Record Arctic ozone loss in 2011

In March 2011 the satellite instruments SCIAMACHY and GOME-2 measured the lowest ozone values above the Arctic since the start of the European data record in 1995. The origin of the strong ozone losses are very low temperatures in the stratosphere (about 20 km altitude) that release chlorine and bromine atoms from the chlorofluorocarbons (cfc) and related brominated substances emitted by humans and catalytically destroy ozone. The measurements by SCIAMACHY confirm high chlorine activation in March 2011.

Stratospheric temperatures in the Arctic are very variable from winter to winter. Last year temperatures and ozone above the Arctic were very high. The year-to-year variability is related to the global upper atmosphere circulation. In winters with a strong circulation more ozone is transported into high latitudes and polar stratospheric temperatures are getting higher resulting in less polar ozone depletion.

In the science community there is currently a debate on why just this Arctic winter was very cold. In a changing climate, it is expected that on average stratospheric temperatures cool which means more chemical ozone depletion will occur. On the other hand many studies show that the stratospheric circulation in the northern hemisphere may be enhanced in the future and consequently more ozone will be transported from the tropics into high latitudes and reduce ozone depletion. The measures by the Montreal protocol banning cfc's and related species have succeeded in that the stratospheric halogen (chlorine and bromine) load is now slowly declining. Nevertheless strong chemical ozone depletion will still occur during unusually cold Arctic winters in coming decades.

The Institute of Environmental Physics of the University of Bremen (IUP) is routinely processing satellite data from GOME (since 1995), SCIAMACHY (since 2002), and GOME-2 (since 2007). IUP has initiated the GOME and SCIAMACHY projects. Spectral data from the satellite instruments are provided by ESA (GOME/ERS-2, SCIAMACHY/Envisat) and EUMETSAT (GOME-2/Metop-A). Calculations using a chemistry-transport model at IUP have shown that about half of the Arctic ozone has been chemically depleted during this winter.

Contact:

Dr. Mark Weber
Institut für Umweltphysik
Universität Bremen FB1
Tel 0421/218-62080
weber@uni-bremen.de

Dr. Andreas Richter
Institut für Umweltphysik
Universität Bremen FB1
Tel 0421/218-62103
richter@iup.physik.uni-bremen.de

Prof. John P. Burrows
Institut für Umweltphysik
Universität Bremen FB1
Tel 0421/218-62100
burrows@iup.physik.uni-bremen.de