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INVESTIGATION ON THE SEMIDIURNAL DESCENT OF SPORADIC-E LAYER USING  
IONOSONDE HEIGHT-TIME-INTENSITY DATA

**Abstract**

Sharjah CADI (Canadian Advanced Digital Ionosonde) is situated at the Arabian Peninsula (geographic coordinates: 25.28N, 55.46E) operating continuously since May 2019. It is programmed to perform 400s frequency sweep, consisting of 250 steps from 1-18 MHz daily, every 15 mins. The ionosonde is routinely supervised and clear of any man-made interference which results in good quality ionogram. In this work, we have analyzed ionosonde data from year 2020 to perform height-time-intensity (HTI) analysis which helps investigate sporadic-E (Es) layer's vertical motion, seasonal variability, and tidal periodicities. The HTI method uses raw ionogram to estimate optimal frequency bins within which traces of ionogram are processed at each time instant during a 24-hour interval. For each ionogram, in the appropriate frequency bin, a virtual height profile of signal strength is obtained. In this work, we have processed HTI plots of hourly averages of reflected signal intensities, for each month, divided into four frequency bins (in MHz): 2-3, 3-4, 4-5 and 5-7. HTI analysis revealed a pronounced semidiurnal periodicity in Es-layer descent and occurrence. A consistent presence of Es can be observed throughout the year in all seasons. The most defining feature of the Es-layer at the Arabian Peninsula is a fork of reflected traces, formed by an upper and a lower Es-layer, starts to formulate at local time (LT) 16-17 and extends until midnight. The fork is more prominent in summer solstice and autumnal equinox. The upper part of the fork starts at an altitude of approximately 150 km at LT 17 and sharply declines to the height of 120 km within an hour. From there, the upper layer gradually descends overnight and settles at a height of

around 100 km before disappearing at sunrise. The lower layer is a more traditional Es-layer present at a fixed height of 100-110 km starting at LT 15-16 running in parallel to the upper layer before disappearing finally at around LT 2. The lower Es-layer clearly has a seasonal dependence with strong presence in summer solstice and very weak or no presence in other seasons. It has a very weak presence at 3-4 MHz bin in winter solstice and vernal equinox compared to summer solstice when it has a strong presence in 2-3 MHz bin. For autumnal equinox, the lower Es-layer has a stronger presence, however, it disappears more quickly (at LT 20-21) compared to summer solstice.