Supplement of The Cryosphere, 12, 325–341, 2018
https://doi.org/10.5194/tc-12-325-2018-supplement

The Cryosphere Open Access EGU

Supplement of

Surface formation, preservation, and history of low-porosity crusts at the WAIS Divide site, West Antarctica

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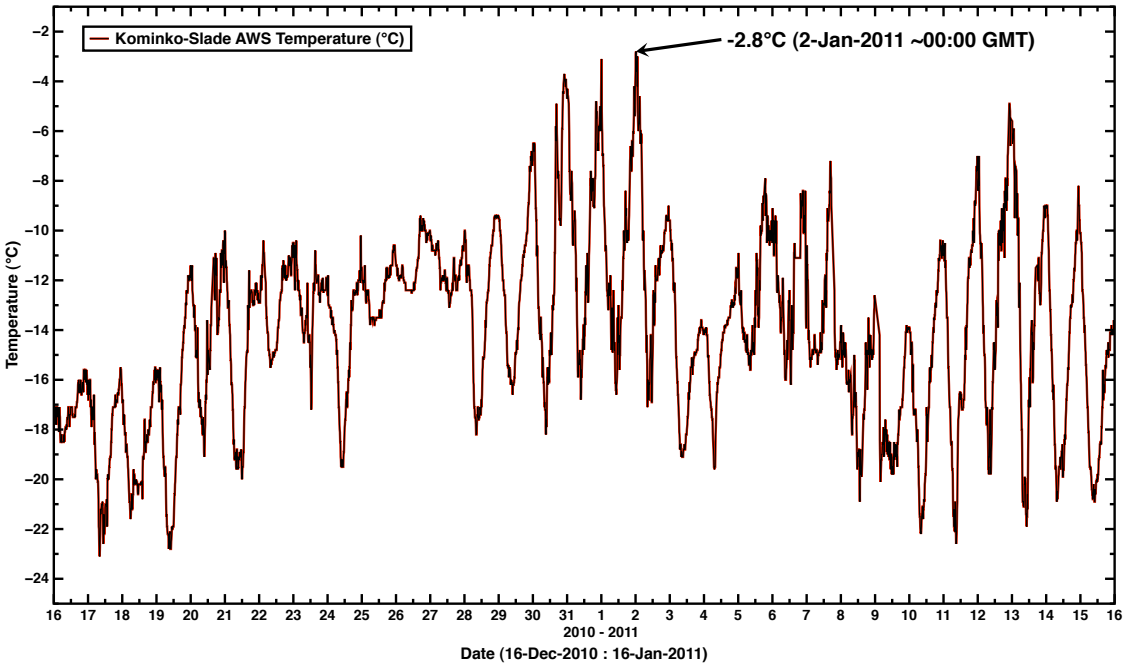

Figure S1: Automated weather station (Kominko-Slade) temperature data for WAIS Divide measured during the 2010-11 season. Temperature data are shown for the peak summertime period of Dec 16th – Jan 15. The peak of -2.8°C on Jan 2nd was the highest observed during our study interval (see also Fig. 6).

Figure S2: Photographs showing melt on disturbed, steep surfaces near the ice-core drilling facility during the 2-Jan-2011 extreme warm episode at WAIS Divide. Limited melting may have occurred beneath nearly horizontal, undisturbed surfaces away from the station.

Figure S3: A 5+ mm crust or refrozen melt layer in a shallow firn core drilled during the 2011-12 WAIS Divide field season. Based upon its depth below the surface (~91 cm) and known accumulation rates for the area, this crust developed during the peak of the previous summer season (2010-2011).

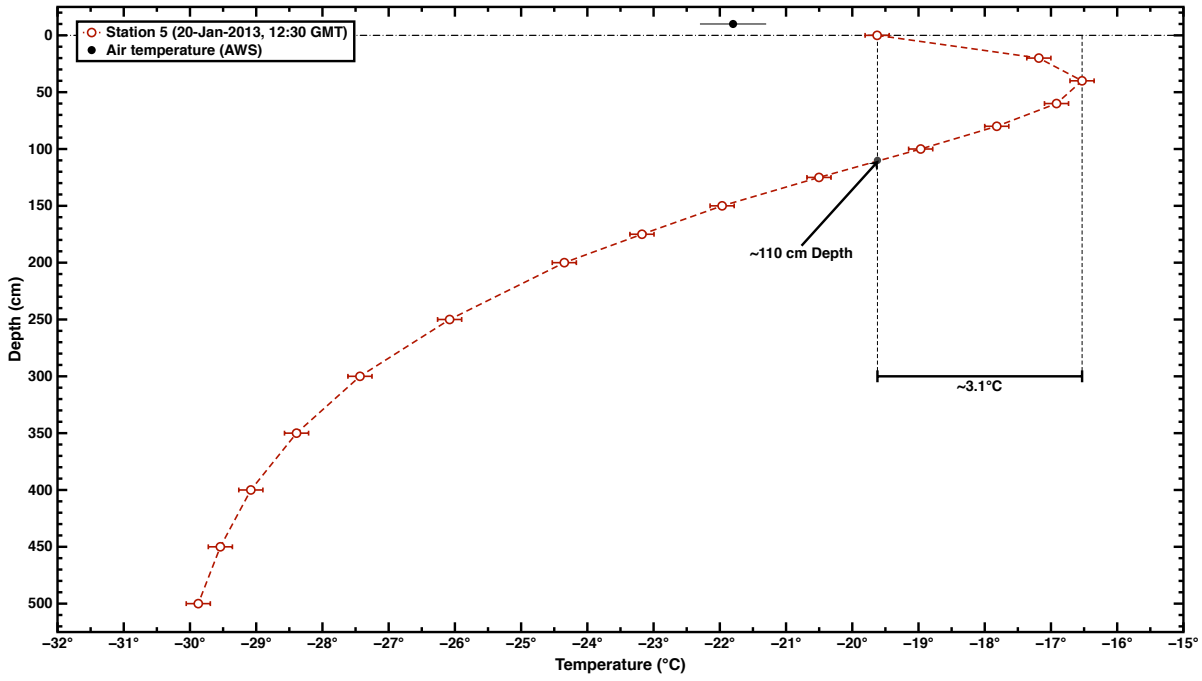

Figure S4: Firn-temperature data at station 5 at 12:30 GMT on 20-Jan-2013, when the largest subsurface temperature inversion was observed from the 2012-13 season (surface 3.1°C colder than the subsurface temperature maximum at 40 cm depth, with the surface approximately the same temperature as 110 cm). Air temperature recorded at the AWS (Kominko-Slade) was ~5°C colder than the subsurface temperature maximum.

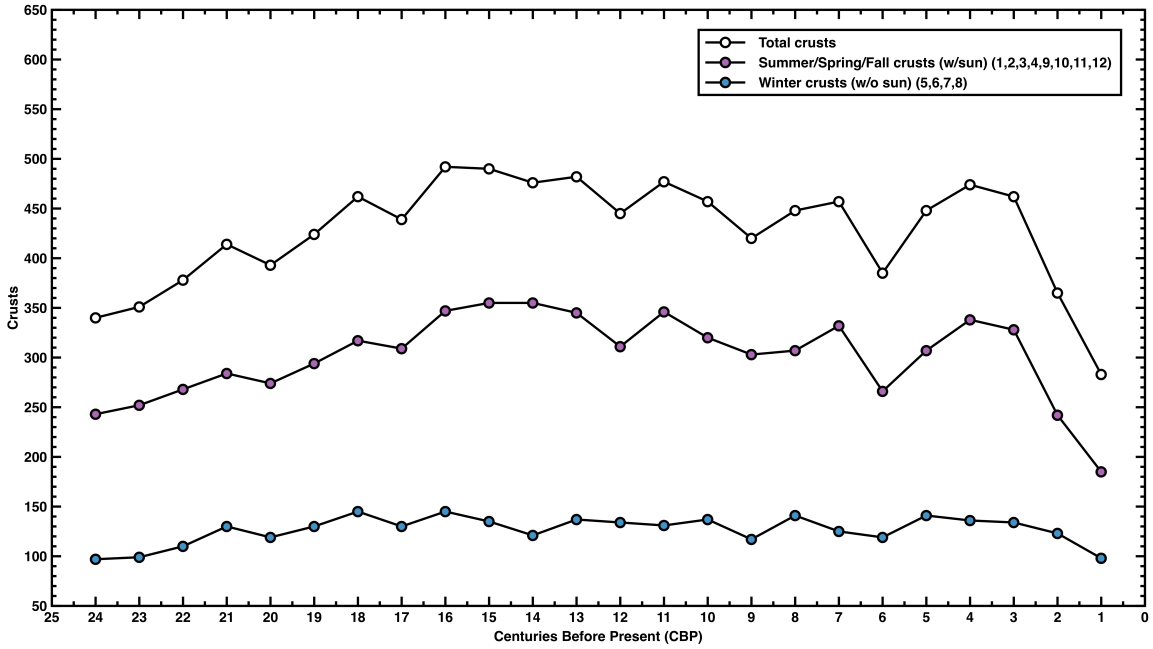

Figure S5: Crusts per century, for the 4-month "dark winter" (May-Aug), 8-month "summer/fall/spring" (Sep-Apr), and total. The larger changes in sunlight and total histories suggest a possible role for insolation. Crusts were bracketed 24 one-hundred-year bins starting with the most current year of 2007 (i.e. 2007-1907, 1907-1807, etc).

Figure S6: Faceted hoar growth on tent guylines that occurred during a heavy fog episode between Dec 30-31, 2009, at WAIS Divide (see also Fig. 5).

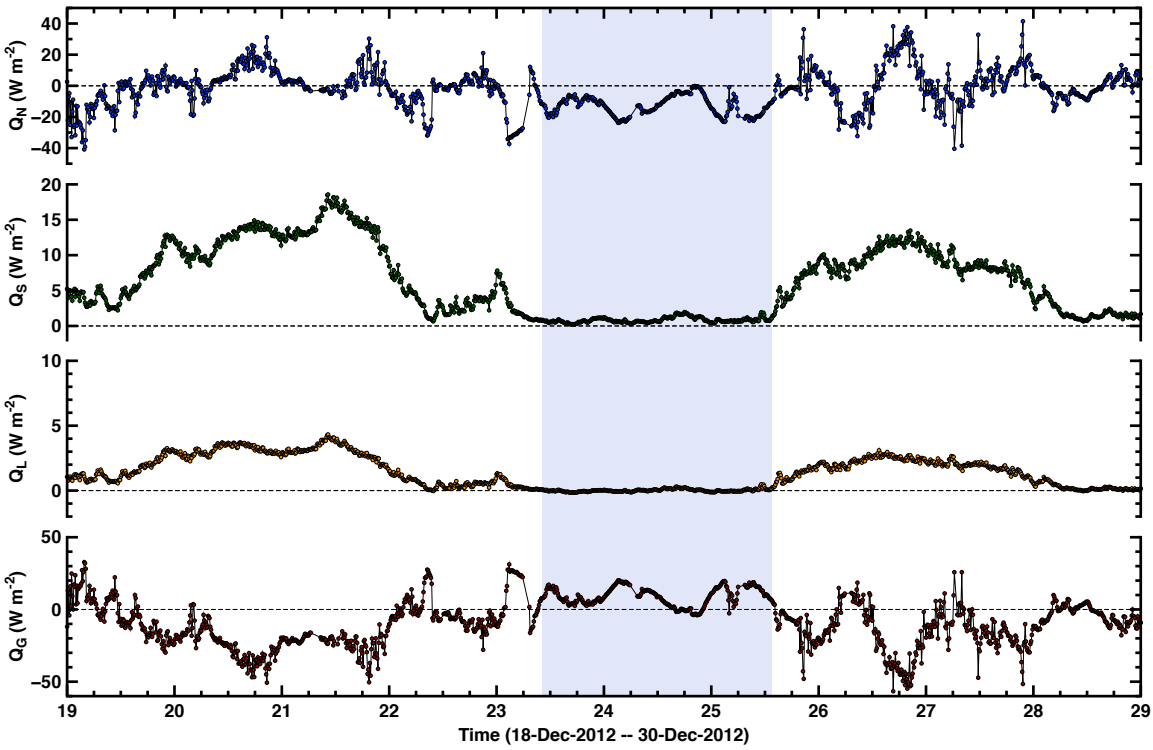

Figure S7: Surface energy budget over 10 days of the 2012-13 season. Shading highlights the ~48-hr period with episodes of glaze formation, polygonal cracking, and surface hoar formation (see also Figure 8). Total net radiation (Q_N), turbulent sensible heat flux (Q_S), turbulent latent heat flux (Q_L) and calculated ground heat flux (Q_G) are shown. Dashed lines in all plots indicate zero values. All dates and times are GMT (-12 WAIS local time).

Table S1: Kominko-Slade (AWS) published errors.

Sensor	Resolution	Accuracy
Temperature	0.125°C	± 0.3
Humidity	1.0%	± 5.0%
Wind Speed	0.20 m/s	± 0.5 m/s
Wind Direction	1.5 Degrees	± 3.0 Degrees

Table S2: PRD constants (RTD, HEL-700 Series).

Variable	1st Level	2nd Level
Alpha (α) ($°C^{-1}$)	0.00375 ± 0.000029	0.003850 ± 0.000010
Delta (δ) (°C)	1.605 ± 0.009	1.4999 ± 0.007
Beta (β) (°C)	0.16	0.10863
A ($°C^{-1}$)	3.81×10^{-3}	3.908×10^{-3}
B ($°C^{-2}$)	-6.02×10^{-7}	-5.775×10^{-7}
C ($°C^{-4}$)	-6.0×10^{-12}	-4.183×10^{-12}

Table S3: PRD string installation details and notes.

Station ID	Dist. from Station 1	Date Installed	Latitude	Longitude
Station 1 (Origin)	0 m	15-Dec-2012	-79.463894°	-112.110625°
Station 2	10 m	15-Dec-2012	-79.463804°	-112.110640°
Station 3	100 m	19-Dec-2012	-79.463004°	-112.111204°
Station 4	1000 m	22-Dec-2012	-79.455013°	-112.120247°
Station 5	2000 m	25-Dec-2012	-79.446509°	-112.137542°
Kominko-Slade AWS	-50 m	01-Dec-2008	-79.466000°	-112.106000°

HEL-700 PRD Functional Behavior and and Constants

Equation S1: $$R_T = R_0(1 + AT + BT^2 - 100CT^3 + CT^4)$$

Where,
R_T = Resistance (Ω) at Temperature T (°C)
R_0 = Resistance (Ω) at 0°C
T = Temperature in °C
$A = \alpha + \alpha\,\delta$
$B = -\alpha\,\delta$
$C_{T<0} = -\alpha\,\beta$