Mineral dust influence on particle composition in Northern Africa

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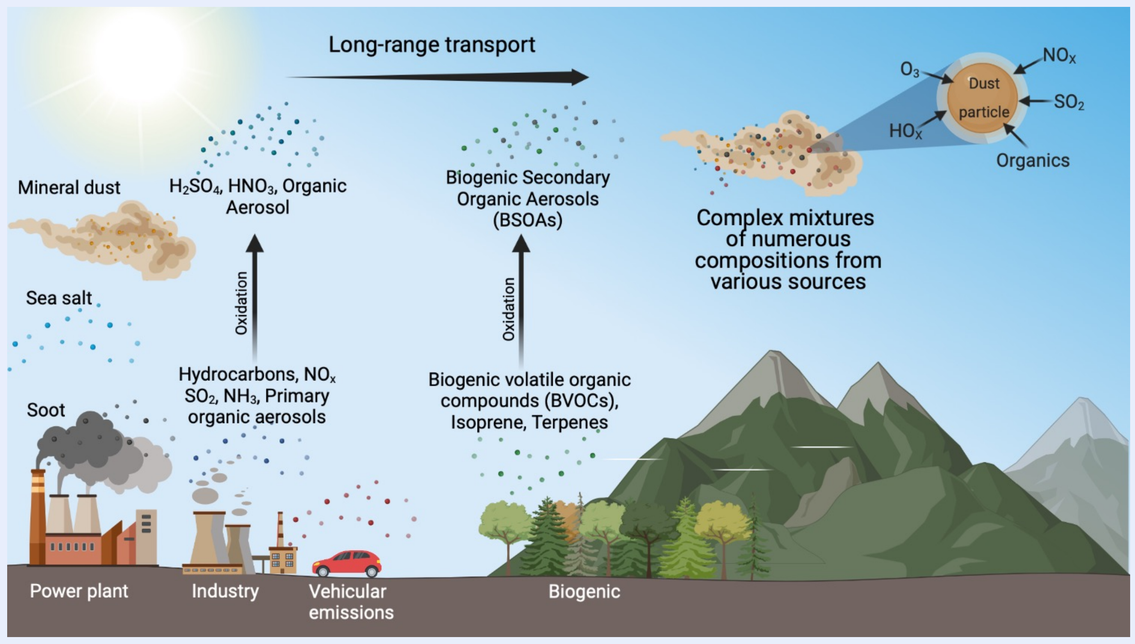
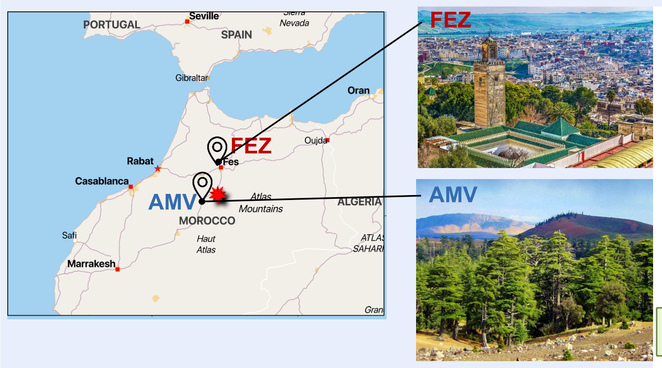
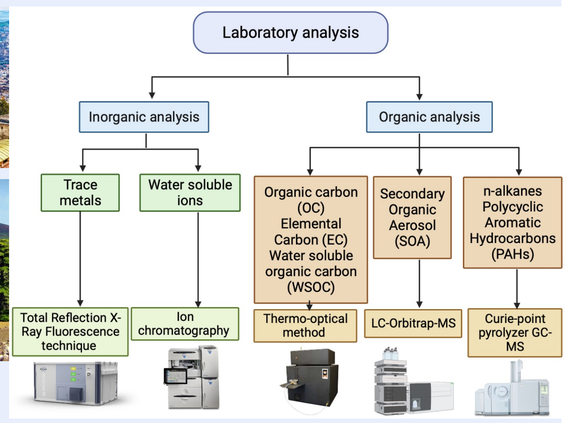
Motivation



- Dust particles influence the formation of sulfate and nitrate by heterogeneous reactions.
- Mixing between dust and organics leads to heterogeneous and aqueous oxidation on the surface of dust particles.
- The effect of dust on the chemical composition in remote and urban sites is not yet fully understood.

Methods

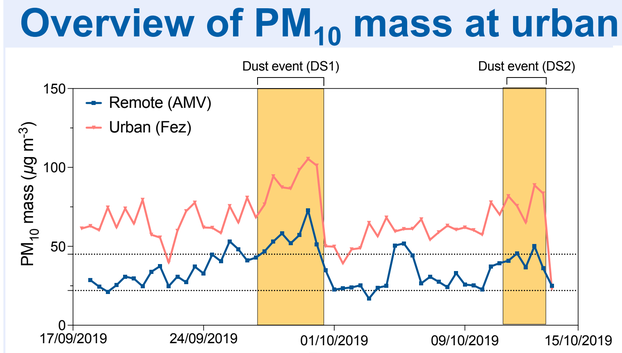


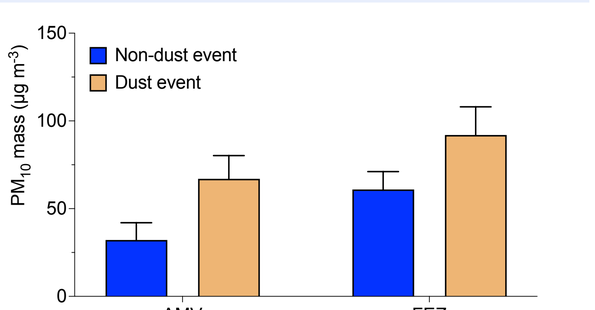


- An intensive sampling campaign was conducted in Sep-Oct 2019 at two distinct sites in Morocco: **Atlas Mohammed V (AMV) -** remote high altitude and **the city of FEZ** – urban.
- Particulate matter (PM) were collected using a high-volume (HV) collector with a PM10 inlet in a 12h sampling interval.
- 96h back trajectories were estimated using the NOAA HYSPLIT to identify the origin of the air masses reaching the station.

Results

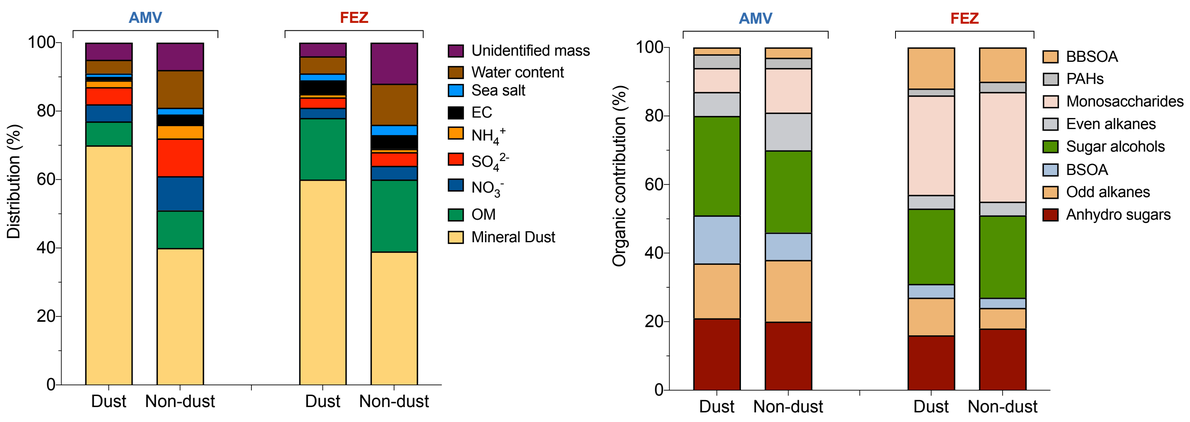
Overview of PM_{10} mass at urban and remote sites





- Mean PM10 mass Fez (68.8 μg m^{-3}) two times higher than AMV (35.1 μg m^{-3}).
- Selection criteria for dust event samples: (1) Back trajectory analysis and (2) dust concentration estimation.
- PM10 mass concentration increased by 67% (AMV) and 50% (FEZ) during dust events.

Chemical composition during dust and non-dust events

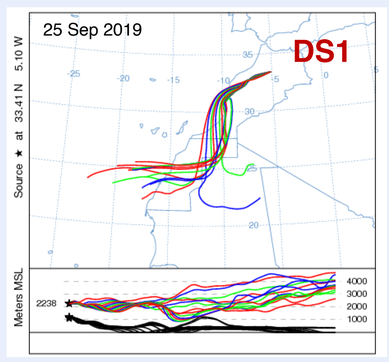


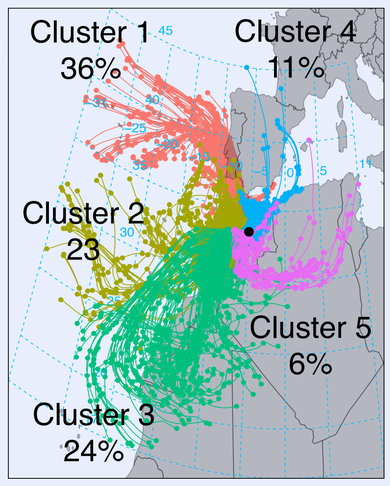
- Higher contribution of biogenic tracers (14%) during dust events at the AMV.
- High contribution of anthropogenic and biomass burning tracers (up to 48%) at FEZ.

Results

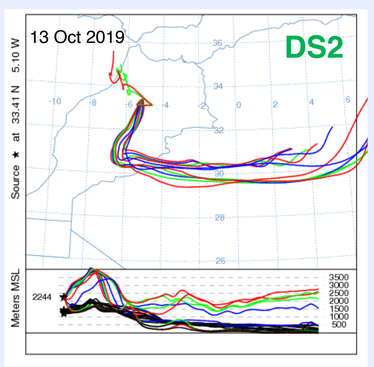
Identification of air mass origins

❖**Cluster 3: Moroccan Western Sahara**



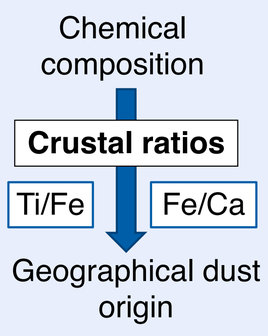


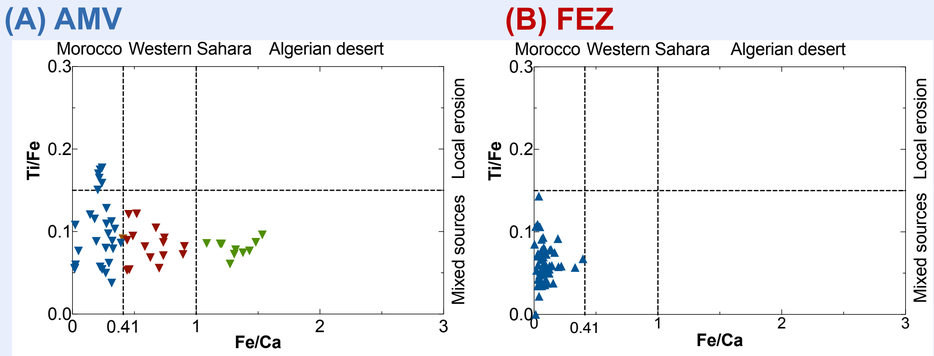
❖**Cluster 5: Algerian desert**



- The cluster approach identified two distinct geographical sources contributing to mineral dust in Morocco.
- The southern region of Morocco (cluster 3) was the most dominant source of mineral dust.

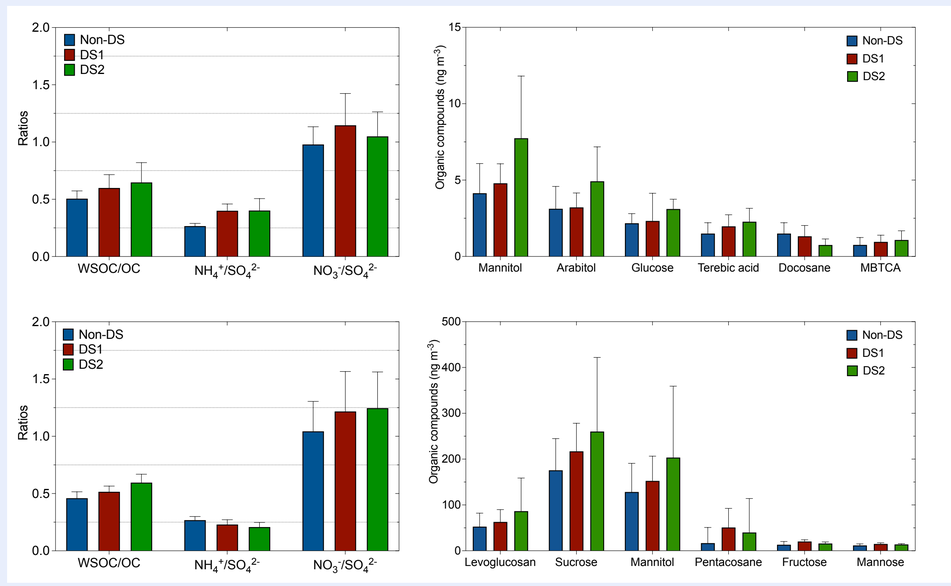
Crustal ratios during dust and non-dust days





- Multiple origins of the dust at AMV mainly local (Morocco), Western Saharan, and Algerian Sahara.
- Local dust from Morocco plays a more important role in Fez as showed by the lowest Fe/Ca ratio (~0.4).

Impact of mineral dust on particle composition



- High WSOC/OC ratio during DS2 indicates significant contributions of secondary or aged organic aerosols at both sites.
- Dust events lead to increase of acidity particles in Fez because of the inversion layer of Saharan dust.
- Dust particles were often loaded with fungal spore material as shown by sugar alcohols during DS2.

Conclusion