



Supplement of

Microphysical view of the development and ice production of mid-latitude stratiform clouds with embedded convection during an extratropical cyclone

Yuanmou Du et al.

Correspondence to: Dantong Liu (dantongliu@zju.edu.cn)

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Supplement

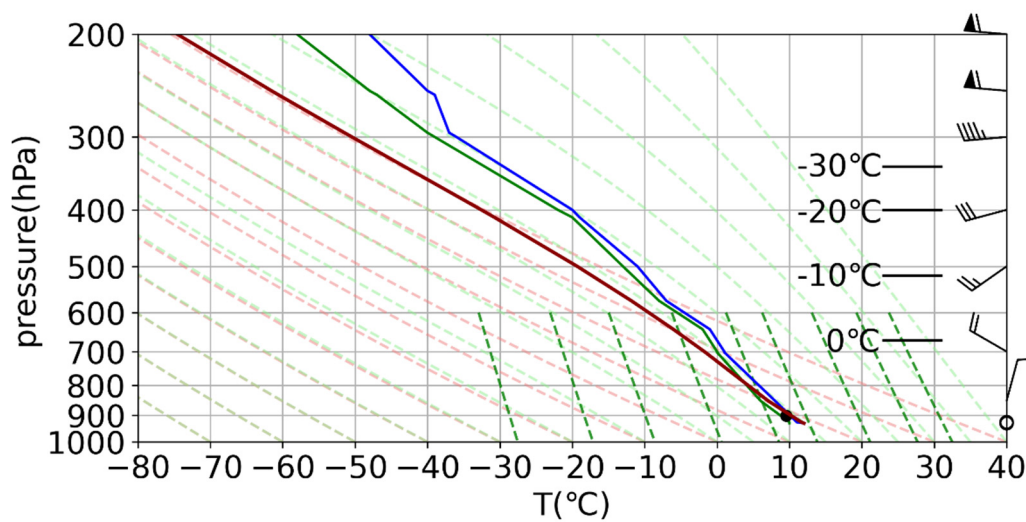


Figure S1: Radiosonde at 08:00 (BJT) on September 26th, 2017.

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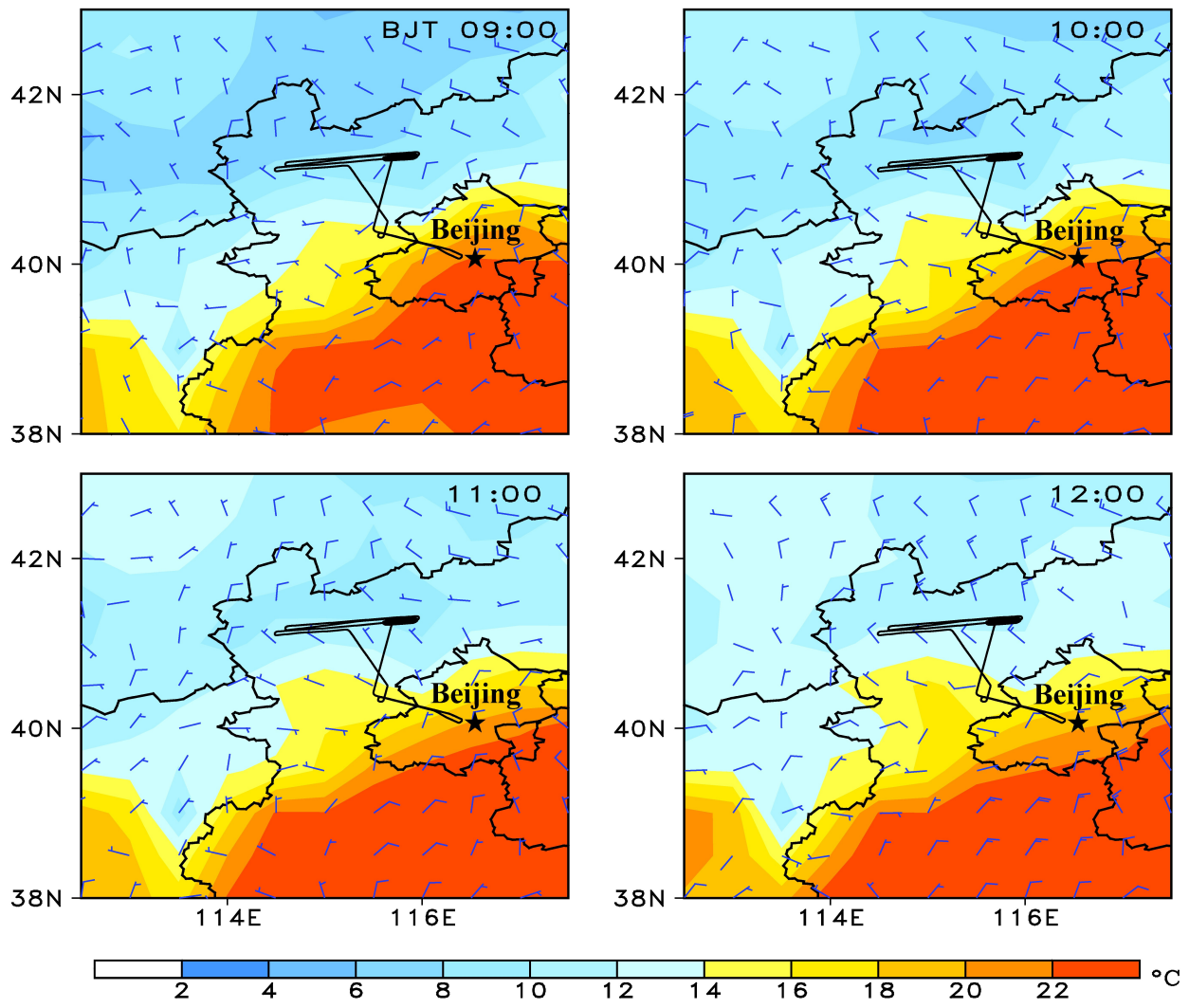
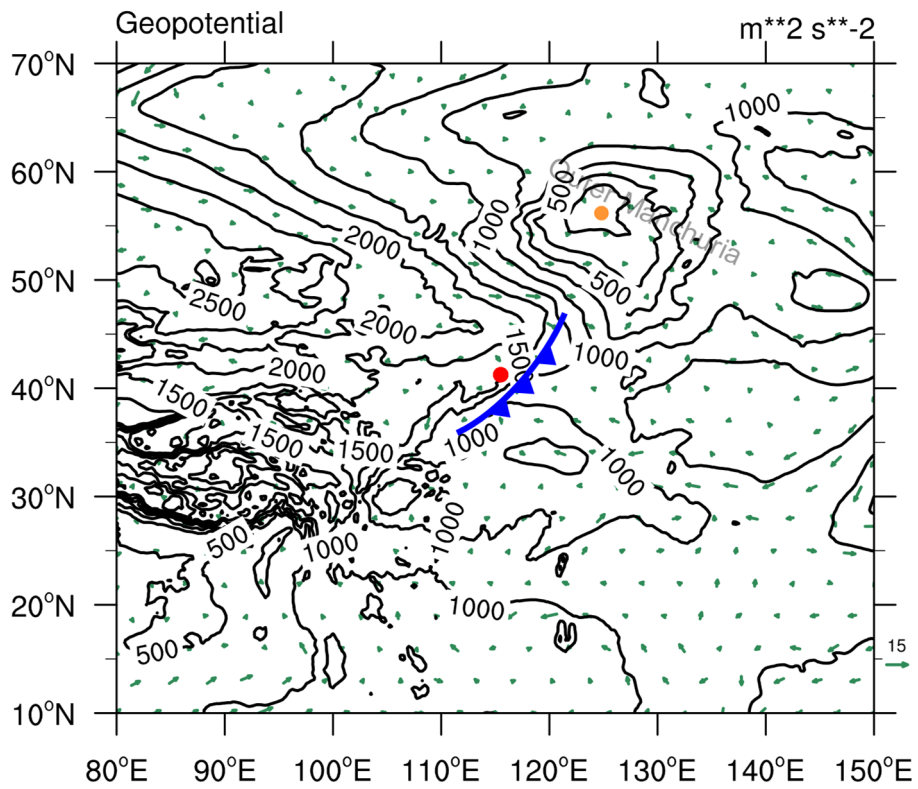


Figure S2: Flight tracks (black line) with the wind field (blue wind shaft) and temperature field (colour) observed by the ground weather observation station from 09:00–12:00 (BJT) on September 26th, 2017. The location of Beijing is indicated by the black five-pointed star.



35 **Figure S3: Geopotential height contour map at 1000 hPa at 09:00 (BJT) on September 26th, 2017. The experimental region and the centre of the extratropical cyclone are indicated by the red dot and yellow dot, respectively, and the surface cold front is indicated by the blue cold front symbol.**

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Table S1. Radar times in Fig. 3 and the corresponding flight time windows for the four stages (all in UTC+8 h).

Stages	Radar time	Flight time window	Targeting periods
Developing cells (P1)	10:06	10:03:35-10:23:55	1.1: 10:09:13-10:10:31
			1.2: 10:11:54-10:12:41
			2.1: 10:42:02-10:42:58
Mature cells (P2)	10:42	10:25:35-11:05:17	2.2: 10:45:47-10:46:25
			2.3: 10:48:38-10:49:33
Dissipating cells (P3)	11:30	11:13:01-11:45:20	\
Young cells (P4)	12:00	11:46:16-12:15:52	4.1: 11:47:16-11:47:35
			4.2: 11:51:02-11:51:05
			4.3: 11:56:30-11:56:50

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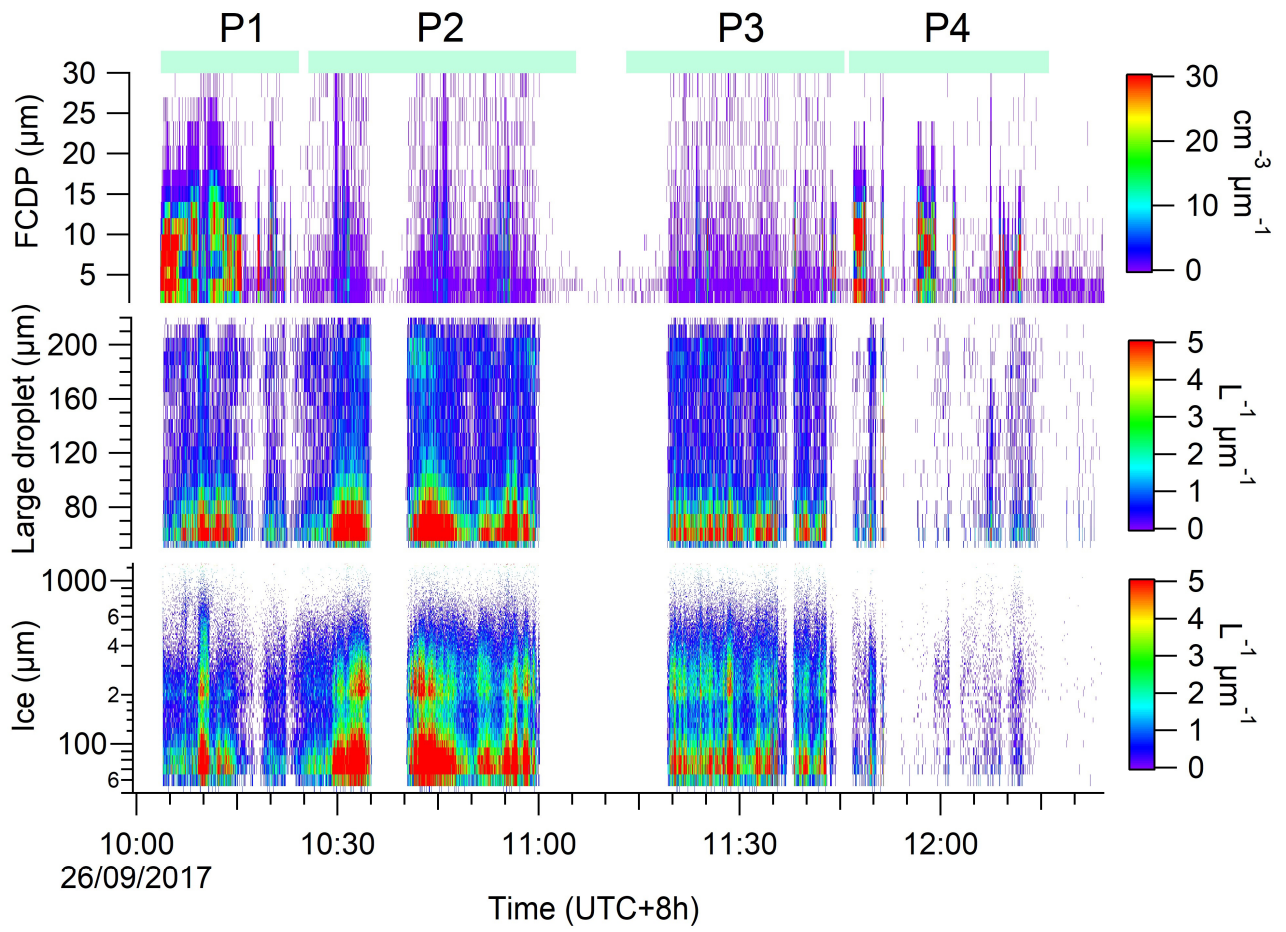
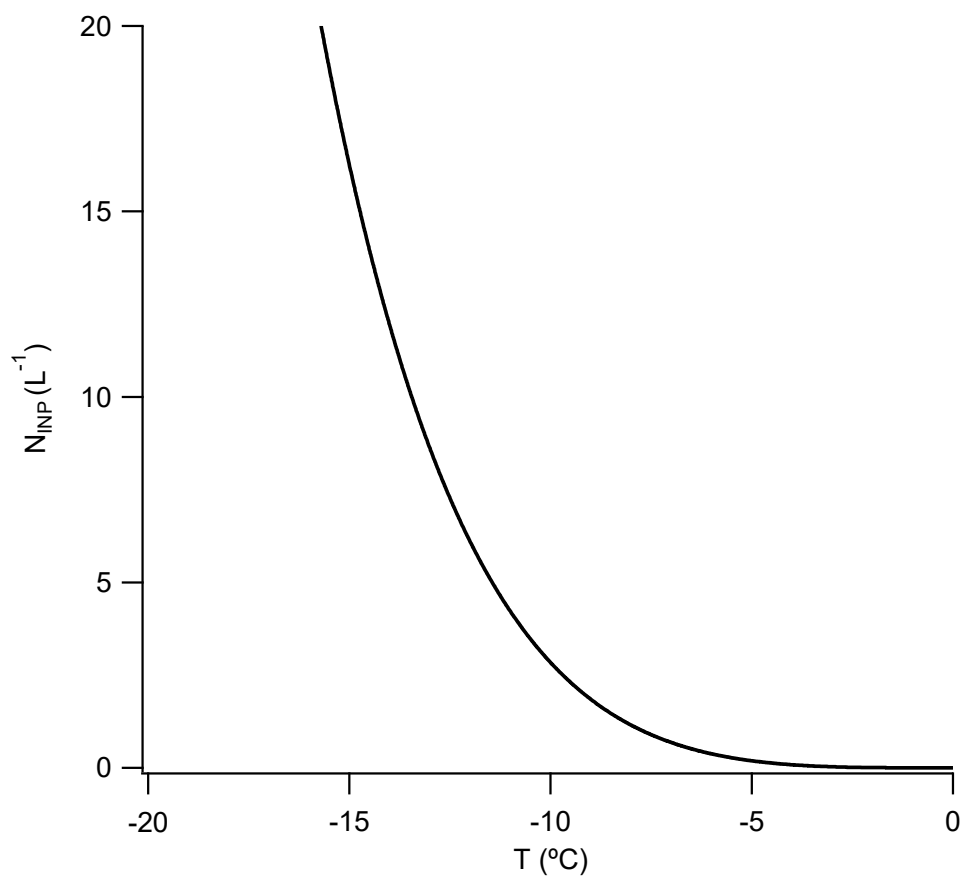


Figure S4: Particle size distribution spectra of the FCDP and 2D-S (ice and large droplet).

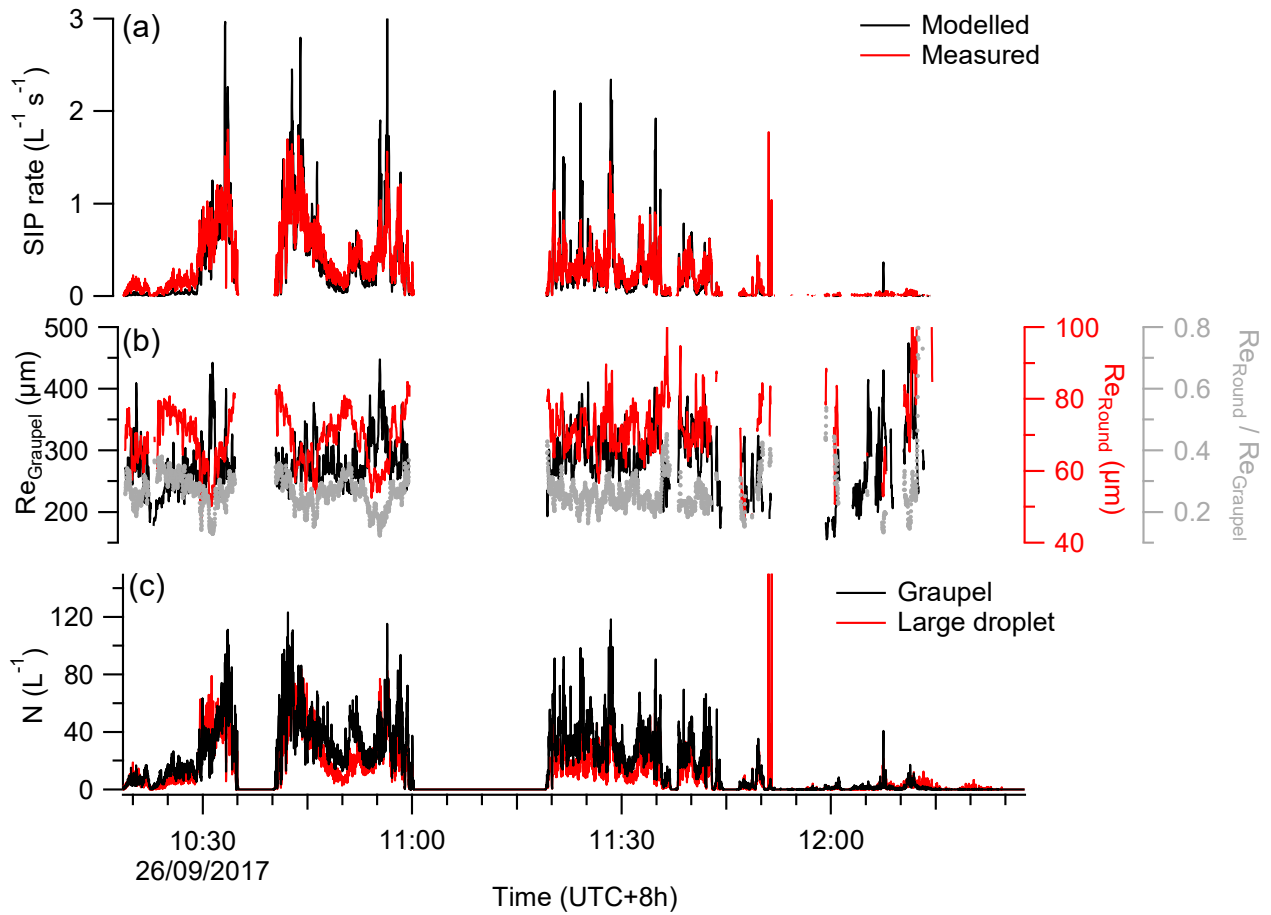
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80 **Figure S5: The number concentration of ice nucleating particles (N_{INP}) as a function of cloud temperature; the N_{INP} was multiplied by a factor of 10 to represent a likely upper limit on primary INP concentrations.**



85 **Figure S6: Time series of modelled and measured secondary ice production (SIP) rates. (a) The modelled and measured SIP rates, (b) effective radii of graupel ($Re_{Graupel}$) and large droplets (Re_{Round}) and the ratios between them ($Re_{Round}/Re_{Graupel}$) and (c) number concentrations (N) of graupel and large droplets.**

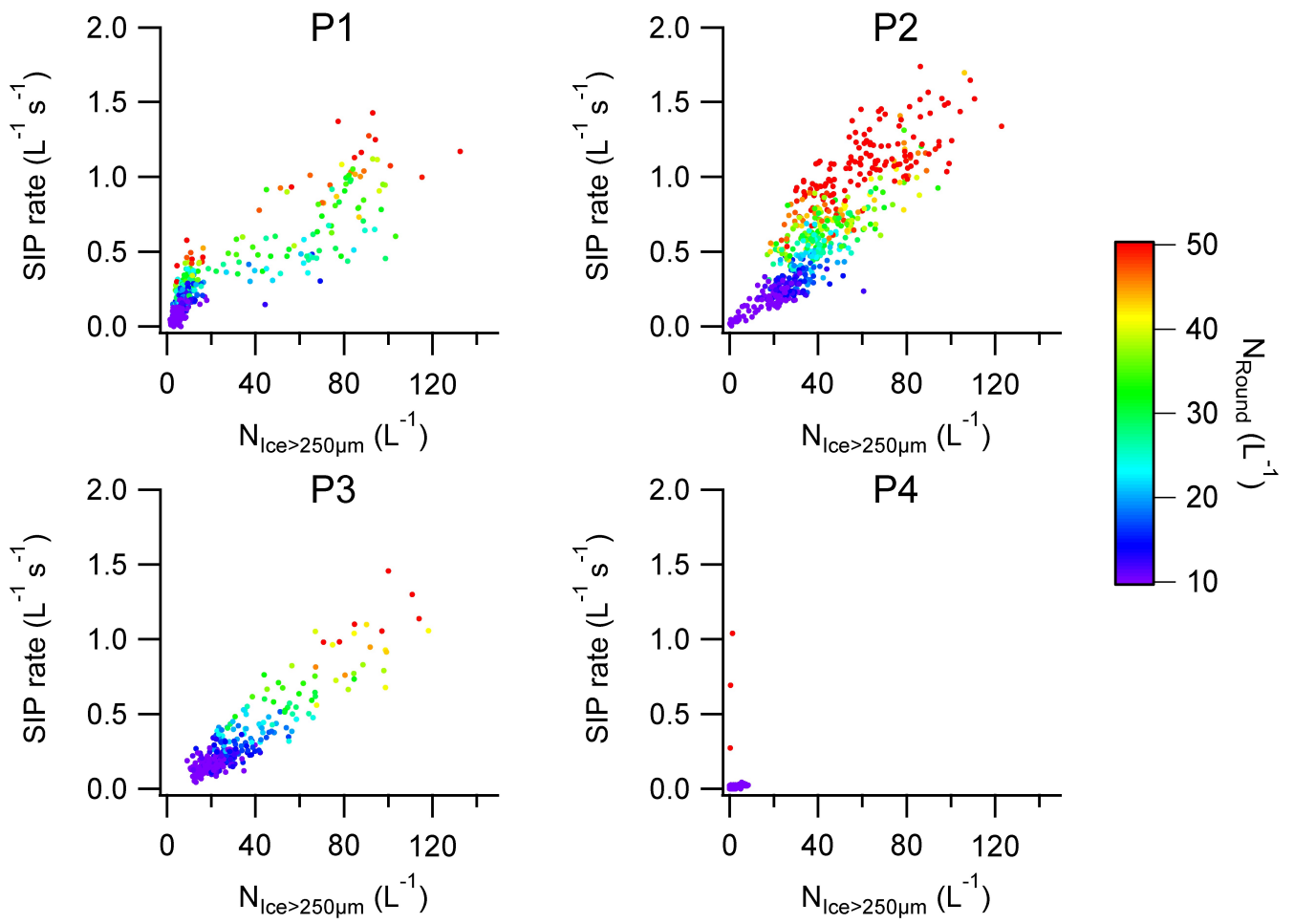


Figure S7: The number concentration of ice with a diameter $> 250 \mu\text{m}$ ($N_{\text{Ice}>250\mu\text{m}}$) as a function of the measured SIP rate at different stages, coloured by N_{Round} .