R005-47
Zoom meeting C ：11/2 PM2 (15:45-17:30)
16:45-17:00

Statistical study of Sporadic Sodium Layers (SSLs) above Tromsoe (3)

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This study is the first statistical study of Sporadic Sodium Layers (SSLs) differentiating in-situ generated SSLs from advected SSLs at high latitudes, and has evaluated conditions necessary for generating a SSL. Based on about 3000 hours of sodium density data obtained with the Tromsoe sodium LIDAR over 7 seasons (October-March) between 2012 and 2018, we have identified 36 events of SSL in the polar mesosphere and lower thermosphere (MLT) region (80 ? 110 km). By using an advantage of five directional simultaneous measurements, we have derived movement velocities of SSLs using detection times (i.e., arrival times) at five positions by assuming that a SSL has a linear front perpendicular to the movement direction and moving at a constant speed. Then, we have compared the movement velocities with wind velocities obtained with the sodium LIDAR. The movement directions of SSLs are dominantly from south-eastward to south-westward except for 3 events: Most SSLs moved southward in the meridional direction. No wind data are available for four events out of the 36 events. Based on comparison of the velocities, we have found that 28 out of 32 events (88%) are likely classified to be advection events, while 4 events are left for candidates of in-situ generation events.
We have evaluated generation mechanisms for “in-situ" events. The event observed on January 21, 2015 is categorized as such an “in-situ" event. The SSL for the night appeared around 21.3 UT and lasted for about 3 hours at the five directions. Time-height development of the SSL is similar at five directions: A high sodium density region gradually moved down from 103 km to 97 km as time went by. Favoured wind directions are observed where the SSL appeared: Westward/northward winds can derive sodium ions downward. Furthermore, southward E-field existed for the interval, and could drive sodium ions downward. The winds and the E-field must play a major role to generate the SSL. We will summarize observational results, and discuss generation mechanisms of SSLs.