Association of fungal tracers with biomass burning activity in northern Vietnam

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Primary biological aerosol particles (PBAPs), as derived from pollen, fungi, bacteria, viruses, algae, and plant fragments, have recently been shown to contribute a sizeable portion of atmospheric particulate matter (PM) on global scale, specifically in coarse particles (Jaenicke et al. 2007). Fungal spores in particular constitute an important type of PBAPs (Elbert et al. 2007; Bauer et al. 2008a). A new method for estimating PBAP contributions was introduced by Bauer and coworkers by utilizing molecular source tracers, i.e., the polyols arabitol and mannitol (Bauer et al. 2008b). Ambient conditions, such as temperature and moisture, influence biological activity, including fungal spore release rates. Therefore, it is important to determine the concentrations of these tracers in ambient PM as a function of environmental conditions.

Biomass burning was proposed as a potential source of fungal spores by using traditional incubation and microscopic methods (Mims and Mims 2004). The study proposed that major fires (which can produce smoke plumes greater than 3 km) could be much more effective in launching spores into the troposphere than surface wind storms, while small burns of diseased plants as well as cooking and heating with diseased firewood might disperse pathogenic spores on a smaller scale. A recent study also showed the elevation of fungal tracer concentrations in ambient PM due to biomass burning in central China (Yang et al. 2012).

In the Southeast Asian region, large-scale biomass combustion activities take place in the dry season each year, especially in March and April. The burning activities not only affect local air quality and regional climate but may also influence biogenic activities, which might further affect human health.

In this report we present observations of surprisingly good correlation of fungal spore tracers (mannitol and arabitol) with biomass burning tracers (levoglucosan, mannosan, galactosan and potassium ion) during the biomass burning season (March and April) at Sonla, Vietnam (Fig. 1), which shows significant impacts of biomass burning on fungal abundance in the atmosphere. Furthermore, a negative correlation was observed for the fungal tracers with humidity and a positive correlation with temperature.

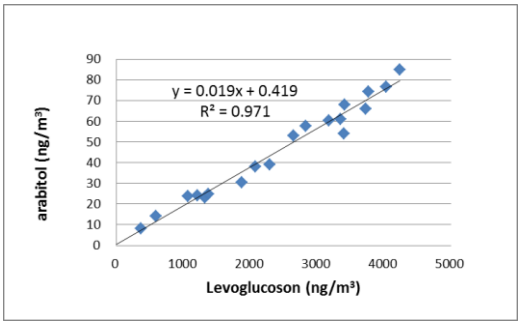

Figure 1. Correlation of concentrations of a biomass burning racer (levoglucosan) and fungal spore tracer (arabitol) during biomass burning season in Vietnam.

While additional work is necessary to understand the association of these two processes, we propose potential release mechanisms of fungal spores triggered by biomass burning processes.

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