On the contribution of ephemeral lakes to the aerosol load

J.A.G. Orza, M. Cabello, E. Doménech, L. Pérez

SCOLAb and Aeolian Research Group, University Miguel Hernández, Elche 03202, Spain
Keywords: mineral dust, resuspension, meteorology.
Presenting author email: ja.garcia@umh.es

The role of dry lakebeds as sources for aeolian export of soil particulates is studied in relation to their inundation extent and meteorological conditions. We focus on two areas: (1) El Hondo Nature Park in southeastern Spain, 2,400 ha, composed by two large reservoirs and several natural lagoons and pools surrounded by a salt marsh, and (2) the region of the Chotts in southern Tunisia, including el-Djerid and el-Gharsa vast saline lakes of 495,000 and 42,000 ha, respectively. The period 2005-2012 is considered.

Despite their differences in spatial extension and some geomorphologic features, both settings are topographic lows with flat terrain and scarce or absent vegetation, which experience ephemeral variations in inundation extent. The desiccated surface is susceptible to deflation by wind, resulting in soil emissions from the sediments lying on the surface and from evaporite minerals.

Several field campaigns were conducted in El Hondo during the period 2009-2012, aimed to analyze wind erosion and suspended particulate levels downwind in connection with the atmospheric and soil conditions. Measurements included size distribution of suspended particles, PM10 concentration and chemical composition; saltation profiles, composition and granulometry; and meteorological and soil parameters.

Previous studies in the Chotts have used very coarse inundation data and the TOMS AI to measure the dust loading (Mahowald et al., 2003). An indication of an increase in dust loading when lake beds are dry was obtained, but no clear conclusions could be drawn due to the additional contribution of the Saharan dust in the area. We make use of more detailed inundation data and the `present weather´ observations of local dust recorded in SYNOP reports at Tozeur, as well as meteorological and visibility data in the area (METARs and SYNOPs).

Variations in water sheet and salt crusted surface, as retrieved from the 7-2-1 spectral bands of MODIS, are driven primarily by the precipitation regime. In El Hondo, conditions may change dramatically due to additional anthropic intervention, as inflow and outflow are ultimately managed by humans.

The majority of the dust storms registered at El Hondo were associated to the passage of Atlantic frontal systems with no rainfall. W/NW/SW winds > 9 m/s (at 2 m above the ground) and average friction velocity of 0.46 m/s triggered these erosion events. Soil emissions from El Hondo had an impact on coastal touristic villages and some of the dust plumes could be observed in MODIS images.

Dust locally entrained in Tozeur was associated (80% of the cases) to horizontal visibility < 5 km, relative humidity < 75% and windspeed ≥ 8 m/s (at 10 m above the ground), mostly of E component (55%) and then W (28%). Events were primarily of synoptic origin and were registered from March to May.

Dust storms occurred in both settings when, in addition to high wind conditions, large dried areas were available. The inundation extent in the Chotts was large in March-May 2009 leading to a decrease in the frequency of erosion events in that period with respect to other years.

We acknowledge support from the Spanish Government (EroHondo, CGL2008-05160).

Mahowald, N. M., Bryant, R. G., del Corral, J., and Steinberger, L. (2003) *Geophys. Rev. Lett.* **30**(2), 1074.