Study of interannual gravity wave in the middle atmosphere over Syowa using Rayleigh/Raman lidar

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Gravity waves have important roles in transporting energy and momentum between the lower and upper atmosphere [Lindzen, 1981; Holton, 1982; Matsuno, 1982]. Their momentum deposition induces a meridional circulation from the summer pole to the winter pole, and the circulation makes the stratospheric temperature distribution in summer and winter away from radiative equilibrium. However, we have not completely known the quantification of gravity wave roles in the middle atmospheric circulation, especially Antarctic. A Rayleigh/Raman (RR) lidar was installed in January 2011 at Syowa Station, Antarctica (69˚S,40˚E). The lidar has measured temperature profiles between 10 and 80 km since February 2011.
In this study, we investigated monthly mean gravity wave potential energy (*Ep*) in the height range of 15-70 km from May 2011 to October 2015 except for November, December and January. The number of nights used for this analysis is 360 nights in five years. Above 30km altitude, *Ep* was maximized during winter in the each year. The seasonal dependence of *Ep* over Syowa was similar to *Ep* over Davis (69˚S,79˚E) [Alexander et al., 2011; Kaifler et al., 2014] and McMurdo (78˚S, 167˚E) [Lu et al., 2015]. We also investigated the the interannual variation of *Ep* in each year, and the variation was ±40%. However, the *Ep* in August of 2014 was 3 times larger than that in August of the other years above 40 km altitude. We also compared the *Ep* with the location of the polar night jet according to Nash et al. [1996]. The comparison shows that the polar night jet existed over Syowa in August of 2014 and suggests that GWs from the polar vortex could contribute to *Ep* in August of 2014.
In this presentation, we will discuss the interannual variation of *Ep* and the contribution of the polar night jet.

キーワード：中層大気、ライダー、重力波、南極域
Keywords: middle atmoshre, lidar, gravity wave, Antarctic

