Biological aerosol particles and ice nuclei that come out during the rain

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Bioaerosols are relevant for public health and may play an important role in the climate system, but their atmospheric abundance, properties, and sources are not well understood. Through a series of recent ground-based measurements we show that bioparticles are often closely correlated with atmospheric ice nuclei (IN) and that in some locations, but not all, the concentration of airborne biological particles increases significantly during rain. The peak in bioparticle concentration is typically ~3 μm and the greatest rain-induced increase of bioparticles and IN occurred in the size range of 2-6 μm, which is characteristic for bacterial aggregates and fungal spores. DNA analysis from a study in a N. American pine forest shows high diversities of airborne bacteria and fungi, including groups containing human and plant pathogens (mildew, smut and rust fungi, molds, *Enterobacteraceae, Pseudomonadaceae*). Long-term measurements of fluorescent bioparticles show seasonal increases during summer and fall, with reductions of more than an order of magnitude during winter. Our findings suggest that atmospheric bioaerosols, IN, and rainfall are more tightly coupled than previously assumed and that daily and seasonal patterns in bioaerosol emission are broadly consistent and predictable.