

Aerosol Production Over a Tropical Mangrove Forest

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The mass loading of sea-salt aerosol in the land-ocean boundary at Sundarban mangrove, NE coast of Bay of Bengal (20°32' - 20°40'N and 88°05' - 89°0E) is studied during dry season between November 2003 and June 2004 before the onset of SW monsoon using a nine-stage cascade impactor. Aerosol concentration is found to be in the range 128.2-148.9 $\mu\text{g m}^{-3}$ with production rate of 0.8 to 4.0 $\mu\text{g m}^{-2}\text{s}^{-1}$ and deposition rate of 0.26 to 0.28 $\mu\text{g m}^{-2}\text{s}^{-1}$. White caps are observable within the upwind distance of 50m when the wind velocity at 10m heights is in the range 0.63 to 2.69 ms^{-1} . The nucleation and accumulation particle modes $<2\mu\text{m}$ constitute 27.9% to 32.2% of total aerosol mass. During NE monsoon, the size distribution of Na^+ and Cl^- show maxima in the coarse mode while NO_3^- , NH_4^+ and SO_4^{2-} have maxima in the accumulation mode. Before onset of SW monsoon, the size distribution of Cl^- shows two more maxima in the nucleation and accumulation modes. Size distribution of NO_3^- shows three distinct peaks in all three size modes while that of SO_4^{2-} is found to be maximum only in coarse mode. Considering the total area of surf zone from receptor point to the upwind edge of the sea source as $7 \times 10^5 \text{m}^2$, net flux of sea-salt aerosol is calculated as 32.4 kg d^{-1} in post monsoon and 225.1 kg d^{-1} in pre-monsoon. Na^+ is the dominant cation species and Cl/Na is 0.4259 ± 0.1734 with average chloride depletion of 75.8% during post monsoon. Cl/Na ratio is further decreased to 0.4130 ± 0.1258 during pre-monsoon with chloride depletion of 77.2%. Maximum non-sea-salt sulfate is found to occur in the accumulation particle mode and about three fold increase of its concentration is found to occur in pre-monsoon. NO_3^- is the predominant form of inorganic nitrogen. NH_4^+ concentration is about fourteen times higher in post monsoon compared to that in pre-monsoon. Results show that there is a considerable loss of NO_3^- by photochemical decomposition, which is calculated considering depleted Cl^- and excess non-sea-salt sulfate.

Keywords: Aerosol size distribution; mangrove forest; sea-salt composition

References

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