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Atmospheric Chemistry and Physics Discussions

Interactive comment on "New insights in the global cycle of acetonitrile: release from the ocean and dry deposition in the tropical savanna of Venezuela" *by* E. Sanhueza, et al.

Anonymous Referee #1

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The manuscript presents new observations of acetonitrile concentrations in South America. Measurements available from this part of the globe are notoriously sparse and therefore highly desirable. As a potentially unique tracer for biomass burning, understanding the global cycle of acetonitrile is of great interest. The measurements suggest substantial dry deposition of acetonitrile, which could have important implications for modeling it's global cycle. I encourage publication after some modification. In particular, the authors argue for an oceanic source, which would have been observed for the first time. They need to make a stronger case for this hypothesis. As reported, previous observations on aircraft and in remote places have suggested a substantial ocean sink with dry deposition velocities on the order of 0.05- 0.24 cm/s.

Two major questions arise:

(1) Can one really exclude the influence of biomass burning? Small-scale fires (e.g. on plantations or from biofuel) are common in the tropics all year round (even in the wet season); this could be responsible for an elevated background causing the observed diurnal variations of acetonitrile. As CO has many other sources, a correlation with acetonitrile would not necessarily be obvious all the time (especially further downwind). The authors also report that there were some periods, when a correlation between CO and acetonitrile was observed, which suggests that biomass burning activities were going on to some extent. The measurement site is situated several hours downwind from the ocean. I imagine that on it's way air masses could be influenced by emissions from biofuel or small-scale fires. Global fire datasets (see also: http://eosdatainfo.gsfc.nasa.gov/eosdata/ssinc/modland_dataprod.shtml?, http://www.cptec.inpe.br/products/queimadas/queimap_i.html, http://www.dpi.inpe.br/proarco/bdqueimadas/) indicate some extent of biomass burning in Venezuela during September and October 1999, when this study was conducted.

(2) Couldn't the observed diurnal variation of acetonitrile be simply explained by the combination of entrainment of residual / free tropospheric air (with concentrations typically between 200-250 pptv) during daytime (as stated in the text) and dry deposition in the surface layer during nighttime? As summarized in table 1, Poeschl et al. measured acetonitrile concentrations up to 270 pptv in the tropical free troposphere (not too far from Venezuela). The concentration range in the free troposphere at the Mauna Loa Observatory was in general bound between 150 and 270 pptv comparable to values (200 to 250 pptv) observed during the INDOEX campaign. It is interesting that the authors see consistently low nighttime concentrations arguing for a significant dry deposition flux; this could imply that dry deposition parameterizations for acetonitrile currently used in atmospheric models might not be representative. Assuming a stable nocturnal boundary layer height of 100 m and an average daytime boundary layer

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height of ˜2000 m, it is expected that entrainment processes sufficiently mix in tropospheric background air with elevated acetonitrile mixing ratios as the boundary layer grows. Given the range and variability of concentrations observed in the free troposphere, it appears that the diurnal acetonitrile cycle could mainly be driven by surface deposition and explained without assuming an oceanic source.

Minor comments:

Rather than only showing mean acetonitrile concentrations in figure 1, I also suggest plotting the standard deviation and/or maximum and minimum concentrations observed during the study.

Page 6: "since the meteorological conditions were stable...". What indicated stable conditions - what fraction of the data was obtained during neutral conditions? Did measurements of wind speed and sensible heat flux indicate stable conditions all the time?

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 5275, 2003.