

Simultaneous observation of sodium layer and lower ionosphere using sodium lidar and EISCAT radar

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In order to obtain better understanding on coupling process between neutral atmosphere and ionosphere in the polar region, we have conducted simultaneous observations of sodium layer and lower ionosphere using a sodium lidar (which was newly installed in early 2010) and EISCAT radar at Tromsø, Norway (69.6 deg N, 19.2 deg E) since October 2010. In the presentation, we will report recent results of the simultaneous observations, in particular focusing on the following two issues. (1) It is considered that atmospheric gravity waves (AGWs) play an important role not only in the mesosphere but also in the thermosphere/ionosphere. However it is well unknown the AGW propagation process from the mesosphere to the thermosphere through the mesopause. Using sodium lidar data at 80-110 km and EISCAT radar data above 100 km, we investigate upward propagating AGWs in the sodium layer and traveling ionospheric disturbances (TIDs) in the lower ionosphere. (2) Relationship between auroral particle precipitations and sodium layer variations is a mysterious subject, although there are a few previous studies on this issue. For example, a previous study reported sodium density decrease during a geomagnetic active period, while another study pointed possibility of sodium density increase due to auroral particle precipitations. We investigate relationship between electron density (i.e. auroral particle precipitations) and sodium density variations based on the simultaneous observations by EISCAT radar and sodium lidar. Furthermore, we will discuss on relationship between auroral particle precipitations and neutral temperature variations.

Keywords: Sodium lidar, EISCAT radar, Polar region, Mesosphere, Lower thermosphere, Lower ionosphere