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

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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. Among many parameters to characterize AGWs, horizontal phase velocity is very important to discuss the vertical propagation. Airglow imaging is a useful technique for investigating the horizontal structures of AGWs at around 90 km altitude. Recently, there are many reports about statistical characteristics of AGWs observed by airglow imaging. However, it is difficult to compare these results obtained at various locations because each research group uses its own method for extracting and analyzing AGW events. In order to deal with huge amounts of imaging data obtained on different years and at various observation sites, without bias caused by different event extraction criteria for the observer, we have developed a new statistical analysis method for obtaining the power spectrum in the horizontal phase velocity domain from airglow image data. This method was applied to the data obtained at Syowa Station, Antarctica, in 2011 and compared with a conventional event analysis in which the phase fronts were traced manually in order to estimate horizontal characteristics. This comparison shows that our new method is suitable for deriving the horizontal phase velocity characteristics of AGWs observed by airglow imaging technique.

We plan to apply this method to airglow imaging data observed at Syowa Station in 2002 and between 2008 and 2013, and also to the data observed at other stations in Antarctica (e.g. Rothera Station (67S, 68W) and Halley Station (75S, 26W)), in order to investigate the behavior of AGWs propagation direction and source distribution in the MLT region over Antarctica. In this presentation, we will report interim analysis result of the data at Syowa Station.

Keywords: atmospheric gravity wave, airglow imaging