Propagation characteristics of mesospheric gravity waves over Syowa and Davis, the Antarctic, using OH airglow imager and MF radar

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Gravity waves transport their momentum and energy from the lower atmosphere to the upper atmosphere and cause the meridional circulation [Fritts and Alexander, 2003]. A modern practical forecast model poorly resolve the gravity waves, because the gravity waves are smaller than a horizontal resolution of the model; the gravity waves are parameterized in the model. However, the parameterizations do not completely represent the effect of the gravity waves. In particular, We have poorly understood their energy and phase speed over the Antarctic (e.g. Garcia et al. [2016] point out that the modern parameterizations could underestimate the gravity wave energy by 25%), because the observation studies are few. In order to show the structures of gravity waves over Syowa, we have observed the gravity waves over Syowa (69°S, 40°E) using some instruments (e.g., lidar, OH imager and MF radar). In recent years, we also compared the gravity waves over Syowa and Davis (69°S, 79°E), which has similar terrain and meteorological condition to Syowa, to show their horizontal variation. Consequently, we found that their vertical variation was different between the two stations using our lidar [Kogure et al., 2017] and their propagation direction was different using our airglow imagers (but during only one month) [Matsuda et al., 2017]. Wind filtering or a larger scale source hardly cause the differences, and to reveal this unknown factor is need.
We analyzed the OH airglow imager data in 8 months (from March to October in 2016) over two stations by using Matsuda transform [Matsuda et al., 2014] in order to investigate propagation directions of gravity wave around 86 km altitude.
Consequently, we found the power over Syowa was larger than that over Davis in September, and the gravity waves with ~10 - 80 m/s southward phase speed over Syowa enhanced in the same month.

In this presentation, we will show the phase speed spectrum over the two stations derived from OH imagers, and also discuss the difference of the grand-based horizontal phase speed and their cause. In addition, we will show the kinetic energy and propagation direction of gravity waves derived from MF radar, and will compare between the results of OH imager and MF radar.