



Dynamical processes associated with stratosphere-troposphere exchange

M. Sprenger (1), H. Wernli (2), M. Croci-Maspoli (1), C. Schwierz (1)

(1) Institute for Atmospheric and Climate Science, ETH Zurich, Switzerland, (2) Institute for Atmospheric Physics, University of Mainz, Germany, (michael.sprenger@env.ethz.ch)

Air mass and the enclosed pollutants are transported across the tropopause in so-called STE (stratosphere-troposphere exchange) events. In recent years, several case and climatological studies have shed light on the spatio-temporal variability of STE and the physical processes which underlie the transport across the dynamical tropopause. Some key processes were identified to be (a) breaking of Rossby waves, (b) tropopause folds, (c) distortions of the tropopause due to extra-tropical cyclones, and (d) turbulence near the tropopause. Thereby, these processes are often not independent.

Here, we discuss and review the relationship between STE and the above processes. The data sets are derived from the ECMWF reanalysis and comprise a Lagrangian-based climatology of STE, a climatology of potential vorticity streamers and cutoffs (indicative for Rossby wave breaking), a climatology of tropopause folds and a climatology of surface cyclones. In all these climatologies, events are identified as coherent structures on a 6-hourly basis. This allows to check for every single STE event its relationship with any of the mentioned processes.

In addition, turbulence near the tropopause is investigated and related to STE. To this end, turbulence parameters are extracted from the ECMWF reanalysis and related to the individual STE trajectories.