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Atmospheric Chemistry and Physics
Discussions

Interactive comment on "Impact of Saharan dust on North Atlantic marine stratocumulus clouds: Importance of the semi-direct effect" *by* Anahita Amiri-Farahani et al.

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Large uncertainty of the estimated dust radiative effect in winter and the contribution of non-dusty aerosols.

Based on satellite-retrieved parameters of cloud properties, the authors (Amiri-Farahani et al., 2016) concluded that, in the winter season, the dust – cloud radiative effect is "weakly positive 0.92 $\pm$ 2.86 W/m2 ". However, in fact, their estimate indicates that, in winter, the dust – cloud radiative effect could be either positive or negative, because of the large uncertainty of their estimate. The presence of non-dusty aerosols could also be a causal factor for the above-mentioned large uncertainty. In our papers (Kishcha et al., 2014, 2015), using NASA MERRAero reanalysis, we showed that, in

winter, Saharan dust is not the predominant aerosol species over the tropical North Atlantic, including the area 45W – 15E; 0N – 35N under the study by Amiri-Farahani et al. (2016). Apart from dust, non-dusty aerosols, such as carbonates (organic and black carbon), sea salt and sulfates also significantly contribute to the total AOD over the tropical North Atlantic. As shown in Fig. 1 (below), in contrast to July, in January dust dominates other aerosol species only near the African coast. The non-dusty aerosol species could affect cloudiness in a different manner. In the winter season, absorbing aerosols, such as organic and black carbon, produce mainly a positive semi-direct radiative effect, similar to the dust effect. Sulfates and sea salt, non-absorbing aerosols, produce a negative indirect radiative effect, acting as effective CCN. Thus, non-dusty aerosols, producing either positive or negative radiative effects, significantly contribute to the large uncertainty of the aerosol-cloud radiative effect in the winter season.

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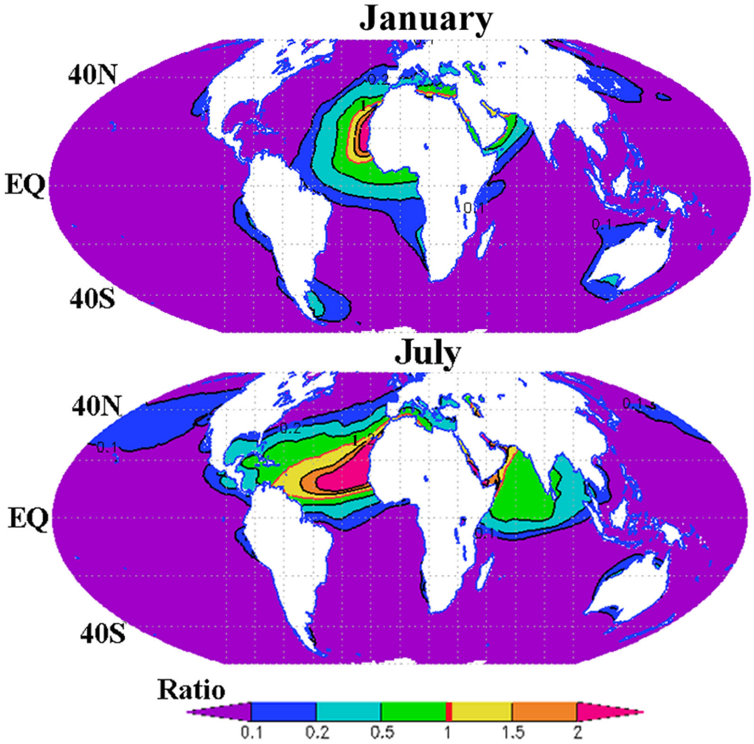

Fig. 1. The ratio of dust aerosol optical depth (AOD) to AOD of all other aerosol species, based on the 10-year MERRAero data (July 2002 - June 2012).