



Tracking air parcels with the flying atmospheric laboratory CARIBIC

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The CARIBIC (Civil Aircraft for the Regular Investigation of the Atmosphere Based on an Instrument Container) project uses a Lufthansa Airbus A340 long-distance passenger aircraft to investigate physical and chemical processes in the Earth's atmosphere. A specially designed inlet system is permanently mounted at the lower aircraft fuselage and provides sampling probes for trace gases, water vapour, total water and aerosol particles. The inlet pylon also houses the three telescopes of a multi-axis DOAS system for remote sensing and a forward looking video camera. In addition to the in situ analyses, up to 116 whole air samples are collected during the monthly flight sequences. Between May 2005 and December 2011, more than 260 measurement flights have been carried out with the CARIBIC container between Germany and many different destinations around the world (see <http://www.caribic-atmospheric.com/>).

After each flight, the whole air samples are analysed in the laboratory for greenhouse gases and a large suite of non-methane hydrocarbons and halocarbons. Backward trajectories are calculated with the KNMI TRAJKS trajectory model along the CARIBIC flight tracks and for each whole air sample to determine the sources of the observed air. In rare cases, the same air parcel is measured twice during the four consecutive monthly measurement flights. This study discusses the difficulties in finding suitable thresholds in time and space when searching for these "revisited" air parcels using the calculated backward trajectories. The tighter these thresholds are chosen, the fewer cases of "revisited" air parcels are found. Long-lived atmospheric species can be used to cross-check the results from the trajectory analyses. We will also present first results of trace gas changes during the transport of the air parcels in between the two CARIBIC measurements.