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Differences in light-absorbing properties of South Asian carbonaceous aerosols in air and rain

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South Asia is a global hotspot for the climate and health impact of black and brown carbon aerosols (BC and BrC, respectively). However, the climate impact is troubled by large uncertainties, including the optical properties of these components. In this poster, we present a comparison of the mass absorption cross-section (MAC) of BC in air (PM10) and in rainwater for year-round samples collected at a South Asian receptor site located in the Maldives. We find that the MAC of BC in rainwater is almost twice as high (13.3 $\pm$ 4.2 m2/g, 678nm) as for PM10 aerosols (7.2 $\pm$ 2.6 m2/g). A possible explanation is the elevated organic carbon (OC) to BC ratios observed in the rain samples, contributing to a coating-enhancement effect.
In addition to BC, we also investigated the MAC of water-soluble BrC in PM10 (0.42 $\pm$ 0.4 m2/g, at 365nm). For the BrC we observed a clear trend of the MAC with respect to air mass history, with higher values for samples with air originating over the South Asian landmass. This trend is less clear for BC MAC, possibly indicating a longer atmospheric lifetime of BC MAC. The washout ratio of BC was significantly lower than for OC and inorganic ions, implying that BC was removed less efficiently from the atmosphere. The wet deposition of BC is 3 times higher during the NE monsoon than SW monsoon. Taken together, this study shows that BC may be more efficient in absorbing light in cloud droplets (while not considering droplet scattering) and that the atmospheric fate of BC and BrC may be very different in the South Asian outflow.