

Synoptic conditions favouring the occurrence of dust transport from Africa toward Sardinia Island.

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Dust events that reach Italy have usually origin in the Sahara and Sahel regions (north-western part of Africa), which represent the dust sources nearest to Italy. In those regions the dust-lifting activity occurs in a remarkable way. Every dust event is different from the others; in fact dust transport and dust concentration in the air can vary remarkably depending on the synoptic situation. In Sardinia, dust events are more frequent in the May-November period, but they can also take place in the December-April period. The main aim of this work was to describe dust outbreaks in Sardinia and to identify the main meteorological scenarios that originate the transport of dust towards the central and western Mediterranean Basin.

The evaluation of the geographical dispersion of Saharan dust was performed by using MODIS satellite data and Meteosat imagery combined with SKIRON forecasting model.

The origin and the trajectory of the dust carried by winds towards Italy were inferred by the NOAA HYSPLIT model (Hybrid Single Particle Lagrangian Integrated Trajectory Model). In addition, PM₁₀ (particulate matter with a diameter of less than 10 μm) and meteorological data registered by the ARPAS (Regional Environmental Protection Agency of Sardinia) monitoring stations were used to highlight the arrival of African air masses in Sardinia. The study was carried out during the 2014.

A total of five events occurred during the year (two in spring and three in autumn) were analyzed. The origin of air masses loaded with dust from North Africa was confirmed by satellite imagery and 3-days air mass backward trajectories calculated by the NOAA HYSPLIT model. The analysis of the PM₁₀ daily pattern registered at northern and southern Sardinia sites showed a rising of values during the dust event. The arrival of air masses from Africa caused the daily mean air temperature to rise whereas relative humidity values decreased. Finally, the results showed that all the event analyzed were characterized by a low-pressure system over the Iberian Peninsula that extended towards Morocco and by the associated high-pressure system over the North-East Africa (Algeria, Tunisia and Libya) and Sicily. This synoptic structure (low pressure over North-Western Africa) forced the dusty air masses towards the Mediterranean basin, favouring the transport of African air masses towards the Sardinia island.