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Trajectory studies of stratosphere-troposphere exchange in extratropics: a case study

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There are several studies of stratosphere-troposphere exchange (STE) in extratropics based on meteorological data sets and trajectory analysis. However, there is currently a debate on efficiency of such exchange on the budget of such key species like water vapour and ozone in the upper troposphere and lower stratosphere (UTLS). This study aims at estimating a depth of STE using different techniques based on ECMWF data with high horizontal resolution 0.5^0x $0.5^0$and temporal resolution 6 hours. Wei-method and trajectory-based method are applied to estimate local and instantaneous cross-tropopause fluxes. A threshold potential vorticity value of 3.5 PVU was adopted to determine the dynamical tropopause. Additionally, 5-day reverse domain filling (RDF) and forward domain filling (FDF) trajectories initiated of the tropopause surface were applied to visualize the locations of deep exchange through the tropopause. An episode with strong stratospheric intrusions over Northern Atlantic on 12 November 2005 was selected for this case study.