LATITUDINAL DEPENDENCE OF THE EQAUTORIAL IONOSPHERIC ANOMALY OBSERVED BY IMAGE/FUV

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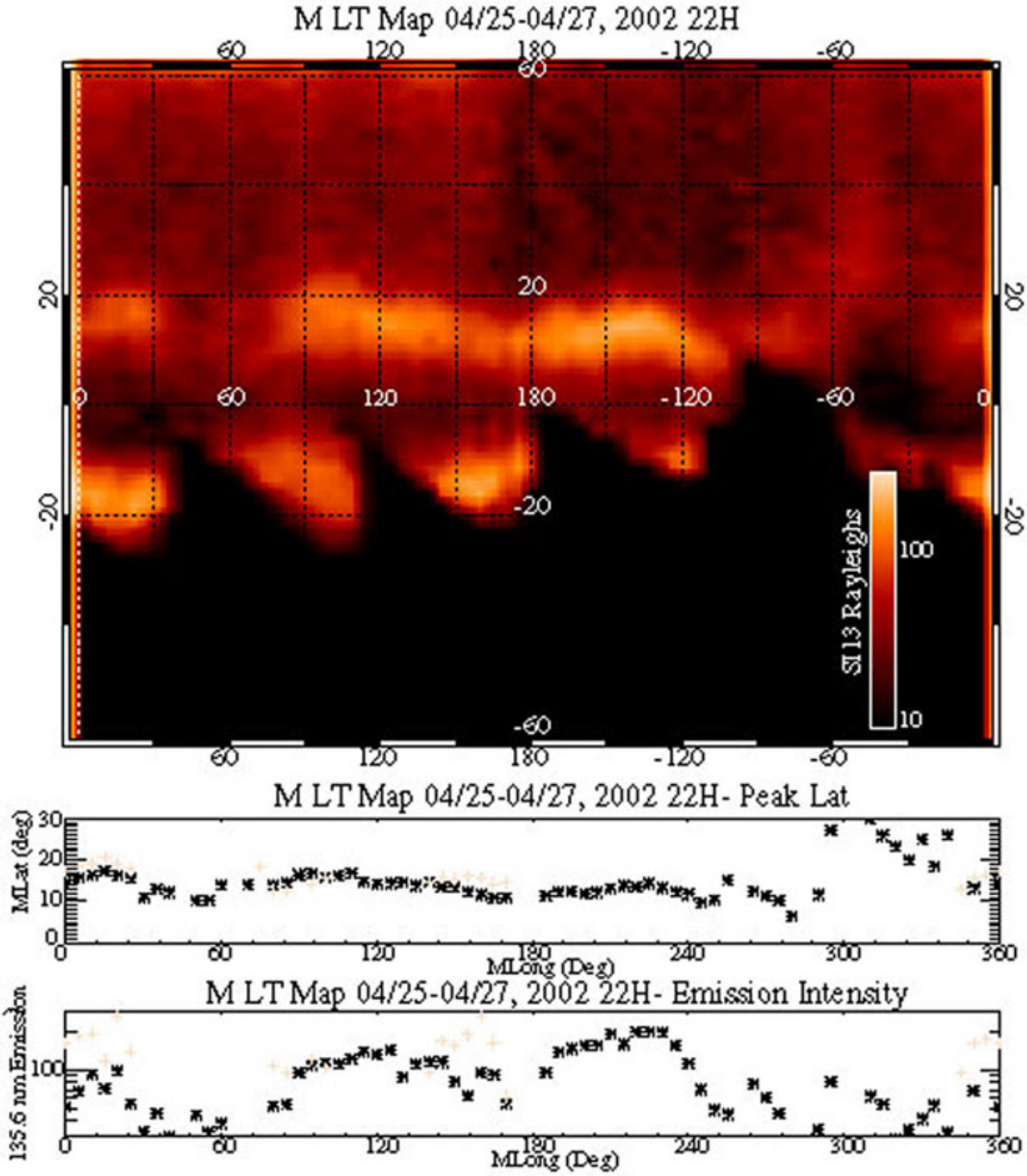
The Equatorial Anomaly (EA) of the ionosphere has been studied by ground-based radio and optical observations and satellite based in-situ and optical observations for more than four decades. So far these observations have not been able to provide information of the EA in a global perspective. The IMAGE/FUV instrument provides, for the first time, instantaneous global images of OI 135.6 nm nightglow with two minutes time resolution. Because the OI 135.6 nm emission from the nighttime ionosphere is determined by the line-of-sight integrated plasma density, the images are useful in investigating the nighttime low latitude ionosphere globally. By using the IMAGE/FUV 135.6 nm observations from March to June, 2002, we have examined the global characteristics of the EA, by constructing the constant local time map (LT map), in which pixels with an assigned local time are extracted from the IMAGE/FUV nightglow images obtained for three or more days, and put together to a global distribution map of emission intensities. An example of LT Maps is shown in Figure 1. The vertical and horizontal axes are geomagnetic latitude and longitude respectively. FUV data used in this example was obtained from April 25 to 27, 2002. Because the IMAGE satellite located over the Northern hemisphere during the period, coverage of the Southern hemisphere was limited. Bottom two panels in this figure are the estimated EA peak latitude (top) and peak emission intensity (bottom), respectively. As in this example, LT maps show that the development of EA has significant longitudinal dependence, that is, during this data period, the most enhanced EA was observed at longitudinal regions centered near 30, 120, 210E, while the development of EA was relatively suppressed at regions at 60, and 150E longitudes. Due to large southward excursion of the geomagnetic equator in the American sector, we do not have good deal of data in this region in terms of geomagnetic latitude coverage. Thus, by ignoring this region, the observed longitudinal variation of EA may have the global wave number of 4. The observed longitudinal dependence of EA can not be completely explained with the electric field model, the geomagnetic declination angle, and the displacement of the geomagnetic equator from the geographic equator. In order to explain the observed global characteristics of EA, we need to consider other effects, for example, forcing from the lower thermosphere, such as tide.


M LT Map 04/25-04/27, 2002 22H
60
120
180
-120
-60
20
0
-20
SI13 Rayleighs
100
10
M LT Map 04/25-04/27, 2002 22H- Peak Lat
MLat (deg)
30
20
10
0
240
300
360
MLong (Deg)
M LT Map 04/25-04/27, 2002 22H- Emission Intensity
135.6 nm Emission
100