



Transport and mixing in the extra-tropical tropopause region investigated with a combined Eulerian-Lagrangian approach

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The atmospheric chemistry general circulation model ECHAM5/MESy is combined with the Lagrangian transport scheme ATTILA. Simulations of the tracer transport across the tropopause are performed simultaneously in grid-point and Lagrangian representation. Whereas in the grid-point representation the mixing of tracers is determined by the numerical advection scheme, in the Lagrangian representation mixing between the air parcels has to be explicitly calculated. The comparison of both approaches allows a quantification of the mixing strength. The Lagrangian approach further allows the direct calculation of age-of-air spectra and provides information about the spatio-temporal characteristics of the cross-tropopause flux. The temporal and spatial correlations of the derived mixing strength with the occurrence of cross-tropopause transport events are investigated.