EGU2020-10891
https://doi.org/10.5194/egusphere-egu2020-10891
EGU General Assembly 2020

On the accumulation of enhanced vertical shear of the horizontal wind in the upper troposphere / lower stratosphere

Thorsten Kaluza, Daniel Kunkel, and Peter Hoor
Johannes Gutenberg-Universität Mainz, Atmospheric Physics, Mainz, Germany (kaluzat@uni-mainz.de)

The extratropical transition or mixing layer indicates the chemical transition from well mixed troposphere to the stably stratified stratosphere . It is located around the classical defitinition of the tropopause and is defined by a set of unique tracer-tracer correlations. Physically, it is the result of cross-tropopause transport, however, many processes associated with the formation and maintenance of the extratropical transition layer with its very distinct features as well as the importance of its overlap with the tropopause inversion layer (TIL) are still a subject of research. In particular, turbulent motions in the UTLS and their relative importance for the ExTL are still unknown.

We analyse the top end of the spectrum of vertical shear of the horizontal wind, S^2, in the troposphere and stratosphere as a proxy for turbulent motions. For this we use 10 years of ECMWF (European Centre for Medium-Range Weather Forecasts) ERA5 reanalysis data. We focus our analysis on the Northern Hemisphere extratropical UTLS, and more specifically on the Northern Pacific and Atlantic sectors. We find strong signatures of high S^2 just above the tropopause in both region. However, differences between the two regions are evident due to difference in the jet stream characteristics in these two regions . The areas of strong vertical wind gradients appear as regions of reduced Richardson numbers in the elsewhere highly dynamically stable lowermost stratosphere. We compare features of these regions in the model output with known characteristics of the extratropical transition layer to see if they are linked.

This work was supported by DFG grant no. KU 3524/1-1.