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Revisiting the IAGOS-CARIBIC CO and O_3 observations and their correlation in the UT/LS

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The CARIBIC research project, the predecessor of the actual IAGOS-CARIBIC project, is divided into two distinct phases: 1997-2002 and 2005-2016. Here, we will present a reassessment of CO and O_3 observed during IAGOS-CARIBIC. The distribution and particularly the tracer-tracer correlation of both species has been widely used as a diagnostic tool for UT/LS transport processes (e.g. Hoor et al., 2002 and 2004; Pan et al., 2004). Up to now, only the early phase of CARIBIC observations of CO and O_3 has been applied for transport studies in the tropopause region (Zahn et al., 2000 and 2002).

The focus of this work here will be on the variability of the CO-O_3 distribution and correlation on seasonal and interannual timescales in the extratropics using the IAGOS-CARIBIC in-situ measurements of CO and O_3 spanning a time period from 1997 to 2016 with more than 400 flights. For a more detailed analysis and understanding of the underlying transport processes, the observations will be interpreted in combination with meteorological reanalysis data sets. The distribution of CO and O_3 will be analysed relative to different tropopause definitions (chemical, dynamical, thermal) and in different coordinate systems (e.g. equivalent latitude, potential temperature, potential vorticity and distance to the tropopause). Also, the role of static stability and the tropopause inversion layer (TIL) on the tracer distribution will be investigated.

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Pan, L. L., W. J. Randel, B. L. Gary, M. J. Mahoney, and E. J. Hintsa (2004), Definitions and sharpness of the extratropical tropopause: A trace gas perspective, J. Geophys. Res., 109, D23103, doi:10.1029/ 2004JD004982.