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# Seasonal characteristics of ozone and water vapour in the tropical UTLS as observed with the MIPAS instrument on ENVISAT

H. Sembhi (1), J Remedios (1), and P Raspollini (2)

(1) University of Leicester, Earth Observation Science,Department Physics & Astronomy, Leicester, United Kingdom (hs32@le.ac.uk), (2) Istituto di Fisica Applicata 'Nello Carrara' (IFAC) del Consiglio Nazionale delle Ricerche (CNR), Firenze (Italy

The tropical upper troposphere and lower stratosphere (UTLS), from approximately 200 to 40 mb (12 to 21 km) is a region where the convection-dominated, turbulent troposphere is coupled to a radiatively-controlled, more stable stratosphere through the tropical tropopause layer (TTL). The variability in the distributions of two important greenhouse gases, ozone and water vapour, can be influenced through dynamical, chemical and radiative processes in the tropical UTLS. Observing UTLS ozone and water vapour concentrations presents a particular challenge because this region is characterised by a high occurrence of clouds in the tropical upper troposphere and because both gases possess strong concentration gradients across the TTL. Quantifying the vertical distribution of ozone and water vapour in this region can provide clear indications of the magnitude of stratosphere to troposphere transport through the TTL and highlight regions within the UTLS where ozone and water vapour concentrations are influenced by pollution and dynamical regimes throughout the year.

Although ground- and air-based measurement networks offer accurate, point- measurements on a fine vertical grid, such measurements can be sparse and are often spatially and temporally limited. Instruments onboard satellite sensors can provide near-global coverage from which variations of ozone and water vapour on a larger scale can be inferred. The limb-sounding, thermal infrared Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) instrument onboard the European Space Agency's ENVISAT mission has measured vertical profiles of ozone and water vapour from the mesosphere to as low as 6 km in the troposphere with a vertical resolution of 3 km. It's near-continuous, global measurements since 1st March 2002 can provide improved coverage of the tropical regions and adequately complement existing in situ measurements.

In this paper, the distribution of ozone and water vapour in the tropical UTLS is investigated. The impact of clouds on MIPAS UTLS measurements is considered by simulating the effect of tropical upper tropospheric cirrus clouds into operational MIPAS ozone and water vapour retrievals. These results lead to an improved identification of cloud-contamination and are used for the development of new cloud filtering methods designed specifically for MIPAS ozone and water vapour. Overall, applications of these methods provide an improvement in the quality of MIPAS ozone and water vapour retrievals in the tropical UTLS region.

Comparisons of tropical cloud filtered MIPAS profiles with ozone and water vapour profiles from coincident satellite and in situ measurements will be shown. Finally, tropical maps of seasonal ozone and water vapour in the upper troposphere, lower stratosphere and TTL regions will be presented with emphasis on particular features such as the zonal "wave-one" South Atlantic ozone enhancement and regions of dehydration throughout the tropics.