

Interactive comment on “Three years of aerosol mass, black carbon and particle number concentrations at Montsec (southern Pyrenees, 1570 m a.s.l.)” by A. Ripoll et al.

Anonymous Referee #2

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The authors present a rich dataset of aerosol observations at two elevated stations in northern Spain though, as stressed in the title, emphasis is put on a specific one. Data are presented and discussed in the light of main meteorological features and comparison with other high altitude station in Europe is proposed. Overall my opinion agrees with Referee 1's to some extent and partly still refrains what observed in my first examination of this paper, confirming that the it is rather well written and organized, presents many elaborations but interpretation and some statements still looks at least a bit simplistic Following the suggestions previously given, many technical details have been formally implemented in the present form though they are still treated very

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(too much?) synthetically. This is particularly true for basic statistics referring not only to correlation analysis with meteorological parameters as previously suggested (but elaborated in a non conclusive way as communicated in the authors' reply); statistical distribution (as pointed out also by Referee 1) of each parameter is missing either on the overall dataset or on a seasonal basis which would help to improve interpretation. The split of meteorological conditions according to air mass provenance makes sense only in part because seasonality is not explicit, while it overlaps to or triggers inherent differences in aerosol behaviour. Going to some details in the paper analysis, I believe that the comparison described in 27209-lines 22-30 is quite hazardous, due to several reasons: time interval for averaging, size range, elevation of the stations. Nucleation processes in fact might too be smoothed out either for the timing chosen (1 hour) or for the size limits of the available instrumentation especially in consideration of the nucleation mode and its tendency to develop below 10 nm. The instruments used in this paper have so different lowest size limits exactly in the range critical for the nucleation mode which might rise abruptly leading to extremely high levels of number densities potentially affecting in a significant way. Nucleation of BioVOC's is only a partial explanation of ultrafine particle formation, since other precursors (both organic and inorganic) are likely responsible for gas-to-particle conversion; within a thermal convective framework like that one projected for the Iberia peninsula affected by long-lasting summer highs, significant pollutant uplift with "in transit" transformation (affected by trace gas concentration and RH%) is also highly expected. As concerns Saharan dust incursions and their effect on mass load and number density which are tentatively compared with other stations, each one with its unique characteristics, it must be recalled that the whole Mediterranean basin is affected by this natural source of aerosol; therefore at least for the southernmost stations elevation may not be a discriminant especially in the warm seasons when thermal convection efficiently redistribute mineral dust 3Dimensionally (note the simultaneous cover of mineral dust on one of the four days NAAPS elaboration reported by the authors across Spain and northern Italy), while the effect north of Pirenees and Alps usually depends on intense events of min-

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eral dust transport capable to cross the mountain barriers. Similarities and differences should be therefore managed with more sensitivity, so for the vertical distribution of mineral dust, as it is not demonstrated that most events mostly travel high. In fact as widely described in climatological investigations mineral dust source areas fluctuates in longitude and height of the lift up changing on an event and on a seasonal basis. Moreover the influence of long lasting pressure highs extending from Africa northward , a potential sign of climate change over the Mediterranean in terms of duration and areal extension, are likely responsible of intense convection (scarcely acknowledged in the text) with consequent mixing of dust upward . Daily variations: diagrams reveal to experts that in general the mountain valley breeze regime is active all the year round at least for some parameters, namely PM coarse and fine (possibly because more representative of aged aerosol constituents), but the behaviour of this daily periodicity in terms of the typical timing of maxima and minima is not esplicated . Usually maximum is found in the advanced afternoon. Please specify and give references. In addition “typical/average day” elaborations would preferably exclude saharan dust episodes from the averages ; in fact they have been estimated to represent about 13% of all the air masses provenances, at least at Monsec (how about Monseni?), but they affect heavily the distribution of coarse particles in respect with fine ones, therefore it would be interesting to select/split data eliminating saharan dust. The position/timing (not always coincident for the several parameters) and shape (wide and noisy -possibly double- for the two PM parameters in the summer months, sharper and possibly anticipated for BC and N) of the maxima deserve some extra attention and at least a re-evaluation after data selection as suggested above.

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