Atmos. Chem. Phys. Discuss., 11, C6871–C6872, 2011
www.atmos-chem-phys-discuss.net/11/C6871/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "In-situ observation of Asian pollution transported into the Arctic lowermost stratosphere" *by* A. Roiger et al.

Anonymous Referee #2

Received and published: 26 July 2011

The paper by Roger et al. describes a case study of a tropospheric intrusion into the lowermost stratosphere above northern Greenland. Detailed trajectory and particle dispersion model studies indicate that the polluted airmass originated over eastern China and was transported into the LMS in ascending air associated with a warm conveyor belt. The paper is well written and the data analysis is sound. Thus I think that it is highly suitable for ACP and should be published as it is, after addressing two minor questions:

Although there is ample evidence about the transport process (warm conveyor belt) and the source region (eastern China), I wonder if biomass burning can be completely excluded as an explanation for the pollution. In particular the very high CO2 value in Fig 9c (approx. 385 ppmv at 140 ppbv CO), which is higher than any tropospheric

value, indicates a very strong combustion source, e.g. biomass burning. From Fig. 9c I estimate a delta CO per delta CO2 ratio of about 4-5 ppbv/ppbm, which is similar to emission ratios in crown fires, that can inject biomass burning debris high into the TP region. Are there other measurements of biomass burning tracers, e.g. CH3CN, so that biomass burning can be definitely excluded as a source? Also, it might be worth checking whether the highest CO2 values observed are consistent with surface measurements over the source region, i.e. eastern China.

In the conclusions the authors state that the mixing is irreversible and thus affects the chemical composition of the mixing layer above the local TP. In order to validate this statement, the authors should calculate forward trajectories from the flight track to investigate the future development of the streamer.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 16265, 2011.