

**Table S1.** The information about historical MSA observations used in this study.

Region	Latitude (°)	Longitude (°)	Time period	Number of samples	Average AEC (mg m <sup>-3</sup> )	Average [MSA] (µg m <sup>-3</sup> )	Reference
1	26 – 35	121 – 124	31 Aug. – 19 Sep. 2014	14	0.97	0.021	(Ji et al., 2016)
1	33 – 37	120 – 124	21 Apr. – 30 Apr. 2010	7	0.72	0.056	(Xue, 2012)
1	34 – 36	120 – 124	9 Spt. – 14 Sep. 2010	5	0.71	0.030	(Xue, 2012)
1	33 – 36	123 – 125	17 Mar. – 20 Mar. 2011	2	1.60	0.056	(Xue, 2012)
1	33 – 37	120 – 124	27 Apr. – 3 May 2009	5	1.56	0.078	(He, 2011)
1	31 – 36	120 – 122	2 Jul. – 19 Jul. 2018	4	0.93	0.060	This study
1	31 – 36	120 – 133	17 Mar. – 20 Mar. 2014	3	2.11	0.078	This study
1	31	123	22 Mar. – 19 Apr. 2013	10	1.10	0.042	(Zhou et al., 2021)
1	31	123	18 Jul. – 10 Aug. 2013	20	1.56	0.038	(Zhou et al., 2021)
1	31	123	7 Apr. – 2 May 2015	6	1.14	0.057	(Zhou et al., 2021)
1	31	123	4 Aug. – 23 Aug. 2015	12	1.47	0.052	(Zhou et al., 2021)
1	31	123	22 Jul. – 17 Aug. 2016	24	1.39	0.040	(Zhou et al., 2021)
1	31	123	14 Mar. – 17 Mar. 2017	2	0.56	0.016	(Zhou et al., 2021)
1	31	123	1 Jul. – 9 Jul., 28 Aug. – 12 Sep. 2017	18	1.09	0.031	(Zhou et al., 2021)
1	31	123	3 Apr. – 30 Apr. 2018	9	1.02	0.037	(Zhou et al., 2021)
2	28 – 37	122 – 127	5 Jul. – 26 Jul. 2011	9	0.39	0.049	(Zhang et al., 2014)
2	27 – 32	122 – 127	20 Mar. – 30 Mar. 2011	4	0.96	0.083	(Xue, 2012)
2	26 – 32	122 – 125	10 Jun. – 19 Jun. 2010	8	0.29	0.044	(Xue, 2012)
2	25 – 33	121 – 128	4 May – 14 May 2009	8	0.79	0.060	(He, 2011)
2	26 – 30	121 – 125	28 May – 10 Jun. 2014	13	0.40	0.033	(Zhou et al., 2018)
2	27 – 31	123 – 127	2 Apr. – 9 Apr. 2017	5	0.61	0.041	This study
2	24 – 31	120 – 124	6 Jul. – 16 Jul. 2018	6	0.35	0.020	This study

2	26 – 32	122 – 128	28 Dec. 2019 – 7 Jan. 2020	7	0.36	0.028	This study
2	26 – 31	121 – 123	25 Oct. – 27 Oct. 2020	3	0.44	0.020	This study
2	28 – 30	124 – 125	1 Apr. – 2 Apr. 2015	1	1.16	0.076	This study
3	27	128	Mar. 2010	4	0.12	0.040	(Zhu et al., 2015)
3	27	128	Apr. 2010	4	0.20	0.045	(Zhu et al., 2015)
3	27	128	May 2010	5	0.19	0.045	(Zhu et al., 2015)
3	27	128	Jun. 2010	4	0.041	0.028	(Zhu et al., 2015)
3	27	128	Jul. 2010	4	0.034	0.015	(Zhu et al., 2015)
3	27	128	Aug. 2010	4	0.052	0.014	(Zhu et al., 2015)
3	27	128	Sep. 2010	4	0.056	0.016	(Zhu et al., 2015)
3	27	128	Mar. 2011	3	0.40	0.044	(Zhu et al., 2015)
3	27	128	Apr. 2011	4	0.40	0.075	(Zhu et al., 2015)
3	27	128	May 2011	2	0.19	0.019	(Zhu et al., 2015)
3	27	128	Jun. 2011	2	0.039	0.012	(Zhu et al., 2015)
3	27	128	Jul. 2011	4	0.056	0.025	(Zhu et al., 2015)
3	27	128	Aug. 2011	4	0.064	0.071	(Zhu et al., 2015)
3	27	128	Sep. 2011	4	0.17	0.043	(Zhu et al., 2015)
3	28 – 37	135 – 150	22 Mar. – 19 Apr. 2014	13	0.17	0.019	This study
3	25 – 38	124 – 152	4 Apr. – 29 Apr. 2015	16	0.19	0.035	This study