Long-term Variations in the Tweek Reflection Height During Solar Cycle 21

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The purpose of this study is to reveal long-term variations in the nighttime tweek reflection height at middle latitudes during Solar Cycle 21 (1976-1986). 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 ionospheric D- and lower E-regions. It is well known that electron density in the sub-ionosphere depends on solar activities, although the detailed investigation has not been sufficiently performed yet. Using the tweek reflection height we can monitor height variations of the ionosphere at electron density less than 10^2 cm^{-3} along long propagation paths (several thousands of kilometers). From cut-off frequency for the first order mode on dynamic spectrum made by Maximum Entropy Method, we can estimate the reflection height in high accuracy. We use tweek data obtained at Kagoshima (31.5N, 130.7E), Japan, on magnetically quiet days during 1976-1981. The results showed that a correlation coefficient between the tweek reflection height and the sunspot number was about -0.35 (Figure 1). The weak negative correlation reveals that the tweek reflection height decreases from 105 km to 95 km with standard deviations of +/- 2.5 km with increasing the sunspot number. In the presentation, we discuss possible causes of this long-term variation of the reflection height.

Keywords: Tweek atmospherics; Sub-ionosphere; Solar Cycle 21.

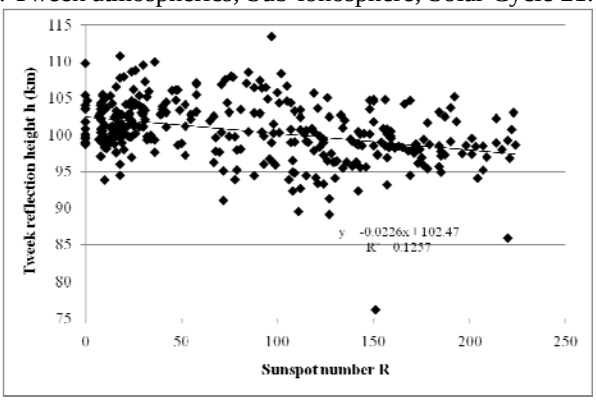

Figure 1. Correlation between the tweek reflection height and the sunspot number.