Geophysical Research Abstracts,
Vol. 11, EGU2009-4851, 2009
EGU General Assembly 2009

High Static Stability in the Mixed Layer Above the Extratropical Tropopause

A. Kunz (1,2), P. Konopka (1), R. Müller (1), L. L. Pan (3), and C. Schiller ()

(1) ICG1, Forschungszentrum Juelich, Juelich, Germany (a.kunz@fz-juelich.de), (2) ICG2, Forschungszentrum Juelich, Juelich, Germany , (3) National Center for Atmospheric Research, Boulder, Colorado, USA

A strong relationship between the static stability N^2 in the tropopause inversion layer (TIL) and the intensity of mixing is evident from in–situ observations during SPURT. With a new simple measure of mixing intensity based on O_3/CO tracer correlations, a very high mixing intensity connected to a high N^2 is found in the extratropical mixing layer.

Using radiative transfer calculations we simulate the influence of trace gases such as O_3 and H_2O on the temperature gradient and thus on the static stability above the tropopause in an idealized (L–shaped) non–mixed and reference mixed atmosphere. N^2 enhances due to an intensifying mixing in the LS. At the same time the temperature decreases together with a development of an inversion and the TIL. Hereby H_2O plays the dominant role in maintenance the temperature inversion and the TIL structure. In case of non mixed profiles the TIL vanishes.

The results motivate a link between the mixing layer and the TIL. The mixing layer contains on the one hand older air masses, with high values of N^2 due to radiative adjustment. This part of the mixing layer is spatial identically to the TIL. On the other hand, there are younger air masses with somehow lower N^2 values within the mixing layer, because of fast intrusion processes from the troposphere due to the permeability or so–called mid–latitude–breaks associated with the jet.