Geophysical Research Abstracts, Vol. 7, 05133, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05133

Transport processes calculated in the TTL by a newly developed trajectory model coupled with a radiative transfer model

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Recent investigations of transport processes in the tropical tropopause region have shown that vertical transport and horizontal transport play important roles in dehydrating water vapour, while entering the stratosphere. Uncertainties in the formulation of vertical transport typically limit our understanding of the dynamical processes in the tropical tropopause layer (TTL).

Here, we focus on a new approach to better constrain the vertical velocities in trajectory models of this region of the atmosphere: a reverse domain filling trajectory model coupled with the ECMWF's radiative transfer model (Morcrette et al., 1998) to derive diabatic heating rates. It is shown that this approach largely reduce the noise in the vertical transport field and hence the vertical diffusion. This powerful tool is used to calculate three dimensional trajectories in the TTL, to better understand the main processes leading to transport of trace gases into the stratosphere.

An intercomparison with conventional trajectory calculations using vertical winds derived from data assimilation systems is carried out. Lidar measurements and meteorological soundings from a ship-based tropical campaign taking place during May and June 2000 will be used to validate the new transport tool in a case study.