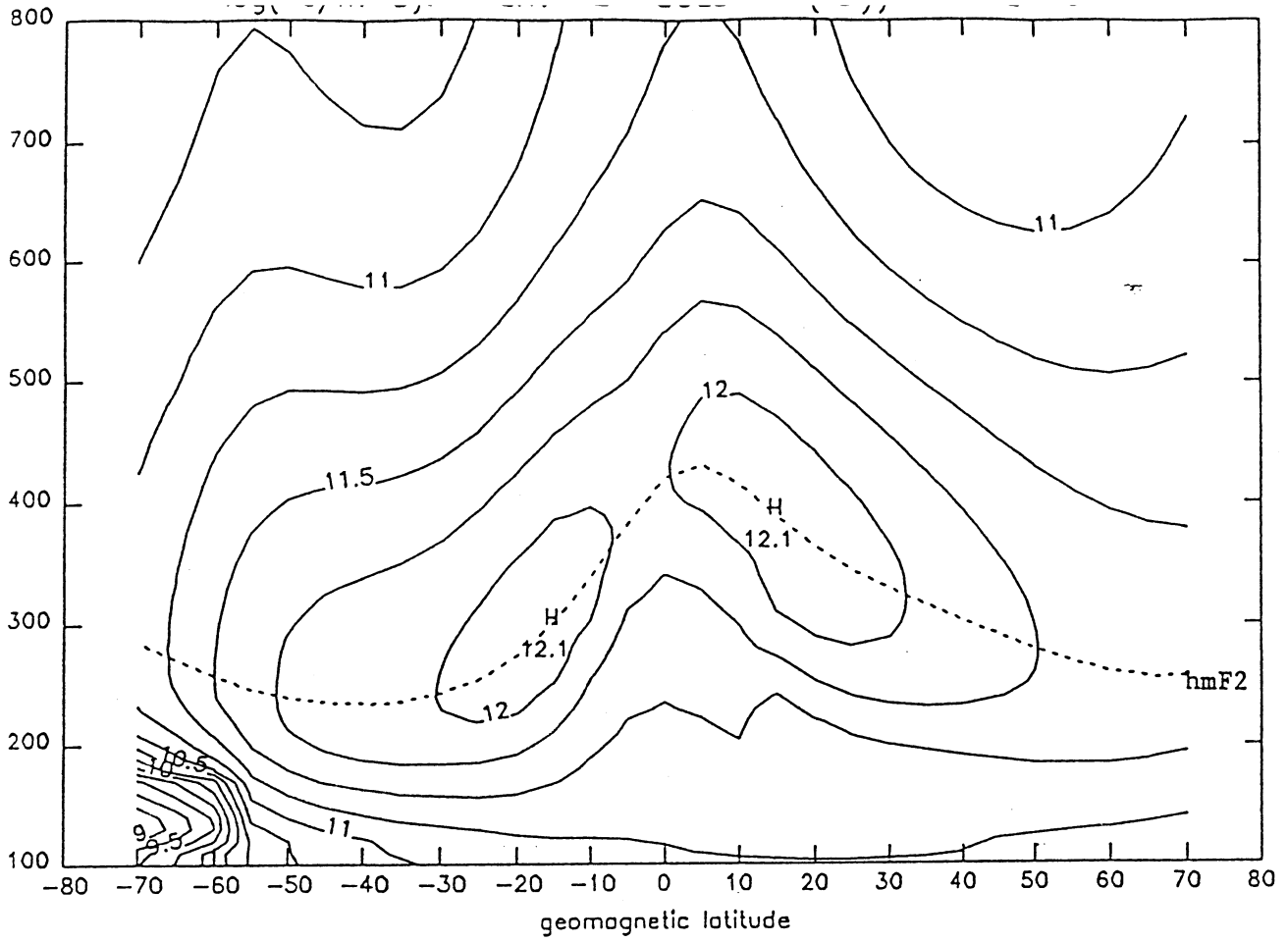


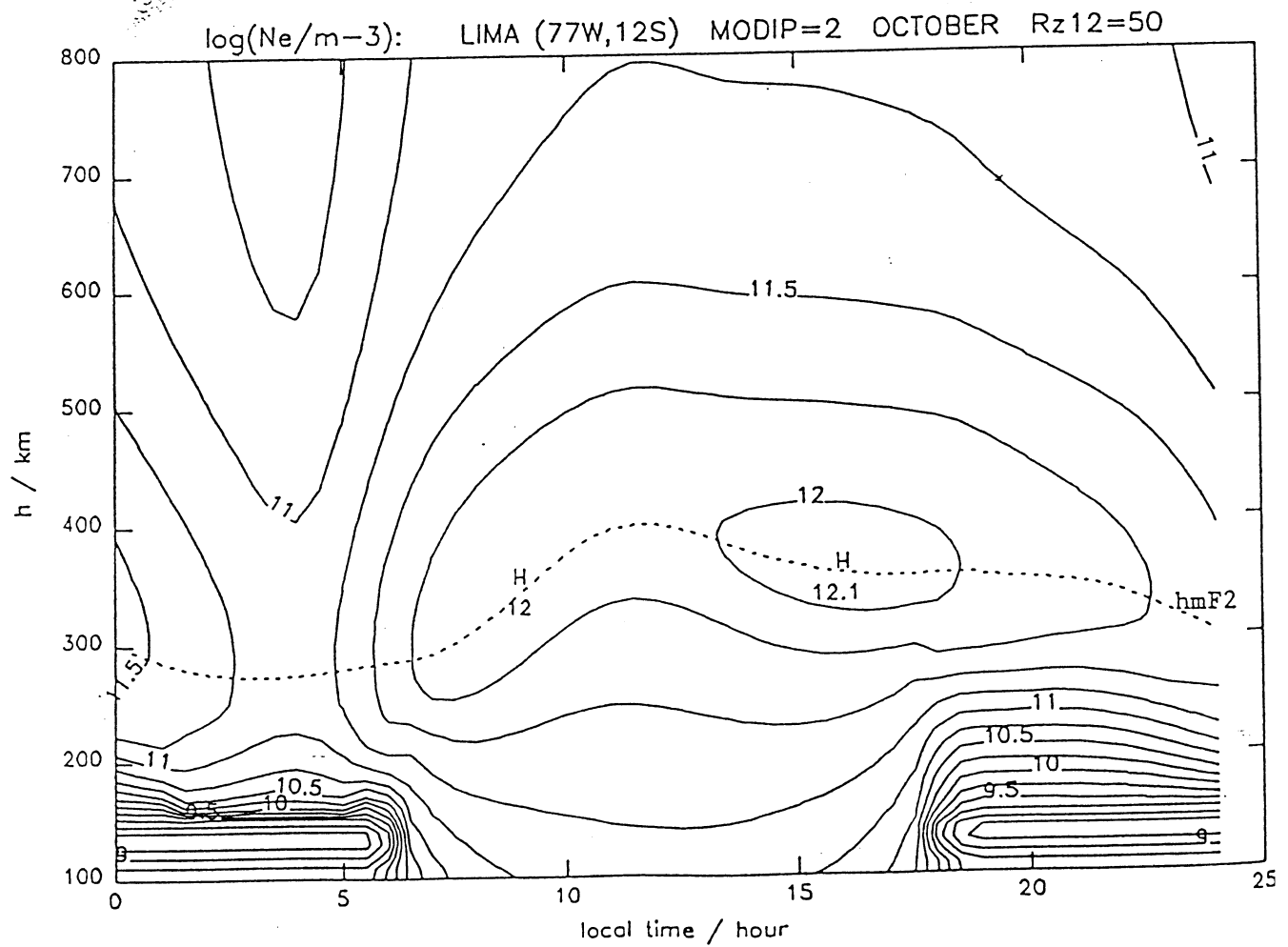
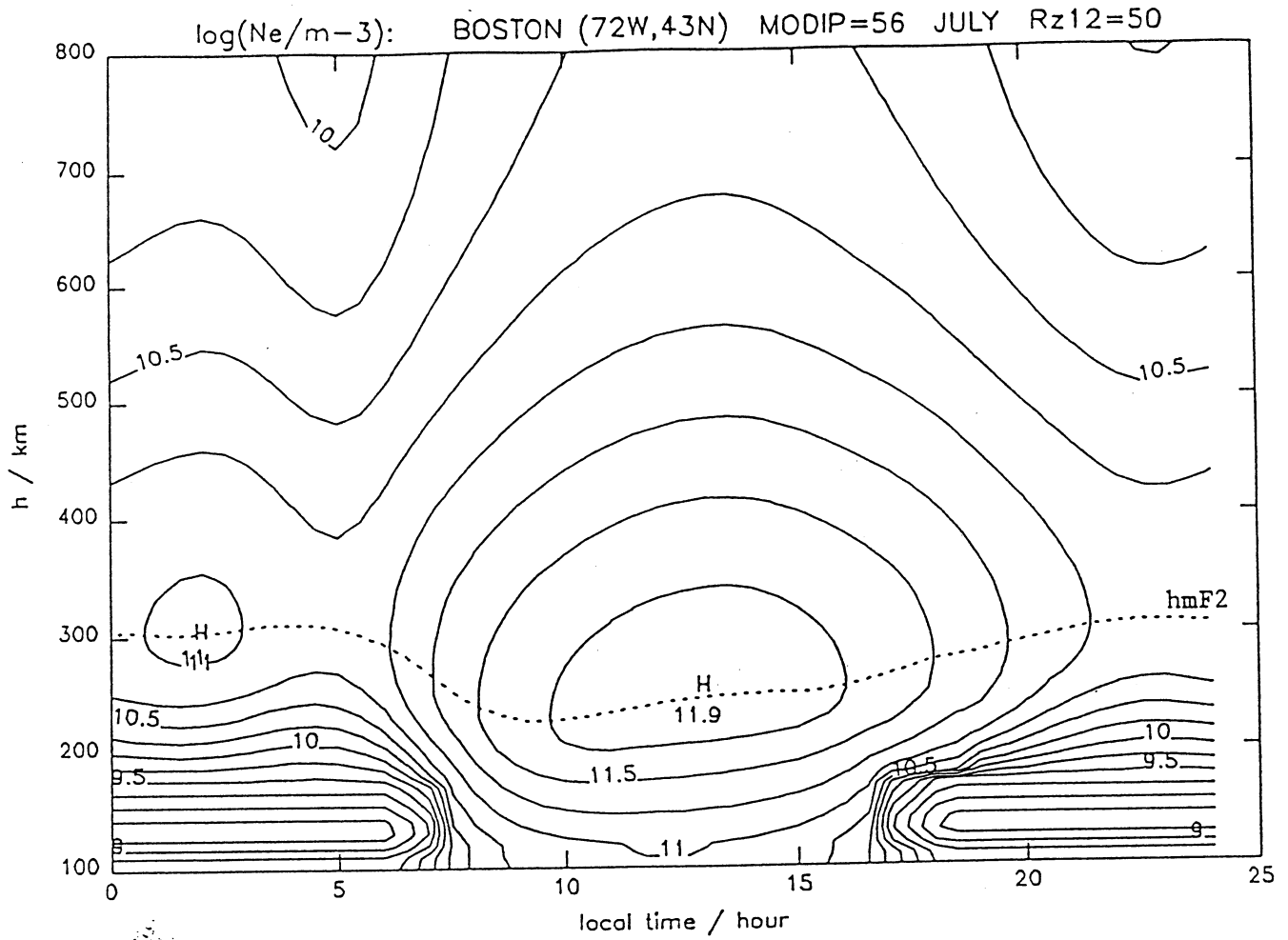
AHMEDABAD	Rz12=10				Rz12=100			
	noon h/km	noon N/m ⁻³	midnight h/km	midnight N/m ⁻³	noon h/km	noon N/m ⁻³	midnight h/km	midnight N/m ⁻³
F2-peak	329.6	8.342E+11	325.0	1.743E+11	366.6	1.635E+12	353.4	6.519E+11
F1-peak	228.4	2.532E+11	0.0	0.000E+00	230.0	3.708E+11	0.0	0.000E+00
E-F-conn.	213.9	1.974E+11	260.7	8.318E-10	208.3	2.565E+11	261.0	2.789E+11
Valley-top	113.9	1.445E+11	161.0	1.707E+09	113.9	1.866E+11	161.0	3.090E+09
Valley-base	110.2	1.410E+11	133.0	3.244E+08	110.2	1.820E+11	133.0	5.871E+08
E-peak	105.0	1.446E+11	105.0	1.707E+09	105.0	1.866E+11	105.0	3.090E+09
D-point	81.0	6.269E+08	88.0	4.000E+08	81.0	1.343E+09	88.0	4.000E+08

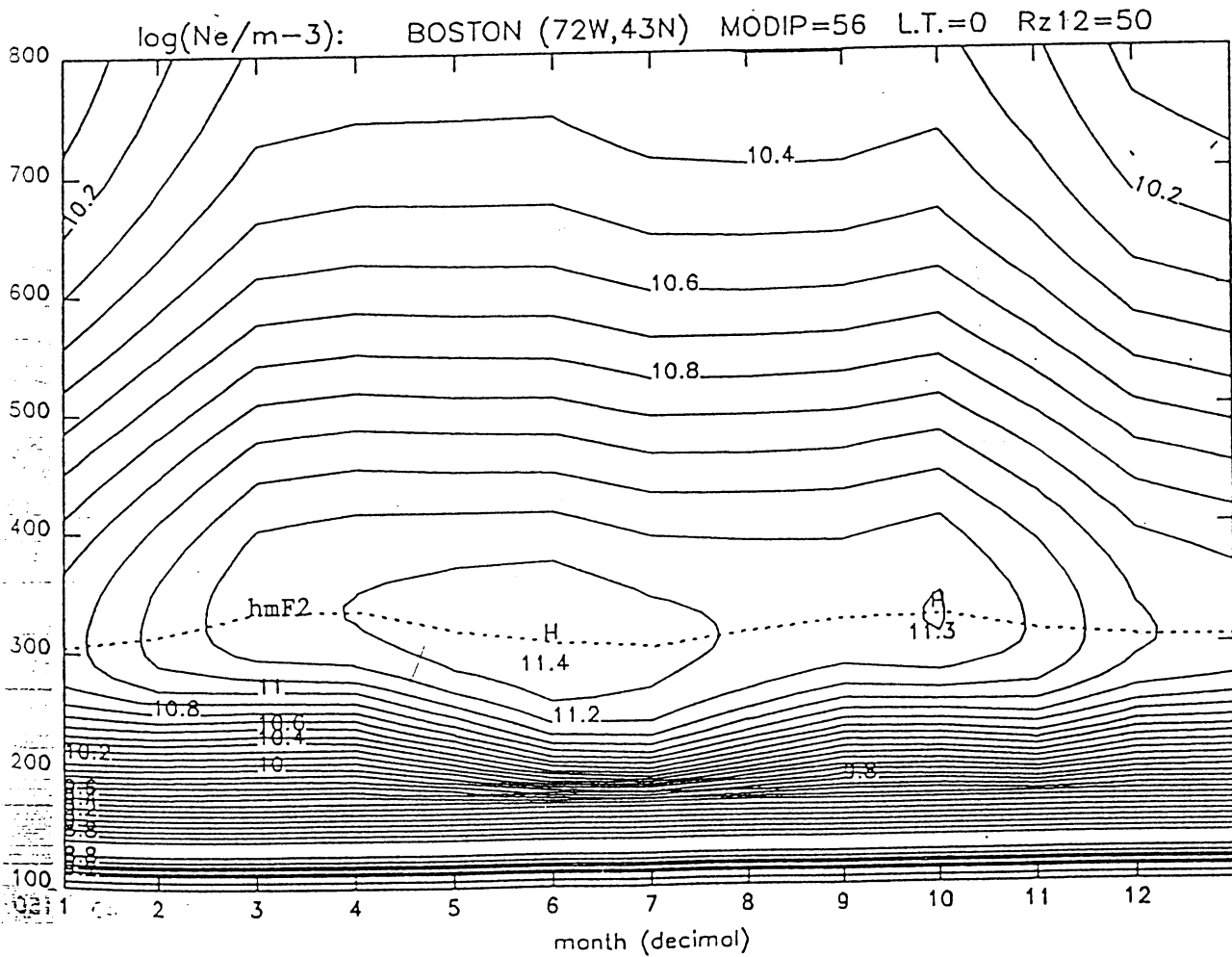
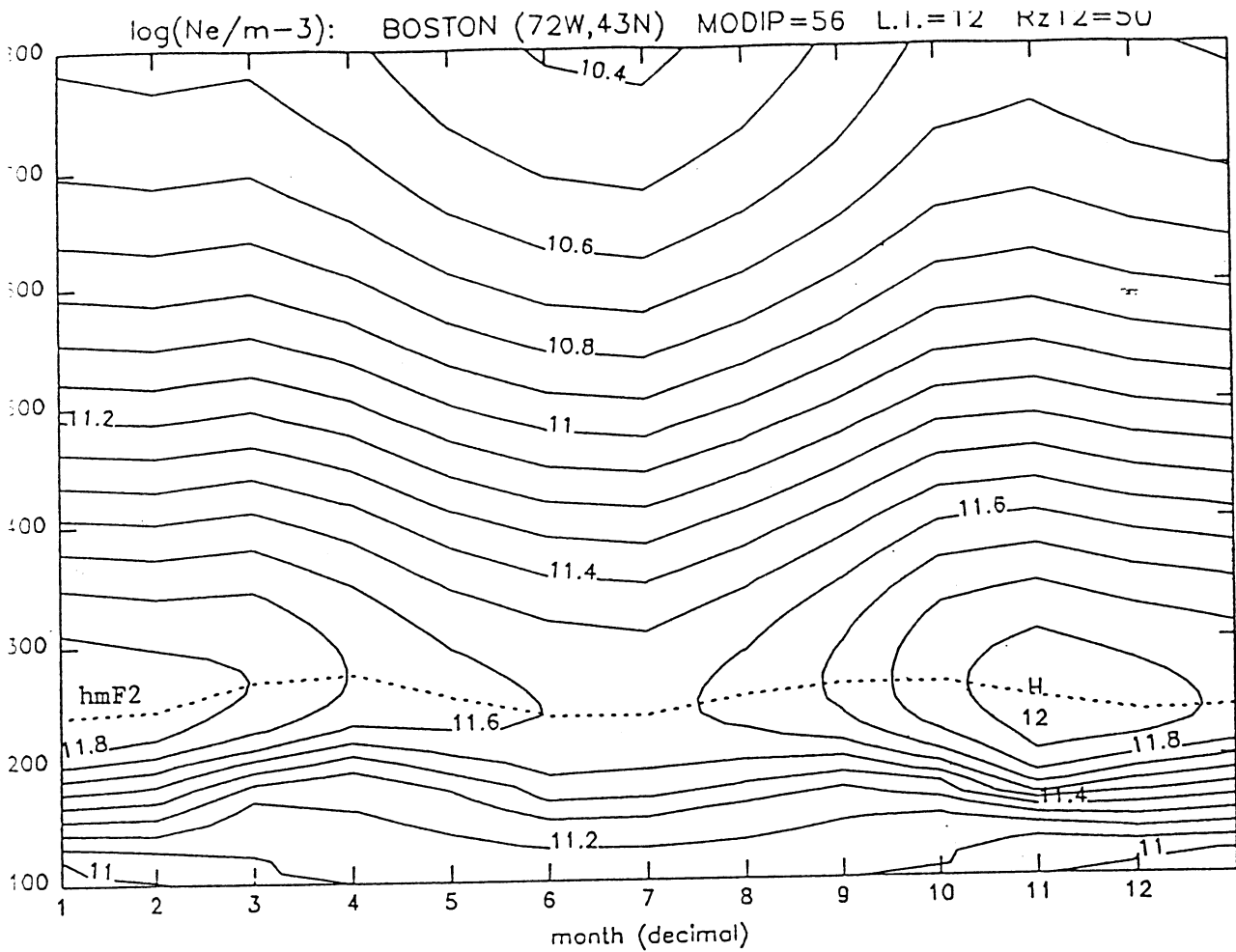
DAKAR	Rz12=10				Rz12=100			
	noon h/km	noon N/m ⁻³	midnight h/km	midnight N/m ⁻³	noon h/km	noon N/m ⁻³	midnight h/km	midnight N/m ⁻³
F2-peak	377.4	7.517E+11	329.9	1.202E+11	412.7	1.417E+12	359.1	3.682E+11
F1-peak	268.9	2.498E+11	0.0	0.000E+00	272.5	3.637E+11	0.0	0.000E+00
E-F-conn.	253.4	1.983E+11	270.0	6.065E+10	252.9	2.685E+11	269.2	1.716E+11
Valley-top	109.1	1.470E+11	155.1	1.707E+09	109.1	1.898E+11	155.1	3.090E+09
Valley-base	107.4	1.453E+11	133.0	3.244E+08	107.4	1.876E+11	133.0	5.871E+08
E-peak	105.0	1.470E+11	105.0	1.707E+09	105.0	1.898E+11	105.0	3.090E+09
D-point	81.0	6.258E+08	88.0	4.000E+08	81.0	1.341E+09	88.0	4.000E+08

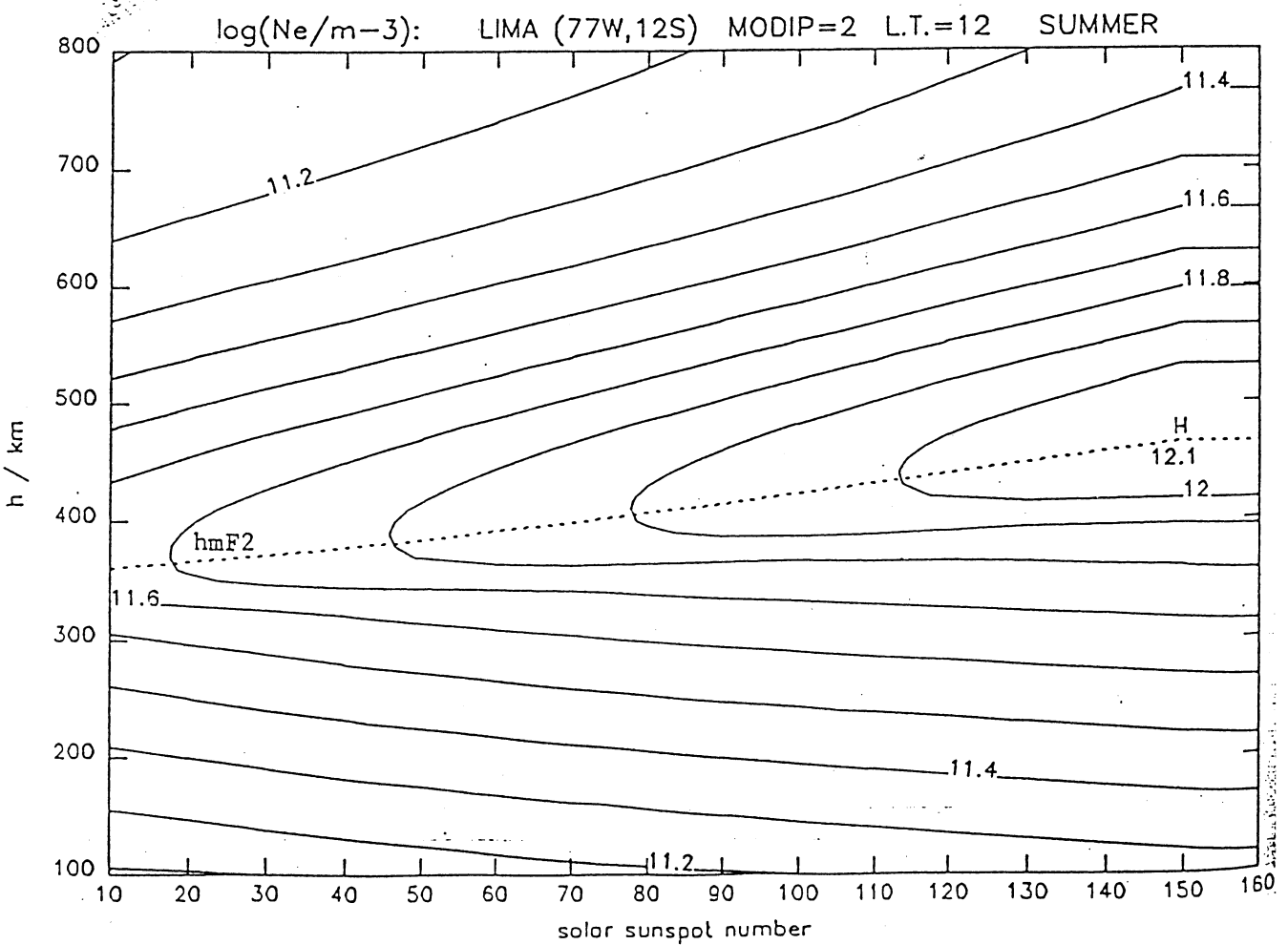
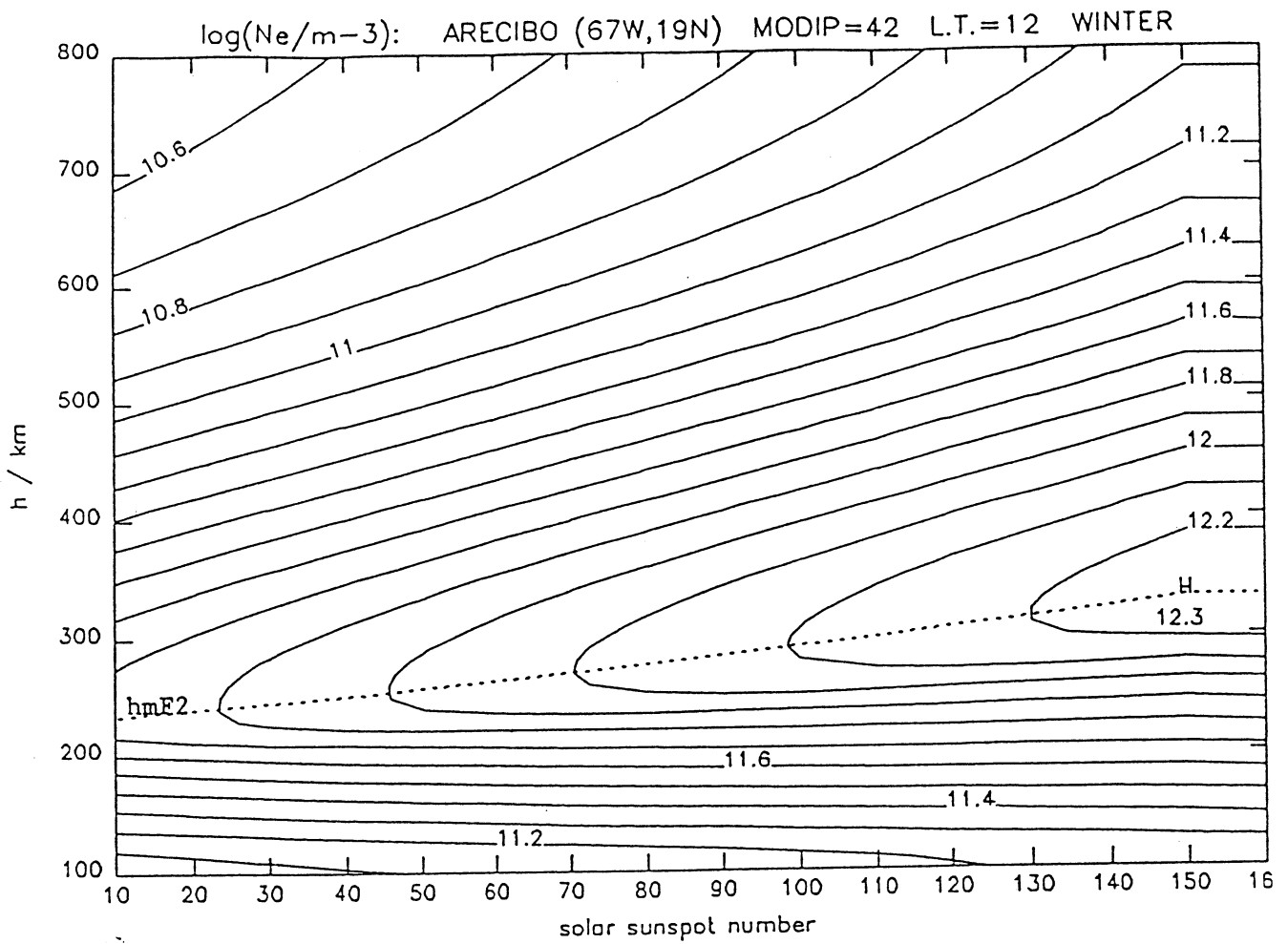
LIMA	Rz12=10				Rz12=100			
	noon h/km	noon N/m ⁻³	midnight h/km	midnight N/m ⁻³	noon h/km	noon N/m ⁻³	midnight h/km	midnight N/m ⁻³
F2-peak	359.8	4.669E+11	269.5	1.847E+11	422.0	9.190E+11	297.5	5.680E+11
F1-peak	0.0	0.000E+00	0.0	0.000E+00	0.0	0.000E+00	0.0	0.000E+00
E-F-conn.	328.1	3.757E+11	215.3	1.024E+11	374.3	6.911E+11	261.9	5.432E+11
Valley-top	109.1	1.324E+11	155.1	1.707E+09	109.1	1.706E+11	155.1	3.090E+09
Valley-base	107.4	1.293E+11	133.0	3.244E+08	107.4	1.669E+11	133.0	5.871E+08
E-peak	105.0	1.324E+11	105.0	1.707E+09	105.0	1.709E+11	105.0	3.090E+09
D-point	81.0	5.888E+08	88.0	4.000E+08	81.0	1.262E+09	88.0	4.000E+08



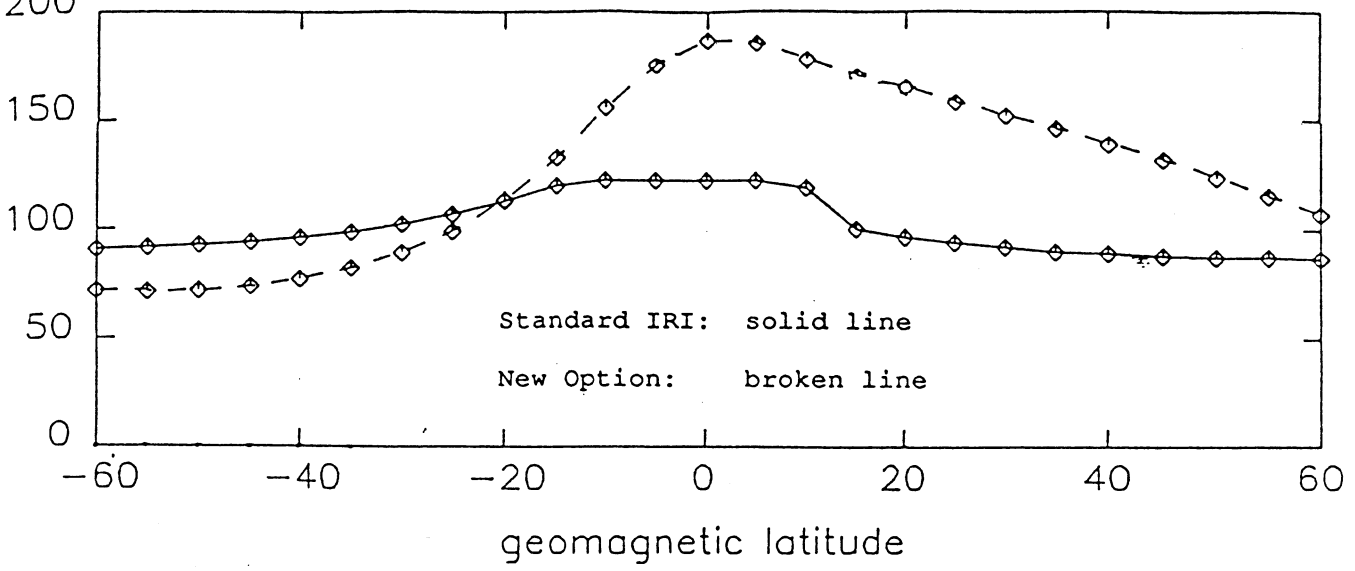




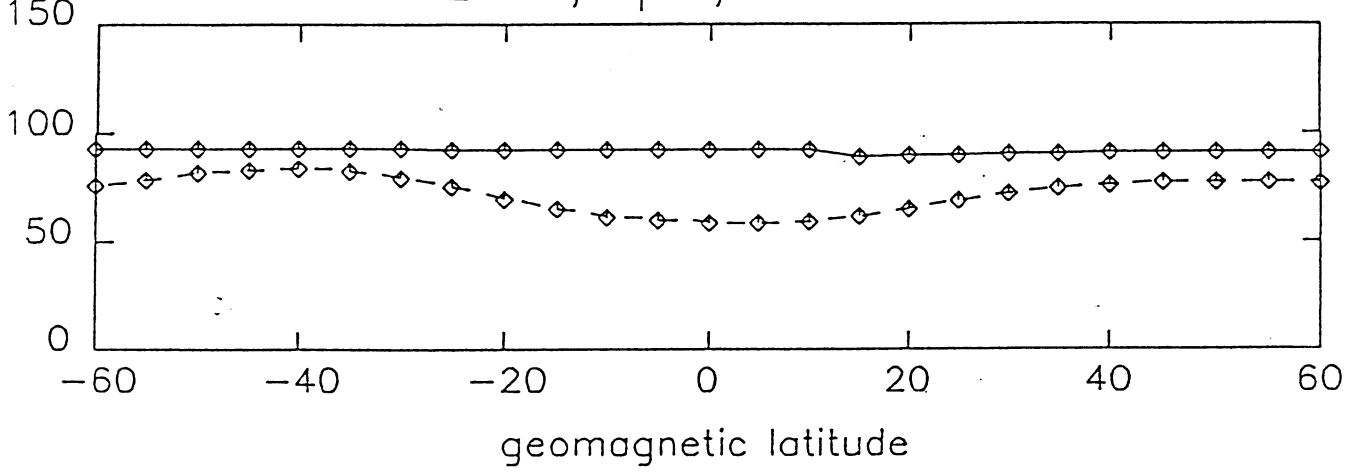




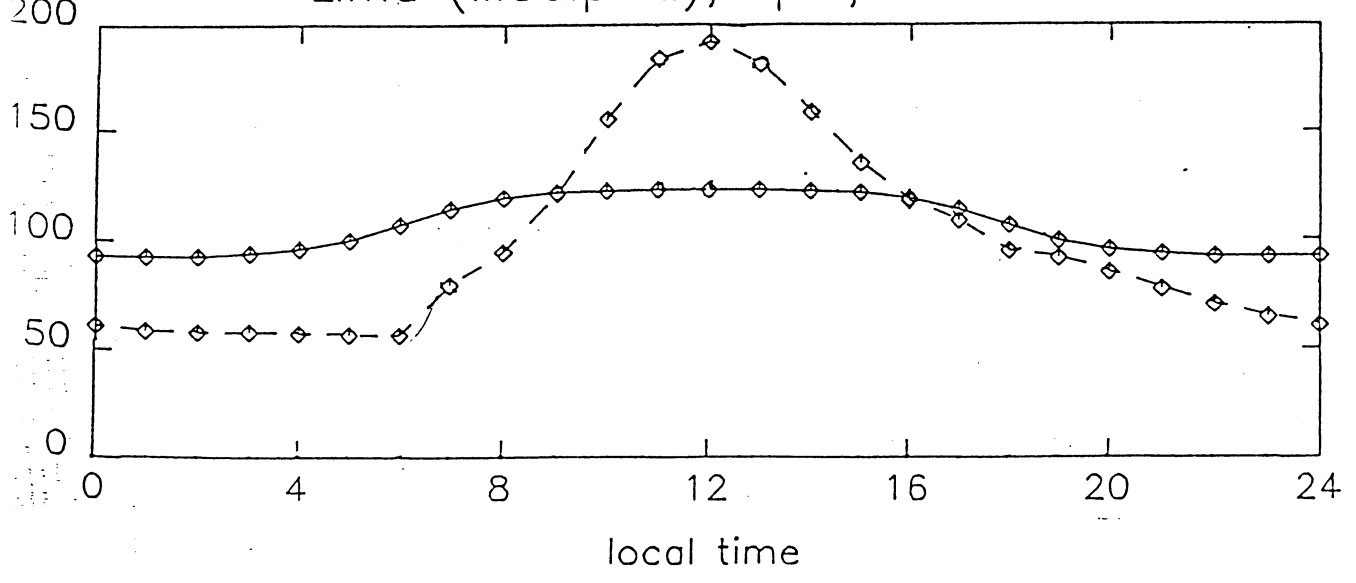
Bottomside Parameters. LT=12, April, Rz12=50



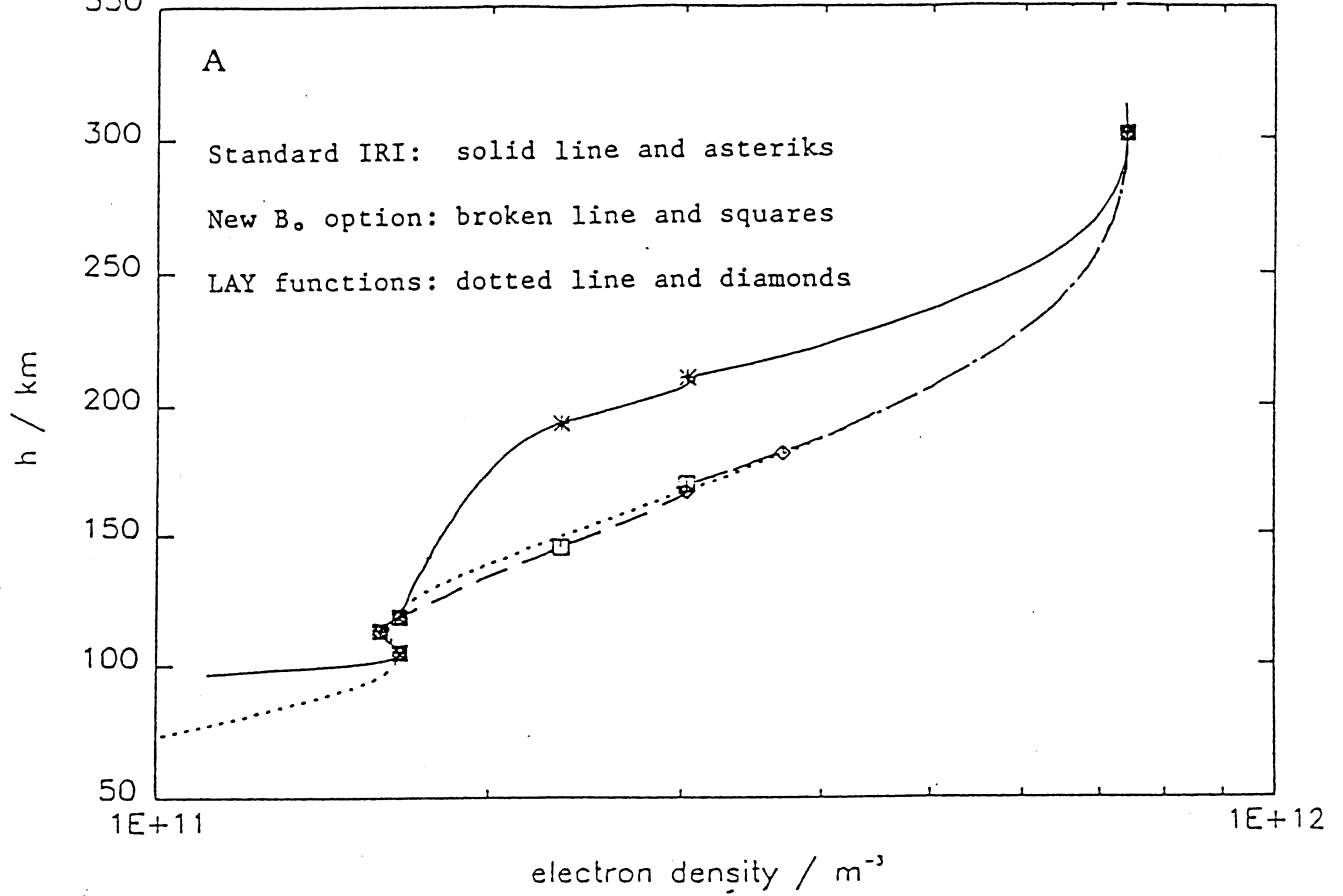
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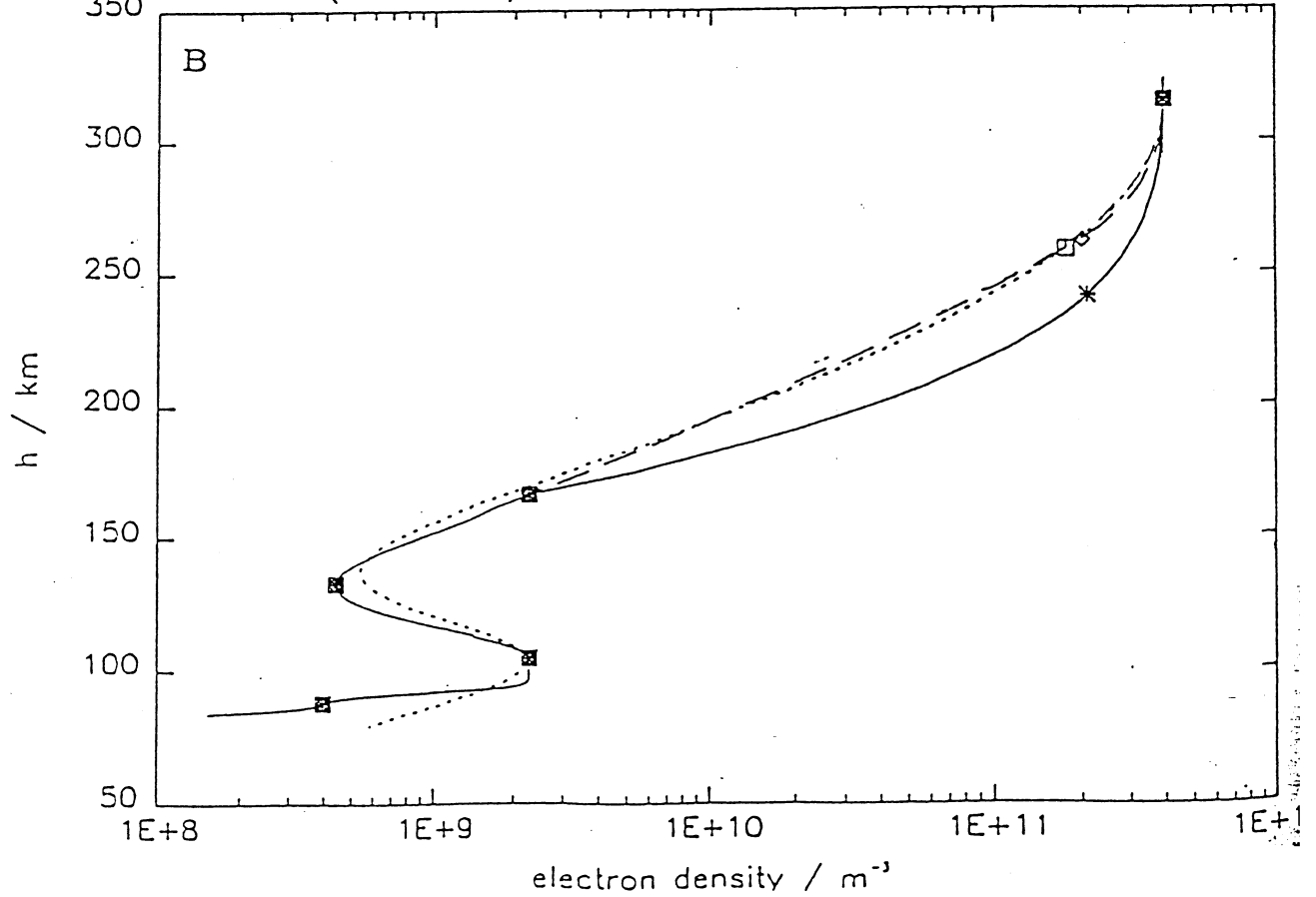
Lima (Modip=2), April, Rz12=50



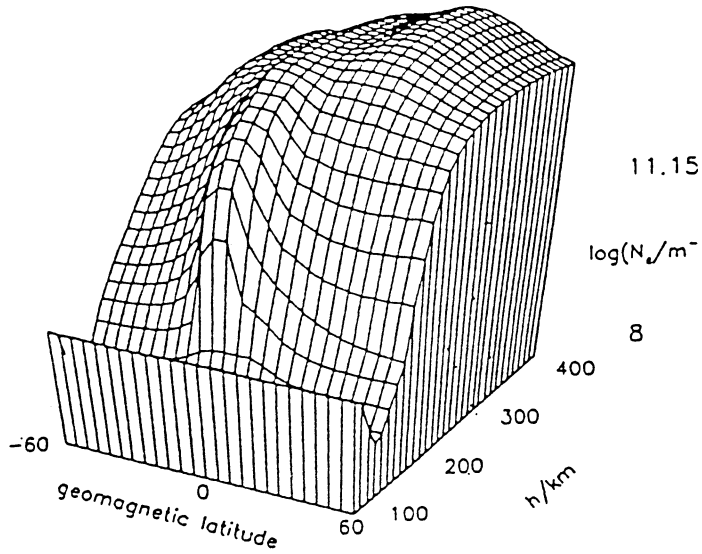
BOSTON (72W,43N) MODIP=55 L.T.=12 JULY Rz12=50



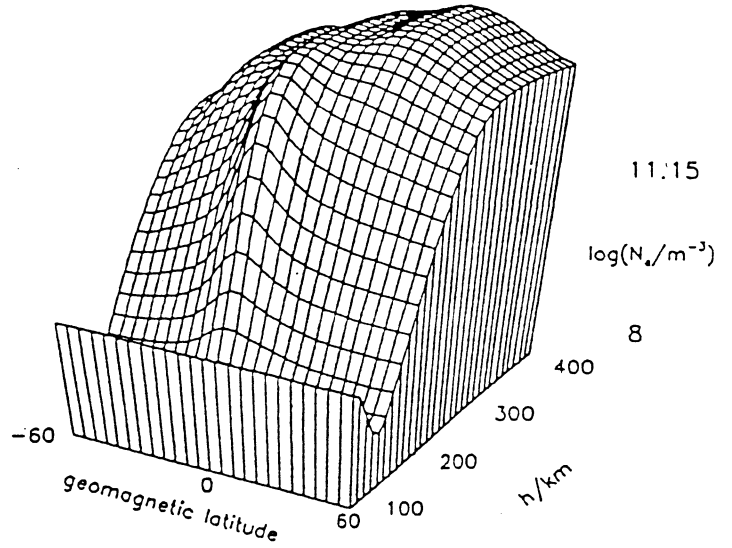
BOSTON (72W,43N) MODIP=55 L.T.=0 JULY Rz12=50



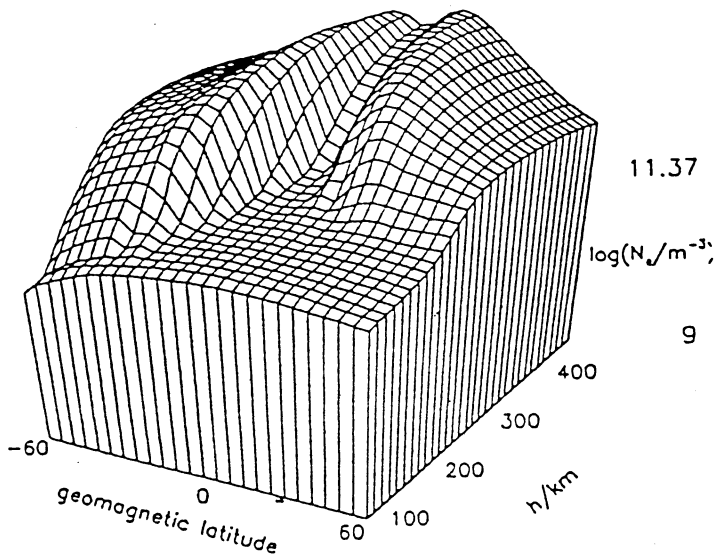
IRI-86, L.T.=0, July, Rz12=50



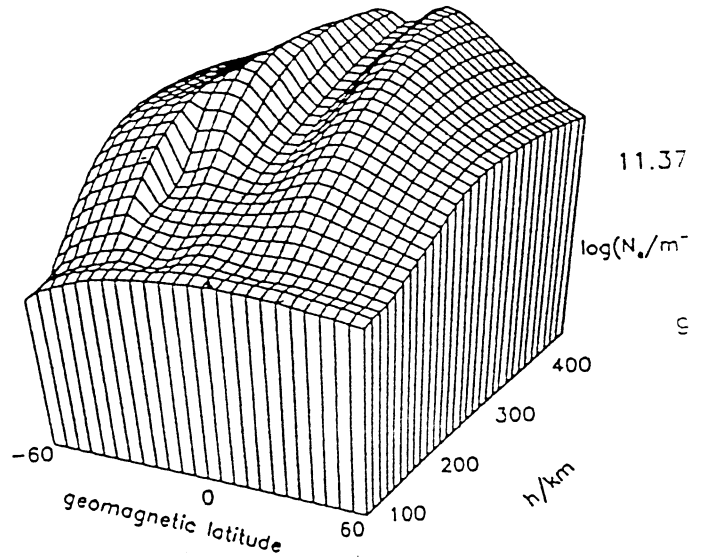
IRI-ANA, L.T.=0, July, Rz12=50



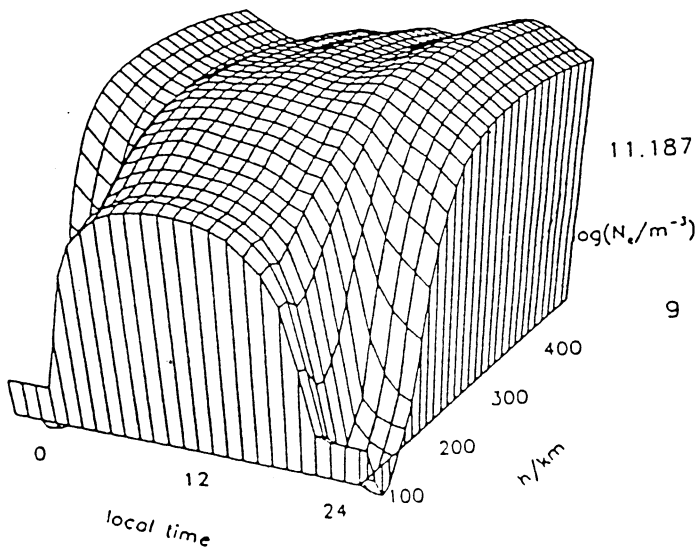
IRI-86, L.T.=12, April, Rz12=50



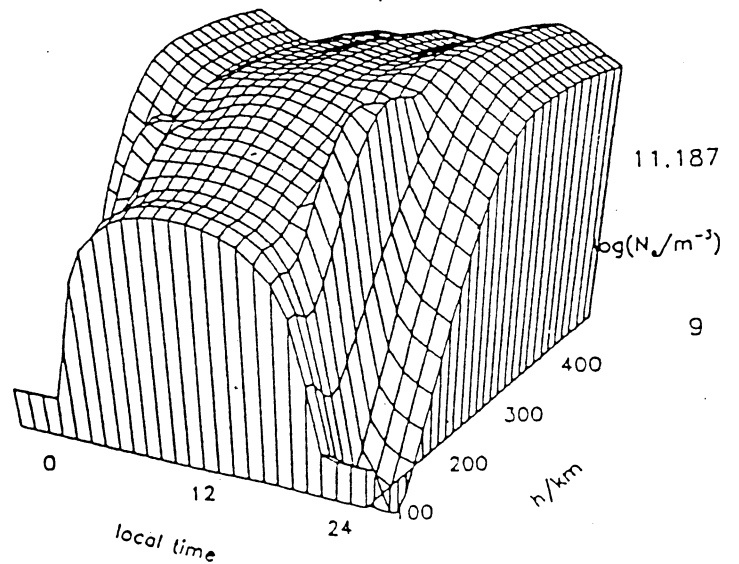
IRI-ANA, L.T.=12, April, Rz12=50



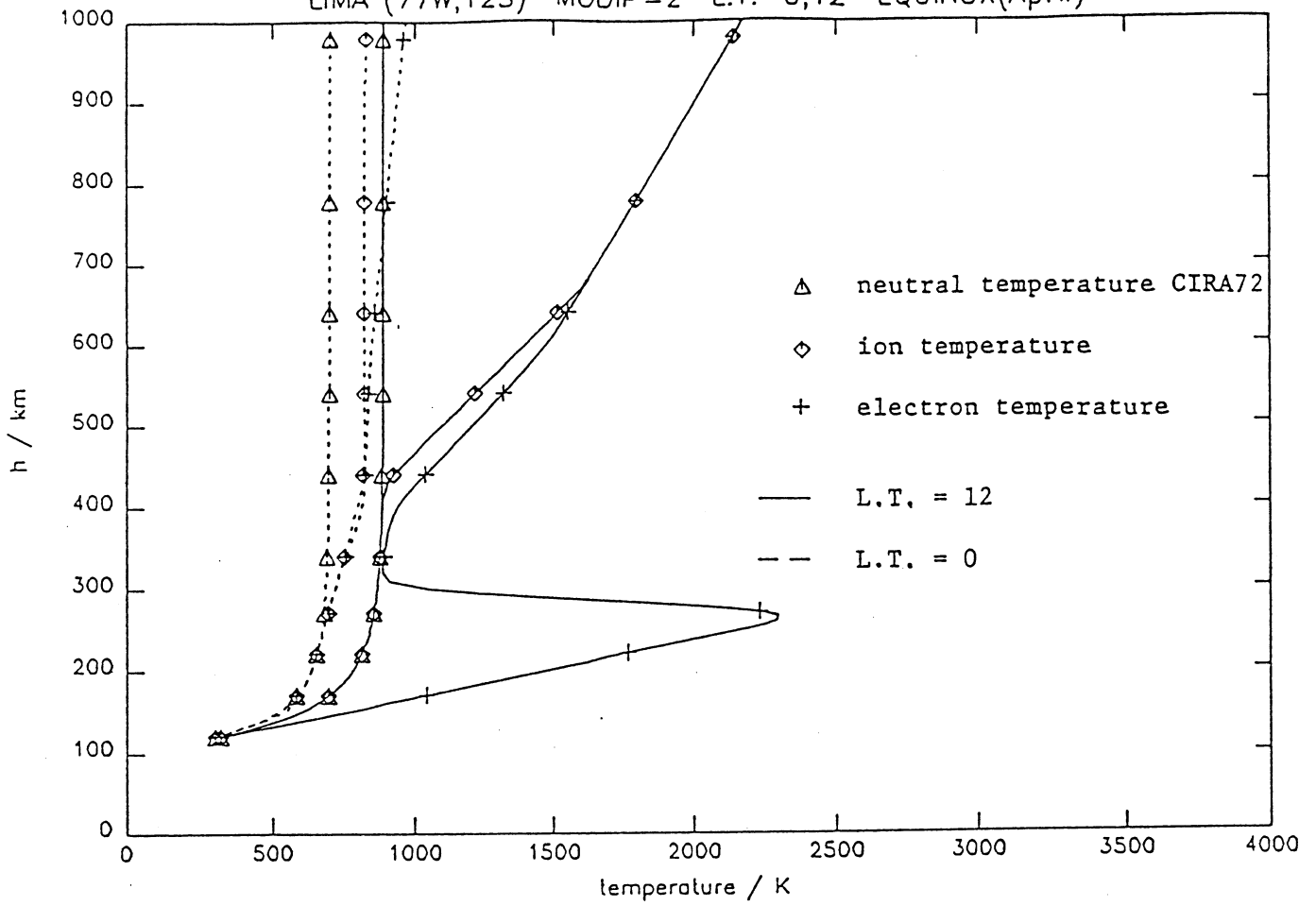
IRI-86, Boston(Modip=56), July, Rz12=50



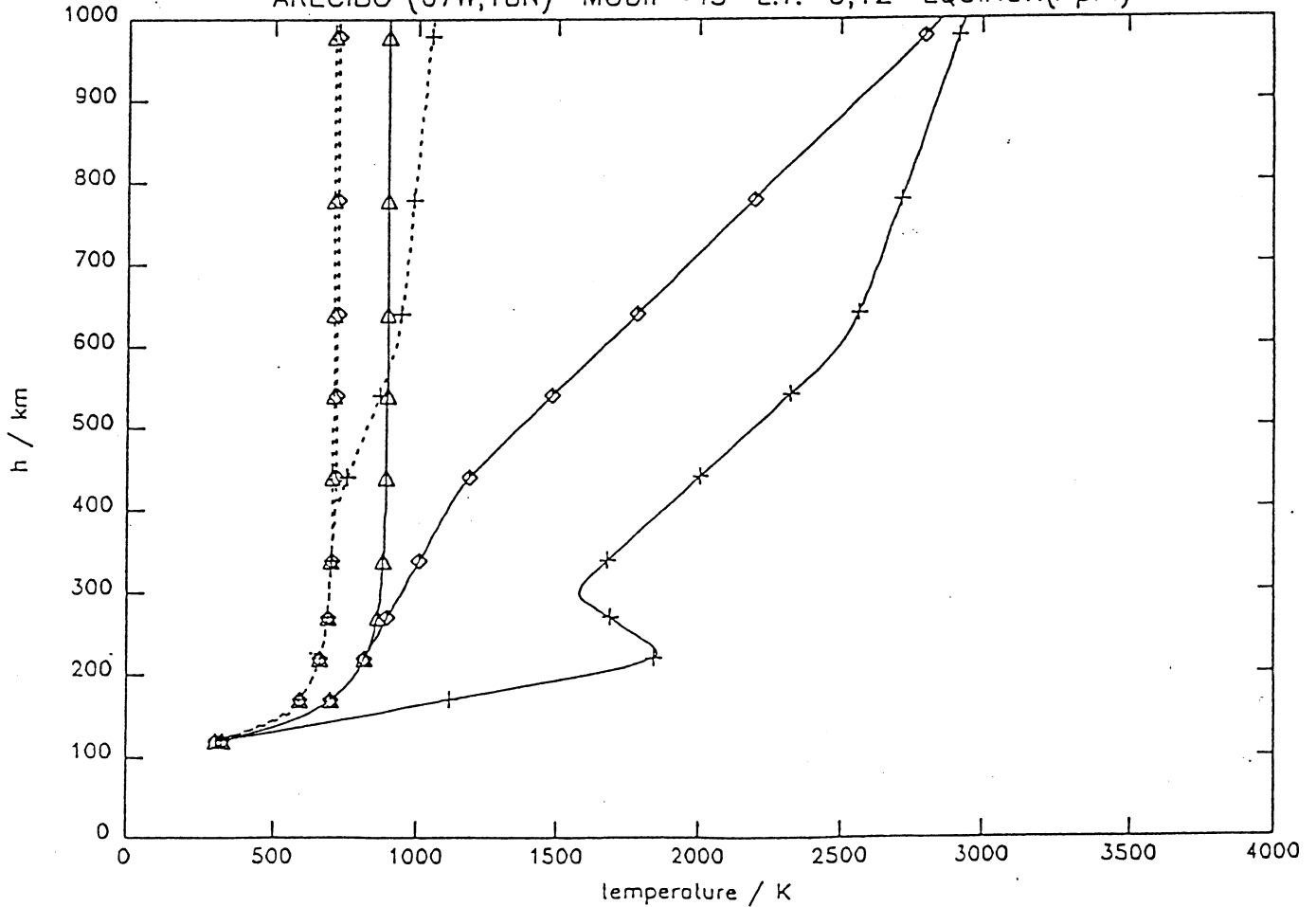
IRI-ANA, Boston(Modip=56), July, Rz12=50

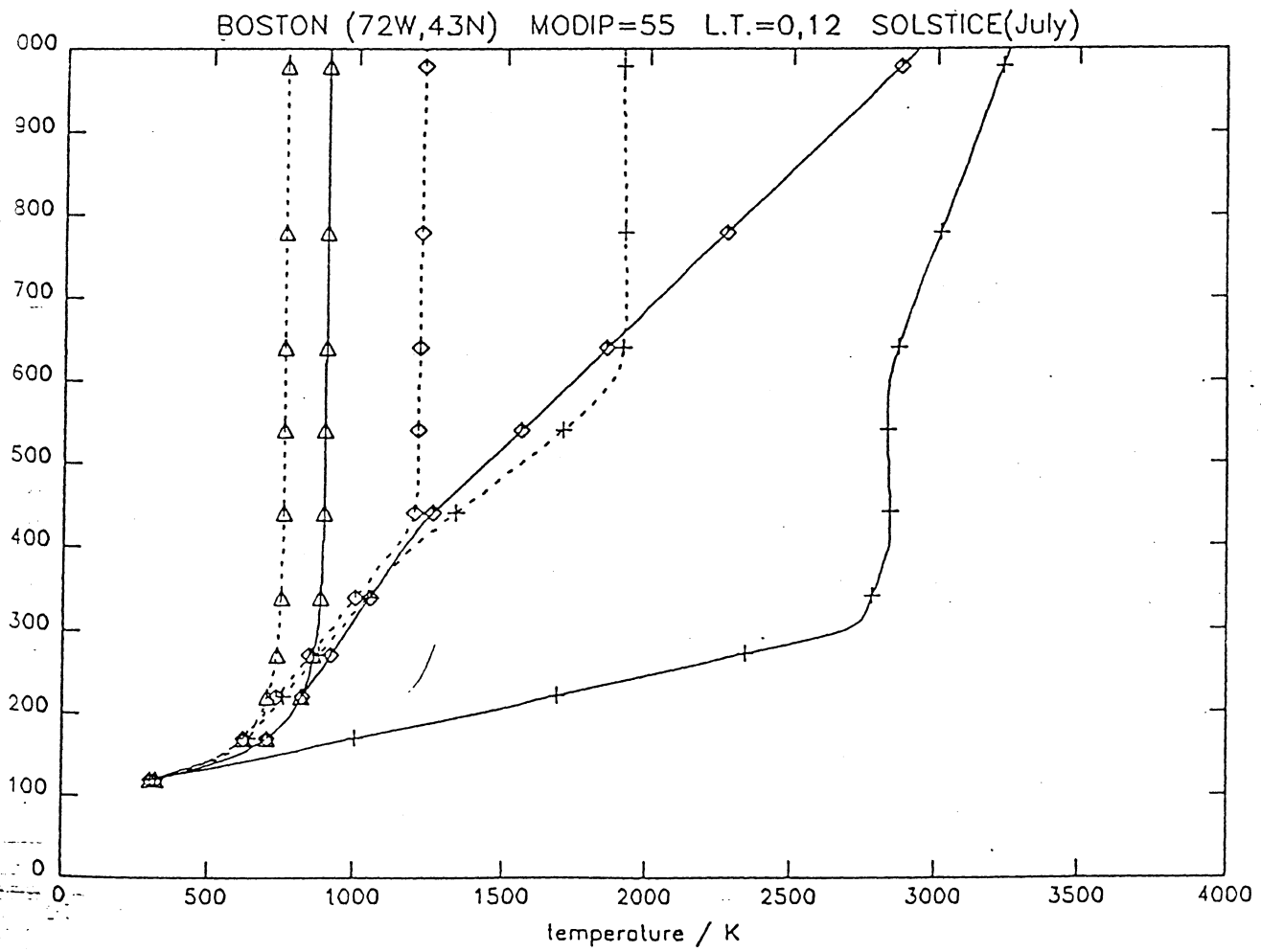
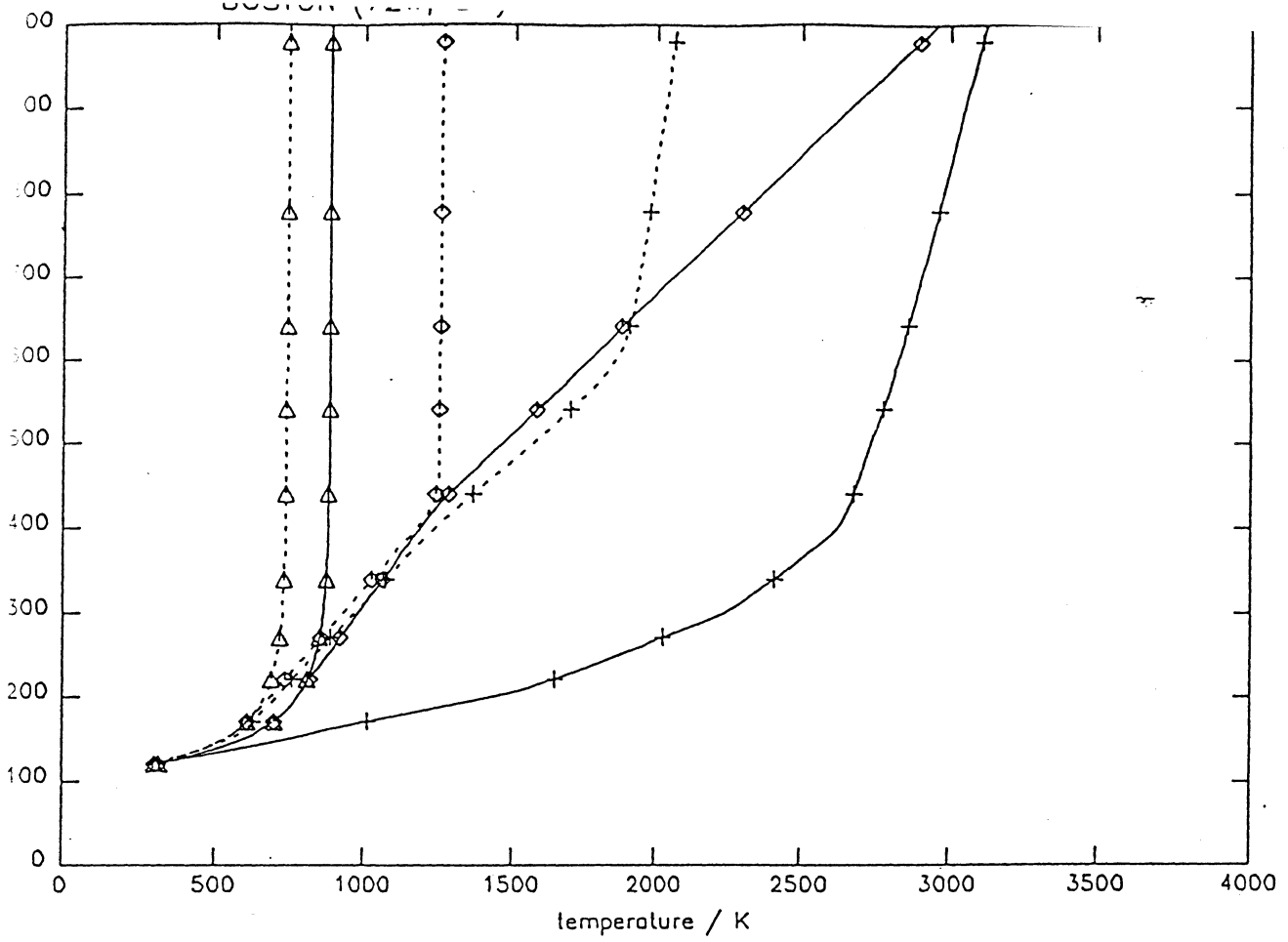


LIMA (77W,12S) MODIP=2 L.I.=0,12 EQUINOX(April)

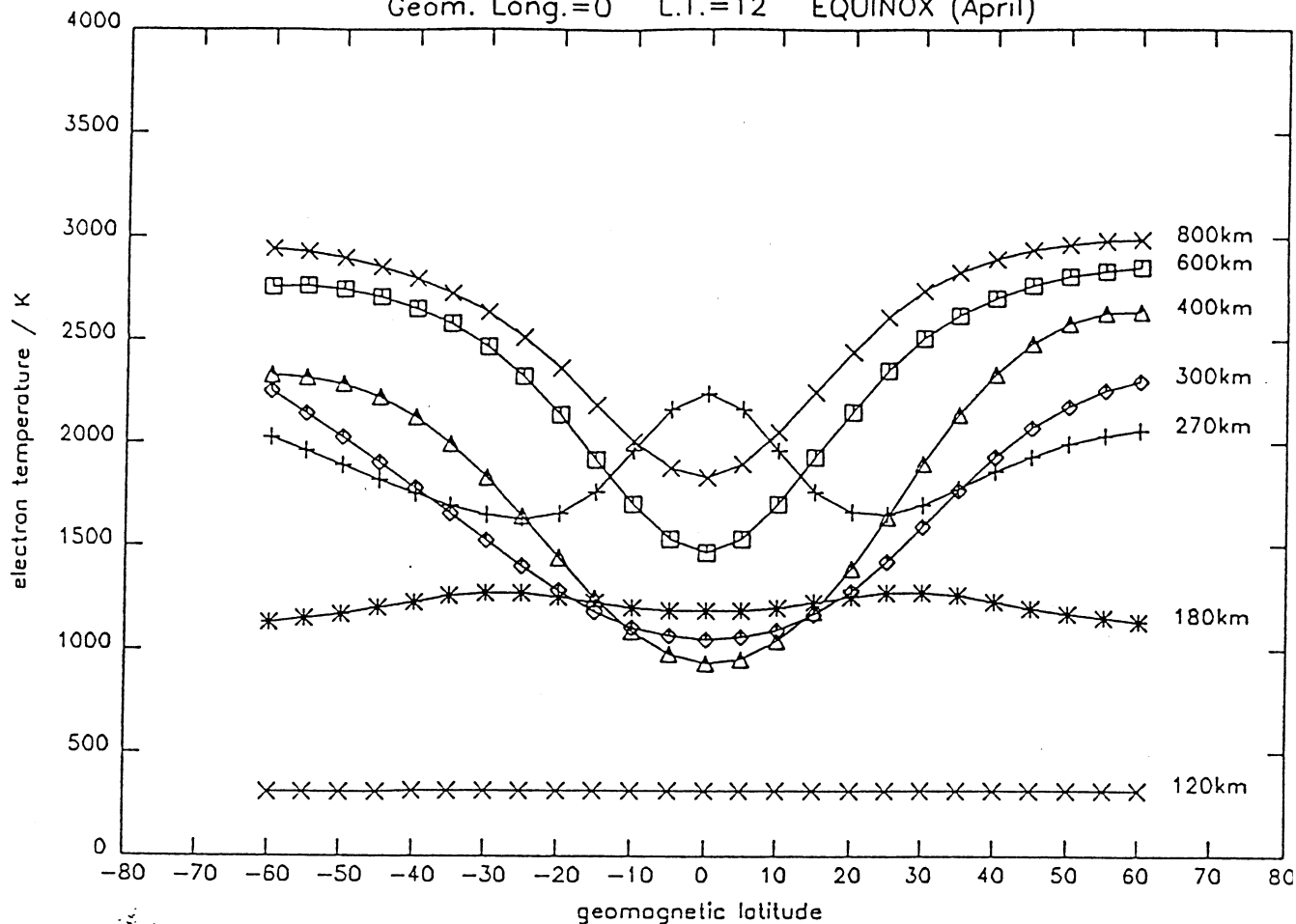


ARECIBO (67W,18N) MODIP=43 L.T.=0,12 EQUINOX(April)

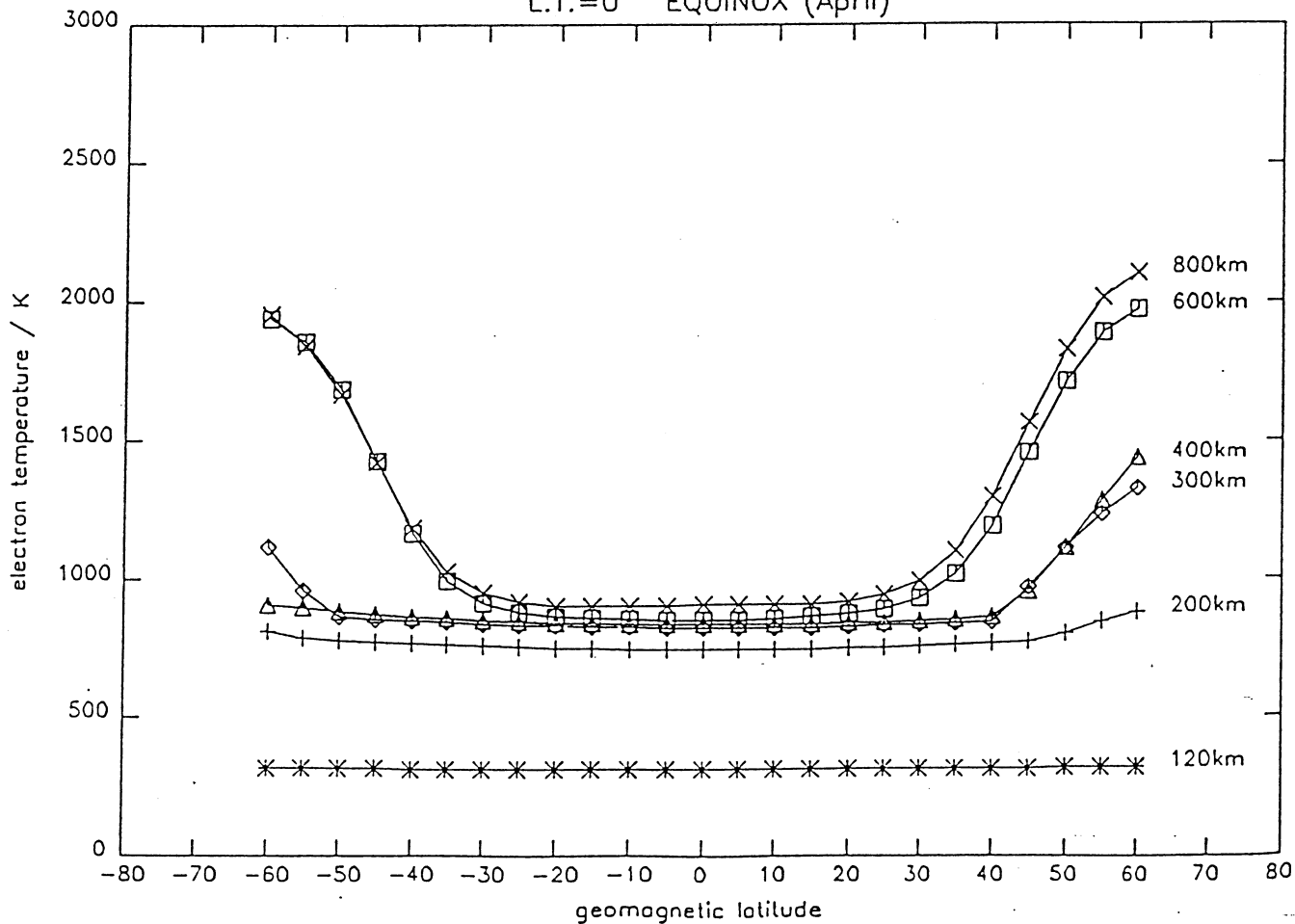


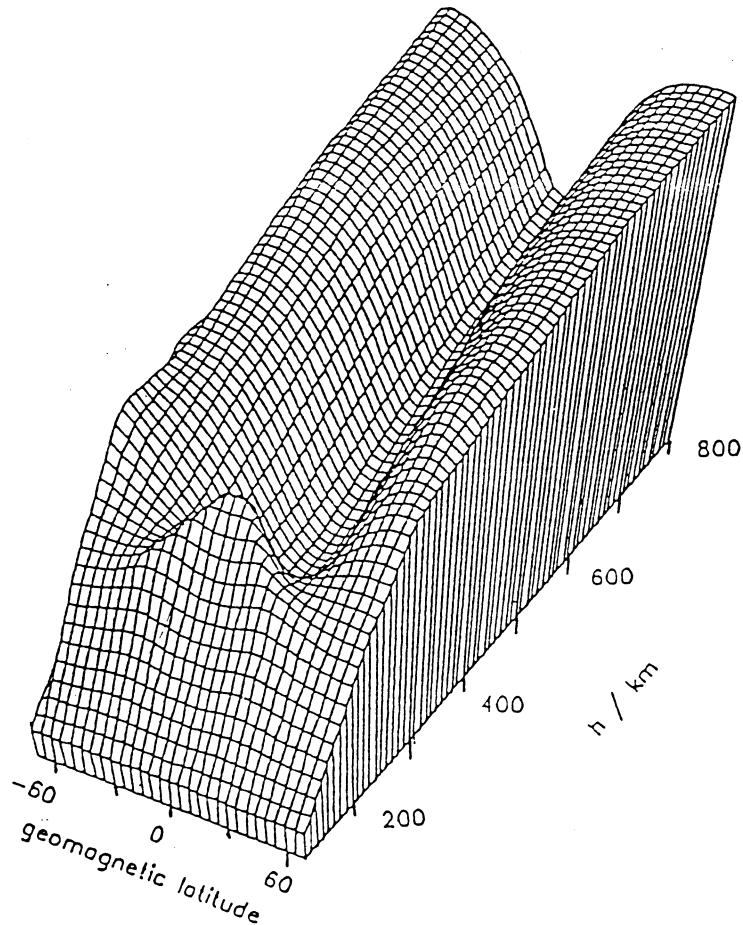
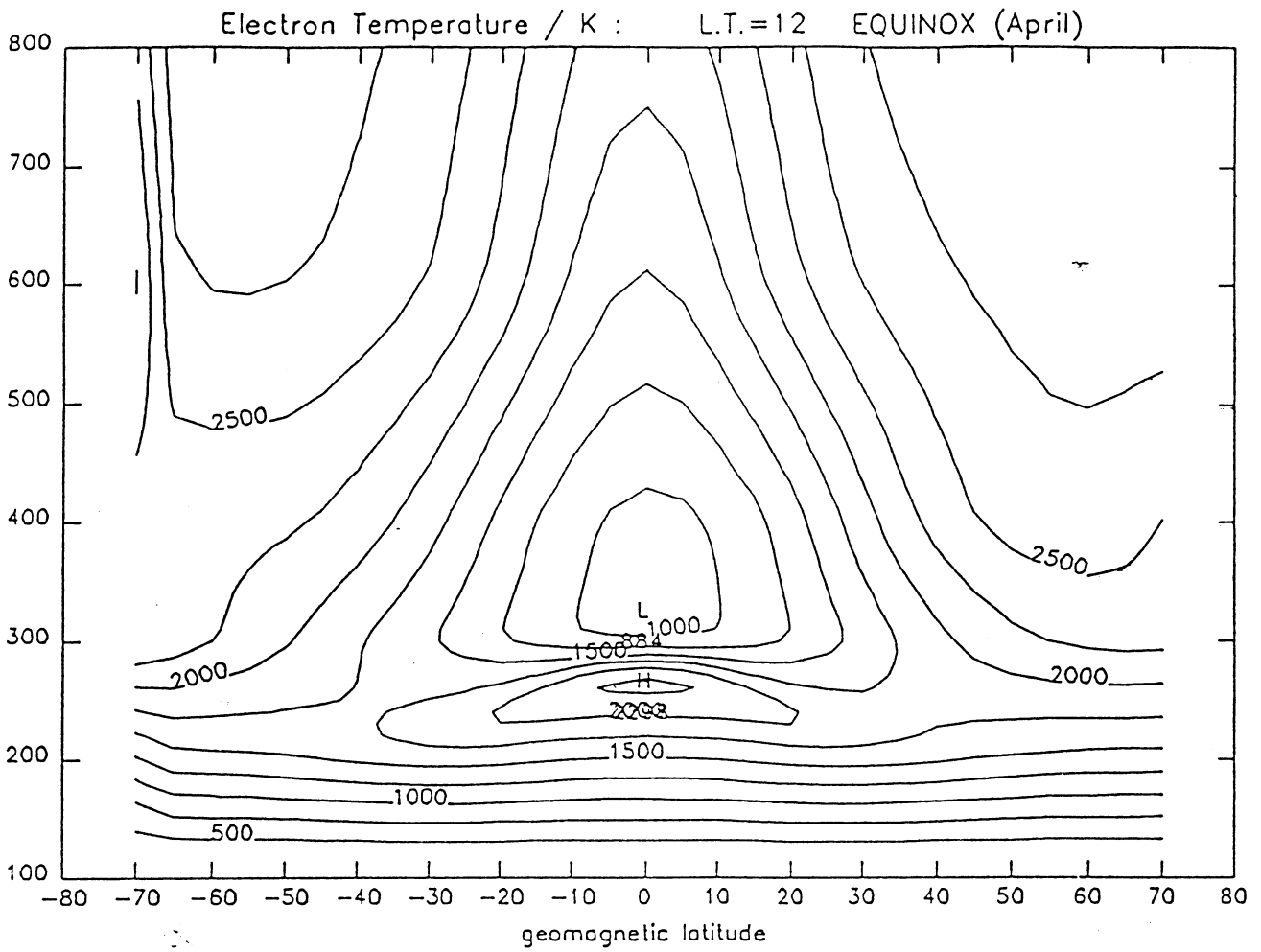


Geom. Long.=0 L.T.=12 EQUINOX (April)

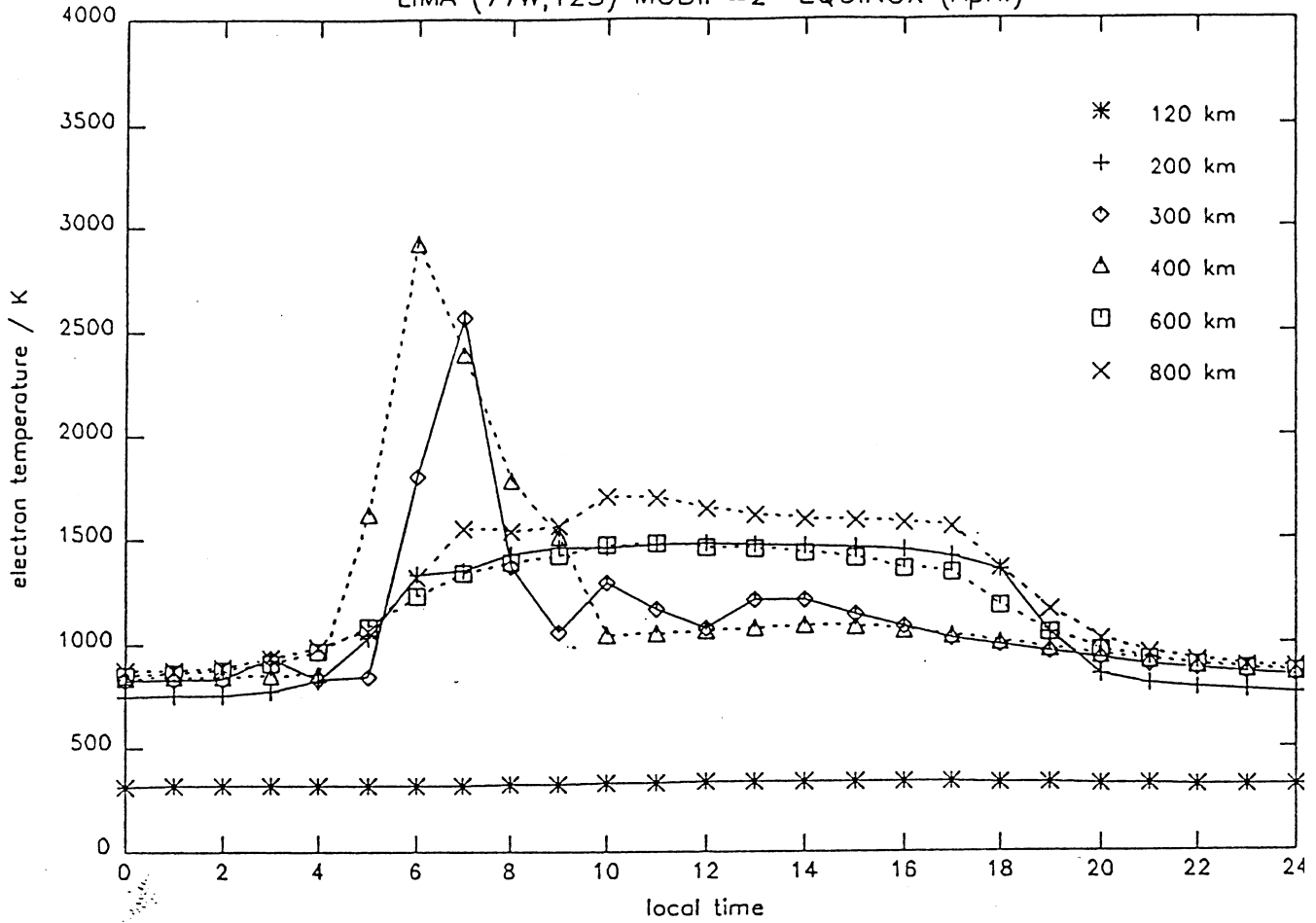


L.T.=0 EQUINOX (April)

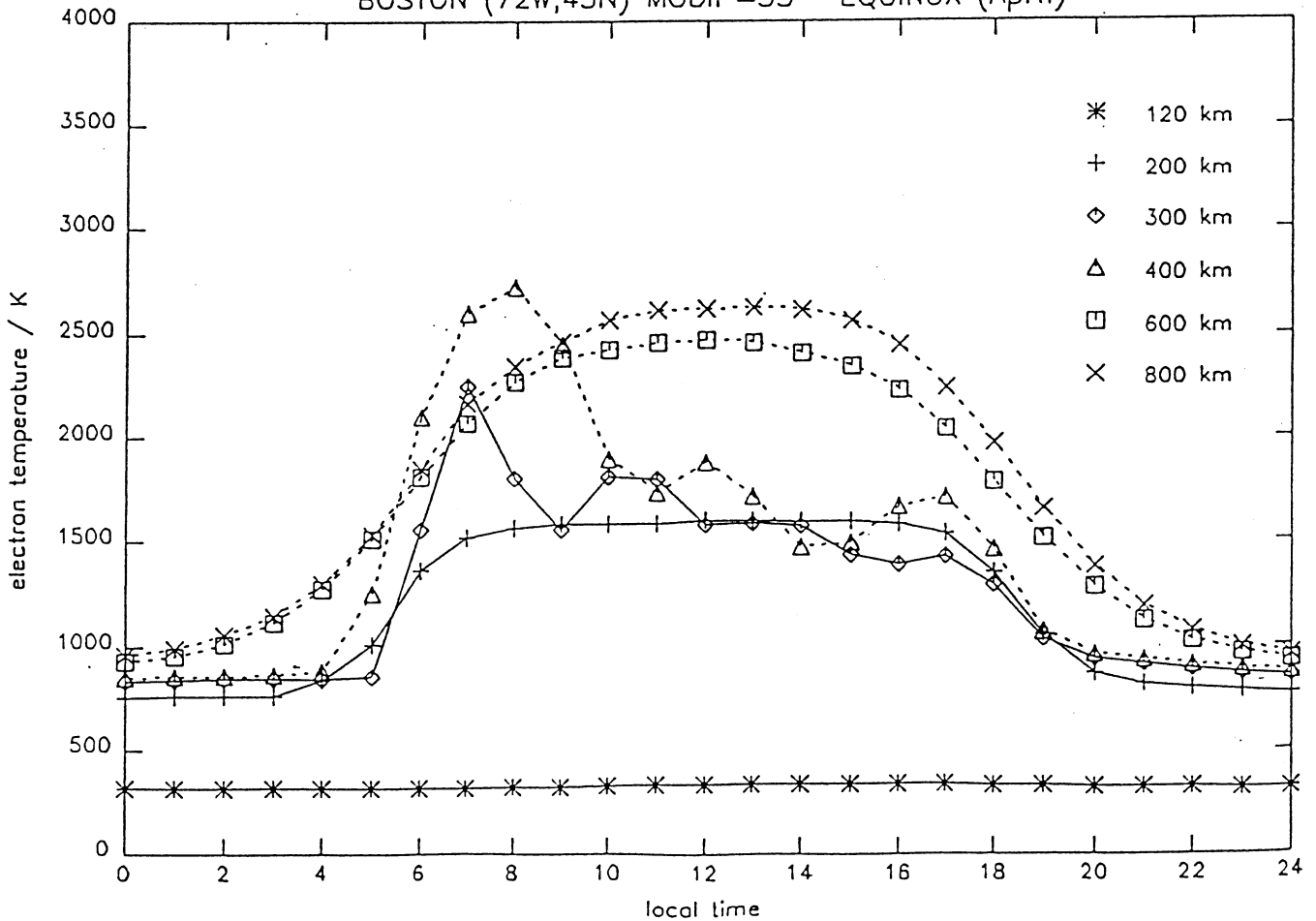




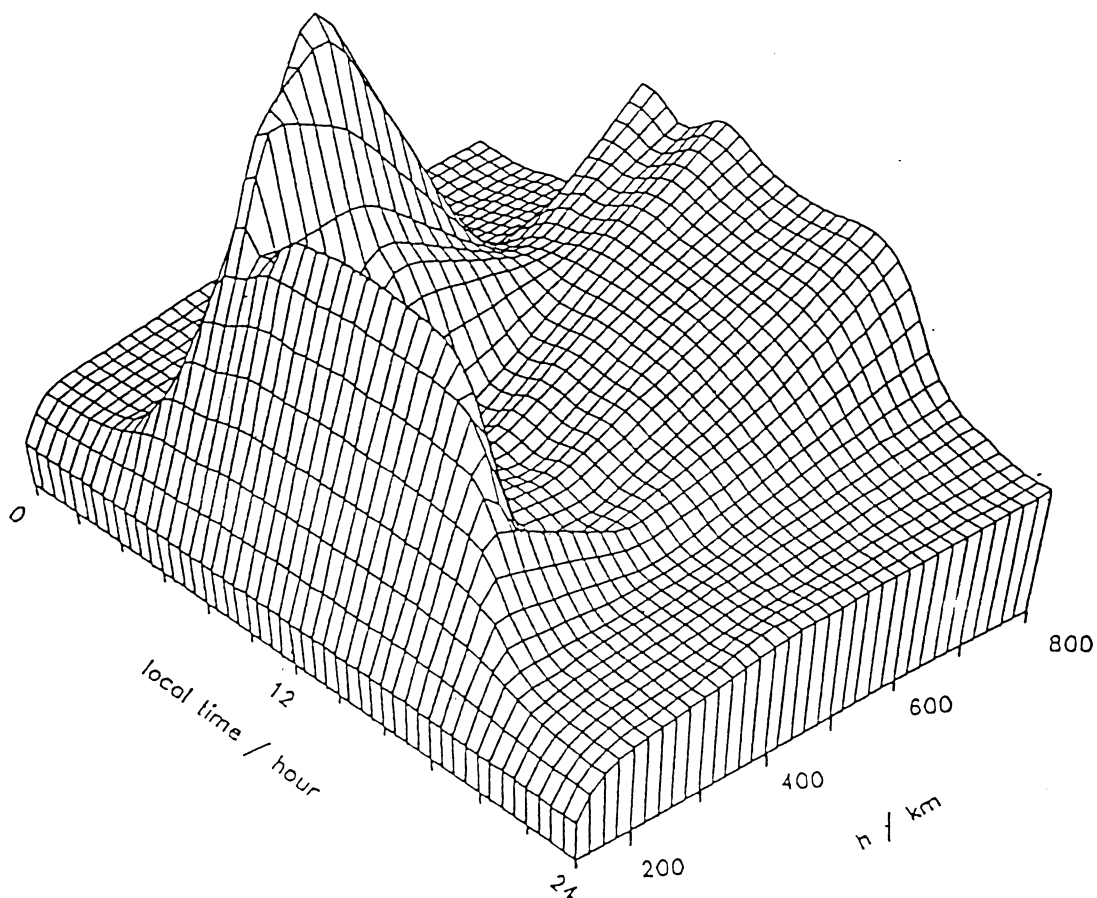
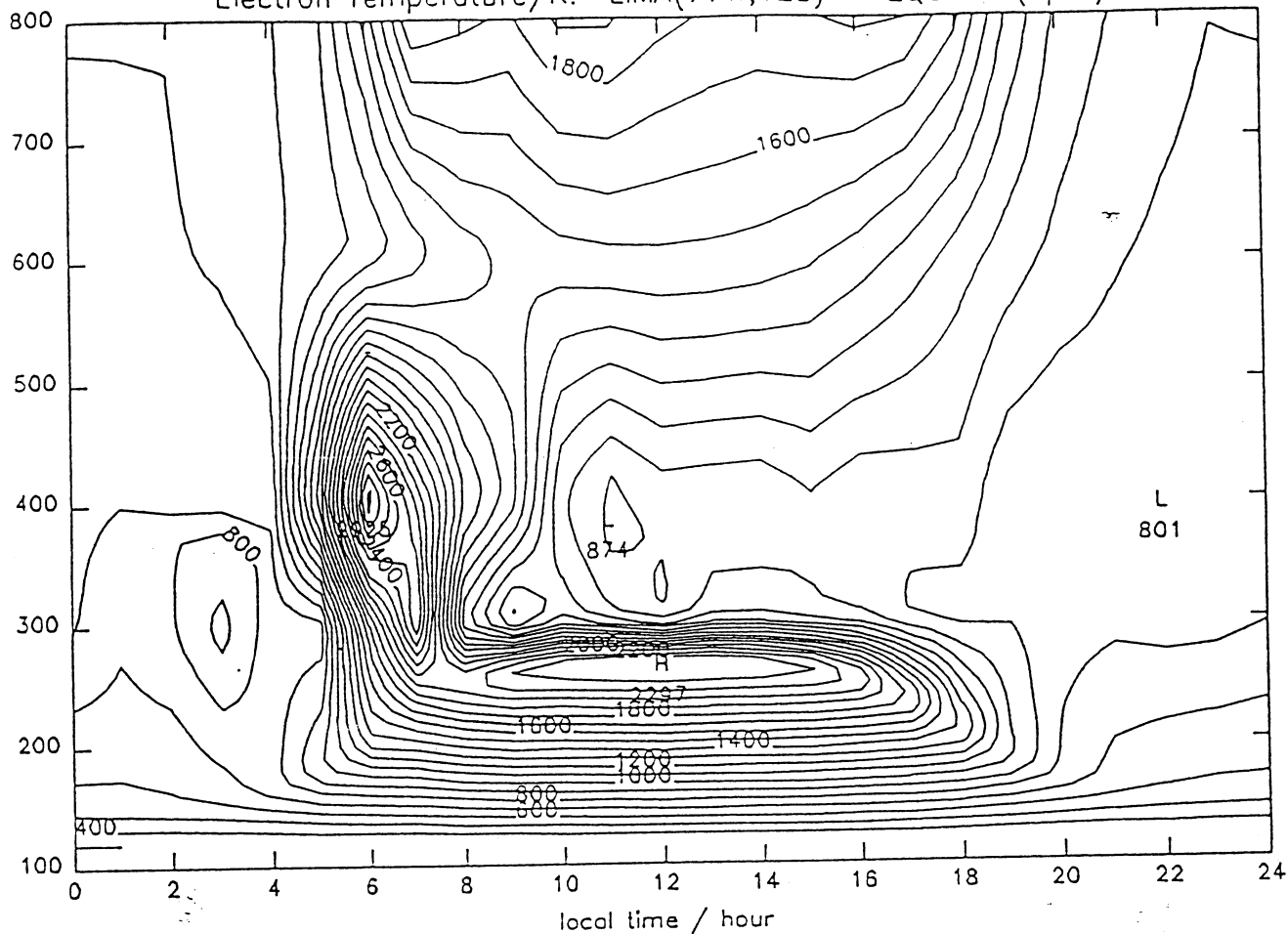
LIMA (77W,12S) MODIP=2 EQUINOX (April)



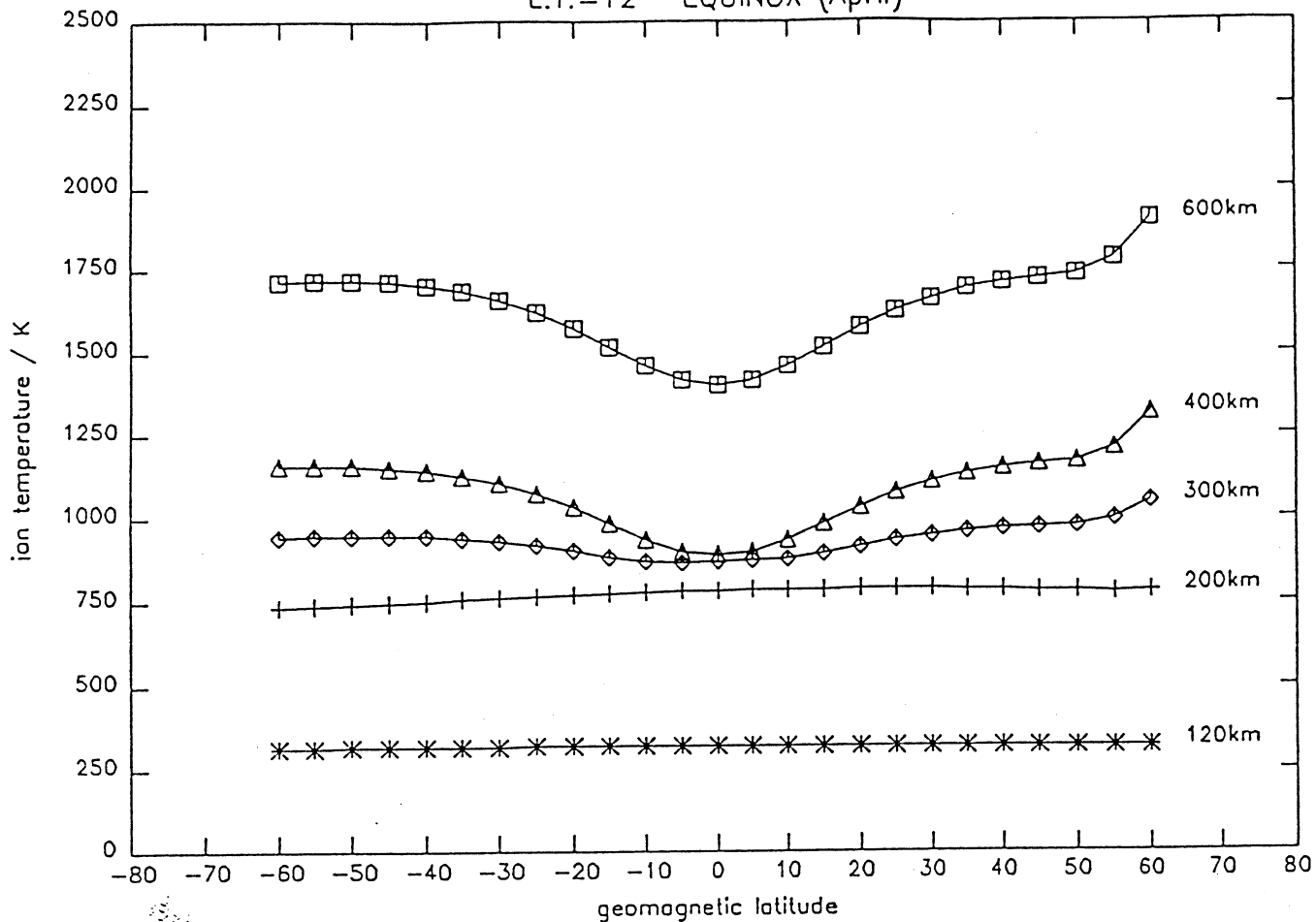
BOSTON (72W,43N) MODIP=55 EQUINOX (April)



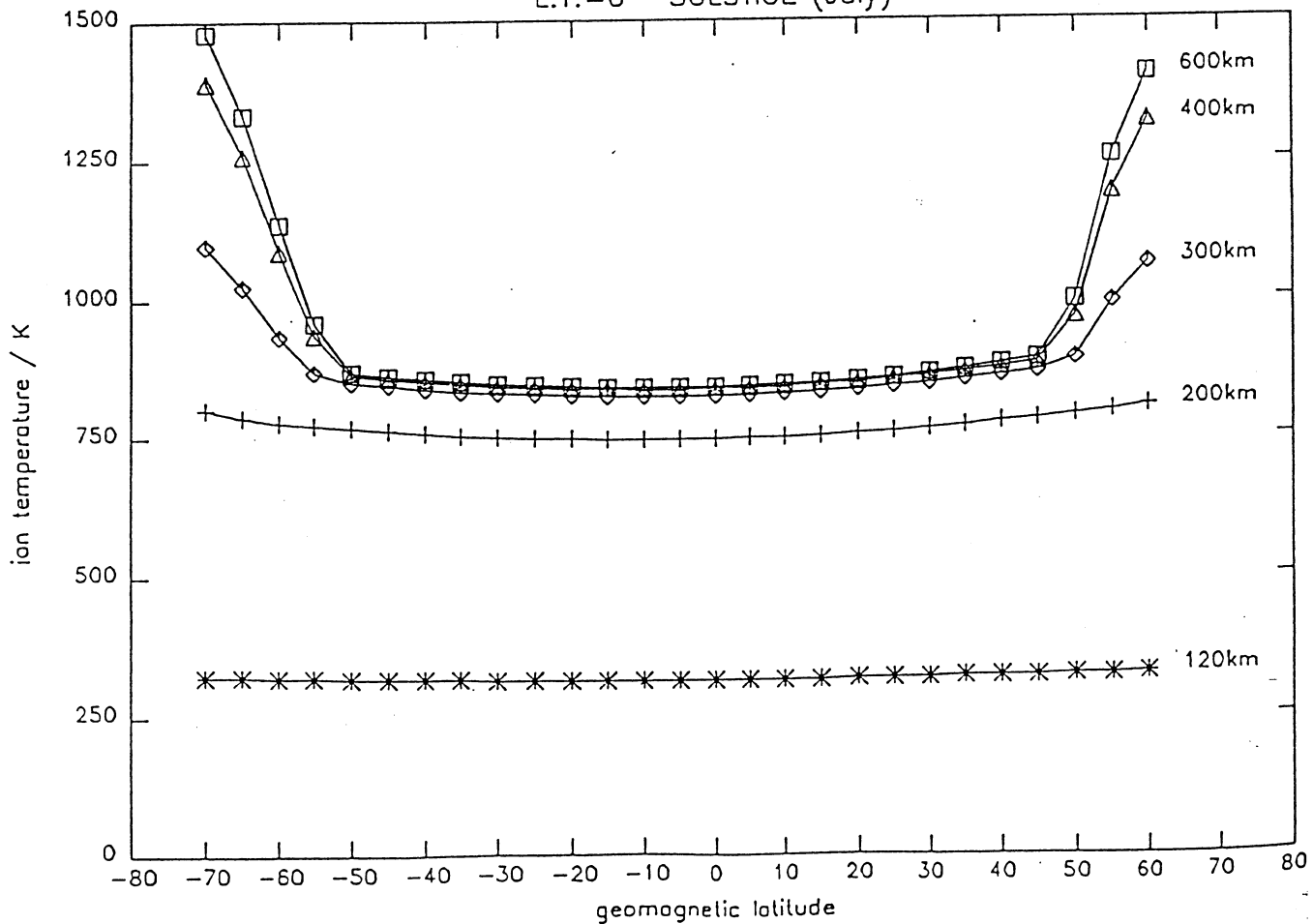
Electron Temperature/K: LIMA(77W,12S) EQUINOX(April)



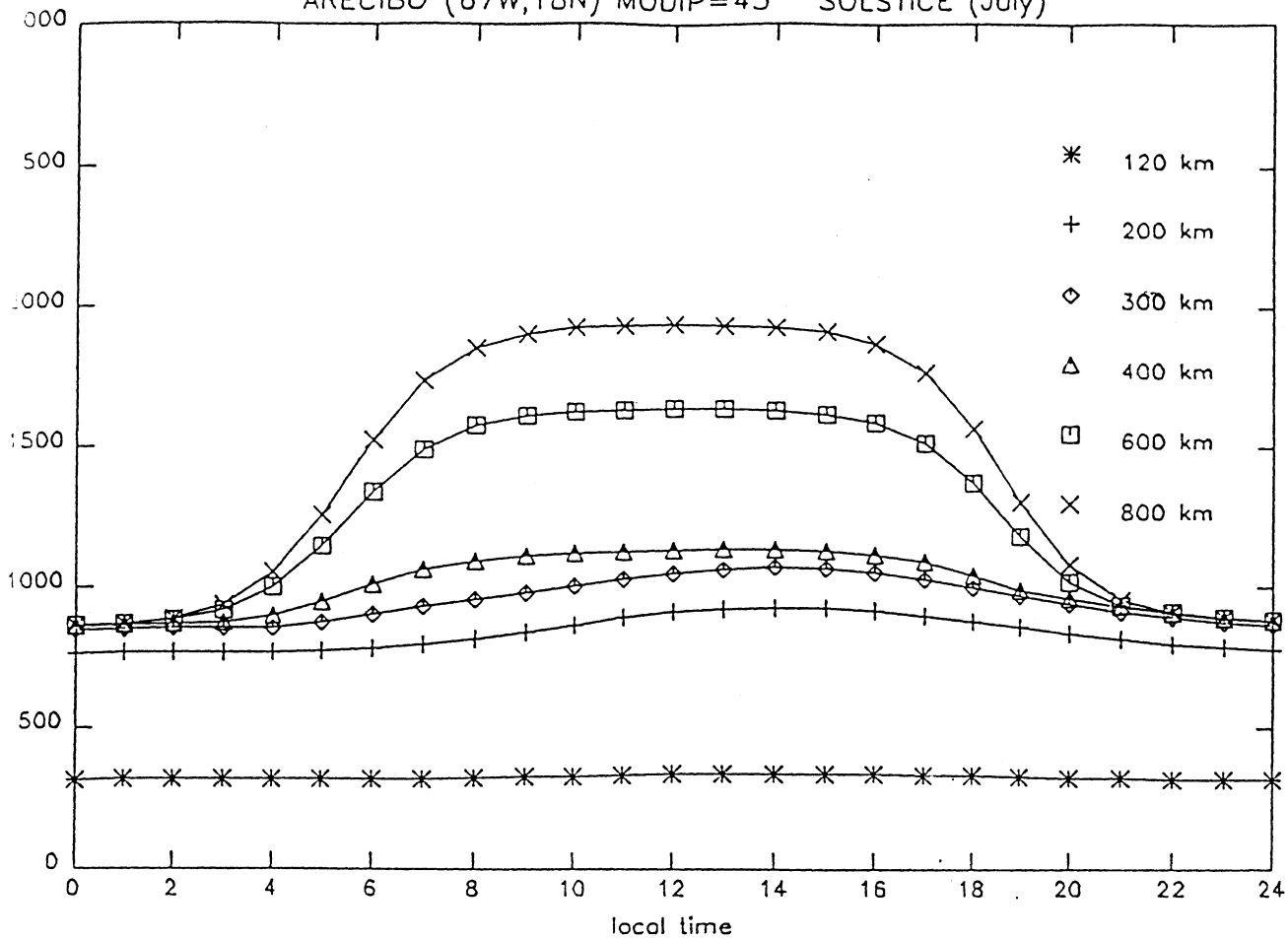
L.T.=12 EQUINOX (April)



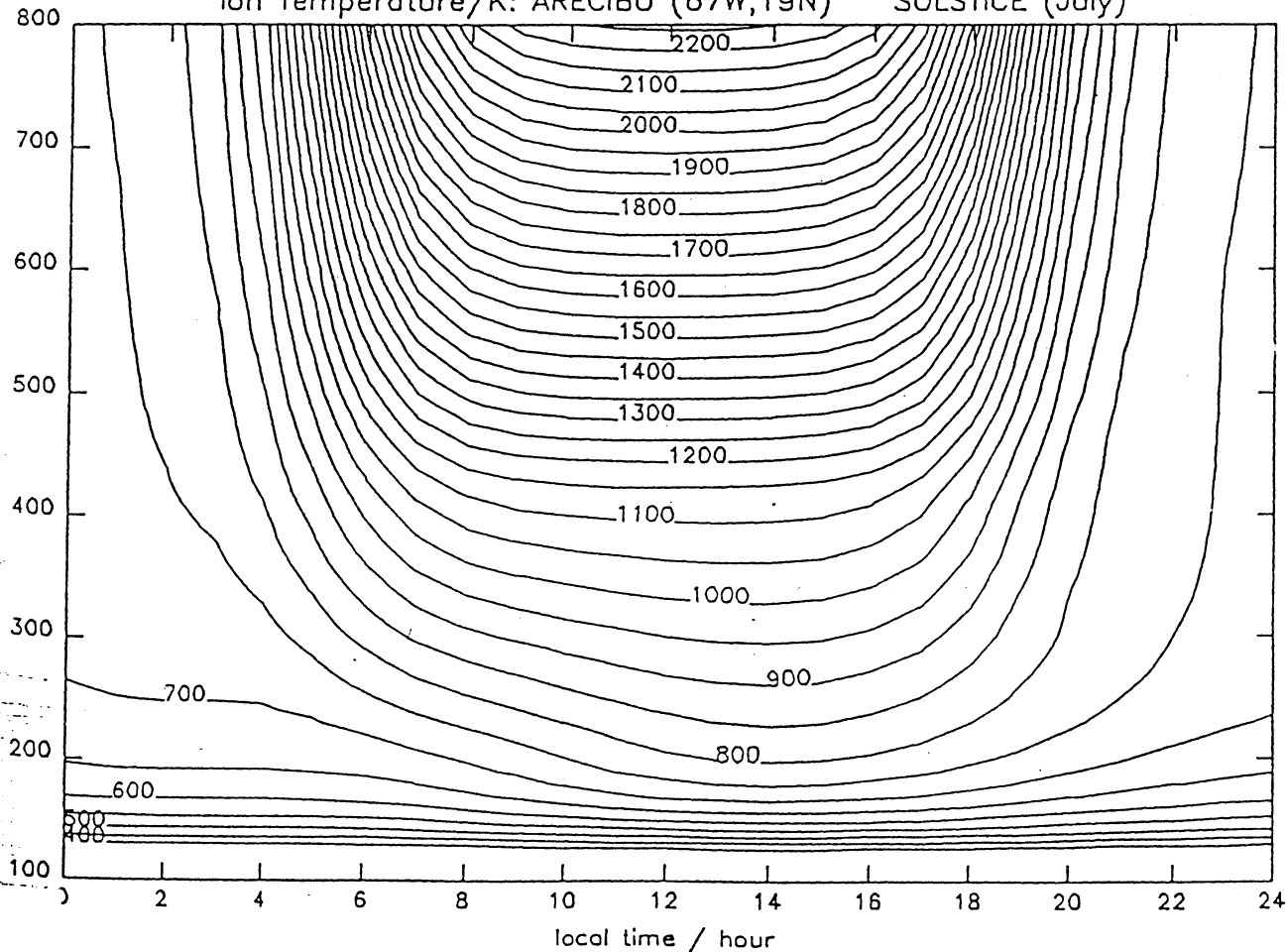
L.T.=0 SOLSTICE (July)

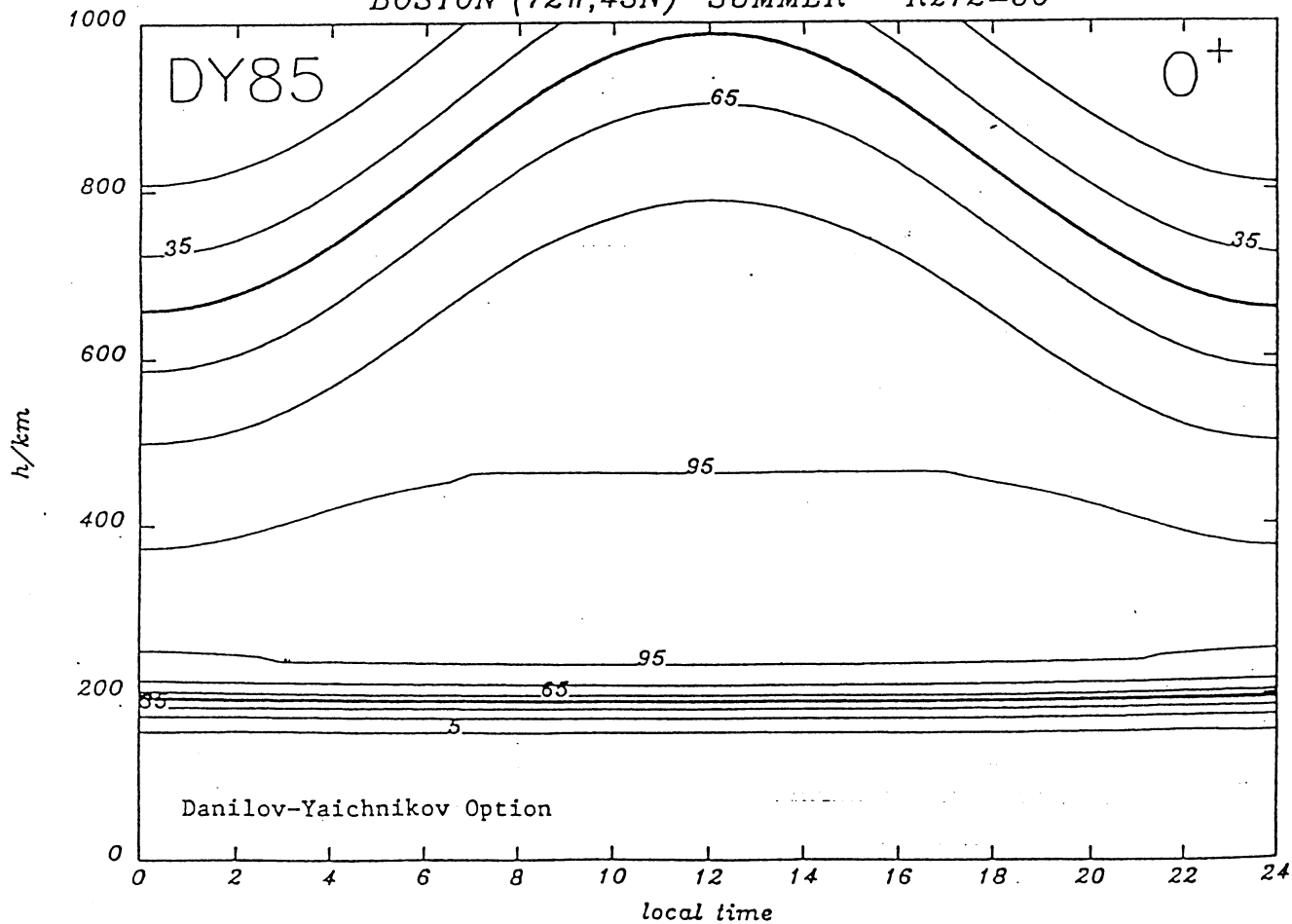
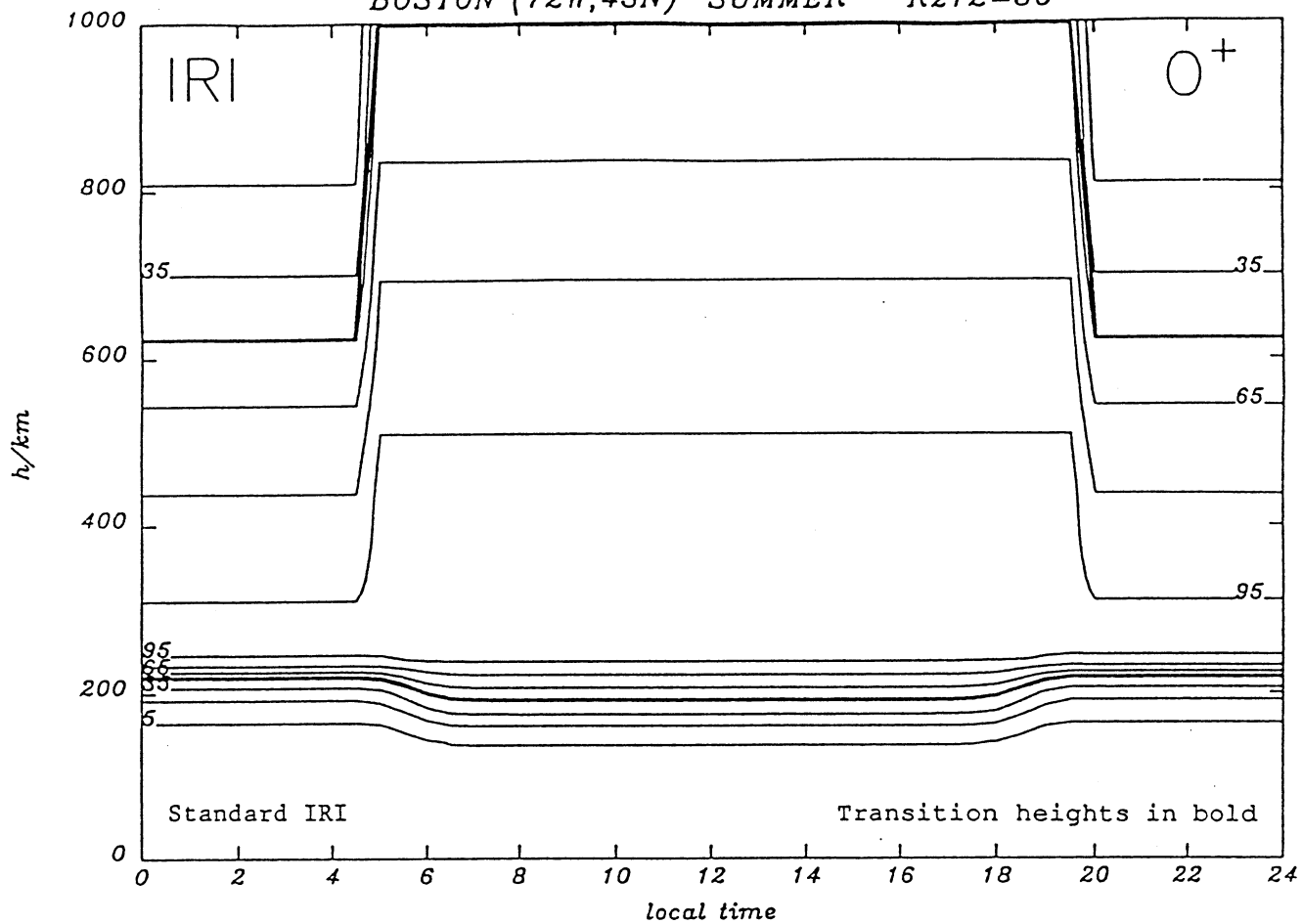


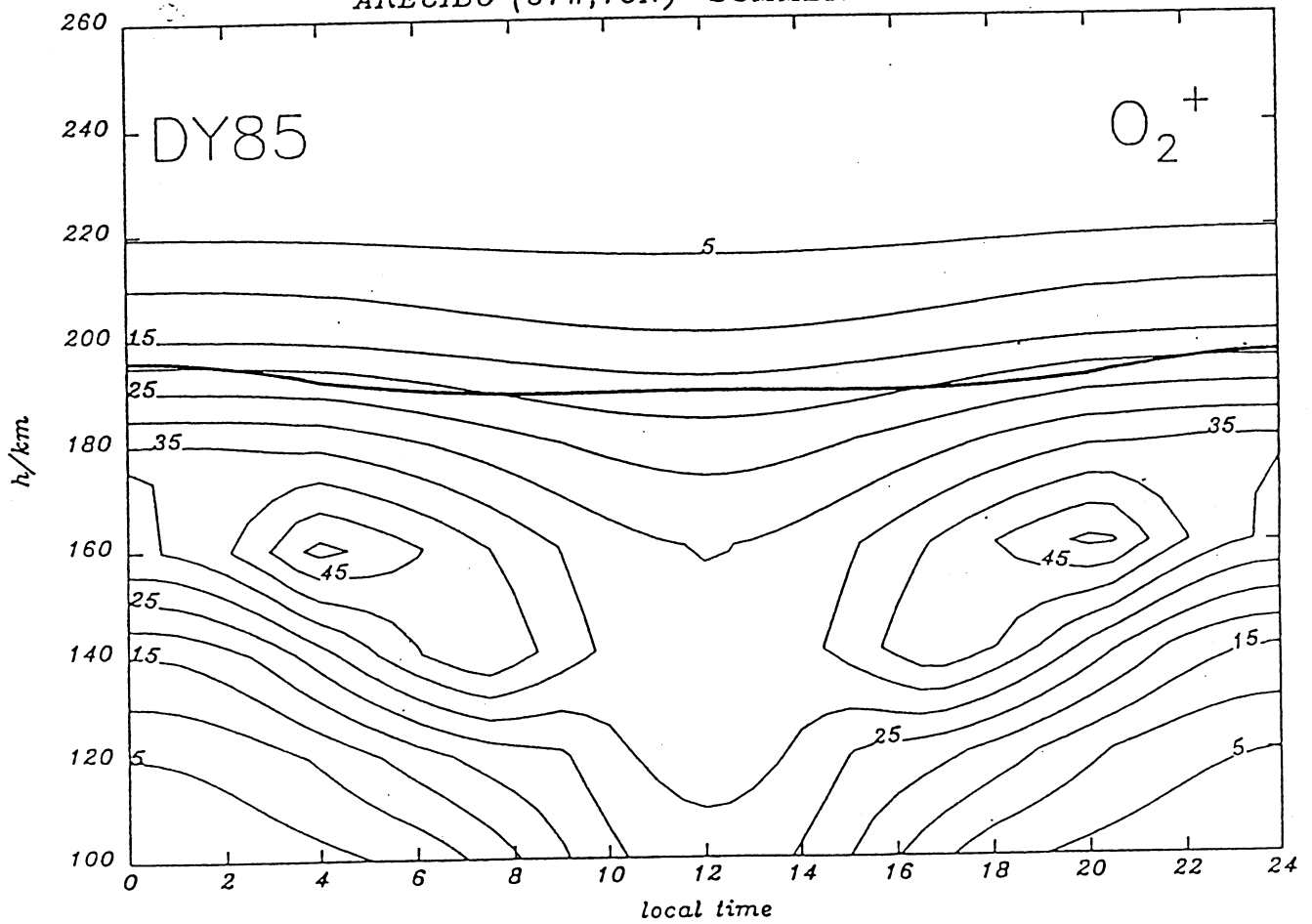
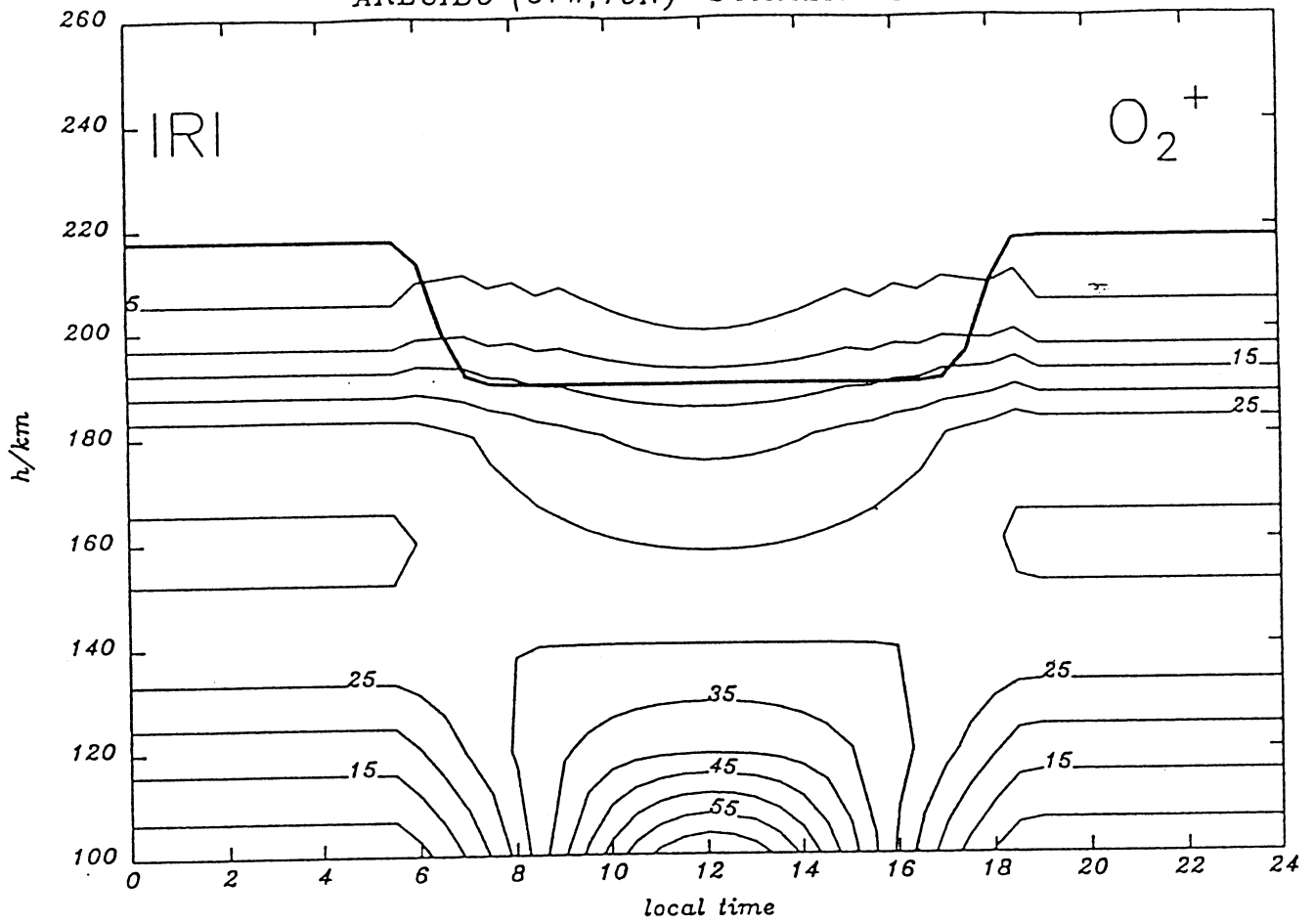
ARECIBO (67W,18N) MODIP=43 SOLSTICE (July)



Ion Temperature/K: ARECIBO (67W,19N) SOLSTICE (July)







Chapter 5

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5.1 INTERNATIONAL REFERENCE IONOSPHERE 1979

K. Rawer, J. V. Lincoln, and R. O. Conkright (eds.)
World Data Center A for Solar-Terrestrial Physics, Report UAG-82, 245 pages,
Boulder, Colorado, 1981.

1. Contributed Papers

- 1.1 Introduction to IRI 1979
K. Rawer
- 1.2 Electron Density in the D-Region as Given by the International Reference Ionosphere
D. Bilitza
- 1.3 Models for Ionospheric Electron and Ion Temperature
D. Bilitza
- 1.4 D-Region Positive Ion Concentrations
B. S. N. Prasad and S. Mohanty
- 1.5 Structure and Composition of the Middle Atmosphere Ionized Component
F. Arnold
- 1.6 References to Contributed Papers

2. Technical Note Concerning the Main Programs

3. Formulas

4. Examples

- 4.1 Tables—3 hours/3 seasons/2 levels of solar activity/6 locations
- 4.2 Figures—2 hours/2 seasons/2 levels of solar activity/9 latitudes

5. FORTRAN Program

- 5.1 Subroutine IONDEM

5.2 Experience With and Proposed Improvements of the International Reference Ionosphere

K. Rawer and C. M. Mittl (eds.)
World Data Center A for Solar-Terrestrial Physics, Report UAG-90, 235 pages,
Boulder, Colorado, 1984.
Proceedings of the 1980 IRI Workshop in Budapest (Hungary).

1. Electron Density Profile

1.1 D- and E-Region

- 1.1.1 D- and Lower E-Region Electron Density Profiles Compared with LF and MF Absorption Data
W. Singer, J. Taubenheim, and J. Bremer
- 1.1.2 D- and Lower E-Region Electron Density Profiles Compared with LF and VLF Reflection Data
Y. V. Ramanamurty
- 1.1.3 Comparison of Ionospheric Electron Density Models Using Data from a Mid-Latitude Absorption Path
M. Friedrich and K. M. Torkar

1.2 Bottomside F-Region

- 1.2.1 Critical Comparison of IRI with Information Obtained from Bottomside Ionograms
T. L. Gulyaeva
- 1.2.2 Comparison of IRI with Measurement of $N(h)$ Profiles in the Bottomside Ionosphere
V. M. Sinel'nikov, G. P. L'vova, T. L. Gulyaeva, S. V. Pakhomov, and A. P. Glotov
- 1.2.3 Comparison of IRI with Electron Density Profiles Obtained Below 200 km by Different Methods
Y. K. Chasovitin, A. D. Danilov, S. M. Demykin, T. L. Gulyaeva, V. I. Ivanov, V. G. Khriukin, A. A. Nikitin, L. L. Sukhacheva, V. B. Shushkova, and S. P. Tikhomirov
- 1.2.4 Comparison of IRI-78 with IZMIRAN's Equinoctial Models
T. L. Gulyaeva, A. G. Israetel, T. Y. Leshchinskaya, T. N. Soboleva, and E. E. Tzedilina
- 1.2.5 Bottomside Electron Density Profile Measurement by Rocket Borne Probes over the Equator
S. P. Gupta

1.3 Topside

- 1.3.1 Rocket and Satellite Measurements Compared with the IRI-79 Electron Density Profiles
E. Neske, S. Ramakrishnan, and C. Rebstock
- 1.3.2 Comparison Between Plasma Densities Measured with the AEROS-B and S3-1 Satellites and the IRI Model
C. R. Philbrick, P. Lämmerzahl, E. Neske, and A. Dumbs
- 1.3.3 Comparison of Theoretical Electron Density Profiles at the Magnetic Equator with IRI Model and Incoherent Scatter Data
T. Y. Leshchinskaya and A. V. Mikhailov
- 1.3.4 Intercomparison of Various Measurements of Thermal Plasma Densities at and Near the Plasmapause
D. V. Williams, M. J. Rycroft, A. J. Smith, V. V. Bezrukikh, K. I. Gringauz, N. C. Maynard, M. J. Morgan, and T. W. Thomas
(This paper was withdrawn by the authors.)
- 1.3.5 Comparison with IRI of Electron Density and Temperature at the Magnetic Equator
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- 1.4.1 Variability of the Equatorial F-Region
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K. Hirao
- 2.1.3 Verification of the International Reference Ionosphere on Electron Temperature Profiles Obtained by Various Methods Below 200 km
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- 2.1.4 Electron Temperature Modeling in the F-Region and Topside of the Ionosphere: A Proposal for Improving the IRI
K. K. Mahajan and V. K. Pandey

2.1.5 Estimation of a Model Electron Temperature Distribution
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2.2 Ion and Electron Temperatures

2.2.1 The Atmospheric Explorer C Ionospheric Temperatures:
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*P. Bencze, K. Kovacs, I. Apa'thy, I. Szemerey, V. Afonin,
V. Bezrukih, and N. Shutte*

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Part I - The Ionospheric Satellite Interkosmos-19

*M. M. Gogoshev, A. Kiraga, Z. Klos, K. Kubat,
Y. V. Kushnerevsky, V. V. Migulin, K. B. Serafimov,
P. Triska, M. D. Fligel, and J. Smilauer*

Part II - First Results of a Statistical Evaluation of Electron
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J. Smilauer and V. V. Afonin

2.3.2 Extremely High F-Region Electron Temperatures During the
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*M. Gogoshev, G. Moraitis, T. Gogosheva, B. Komitov,
B. Taneva-Mendava, T. Markova, I. Mendov, T. Pashova,
K. Kunev, and S. Spasov*

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3.1.2 A Proposed Improvement of IRI Using the O⁺ - H⁺
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I. Kutiev, K. Serafimov, M. Karadimov, and K. Heelis

- 3.1.3 Comparison of IRI with Vertical Profiles for Ion and Electron Density and Electron Temperature Deduced on Board Vertical Rockets
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- 3.1.4 Empirical F-Regions Model Development Based on S3-1 Satellite Measurement
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- 3.3.1 Limitations of the IRI-78 Models
S. Ramakrishnan, D. Bilitza, and H. Thiemann
- 3.3.2 Summary and Conclusions Concerning IRI
K. Rawer

4. References

5.3 The Upper Atmospheres of the Earth and Planets

*C. A. Barth, D. Offermann, K. Labitzke, J. I. Vette, K. Rawer, H. A. Taylor (eds.)
Advances in Space Research, Volume 2, Number 10, 183-260, 1982.
Proceedings of the 1982 IRI Workshop in Ottawa (Canada).*

Section 1 — ELECTRON DENSITY PROFILES

Replacement of the Present Sub-Peak Plasma Density Profile by a Unique Expression

K. Rawer

Implementation of a New Characteristic Parameter into the IRI Sub-Peak Electron Density Profile

T. L. Gulyaeva

In Situ Studies of Electron Density During Equatorial Spread-F

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Equatorial F-Region Ionization Differences Between March and September, 1979

A. DasGupta, D. N. Anderson, and J. A. Klobuchar

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Mesospheric Ionization Over Dip Equator at Sunrise

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O. A. Molchanov, O. A. Maltseva, E. E. Titova, V. I. Di, F. Jiricek, and P. Triska

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F. Jiricek and P. Triska

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D. Bilitza

Relationship Between Electron Density and Electron Temperature as a Function of Solar Activity

K. K. Mahajan, V. K. Pandey, and V. C. Jain

Section 5 — ION COMPOSITION

F-Region Ion Composition Modeling

C. R. Philbrick and K. H. Bhavnani

5.4 Toward an Improved International Reference Ionosphere

*K. Rawer, C. M. Minnis, K. B. Serafimov (eds.)
Advances in Space Research, Volume 4, Number 1, 1-171, 1984.
Proceedings of the 1983 IRI Workshop in Stara Zagora (Bulgaria).*

Chapter 1 — ELECTRON DENSITY PROFILES

New Description of the Electron Density Profile
K. Rawer

Geometry of the "Exponential" Middle Ionosphere
T. L. Gulyaeva

Prediction of Total Electron Content Using the IRI
L. F. McNamara

Model Representation of Mid-Latitudinal Electron Density by Means of
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Chapter 6

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