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Ozone depletion events over the Weddell Sea, Antarctica observed between August and October 2006

Elena Stautzebach (1,4), Andreas Richter (2), Henning Kirk (3), and Hans-Werner Jacobi (1)

(1) Laboratoire de Glaciologie et Géophysique de l'Environnement, CNRS/Université Joseph Fourier, Grenoble, France, (2) Institute for Environmental Physics, University of Bremen, Bremen, Germany, (3) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany, (4) Institut für Meteorologie und Geophysik, Universität Wien, Vienna, Austria

So-called ozone depletion events (ODE) have been investigated since their first appearance in the mid 1980s. They are characterized as drops of ozone in the boundary layer in a timescale of minutes to several days and have mostly been observed in polar regions. Chemical catalytic cycles known as the "bromine explosion" generate reactive bromine atoms that destroy surface ozone and lead to an increase of the BrO vertical column. These chemical reactions are linked to sea ice-covered regions as well as insolation and are limited to the springtime in both polar regions. ODEs have already been well-probed in the Arctic Ocean. However in Antarctica only ozone concentrations observed at coastal and inland sites have so far been analysed. During a cruise with the German Research Vessell Polarstern ozone investigations were performed for the first time in the north-western Weddell Sea. Several meteorological parameters were recorded as well. Furthermore a 2-channel multiaxis DOAS (Differential Optical Absorption Spectroscopy) instrument allowing the detection of BrO was installed onboard and data from the SCIAMACHY (SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY) sensor were used. The entire data set was analysed to investigate the connection between ozone concentrations, prevailing meteorological conditions, and BrO vertical columns during ODEs in the Weddell Sea. During the cruise four ODEs were recorded. The investigations allowed a distinction between chemically and meteorologically induced ozone depletion events. The meteorologically induced ODEs were characterized by the advection of air masses already depleted in ozone. Using backward-trajectories, the origin of the depleted air masses was detected. The simultaneous increase of BrO and decrease of ozone indicates that the ODEs measured onboard were in fact activated by the presence of Br in the atmosphere. In the majority of cases, the chemical reactions destroying ozone took place over the Central Weddell Sea. In most cases, enhanced BrO vertical columns were observed simultaneously in the same region. Finally the role of low pressure systems in generating BrO was analysed. High wind speeds favoured the turbulent mixing and, therefore, the increase of salinity and reactive bromine atoms in the boundary layer. Since low pressure systems are often accompanied by high wind speeds, a link between low pressure systems and enhanced BrO vertical columns is proposed.