Supplementary Information: Vertical distribution of ice optical and microphysical properties in Arctic low-level mixed-phase clouds during ACLOUD

December 23, 2022

Table S1: Vertical cloud profiles included in the analysis of liquid water path (LWP) and ice water path (IWP) over different surfaces. For each profile the cloud top temperature (T), LWP, IWP and surface are given.

Date	Cloud Top T °C	LWP g m^{-2}	IWP g m^{-2}	surface
Cold Period				
27 May	-15.2	41.4	1.0	marginal sea ice
Warm Period				
2 June	-4.5	85.4	10.0	sea ice
4 June	-6.7	60.0	4.1	sea ice
5 June	-6.4	49.5	7.4	sea ice
8 June	-1.5	64.7	0	open ocean
8 June	-6.8	39.5	0.008	sea ice
Normal Period				
14 June	-3.8	27.5	0.14	sea ice
14 June	-2.8	17.1	0.08	sea ice
16 June	-8.7	39.8	5.02	sea ice
17 June	-5.2	37.4	9.5	sea ice
17 June	-5.0	6.3	0.05	sea ice
17 June	-2.4	98.6	0.05	open ocean
18 June	-3.0	13.0	0.004	sea ice
18 June	-3.4	24.2	0.01	sea ice
18 June	-5.2	27.4	44.3	open ocean
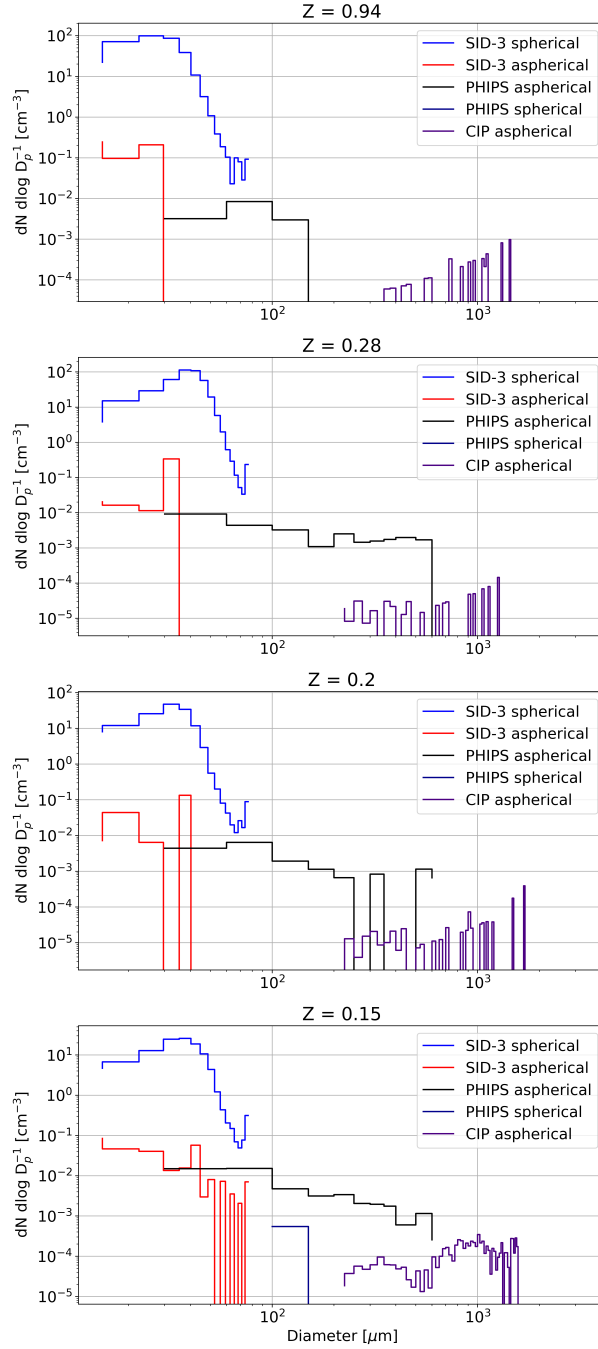
Figure S1: Phase separated particle size distributions for different normalised altitudes (Z) measured during cloud sampling on 27 May. Note that PHIPS and SID-3 aspherical particles were excluded from analysis of ice concentration, ice effective diameter, IWC and ice extinction coefficient due to shattering artefact.
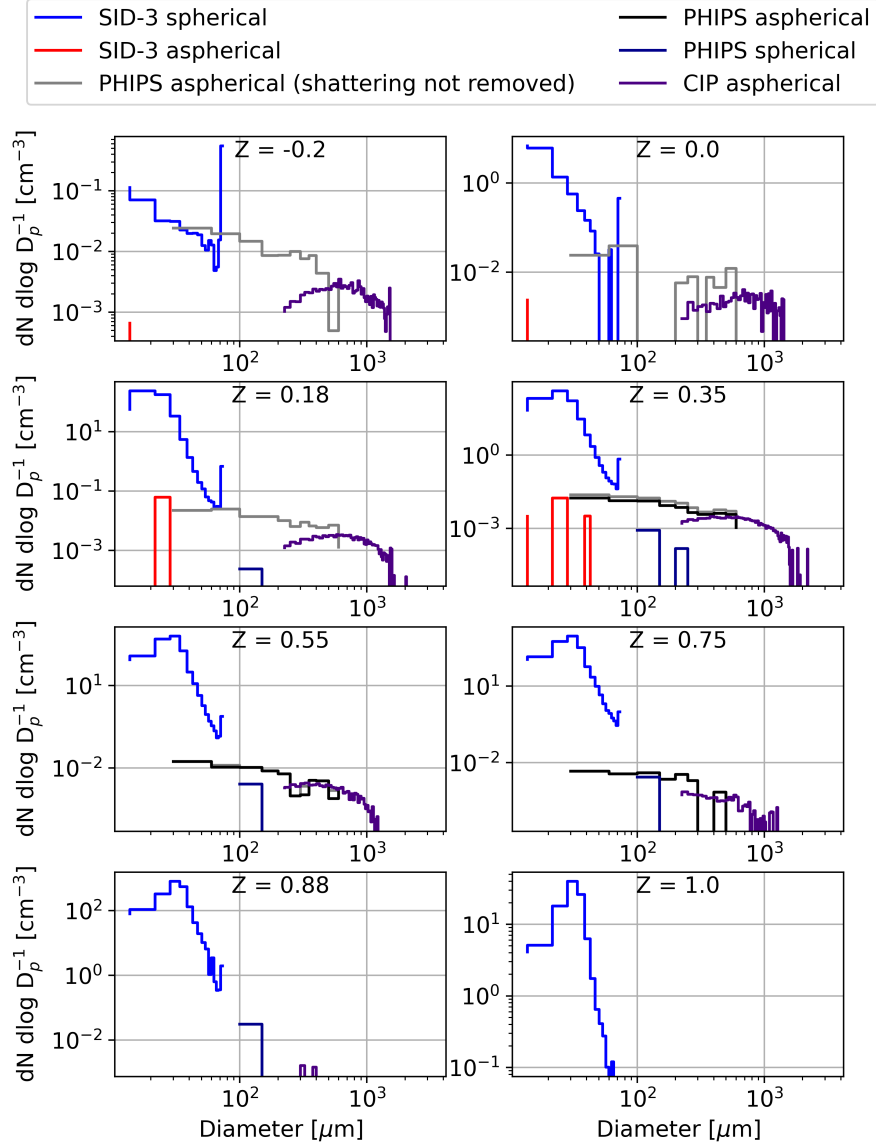
Figure S2: Phase separated particle size distributions for different normalised altitudes (Z) measured during cloud sampling on 2 June. Periods with shattering artifacts are identified in PHIPS aspherical concentrations with grey color and for these periods the ice concentration, ice effective diameter, IWC and ice extinction coefficient are calculated only using CIP.
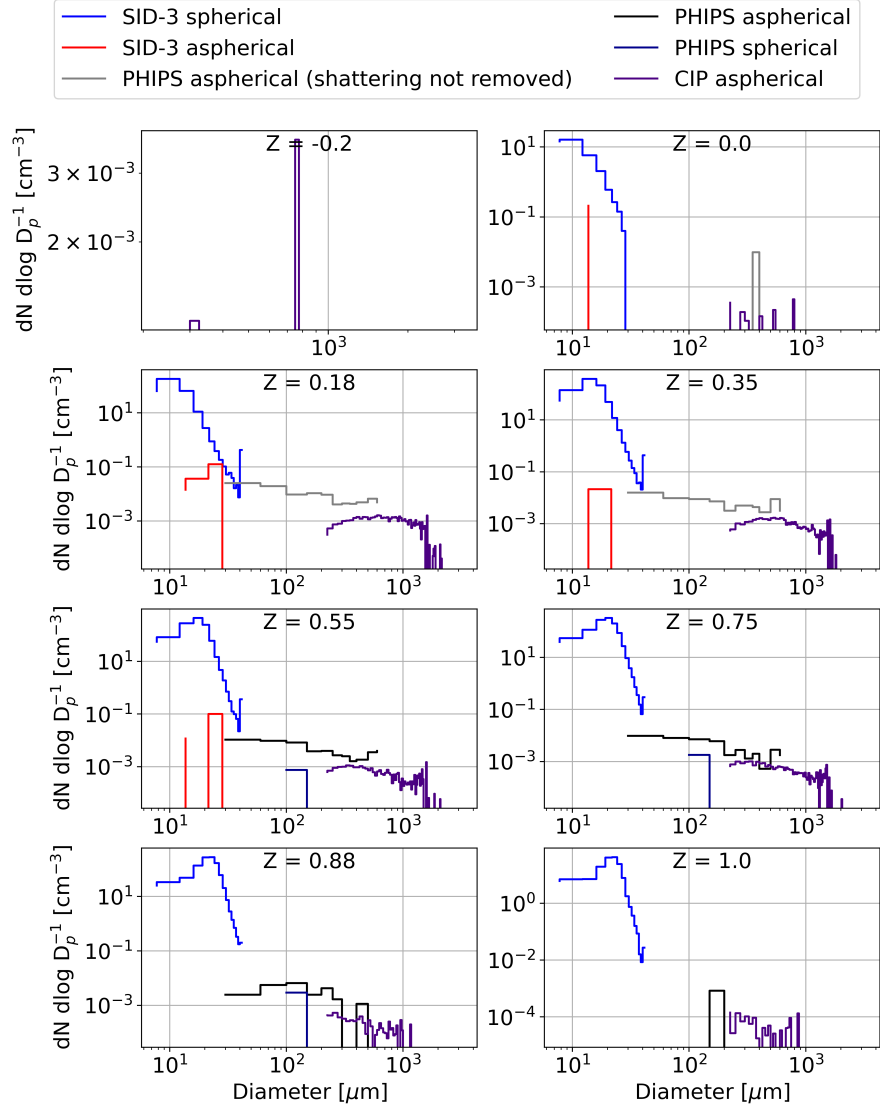
Figure S3: Phase separated particle size distributions for different normalised altitudes (Z) measured during cloud sampling on 4 June. Periods with shattering artifacts are identified in PHIPS aspherical concentrations with grey color and for these periods the ice concentration, ice effective diameter, IWC and ice extinction coefficient are calculated only using CIP.
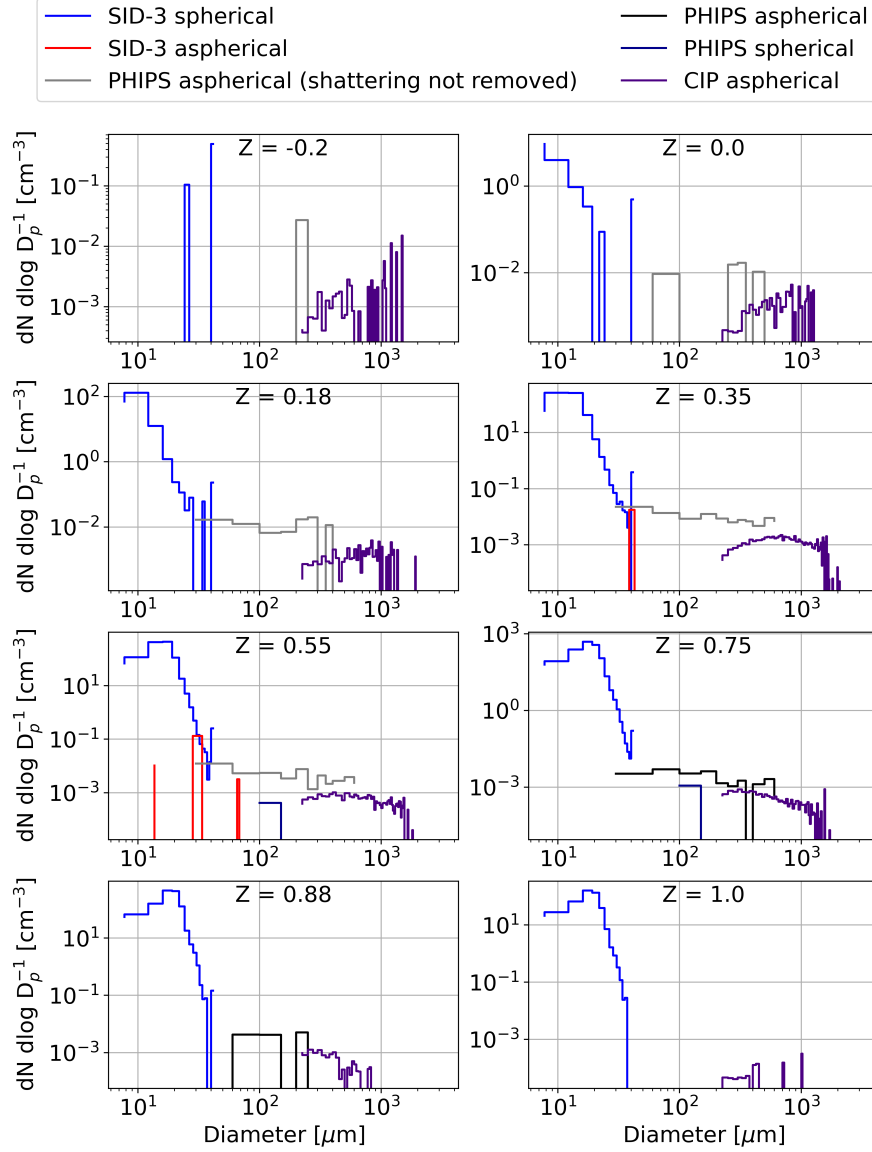
Figure S4: Phase separated particle size distributions for different normalised altitudes (Z) measured during cloud sampling on 5 June. Periods with shattering artifacts are identified in PHIPS aspherical concentrations with grey color and for these periods the ice concentration, ice effective diameter, IWC and ice extinction coefficient are calculated only using CIP.
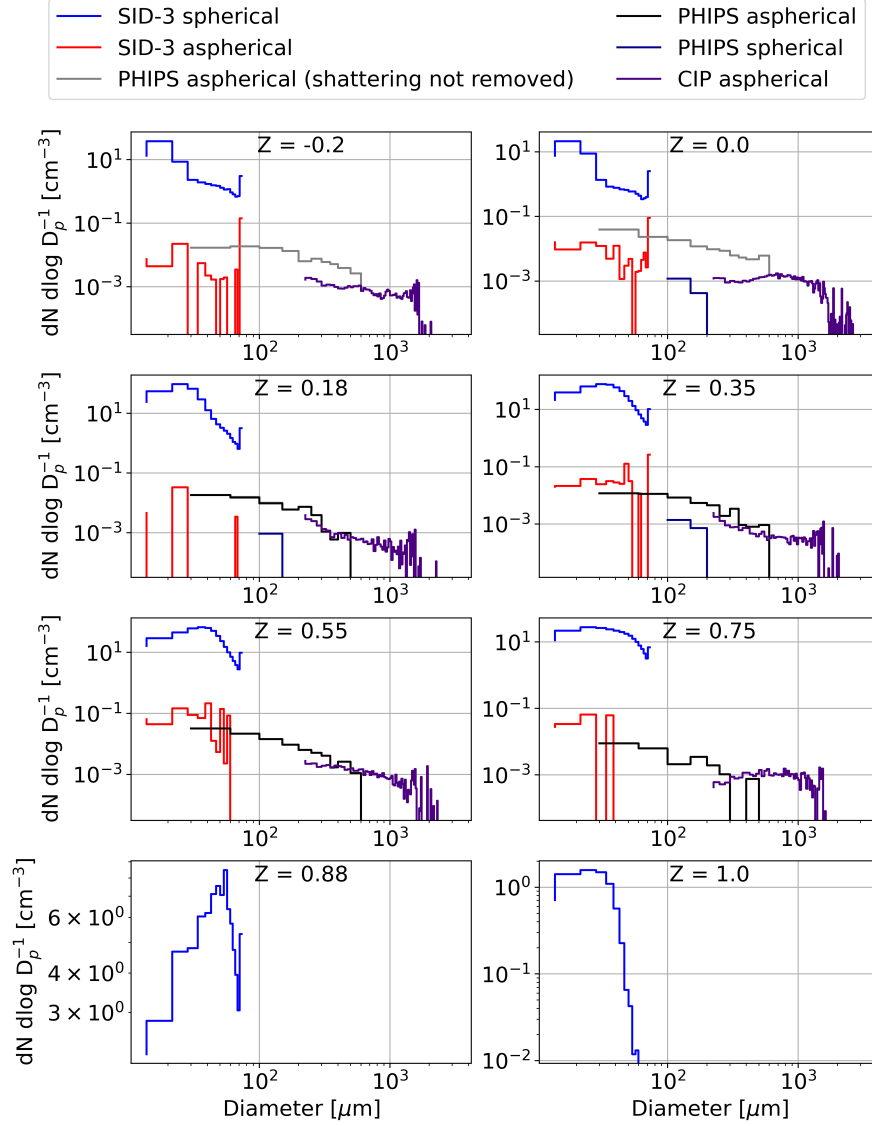
Figure S5: Phase separated particle size distributions for different normalised altitudes (Z) measured during cloud sampling on 17 June. Periods with shattering artifacts are identified in PHIPS aspherical concentrations with grey color and for these periods the ice concentration, ice effective diameter, IWC and ice extinction coefficient are calculated only using CIP.
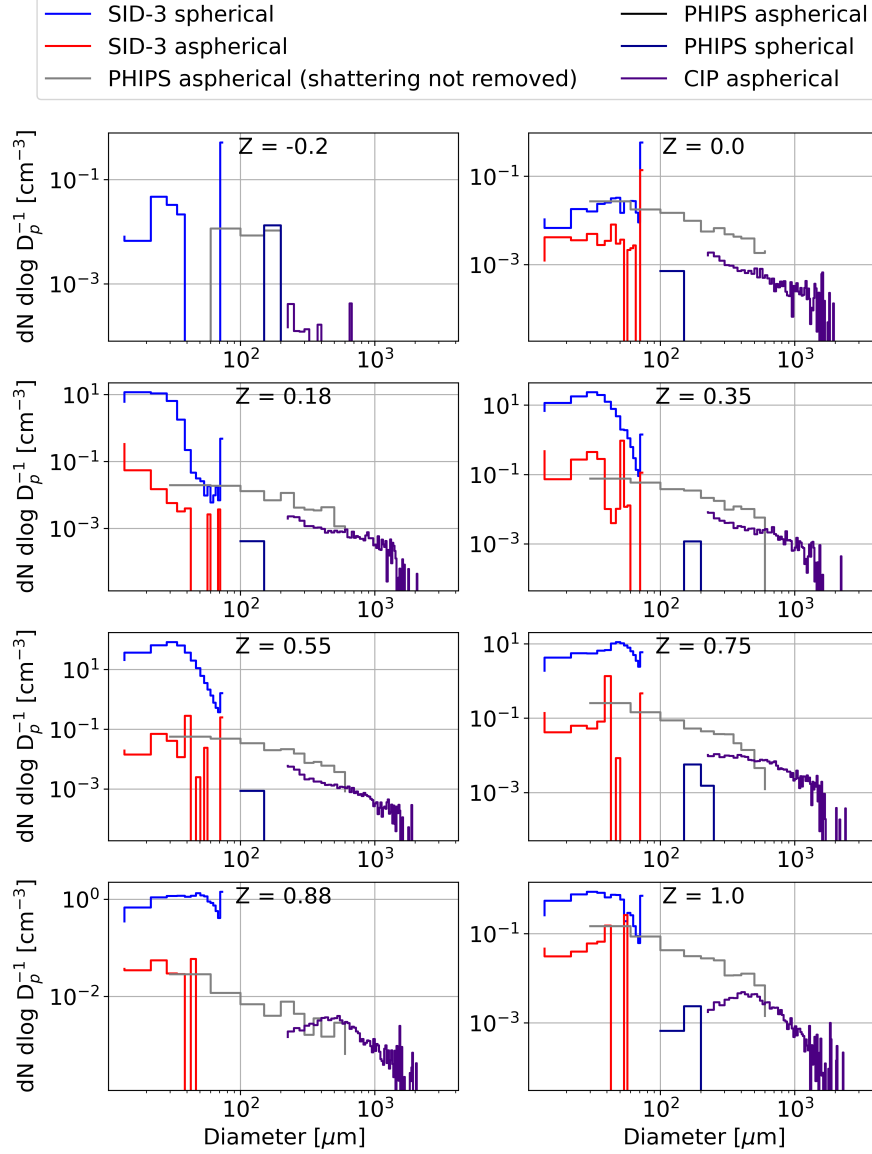
Figure S6: Phase separated particle size distributions for different normalised altitudes (Z) measured during cloud sampling on 18 June. Periods with shattering artifacts are identified in PHIPS aspherical concentrations with grey color and for these periods the ice concentration, ice effective diameter, IWC and ice extinction coefficient are calculated only using CIP.