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Application of Fluorescence In Situ Hybridization to analyze bioaerosols in the transatlantic transport of Saharan dust

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Biological aerosol particles are ubiquitous in the Earth's atmosphere with fractions up to 70% in the coarse mode aerosol population. Airborne bacteria, pollen and spores are well known to play an important role in public health and the spread organisms. Moreover bioaerosols are supposed to affect the Earth's climate by influencing the atmospheric energy budget and as well as physical and chemical processes. Even though the importance of these highly diverse particles was already realized decades ago, their composition, abundance and identity are still poorly understood (Després et al., 2012).

A promising technique to address the afore mentioned open questions is Fluorescence In Situ Hybridization (FISH). This molecular biological method enables the identification of single cells in complex biological and non-biological material such as ambient aerosol samples. Thereby, fluorescently labeled oligonucleotide probes mark target organisms down to genus level (Amann and Fuchs, 2008). The following fluorescence microscopic analysis sheds light on the taxonomic diversity of the sample's bioaerosol content. As a result, we receive information on dominant organism groups as well as their mixing and agglomeration properties.

This method is currently being established for ambient samples, which were collected in August 2016 at Ragged Point, Barbados. During the summer months, trade winds carry Saharan desert dust plumes over the Atlantic Ocean, which are typically reaching the Barbados coastal site after 5-7 days of transport. Besides mineral particles, these air masses also contain biological matter (Prospero et al., 2005). By the application of FISH to daily aerosol samples, we aim to clarify which organisms are co-advected with the Saharan dust plumes. The microscopic analysis provides a direct visualization of the aerosol mixing state and helps to clarify the bioaerosol transport modes. Thus, the FISH results will allow a deeper understanding of the abundance and mixing properties of bioaerosols in general and their specific role in transatlantic dust transport.

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