

Interactive comment on “A global analysis of climate-relevant aerosol properties retrieved from the network of GAW near-surface observatories” by Paolo Laj et al.

Anonymous Referee #1

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The results of a large effort to summarize the climate-relevant in situ aerosol properties available at all sites connected to the GAW network are presented. The growth of the global base over the past few decades is shown as well as the increase in the usage of the data over the past ten years. Values of absorption, scattering, and SSA are compared for the wide range of existing sites. Seasonal data and annual trends are also presented. All in all, it is a substantial effort that is definitely worthy of publication in AMT. Relatively minor comments are listed below.

Table 1. Should the description of CCN say “CCN number concentration is sometimes approximated using the fraction of particles larger than a given diameter from the par-

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title number size distribution AND AN ASSUMED CHEMICAL COMPOSITION”?

Line 225: “. . .but also including sites IN other WMO regions. . .”

Line 249: “. . .many of them ARE no longer documented. . .”

Line 271: Analyzes instead of analyses?

Line 271: Define SARGAN here where it is first used.

Lines 320 – 325: It would be handy to have a reference to the relevant report of the GAW measurement guidelines included in Table 2 , i.e. WMO/GAW Report #200 for light scattering and absorption.

Line 364: define the ultrafine and fine ranges in terms of diameter.

Lines 400 – 413: When was this change made, i.e. only removing data affected by instrument issues or contamination? Were older data sets amended?

Lines 439 – 440: Are there references for the “manual-expansion type” and “automated version” that can be provided so the reader knows what these particle counters are?

Line 484: define kerbside.

Line 540: A couple of sentences with references on different methods that have been used to calculate trends would be helpful here.

Line 551: “. . .too high, however, OBSERVATIONS INDICATE it is. . .”

Lines 551 – 552: What exactly is meant by “While the bias values are robust at the sites investigated. . .”? The bias values (i.e. model – measurement differences) are well characterized or low?

Lines 565 – 569: How did the measured and modelled number size distributions compare?

Line 570: “. . .is the evaluation OF MEASURED AND MODELLED cloud condensation

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nuclei.”

Line 580: Provide the link to GAWSIS here where it is first mentioned.

Line 587 – 589: What is the connection between not all GAW stations being able to measure all variables listed in Table 1 and SARGAN being a subset of stations in GAW? Please clarify.

Line 628: Where are WMO regions I, II, III, and IV? I don’t think this is stated previously.

Line 634: What is meant by “a station footprint that is large”? Is this related to its representativeness of a region? Or land type?

Line 735: “. . .for 29 of these sites IT was possible. . .”

Lines 744 – 746: Is it possible to cite a reference for this assumption?

Line 772: It is more commonly thought that Cape Grim is a coastal Southern site, than a Pacific site.

Table 3: Abbreviations shown in the plots (DE, RB, U) should be defined in the caption.

Figure 8a: The title says monthly means while the caption says seasonal means. Given the number of points, I assume it is the former.

Figure 8: Coloring the points by month may provide useful information on under- and overestimates by the models. Also – 8a shows absorption and 8b shows scattering but scattering is introduced in the text first.

Figure 9 caption: Provide a reference for the Mann-Kendall trend method and describe the Sen’s slope estimator.

Lines 868 – 870: This sentence is confusing. What does “almost all stations have either statistically significant decreasing or not statistically significant trends in the absorption coefficient” mean? Does it mean that the only ss trends in absorption are decreasing trends?

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Lines 873 – 879: It is a little frustrating that hints of interesting trends are mentioned (“Polar stations exhibit a mix of increasing and decreasing trends”) without more detailed explanation. Why is scattering at ZEP, PAL, and SPO increasing on an annual basis but decreasing at BRW? If this is discussed in more detail in the companion papers that should be explicitly stated here so that the reader knows where to find further information. Also – it’s not clear what an annual average represents since there may be a decreasing trend in one season and an increasing trend in another. I am thinking of sulfate in the Arctic where it is decreasing in winter/spring due to air quality regulations but could be increasing in summer due to decreasing sea ice.

Lines 888 – 890: “. . .simulated trends are in agreement with SARGAN derived trends suggesting significant decreases found over North America and Europe. . .” This sounds like models are being used to validate measurements.

Lines 892 – 894: Is this supposed to say that “. . .NO statistically significant AOD and sulfate trends. . .”.

General comment: There is heavy use of Collaud Coen et al. (submitted) and Mortier et al. (submitted) in this paper. I am not sure of AMT’s policies concerning citing results from papers that have not been published yet.

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