南極昭和基地の共鳴散乱ライダーシステム: K 原子層の国内試験観測

江尻 省 [1]; 津田 卓雄 [1]; 西山 尚典 [1]; 阿保 真 [2]; 川原 琢也 [3]; 中村 卓司 [1]
[1] 極地研; [2] 首都大・システムデザイン; [3] 信州大・工

Resonance scattering lidar system at Syowa Station in Antarctica: Test observations of K atom layer in Japan

Mitsumu K. Ejiri[1]; Takuo Tsuda[1]; Takanori Nishiyama[1]; Makoto Abo[2]; Takuya Kawahara[3]; Takuji Nakamura[1]
[1] NIPR; [2] System Design, Tokyo Metropolitan Univ.; [3] Faculty of Engineering, Shinshu University

A new resonance scattering lidar system with tunable wavelengths is developed to be installed and operated at Syowa (69S, 36E), Antarctica. The lidar transmitter is based on injection-seeded, pulsed alexandrite laser for 768-788 nm (fundamental wavelengths) and a second-harmonic generation (SHG) unit for 384-394 nm (second harmonic wavelengths). The laser wavelengths are tuned in to the resonance wavelengths by a wavemeter that is well calibrated using a wavelength-stabilized He-Ne laser. The new lidar has capabilities to measure density variations of minor constituents such as atomic iron (Fe, 386 nm), atomic potassium (K, 770 nm), calcium ion (Ca^+, 393 nm), and aurorally excited nitrogen ion ($N_2{}^+$, 390-391 nm) and temperature profiles in the mesosphere and lower thermosphere (MLT) region using resonance scatter of K. Currently, the fundamental laser pulses are transmitted with approximately 120-160 mJ/pulse at 25 Hz (i.e., ˜3-4 W) and the backscattered signal is received with a 35 cm diameter telescope. We have started test operation to measure K density profiles at National Institute of Polar Research in Tachikawa (36N, 139E). According to the test observations, peak densities of K layer were approximately $10x10^7$ m^{-3} and ˜$4x10^7$ m^{-3} in winter (January and February) and in early summer (May), respectively. In this study, we will show the test observation results and discuss seasonal dependencies of the K layer and nightly variations of the K densities.