Quantifying the global sources and concentrations of primary biogenic particles

BURROWS SUSANNAH[1]*

[1]Pacific Northwest National Laboratory, Atmospheric Sciences and Global Change Division

Primary biological and biogenic particles (Després *et al*, 2012) have been suggested to play a role in cloud process by acting as ice nuclei (IN) to trigger heterogeneous freezing of cloud droplets at warm temperatures (e.g., -5 to -15 °C). Furthermore, biogenic contributions to sea spray aerosol may substantially modify the chemical composition of nascent fine-mode sea spray, thereby potentially affecting its cloud nucleating ability. However, the relevance of biogenic particles depends greatly on their global distribution.

I will discuss the development of global emissions parameterizations for primary biogenic particles, and implications for aerosol-cloud interactions. Continental sources of primary biological particles include bacteria (Burrows *et al*, 2009), fungal spores, pollen, leaf fragments, and others. Estimates suggest that these classes of particles play a small role in freezing on a global scale due to their low concentrations, although (Hoose *et al*, 2010). In the marine atmosphere, observations suggest that a weak ocean source of ice nuclei to the atmosphere may exist and may be sufficient to dominate the IN population sampled in the remote marine boundary layer, particularly over the Southern Ocean (Burrows *et al*, 2013).

Finally, some observations indicate a relationship between the organic mass fraction of submicron sea spray and ocean chlorophyll concentrations, however, the mechanism underlying this relationship has not yet been described. We have recently developed a model of the chemical composition of nascent film drop aerosol based on a simplified model of surfactant coverage of bubbles in the ocean, combined with estimated oceanic distributions of various classes of organic molecules. Observed relationships between chlorophyll and fine mode sea spray organic mass can be largely explained by the correlation between ocean chlorophyll and ocean surfactants (Burrows *et al*., 2014 *submitted*).

[1] Burrows, Butler, Jöckel, Tost, Kerkweg, Pöschl, and Lawrence (2009), *Atmospheric Chemistry and Physics* **9**, 9281-9297. Hoose, Kristjánsson and Burrows (2010), *Environ. Res. Lett.* **5**, 024009. Després, Huffman, Burrows, Hoose, Safatov, Buryak, Fröhlich-Nowoisky, Elbert, Andreae, Pöschl, Jaenicke (2012), *Tellus B,* **64**, 15598. Burrows, Hoose, Pöschl, and Lawrence (2013), *Atmos. Chem. Phys*., **13**, 245-267.