

**GRAVITY WAVES IN THE ANTARCTIC LOWER STRATOSPHERE OBSERVED WITH SUPERPRESSURE BALLOONS**

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Small-scale atmospheric gravity (buoyancy) waves play an important role in determining the state of the atmosphere and in climate, including the formation of the Antarctic ozone hole. Incorporating gravity wave effects in numerical climate models is a significant challenge. Superpressure balloons have the unique capability of behaving as quasi-Lagrangian tracers in the lower stratosphere. Drifting at heights near 20 km they measure pressure, temperature and wind fluctuations with good time resolution. Long duration flights ensure a wide coverage in latitude and longitude. Datasets acquired by such balloons are particularly well suited to study gravity wave parameters and their spatial and temporal variability in ways that cannot be achieved using other techniques.

Starting in September 2005 a sequence of 27 superpressure balloons were progressively launched from McMurdo station (78S, 160E) as part of the STRATEOLE-VORCORE initiative. The southern hemisphere lower stratosphere was sampled between 40S and the pole. Some balloons had flight durations of over 3 months and, in total, the balloons travelled several million km. This very extensive data set provides an unprecedented view of gravity wave activity and its variability. A number of important wave parameters can be derived from these observations. One particularly novel result is the estimation of the distribution of the vertical flux of zonal momentum as a function of ground-based phase speed, the distribution most required by climate models. The large number of observations enables the flux to be related to various wave sources. The techniques used to analyse the results will be described and the results compared with a smaller set of balloon observations made in the Arctic lower stratosphere.