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Out of Africa: High aerosol concentrations in the upper troposphere over Africa

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Abstract. In the year 2000, six flights (three southbound and three northbound) of the CARIBIC project were conducted between Germany and two destinations in the southern hemisphere (Windhoek, Namibia and Cape Town, South Africa). In the present report, results on particle number concentrations are discussed in three size ranges (>4 nm, >12 nm, and >18 nm particle diameter) during the unique transequatorial Africa flights. The flights covered a total of about 80 h in May, July, and December. Thus, no claim can be made for long-term representativeness of the aerosol data. Nevertheless, they are the first upper systematic tropospheric transequatorial aerosol profiles over Africa. The average aerosol results show a broad maximum, roughly symmetrical to the equator, which compares well in latitudinal extent to a maximum of CO concentrations measured on the same flights. This export of continental surface aerosol to the upper troposphere will be dispersed on a global scale both with the easterly flow near the equator and with the westerlies in the adjacent subtropical regions. There was strong evidence of recent new particle formation before aerosol arrival at flight level, in particular during the time periods between 9:00 and 13:00 local time over Africa. Direct and indirect climate effects of the respective particulate matter remain to be investigated by future flights with the ongoing extension of the CARIBIC payload towards size-resolved measurements above 100 nm particle diameter. At the same time global chemical transport models and aerosol dynamics models need to be extended to be able to reproduce the CARIBIC findings over Africa.

Final Revised Paper (PDF, 2757 KB) Discussion Paper (ACPD)

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