Grant AFOSR-91-0414

IONOSPHERIC STRUCTURE OVER NORTHERN EUROPE

L. KERSLEY
J.A.T. HEATON
A.J. SANCISI
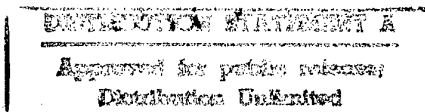
Department of Physics
University of Wales,
Aberystwyth,
Dyfed,
U.K.

30 November 1995

Scientific Report

19970618 042

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	

4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
AFOSR-91-0414	

6a. NAME OF PERFORMING ORGANIZATION	6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION
University of Wales, Aberystwyth		

6c. ADDRESS (City, State, and ZIP Code)	7b. ADDRESS (City, State, and ZIP Code)
Department of Physics, Penglais, Aberystwyth, Dyfed SY23 3BZ, U.K.	

8a. NAME OF FUNDING/SPONSORING ORGANIZATION	8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
EOARD		

8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS			
223/231 Old Marylebone Road, LONDON NW1 5TH, U.K.	PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
Ionospheric structure over northern Europe.

12. PERSONAL AUTHOR(S)
L. Kersley, J.A.T. Heaton, and A.J. Sancisi

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Scientific	FROM 94.7.1 TO 95.11.30	95.11.30	126

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Ionospheric tomography, ionospheric electron density, mid-latitude trough

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Tomographic images are presented of the spatial distribution of electron density in the sub-auroral ionosphere. The reconstructions have been obtained by inversion of total electron content measurements made at four stations in UK. The images cover the period from early January to mid-April 1993 and represent the first set of tomographic reconstructions obtained in monitoring the ionosphere over an extended period. Of particular interest is the spatial development of the main trough in the nighttime ionosphere. The potential of the tomographic method for routine observations of the ionosphere is demonstrated.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	
22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code) | 22c. OFFICE SYMBOL

· **DD Form 1473, JUN 86**   *Previous editions are obsolete.*

INTRODUCTION

The background to the project was given in previous reports (Kersley, et.al., 1994[1] and references therein). The early part of the work was concerned with the study of ionospheric electron content and radio-wave scintillations in the sub-auroral ionosphere. The original experimental observations were made using a receiving system for transmissions from NNSS satellites located at Lerwick (60.1°N, 1.2°W). Subsequent observations of the scintillation of the received signals were made at Whitby (54.5°N, 0.6°E). In addition, a chain of four stations was established in UK (Figure 1), essentially in a meridian and covering same 9° latitude, to monitor total electron content using the differential doppler technique with a view to providing tomographic reconstructions of ionospheric electron density on an extended basis. Some examples of two-dimensional images of electron density obtained from the resultant data set were presented in an earlier report to illustrate the power of the tomographic method.

RESULTS

The present report takes the form of an atlas of tomographic images obtained from successive satellite passes over this extended period from early-January to mid-April 1992. These serve to demonstrate the potential of ionospheric tomography in the routine monitoring of ionospheric electron density over a region of substantial spatial coverage. Of particular interest in the data presented here is the location and form of the main ionospheric trough, a key feature of the sub-auroral ionosphere. In the earlier part of the work, data from all available satellite passes were analysed to give complete diurnal coverage. However, it later became

[1] Kersley, L., Russell, C.D., and Pryse, S.E. Ionospheric structure over northern Europe. Report AFOSR-91-0414, University of Wales, Aberystwyth, November 1994

1
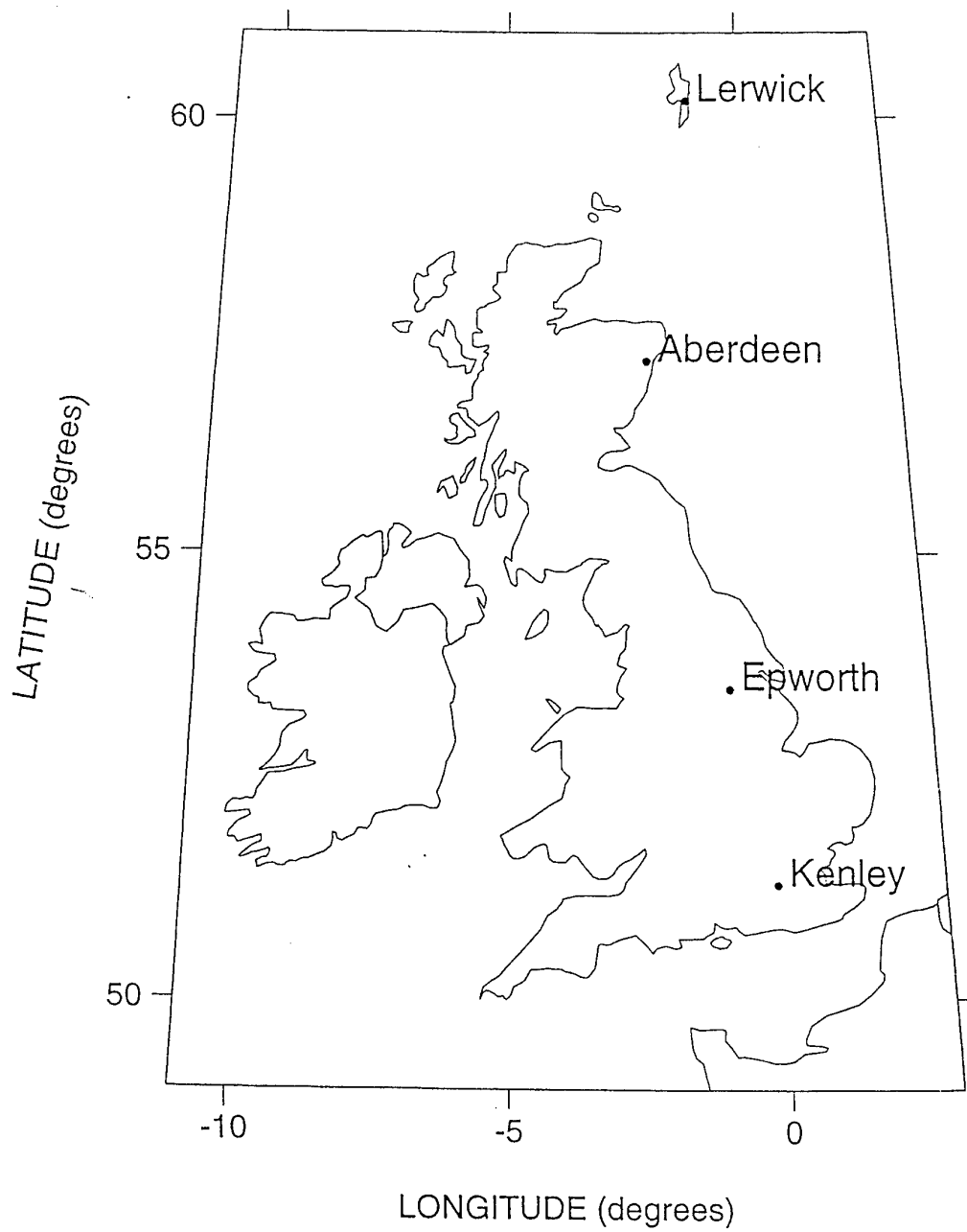
Figure 1

clear that it would not be possible to reconstruct images from all passes in the available time, so to some extent the analysis has been concentrated on the nighttime observations with the intention of bringing out the features of the trough. The results illustrate the power of the tomographic reconstruction technique as a routine monitor of the trough and serve to demonstrate the importance of the role of the trough in the nighttime sub-auroral ionosphere.

The images presented here have been obtained by inversion of the multistation total electron content measurements using a reconstruction method essentially similar to that described by Kersley et al (1993)[2] . The two-stage method involves the creation of an appropriate background ionosphere that is then used to initialise a MART iterative algorithm. For the present work the background has been based on the IRI90 model ionosphere, updated with input on the density and height of the layer peak obtained from the ionosonde at Slough (51.5°N) when available. The poor contouring of the bottomside ionosphere in a number of the tomographic images for daytime arises from E-layer input in the background model and represents a current limitation in ionospheric tomography. Work is progressing in developing techniques to image E-layer ionisation and to create smooth contouring in the valley region between the E- and F-layers. Another artefact of the method found in a few of the plots are the 'wings' or concentrations of contours along particular directions. These arise along lines where data from a particular station end due to loss of signal. The artefact can usually be identified with ease on the tomographic reconstruct as the concentration of the contours is directed downwards towards the latitude of one of the receiving stations.

The images of electron density shown here represent the first set of comprehensive results from the tomographic method over an extended period of several months.

---

[2] Kersley, L., Heaton, J.A.T., Pryse, S.E., and Raymund, T.D., Experimental ionospheric tomography with ionosonde input and EISCAT verification, Ann. Geophysical, 11, 1064-1074, 1993

They serve to illustrate the potential power of ionospheric tomography in the routine monitoring of structures in the electron density like the mid-latitude trough.
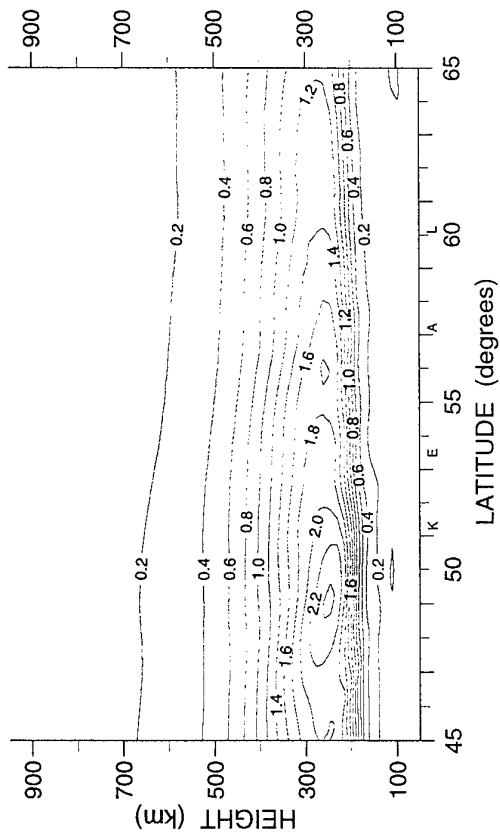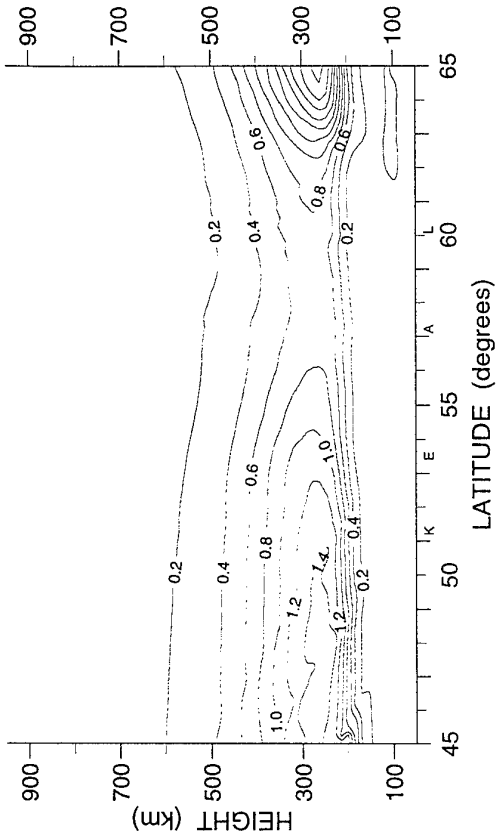
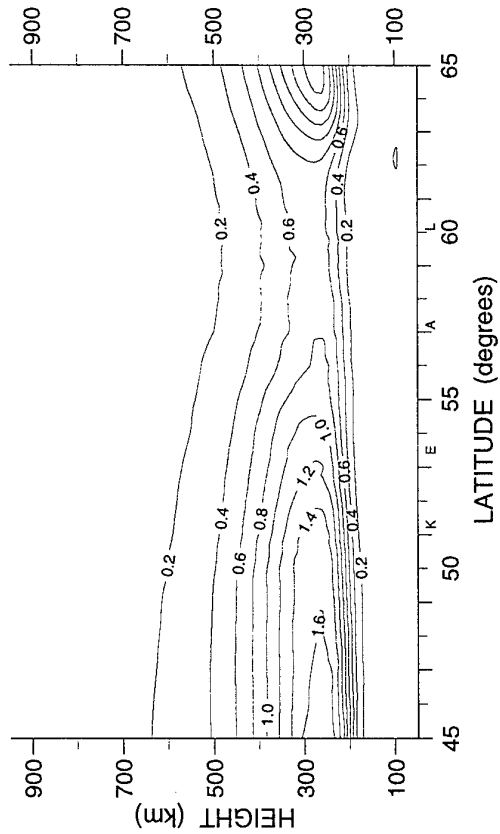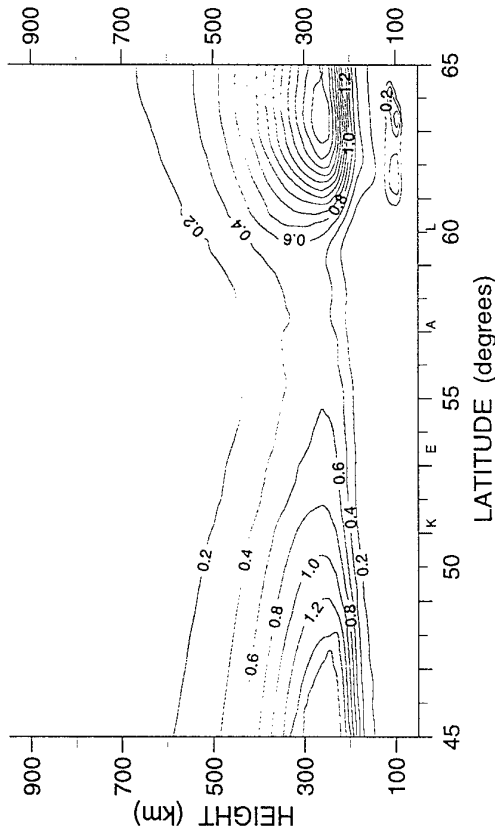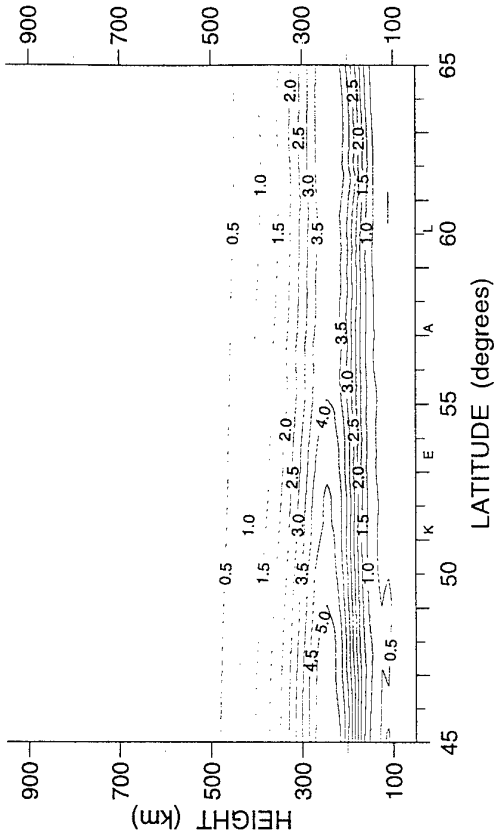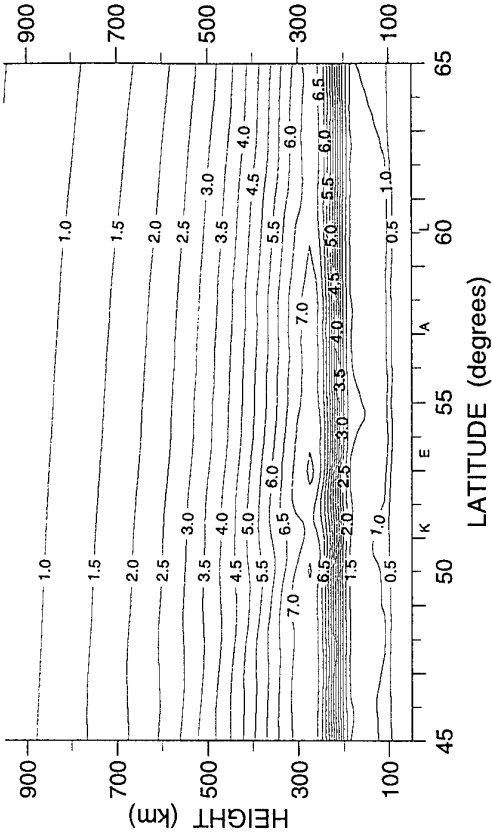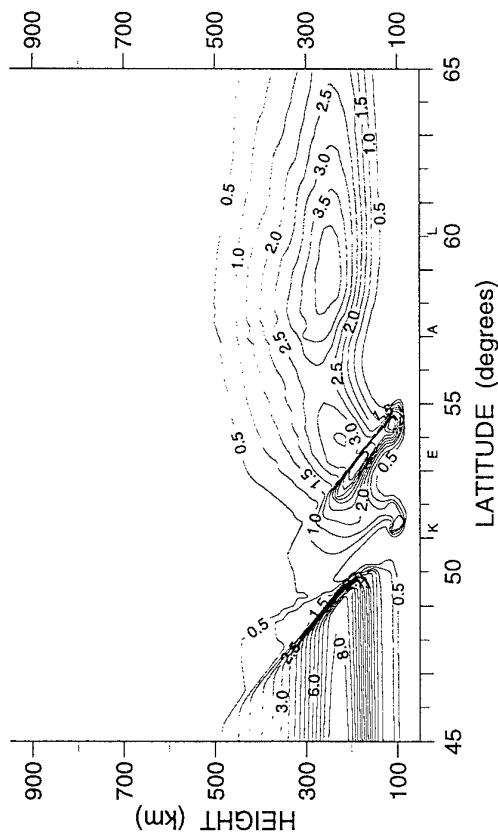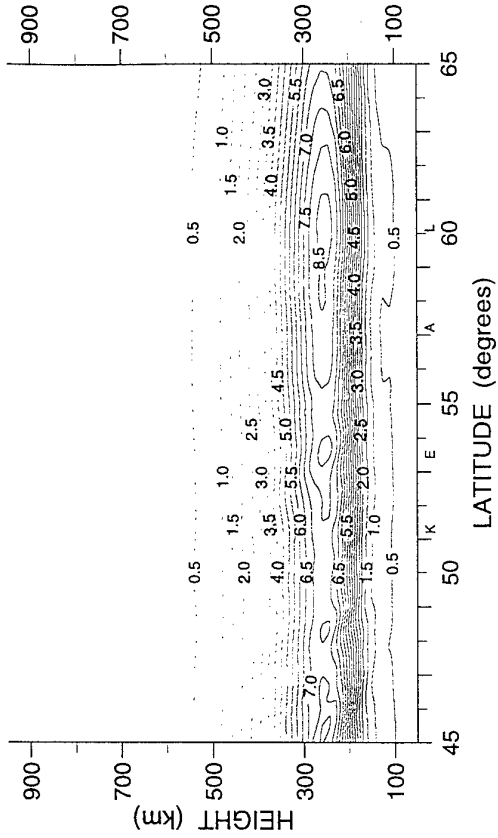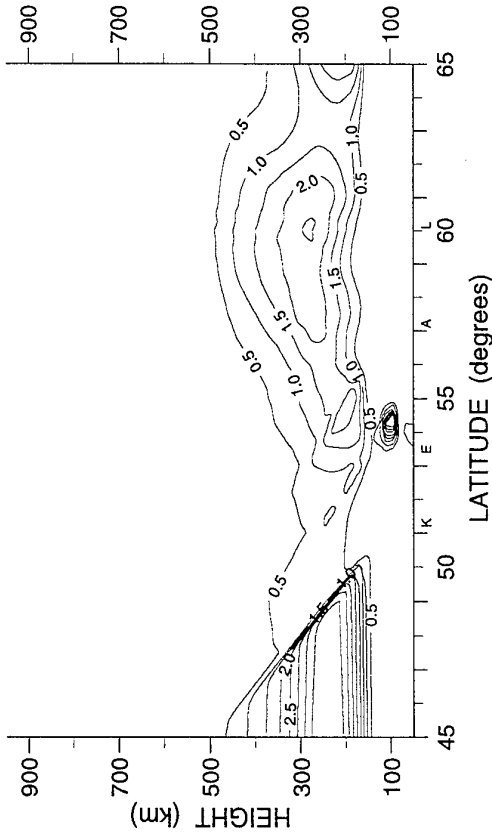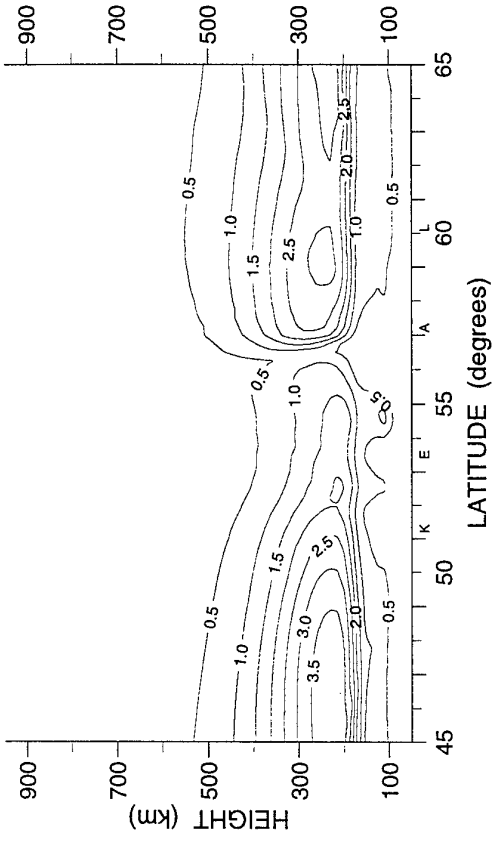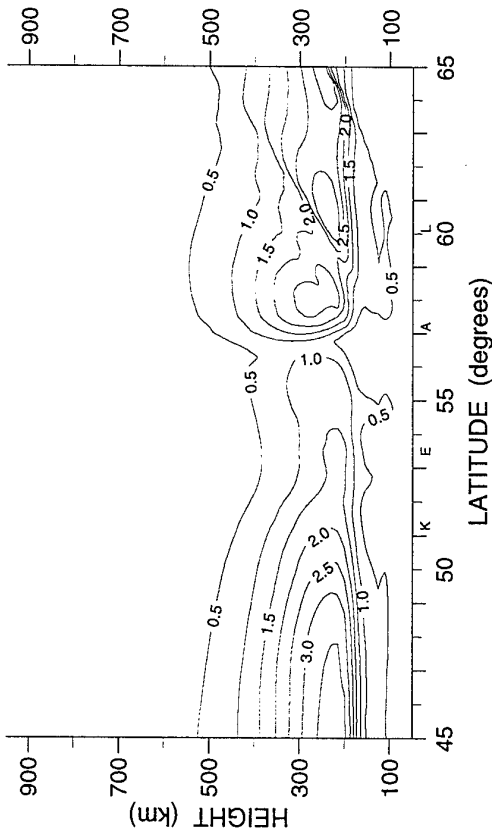Tomographic Image: 04/02/93 10:45 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 04/02/93 14:59 UT
Electron density (x10^{11} m^{-3})
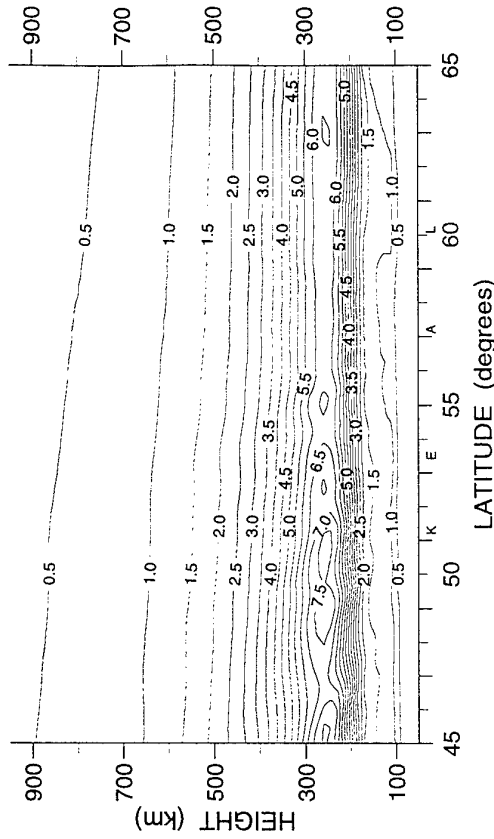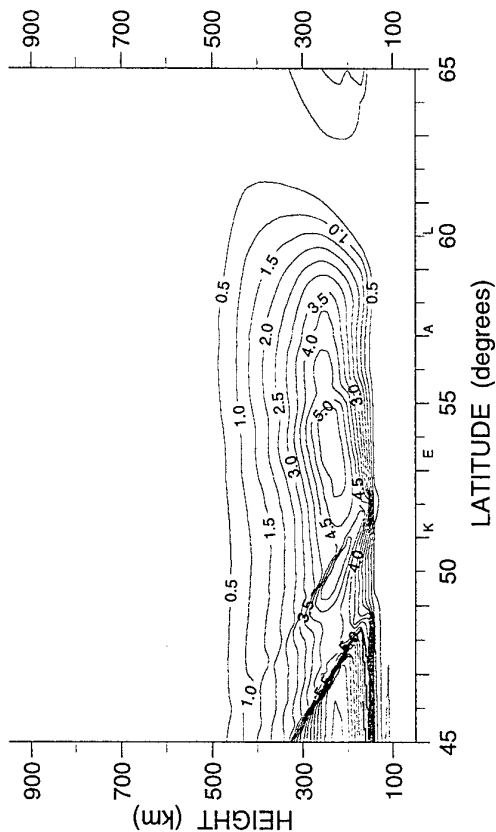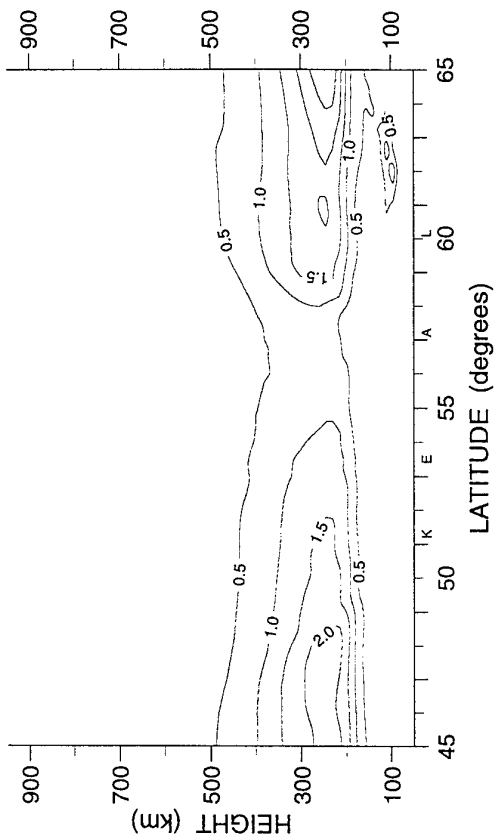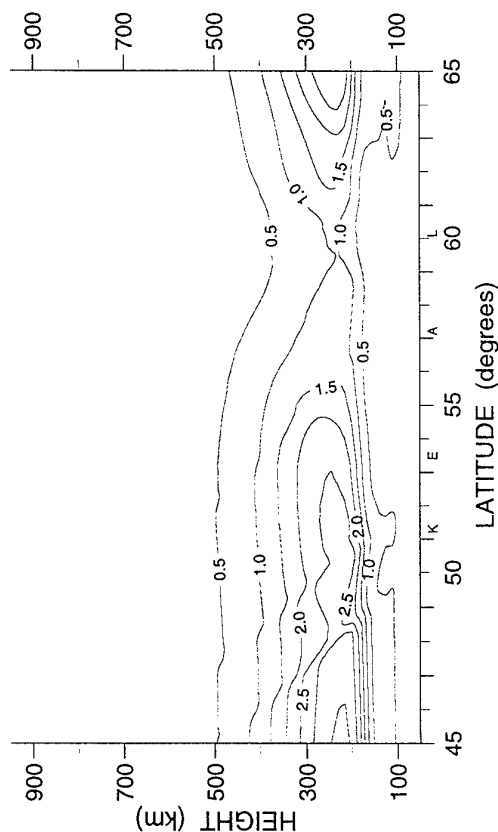
Tomographic Image: 04/02/93 12:32 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 04/02/93 17:45 UT
Electron density (x10^{11} m^{-3})

LATITUDE (degrees)

HEIGHT (km)

5

Tomographic Image: 04/02/93 19:32 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 04/02/93 22:56 UT
Electron density (x10^{11} m^{-3})
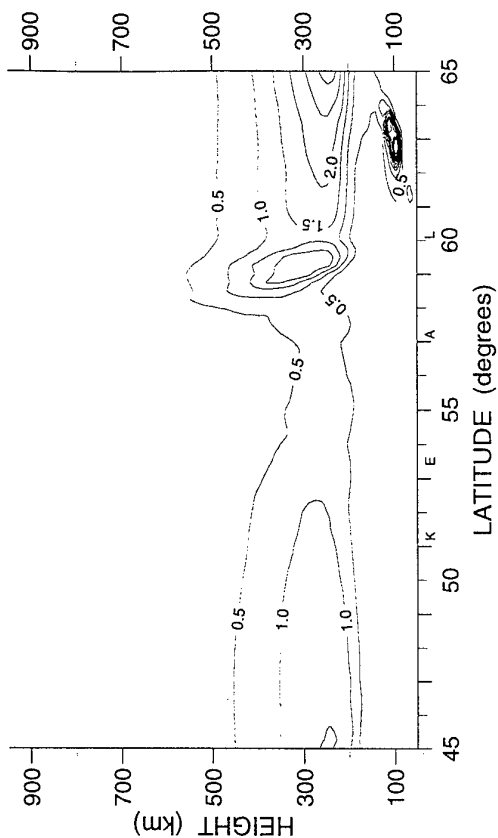
Tomographic Image: 04/02/93 20:05 UT
Electron density (x10^{11} m^{-3})

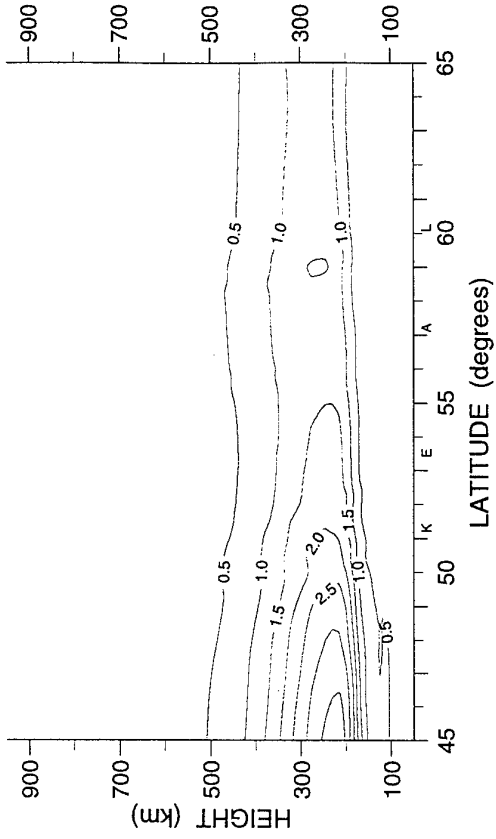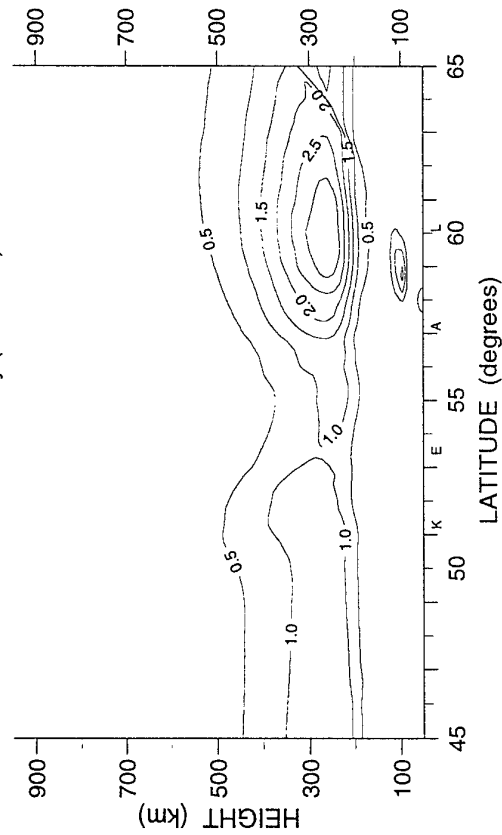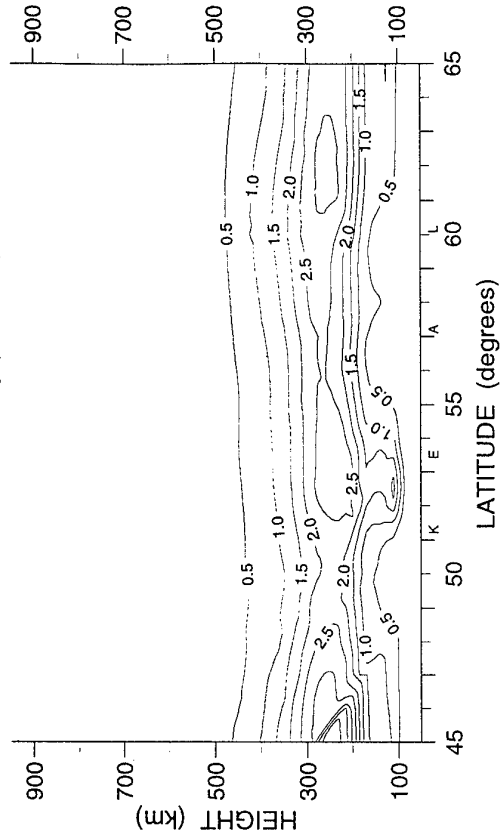Tomographic Image: 05/02/93 00:43 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 07:20 UT
Electron density (x10^{11} m^{-3})

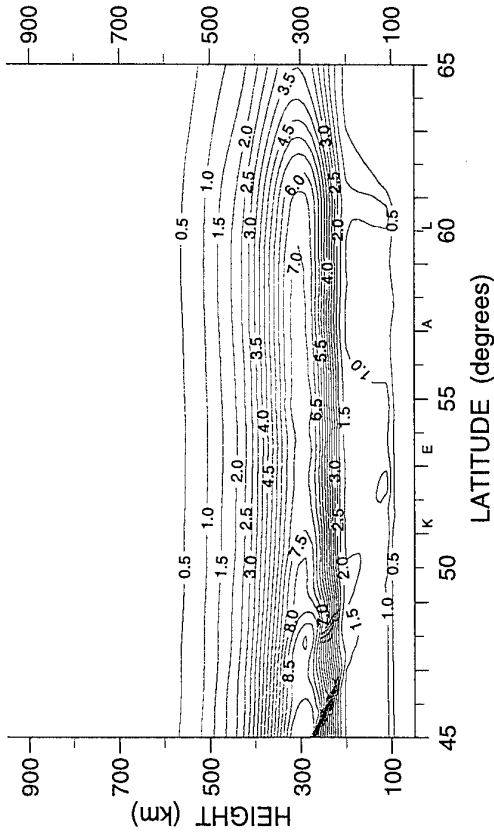Tomographic Image: 05/02/93 10:02 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 04:00 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 06:37 UT
Electron density (x10^{11} m^{-3})

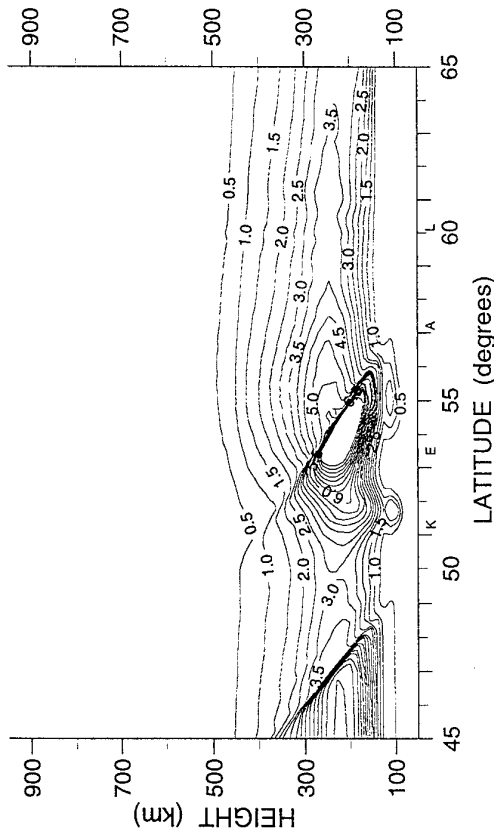Tomographic Image: 05/02/93 11:49 UT
Electron density (x10^{11} m^{-3})

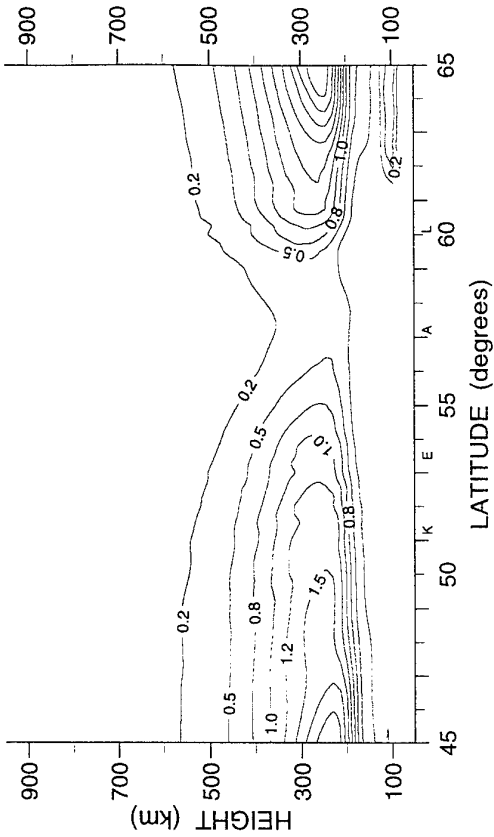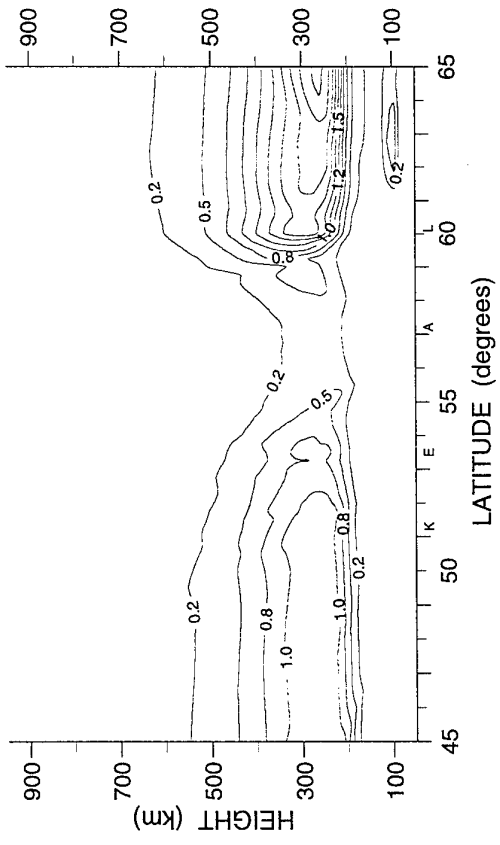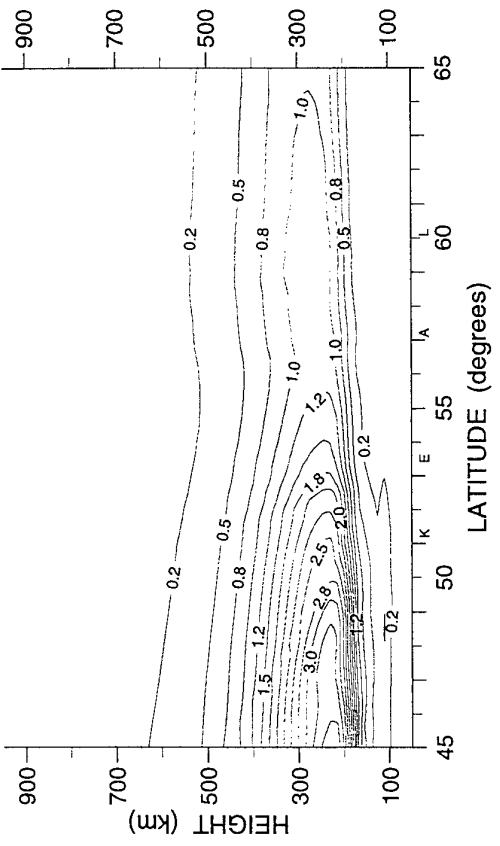Tomographic Image: 05/02/93 16:59 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 12:09 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 17:53 UT
Electron density (x10^{11} m^{-3})

8

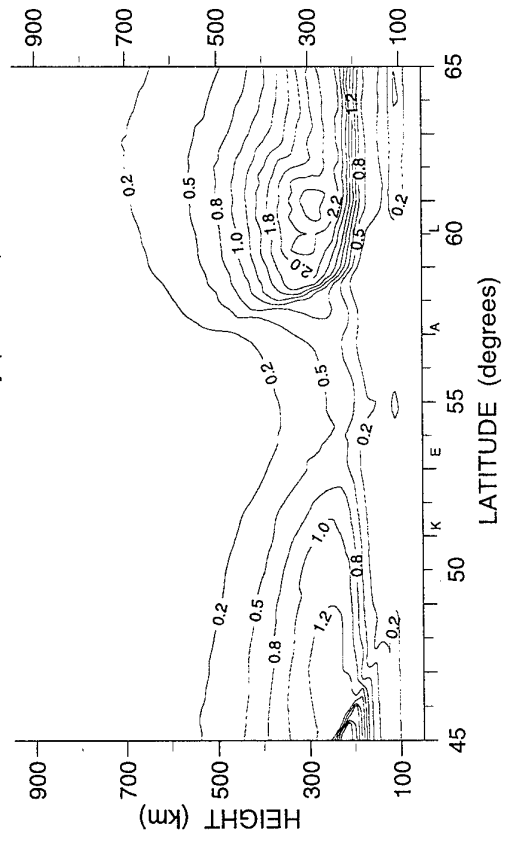Tomographic Image: 05/02/93 18:47 UT
Electron density (x10^{11} m^{-3})

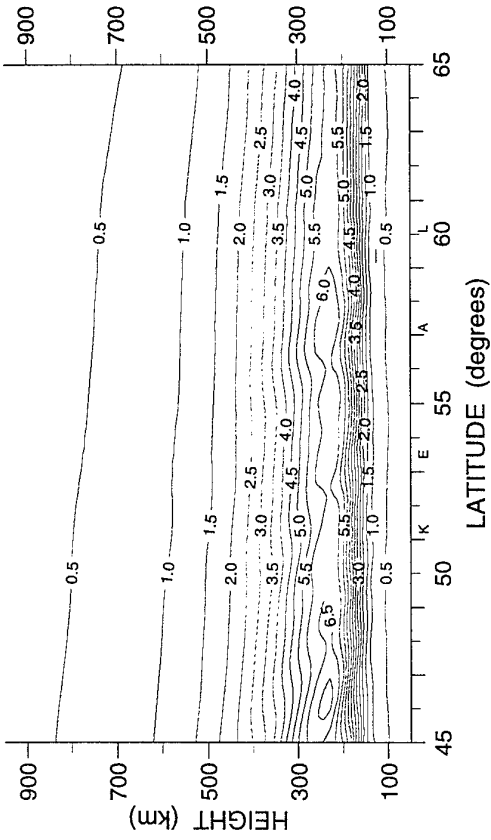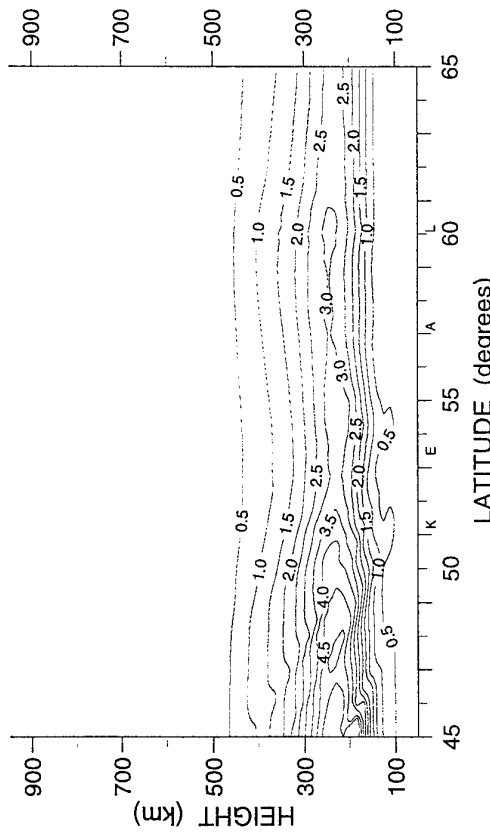Tomographic Image: 05/02/93 21:03 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 19:42 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 22:13 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

9

Tomographic Image: 06/02/93   05:51   UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 06/02/93   07:39   UT
Electron density (x10^{11} m^{-3})

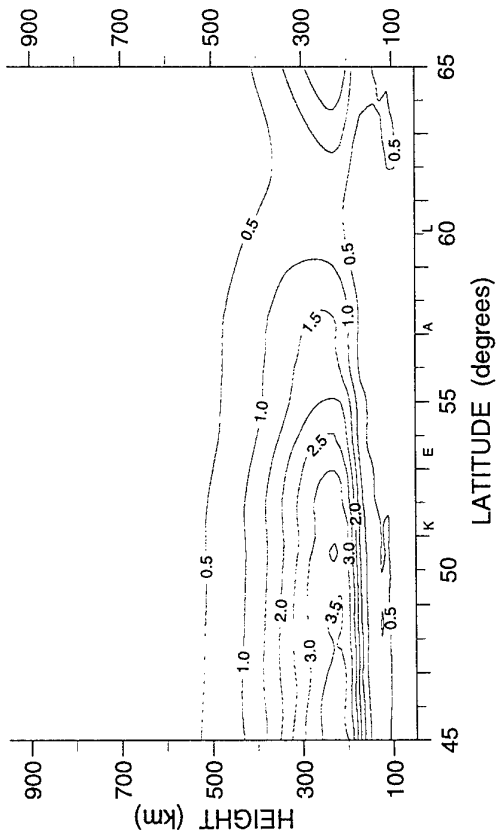Tomographic Image: 05/02/93   24:00   UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 06/02/93   05:08   UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 06/02/93 08:46 UT
Electron density (x10^11 m^-3)
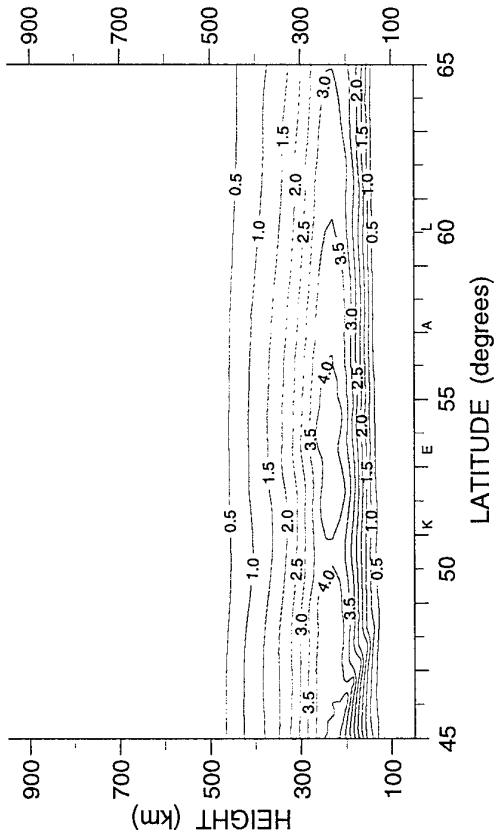
Tomographic Image: 06/02/93 16:14 UT
Electron density (x10^11 m^-3)
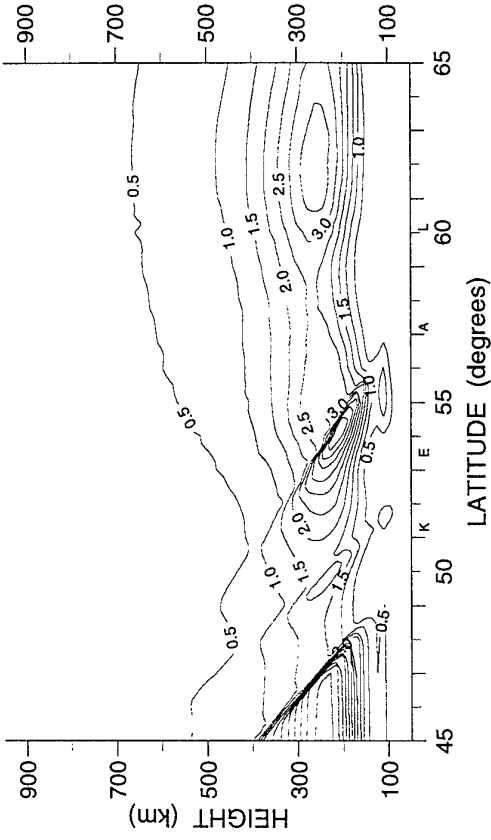
Tomographic Image: 06/02/93 10:08 UT
Electron density (x10^11 m^-3)
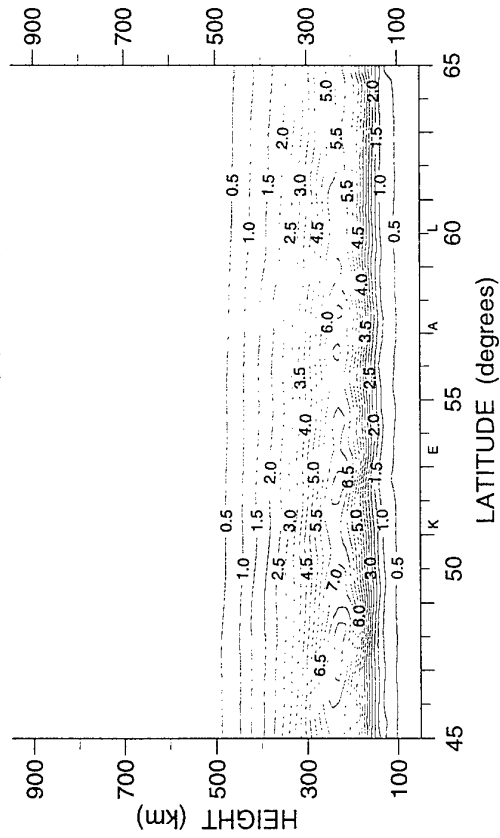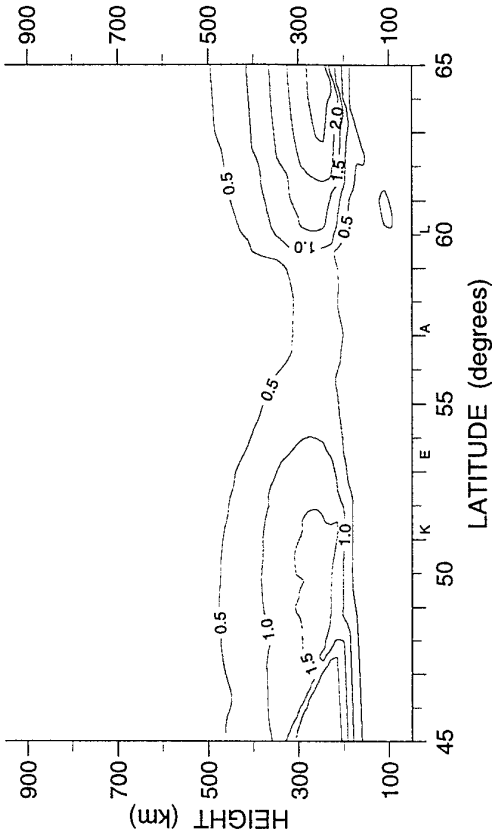
Tomographic Image: 06/02/93 17:30 UT
Electron density (x10^11 m^-3)

Tomographic Image: 06/02/93 21:29 UT
Electron density (x10^{11} m^{-3})
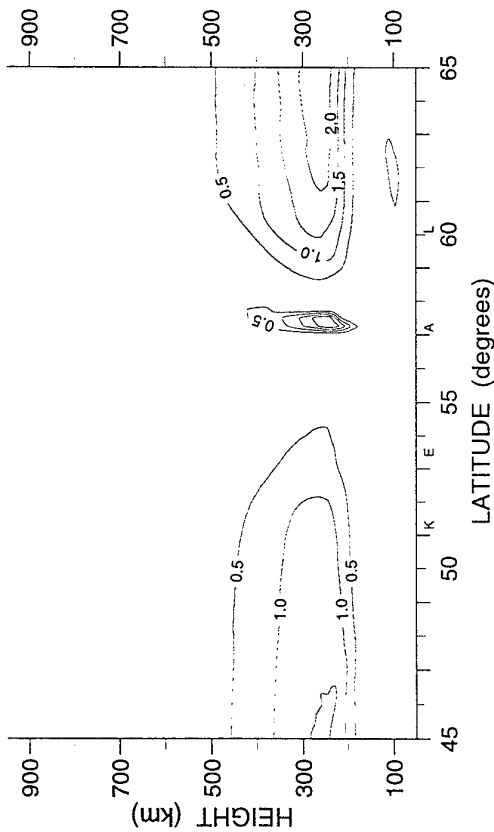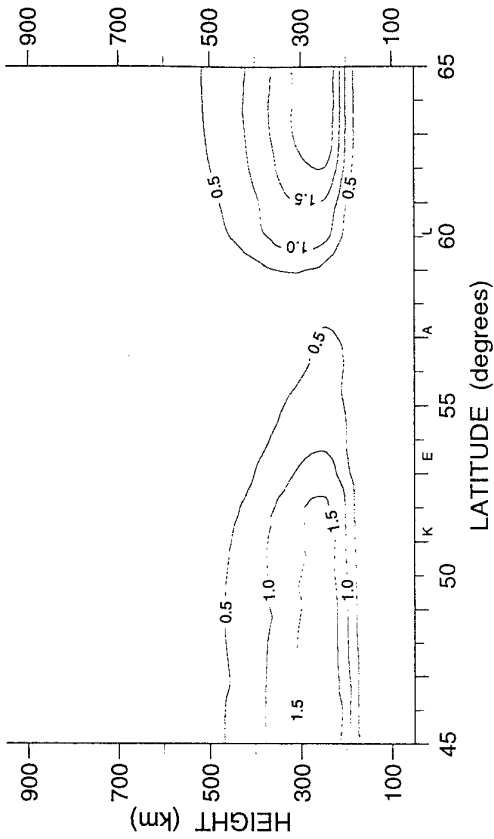
Tomographic Image: 06/02/93 22:21 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 06/02/93 18:01 UT
Electron density (x10^{11} m^{-3})
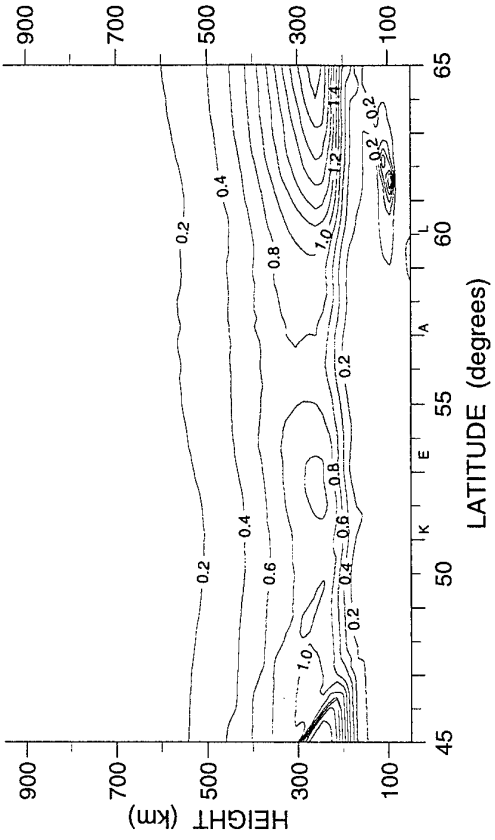
Tomographic Image: 06/02/93 19:19 UT
Electron density (x10^{11} m^{-3})

12

Tomographic Image: 06/02/93 23:17 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 07/02/93 01:04 UT
Electron density (x10^{11} m^{-3})
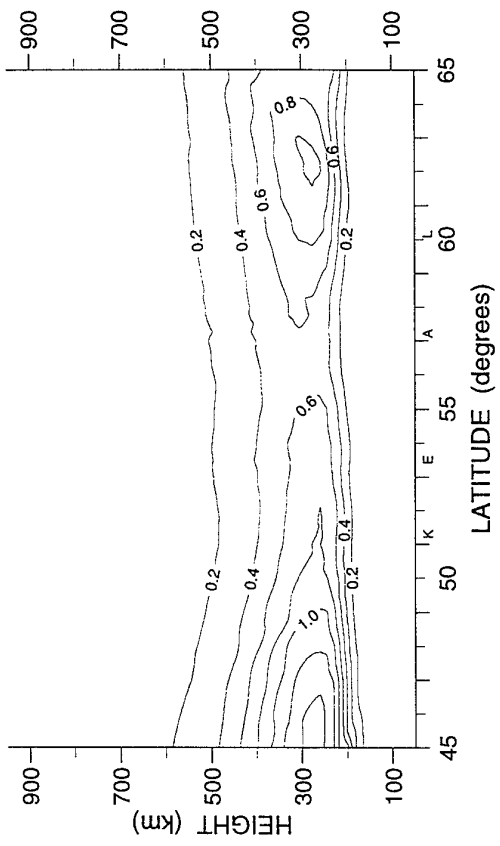
Tomographic Image: 07/02/93 00:08 UT
Electron density (x10^{11} m^{-3})
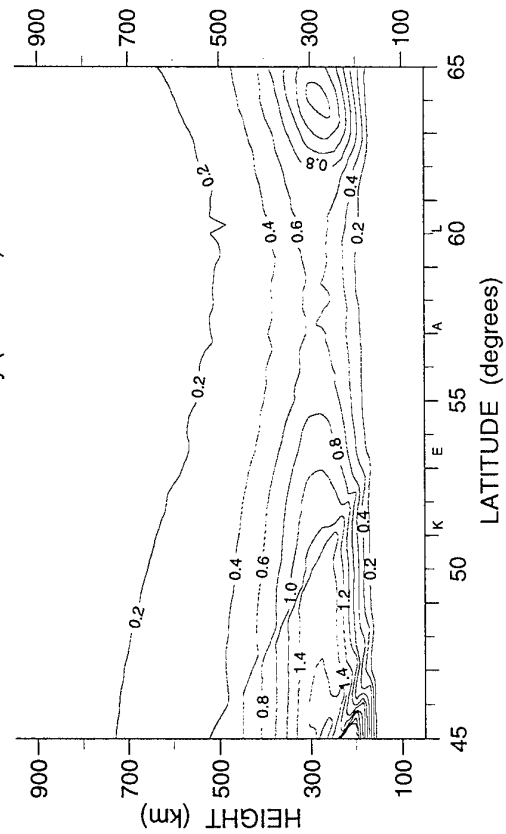
Tomographic Image: 07/02/93 03:04 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

13

Tomographic Image: 07/02/93   07:56 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 07/02/93   08:23 UT
Electron density (x10^{11} m^{-3})
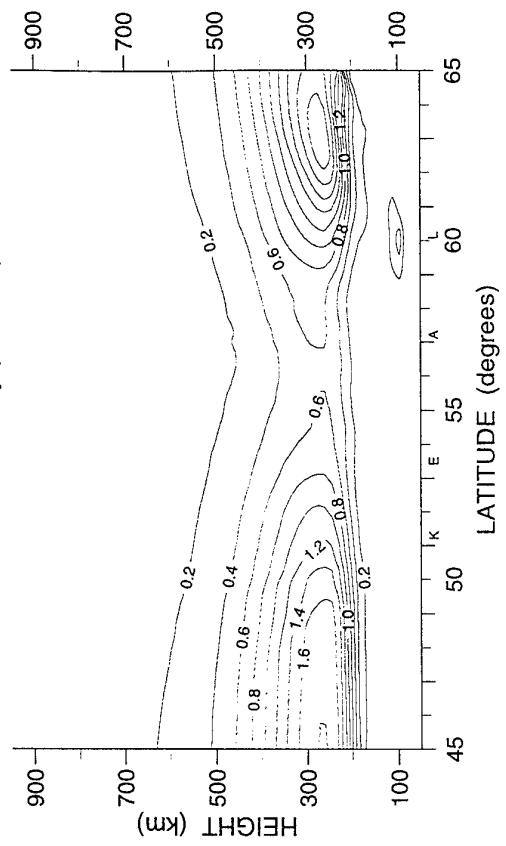
Tomographic Image: 07/02/93   06:34 UT
Electron density (x10^{11} m^{-3})
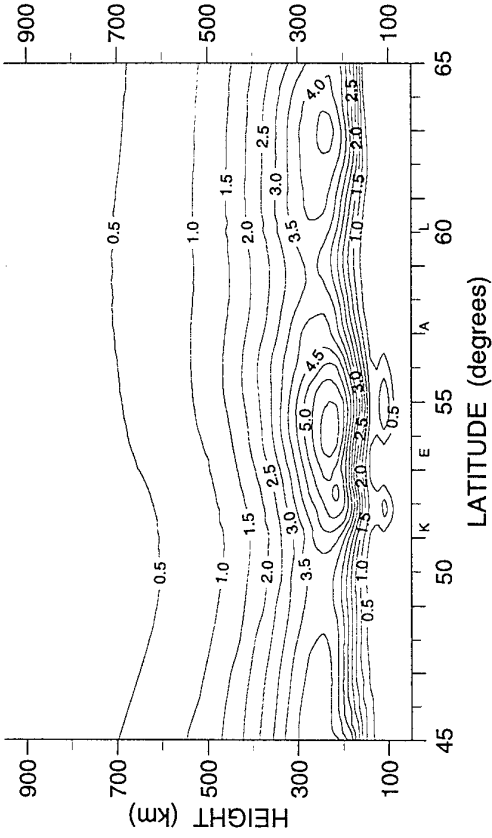
Tomographic Image: 07/02/93   06:54 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

14

Tomographic Image: 07/02/93 09:45 UT
Electron density (x10^{11} m^{-3})
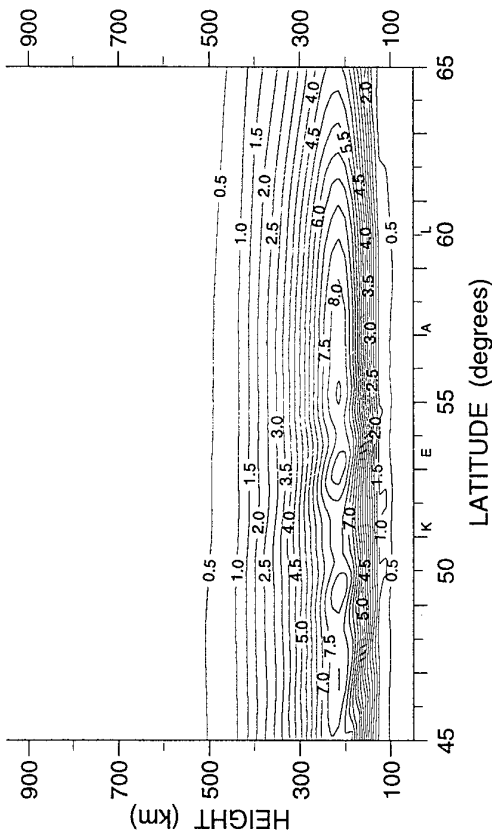
Tomographic Image: 07/02/93 11:14 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 07/02/93 10:12 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 07/02/93 15:24 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

15

Tomographic Image: 07/02/93 22:06 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 07/02/93 22:34 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 07/02/93 17:07 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 07/02/93 18:56 UT
Electron density (x10^{11} m^{-3})
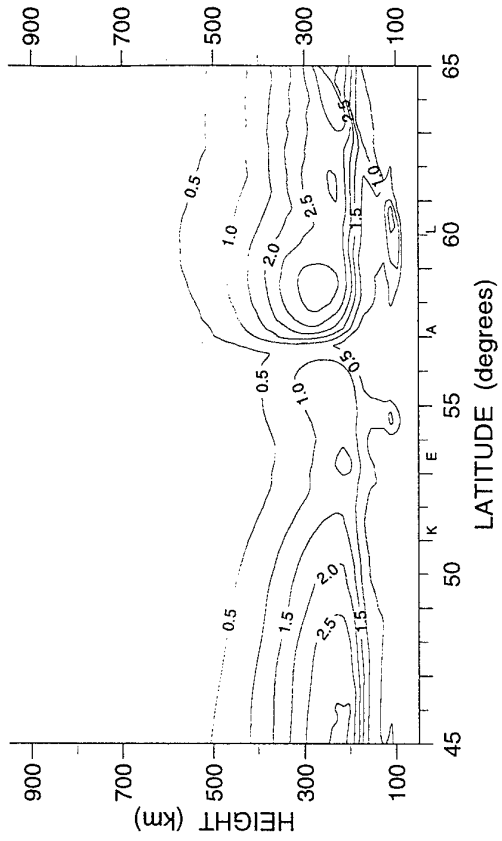
Tomographic Image: 07/02/93 23:25 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 08/02/93 07:33 UT
Electron density (x10¹¹ m⁻³)
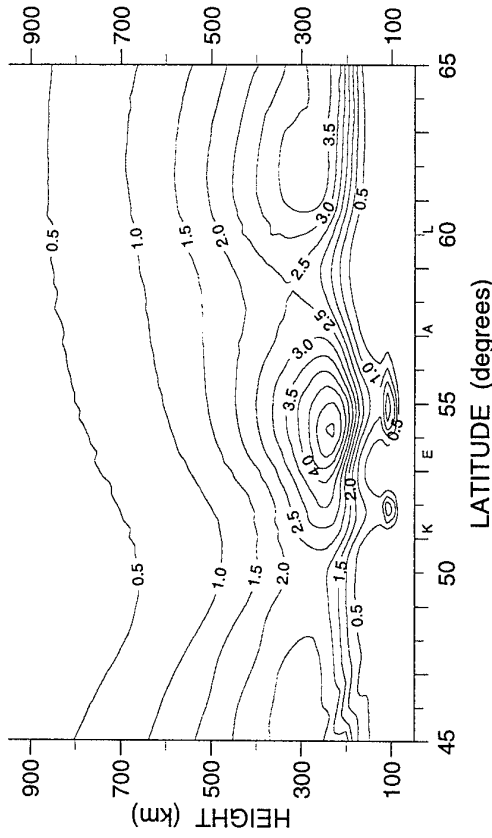
Tomographic Image: 08/02/93 00:21 UT
Electron density (x10¹¹ m⁻³)
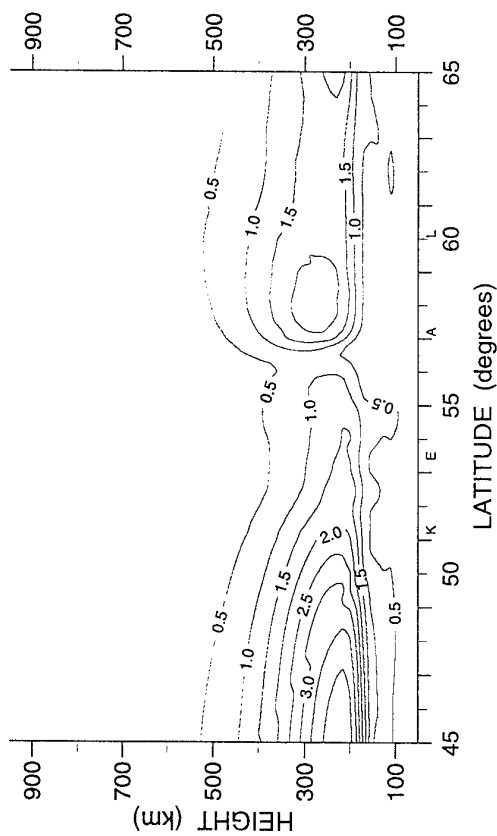
Tomographic Image: 08/02/93 09:22 UT
Electron density (x10¹¹ m⁻³)

17
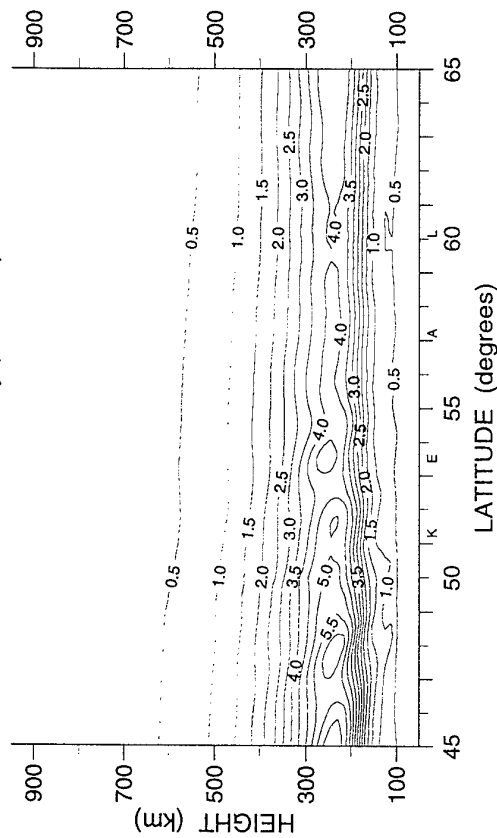
Tomographic Image: 08/02/93 09:39 UT
Electron density (x10^{11} m^{-3})
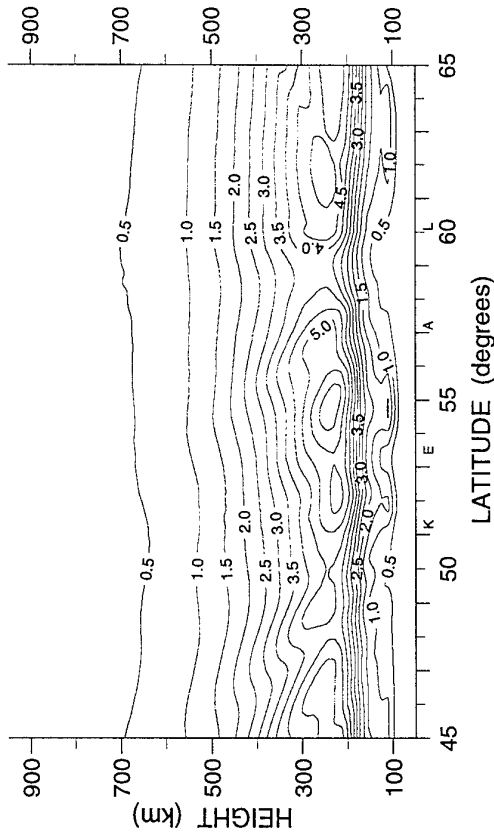
Tomographic Image: 08/02/93 11:11 UT
Electron density (x10^{11} m^{-3})
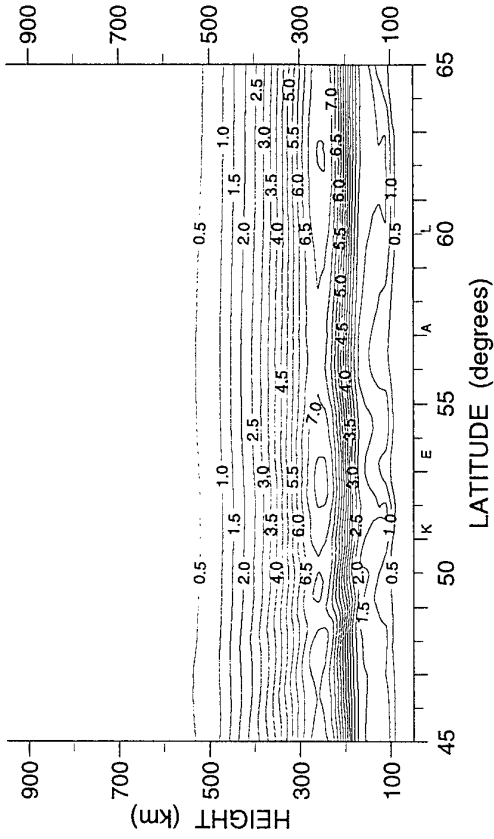
Tomographic Image: 08/02/93 10:22 UT
Electron density (x10^{11} m^{-3})
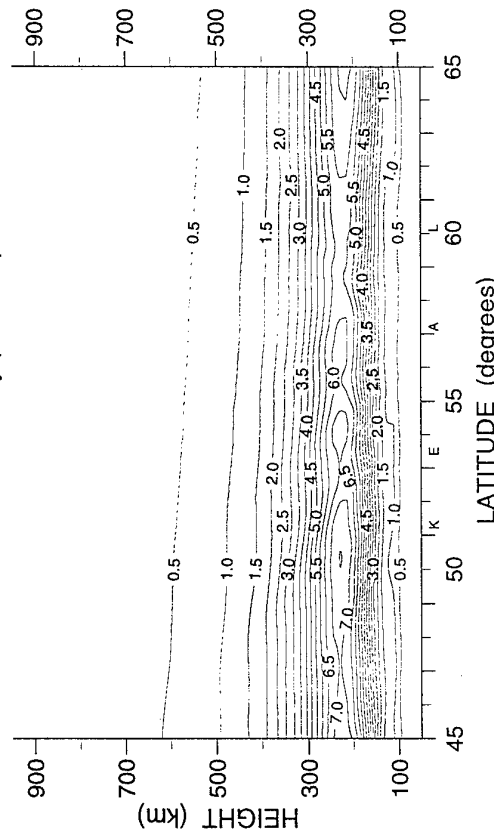
Tomographic Image: 08/02/93 11:27 UT
Electron density (x10^{11} m^{-3})

LATITUDE (degrees)

HEIGHT (km)

Tomographic Image: 08/02/93 20:22 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 08/02/93 21:43 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 08/02/93 16:31 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 08/02/93 18:33 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

Tomographic Image: 08/02/93 24:04 UT
Electron density (x10^{11} m^{-3})
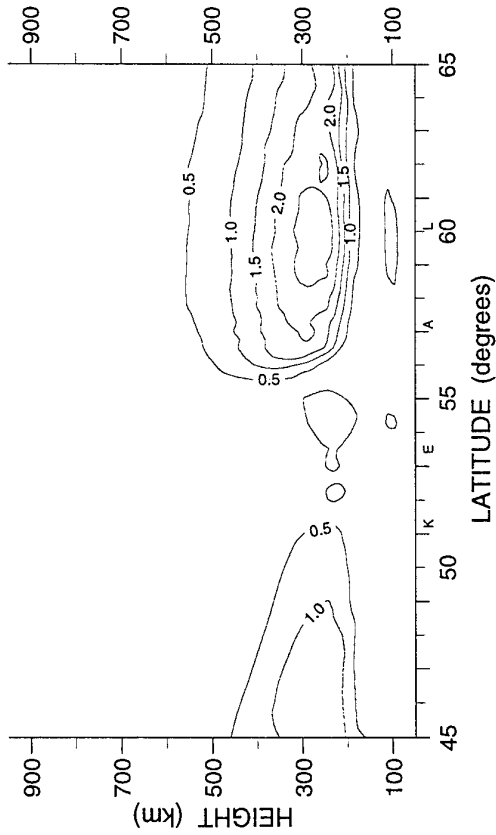
Tomographic Image: 09/02/93 07:37 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 09/02/93 02:08 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 09/02/93 09:26 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 09/02/93   18:10 UT

Electron density (x10^{11} m^{-3})

Tomographic Image: 09/02/93   19:59 UT

Electron density (x10^{11} m^{-3})

Tomographic Image: 09/02/93   14:28 UT

Electron density (x10^{11} m^{-3})
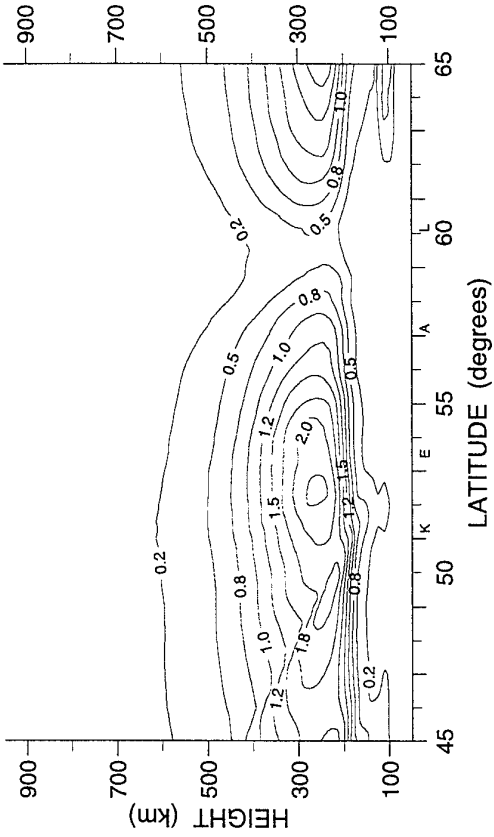
Tomographic Image: 09/02/93   15:46 UT

Electron density (x10^{11} m^{-3})

21
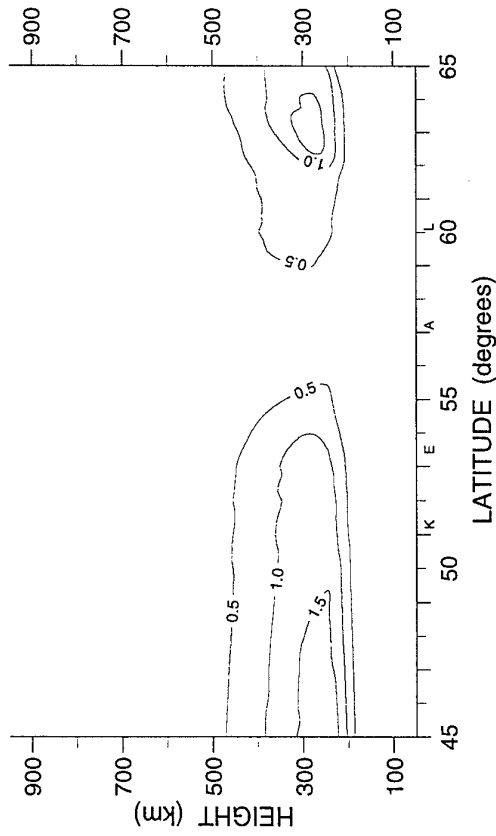
Tomographic Image: 09/02/93 21:20 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 10/02/93 07:14 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 09/02/93 23:09 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 10/02/93 08:36 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

22
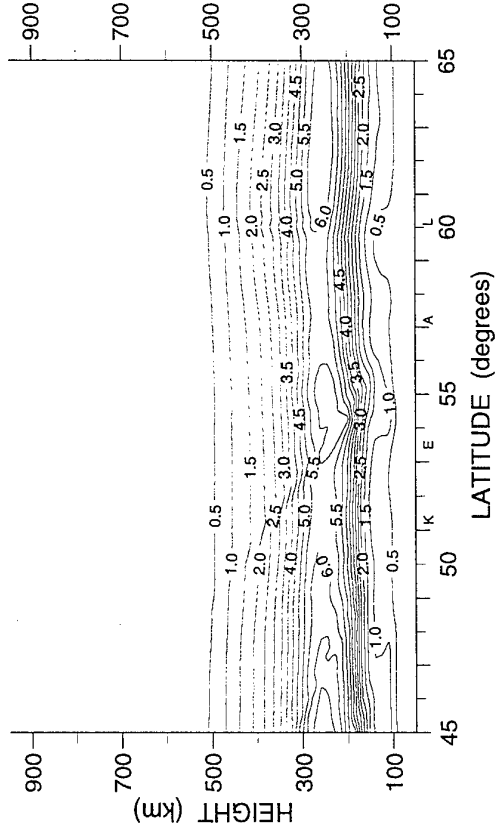
Tomographic Image: 10/02/93 08:36 UT
Electron density (x10^11 m^-3)
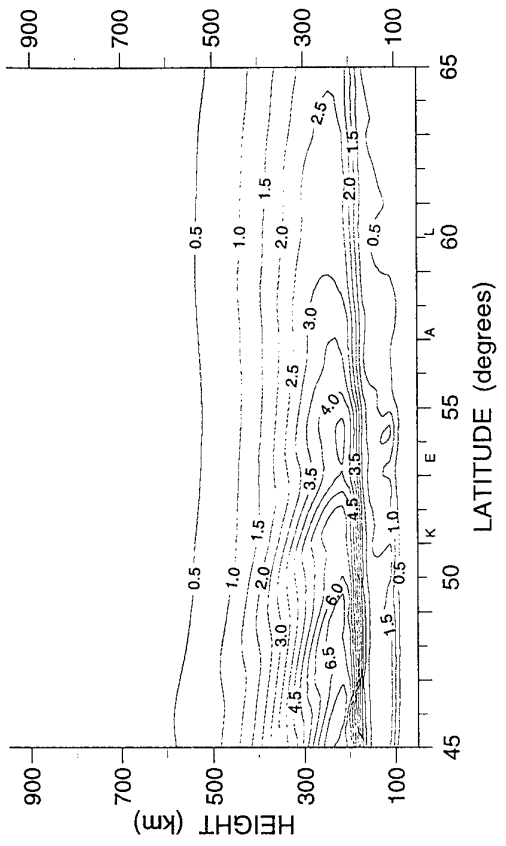
Tomographic Image: 10/02/93 09:03 UT
Electron density (x10^11 m^-3)
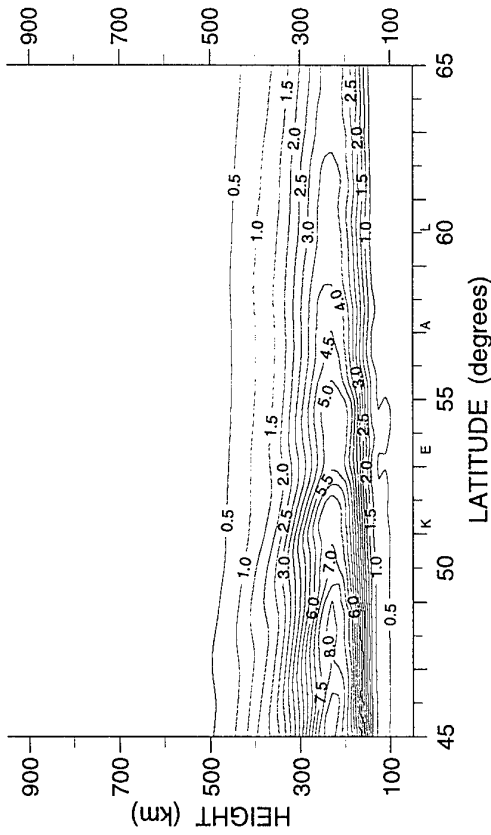
Tomographic Image: 10/02/93 11:48 UT
Electron density (x10^11 m^-3)

Tomographic Image: 10/02/93 16:48 UT
Electron density (x10^11 m^-3)
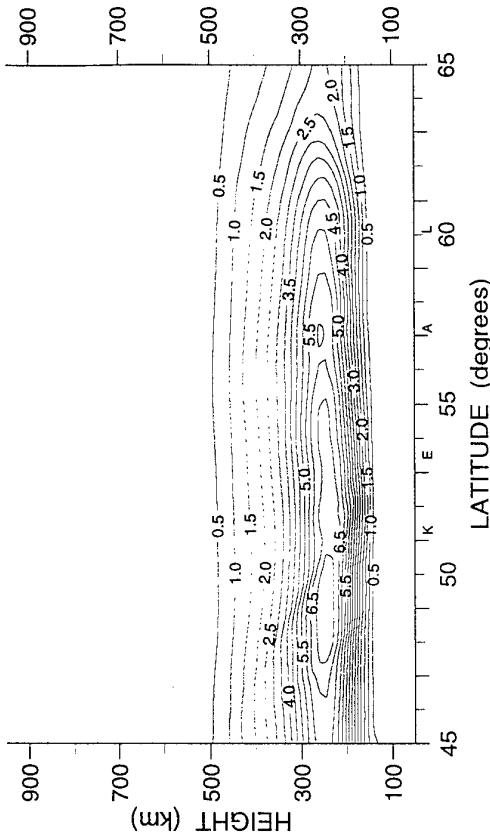
Tomographic Image: 10/02/93 18:35 UT
Electron density (x10^{11} m^{-3})

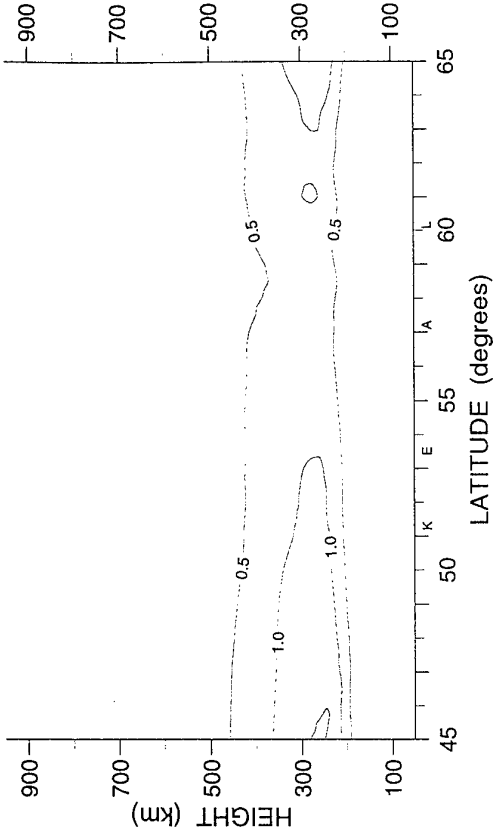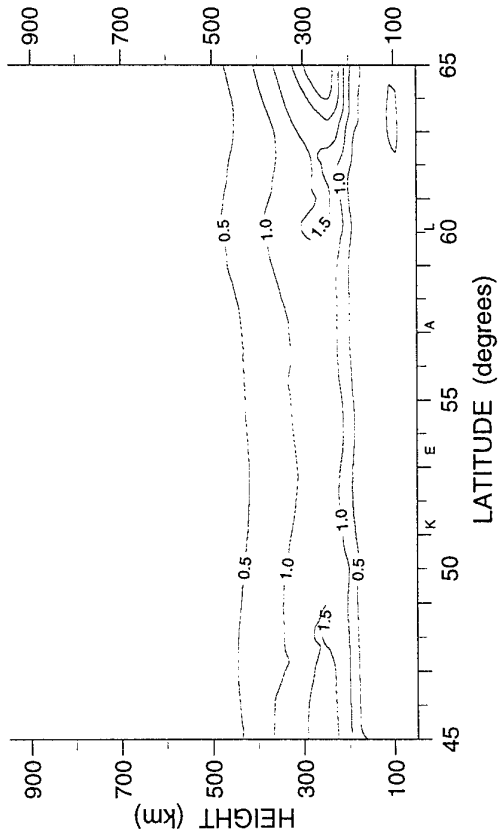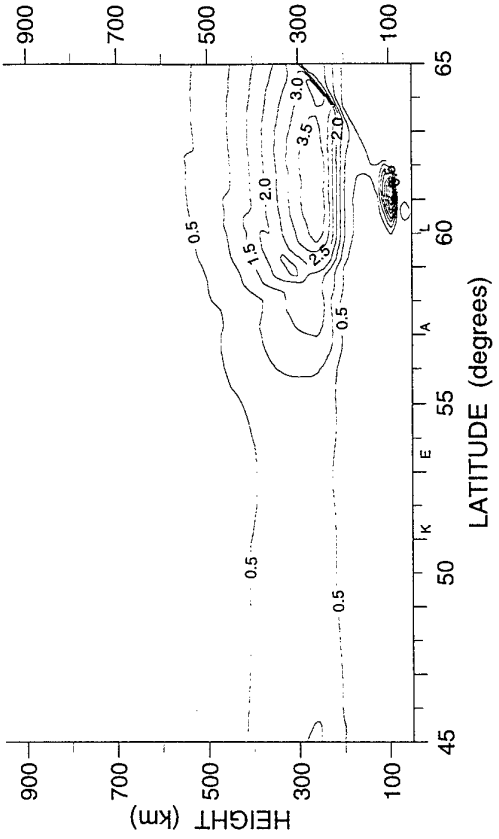Tomographic Image: 10/02/93 20:57 UT
Electron density (x10^{11} m^{-3})
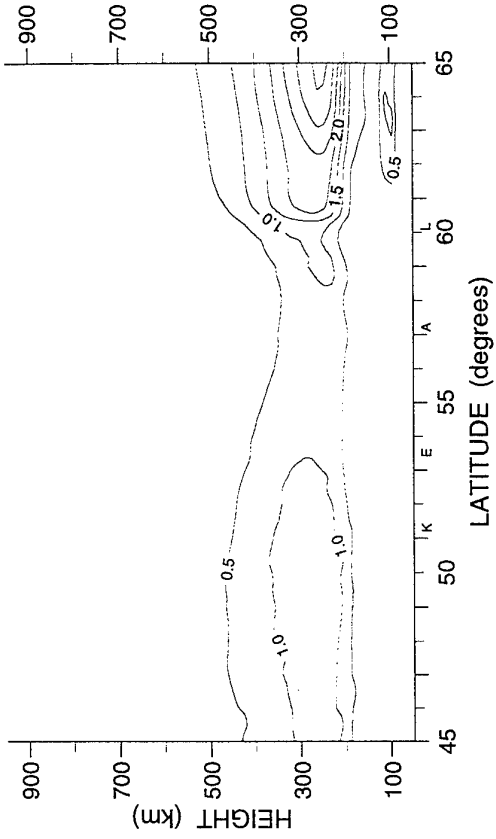
Tomographic Image: 10/02/93 19:36 UT
Electron density (x10^{11} m^{-3})
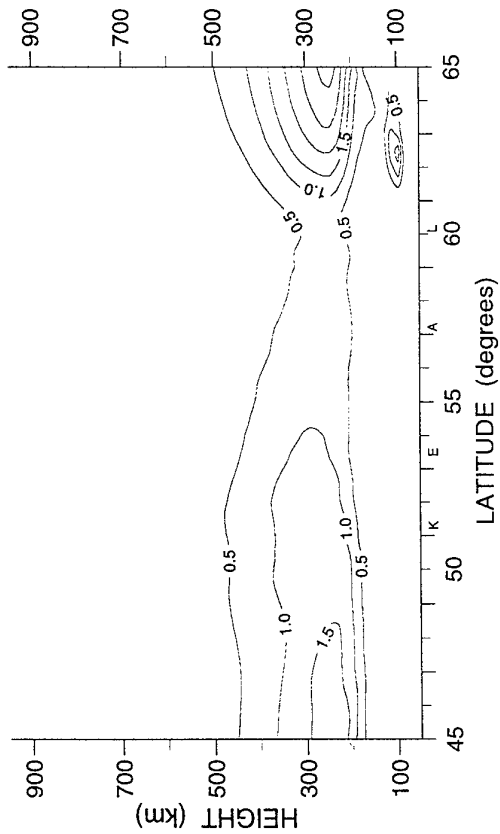
Tomographic Image: 10/02/93 21:43 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

24
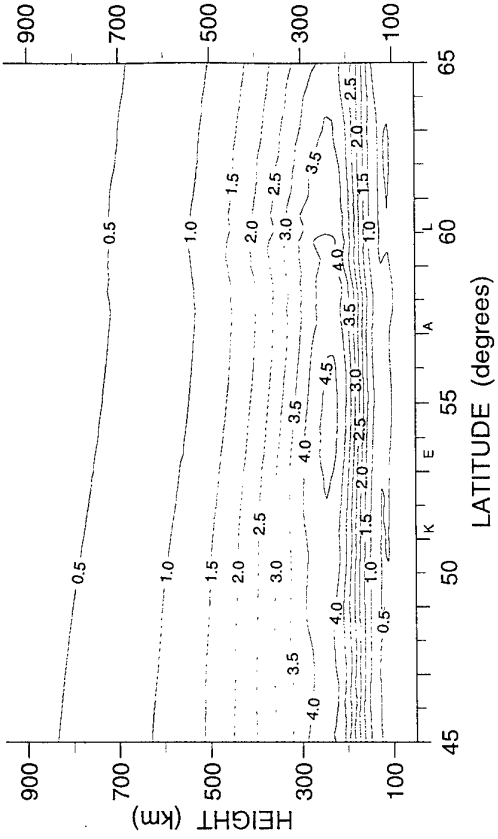
Tomographic Image: 10/02/93 23:03 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 10/02/93 23:59 UT
Electron density (x10^{11} m^{-3})

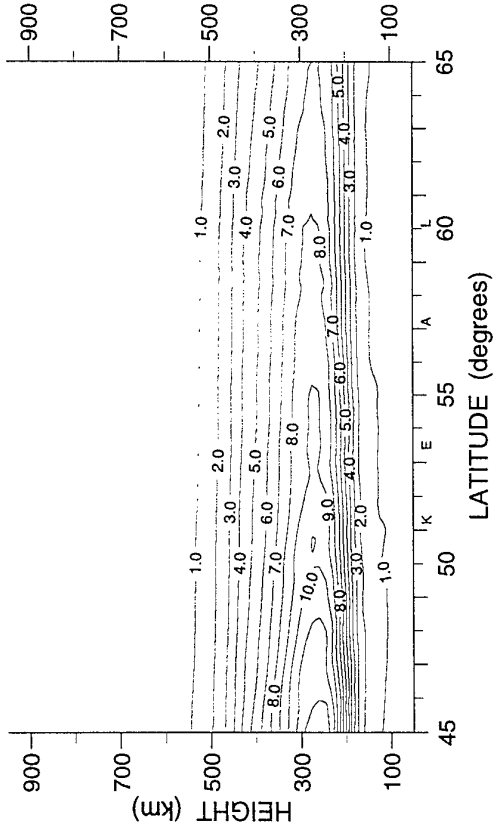Tomographic Image: 10/02/93 22:11 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 10/02/93 22:46 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 11/02/93   03:01 UT
Electron density (x10^{11} m^{-3})
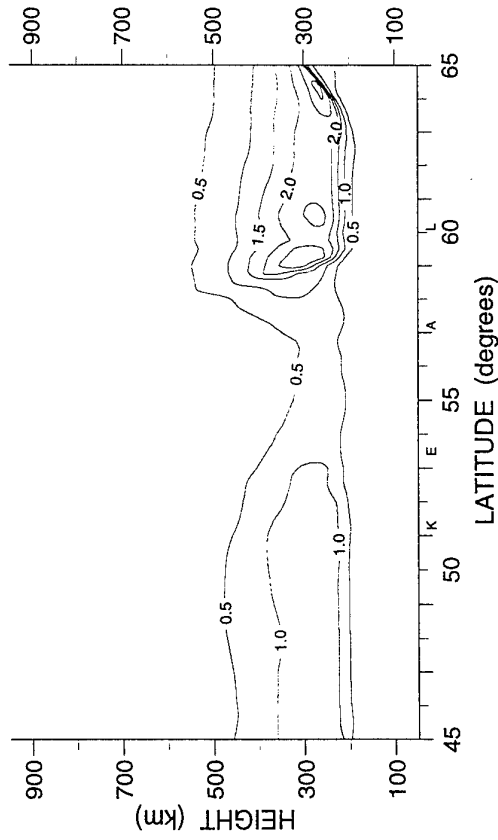
Tomographic Image: 11/02/93   10:02 UT
Electron density (x10^{11} m^{-3})
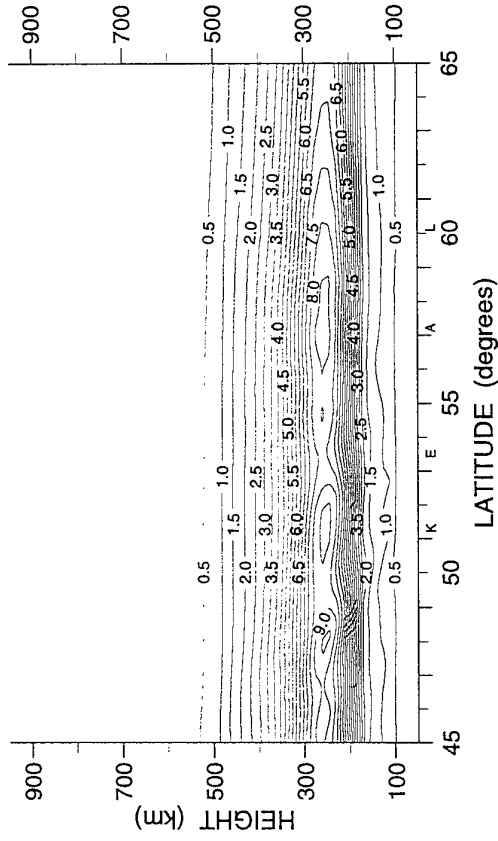
Tomographic Image: 11/02/93   08:13 UT
Electron density (x10^{11} m^{-3})
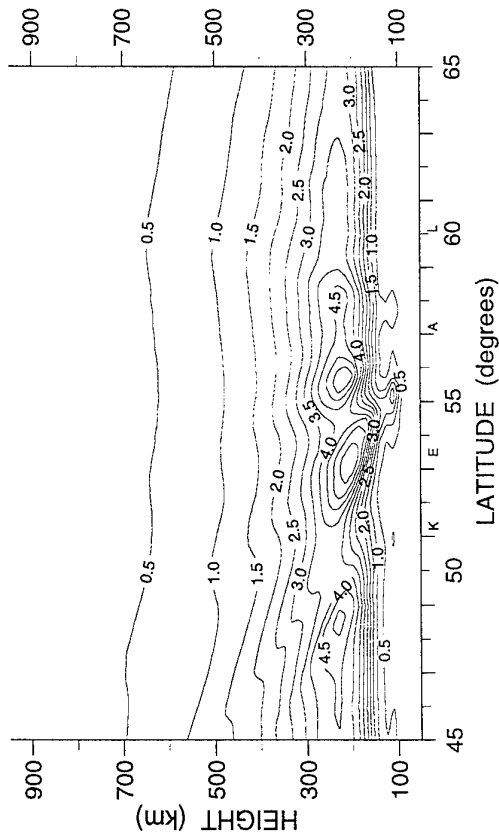
Tomographic Image: 11/02/93   11:04 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)
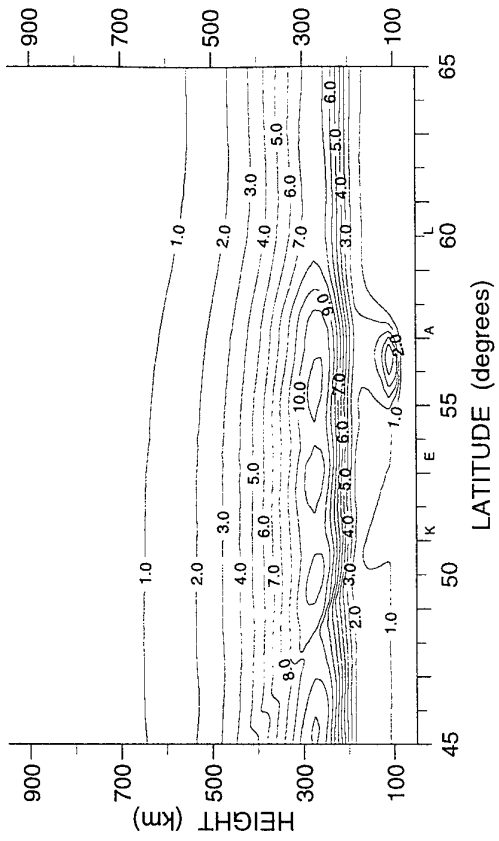
Tomographic Image: 14/02/93 18:03 UT
Electron density (x10^{11} m^{-3})
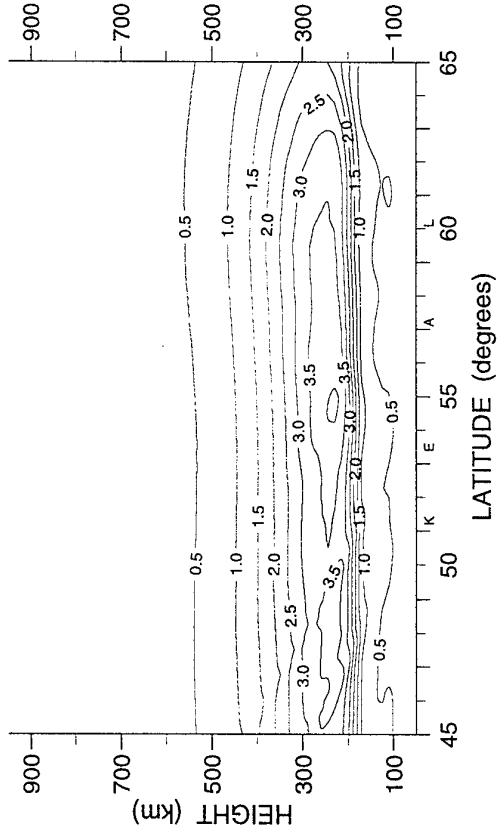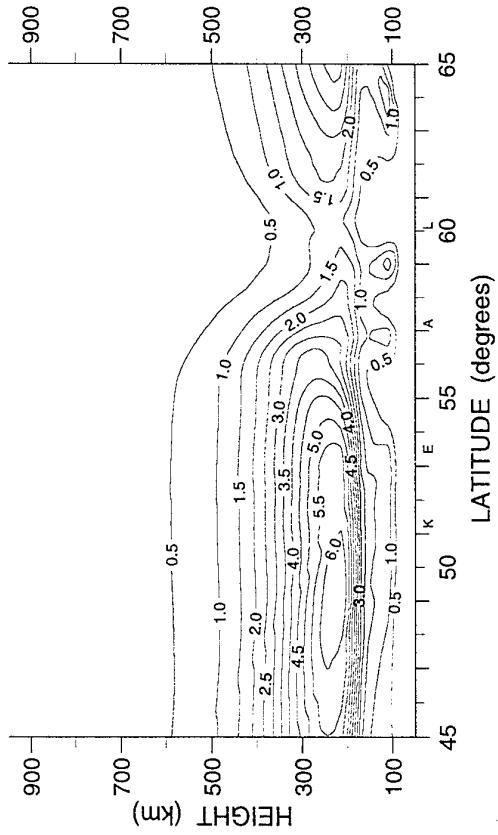
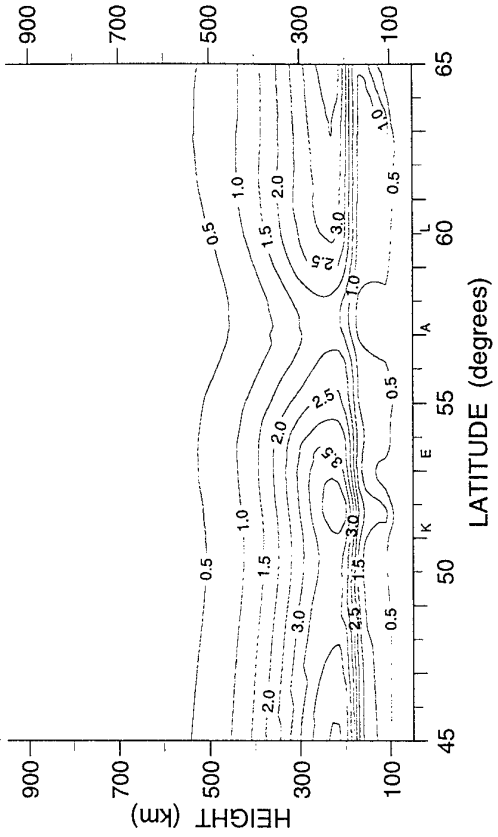Tomographic Image: 14/02/93 20:31 UT
Electron density (x10^{11} m^{-3})
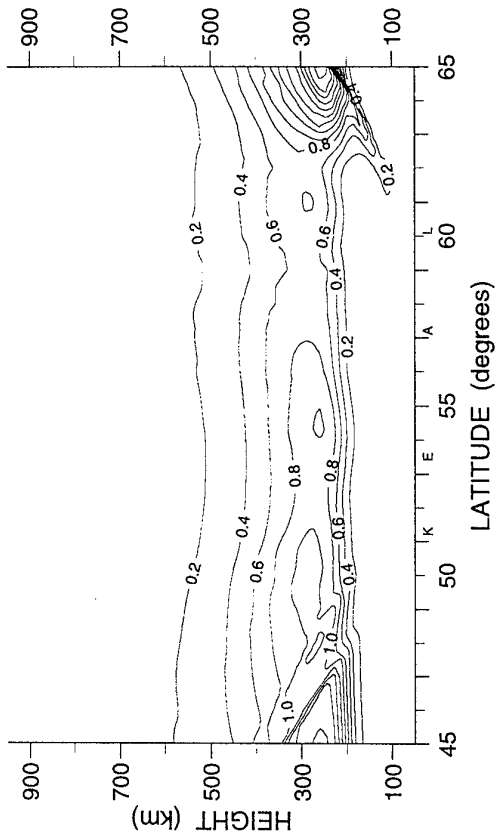
Tomographic Image: 14/02/93 19:52 UT
Electron density (x10^{11} m^{-3})
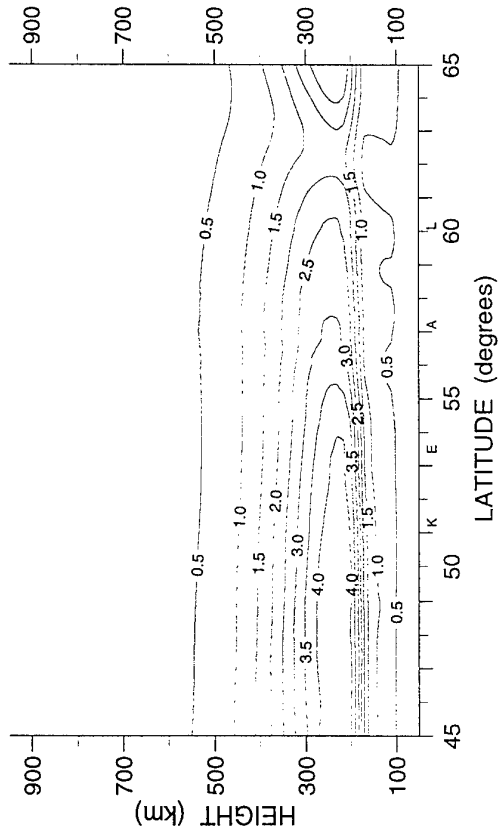
Tomographic Image: 14/02/93 21:59 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 14/02/93 23:46 UT
Electron density (x10^{11} m^{-3})
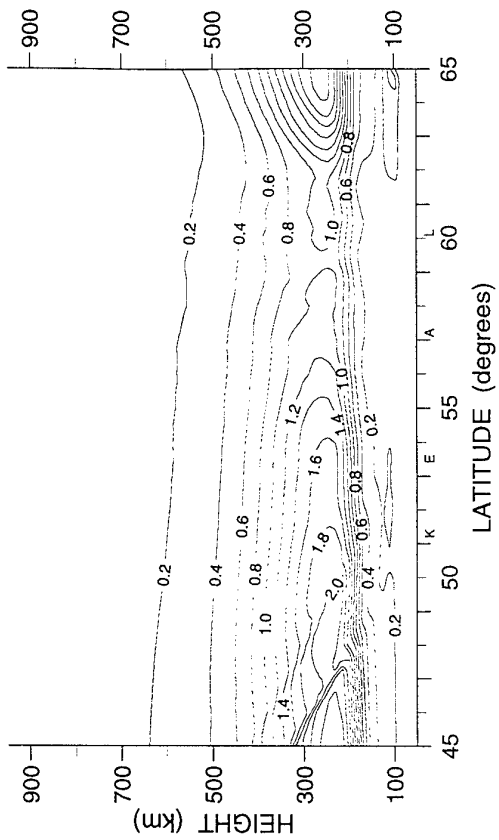
Tomographic Image: 14/02/93 22:17 UT
Electron density (x10^{11} m^{-3})
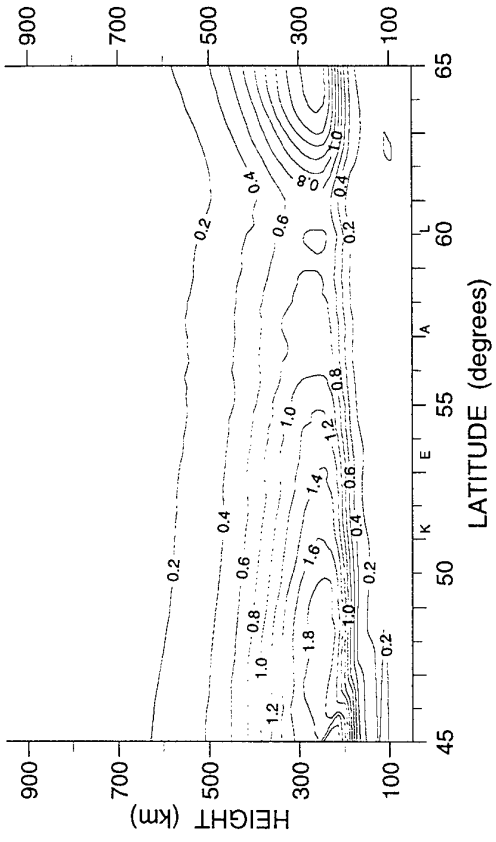
Tomographic Image: 14/02/93 22:53 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 15/02/93 17:40 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 15/02/93 20:51 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 15/02/93 04:27 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 15/02/93 07:08 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 16/02/93 02:31 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 16/02/93 06:45 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 15/02/93 22:10 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 15/02/93 23:57 UT
Electron density (x10^{11} m^{-3})
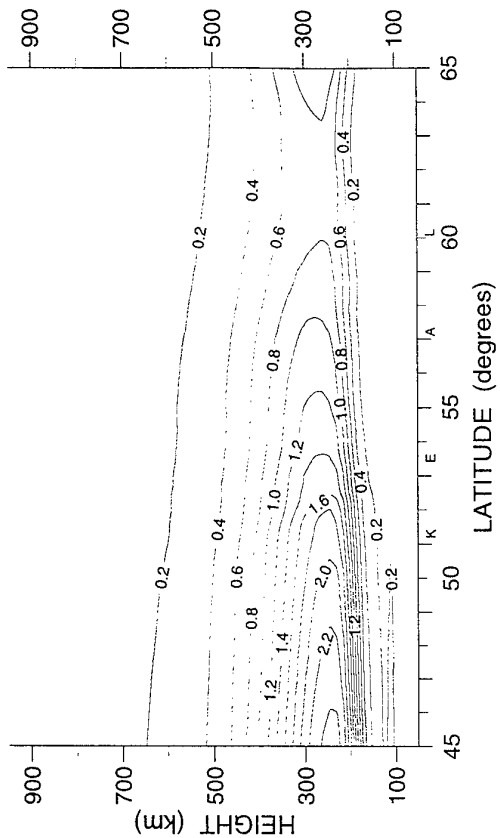
Tomographic Image: 16/02/93 11:03 UT
Electron density (x10^{11} m^{-3})
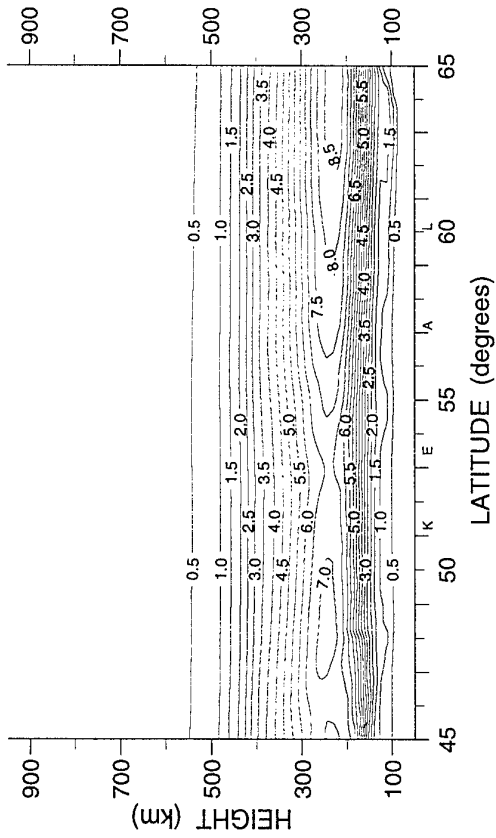
Tomographic Image: 16/02/93 17:17 UT
Electron density (x10^{11} m^{-3})
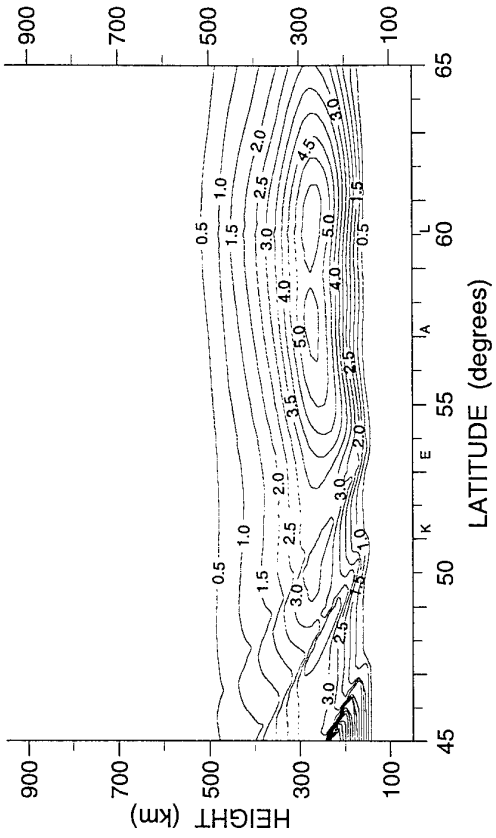
Tomographic Image: 16/02/93 14:50 UT
Electron density (x10^{11} m^{-3})
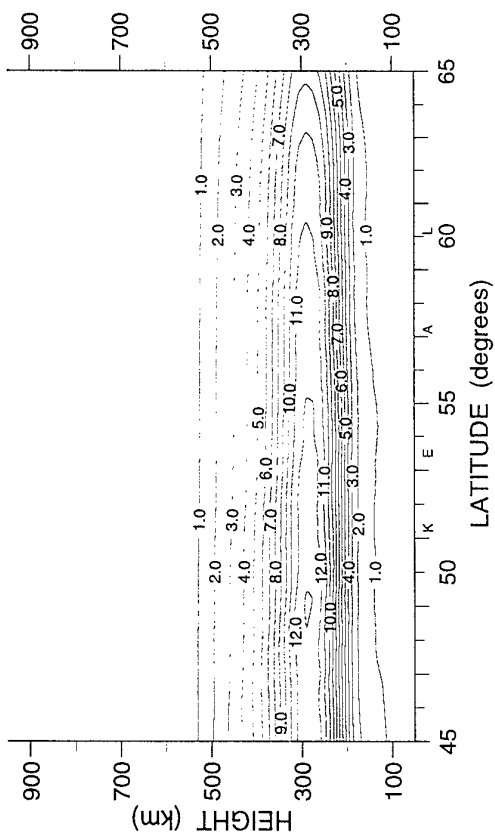
Tomographic Image: 16/02/93 17:39 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

Tomographic Image: 16/02/93 20:55 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 16/02/93 21:41 UT
Electron density (x10¹¹ m⁻³)
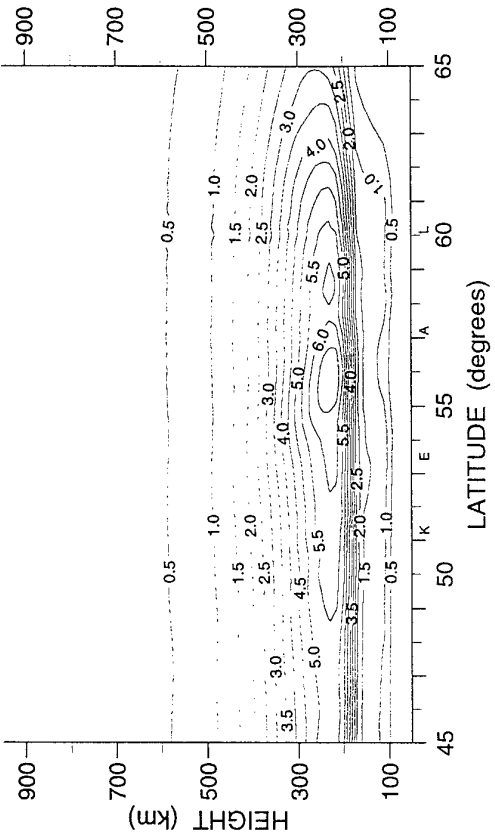
Tomographic Image: 16/02/93 19:06 UT
Electron density (x10¹¹ m⁻³)
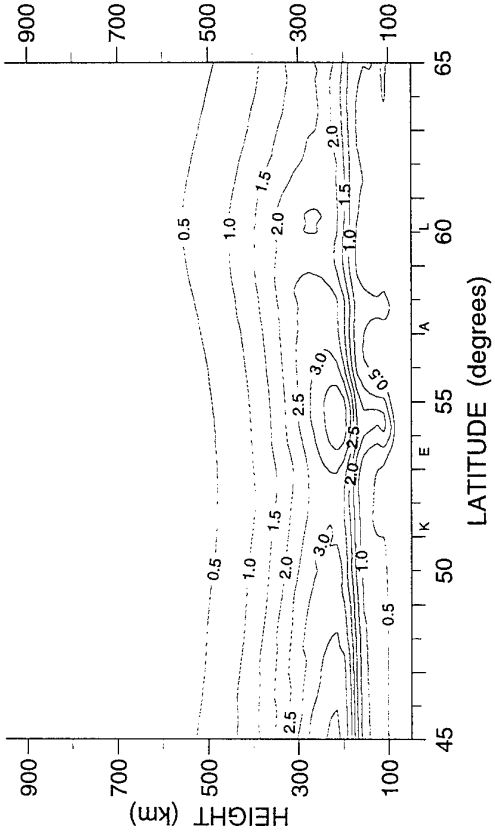
Tomographic Image: 16/02/93 20:28 UT
Electron density (x10¹¹ m⁻³)
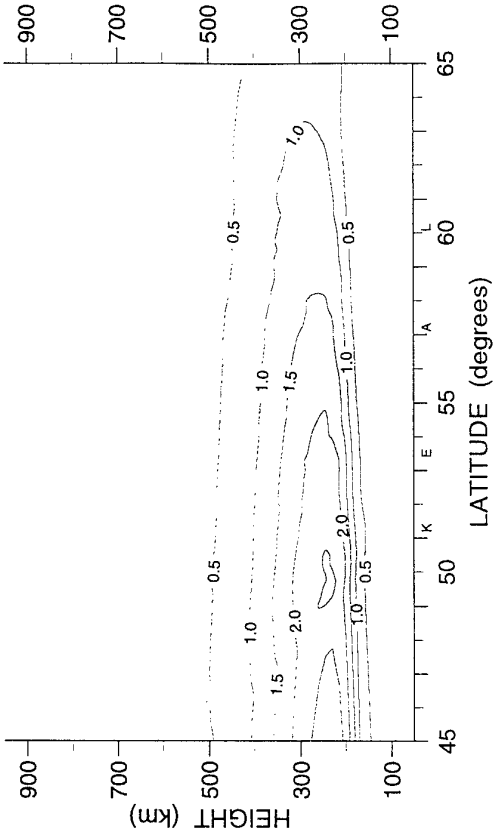
Tomographic Image: 16/02/93 22:17 UT
Electron density (×10^{11} m^{-3})
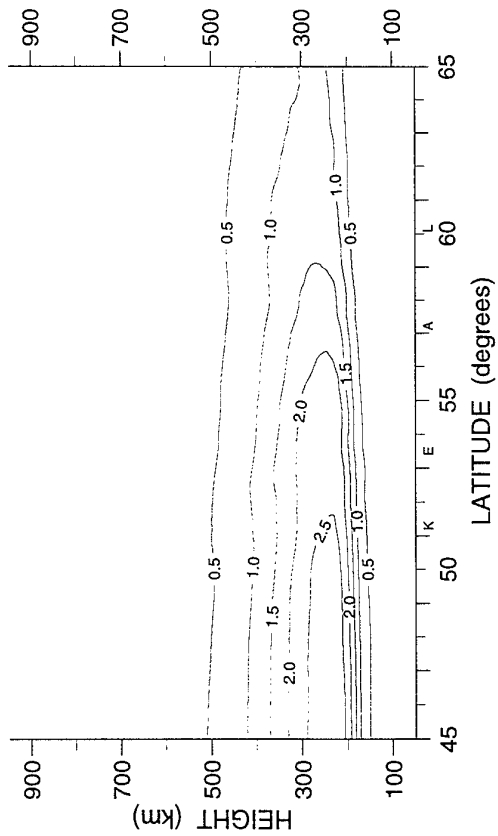
Tomographic Image: 17/02/93 06:22 UT
Electron density (×10^{11} m^{-3})
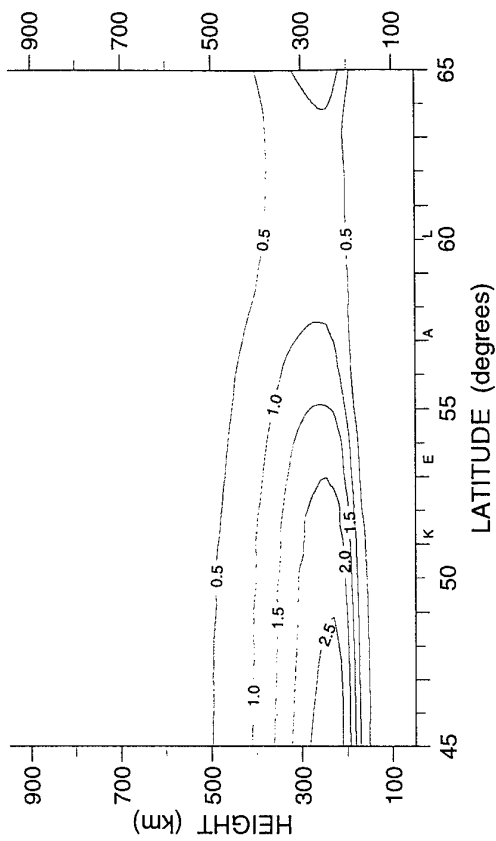
Tomographic Image: 16/02/93 23:14 UT
Electron density (×10^{11} m^{-3})
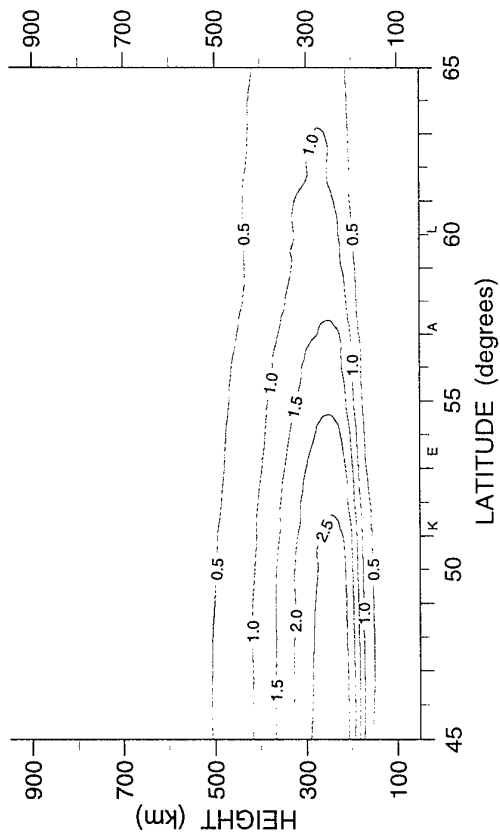
Tomographic Image: 17/02/93 08:11 UT
Electron density (×10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)
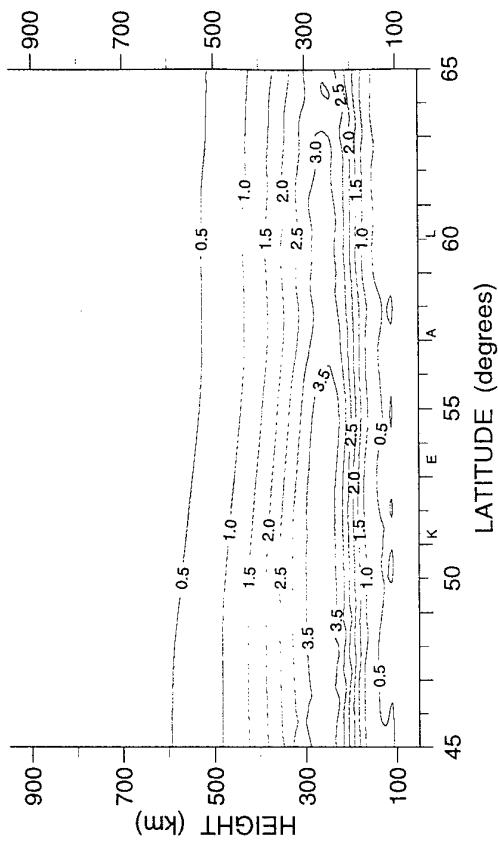
Tomographic Image: 17/02/93 20:05 UT
Electron density (x10^{11} m^{-3})
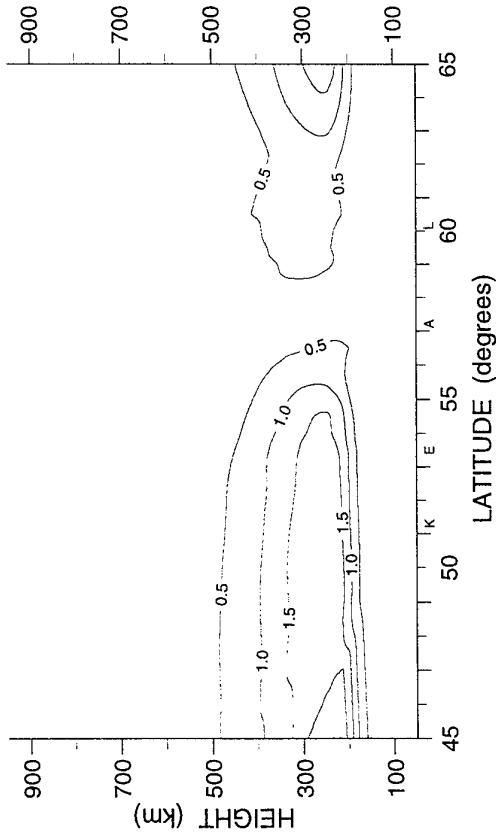
Tomographic Image: 17/02/93 23:24 UT
Electron density (x10^{11} m^{-3})
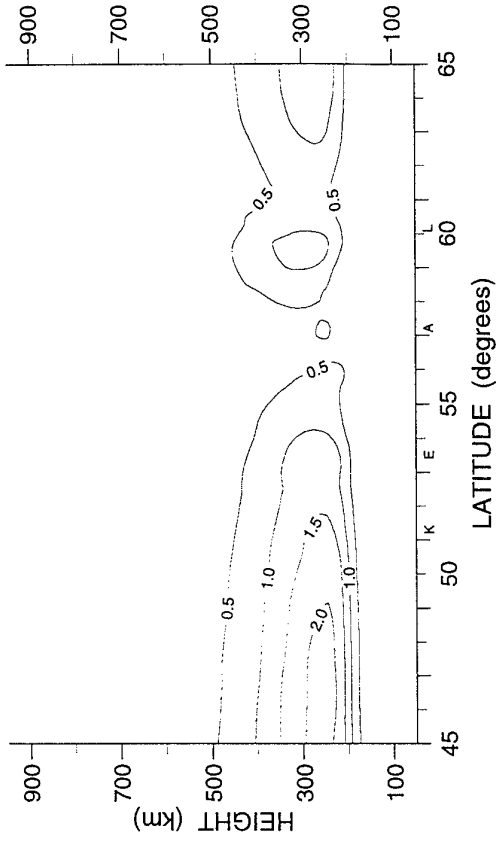
Tomographic Image: 17/02/93 21:54 UT
Electron density (x10^{11} m^{-3})
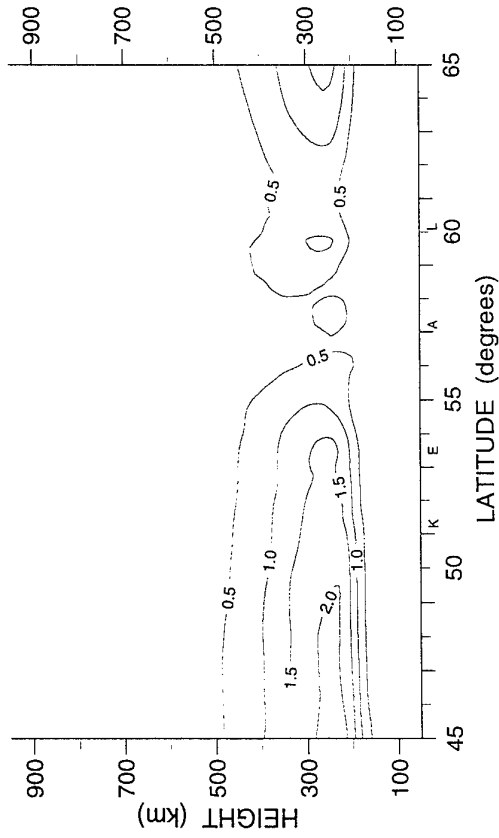
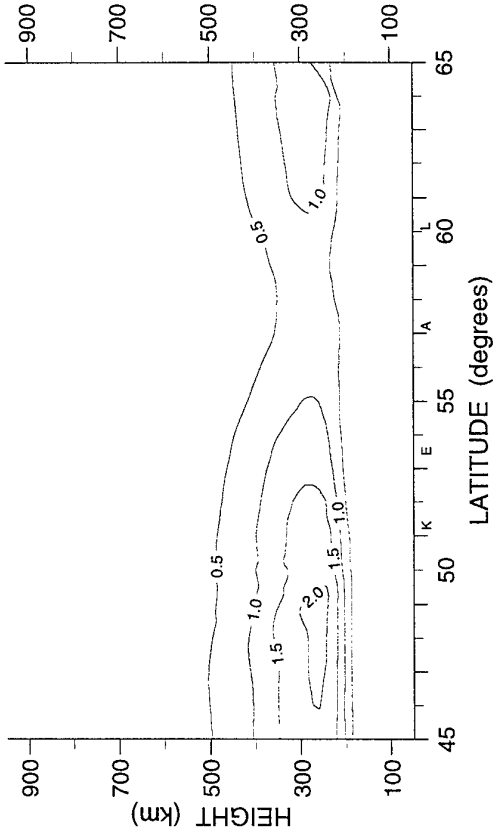Tomographic Image: 18/02/93 00:18 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 18/02/93 11:24 UT
Electron density (x10^{11} m^{-3})

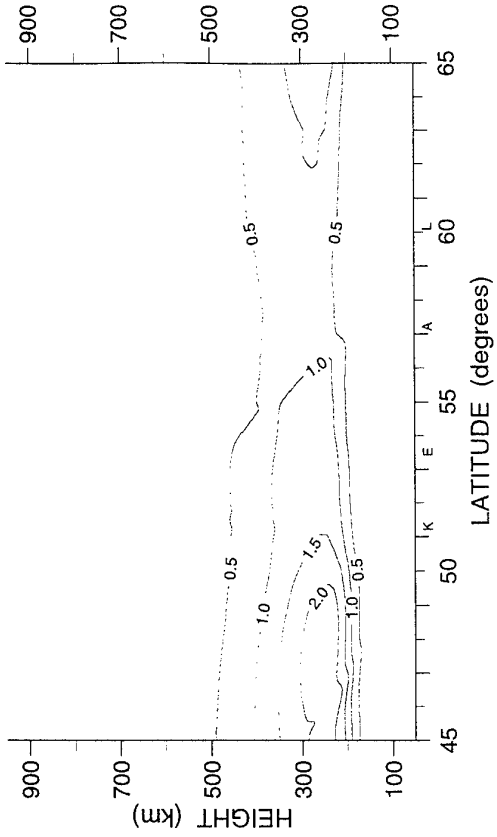Tomographic Image: 19/02/93 08:46 UT
Electron density (x10^{11} m^{-3})
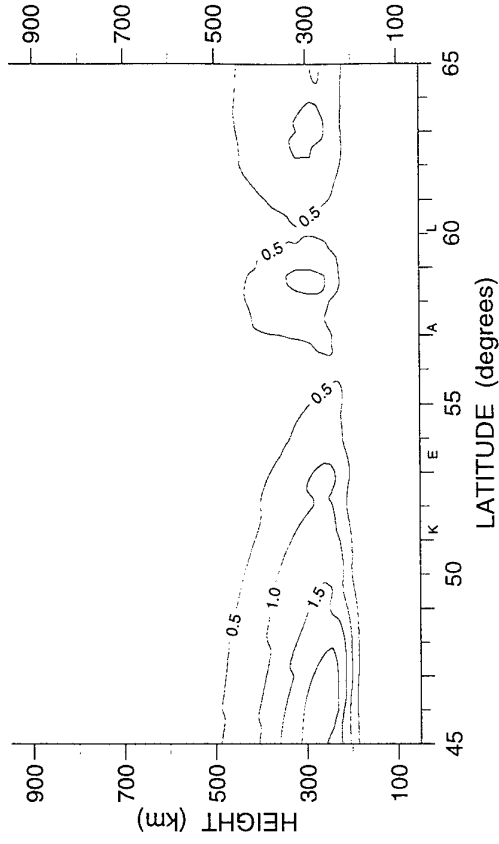
Tomographic Image: 18/02/93 01:35 UT
Electron density (x10^{11} m^{-3})
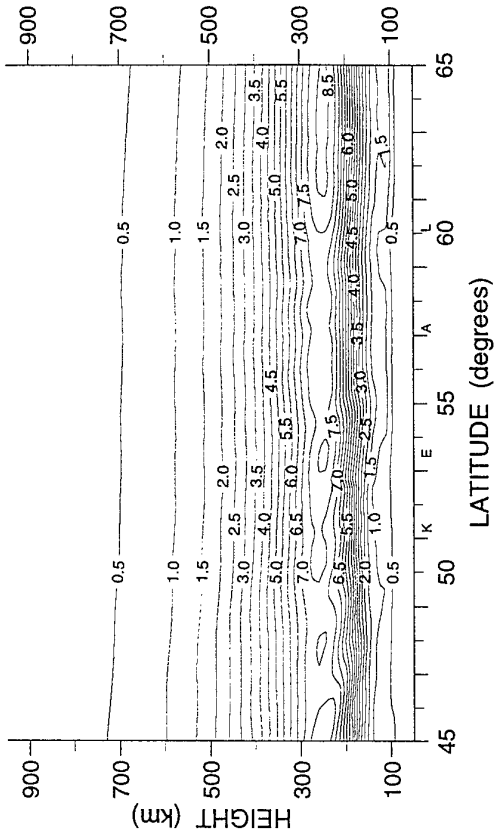
Tomographic Image: 18/02/93 09:09 UT
Electron density (x10^{11} m^{-3})

LATITUDE (degrees)

HEIGHT (km)

Tomographic Image: 19/02/93 19:46 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 19/02/93 21:58 UT
Electron density (x10^{11} m^{-3})
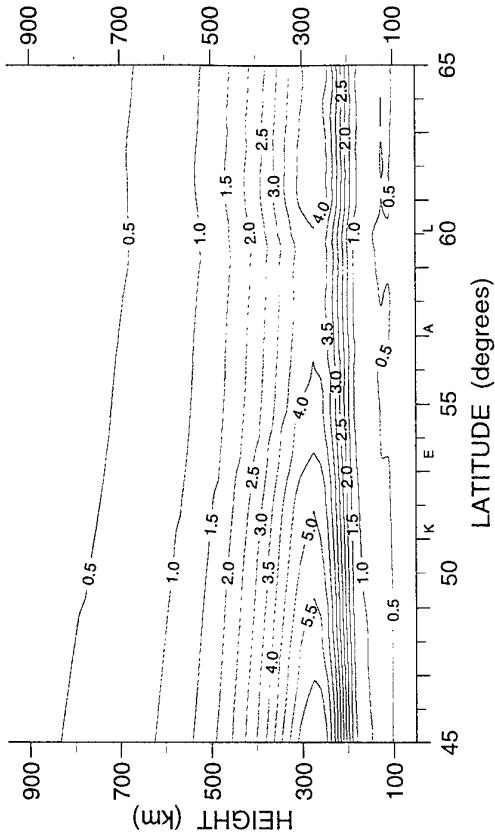
Tomographic Image: 19/02/93 11:29 UT
Electron density (x10^{11} m^{-3})
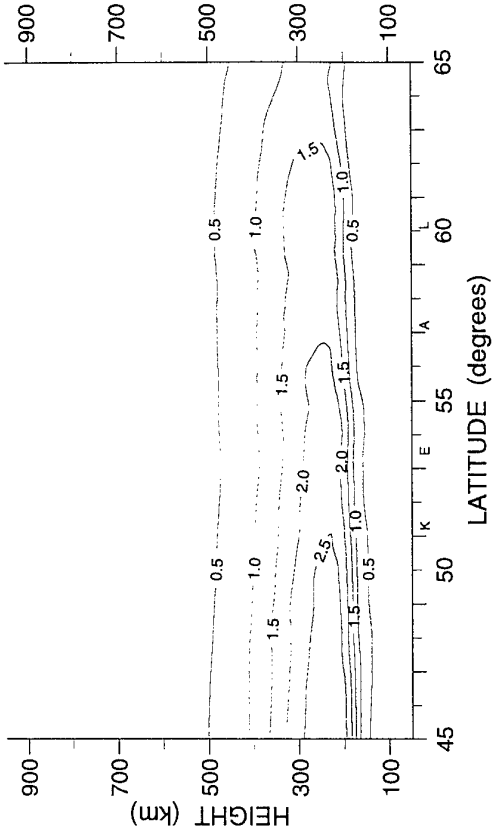
Tomographic Image: 19/02/93 17:57 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 19/02/93 23:26 UT
Electron density (x10^11 m^-3)

Tomographic Image: 20/02/93 06:03 UT
Electron density (x10^11 m^-3)

Tomographic Image: 19/02/93 23:46 UT
Electron density (x10^11 m^-3)
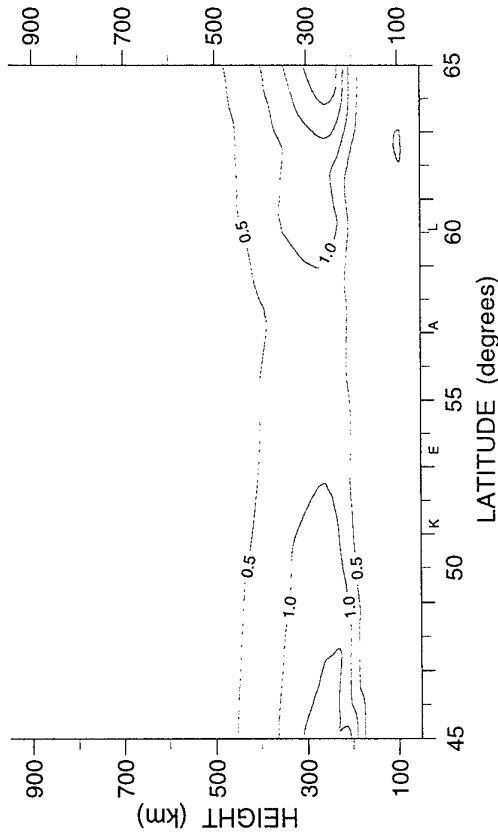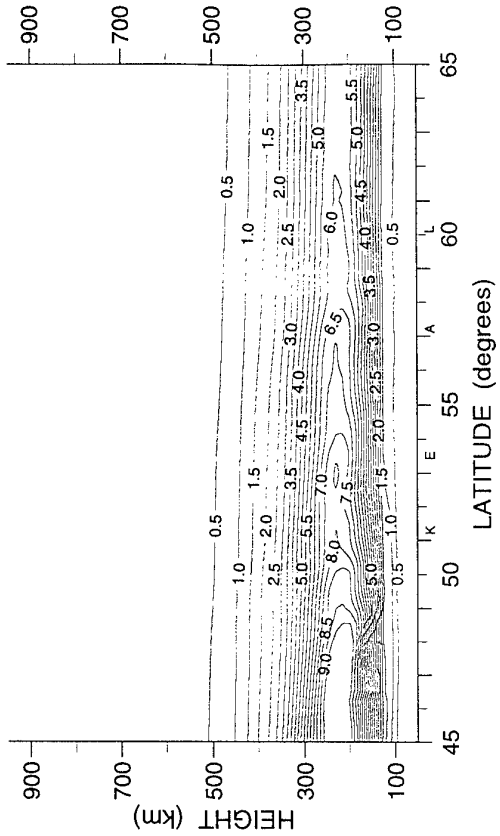
Tomographic Image: 20/02/93 08:23 UT
Electron density (x10^11 m^-3)

37

Tomographic Image: 20/02/93 16:26 UT
Electron density (x10^{11} m^{-3})

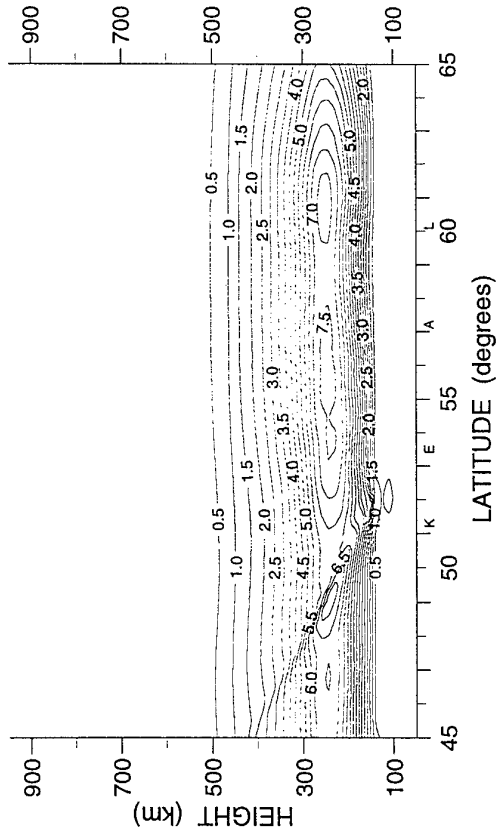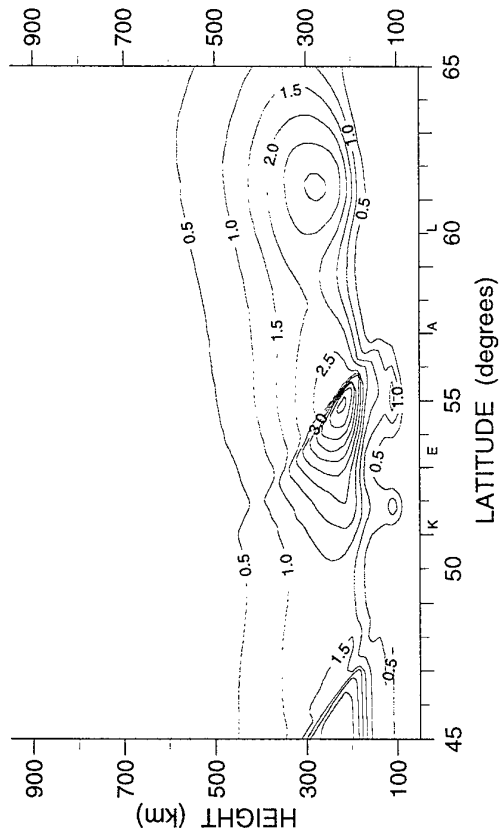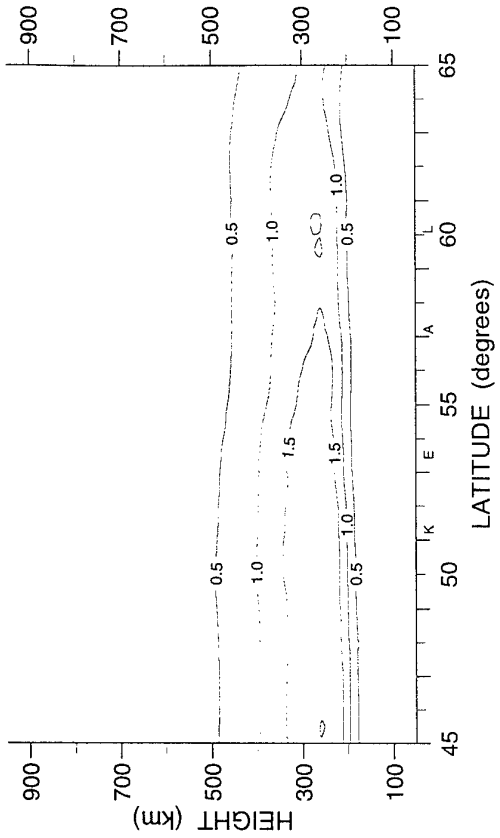Tomographic Image: 20/02/93 17:34 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 20/02/93 09:57 UT
Electron density (x10^{11} m^{-3})
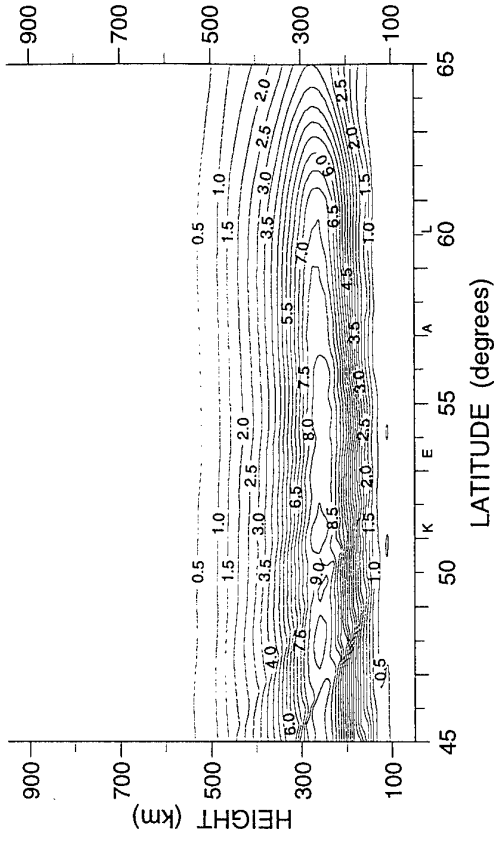
Tomographic Image: 20/02/93 10:12 UT
Electron density (x10^{11} m^{-3})

LATITUDE (degrees)

HEIGHT (km)

38
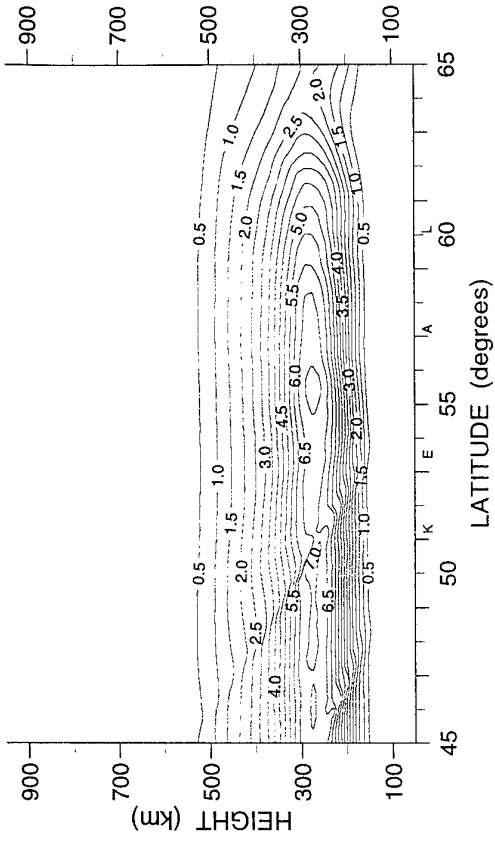
Tomographic Image: 20/02/93 19:23 UT
Electron density (x10^{11} m^{-3})
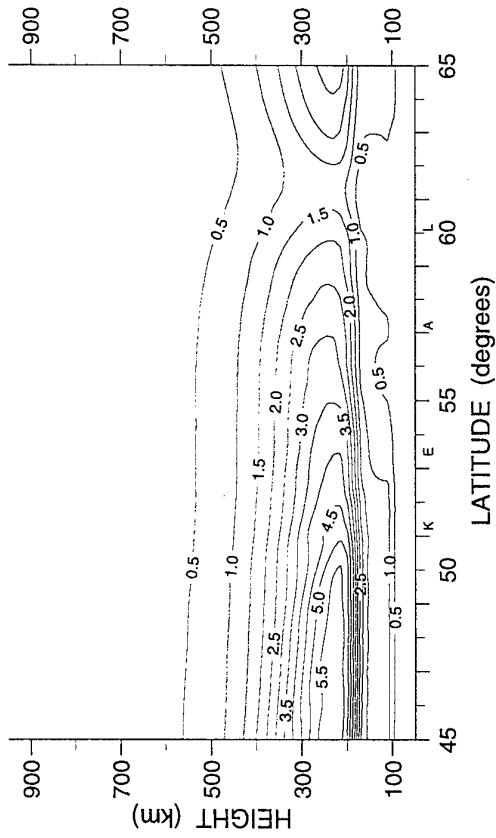
Tomographic Image: 20/02/93 22:08 UT
Electron density (x10^{11} m^{-3})
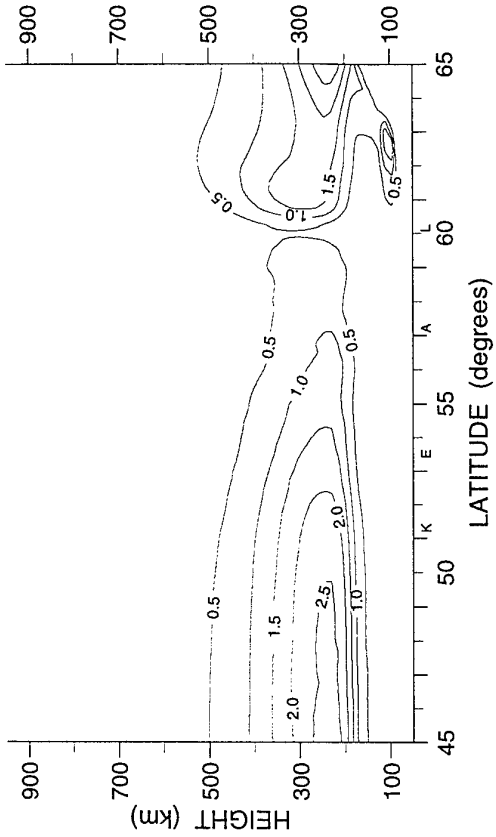
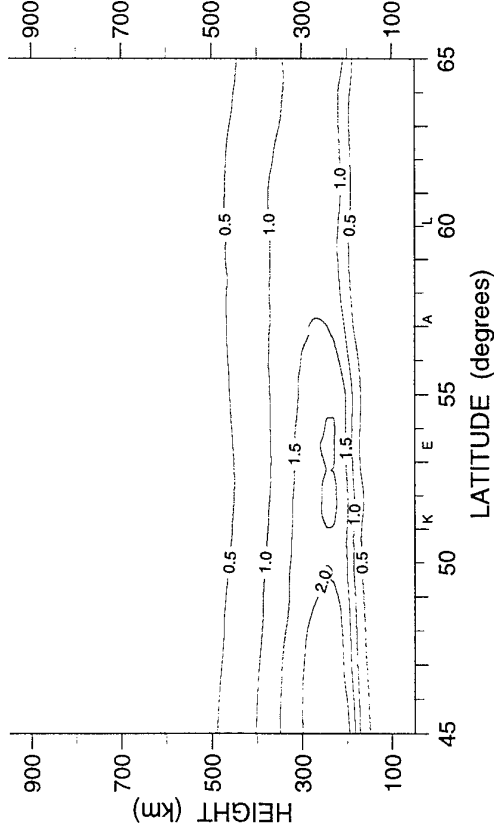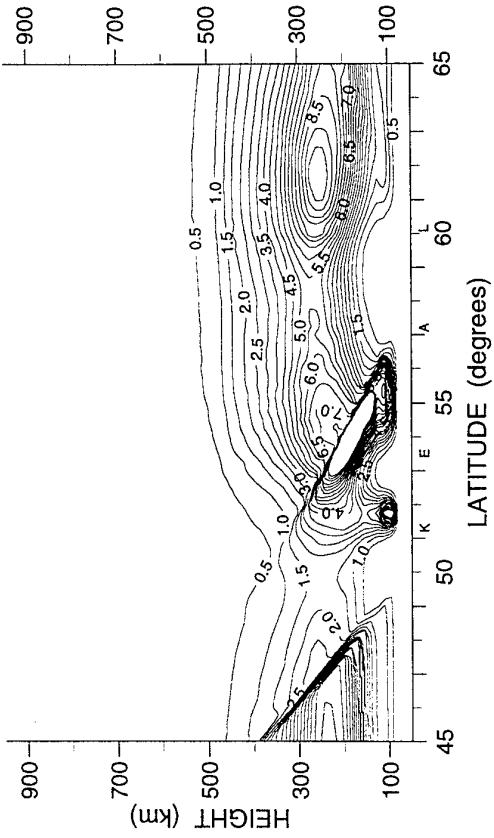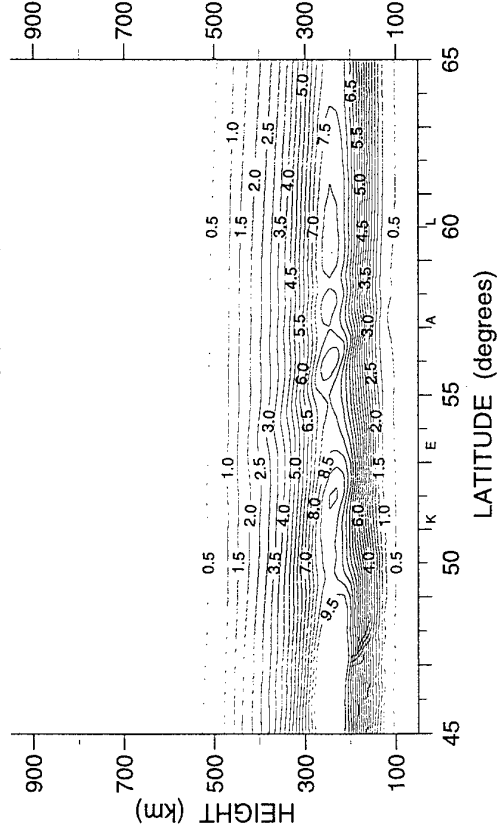Tomographic Image: 20/02/93 20:45 UT
Electron density (x10^{11} m^{-3})
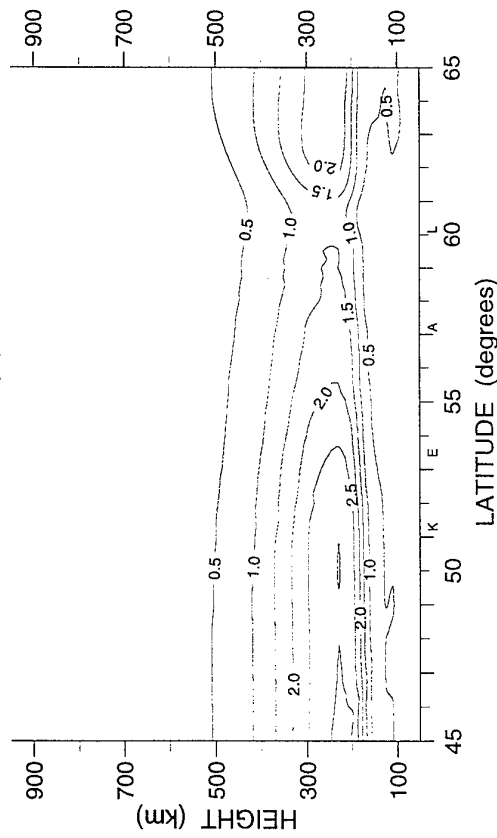
Tomographic Image: 21/02/93 17:28 UT
Electron density (x10^{11} m^{-3})
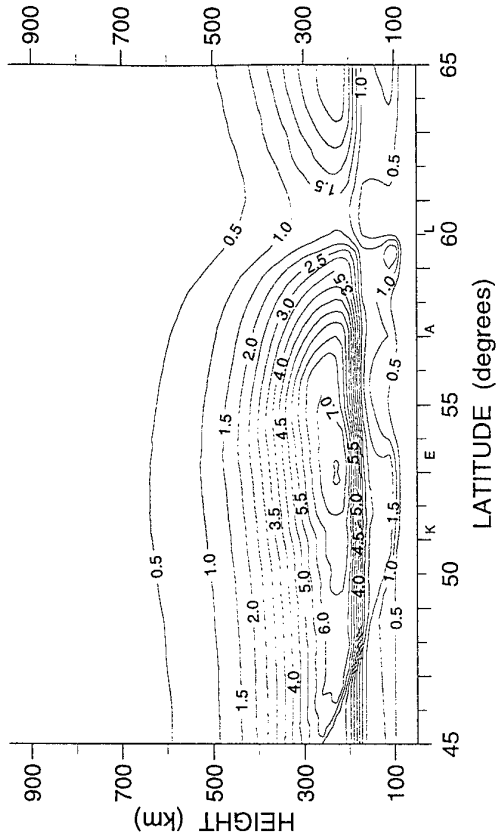
Tomographic Image: 21/02/93 19:00 UT
Electron density (x10^11 m^-3)
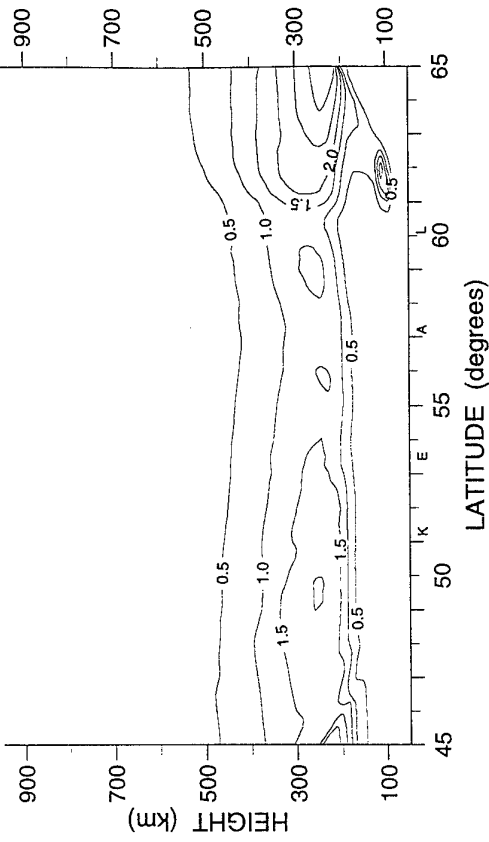
Tomographic Image: 22/02/93 20:26 UT
Electron density (x10^11 m^-3)

Tomographic Image: 21/02/93 20:22 UT
Electron density (x10^11 m^-3)
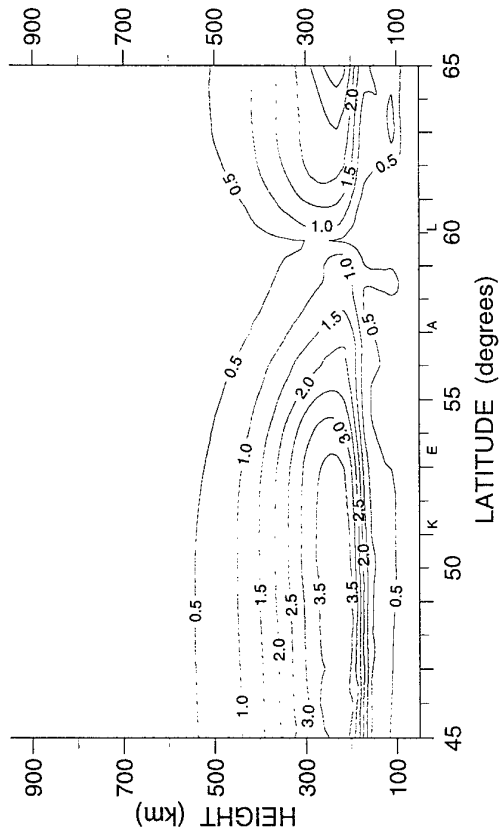
Tomographic Image: 22/02/93 22:29 UT
Electron density (x10^11 m^-3)

Tomographic Image: 23/02/93 09:03 UT
Electron density (x10^11 m^-3)

Tomographic Image: 23/02/93 10:18 UT
Electron density (x10^11 m^-3)
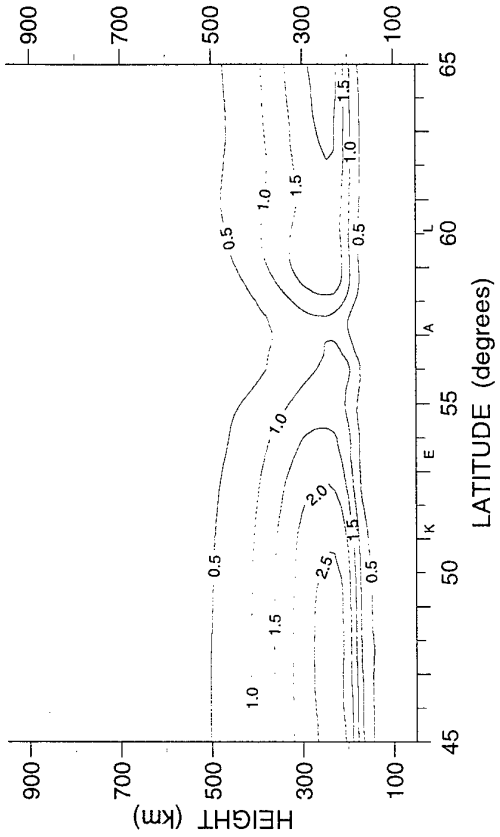
Tomographic Image: 23/02/93 01:05 UT
Electron density (x10^11 m^-3)
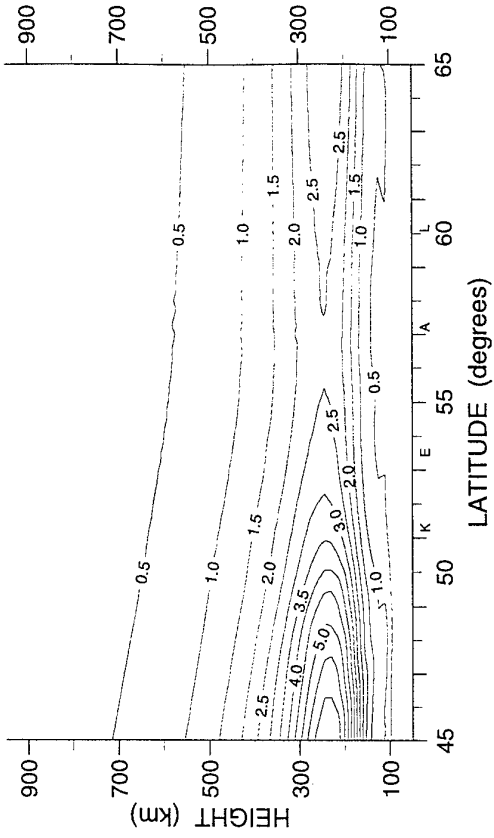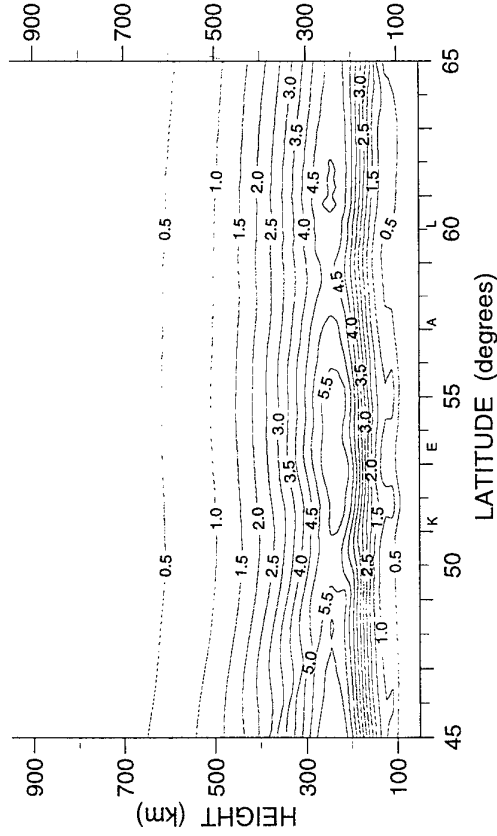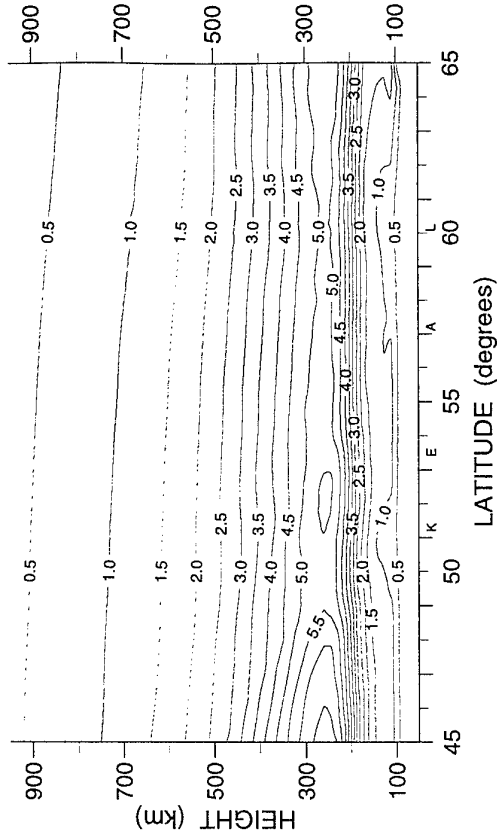
Tomographic Image: 23/02/93 02:54 UT
Electron density (x10^11 m^-3)

41
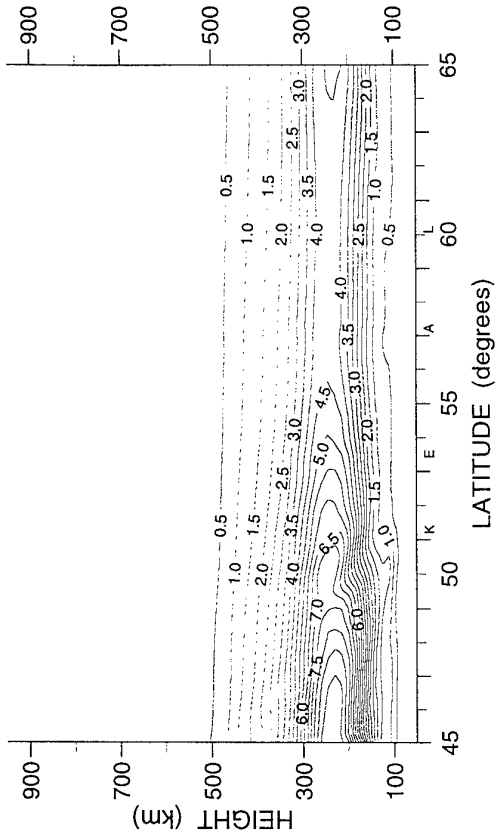
Tomographic Image: 23/02/93 10:52 UT
Electron density (x10^{11} m^{-3})
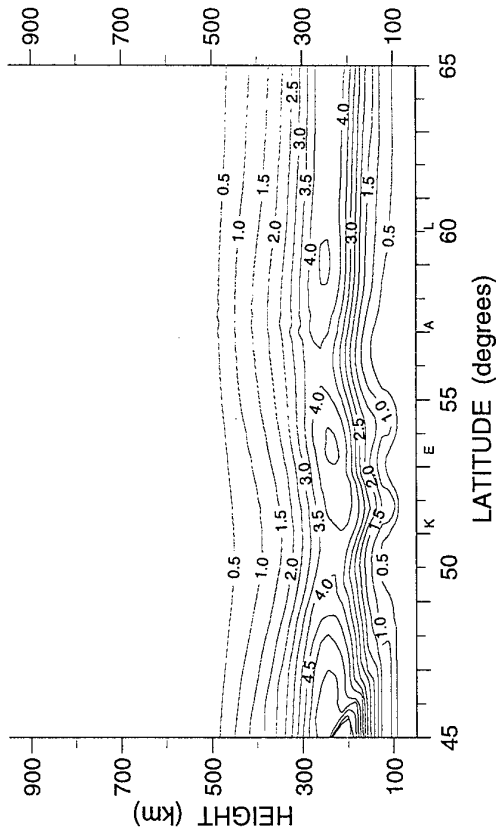
Tomographic Image: 23/02/93 18:14 UT
Electron density (x10^{11} m^{-3})
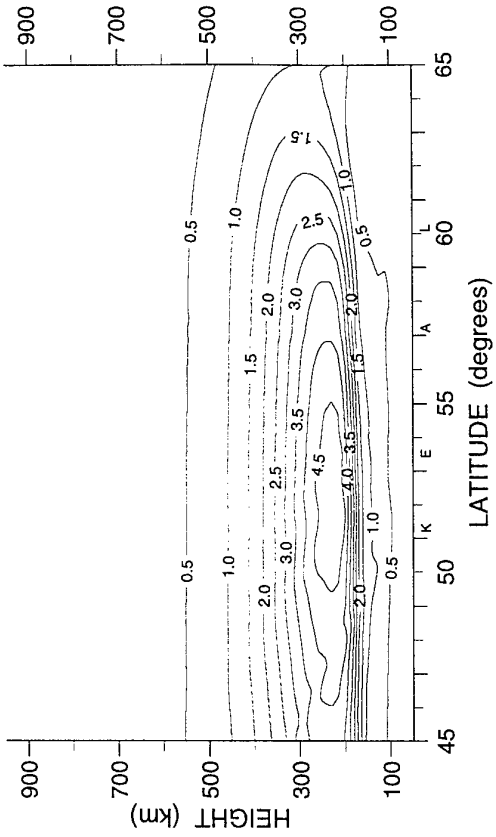
Tomographic Image: 23/02/93 13:24 UT
Electron density (x10^{11} m^{-3})
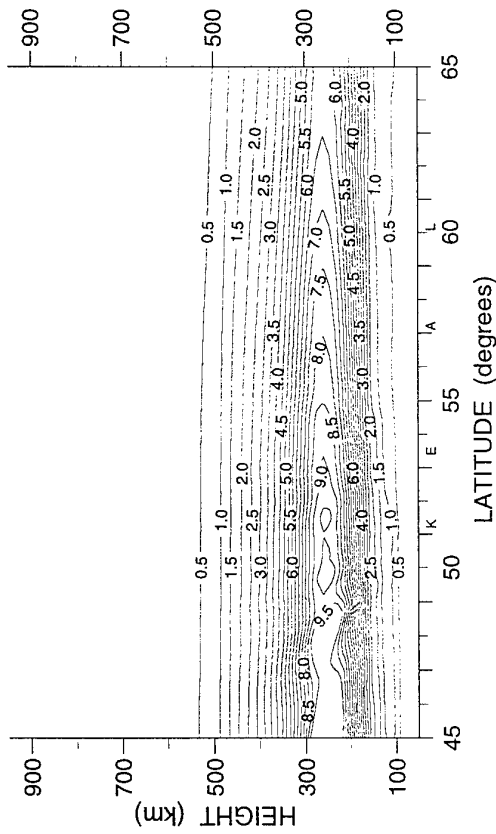
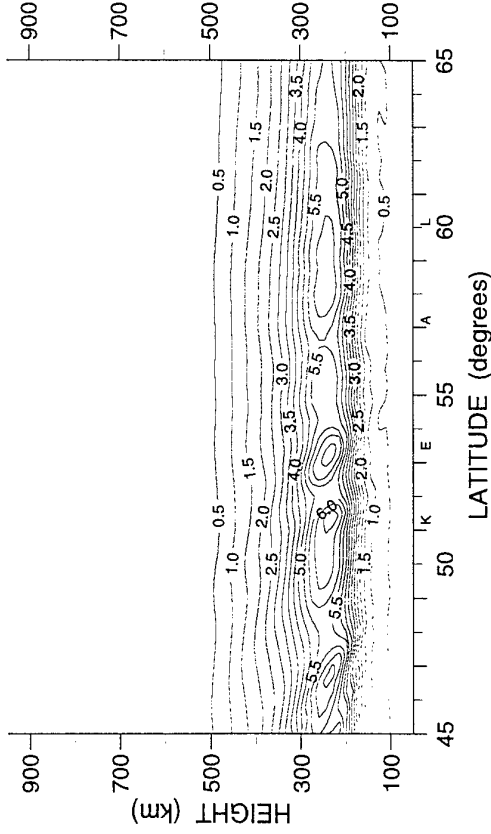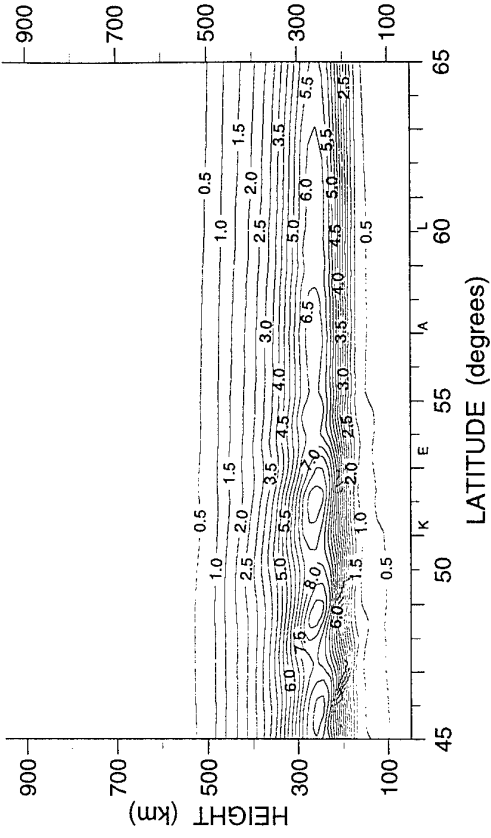Tomographic Image: 23/02/93 21:25 UT
Electron density (x10^{11} m^{-3})
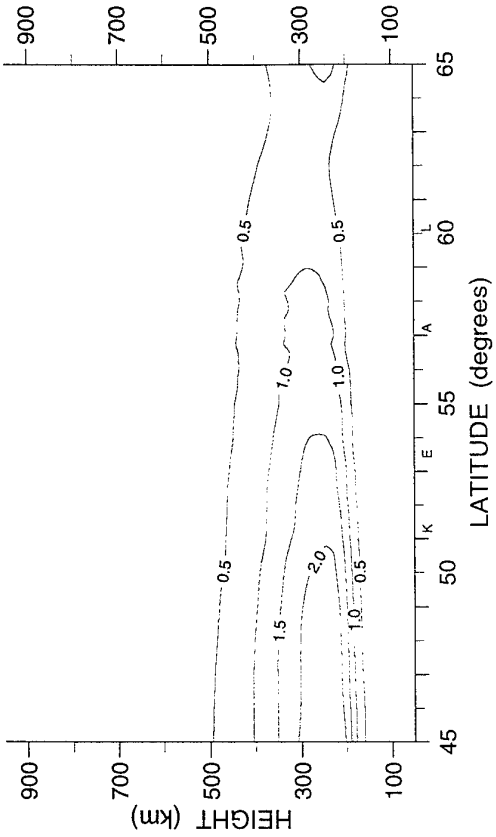
Tomographic Image: 23/02/93 22:41 UT
Electron density (x10^{11} m^{-3})
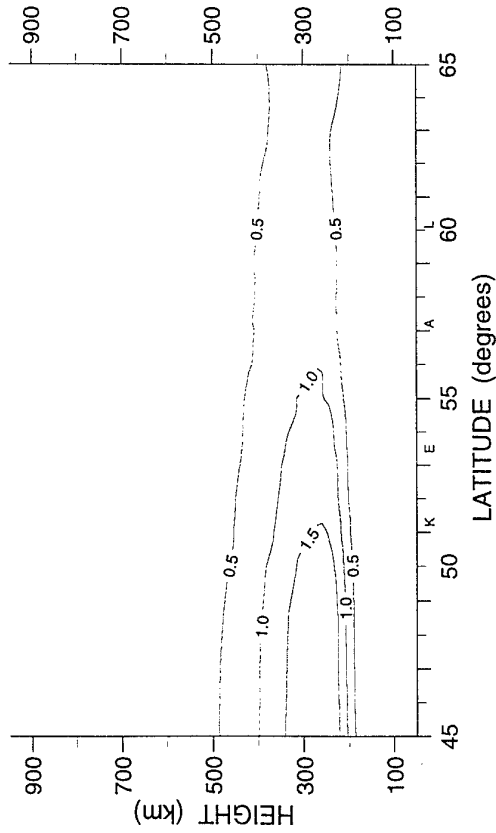
Tomographic Image: 24/02/93 02:26 UT
Electron density (x10^{11} m^{-3})
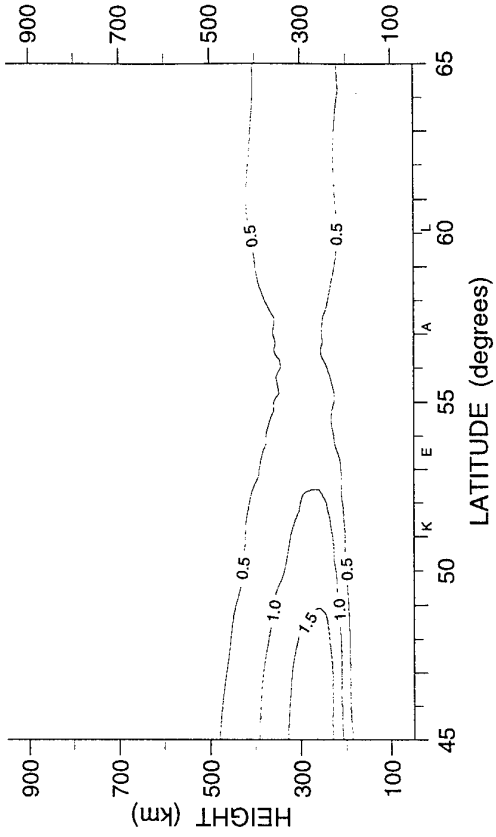
Tomographic Image: 23/02/93 23:33 UT
Electron density (x10^{11} m^{-3})
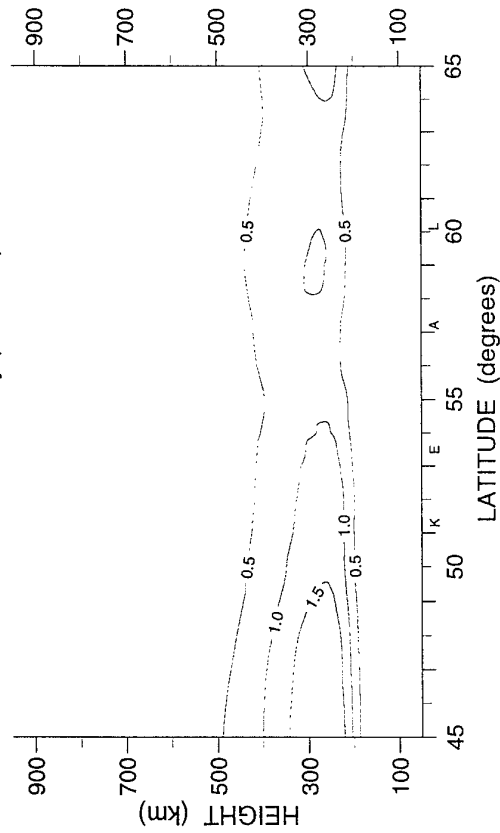
Tomographic Image: 24/02/93 07:18 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

Tomographic Image: 24/02/93 12:56 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 24/02/93 16:02 UT
Electron density (x10^{11} m^{-3})
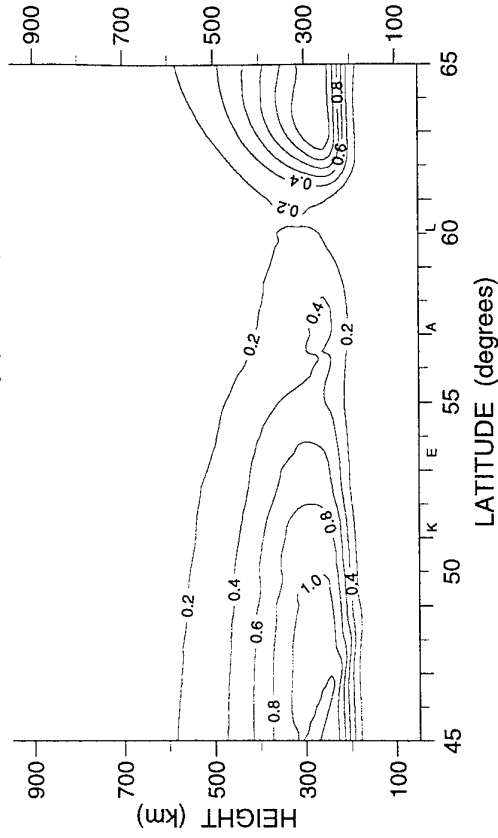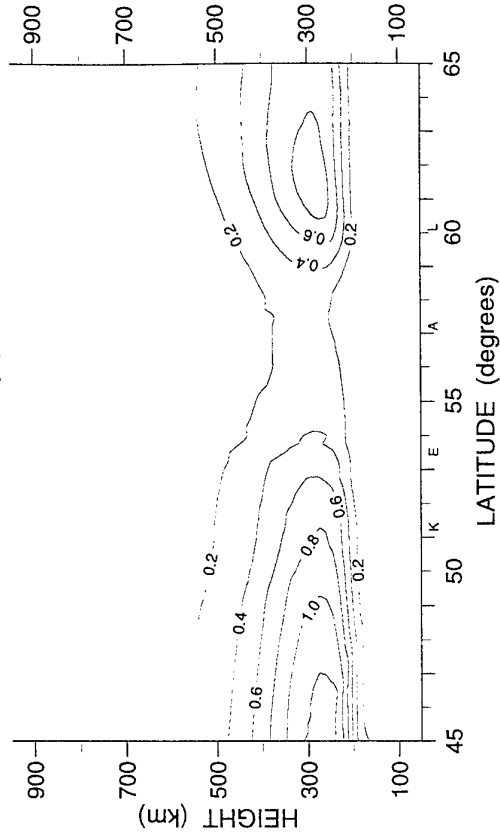
Tomographic Image: 24/02/93 08:40 UT
Electron density (x10^{11} m^{-3})
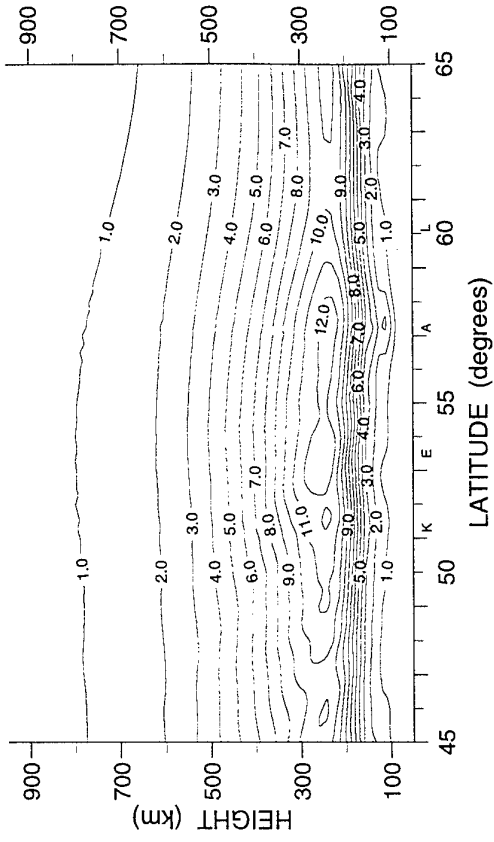
Tomographic Image: 24/02/93 11:34 UT
Electron density (x10^{11} m^{-3})
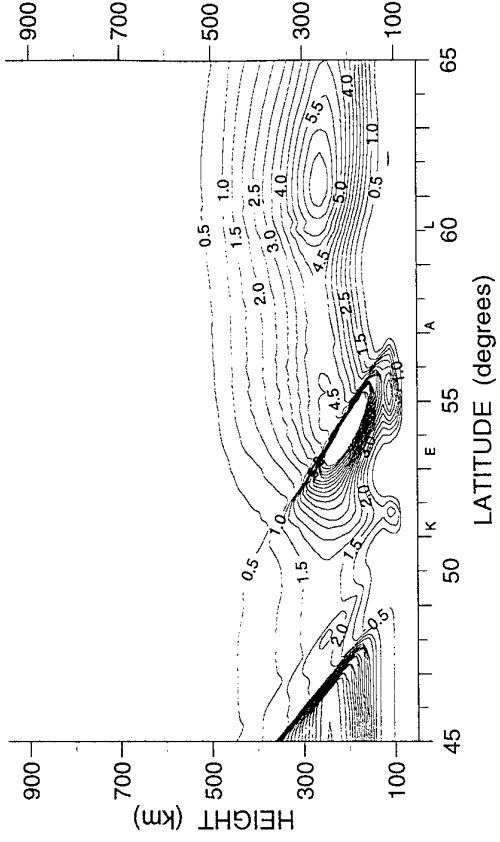
Tomographic Image: 24/02/93 17:51 UT
Electron density (x10^{11} m^{-3})
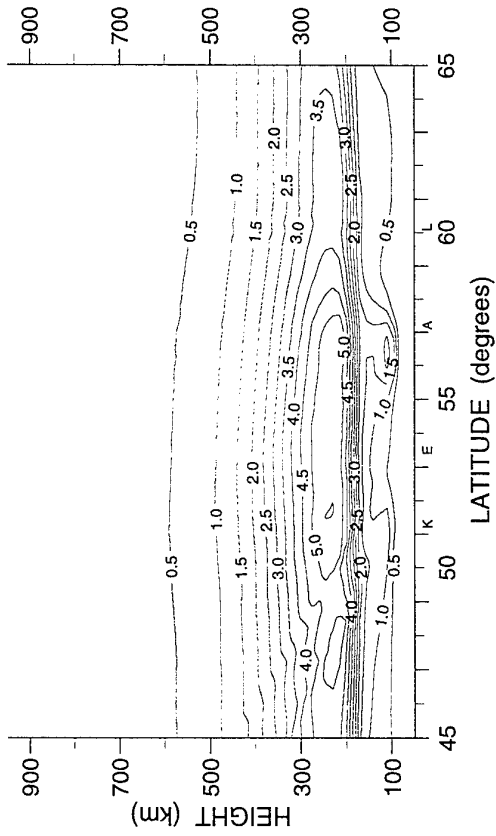
Tomographic Image: 24/02/93 20:10 UT
Electron density (x10^{11} m^{-3})
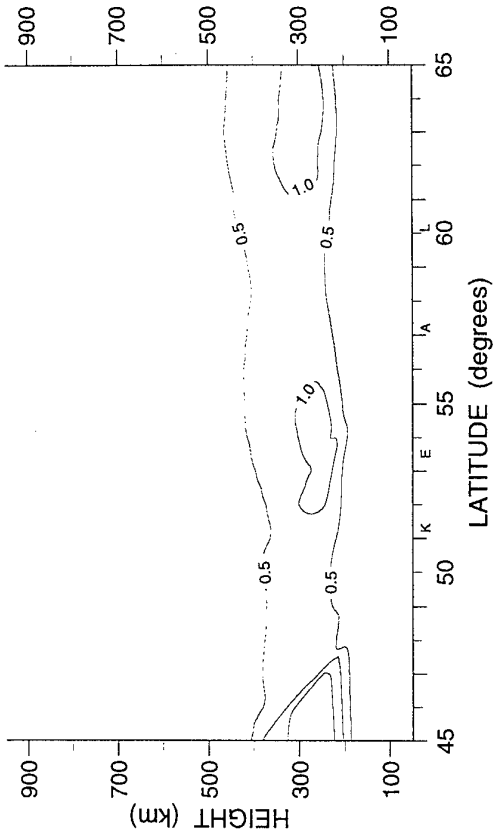
Tomographic Image: 24/02/93 19:13 UT
Electron density (x10^{11} m^{-3})
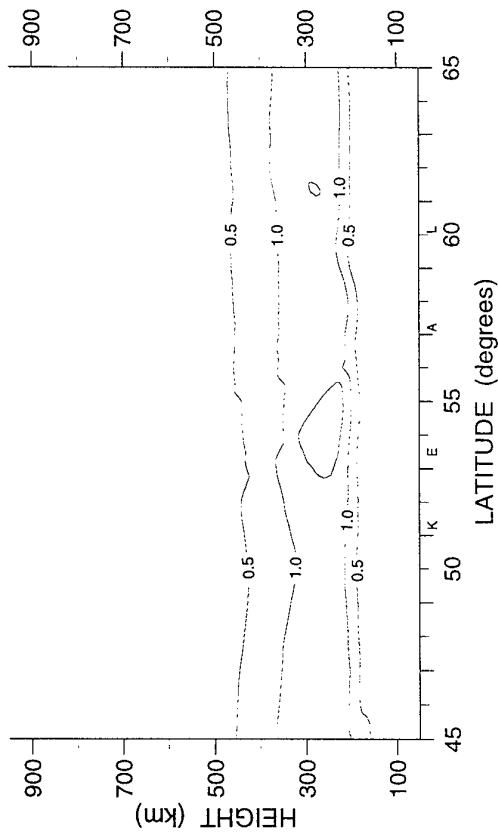
Tomographic Image: 24/02/93 21:02 UT
Electron density (x10^{11} m^{-3})
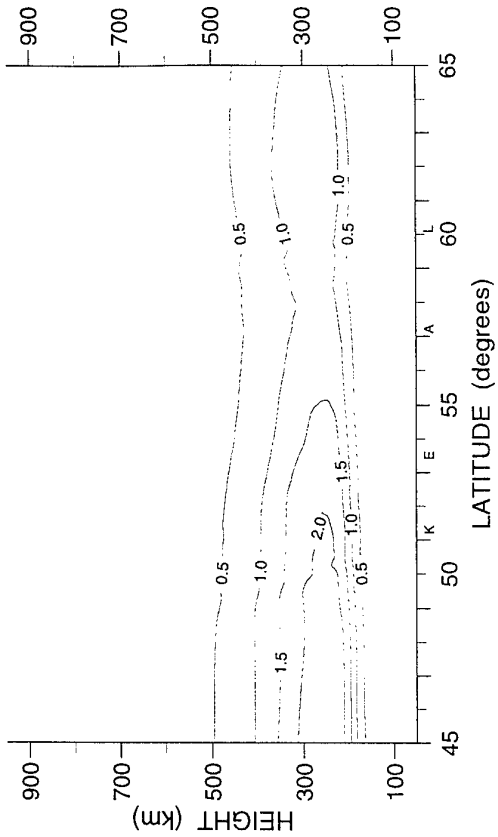
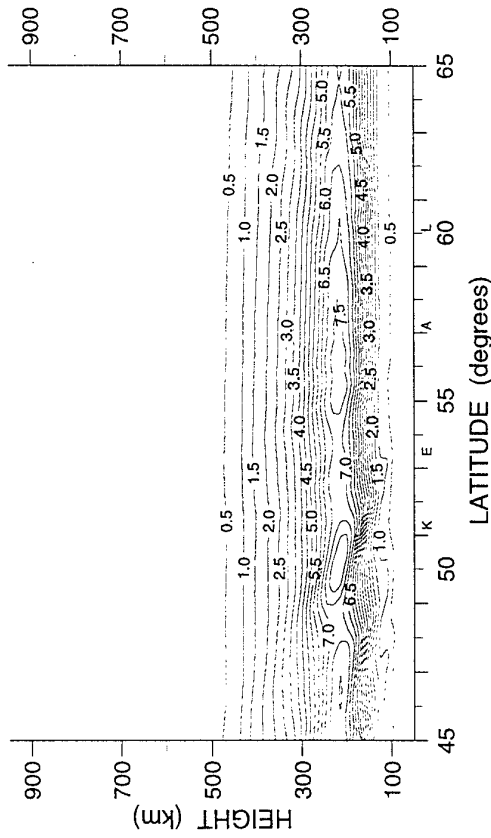Tomographic Image: 24/02/93 21:58 UT
Electron density (x10^{11} m^{-3})
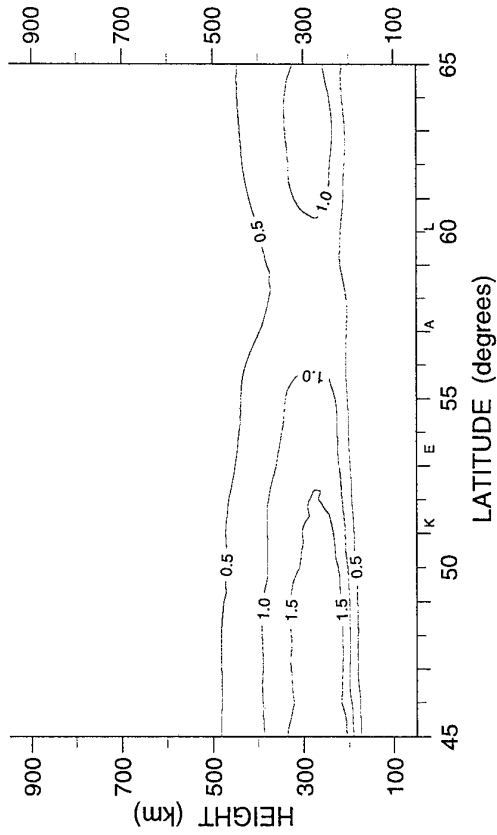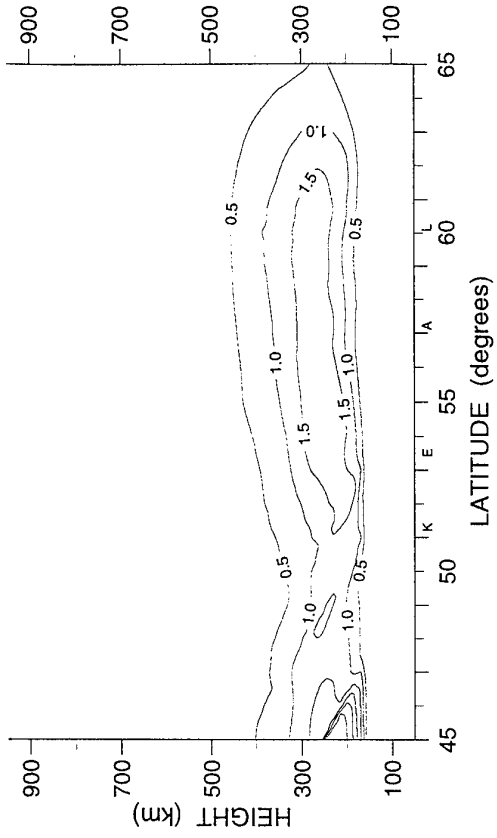
Tomographic Image: 25/02/93 01:58 UT
Electron density (x10^{11} m^{-3})
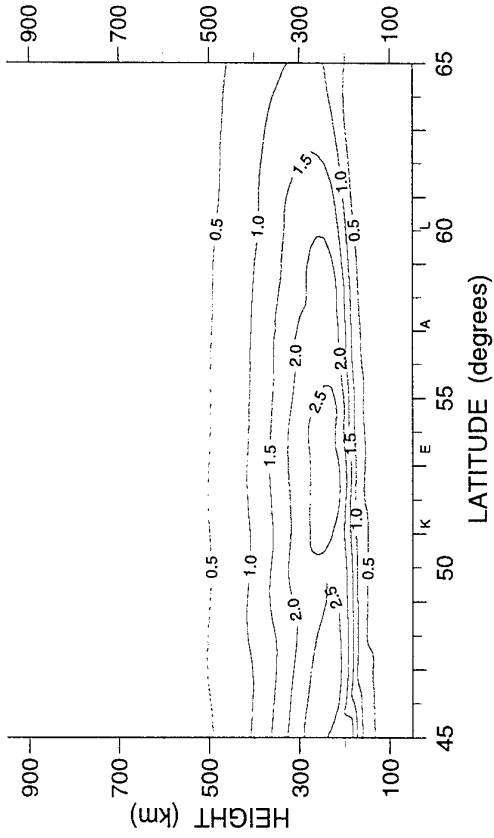
Tomographic Image: 25/02/93 00:09 UT
Electron density (x10^{11} m^{-3})
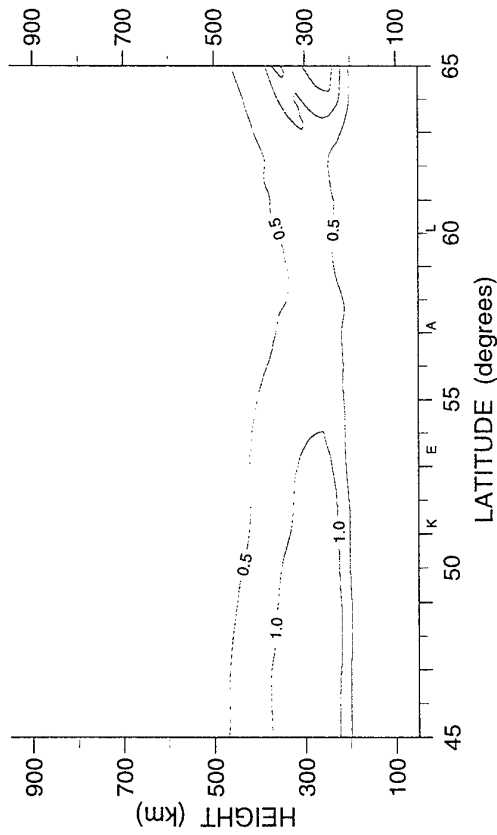
Tomographic Image: 25/02/93 04:05 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

Tomographic Image: 25/02/93 06:28 UT
Electron density (x10^{11} m^{-3})
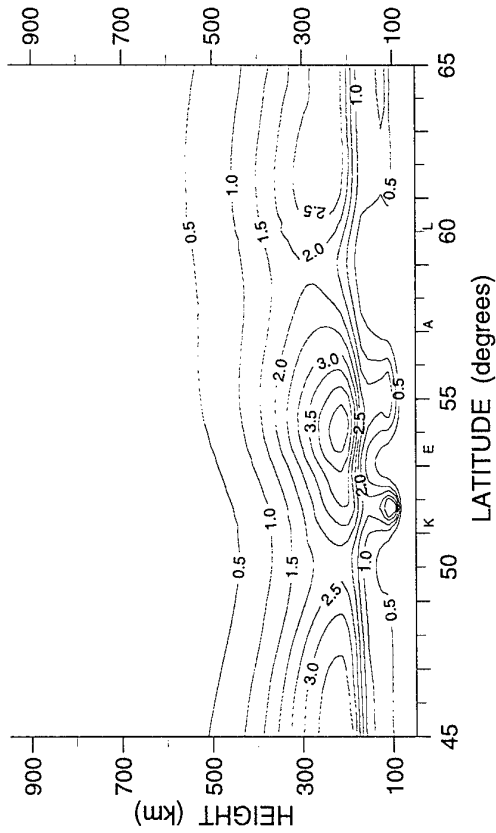
Tomographic Image: 25/02/93 20:19 UT
Electron density (x10^{11} m^{-3})
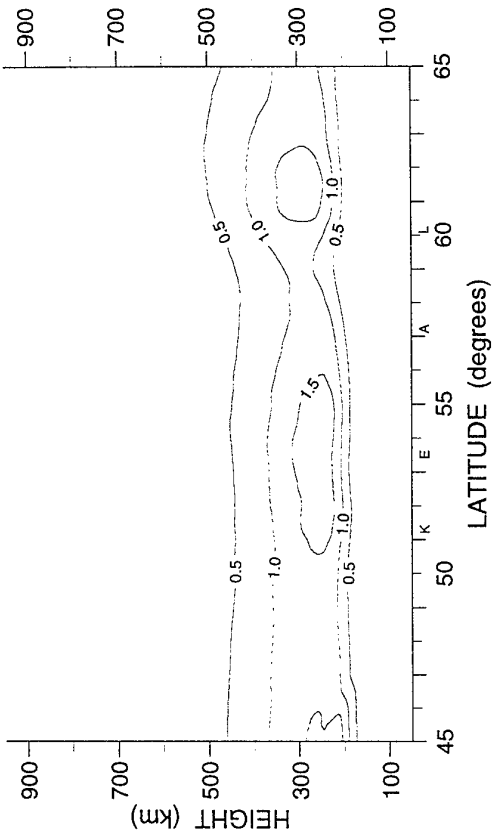
Tomographic Image: 25/02/93 06:55 UT
Electron density (x10^{11} m^{-3})
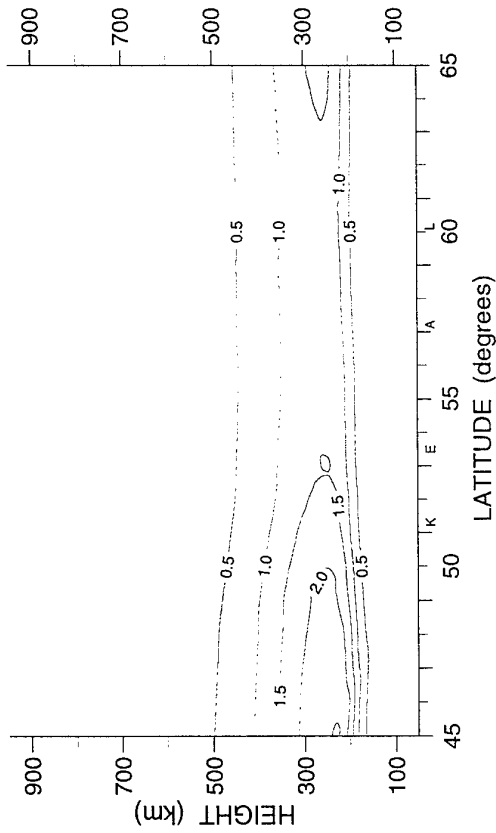
Tomographic Image: 26/02/93 04:43 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 26/02/93 09:12 UT
Electron density (×10^{11} m^{-3})

Tomographic Image: 26/02/93 10:08 UT
Electron density (×10^{11} m^{-3})
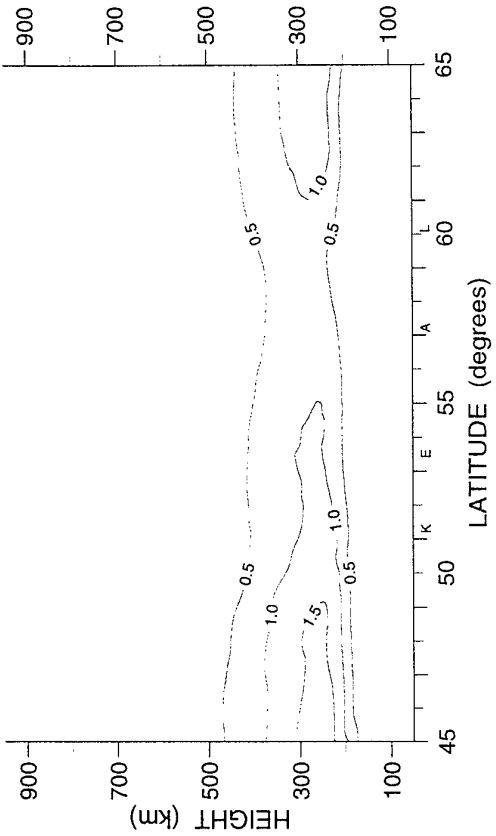
Tomographic Image: 26/02/93 06:32 UT
Electron density (×10^{11} m^{-3})
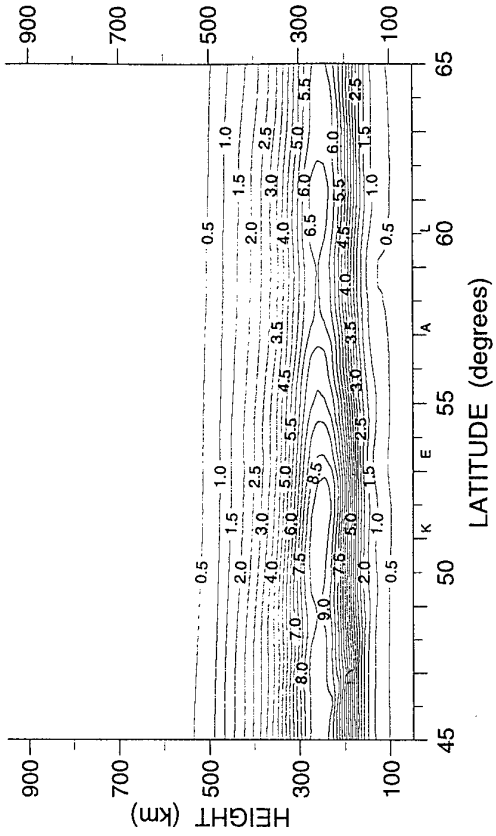
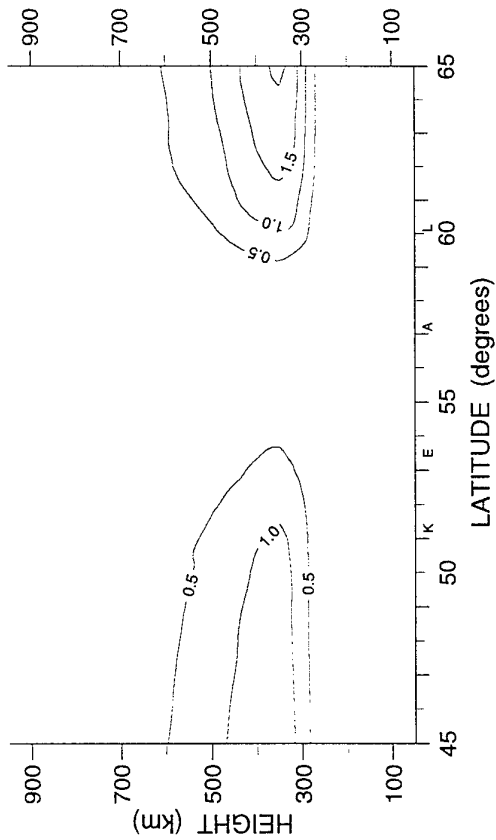Tomographic Image: 26/02/93 07:54 UT
Electron density (×10^{11} m^{-3})

48

Tomographic Image: 26/02/93 17:05 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 26/02/93 20:15 UT
Electron density (x10¹¹ m⁻³)
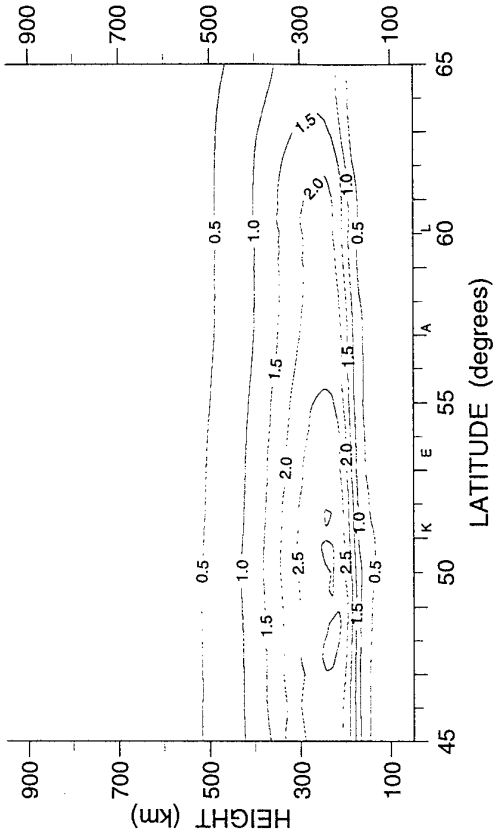
Tomographic Image: 26/02/93 18:26 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 26/02/93 21:24 UT
Electron density (x10¹¹ m⁻³)

49

Tomographic Image: 27/02/93   11:09 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 27/02/93   20:40 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 26/02/93   22:04 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 27/02/93   10:16 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 28/02/93 00:35 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 28/02/93 07:08 UT
Electron density (x10^{11} m^{-3})
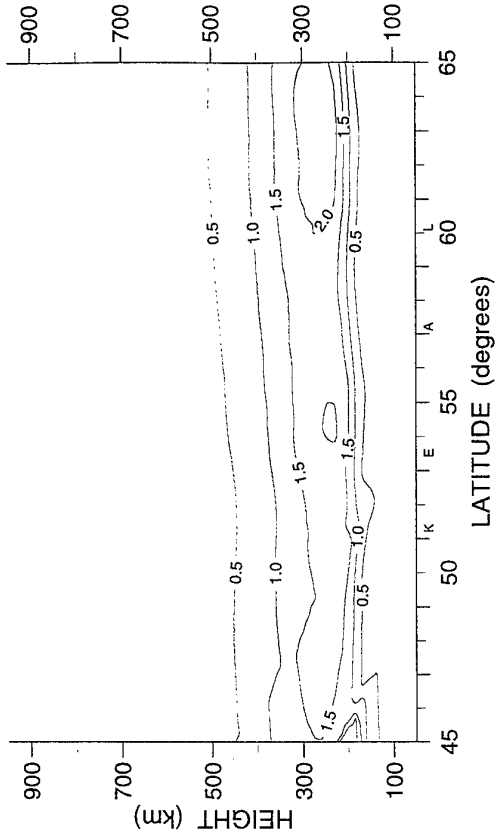
Tomographic Image: 27/02/93 22:28 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 27/02/93 23:23 UT
Electron density (x10^{11} m^{-3})

51
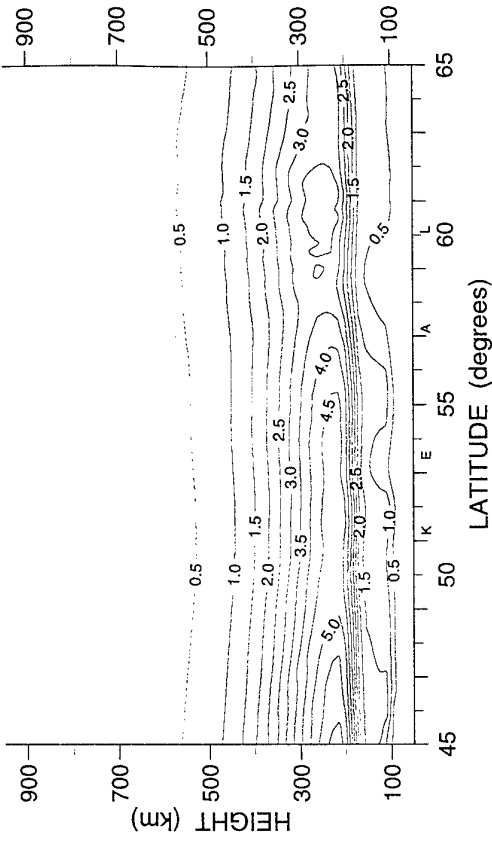
Tomographic Image: 28/02/93 07:56 UT
Electron density (x10^{11} m^{-3})
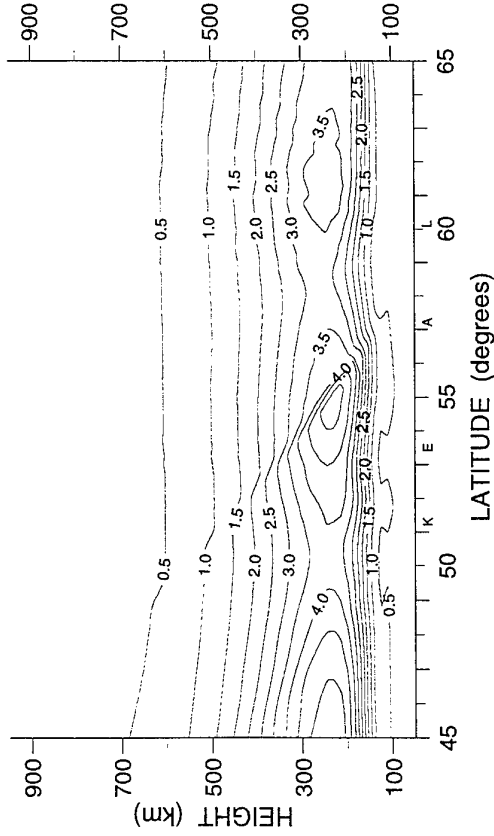
Tomographic Image: 28/02/93 08:57 UT
Electron density (x10^{11} m^{-3})
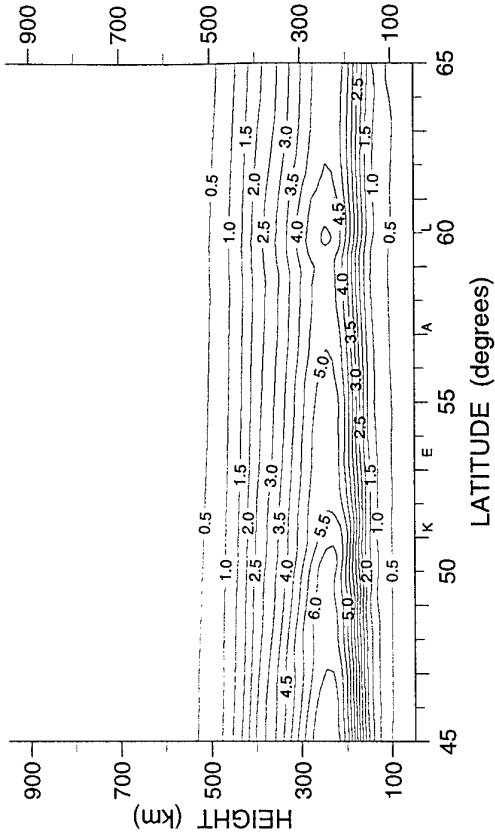
Tomographic Image: 28/02/93 08:41 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 28/02/93 10:29 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 04/02/93 10:45 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 04/02/93 14:59 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 04/02/93 12:32 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 04/02/93 17:45 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 04/02/93 22:56 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 00:43 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 04/02/93 19:32 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 04/02/93 20:05 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 07:20 UT
Electron density (×10¹¹ m⁻³)

Tomographic Image: 05/02/93 10:02 UT
Electron density (×10¹¹ m⁻³)

Tomographic Image: 05/02/93 04:00 UT
Electron density (×10¹¹ m⁻³)

Tomographic Image: 05/02/93 06:37 UT
Electron density (×10¹¹ m⁻³)

55

Tomographic Image: 05/02/93 11:49 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 16:59 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 12:09 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 17:53 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/02/93 18:47 UT
Electron density (x10^11 m^-3)

Tomographic Image: 05/02/93 21:03 UT
Electron density (x10^11 m^-3)

Tomographic Image: 05/02/93 19:42 UT
Electron density (x10^11 m^-3)

Tomographic Image: 05/02/93 22:13 UT
Electron density (x10^11 m^-3)

57

Tomographic Image: 06/02/93 05:51 UT
Electron density (x10^11 m^-3)

Tomographic Image: 06/02/93 07:39 UT
Electron density (x10^11 m^-3)

Tomographic Image: 05/02/93 24:00 UT
Electron density (x10^11 m^-3)

Tomographic Image: 06/02/93 05:08 UT
Electron density (x10^11 m^-3)

58

Tomographic Image: 10/03/93 22:39 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 10/02/93 22:46 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 10/02/93 22:46 UT
Electron density (x10^{11} m^{-3})
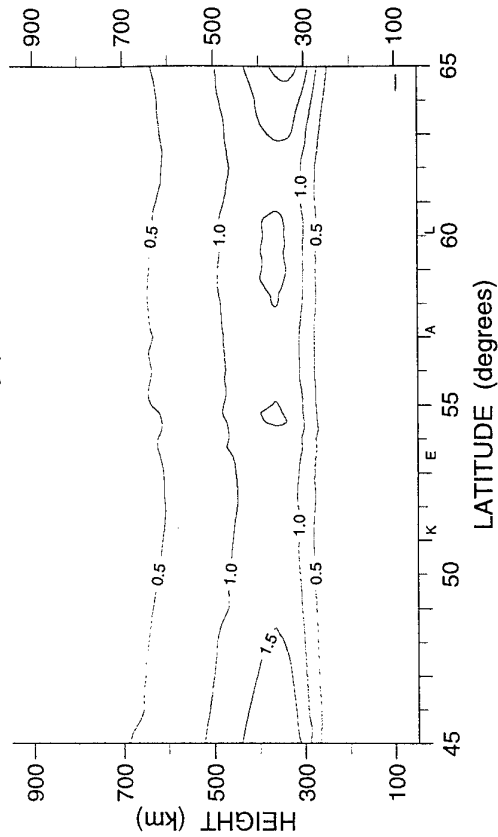
Tomographic Image: 10/03/93 22:09 UT
Electron density (x10^{11} m^{-3})
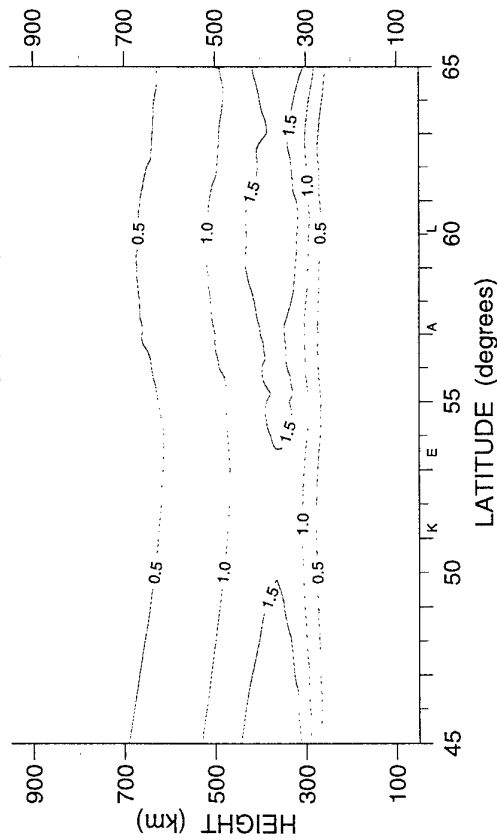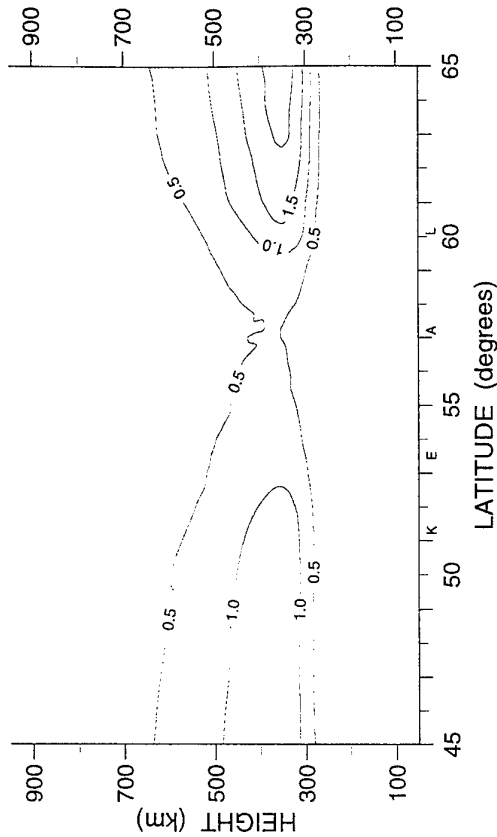
Tomographic Image: 11/03/93   00:55 UT
Electron density (x10^{11} m^{-3})
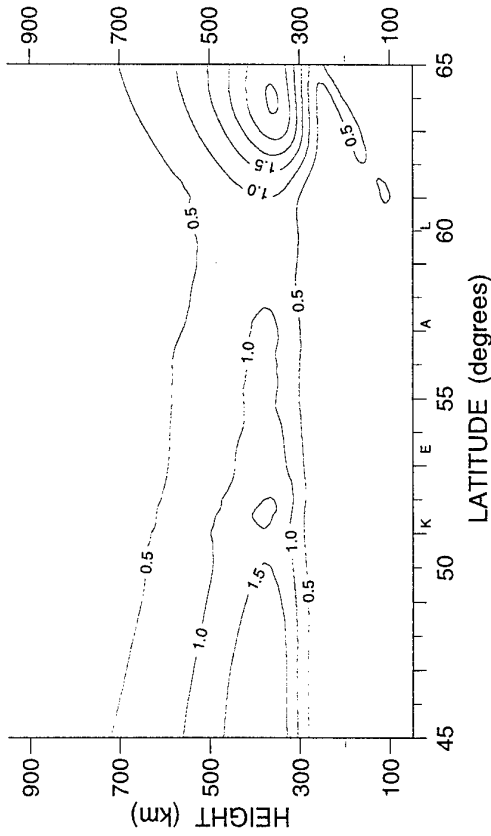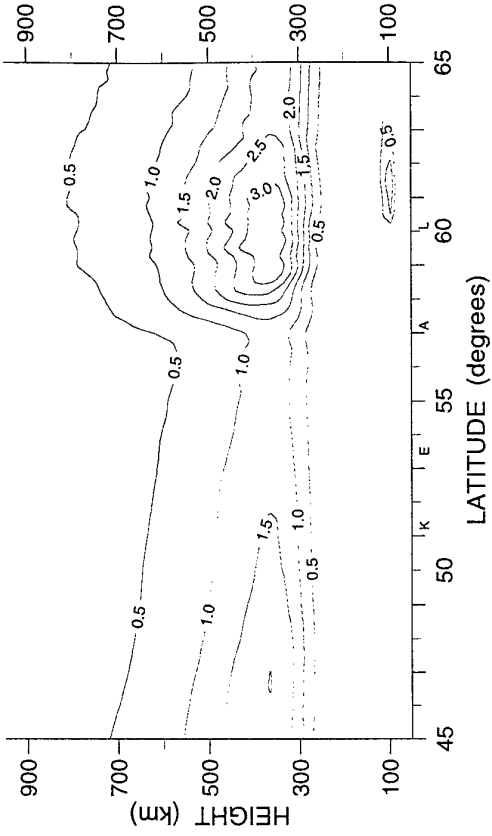
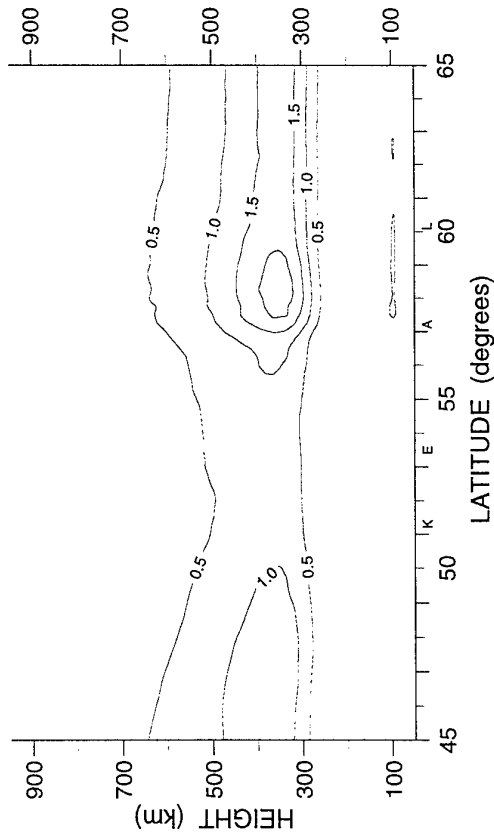Tomographic Image: 11/03/93   04:16 UT
Electron density (x10^{11} m^{-3})
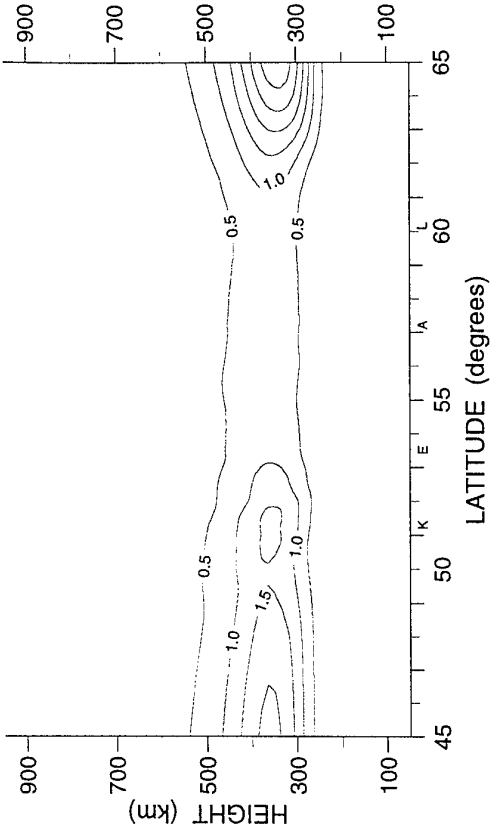
Tomographic Image: 11/03/93   03:22 UT
Electron density (x10^{11} m^{-3})
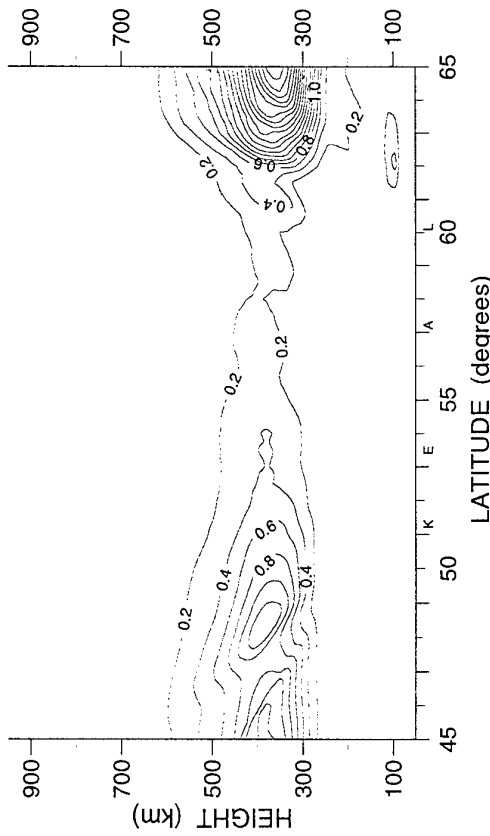
Tomographic Image: 11/03/93   05:11 UT
Electron density (x10^{11} m^{-3})
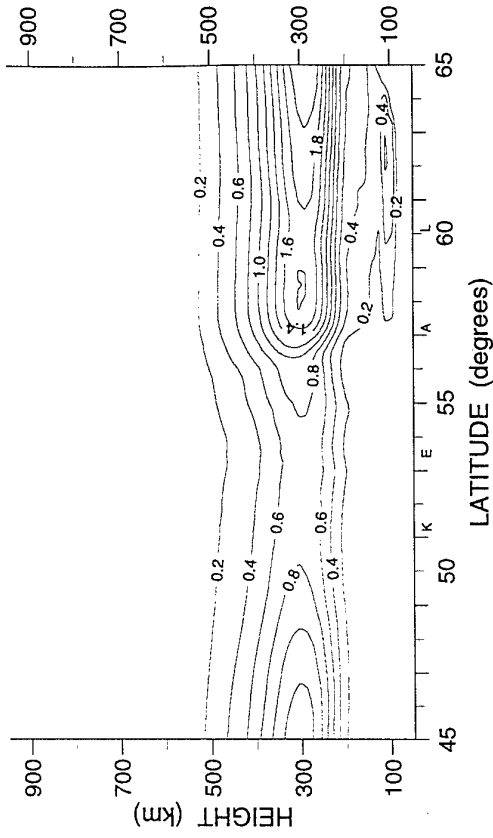
Tomographic Image: 11/03/93 13:13 UT
Electron density (x10^{11} m^{-3})

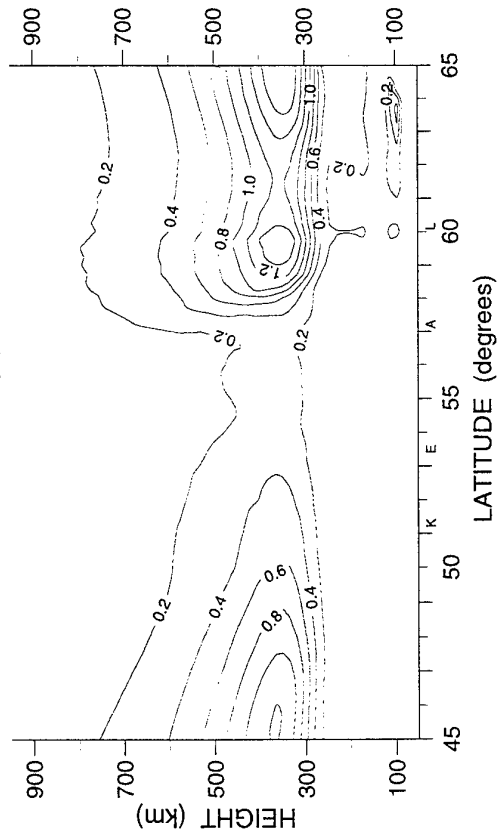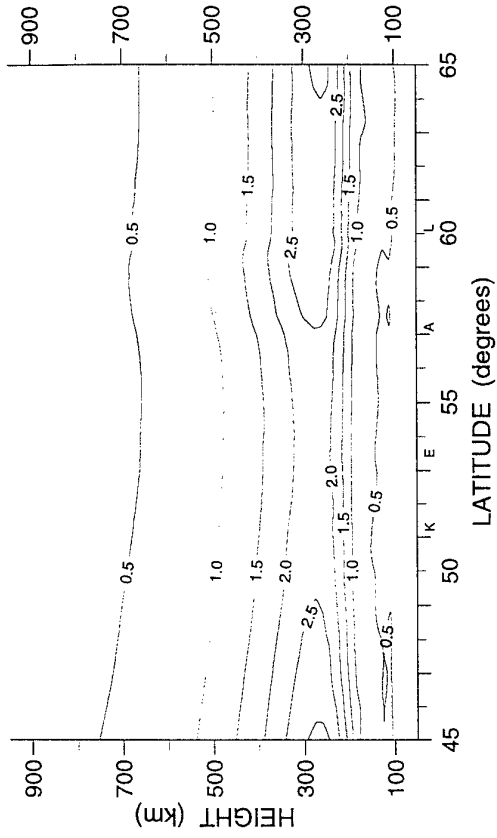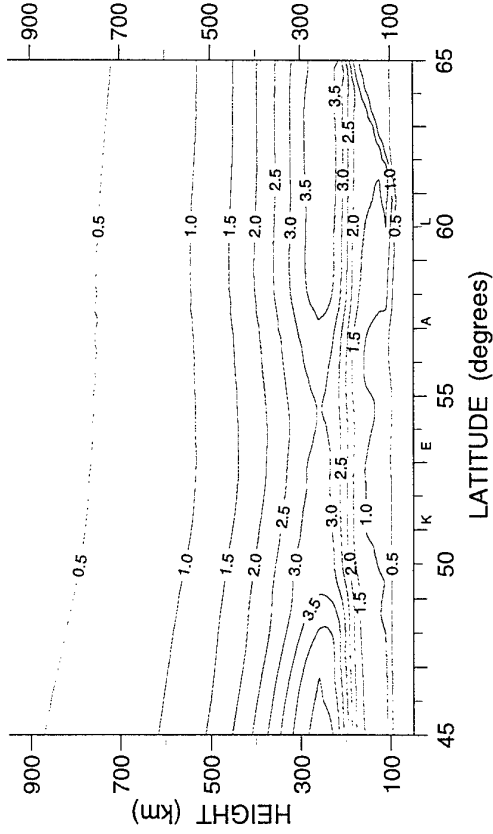Tomographic Image: 11/03/93 15:43 UT
Electron density (x10^{11} m^{-3})

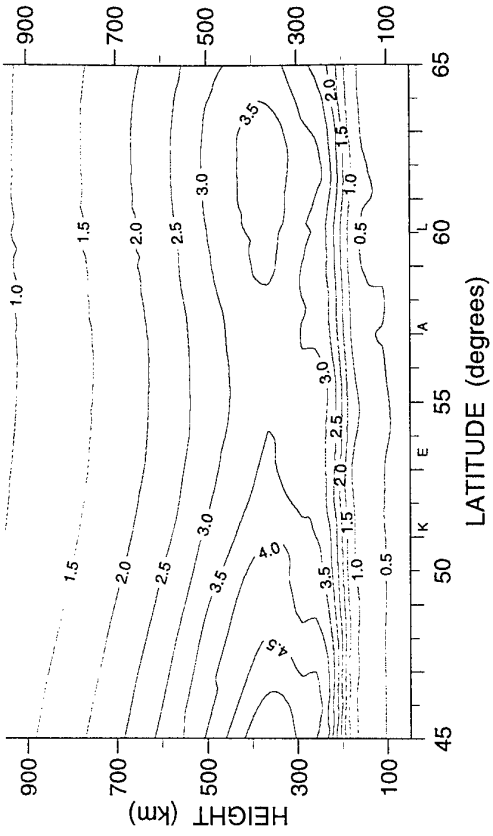Tomographic Image: 11/03/93 08:21 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 11/03/93 10:34 UT
Electron density (x10^{11} m^{-3})

LATITUDE (degrees)

HEIGHT (km)
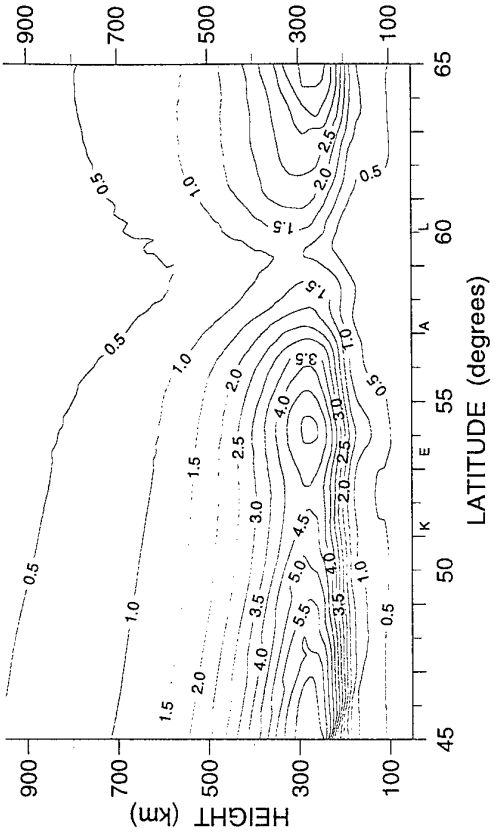
Tomographic Image: 11/03/93 18:54 UT
Electron density (x10^{11} m^{-3})
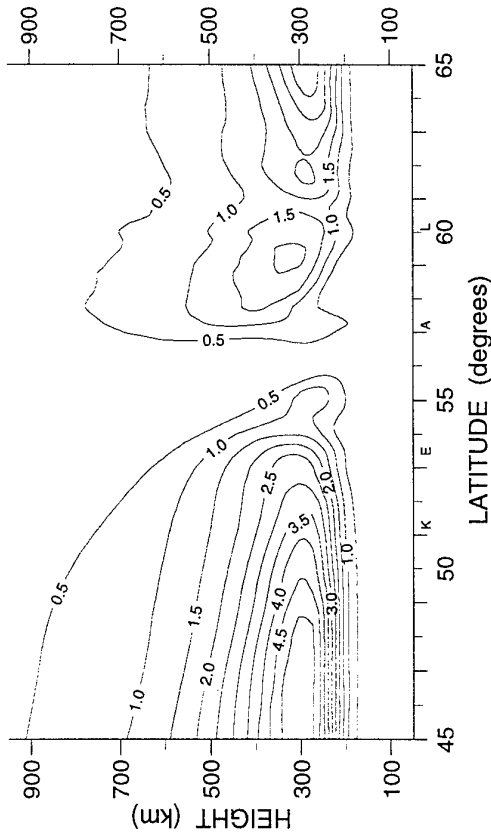
Tomographic Image: 11/03/93 20:43 UT
Electron density (x10^{11} m^{-3})
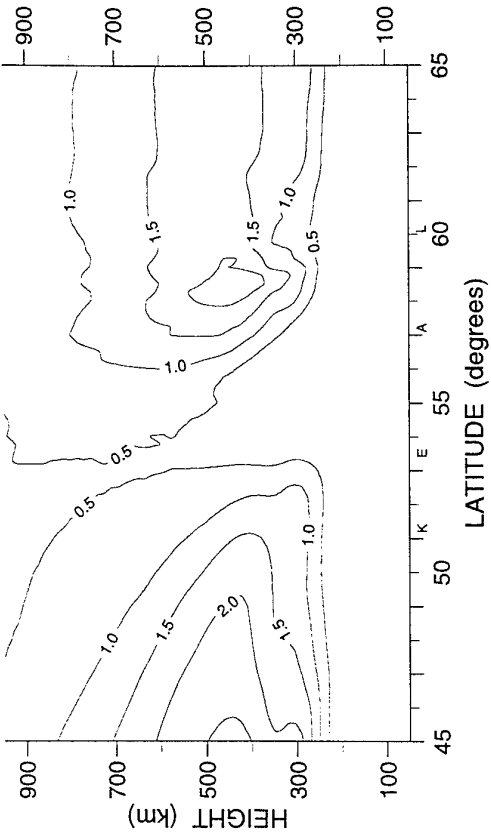
Tomographic Image: 11/03/93 20:09 UT
Electron density (x10^{11} m^{-3})
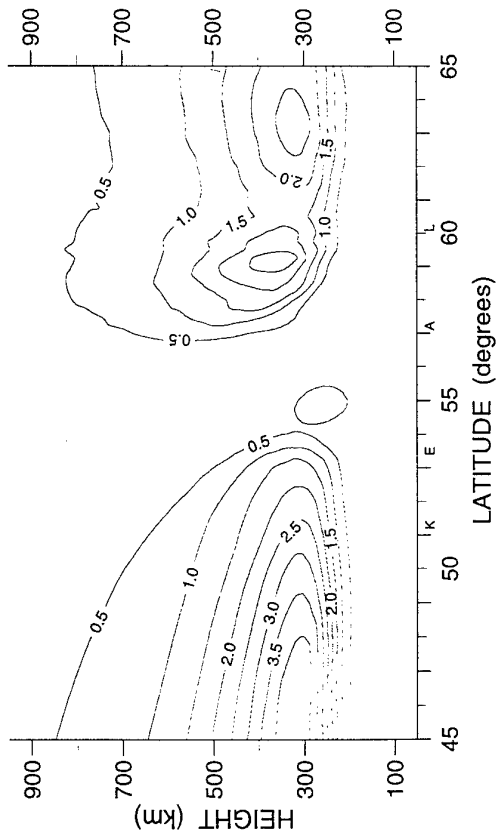
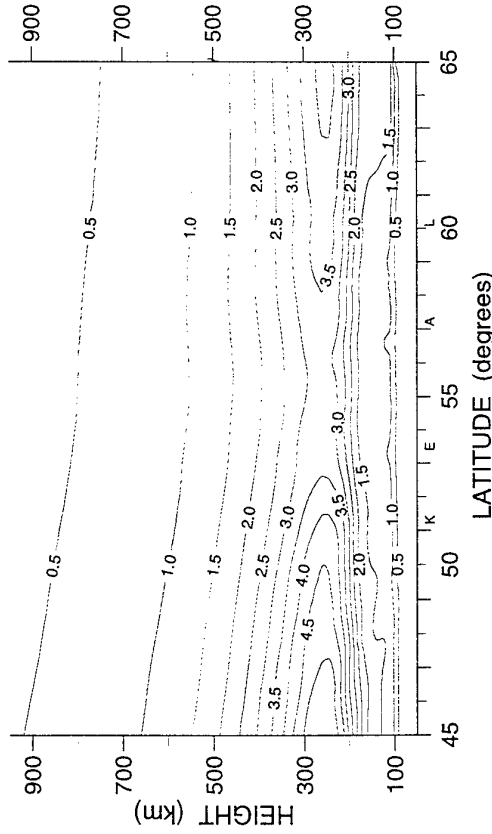Tomographic Image: 11/03/93 21:56 UT
Electron density (x10^{11} m^{-3})
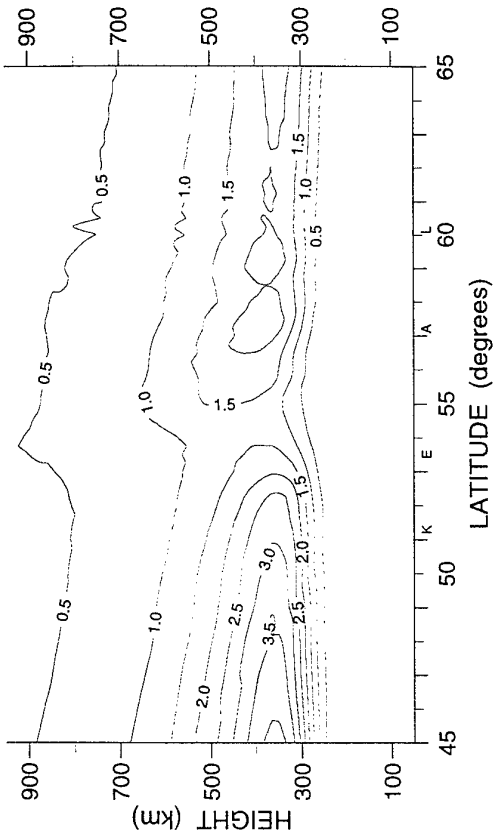
Tomographic Image: 12/03/93 00:27 UT
Electron density (×10^{11} m^{-3})
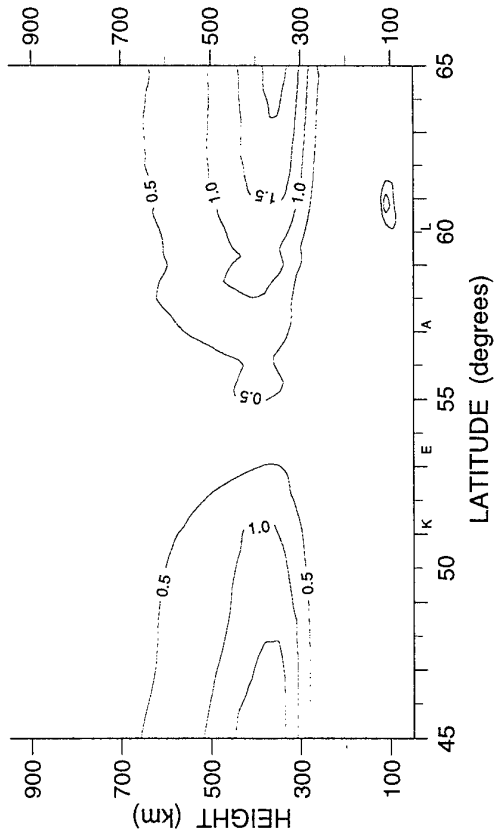
Tomographic Image: 12/03/93 05:18 UT
Electron density (×10^{11} m^{-3})
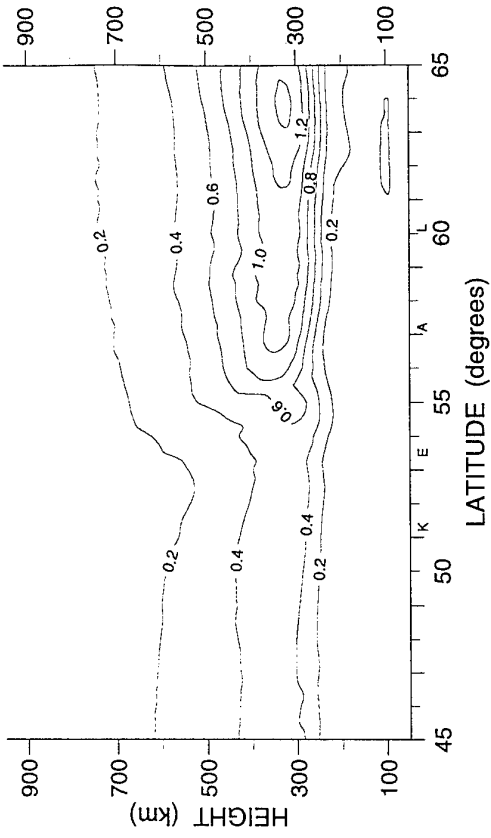
Tomographic Image: 12/03/93 04:48 UT
Electron density (×10^{11} m^{-3})
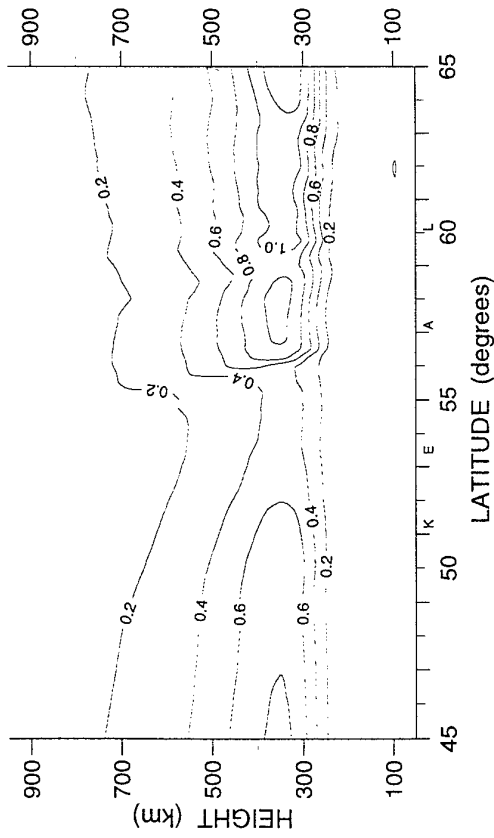
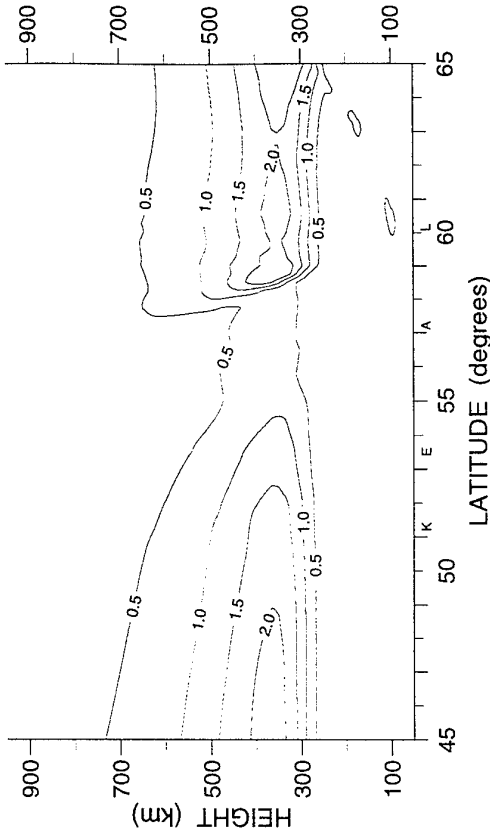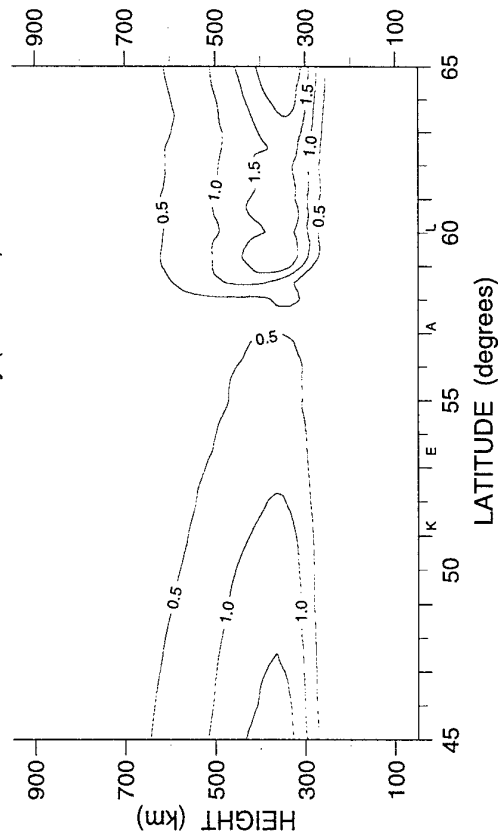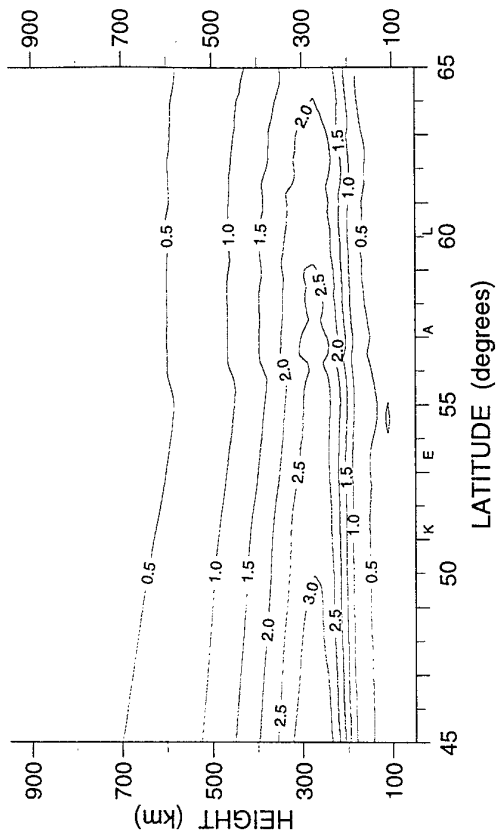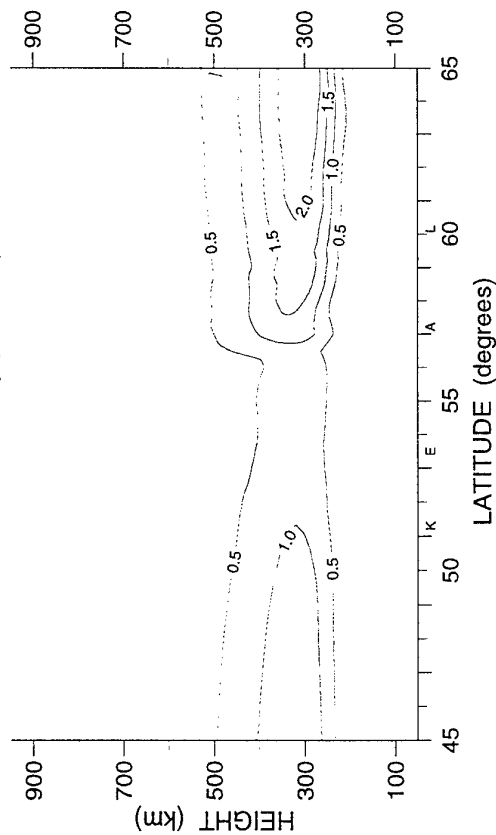Tomographic Image: 12/03/93 06:37 UT
Electron density (×10^{11} m^{-3})
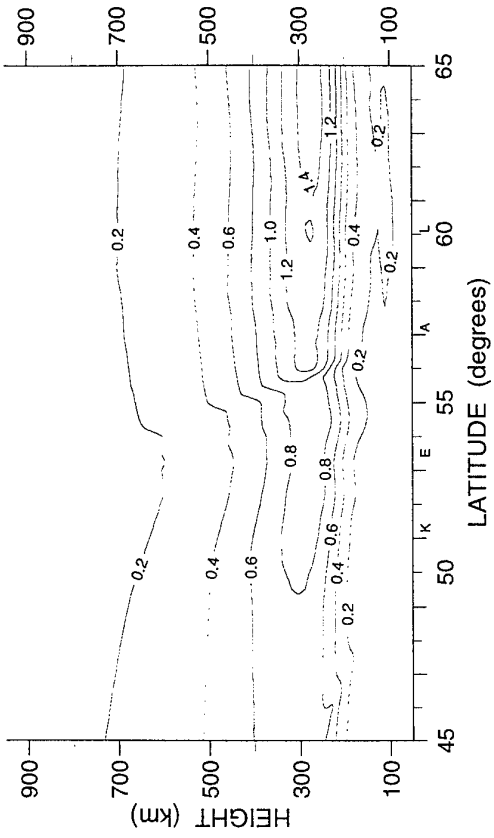
Tomographic Image: 12/03/93 09:01 UT
Electron density (x10^11 m^-3)
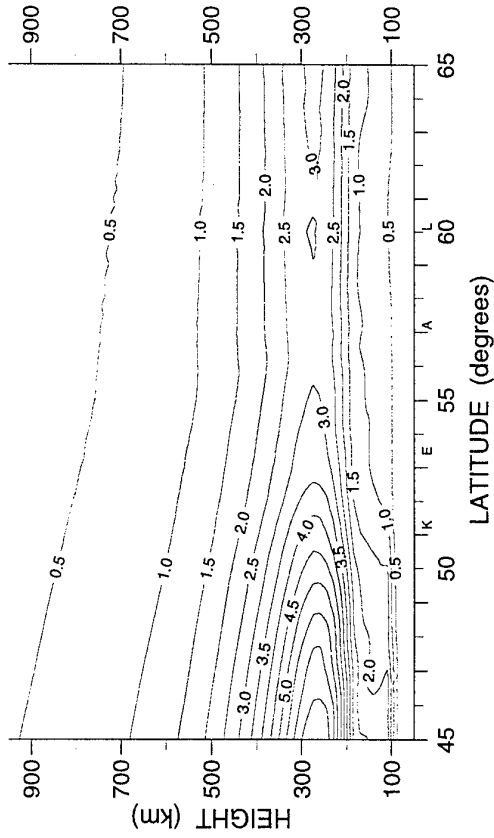
Tomographic Image: 12/03/93 15:41 UT
Electron density (x10^11 m^-3)
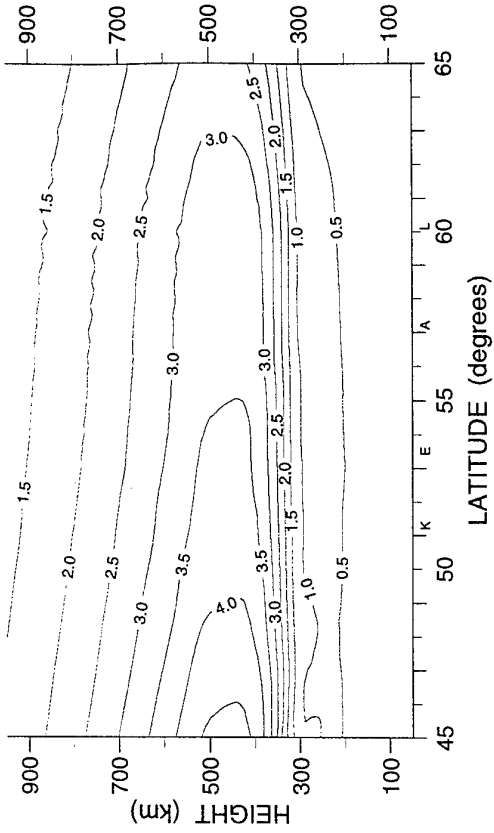
Tomographic Image: 12/03/93 12:45 UT
Electron density (x10^11 m^-3)
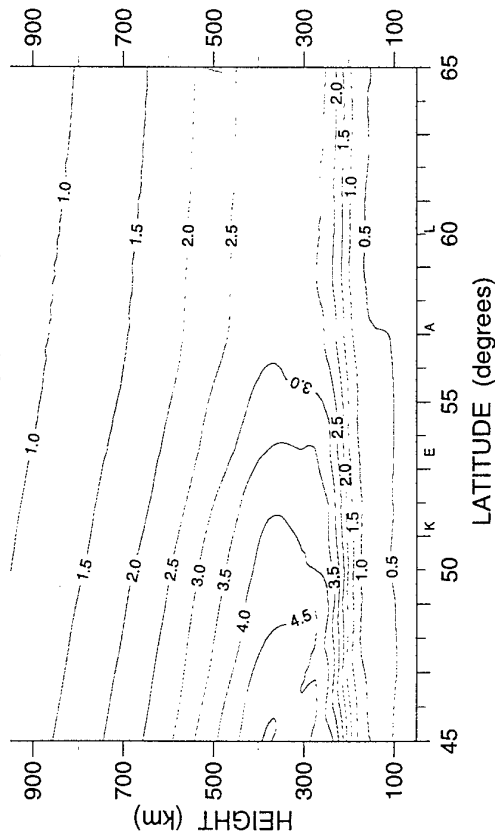
Tomographic Image: 12/03/93 17:09 UT
Electron density (x10^11 m^-3)
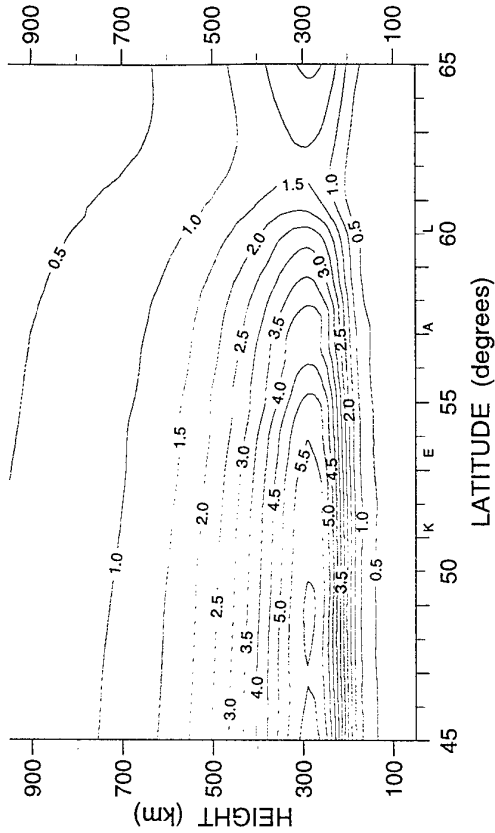
Tomographic Image: 12/03/93 18:31 UT
Electron density (x10^{11} m^{-3})
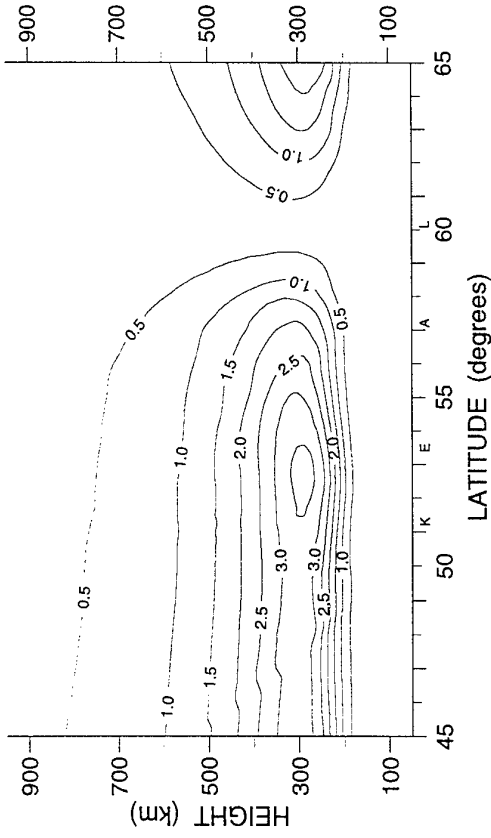
Tomographic Image: 12/03/93 21:13 UT
Electron density (x10^{11} m^{-3})
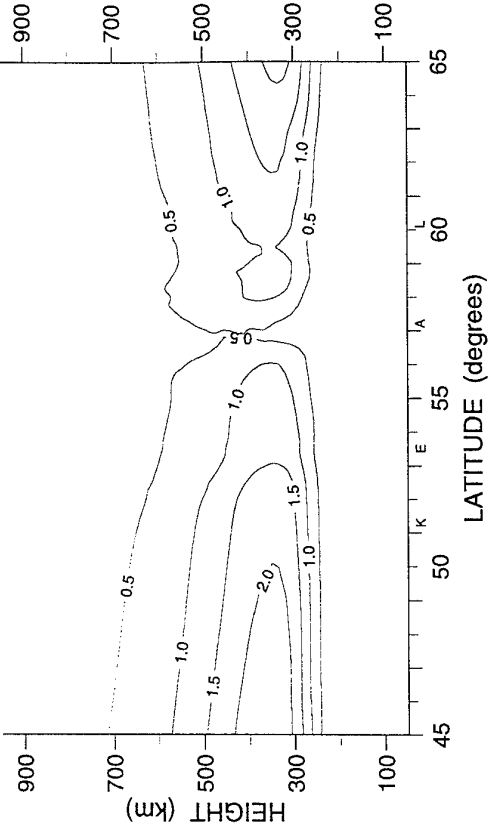
Tomographic Image: 12/03/93 19:48 UT
Electron density (x10^{11} m^{-3})
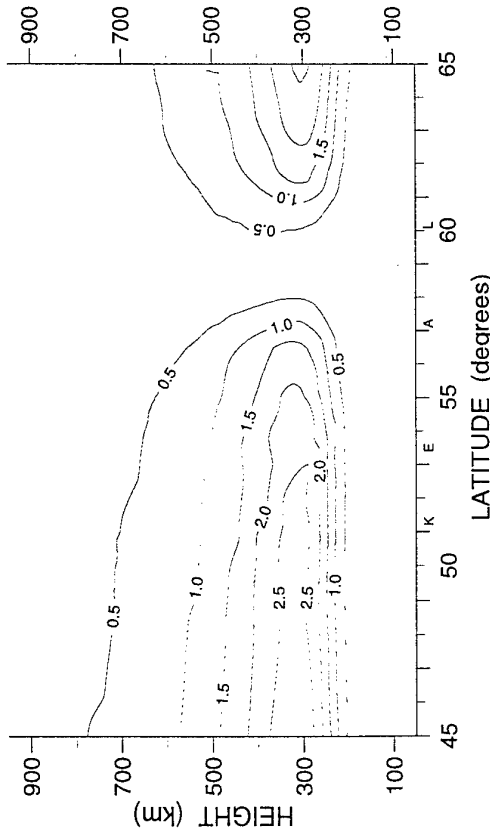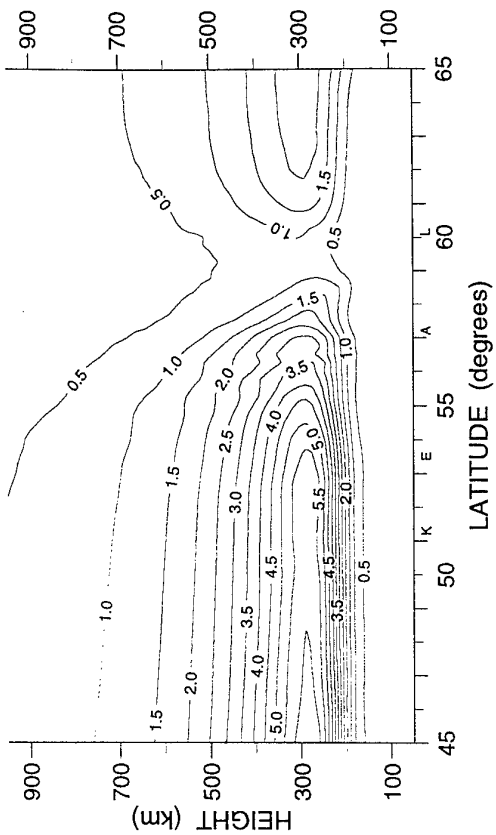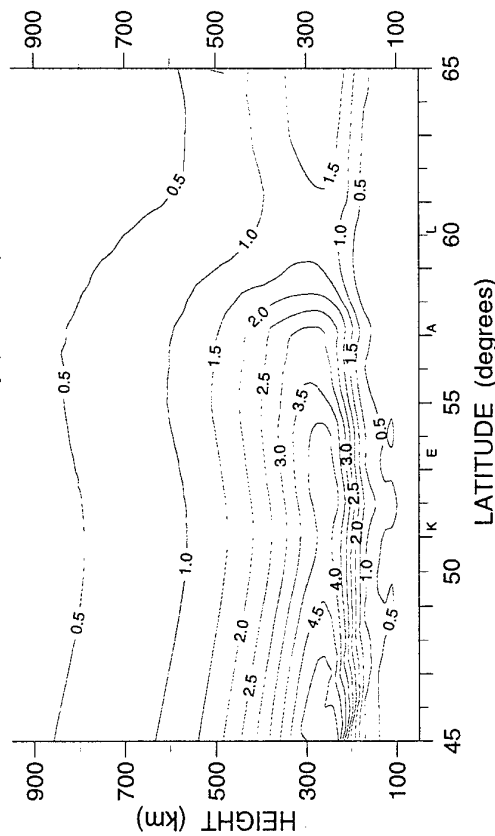
Tomographic Image: 12/03/93 21:34 UT
Electron density (x10^{11} m^{-3})

65
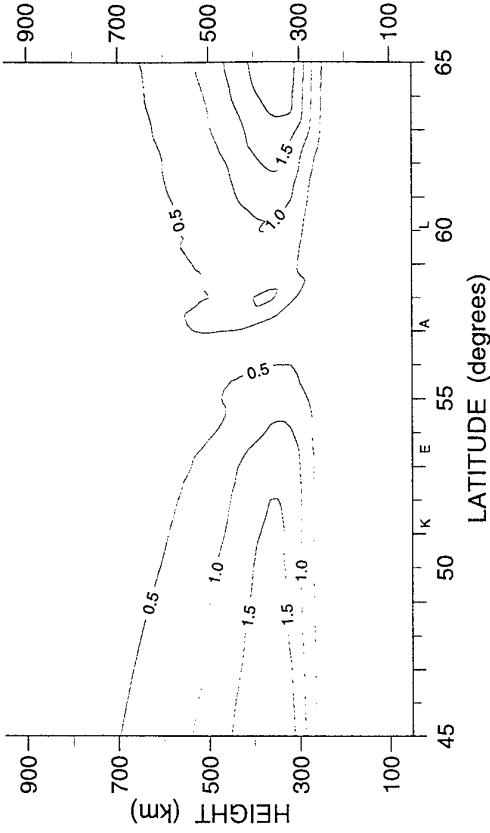
Tomographic Image: 12/03/93 22:02 UT
Electron density (×10^{11} m^{-3})
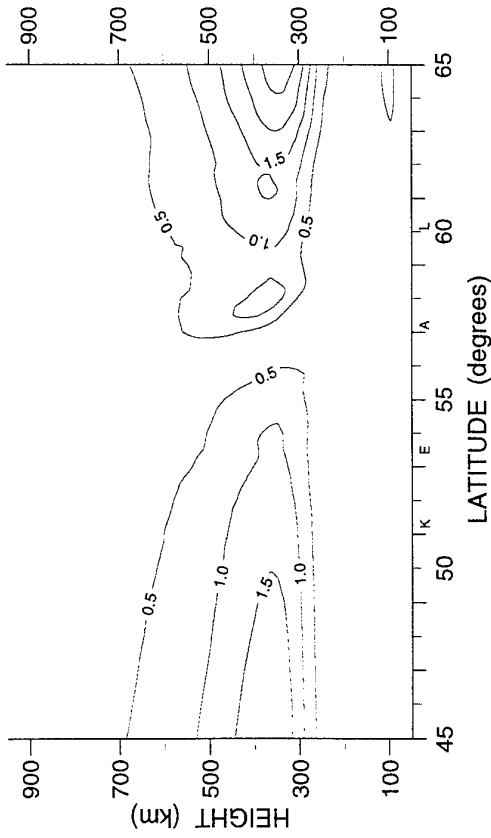
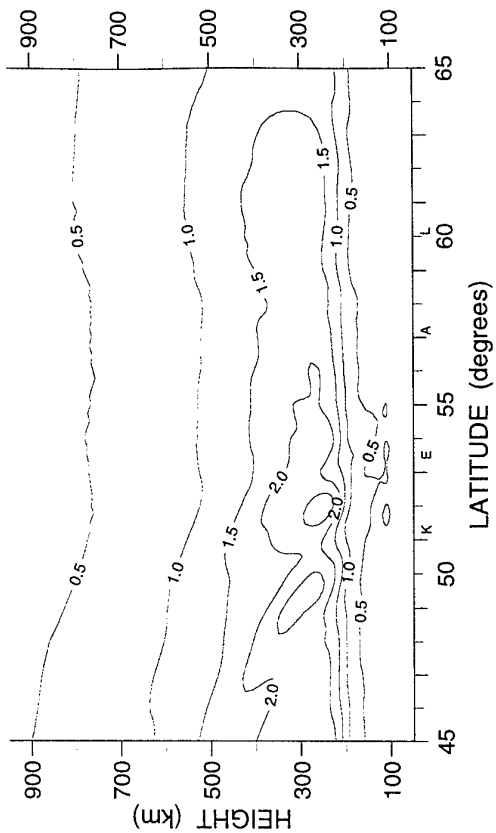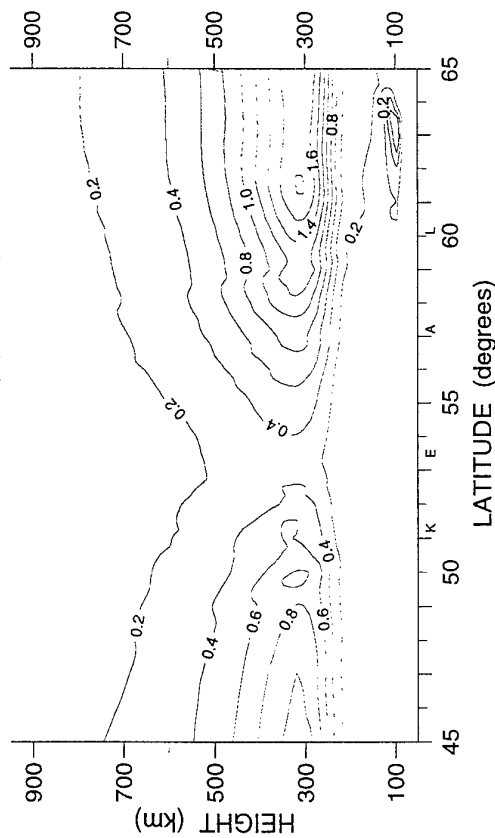Tomographic Image: 13/03/93 06:13 UT
Electron density (×10^{11} m^{-3})
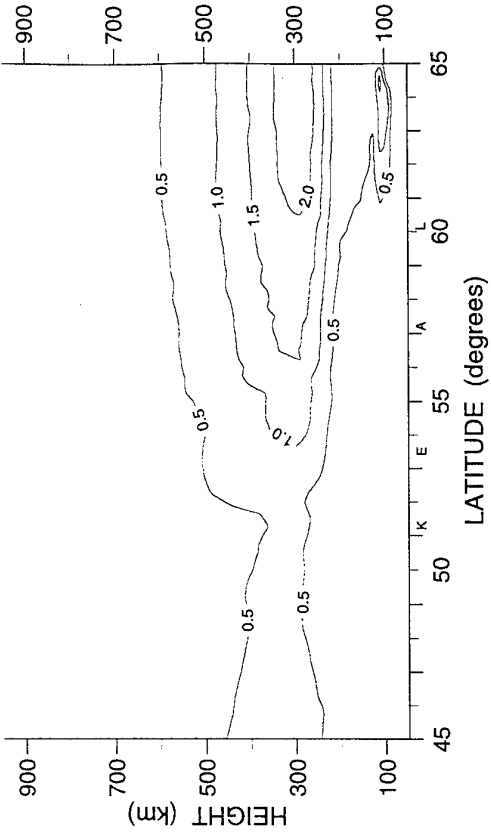
Tomographic Image: 13/03/93 04:24 UT
Electron density (×10^{11} m^{-3})
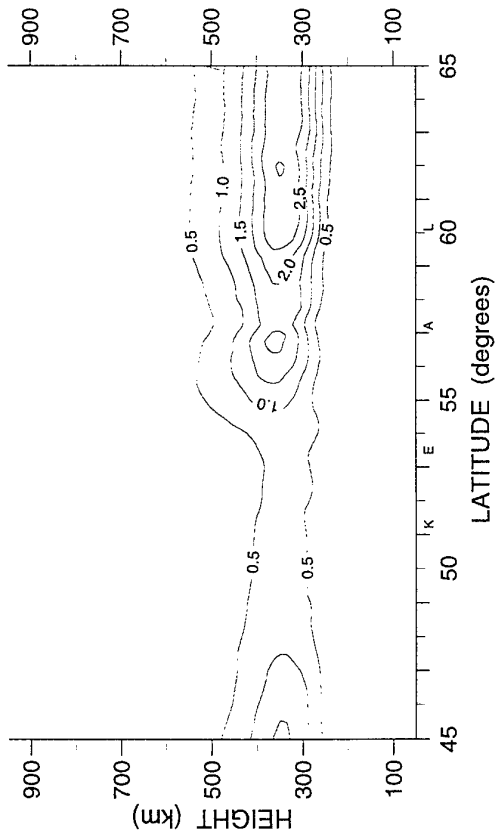
Tomographic Image: 13/03/93 07:35 UT
Electron density (×10^{11} m^{-3})

Tomographic Image: 13/03/93 12:18 UT
Electron density (x10^{11} m^{-3})

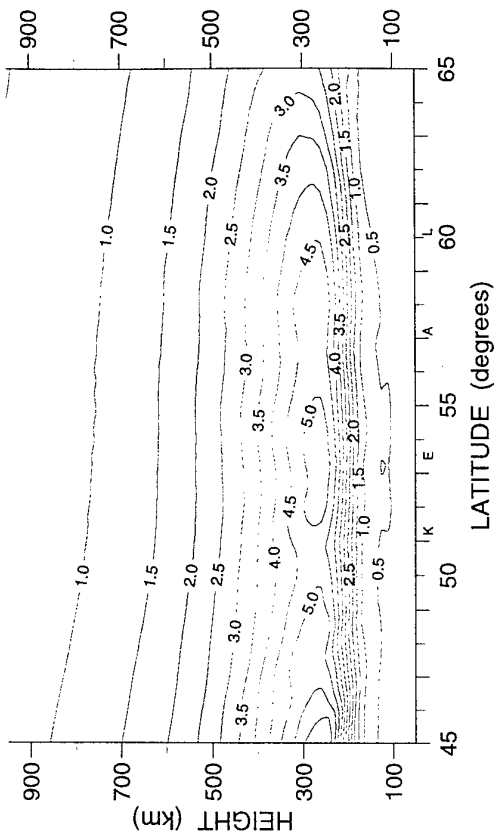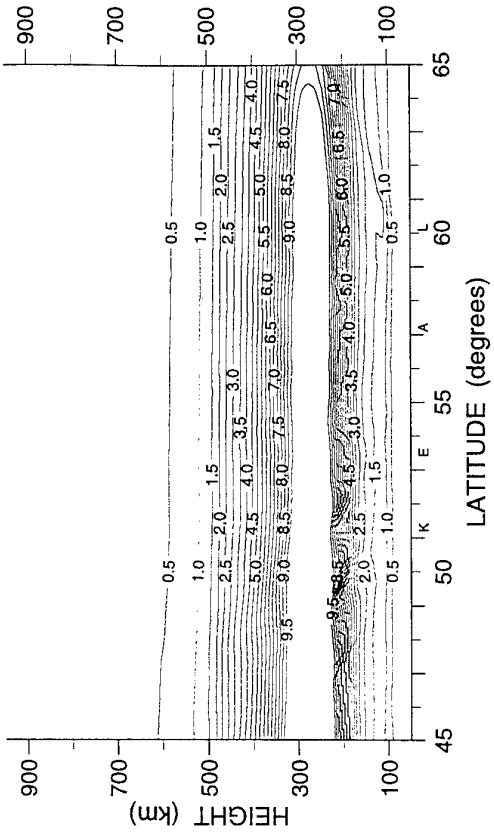Tomographic Image: 13/03/93 16:46 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 13/03/93 08:18 UT
Electron density (x10^{11} m^{-3})
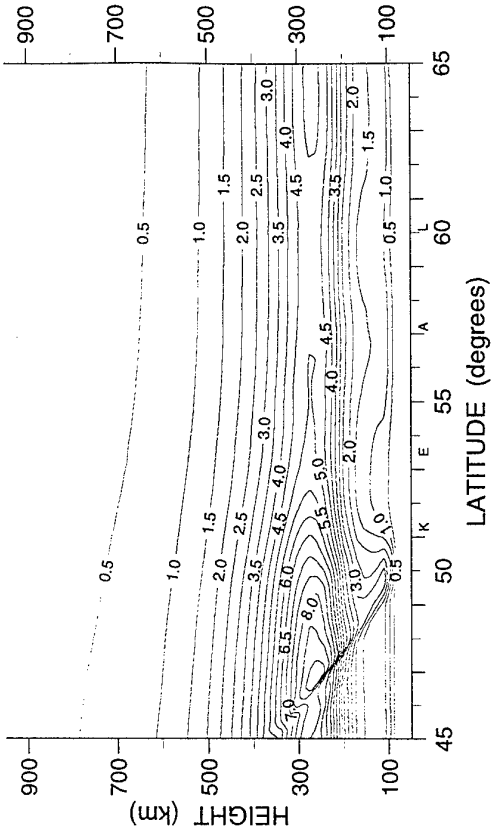
Tomographic Image: 13/03/93 09:07 UT
Electron density (x10^{11} m^{-3})
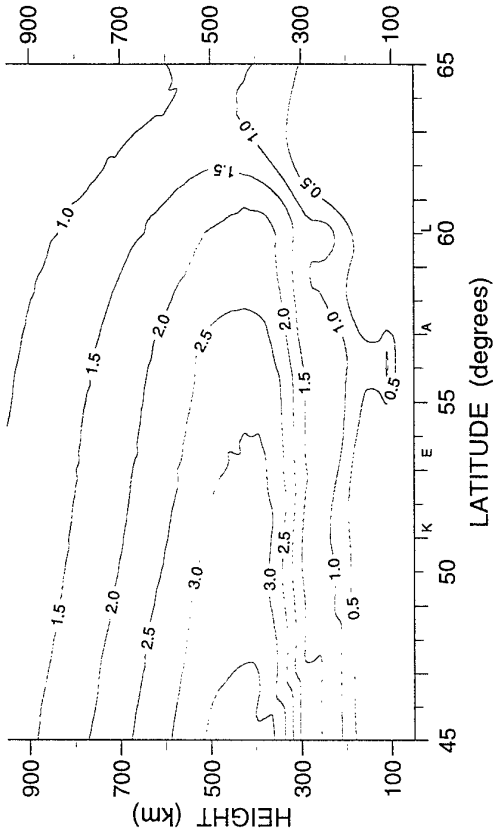
Tomographic Image: 13/03/93 19:57 UT
Electron density (x10^{11} m^{-3})
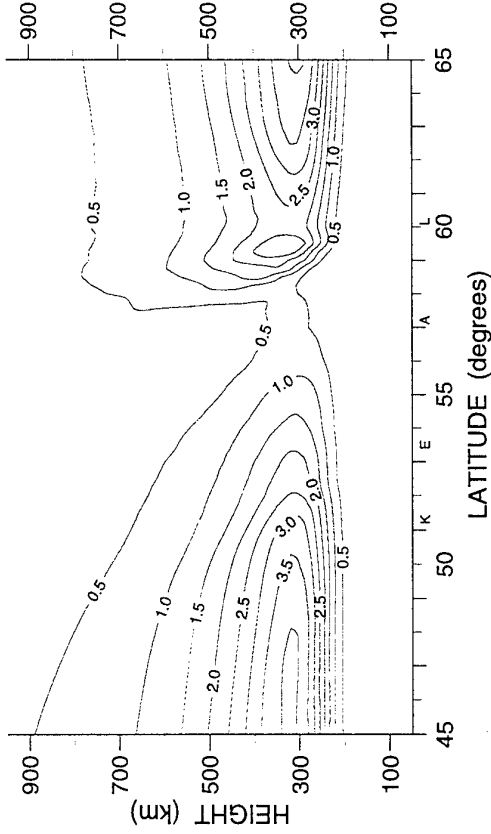
Tomographic Image: 13/03/93 21:19 UT
Electron density (x10^{11} m^{-3})
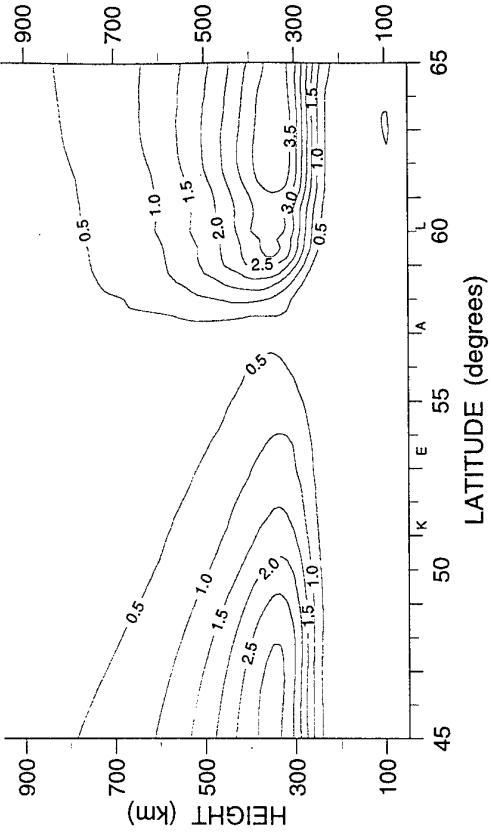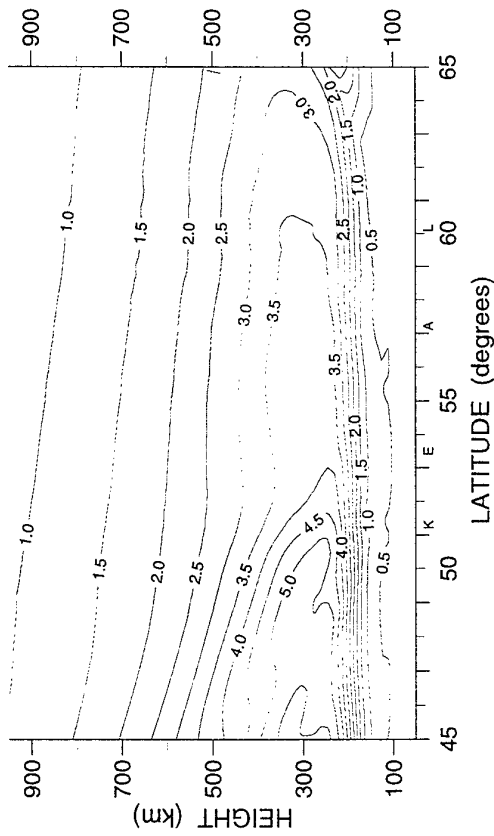
Tomographic Image: 13/03/93 20:23 UT
Electron density (x10^{11} m^{-3})
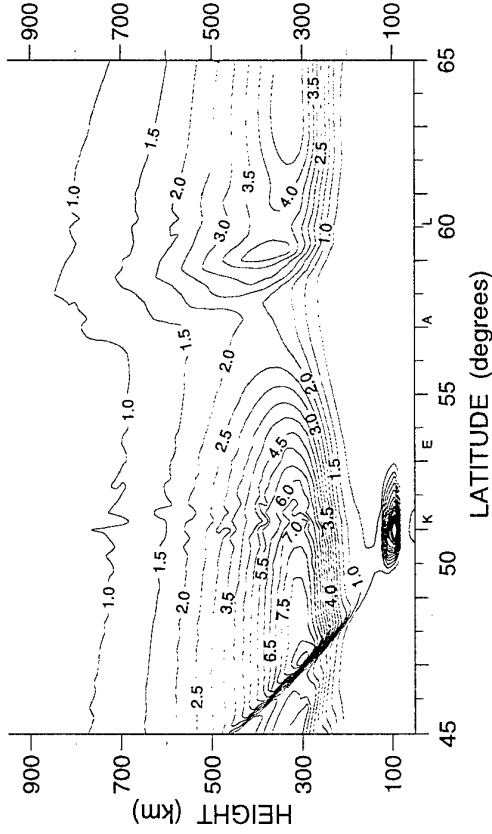
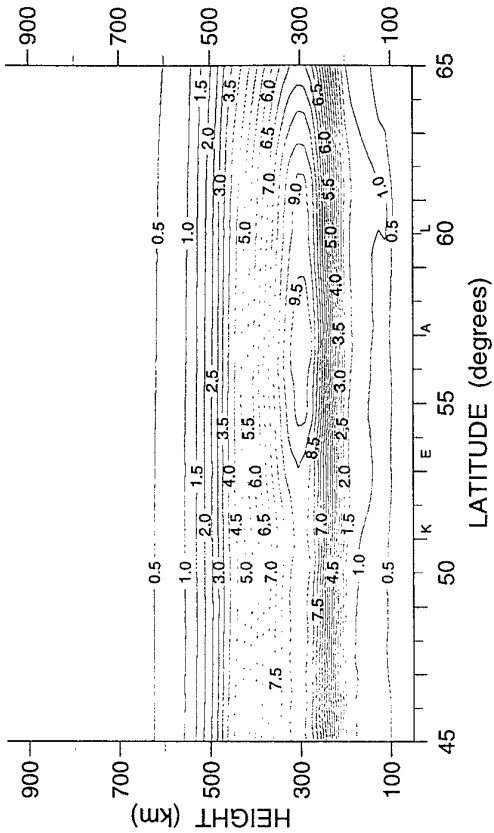Tomographic Image: 13/03/93 23:31 UT
Electron density (x10^{11} m^{-3})

68

Tomographic Image: 14/03/93   05:50 UT
Electron density (×10^{11} m^{-3})

Tomographic Image: 14/03/93   07:12 UT
Electron density (×10^{11} m^{-3})

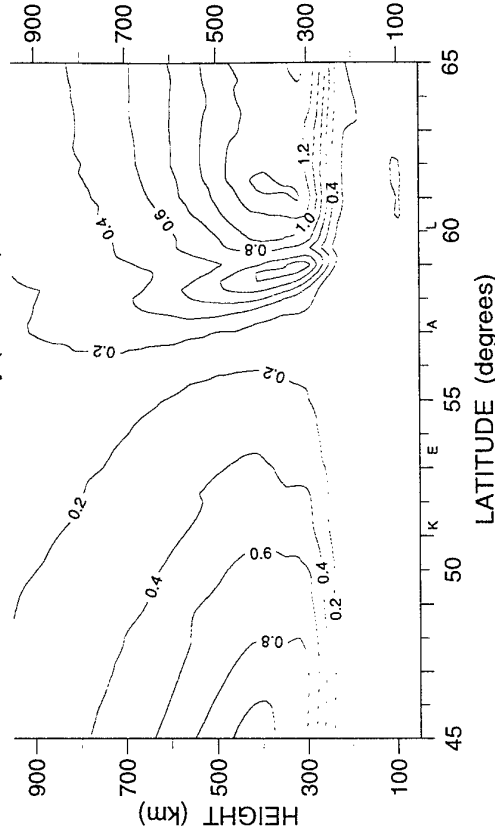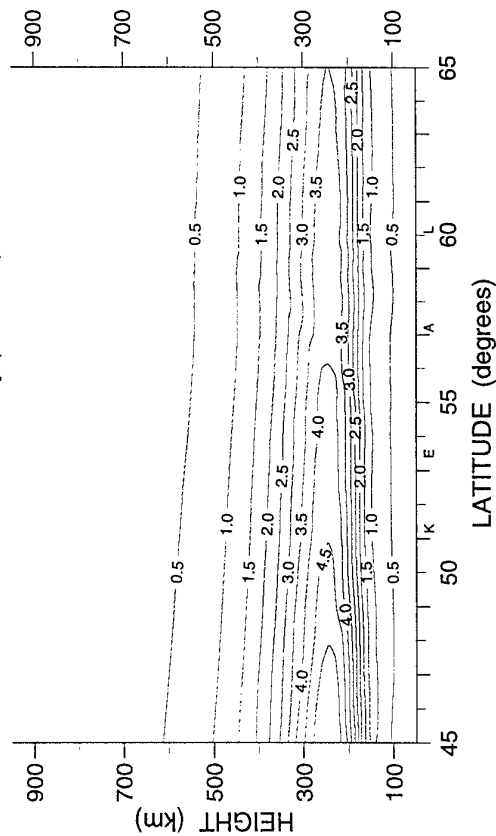Tomographic Image: 14/03/93   01:20 UT
Electron density (×10^{11} m^{-3})

Tomographic Image: 14/03/93   03:48 UT
Electron density (×10^{11} m^{-3})

Tomographic Image: 14/03/93 08:24 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 14/03/93 13:38 UT
Electron density (x10^{11} m^{-3})
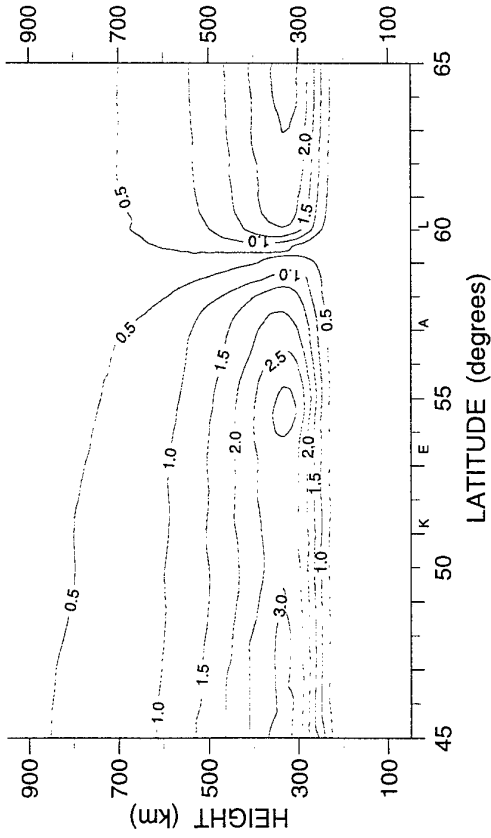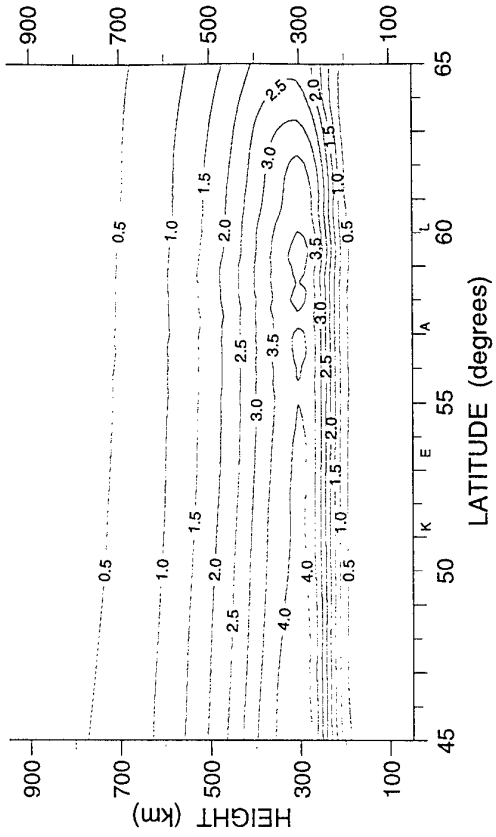
Tomographic Image: 14/03/93 09:23 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 14/03/93 16:23 UT
Electron density (x10^{11} m^{-3})
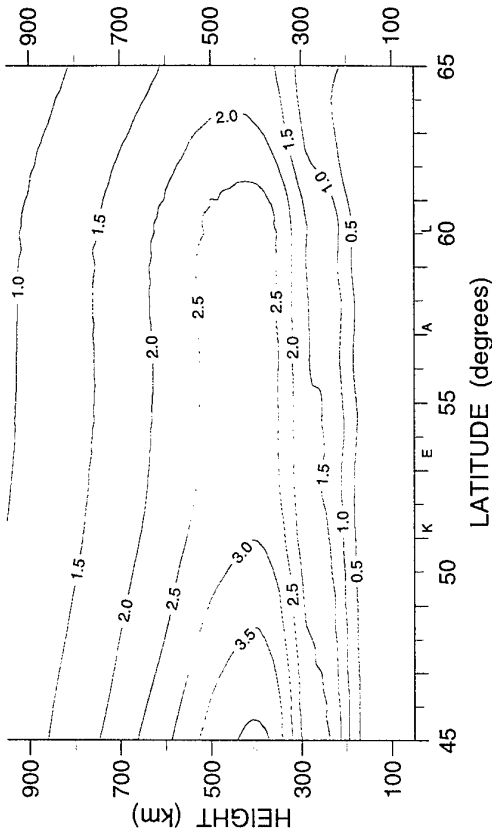
Tomographic Image: 14/03/93 19:34 UT
Electron density (x10^{11} m^{-3})
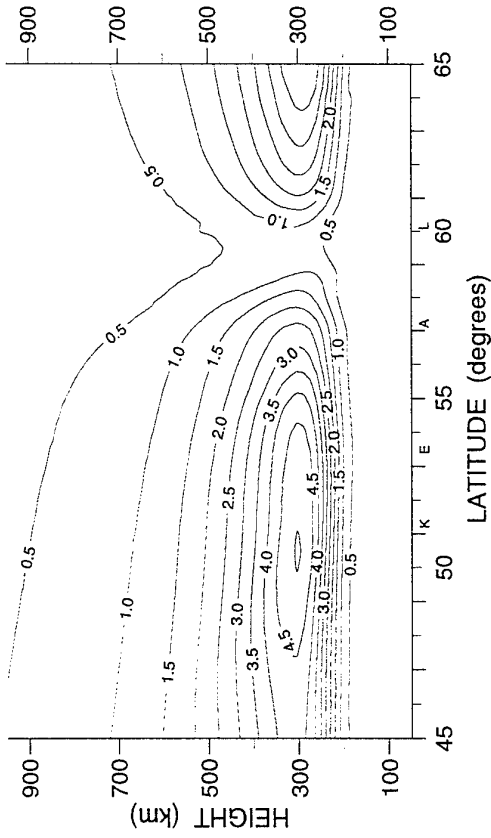
Tomographic Image: 14/03/93 20:58 UT
Electron density (x10^{11} m^{-3})
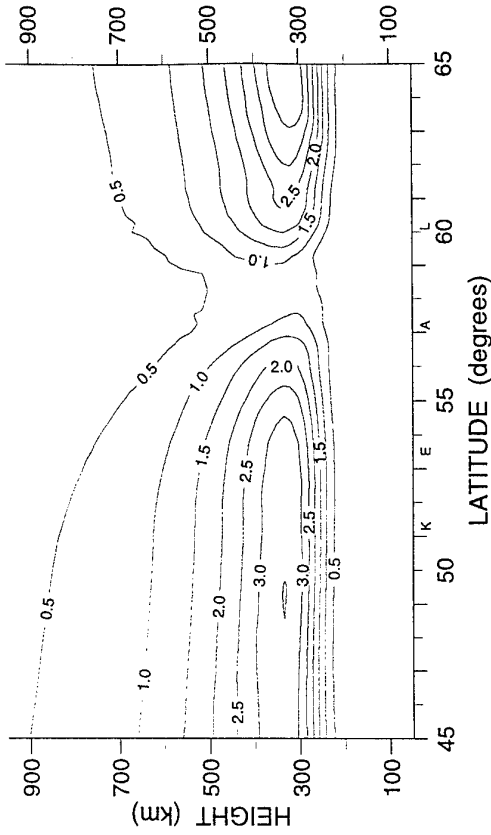
Tomographic Image: 14/03/93 20:36 UT
Electron density (x10^{11} m^{-3})
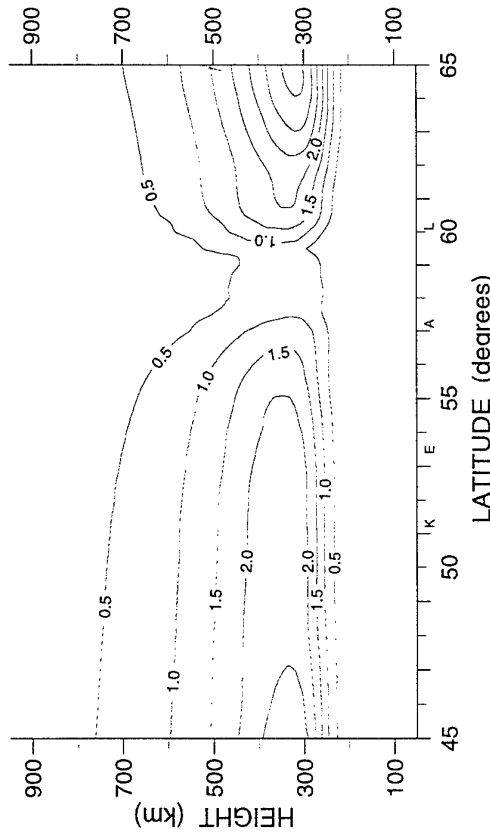
Tomographic Image: 15/03/93 00:52 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 15/03/93 06:49 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 15/03/93 08:38 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 15/03/93 03:03 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 15/03/93 05:27 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

Tomographic Image: 15/03/93 17:49 UT
Electron density (x10^11 m^-3)

Tomographic Image: 15/03/93 21:33 UT
Electron density (x10^11 m^-3)
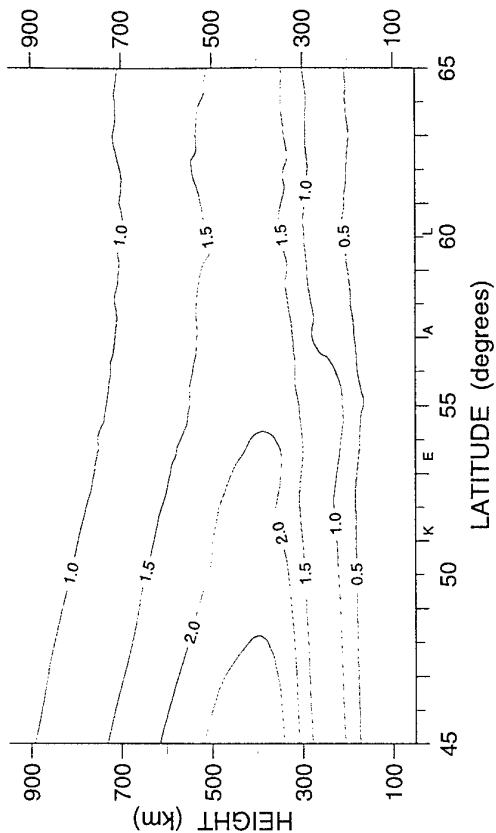
Tomographic Image: 15/03/93 16:00 UT
Electron density (x10^11 m^-3)

Tomographic Image: 15/03/93 17:00 UT
Electron density (x10^11 m^-3)
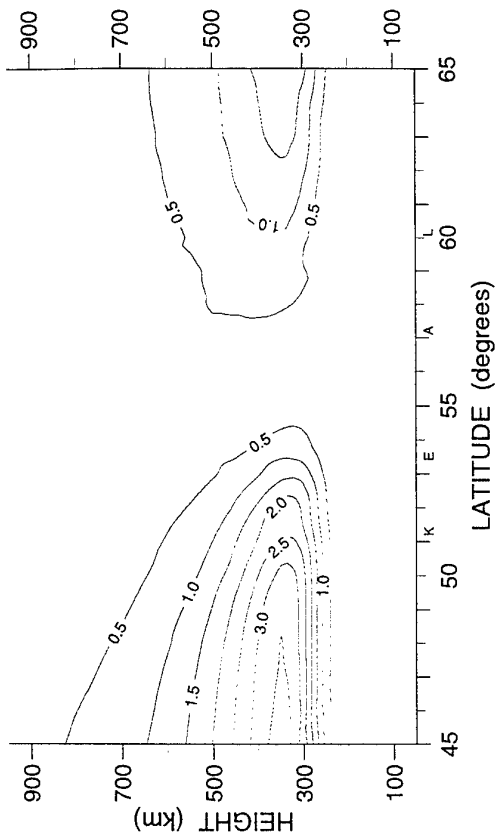
Tomographic Image: 16/03/93 00:24 UT
Electron density (x10^11 m^-3)
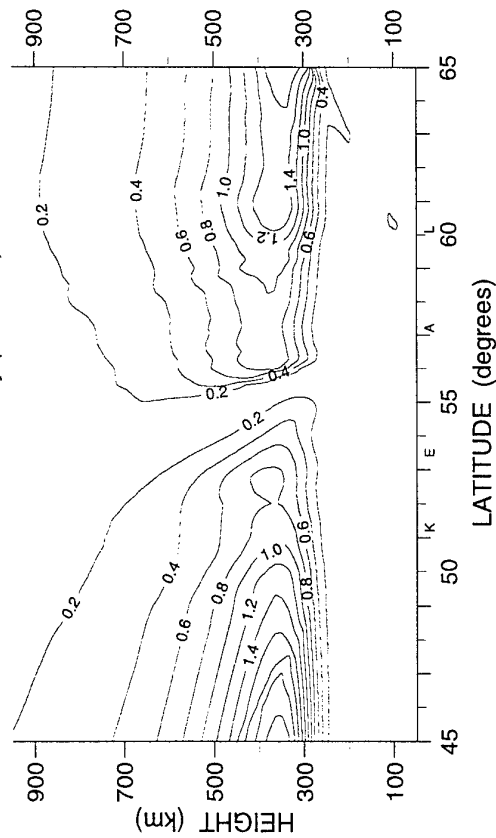
Tomographic Image: 16/03/93 06:26 UT
Electron density (x10^11 m^-3)

Tomographic Image: 16/03/93 05:04 UT
Electron density (x10^11 m^-3)

Tomographic Image: 16/03/93 07:56 UT
Electron density (x10^11 m^-3)

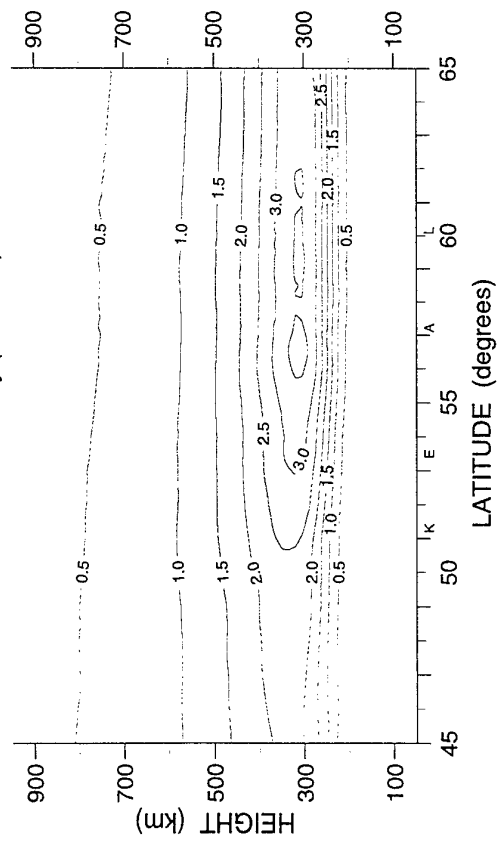Tomographic Image: 16/03/93   08:15 UT
Electron density (×10^{11} m^{-3})
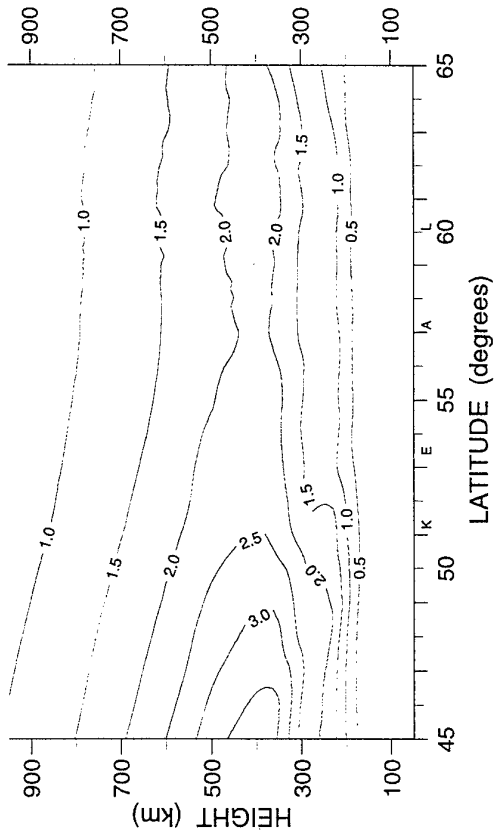
Tomographic Image: 16/03/93   12:43 UT
Electron density (×10^{11} m^{-3})

Tomographic Image: 16/03/93   08:45 UT
Electron density (×10^{11} m^{-3})

Tomographic Image: 16/03/93   16:15 UT
Electron density (×10^{11} m^{-3})

LATITUDE (degrees)

HEIGHT (km)

75

Tomographic Image: 14/02/93 18:03 UT
Electron density (x10¹¹ m⁻³)
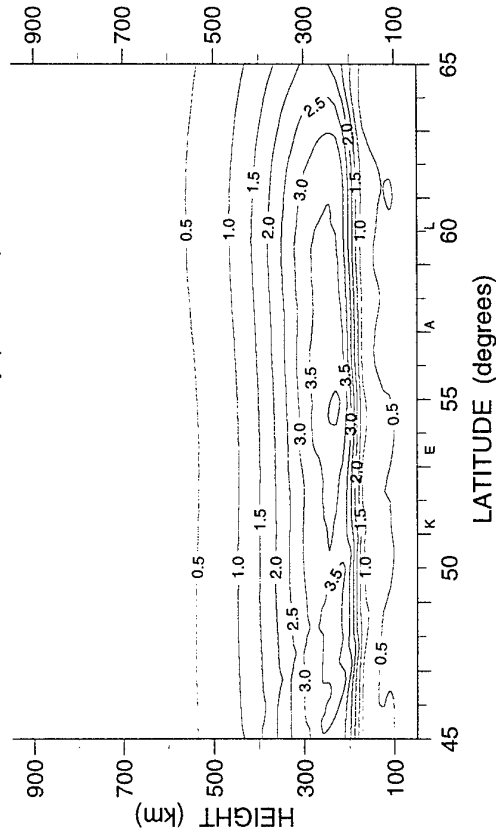
Tomographic Image: 16/03/93 20:57 UT
Electron density (x10¹¹ m⁻³)
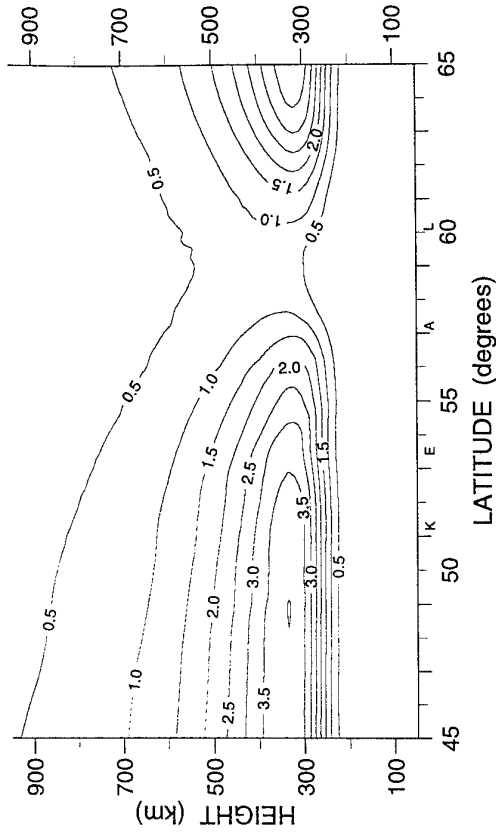
Tomographic Image: 16/03/93 20:08 UT
Electron density (x10¹¹ m⁻³)
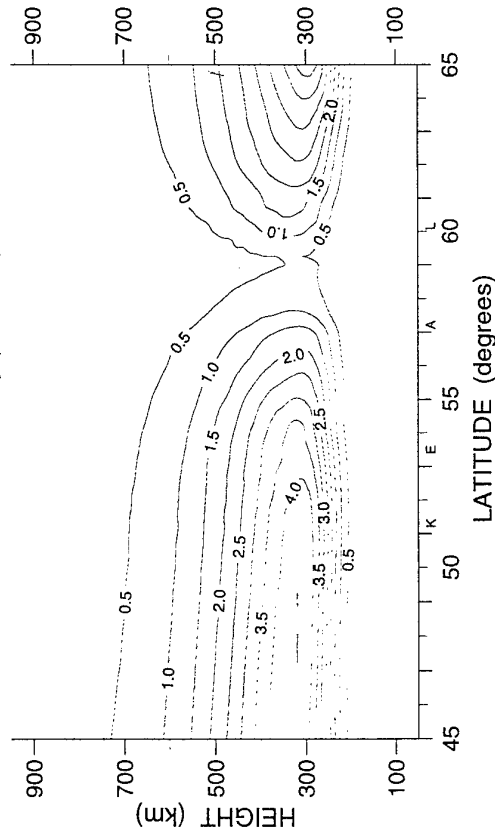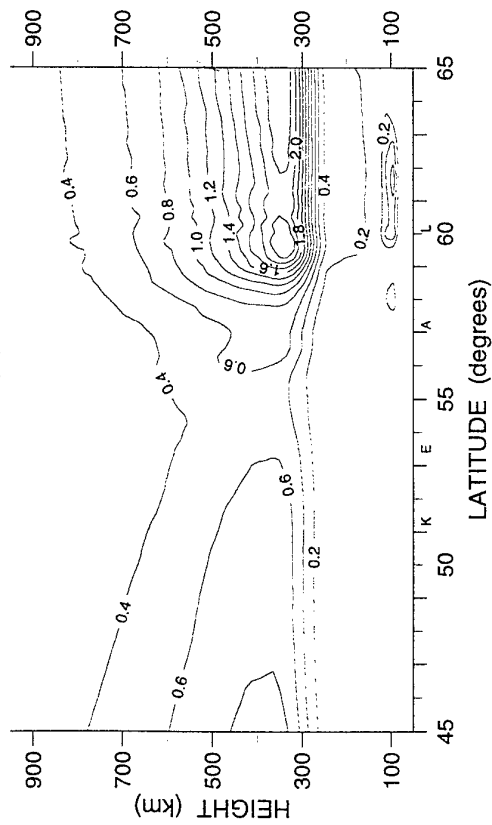
Tomographic Image: 17/03/93 04:41 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 17/03/93 20:57 UT
Electron density (x10^{11} m^{-3})
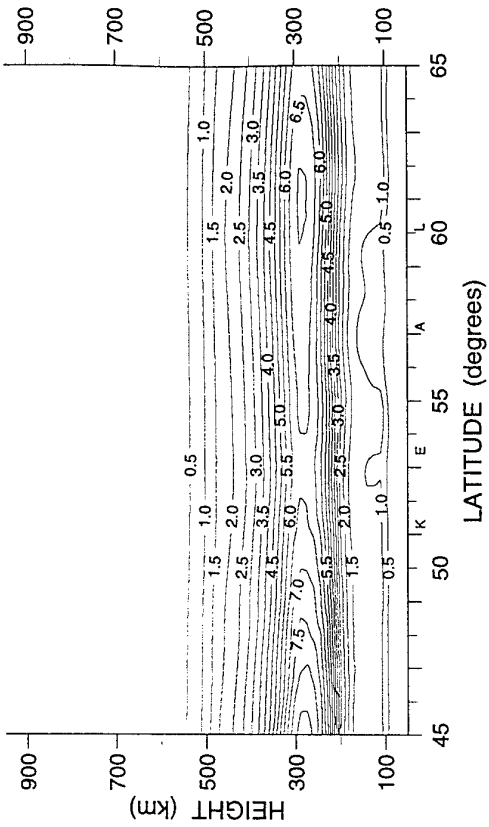
Tomographic Image: 17/03/93 07:52 UT
Electron density (x10^{11} m^{-3})
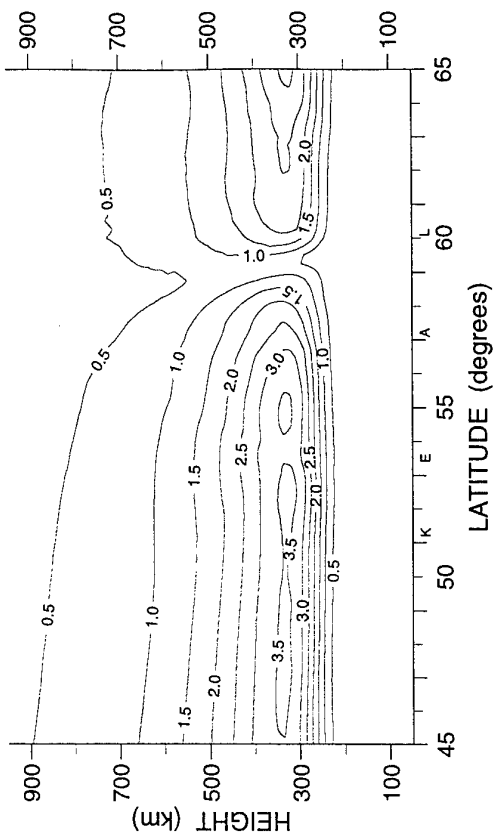
Tomographic Image: 17/03/93 18:25 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 26/03/93 20:07 UT
Electron density (x10^11 m^-3)

Tomographic Image: 27/03/93 04:29 UT
Electron density (x10^11 m^-3)
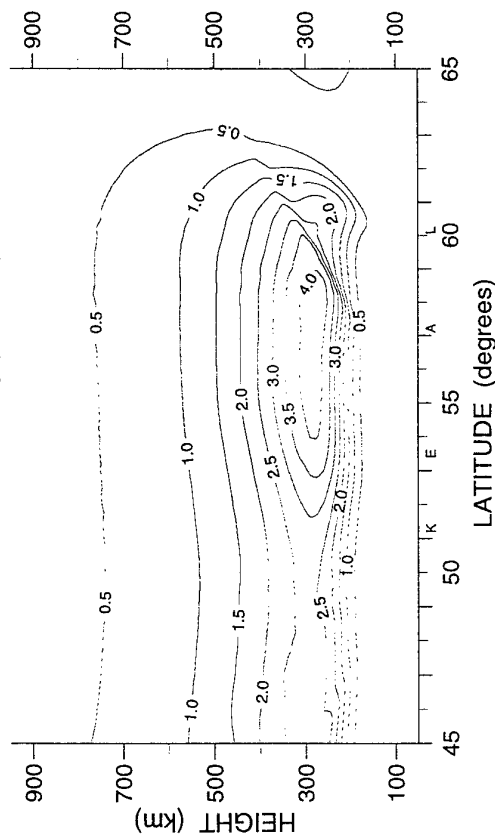
Tomographic Image: 17/03/93 21:12 UT
Electron density (x10^11 m^-3)

Tomographic Image: 17/03/93 22:01 UT
Electron density (x10^11 m^-3)

Tomographic Image: 27/03/93 07:59 UT
Electron density (×10^11 m^-3)

Tomographic Image: 27/03/93 11:14 UT
Electron density (×10^11 m^-3)
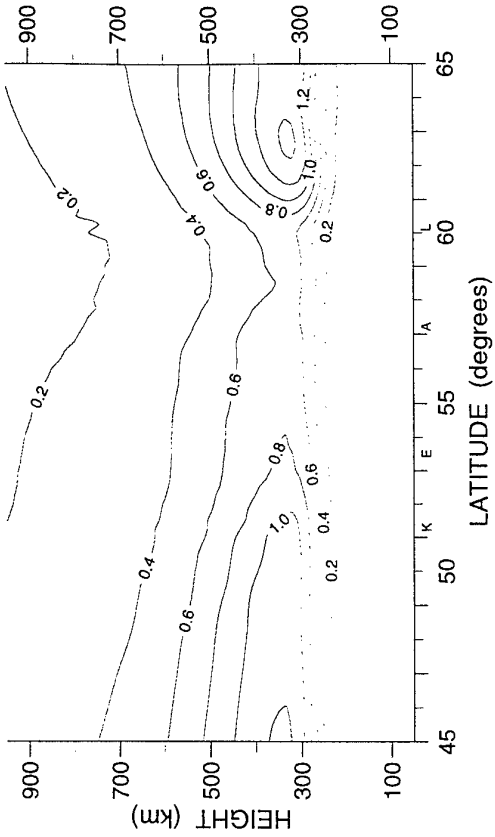
Tomographic Image: 27/03/93 05:50 UT
Electron density (×10^11 m^-3)
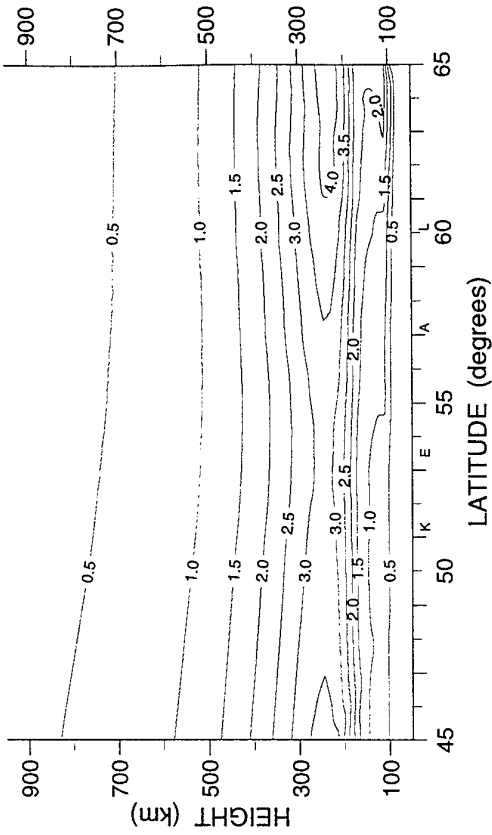
Tomographic Image: 27/03/93 07:39 UT
Electron density (×10^11 m^-3)
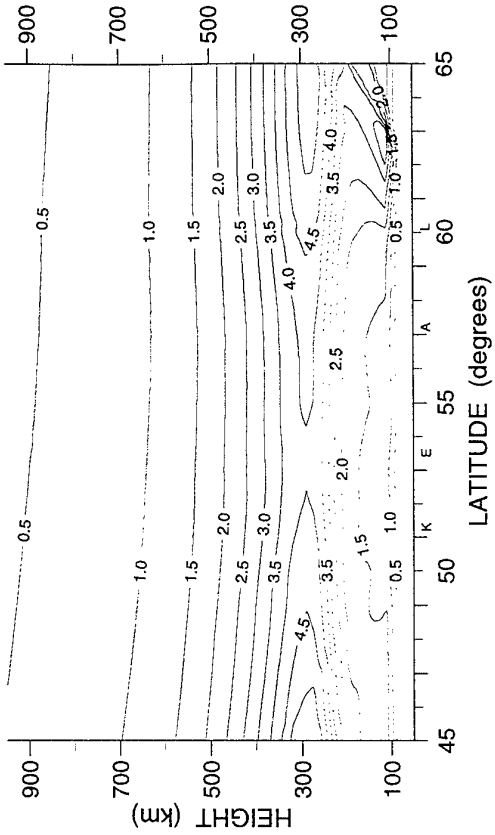
Tomographic Image: 27/03/93 20:01 UT
Electron density (x10^{11} m^{-3})
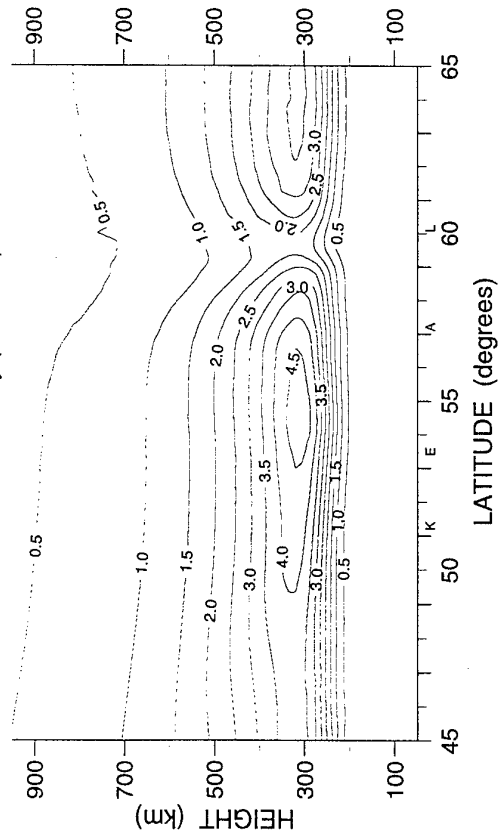
Tomographic Image: 28/03/93 08:16 UT
Electron density (x10^{11} m^{-3})
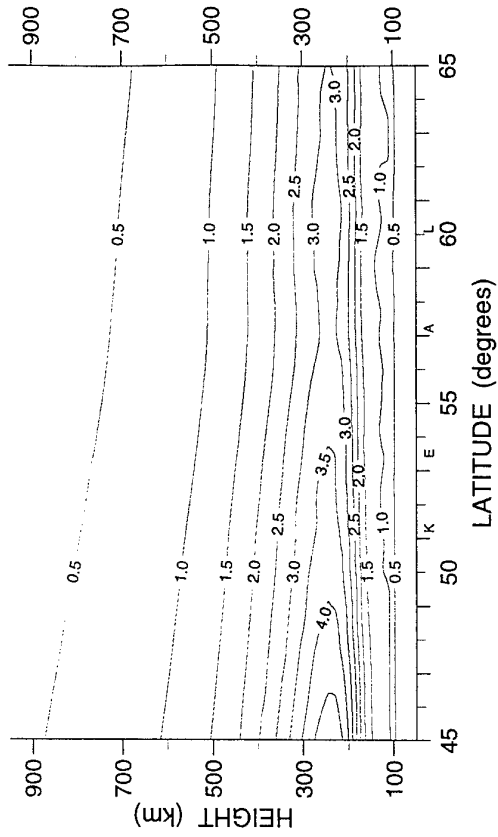
Tomographic Image: 28/03/93 05:27 UT
Electron density (x10^{11} m^{-3})
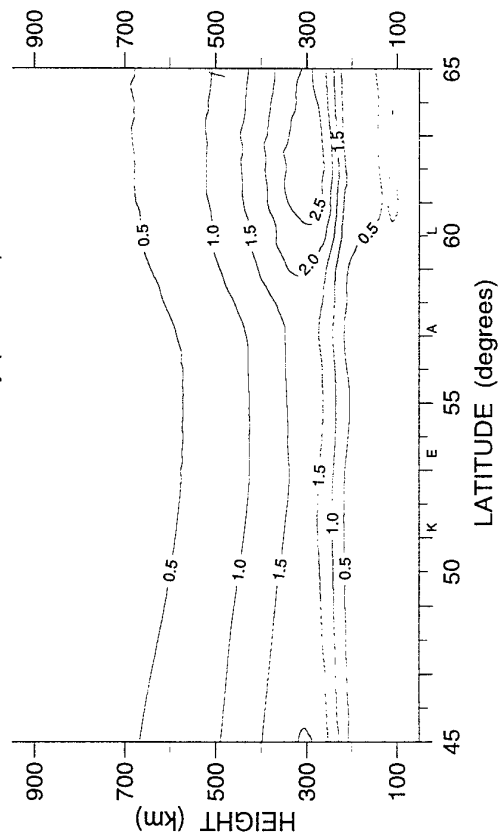
Tomographic Image: 28/03/93 19:27 UT
Electron density (x10^{11} m^{-3})
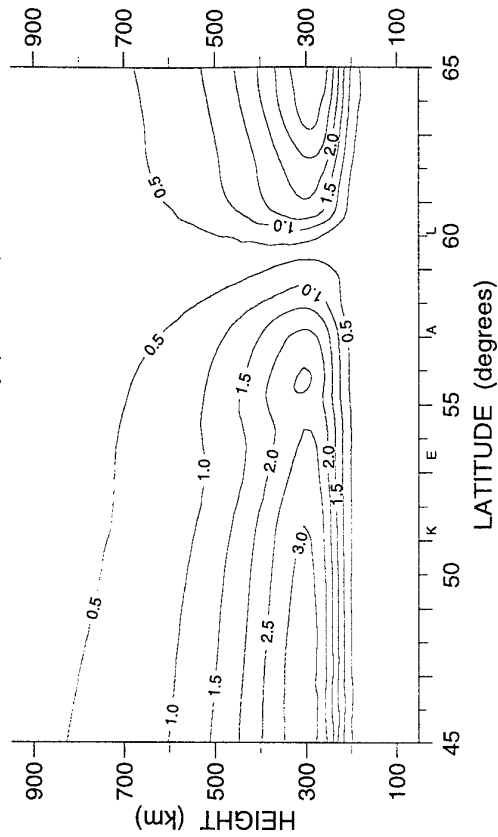
Tomographic Image: 28/03/93 21:14 UT
Electron density (x10^11 m^-3)
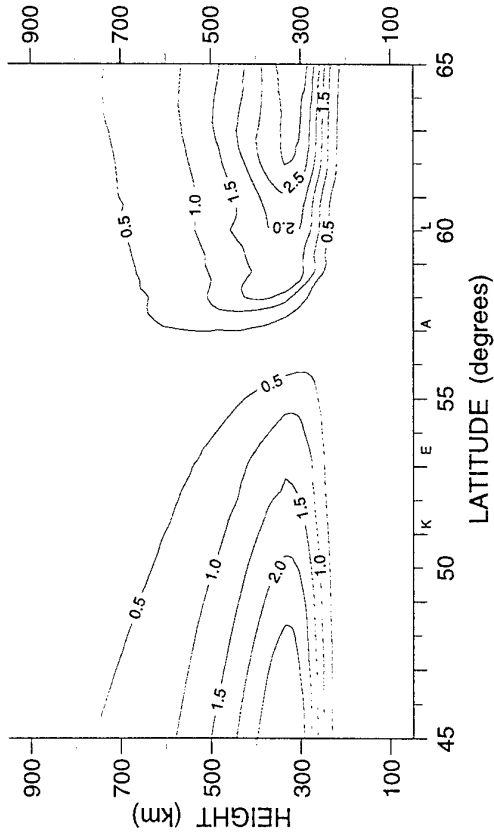
Tomographic Image: 29/03/93 06:53 UT
Electron density (x10^11 m^-3)
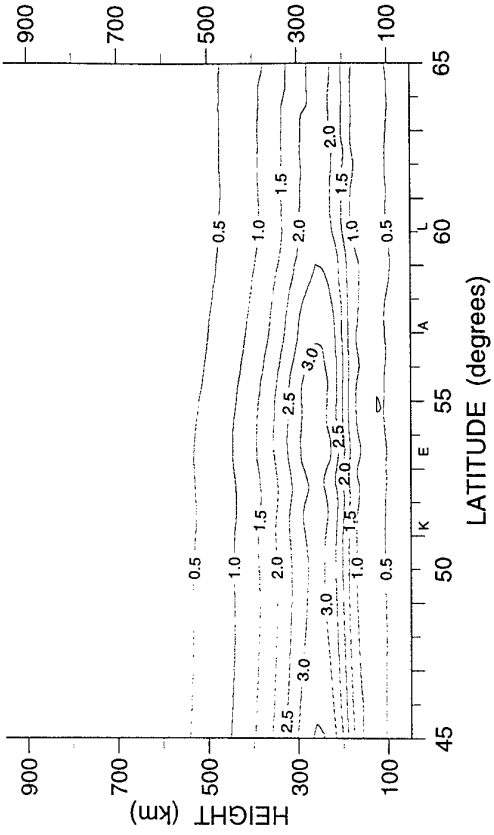
Tomographic Image: 29/03/93 03:14 UT
Electron density (x10^11 m^-3)
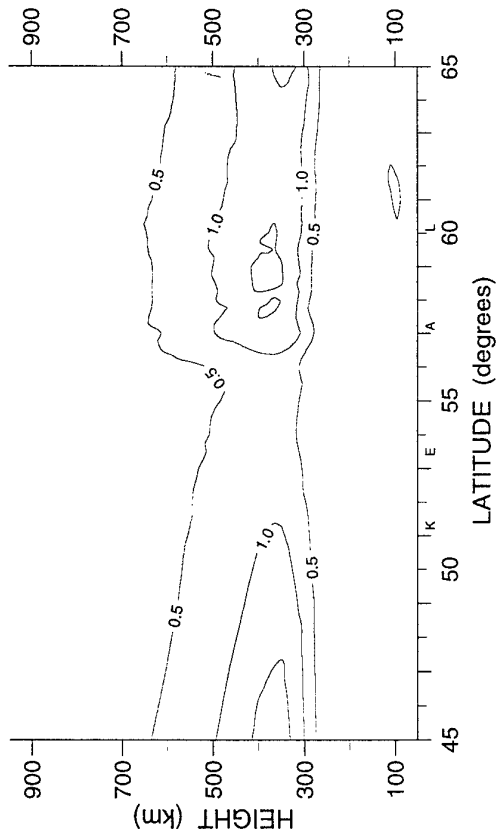
Tomographic Image: 29/03/93 18:43 UT
Electron density (x10^11 m^-3)

81

Tomographic Image: 30/03/93 03:20 UT
Electron density (x10^11 m^-3)
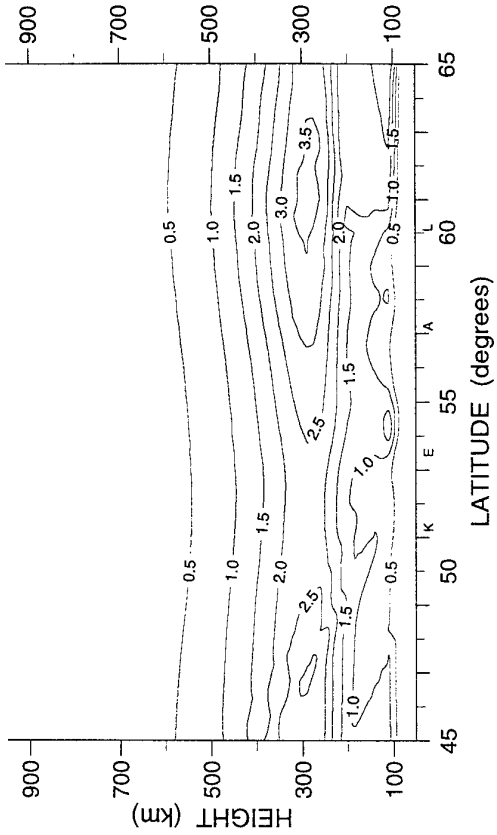
Tomographic Image: 29/03/93 20:31 UT
Electron density (x10^11 m^-3)
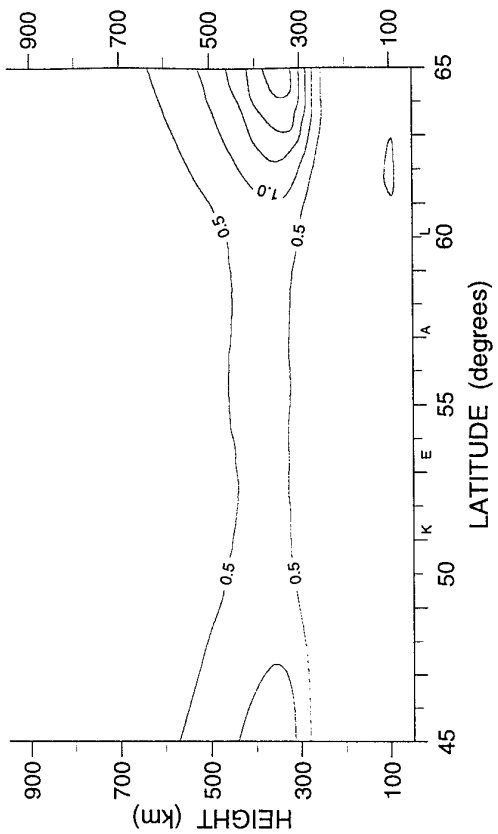
Tomographic Image: 30/03/93 02:29 UT
Electron density (x10^11 m^-3)

Tomographic Image: 31/03/93 04:46 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 31/03/93 06:07 UT
Electron density (x10^{11} m^{-3})
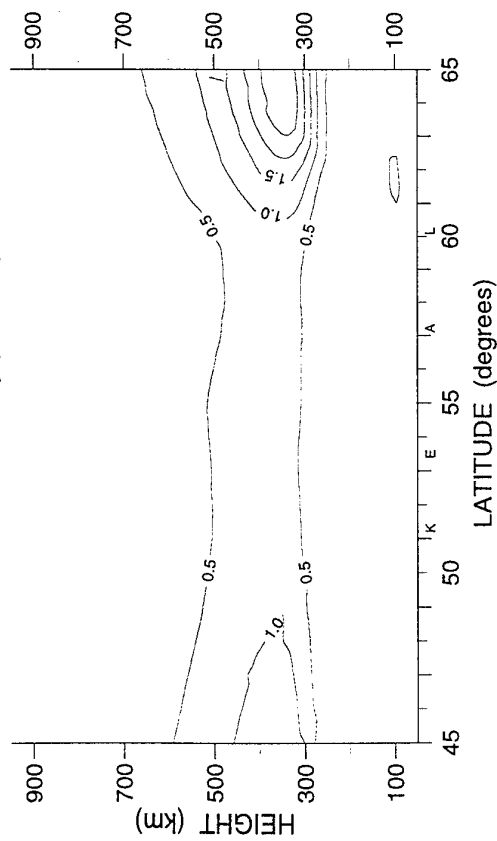
Tomographic Image: 31/03/93 02:57 UT
Electron density (x10^{11} m^{-3})
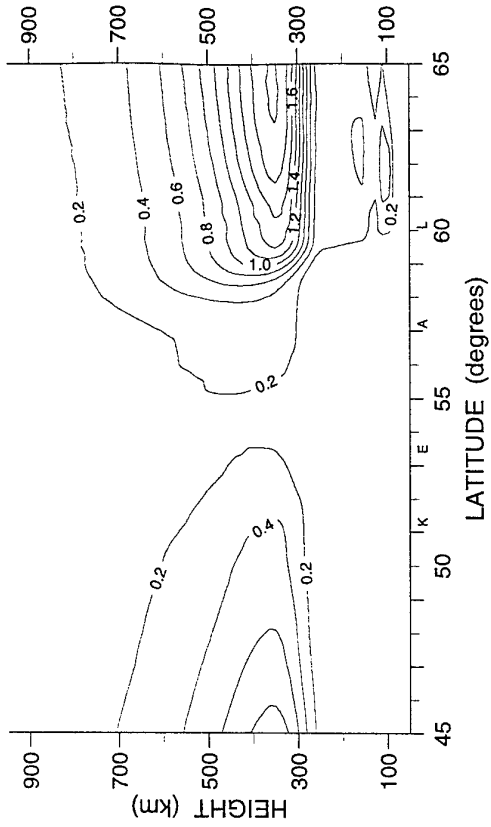
Tomographic Image: 31/03/93 03:31 UT
Electron density (x10^{11} m^{-3})
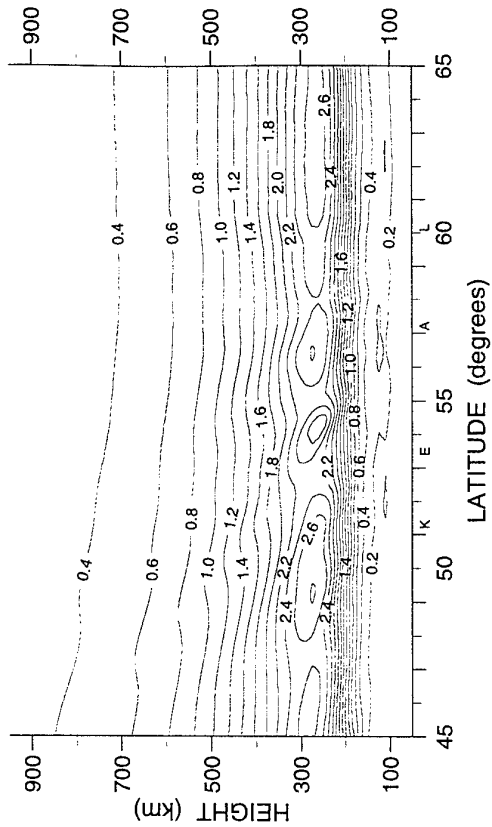
Tomographic Image: 31/03/93 11:12 UT
Electron density (x10^{11} m^{-3})
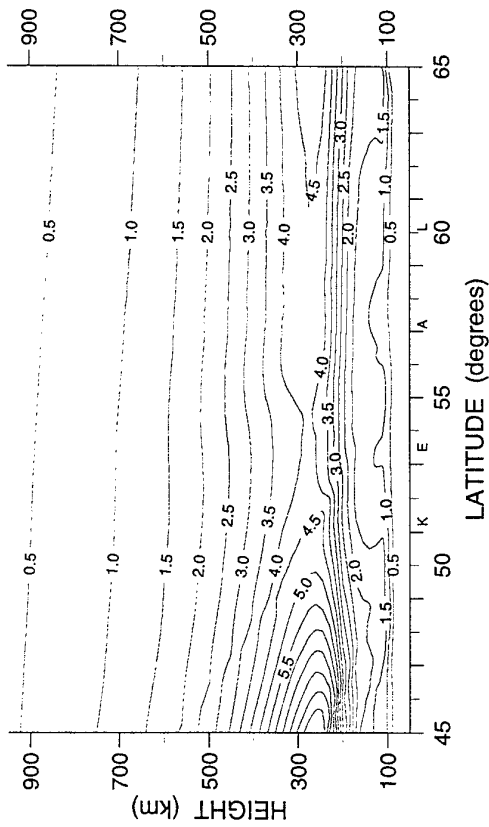
Tomographic Image: 31/03/93 15:18 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 31/03/93 13:54 UT
Electron density (x10^{11} m^{-3})
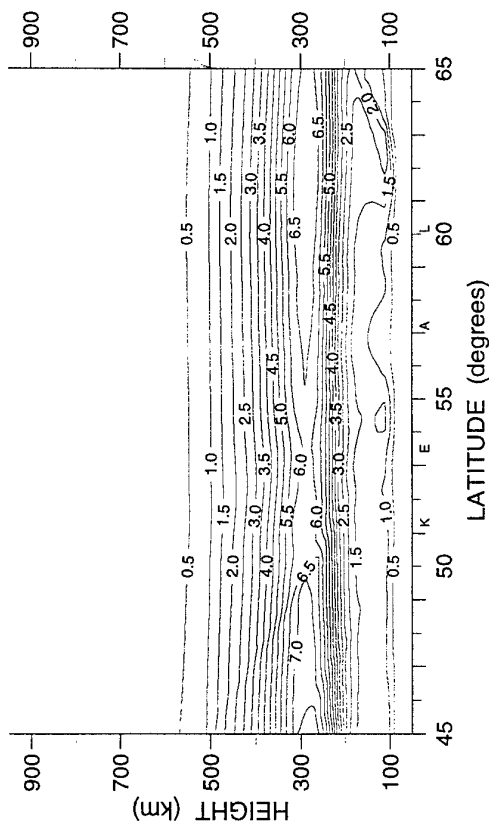
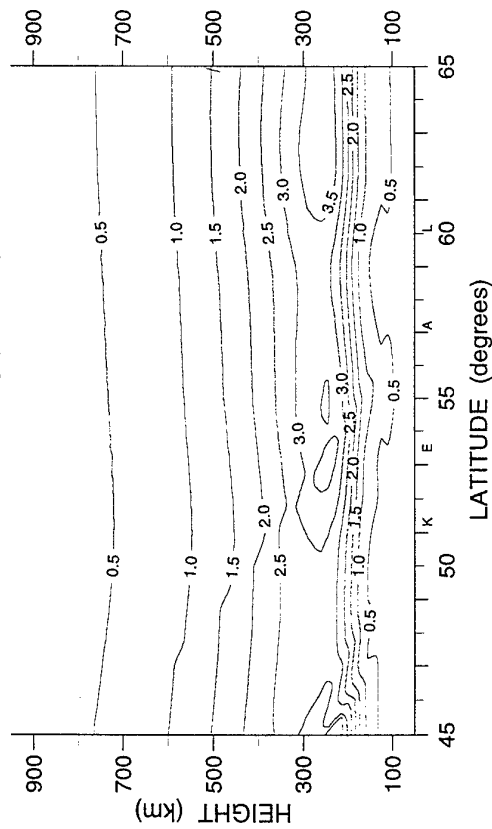Tomographic Image: 31/03/93 17:07 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 01/04/93 00:14 UT

Electron density (x10^{11} m^{-3})

Tomographic Image: 01/04/93 04:22 UT

Electron density (x10^{11} m^{-3})

Tomographic Image: 31/03/93 20:06 UT

Electron density (x10^{11} m^{-3})

Tomographic Image: 31/03/93 20:52 UT

Electron density (x10^{11} m^{-3})
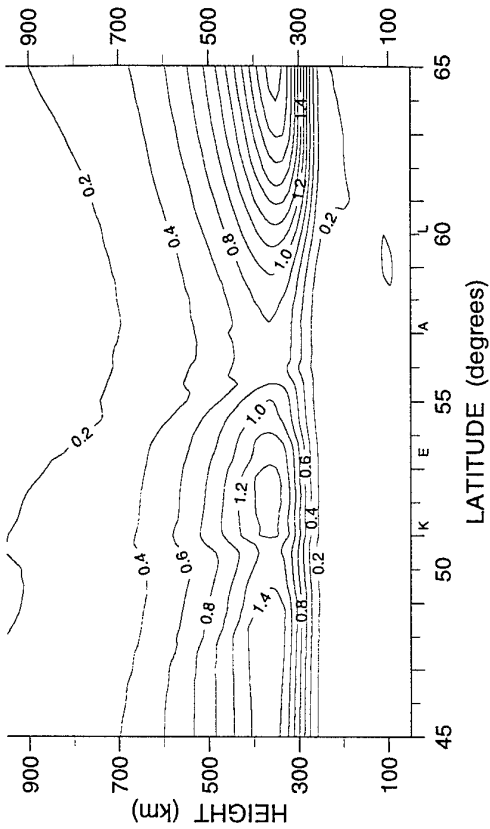
Tomographic Image: 01/04/93 07:57 UT
Electron density (x10^11 m^-3)
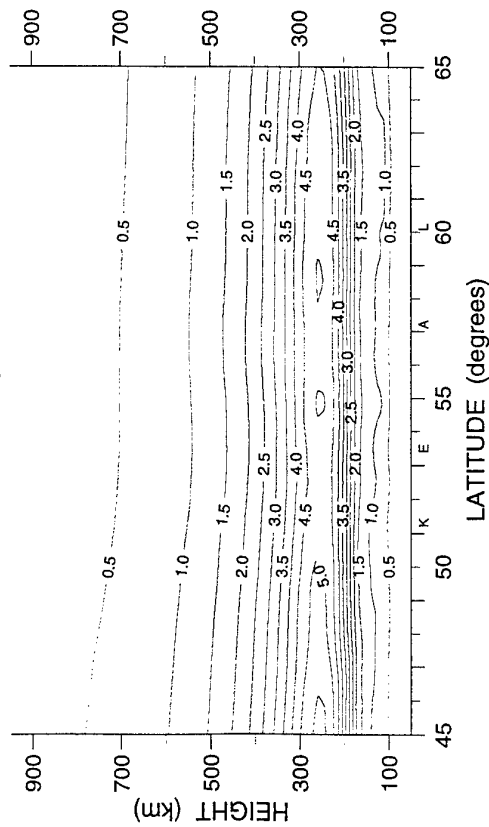
Tomographic Image: 01/04/93 14:55 UT
Electron density (x10^11 m^-3)
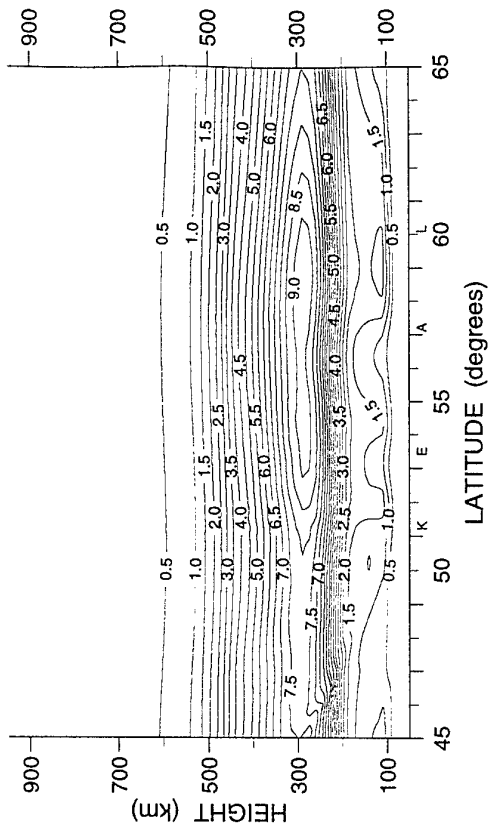
Tomographic Image: 01/04/93 12:33 UT
Electron density (x10^11 m^-3)
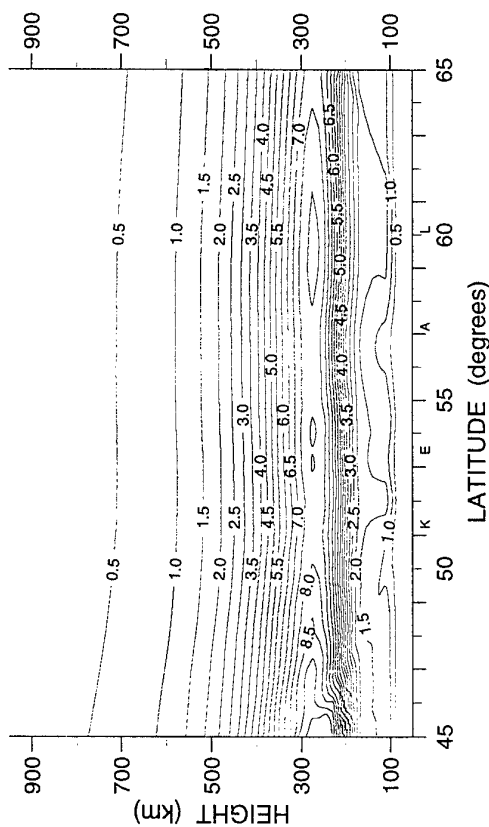
Tomographic Image: 01/04/93 18:06 UT
Electron density (x10^11 m^-3)
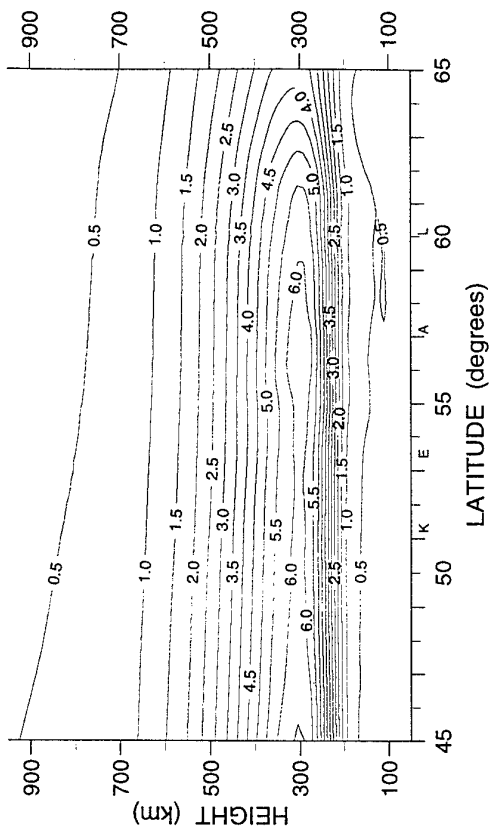
Tomographic Image: 01/04/93 23:46 UT
Electron density (x10^{11} m^{-3})
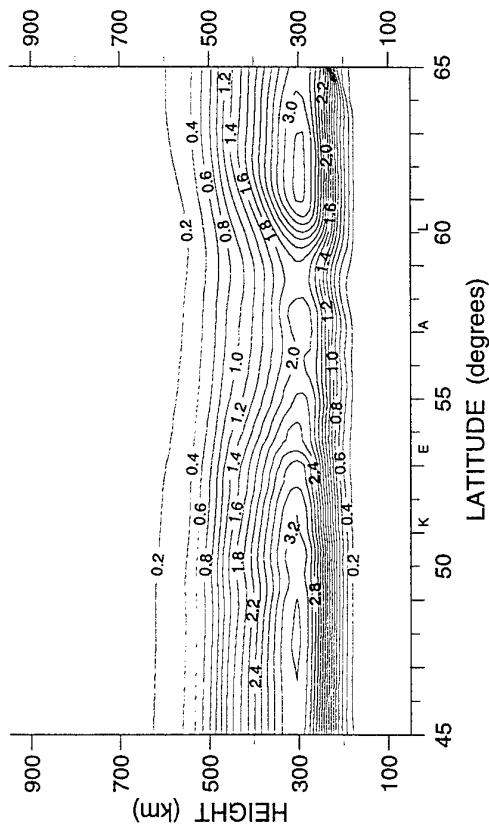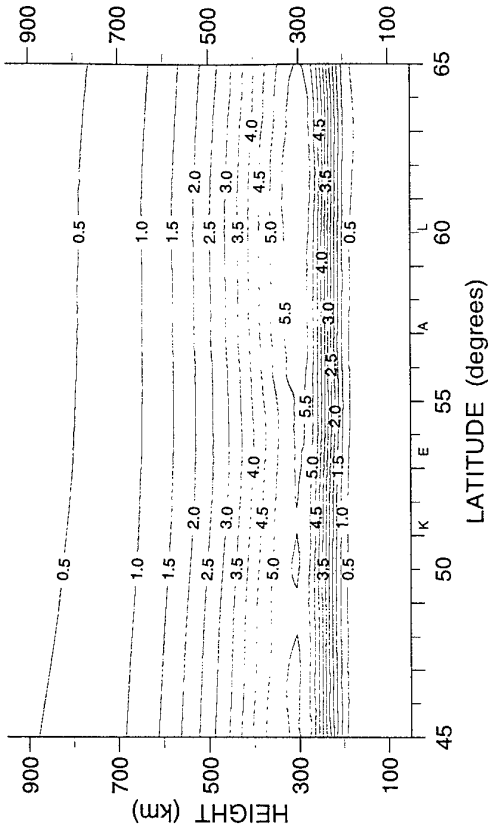
Tomographic Image: 02/04/93 07:10 UT
Electron density (x10^{11} m^{-3})
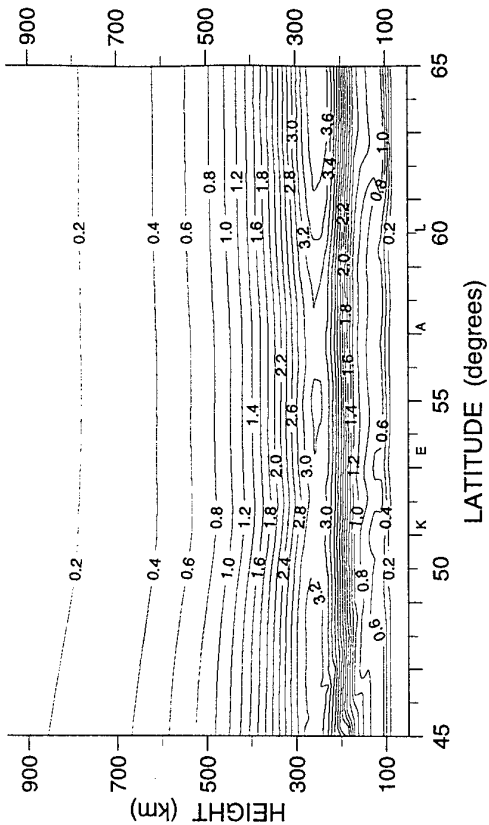
Tomographic Image: 02/04/93 05:21 UT
Electron density (x10^{11} m^{-3})
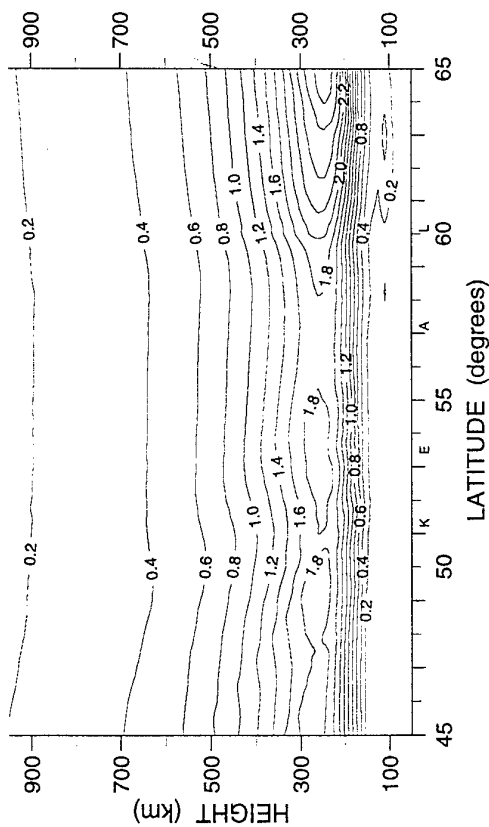
Tomographic Image: 02/04/93 10:16 UT
Electron density (x10^{11} m^{-3})
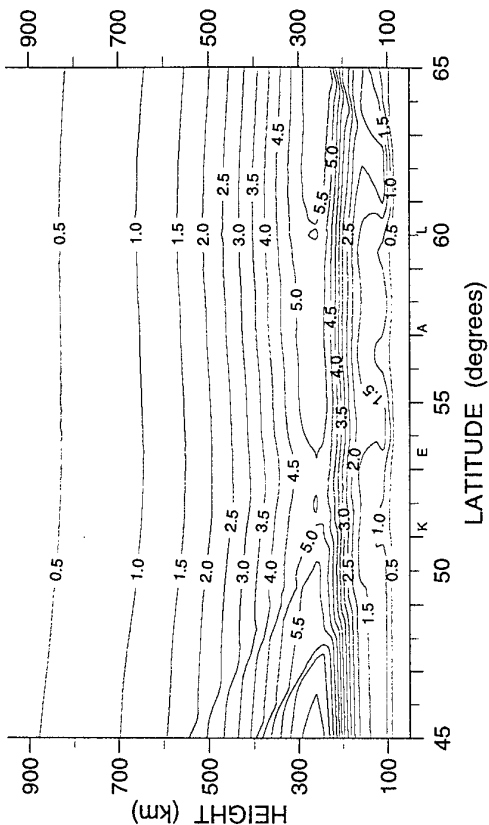
Tomographic Image: 02/04/93 12:05 UT
Electron density (x10^{11} m^{-3})
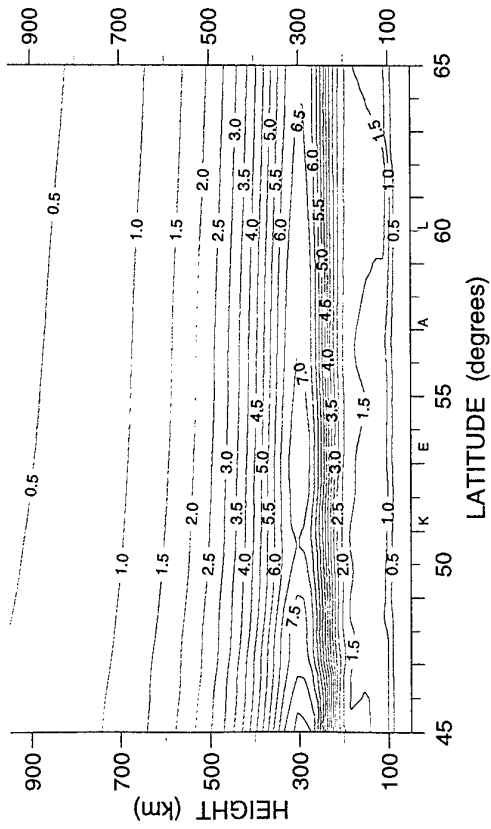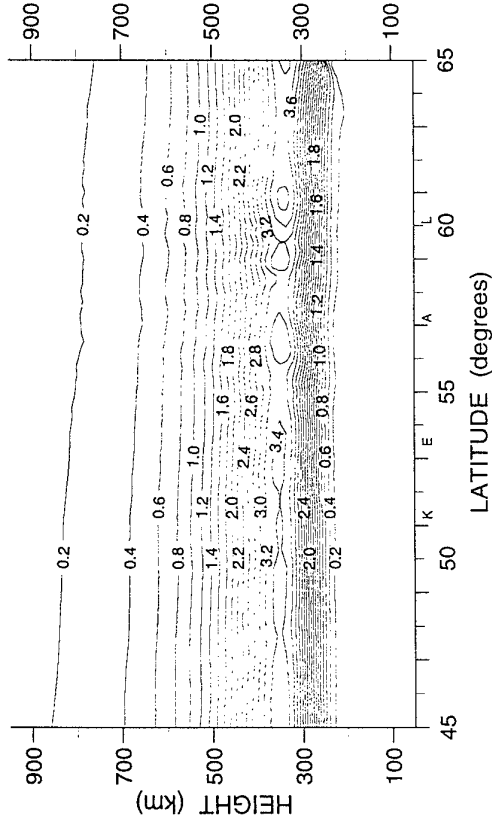
Tomographic Image: 02/04/93 18:40 UT
Electron density (x10^{11} m^{-3})
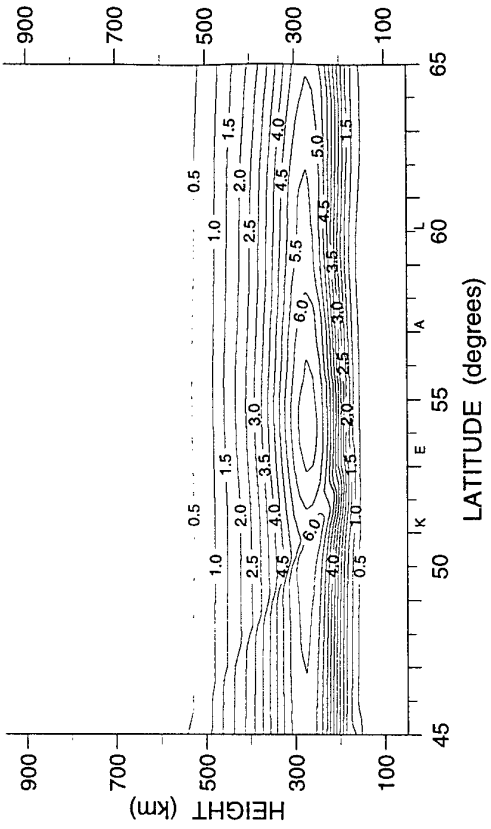
Tomographic Image: 02/04/93 14:11 UT
Electron density (x10^{11} m^{-3})
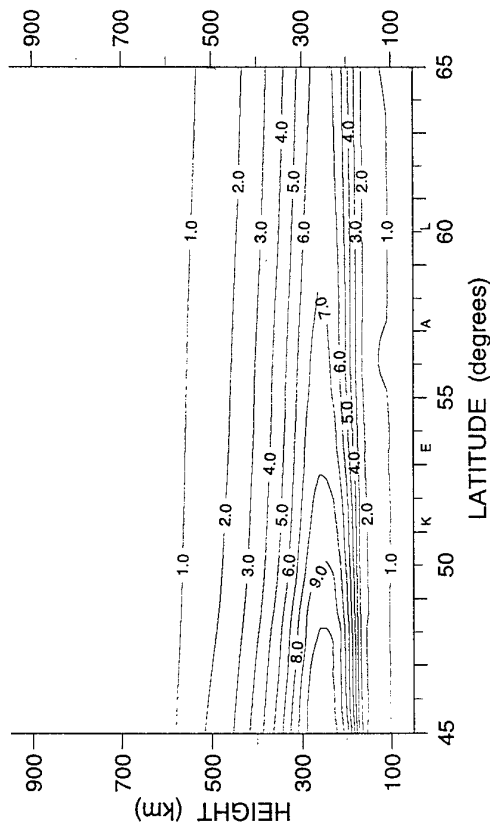
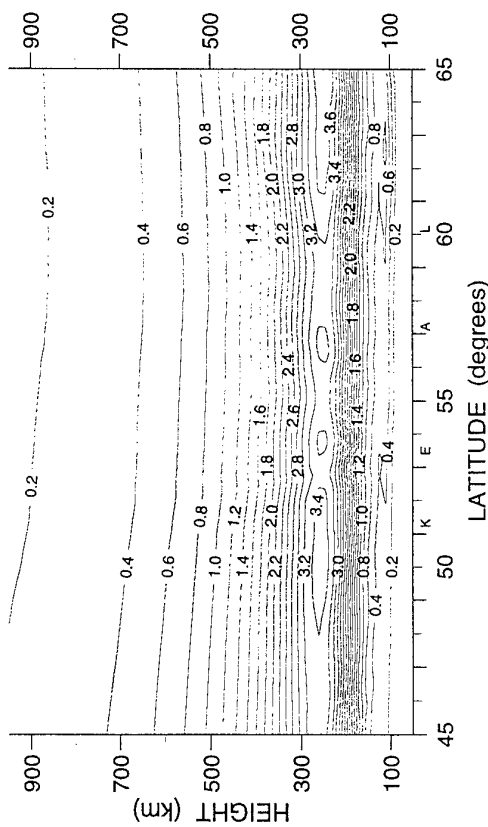Tomographic Image: 02/04/93 19:25 UT
Electron density (x10^{11} m^{-3})
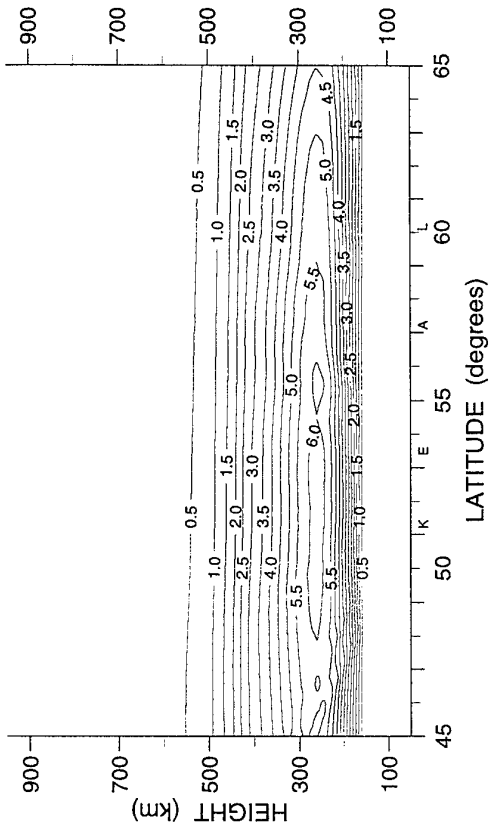
Tomographic Image: 02/04/93 20:27 UT
Electron density (x10^{11} m^{-3})
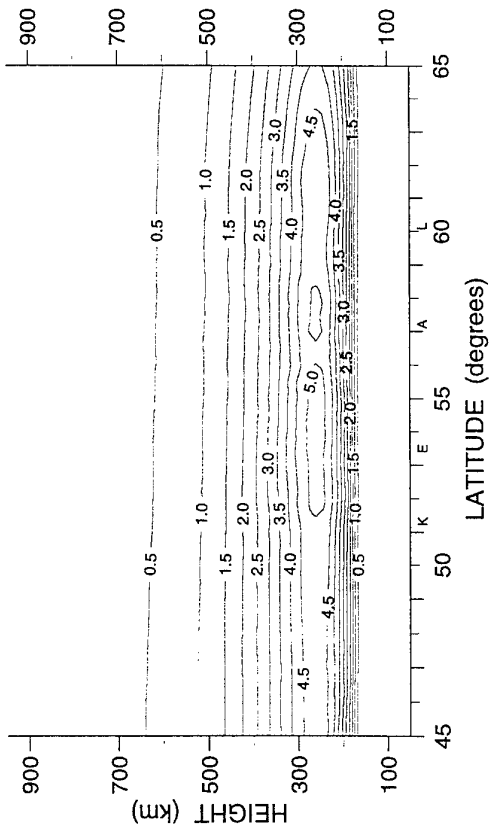
Tomographic Image: 03/04/93 03:03 UT
Electron density (x10^{11} m^{-3})
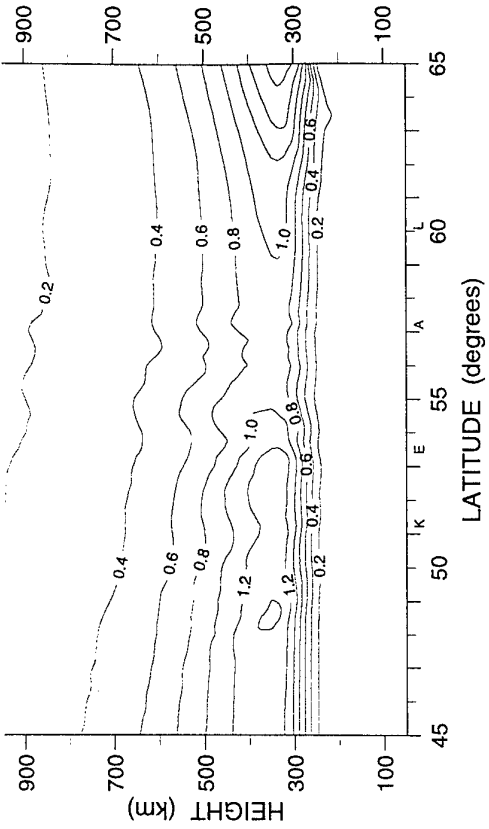
Tomographic Image: 02/04/93 23:18 UT
Electron density (x10^{11} m^{-3})
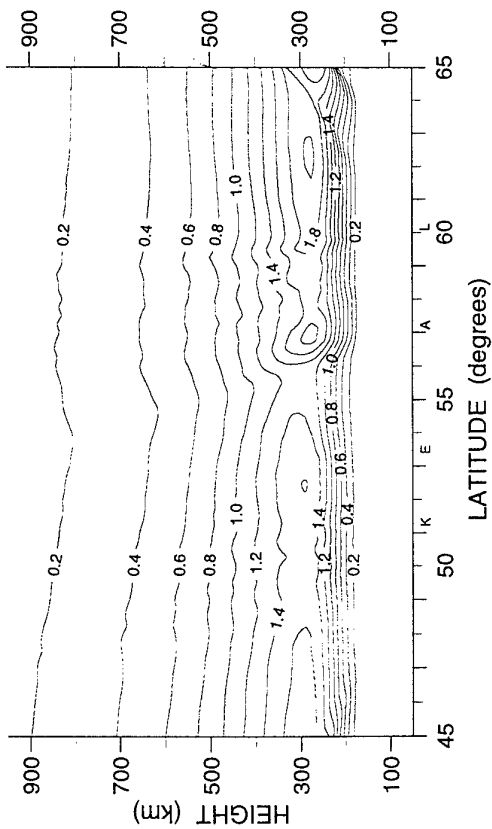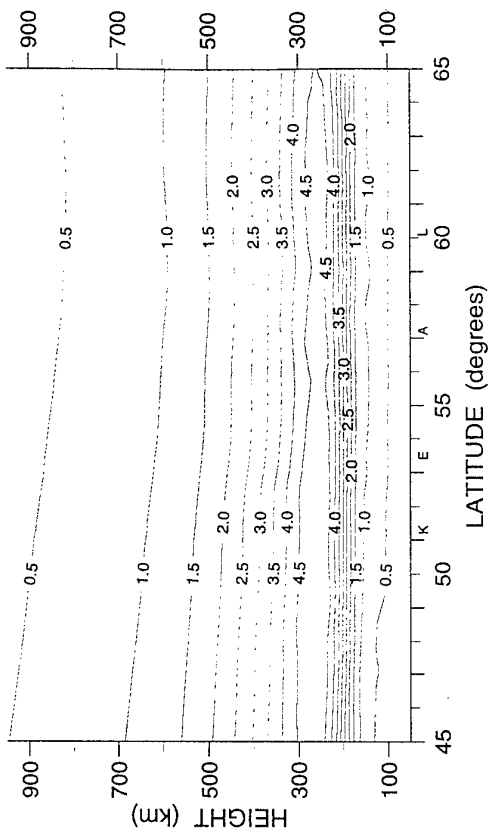
Tomographic Image: 03/04/93 03:36 UT
Electron density (x10^{11} m^{-3})

89
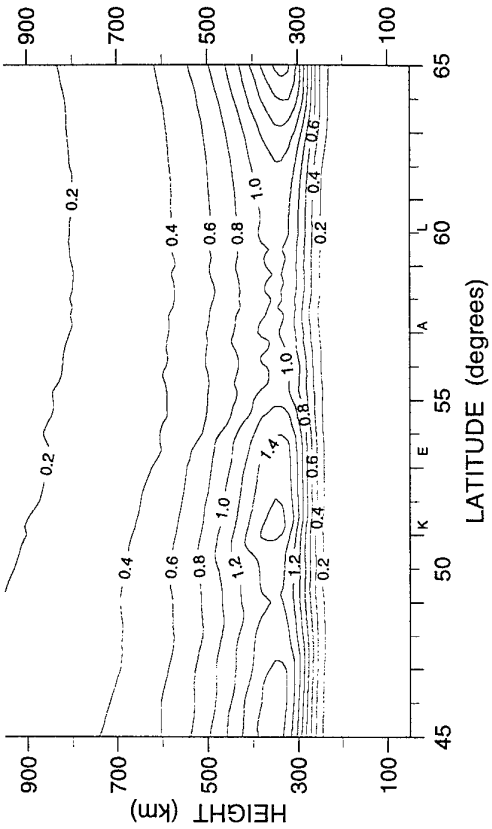
Tomographic Image: 03/04/93 05:45 UT
Electron density (x10^11 m^-3)
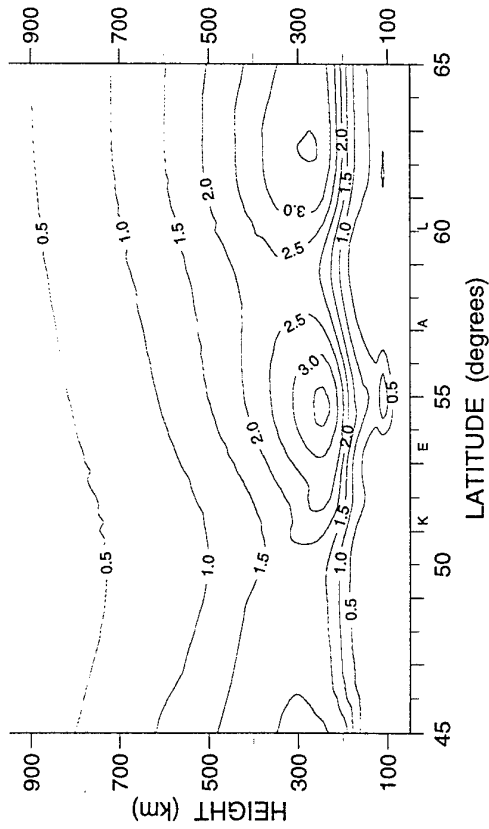
Tomographic Image: 03/04/93 06:47 UT
Electron density (x10^11 m^-3)
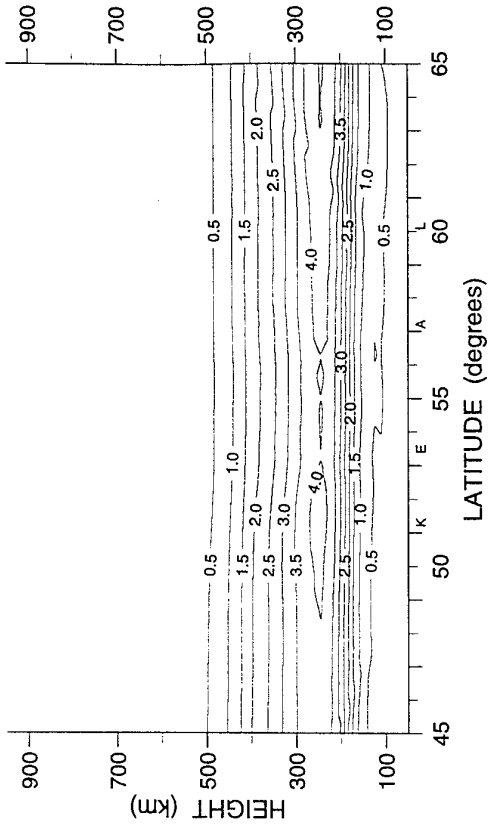
Tomographic Image: 03/04/93 06:30 UT
Electron density (x10^11 m^-3)

Tomographic Image: 03/04/93 07:32 UT
Electron density (x10^11 m^-3)

90
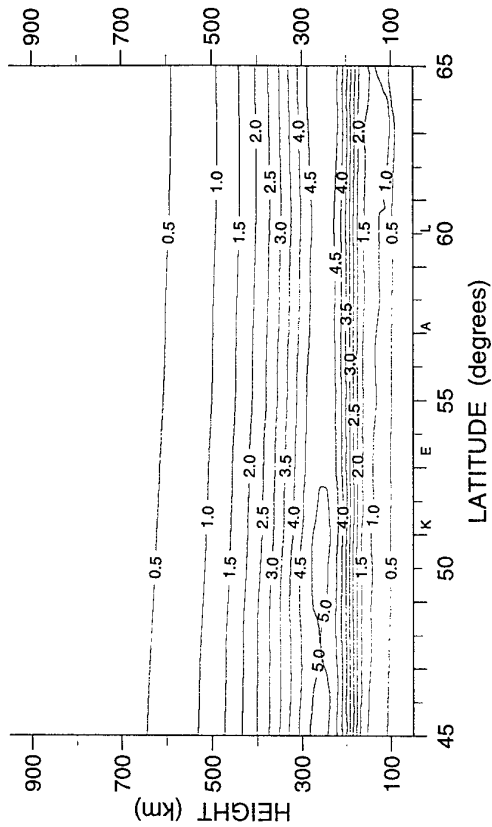
Tomographic Image: 03/04/93 08:18 UT
Electron density (x10^{11} m^{-3})
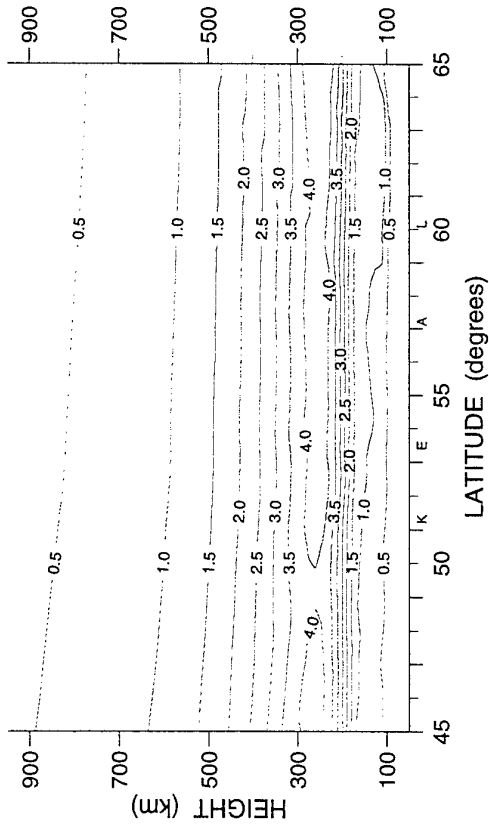
Tomographic Image: 03/04/93 11:37 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 03/04/93   17:20 UT
Electron density (×10^{11} m^{-3})
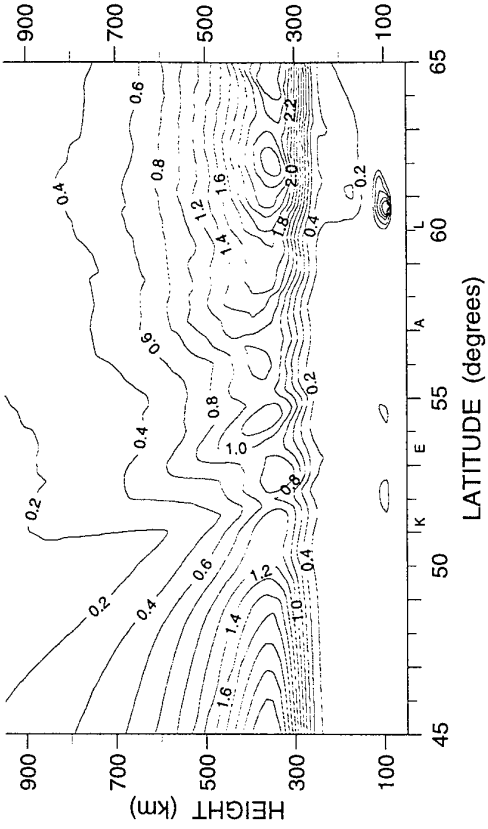
Tomographic Image: 03/04/93   19:09 UT
Electron density (×10^{11} m^{-3})
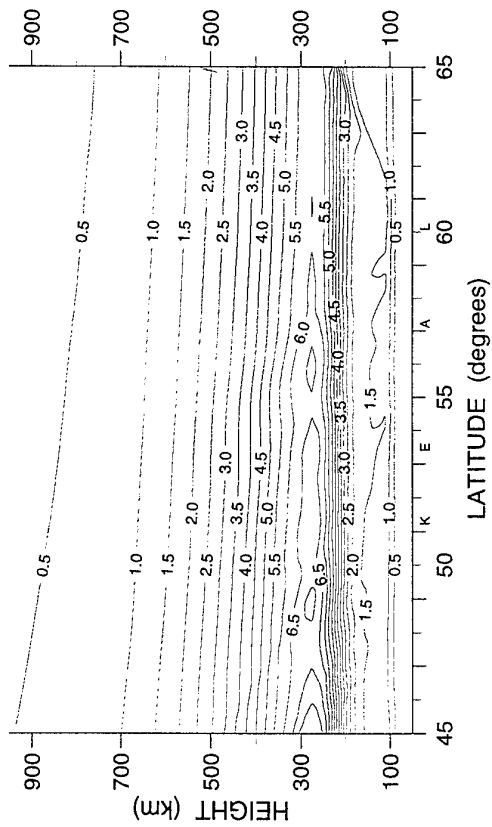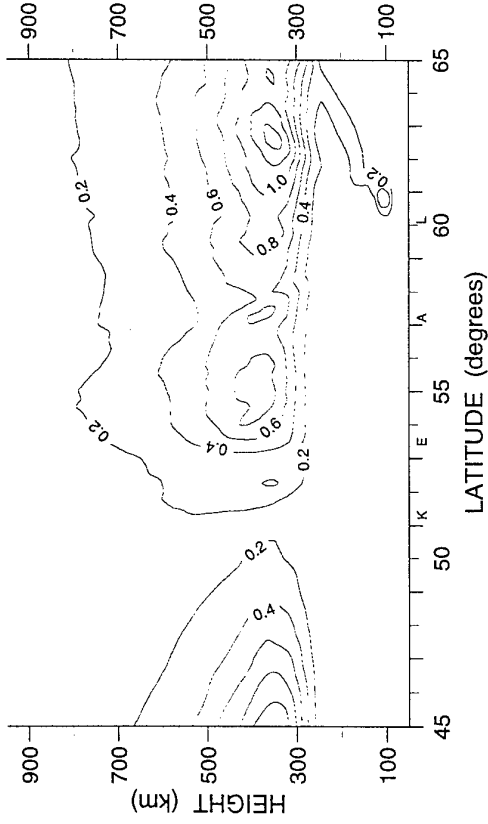
Tomographic Image: 03/04/93   15:13 UT
Electron density (×10^{11} m^{-3})
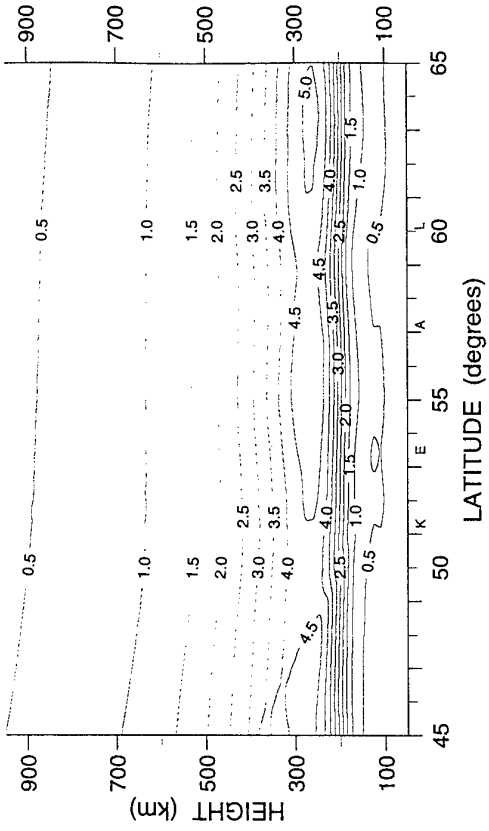
Tomographic Image: 03/04/93   15:58 UT
Electron density (×10^{11} m^{-3})

92

Tomographic Image: 03/04/93 19:44 UT
Electron density (×10¹¹ m⁻³)
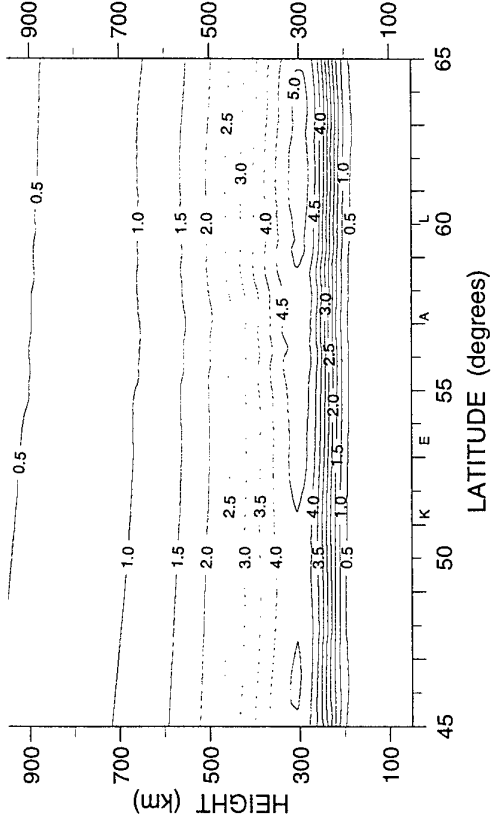
Tomographic Image: 04/04/93 02:18 UT
Electron density (×10¹¹ m⁻³)
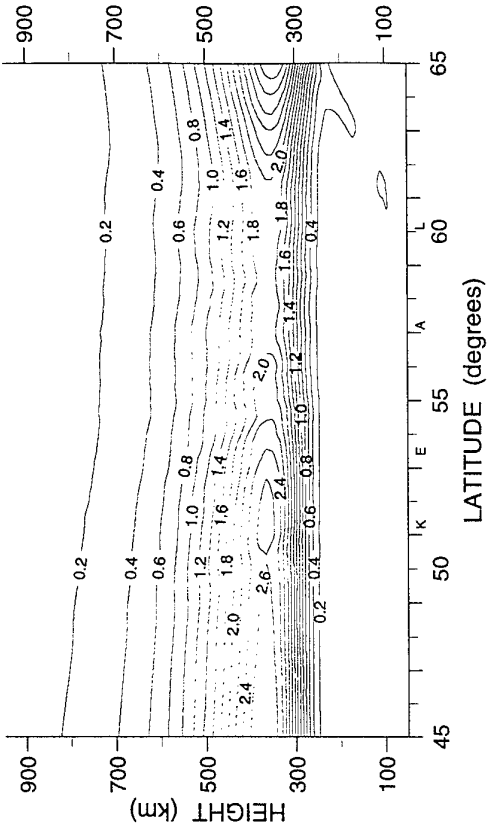
Tomographic Image: 03/04/93 22:50 UT
Electron density (×10¹¹ m⁻³)

Tomographic Image: 04/04/93 03:13 UT
Electron density (×10¹¹ m⁻³)

Tomographic Image: 04/04/93   06:49 UT
Electron density (x10^11 m^-3)

Tomographic Image: 04/04/93   07:34 UT
Electron density (x10^11 m^-3)
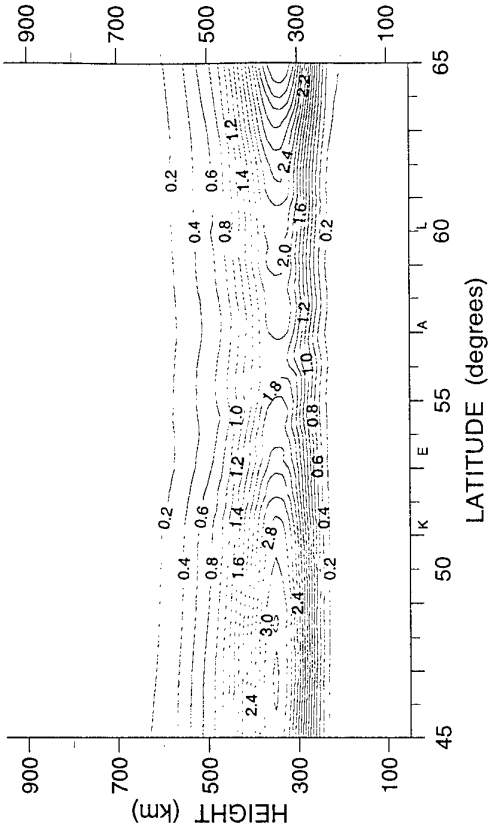
Tomographic Image: 04/04/93   05:02 UT
Electron density (x10^11 m^-3)
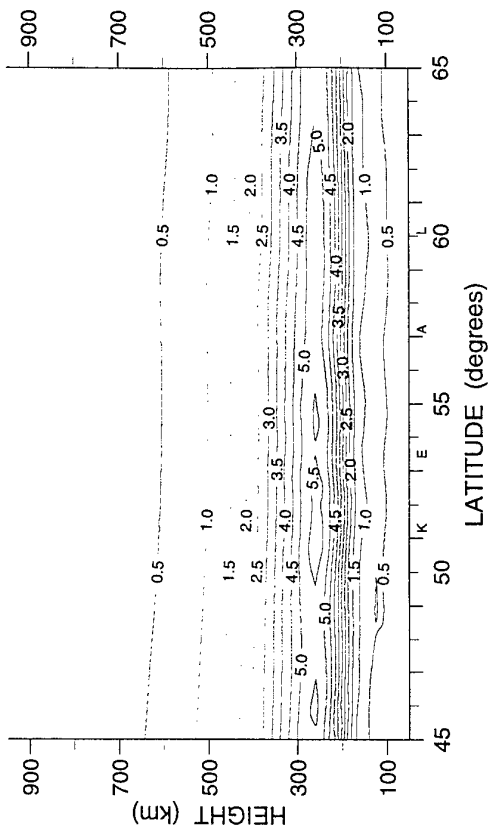
Tomographic Image: 04/04/93   06:24 UT
Electron density (x10^11 m^-3)

94

Tomographic Image: 04/04/93 16:57 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 04/04/93 18:46 UT
Electron density (x10^{11} m^{-3})
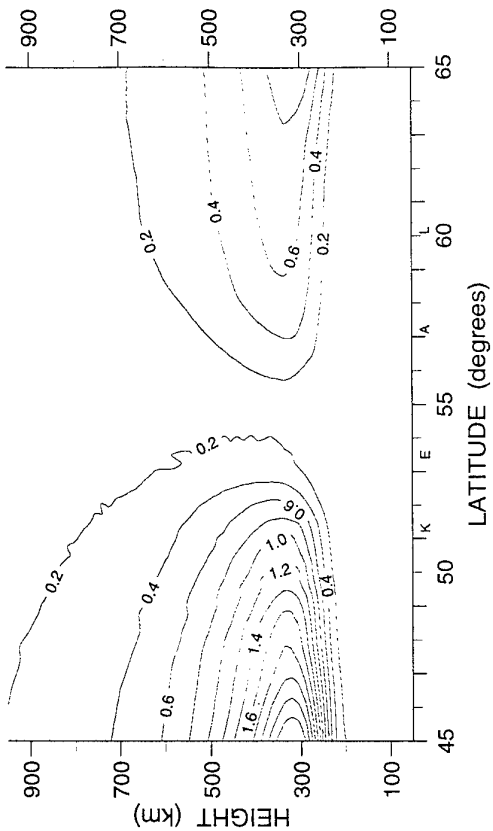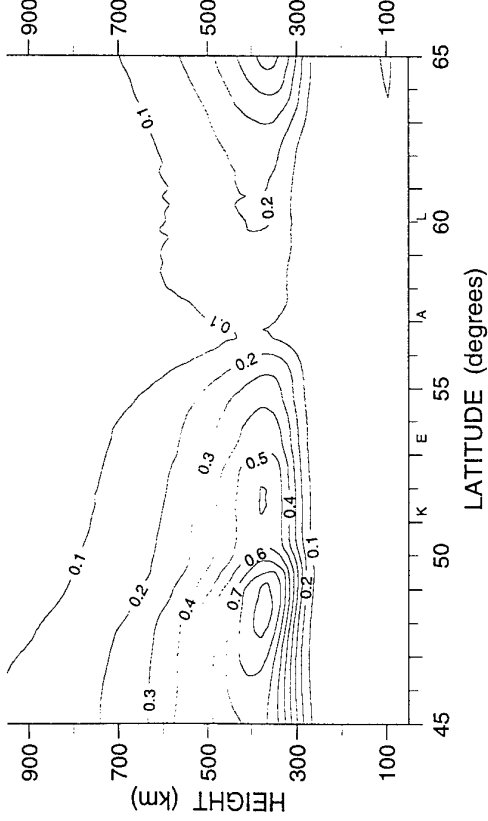
Tomographic Image: 04/04/93 11:09 UT
Electron density (x10^{11} m^{-3})
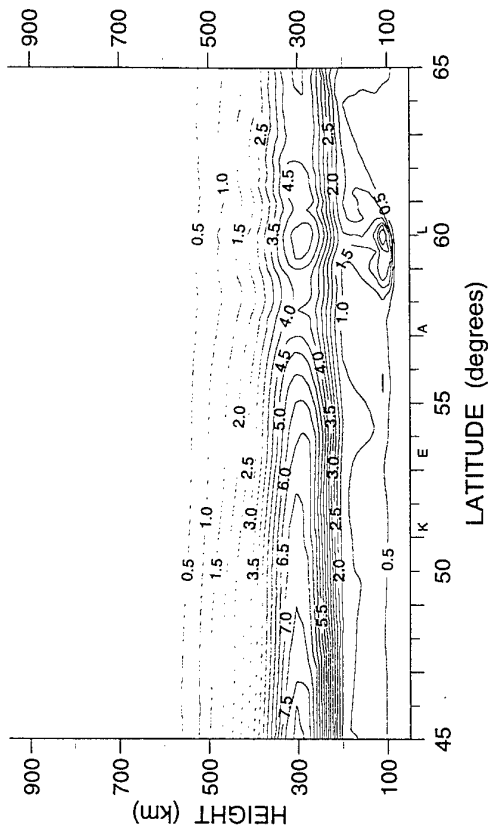
Tomographic Image: 04/04/93 15:35 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

95
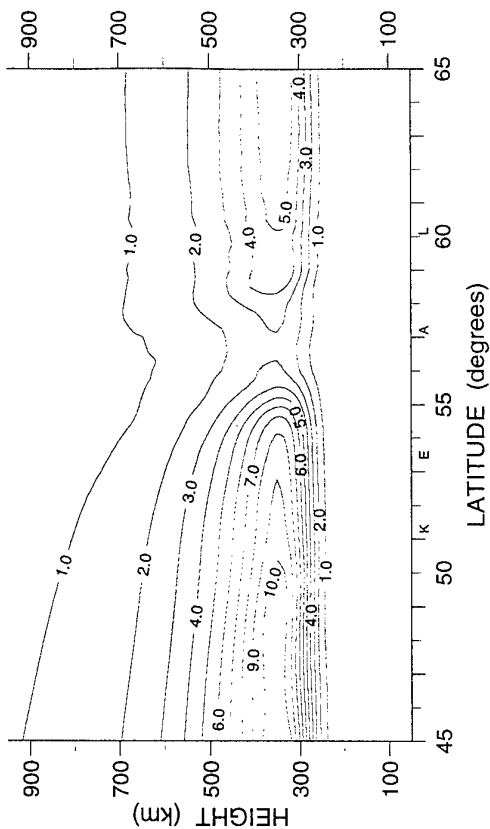
Tomographic Image: 04/04/93 19:46 UT
Electron density (x10¹¹ m⁻³)
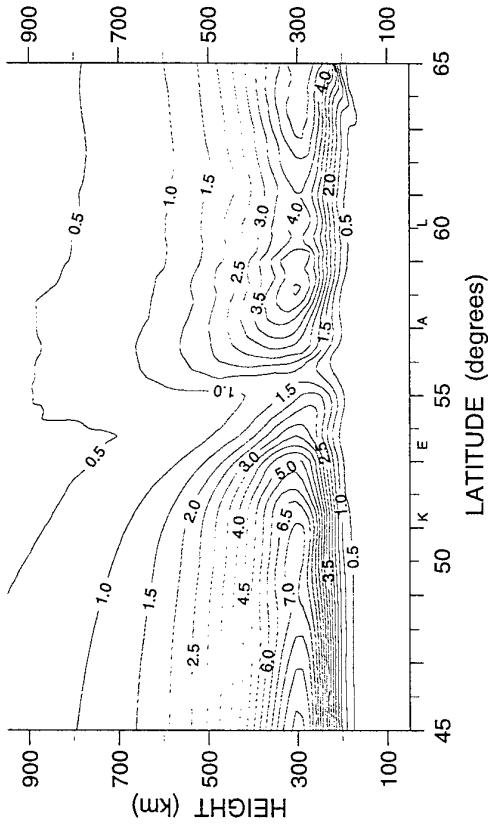
Tomographic Image: 05/04/93 00:11 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 04/04/93 22:23 UT
Electron density (x10¹¹ m⁻³)
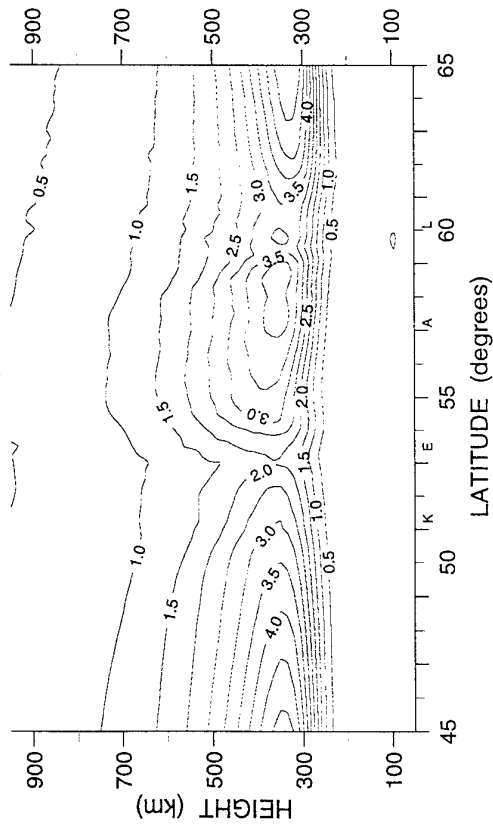
Tomographic Image: 05/04/93 01:33 UT
Electron density (x10¹¹ m⁻³)
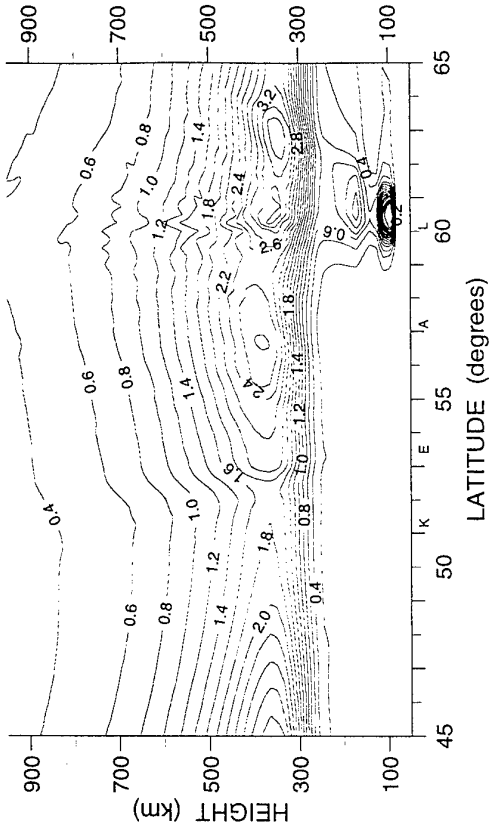
Tomographic Image: 05/04/93 02:50 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 05/04/93 04:39 UT
Electron density (x10^{11} m^{-3})
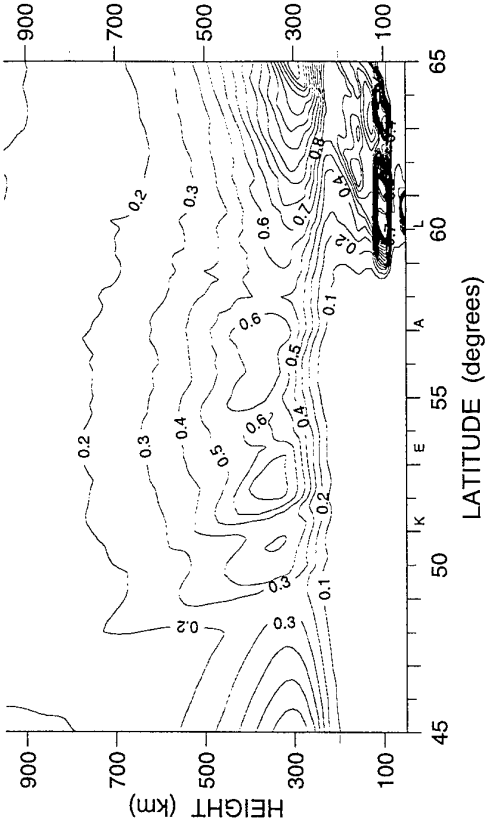
Tomographic Image: 05/04/93 03:20 UT
Electron density (x10^{11} m^{-3})
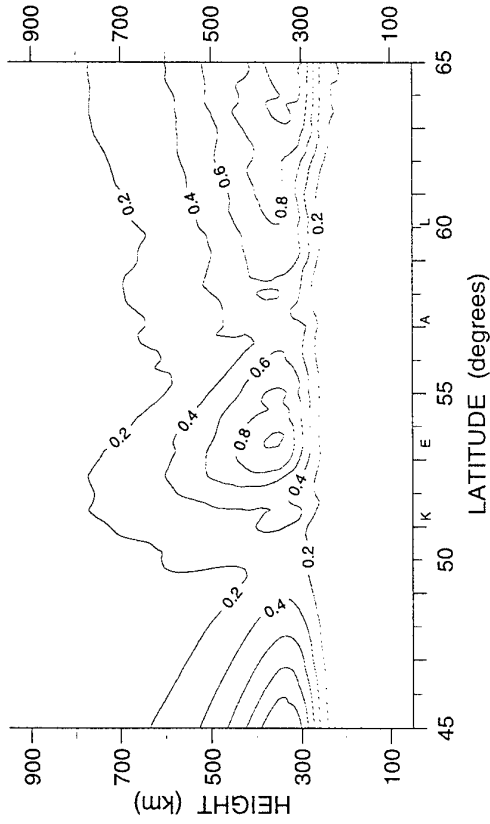
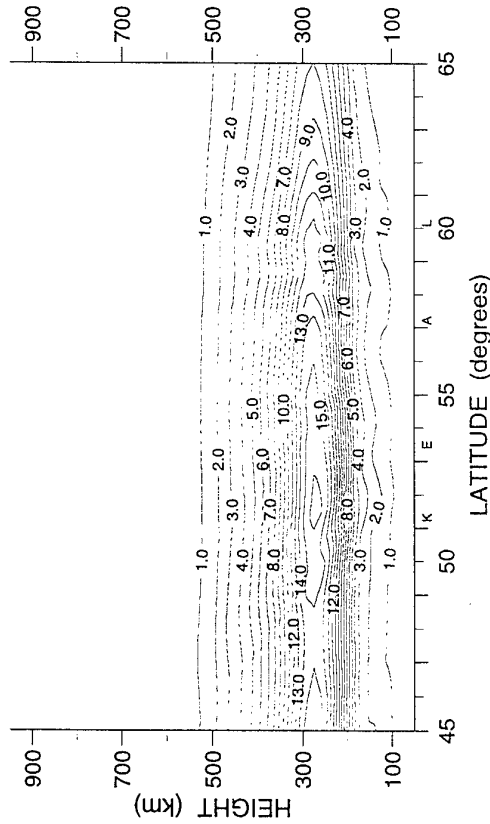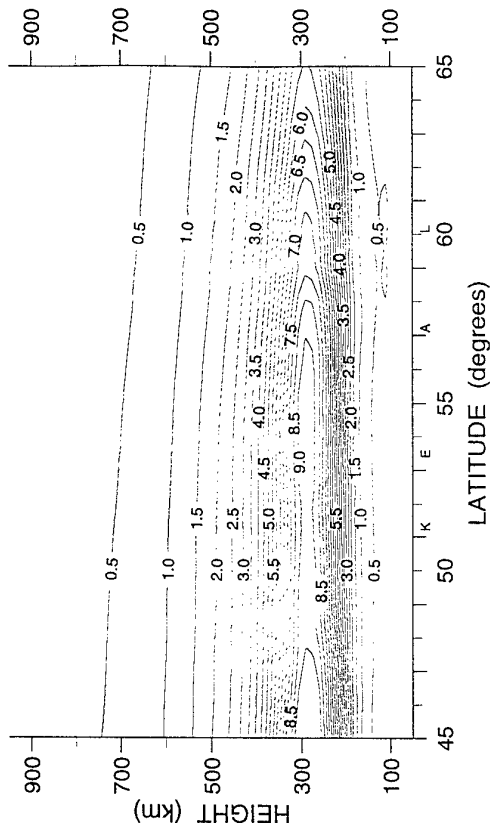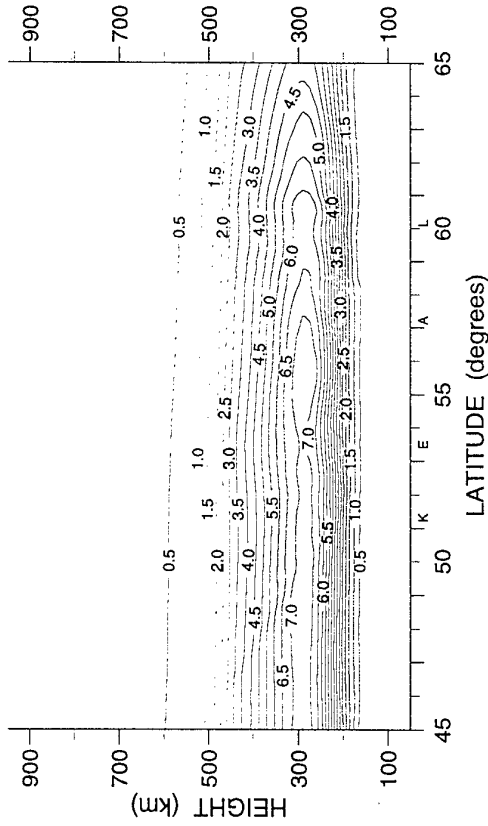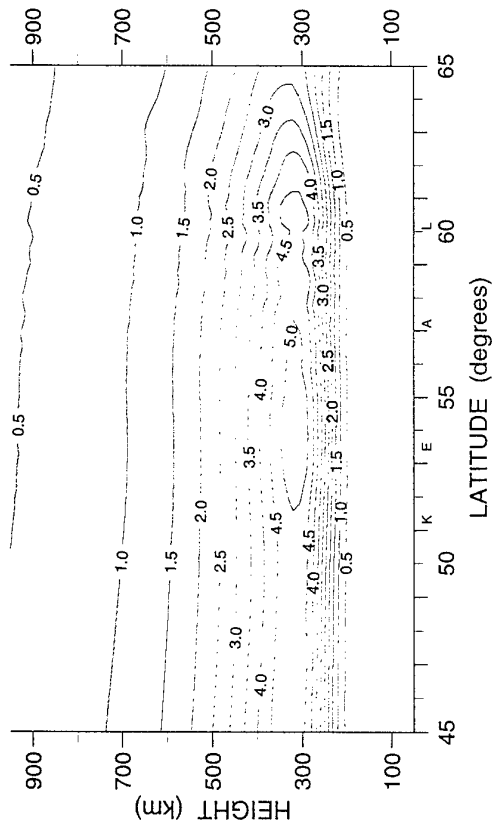Tomographic Image: 05/04/93 06:51 UT
Electron density (x10^{11} m^{-3})
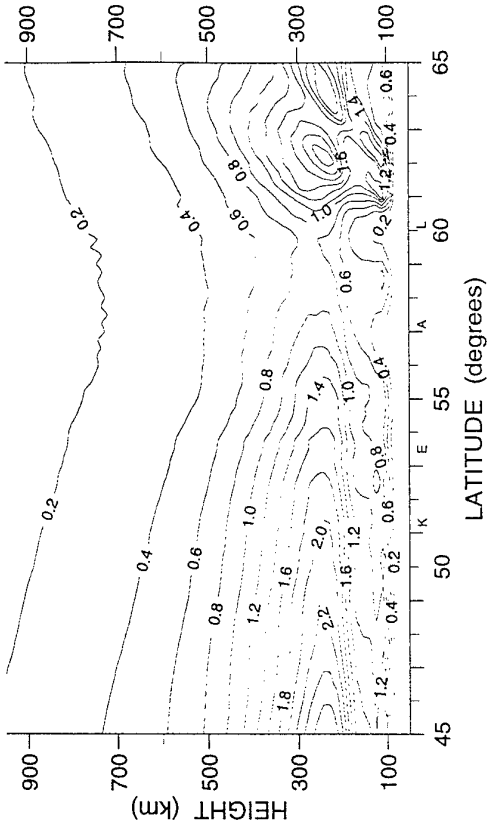
Tomographic Image: 05/04/93 17:01 UT
Electron density (x10^{11} m^{-3})
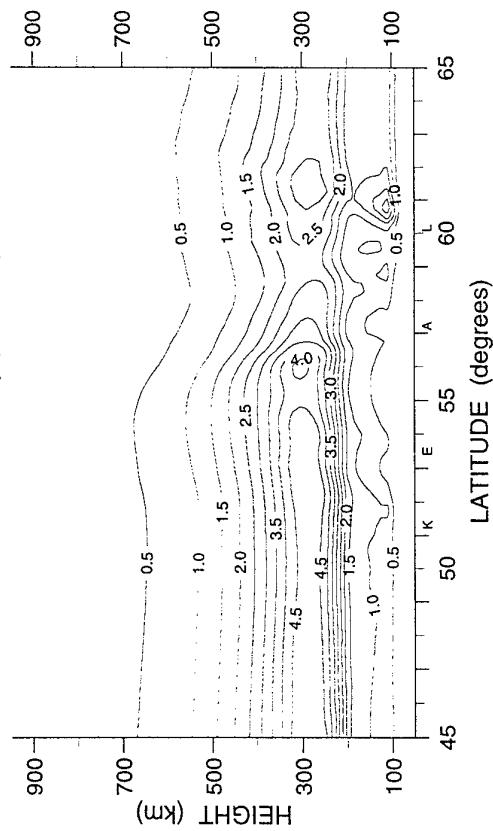
Tomographic Image: 05/04/93 20:50 UT
Electron density (x10^{11} m^{-3})
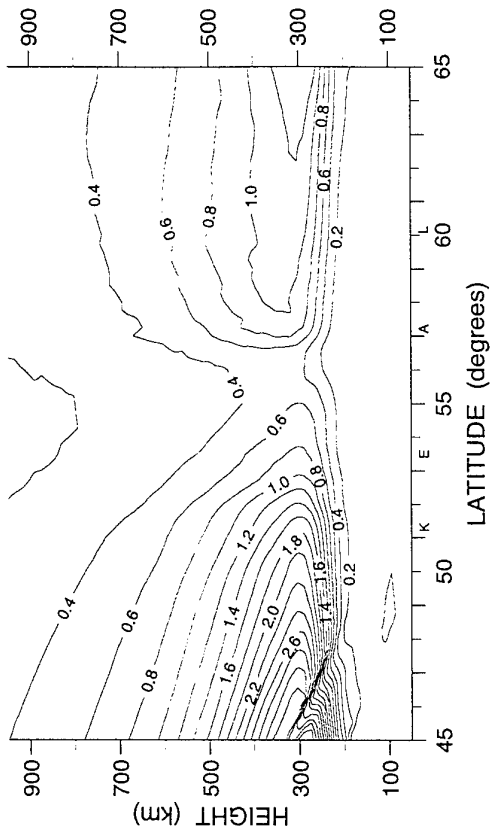
Tomographic Image: 05/04/93 19:03 UT
Electron density (x10^{11} m^{-3})
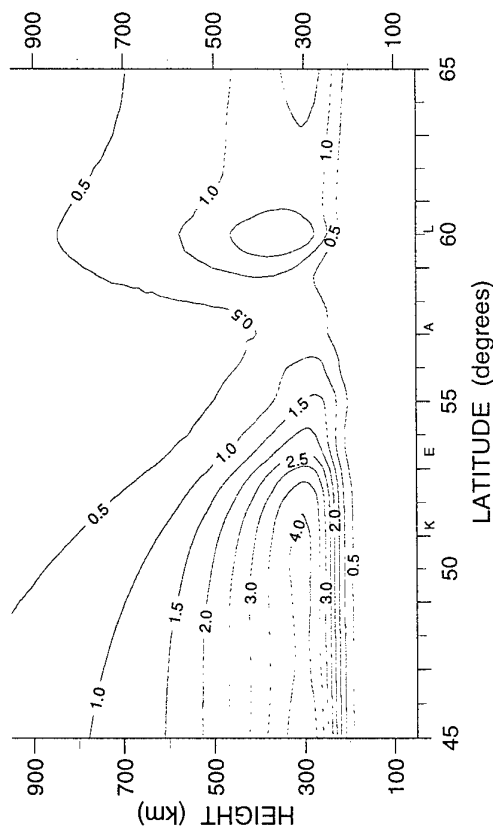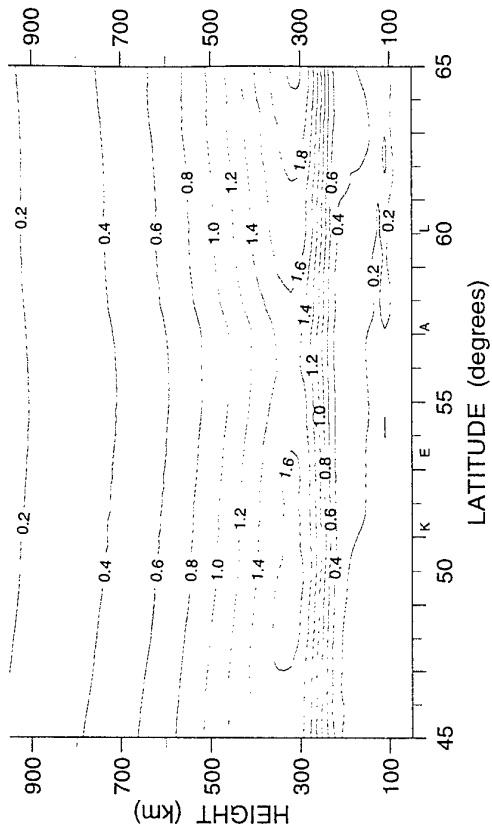
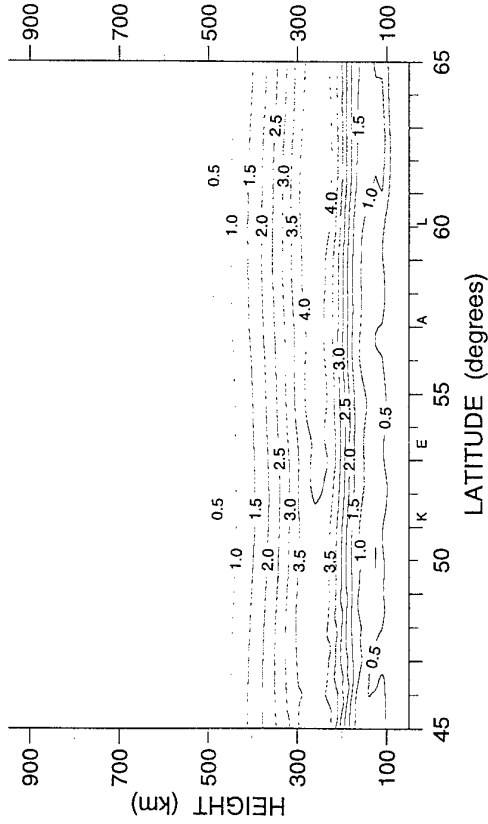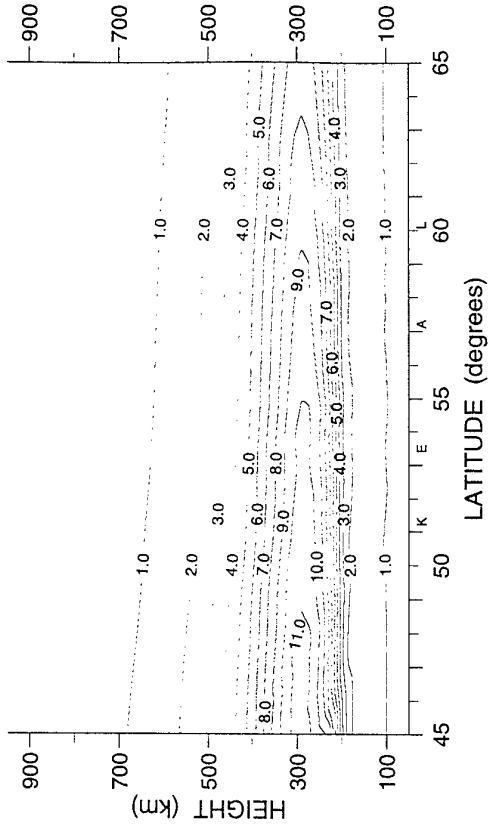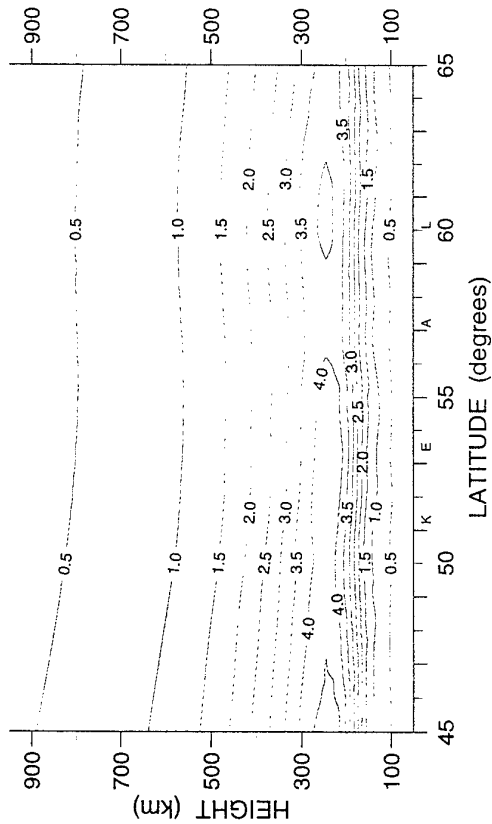Tomographic Image: 05/04/93 21:55 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 06/04/93 02:27 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 06/04/93 05:38 UT
Electron density (x10^{11} m^{-3})
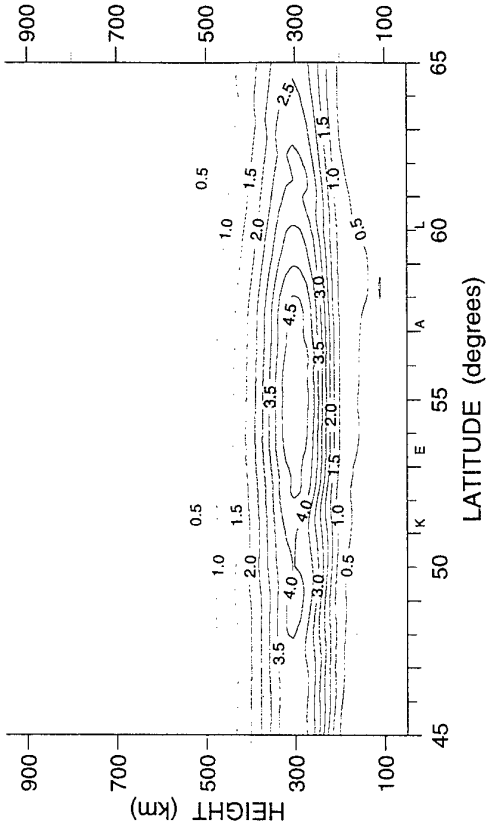
Tomographic Image: 06/04/93 04:16 UT
Electron density (x10^{11} m^{-3})
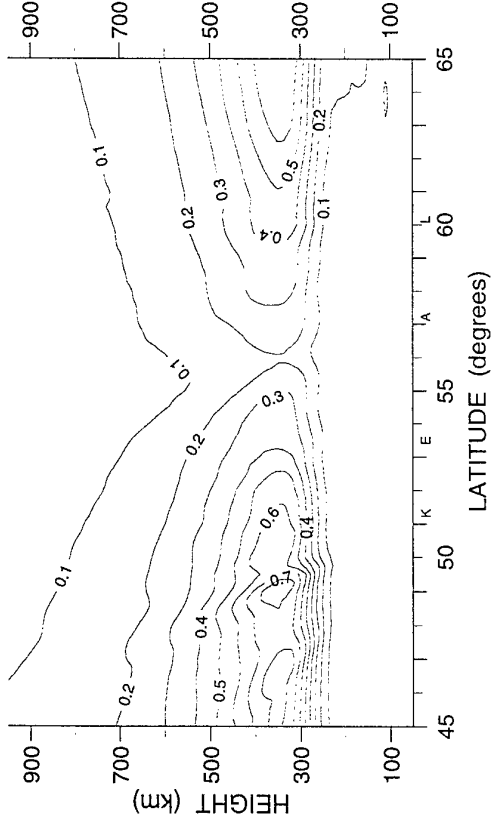
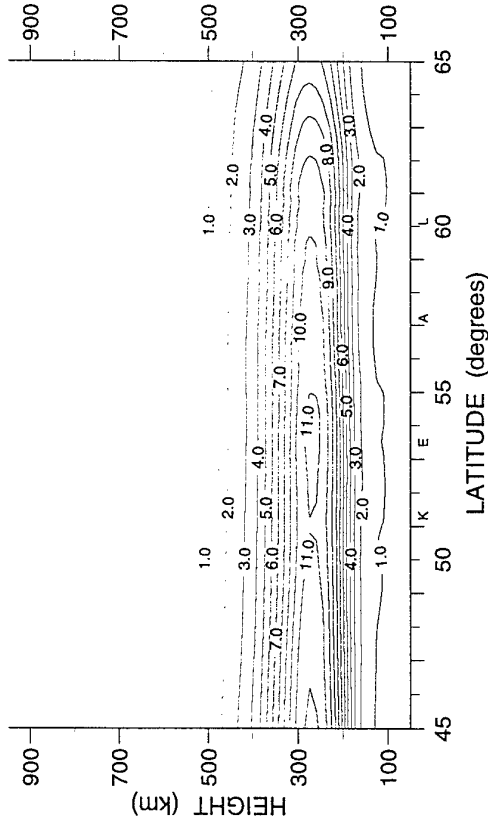Tomographic Image: 06/04/93 07:11 UT
Electron density (x10^{11} m^{-3})
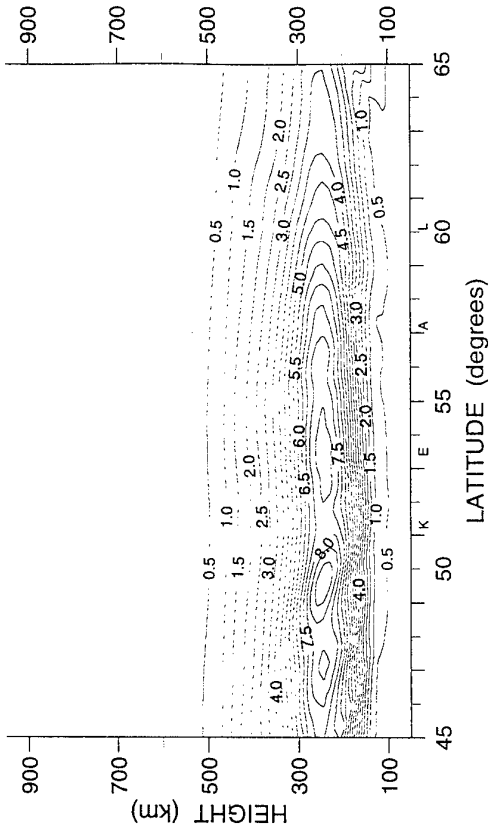
Tomographic Image: 06/04/93   07:27 UT
Electron density (x10^{11} m^{-3})
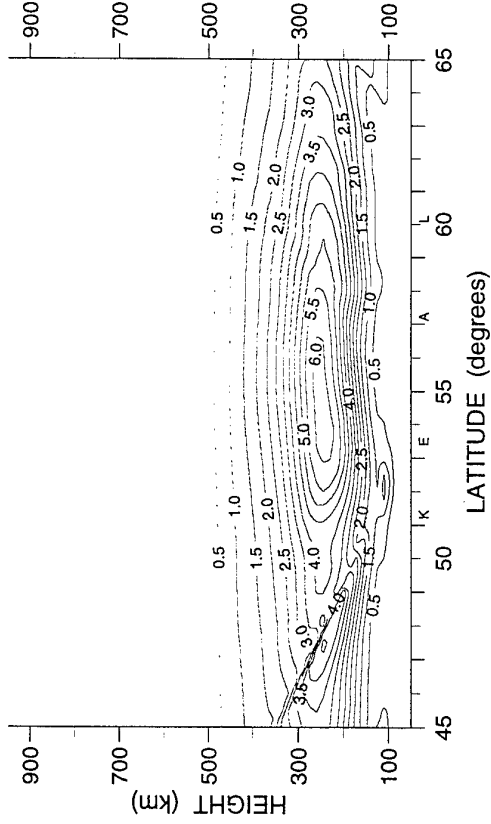
Tomographic Image: 06/04/93   12:02 UT
Electron density (x10^{11} m^{-3})
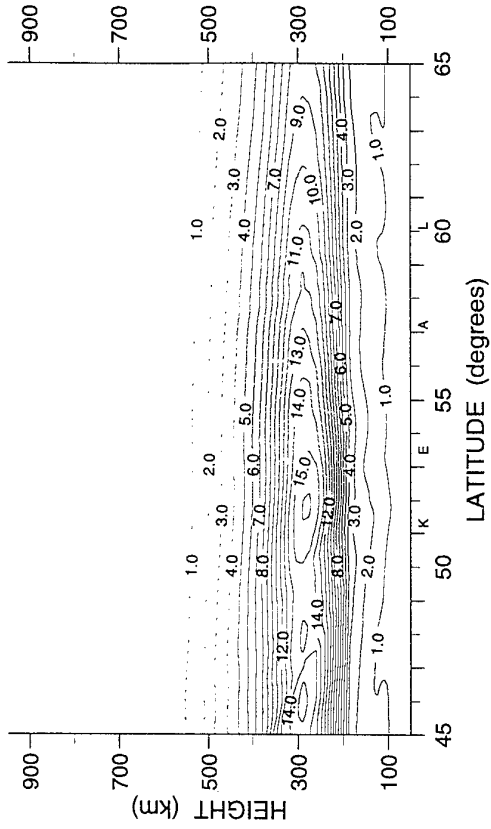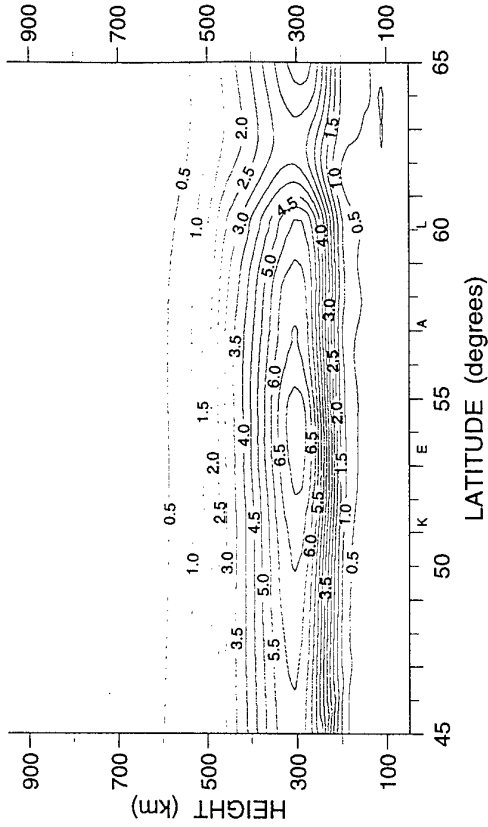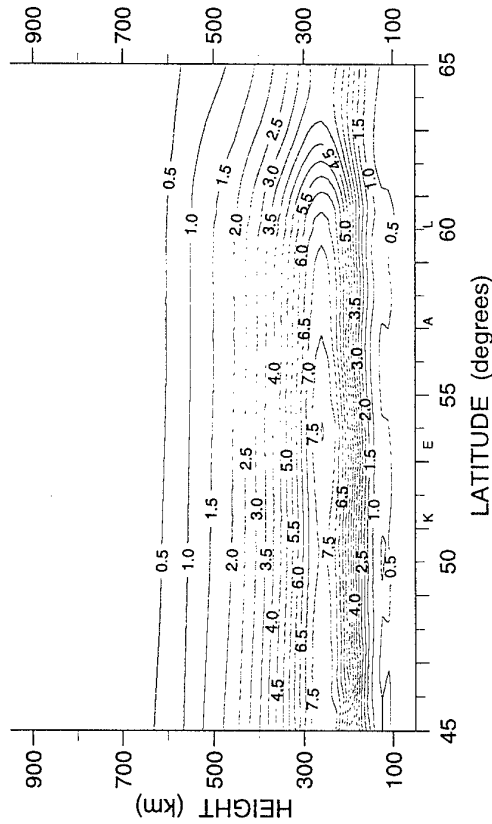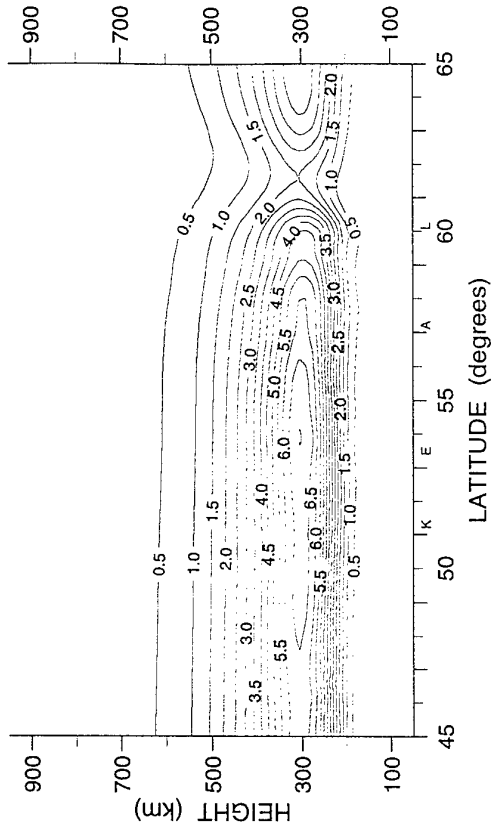
Tomographic Image: 06/04/93   10:13 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 06/04/93   17:59 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

Tomographic Image: 07/04/93 03:53 UT
Electron density (×10^11 m^-3)

Tomographic Image: 07/04/93 05:15 UT
Electron density (×10^11 m^-3)

Tomographic Image: 06/04/93 19:22 UT
Electron density (×10^11 m^-3)
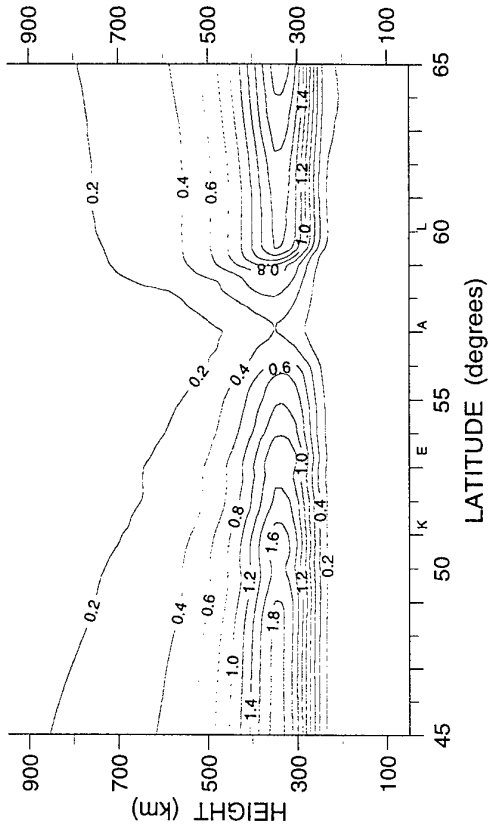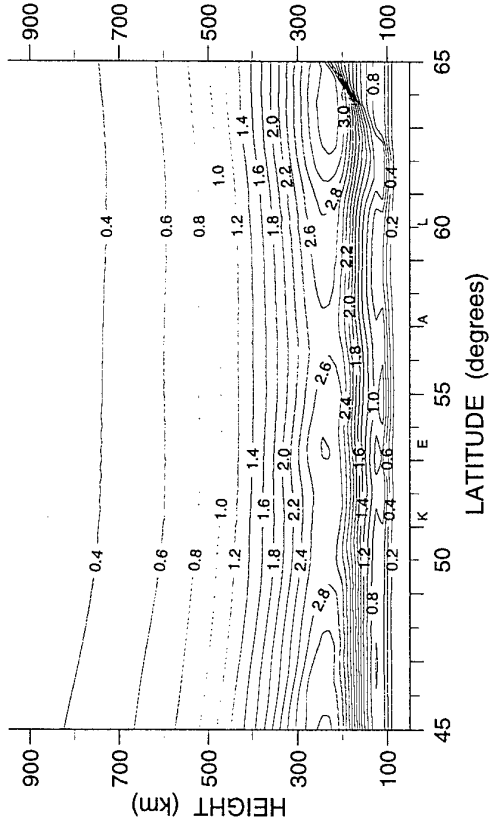
Tomographic Image: 06/04/93 20:07 UT
Electron density (×10^11 m^-3)

101

Tomographic Image: 07/04/93 07:04 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 07/04/93 11:34 UT
Electron density (x10^{11} m^{-3})
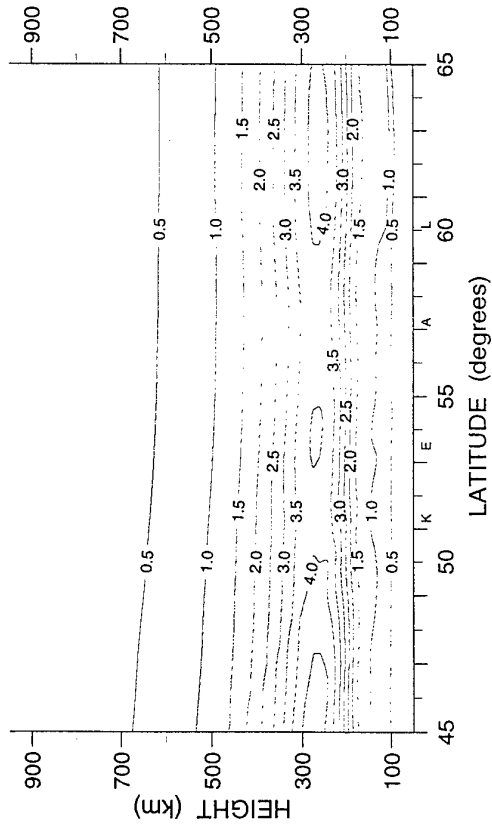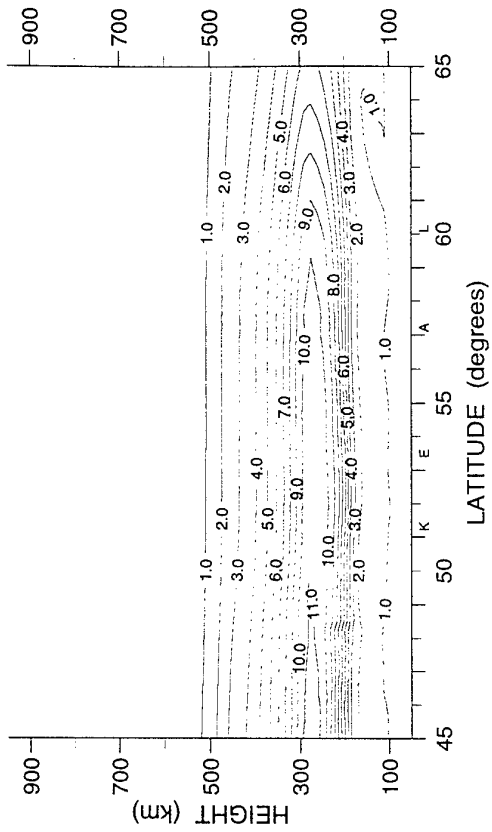
Tomographic Image: 07/04/93 08:15 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 07/04/93 14:26 UT
Electron density (x10^{11} m^{-3})
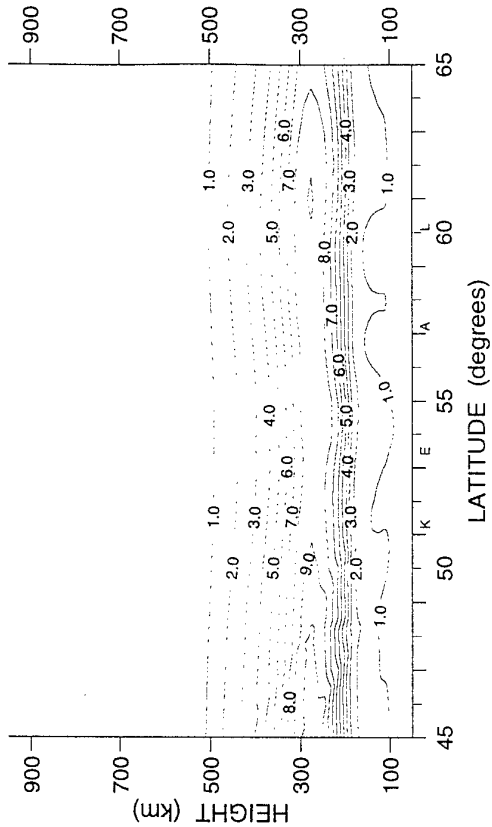
Tomographic Image: 07/04/93 16:15 UT
Electron density (x10^11 m^-3)
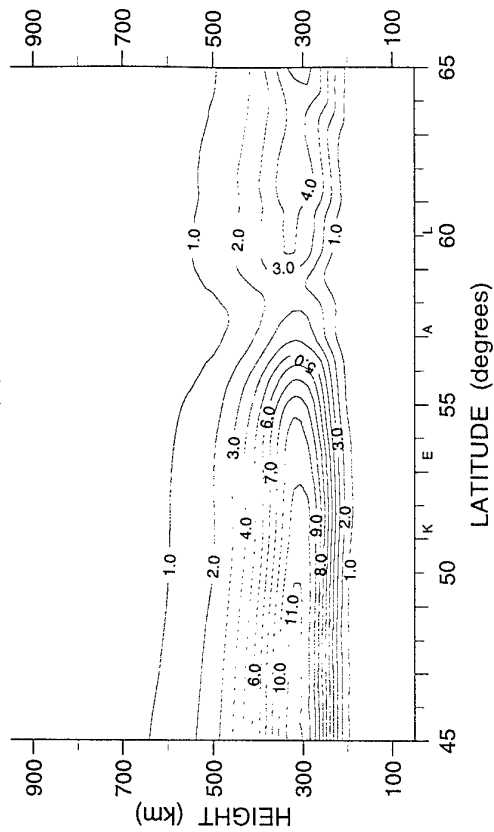
Tomographic Image: 07/04/93 18:39 UT
Electron density (x10^11 m^-3)

Tomographic Image: 07/04/93 17:36 UT
Electron density (x10^11 m^-3)

Tomographic Image: 07/04/93 19:24 UT
Electron density (x10^11 m^-3)

103

Tomographic Image: 08/04/93 02:52 UT
Electron density (×10¹¹ m⁻³)
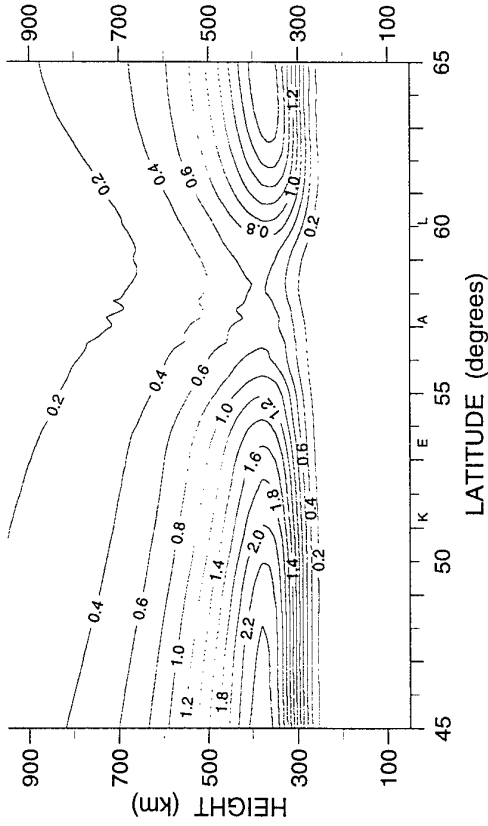
Tomographic Image: 08/04/93 04:51 UT
Electron density (×10¹¹ m⁻³)
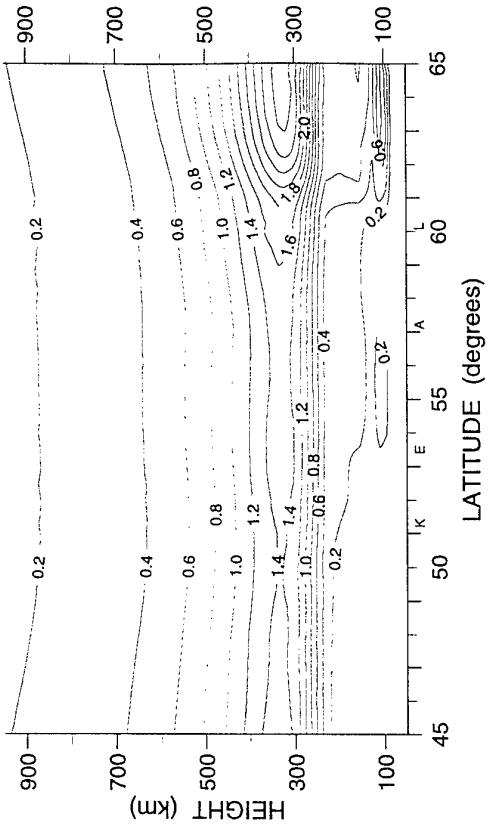
Tomographic Image: 08/04/93 03:30 UT
Electron density (×10¹¹ m⁻³)
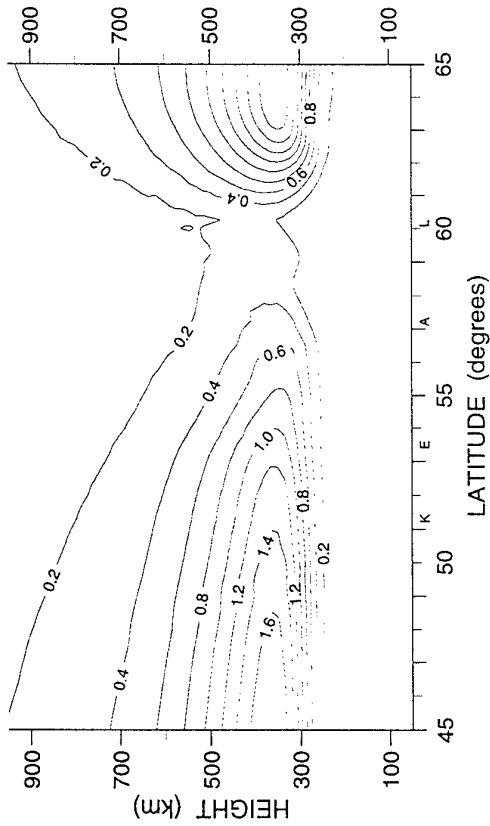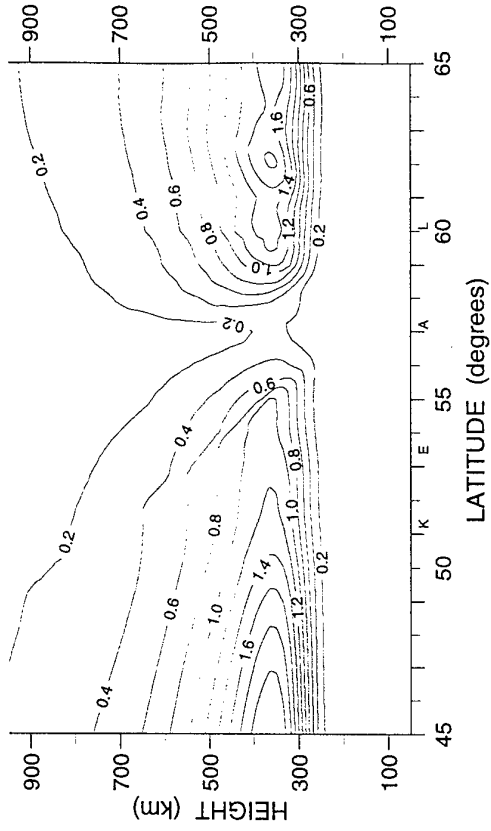
Tomographic Image: 08/04/93 05:44 UT
Electron density (×10¹¹ m⁻³)

104

Tomographic Image: 08/04/93 11:06 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 08/04/93 15:02 UT
Electron density (x10¹¹ m⁻³)
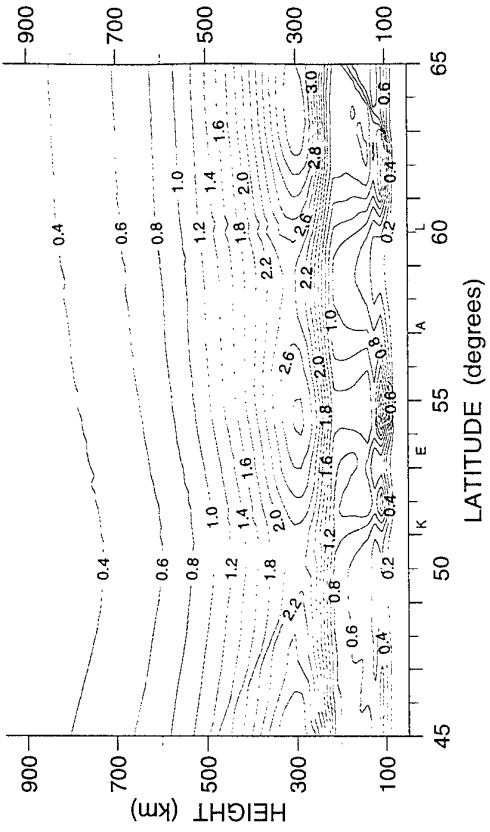
Tomographic Image: 08/04/93 06:29 UT
Electron density (x10¹¹ m⁻³)
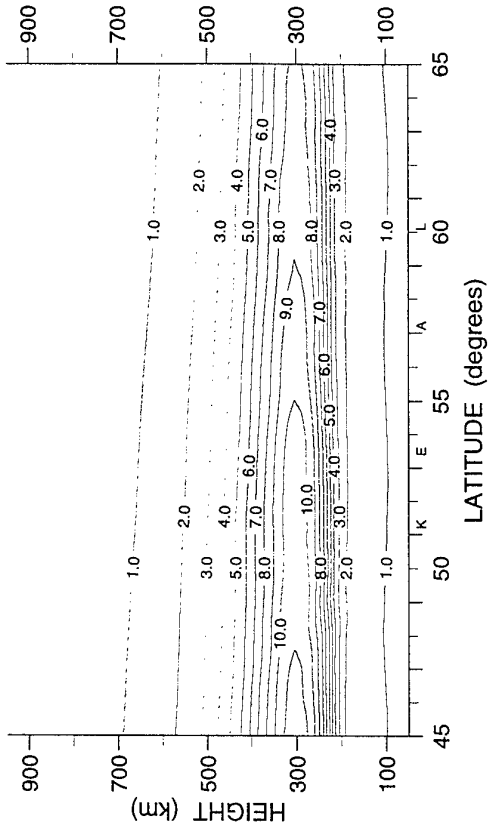
Tomographic Image: 08/04/93 07:32 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 08/04/93 15:52 UT
Electron density (x10^11 m^-3)
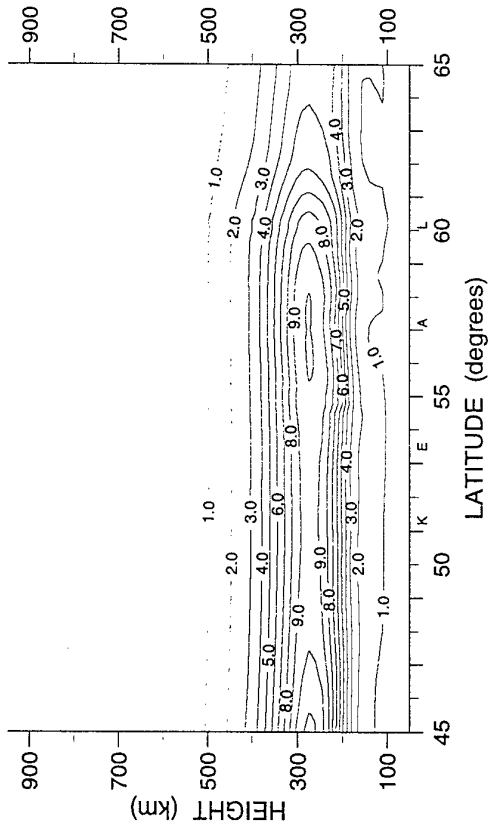
Tomographic Image: 08/04/93 18:40 UT
Electron density (x10^11 m^-3)
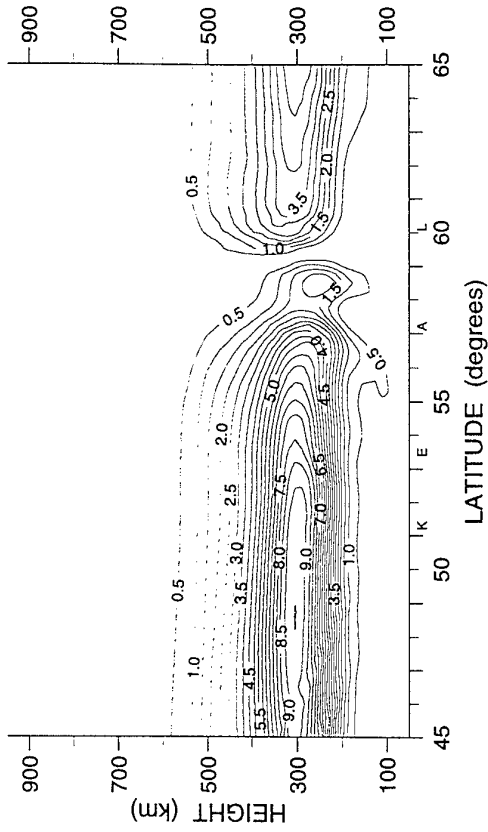
Tomographic Image: 08/04/93 17:13 UT
Electron density (x10^11 m^-3)
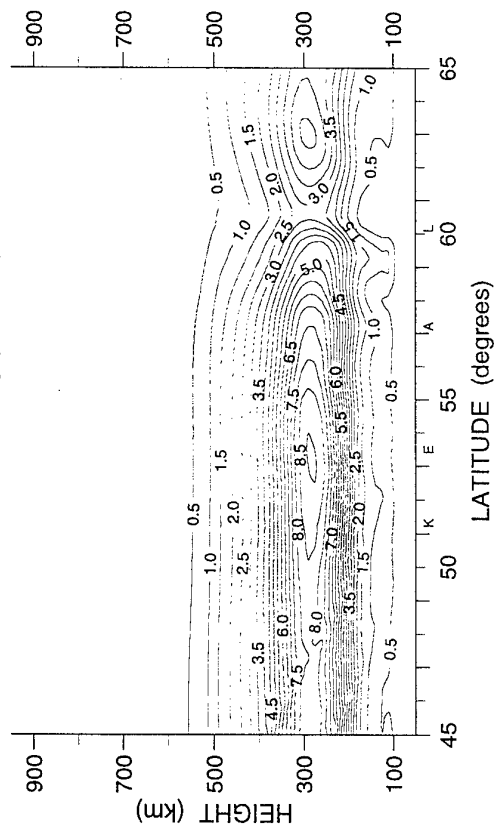
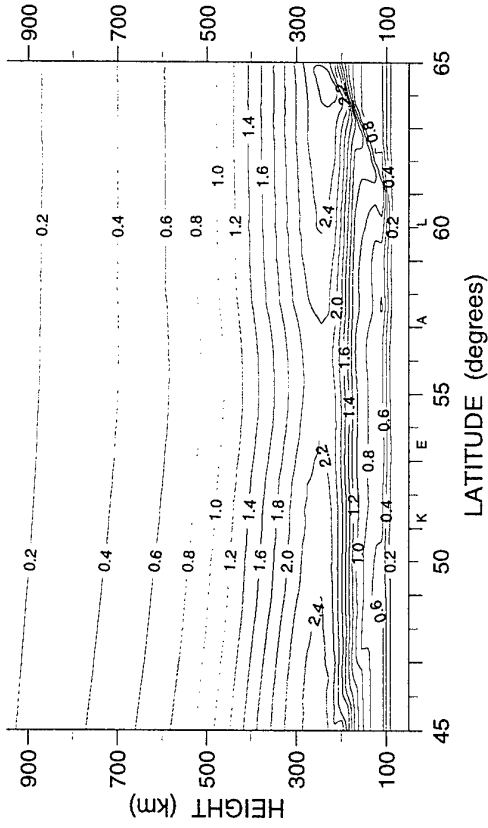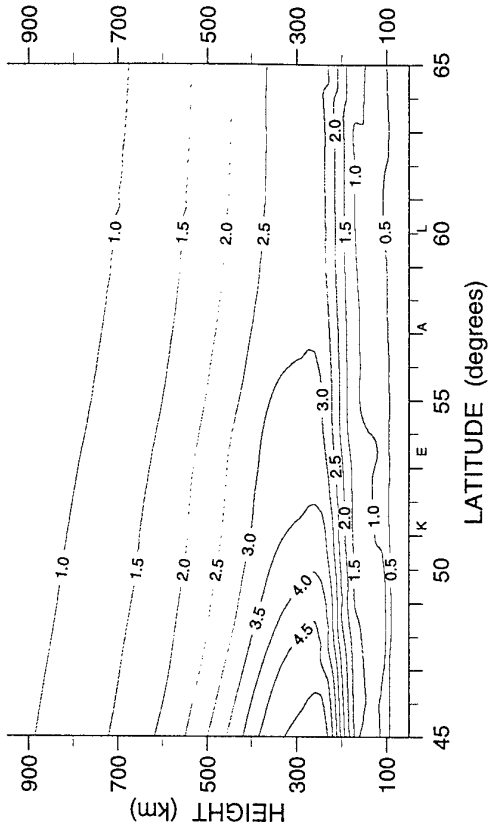Tomographic Image: 08/04/93 19:02 UT
Electron density (x10^11 m^-3)

106

Tomographic Image: 09/04/93   03:07 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 09/04/93   06:17 UT
Electron density (x10^{11} m^{-3})
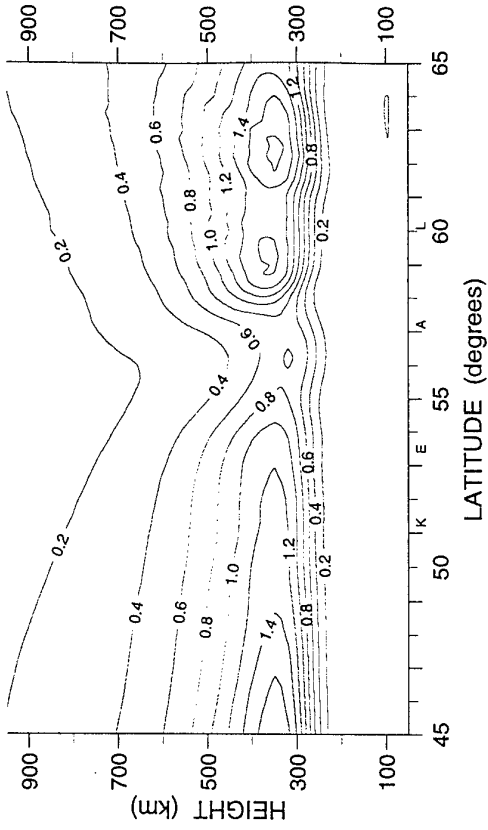
Tomographic Image: 08/04/93   20:28 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 09/04/93   02:06 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

107

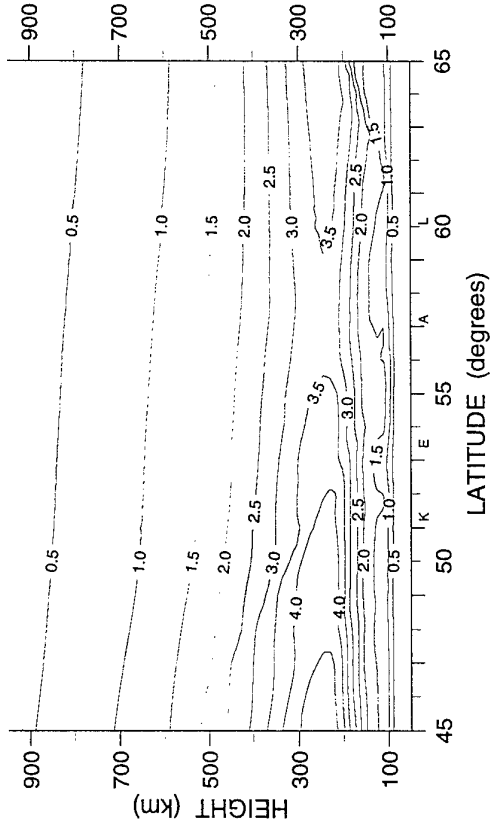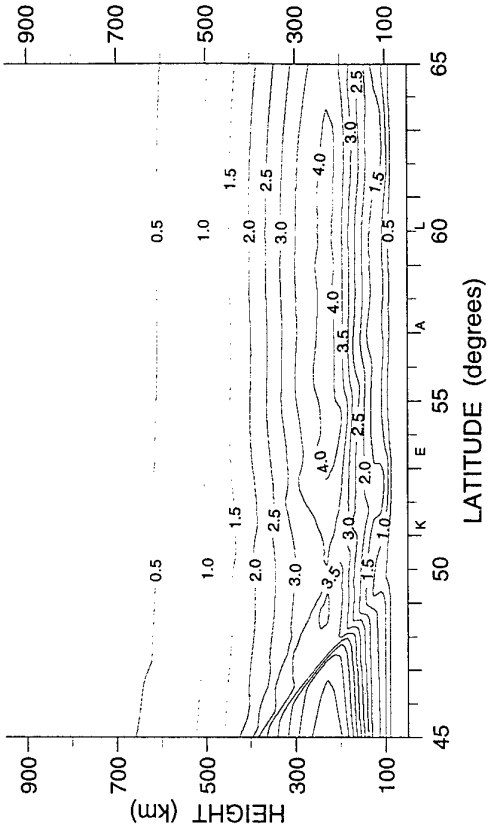Tomographic Image: 09/04/93 10:39 UT
Electron density (x10^{11} m^{-3})
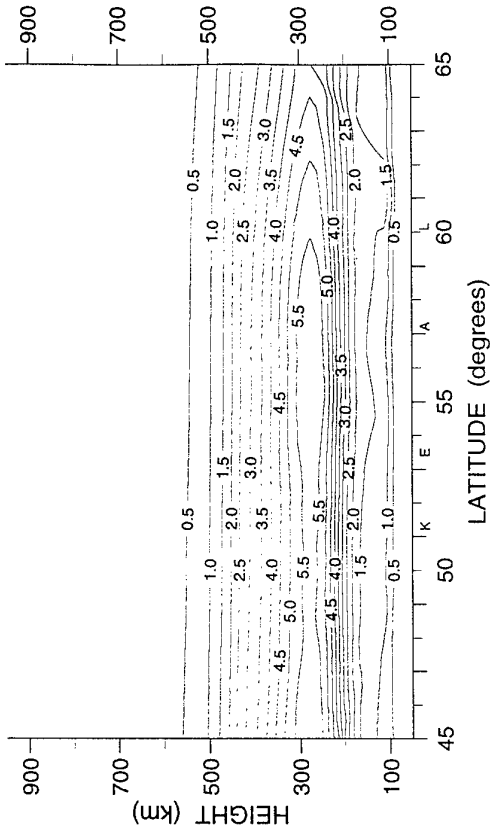
Tomographic Image: 09/04/93 14:17 UT
Electron density (x10^{11} m^{-3})
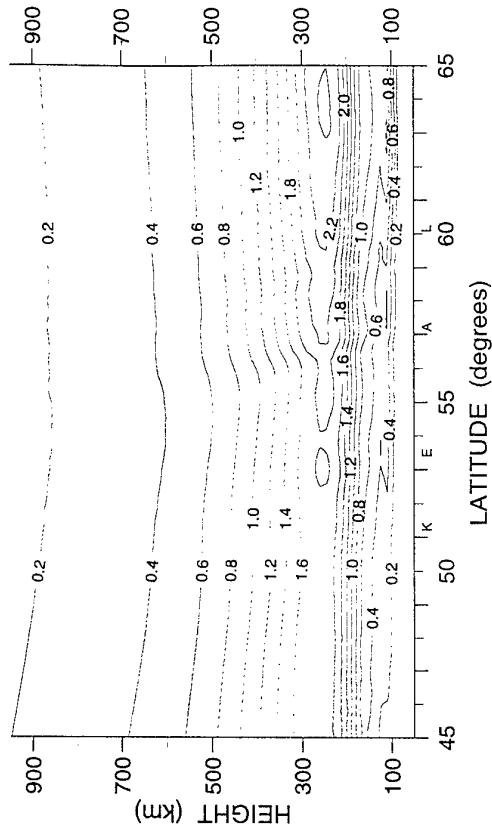
Tomographic Image: 09/04/93 06:49 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 09/04/93 07:33 UT
Electron density (x10^{11} m^{-3})

108
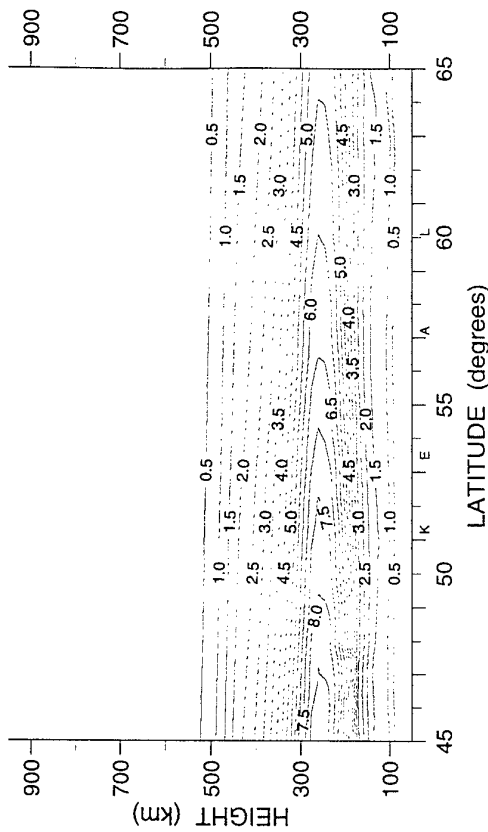
Tomographic Image: 09/04/93 15:29 UT
Electron density (x10^11 m^-3)
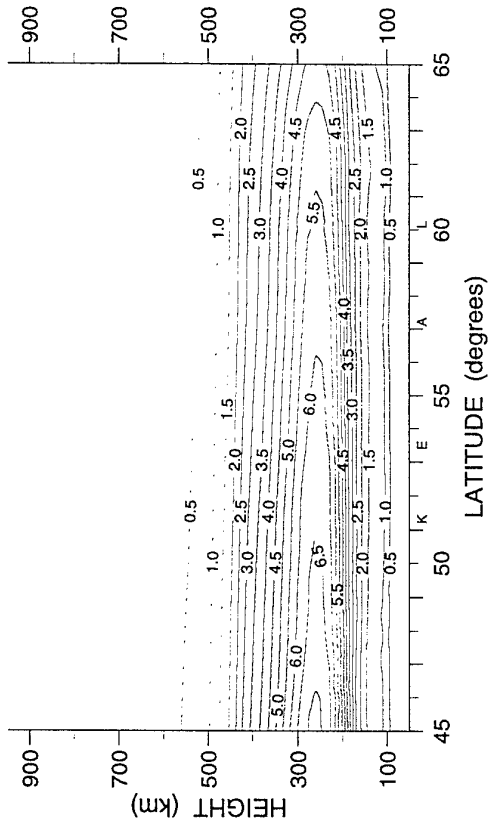
Tomographic Image: 10/04/93 02:44 UT
Electron density (x10^11 m^-3)

Tomographic Image: 09/04/93 19:00 UT
Electron density (x10^11 m^-3)
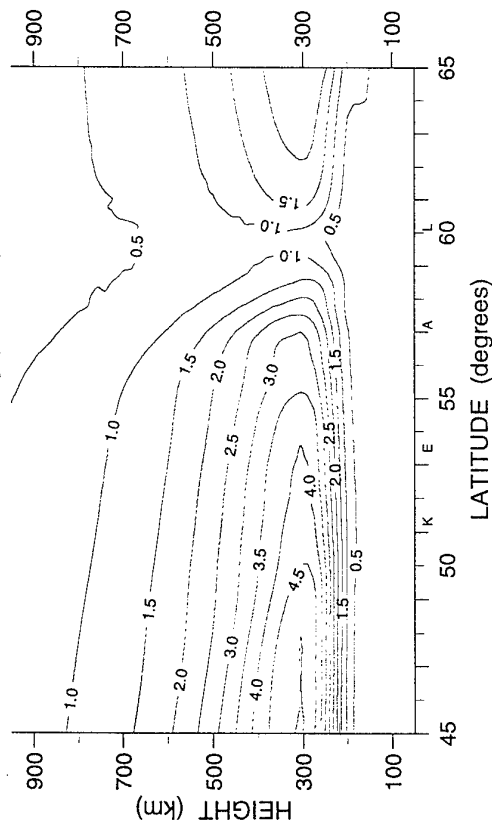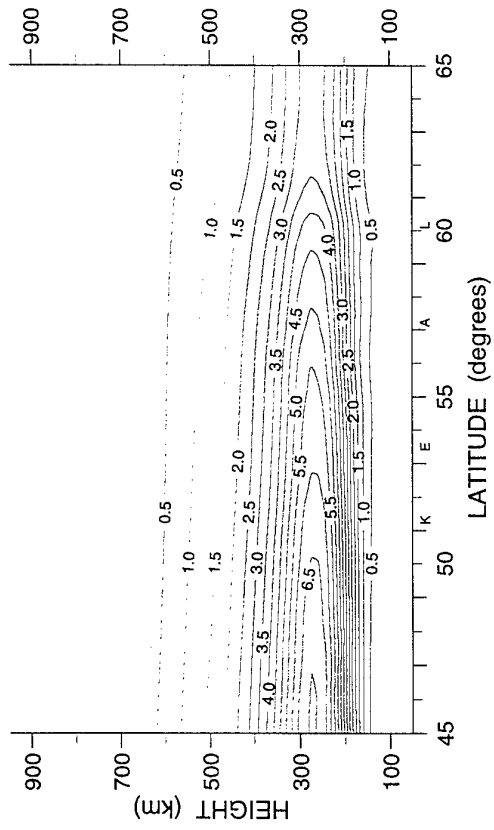
Tomographic Image: 10/04/93 05:54 UT
Electron density (x10^11 m^-3)
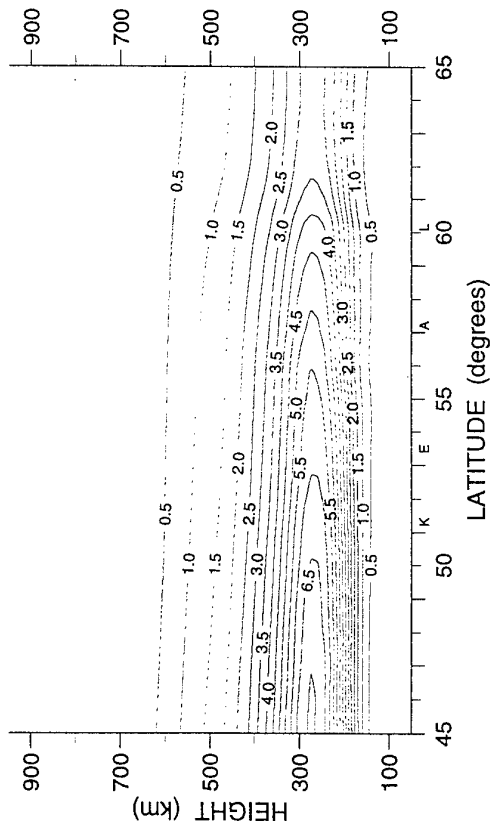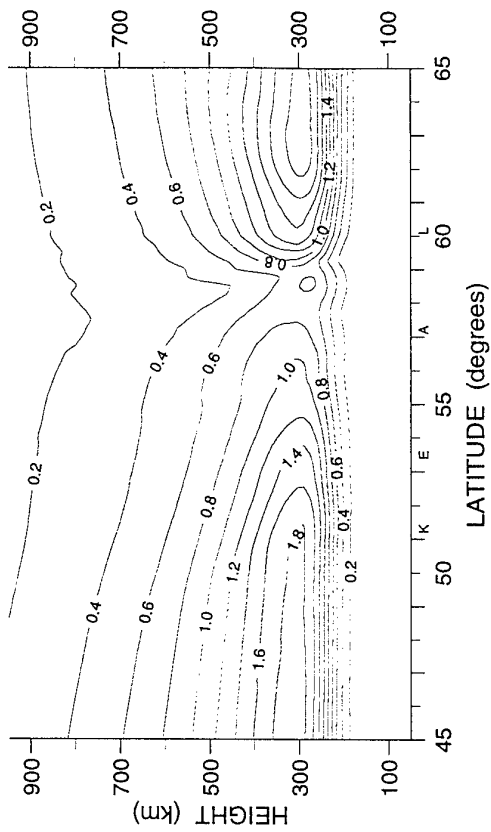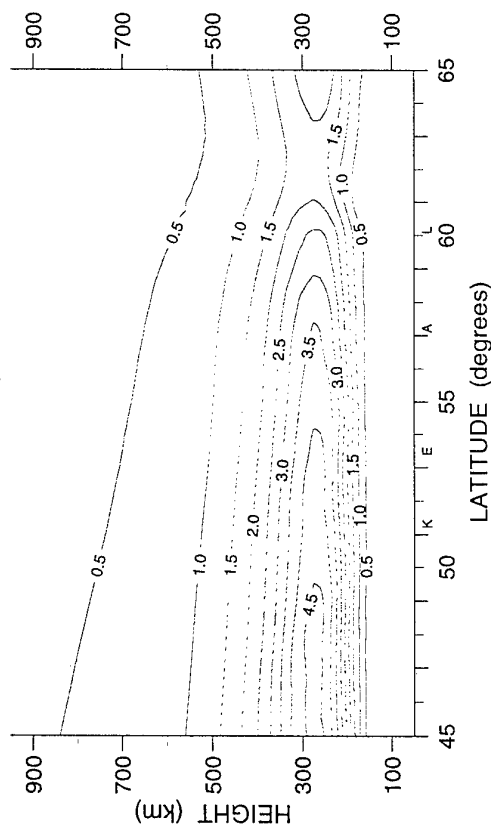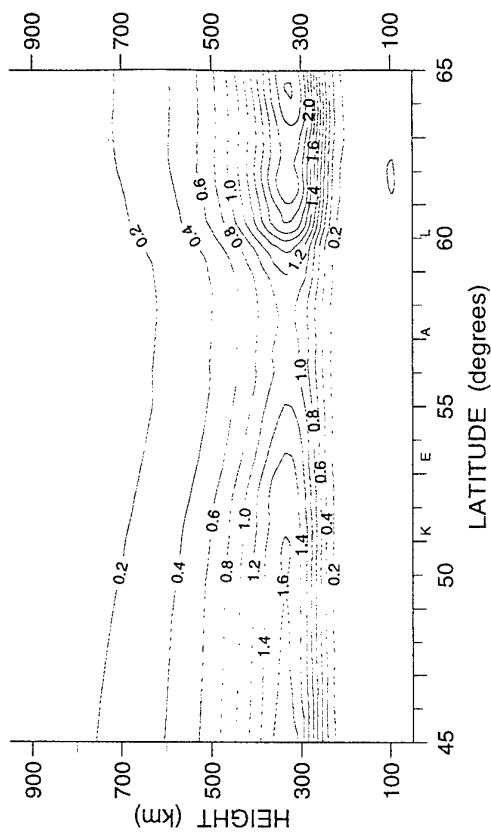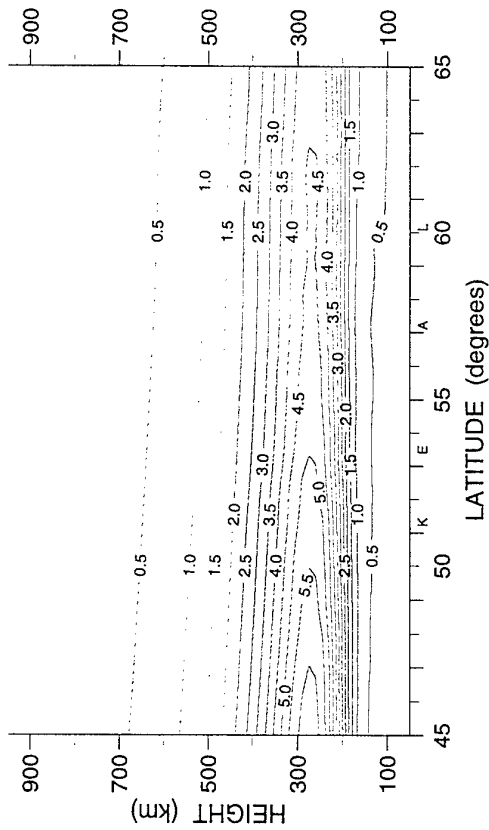
Tomographic Image: 10/04/93 13:32 UT
Electron density (x10^11 m^-3)

Tomographic Image: 10/04/93 15:06 UT
Electron density (x10^11 m^-3)
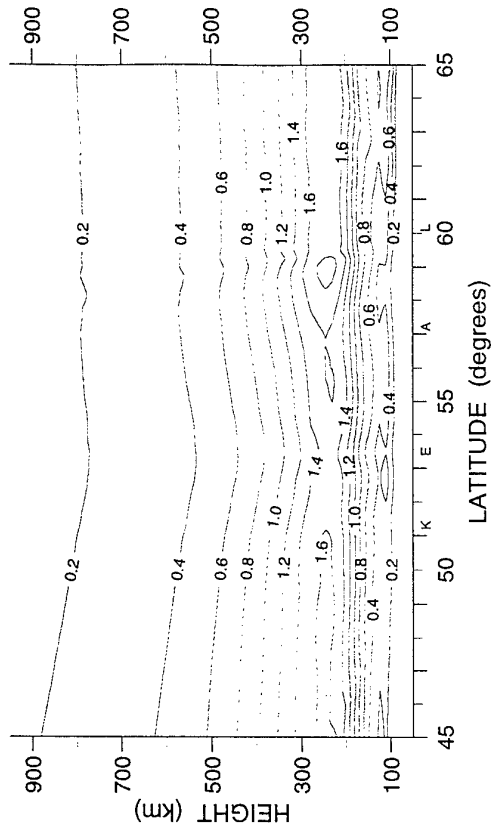
Tomographic Image: 10/04/93 10:11 UT
Electron density (x10^11 m^-3)

Tomographic Image: 10/04/93 11:60 UT
Electron density (x10^11 m^-3)

110

Tomographic Image: 10/04/93 18:16 UT
Electron density (x10^11 m^-3)

Tomographic Image: 10/04/93 18:16 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 10/04/93 23:13 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 10/04/93 19:01 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 11/04/93 02:21 UT
Electron density (x10^{11} m^{-3})

112

Tomographic Image: 11/04/93 17:53 UT
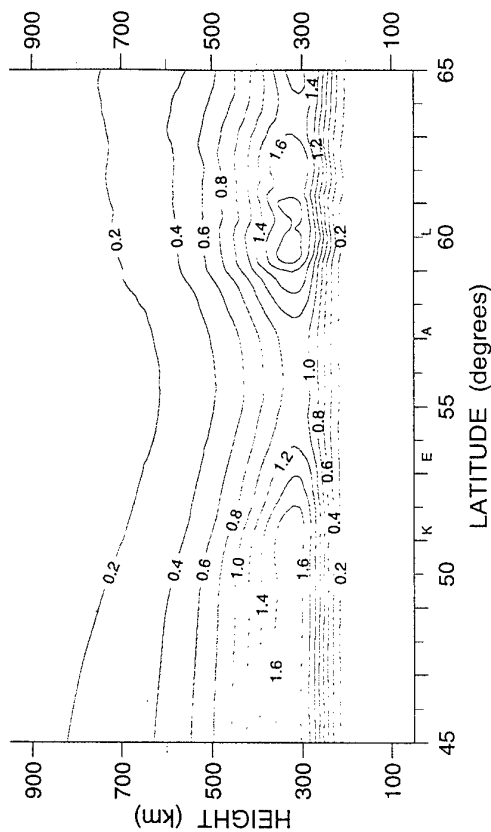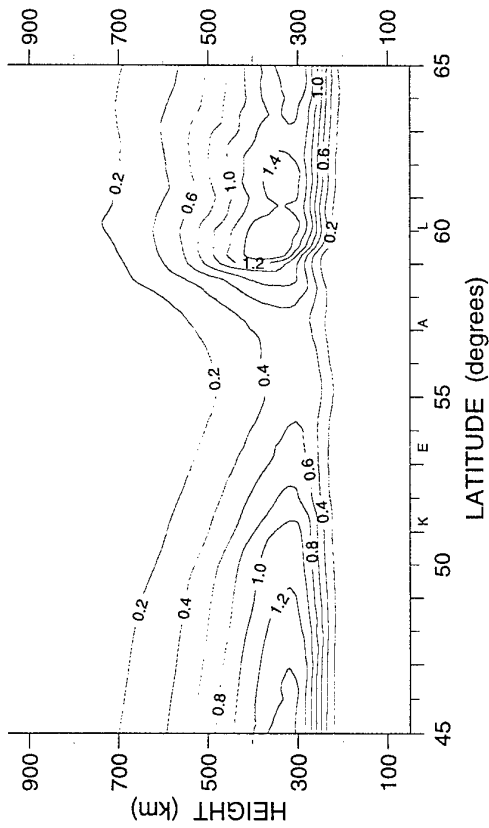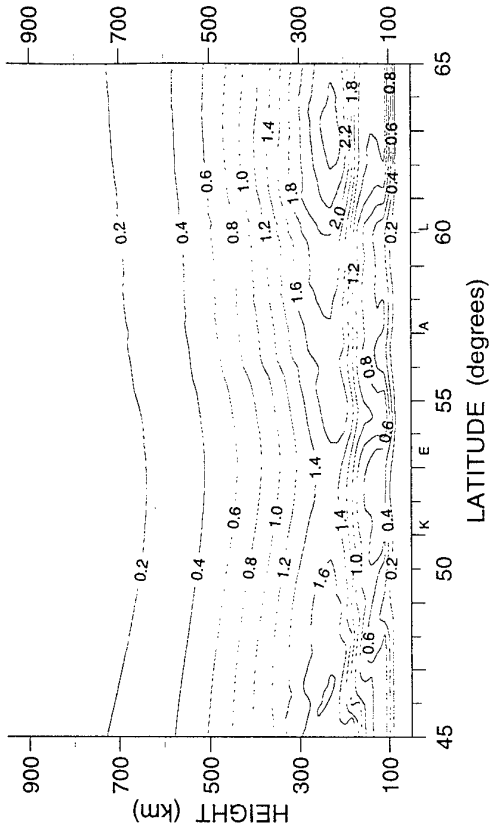Electron density (x10¹¹ m⁻³)

Tomographic Image: 11/04/93 20:05 UT
Electron density (x10¹¹ m⁻³)
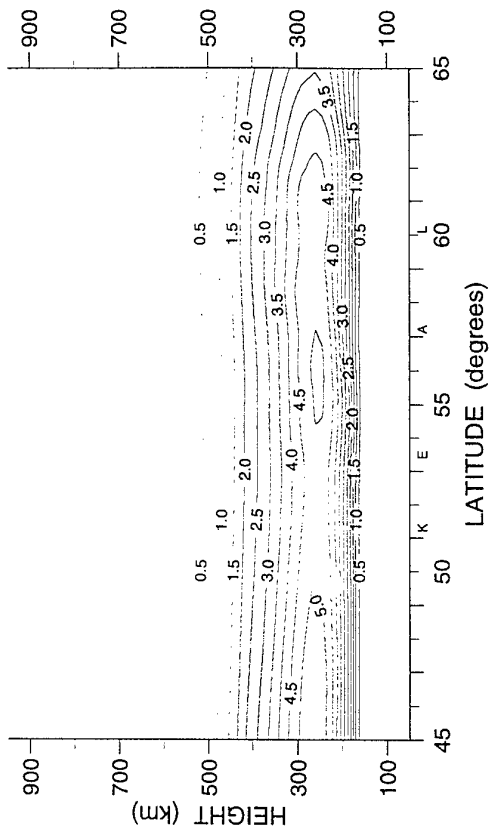
Tomographic Image: 11/04/93 19:22 UT
Electron density (x10¹¹ m⁻³)
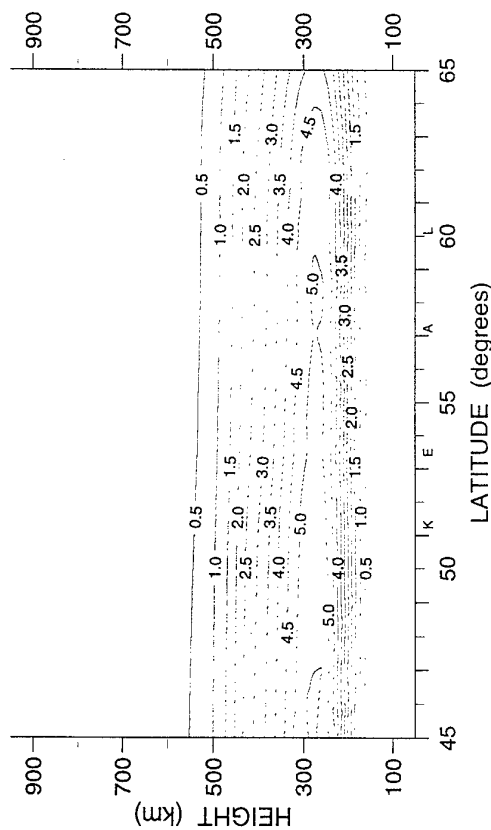
Tomographic Image: 12/04/93 01:38 UT
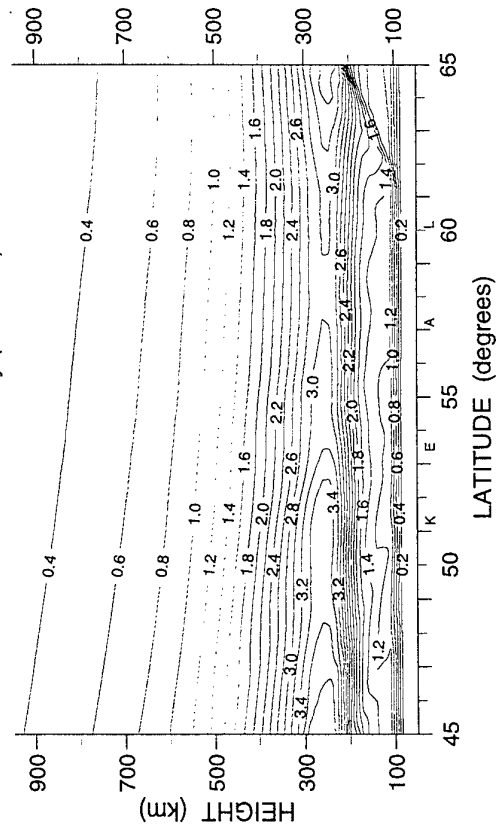Electron density (x10¹¹ m⁻³)

HEIGHT (km)

LATITUDE (degrees)

113

Tomographic Image: 12/04/93 11:04 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 12/04/93 06:57 UT
Electron density (x10^{11} m^{-3})

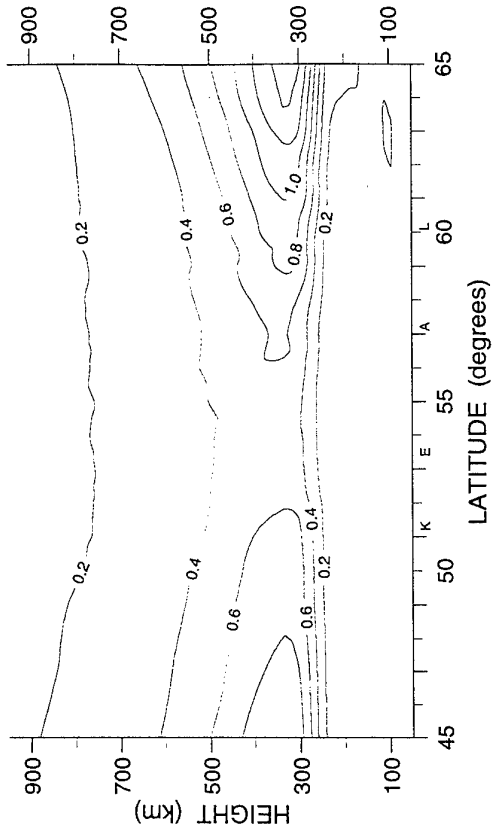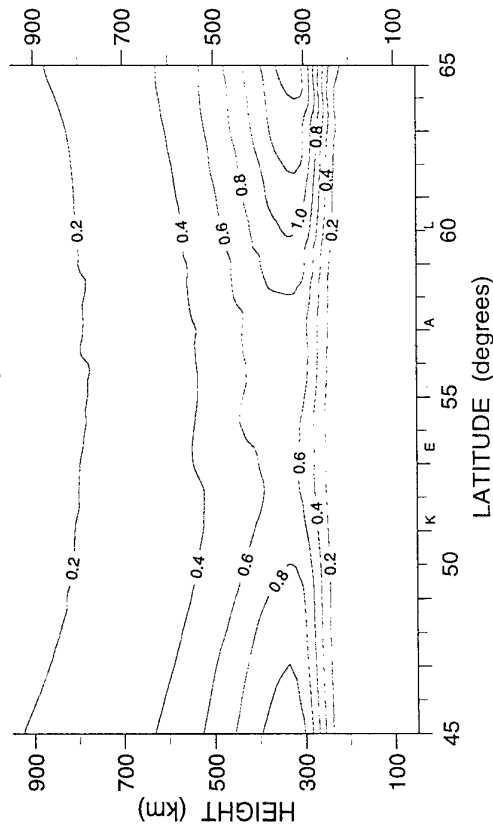Tomographic Image: 12/04/93 01:58 UT
Electron density (x10^{11} m^{-3})
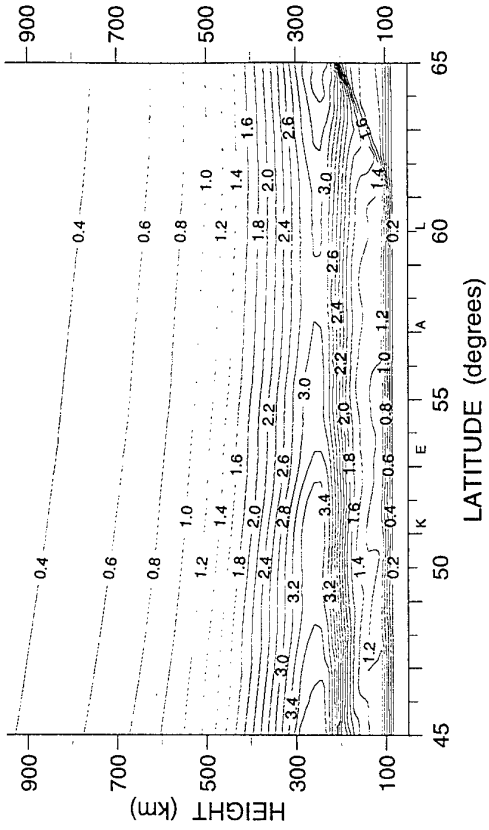
Tomographic Image: 12/04/93 03:47 UT
Electron density (x10^{11} m^{-3})

114

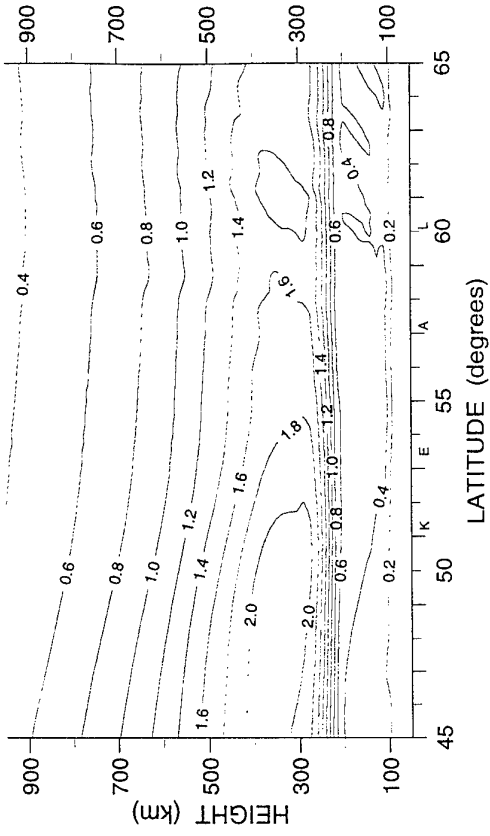Tomographic Image: 12/04/93 11:04 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 13/04/93 03:24 UT
Electron density (x10^{11} m^{-3})
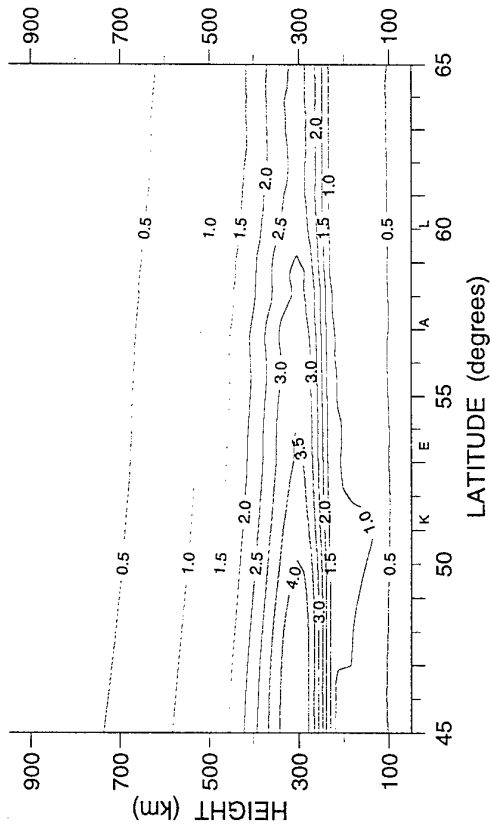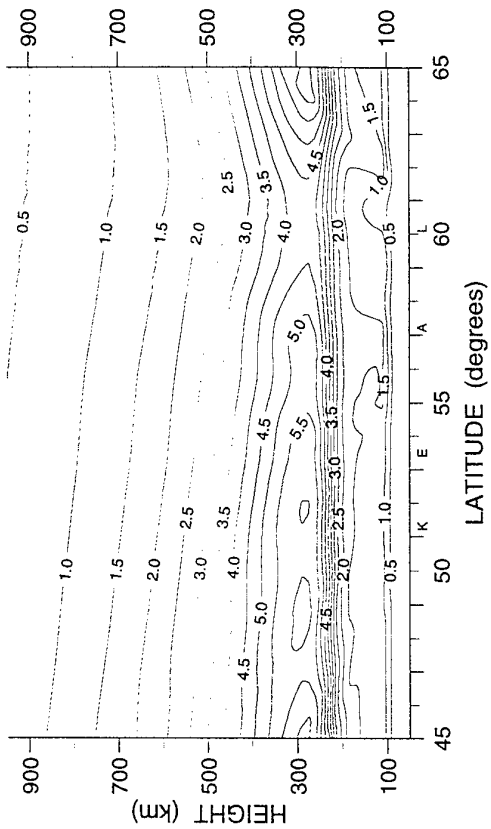
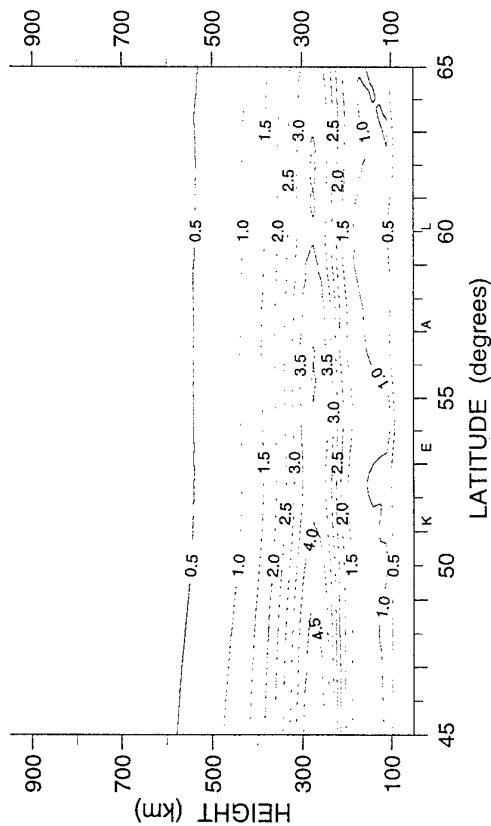Tomographic Image: 13/04/93 02:40 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 13/04/93 06:27 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 13/04/93 10:36 UT
Electron density (x10^11 m^-3)

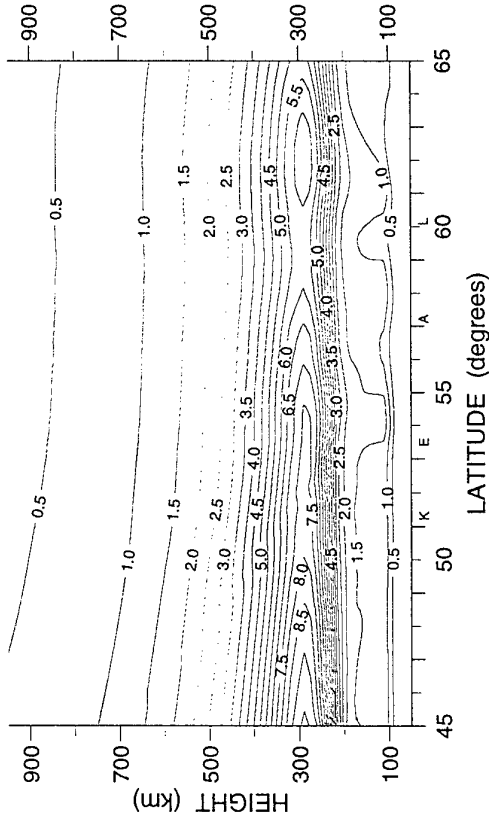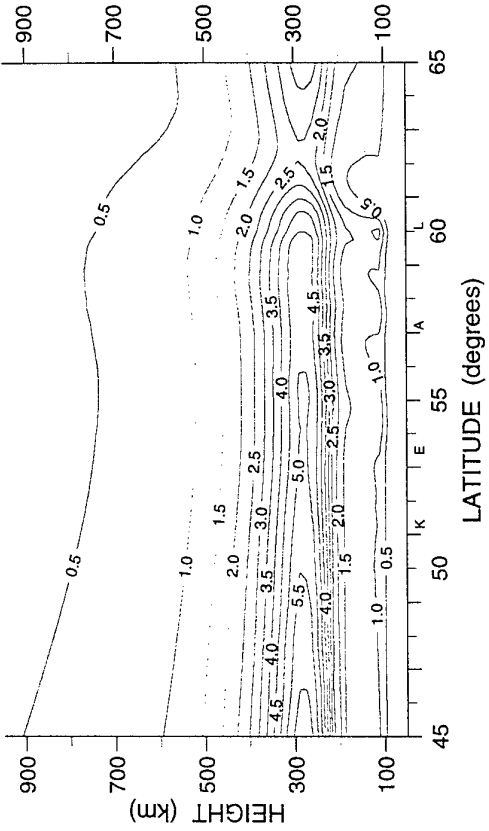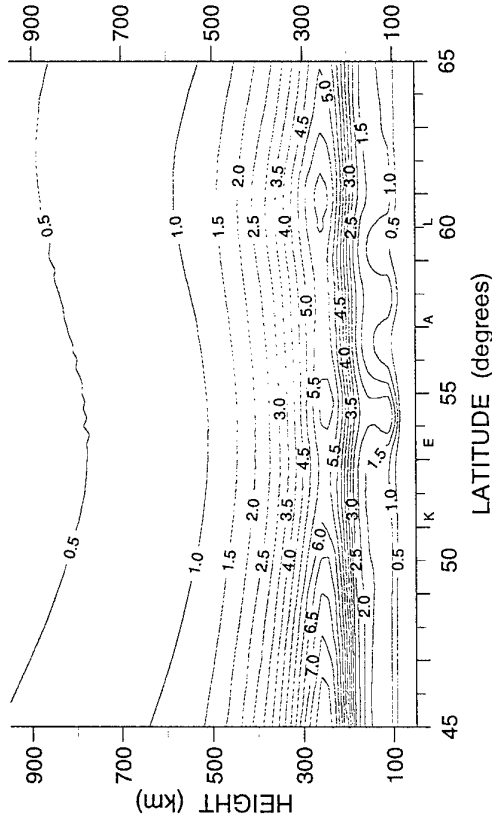Tomographic Image: 13/04/93 07:31 UT
Electron density (x10^11 m^-3)

Tomographic Image: 13/04/93 08:15 UT
Electron density (x10^11 m^-3)

Tomographic Image: 13/04/93 15:46 UT
Electron density (x10^11 m^-3)
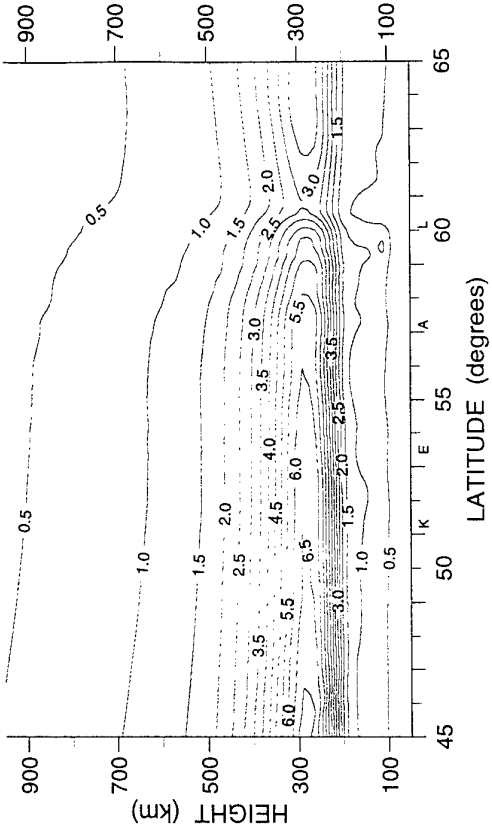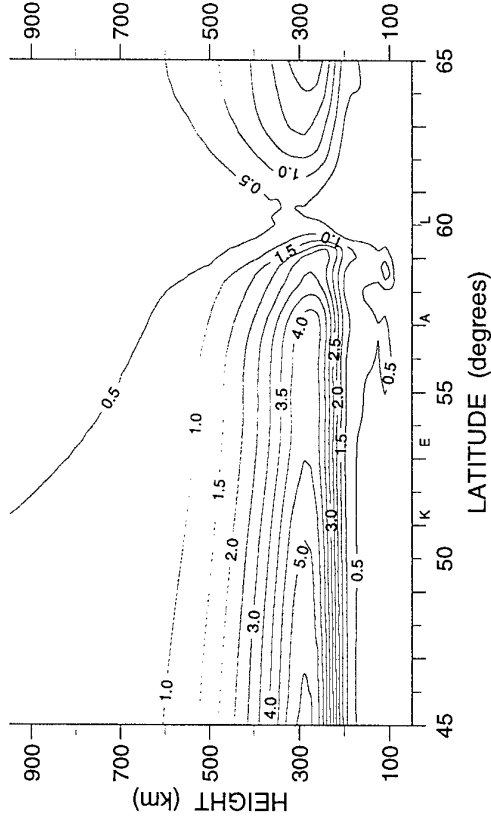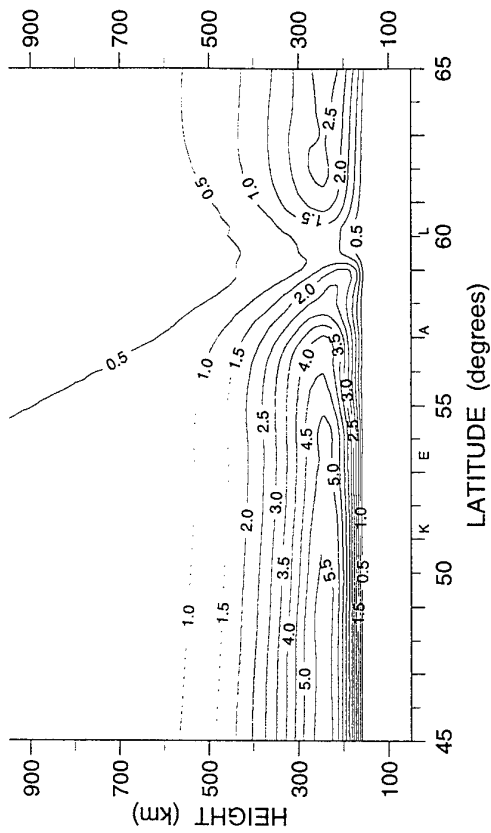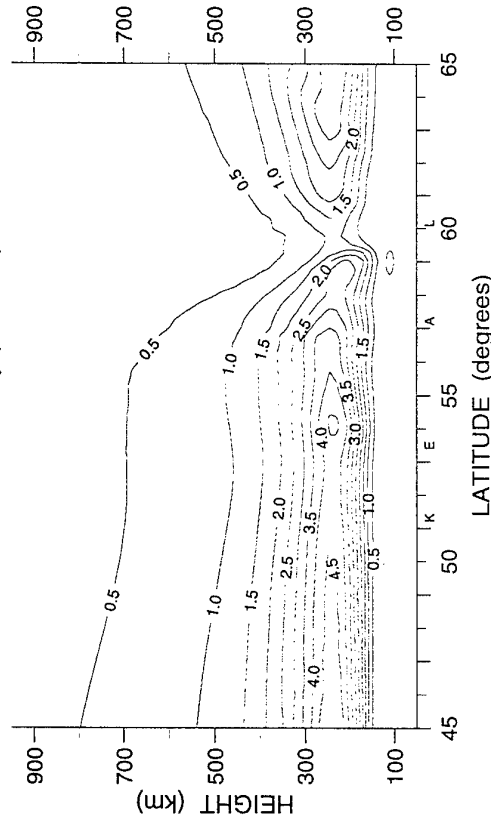
Tomographic Image: 13/04/93 17:07 UT
Electron density (x10^11 m^-3)

Tomographic Image: 13/04/93 13:03 UT
Electron density (x10^11 m^-3)

Tomographic Image: 13/04/93 13:57 UT
Electron density (x10^11 m^-3)

Tomographic Image: 13/04/93 18:39 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 13/04/93 19:43 UT
Electron density (x10¹¹ m⁻³)

Tomographic Image: 13/04/93 18:56 UT
Electron density (x10¹¹ m⁻³)
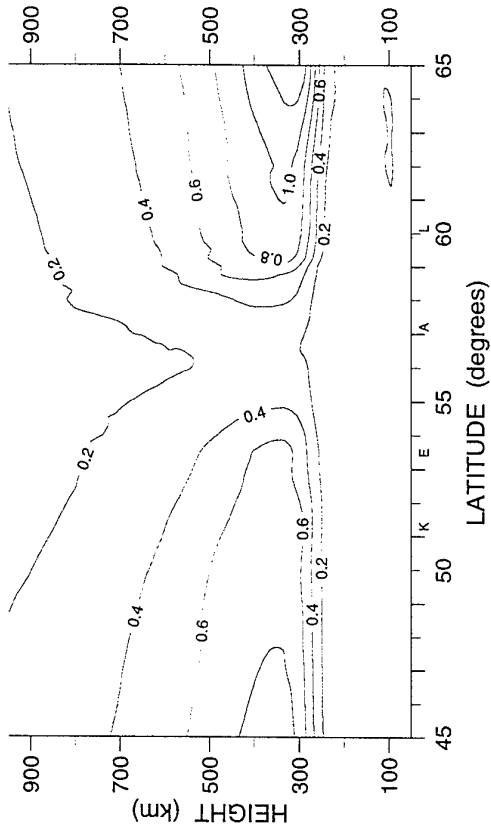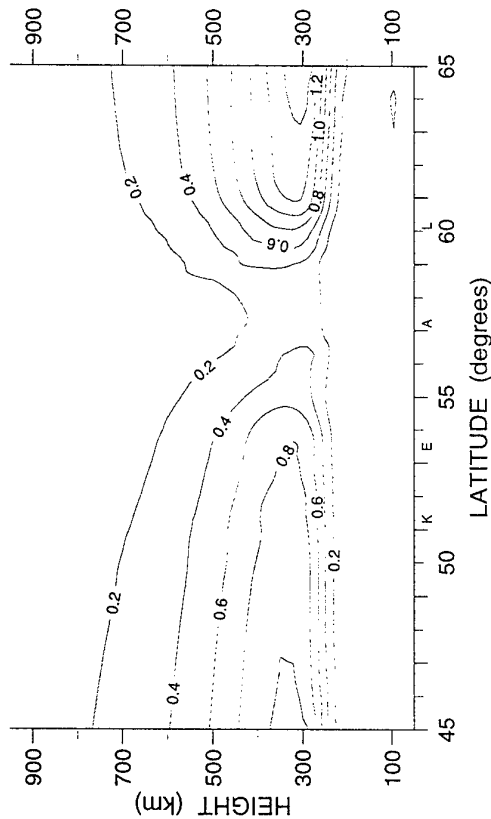
Tomographic Image: 13/04/93 20:26 UT
Electron density (x10¹¹ m⁻³)

118
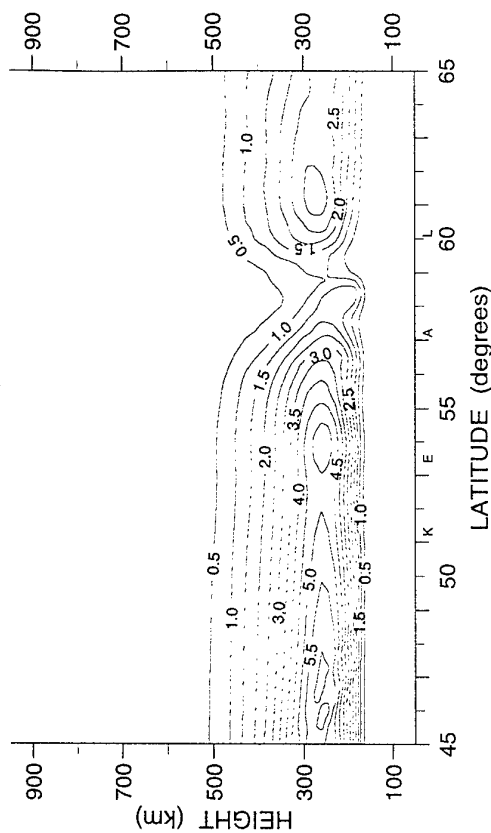
Tomographic Image: 13/04/93 21:49 UT
Electron density (x10^11 m^-3)
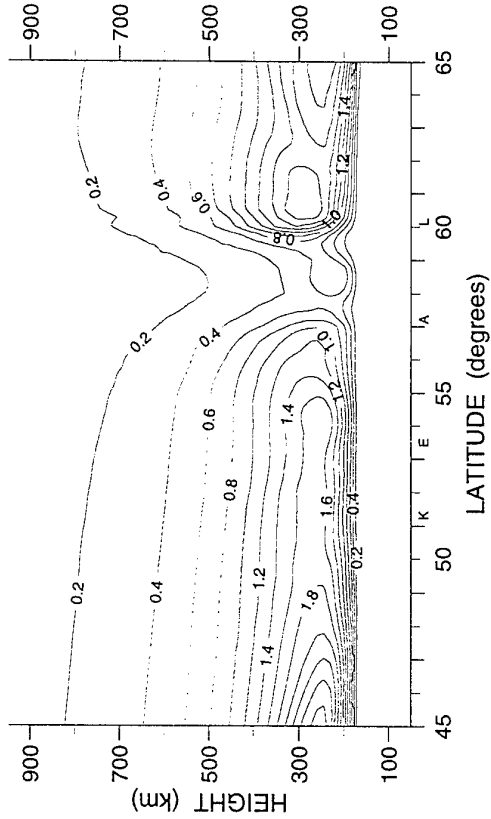
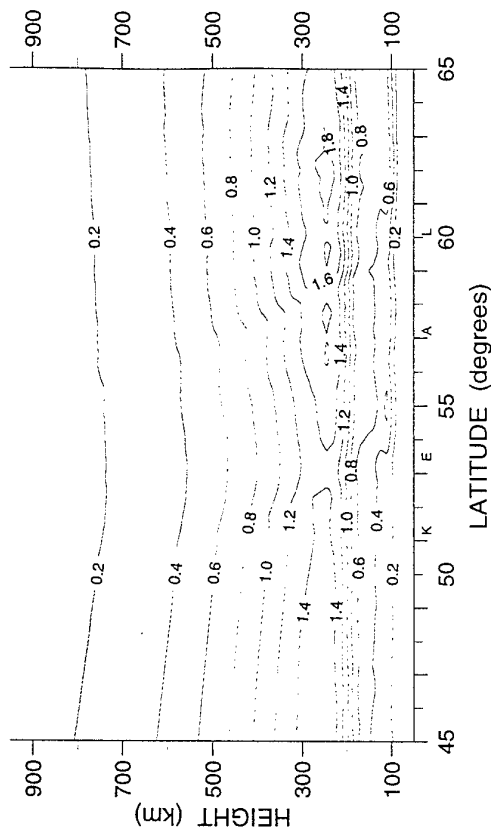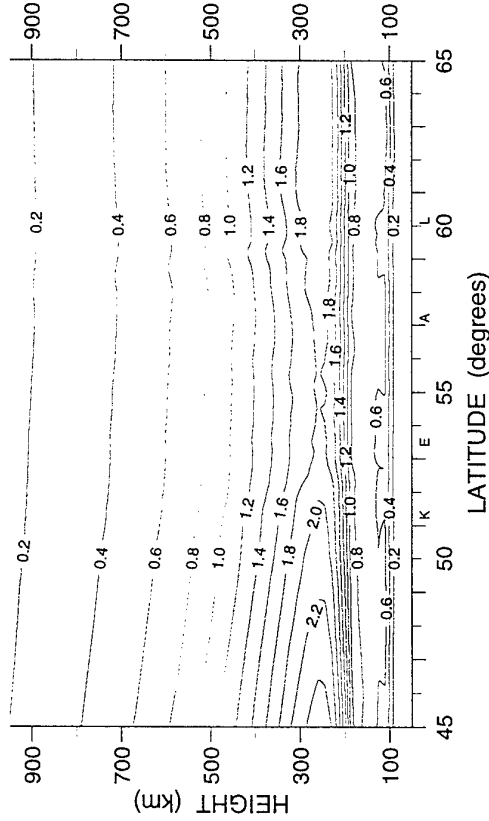Tomographic Image: 14/04/93 03:01 UT
Electron density (x10^11 m^-3)

Tomographic Image: 14/04/93 01:55 UT
Electron density (x10^11 m^-3)
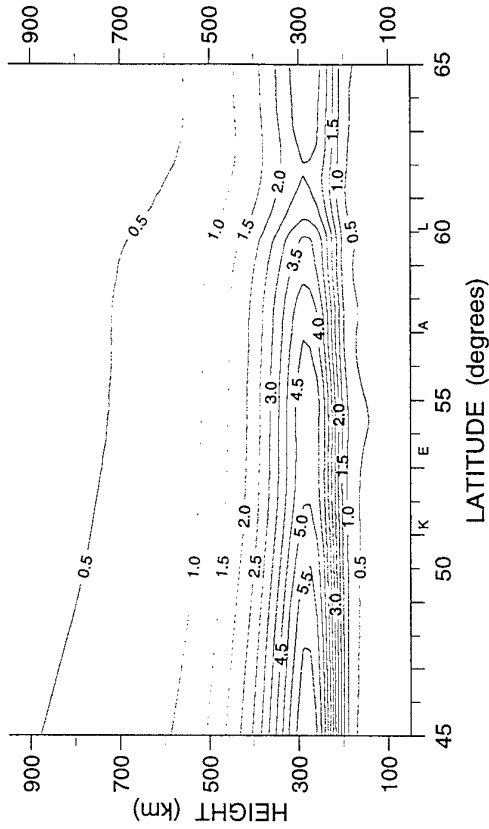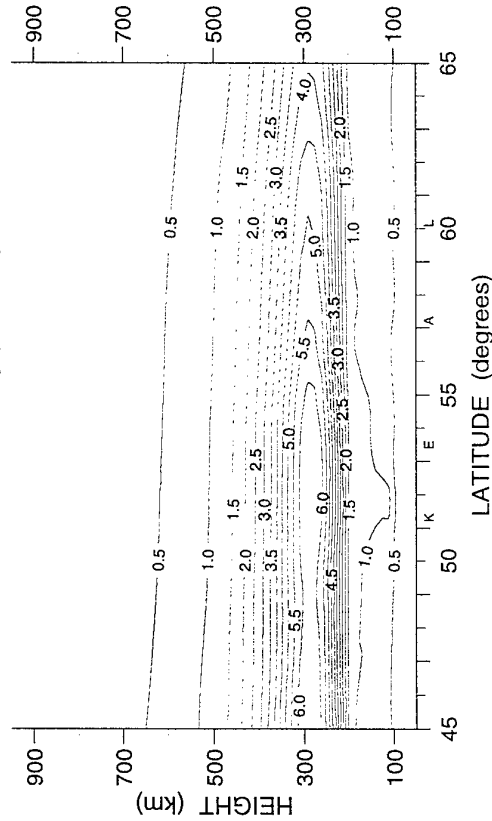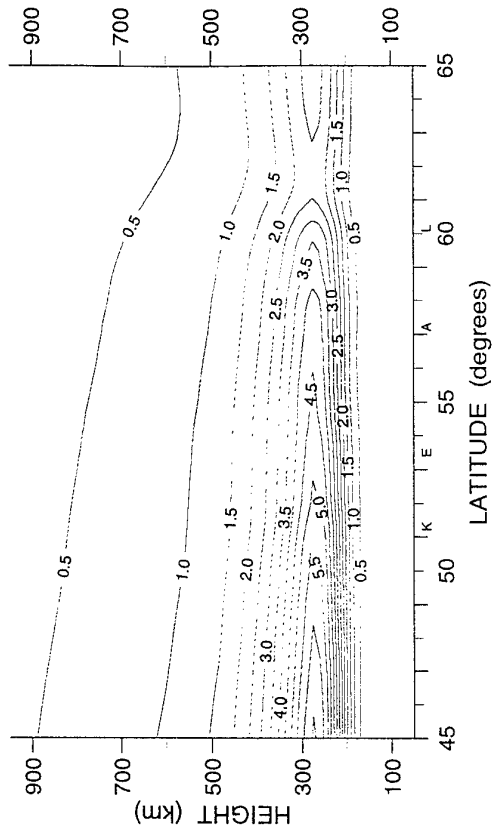
Tomographic Image: 14/04/93 06:11 UT
Electron density (x10^11 m^-3)

Tomographic Image: 14/04/93 18:33 UT

Electron density (x10^{11} m^{-3})

Tomographic Image: 14/04/93 18:60 UT

Electron density (x10^{11} m^{-3})

Tomographic Image: 14/04/93 06:48 UT

Electron density (x10^{11} m^{-3})
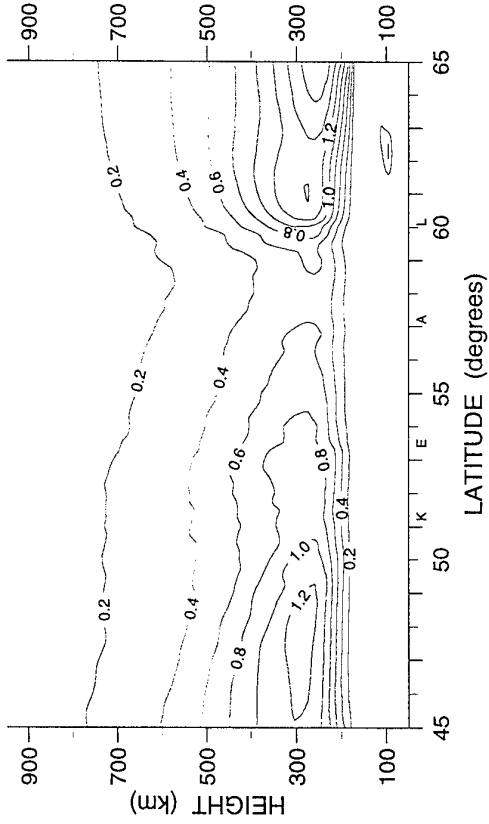
Tomographic Image: 14/04/93 16:44 UT

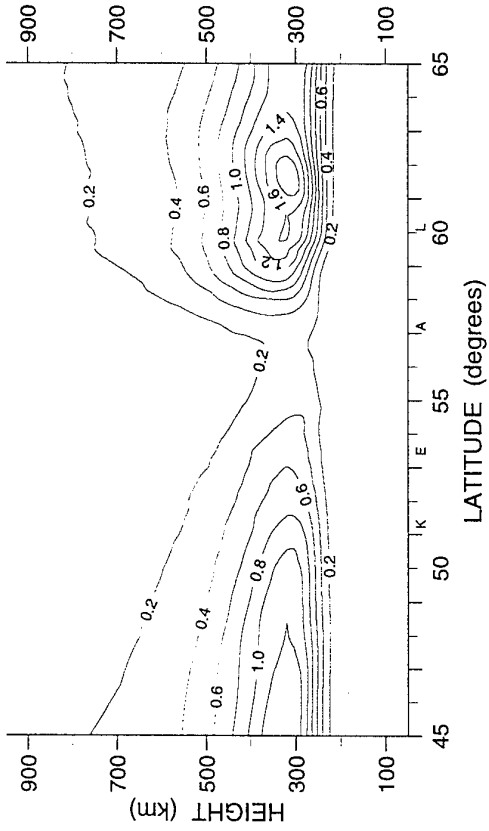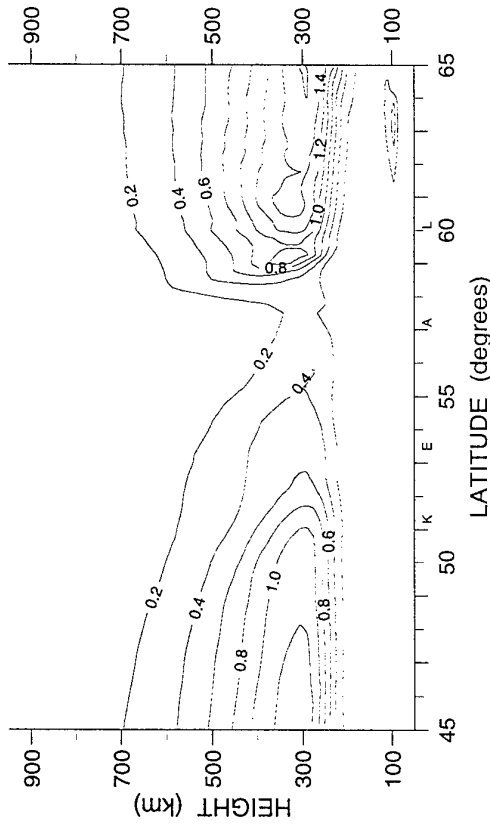Electron density (x10^{11} m^{-3})
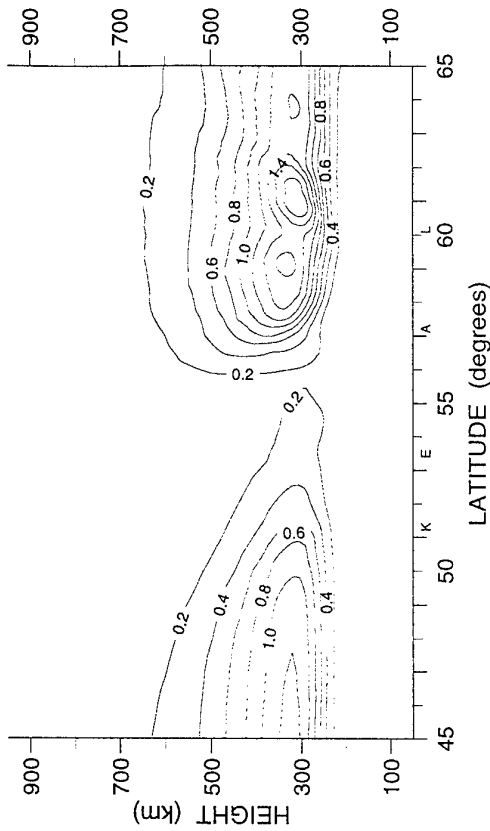
Tomographic Image: 14/04/93 23:10 UT
Electron density (x10^11 m^-3)

Tomographic Image: 15/04/93 02:38 UT
Electron density (x10^11 m^-3)
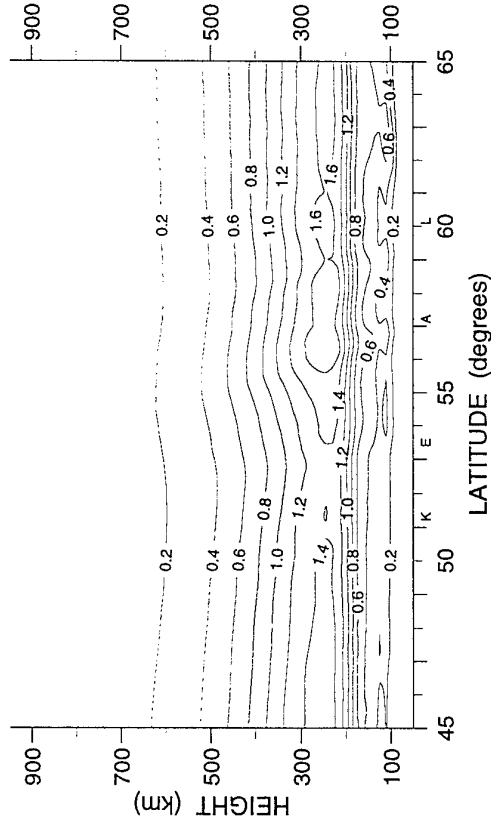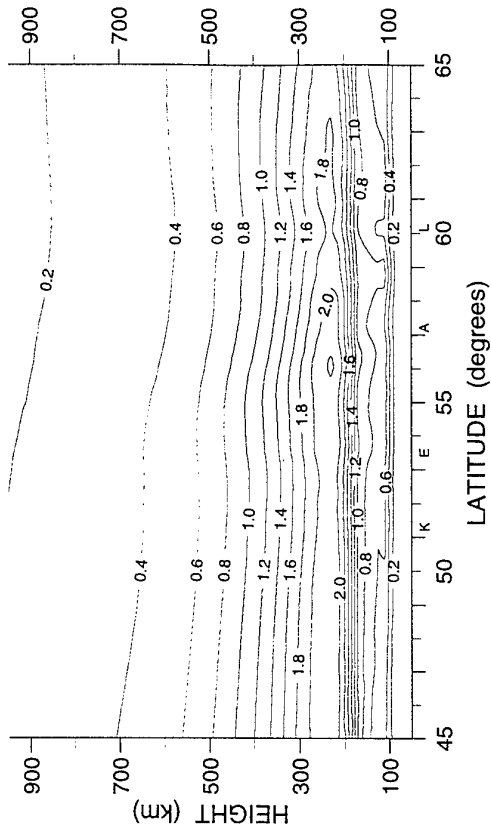
Tomographic Image: 15/04/93 01:10 UT
Electron density (x10^11 m^-3)

Tomographic Image: 15/04/93 02:57 UT
Electron density (x10^11 m^-3)

121

Tomographic Image: 15/04/93   06:48 UT
Electron density (x10^{11} m^{-3})

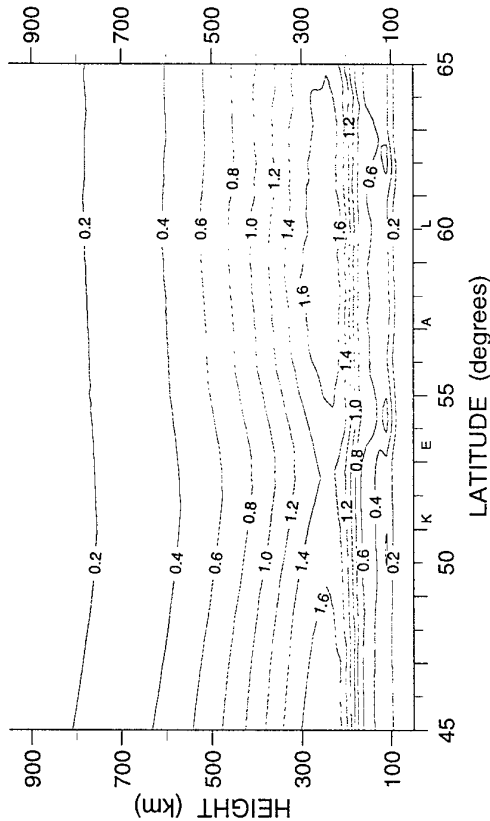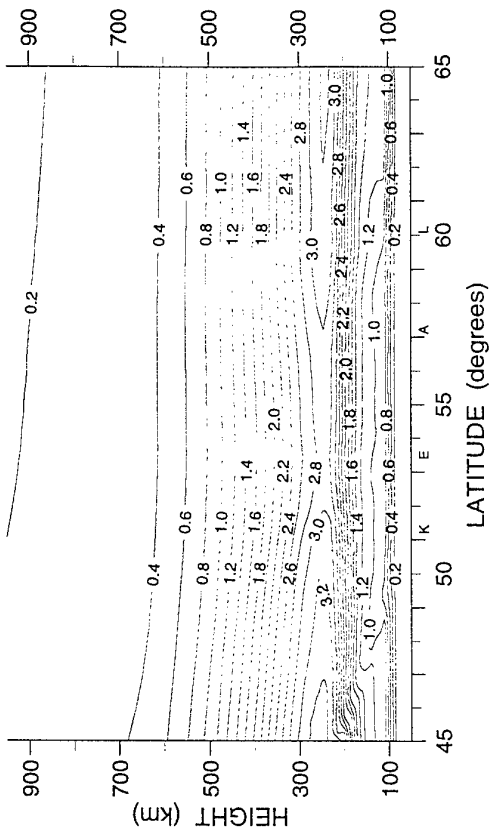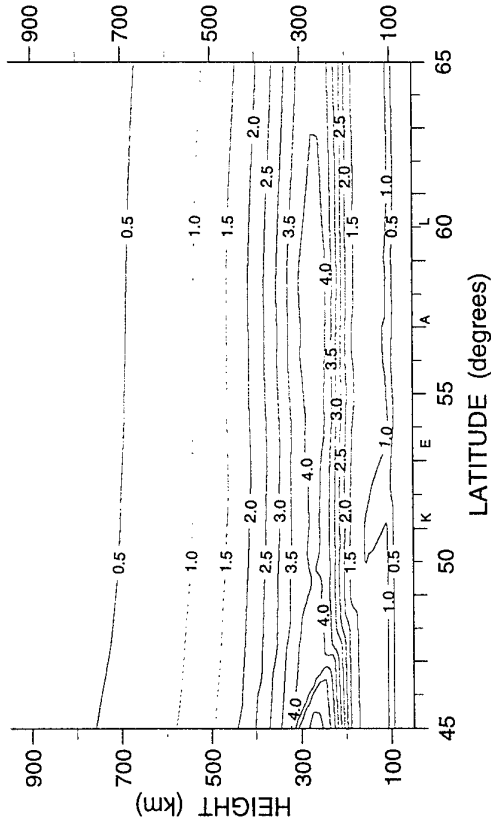Tomographic Image: 15/04/93   14:60 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 15/04/93   05:48 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 15/04/93   06:05 UT
Electron density (x10^{11} m^{-3})

HEIGHT (km)

LATITUDE (degrees)

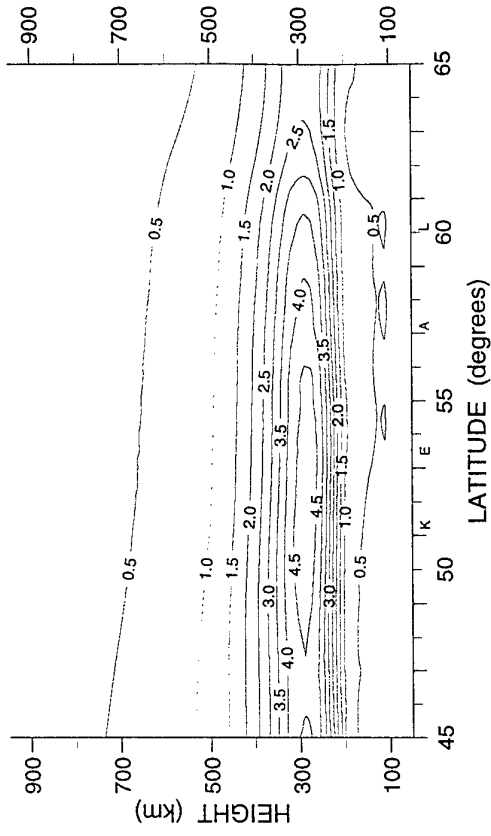Tomographic Image: 16/04/93 18:16 UT
Electron density (x10^{11} m^{-3})

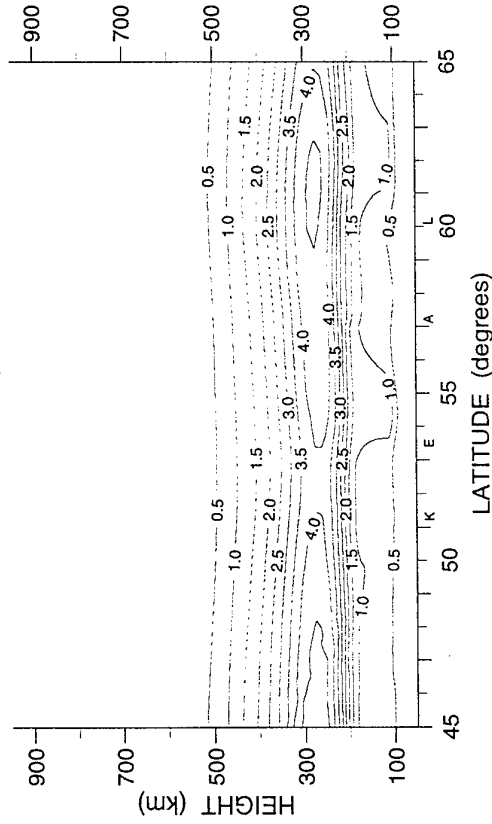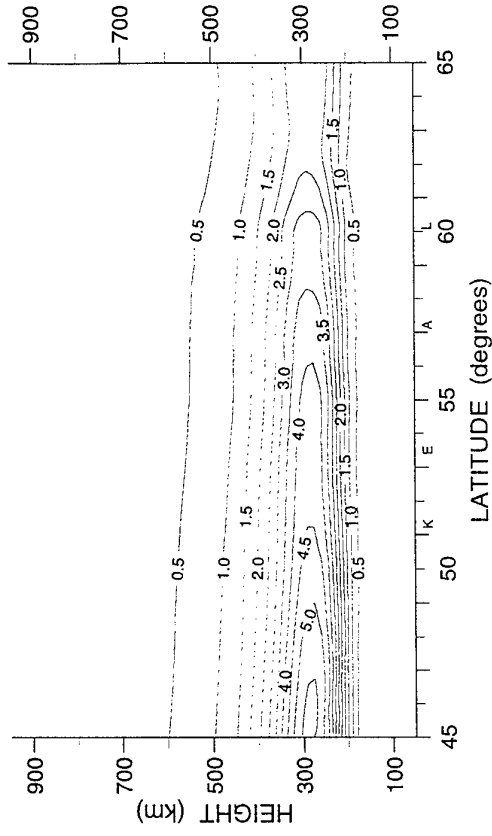Tomographic Image: 16/04/93 19:21 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 16/04/93 14:37 UT
Electron density (x10^{11} m^{-3})

Tomographic Image: 16/04/93 16:25 UT
Electron density (x10^{11} m^{-3})

LATITUDE (degrees)

HEIGHT (km)

123
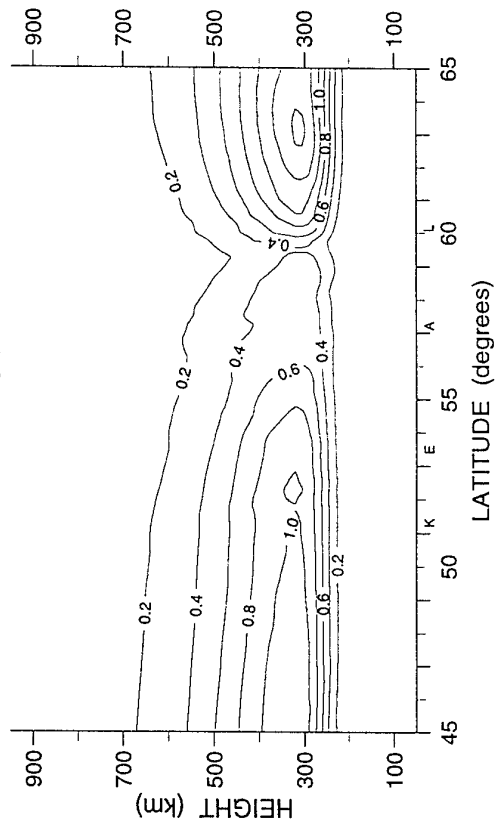
Tomographic Image: 16/04/93 20:04 UT
Electron density (x10^11 m^-3)
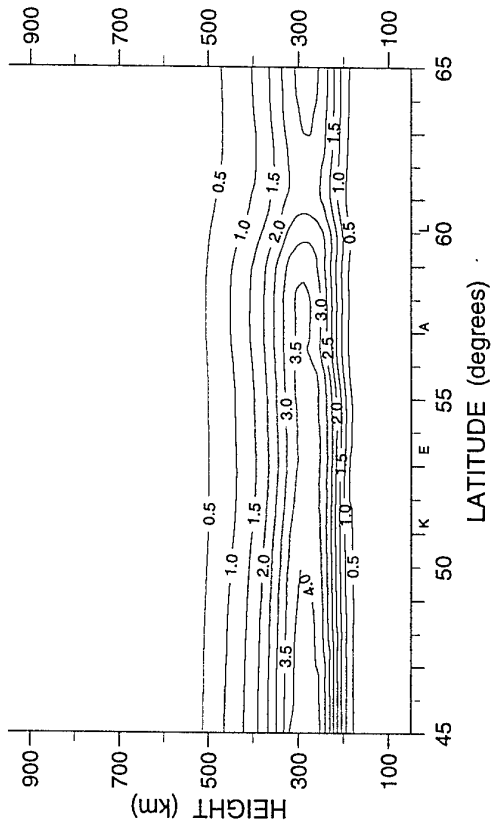
Tomographic Image: 17/04/93 01:52 UT
Electron density (x10^11 m^-3)
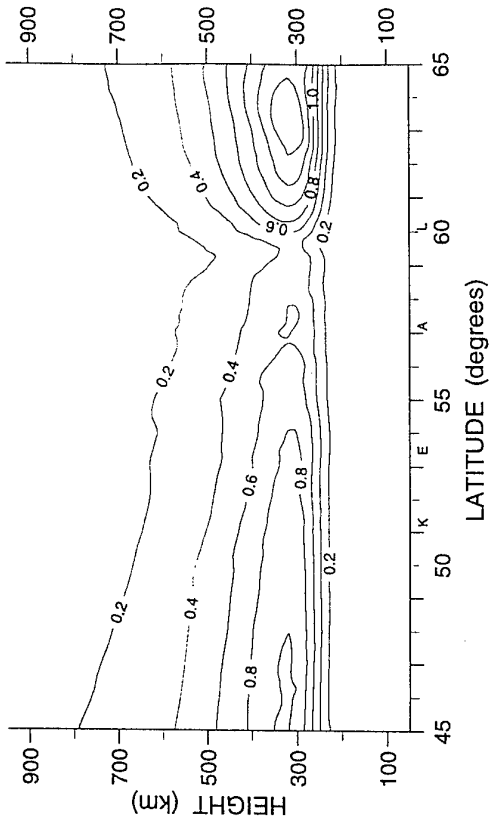
Tomographic Image: 17/04/93 01:27 UT
Electron density (x10^11 m^-3)
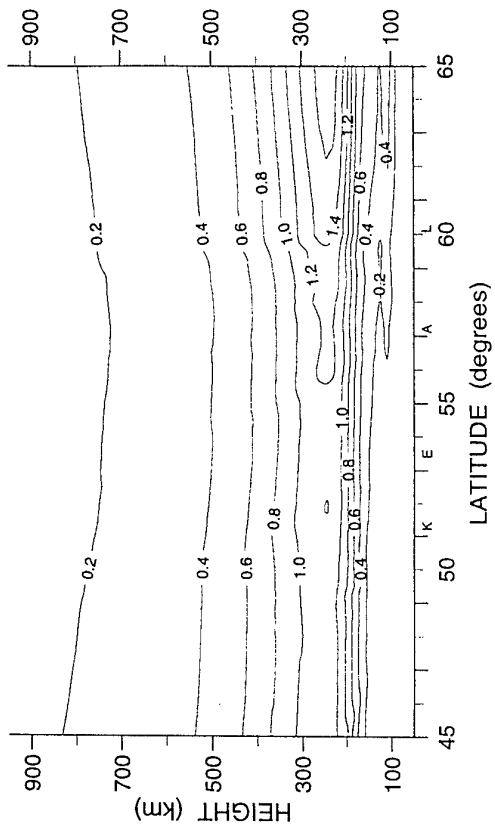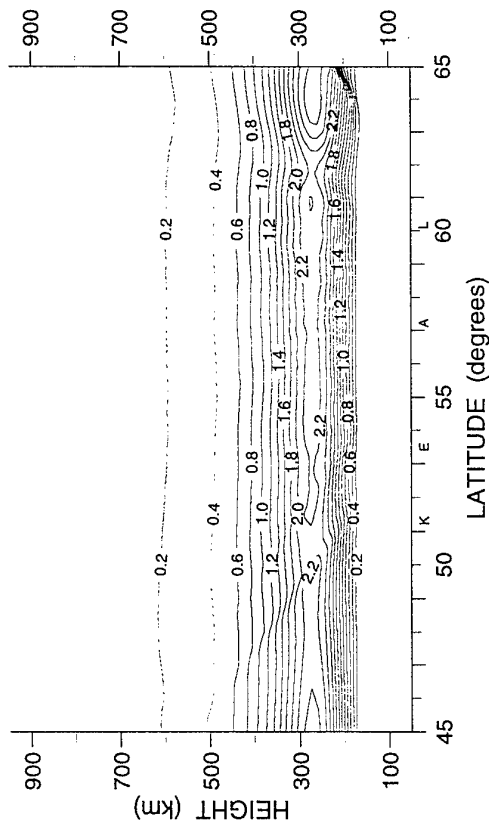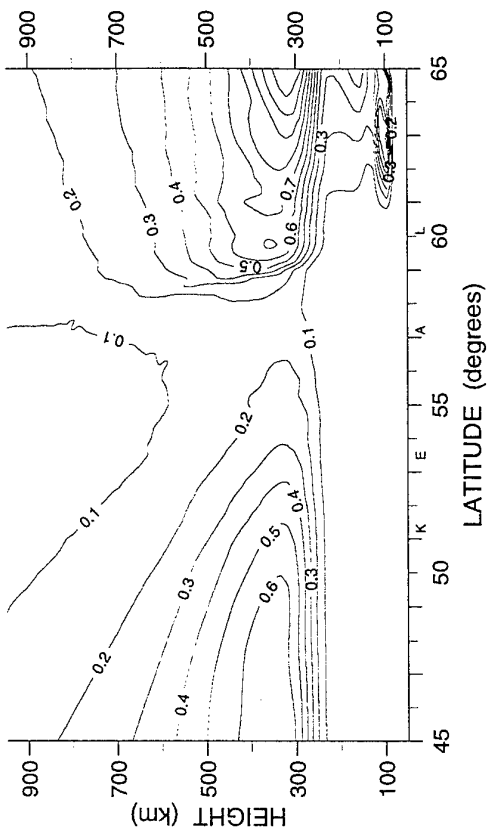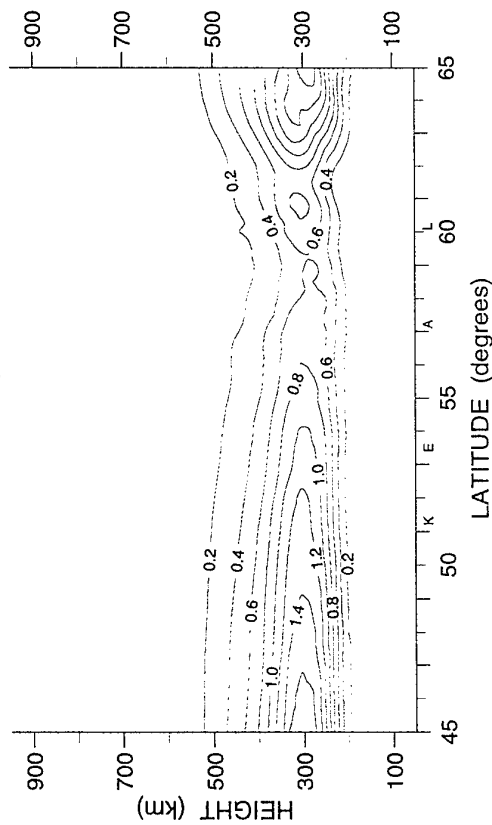
Tomographic Image: 17/04/93 05:02 UT
Electron density (x10^11 m^-3)

124

Tomographic Image: 17/04/93 21:47 UT
Electron density (×10^{11} m^{-3})
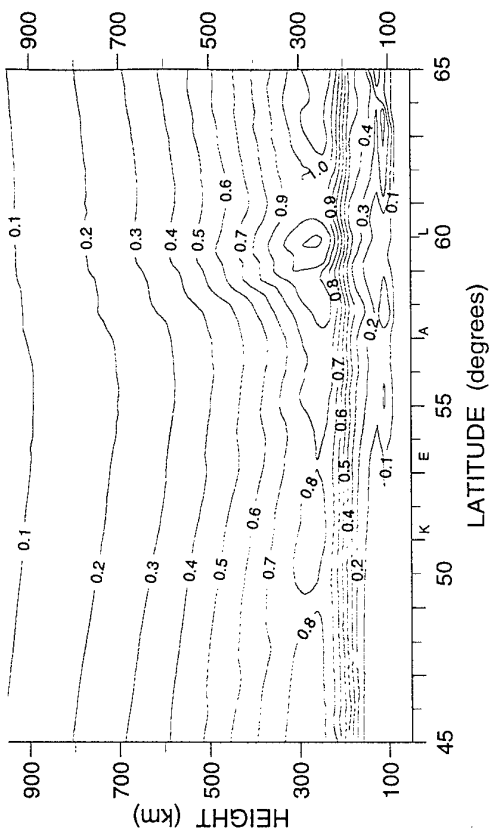
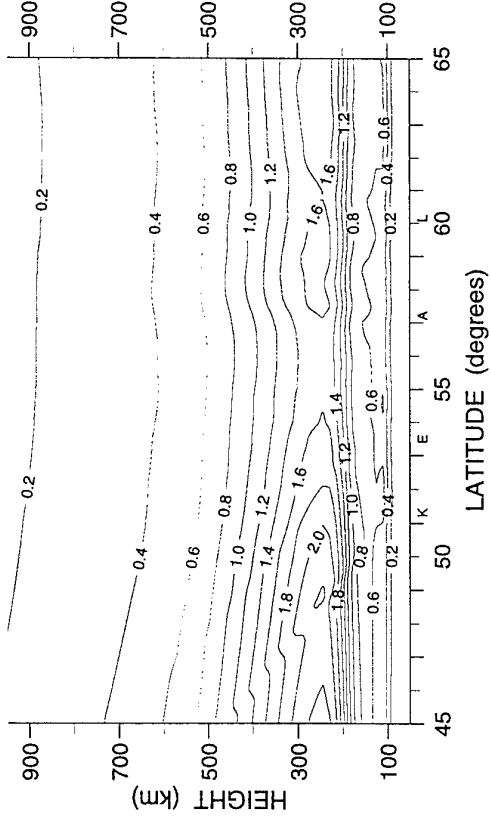Tomographic Image: 18/04/93 03:18 UT
Electron density (×10^{11} m^{-3})

Tomographic Image: 18/04/93 00:42 UT
Electron density (×10^{11} m^{-3})

Tomographic Image: 18/04/93 04:39 UT
Electron density (×10^{11} m^{-3})

HEIGHT (km)

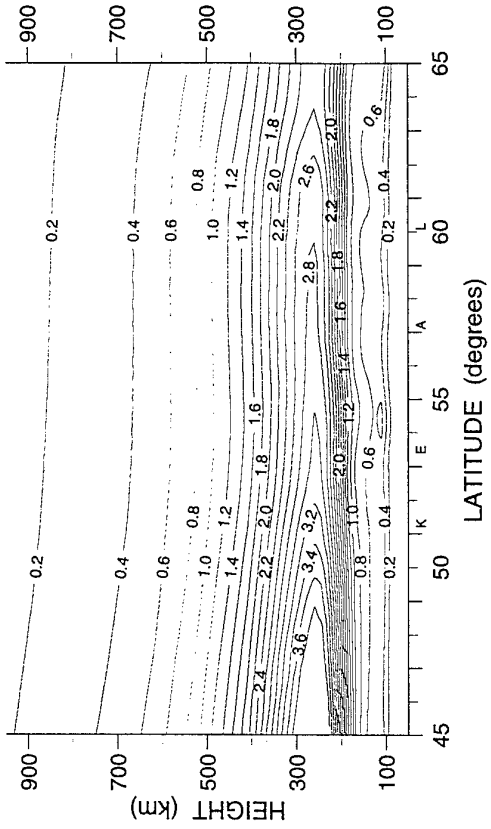LATITUDE (degrees)

Tomographic Image: 18/04/93 17:55 UT
Electron density (x10^11 m^-3)
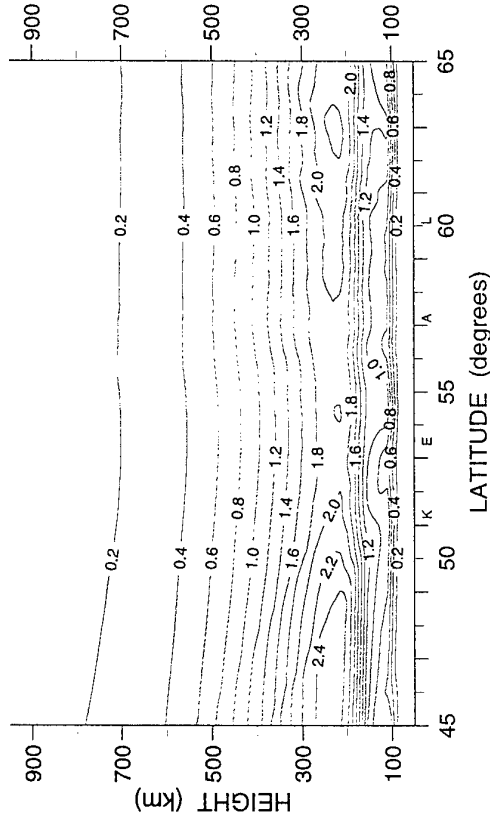
Tomographic Image: 19/04/93 01:44 UT
Electron density (x10^11 m^-3)

Tomographic Image: 18/04/93 06:26 UT
Electron density (x10^11 m^-3)

Tomographic Image: 18/04/93 07:31 UT
Electron density (x10^11 m^-3)