$PM_{2.5}$, PM_1 and $PM_{0.4}$ hygroscopicity during spring and summer at one Po Valley site.

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Aerosols hygroscopicity is fundamental for climate change (IPCC, 2007; Kaufman et al., 2002) as well as for remote sensing applications (Wang et al., 2010; Di Nicolantonio et al., 2009). Aerosol hygroscopicity is also important in local studies involving industrial application, i.e. to prevent corrosion effects in computer centres; the latter topic is normed by ASRHAE (2009).
In this study aerosol hygroscopicity was investigated at a rural site located in the middle of the Po Valley (Sannazaro de' Burgondi, Pavia, North of Italy); this place was chosen as it will be the location of a computer centre.
To study aerosol hygroscopicity PM_x samples ($PM_{2.5}$, PM_1, $PM_{0.4}$) were collected using a FAI-Hydra dual channel low volume sampler with the following time resolutions: $PM_{2.5}$ (4-h filters), PM_1 (8-h filters) and $PM_{0.4}$ (24-h filters). The sampling period was 24 March – 19 April (spring) and 10 June – 2 July 2010 (summer). All the collected filters were extracted in ultra-pure water and analyzed by IC to determine the concentration of water soluble inorganic ions (Na^+, NH_4^+, K^+, Mg^{2+}, Ca^{2+}; F^-, Cl^-, NO_3^-, PO_4^{3-}, SO_4^{2-}) and mono-/dicarboxylic acids (acetic, propionic, formic, glutarric, succinic, malonic, maleic, oxalic acids). Then, a thermodynamic model (*E-AIM*, Clegg et al., 1998; http://www.aim.env.uea.ac.uk/aim/aim.php) was used to determine humidographs for each collected sample. Figure 1 reports daily averaged humidographs for $PM_{2,5}$, PM_1 and $PM_{0.4}$ for the spring campaign. The total amount of water uptake in the reported humidographs depends on the atmospheric concentrations of water soluble inorganic and organic ions available on particulate phase.
At the same time, a tandem-OPC system allowed to estimate (Snider et al., 2008) aerosol hygroscopicity with a time resolution of 1 minute. The system is composed by 2 OPCs GRIMM *1.107* (31 size classes between 0.25 to 32 µm): one OPC measures particle number size distribution under dried conditions (OPC_{dry}), the other one performs the same measurement but at ambient RH (OPC_{wet}).
Humidographs for particle with diameter less than 2.5 µm and 1 µm were derived from collected data and compared to that estimated using the *E-AIM* model.
Figure 2 reports humidograph for $V_{2.5}$ (particle volume obtained by particles with diameter less than 2.5 µm) for the spring campaign, as calculated from tandem-OPC system data. The total amount of water uptake in the reported humidograph was calculated from the volume difference between the OPC_{wet} and the OPC_{dry}.

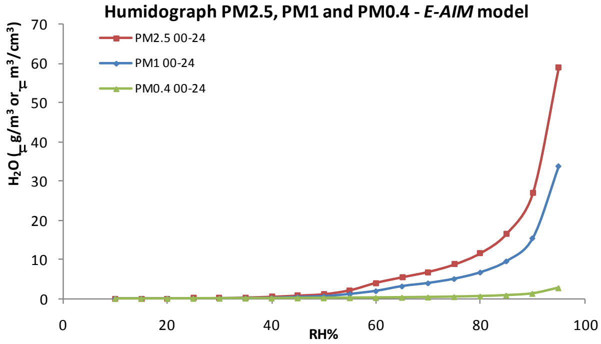

Figure 1. Humidographs calculated from the application of *E-AIM* model to the daily averaged PM_x ionic composition of the spring campaign.

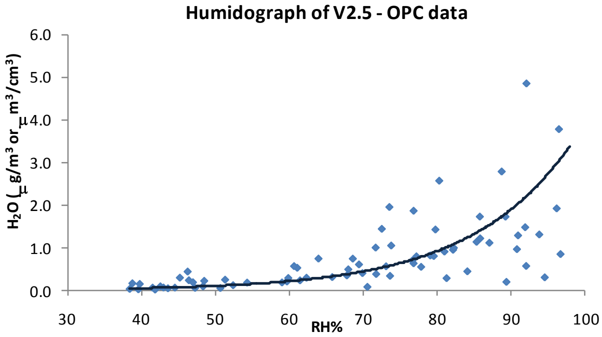

Figure 2. Humidograph for $V_{2.5}$ (particle volume obtained by particles with diameter less than 2.5 µm) for the spring campaign, as calculated from tandem-OPC system data.

Both experimental and modeling data evidenced 65% of relative humidity (RH) as the moisture of the beginning of the hygroscopic growth of particles. Daily cycle of the deliquescence relative humidity will be discussed. As RH in data centres is controlled and kept lower than 60%, these results avoid corrosion hazards due to particle hygroscopicity.

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