Observational Evidence for Long-Range Transport of Bioaerosols by African Dust

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Overview

Bioaerosols might be some of the most understudied and puzzling environmental particles when it comes to our understanding of their impact on weather and climate. More research has been focused on their health impacts than on how they impact cloud and precipitation formation (Kim *et al.*, 2018). Some studies suggest that bioaerosols are not just a local phenomenon but, in fact, can be transported over thousands of kilometers by deep convection, tropical waves and on dust from African windstorms.

Recent measurements of fluorescing aerosol particles (FAP) with the Wideband Integrated Bioaerosol Sensor (WIBS) in Puerto Rico, Spain and the United Kingdom, have identified large increases in the number concentration of these particles embedded in African dust layers that have travelled extensive distances. In our presentation we do the following comparisons:

1. African dust aged over widely different time scales – 3 to 10 days.
2. African dust that passed over different surfaces – land vs marine.
3. African dust generated during winter and autumn – possible differences in bioaerosol type.
4. Bioaerosol characteristics – FAP type (A, B, C, AB, BC, AC, ABC) number concentration, fraction of total particles, fluorescence intensity, size and shape.
5. Comparison of non-FAP characteristics – number and volume concentration, size and shape.
6. Air mass histories – RH, mixing depth, temperature and precipitation.

Preliminary Results

Figure 1 shows the trajectories of airmasses originating over northern Africa arriving in León, Spain, three days later. Figures 2 and 3 compare particle properties from an African dust event over Puerto Rico in 2020 and the 2022 event over Spain. The number concentrations of FAP increased by an order of magnitude at both locations, as did the asphericity of all non-FAP particles.

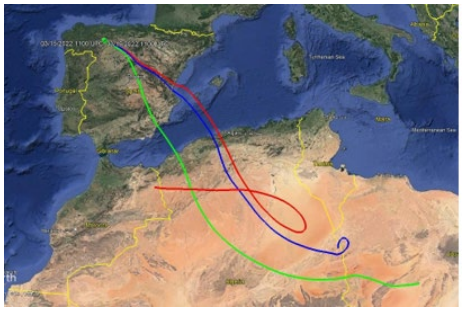

Figure 1. The 24-hour back trajectories ending at 50, 100 and 300 m on March 25th, 2022.

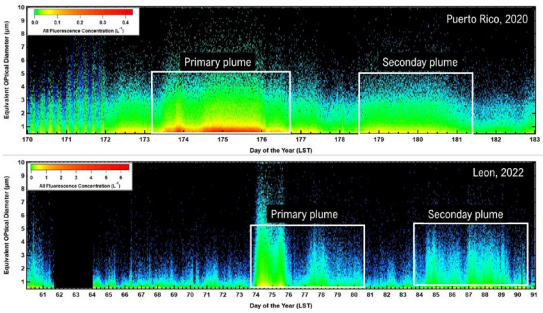

Figure 2. Fluorescence particle concentrations during dust events in Puerto Rico and Spain.

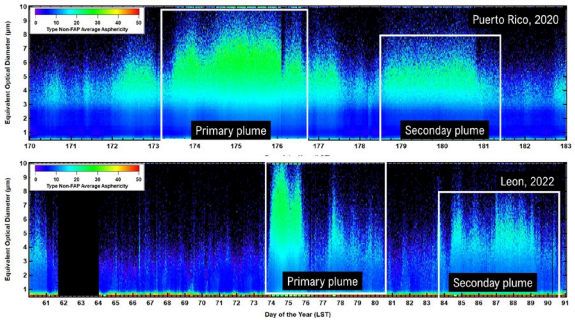

Figure 3. Non-fluorescing particle asphericity during dust events in Puerto Rico and Spain.

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Kim et al. (2018). *J Environ Sci*, **67**, 23–35.