

EGU2020-12009

<https://doi.org/10.5194/egusphere-egu2020-12009>

EGU General Assembly 2020

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## The long-range transport of African mineral dust to the Amazon basin

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Being the largest mineral dust source, Africa contributes over half of the global mineral dust emission. The trans-Atlantic transport of the large amount of mineral dust is shown to enter the Amazon basin frequently, not only perturbing the near pristine condition in the Amazon during the wet season, but also fertilizing the Amazon rainforest due to dust deposition and associated nutrients input. In this study, we use a global chemical transport model (GEOS-Chem) to simulate the emission, the long-range trans-Atlantic transport, and the deposition flux of African mineral dust to the Amazon basin during the period of 2013-2017, with observational constraints from AERONET data, MODIS data, as well as the observation from the Amazon Tall Tower Observatory (ATTO). With optimized size distribution of African dust, we improve the simulation of dust over both source (north Africa) and remote region (Amazon basin). The trans-Atlantic transport of African dust reaching the Amazon Basin generally occurs in winter and spring (Northern Hemisphere) associated with the northeasterly trade wind advection. In winter, the transport of dust layer occurs below 2 km height while in other seasons it occurs between 1 Km and 3 Km. With average annual emission of  $0.78 (\pm 0.14) \text{ Pg a}^{-1}$ , African dust entering the amazon basin could reach  $3.93 (\pm 0.76) \text{ ug m}^{-3}$  at ATTO, account for  $19\% (\pm 2.5\%)$  of total particle concentrations. However, the contribution could be up to 91% during strong dust events. Assuming mass fraction of 4.4% and 0.082% of iron and phosphorus in the mineral dust, we estimate an annual mass flux of  $35.3 (\pm 4.49) \text{ mg m}^{-2} \text{ a}^{-1}$  and  $0.66 (\pm 0.084) \text{ mg m}^{-2} \text{ a}^{-1}$  of iron and phosphorus deposit in the Amazon rainforest, respectively.