



Supplement of

Arctic spring and summertime aerosol optical depth baseline from long-term observations and model reanalyses – Part 1: Climatology and trend

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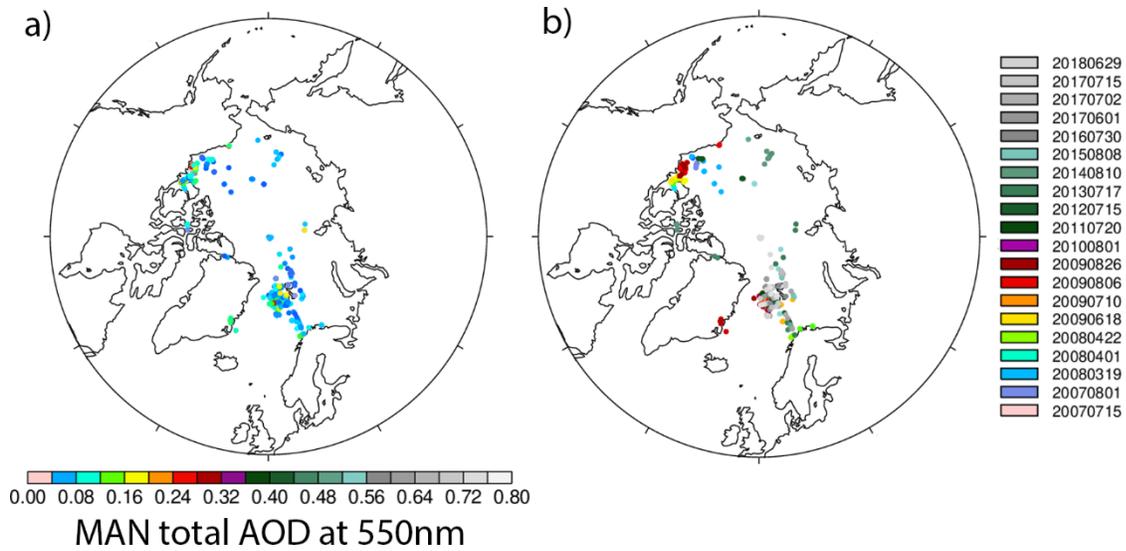
1 Discussion of Table 1 in terms of difference between FMF vs. SMF and arithmetic vs geometric
 2 statistics:

3 The CM AODs of Table 1 tend to be substantially higher than the values reported in Aboel-
 4 Fetouh et al. (2020) for common sites of Barrow, Resolute Bay, Thule and Hornsund (MAM and
 5 JJA arithmetic averages of 0.031 and 0.016 vs ~ geometric means of 0.02 and 0.002
 6 respectively). Part of the reason for this is the difference between their SMF approach and our
 7 FMF approach (as per the next paragraph, our FMFs transform to larger SMFs) and the fact that
 8 they used geometric means as opposed to our arithmetic means. If we employ the average FMF
 9 to SMF (SDA to Aboel-Fetouh et al. change in FMF) we obtain a CM AOD decrease (averaged
 10 over the 4 common sites) of 0.012 and 0.015 for the MAM and JJA periods. If we employ the
 11 arithmetic to geometric statistics transformations given in Hesaraki et al. (2017) we obtain a
 12 mean reduction in our CM AOD of 0.012 and 0.008 for MAM and JJA respectively (again
 13 averaged over the four common sites). These substantial reductions in CM AOD would produce
 14 CM AOD values that were ~ those in Aboel-Fetouh et al. (2020). The associated changes in FM
 15 AOD would be significantly less important in a relative sense. The reanalysis results of Table 1
 16 would, of course, be subject to the same types of FMF to SMF and arithmetic to geometric
 17 transformations as the data.

18 **Table S1.** Geographical coordinates of AERONET sites used in this study, and seasonal mean
 19 total, FM and CM AOD at 550nm derived with SDA for MAM and JJA based on 2003-2019
 20 daily data, in comparison with Table 1, in which 6-hrly data is used. “n” represents the number
 21 of daily AERONET data.

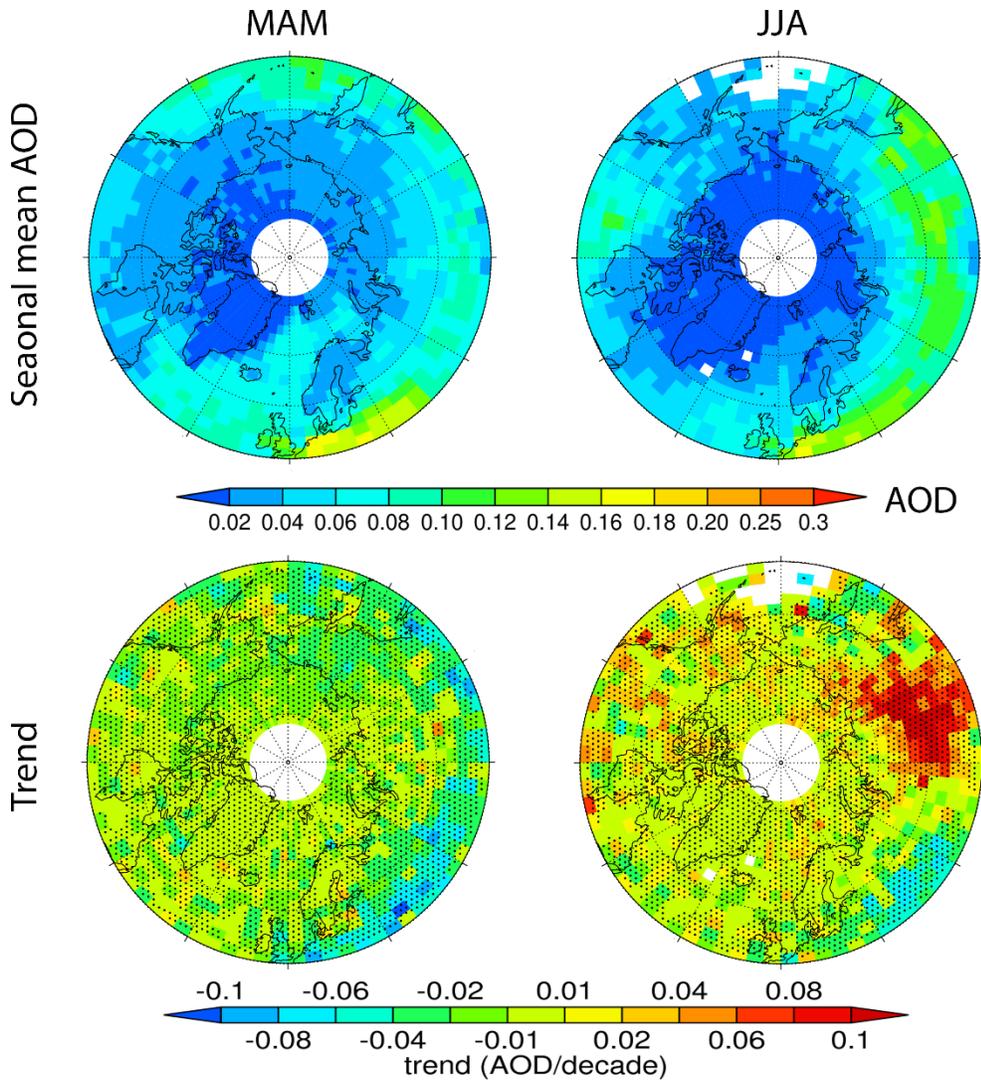
sites	latitude	longitude	elevation (m)	region	MAM (mean median std)				MAM FMF		JJA (mean median std)				JJA FMF	
					total AOD	FM AOD	CM AOD	n	mean median	total AOD	FM AOD	CM AOD	n	mean median		
Hornsund	77.0N	15.6E	12	Svalbard	0.10 0.09 0.05	0.07 0.06 0.04	0.03 0.02 0.03	215	0.72	0.76	0.08 0.06 0.07	0.06 0.04 0.07	0.02 0.01 0.02	302	0.76	0.81
Thule	76.5N	68.8W	225	Greenland	0.09 0.07 0.05	0.06 0.06 0.03	0.03 0.01 0.04	324	0.76	0.81	0.07 0.05 0.08	0.06 0.04 0.08	0.01 0.01 0.02	464	0.85	0.87
Kangerlussuaq	67.0N	50.6W	320	Greenland	0.07 0.06 0.03	0.05 0.04 0.02	0.02 0.02 0.02	295	0.69	0.72	0.07 0.05 0.05	0.05 0.04 0.04	0.01 0.01 0.02	476	0.77	0.82
Ittoqqortoormiit	70.5N	21.0W	68	Greenland	0.06 0.06 0.03	0.04 0.04 0.02	0.02 0.01 0.03	193	0.72	0.78	0.06 0.04 0.04	0.05 0.03 0.04	0.01 0.01 0.02	369	0.80	0.84
Andenes	69.3N	16.0E	379	Norway	0.09 0.07 0.06	0.05 0.04 0.04	0.03 0.02 0.04	226	0.67	0.72	0.08 0.06 0.05	0.06 0.05 0.05	0.02 0.01 0.02	331	0.75	0.79
Resolute Bay	74.7N	94.9W	35	Canada	0.10 0.09 0.05	0.07 0.06 0.03	0.03 0.02 0.03	173	0.72	0.74	0.07 0.05 0.09	0.06 0.04 0.09	0.02 0.01 0.02	371	0.78	0.83
Barrow	71.3N	156.7W	8	Alaska	0.12 0.09 0.10	0.08 0.06 0.07	0.04 0.02 0.06	158	0.69	0.74	0.09 0.06 0.09	0.07 0.05 0.09	0.02 0.01 0.02	335	0.79	0.82
Bonanza_Creek	64.7N	148.3W	353	Alaska	0.11 0.07 0.09	0.06 0.04 0.07	0.04 0.02 0.04	297	0.64	0.65	0.18 0.09 0.27	0.16 0.06 0.26	0.02 0.02 0.02	445	0.78	0.82
Tiksi	71.6N	129.0E	17	Siberia	0.09 0.10 0.03	0.07 0.07 0.02	0.03 0.02 0.02	13	0.73	0.78	0.13 0.08 0.19	0.11 0.07 0.18	0.02 0.01 0.02	139	0.81	0.85
Yakutsk	61.7N	129.4E	119	Siberia	0.15 0.11 0.15	0.11 0.08 0.13	0.04 0.02 0.06	517	0.73	0.77	0.17 0.09 0.23	0.14 0.07 0.23	0.02 0.01 0.03	748	0.81	0.84

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Figure S1. MAN a) total AOD at 550nm for measurements made north of 70°N and between 2003-2019, and b) measurement date in the format of year-month-date. 6-hrly AOD data is used.



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 34 **Figure S2.** CALIOP mean climatological MAM (upper-left) and JJA (upper-right) AOD at 532
 35 nm (2006-2019) and AOD trends (lower) derived with AOD=0 values retained in the CALIOP
 36 V4.2 L2 data analysis, to compare with CALIOP AOD seasonal climatology and trends derived
 37 with AOD=0 values removed in Fig. 3 and Fig. 9. White area means lack of data.

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