

Interactive comment on “Deep convective injection of boundary layer air into the lowermost stratosphere at midlatitudes” by H. Fischer et al.

A. Stohl

as@forst.tu-muenchen.de

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General comments:

This paper presents in-situ measurements of several chemical compounds (methane, CO, ozone, benzene acetone, methanol, acetonitrile) and ultrafine particles obtained on board of a research aircraft. During an ascent of the aircraft to the lowermost stratosphere, enhanced concentrations of tropospheric trace substances were encountered that were attributed to recent convective injections. The case is well supported by satellite images, meteorological maps and trajectory calculations. The paper is well written and should be published only with some small modifications.

Specific points:

There also exist other observations of boundary-layer air reaching the stratosphere

via convection, and the authors should give proper reference to earlier studies. Two examples that I am aware of are:

Fromm et al., Observations of boreal forest fire smoke in the stratosphere by POAM III, SAGE II, and lidar in 1998. *Geophys. Res. Lett.* 27, 1407-1410, 2000.

Siebert et al., A strange cloud in the Arctic summer stratosphere 1998 above Esrange (68°N), Sweden. *Ann. Geophysicae* 18, 505-509, 2000.

2004, line 26: The statement "In the tropics deep convection can penetrate the tropopause" and the following discussion is misleading. It implies that it is clear that tropical deep convection transports tropospheric air into the stratosphere, whereas this is less clear for the midlatitudes. Actually, the reverse is true. In the tropics, convection normally does not reach the tropopause (thence the debate about how the freeze-drying of air upon its entry into the stratosphere works!), whereas it is long known that convection can penetrate the tropopause in the midlatitudes. Actually, e.g., in cut-off lows, convection is an important process in (re-)establishing (and sharpening) the tropopause at a higher level than before the onset of convection.

Fig. 1 and corresponding discussions: The authors say they have observed a case of deep penetration of boundary-layer air into the lower stratosphere. However, the PV contour lines in Fig. 1b reveal a folded structure, and the blob of stratospheric air, into which the pollution was injected, may actually be returned to the troposphere shortly after the event. Clearly, the significance of this case would be much reduced, should this be the case. The authors should therefore check the fate of this blob of stratospheric air, e.g., using forward trajectory calculations.

Language:

2004, line 18: tropospheric

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 2, 2003, 2002.

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