Time and height variability of Fe-layer in the Mesosphere and the Lower Thermosphere region at NIPR (36N, 140E)

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The National Institute of Polar Research (NIPR) is leading a six year prioritized project of the Antarctic research observations since 2010. One of the sub-projects is entitled 'the global

environmental change revealed through the Antarctic middle and upper atmosphere'. As a part of the sub-project, a Rayleigh/Raman lidar (RR lidar) was installed at Syowa, Antarctica (69^{o}S, 39^{o}E) in

January, 2011. The operation has been conducted since February 2011 and the RR lidar has kept measuring temperature profiles continuously between approximately 10 and 80 km for almost 3 years.

In order to extend the height coverage to include the mesosphere and the lower thermosphere (MLT) region, a new resonance scattering lidar system with tunable wavelengths lasers has been developed at NIPR in Tachikawa (35.7^{o}N, 139.4^{o}E).

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 into the resonance wavelengths by a wavemeter that is calibrated and validated using a wavelength-stabilized He-Ne laser and a potassium vapor cell for doppler-free spectroscopy. This 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 nitrogen ion ($N_2{}^+$:390, 391 nm) and temperature profiles in the MLT region. It can also estimate temperature profiles from the upper Stratosphere to the lower mesosphere using signals of Rayleigh scattering.

In this presentation, we will present time and height variability of Fe-layer in the MLT region. In addition, dynamical and/or chemical response to Sudden Stratospheric Warming and sporadic E-layer in the MLT region are also discussed.