INFLUENCE OF SAHARAN INTRUSIONS ON PM10 LEVELS IN THE CASTELLÓN CERAMIC CLUSTER

S. Pallarés, T. Sanfelix, A.B. Vicente, T. Sanfeliu

Unit for Applied and Environmental Mineralogy. Universidad Jaume I. Castellón.
e-mail: spallare@sg.uji.es

1. INTRODUCTION

A study was conducted in 2003 on the levels of PM10 concentration in three populations of the Province of Castellón, two of which were located near industrial centres (Vila-real and Alcora), and the other in an urban enclave (Castellón).

Figure 1. Map of the location of the sampling stations.

These populations exhibited high levels of suspended particulates as a result of pollutant emissions into the atmosphere by significant industrial activity (mainly of the ceramic sector), as well as natural events, particularly those due to long-distance transport of mineral dust from the Sahara and local resuspension. Directive 1999/30/EC establishes an average annual limit value for the protection of human health of 40 $\mu g/m^3$ in its first application phase (2005), and 20 $\mu g/m^3$ in its second phase (2010). The Directive sets 50 $\mu g/m^3$ as a daily limit value, which shall not be exceeded more than 35 times per year in the first phase, and 7 times in the second phase. Article 5.4 of the Directive proposes elimination of those days on which the limit values of the PM10 concentrations are exceeded owing to natural causes that lead to higher PM10 concentrations in ambient air than the normal values of natural origin. In such cases, the Article requires due justification and demonstration that transgressions of the limit values are due to natural causes.

2. METHODOLOGY

Suspended samples of particulates smaller than 10 μg were collected by an IND-LVS3 Kleinfiltergerät instrument, determining the levels of particulate concentration by the gravimetric method (EN-UNE 12341:1999). Transgressions of the daily limit value were studied at the three sampling stations by chemical and mineralogical analysis of the samples, evaluating the atmospheric models of the TOMS satellite aerosol index distribution and simulations of the SKIRON programme of the University of Thessalonica (Greece) to demonstrate the possible influences of Saharan intrusions on PM10 levels.

3. RESULTS

Using these techniques and research tools, several periods with important natural contribution inputs (episodes of African air intrusion) were identified. These events occurred in most instances in spring and summer. Two days have been chosen

on which the daily limits were exceeded at the three locations and an intrusion from North Africa occurred (Table 1).

DATE	PM10 CONCENTRATION (μg/m³)		
	Alcora	Vila-real	Castellón
24/06/03	90	82	51
21/07/03	96	97	75

Table 1. PM10 concentration on the study days at the three locations.

Figures 2 and 3 show the TOMS satellite maps of the suspended dust index and the SKIRON forecast for these days.

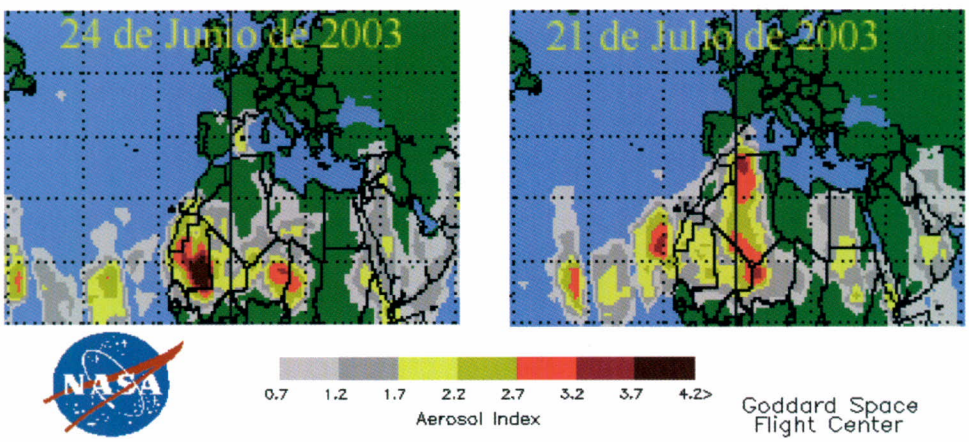

Figure 2. Images of the TOMS satellite maps.

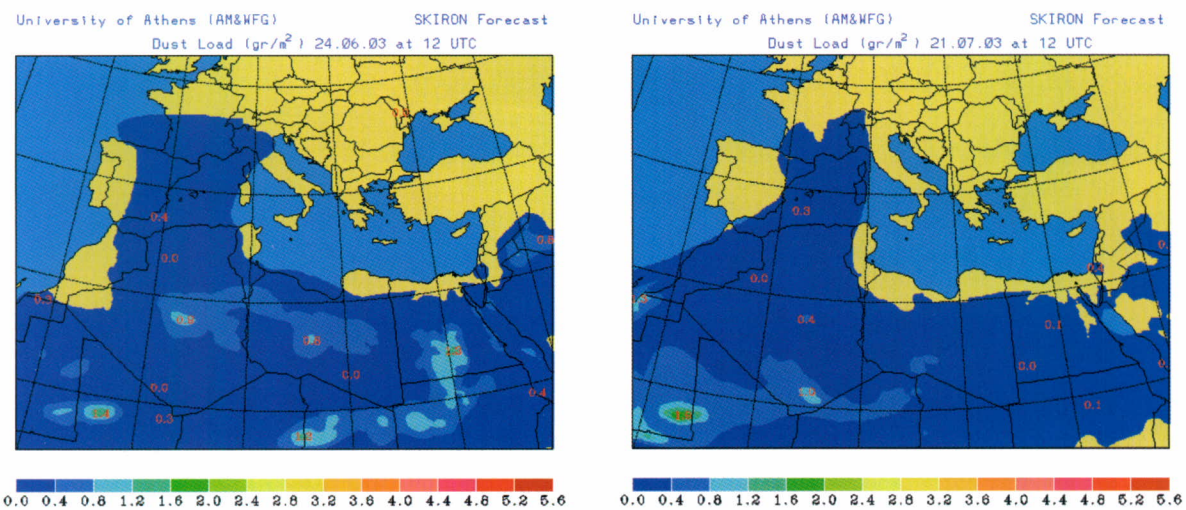

Figure 3. Images of the SKIRON programme forecast

Chemical and mineralogical analysis of the PM10 fraction on the days when intrusion occurred revealed great compositional similarity with that of the particulate from North Africa. The Saharan dust is made up of mineral particles (mainly quartz, calcite, dolomite, ferric oxide and clay minerals), which differ considerably in composition and particle size from the particulates of anthropogenic origin.

REFERENCES

[1] ECWGPM "Natural Events", Draft final Report On Guidance to Member States on PM10 Monitoring and Intercomparison with Reference Method. pp. 21-26 Ed. Martin Willians, Peter Bruckman. January 2001.

[2 A.Avila, I. Queralt, F. Gallart, J. Martin-Vide. "Saharan dust over northeastern Spain: Mineralogy and source regions." The impact of Desert Dust across the Mediterranean. 201-205 (1996).

[3 T. Sanfeliu, M.M. Jordán, E.T. Gómez, C.Álvarez, M.A. Montero "Contribution of the atmospheric emissions of Spanish ceramics industries." Environmental Geology 41, 601-607 (2002).