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Air Pollution Transport towards Mt.Kenya Global GAW Station

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The Global WMO/GAW station Mt. Kenya (37.22 E, 0.03 S) in Eastern Africa is situated in a data sparse region at an altitude of 3678 m a.s.l. Surface carbon monoxide (CO) and ozone (O_3) are monitored continuously since 2002. In this contribution we present data from 2002 to 2006, that was interpreted utilizing backward trajectory and Lagrangian particle dispersion modelling (FLEXTRA/FLEXPART) complemented by an emissions inventory (EDGAR) and satellite retrieved biomass burning estimates (MODIS FRP).

During night-time the Mt. Kenya GAW station was situated within the free troposphere, well above the more polluted atmospheric boundary layer. Therefore, the station is well suited to analyse long range transport of air pollutants towards Eastern Africa.

The site was influenced by easterlies throughout most of the year. Furthermore the passage of the intertropical convergence zone (ITCZ) and the associated monsoon circulations caused distinctly different air masses to reach the site within one seasonal cycle. During the northern hemispheric winter, flow towards Eastern Africa was predominantly from the North-East. Two major pathways towards Kenya were identified during this season. The first was from India and air reached Kenya flowing along the Somali coast. The second pathway originated over the Arabian Peninsula. During the northern hemispheric summer, south-easterlies prevailed. Again, two different flow regimes were recognized. The first originated over the South-West Indian Ocean, while the second originated over southern Africa. During the transitional seasons flow was more directly from the Indian Ocean without getting under continental influence.

However, direct easterly flow along the equator only occurred in a few cases.

The largest CO concentrations were monitored during the northern hemispheric winter and were attributed to higher background concentrations in the northern hemisphere and additional emissions in India and the Arabic Peninsula. A second maximum in CO concentrations, showing more year to year variability than the first, was observed during northern hemispheric summer and was ascribed to biomass burning emissions in southern Africa. Minima in CO concentration occurred during transitional phases when the flow was more directly from the undisturbed Indian Ocean.