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Monitoring the Spatial Aerosol Distribution of Volcanic Ashes and Sahara Dust on La Palma Island

Airborne dust affects both human health and the environment. In the human lung, dust deposition can cause respiratory diseases. And dust deposition of snow and glaciers for example intensifies melting and probably also influences other atmospheric conditions that are related to climate change. This wide range of effects leads to a major interest in aerosol measurements for large group of researchers.

Measurement setup

Nine aerosol spectrometers (AQ Guard Smart System) were installed around the volcano from mid November 2021 until mid-February 2022. The measurements covered a period with volcanic activities (until 13.12.2021) and without as well a Sahara sand dust event on the island ("La Calima", 14./15.01.2022). The devices recorded aerosol number concentration and size distribution as well as particulate matter values.

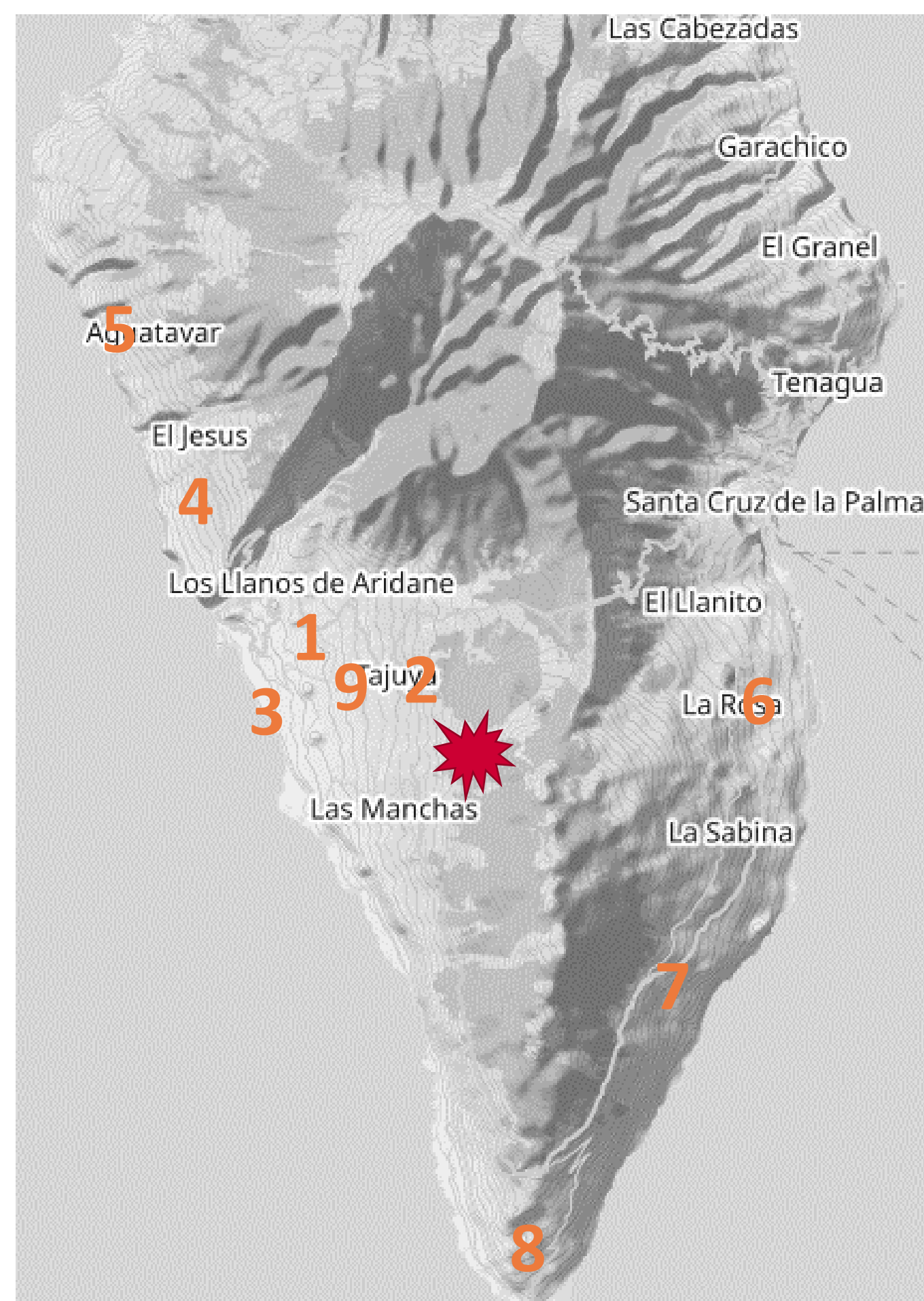


Figure 1: Location of AQ Guard Smart units

Differences in aerosol size distribution

The particle size distribution (1h average) obtained during the volcano eruption (airborne volcanic ashes) and the Sahara sand dust event (airborne sand dust) are shown in the figure below together with an exemplary size distribution of normal ambient air at the same location. While sand dust influences the whole captured particle size range, volcanic dust is found to be much coarser.

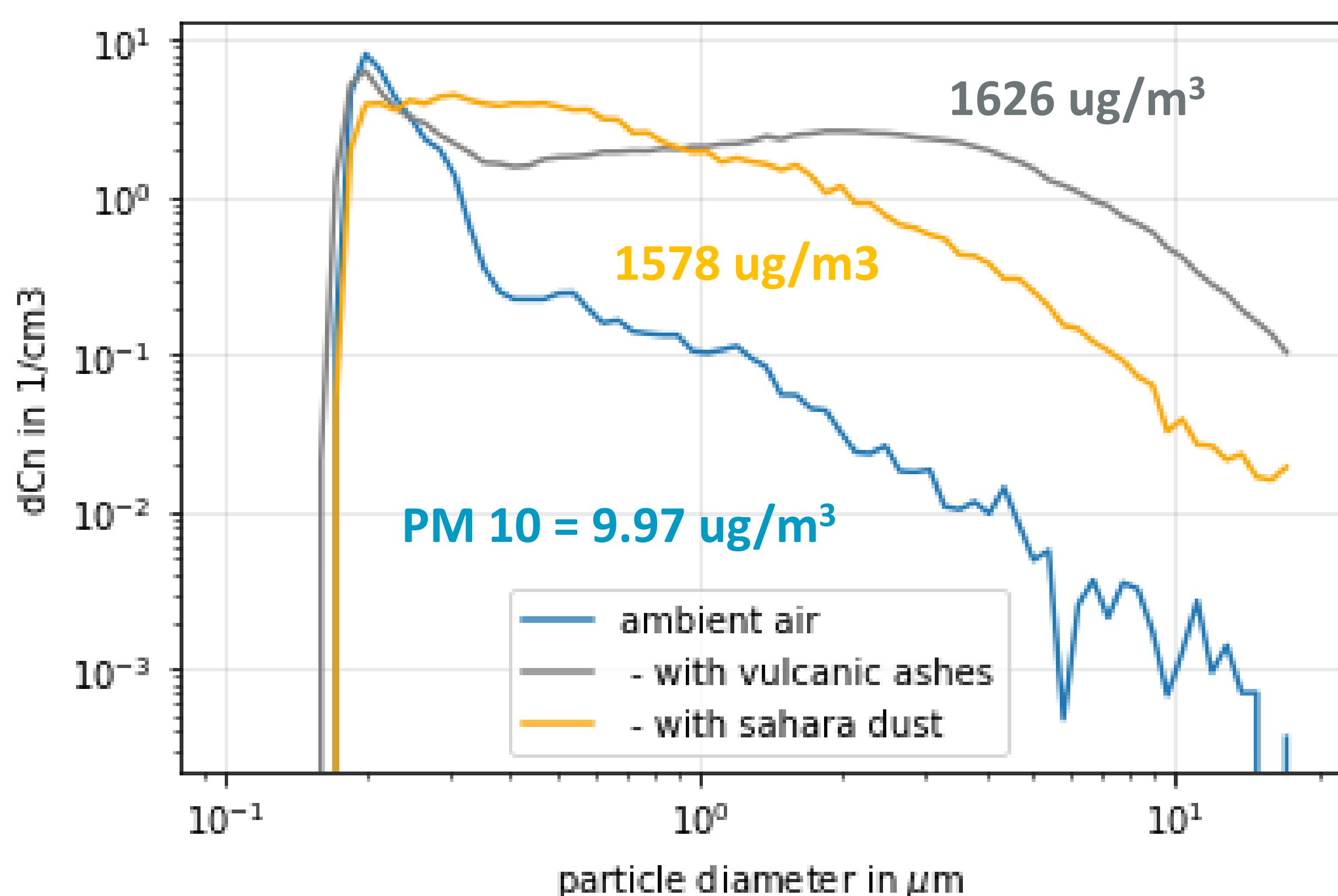


Figure 2: Particle size distribution (1 h average) measured during different events at location 1



Spatial distribution of aerosol during „La Calima“ sand dust event

Figure 3 shows how coarse dust pollution from Sahara dust loaden North-west wind reaching evolves on the island. Location 3 and 6 are the first ones to be affected. Station 1 and station 7 following shortly after that with a much lower dust load. The results show, that the transport of the dust from the sea to the island highly depends on the local geography and such a dense network of measuring points is needed to study it in detail.

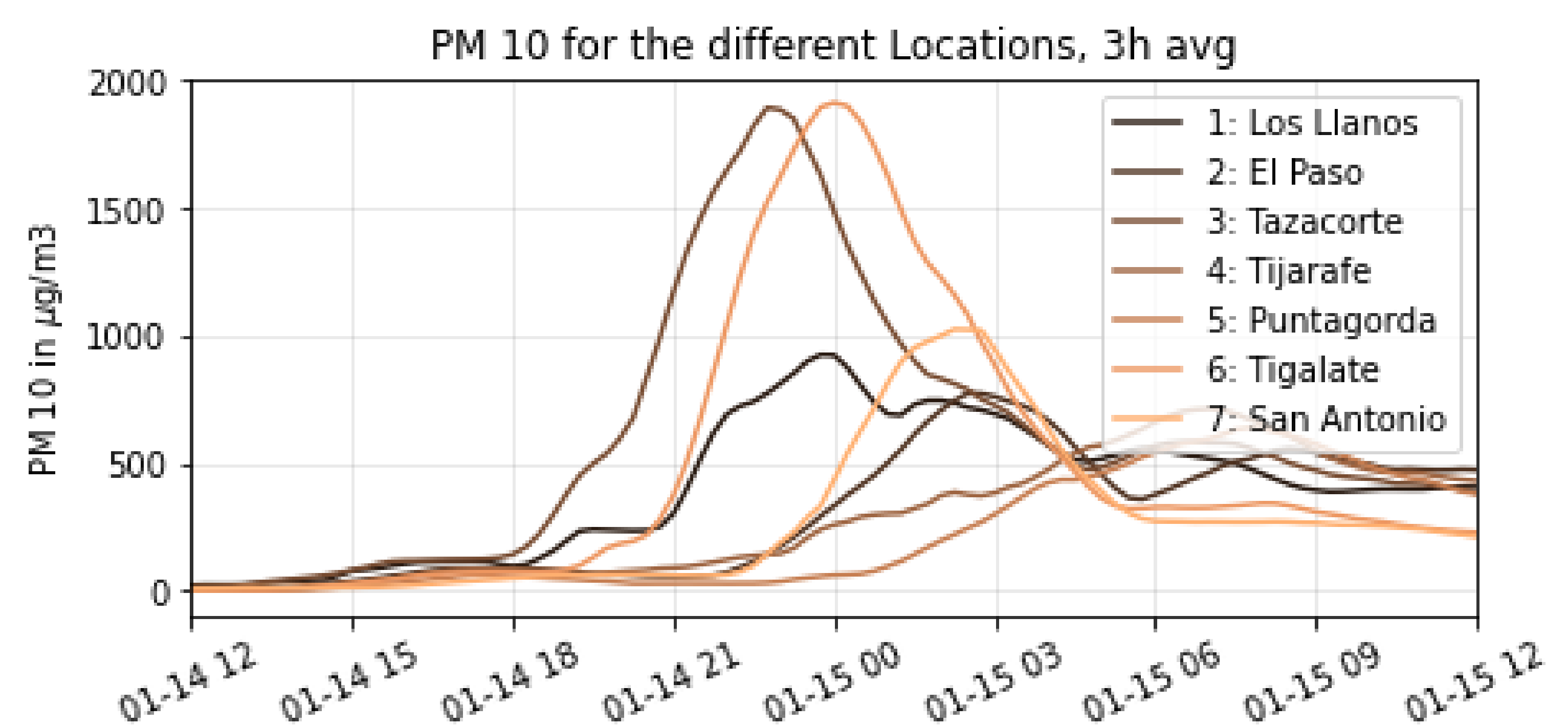


Figure 3: Spatial and temporal resolution of coarse dust pollution during Sahara sand dust event

Outcomes

- Aerosol composition can be very different even if particulate matter values are similar. Aerosol size spectrometers can be used to make this differences visible
- Dust transport depends highly on local geographic and weather conditions. A dense network of measuring points is needed, for detailed studies

