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*Supplement of*

## **Long-term real-time chemical characterization of submicron aerosols at Montsec (southern Pyrenees, 1570 m a.s.l.)**

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Supplementary Material

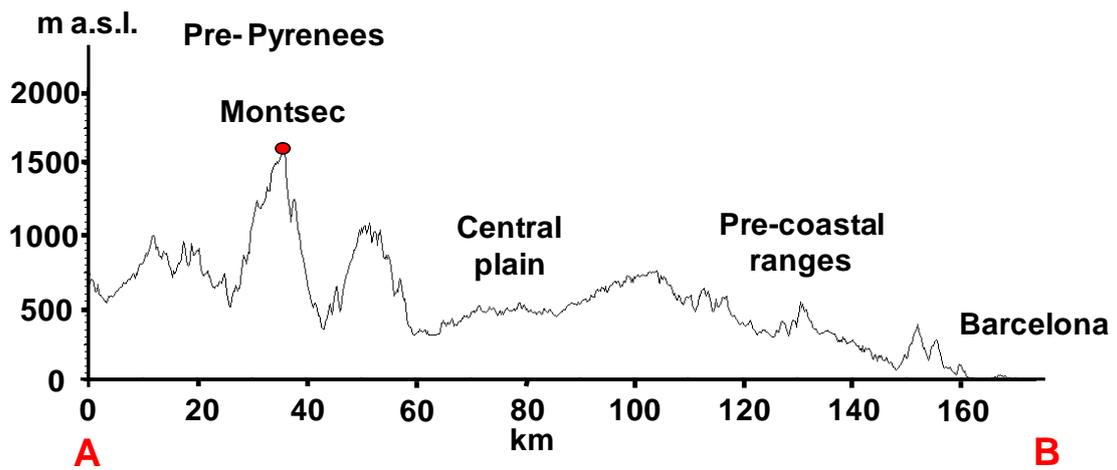
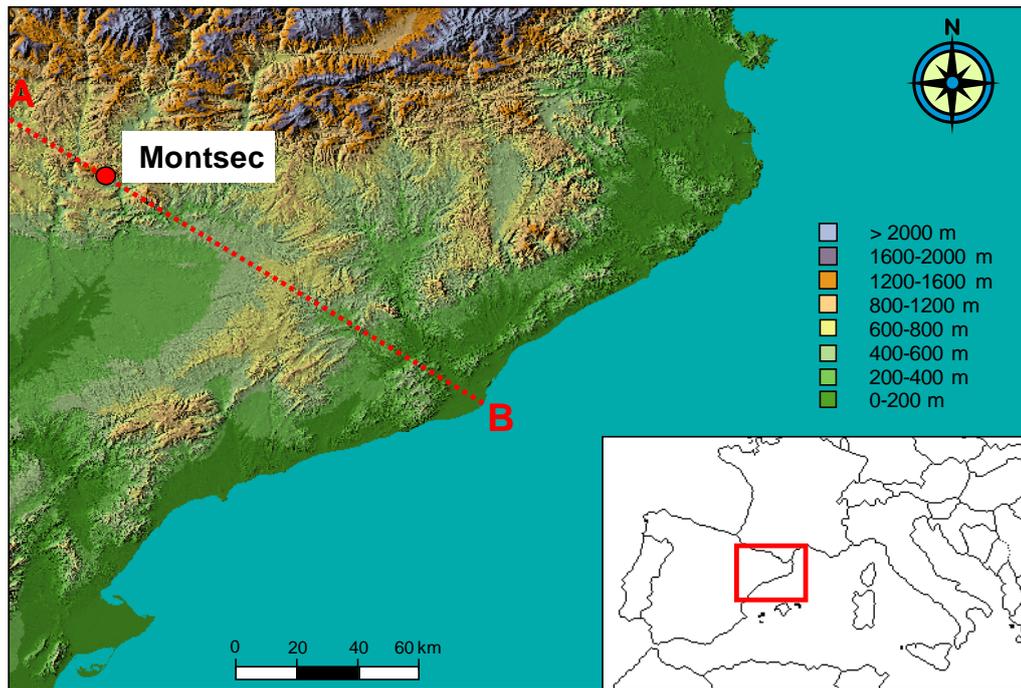
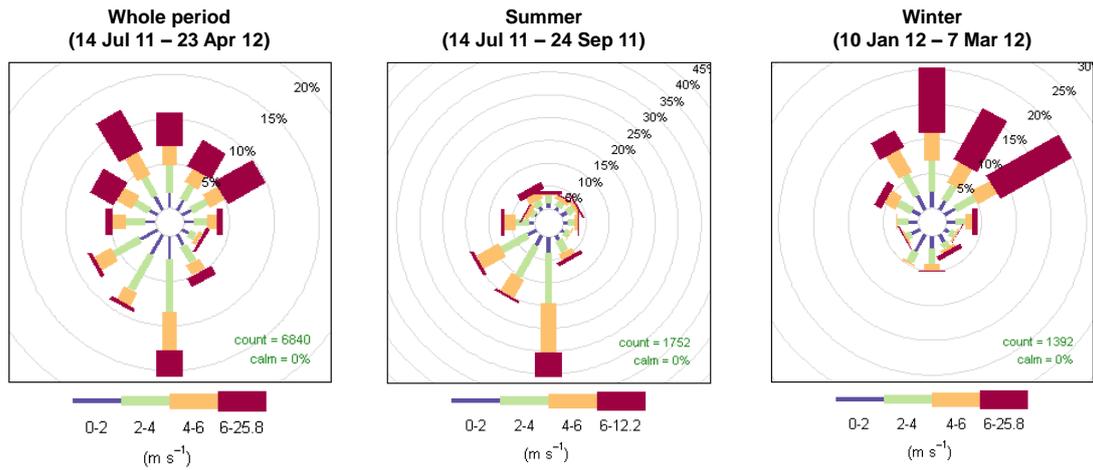
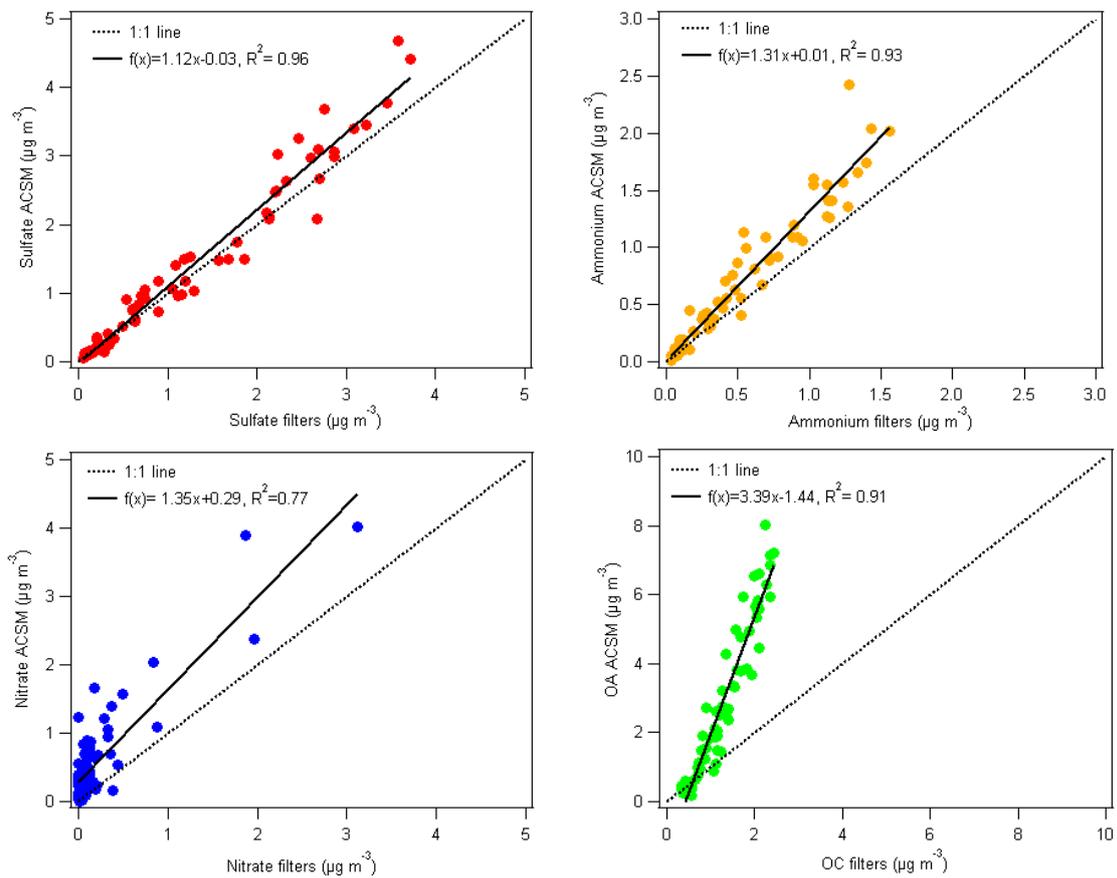


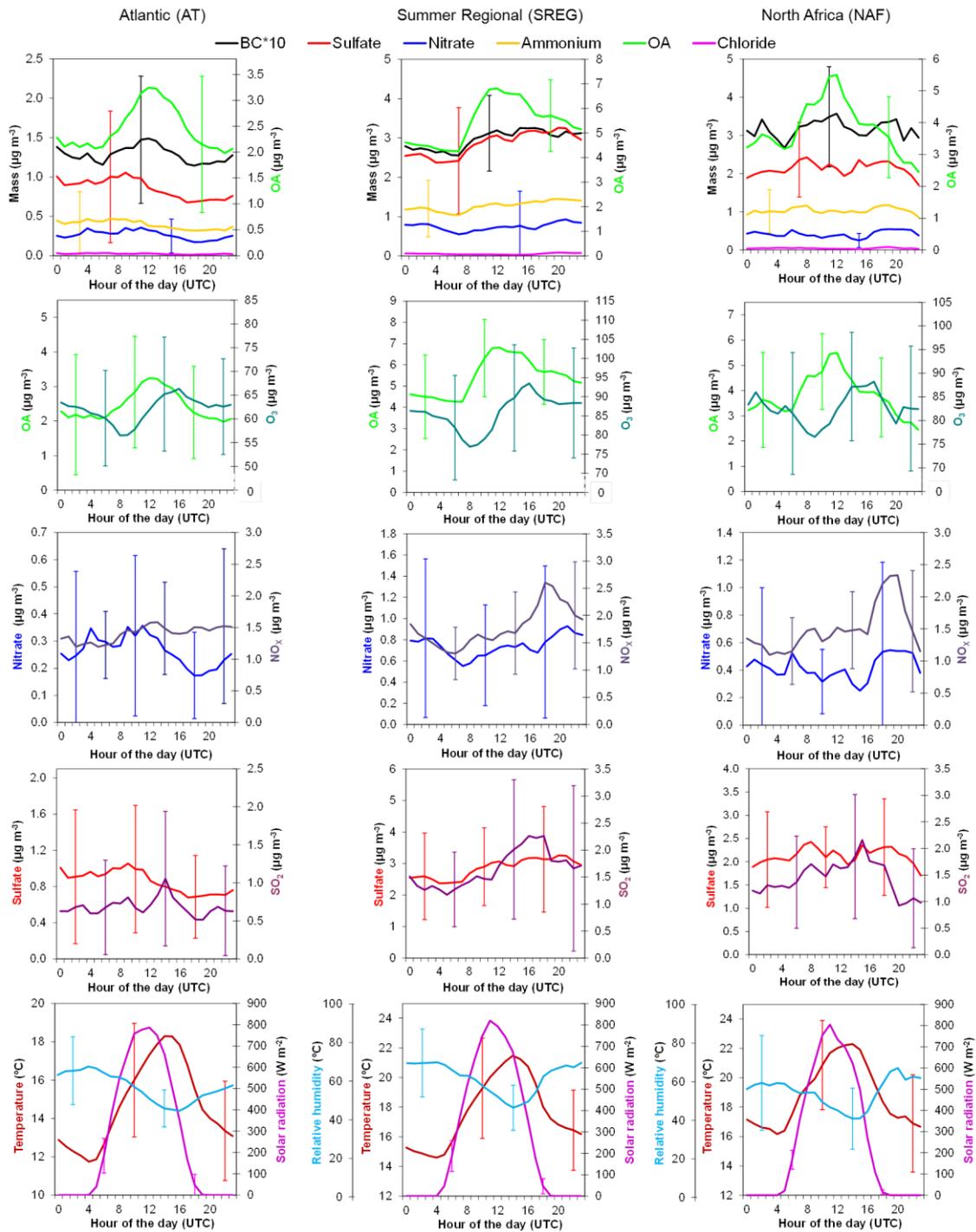
Fig.S1 Top: location of the Montsec sampling site. Bottom: topography of Montsec area following the red line.



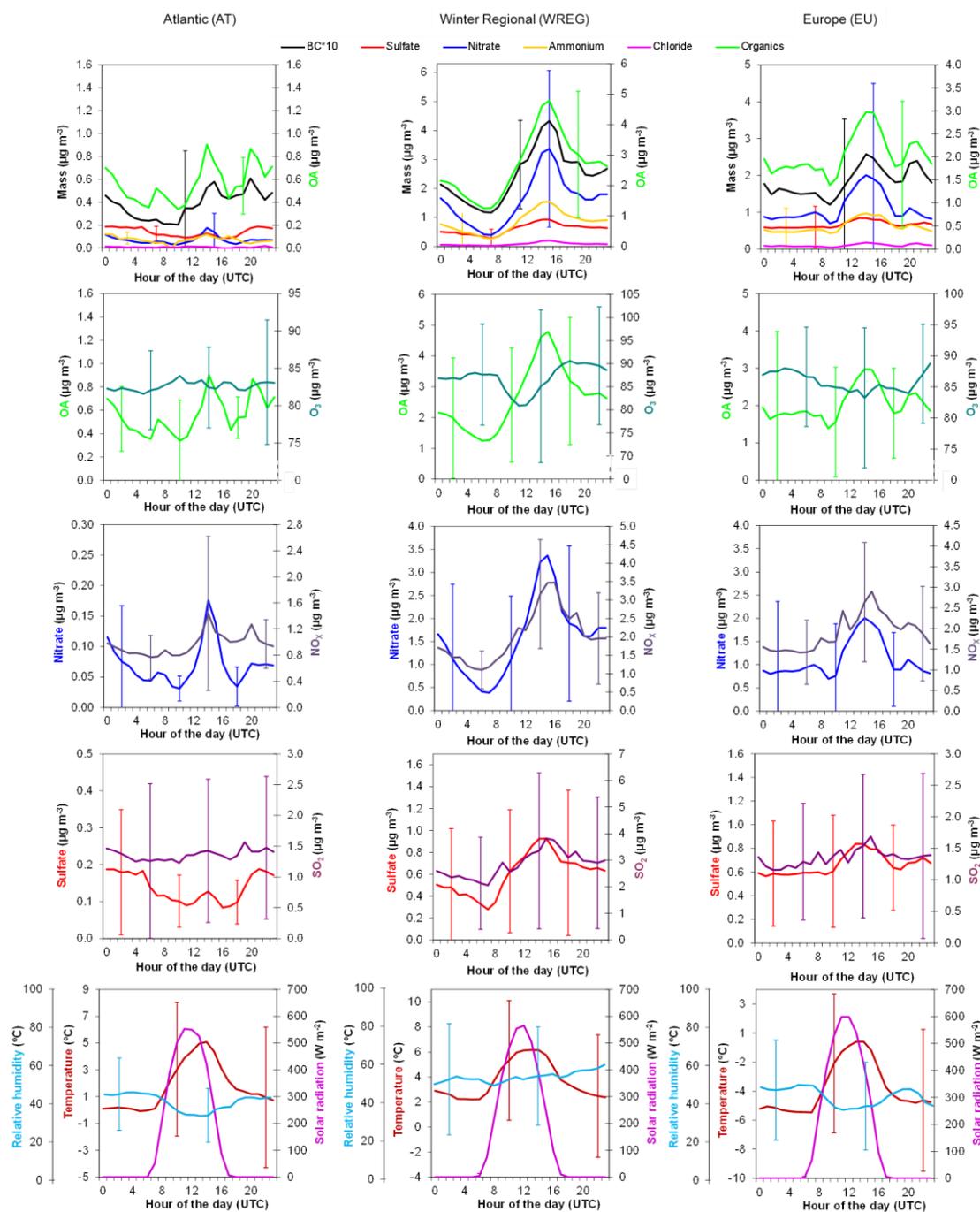
**Fig.S2** Wind rose frequency at Montsec during the study.



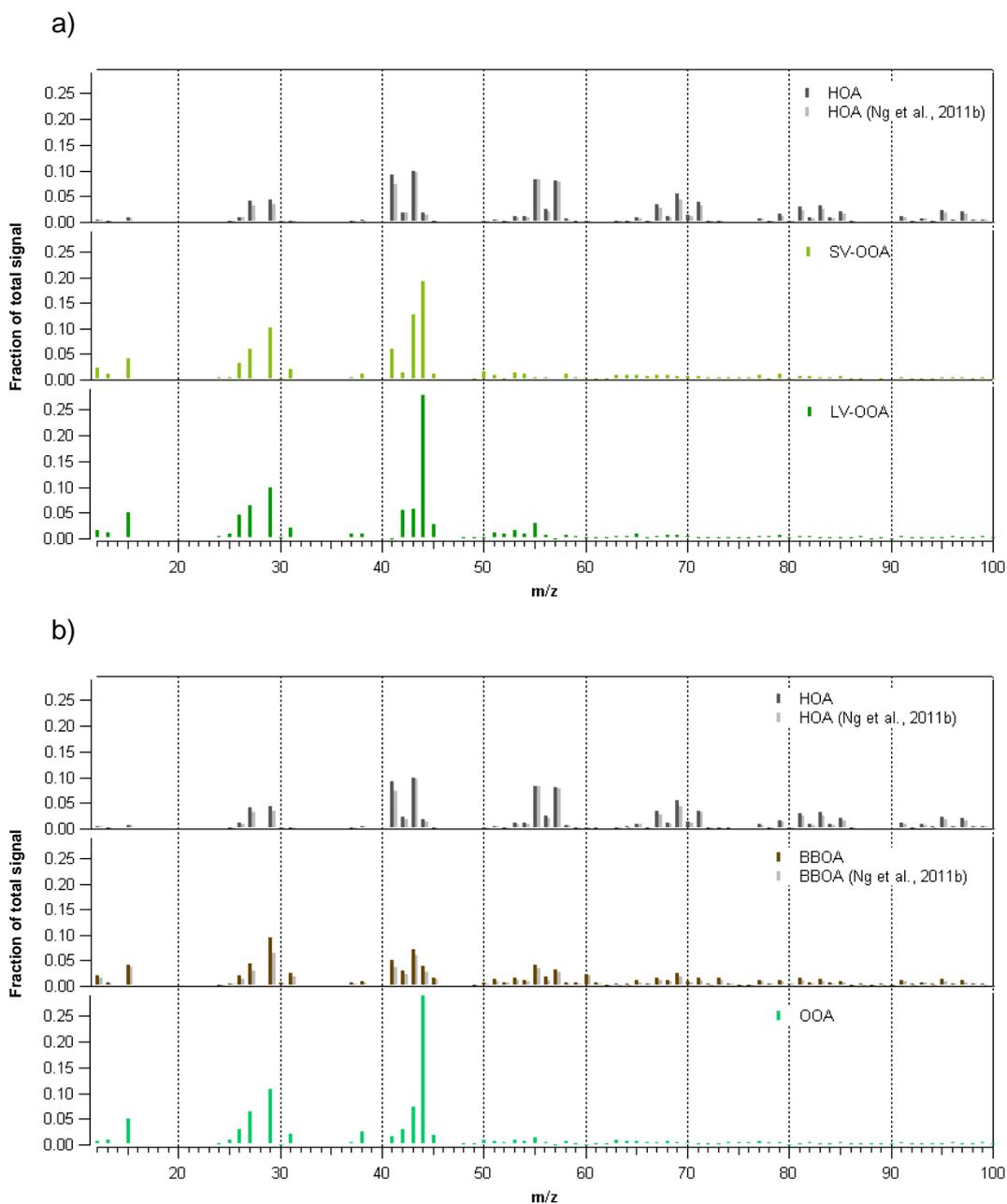
**Fig.S3** Scatter plots of chemical species concentrations measured by the ACSM versus those measured off-line in 24-h PM<sub>1</sub> filter samples.



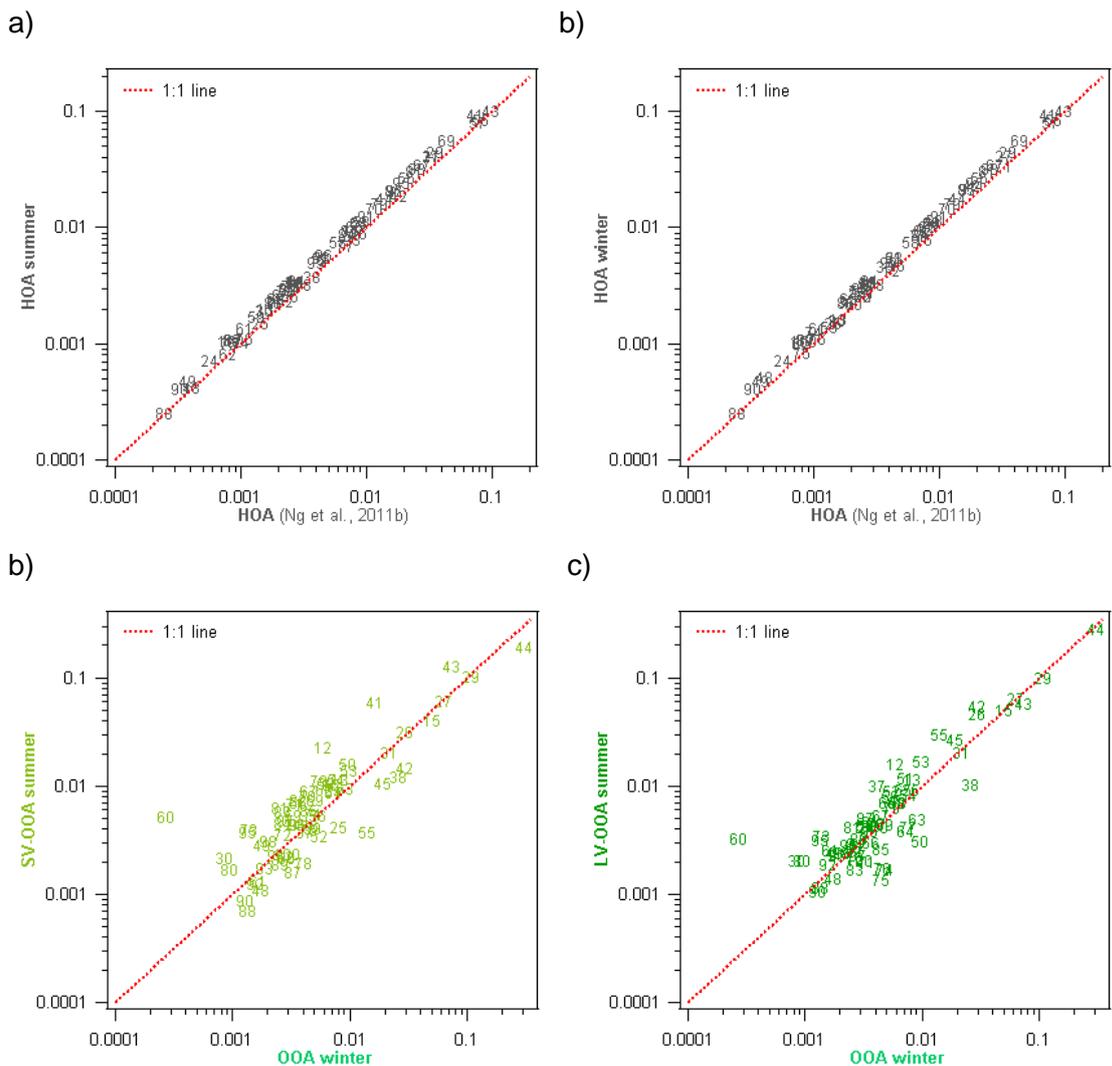
**Fig.S4** Diurnal cycles of PM<sub>1</sub> chemical species (black carbon (BC), sulfate, nitrate, ammonium, chloride and OA), gaseous pollutants (ozone (O<sub>3</sub>), nitrogen oxides (NO<sub>x</sub>), and sulfur dioxide (SO<sub>2</sub>)), and meteorological parameters (relative humidity, temperature and solar radiation) averaged as a function of meteorological episode for the summer period (14 Jul 11 – 24 Sep 11). Variation bars indicate ± standard deviation.



**Fig.S5 Diurnal cycles of  $\text{PM}_{10}$  chemical species (black carbon (BC), sulfate, nitrate, ammonium, chloride and OA), gaseous pollutants (ozone ( $\text{O}_3$ ), nitrogen oxides ( $\text{NO}_x$ ), and sulfur dioxide ( $\text{SO}_2$ )), and meteorological parameters (relative humidity, temperature and solar radiation) averaged as a function of meteorological episode for the winter period (10 Jan 12 – 7 Mar 12). Variation bars indicate  $\pm$  standard deviation.**



**Fig.S6 Organic species profiles extracted from the ME-2 analysis for (a) the summer period (14 Jul 11 – 24 Sep 11) and for the winter period (10 Jan 12 – 7 Mar 12). The hydrocarbon-like organic aerosol (HOA) and the biomass burning organic aerosol (BBOA) were constrained using an average HOA and BBOA factors from different datasets (Ng et al., 2011b), with an a-value of 0.1.**



**Fig.S7 Scatter plot of organic species profiles, (a) hydrocarbon-like organic aerosol (HOA) for the summer period (14 Jul 11 – 24 Sep 11) versus HOA from Ng et al. (2011b), (b) HOA for the winter period (10 Jan 12 – 7 Mar 12) versus HOA from Ng et al. (2011b), (c) semi-volatile oxygenated organic aerosol (SV-OOA) for the summer period versus oxygenated organic aerosol (OOA) for the winter period, and (d) low-volatility oxygenated organic aerosol (LV-OOA) for the summer period versus OOA for the winter period. The numerical markers correspond to  $m/z$  values.**

**Table S1 Average of meteorological parameters recorded at Montsec during the study. Note that the whole period averages include also spring and fall.**

	Whole period	Summer	Winter
Period	14 Jul11 - 23 Apr 12	14 Jul 11 - 24 Sep 11	10 Jan 12 - 7 Mar 12
Tavg (°C)	7.9	16.6	1.1
Tmax (°C)	28.8	28.8	13.5
Tmin (°C)	-13.5	5.5	-13.5
RH (%)	59	58	45
TAP* (mm)	422	51	3
WS** (m s <sup>-1</sup> )	0.8	2.0	3.6
WD** (degrees)	347	206	22
P (hPa)	852	853	852
SR (W m <sup>-2</sup> )	180	273	152

\*Total Accumulated precipitation

\*\*Vector average