

Gravity waves in the middle atmosphere over Syowa Station, the Antarctic (69S, 40E), observed with ground-based optical observations

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Gravity waves over the Antarctic from the ground up the lower thermosphere have not yet observed sufficiently, and our knowledge is quite limited. This paper will report the gravity waves observed with our Antarctic observation in Syowa station (69S, 40E) in recent years, focusing on the results from ground-based optical instruments such as a lidar and airglow imagers.

JARE (Japanese Antarctic Research Expedition) has been carrying out a six year prioritized project of the Antarctic research observations since 2010. One of the sub projects is on the precise profiling of Antarctic middle and upper atmosphere from the ground by radio and optical observations at Syowa, in the Antarctic. During this project, intensive observation using a Rayleigh/Raman lidar (installed in early 2011) between 10 and 80 km altitude, and an all-sky airglow imager around the mesopause region. The lidar observed temperature profiles, including upper troposphere and above tropopause due to Raman scatter channel. Ep (potential energy) profiles of gravity waves are analyzed for years providing altitude and seasonal variations. The airglow imager observed sodium airglow at around 90 km, in order to avoid strong aurora emission contamination at Syowa, located in the middle of auroral zone. Horizontal propagation characteristic of gravity waves have been analyzed using a new 3-D spectral analysis technique. Observed results are further investigated with radar and re-analysis data results, for discussing their source and propagation through the middle atmosphere.

We also introduce the upgrade plan of our system for next 6 year project between 2016 and 2022.

Key words: gravity wave, Antarctic, lidar, airglow imaging,