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2 **SUPPORTING INFORMATION**

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4 **Simplifying aerosol size distributions modes**
5 **simultaneously detected at four monitoring sites**
6 **during SAPUSS**

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Table S1: Hourly k-means cluster size distributions for daylight hours of 28th of September 2010 at the four monitoring sites (RS_{site}, UB_{site}, TC_{site}, RB_{site}).

Time	RS _{site}	UB _{site}	TC _{site}	RB _{site}
28/09/2010 08:00	T _{clus_2}	T _{clus_3}	RB_1	
28/09/2010 09:00	T _{clus_2}	T _{clus_3}	UB _{clus_1}	
28/09/2010 10:00	T _{clus_2}	T _{clus_3}	UB _{clus_1}	
28/09/2010 11:00	T _{clus_2}	T _{clus_3}	UB _{clus_1}	
28/09/2010 12:00	T _{clus_2}	T _{clus_3}	T _{clus_3}	
28/09/2010 13:00	T _{clus_2}	T _{clus_3}	T _{clus_3}	
28/09/2010 14:00	T _{clus_1}	T _{clus_3}	NU _{clus}	
28/09/2010 15:00	T _{clus_1}	T _{clus_3}	T _{clus_3}	UB _{clus_1}
28/09/2010 16:00	T _{clus_2}	T _{clus_3}	T _{clus_3}	UB _{clus_1}
28/09/2010 17:00	T _{clus_2}	T _{clus_3}	T _{clus_3}	UB _{clus_1}
28/09/2010 18:00	T _{clus_2}		T _{clus_3}	UB _{clus_1}
28/09/2010 19:00	T _{clus_2}		T _{clus_3}	UB _{clus_1}

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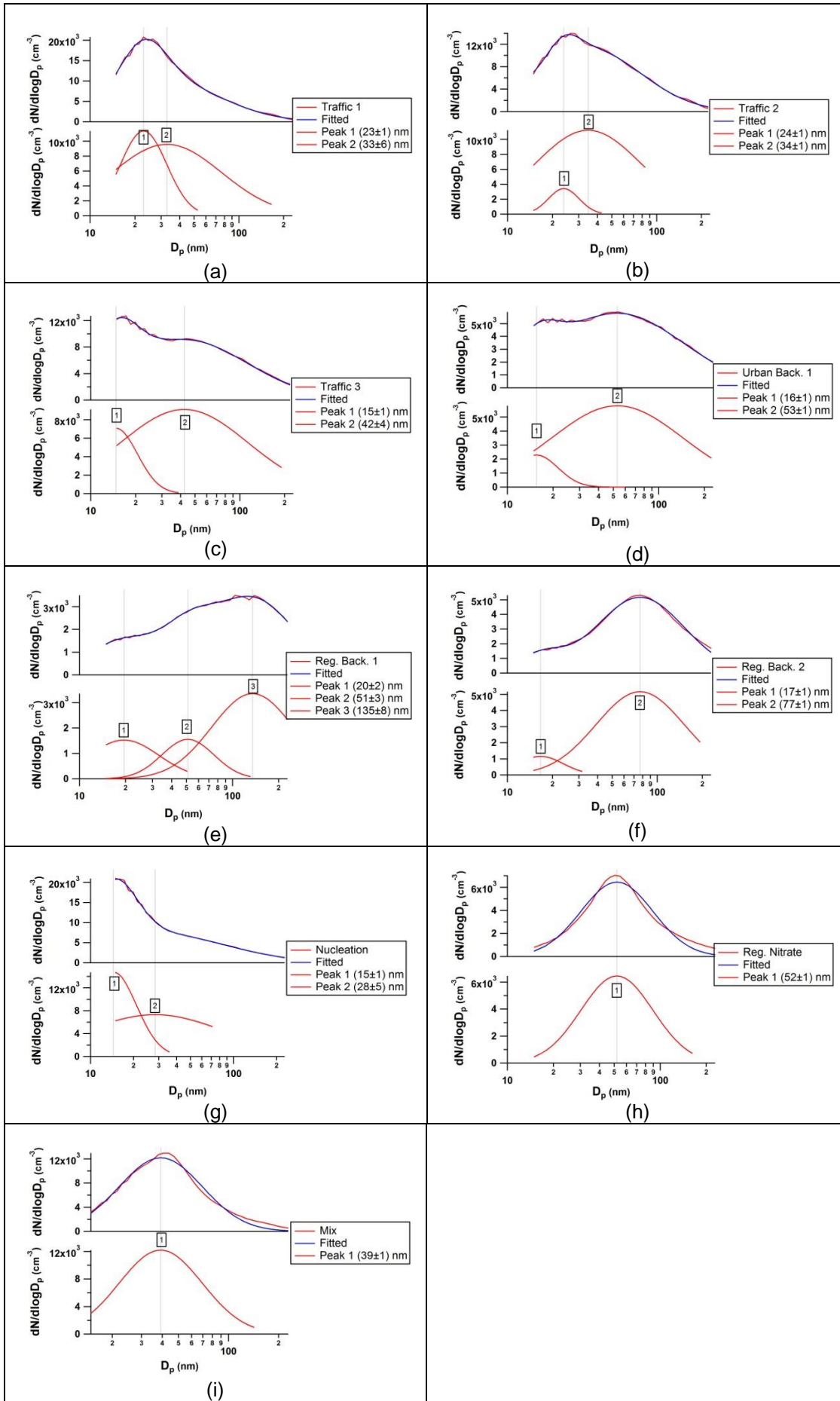
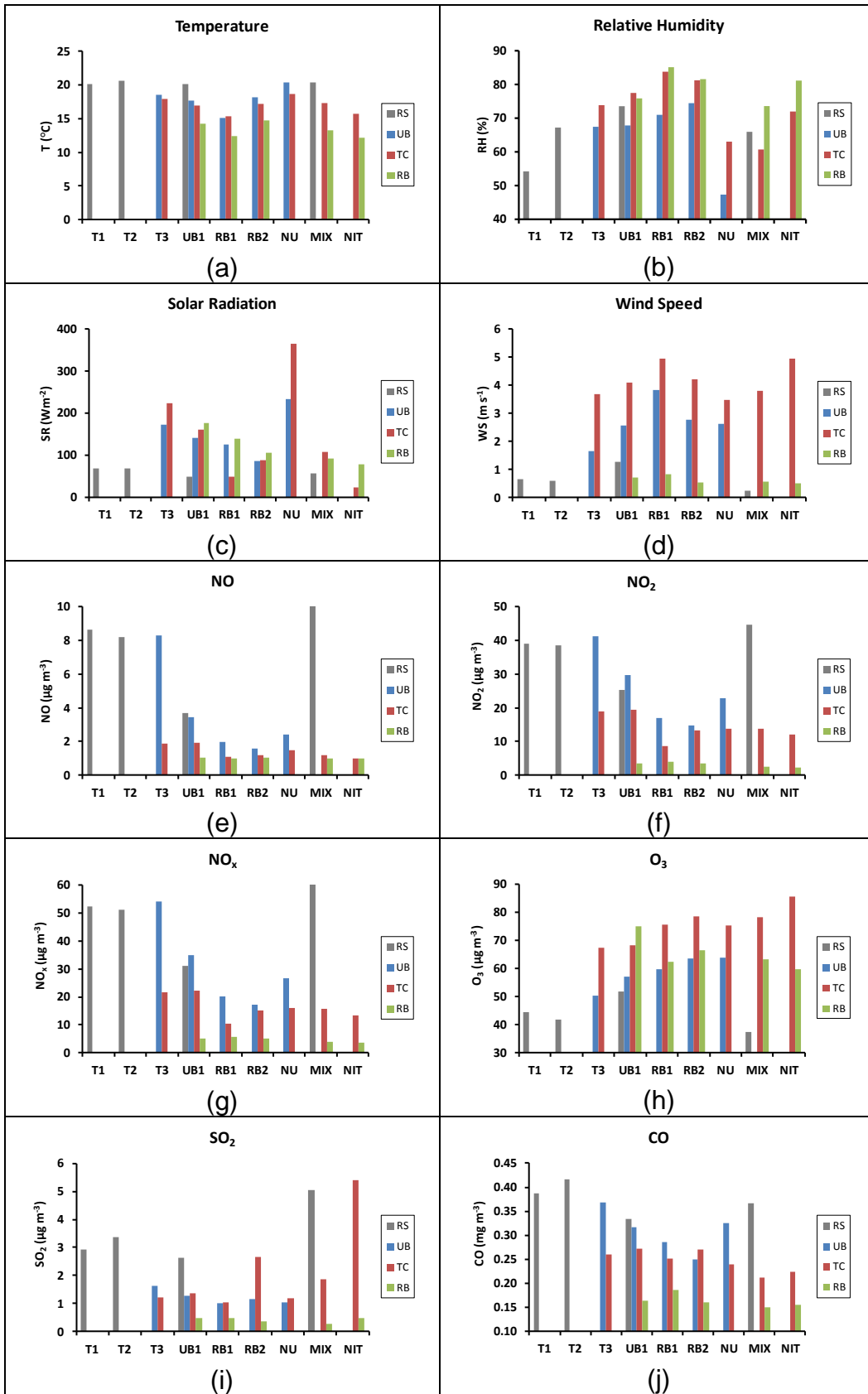
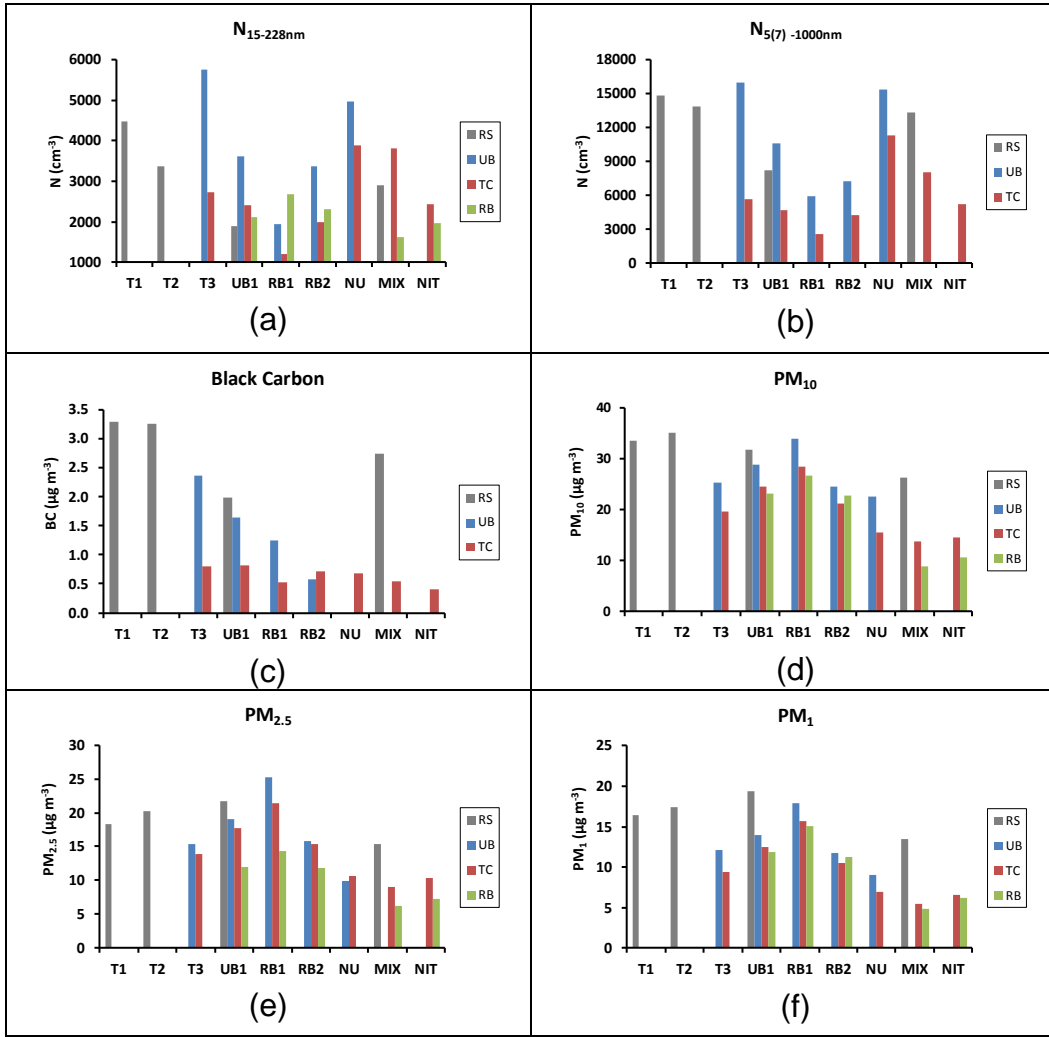


Figure S1: Log normal fitting curves and the peak values for each cluster: a) Traffic 1, b) Traffic 2, c) Traffic 3, d) Urban Background 1, e) Regional Background 1, f) Regional Background 2, g) Nucleation, h) Regional Nitrate, i) Mix.



2 **Figure S2:** Comparison of meteorological factors and gaseous pollutants average values for each significant
 3 cluster at each site (RS_{site}, UB_{site}, TC_{site}, RB_{site}) : a) temperature, b) relative humidity, c) solar radiation, d)
 4 wind speed, e) NO, f) NO₂, g) NO_x, h) O₃, i) SO₂, j) CO.
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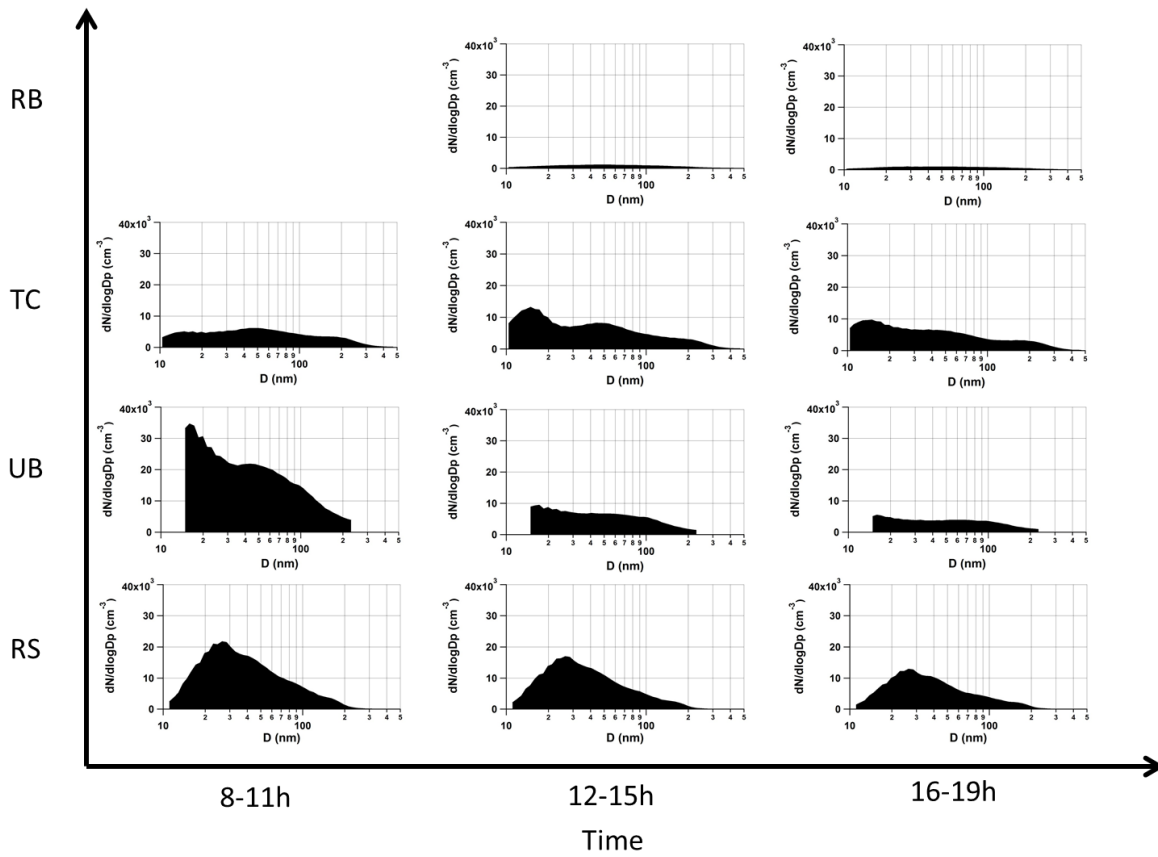
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2 **Figure S3:** Comparison for each significant cluster at each site (RS, UB, TC, RB) of: a) particle number
3 concentration measured with the SMPS ($N_{15-228\text{nm}}$), b) particle number concentration measured with the CPC
4 ($N_{5(7)-1000\text{nm}}$), c) black carbon (BC), d) PM_{10} , e) $\text{PM}_{2.5}$, f) PM_1 .

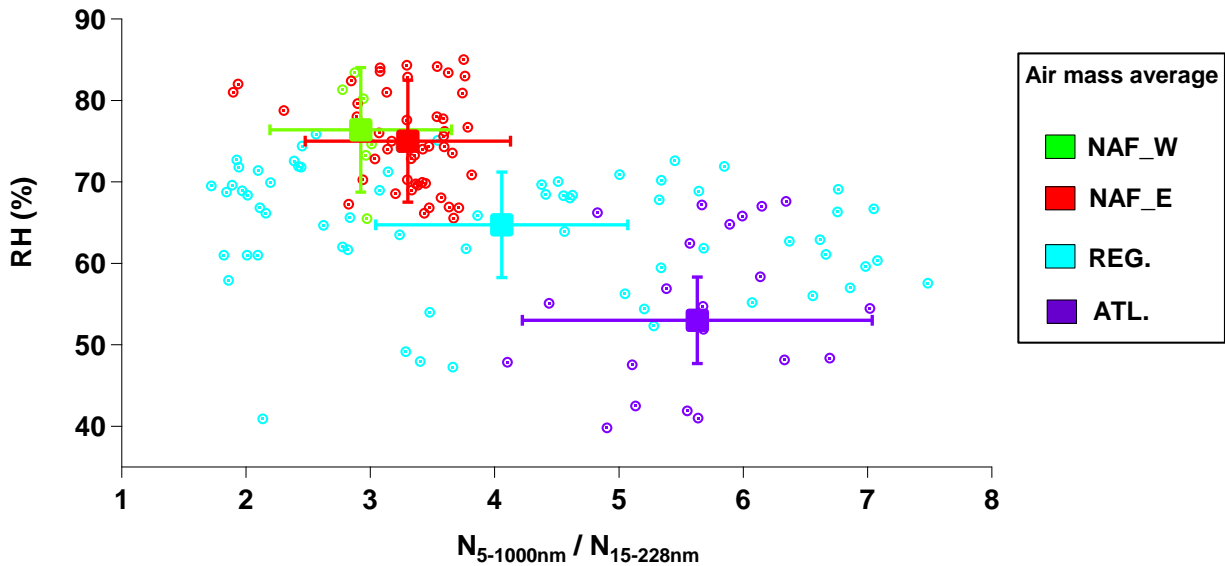
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Figure S4: Aerosol size distributions at daytime during the 28th of September 2010 at the four monitoring sites (RS_{site} , UB_{site} , TC_{site} , RB_{site}).



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Figure S5: Particle number concentration ratio of $N_{5-1000nm} / N_{15-228nm}$ versus relative humidity (RH). Colour plot indicates the four different air mass types encountered. Please note that only hourly data characterised by a specific size distributions (Traffic 2) at a specific hot spot road site (RS_{site}) are considered in this analysis. Regional nucleation and raining event days are not taken into account.