Interim report on state of the Arctic winter stratosphere 2007/08

(7th February 2008)

The Arctic polar stratosphere cooled down as usual in November / December 2007 as the Arctic vortex grew in strength. By mid-December temperatures at 10 hPa were below those necessary for Polar Stratospheric Clouds to form, an unusual occurrence at these altitudes - the observed temperatures were among the lowest in the 50 year record. At lower altitudes the temperatures were not so unusual though they were slightly below average. These cold conditions have, however, been sustained: the PSC formation temperature was reached at the start of December and the minimum temperatures inside the vortex have remained below it ever since indicating the potential for PSC existence for all of the last two months. PSCs have indeed been observed above several ground stations in the Arctic. Despite some transient warming going in recent days, according to the meteorological forecasts the vortex will remain cold and stable for at least the next week or so.

The accumulated volume of PSCs to date this winter is already now unusually large and it may grow further if the cold conditions are sustained. This current winter is generally consistent with the tendency of the cold winters becoming colder in recent years, although overall the average stratospheric temperatures over the Arctic have remained the same or even warmed. In other words it appears that the range (variability) of the observed temperatures has increased. The reasons for this are not yet clear, though SCOUT-O3 scientists are investigating the possibility of a link to climate change.

The volume of PSCs shows a tight, empirical relation to the amount of ozone loss in the Arctic vortex if it survives until the end of March. Assuming that this relation holds for the current winter and that the vortex is stable for the next few weeks, there is clearly the potential for large ozone losses in the Arctic vortex this winter. In these circumstances, the volume of PSCs observed to date indicates the potential for an overall loss of more than 20% in the column amount of ozone by the end of March. The longer the vortex remains cold enough for PSCs to be present, the larger that loss is likely to become.

The ozone loss is being measured using ozonesondes by an international group of scientists in the SCOUT-O3 coordinated Match programme. No results are available to date (and anyway the losses are expected to have been small due to the small amount of sunlight in the Arctic). A second interim report will be made in 2-3 weeks.

Prepared on behalf of SCOUT-O3 scientists by Neil Harris (U. Cambridge), Markus Rex and Peter von der Gathen (AWI-Potsdam).

SCOUT-O3 is a 5 year project receiving 15 million euros from the European Commission Research DG's Global Change and Ecosystems Programme and a similar amount of associated funding from national agencies. More information on the SCOUT-03 project can be found at: www.ozone-sec.ch.cam.ac.uk.

National funding agencies support considerable research and monitoring activity in the Arctic region. Without this support, these summaries would not be possible.