

Upgrade plan of an injection seeded, laser diode-pumped Nd:YAG laser-based sodium lidar

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The polar mesosphere and lower thermosphere (MLT) region is a complex and important region, here the neutral atmosphere and ionospheric plasma interact, and the region is coupled with the lower atmosphere as well as the ionosphere. In order to advance our knowledge on the coupling between the neutral atmosphere and the ionosphere greatly, it is essential to measure relevant neutral and ionospheric physical parameters simultaneously. In March 2010, we launched lidar observations with a sodium temperature/wind lidar at EISCAT radar site in Tromsø (69.6°N, 19.2°E). Using the sodium lidar and the EISCAT radar, we are able to carry out simultaneous and common volume observations of fundamental neutral and ionospheric parameters, i.e. temperatures and radial velocities of neutral and ions, in the high-latitude MLT region.

In this talk we present an injection seeded, laser diode-pumped Nd:YAG laser-based sodium lidar in detail. The lidar is robust, maintenance-free system for temperature and wind measurements in the MLT. The current observation mode is (1) Na density, temperature, zonal and meridional wind observation, (2) five-direction (zenith, north, south, east, west) observation, (3) nighttime observation in Polar region, with time resolution of 6 minutes. Now we are planning to expand the capability for (1) higher time resolution (a few seconds) observation with an improvement of acoust-optic frequency shifter, (2) vertical wind observation with precise laser frequency locking, (3) daytime observation with a robust Na Faraday filter. Details of these upgrades are discussed.