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Supplement of

Vertical profiling of aerosol hygroscopic properties in the planetary boundary layer during the PEGASOS campaigns

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Effective indices of refraction during the PEGASOS study:

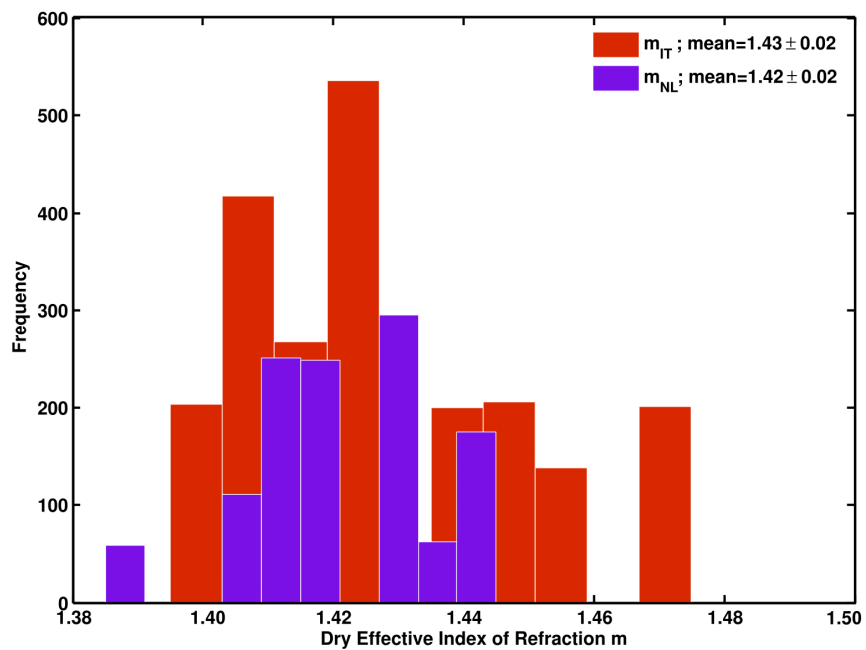


Figure S1. Histogram of the temporal variability of the dry effective indices of refraction (m), observed during the flights on 20 June 2012 in the Po Valley, Italy, (m_{IT} , dark red bars) and 24 May 2012 close to Cabauw, Netherlands, (m_{NL} , violet bars). Only the results for size-selected particles with a dry mobility diameter of 500 nm are presented. On average, effective indices of refraction of 1.43 ± 0.02 (mean \pm SD) and 1.42 ± 0.02 were found in Italy and the Netherlands, respectively. However, an absolute uncertainty of ± 0.04 has to be attributed to all index of refraction retrievals (see Rosati et al., 2015a).

Meteorological parameters measured during the flight on 20 June 2012 in the Po Valley, Italy:

Supplement Table 1. Mean potential temperature (Θ) and relative humidity (RH) during IHP1/2 and IHP5/6 with respective standard deviations representing the temporal variability. Results are presented for two different altitudes, 100 m and 700 m AGL. Measurements of the temperature (Pt100-Sensor; OMEGA; 15s time respond), RH (HMP45-Sensor; Vaisala; 15s time respond), height above ground, wind-speed and direction (all three retrieved by measurement of the pressure using sensors #239 and #270; Setra) were continuously recorded on board the airship. All of these measurements were logged with a 100 Hz frequency and finally averaged over 10 data points.

<i>Profile</i>	<i>Altitude</i>	<i>Layer</i>	<i>Zeppelin</i> Θ [$^{\circ}\text{C}$]	<i>Zeppelin</i> RH [%]
IHP1/2	100 m	New ML	26.0 (± 0.6)	60.1 (± 2.0)
	700 m	RL	33.0 (± 0.9)	39.4 (± 3.1)
IHP5/6	100 m	Fully developed ML	33.4 (± 0.6)	31.5 (± 3.1)
	700 m	Fully developed ML	33.6 (± 0.5)	36.5 (± 4.2)

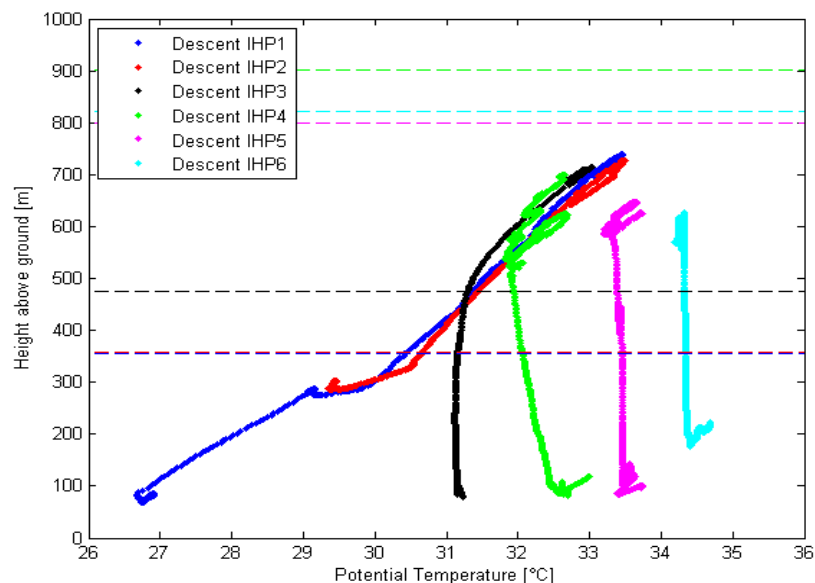


Figure S2: Height profiles of the potential temperature (Θ) measured aboard the Zeppelin NT during the flight on 20 June 2012, in Italy. Each color represents the descents of height profiles 1-6 (IHP1-6), respectively. The horizontal lines depict the estimated mixed layer height (MLH) from the ceilometer retrieval during the six height profiles. A clear vertical structure of Θ is visible for the first two profiles, while the last four show very little or no altitude dependence at all. This indicates that the sub-layers in the PBL were still separated at the beginning of the flight and that a fully mixed layer was probed at the end. The estimated MLH retrieved from the ceilometer shows comparable results with a low MLH of approximately 350 m above ground in the morning that evolves to over 800 m above ground later during the day.