An improved algorithm for retrieving the fine-mode fraction of aerosol optical thickness. Part 2: Application and validation in Asia

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Table S1. AERONET stations considered in this study.

AERONET Station	Longitude (ºE)	Latitude (ºN)	Altitude (m)	Used for validation
Xianghe	116.9615	39.7536	36	√
Beijing	116.38137	39.97689	92	√
XuZhou-CUMT	117.14167	34.21667	59.7	√
Hangzhou_City	120.156917	30.289633	30	
LA-TM	119.44	30.324	439	
Hefei	117.162222	31.904722	36	
Shijiazhuang-SZF	114.45833	38.01667	71	
Taihu	120.215333	31.421	20	√
Ussuriysk	132.1635	43.7004	280	√
NAM_CO	90.96245	30.772517	4746	√
Mt_WLG	100.89583	36.28333	3816	
Hong_Kong_PolyU	114.179722	22.303333	30	√
Anmyon	126.330194	36.538537	47	√
Bac_Lieu	105.73	9.28	10	√
Chen-Kung_Univ	120.204664	22.993419	50	√
Chiang_Mai_Met_Sta	98.972467	18.771125	312	√
Chiayi	120.495975	23.495975	62	√
Dhaka_University	90.39819	23.72839	34	√
Gangneung_WNU	128.867	37.771	60	√
Gwangju_GIST	126.843139	35.228278	52	√
Hankuk_UFS	127.26582	37.33883	167	√
Jambi	103.641563	-1.632445	30	√
Kuching	110.348611	1.490556	28	√

Continued Table S1

AERONET Station	Longitude (°E)	Latitude (°N)	Altitude (m)	Used for validation
Nong_Khai	102.71671	17.8772	175	√
Omkoi	98.431667	17.798333	1120	√
Osaka	135.590633	34.650933	50	√
Palangkaraya	113.94624	-2.22799	27	√
Pontianak	109.19086	0.07538	2	√
Pusan_NU	129.082493	35.235354	78	√
Shirahama	135.356917	33.69345	10	√
Silpakorn_Univ	100.041183	13.819308	72	√
Singapore	103.780383	1.297667	30	√
Son_La	103.905151	21.3322	681	√
Songkhla_Met_Sta	100.604583	7.184387	15	√
Ubon_Ratchathani	104.871011	15.245518	120	√
USM_Penang	100.30231	5.35838	51	√
Yonsei_University	126.93479	37.56443	97	√
NhaTrang	109.205566	12.204722	20	√
Fukuoka	130.475	33.524	30	√
Noto	137.136944	37.334444	200	√
Chiba_University	140.1038	35.6247	60	
AOE_Baotou	109.6288	40.8517	1314	√
Yulin	109.716667	38.283333	1080	
Xinglong	117.578333	40.396389	899	
EPA-NCU	121.185483	24.967533	144	√
Gandhi_College	84.127944	25.871	60	√
Zhongshan_Univ	113.39	23.06	27	
Hokkaido_University	141.3407	43.0755	59	√
Makassar	119.57227	-4.99768	16	
Bandung	107.61	-6.888417	826	√
Sorong	131.2677	-0.8746	127	√

Continued Table S1

AERONET Station	Longitude (ºE)	Latitude (ºN)	Altitude (m)	Used for validation
Luang_Namtha	101.4162	20.9311	557	√
Manila_Observator	121.07784	14.63525	63	√
ND_Marbel_Univ	124.842531	6.496011	70	√
NGHIA_DO	105.79964	21.04778	40	√

Table S2. Validation of MOD08 AOT

Site name	N	RMSE	Above EE%	Between EE%	Below EE%
Anmyon	333	0.29	60.66	36.64	2.70
AOE_Baotou	178	0.35	42.70	48.31	8.99
Beijing	389	0.41	12.08	40.10	47.81
Bac_Lieu	192	0.41	85.42	13.54	1.04
Bandung	167	0.36	53.29	32.93	13.77
EPA-NCU	185	0.23	52.43	35.68	11.89
Chen-Kung_Univ	238	0.25	36.13	43.70	20.17
Chiang_Mai_Met_Sta	360	0.25	29.72	39.44	30.83
Fukuoka	273	0.25	58.24	38.10	3.66
Chiayi	342	0.39	19.88	39.18	40.94
Dhaka_University	231	0.46	30.30	49.35	20.35
Gandhi_College	360	0.57	46.11	45.83	8.06
Gangneung_WNU	322	0.25	22.67	60.25	17.08
Luang_Namtha	341	0.43	28.74	46.04	25.22
Manila_Observator	281	0.24	53.74	33.10	13.17
Hankuk_UFS	271	0.20	27.31	64.21	8.49
Hokkaido_Universi	147	0.26	52.38	42.86	4.76
Hong_Kong_PolyU	109	0.32	36.70	36.70	26.61
Luang_Namtha	341	0.43	28.74	46.04	25.22
Noto	120	0.15	45.83	50.00	4.17
ND_Marbel_Univ	327	0.19	48.01	39.45	12.54
Kuching	94	0.64	68.09	28.72	3.19
NGHIA_DO	112	0.31	41.96	47.32	10.71
NhaTrang	41	0.56	68.29	21.95	9.76
Nong_Khai	325	0.45	31.69	36.00	32.31
Palangkaraya	130	0.66	67.69	25.38	6.92
Pontianak	245	0.29	53.88	38.78	7.35
Omkoi	280	0.20	50.36	47.14	2.50
Osaka	329	0.20	48.94	44.98	6.08
Pusan_NU	262	0.20	32.06	61.45	6.49

Continued Table S2

Site name	N	RMSE	Above EE%	Between EE%	Below EE%
Shirahama	98	0.13	21.43	65.31	13.27
Singapore	257	0.48	55.64	34.63	9.73
Son_La	122	0.24	33.61	50.00	16.39
Songkhla_Met_Sta	187	0.32	66.84	27.81	5.35
Sorong	91	0.18	68.13	27.47	4.40
Ubon_Ratchathani	319	0.33	31.66	51.72	16.61
USM_Penang	389	0.34	37.79	43.70	18.51
Ussuriysk	236	0.23	26.27	63.56	10.17
Xianghe	366	0.45	50.55	44.81	4.64
Taihu	134	0.53	92.54	6.72	0.75
Xuzhou	307	0.48	58.31	31.60	10.10
Yonsei_University	385	0.23	11.69	48.31	40.00
Jambi	112	0.53	33.93	42.86	23.21
NAM_CO	19	0.21	52.63	42.11	5.26
Silpakorn_Univ	451	0.53	74.06	22.62	3.33
Total N and Mean error	107 98	0.34	45.54	40.81	13.65

Table S3. Validation of MODIS FMF

Site name	R	RMSE	N
Anmyon	0.500	0.640	139
AOE_Baotou	0.175	0.526	70
Bac_Lieu	0.153	0.621	39
Beijing	0.590	0.567	198
Chen.Kung_Univ	0.215	0.568	76
Chiayi	0.505	0.264	153
Chiang_Mai_Met_Sta	0.062	0.503	243
Dhaka_University	0.343	0.621	148
EPA.NCU	0.279	0.657	101
Fukuoka	0.330	0.565	126
Gandhi_College	0.551	0.473	272
Gangneung_WNU	0.492	0.597	212
Gwangju_GIST	0.380	0.610	110
Hankuk_UFS	0.424	0.524	115
Hokkaido_Universi	0.644	0.539	58
Hong_Kong_PolyU	0.192	0.571	24
Kuching	0.619	0.472	24
Luang_Namtha	0.058	0.533	187
Manila_Observator	0.057	0.469	56

Continued Table S3

Site name	R	RMSE	N
Osaka	0.421	0.545	70
Palangkaraya	0.464	0.637	28
Pontianak	0.516	0.647	60
Pusan_NU	0.468	0.597	99
Shirahama	0.531	0.580	32
Silpakorn	0.503	0.528	290
Son_La	0.093	0.482	67
Songkhla_Met_Sta	0.547	0.560	26
ND_Marbel_Univ	0.391	0.597	179
NGHIA_DO	0.180	0.636	60
Nong_Khai	0.494	0.559	207
Noto	0.421	0.557	75
Omkoi	0.414	0.694	166

	Spring	Summer	Autumn	Winter	
	NA	36	37	NA	Hong_Kong_PolyU
	NA	NA	37	NA	NhaTrang
	NA	35	NA	NA	Palangkaraya
	28	43	NA	NA	Bandung
	25	13	NA	34	Bac_Lieu
	18	6	NA	NA	Taihu
	NA	NA	NA	NA	NAM_CO
	48	58	18	NA	Kuching
	63	58	NA	NA	Noto
	52	61	NA	NA	Jambi
	52	21	NA	NA	Son_La
	65	NA	NA	NA	Shirahama
	69	NA	NA	NA	Sorong
	54	58	41	19	Pontianak
	62	63	69	NA	Ussuriysk
	58	52	60	NA	Hokkaido_Universi
	58	45	72	NA	AOE_Baotou
	38	47	NA	62	NGHIA_DO
	63	53	74	82	Gangneung_WNU
	56	47	69	82	Hankuk_UFS
	62	41	57	80	Pusan_NU
	46	41	52	72	Yonsei_University
	52	39	64	67	Gwangju_GIST
	51	NA	32	56	Omkoi
	41	NA	62	66	Ubon_Ratchathani
	NA	37	52	50	Dhaka_University
	40	25	50	61	Luang_Namtha
	42	35	43	55	Anmyon
	43	23	40	53	USM_Penang
	51	30	32	58	Xianghe
	49	31	34	52	Chen−Kung_Univ
	40	38	40	67	Osaka
	34	36	33	61	Chiayi
	49	41	20	43	Manila_Observator
	46	46	31	35	Songkhla_Met_Sta
	33	42	35	35	Singapore
	28	34	44	41	Silpakorn_Univ
	23	39	26	55	Xuzhou
	29	35	34	50	EPA−NCU
	48	45	63	38	Fukuoka
	40	49	55	43	Nong_Khai
	54	35	54	51	Beijing
	47	48	51	55	ND_Marbel_Univ
	43	17	52	27	Gandhi_College
	48	26	67	48	Chiang_Mai_Met_Sta

Within EE (%)
80
60
40
20
NA

Fig. S1. Validation of the LUT-SDA for different seasons. The estimated error (EE) envelope is ± (0.05 + 0.15 × AERONET fAOT). NA means that the validation result is unavailable because the sample size (N) < 30.
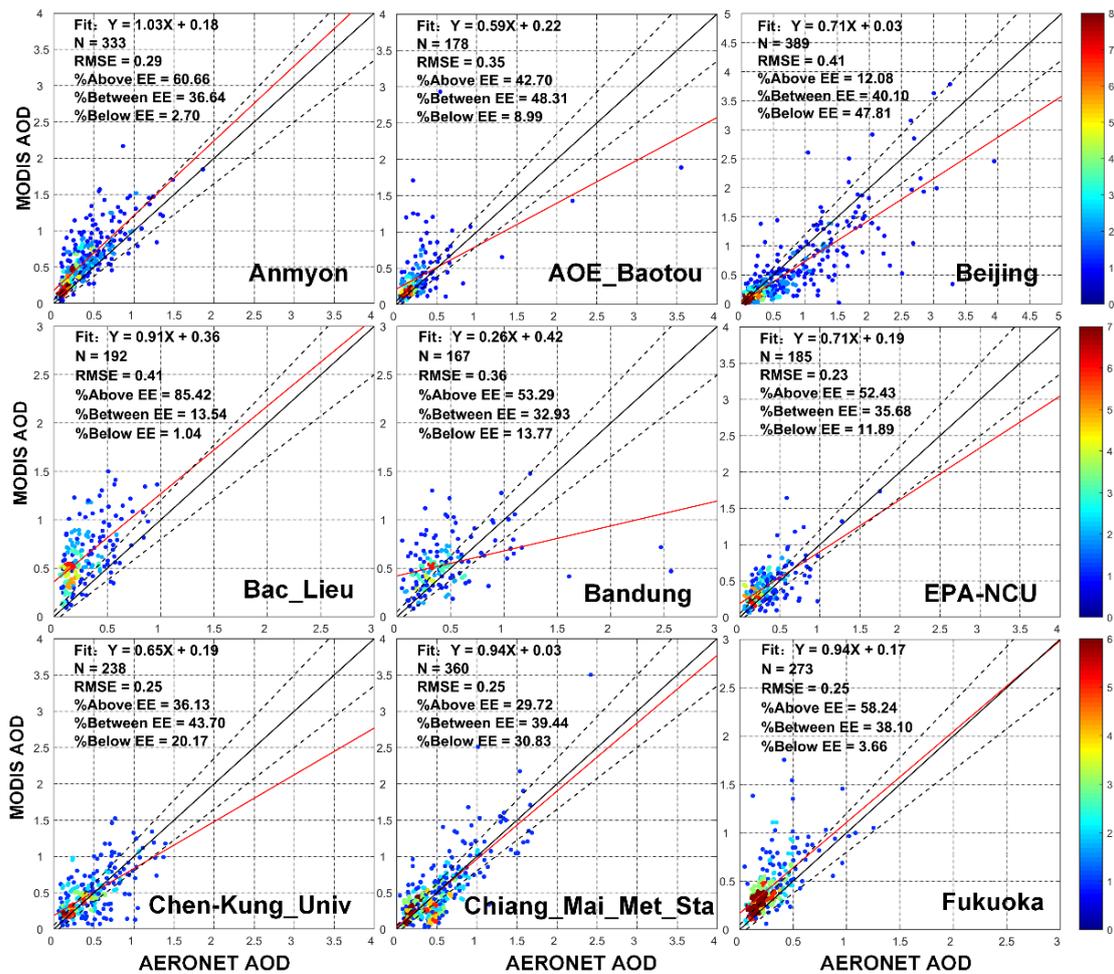
Fig. S2. Validation of the MOD08 AOD for 8 AERONET sites in Asia. The red lines are the best-fit lines from linear regression and the black solid lines are the 1:1 lines. The two dashed error lines are y=1.15x+0.05 (upper line) and y=0.85x-0.05(bottom line), which correspond to the error ±(0.05+0.15AERONET AOT). The regression equations and coefficients of determination (R^2) are given as well as the number of data points (N) and the root-mean-square errors (RMSE). Data are sorted according to ordered pairs (AERONET, MOD08) of AOT in 0.05 intervals, and the color represents the number of cases (color bar) having that particular ordered pair value.
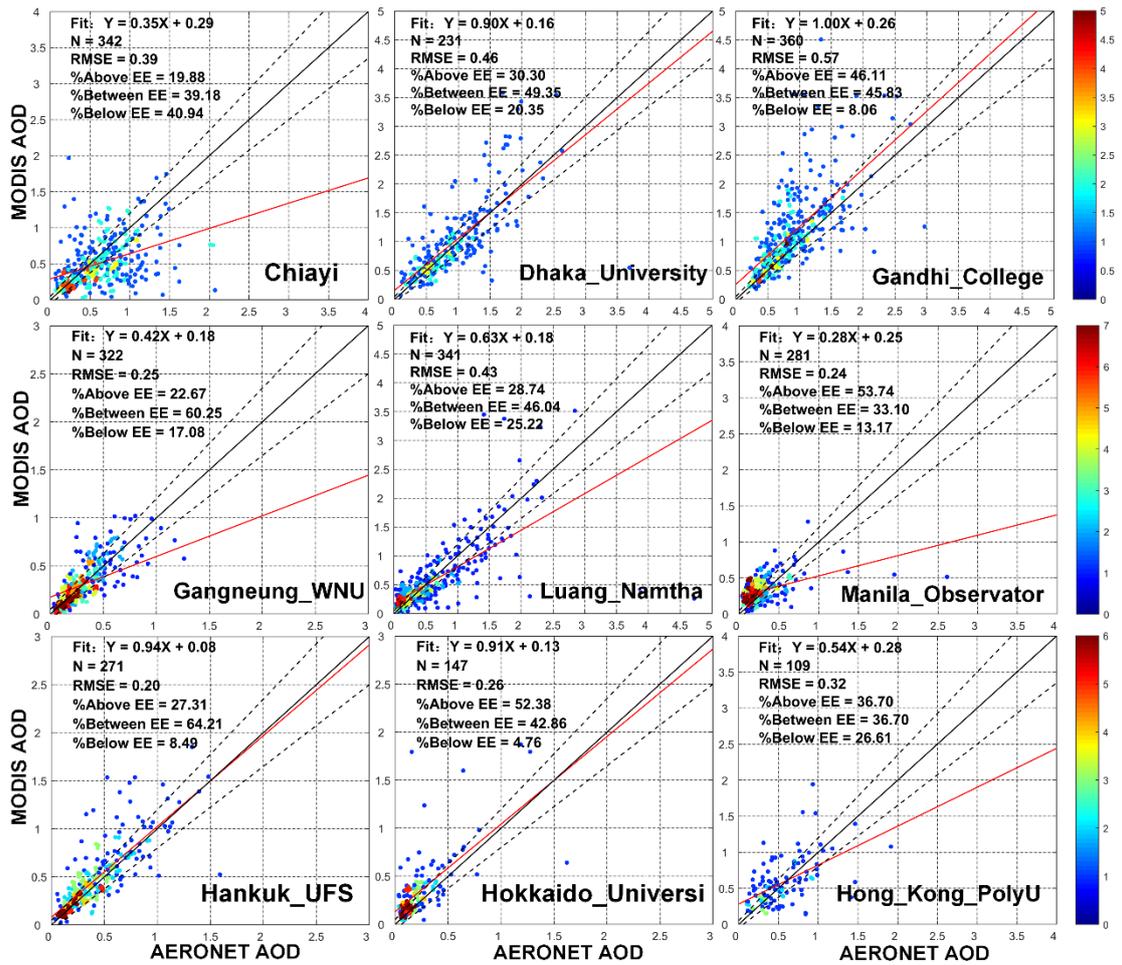
Fig. S3. Same as Fig. S2 but for other 8 AERONET sites in Asia.
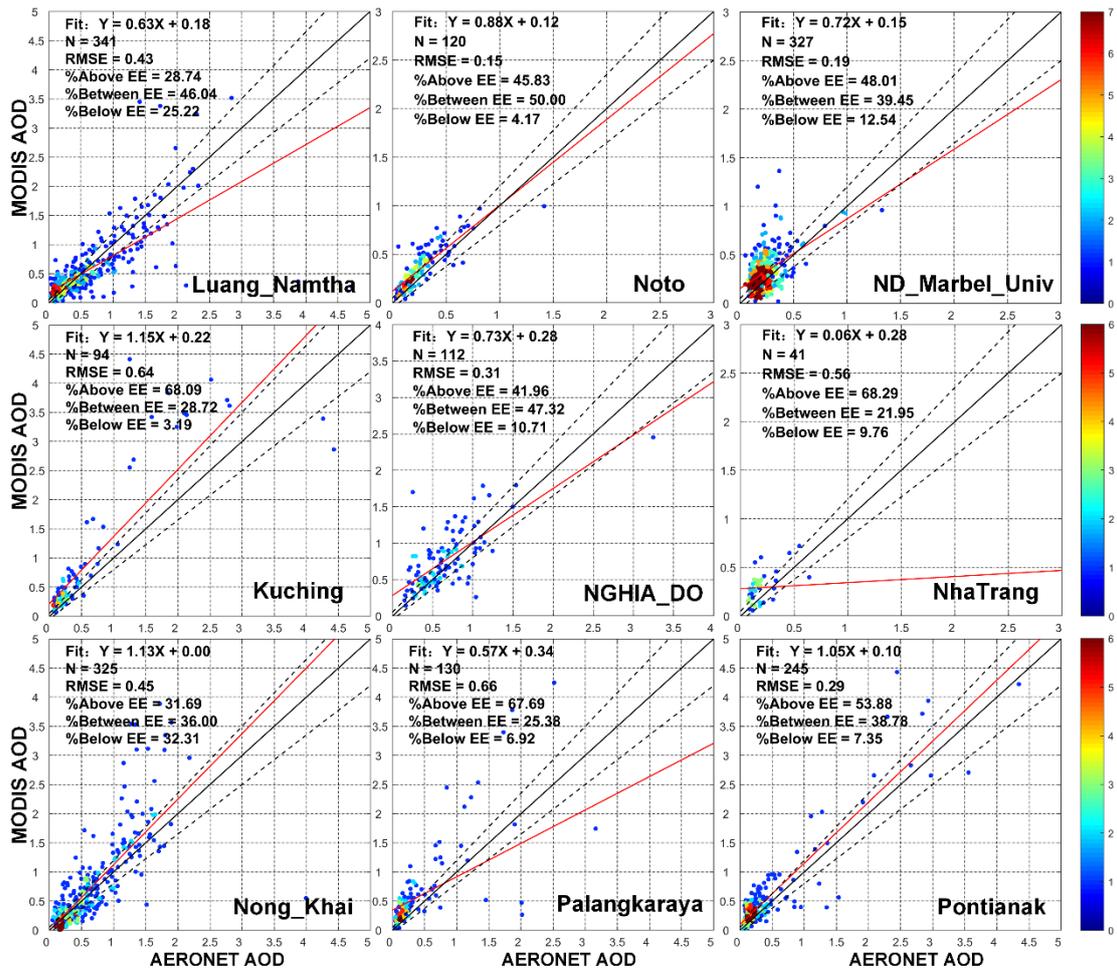
Fig. S4. Same as Fig. S2 but for other 8 AERONET sites in Asia.
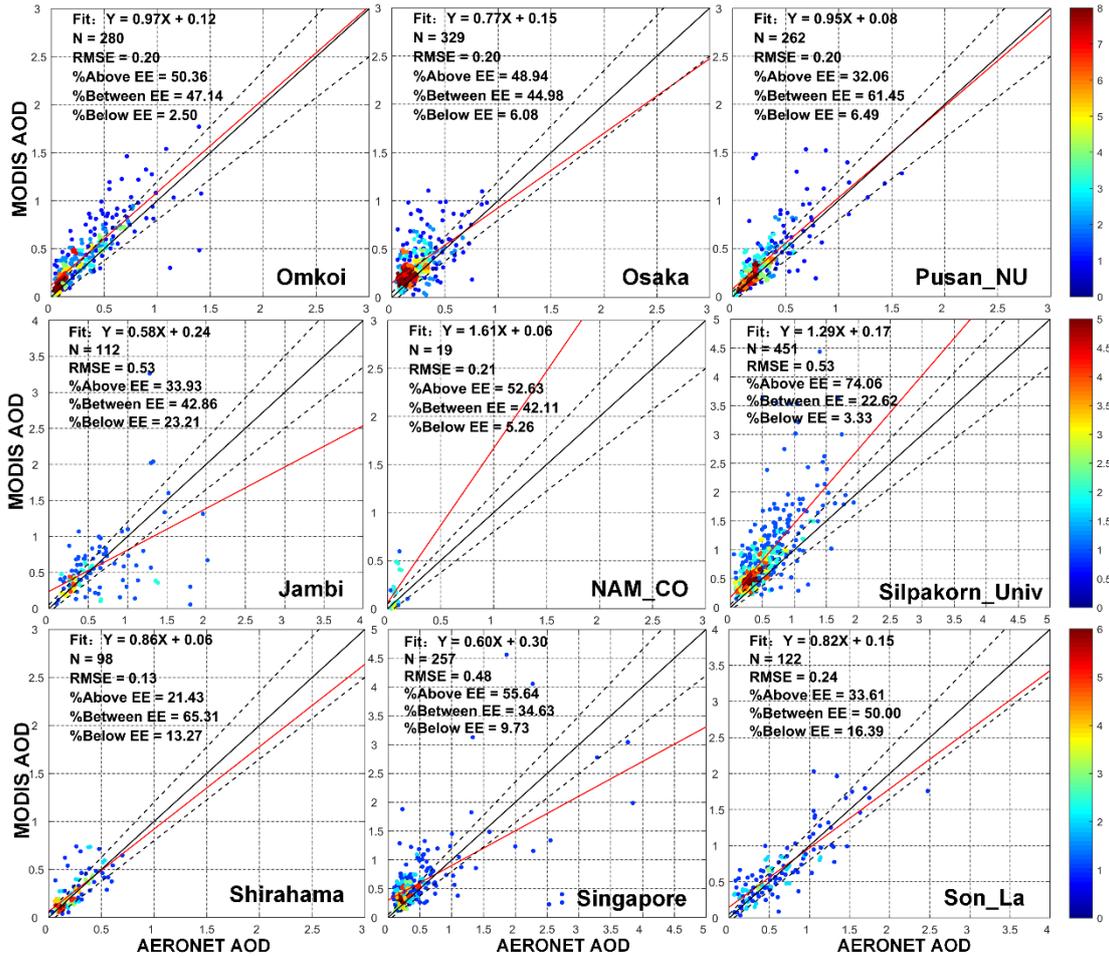
Fig. S5. Same as Fig. S2 but for other 8 AERONET sites in Asia.
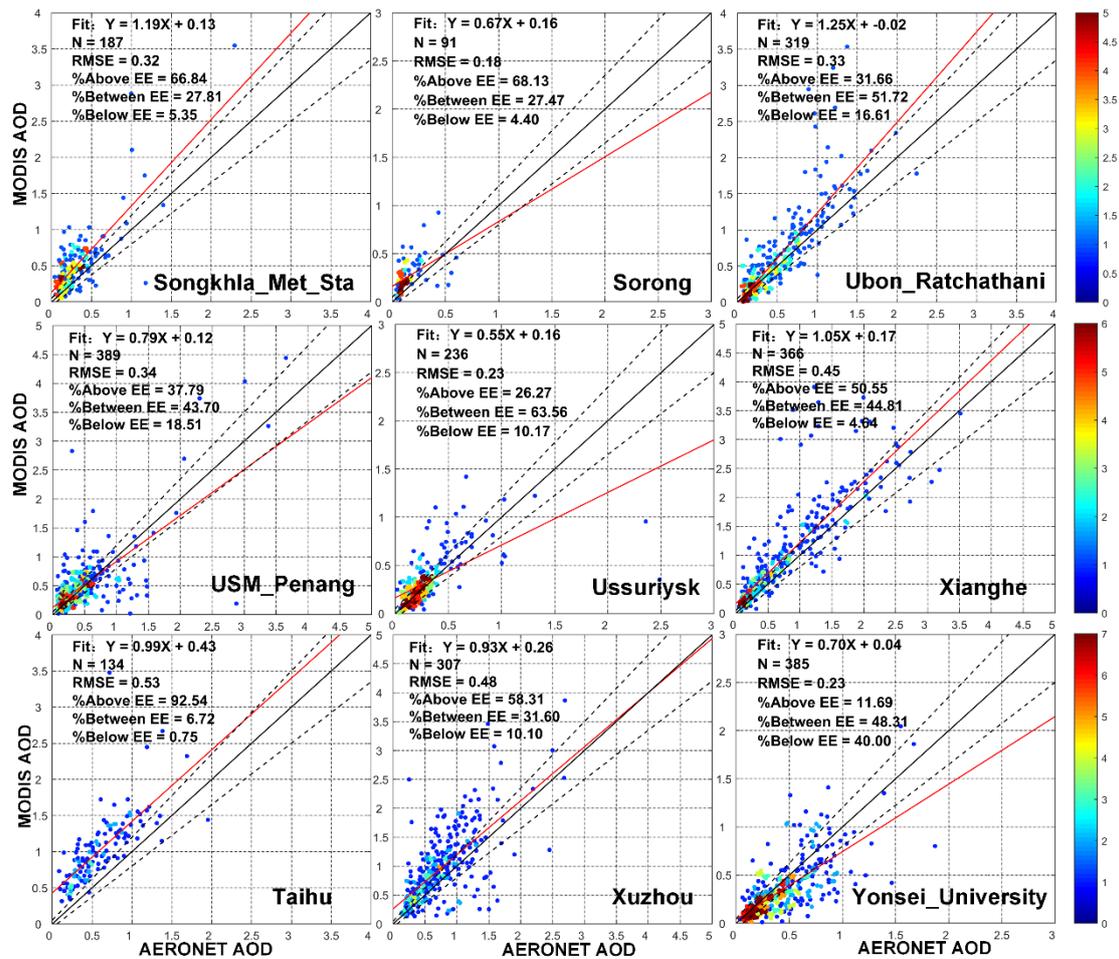
**Fig. S6.** Same as Fig. S2 but for other 8 AERONET sites in Asia.
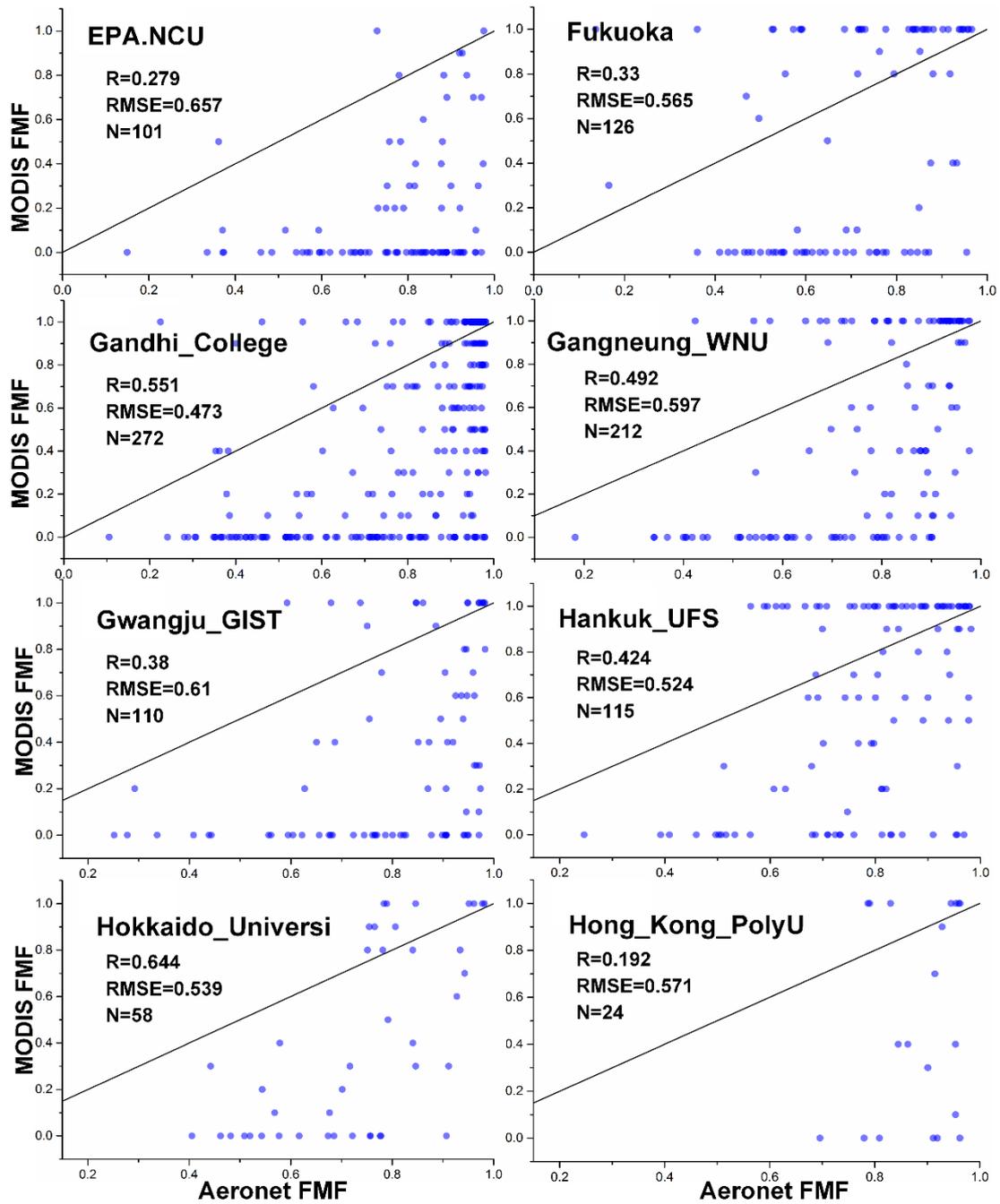
Fig. S7. Validation of the MODIS FMF for 8 AERONET sites in Asia. The black solid lines are the 1:1 lines.
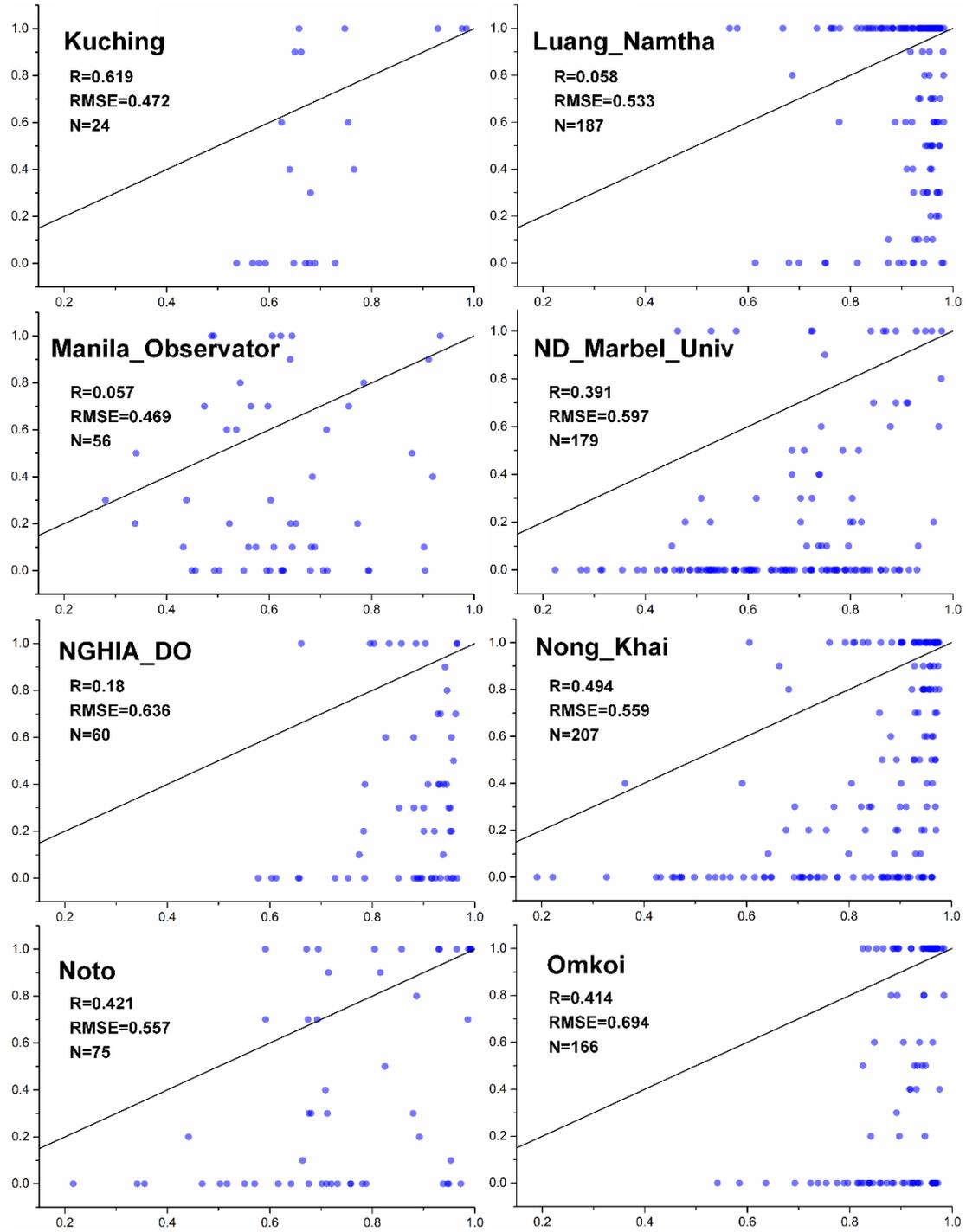
**Fig. S8.** Same as Fig. S7 but for other 8 AERONET sites in Asia.
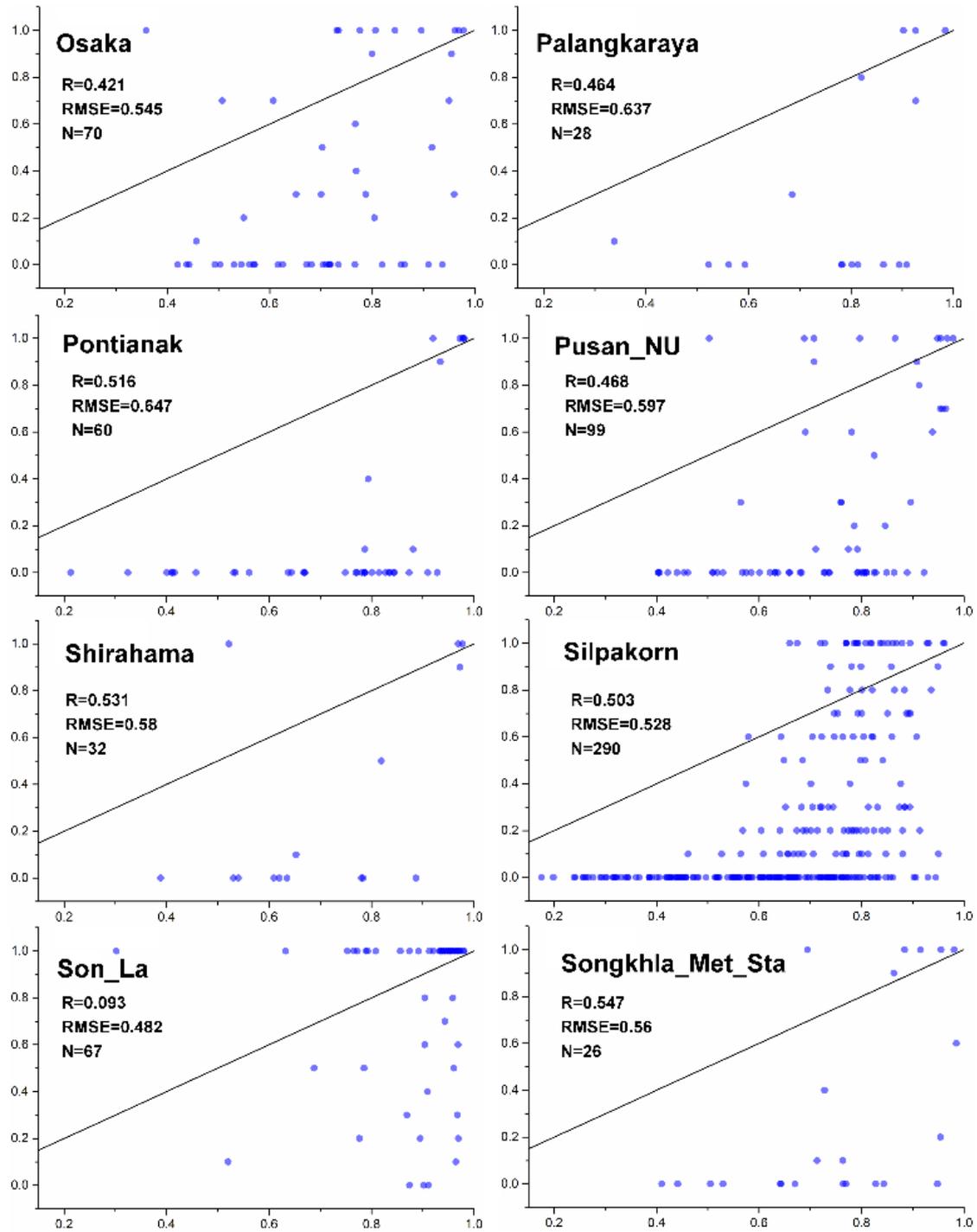
**Fig. S9.** Same as Fig. S7 but for other 8 AERONET sites in Asia.
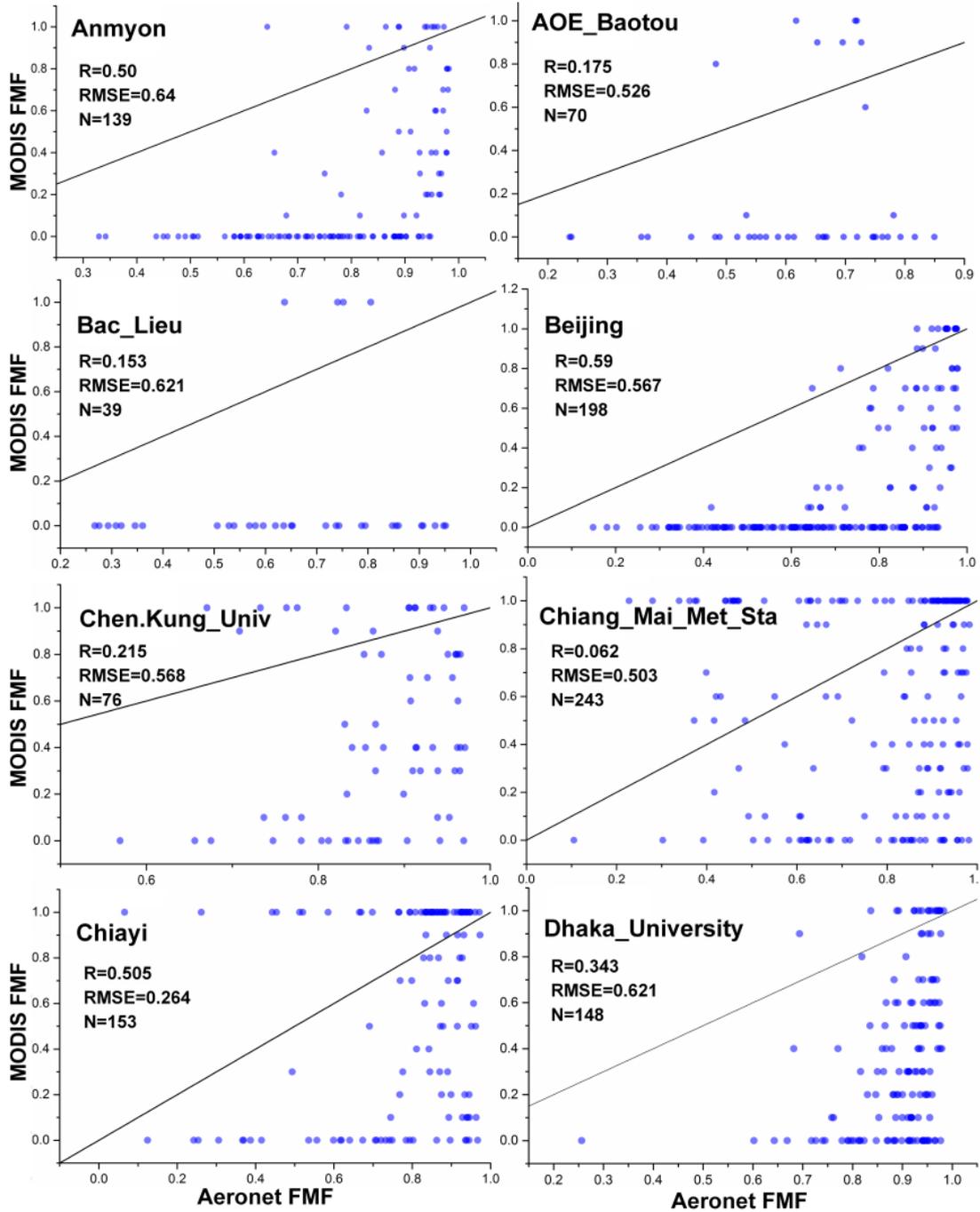
Fig. S10. Same as Fig. S7 but for other 8 AERONET sites in Asia.