The Arctic winter 2010/11 as observed by GOME-2 and SCIAMACHY and its relation to dominant modes of interannual climate variability

R Hommel (1), K-U Eichmann (1), C von Savigny (1), M Weber (1), A Rozanov (1), A Richter (1), K Bramstedt (1), F Wittrock (1), S Noel (1), J Aschmann (1), J P Burrows (1), H F Graf (2), and F Khosrawi (3)

(1) University of Bremen, Institute of Environmental Physics, Bremen, Germany (rene.hommel@iup.physik.uni-bremen.de), (2) University of Cambridge, Centre for Atmospheric Science, Cambridge, UK, (3) Stockholm University, Department of Meteorology, Stockholm, Sweden

Arctic winter-spring ozone losses in the stratosphere exhibit a large inter annual variability, emphasising that planetary wave driving largely controls magnitude as well as timing of chemically-induced losses in the stratosphere by a maintaining the strength of the polar vortex. In the course of implementing the Montreal Protocol, the release of anthropogenic long-lived ozone depleting substances into the atmosphere was greatly reduced, so that ongoing observations of stratospheric ozone suggest that the declining trend in the global ozone abundance is being reversed. However, through their long-lived nature, the reservoir of ozone killers in the upper atmosphere remains large so that one may expect that those substances may also force severe ozone losses in necessarily cold polar vortices in near future.

In this work, we present a comprehensive compilation of SCIAMACHY/ENVISAT stratospheric trace gas (O_3, BrO, NO_2, OClO) and PSC observations during winter 2010/2011. We compare this situation of the Arctic stratosphere with that during precedent boreal winters within the SCIAMACHY period. Furthermore, we show that severe ozone losses over the Arctic are clearly associated with a characteristic evolution of the planetary wave activity in the stratosphere before and during the formation of the polar vortex, and show that this mode predominated establishes when La Niña occurred in precedent summer month.