

Seasonal variation in sunset ionospheric disturbances found in a long-term HF Doppler observation dataset

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Ionospheric disturbances are regularly observed after sunset. These disturbances can be associated with two major causes; on the one hand it is caused by the ionosphere itself with the elimination of ionization after sunset, on the other hand it is caused by atmospheric gravity waves (AGWs) which originate in lower atmosphere -presumably in the stratosphere or lower mesosphere -when the air becomes cold after sunset. These ionospheric disturbances are observed with radio instruments such as ionosondes, incoherent scatter radars, HF Doppler (HFD), and GPS TEC. However, except for HFD, it is inherently difficult to identify the causes of the disturbance from data obtained by these methods. Recently, by employing HFD, one of the authors and his colleague identified the altitude of the source region of an AGW which caused an ionospheric disturbance after sunset; it is suggested that the source altitude was about 50 km, which roughly corresponds to the upper bound of the ozone layer. As a sunset is a regular periodic phenomenon, the seasonal variations of the ionospheric disturbances associated with a sunset can be isolated from others relatively easily. It is therefore useful to study ionospheric disturbances after sunset to understand the characteristics of atmosphere-ionosphere coupling. In this study, we present some features of seasonal variation in sunset ionospheric disturbance obtained from a long-term HFD dataset.

Keywords: ionospheric disturbance, sunset, HF Doppler