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# Long-term airborne black carbon measurements on a Lufthansa passenger aircraft

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Aerosol particles containing black carbon are the most absorbing component of incoming solar radiation and exert a significant positive radiative forcing thus forming next to $CO^2$ the strongest component of current global warming (Bond, 2013). Nevertheless, the role of black carbon particles and especially their complex interaction with clouds needs further research which is hampered by the limited experimental data, especially observations in the free and upper troposphere, and in the UTLS (upper troposphere and lower stratosphere). Many models underestimate the global atmospheric absorption attributable to black carbon by a factor of almost 3 (Bond, 2013). In August 2014, a single particle soot photometer was included in the extensive scientific payload of the CARIBIC (Civil Aircraft for the Regular Investigation of the atmosphere Based on an Instrument Container) project. CARIBIC is in operation since 1997 (with an interruption for 2002-2005) and carries out systematic observations at 10-12 km altitude. For this a special air freight container combining different instruments is transported on a monthly basis using a Lufthansa Airbus A340-600 passenger aircraft with destinations from 120°W to 120°E and 10°N to 75°N. The container has equipment for trace gas analyses and sampling and aerosol analyses and sampling and is connected to an inlet system that is part of the aircraft which contains a camera and DOAS remote sensing system. The integration of a single particle soot photometer (SP2) offers the possibility for the first long-term measurement of global distribution of black carbon and so far flights up to November 2015 have been conducted with more than 400 flight hours.
So far the SP2 measurements have been analysed for flights over four continents from Munich to San Francisco, Sao Paulo, Tokyo, Beijing, Cape Town, Los Angeles and Hong Kong). The first measurements show promising results of black carbon measurements. Background concentrations in the UTLS have been determined. Beside a general distribution of number and mass of black carbon particles, single peak events were detected with an up to 20 times higher concentration. High concentration plumes have been observed continuously over a range of 10,000 km. Interestingly, the first measurements show also a lower amount of black carbon mass in the tropics compared to the mid latitude northern hemisphere.

References

CARIBIC: www.caribic-atmospheric.com /
www.caribic-atmospheric.org / www.caribic.de
Bond, T. C., et al. (2013), Bounding the role of black carbon in the climate system: A scientific assessment, J. Geophys. Res. Atmos., 118, 5380–5552, doi:10.1002/jgrd.50171