Comparison of Gravity Wave Activity in the Mesosphere Observed by OH Airglow Imagers and MF Radars over the Antarctic (Syowa & Davis).

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Gravity waves transport momentum and energy from the lower atmosphere to the upper atmosphere and drive the general circulation, which significantly changes the temperature in the middle atmosphere [Fritts and Alexander, 2003]. To understand this role quantitatively will improve the modern general circulation models [Garcia et al., 2017].

The polar night jet region is known to have high gravity-wave activity. However, sources of gravity waves, their propagation, and their spectra are poorly understood because of a lack of observations. In particular, little is known about the dependence of their characteristics on their spectra (i.e., wavenumber and frequency) and on interactions among waves with several wavenumbers and frequencies [Fritts and Alexander, 2003]. To understand these, our group has observed gravity waves at different sites over the Antarctic.

Observation techniques have limitations due to the breadth of the gravity wave spectrum and the target and physical parameter sensed by the observing system [Alexander et al., 1998]. In this study an OH imager and an MF radar are used. Both instruments cover the OH layer (~87 km altitude), but both cover quite different ranges of the wave spectrum. The OH imager can observe waves with shorter ground-based periods (8-60 min) and shorter horizontal wavelengths (2-100 km) [Matsuda et al., 2017]. On the other hand, the MF radar can observe waves with the longer ground-based periods (>~30 min). It also has a preference for the waves with longer horizontal wavelength because of its observational volume.

This study derives gravity-wave perturbations, over Syowa and Davis, from the OH imager data based on Matsuda et al. [2014] and the MF radar data based on Murphy et al. [2007], respectively. In this presentation, we would like to show the gravity wave activity, over Syowa and Davis, with the shorter horizontal wavelength (i.e., observed by the OH imagers) and with the longer horizontal wavelength (i.e., observed by the MF radars). The correlation and relationship between both wave activities will be discussed. Also, we would like to discuss the local variation of that relationship.

Keywords: Gravity Wave, Middle Atmosphere, OH Imager

