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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Physical aerosol properties and their relation to air mass origin at Monte Cimone (Italy) during the first MINATROC campaign" *by* R. Van Dingenen et al.

**Anonymous Referee #1**

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Physical aerosol properties and their relation to air mass origin at Monte Cimone (Italy) during the first MINATROC campaign by Rita Van Dingenen et al.

General Comments: I like many aspects of this paper and the instrumentation of using both volatility and hygroscopic is something I guess we will se more of in the future. Deducing chemical properties from a set of physical characterizations is a powerful approach.

A few things needs to be clarified and some statements requires more analysis or should be removed before puplished. Thoughts and comments to the paper are pre-

sented in chronological order below.

Specific comments:

Issues in the Abstract will be addressed by the point-by-point comments below.

P1071, L10 Since both radius and diameter are used in the literature, please specify which is referred to here.

P1071, L26 Non-overlapping distributions between the DMPS and OPC instruments are not necessary for “good” measurements, but at the same time overlapping can not be used to verify the relative humidity in the instrument. The two devises measures different properties of the aerosol and these are not necessarily translated into the same particle size. Shape and refractive index of the particles will cause the size to be interpreted differently. It is good that the overlap is not significantly different, but do not use that as a verification of relative humidity effects.

P1072, L11 Here is mentioned 300C, in abstract it is 270C.

P1072, L17 Two questions regarding this statement. 1) Is this result valid for all aerosol loadings observed during the campaign? That is, was the test performed with comparable amounts of sulfates as was observed at MTC. 2) Was the volatilization complete also for sulfate particles in the upper size range? That is, can one exclude that sulfate particles outside the measuring range of the DMPS caused residues to be observed in the size range of the DMPS?

P1072, L23 What is the probable cause for the 20%+ losses? Is it size dependent? If it is, what will be the implication of the corrections applied for these losses, if the correction is applied on the whole size distribution?

P1072, L25 Did these random events cover all “air masses”? Is the observation valid for the whole campaign?

P1075, L21 Here the RH is quoted as 88.5% on P1073 (L12) it is 87%, and in Abstract



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it says “90% RH Ĕ.continuously measured” why are these different? The 90% is a calculated value and not measure.

P1075, L25 I don’t quite understand how the non-conditioned sample flow will explain the systematic under sizing of the aerosol. Is it due to kinetic effects? Time it takes for the aerosol to equilibrate to 88.5% RH? I thought for 100nm particles that this was on the order of micro seconds. Is it an overestimation of the measured RH? But if the sample air dilutes and reduces the sheath air RH will this not be observed? If the later is the case, what implications will this have to the correction to 90%RH?

P1077, L3 First of all these classes are at various locations in the manuscript referrers to as air masses, but the classification are actually sectors from where the air originates. Many times, but not always, this is associated with certain air masses. Air masses in a meteorological context are usually defined by various thermodynamic parameters. Second, the Arctic class must be renamed; unless the authors can show that the trajectories actually did come from the Arctic. I think that people in Oslo over which the example trajectory originates in Figure 4, don’t feel very Arctic. I suggest that the authors follows the naming convention they have and call the Arctic sector N-EUR, alternatively Scandinavia.

P1080, L10 The statement that the transition zone seems favorable for new particle formation is backed up with far too little analysis. Essentially the only support for this is that N20 increases 2 hour after the increase in EBC. This is not sufficient and unless more analysis is provided this statement should be removed. The observations can be explained by kinetic effects entirely. Particles are formed/emitted together with EBC in the boundary layer below the transition zone, but it takes some time for these particles to grow to detectable sizes.

P1081, L12 Please tell the reader how he/she can see the “consistent and adequate description” from figure 8.

P1082, L5 I can absolutely not agree with the authors that they are able to present pa-



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rameterizations based on this study. The authors have fitted log-normal distributions to observed mean size distribution based on the sector from where the aerosol originates. How exactly would this “parameterization be used by someone? To me the results are examples of size distributions at MTC when the air comes from different directions and should not be referred to in any other way. I fail to see the parameterization. What exactly is parameterized? Moreover, the data set is far too small. As is already emphasized in the abstract the MTC is a location with variability in the air masses both horizontally and vertically. Figure 5 shows that for some air mass categories the accumulated measuring time only adds up to a few days at most. It is a little strong to claim that the aerosol categories are parameterized base on this limited data set. Given that only night time conditions can be used the 36 days is equivalent to 18 days divided into 7(8) classes, which gives an average of about 2.5 full days per class, some more some less.

P1086, L17 Why is the refractory volume fraction high in the N-EUR sector?

P1086, L27 I can not retrace the BC value 62ng m-3 in Table 1 or any other table. I’m also not sure if the authors actually claim that this very high value for the free troposphere would be attributed to aircraft emissions. If they are, more analysis is needed to claim this. The contribution from aircraft at 6km altitude must be regarded as miniscule. What is the range +/- 87 nm m-3? Please clarify this section.

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 1067, 2005.