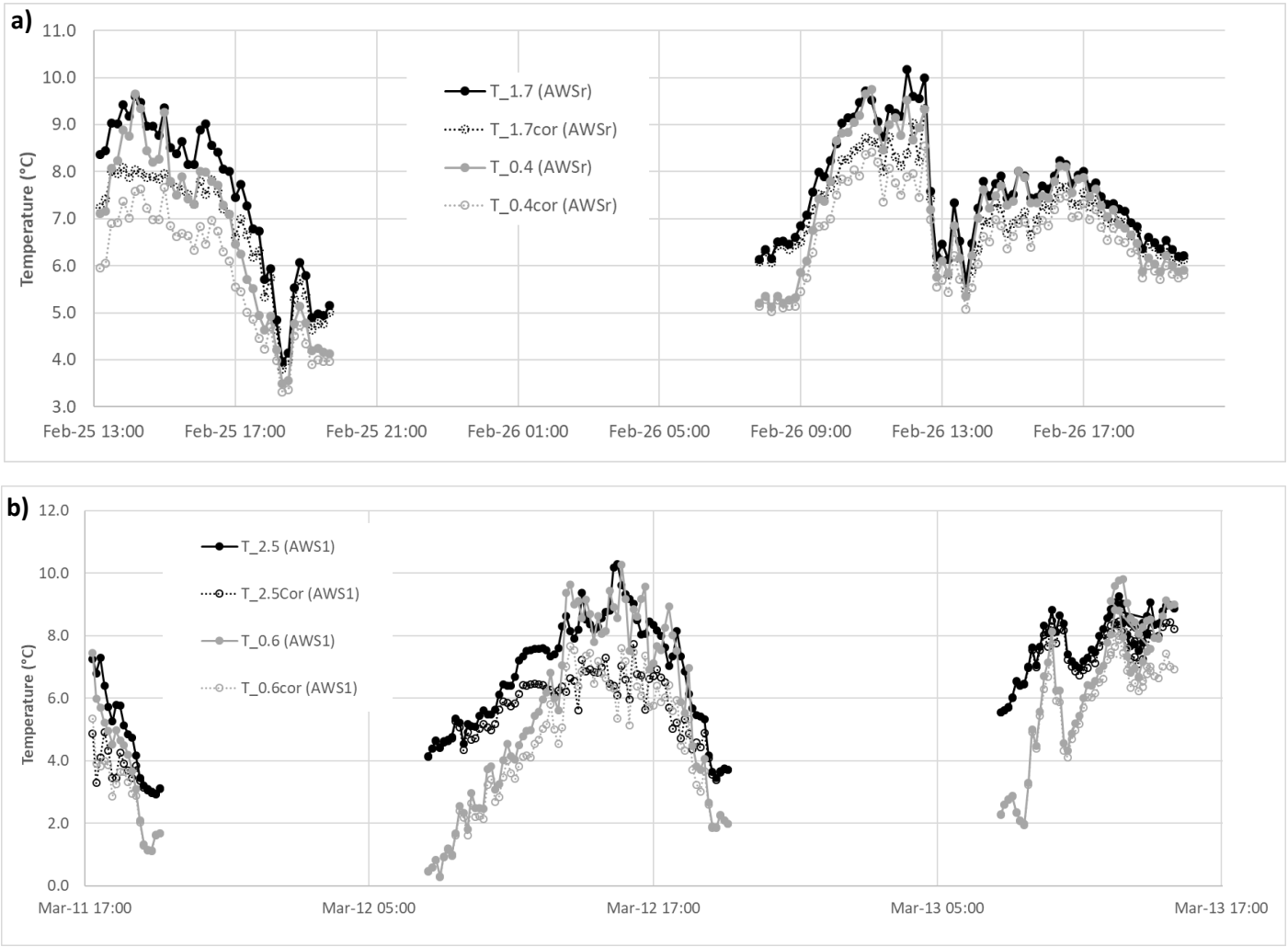
The following are supporting documents for Purdie and others 'Variability in the vertical temperature profile within crevasses at an alpine glacier'

Supplementary 1: Huwald et al (2009, Figure 8b) corrections applied to the unventilated AWS temperature sensors deployed on the Tasman Glacier snow surface in February 2020 (a) and March 2021 (b). Applying this formula to the 2020 data derives an average correction of 0.52°C at the 1.7 m sensor (maximum correction of 1.79 °C at midday on Feb 26), and average correction of 0.63°C at the 0.4 m sensor (maximum of 2.08°C at 10 am Feb 25). In 2021 the average correction calculated was 0.93°C at the 2.5 m sensor (maximum 4.20 °C at 15:30 on Mar 12) and average correction of 0.85°C at the 0.6m (maximum of 3.21°C at 15:30 on Mar 12). It is important to note that this correction is derived from different temperature sensors and radiation shields to what was used in our study, so it can only provide an estimate of what the impact of solar heating might be at this site. Although we can potentially apply this correction to the AWS data we cannot apply it to the in-crevasse data, and to correct one but not the other would only accentuate the differences between the air temperature recorded over the glacier surface and temperature recorded inside the crevasses. We acknowledge that the unventilated temperature sensors installed inside the crevasses will at times be subject to solar heating (as wind flow inside crevasses is lower than the glacier surface), any attempt to correct for this effect requires a number of assumptions (see section 3.1). Hence in the paper we report the data as collected on site.



Supplementary 2: Pearson's correlations coefficients for relationships between selected AWSr parameters and in-crevasse temperatures for the period of overlapping data (25/02/2020 13:10 -27/02/2020 10:20, n=272 10 minute observations).

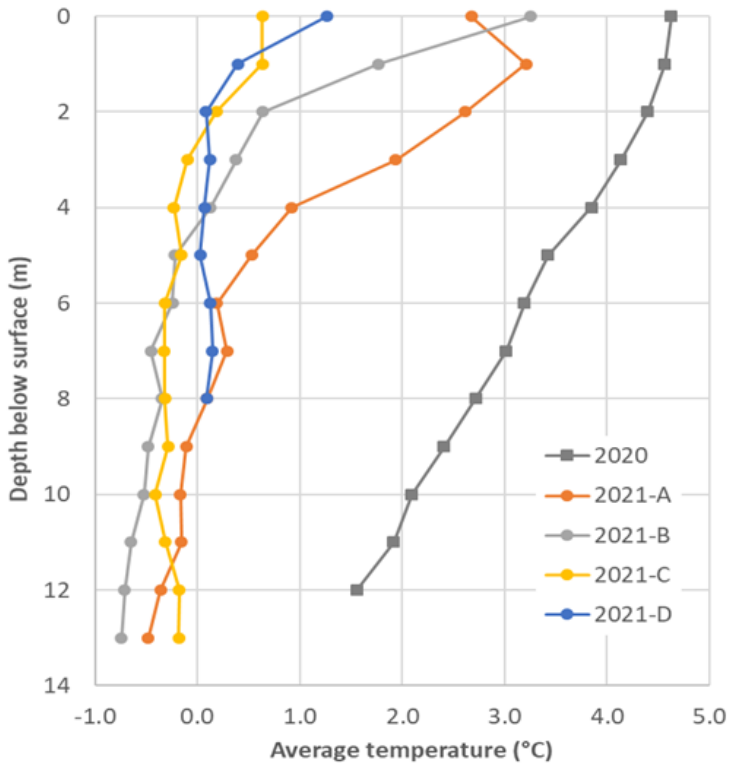
	T_1.7	*T_0.4*	*SW_net*	*LW_net*	*NetRad*	*ws_1.7*	*ws_.4*	*C_.5*	*C_1*	*C_2*	*C_3*	*C_4*	*C_5*	*C_6*	*C_7*	*C_8*	*C_9*	*C_10*	*C_11*	*C_12*
T_1.7	1																			
T_0.4	.977**	1.00																		
SW_net	.715**	.765**	1.00																	
LW_net	-.577**	-.573**	-.522**	1.00																
NetRad	.686**	.739**	.994**	-.428**	1.00															
ws_1.7	-.599**	-.496**	-.379**	.334**	-.360**	1.00														
ws_.4	-.595**	-.500**	-.404**	.266**	-.395**	.977**	1.00													
C_.5	.871**	.892**	.826**	-.576**	.803**	-.432**	-.435**	1.00												
C_1	.869**	.892**	.831**	-.574**	.809**	-.419**	-.421**	.997**	1.00											
C_2	.855**	.877**	.824**	-.573**	.802**	-.395**	-.392**	.983**	.988**	1.00										
C_3	.824**	.849**	.764**	-.551**	.741**	-.348**	-.344**	.939**	.942**	.972**	1.00									
C_4	.771**	.803**	.677**	-.519**	.652**	-.264**	-.256**	.860**	.868**	.905**	.969**	1.00								
C_5	.658**	.700**	.506**	-.437**	.481**	-.127*	-.111	.736**	.745**	.788**	.871**	.942**	1.00							
C_6	.546**	.593**	.400**	-.376**	.377**	-.009	.014	.644**	.654**	.706**	.793**	.873**	.979**	1.00						
C_7	.458**	.515**	.361**	-.337**	.341**	.097	.124*	.592**	.603**	.661**	.742**	.819**	.939**	.984**	1.00					
C_8	.366**	.421**	.306**	-.303**	.286**	.163**	.193**	.556**	.561**	.618**	.692**	.752**	.875**	.939**	.978**	1.00				
C_9	.313**	.369**	.274**	-.286**	.255**	.197**	.225**	.532**	.533**	.588**	.654**	.702**	.817**	.889**	.940**	.989**	1.00			
C_10	.240**	.299**	.211**	-.251**	.192**	.267**	.299**	.477**	.477**	.528**	.584**	.629**	.752**	.836**	.901**	.966**	.991**	1.00		
C_11	.202**	.254**	.188**	-.243**	.169**	.270**	.303**	.455**	.451**	.498**	.548**	.581**	.697**	.784**	.853**	.935**	.972**	.988**	1.00	
C_12	.152*	.187**	.155*	-.221**	.137*	.245**	.278**	.416**	.405**	.447**	.484**	.491**	.594**	.682**	.756**	.859**	.910**	.935**	.973**	1.00

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Supplementary 3: Average temperature statistics during each study period for all AWS and crevasse samplers. AWS numbers are for the upper/lower sensors respectively. Statistics and line graph below for the crevasse samplers are the average, maximum, and minimum at each depth recorded during the whole field season, so represent the average vertical temperature structure of each crevasse.

Automatic weather station	n (10 min)	Mean	Maximum	Minimum
AWSs 2020	421	5.88/4.67	9.74/8.24	0.11/0.12
AWSr 2020	396	5.96/5.23	10.17/9.17	0.28/0.24
AWS1 2021	270	5.88/3.70	10.29/10.27	1.85/-0.41
AWS2 2021	287	6.16/4.39	10.80/11.06	2.09/-0.62
Crevasse sampler				
2020	9720	3.15	12.64	-0.08
A 2021	3934	0.80	21.66	-2.68
B 2021	3504	0.27	14.66	-3.31
C 2021	3504	-0.08	5.67	-3.31
D 2021	1570	0.24	4.20	-0.07



Supplementary 4: Pearson's correlations coefficients for relationships between selected AWS1 parameters and in-crevasse (A) temperatures for the period of overlapping data (11/03/2021 17:10 -13/03/2021 14:00 n=270 10 minute observations).

	T_2.5	*T_0.6*	*SW_net*	*LW_net*	*NetRad*	*ws_2.5*	*ws_0.6*	*A0*	*A1*	*A2*	*A3*	*A4*	*A5*	*A6*	*A7*	*A8*	*A9*	*A10*	*A11*	*A12*	A13
T_2.5	1.00																				
T_0.6	.890**	1.00																			
SW_net	.723**	.721**	1.00																		
LW_net	-.711**	-.828**	-.762**	1.00																	
NetRad	.703**	.687**	.997**	-.711**	1.00																
ws_2.5	.212**	.023	.294**	.111	.332**	1.00															
ws_0.6	.022	-.222**	.085	.364**	.135*	.928**	1.00														
A0	.755**	.907**	.627**	-.917**	.572**	-.143*	-.385**	1.00													
A1	.576**	.752**	.315**	-.791**	.248**	-.294**	-.502**	.916**	1.00												
A2	.608**	.772**	.341**	-.792**	.279**	-.263**	-.483**	.889**	.957**	1.00											
A3	.622**	.773**	.369**	-.768**	.312**	-.210**	-.431**	.845**	.889**	.966**	1.00										
A4	.685**	.840**	.465**	-.800**	.413**	-.130*	-.367**	.886**	.879**	.938**	.970**	1.00									
A5	.733**	.901**	.556**	-.845**	.505**	-.077	-.325**	.940**	.891**	.919**	.925**	.965**	1.00								
A6	.729**	.896**	.539**	-.846**	.487**	-.125*	-.366**	.945**	.897**	.914**	.913**	.952**	.991**	1.00							
A7	.740**	.903**	.558**	-.844**	.508**	-.089	-.335**	.943**	.890**	.910**	.911**	.954**	.995**	.998**	1.00						
A8	.707**	.877**	.491**	-.821**	.438**	-.159**	-.389**	.930**	.901**	.916**	.914**	.950**	.983**	.996**	.991**	1.00					
A9	.687**	.858**	.458**	-.790**	.405**	-.160**	-.381**	.907**	.886**	.898**	.896**	.934**	.971**	.987**	.981**	.996**	1.00				
A10	.673**	.851**	.447**	-.774**	.394**	-.153*	-.370**	.902**	.873**	.882**	.879**	.924**	.964**	.982**	.974**	.991**	.997**	1.00			
A11	.657**	.839**	.433**	-.751**	.382**	-.141*	-.353**	.887**	.855**	.859**	.855**	.906**	.952**	.971**	.964**	.982**	.991**	.998**	1.00		
A12	.576**	.771**	.388**	-.684**	.340**	-.130*	-.326**	.822**	.782**	.775**	.768**	.832**	.898**	.921**	.913**	.936**	.958**	.969**	.981**	1.00	
A13	.170**	.419**	.120*	-.437**	.079	-.240**	-.352**	.510**	.516**	.497**	.481**	.530**	.596**	.619**	.602**	.636**	.670**	.690**	.715**	.797**	1.00

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Supplementary 5: Pearson's correlations coefficients for relationships between AWS2 parameters and in-crevasse (B) temperatures for the period of overlapping data (11/03/2021 15:20 -13/03/2021 15:00 n=287 10 minute observations).

	T_2.5	*T_0.6*	*SW_net*	*LW_net*	*NetRad*	*ws_2.5*	*ws_0.6*	*B0*	*B1*	*B2*	*B3*	*B4*	*B5*	*B6*	*B7*	*B8*	*B9*	*B10*
T2.5R	1.00																	
T0.6R	.880**	1.00																
SW_net	.749**	.813**	1.00															
LW_net	-.555**	-.816**	-.730**	1.00														
NetRad	.748**	.799**	.999**	-.701**	1.00													
ws2.5R	.285**	.085	.285**	.032	.300**	1.00												
ws0.6R	.288**	.143*	.256**	-.039	.265**	.844**	1.00											
B0	.803**	.964**	.815**	-.867**	.798**	.002	.071	1.00										
B1	.763**	.913**	.637**	-.807**	.615**	-.016	.091	.938**	1.00									
B2	.819**	.918**	.711**	-.769**	.696**	.178**	.213**	.916**	.936**	1.00								
B3	.792**	.877**	.673**	-.726**	.659**	.247**	.248**	.861**	.893**	.986**	1.00							
B4	.758**	.813**	.656**	-.656**	.645**	.355**	.305**	.781**	.805**	.944**	.982**	1.00						
B5	.696**	.732**	.626**	-.594**	.618**	.433**	.354**	.691**	.708**	.883**	.939**	.986**	1.00					
B6	.658**	.692**	.596**	-.561**	.588**	.468**	.387**	.646**	.671**	.856**	.918**	.972**	.995**	1.00				
B7	.635**	.703**	.562**	-.598**	.550**	.409**	.347**	.670**	.719**	.875**	.930**	.967**	.978**	.987**	1.00			
B8	.616**	.699**	.541**	-.631**	.526**	.370**	.316**	.674**	.730**	.873**	.927**	.959**	.967**	.973**	.992**	1.00		
B9	.609**	.698**	.502**	-.635**	.485**	.295**	.258**	.685**	.751**	.877**	.927**	.948**	.947**	.946**	.972**	.989**	1.00	
B10	.605**	.678**	.433**	-.595**	.416**	.205**	.190**	.678**	.753**	.861**	.907**	.916**	.902**	.891**	.919**	.941**	.977**	1.00

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Supplementary 6: Pearson's correlations coefficients for relationships between AWS2 parameters and in-crevasse (C) temperatures for the period of overlapping data (11/03/2021 15:20 -13/03/2021 15:00 n=287 10 minute observations).

	T_2.5	*T_0.6*	*SW_net*	*LW_net*	*NetRad*	*ws_2.5*	*ws_0.6*	*C0*	*C1*	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*	*C8*	*C9*	*C10*	*C11*
T_2.5	1.00																		
T 0.6	.880**	1.00																	
SW_net	.749**	.814**	1.00																
LW_net	-.555**	-.816**	-.731**	1.00															
NetRad	.748**	.800**	.999**	-.702**	1.00														
ws_2.5	.285**	.085	.284**	.032	.298**	1.00													
ws_0.6	.288**	.143*	.255**	-.039	.264**	.844**	1.00												
C0	.781**	.932**	.713**	-.836**	.693**	.101	.151*	1.00											
C1	.783**	.933**	.716**	-.836**	.696**	.103	.154**	1.000**	1.00										
C2	.779**	.898**	.705**	-.787**	.688**	.206**	.226**	.980**	.980**	1.00									
C3	.747**	.847**	.687**	-.744**	.672**	.287**	.276**	.942**	.942**	.987**	1.00								
C4	.718**	.806**	.673**	-.710**	.659**	.344**	.312**	.902**	.903**	.963**	.991**	1.00							
C5	.677**	.761**	.628**	-.691**	.614**	.337**	.303**	.869**	.869**	.938**	.974**	.991**	1.00						
C6	.660**	.746**	.583**	-.686**	.567**	.279**	.265**	.860**	.860**	.927**	.959**	.972**	.989**	1.00					
C7	.590**	.725**	.513**	-.742**	.490**	.127*	.146*	.857**	.856**	.903**	.917**	.920**	.944**	.972**	1.00				
C8	.588**	.743**	.498**	-.763**	.473**	.046	.080	.873**	.871**	.903**	.903**	.895**	.914**	.946**	.990**	1.00			
C9	.563**	.737**	.473**	-.768**	.447**	-.006	.027	.875**	.873**	.896**	.887**	.869**	.882**	.914**	.968**	.989**	1.00		
C10	.566**	.731**	.459**	-.747**	.434**	.000	.016	.874**	.872**	.895**	.883**	.859**	.867**	.896**	.947**	.970**	.991**	1.00	
C11	.491**	.668**	.403**	-.741**	.376**	-.043	-.034	.831**	.830**	.853**	.845**	.826**	.842**	.875**	.943**	.965**	.984**	.984**	1.00

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

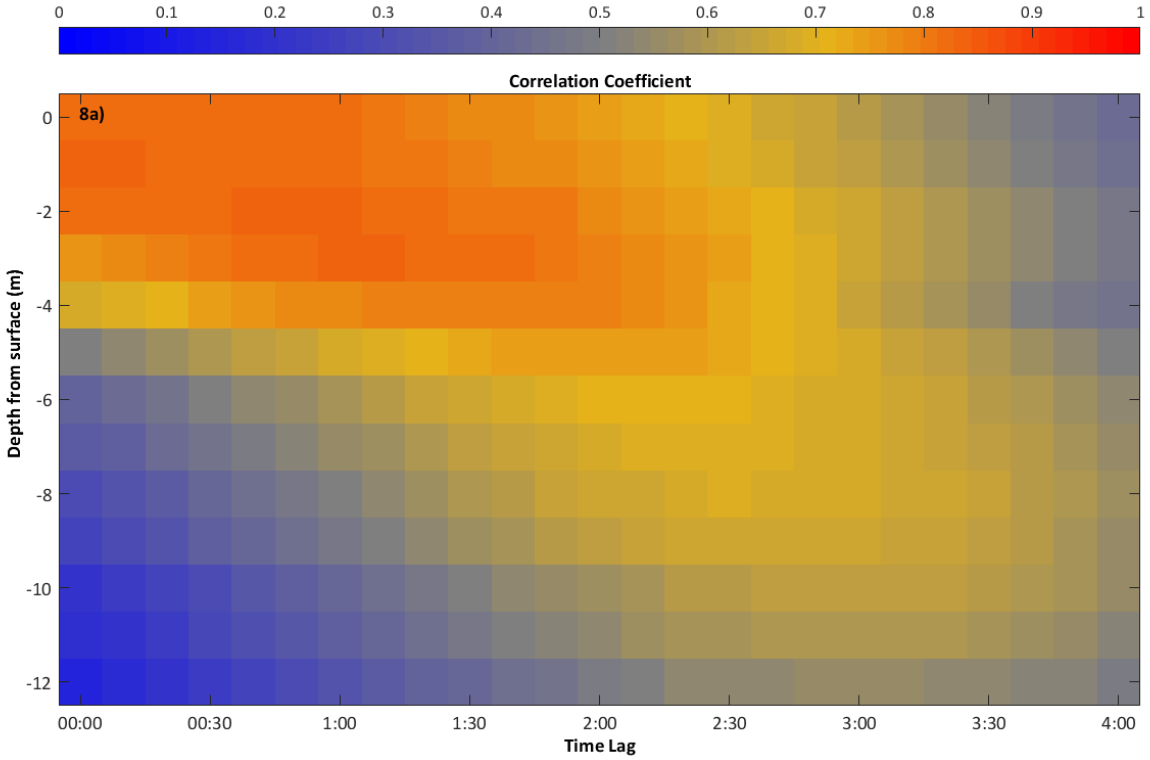
Supplementary 7: Pearson's correlations coefficients for relationships between AWS2 parameters and in-crevasse (D) temperatures for the period of overlapping data (12/03/2021 13:30 -13/03/2021 15:00 n=154 10 minute observations).

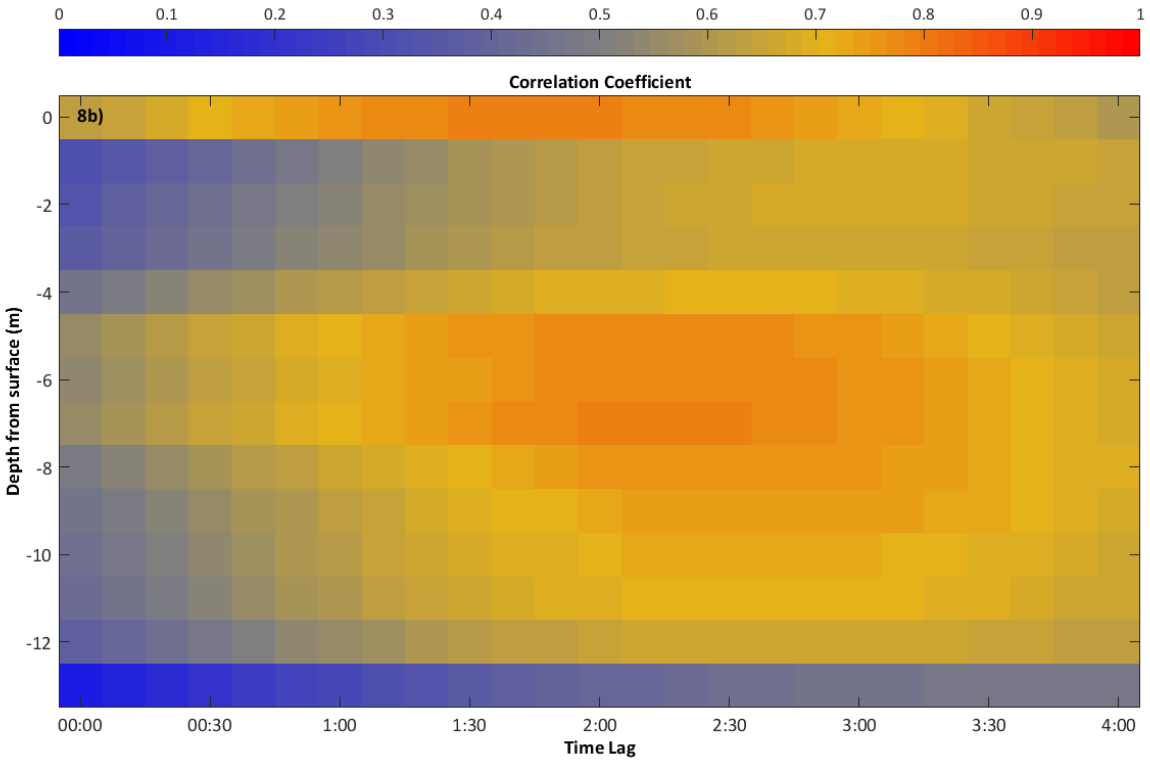
	T_2.5	*T_0.6*	*SW_net*	*LW_net*	*NetRad*	*ws_2.5*	*ws_0.6*	*D0*	*D1*	*D2*	*D3*	*D4*	*D5*	*D6*	*D7*	*D8*	*D9*
T_2.5	1.00																
T_0.6	.918**	1.00															
SW_net	.834**	.864**	1.00														
LW_net	-.821**	-.951**	-.884**	1.00													
NetRad	.829**	.853**	1.000**	-.870**	1.00												
ws_2.5	.192*	.082	.386**	-.140	.398**	1.00											
ws_0.6	.259**	.170*	.354**	-.196*	.361**	.845**	1.00										
D0	.814**	.926**	.887**	-.947**	.877**	.157	.162*	1.00									
D1	.811**	.915**	.892**	-.945**	.882**	.151	.169*	.992**	1.00								
D2	.735**	.830**	.828**	-.873**	.819**	.078	.116	.919**	.958**	1.00							
D3	.568**	.644**	.658**	-.705**	.650**	-.041	.016	.733**	.806**	.938**	1.00						
D4	.437**	.493**	.523**	-.556**	.517**	-.107	-.031	.577**	.666**	.846**	.974**	1.00					
D5	.368**	.418**	.453**	-.481**	.448**	-.124	-.047	.504**	.599**	.799**	.952**	.990**	1.00				
D6	.313**	.360**	.397**	-.425**	.392**	-.154	-.074	.446**	.544**	.756**	.929**	.980**	.990**	1.00			
D7	.267**	.297**	.347**	-.361**	.344**	-.133	-.053	.370**	.475**	.700**	.895**	.962**	.979**	.984**	1.00		
D8	.205*	.231**	.282**	-.298**	.279**	-.174*	-.092	.309**	.415**	.653**	.867**	.947**	.970**	.981**	.984**	1.00	
D9	.186*	.210**	.260**	-.277**	.257**	-.187*	-.100	.281**	.389**	.630**	.852**	.939**	.963**	.973**	.980**	.990**	1.00

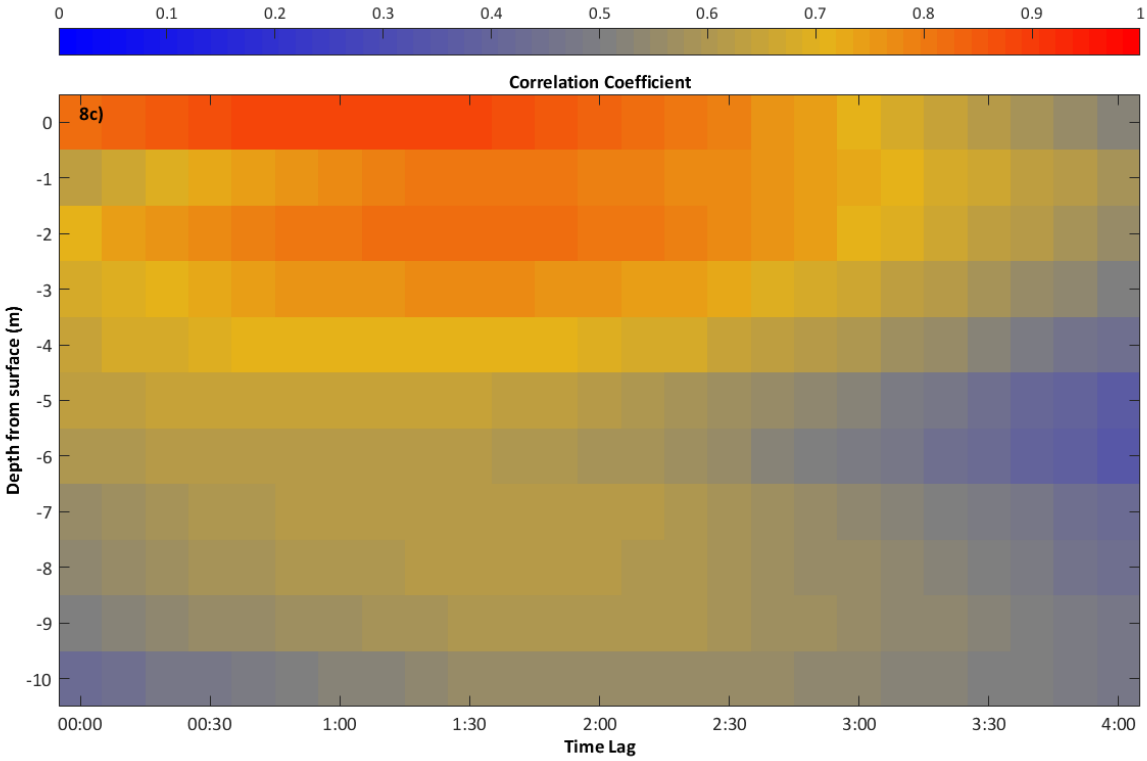
**. Correlation is significant at the 0.01 level (2-tailed).

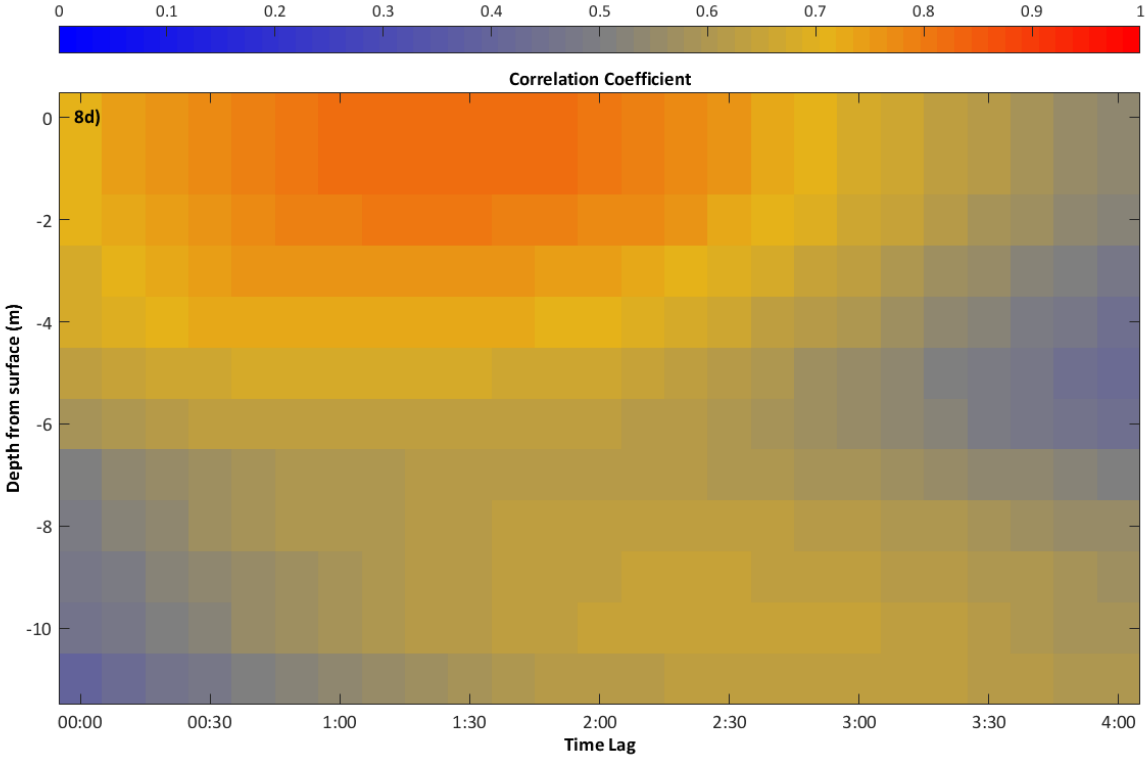
*. Correlation is significant at the 0.05 level (2-tailed).

Supplementary 8: Results of the cross-correlation analysis between net shortwave radiation data collected at the glacier surface and in-crevasse temperatures in 2020 (a) and at crevasses A-C (b-d). In-crevasse temperature data were lagged by 10 minute steps up to a maximum lag of 4 hours.






0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
Correlation Coefficient
8c)
Depth from surface (m)
0 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10
00:00 00:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00
Time Lag


0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
Correlation Coefficient
8d)
Depth from surface (m)
0 -2 -4 -6 -8 -10
00:00 00:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00
Time Lag

Supplementary 9: Pearson's correlations coefficients for relationships between in-crevasse air temperature in 2020 and wind speed recorded at the AWSr at 1.7 and 0.4 m above the surface and inside the crevasse at -2.5 and -10.25 m for the period of overlapping data (25/02/2020 13:30 -26/02/2020 06:40 and 26/02/2020 11:00 – 26/02/20202 23:50, n=182 10 minute observations).

	WS_1.7	*WS_0.4*	*ws -2.5*	*ws -10.25*	*C_0.5*	*C_1*	*C_2*	*C_3*	*C_4*	*C_5*	*C_6*	*C_7*	*C_8*	*C_9*	*C_10*	*C_11*	*C_12*
WS_1.7	1.00																
WS_0.4	.988**	1.00															
ws -2.5	.581**	.544**	1.00														
ws -10.25	.427**	.406**	.707**	1.00													
C_0.5	-.162*	-.208**	.038	-.239**	1.00												
C_1	-.153*	-.201**	.053	-.232**	.998**	1.00											
C_2	-.134	-.181*	.085	-.192**	.986**	.987**	1.00										
C_3	-.095	-.144	.148*	-.126	.936**	.933**	.965**	1.00									
C_4	.004	-.050	.246**	-.033	.839**	.840**	.875**	.956**	1.00								
C_5	.189*	.131	.388**	.104	.706**	.706**	.740**	.834**	.926**	1.00							
C_6	.298**	.245**	.441**	.168*	.616**	.614**	.654**	.748**	.844**	.977**	1.00						
C_7	.370**	.319**	.470**	.193**	.593**	.590**	.634**	.715**	.798**	.943**	.987**	1.00					
C_8	.385**	.342**	.419**	.170*	.591**	.579**	.623**	.689**	.743**	.886**	.946**	.977**	1.00				
C_9	.376**	.338**	.391**	.149*	.589**	.572**	.615**	.670**	.705**	.836**	.901**	.941**	.989**	1.00			
C_10	.419**	.384**	.397**	.153*	.556**	.538**	.576**	.620**	.647**	.785**	.858**	.909**	.971**	.992**	1.00		
C_11	.320**	.298**	.279**	.072	.533**	.505**	.538**	.561**	.549**	.666**	.743**	.799**	.894**	.937**	.953**	1.00	
C_12	.309**	.291**	.261**	.062	.518**	.488**	.520**	.539**	.521**	.631**	.709**	.765**	.866**	.913**	.932**	.997**	1.00

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Supplementary 10: Pearson's correlations coefficients for relationships between in-crevasse air temperature in 2020 and wind speed recorded at the AWSr at 1.7 and 0.4 m above the surface and inside the crevasse at -2.5 and -10.25 m for day-time only (8am-8pm) for the period of overlapping data (25/02/2020 13:30 -25/02/2020 20:00 and 26/02/2020 11:00 – 26/02/20202 20:00, n=95 10 minute observations).

	WS_1.7	WS_0.4	WS-2.5	WS-10.25	C_.5	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_10	C_11	C_12
WS_1.7	1.00																
WS_0.4	.986**	1.00															
WS-2.5	.469**	.380**	1.00														
WS-10.25	.624**	.555**	.724**	1.00													
C_.5	-.598**	-.593**	-.299**	-.332**	1.00												
C_1	-.616**	-.614**	-.282**	-.326**	.991**	1.00											
C_2	-.517**	-.520**	-.140	-.169	.942**	.945**	1.00										
C_3	-.404**	-.423**	.048	.018	.811**	.802**	.904**	1.00									
C_4	-.221*	-.254*	.238*	.195	.591**	.591**	.696**	.904**	1.00								
C_5	.101	.063	.474**	.443**	.336**	.324**	.429**	.668**	.857**	1.00							
C_6	.238*	.207*	.533**	.508**	.230*	.207*	.325**	.548**	.730**	.966**	1.00						
C_7	.309**	.281**	.562**	.533**	.201	.171	.303**	.499**	.654**	.917**	.981**	1.00					
C_8	.299**	.290**	.430**	.434**	.269**	.215*	.338**	.484**	.570**	.823**	.914**	.961**	1.00				
C_9	.277**	.276**	.356**	.362**	.291**	.226*	.345**	.461**	.509**	.736**	.840**	.903**	.983**	1.00			
C_10	.320**	.323**	.334**	.344**	.246*	.177	.286**	.379**	.415**	.655**	.774**	.852**	.956**	.988**	1.00		
C_11	.215*	.233*	.175	.180	.317**	.237*	.314**	.349**	.315**	.510**	.632**	.716**	.863**	.922**	.945**	1.00	
C_12	.204*	.223*	.152	.160	.316**	.235*	.309**	.335**	.289**	.474**	.594**	.680**	.833**	.896**	.922**	.997**	1.00

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).