

Interactive comment on “Anthropogenic influences on the physical state of submicron particulate matter over a tropical forest” by Adam P. Bateman et al.

Anonymous Referee #2

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The paper reports particle bounce measurements made in Amazonia during GOAmazon2014 campaign. According to the results, particles are mostly liquid like in Amazonia and the anthropogenic influence can be seen in increased fraction of bounced particles. The paper is well written and the results are interesting enough so that I can recommend that the paper could be accepted to ACP after following comments have been addressed by the authors.

1) Page 11, line 226: “Calibration of the impactor shows a transition from rebound to adhesion between 102 to 1 Pa s in viscosity for sucrose particles (Bateman et al., 2015).” To relate particle bounce to viscosity values, more than one substance should be used in calibrations. The particle bounce properties are not affected only by viscosity, but

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also other material characteristics which may vary between different substances.

2) Page 11-12, lines 245-246: It seems that authors interpret the bounce curves in a way that if the rebound fraction is 5%, approximately 5% of the particles are solid. Even the bounce curves for single components, such as sucrose, are s-shaped curves and rebound value varies between 1 and 0. In the case of sucrose particles all the particles have absorbed same amount of water at certain RH, hence they all have the same physical phase state. The reason why for example 20% of sucrose particles are bouncing off from the impactor is not because 20% of the particles are solid and 80% liquid. 20% of sucrose particles are bouncing off at certain RH and 80% are sticking on the impactor substrate because the velocity of particles in impactor jet depends on their radial distance from the center of the impactor jet. Hence in this example, 20% of sucrose particles have kinetic energy higher than the dissipation and surface adhesion energies. So it is obvious that increasing rebound fraction doesn't necessarily imply external mixture and increasing fraction of solid particles. It can also imply changes in material characteristics of all particles (more solid particles). This should be taken into account in data interpretation and also the text should be changed accordingly throughout the manuscript.

3) According to main conclusions of the paper the changes in measured rebound correlated with decreasing kappa and decreasing O:C. Still no data on O:C is shown in the whole manuscript. Authors should show, for example, how O:C varies between pollution, biomass burning and background cases and also during day and night (Figure 3). Also O:C panel should be added to figure 4.

4) Also the rebound data corresponding different cases (polluted-biomass burning-background) should be shown.

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