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Analysing the transport in the TTL using CCMVal2 models with a Lagrangian approach

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The tropical tropopause layer (TTL) is the main entrance region for trace gases traveling from the troposphere to the stratosphere. The amount of stratospheric water vapour as well as the contribution of brominated very-short lived substances (VSLS) to the stratospheric bromine loading depends strongly on the transport through the TTL. Our understanding of the underlying chemical and dynamical processes and their transit timescales in the TTL are important to quantify the amount of these trace gases transported into stratosphere.

Coupled chemistry-climate models (CCMs) are able to reproduce the basic structure of the TTL. We use CCM simulations to analyze the transport pathways in the TTL in more detail based on a Lagrangian approach. Backward trajectories are carried out to evaluate how well the transport of VSLS through the TTL is represented by the CCMs. Our study is carried out for CCMVal2 models e.g. the Canadian Middle Atmosphere Model (CMAM) and the CCM from the National Institute of Water & Atmospheric in New Zealand (NIWA), based on daily data output. Transport through the TTL is most efficient during the northern hemisphere winter months when extratropical wave breaking is most pronounced. Therefore we evaluate the representation of transport in the CCMs from December to February based on multi-year runs. Of special interest for the transport of water vapour and VSLS are the cold point temperature and the residence time in the TTL which will be analyzed in detail.