Source apportionment of dust over the North Atlantic using surface measurements and GFDL dust model with tagged sources

Paul Ginoux (1), Joseph Prospero (2), François-Xavier Collard (3), Alexis jeannot (3), Jack Molinié (4), Beatrice Marticorena (5), and Gilles Bergametti (5)

(1) NOAA-Geophysical Fluid Dynamics Laboratory, NJ, USA (paul.ginoux@noaa.gov), (2) University of Miami, FL, USA, (3) Observatoire Regional de l'Air, Cayenne, France, (4) Université des Antilles et de la Guyane, Guadeloupe, France, (5) Laboratoire Interuniversitaire des Systèmes Atmosphériques (LISA), Paris, France

Decades of aerosol measurements on Barbados have yielded a detailed picture of African mineral dust transport to the Caribbean Basin that shows a strong seasonal cycle with a maximum in boreal summer and a minimum in winter. Recently Prospero et al. (Global Biogeochemical Cycles, 2014) presented 10 years of aerosol measurements made at Cayenne, French Guiana, along with concurrent dust measurements on Barbados. Various lines of evidence suggest that the sources that impact on Cayenne in spring are mainly in the Sahel region, including the Bodele Depression. In summer transport to Barbados is believed to be most affected primarily by emissions that lie in more northerly regions.

In the framework of the AMMA (African Monsoon Multidisciplinary Analysis) International Program, Marticorena et al. (Atm. Chem. Phys., 2010) have obtained since 2006 quantitative information on the mineral dust content and its variability at 3 stations over the Sahel.

Here we attempt to link the measurements at Cayenne and Barbados to specific source regions using the GFDL global climate model (Donner et al., 2011). African dust emission is analyzed with AMMA data. The various hypothesized source regions are tagged and the day-by-day transport is depicted in color-coded images. The model accurately depicts the strong seasonal contrast in dust transport to these two sites and shows the changing impact of African sources over the course of the year. In our presentation we will examine the model results and compare them to the measurements at the source and receptor sites.