Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2015-671-RC2, 2016
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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Fungal spores overwhelm biogenic organic aerosols in a mid-latitudinal forest" *by* Chunmao Zhu et al.

Anonymous Referee #2

Received and published: 25 February 2016

Zhu et al report on biological aerosol particles contribution to organic aerosol (OA) at a fine temporal scale. Their main finding is that fungal spores overwhelm BVOC oxidation products in terms of % contribution to OA, especially at night time due to sporulation and absence of photochemistry (45% vs 15%), but also at daytime (22% vs 19%). The paper is well written and presents novel data, and is worth to be published after revisions as detailed below. While I find that the sampling methodology, the analytical and chemical sections and discussions are sound and consistent, the interpretations the authors give of observed patterns in light of atmospheric dynamic are often weak and sometimes wrong in my opinion. Overall they are not supported by any atmospheric data, nor local meteorological or micrometeorological data, nor trajectory analysis. This lack of analysis makes all the atmospheric arguments rather speculative. I strongly encourage to make use of the data that are available to support

the discussion, especially a back-trajectory analysis would be informative, coupled at least to local wind-rose analysis. Mesoscale model runs (WRF etc) would be also very helpful if feasible. The discussion needs to be refocused based on the available data.

Major comments: âĂć L97 - 104: the authors divide the study period (10 days) into two 5 days sub-periods: "During August 20–25, air masses originated from the Asian continent or passed over the Japanese islands brought pollutants from anthropogenic sources, while during August 26–30 air masses originated from the western North Pacific, which create an environment close to the pristine forest"

This is a superficial assumption not supported by any atmospheric circulation-back trajectory analysis. I did some very basic back-trajectory with Hysplit (see figure), showing that while the backward oceanic circulation (on the sampling day Aug 28) is indeed very clear (red trajectory), the terrestrial land influence (sampling day on Aug 23) is not (green). Winds are very weak, making the assessment of the air mass origin quite difficult, and the time scales involved very long. On a 72 hrs scale (see figure), if there is any land influence it appears more from Japan than from asian continent. Then saying that continental air masses carry anthropogenic pollution signatures is also not supported, since this will depend again on the airmass trajectory (pollution sources concentrate in cities that are a minor fraction of land cover).

âĂć L168-170: "Insignificant diurnal variations of these two compounds imply that they were emitted ubiquitously in the forest possibly from plants and microorganisms".

I do not agree here: absence of diurnal variation of a compound is likely because it is not emitted at all, and the measured signal moslty advected. If there's an ubiquotuous emission, we should more see a diurnal trend, driven by PBL growth during the day and collapsing at night.

âĂć L185-187: "The diurnal variation of levoglucosan with daytime maxima in the Wakayama aerosols indicates that the Asian outflow of biomass burning emissions approached to the sampling site."

Again this is not adequately supported with trajectory analysis, see also comment above. If there's any (and it appears not) influence of asian continet, this will act on a multi-day scale (distance > 1000 km!), so linking this hypothetical difference to the daytime-nighttime difference makes no sense.

âĂć L182 . . . " sea-breeze circulations at day and drainage flows at night". Again not supported. Here the authors are going on a finer scale interpretation (local sea breeze developments) that is mixed with the long range transport interpretation (the asian outflow..). Is at least wind speed and direction supporting the sea breeze regime? No wind data is reported in the study.

âĂć Fig 2 (hourly patterns) reveals interesting patterns: while BVOC patterns are more clear and consistent (panels c and d) with photochemical activity, some other are less (a, b). Some more interpretation in the light of night accumulation and turbulent mixing built up in the morning could improve the analysis, again depending on wind-turbulence data availability.

Minor: L71-73: also PTR-MS technology to measure BVOC continuously in field. L136: it appears text is confounding fungus with tracers? Please clarify this section, also better supporting the use of those sugar alcohols as PBAP tracers. How consolidates is this asumption? what limitations? waht accuracy in estimating PBAP indirectly. L162-164: can this be better supported? pollen sampling?

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2015-671, 2016.

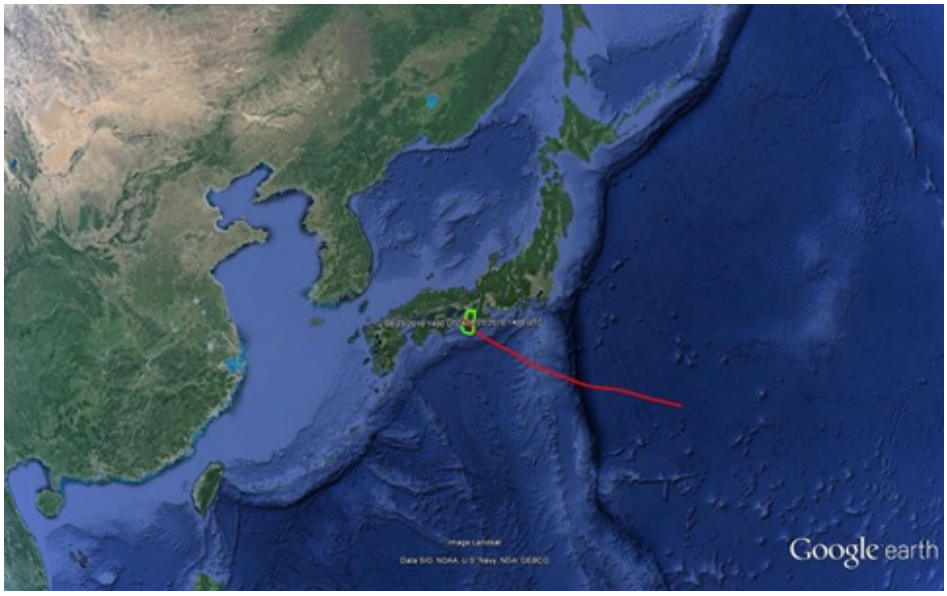

Fig. 1. Hysplit back-traj