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Neural networks algorithms for ozone profiles retrieval from satellite measurements: analysis with ESA-Envisat SCIAMACHY and NASA-Aura OMI data

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The derivation of atmospheric quantities from satellite platform is decisive to monitor Earth's atmosphere and climatic changes, and to understand chemical and physical processes occurring. However, the atmospheric structure and trace gases concentrations result from a series of complex phenomena, involving the interaction between radiative, chemical and physical processes. A typical problem is related with the difficulty of inverting radiance data to obtain height resolved information on ozone concentration, particularly in the troposphere. The most widely used methods to obtain ozone concentration profiles from satellite data are based on Optimal Estimation schemes, that involve the use of a direct radiative transfer code and some a priori information. In recent years, an alternative approach based on Neural Networks (NNs) has been proposed, allowing ozone profiles retrievals in a very short computational time and without the need of a priori and/or climatological data. Some papers showed that NNs can be effective in the inversion of ESA-ERS2 GOME measurements to obtain ozone concentration profiles [1,2].

In this work we present our new NNs inversion schemes applied on ESA-ENVISAT SCIAMACHY level 1 data to obtain ozone concentration profiles, in the frame of ESA Cat-1 project 2930. We have trained our nets with a large set of input-output pairs. UV/VIS extracted nadir radiances were matched with co-located WOUDC and SHADOZ ozonesondes concentration measurements. After the training phase, the retrieved concentration profiles have been compared with an independent ozonesondes subset and with ERS2-GOME profiles [1]. Dedicated NNs to tropospheric ozone in-

formation extraction from SCIAMACHY data have been developed as well. In this case, we previously performed a systematic analysis of the sensitivity of nadir SCIAMACHY measurements on tropospheric ozone, carried out by means of the UV-spec radiative transfer model. It has to be noticed that most of the existing techniques to retrieve tropospheric ozone information from space are based on indirect methods, such as the Tropospheric Ozone Residual (TOR) method, where measurements from two instruments, the first nadir sensor measuring total ozone contents and the second limb viewer measuring stratospheric ozone [3], are considered. Alternatively, we performed a direct retrieval from SCIAMACHY nadir measurements, obtaining the advantages of a) using only one sensor's data, and b) having, in principle, better spatial resolutions. In addition, a preliminary experiment using the very recently provided NASA-AURA OMI data is currently ongoing, and the first results are here reported. It should be noted that these latter data, owing to a better spatial resolution, could allow the detection of local pollution phenomena. Comparisons have been made between ozone retrievals from different sensors, and are here critically discussed.

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