

3.045 Primary and secondary biogenic organic aerosols in a midlatitudinal forest in Wakayama, Japan.

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Abstract:

Both primary biological aerosol particles (PBAPs) and oxidation products of biogenic volatile organic compounds (BVOCs) contribute significantly to organic aerosols (OAs) in forested regions. However, little is known about their relative importance in diurnal timescales. We report biomarkers of PBAP and secondary organic aerosols (SOAs) for their diurnal variability in a temperate coniferous forest in Wakayama, Japan. Tracers of fungal spores, trehalose, arabitol and mannitol, showed significantly higher levels in nighttime than daytime ($p < 0.05$), resulting from the nocturnal sporulation under near-saturated relative humidity. On the contrary, BVOC oxidation products showed higher levels in daytime than nighttime, indicating substantial photochemical SOA formation. Using tracer-based methods, we estimated that fungal spores account for 45% of organic carbon (OC) in nighttime and 22% in daytime, whereas BVOC oxidation products account for 15 and 19%, respectively. To our knowledge, we present for the first time highly time-resolved results that fungal spores overwhelmed BVOC oxidation products in contributing to OA especially in nighttime. We also present the genetic diversity of fungal species contributing to OC. This study emphasizes the importance of both PBAPs and SOAs in forming forest organic aerosols.