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Comparative analysis of Coherent Omnipresent Fluctuations in the Ionosphere and amplitude variations within ionogram traces

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Recent observations of the incoherent scatter radar (ISR) power profiles at Arecibo, Millstone Hill, and Poker Flat showed constant presence of continuous quasi-periodic variations in the F region with periods of about 1 hour. This phenomenon was named the Coherent Omnipresent Fluctuations in the Ionosphere (COFIs) (Livneh et al. [2007]; Livneh et al. [2009]). Such variations are visible not only at night but also during daytime. Their nature and their origin are not clear. These fluctuations bear a lot of general similarity to the traveling ionospheric disturbances (TIDs) which are observed with coherent scatter radars as well. It is commonly accepted that the main cause of the TIDs is acoustic gravity waves (AGWs). The authors suggest that the COFIs nature may be attributed both to AGWs and to ionospheric manifestations of magnetospheric disturbances caused by irregularities of the solar wind. The COFIs were revealed after a high-pass filtering of the RTI images. These appear as near vertical stripes with periods ranging from roughly 30 to 60 minutes. Their apparent vertical wavelengths increase with altitude from 10 to 100 km. Since these fluctuations are omnipresent according to [Livneh et al., 2009], it is of great interest to find similar fluctuations in vertical sounding data. Partially because ionosondes are more widely distributed throughout the world than ISRs. It is particularly convenient to perform this analysis with an ionosonde capable of a high cadence operation mode, such as the one developed at KFU. A special format of graphical representation of ionosonde data facilitates observations of such ionospheric fluctuations. Spectral power analysis performed by Djuth et al. (1997) showed that at the levels -10 dB and -20 dB the cutoff point variations are characterized by the periods 5.6 min (3 mHz frequency) and 3.3 min (5 mHz frequency), respectively. In this paper, we determine periods of the ionogram trace amplitude variations, which were obtained using A-maps, and compare them to similar characteristics of the COFIs. In the future, it would be interesting to perform coordinated observations of this phenomenon using co-located radar, airglow imager, and ionosonde.