Ozone Profiles Retrieval: Intercomparison between Neural Networks Inversion and Other Estimation Techniques

M. Iapaolo[1], **F. Del Frate**[1], **and S. Casadio**[2]

[1]Università di Roma Tor Vergata, Italy
[2]Karl Franzens University of Graz, Italy

The Global Ozone Monitoring Experiment (GOME) is a nadir-viewing broadband spectrometer (240–790 nm) of moderate resolution (0.2–0.4 nm) on board the European ERS-2 spacecraft which has been operational since mid 1995. Its measurements allow the retrieval of global distributions of ozone and a number of chemically associated atmospheric trace gases, such as NO_2, BrO, $HCHO$, $OClO$ and SO_2. GOME is the first in a series of European space-borne ozone monitoring instruments; it has been followed by the SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY (SCIAMACHY) on Envisat (2002) and by the Ozone Monitoring Instrument (OMI) on EOS-Aura satellite (2004), and it will be continued by GOME-2 series on the EUMETSAT Metop-1, 2, 3 satellites, planned to be launched in 2006.

Most important for climate and environmental application is the retrieval of vertical ozone profiles, which yield pertinent information on the ozone distribution in the stratosphere and the upper troposphere exploiting the spectral information of the Hartley and Huggins bands in the UV range. Recently, a retrieval methodology based on neural networks (NNs) has been proposed; such a technique is very attractive for its capability to provide a real-time accurate solution of the inversion problem, as required to process the huge volume of data that characterize the continuous observation of the atmosphere from a satellite platform. In this study all GOME spectral measurements from July 1995 to June 2003 have been successfully processed. The effectiveness of the retrieval algorithm has been tested, and the accuracy of the retrieved ozone profiles has been evaluated performing an extended inter-comparison with similar products provided by other instruments and inversion techniques. The Improved Limb Atmospheric Spectrometer (ILAS), a limb-scanning instrument boarded on the Japanese satellite ADEOS, and a series of lidar stations belonging to the Network for Detection of Stratospheric Changes (NDSC) have been considered in this work. Tropical, mid-latitude and high-latitude regions have been considered during the inter-comparison, either in the Northern or in the Southern Hemisphere, and the results have been critically analized.