Fungal spores can account for large proportions of air particulate matter, and they may potentially influence the hydrological cycle and climate as nuclei for water droplets and ice crystals in clouds, fog, and precipitation. Moreover, some fungi are major pathogens and allergens. However, the diversity and biogeographic distribution of fungi in air particulate matter is hardly known, although air is one of the main media for the dispersal of microorganisms connecting all ecosystems at the Earth's surface.

Here we report first insights into the global atmospheric distribution of fungal diversity obtained by DNA analysis of air filter samples collected in different climatic zones around the world. In particular we found that the ratio of species richness between Basidiomycota and Ascomycota is much higher in continental air than in marine air.

Our results clearly demonstrate the presence of geographic boundaries in the global distribution of microbiotic taxa in air, and indicate that regional differences may be important for the effects of microorganisms on climate and public health. Our findings also suggest that air flow patterns and the global atmospheric circulation are important for the evolution of microbial ecology and for the understanding of global changes in biodiversity.