Gravity waves in models and observations over Antarctica and the Southern Ocean

Damian J. MURPHY[1], Simon P. ALEXANDER[1], Peter T. LOVE[1],
Andrew R. KLEKOCIUK[1], Greg ROFF[2] and Anne K. SMITH[3]

[1] *Australian Antarctic Division, Kingston, Australia*
[2] *Bureau of Meteorology, Melbourne, Australia*
[3] *National Center for Atmospheric Research, Boulder, USA*

Observations and modelling of our whole atmosphere show that, despite common physical processes, there are significant differences between the hemispheres. Notable among these is the springtime stratospheric ozone depletion that has occurred with greater intensity in the southern hemisphere since the mid-1980s.

The dynamical consequences of the ozone hole extend beyond Antarctica through its influence on the Southern Annular Mode. Illustrating the role the stratosphere can play on surface climate, these changes to the polar stratosphere also act as a harbinger of future change in world of increased carbon dioxide concentrations.

Modelling studies have sought to simulate both the ozone hole and its impact on weather and climate, but they are stymied by the so called 'cold-pole problem' where dynamical heating associated with the Brewer-Dobson circulation is too weak in the southern-hemisphere polar stratosphere. This prevents the ozone chemistry from being correctly simulated, with flow-on consequences for the model dynamics. The wave forcing that drives this circulation is seen to be too weak due to shortcomings of the parameterization of gravity waves in the models.

The importance of bringing observations of gravity waves and their representation in models closer together is now recognized. Japan and Australia both have a long history of observations and collaboration in the Antarctic region. In the Australian context, MST radar, MF radar and radiosonde data have been explored and high-resolution modelling studies are underway. In this talk, recent observations of gravity waves from Antarctica and Macquarie Island will be presented and discussed through the prism of model parameterization schemes such as that used in WACCM.

Key words: gravity waves, observations, modelling, southern hemisphere