Geophysical Research Abstracts, Vol. 8, 03665, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03665

A 15 year climatology of Rossby wave breaking and its relationship to stratosphere-troposphere exchange

M. Sprenger (1), H. Wernli (2), O. Martius (1), F. Isotta (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)

Breaking of Rossby waves is an important dynamical process near the tropopause which manfifests itself in so-called potential vorticity (PV) streamers. Stratospheric streamers are extrusions of stratospheric air (i.e. air with PV larger than 2 pvu) towards the south. In an analogue way, tropospheric streamers can be defined. Streamers indicate regions with enhanced dynamics near the tropopause (so-called Rossby wave breaking), and are thus in itself of great interest. Additionally, they are often associated with other processes. Stratospheric streamers, for instance, often induce cross-tropopause mass exchange (STE) through their boundaries.

In this study a 15-year climatology of streamers is presented (based upon the ERA-15 data set). They are identified on isentropic surfaces from 290 K to 360 K. The resulting geographic distributions show a pronounced seasonal and zonal variability. The position of the maxima shifts also in dependence of the isentropic surface. At 320 K, for instance, a clear winter maximum is found over the Mediterranean and near the west coast of northern America. In the subtropics (at 360 K) a pronounced band of stratospheric cutoffs extends from the Mediterranean to the east coast of Asia.

Moreover, the streamer climatology is used to estimate their importance for STE. For that aim, a 15-year climatology of STE (based upon a Lagrangian approach) with equal temporal resolution (6 hours) is considered. It is then checked whether any streamer occurs in the near vicinity of a STE event. This approach yields a simple count statistics for the link between the two dynamical features. The resulting high percentages of STE events with a nearby streamer (up to 50 percent) indicate the eminent importance of streamers for cross-tropopause exchange. Furthermore, it is shown that nearly all transport from the stratosphere to the near-surface over Europe is asso-

ciated with a stratospheric streamer.