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Modelling the impact of fungal spore ice nuclei on clouds and precipitation

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Fungal spores are part of the atmospheric bioaerosols such as pollen or bacteria. Interest in bioaerosols is mainly related to their health effects, impacts on agriculture, ice nucleation and cloud droplet activation, as well as atmospheric chemistry (Morris et al. 2011). Spores of some fungal species have been found to be very efficient ice nuclei, e.g. in laboratory studies by Pouleur et al. (1992). Recent field studies by Poehlker et al. (2012) found that fungal spores are important contributors to the development of mist and clouds in rainforest ecosystems.

In our study we investigated the impact of fungal spores acting as ice nuclei on clouds and precipitation on a global scale. Fungal spores as a new aerosol species were introduced into the global climate model ECHAM5-HAM (Sesartic et al. 2012) using observational fungal spore data compiled by Sesartic & Dallafior (2011).

The addition of fungal spores lead to only minor changes in cloud formation and precipitation on a global level, however, changes in the liquid water path and ice water path as well as stratiform precipitation in the model were observed in the boreal regions where tundra and forests act as sources of fungal spores. This goes hand in hand with a decreased ice crystal number concentration and increased effective radius of ice crystals. An increase in stratiform precipitation and snowfall can be observed in those regions as well. Although fungal spores contribute to heterogeneous freezing, their impact in the model was reduced by their low numbers compared to other heterogeneous ice nuclei. These results for fungal spores are comparable to the ones achieved with bacteria (Sesartic et al. 2012).

REFERENCES

Morris, C. E. et al. 2011: Microbiology and atmospheric processes: research challenges concerning the impact of airborne micro-organisms on the atmosphere and climate, Biogeosciences, 8, 17-25.

Poehlker, C. et al. 2012: Biogenic Potassium Salt Particles as Seeds for Secondary Organic Aerosol in the Amazon, Science, 337 (6098), 1075-1078.

Pouleur, S. et al. 1992: Ice Nu-cleation Activity in Fusarium acuminatum and Fusarium avenaceum, Appl. Environ. Microb., 58, 2960-2964.

Sesartic, A. and T. N. Dallafior, 2011: Global fungal spore emissions, review and synthesis of literature data. Biogeosciences, 8, 1181-1192.

Sesartic, A., U. Lohmann and T. Storelvmo, 2012: Bacteria in the ECHAM5-HAM global climate model. Atmos. Chem. Phys., 12, 8645-8661.