



Transport of Saharan dust over the North Atlantic Ocean: Study of a post seasonal event over Guadeloupe (Lesser Antilles).

J. Laffont, J. Molinié and R.-H. Petit .

Université des Antilles et de la Guyane, Laboratoire de Physique de l'Atmosphère Tropicale, Pointe-à-Pitre, Guadeloupe.

The Sahara and the Sahel are the world's largest source of aeolian soil dust (D'Almeida, 1987). Important amounts of mineral dust are transported from their African source to the Atlantic Ocean. There is a seasonal variation in the trajectory of Saharan dust over the Northern part of the Atlantic Ocean. The Saharan dust is carried in the Saharan Air Layer (SAL) to the Caribbean Sea from April to September (Prospero et al., 1981). Usually in November, western winds keep the dust near the African coast. Indeed PM₁₀ data of the past 2 years over Guadeloupe present a hourly mean value of $18,89 \pm 0,33 \mu\text{g}/\text{m}^3$ in November (Gwad'air).

On 11 November 2007, by clear sky, an exceptional dust plume arrived over Guadeloupe and lasted 4 days. The PM₁₀ mean value from 10 to 15 November is over $60 \mu\text{g}/\text{m}^3$, with a peak at $114 \mu\text{g}/\text{m}^3$ on the 11th evening. These observations are consistent with hourly horizontal visibility values which decreased suddenly from 25 to 9 km (Meteofrance). The values stayed around 10 km during the dusty period, instead of the typical 30 km of dust-free days in this season.

The back trajectories, started on 11 November at 1600m over Guadeloupe, indicate a strong uplift of air masses in West Africa on 4 November to an altitude of 4100 m. The dusty air masses, after a loop over Mauritania and occidental Sahara, leave African coasts on 7 November, and cross the Atlantic Ocean in a subsiding motion. The meteorological situation over the Atlantic shows East winds at 850 hPa (1400 m), with a mean value over 10 m/s (from NOAA data). This is in agreement with a

4000 km transport of 4 days from West African coasts to Lesser Antilles and with the vertical soundings on the East and West sides of the Atlantic Ocean, where the presence of a SAL is obvious.

The presence of dust off Mauritania on 7 November is confirmed by the Total Ozone Mapping Spectrometer (TOMS) data, which registered an Aerosol Index over 3.0. The water vapor satellites imagery (GOES) shows the presence of a wide East to West corridor of dry air between Africa and Antilles from 11 to 15 November allowing the transport of Saharan dust.

This exceptional post seasonal event may be one of the first signs of the influence of the climate changes on the aeolian soil dust long range transport over the North Atlantic Ocean. A corresponding increase of the concentration of mineral aerosols in the atmosphere may have consequences on the global radiative balance of the atmosphere.

References :

Prospero, J.M., and T.N. Carlson, Saharan air outbreaks over the tropical North Atlantic, *Pageoph.* 119, 677-691, 1981.

D'Almeida, G. A., 1987. On the variability of desert aerosol radiative characteristics. *Journal of Geophysical Research.* 92, 3017-3026.