Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union










Atmos. Chem. Phys., 3, 563-579, 2003
www.atmos-chem-phys.net/3/563/2003/


# Differences across the ITCZ in the chemical characteristics of the Indian Ocean MBL aerosol during INDOEX

M. Norman, C. Leck, and H. Rodhe
Department of Meteorology, Stockholm University, S-106 91 Stockholm, Sweden

Abstract. The water soluble inorganic part of the sub-micrometer aerosol was measured from two research vessels over the Indian Ocean during the winter monsoon season (February and March) as part of the INDOEX project in 1998 and 1999. Additional measurements were made of gas phase $SO_2$ from one of the vessels in 1999. All samples collected north of the Inter Tropical Convergence Zone, ITCZ, were clearly affected by continental, anthropogenic sources. A sharp transition occurred across the ITCZ with concentrations of nss-$SO_4^{2-}$, $NH_4^+$ and nss-$K^+$ being lower by a factor of 7-15, >20 and >40, respectively, on the southern side of the ITCZ. The contribution from DMS to the sub-micrometer nss-$SO_4^{2-}$ was estimated to be up to 40% in clean air north of the ITCZ but less than 10% in polluted air originating from India. South of the ITCZ virtually all nss-$SO_4^{2-}$ was likely to be derived from oxidation of DMS. The concentration of $SO_2$ decreased rapidly with distance from the Indian coast, the molar ratio $SO_2$/nss-$SO_4^{2-}$ reaching values below 5% after 35 h travel time over the ocean. Surprisingly, MSA, which is derived from DMS, also showed higher concentrations in the sub-micrometer aerosol north of the ITCZ than south of it. This could be explained by the larger sub-micrometer surface area available north of the ITCZ for the condensation of MSA. South of the ITCZ a major part of the MSA was found on the super-micrometer particles. An analysis based on the air trajectories showed that systematic variation in the observed concentrations was associated with variations in the transport from source regions. For example, differences in time since air parcels left the Arabian or Indian coasts was shown to be an important factor for explaining the substantial differences in absolute concentrations.

Final Revised Paper (PDF, 542 KB) Discussion Paper (ACPD)

Citation: Norman, M., Leck, C., and Rodhe, H.: Differences across the ITCZ in the chemical characteristics of the Indian Ocean MBL aerosol during INDOEX, Atmos. Chem. Phys., 3, 563-579, 2003. Bibtex EndNote Reference Manager