Geophysical Research Abstracts,
Vol. 11, EGU2009-8796-2, 2009
EGU General Assembly 2009

Temporal and spatial variability of residence time and vertical velocity in the TTL

K. Krüger (1), S. Tegtmeier (2), and M. Rex (3)

(1) IFM-GEOMAR, Leibniz-Institut für Meereswissenschaften, Kiel, Germany (kkrueger@ifm-geomar.de, +49 (0)431 600-4052), (2) Environment Canada, Canada, (3) AWI Potsdam, Germany

Multi-year calculations of radiative heating rates and isentropic trajectories have been carried out (Krüger et al. 2008) to investigate transport time scales in the upper part of the TTL with an alternative approach. For this purpose, we have developed a different method to better constrain the vertical velocities in trajectory models of this region of the atmosphere: a reverse domain filling trajectory model driven by diabatic heating rates from the ECMWF's radiative transfer model calculated offline (Tegtmeier et al. 2008). The multi-year time series is covering the ERA40 and operational ECMWF analyses period from the 1960s to 2000s during northern hemispheric winter months. Quantifying the temporal and spatial variability of residence time and vertical velocity is important for long-term transport studies of halogenated very short lived substances, indicating the range of transport time scales within the TTL.

The residence time between the Lagrangian Cold Point (LCP) and 400K can vary from approximately 30 to 50 days for different years, demonstrating a high amount of interannual variability. To gain further insights of the underlying physical processes a detailed analysis has been carried out between the TTL residence time, vertical velocity (Q), potential temperature, LCP temperature and the extratropical wave driving.