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## Transport of ozone, methane and water vapour as seen by MIPAS

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MIPAS, on ENVISAT, has made high quality observations of ozone, methane and water vapour. Gridded fields, at 4 hourly intervals and, have been calculated for all of 2003 using data assimilation with isentropic advection as a constraint. The gridded fields are validated against independent measurements (from 7 other instruments in the case of ozone, 3 for water vapour and one for methane). For ozone the results are in agreement with previously published results. For water vapour the bias relative to HALOE is below 10% between 20 and 48km, and the standard deviation is below 12% in this range. Departures from SAGE II and POAM III are substantially larger. The methane analysis has a bias of less than 5% relative to HALOE between 23 and 40km, with a standard deviation less than 10% in this height range. The water vapour field clearly reflects the upward motion in the lower tropical stratosphere, while both water vapour and methane show the signature of advection higher up. In the polar regions the descent in the vortex is clearly visible, with strong descent in autumn giving way to weaker descent through the winter. Descent rates of around  $10^{-3}$  are found during the formation of the polar vortices, slowing to around  $3 \times 10^{-4}$  during the winter. Ascent of around  $2 \times 10^{-4}$  in the tropics is revealed by the water vapour and total observed hydrogen fields (4 times the methane plus twice the water vapour concentration). The total observed hydrogen is depleted in the polar upper stratosphere when air is advected down from the upper mesosphere.