IRS2012-527
International Radiation Symposium 2012
Dahlem Cube, Berlin, Germany, 06 – 10 August 2012


# 15 years of stratospheric Nitrogen Dioxide and Ozone measurements in Antarctica

D. Bortoli (1,2), M.J. Costa (1,3), P.S. Kulkarni (1), M. Antón (1,4), F. Ravegnani (2), G. Giovanelli (2), A.M. Silva (1,3)

(1) Évora Geophysics Centre - University of Evora (CGE - UE), Rua Romão Ramalho, 59, 7000 Évora. Portugal., (2) Institute for Atmospheric Science and Climate - National Research Council (ISAC - CNR), Via Gobetti 101, 40129 Bologna, Italy, (3) Department of Physics, University of Evora, Rua Romão Ramalho, 59, 7000 Évora. Portugal., (4) Departamento de Física Aplicada, Universidad de Granada and Centro Andaluz de Medio Ambiente (CEAMA), Granada, Spain

For the study the chemical composition of the Antarctic stratosphere and the denitrification processes during the Ozone Hole period, a ground based DOAS spectrometer developed at the ISAC-CNR Institute was modified for unattended and automatic measurement in extreme high-latitude environment. The GASCOD (Gas Analyzer Spectrometer Correlating Optical Differences) was installed at the Mario Zucchelli Antarctic Station - 74.69S, 164.12E - on December 1995.
The application to the spectral data of the DOAS (Differential Optical Absorption Spectroscopy) algorithms coupled with a Radiative Transfer Model (RTM) for the computation of the Air Mass Factor (AMF), allows for the retrieval of the total content of the main absorber in this spectral range, namely nitrogen dioxide ($NO_2$). Moreover, the application of sophisticated inversion schemes to the output of the DOAS program, using the AMF matrix as the kernel of the inversion algorithm, permits the determination of the vertical distribution of the above mentioned compound. The full dataset of the spectral data obtained with GASCOD during the period 1996-2011, was re-analyzed with a modified version of the software tool previously utilized. Even if the spectral range examined with GASCOD is not the most favorable for the ozone total column and vertical profile retrieval, the re-processing of the spectral data allowed for the determination of the total ozone columns (TOC). The uncertainties range from 4% to 8% for ozone and 3% to 6% for $NO_2$. The peculiar features of the seasonal variation of $NO_2$ total columns (i.e. the normal decreasing during the austral fall and the irregular growing towards the summer month) are presented and discussed. The relationships of $NO_2$ vertical column with total ozone and meteorological and physical parameters, such as potential vorticity, stratospheric temperature and sunlit time, are analyzed.The confirmations of the significant declining of the ozone total columns during the 'Ozone Hole' periods (mid-August to mid-October) are reported. The vertical distributions obtained for the preceding atmospheric compounds are shown and examined.