Atmospheric
Measurement
Techniques

Supplement of

Partition between supercooled liquid droplets and ice crystals in mixed-phase clouds based on airborne in situ observations

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Table S1. Time stamps of precipitating segments identified in the NSF SOCRATES campaign that are excluded from this study.

| Research flight (RF)	Time stamps of precipitation segments removed
RF01	N/A
RF02	5:55 to 6:32 UTC
RF03	23:50 to 00:00 UTC, 00:00 to 00:05 UTC, 00:34 to 00:40 UTC, and 01:16 to 01:32 UTC
RF04	03:47 to 03:52 UTC
RF05	04:40 to 05:00 UTC
RF06	02:28 to 02:32 UTC
RF07	05:10 to 05:15 UTC
RF08	05:00 to 05:10 UTC
RF09	04:29 to 04:32 UTC
RF10	02:44 to 02:56 UTC, and 03:58 to 04:00 UTC
RF11	03:41 to 03:46 UTC
RF12	05:09 to 05:15 UTC
RF13	03:40 to 03:50 UTC, and 04:38 to 04:43 UTC
RF14	03:19 to 03:28 UTC, and 04:38 to 04:42 UTC
RF15	07:20 to 08:36 UTC

Table S2. Number of one-second samples of σ_w (i.e., standard deviation of vertical velocity) in four phases at various ranges. Percentages relative to the total number of σ_w samples of each phase are shown in parentheses.

Phase number	All σ_w values	$\sigma_w \geq 0.5$ m/s	$\sigma_w \geq 1$ m/s	$\sigma_w \geq 1.25$ m/s
Phase 1	4549	621 (13.7%)	15 (0.330%)	0
Phase 2	8730	1360 (15.6%)	174 (1.99%)	36 (0.41%)
Phase 3	8638	1491 (17.3%)	251 (2.91%)	57 (0.66%)
Phase 4	7814	176 (2.25%)	0	0

2
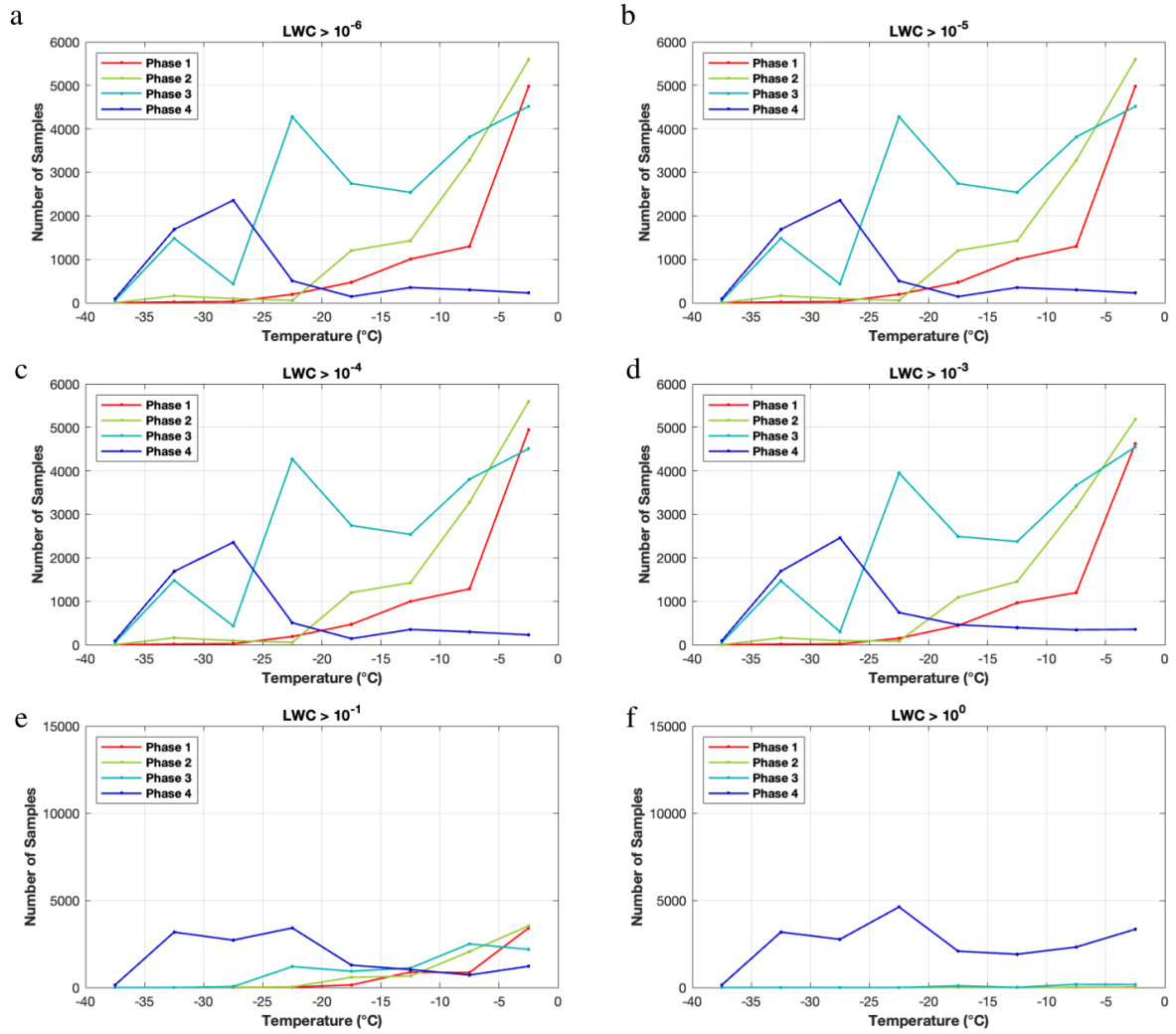
20 **Figure S1**. Similar to Figure 4 a, number of 1-Hz samples for four phases but using different liquid water content (LWC) values (unit: g m^{-3}) as the threshold for defining in-cloud conditions.
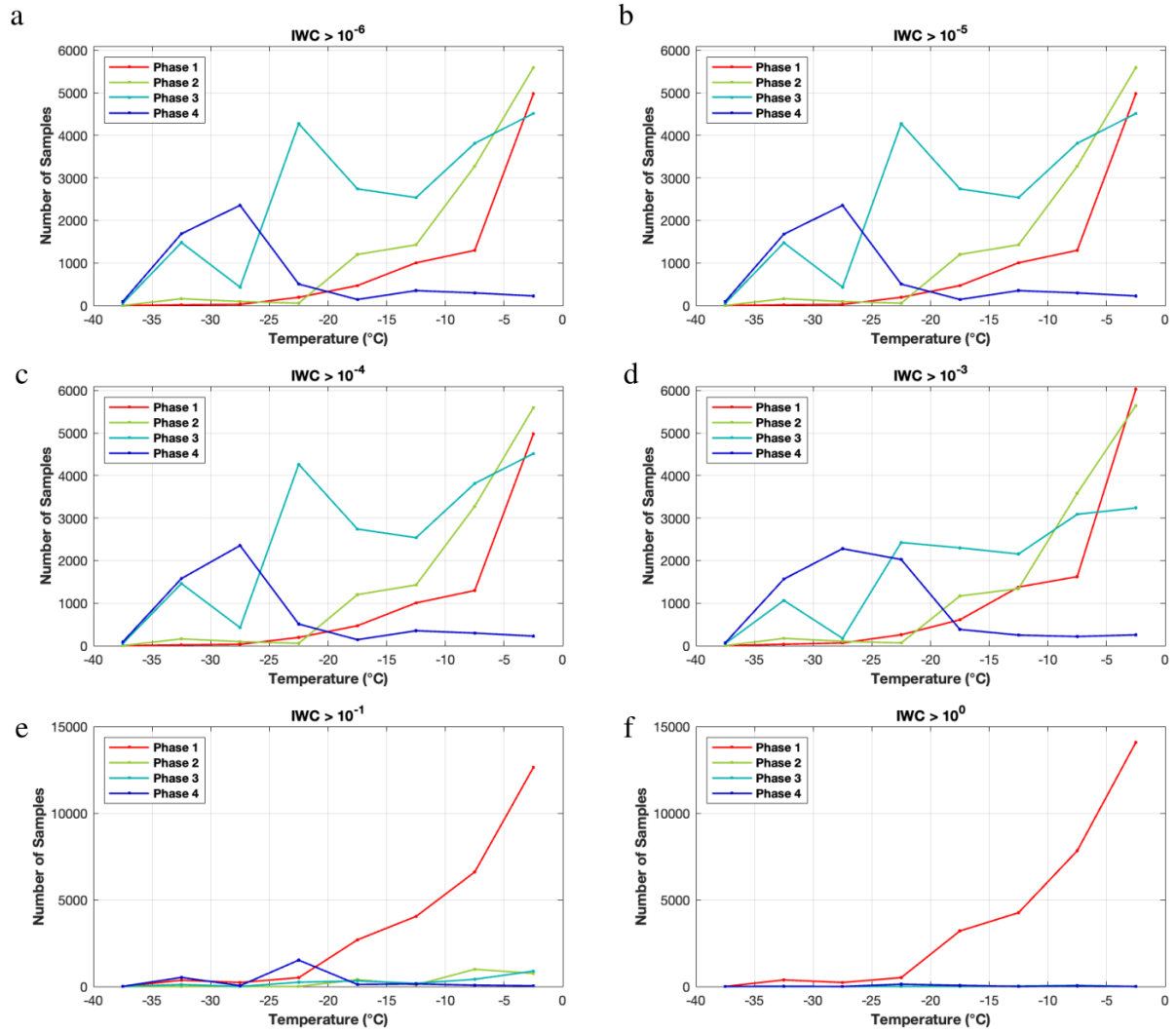
25 **Figure S2.** Similar to Figure 4 a, number of 1-Hz samples for four phases but using different ice water content (IWC) values (unit: g m^{-3}) as the threshold for defining in-cloud conditions.

4
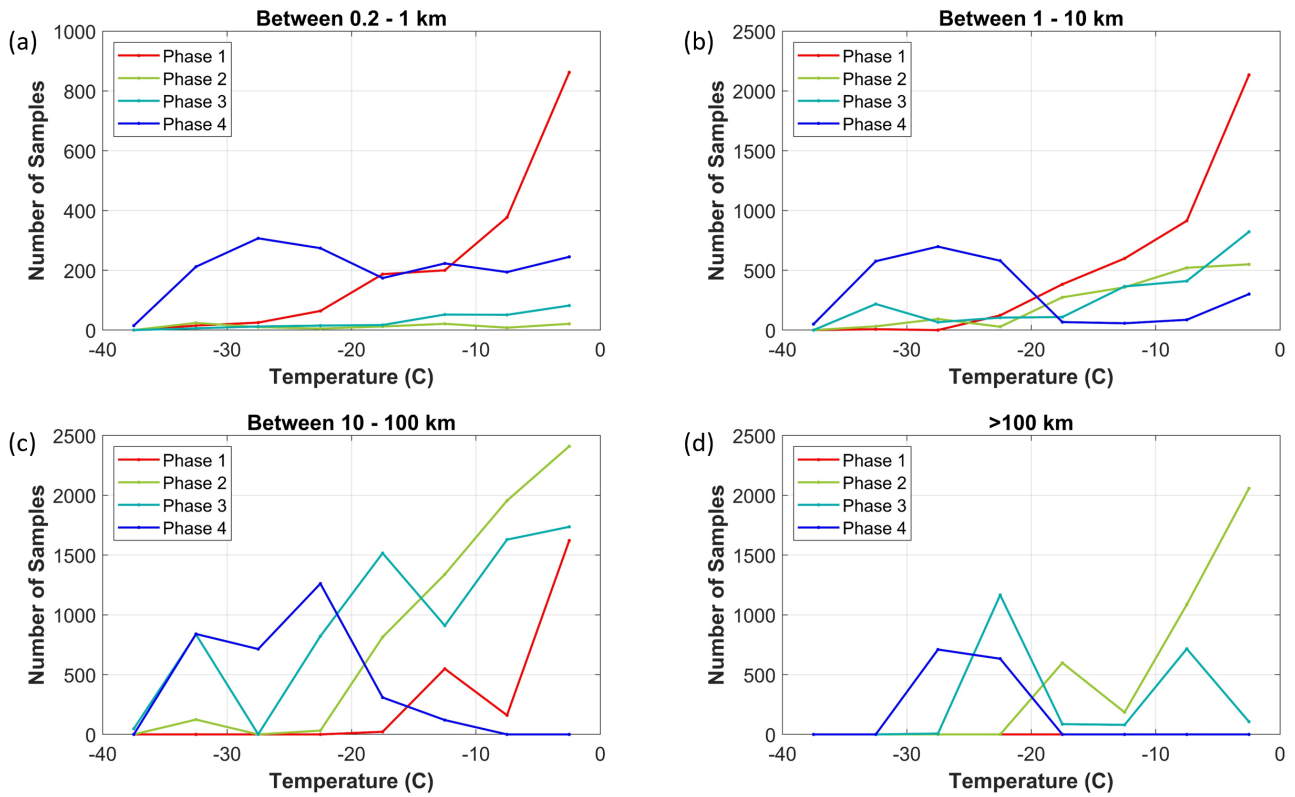
Figure S3. Similar to Figure 4 a, distributions of 1-Hz samples in four phases at various temperatures, but separated by the length scales of TCR samples. Each second within the TCR is counted as a sample.
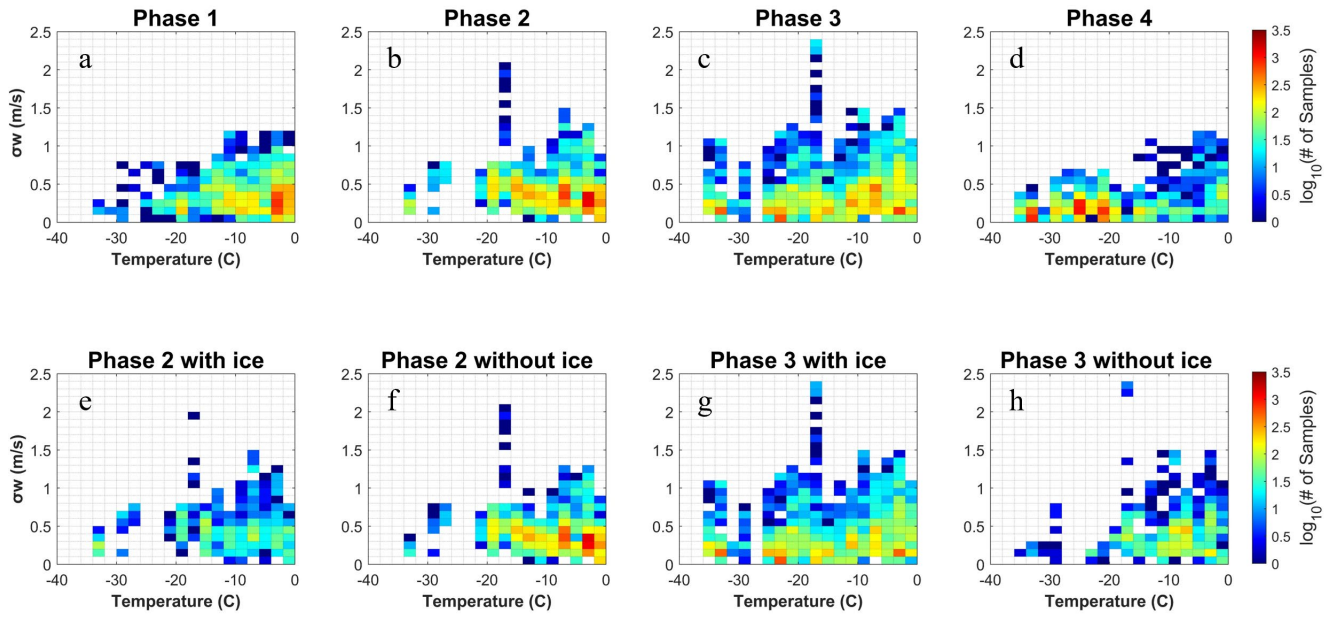
Figure S4. Similar to Figure 5 a – h, but for distributions of standard deviations of vertical velocity (σ_w) as a function of temperature in four phases. The bins are color coded by number of one-second samples in log10 scale.
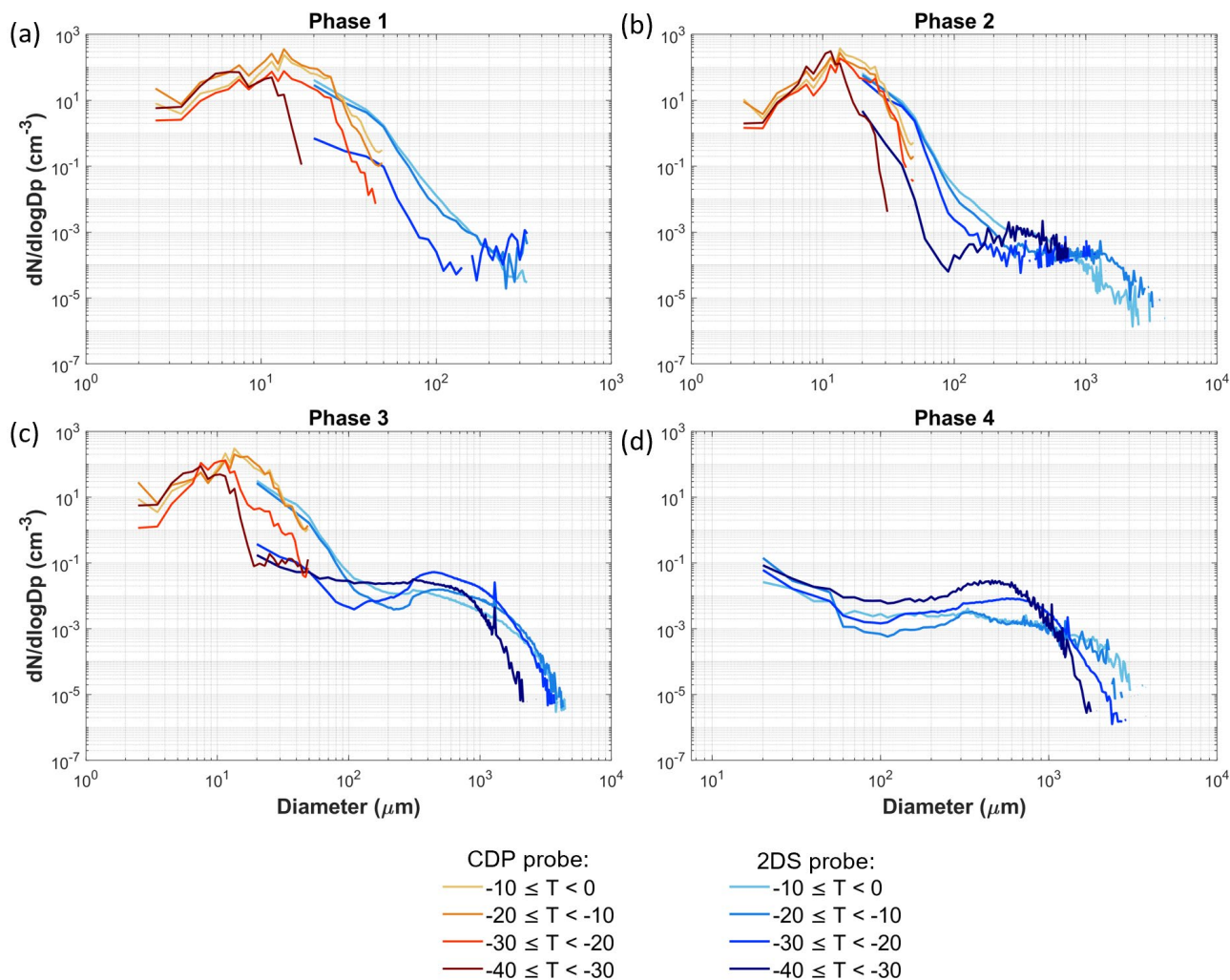
Figure S5. Particle size distribution separated by four phases and various temperature ranges. Four temperature bins between -40°C to 0°C are shown in each panel. Phase 4 only shows 2DS measurements because ice particles measured by CDP are excluded from the analysis.
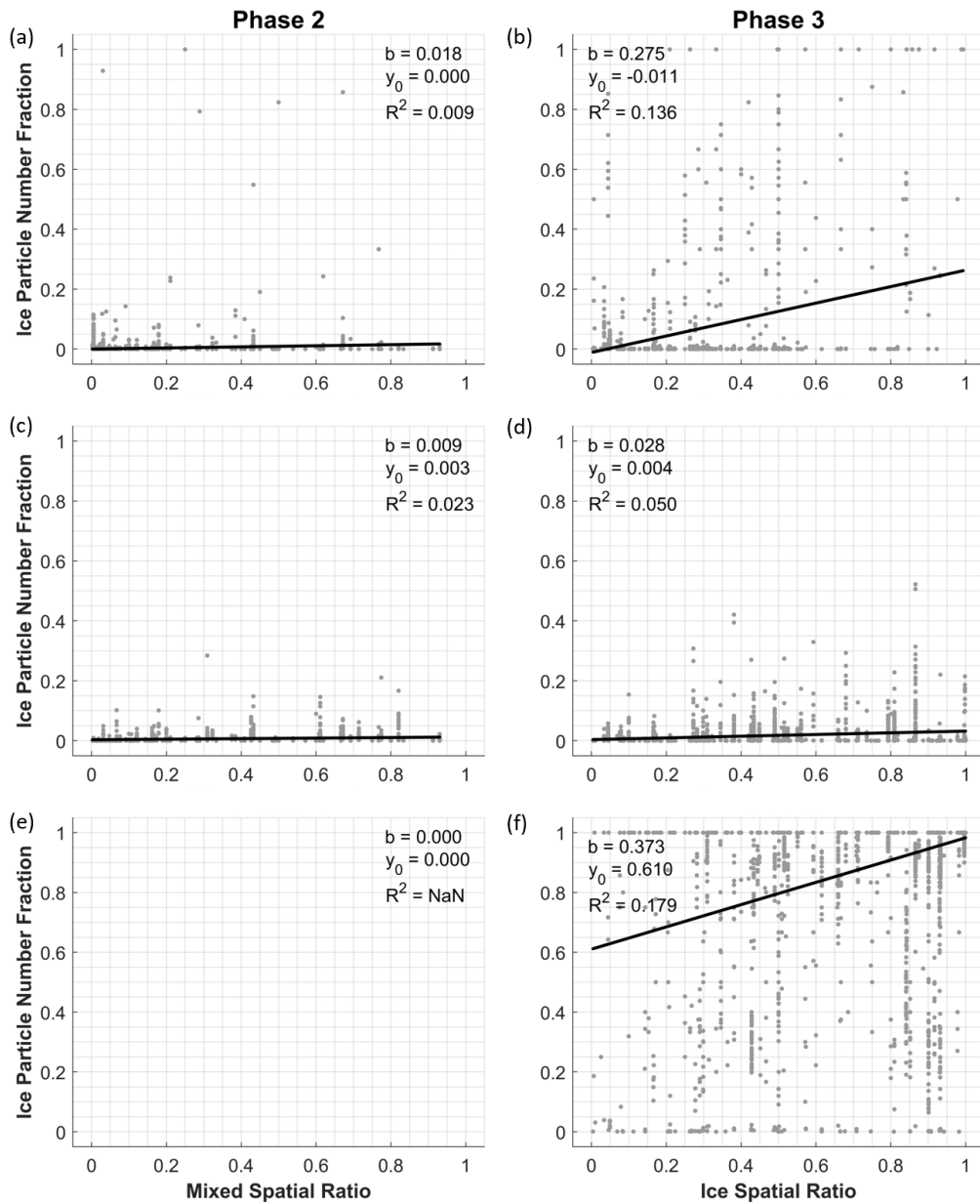
Figure S6. Similar to Figure 7, but applying the linear regressions directly to individual seconds of samples.
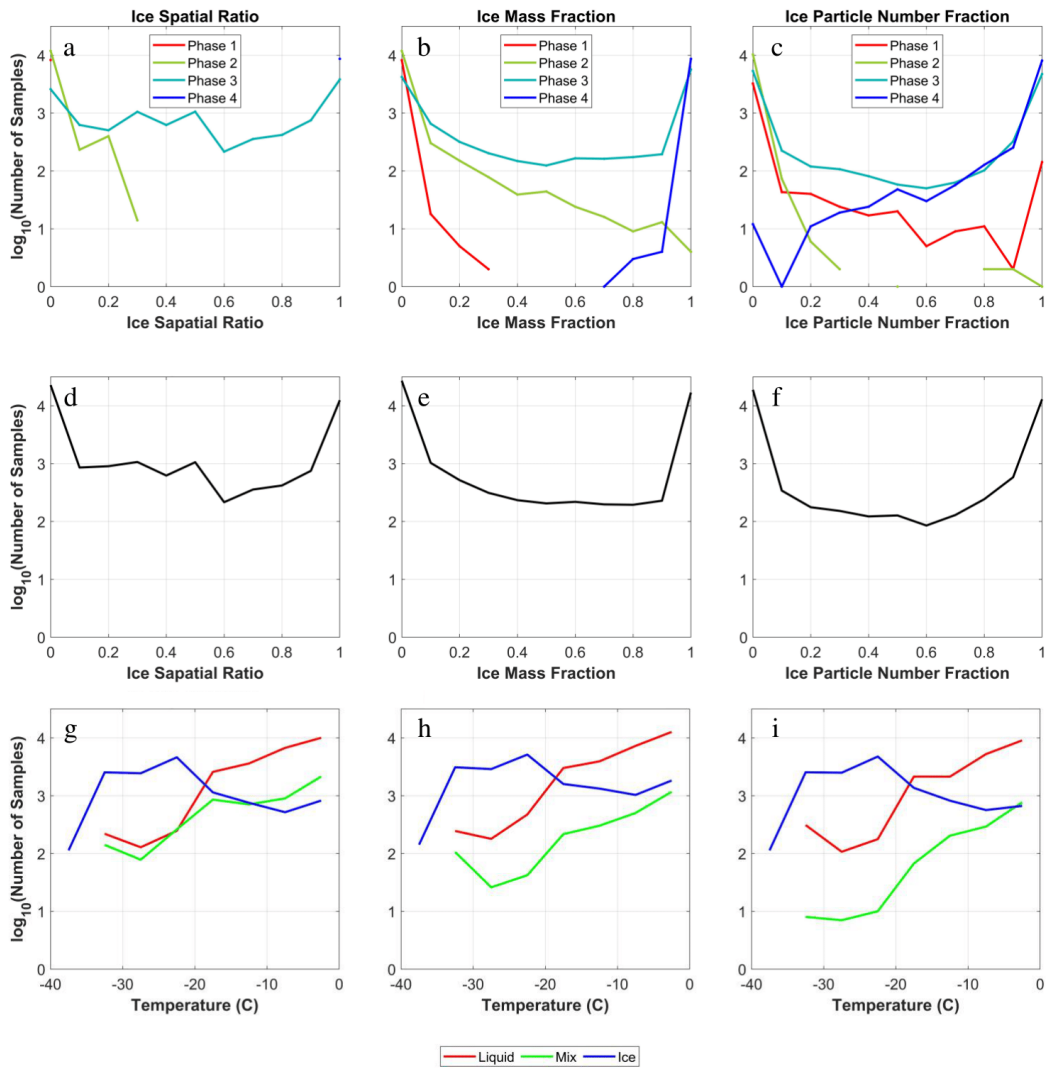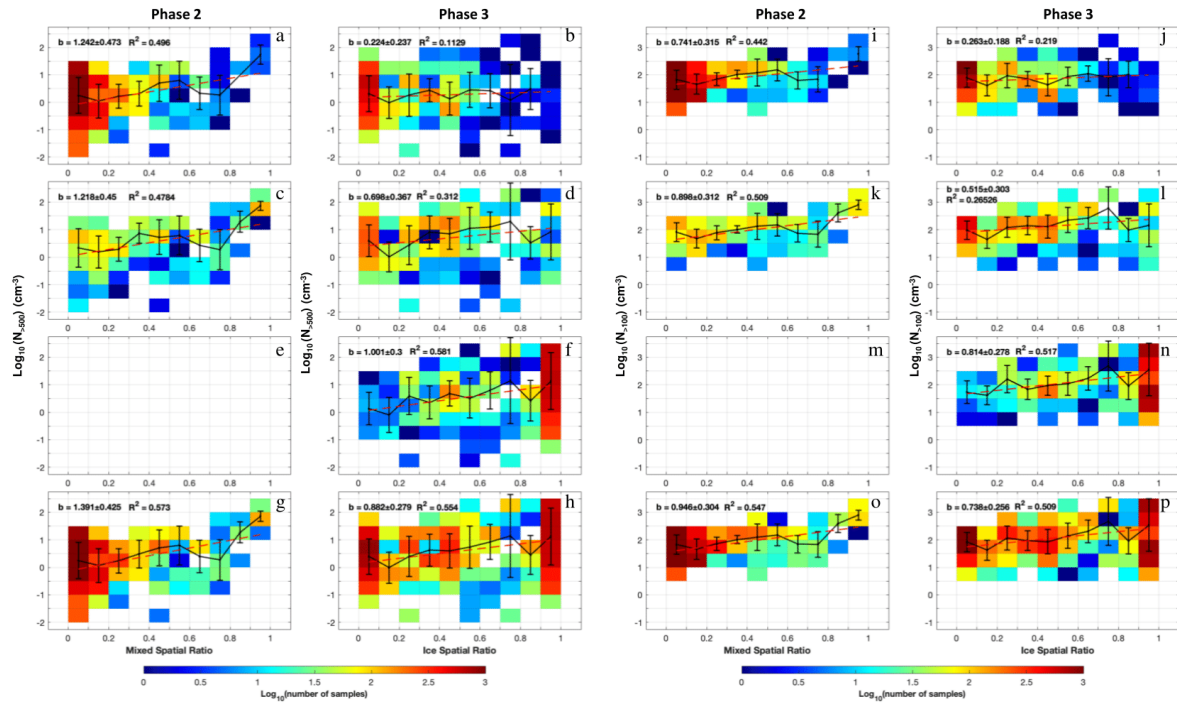
Figure S7. Number of samples for Figure 9 in the main manuscript.

Figure S8. Similar to Figure 10 in the main manuscript but using 100-second moving averages of logarithmic scales of $N_{>500}$ and $N_{>100}$ for the clear-sky conditions only. The results using the coarser scale of aerosol number concentrations are very similar to those shown in Figure 10.