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The resuspension contribution to airborne particulate matter levels in SE Spain: An overview of the RESUSPENSE project

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The aim of the RESUSPENSE project is to study *from immission measurements* the contribution of the suspended/resuspended mineral dust of local or regional origin to the aerosol load in semiarid SE Spain. The relative influence of human activities is assessed. This three-year project was completed in December 2007.

The sources of (coarse) suspended mineral particles include predominantly emissions from activities such as construction work, quarrying and tillage operations, traffic-related resuspension, and suspension/resuspension due to the action of wind on surface soils both disturbed and undisturbed by human activities. A further contribution in the study area is the frequent intrusion of African mineral dust plumes.

Daily PM10 levels were measured at three sites categorized as urban background, rural and rural background locations. Aerosol size distribution (0.25um to $>$32 um in 31 size channels) was continuously measured during periods of several months at the two rural locations.

The chemical composition of a subset of the PM10 samples was determined in the frame of the project for subsequent source apportionment analysis. Although a number of components were grouped by factor analysis and attributed to a crustal source, it is difficult to distinguish between natural and anthropogenic crustal dusts. We will not focus on this issue. On the other hand, African dust intrusions can be isolated from the output of a number of dust transport prediction models and satellite imagery.

Synoptic conditions leading to the arrival of air masses with (or without) dust load and

driving characteristic surface wind speeds were also studied.

24-hour average PM10 concentrations are in general low at high wind speeds, while high PM10 values (also moderate and low values) can occur when the winds are calm. This means that there are other factors affecting PM10 levels. PM10 has a component that is accumulated in stable conditions and diluted with increasing wind speeds: a combination of emissions from combustion, formation of secondary aerosols and re-suspended dust due to human activities. The component of PM10 that increases with wind speed is less intense in the study region.

The wind-driven components of the suspended particulate matter (PM) are disaggregated when studying the aerosol size distribution measured in 5 or 10 minute intervals. We looked at the effect of wind speed on the different particle size channels by averaging the number particle concentrations in each channel divided into 1m/s wind speed intervals. The concentration of particles bigger than 6.5um show a marked net increase with wind speed while the concentration of smaller particles decrease due to ventilation. The 7-day (anthropogenic) and 24-h (anthropogenic and natural) periodic components and also the non-periodic ones were studied for each size fraction. The analysis of weekdays and weekend days provides further insight.

A field campaign was conducted during the last period of the project to relate aeolian erosion and PM measurements at the rural site. Two passive collectors were developed to measure the vertical profile of the horizontal flux.

When measurements are not *directly* affected by a nearby local source, human activities provoking the resuspension of PM are the main contributors to the crustal PM load in the study area. Erosion events are supply-limited and events of several hours (or less) duration result in a reduced contribution to 24-h average concentration levels.