

カリウム共鳴散乱ライダーによる3周波温度観測のための最適観測周波数の検討

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Examination of optimum frequencies for 3-frequency measurement by potassium resonance scattering lidar

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Mesopause region is a boundary of neutral atmosphere and ionospheric plasma. They interact with each other and are exchanging energy, momentum, and substance through atmospheric wave activities, meteor showers, precipitation of energetic particles during magnetic storms in the polar region, and so on. However, quantitative interactions are still under investigation. Because observation is poor especially in the Antarctica, we are developing a new resonance scattering lidar system with multiple wavelengths and plan to install and operate it at Syowa (69S), Antarctica. The lidar will measure temperature profiles using resonance scatter of atomic potassium (K) and density variations of minor constituents such as atomic iron (Fe) and K, calcium ion (Ca^+), and aurorally excited nitrogen ion (N_2^+). In our lidar system, laser frequencies are tuned in to the resonance frequencies by a wavemeter. The wavemeter is well calibrated using a frequency-stabilized laser. However, we still need some calibration of laser frequencies because the frequency-shift is a major cause of temperature error. We apply three-frequency wind measurement method [She and Yu, 1994] and measure temperature profiles and calibrate laser frequencies, simultaneously. In this study, we examine optimum frequencies in order to observation and concurrent calibration by the three frequency measurements with a K resonance scattering lidar.