SEASONAL TIDAL VARIABILITY AND DESCENT OF MIDLATITUDE SPORADIC LAEYRS AT ARECIBO

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Contrary to what the name implies, sporadic *E* layers (E_s) follow regular daily patterns in variability and altitude descent, determined primarily by vertical wind shears in the lower thermosphere. Here, a novel method is used to analyze a large data set of high-resolution sporadic *E* layer incoherent scatter radar (ISR) measurements. These were made at Arecibo (Geog. Lat. ~18^o N; Magnetic Dip ~ 50^o) over many years with ISR runs lasting from several hours to several days, covering all seasons. A new methodology is applied, in which both weak and strong layers are clearly traced by using the vertical electron density gradient as a function of altitude and time. By taking a time base equal to the 24-hour local day, statistics were obtained on the seasonal behavior of the diurnal and semidiurnal tidal variability and altitude descent patterns of sporadic E. It turns out that, the diurnal tide is the key agent responsible for the formation of sporadic E at lower altitude for all seasons. Presumably, the layers form at tidal convergence nodes near 108 km at ~06 h local time (LT) and move with the vertical tidal phase speed down to altitudes below 90 km in about 24 hours. In addition, a weaker diurnal trace is also seen at higher altitudes only during summer, starting at ~125 km near 06 LT and moving downwards at about the same speed as the dominant E_s trace at lower heights. At higher altitudes, there are two prevailing layers formed by vertical wind shears associated mainly with semidiurnal tides. These include: 1) a daytime layer starting at ~130 km around midday and descending down to 105 km by local midnight, and 2) a less frequent and weaker nighttime layer which starts prior to midnight at ~130 km, descending downwards at somewhat faster rate to reach 110 km by sunrise. The diurnal and semidiurnal-like pattern prevails, with some differences, in all seasons. These results can be useful in the study of the diurnal and semidiurnal tidal characteristics in the lower thermosphere between 90 and 130 km.

Sporadic E layers, Atmospheric tides, atmosphere- ionosphere interaction

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