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Quantifying emissions of Primary Biological Aerosol Particles (PBAP's)

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Primary biological aerosol particles (PBAP's) are fragments of biological tissue or tiny organisms which become airborne basically unaltered. These particles either fully retain their original cell structure (and thus maintain their cell walls to separate their interior from outside influences), or they consist of broken-up cells. Their material is organically produced matter. An overview has been presented by Wittmaack et al. (2005).

Recent research to assess sources of particulate material in the atmosphere indicates a considerable contribution from biological material (Jaenicke, 2005). Biological material is recognized as such by specific compounds (e.g., proteins or cellulose) which are important constituents of such material. These compounds are not able to undergo phase transfer, thus it may be concluded that the material in question has become suspended in air by primary emission.

Material in question contributes to organic carbon aerosol, but develops either from friction processes on the earth surface (plant debris, cellular particles), or it is actively emitted by plants to become airborne (fungal spores). In the large size fraction, also pollen are relevant, and in terms of number concentration (but not for mass) also bacteria need to be considered.

Both protein (Matthias-Maser et al., 2000) and cellulose (Kunit and Puxbaum, 1996) have been used previously to trace these specific compounds. They may encompass direct consequences of human activities (agriculture, animal breeding, waste storage,

composting or landfilling), but they also may derive from natural processes.

Assessing emissions is hampered by the lack of a specific source term. As long as emitting processes are not defined, the only possibility for quantification is to use atmospheric concentration data. There is a potential that emissions derived according to atmospheric concentrations are covered as emissions in existing inventories, if they derive from anthropogenic processes.

Long-term measurements on cellulose and laevoglucosan, a wood-fire tracer, are available from Sanchez-Ochoa (2005) and can be used to obtain a ratio to emissions from wood combustion. On an area scale, an emission factor of 8 kg/km^2 vegetated area and year can be derived for plant debris. A number of observations indicate that significantly more biological material exists airborne than cellulose. Using a full-year dataset of fungal spore concentrations, we arrive at roughly 80 kg/km^2 and year of fungal material as obtained from microscopy on aerosol samples.

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Literature:

Jaenicke, R. (2005). Science 308, 73.

Kunit, M., and H. Puxbaum (1996). Atmos.Environ. 30, 1233-1236.

Matthias-Maser, S., K. Reichert and R. Jaenicke (2000). Journal of Aerosol Science 31, S 955-956 2000

Sanchez-Ochoa, A., 2005. Dissertation, Vienna University of Technology.

Wittmaack, K., H. Wehnes, U. Heinzmann, R. Agerer (2005). Science of the Total Environment 346, 244- 255.