波長可変共鳴散乱ライダーにおける送信レーザ周波数モニタシステムの開発 ～極域MLT領域の鉛直風観測を目指して～

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Development of laser-freq. monitoring system for a resonance scattering lidar -To measure vertical wind in the polar MLT region-

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Large perturbations of vertical winds associated with aurora activities had been observed not only in the upper thermosphere but also in the lower thermosphere with Fabry-Perot interferometers (FPIs). However, passive observations such as FPI measurements do not provide the distance to the observation targets. Vertical distribution of vertical wind in the mesosphere and lower-thermosphere (MLT) region is still under investigation. We are developing a new resonance scattering lidar system as a part of a prioritized project of the Antarctic research observations to profile dynamical parameters such as temperature and wind, as well as minor constituents. The lidar system has a frequency-tunable Alexandrite laser as a transmitter. Vertical wind profiles can be potentially measured by the lidar if the accurate laser frequency is monitored each measurement. Our seeder-laser frequency is well tuned by a calibration using potassium vapor cell while the Alexandrite laser frequency shifts slightly toward higher frequency from the seeder-laser. So, we are developing a monitoring system of the differences between two laser frequencies determined using optical heterodyne method; Alexandrite pulsed laser is combined with continuous-wave (CW) seeder-laser in a optical fiber, and the resulting mixing product (beat signal) is then detected by a photo-diode. In this presentation, we introduce the monitoring system in detail and discuss a possibility of vertical wind measurements using some results of test observations in Japan.