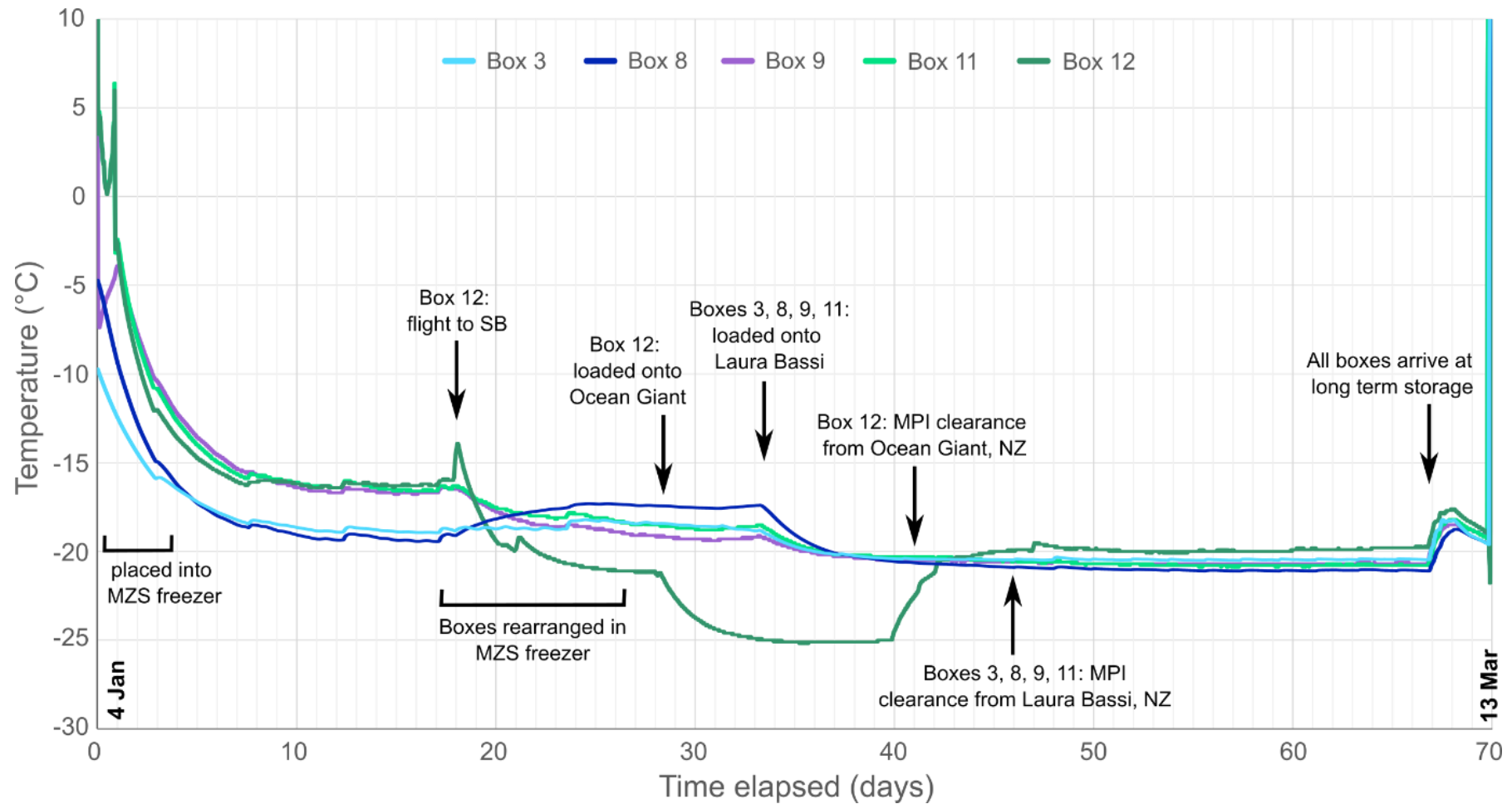


Supplementary Material



Supplementary Figure 1. Temperature history of four core boxes from packaging in the field through transport to long term storage. Temperature loggers in boxes 3 and 8 were installed on Day 0 (January 3rd, 2020). Loggers in boxes 9, 10 and 11 were installed on Day 1.

Supplementary Table 1. CPO strength and orientation data for Priestley Glacier ice core samples. For definitions of M-index and *c*-axis eigenvalues, see section 4.6. ‘Odd’ refers to grains oriented differently to the main *c*-axis cluster (section 4.3).

Sample	Depth m	No. of grains	C-axis maximum orientation (°)	M-index	C-axis Eigenvalues			No. ‘odd’ grains in map	% ‘odd’ grains in map
					S1	S2	S3		
003	2.4	558	109	0.3514	0.8092	0.1562	0.0346	43	7.71
004	4.1	448	116	0.4308	0.8613	0.1125	0.0262	23	5.13
005	4.59	393	104	0.3483	0.8029	0.1683	0.0288	31	7.89
006	5.05	537	109	0.4610	0.8806	0.0910	0.0284	7	1.30
007	5.7	478	110	0.4987	0.9018	0.0782	0.0200	20	4.18
008	7.0	466	118	0.5698	0.9429	0.0399	0.0173	6	1.29
009	8.15	494	126	0.5955	0.9565	0.0294	0.0141	3	0.61
010	9.1	658	113	0.4955	0.9015	0.0815	0.0170	29	4.41
011	9.75	443	127	0.6096	0.9635	0.0233	0.0133	2	0.45
013	11.9	379	124	0.5584	0.9357	0.0513	0.0129	2	0.53
016	13.9	994	114	0.5924	0.9540	0.0290	0.0170	3	0.40
018	15.9	541	99	0.5887	0.9528	0.0338	0.0134	9	1.66
020	17.4	553	110	0.4524	0.8736	0.1112	0.0152	39	7.05
021	18.0	401	109	0.5630	0.9391	0.0458	0.0152	11	2.74
023	20.1	440	110	0.6018	0.9592	0.0260	0.0148	8	1.82
025	21.8	205	123	0.6057	0.9614	0.0231	0.0156	1	0.49
027	23.8	497	116	0.5076	0.9096	0.0673	0.0230	30	6.04
030	26.2	506	115	0.5057	0.9083	0.0742	0.0175	24	4.74
031	27.3	379	112	0.5460	0.9308	0.0538	0.0154	16	4.22
033	29.5	496	118	0.4443	0.8726	0.1052	0.0222	36	7.26

036	32.3	345	102	0.5640	0.9400	0.0461	0.0139	14	4.06
U036-1	32.9	334	88	0.5583	0.9366	0.0482	0.0152	11	3.29
U037	33.6	399	-	0.5289	0.9208	0.0656	0.0135	19	4.76
U040	35.6	455	-	0.5505	0.9324	0.0518	0.0158	16	3.51
U043	38.9	285	-	0.5822	0.9498	0.0367	0.0135	8	2.81
U044	39.8	521	-	0.5243	0.9181	0.0658	0.0161	38	7.29
U045-1	40.7	266	-	0.5881	0.9529	0.0342	0.0129	4	1.50
U047	42.8	478	-	0.5520	0.9343	0.0517	0.0141	9	1.88
063	58.7	311	-	0.5659	0.9405	0.0435	0.0160	3	0.96

Supplementary Table 2. Grain size and shape data for all Priestley Glacier samples. Colored parameters correspond to colored arrows on Supplementary Figure 3.

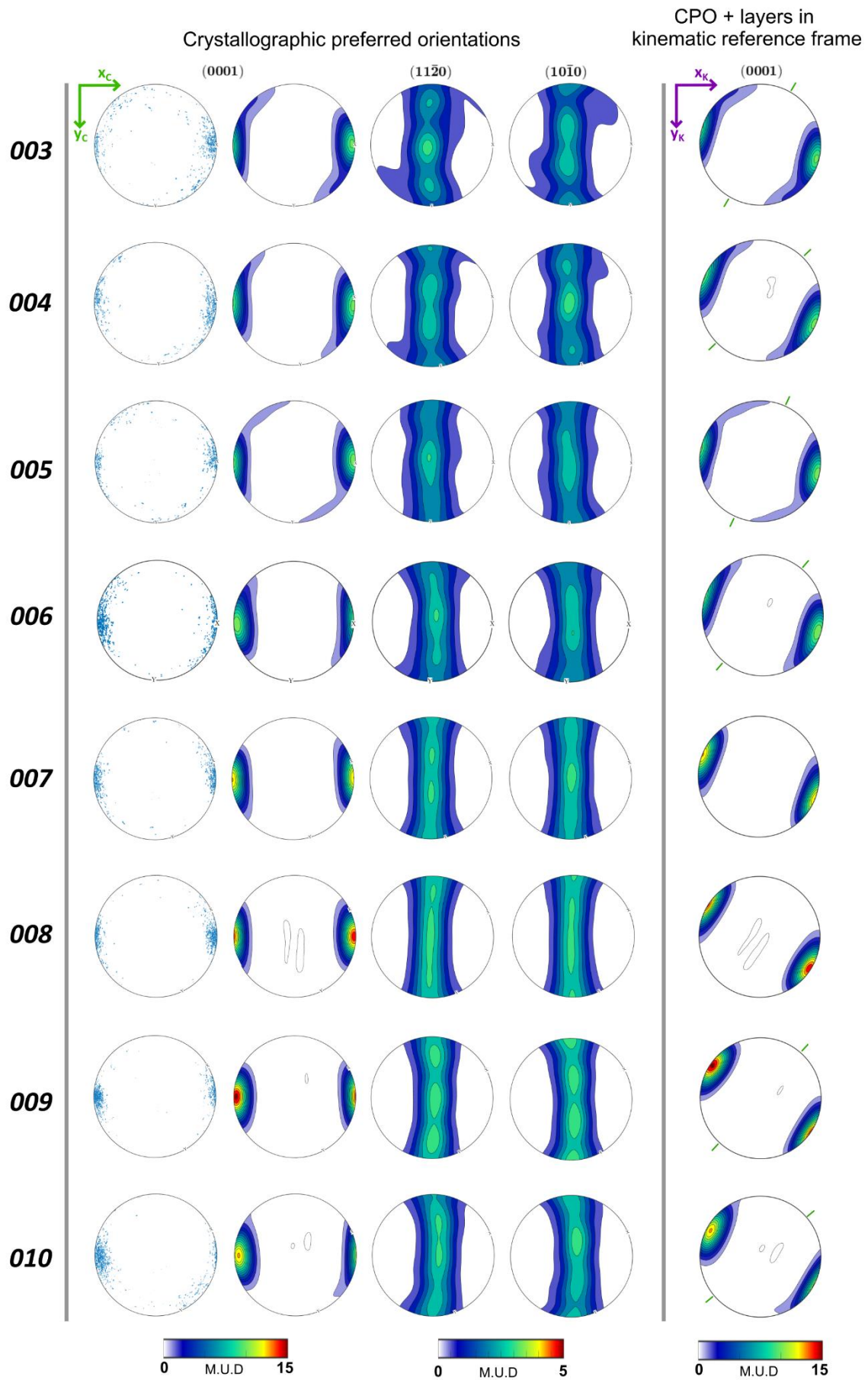
Sample	\bar{d} μm	\pm	\bar{d}_{SMR} μm	\pm	Axial Ratio	\pm	Mean cSPO ¹ (°)	Mean kSPO ² (°)	Mean kSPO [second.] (°)
003	1120	702	1017	100	1.61	0.47	92	111	-
004	1310	929	1156	154	1.64	0.51	105	131	-
005	1140	800	998	137	1.64	0.46	111	125	-
006	1180	734	1063	117	1.68	0.65	92	111	28
007	1100	768	973	125	1.64	0.50	112	132	38
008	1160	815	1030	135	1.66	0.53	105	133	-
009	1100	810	960	139	1.68	0.66	106	142	-
010	1010	645	912	100	1.59	0.55	100	123	-
011	1130	872	985	149	1.78	0.64	109	146	-
013	1090	905	942	151	1.68	0.58	106	140	-
016	1050	863	888	161	1.88	1.23	102	126	33
018	1170	832	1030	140	1.66	0.55	95	104	9
020	1130	826	998	134	1.61	0.59	97	117	29
021	1190	881	1043	141	1.64	0.50	91	110	10
023	1220	880	1063	146	1.67	0.59	95	115	-
025	983	820	846	137	1.68	0.58	99	132	-
027	1040	781	912	132	1.69	0.57	117	143	-
030	1110	770	986	123	1.67	0.58	105	130	-
031	1400	971	1246	149	1.54	0.39	97	119	49
033	1160	810	1030	130	1.65	0.54	95	123	-
036	1130	908	973	161	1.63	0.47	94	106	21
U036-1	1150	932	986	164	1.74	0.71	102	100	-
U037	1100	865	955	151	1.80	0.97	99	-	-
U040	1210	919	1056	156	1.76	0.92	101	-	-
U043	1250	1020	1069	188	1.77	0.77	83	-	-
U044	1190	837	1050	137	1.64	0.61	98	-	-
U045-1	1100	883	955	146	1.72	0.82	94	-	-
U047	1160	876	1011	149	1.74	0.77	93	-	-
063	1180	859	1030	146	1.72	0.69	88	-	-

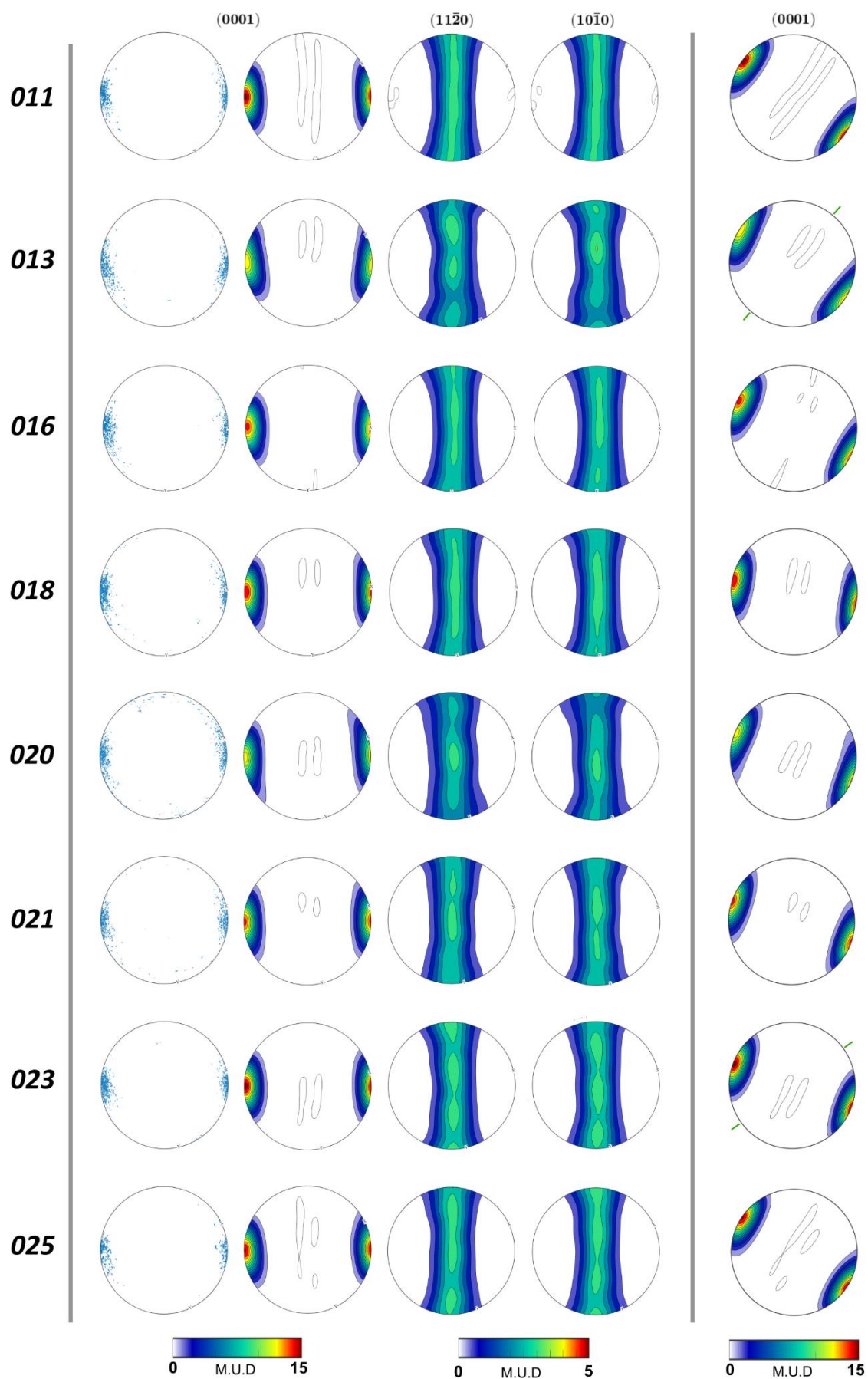
1- SPO of grain long axes with sample arranged in the ‘c-axis maximum’ reference frame.

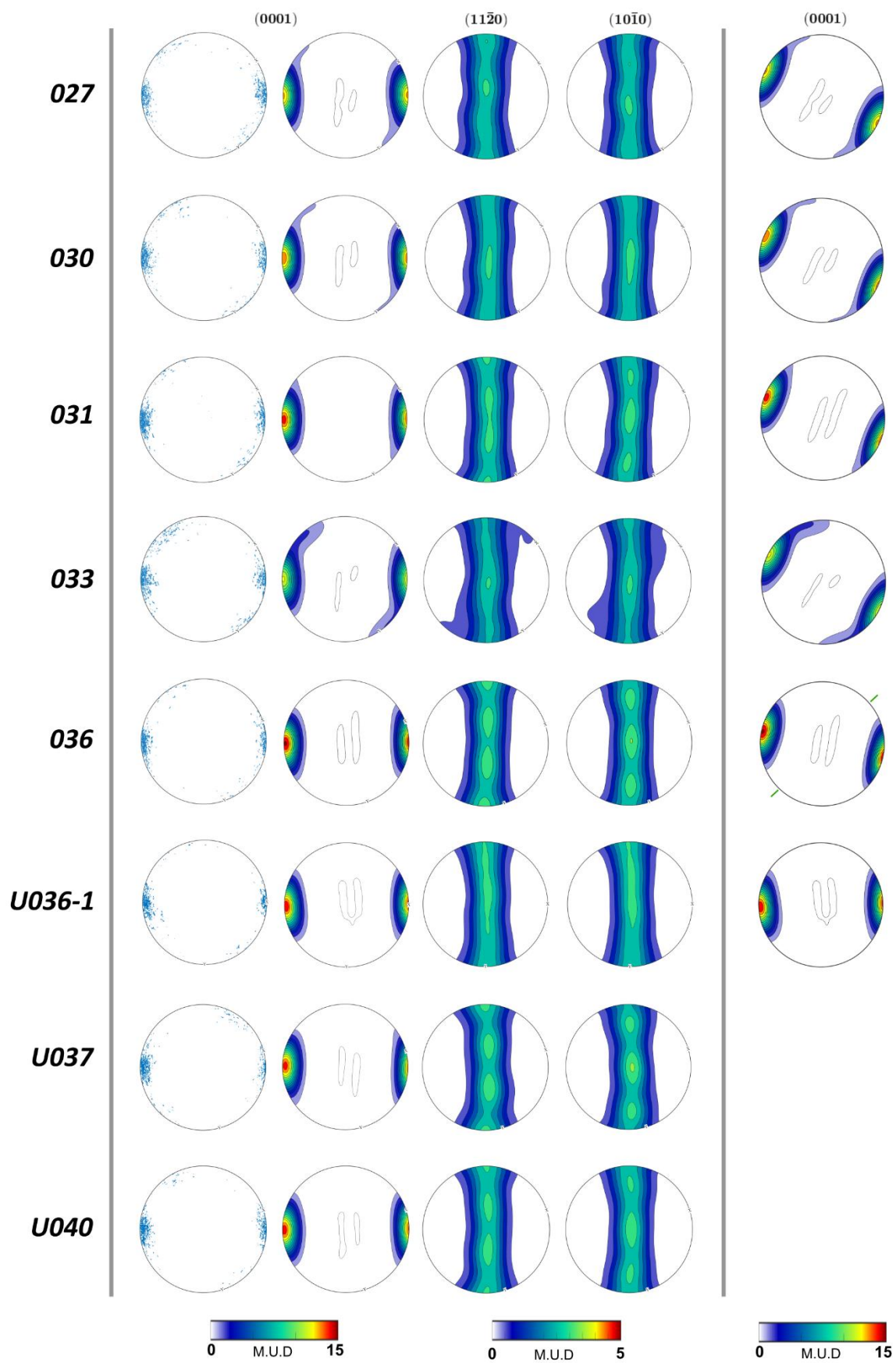
2- SPO of grain long axes with sample arranged in the ‘kinematic’ reference frame.

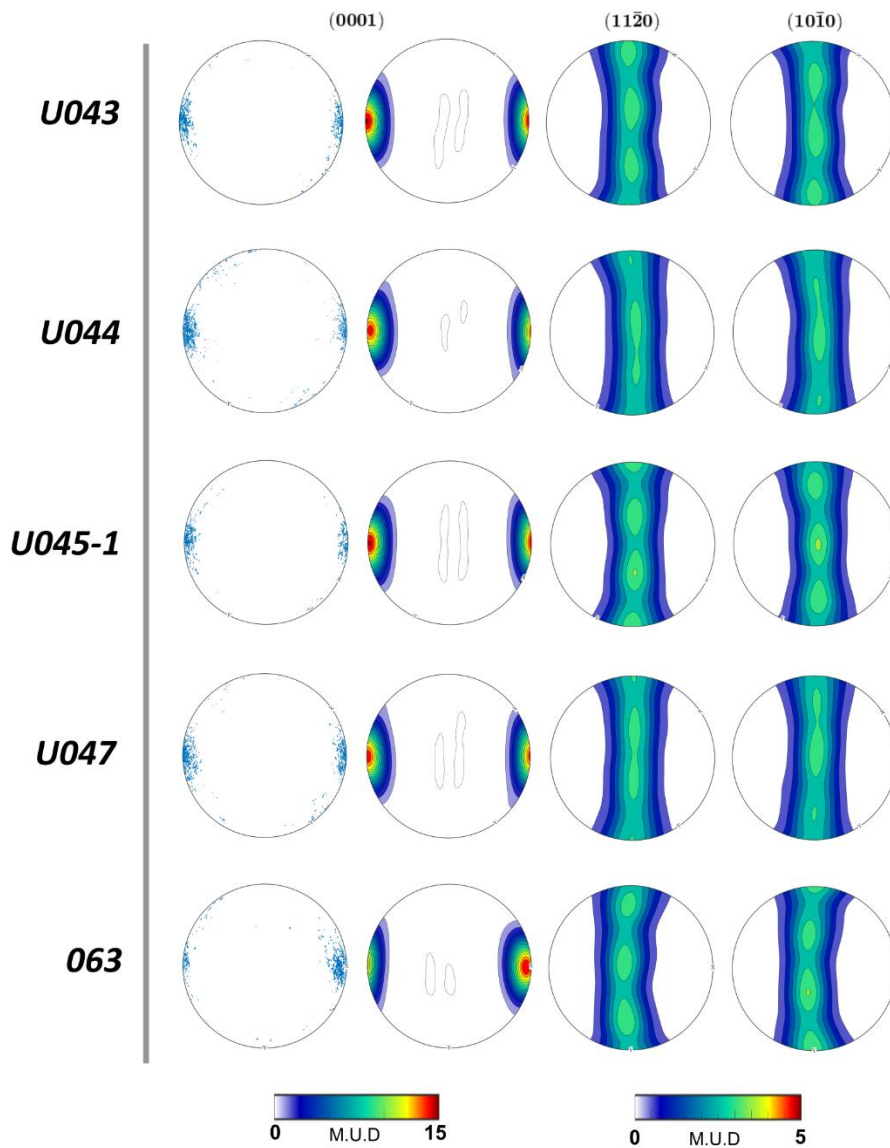
Supplementary Table 3. Misorientation and vorticity data for all Priestley Glacier samples.

Sample	mean GOS (°)	% high GOS grains (>2°)	% high GOS grains (>5°)	No. grains for CVA	CVA M.U.D at vertical	CVA M.U.D at x_C axis	R-pair M.U.D at vertical	R-pair M.U.D at x_C axis
003	0.437	2.09	0.16	51	1.93	1.30	2.80	1.01
004	0.834	11.17	1.49	97	2.76	2.51	2.81	1.11
005	0.476	3.04	0.48	51	3.07	1.04	3.68	1.09
006	0.832	9.84	1.93	103	1.96	2.23	1.89	1.16
007	0.788	9.26	0.94	96	2.91	2.27	2.06	1.96
008	0.931	10.83	3.49	101	2.39	2.18	1.01	2.35
009	0.935	12.75	4.13	115	2.22	2.58	0.70	2.91
010	0.886	10.83	3.43	123	1.91	1.48	1.05	1.89
011	0.567	4.24	0.82	80	2.32	1.71	0.61	2.77
013	0.979	10.81	3.32	95	1.74	2.83	0.81	1.75
016	0.932	12.71	3.83	106	2.01	2.39	0.70	2.22
018	0.991	12.50	3.09	138	2.09	1.56	0.94	2.57
020	0.854	10.01	2.24	119	3.69	2.14	3.07	1.82
021	0.783	8.92	2.41	85	3.04	1.63	1.12	2.43
023	1.067	15.16	5.32	114	2.48	2.28	0.86	2.82
025	0.981	11.68	4.20	39	2.15	3.89	0.60	2.86
027	0.863	9.56	2.48	103	3.54	1.98	1.40	1.88
030	0.892	12.29	2.20	106	3.25	2.29	2.02	2.30
031	0.638	4.65	0.60	78	3.40	1.93	1.50	2.29
033	0.837	9.33	1.42	101	2.75	1.97	2.72	1.67
036	1.114	15.64	4.74	83	3.49	2.61	1.49	2.90
U036-1	0.954	13.74	2.15	77	2.41	1.80	1.51	2.61
U037	0.902	13.12	2.38	99	2.97	1.64	1.42	2.61
U040	1.027	12.50	3.95	112	3.14	2.16	1.33	2.46
U043	1.077	15.85	1.94	74	2.57	1.94	1.17	2.71
U044	0.983	13.38	3.16	130	3.16	1.76	1.99	2.47
U045-1	0.928	11.87	3.95	46	2.62	2.99	0.81	2.91
U047	1.015	12.74	4.05	122	3.20	2.09	1.51	2.70
063	0.961	12.13	2.66	71	3.46	2.566	1.05	2.62

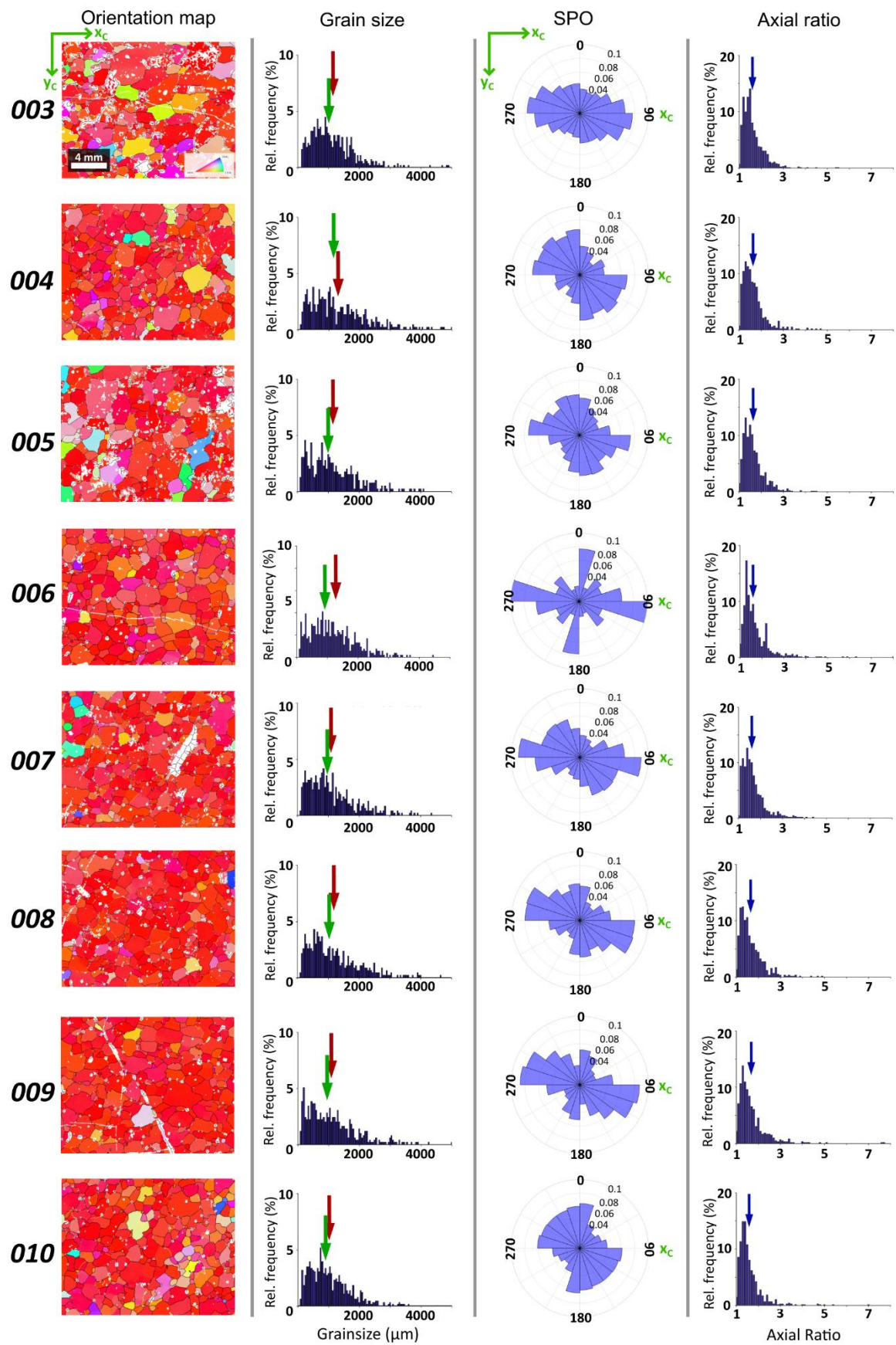


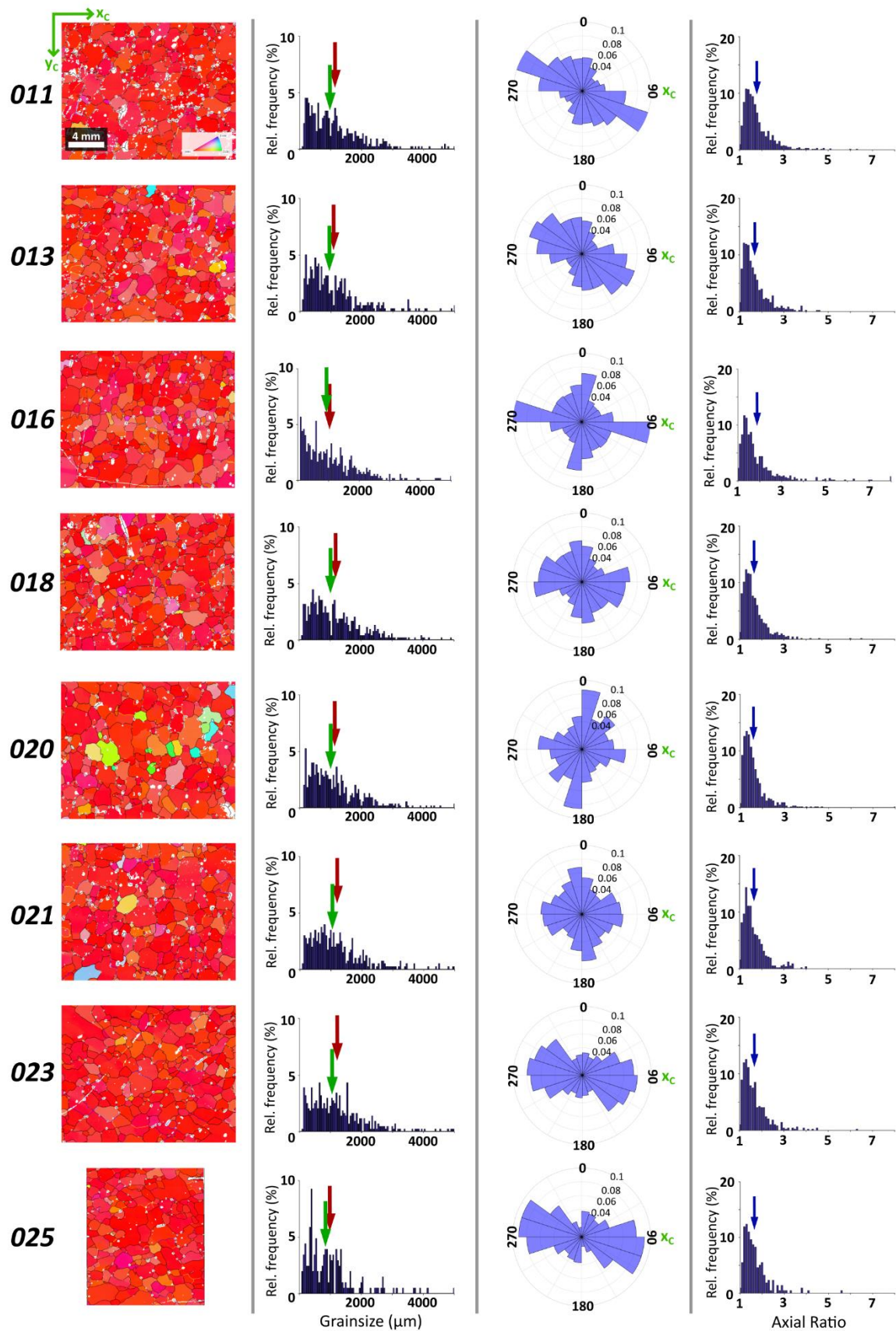


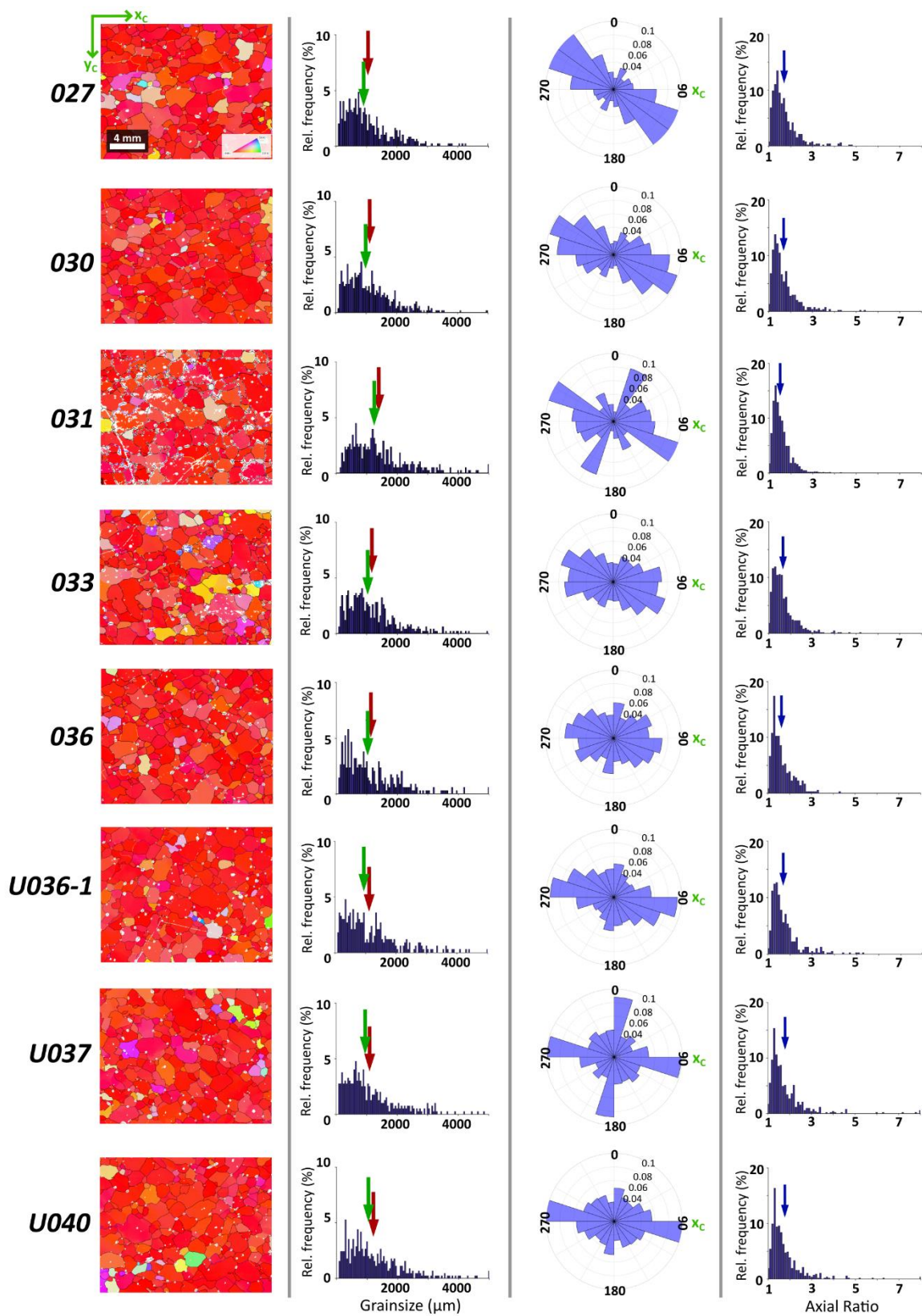


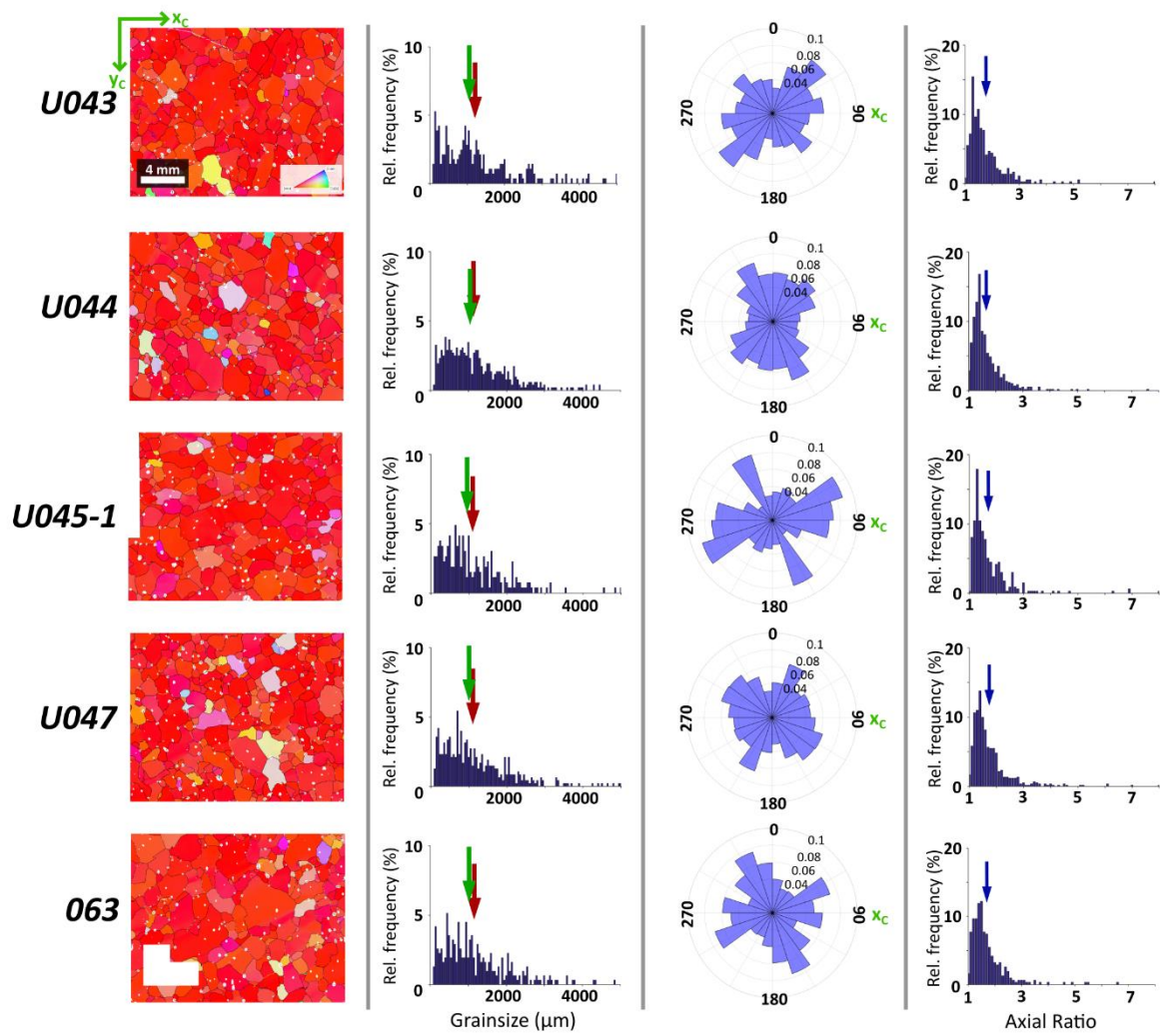


Supplementary Figure 2. Crystallographic preferred orientations of all Priestley Glacier samples in the 'c-axis maximum' and kinematic reference frames.

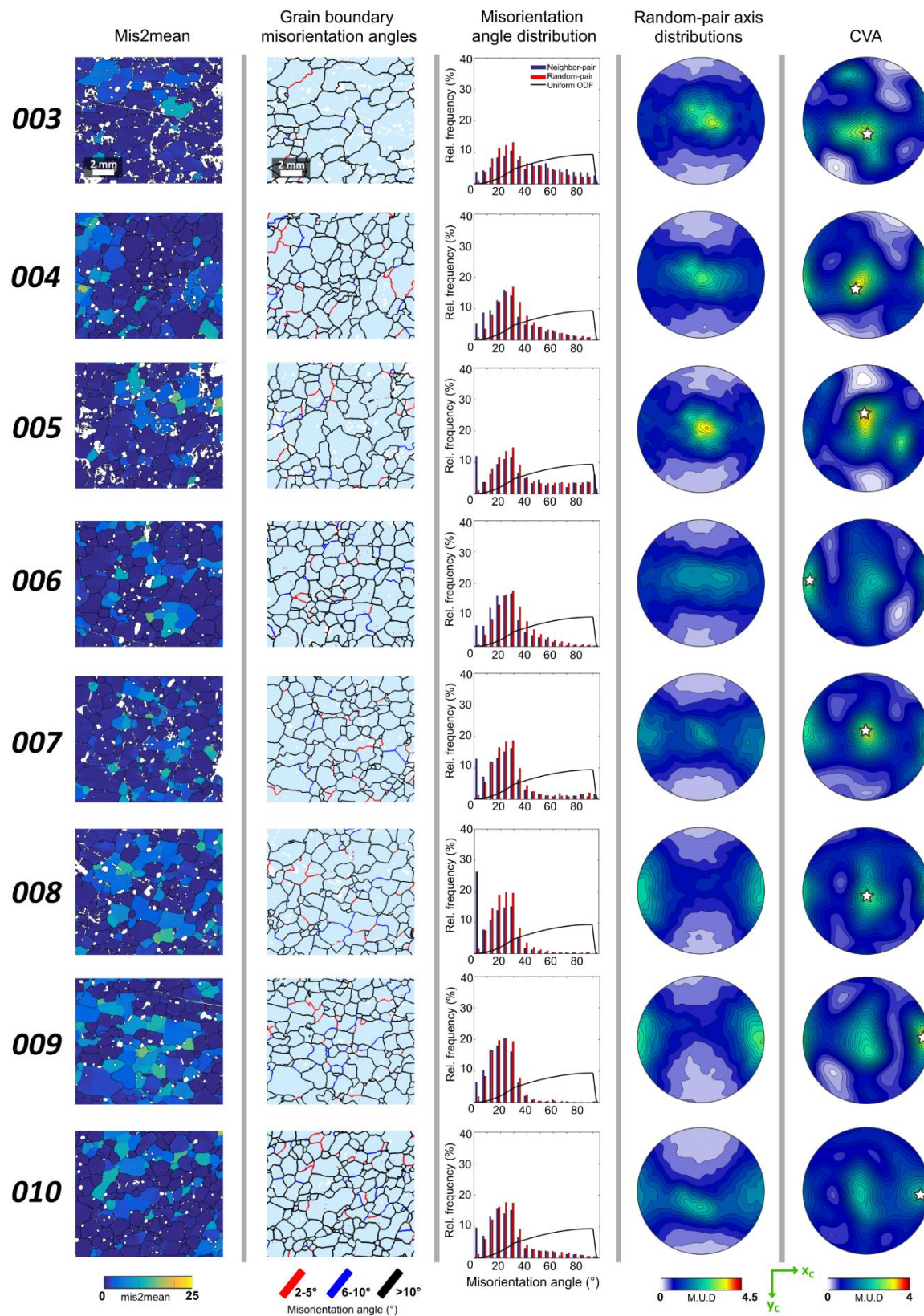




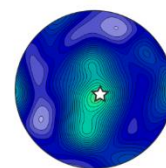
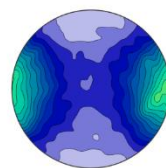
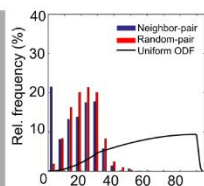
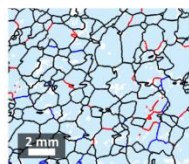
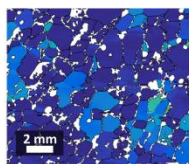




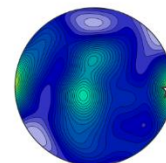
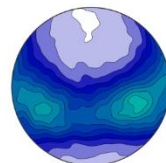
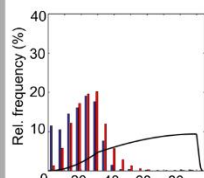
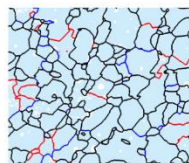
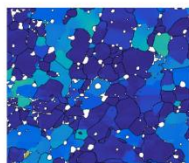
Supplementary Figure 3. Microstructural analysis of all Priestley Glacier samples (see section 4.3 for details).



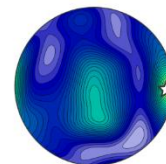
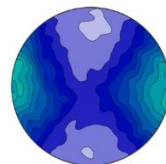
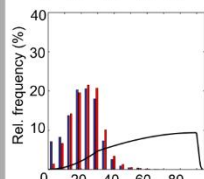
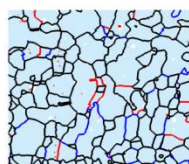
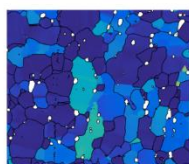
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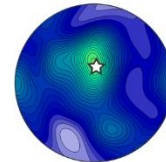
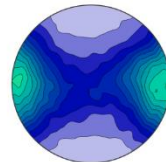
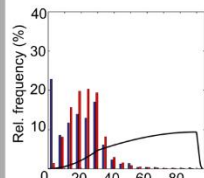
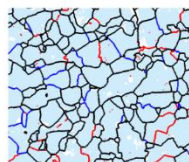
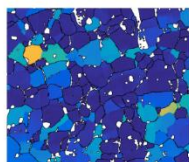
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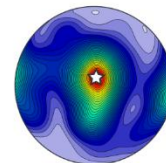
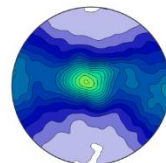
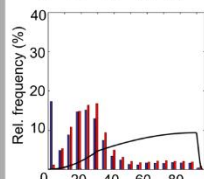
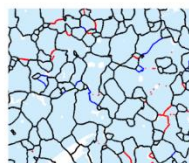
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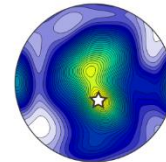
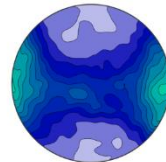
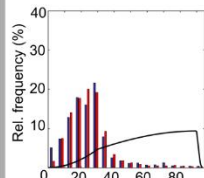
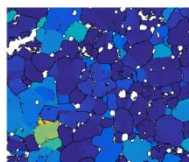
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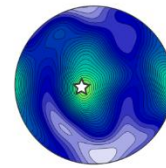
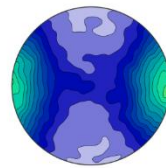
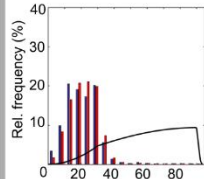
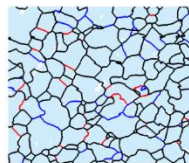
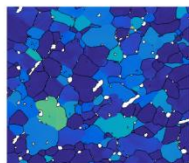
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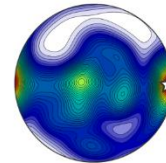
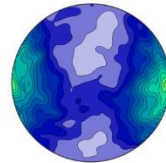
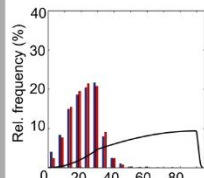
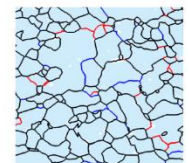
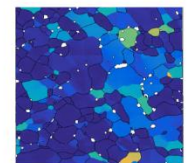
021



023



025



0 mis2mean 25

2-5° 6-10° >10°
Misorientation angle (°)

Misorientation angle (°)

0 M.U.D. 4.5
y_c x_c

0 M.U.D. 4

