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Joined satellite tomography and EISCAT observation of the F region trough and comparisons with the CTIPe model

M. Voiculescu (1,2), T. Nygren (2), M. Codrescu (3),I. Virtanen (2), T. Fuller-Rowell (3)

(1) Dept. of Physics, 'Dunarea de Jos' University of Galati, Romania, (2) Dept. of Physical Sciences, University of Oulu, Oulu, Finland, (3) CIRES, University of Colorado and NOAA, SEC, Boulder, Colorado, USA (Mirela.Voiculescu@ugal.ro)

The F region trough is a well-known feature of the transition zone between the mid-latitude and high-latitude ionosphere. Studies of the trough have started more than 30 years ago, however, the understanding of the trough formation or occurrence is still ambiguous, due either to limited spatial extent or to restricted time of observations. The satellite tomography method was developed during the last decade and has become a useful tool for monitoring the F region ionosphere. Ionospheric features like the F region trough especially benefit from this method, due to the large latitudinal extent of the observed area (20 degrees) and to the relatively continuous monitoring (satellite passes at about 1 hour interval). However, the tomographic results are still lacking accuracy in the estimation of the electron density and, more important, they do not offer information on the other ionospheric properties. Incoherent scatter radar observations are essential for detailed study of a certain event. The tomography is suitable for long-term and/or statistical investigations, while EISCAT results are used in analysing some particular cases, specifically to identify the possible mechanisms of the trough generation. Using the tomographic results of the Finnish chain of receivers, several events for which EISCAT meridional scans were available were identified. We compared the tomographic and radar images with the coupled thermosphere ionosphere plasmasphere electrodynamics (CTIPe) model results. The maximum electron density and height given by CTIP are generally close to those that are seen in the tomographic reconstructions and in EISCAT. Sometimes CTIPe overestimates the electron density; both tomography and EISCAT show lower values for the electron density in

winter. The observed trough (by both satellite tomography and EISCAT) either coincides with the modelled trough or with areas where CTIPe shows a decrease in the density. The trough is reproduced by CTIPe model in the afternoon/evening but not at other times of the day. All these information can be used further in indentifying the processes which are responsible for the trough which, in the same time, are not well reproduced by the CTIPe model.