Diurnal, seasonal and solar cycle variations of tweek reflection height in the D- and lower E-region ionosphere

Hiroyo Ohya[1]; Kazuo Shiokawa[2]; Yoshizumi Miyoshi[3]
[1] Graduate School of Eng.,Chiba Univ; [2] STELAB, Nagoya Univ.; [3] STEL, Nagoya Univ.

The purpose of this study is to reveal diurnal, seasonal, and solar cycle variations of tweek reflection height (h) and propagation distance (d) during solar cycle 21. Typical tweek atmospherics are reflected at a height where the equivalent electron densities are ~20 - 30 cm^{-3}. Descent (rise) of the reflection height corresponds to increase (decrease) in electron density in the D- and lower E-region ionosphere. It is well known that electron density in the sub-ionosphere depends on solar activities, although the detailed investigation for nighttime lower ionosphere has not been sufficiently performed yet. Using tweek cut-off frequencies we can monitor variations of ionospheric D-/E- region height at electron densities of less than 10^2 cm^{-3} along long propagation paths (several thousands of kilometers). We analyzed 87017 tweeks obtained at Kagoshima (31.5N, 130.7E), Japan, on magnetically quiet days in the rising phase of Solar Cycle 21 from April 1976 to March 1980 by using an automatic procedure that we developed. Average nighttime height h and propagation distance d were 101.6 km and 7916.1 km, respectively. As for seasonal variations, monthly mean h was lower from April to June and highest in September. Monthly mean d was shorter from May to August and longer from January to March, probably because of the difference of the lightning distribution between summer and winter. The h at the solar maximum tends to be lower than those at the solar minimum. In the presentation, we discuss possible causes of these variations of tweek parameters.