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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Seasonality and extent of extratropical TST derived from in-situ CO measurements during SPURT" *by* P. Hoor et al.

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With regard to the high CO2 concentrations measured in August 2002 at high levels in the stratosphere it may be worthwhile to think about an alternative explanation.

In June and July 2002 extensive forest fires raged in North America. These fires are known to trigger a lot of convection (Fromm et al., 2004, and references therein), so-called pyro-convection. For summer 2002, there is very good evidence from the CRYSTAL-FACE mission that fire emissions penetrated deep into the stratosphere. In-situ measurements in July 2002 showed large enhancements of particles, CO and CO2 in the lowermost stratosphere and even at potential temperature levels above 380 K (Jost et al., 2004). This is normally considered the stratospheric overworld, which is supposedly not influenced by transport from the troposphere, except for the ascent in

the tropics. However, during CRYSTAL-FACE the large enhancements in these trace species did result from forest fires in North America and the associated very deep pyro-convection.

Could the injection of these forest fire emissions explain your observations of high CO2 concentrations relatively deep in the stratosphere in August 2002? If so, the conclusions about a tropical tropospheric source possibly need revision. Instead, you might have a very nice data set to investigate how the forest fires have changed the chemical composition of the stratosphere, even a month after the CRYSTAL-FACE mission and in an entirely different region.

There are also satellite observations of injections into the stratosphere of aerosols by pyro-convection for other cases (see references in Fromm et al., 2004). Although the exact exchange mechanism is still not well understood it seems to be a phenomenon that occurs regularly, such that the validity of isentropic transport being a good model for mixing between different regions in the stratosphere must be questioned more generally - but this should be of concern to all scholars doing stratospheric research and is not thought of as criticism of your paper particularly. If found to be relevant for your case, your data set, in fact, could shed some light onto the effect pyro-convection has on tracer correlations in the stratosphere.

References:

Fromm, M., and R. Bevilacqua, New Directions: Eruptive transport to the stratosphere: Add fire-convection to volcanoes. Atmos. Environ. 38, 163-165, 2004.

Jost, H.-J., et al., In-situ observations of mid-latitude forest fire plumes deep in the stratosphere. Geophys. Res. Lett., in press, 2004.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 1691, 2004.