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Supplement of

Temporal evolution of crack propagation propensity in snow in relation to slab and weak layer properties

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Supplement 1: Table with PTV and SMP-derived properties

Table S1: PTV- and SMP-derived properties (Figures 2-5)

All measurements performed during winter 2014-2015 in the study plot surrounding the automatic weather station WAN 7 (2442 m a.s.l.) located in the Steintälli field site above Davos, eastern Swiss Alps (46.808° N, 9.788° E).

date	Date of measurement
SMP#	SMP file number
Video#	Video file name (PST)
L_tot	Length of column of PST
sigma_obs	Load on weak layer, based on manual measurements of density and slab thickness
r_c^OBS	Critical cut length as observed in PST
E^PTV	Effective elastic modulus of slab derived from PTV analysis
w_f^PTV	Specific fracture energy of weak layer derived from PTV analysis
sigma^SMP	Load on weak layer derived from SMP signal analysis
E^SMP	Effective elastic modulus of slab derived from SMP signal analysis and FE modelling
E*_rho^SMP	Effective elastic modulus of slab derived from SMP signal analysis and FE modelling (layer moduli parameterized from density using relation by Scapozza (2004))
w_f^SMP	Specific fracture energy of weak layer derived from SMP signal analysis
S	Failure initiation criterion derived from SMP signal analysis and FE modelling
r_c^SMP	Crack propagation criterion derived from SMP signal analysis and FE modelling

date	SMP#	Video#	L_tot (m)	sigma^OBS (kPa)	r_c^OBS (cm)	E*^PTV (MPa)	w_f^PTV (J m-2)	sigma^SMP (kPa)	E*^SMP (Pa)	E*_rho_^SMP (Pa)	w_f^SMP (J m-2)	S	r_c^SMP (m)
6-Jan-15	112							1.57	4.39	8.077	0.99	725	0.59
6-Jan-15	113							1.43	4.75	6.772	0.52	447	0.42
6-Jan-15	114							1.26	4.67	5.502	0.48	512	0.41
6-Jan-15	115							1.17	3.43	6.686	0.47	309	0.44
6-Jan-15	118	DSCN7411	1.5	1.42	0.24	2.49	0.56	1.41	2.54	9.111	0.40	273	0.43
6-Jan-15	123	DSCN7412	1.5	1.42	0.25	2.79	0.49	1.29	2.35	8.081	0.30	228	0.38
6-Jan-15	119	DSCN7413	1.5	1.42	0.23			1.19	2.85	7.79	0.21	188	0.33
6-Jan-15	120	DSCN7414	1.5	1.42	0.29	3.02	0.58	1.28	2.24	14.088	1.07	305	0.70
6-Jan-15	120	DSCN7416	1.5	1.42	0.27	2.16	0.63	1.28	2.24	14.088	1.07	305	0.70
14-Jan-15	124							1.91	2.91	18.109	0.71	380	0.61
14-Jan-15	125							1.93	2.97	18.434	0.72	341	0.61
14-Jan-15	126							1.90	3.02	18.849	0.31	272	0.43
14-Jan-15	127	MVI_9122	2	1.49	0.33	5.60	0.47	0.99	2.21	9.074	0.34	147	0.44
14-Jan-15	129	MVI_9123	2	1.49	0.32	5.52	0.41	0.85	2.57	7.047	0.22	157	0.36
14-Jan-15	129	MVI_9126	2	1.49	0.33	4.97	0.49	0.85	2.57	7.047	0.22	157	0.36
14-Jan-15	130	MVI_9128	2	1.49	0.27	3.31	0.46	0.73	2.40	5.774	0.18	114	0.33
14-Jan-15	131	MVI_9130	2	1.49	0.32	2.85	0.71	0.68	2.50	5.685	0.27	111	0.39
21-Jan-15	44	MVI_9168	1.5					2.29	2.85	18.829	0.64	529	0.58
21-Jan-15	45	MVI_9170	1.7	1.94	0.31	4.57	0.76	2.36	2.87	20.971	1.01	492	0.74
21-Jan-15	43	MVI_9173	1.6	1.94	0.40	5.47		2.36	2.34	20.421	0.81	552	0.66
28-Jan-15	43							3.38	4.72	18.579	0.53	932	0.38
28-Jan-15	45							2.71	4.62	17.525	0.82	587	0.61
28-Jan-15	42	150128_STEI 052	1.8	2.20	0.19	6.25	0.26	2.84	5.06	21.093	0.66	813	0.58
28-Jan-15	44	150128_STEI 076	1.8	2.20	0.24	7.78	0.33	2.67	4.91	19.297	0.62	557	0.55
28-Jan-15	46	150128_STEI 078	1.8	2.20	0.20	3.97	0.49	2.59	4.58	16.618	0.56	499	0.49
3-Feb-15	9							3.37	4.25	23.164	0.53	825	0.46
3-Feb-15	10							3.30	4.41	25.631	0.88	1322	0.68
3-Feb-15	12							3.28	4.35	25.816	0.99	1177	0.73
3-Feb-15	15	MVI_9243	1.8	2.78	0.17	4.60	0.57	2.92	3.40	21.454	0.81	761	0.65
3-Feb-15	16	MVI_9251	1.8	2.78	0.38	4.97	1.44	2.73	2.58	15.635	0.53	493	0.45
3-Feb-15	19	MVI_9254	1.8	2.78		9.52	1.16	2.40	2.56	13.124	0.44	523	0.41
13-Feb-15	46							3.25	1.81	25.45	1.36	817	0.78
13-Feb-15	47							3.13	2.22	20.79	0.68	600	0.52
13-Feb-15	48	MVI_9333	2	2.94	0.32	5.79	0.94	2.60	2.21	16.281	0.60	567	0.49
13-Feb-15	49	MVI_9336	1.9	2.94	0.34	4.46	1.52	2.60	2.35	16.82	0.68	566	0.54
13-Feb-15	50	MVI_9338	2	2.94	0.31	2.38	2.38	2.88	2.34	19.649	0.87	671	0.61
13-Feb-15	51	MVI_9340	2	2.94	0.33	6.09	1.04	2.79	2.43	19.137	0.79	627	0.58
19-Feb-15	64							3.07	2.45	24.609	0.94	889	0.67
19-Feb-15	63							3.16	2.53	25.502	0.91	781	0.65
19-Feb-15	65							3.02	2.59	22.717	1.24	1020	0.74
19-Feb-15	57	MVI_9354	1.8					3.10	3.28	36.579	2.35	1298	1.13
19-Feb-15	58	MVI_9356	1.75					3.40	2.58	29.704	1.39	793	0.82
19-Feb-15	59	MVI_9357	1.75					3.33	2.45	28.47	1.05	786	0.72
19-Feb-15	60	MVI_9358	1.5					3.25	2.47	26.807	1.48	1077	0.83
19-Feb-15	61	MVI_9360	1.75					3.18	2.51	25.222	1.45	991	0.81
3-Mar-15	81							3.78	1.62	21.002	1.07	1004	0.62
3-Mar-15	83							3.96	1.62	23.256	1.49	1330	0.77
3-Mar-15	77	MVI_9493	2	3.90	0.47			3.82	1.77	21.888	1.54	1224	0.78
3-Mar-15	78	MVI_9506	2.1	3.90	0.54	8.12	2.71	3.47	1.90	17.734	1.36	980	0.70
3-Mar-15	79	MVI_9512	2.2	3.90	0.51	11.72	1.66	3.32	1.90	16.134	1.33	1118	0.69

Supplement 2: Eight detailed snow profiles observed during winter 2014-2015 in the study plot surrounding the automatic weather station WAN 7 (2442 m a.s.l.) located in the Steintälli field site above Davos, eastern Swiss Alps (46.808° N, 9.788° E).

Location: Davos - Strela - Steintälli (GR)

Observer: Schweizer / Reuter

Profilnr: 1

Snow water equivalent: 335.49 mm (HS: 115 cm)

Hasty Pit: No

Weather / Precipitation:

Remarks: Profil bei Wetterstation WAN7

Altitude: 2440 m

Exposition: flat / Slope: 0°

Coordinates: 779295 / 186730

Avg. density: 292 kg/m³

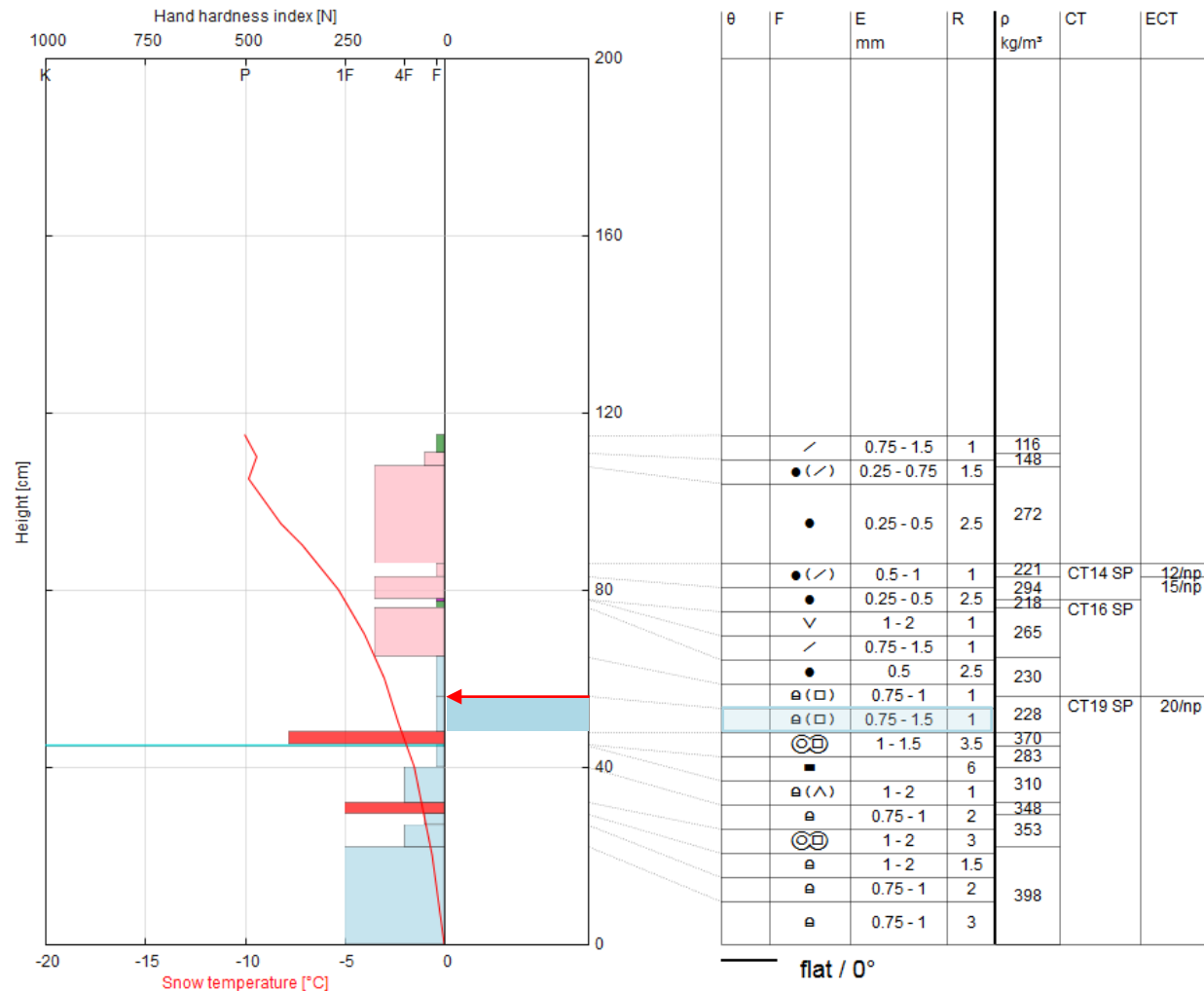
Date / Time: 2015-01-06 11:30

Air temp.: -3 °C

Cloudiness: CLR

Wind: W / 1 km/h

Avg. ram resistance:



Location: Davos - Steintälli - WAN7 (GR)

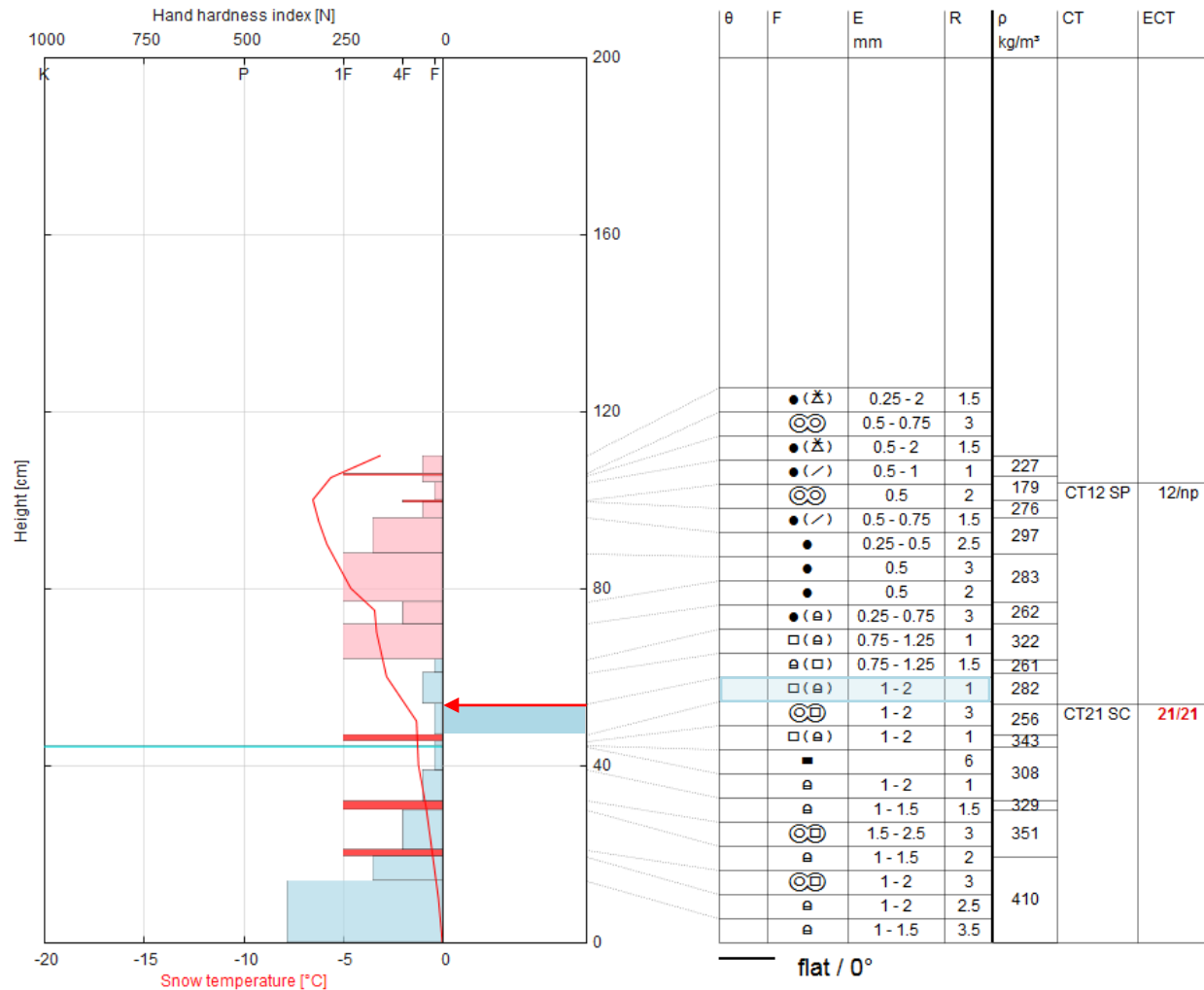
Observer: Schweizer / Zahner
 Profilenr: 2

Altitude: 2442 m
 Exposition: flat / Slope: 0°
 Coordinates: 779302 / 186726
 Avg. density: 310 kg/m³

Date / Time: 2015-01-14 10:30

Air temp.: -2 °C
 Cloudiness: BKN
 Wind: SW / 20 km/h
 Avg. ram resistance: 119 N

Snow water equivalent: 336.73 mm (HS: 110 cm)
 Hasty Pit: No
 Weather / Precipitation: kein
 Remarks:



Location: Davos - Steintälli - WAN7 (GR)

Observer: van Herwijnen

Profilnr: 1

Snow water equivalent:

Hasty Pit: No

Weather / Precipitation:

Remarks:

Altitude: 2442 m

Exposition: flat / Slope: 0°

Coordinates: 779302 / 186726

Avg. density: 292 kg/m³

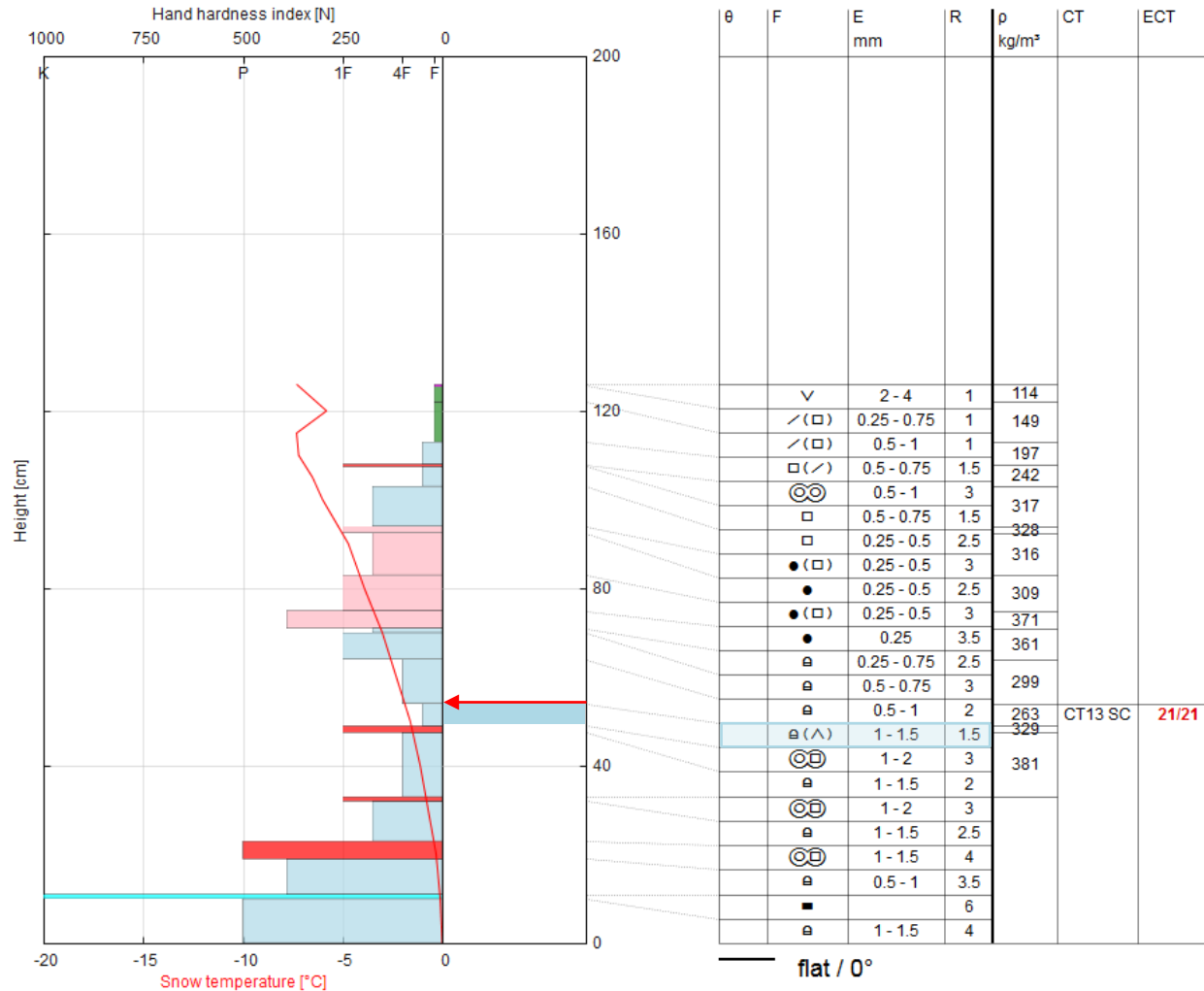
Date / Time: 2015-01-21 13:30

Air temp.: -5.5 °C

Cloudiness: FEW

Wind: SE / 15 km/h

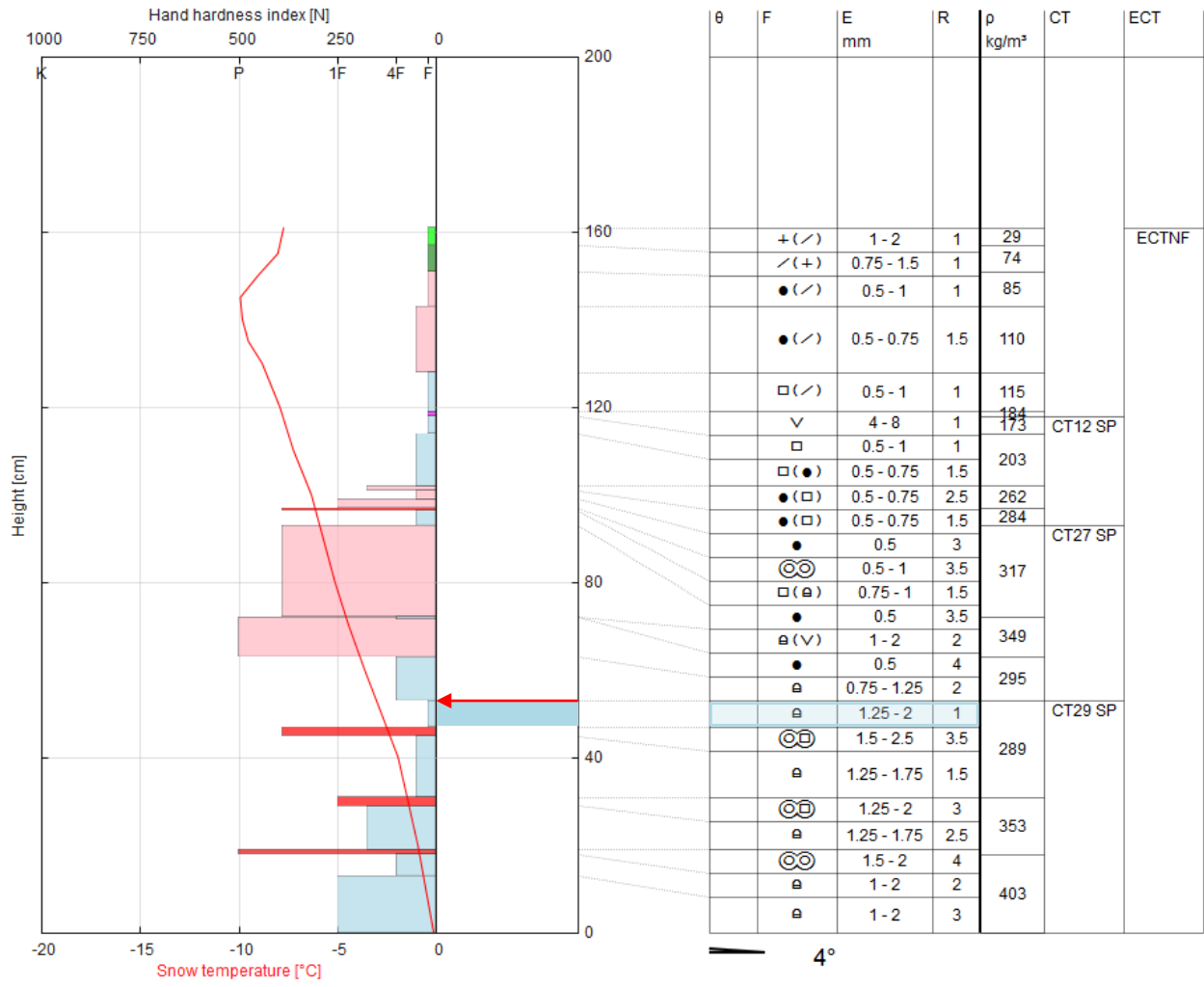
Avg. ram resistance:



Location: Davos - Strela - Steintälli (GR)
Observer: Schweizer / Zahner
Profilenr: 2
Snow water equivalent: 406.03 mm (HS: 161 cm)
Hasty Pit: No
Weather / Precipitation: leichter Schneefall
Remarks:

Altitude: 2442 m
Exposition: / Slope: 4°
Coordinates: 779302 / 186726
Avg. density: 252 kg/m³

Date / Time: 2015-01-28 11:00
Air temp.: -11.5 °C
Cloudiness: OVC
Wind:
Avg. ram resistance: 83 N



Location: Davos - Steintälli - WAN7 (GR)

Observer: Schweizer / Capelli

Profilenr: 3

Snow water equivalent:

Hasty Pit: No

Weather / Precipitation:

Remarks:

Altitude: 2442 m

Exposition: flat / Slope: 0°

Coordinates: 779302 / 186726

Avg. density: 249 kg/m³

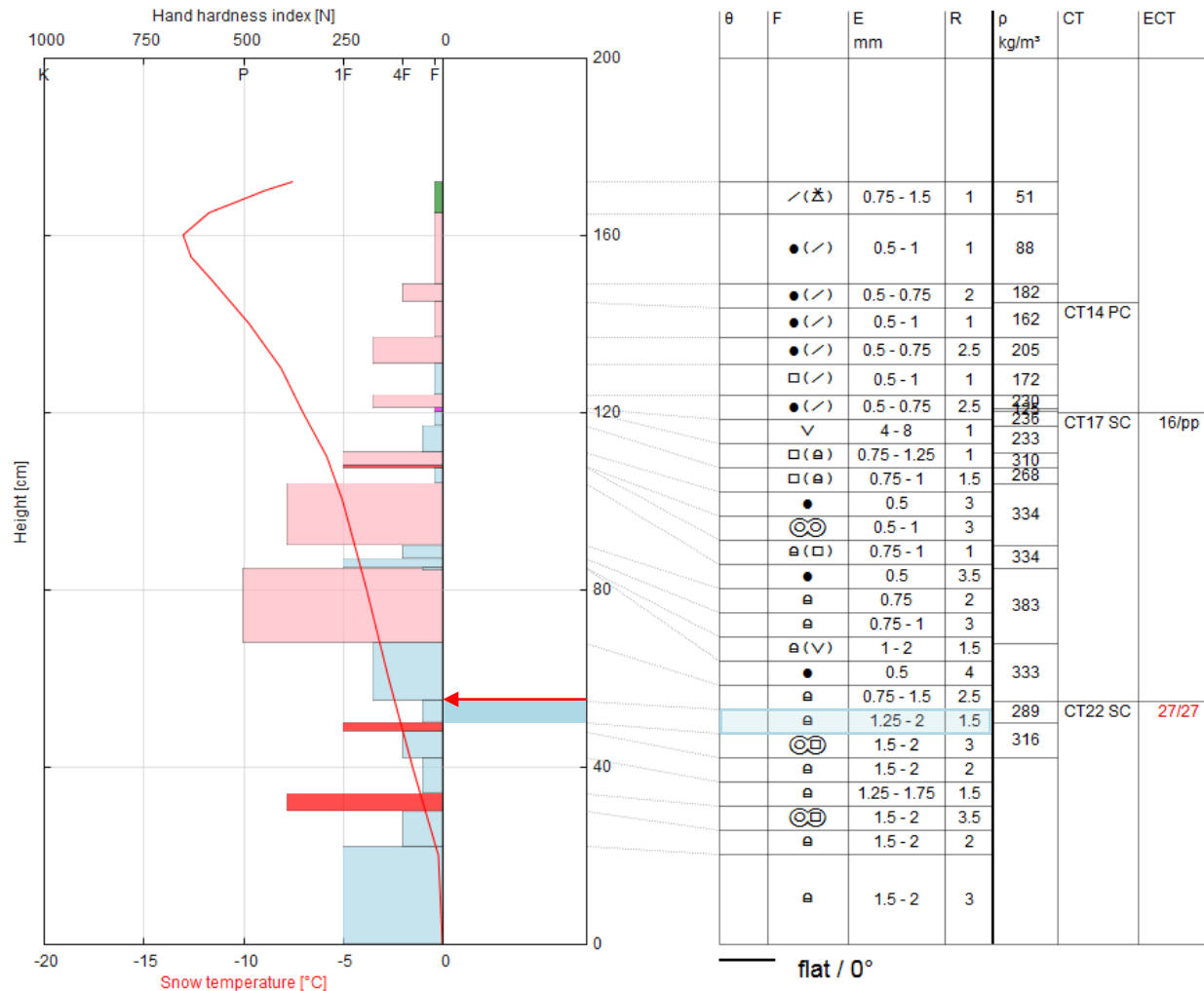
Date / Time: 2015-02-03 10:30

Air temp.: -10.5 °C

Cloudiness: OVC

Wind: S / 7 km/h

Avg. ram resistance:



Location: Davos - Strela - Steintälli (GR)

Observer: Schweizer / Zahner

Profilnr: 1

Snow water equivalent: 433.08 mm (HS: 139 cm)

Hasty Pit: No

Weather / Precipitation: sonnig

Remarks:

Altitude: 2442 m

Exposition: / Slope: 4°

Coordinates: 779306 / 186732

Avg. density: 312 kg/m³

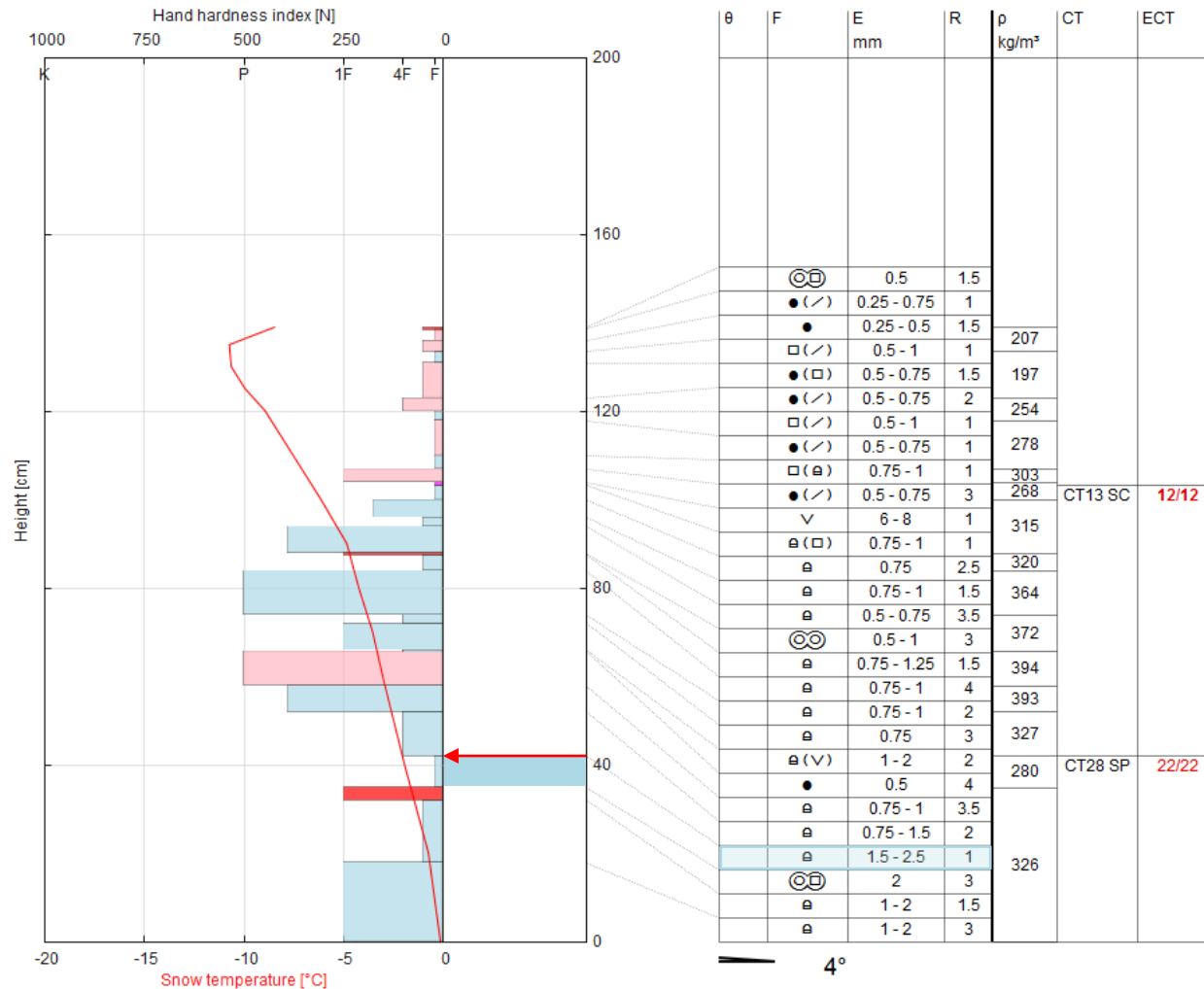
Date / Time: 2015-02-13 10:45

Air temp.: -3 °C

Cloudiness:

Wind:

Avg. ram resistance:



Location: Davos - Strela - Steintälli (GR)

Observer: Schweizer, Reuter

Profilenr: 1

Snow water equivalent:

Hasty Pit: No

Weather / Precipitation: sonnig

Remarks:

Altitude: 2442 m

Exposition: flat / Slope: 0°

Coordinates: 779303 / 186727

Avg. density: 277 kg/m³

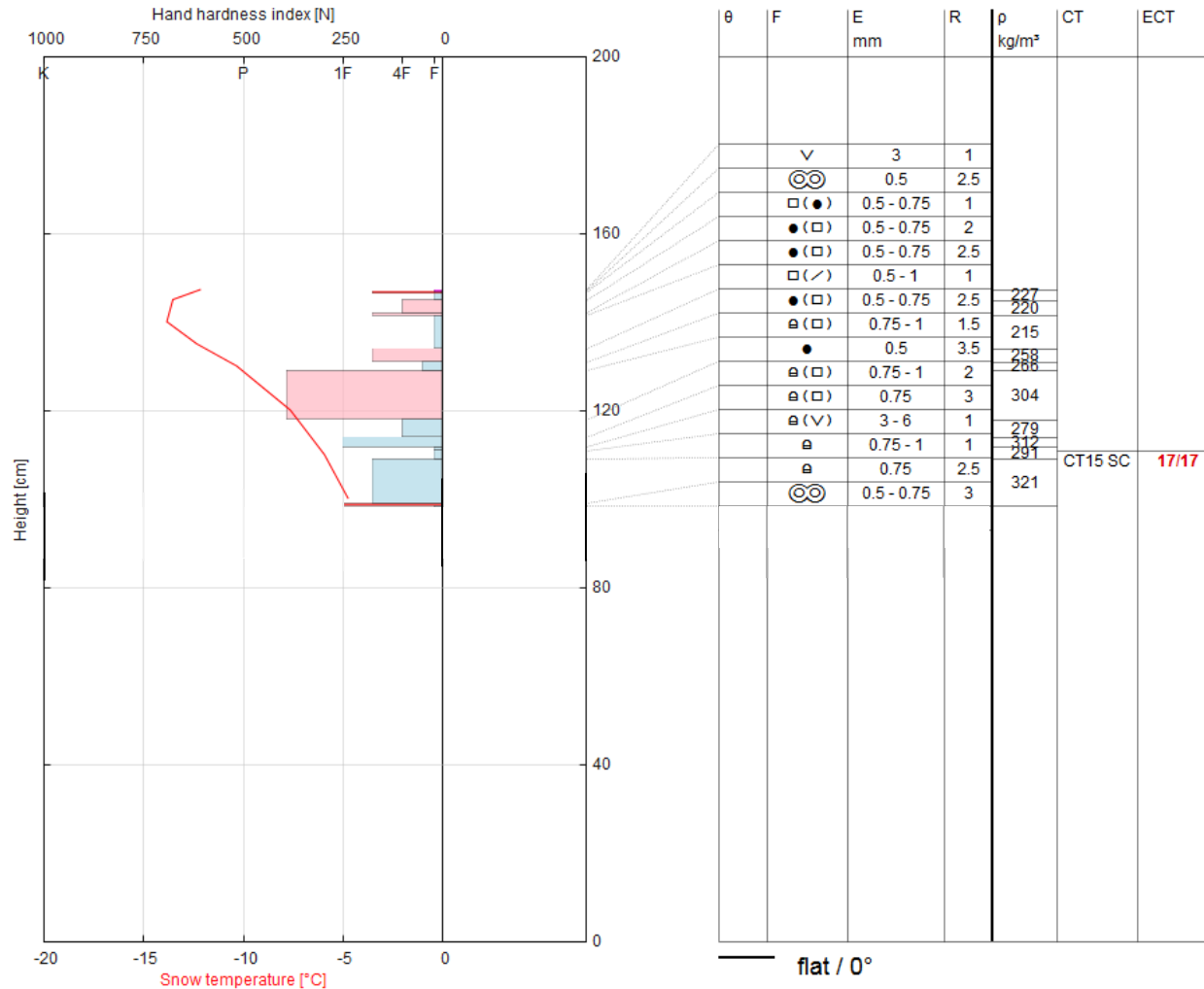
Date / Time: 2015-02-19 10:20

Air temp.: 1.6 °C

Cloudiness: FEW

Wind: NW / 1 km/h

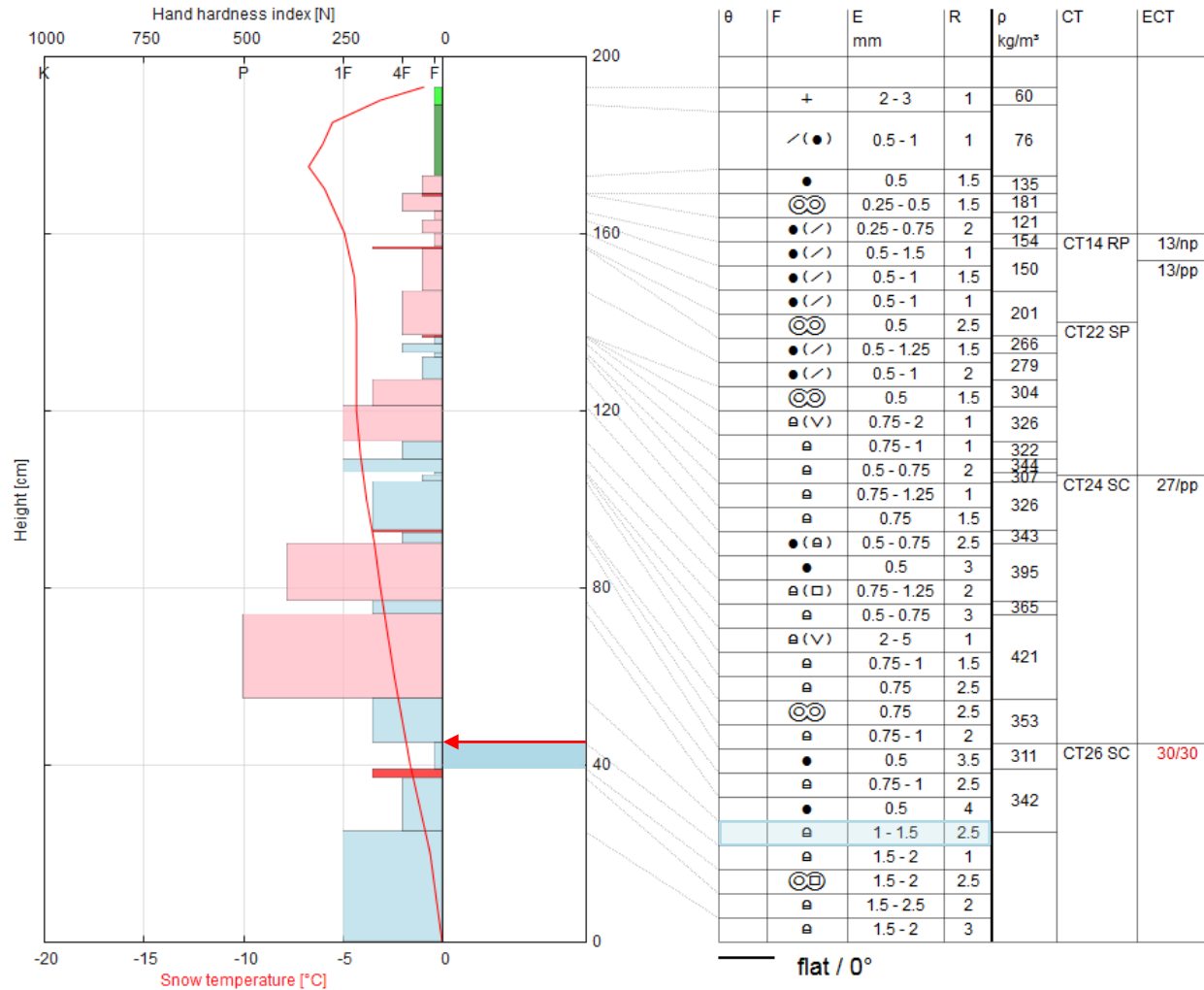
Avg. ram resistance:



Location: Davos - Strela - Steintälli (GR)
Observer: Schweizer, Reuter
Profilnr: 1
Snow water equivalent:
Hasty Pit: No
Weather / Precipitation:
Remarks: SMP Messungen: #81, #83, #82

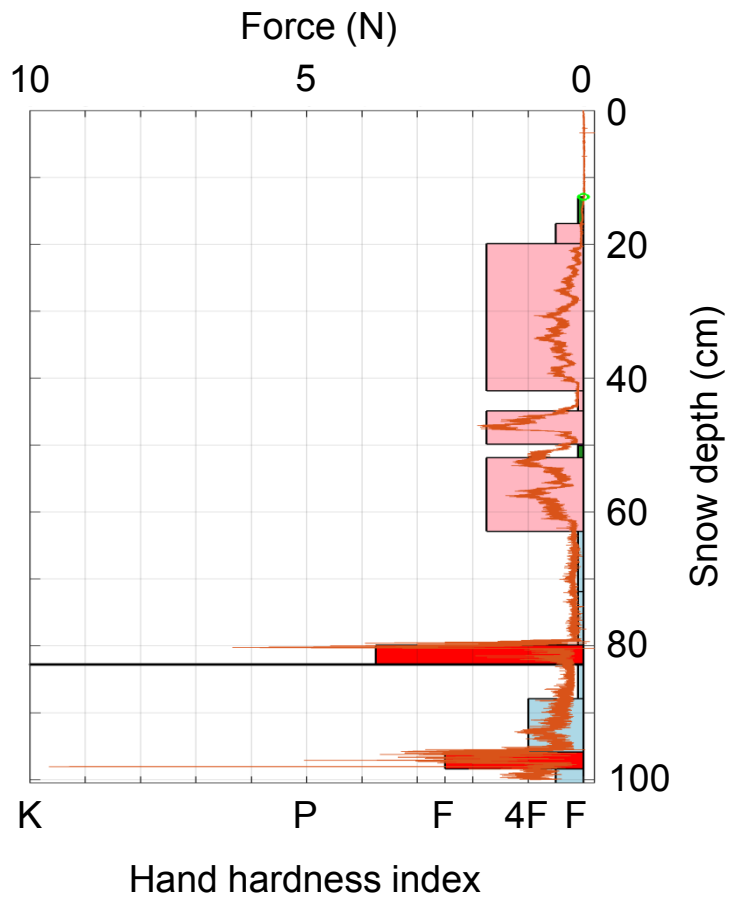
Altitude: 2442 m
Exposition: flat / Slope: 0°
Coordinates: 779311 / 186732
Avg. density: 276 kg/m³

Date / Time: 2015-03-03 10:40
Air temp.: -10 °C
Cloudiness: BKN
Wind: SW / 1 km/h
Avg. ram resistance:

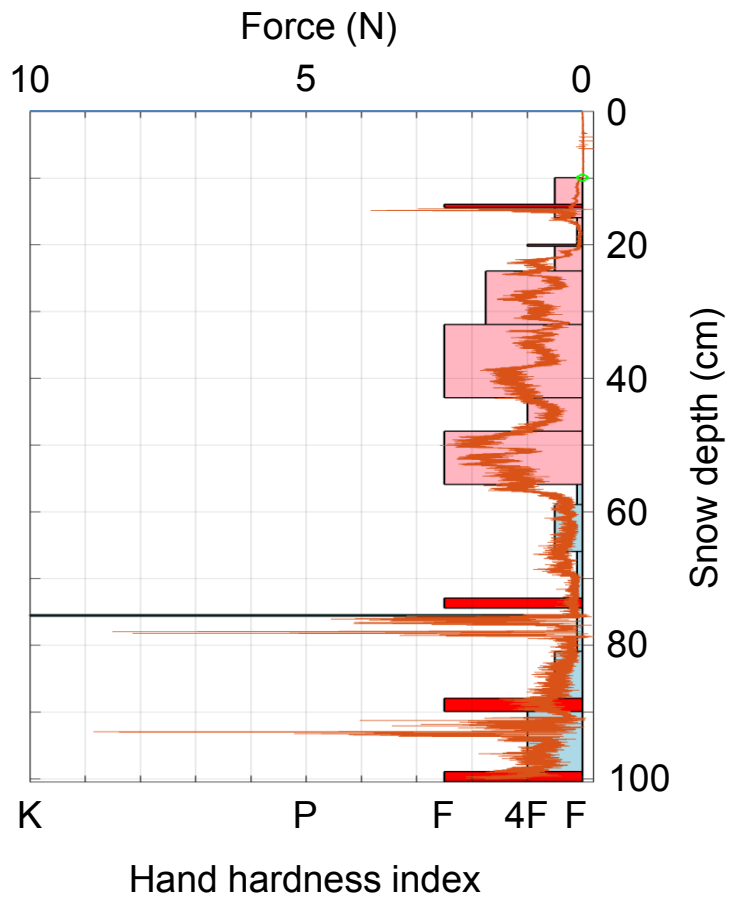


Supplement 3: Eight SMP profiles overlain on the simplified manually observed snow profile. SMP profiles were measured at the snow pit location. Same snow profiles as in Supplement 1.

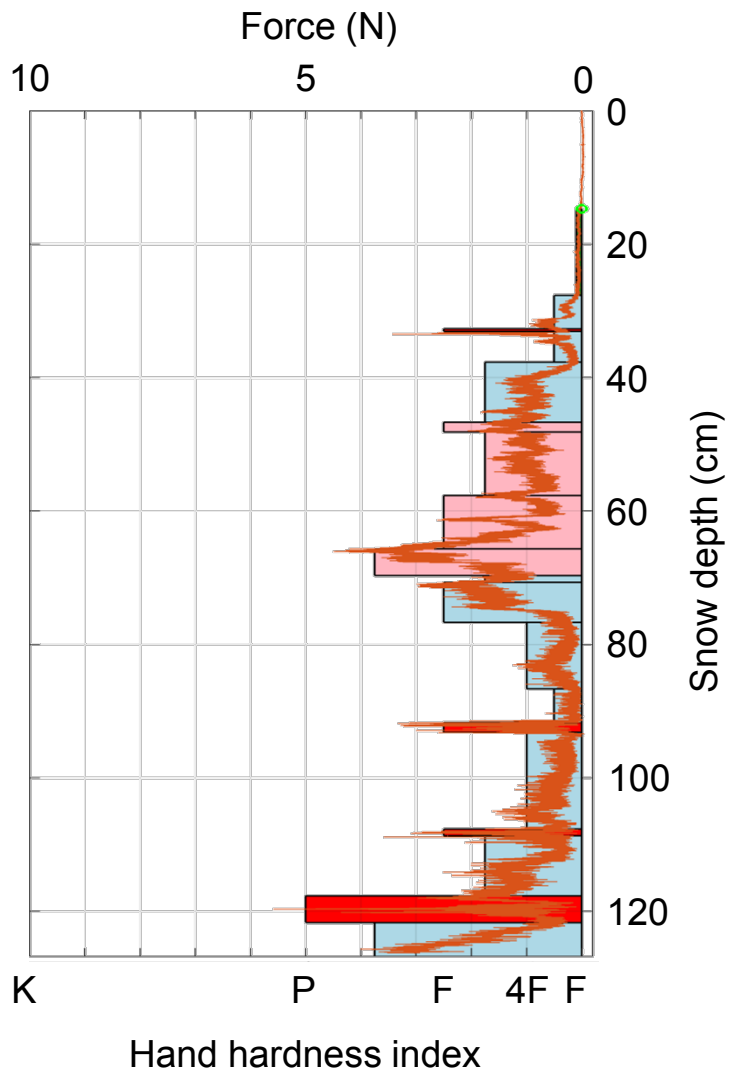
Davos - Steintälli - WAN7
6 January 2015, SMP #112



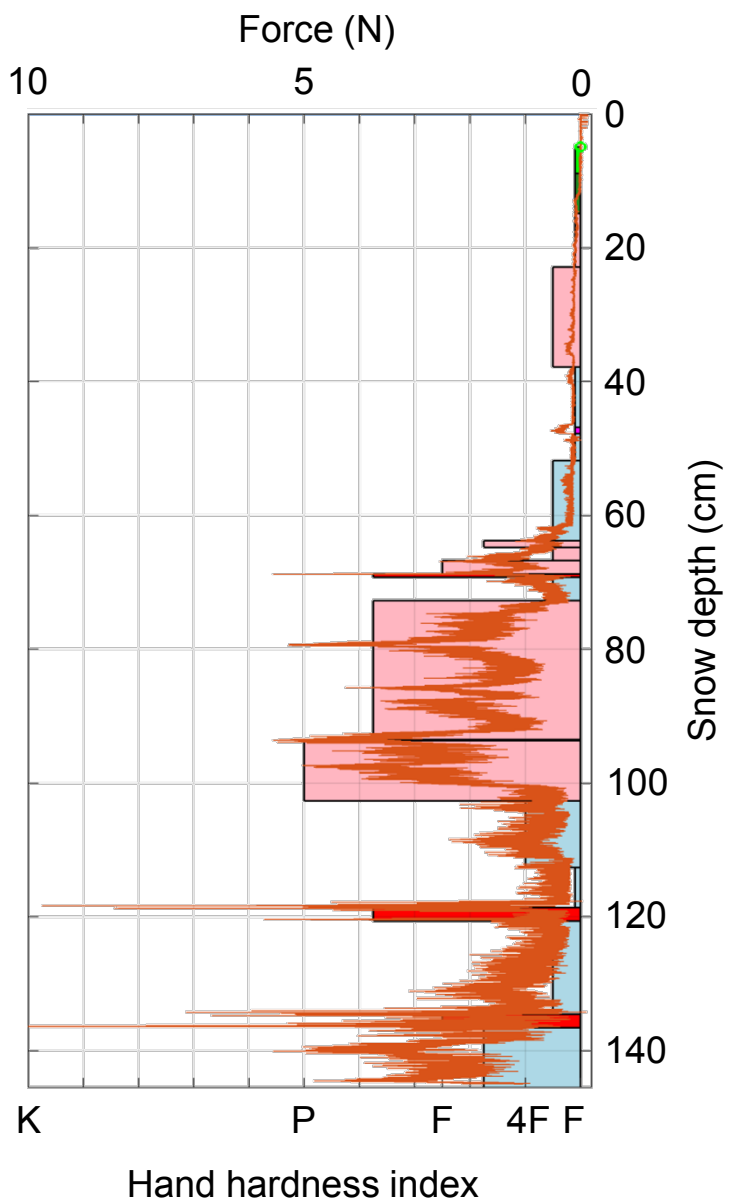
Davos - Steintälli - WAN7
14 January 2015, SMP #124



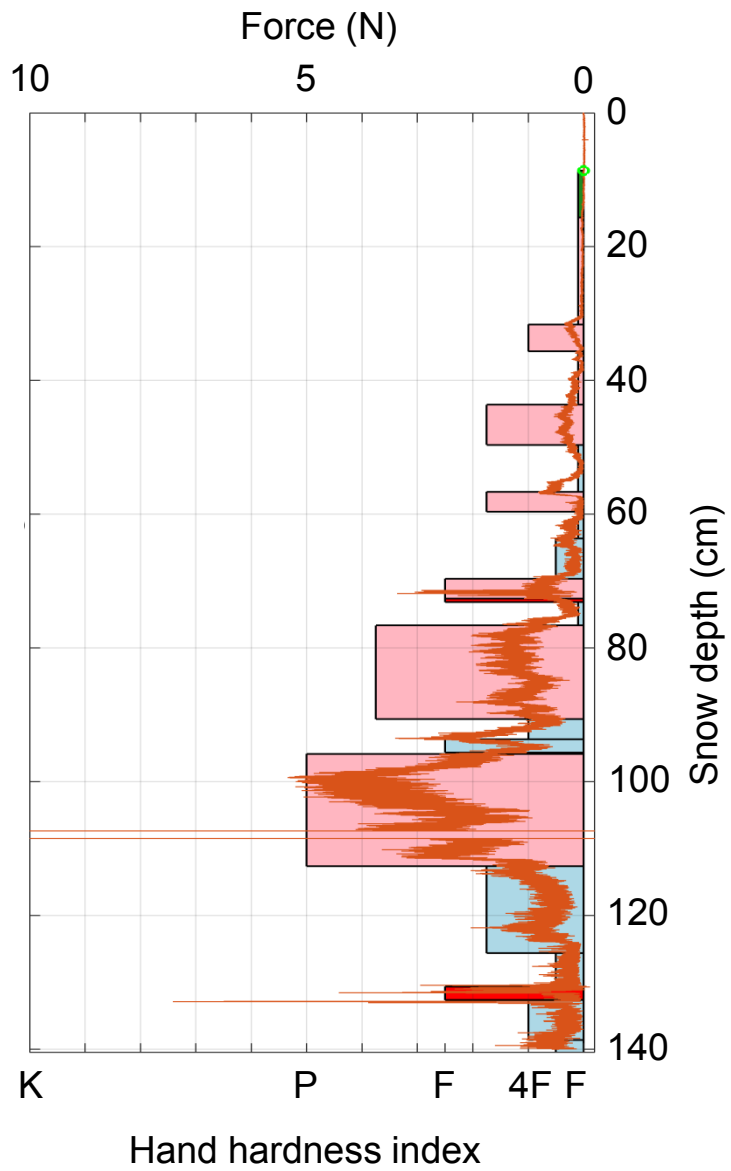
Davos - Steintälli - WAN7
21 January 2015, SMP #44



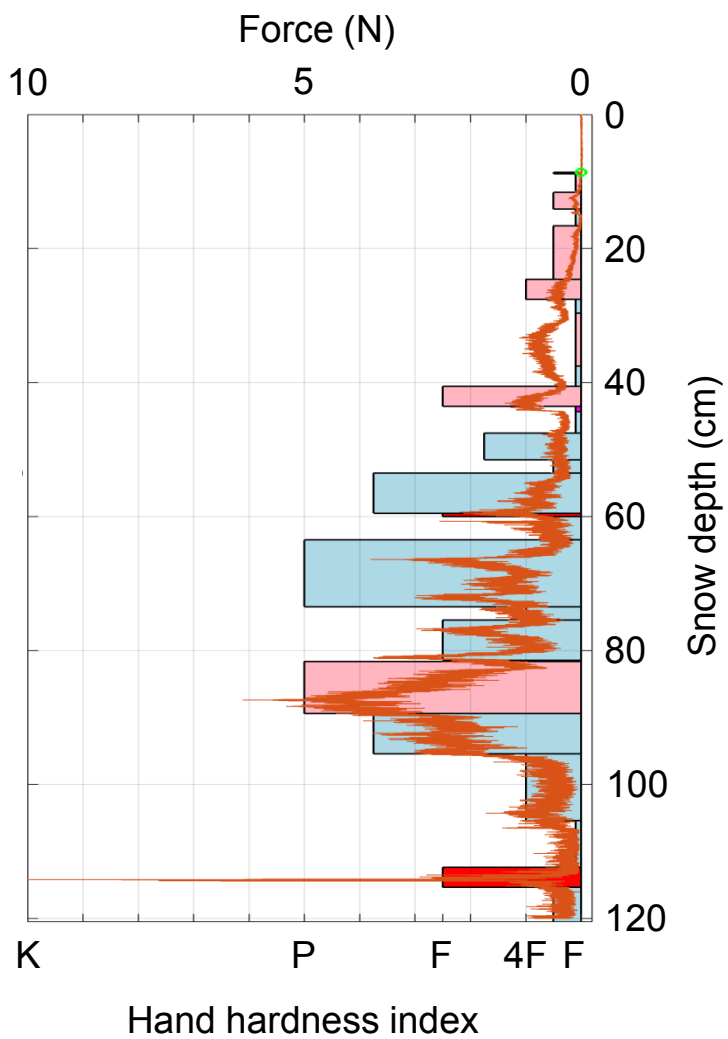
Davos - Steintälli - WAN7
28 January 2015, SMP #43



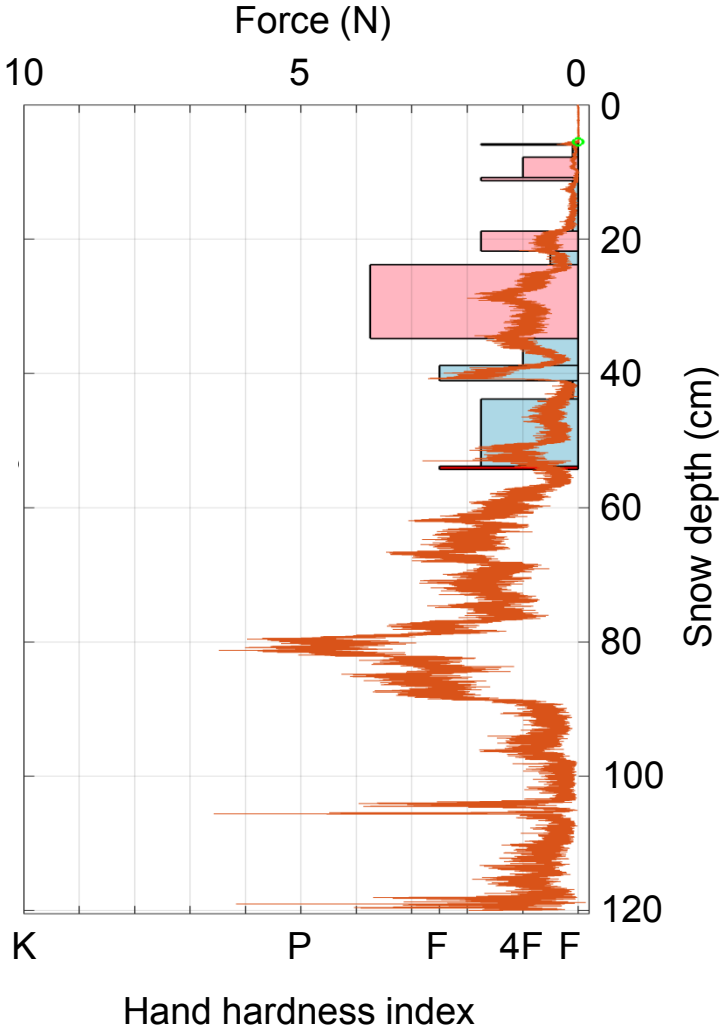
Davos - Steintälli - WAN7
3 February 2015, SMP #12



Davos - Steintälli - WAN7
13 February 2015, SMP #47



Davos - Steintälli - WAN7
19 February 2015, SMP #64



Davos - Steintälli - WAN7
3 March 2015, SMP #83

