

Wide-area gravity wave observation by ground-based airglow-imaging in Antarctica: The Antarctic Gravity Wave Instrument Network

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Gravity waves have long been known as a key driver of the general circulation and temperature structure of the lower, middle and upper atmosphere through their ability to transport large amounts of energy and momentum upwards from copious tropospheric sources. Recent understanding of the effects of gravity waves within the troposphere, middle atmosphere and coupled thermosphere/ionosphere system has been significantly improved by theoretical, observational and modeling studies, and their global importance for modeling our atmosphere and its climate has been demonstrated. However, the contributions from gravity waves at polar latitudes are not well understood, due primarily to a paucity of measurements. The ANGWIN is a 'grass roots' international program initiated by a group of scientists focusing on Antarctic research with a goal of developing and utilizing a network of airglow imagers (and other instruments) located at established research stations around the continent. In particular, ANGWIN seeks to quantify the characteristics of mesospheric gravity waves, their dominant sources, propagation and breaking/dissipation over Antarctica to gain new knowledge of their large 'continental-scale' effects on the general circulation of the middle and upper atmosphere.

Currently, ANGWIN includes nine stations (Halley (UK), Rothera (UK), South Pole (US), McMurdo (US), Syowa (Japan), Davis (Australia), Scott Base (New Zealand), Sanae (South Africa), Comandante Ferraz (Brazil)). All-sky airglow imagers have been operated at seven stations among them. The 1st ANGWIN meeting was held in March 2013 at NIPR, Tokyo, Japan, to facilitate the exchange of airglow imaging and other instruments' data. The unification of analysis methods, including the way of extracting gravity wave events, was discussed. The potential for including space-based observations is also being investigated; the southern limit of ISS-IMAP (Ionosphere, Mesosphere, upper Atmosphere, and Plasmasphere mapping) observation area is located at the edge of the field-of-view of the ANGWIN. Therefore, it is expected that the global distribution of gravity waves in the low and mid latitudes observed by ISS-IMAP will provide useful clues for investigation of sources, propagation and breaking/dissipation of gravity waves over Antarctica.