

Analysis of gravity waves observed by airglow imaging at Syowa Station (69S,39E), Antarctica

Takashi Matsuda^{1*}, Takuji Nakamura², Mitsumu Ejiri², Masaki Tsutsumi², Kazuo Shiokawa³, Shin Suzuki³, Yoshihiro Tomikawa²

¹The Graduate University for Advanced Studies, ²National Institute of Polar Research, ³Solar-Terrestrial Environment Laboratory, Nagoya University

Atmospheric gravity waves (AGWs), which are generated in the lower atmosphere, transport significant amount of energy and momentum into the mesosphere and lower thermosphere and cause the mean wind accelerations in the mesosphere. This momentum deposit drives the general circulation and affects the temperature structure. Airglow imaging is a useful technique for investigating the horizontal structures of AGWs at around 90 km altitude. However, observations of airglow imaging in Antarctica are very limited because of lack of observation sites. The Japanese Antarctic Research Expedition (JARE) has operated airglow imagers at Syowa Station (69S, 39E), Antarctica in 2002 and between 2008 and 2012.

Statistical analysis of image data in 2011 was performed. Observation was carried out from March to September at 139 nights, out of which 71 nights were with clear sky. We picked up 81 wave events in sodium images. Horizontal characteristics such as propagation directions, phase speeds, wavelengths, and observed periods were determined. Distributions of horizontal wavelength and observed period were similar to those obtained by imaging observations at middle and low latitudes, but the distributions of propagation direction and horizontal phase speed showed zonal anisotropy and seasonal variation.

The observed waves propagating eastward had faster phase speed (0m/s -150m/s) than those propagated westward (0m/s -60m/s) and faster waves (30m/s -150m/s) were only observed in July and August. The zonal anisotropy of the phase velocity distribution could be explained if wave sources are located at the eastward wind such as stratospheric polar night jet.

We will report analysis of the data in 2012 and discuss inter-annual variation of the phase velocity distribution and analysis using spectral techniques.

Keywords: atmospheric gravity wave, airglow imaging