



E-layer dominated ionosphere observed by EISCAT/ESR radars during solar minimum

Hongtao Cai (1), Fei Li (1), Ge Shen (1), Weijia Zhan (1), Kangjun Zhou (1), Ian W. McCrea (2), and Shuying Ma (1)

(1) School of Electronics Information, Wuhan University, Space physics, Wuhan, China (htcai@whu.edu.cn, 8627 68778923),
(2) Space Science and Technique Department, Rutherford Appleton Laboratory, OX11 0QX, UK

E-layer dominated ionosphere (ELDI) is referred to vertical profiles having peak density at E-layer altitudes (Mayer and Jakowski, 2009). In this paper, characteristics of ELDI were investigated with the help of field-aligned measurements of EISCAT/ESR radars during 2009-2011. ELDI events were identified with simple but reasonable criteria, in which a minimal duration was required to exclude possible “fake” events induced by random errors in measurements. It was found that ELDI were observed more often in winter than other seasons. In winter, occurrence of ELDI peaks around mid-night at auroral latitude, while it reaches its maximum around geomagnetic local noon at ESR latitude. Our results imply that ELDI looks like a sporadic rather than a regular phenomenon, being contrary to previous results inferred from radio occultation measurements. Discrepancy in duration of ELDI events observed by the two radars is remarkable, being 30 minutes at Tromsø on average and about a half of it at Svalbard. During the presence of ELDI, average thickness of E-layer exhibits undetectable variations at the two sites, as well as H_mE and the ratio of N_mE/N_mF . Case studies reveal that either extra E-layer ionization possible induced by auroral precipitation or density depletion in F-layer caused by plasma convection alone could lead to the presence of ELDI. We suggest that both them play an important role in ELDI formation.