Atmos. Chem. Phys. Discuss., 11, C5309–C5315, 2011
www.atmos-chem-phys-discuss.net/11/C5309/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Absorbing aerosol in the troposphere of the Western Arctic during the 2008 ARCTAS/ARCPAC airborne field campaigns" *by* C. S. Mc Naughton et al.

C. S. Mc Naughton et al.

csmcnaug@hawaii.edu

Received and published: 22 June 2011

Both reviewers comments were helpful and we have revised the manuscript accordingly. Thanks to input from the PALMS team we were able to separate supermicrometer aerosol mass into dust and seasat aerosol types.

Figure 10 has been updated from simple histograms to vertical profiles of FMF_scat for each of the field campaigns.

Figure 12 has been updated to separate dust and seasalt and now includes a panel summarizing profiles of SSA.

Updates based on PALMS data analysis and Figure 12 bears upon Figure 13 which has been updated as well.

As suggested, summary tables of aerosol mass and aerosol optical properties are provided for use by the broader community.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/11/C5309/2011/acpd-11-C5309-2011-supplement.pdf

---

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 1543, 2011.

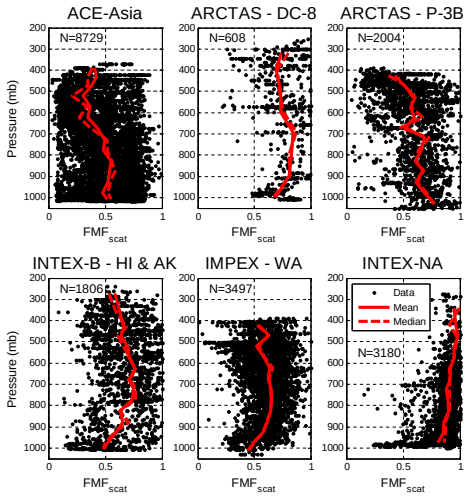

Figure 10 – Vertical profiles of the fine mode fraction of scattering (FMF_{scat}) measured in-situ via aircraft during recent NASA and NSF-funded airborne field campaigns. Data points (N) are restricted to cases where total scattering is greater than 3 Mm^{-1} to eliminate ratios computed from low signal-to-noise scattering values.

Fig. 1.

ACPD
11, C5309–C5315, 2011

Interactive Comment

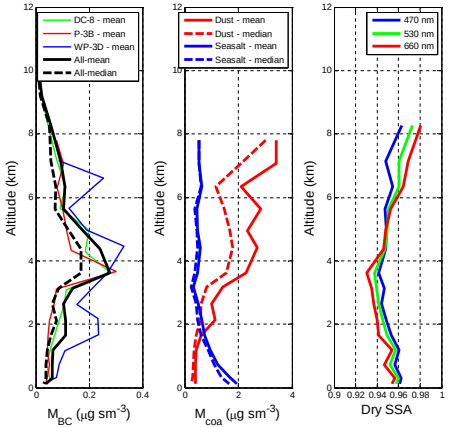

Figure 12 – Aircraft specific, and campaign averaged vertical profiles of (left) black carbon mass, (middle) classified supermicrometer aerosol mass - dust (red) and seasalt (blue), and (right) total dry single scattering albedo at 470, 530 and 660 nm wavelengths.

Fig. 2.

ACPD
11, C5309–C5315, 2011

Interactive Comment

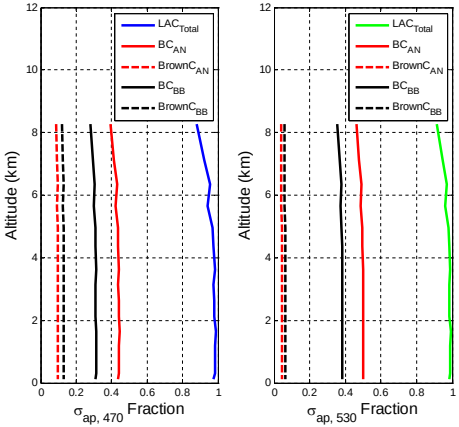

Figure 13 – Relative contributions of light absorbing carbon to total absorption as a function of altitude over the Western Arctic at 470 nm (left) and 530 nm (right) wavelengths. Contributions by black carbon (solid lines) and brown carbon (dashed) are further separated by their sources, urban/industrial emissions (red), and emissions from biomass burning (black).

Fig. 3.

ACPD
11, C5309–C5315, 2011

Table 5 - Summary of vertical profiles for black carbon mass, submicrometer aerosol mass, refractory submicrometer aerosol mass, as well as supermicrometer mineral dust and seasalt aerosol mass. Statistics include mean, median and standard deviations calculated from all available 1-minute averaged data measured onboard the NASA DC-8, P-3B and NOAA WP-3D during ARCTAS/ARCPAC.

Altitude (km)	Black Carbon Mass ($\mu g\ m^{-3}$)			Submicrometer Mass rho = 1.6 ($\mu g\ m^{-3}$)			Refractory Sub. Mass rho = 1.3 ($\mu g\ m^{-3}$)			Dust Mass rho = 2.06 ($\mu g\ m^{-3}$)			Seasalt Mass rho = 2.20 ($\mu g\ m^{-3}$)		
mean	mean	median	stdev	mean	median	stdev	mean	median	stdev	mean	median	stdev	mean	median	stdev
10.7	0.002	0.001	0.004												
9.2	0.023	0.017	0.019												
8.3	0.057	0.052	0.026												
7.1	0.093	0.057	0.117	1.4	0.77	2.0	0.47	0.28	0.68	3.4	2.2	3.9	0.55	0.54	0.62
6.3	0.110	0.075	0.099	1.5	1.3	1.6	0.39	0.23	0.50	2.1	1.2	3.2	0.63	0.62	0.95
5.6	0.105	0.073	0.102	2.8	1.6	2.6	0.35	0.24	0.33	2.8	1.5	4.5	0.45	0.39	0.71
5.0	0.176	0.123	0.168	4.7	3.8	4.2	0.50	0.33	0.73	2.3	1.7	3.0	0.49	0.46	0.63
4.4	0.241	0.169	0.235	7.1	4.7	7.7	0.54	0.39	0.62	2.7	1.8	2.9	0.58	0.48	0.63
3.6	0.277	0.171	0.288	6.2	2.1	8.9	1.94	0.52	3.45	2.3	1.6	2.2	0.47	0.37	0.46
3.1	0.137	0.086	0.155	4.1	1.5	6.4	0.46	0.23	0.63	1.4	0.82	1.6	0.35	0.25	0.40
2.6	0.103	0.061	0.118	2.5	1.5	3.6	0.26	0.17	0.36	1.0	0.61	1.3	0.52	0.42	0.69
2.1	0.112	0.077	0.122	3.8	3.1	4.4	0.26	0.18	0.29	1.1	0.57	1.5	0.64	0.50	0.86
1.6	0.111	0.058	0.136	4.5	1.7	5.6	0.27	0.22	0.22	0.61	0.44	0.61	0.74	0.60	0.74
1.2	0.065	0.044	0.067	2.6	2.0	2.2	0.30	0.23	0.28	0.44	0.36	0.37	0.94	0.87	0.79
0.73	0.063	0.039	0.058	2.7	2.2	2.0	0.43	0.40	0.30	0.40	0.31	0.39	1.2	1.1	1.2
0.30	0.061	0.039	0.065	2.8	2.1	2.0	0.40	0.30	0.33	0.39	0.30	0.33	1.7	1.4	1.4
0.13	0.037	0.030	0.042	1.7	1.5	0.83	0.57	0.30	0.54	0.40	0.26	0.41	2.0	1.6	2.0

1

Fig. 4.

ACPD

11, C5309–C5315, 2011

Interactive Comment

ACPD

11, C5309–C5315, 2011

Interactive Comment

Table 6 - Summary of vertical profiles for total light extinction and aerosol single scattering albedo at 470, 530 and 660 nm wavelengths. Statistics include mean, median and standard deviations from all available 1-minute averaged data measured onboard the NASA DC-8, P-3B during ARCTAS. Column dry aerosol optical depth (AOD) and SSA values are weighted by extinction.

Altitude (km)	Total 470 nm Extinction (Mm^{-1})			Total 530 nm Extinction (Mm^{-1})			Total 660 nm Extinction (Mm^{-1})			Total SSA at 470 nm		Total SSA at 530 nm		Total SSA at 660 nm	
mean	mean	median	stdev	mean	median	stdev	mean	median	stdev	mean	stdev	mean	stdev	mean	stdev
10.7	4.8	4.8	1.6	2.6	2.5	1.1	2.3	2.2	1.4						
9.2	6.9	6.5	3.9	4.0	3.6	2.7	4.6	3.7	3.3						
8.3	12	10	8.5	11	9.3	7.6	9.1	7.7	6.9	0.96	0.03	0.97	0.02	0.98	0.03
7.1	19	11	31	16	9.8	25	13	7.7	18	0.95	0.03	0.96	0.03	0.97	0.03
6.3	18	11	25	15	9.5	20	11	6.8	14	0.95	0.04	0.96	0.04	0.96	0.05
5.6	17	11	21	13	8.7	17	9.4	6.3	12	0.95	0.03	0.95	0.03	0.95	0.04
5.0	37	18	73	28	14	61	19	9.7	47	0.95	0.04	0.95	0.04	0.95	0.04
4.4	34	16	58	26	12	44	17	8.8	28	0.95	0.03	0.95	0.03	0.95	0.04
3.6	75	25	129	54	18	95	34	12.4	58	0.94	0.03	0.94	0.03	0.93	0.05
3.1	22	13	29	16	9.6	21	11	6.7	13	0.95	0.03	0.94	0.04	0.93	0.05
2.6	17	14	17	14	10	26	8.4	7.1	8.1	0.94	0.03	0.94	0.04	0.94	0.05
2.1	15	12	13	11	8.8	10	7.3	6.0	6.5	0.95	0.03	0.95	0.04	0.94	0.05
1.6	13	13	12	10	9.5	9.3	6.6	6.2	6.5	0.95	0.02	0.95	0.03	0.94	0.04
1.2	16	15	13	11	11	9.4	7.8	7.3	6.0	0.96	0.02	0.96	0.03	0.95	0.03
0.73	17	16	11	13	11	7.9	8.5	7.8	5.0	0.96	0.03	0.95	0.03	0.95	0.04
0.30	17	16	7.0	13	12	5.4	8.9	8.4	4.0	0.96	0.02	0.96	0.02	0.96	0.02
0.13	16	14	6.7	12	10	5.3	8.7	7.1	4.3	0.96	0.02	0.96	0.02	0.95	0.03
AOD & SSA	0.20	0.13		0.15	0.10		0.11	0.07		0.95	0.03	0.95	0.03	0.95	0.04

Fig. 5.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper