Geophysical Research Abstracts
Vol. 15, EGU2013-7813, 2013
EGU General Assembly 2013

Primary Biological Aerosol as Cloud Condensation Nuclei

Francis Pope (1), Paul Griffiths (2), Michael Herzog (3), and Markus Kalberer (2)

(1) School of Geography, Earth and Environmental Sciences, University of Birmingham, Birmingham, United Kingdom (f.pope@bham.ac.uk), (2) Department of Chemistry, University of Cambridge, Cambridge, UK, (3) Department of Geography, University of Cambridge, Cambridge, UK

Primary biological aerosols (PBAs) represent a significant fraction of the total atmospheric aerosol mass burden. The low number density of PBA precludes a significant direct effect on the radiative budget of the Earth. However, the large particle size of PBA should allow them to have a significant indirect radiative effect on cloud processes if they are wettable. In particular, PBA may preferentially activate as cloud condensation nuclei (CCN) when compared to the smaller background aerosol. This effect will be most pronounced under pristine conditions where the background aerosol concentrations are small and of low hygroscopicity. Recent measurements of high PBA concentration within the Amazon (Huffman et al. 2012) suggest that this region may be particularly important for PBA-cloud interactions, and hence a potential feedback between the atmosphere and biosphere could be established (Pöschl et al. 2010).

This study investigates the ability of primary biological aerosol (PBA) to influence cloud formation and precipitation dynamics. In particular, pollen grains and fungal spores have been studied using a combined laboratory and modelling approach. The laboratory studies assessed the hygroscopicity, wettability and activation of the particles. The model output data suggests that under certain atmospheric conditions the activation of PBA can significantly interfere with the activation of the fine aerosol mode thus changing cloud dynamics. This work expands upon our previously published results on pollen activation (Pope 2010, Griffiths et al. 2012).

References

Huffman et al. (2012) 12, 11997. doi:10.5194/acp-12-11997-2012
Pöschl et al. (2010) Science. 329(5998), 1513. doi:10.1126/science.1191056
Pope (2010) Environ. Res. Lett. 5, 004015. doi:10.1088/1748-9326/5/4/044015
Griffiths et al. (2012) Atmos. Sci. Lett. 13(4), 289. doi:10.1002/asl.397