

**Table 1:** Structural properties of the snow samples and thermal conductivity values measured with SIM, NP and HFP<sup>a</sup>.

Grain Shape, main class	ISC	Density kg m <sup>-3</sup>	SSA mm <sup>-1</sup>	i.th mm	i.sp mm	$k_x^{SIM}$ W K <sup>-1</sup> m <sup>-1</sup>	$k_z^{SIM}$ W K <sup>-1</sup> m <sup>-1</sup>	$k_x^{NPH}$ W K <sup>-1</sup> m <sup>-1</sup>	$k_z^{NPH}$ W K <sup>-1</sup> m <sup>-1</sup>	$k^{HFP}$ W K <sup>-1</sup> m <sup>-1</sup>
Depth Hoar	DHch	172	12.90	0.20 ± 0.07	1.76 ± 1.27	0.152	0.174	0.055 ± 0.005	0.065 ± 0.006	0.193
Faceted Crystals	FCso	230	12.71	0.25 ± 0.07	0.42 ± 0.15	0.131 ± 0.003	0.154 ± 0.037	0.080 ± 0.000	0.101 ± 0.023	0.230
Rounded Grains	RGxf	246	17.63	0.17 ± 0.04	0.36 ± 0.14	0.204 ± 0.004	0.146 ± 0.006	0.115 ± 0.005	0.115 ± 0.015	0.176
Rounded Grains	FCxr	251	17.05	0.18 ± 0.05	0.40 ± 0.14	0.189 ± 0.001	0.137 ± 0.003	0.145 ± 0.005	0.076 ± 0.010	0.176
Rounded Grains	RGsr	253	14.47	0.22 ± 0.05	0.30 ± 0.13	0.128 ± 0.002	0.156 ± 0.000	0.090 ± 0.001	0.111 ± 0.001	0.189
Rounded Grains	RGl	267	16.16	0.19 ± 0.07	0.41 ± 0.16	0.196 ± 0.006	0.177 ± 0.007	0.120 ± 0.000	0.130 ± 0.010	0.197
Rounded Grains	RGsr	286	8.84	0.34 ± 0.13	0.81 ± 0.36	0.245 ± 0.002	0.211 ± 0.005	0.180 ± 0.001	0.180 ± 0.001	0.219
Rounded Grains	RGsr	331	19.89	0.16 ± 0.03	0.27 ± 0.09	0.327 ± 0.012	0.275 ± 0.017	0.225 ± 0.015	0.169 ± 0.055	0.271

<sup>a</sup>Snow type: description, ISC: International Classification, Density: gravimetrically determined, SSA: specific surface area from tomography, i.th: thickness of ice structures by tomography, i.sp: pore size by tomography,  $k_x^{SIM}$ :  $k_x$  obtained with the simulation,  $k_z^{SIM}$ :  $k_z$  obtained with the simulation,  $k_x^{NPH}$ :  $k_x$  obtained with needle probe measurements,  $k_z^{NPH}$ :  $k_z$  obtained with needle probe measurements,  $k^{HFP}$ :  $k_z$  obtained with the heat flux plate.

**Table 2:** Structural properties of the additional snow samples and thermal conductivity values obtained with the simulation<sup>a</sup>.

Grain Shape, main class	ISC	Density kg m <sup>-3</sup>	SSA mm <sup>-1</sup>	i.th mm	i.sp mm	$k_x^{SIM}$ W K <sup>-1</sup> m <sup>-1</sup>	$k_z^{SIM}$ W K <sup>-1</sup> m <sup>-1</sup>
Precipitation Particles	PPsd	91	64.65	0.05 ± 0.03	0.45 ± 0.19	0.024	0.024
Rounded Grains	RGsr	118	25.09	0.13 ± 0.04	0.56 ± 0.34	0.081	0.050
Rounded Grains	RGsr	155	29.03	0.12 ± 0.03	0.31 ± 0.11	0.103	0.094
Rounded Grains	RGsr	155	27.15	0.12 ± 0.03	0.33 ± 0.12	0.115	0.093
Rounded Grains	RGsr	164	26.78	0.12 ± 0.03	0.34 ± 0.13	0.135	0.086
Rounded Grains	RGsr	173	23.41	0.14 ± 0.04	0.36 ± 0.14	0.130	0.102
Rounded Grains	RGsr	182	25.50	0.13 ± 0.03	0.30 ± 0.11	0.124	0.111
Rounded Grains	RGsr	191	26.39	0.13 ± 0.03	0.28 ± 0.10	0.136	0.125
Rounded Grains	RGsr	191	24.90	0.13 ± 0.03	0.32 ± 0.12	0.150	0.112
Rounded Grains	RGsr	191	31.34	0.10 ± 0.03	0.24 ± 0.09	0.145	0.125
Rounded Grains	RGsr	200	24.85	0.13 ± 0.04	0.29 ± 0.11	0.149	0.144
Depth Hoar	DHcp	209	12.28	0.23 ± 0.14	0.93 ± 0.53	0.118	0.118
Depth Hoar	DHcp	228	11.31	0.25 ± 0.13	0.78 ± 0.37	0.147	0.199
Depth Hoar	DHcp	237	15.99	0.17 ± 0.07	0.49 ± 0.23	0.138	0.248
Depth Hoar	DHcp	237	16.37	0.16 ± 0.07	0.47 ± 0.22	0.143	0.249
Faceted Crystals	FCso	246	11.65	0.26 ± 0.09	0.54 ± 0.21	0.151	0.167
Depth Hoar	DHcp	246	10.51	0.29 ± 0.20	0.82 ± 0.44	0.136	0.185
Depth Hoar	DHcp	255	12.97	0.20 ± 0.10	0.62 ± 0.33	0.181	0.264
Melt Forms	MFcl	264	8.21	0.35 ± 0.13	0.80 ± 0.35	0.124	0.240
Rounded Grains	RGlR	264	11.89	0.26 ± 0.09	0.49 ± 0.20	0.152	0.198
Melt Forms	MFcl	273	9.40	0.31 ± 0.12	0.63 ± 0.29	0.142	0.264
Depth Hoar	DHcp	282	14.05	0.17 ± 0.07	0.54 ± 0.32	0.197	0.354
Melt Forms	MFcl	282	14.72	0.21 ± 0.06	0.34 ± 0.13	0.247	0.213
Depth Hoar	DHcp	291	13.51	0.19 ± 0.10	0.51 ± 0.28	0.236	0.316
Melt Forms	MFcl	300	15.14	0.21 ± 0.06	0.31 ± 0.12	0.284	0.201
Faceted Crystals	FCso	309	7.11	0.41 ± 0.18	0.71 ± 0.29	0.200	0.310
Melt Forms	MFcl	364	9.62	0.31 ± 0.11	0.40 ± 0.17	0.247	0.422

<sup>a</sup>

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