

Study on pulsating aurora-induced sodium density variation: high-speed sodium lidar observation

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We have been made observations of the sodium density, neutral temperature and wind velocity in the polar MLT region since October 2010 by a sodium lidar installed at Tromsø, Norway. By using the sodium lidar together with EISCAT radars, MF radar, meteor radar, FPI, and aurora imagers, we have studied and reported several results, such as the upward propagating gravity wave, the comparison of the neutral temperature and ion temperature, and the generation mechanism of the sporadic sodium layer, whose time scale are a few minutes to several hours.

Energetic electrons, which can be the source for the pulsating aurora, release their energy by collision with neutral particles below 100 km. The periods of the pulsating aurora are seconds to sub-seconds. This implies that the neutral atmosphere may change in the similar time scales in terms of composition, temperature, and wind velocity by the energy input from the energetic particles. To date, however, there are no observations of the neutral atmosphere in these time scale at polar region as far as we knows. Thus, the high-speed observation would be essentially important for understanding in the neutral atmospheric response during the pulsating aurora.

In this study, we have been made an upgrade in the data recording and laser control system for the Tromsø sodium lidar system. We have installed the new recording system in January 2016, and already started test observations. Currently, we are successful to make the sodium density observation with time resolution of seconds to sub-seconds. In this presentation, we will introduce the high-time resolution data in the sodium density obtained from January to March 2016.

Keywords: sodium lidar, pulsating aurora