S1: Sample information

Table S1: Sampling time, average temperature and sample number

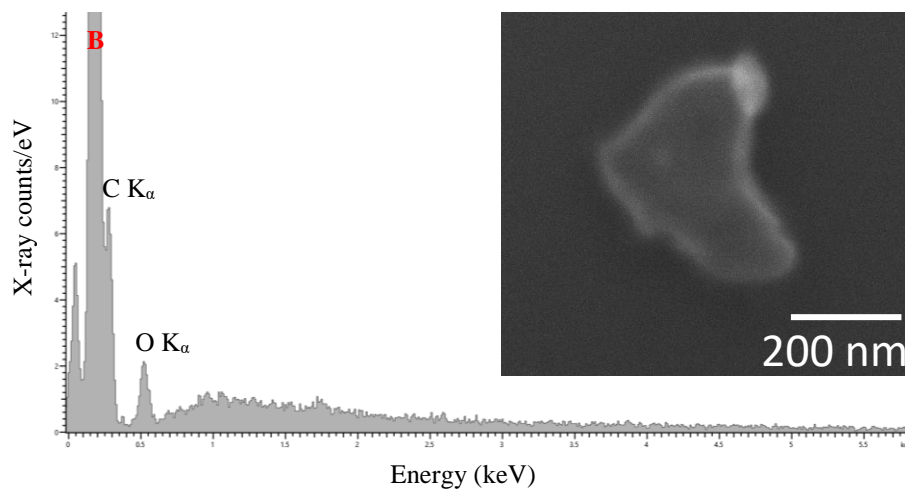| Date and time (UTC+1)	Temperature*(ºC)	Sample number
02.02.2017 (11:08-15:00)	-11	1
02-03.02.2017 (21:51-5:57)	-11	2a+b
04.02.2017 (10:02-13:37)	-13	3a+b
04.02.2017 (16:16-20:06)	-16	4a+b
06.02.2017 (09:29-15:16)	-15	5a+b
10.02.2017 (08:31-12:03)	-16	6a+b
10.02.2017 (13:40-16:46)	-16	7
12.02.2017 (08:32-10:12)	-11	8a+b
17.02.2017 (10:06-14:06)	-12	9
17.02.2017 (15:41-21:14)	-15	10

*mean value for sampling period

5

Figure S1**:** Secondary electron image and corresponding energy dispersive X-ray spectrum for a typical C-rich particle in the IPR fraction. B indicates the X-ray peak from the boron substrate
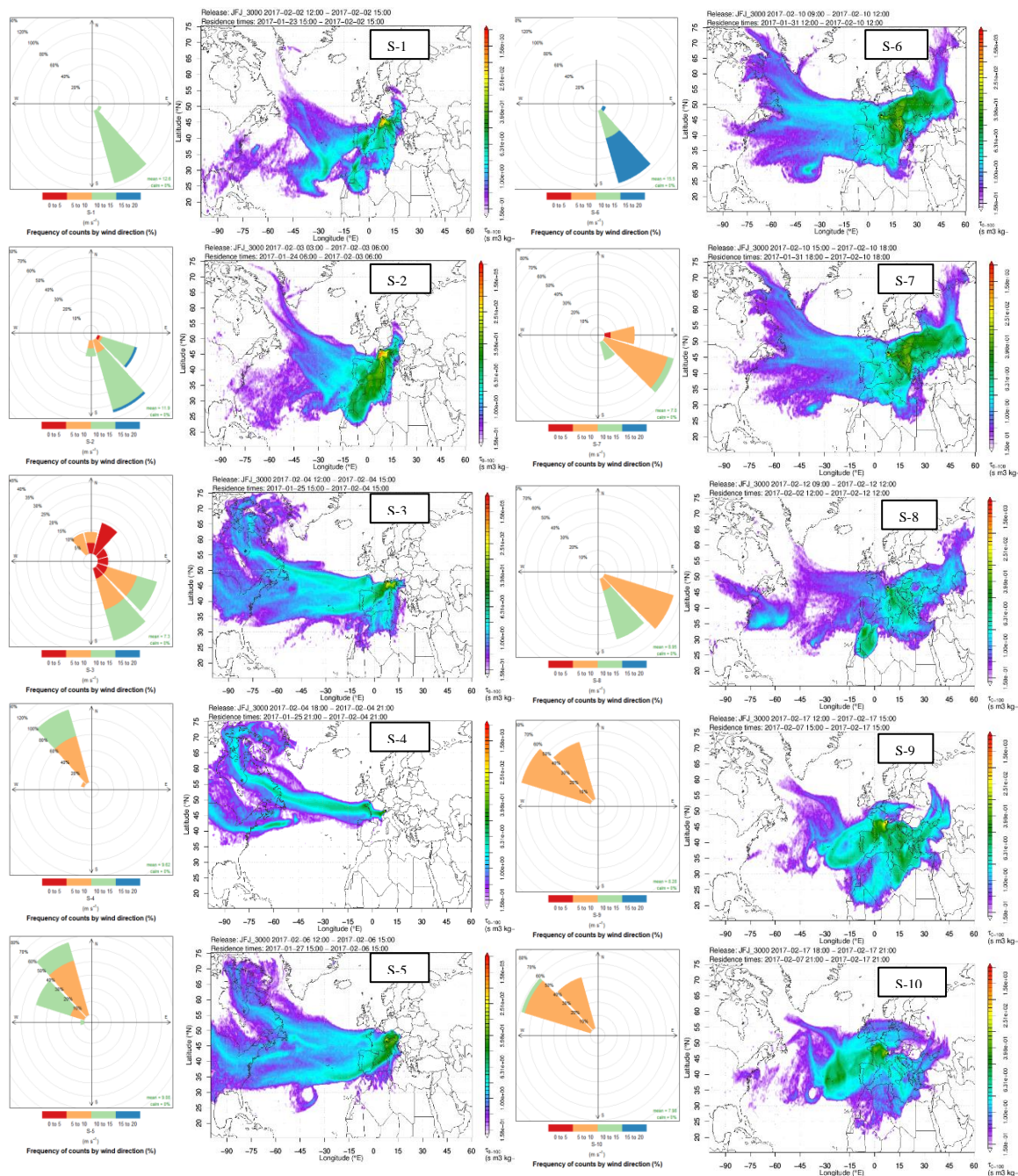
10

Figure S2: Wind rose (left) and footprint plots (right) calculated with the FLEXPART model, http://lagrange.empa.ch/FLEXPART_browser/ (Stohl et al., 1998;Stohl and Thomson, 1999;Stohl et al., 2005;Seibert and Frank, 2004)[1]. Horizontal wind direction and speed were received from the Federal Office of Meteorology and Climatology (MeteoSwiss; www.meteoswiss.admin.ch)

[1]Seibert, P., and Frank, A.: Source-receptor matrix calculation with a Lagrangian particle dispersion model in backward mode, Atmospheric Chemistry and Physics, 4, 51-63, 2004.
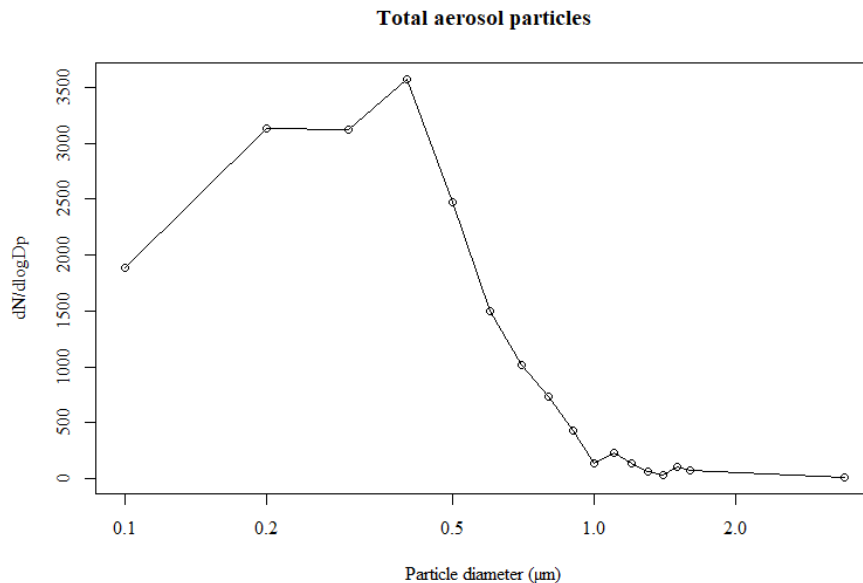
Stohl, A., and Thomson, D. J.: A Density Correction for Lagrangian Particle Dispersion Models, Boundary-Layer Meteorology, 90, 155-167, 10.1023/a:1001741110696, 1999.

Stohl, A., Forster, C., Frank, A., Seibert, P., and Wotawa, G.: Technical note: The Lagrangian particle dispersion model FLEXPART version 6.2, Atmos. Chem. Phys., 5, 2461-2474, 10.5194/acp-5-2461-2005, 2005.

Stohl, A., Hittenberger, M., and Wotawa, G.: Validation of the lagrangian particle dispersion model FLEXPART against large-scale tracer experiment data, Atmospheric Environment, 32, 4245-4264, https://doi.org1/10.1016/S1352-2310(98)00184-8, 1998.

S2: Size distribution

Figure S3: Size distribution of total aerosol, all groups and samples combined.

Ice particle residuals

dN/dlogDp
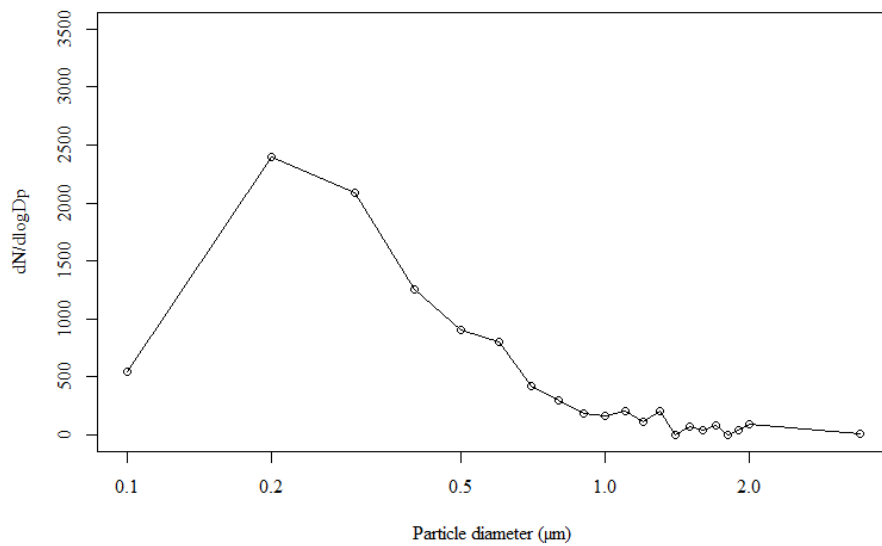
Particle diameter (μm)

Figure S4: Size distribution of ice particle residual, all groups and samples combined.

5

10

15

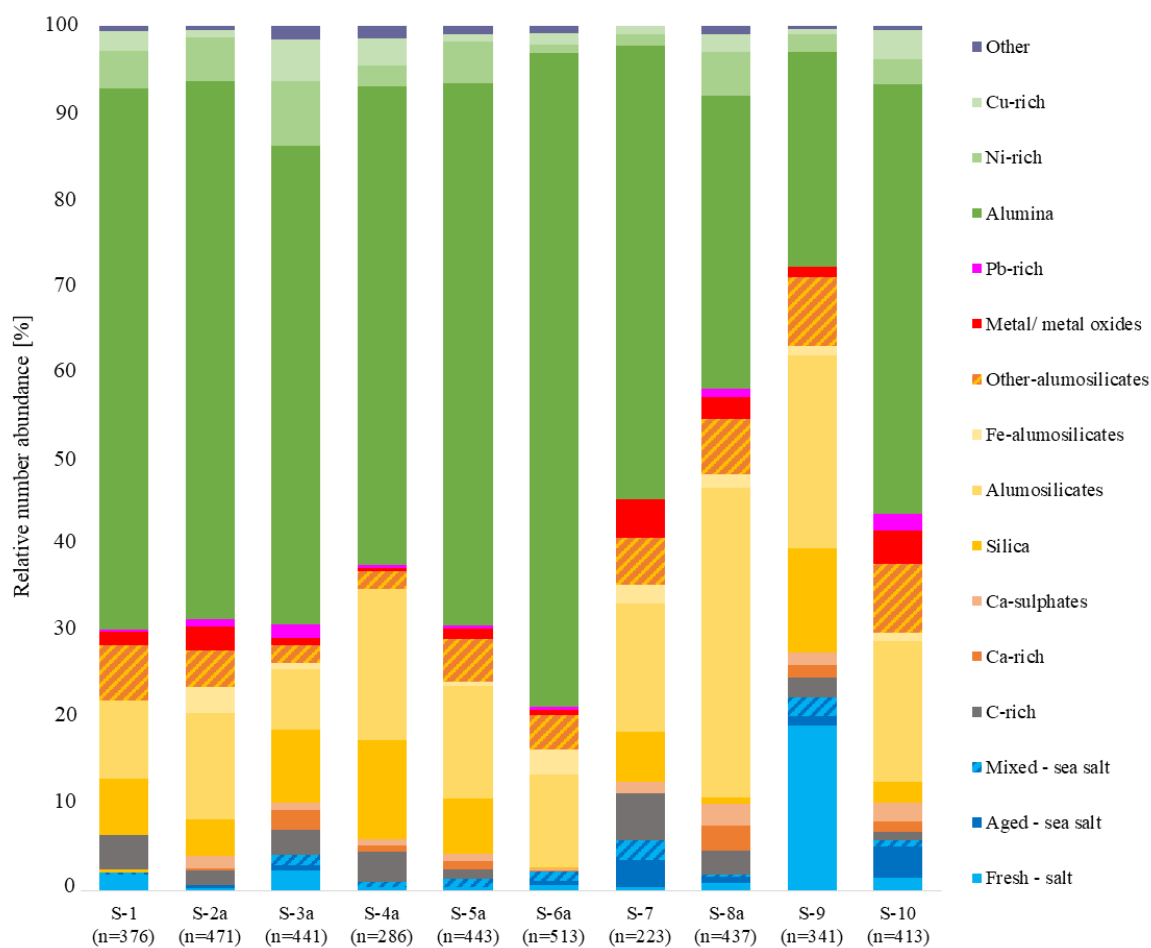**S3: All particle groups found in the IPR samples**

Figure S5: Relative number abundance of the different particle groups of IPR sampled in mixed phase clouds at temperatures between -10°C and -18°C including sampling artefacts (pure salt, alumina, Ni-rich and Cu-rich particles).

5