

Terdiurnal tidelike variability in mid-latitude sporadic E layers

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Time series analysis was performed on a large data base of ionosonde recordings taken over 12 years, for the 6-month period from the beginning of May to the end of October when sporadic E layer occurrence is frequent. The results show that, in addition to the well known 24- and 12-hour tidal variations, there is also a weaker but regular 8-hour periodicity in midlatitude sporadic E layers (Es). Statistically, this terdiurnal periodicity is significant and occurs in both, the sporadic E layer critical frequency (foEs) and the layer virtual height (h'Es), becoming strongest around summer solstice and later in October after a minimum in September. At times a weak 6-hour periodicity can also be present in Es but its effects are less significant than those of the 8-hour oscillation. The 8-hour periodicity in Es is attributed to the terdiurnal tide, presumably acting through its vertical wind shear forcing of the metallic ions in the lower thermosphere. The relation to the terdiurnal tide was inferred from simultaneous ionosonde recordings from three widely spaced stations in the same mid-latitude zone, showing the 8-hour oscillation to be present in all ionosonde stations and have phases which are consistent with a westward propagating terdiurnal wave of zonal wave number 3. The present study establishes the regular occurrence of a terdiurnal tidelike oscillation in Es which needs to be incorporated into the physics and modeling