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Atmospheric Chemistry and Physics
Discussions

Interactive comment on "How much is particulate matter near the ground influenced by upper level processes within and above the PBL? A summertime case study in Milan (Italy)" *by* G. Curci et al.

Anonymous Referee #1

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Review of "How much is particulate matter near the ground influenced by upper level processes within and above the PBL? A summertime case study in Milan (Italy)" by Curci et al.

This study uses field data in Milan, Italy in 2007 along with WRF/CHEM modeling to investigate what the composition is of aerosol layers formed at the top of the boundary layer during the day, how much of the surface aerosol layer is from entrainment of aerosols aloft, and how much these layers aloft contribute to surface concentrations on

the following day. The topic is of interest to this journal. This topic has not received that much attention and this paper adds to the growing body of knowledge about how aerosol layers above the PBL can influence the surface layer. The authors focus on one case event and treat it in depth and reach interesting conclusions that are worthy of publication. The paper requires minor English editing. Prior to publication, the authors should address the issues below.

Specific Comments:

Page 26405, Line 2: I suggest changing "yield" to "lead" Page 26405, Line 11: change "evidences" to "evidence" Pg 26406, Line 2: remove "the" before "atmospheric" Page 26407, Line 26: Could another reason for why winter PM is high is low-level residential combustion for heating purposes?

Page 26408, Line 1-6: The authors should improve the balance of this paragraph's discussion to also mention other airborne data that have shown that secondarily produced species can be higher aloft than at the surface. Such studies shown below have pointed to the importance of clouds and relative humidity in leading to higher mass concentrations of aerosol species aloft.

Duong et al. (2011). Water-soluble organic aerosol in the Los Angeles Basin and outflow regions: Airborne and ground measurements during the 2010 CalNex field campaign, J. Geophys. Res., 116, D00V04, doi:10.1029/2011JD016674.

Wonaschuetz et al. (2012). Aerosol and gas re-distribution by shallow cumulus clouds: an investigation using airborne measurements, J. Geophys. Res., 117, D17202, doi:10.1029/2012JD018089.

Heald et al. (2006), Concentrations and sources of organic carbon aerosols in the free troposphere over North America, J. Geophys. Res., 111, D23S47, doi:10.1029/2006JD007705.

Novakov et al. (1997), Airborne measurements of carbonaceous aerosols on the

East Coast of the United States, J. Geophys. Res., 102(D25), 30,023–30,030, doi:10.1029/97JD02793.

Page 26410, last line and into next page: this sentence confuses me about why nitrate is in the coarse fraction due to ammonium being neutralized by sulfate. If sulfate is fully neutralized by ammonium it would seem that if there is any more ammonia present that it can then interact with nitric acid to produce ammonium nitrate, which typically is in the fine mode. Based on literature (see for instance: Lee et al. (2008), Observations of fine and coarse particle nitrate at several rural locations in the United States, Atmos. Environ., 42, 2720–2732, doi:10.1016/j.atmosenv.2007.05.016.), coarse mode nitrate originate from interactions of nitric acid with coarse particle types such as mineral dust and sea salt. This sentence should be revised as it currently confuses this reviewer.

Page 26414, Line 9: A period is missing after “measurements”

Page 26424, Line 1: Can the authors be more clear when they say it is “visible e.g. on 16-17 July in both observations and models”. Are readers supposed to know this clearly from looking at specific figures? If so, what figures and be specific as to how readers will know that this is visible.

Page 26427, Lines 4-8 and subsequent text: It is argued that nitrate is produce at higher altitudes due to more favorable RH values that allow for aqueous conversion of nitric acid to nitrate. But one major aspect of this argument that requires discussion is that if such aerosols aloft are then brought down to the surface, wouldn’t the aerosols get dried at lower RHs and then the nitrate evaporates back out? For the case of cloud droplets for instance, it has been shown in past studies that evaporation of drops leads to losses of nitrate back to the gas phase. Also, in the discussion in this same section, I was hoping the authors could discuss whether the ambient multicomponent particles would be expected to deliquesce at the DRH point of ammonium nitrate or at a different RH. Past work has shown that the DRH varies from the pure salt form when there are other components included, and it can be argued that it is more practical to

assume that the aerosols in the region will deliquesce at a point other than the DRH of ammonium nitrate.

Figure 2 caption: should say “. . .shown in inset are. . .”

Figure 2 caption: should say “. . .shown in inset to. . .”

Figure S5 caption: “Rolf” is mis-spelled and should be “Rolph”

Figure 12: I recommend moving the text box off of the data curves as it is distracting.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 26403, 2014.