



Supplement of

Observations of the macrophysical properties of cumulus cloud fields over the tropical western Pacific and their connection to meteorological variables

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Table S1: Cloud mask thresholds on the digital numbers (DNs) for ASTER L1T scenes.

ASTER file	Thresholds
AST L1T 00308022019031333 20190803141911 14051	26
AST L1T 00308022019031342 20190803141600 9757	26
AST L1T 00308112019030349 20190812105135 28843	32
AST L1T 00308112019030357 20190812104954 23382	34
AST L1T 00308112019030406 20190812105004 23706	34
AST L1T 00308112019030610 20190812105215 31501	31
AST L1T 00308112019030619 20190812140508 25723	31
AST L1T 00308112019030628 20190812140438 25011	28
AST L1T 00308112019030637 20190812140448 25276	28
AST L1T 00308122019020838 20190813144916 10612	26
AST L1T 00308122019021024 20190813144316 1211	18
AST L1T 00308122019021033 20190813144326 1313	18
AST L1T 00308122019021236 20190813143955 28514	14
AST L1T 00308122019021245 20190813144026 29126	14
AST L1T 00308122019021254 20190813144107 30191	14
AST L1T 00308122019021303 20190813144055 29900	13
AST L1T 00308122019021312 20190813144035 29334	15
AST L1T 00308122019021321 20190813143858 26750	13
AST L1T 00308122019021330 20190813144005 28815	12
AST L1T 00308122019021338 20190813144246 429	11
AST L1T 00308132019025228 20190814180250 22041	33
AST L1T 00308132019025313 20190814180400 23562	34
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AST L1T 00308132019025339 20190814180130 19897	31
AST L1T 00308132019025348 20190814180040 19019	32
AST L1T 00308132019025357 20190814180050 19143	31
AST L1T 00308132019025406 20190814175940 17219	32
AST L1T 00308132019025415 20190814175920 16589	32
AST L1T 00308132019025423 20190814180140 19989	32
AST L1T 00308132019025432 20190814175950 17450	32
AST L1T 00308172019023134 20190818134456 19678	16
AST L1T 00308202019030015 20190821155036 29366	31
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AST L1T 00308202019030041 20190821154846 22696	31
AST L1T 00308202019030050 20190821155146 1590	33
AST L1T 00308212019020752 20190822141412 5251	22
AST L1T 00308222019024819 20190823133642 1034	19

AST L1T 00308272019030344 20190828175532 6328	20
AST L1T 00308272019030353 20190828175322 31437	18
AST L1T 00308272019030504 20190828171148 6847	16
AST L1T 00308282019020833 20190829143226 23340	23
AST L1T 00308282019021258 20190829114004 875	17
AST L1T 00308282019021307 20190829142706 15382	18
AST L1T 00308302019020045 20190831144610 18880	17
AST L1T 00308302019020054 20190831144510 17404	17
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AST L1T 00309012019014313 20190902143906 21600	21
AST L1T 00309012019014322 20190902111738 24363	22
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AST L1T 00309302019025448 20191001113628 387	14
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AST L1T 00310022019023938 20191004192951 3288	12
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AST L1T 00310032019014317 20191006205647 9353	13
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AST L1T 00310032019014428 20191006205927 13434	13
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AST L1T 00310032019014512 20191006205957 14222	9
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AST L1T 00310032019014556 20191006210017 14502	17
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AST L1T 00310032019014658 20191006205116 1886	13
AST L1T 00310032019014707 20191006205126 2020	14
AST L1T 00310032019014716 20191006210057 15184	13
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AST L1T_00310222019021307_20191023170118_13156	13
AST L1T_00310222019021316_20191023170128_13212	13
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AST L1T_00310252019024640_20191029052554_11316	20
AST L1T_00310252019024658_20191029055125_583	22
AST L1T_00310252019024707_20191029065622_1217	24
AST L1T_00310252019024716_20191029065632_1452	22
AST L1T_00310252019024724_20191029065642_1874	23
AST L1T_00310252019024751_20191029065232_19089	28
AST L1T_00310252019024800_20191029065312_21734	29
AST L1T_00310252019024809_20191029055135_1005	31

Table S2: Pooled standard deviation and median coefficient of variation of the scene averaged meteorological variables.

Meteorological Variable	Level	Pooled Standard Deviation	Median Coefficient of Variation
u-wind component	1000 hPa	0.512	-0.003
u-wind component	975 hPa	0.539	0.013
u-wind component	950 hPa	0.565	-0.018
u-wind component	925 hPa	0.609	-0.025
u-wind component	900 hPa	0.622	-0.020
u-wind component	875 hPa	0.546	-0.014
u-wind component	850 hPa	0.503	-0.001
u-wind component	600 hPa	0.388	-0.041
v-wind component	1000 hPa	0.509	0.022
v-wind component	975 hPa	0.527	0.026
v-wind component	950 hPa	0.502	0.026
v-wind component	925 hPa	0.480	0.028
v-wind component	900 hPa	0.451	0.037
v-wind component	875 hPa	0.429	0.042
v-wind component	850 hPa	0.391	0.045
v-wind component	600 hPa	0.393	-0.042
Vertical velocity	1000 hPa	0.020	-0.579
Vertical velocity	975 hPa	0.032	-0.371
Vertical velocity	950 hPa	0.042	0.272
Vertical velocity	925 hPa	0.048	0.282
Vertical velocity	900 hPa	0.049	0.311
Vertical velocity	875 hPa	0.049	0.159

Vertical velocity	850 hPa	0.047	0.164
Relative humidity	1000 hPa	1.552	0.013
Relative humidity	975 hPa	1.737	0.013
Relative humidity	950 hPa	3.013	0.018
Relative humidity	925 hPa	4.330	0.038
Relative humidity	900 hPa	4.190	0.036
Relative humidity	875 hPa	3.565	0.034
Relative humidity	850 hPa	3.588	0.034
Sea surface temperature (SST)		0.121	0.000
Total column water vapor (TCWV)		1.138	0.016
Wind speed	10 m	0.504	0.060
Wind speed	1000 hPa	0.585	0.064
Wind speed	975 hPa	0.619	0.067
Wind speed	950 hPa	0.635	0.066
Wind speed	925 hPa	0.671	0.065
Wind speed	900 hPa	0.647	0.064
Wind speed	875 hPa	0.554	0.062
Wind speed	850 hPa	0.501	0.058
Wind speed	600 hPa	0.386	0.057
Wind direction	10 m	11.668	0.025
Wind direction	1000 hPa	11.701	0.024
Wind direction	975 hPa	11.917	0.024
Wind direction	950 hPa	17.310	0.023
Wind direction	925 hPa	12.770	0.025
Wind direction	900 hPa	18.503	0.024
Wind direction	875 hPa	18.688	0.023
Wind direction	850 hPa	10.184	0.022
Wind direction	600 hPa	24.196	0.033
Lower tropospheric stability (LTS)	1000-700 hPa	0.193	0.011
Lower tropospheric stability (LTS)	1000-850 hPa	0.198	-0.017
Lower tropospheric stability (LTS)	1000-875 hPa	0.213	0.038
Lower tropospheric stability (LTS)	1000-900 hPa	0.236	0.056
Lower tropospheric stability (LTS)	1000-925 hPa	0.257	0.114
Lower tropospheric stability (LTS)	1000-950 hPa	0.193	0.379
Lower tropospheric stability (LTS)	1000-975 hPa	0.041	-0.586
Estimated inversion strength (EIS)	1000-700 hPa	0.204	-0.092
Equivalent potential temperature	1000 hPa	0.709	0.001
Equivalent potential temperature	975 hPa	0.708	0.001
Equivalent potential temperature	950 hPa	0.721	0.001
Equivalent potential temperature	925 hPa	0.787	0.002

Equivalent potential temperature	900 hPa	0.668	0.001
Equivalent potential temperature	875 hPa	0.523	0.001
Equivalent potential temperature	850 hPa	0.466	0.001

Table S3: Statistics of the meteorological variables among all scenes used for multiple linear regression analysis.

Cloud Macrophysical Property	Mean	Standard Deviation	Median	25th Percentile	75th Percentile
Line-Fit	2.346	0.225	2.320	2.214	2.492
Direct Power-Law Fit	2.124	0.169	2.103	2.007	2.212
Fractal Dimension	1.246	0.035	1.245	1.232	1.266
Mean Cloud Top Height	967.181	245.645	941.414	815.095	1115.253
Cloud Fraction	0.115	0.091	0.092	0.057	0.155

Table S4: Statistics of the cloud macrophysical properties among all scenes used for multiple linear regression analysis.

Meteorological Variable	Level	Mean	Standard Deviation	Median	25th Percentile	75th Percentile
u-wind component	1000 hPa	-0.308	5.215	-0.004	-3.737	3.020
u-wind component	975 hPa	-0.224	5.648	0.022	-3.821	3.113
u-wind component	950 hPa	-0.034	6.252	-0.211	-3.838	2.907
u-wind component	925 hPa	0.247	6.720	-0.411	-3.601	3.265
u-wind component	900 hPa	0.375	6.880	-0.172	-3.823	4.168
u-wind component	875 hPa	0.500	6.777	-0.227	-4.055	4.029
u-wind component	850 hPa	0.646	6.659	-0.043	-4.348	4.845
u-wind component	600 hPa	-1.381	5.007	-2.336	-4.866	1.306
v-wind component	1000 hPa	1.709	4.883	1.016	-1.440	6.145
v-wind component	975 hPa	1.858	5.163	1.016	-1.490	6.604
v-wind component	950 hPa	2.015	5.236	1.146	-1.475	6.832
v-wind component	925 hPa	1.962	4.847	1.280	-1.336	5.955
v-wind component	900 hPa	1.745	4.400	1.370	-1.396	5.616
v-wind component	875 hPa	1.476	3.918	1.248	-1.260	4.423
v-wind component	850 hPa	1.197	3.461	1.124	-0.935	3.703
v-wind component	600 hPa	0.006	3.353	-0.297	-1.894	1.208
Vertical velocity	1000 hPa	-0.010	0.015	-0.010	-0.018	-0.001
Vertical velocity	975 hPa	-0.002	0.033	-0.001	-0.024	0.016
Vertical velocity	950 hPa	0.005	0.051	0.007	-0.028	0.032
Vertical velocity	925 hPa	0.009	0.062	0.006	-0.031	0.052
Vertical velocity	900 hPa	0.008	0.067	0.010	-0.035	0.053

Vertical velocity	875 hPa	0.006	0.072	0.004	-0.043	0.055
Vertical velocity	850 hPa	0.006	0.076	0.003	-0.048	0.064
Relative humidity	1000 hPa	77.994	3.974	78.127	75.979	80.209
Relative humidity	975 hPa	85.767	4.220	85.979	83.628	88.366
Relative humidity	950 hPa	87.330	5.229	88.388	85.321	90.645
Relative humidity	925 hPa	78.270	9.295	79.850	73.407	86.087
Relative humidity	900 hPa	72.230	10.356	74.443	66.046	79.749
Relative humidity	875 hPa	69.238	11.714	71.990	63.723	78.051
Relative humidity	850 hPa	67.078	12.670	69.589	61.642	76.441
Sea surface temperature (SST)		302.053	0.811	302.186	301.687	302.572
Total column water vapor (TCWV)		45.362	6.877	46.261	41.860	50.358
Wind speed	10 m	5.758	3.049	5.748	3.008	8.268
Wind speed	1000 hPa	6.411	3.594	6.315	3.153	9.202
Wind speed	975 hPa	6.801	3.967	6.535	3.205	10.051
Wind speed	950 hPa	7.145	4.405	6.811	3.103	11.012
Wind speed	925 hPa	7.178	4.573	6.754	3.413	10.953
Wind speed	900 hPa	7.037	4.500	6.711	3.324	9.796
Wind speed	875 hPa	6.733	4.278	6.582	3.049	9.770
Wind speed	850 hPa	6.497	3.983	5.768	3.301	9.067
Wind speed	600 hPa	5.440	2.935	4.683	3.204	7.187
Wind direction	10 m	160.086	83.233	178.961	69.362	224.789
Wind direction	1000 hPa	160.141	83.149	179.210	69.456	224.459
Wind direction	975 hPa	160.087	82.987	179.865	69.603	224.862
Wind direction	950 hPa	159.547	81.535	172.946	71.410	226.405
Wind direction	925 hPa	158.675	81.945	170.572	76.025	231.309
Wind direction	900 hPa	161.615	81.366	176.881	80.344	234.184
Wind direction	875 hPa	162.954	81.712	171.580	80.021	238.564
Wind direction	850 hPa	166.249	84.611	176.105	80.659	245.307
Wind direction	600 hPa	145.683	92.380	103.396	78.216	237.452
Wind shear	1000-975 hPa	0.406	0.487	0.228	0.078	0.611
Wind shear	1000-950 hPa	1.023	1.091	0.616	0.254	1.302
Wind shear	1000-925 hPa	1.786	1.631	1.215	0.682	2.322
Wind shear	1000-900 hPa	2.420	1.935	1.797	1.043	3.097
Wind shear	1000-875 hPa	2.910	2.175	2.376	1.213	4.093
Wind shear	1000-850 hPa	3.372	2.485	2.621	1.434	5.452
Wind shear	950-925 hPa	1.053	0.785	0.886	0.453	1.435
Wind shear	950-900 hPa	1.880	1.353	1.495	0.799	2.887
Wind shear	950-875 hPa	2.555	1.889	1.965	0.989	3.906
Wind shear	950-850 hPa	3.210	2.372	2.567	1.257	4.753
Wind shear	850-600 hPa	5.371	3.547	4.957	2.523	7.200

Lower tropospheric stability (LTS)	1000-700 hPa	13.876	1.029	13.839	13.060	14.489
Lower tropospheric stability (LTS)	1000-850 hPa	-8.456	0.713	-8.512	-8.906	-8.158
Lower tropospheric stability (LTS)	1000-875 hPa	4.226	0.696	4.138	3.788	4.599
Lower tropospheric stability (LTS)	1000-900 hPa	3.034	0.654	2.934	2.618	3.429
Lower tropospheric stability (LTS)	1000-925 hPa	1.697	0.613	1.723	1.316	2.122
Lower tropospheric stability (LTS)	1000-950 hPa	0.430	0.400	0.355	0.082	0.641
Lower tropospheric stability (LTS)	1000-975 hPa	-0.003	0.039	-0.010	-0.021	0.001
Estimated inversion strength (EIS)	1000-700 hPa	-1.201	1.058	-1.250	-2.052	-0.578
Equivalent potential temperature	1000 hPa	352.621	5.045	353.115	349.639	355.706
Equivalent potential temperature	975 hPa	352.167	4.962	352.830	349.182	355.271
Equivalent potential temperature	950 hPa	349.378	4.553	350.306	347.020	352.250
Equivalent potential temperature	925 hPa	344.111	5.157	344.204	340.413	348.034
Equivalent potential temperature	900 hPa	341.117	5.943	341.940	338.019	345.423
Equivalent potential temperature	875 hPa	339.282	6.430	340.784	336.359	343.504
Equivalent potential temperature	850 hPa	337.881	6.686	339.519	334.777	342.079
Equivalent potential temperature difference	1000-975 hPa	0.454	0.266	0.379	0.285	0.555
Equivalent potential temperature difference	1000-950 hPa	3.243	2.707	2.445	1.131	4.562
Equivalent potential temperature difference	1000-925 hPa	8.510	4.189	7.805	5.136	11.024
Equivalent potential temperature difference	1000-900 hPa	11.504	4.305	11.266	8.117	14.434
Equivalent potential temperature difference	1000-875 hPa	13.339	4.625	12.513	9.895	16.352
Equivalent potential temperature difference	1000-850 hPa	14.740	4.827	13.932	11.129	17.949
Equivalent potential temperature difference	950-925 hPa	5.267	3.163	4.421	3.166	6.414
Equivalent potential temperature difference	950-900 hPa	8.261	3.793	7.482	5.560	10.166
Equivalent potential temperature difference	950-875 hPa	10.095	4.267	9.391	7.193	11.731
Equivalent potential temperature difference	950-850 hPa	11.497	4.625	10.797	8.377	13.885
Convective available potential energy (CAPE)	850 hPa	0.759	1.618	0.000	0.000	0.556
Convective inhibition (CIN)	850 hPa	-6.328	8.577	0.000	-12.745	0.000