Supplementary files to

Impact of short-term atmospheric warming events on the Ice sheet surface and subsurface temperatures of coastal Dronning Maud Land, East Antarctica

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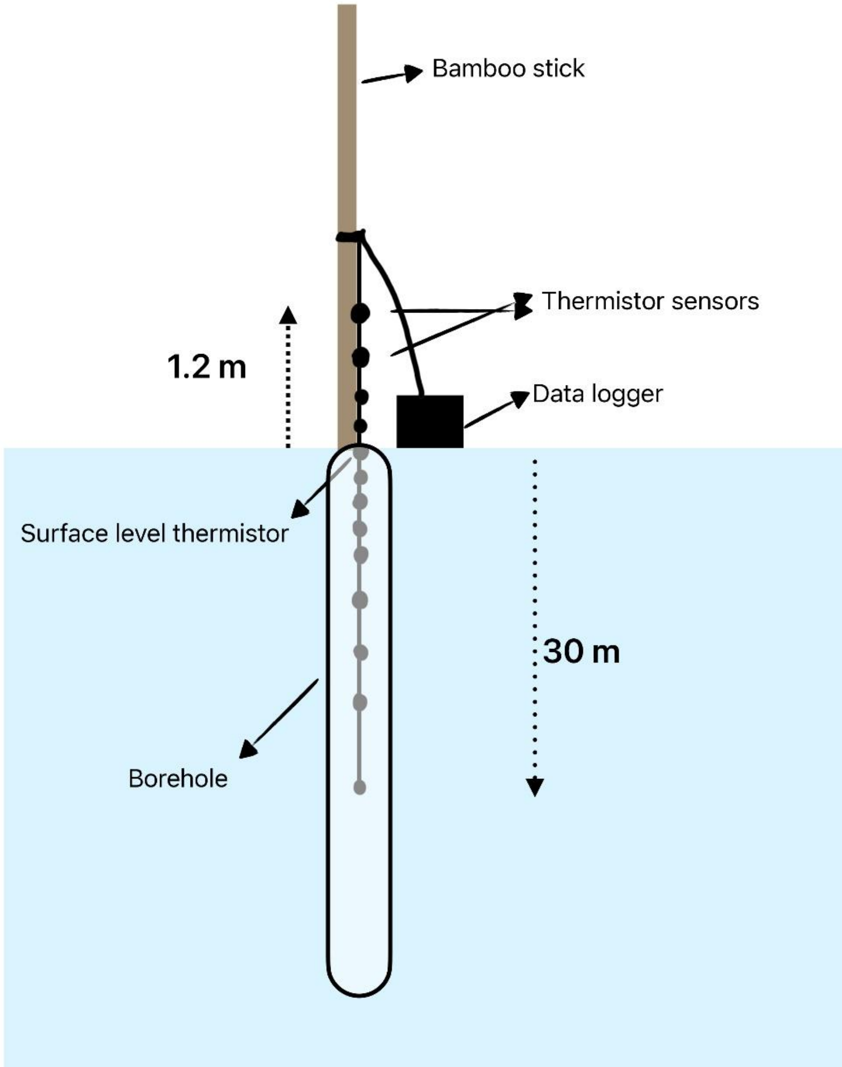

Figure 1s: Schematic diagram of thermistors set up installed in a borehole. The borehole is filled with snow after deploying thermistors. The black dots represent sensors at different levels from 1.2 m above the surface to 30 m below the surface. The thermistor string is firmly attached to a bamboo stick and connected to the data logger.

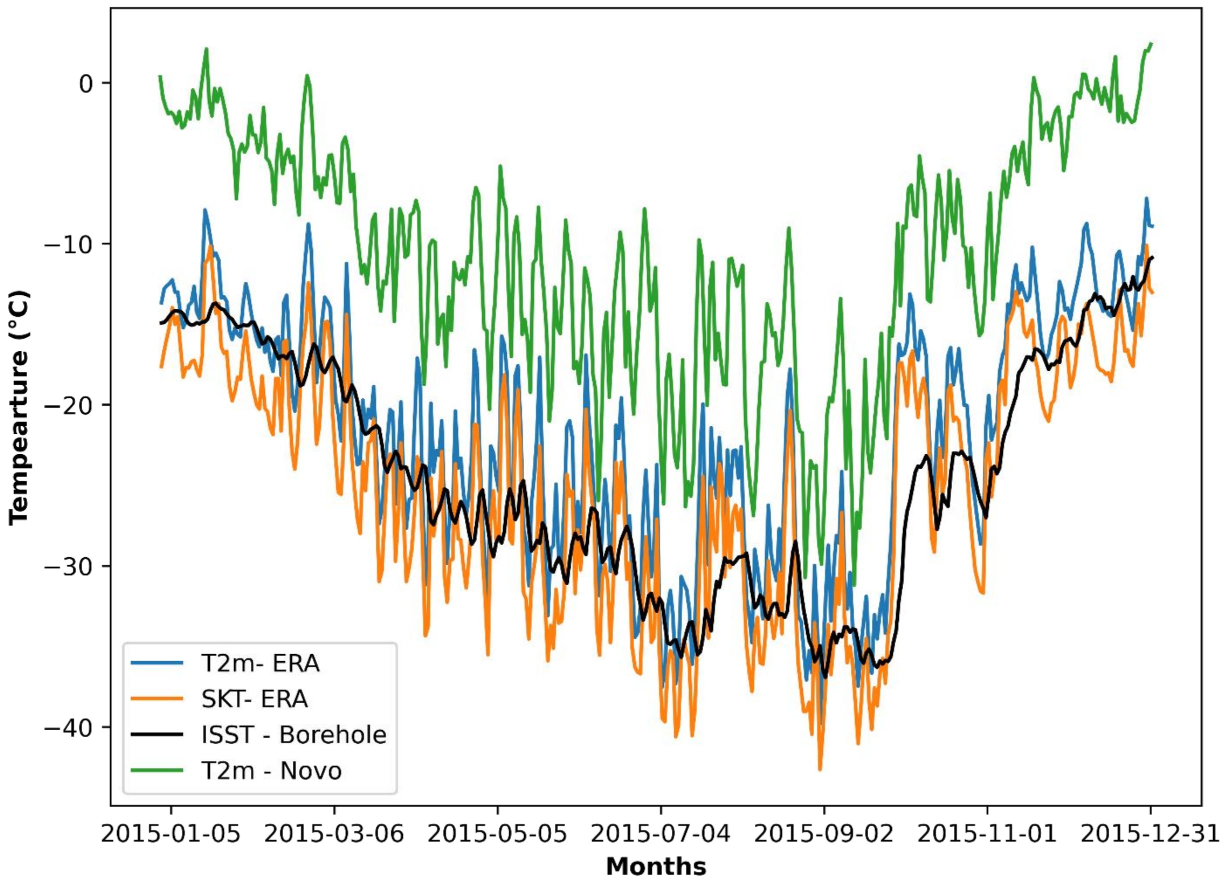

Figure 2s: The comparison of daily variability of borehole surface temperature (ISST - Borehole), 2 m temperature (T2m - ERA) and skin temperature (SKT - ERA) of ERA 5 dataset retrieved from a grid point near to borehole location and Novolazarskaya station observation of 2m air temperature (T2m - Novo) for the year 2015. The station data for Novolazarskaya is available on ftp://ftp.bas.ac.uk/src/ANTARCTIC_METEOROLOGICAL_DATA/GTS_DATA/SURFACE/ (Turner et al., 2004).

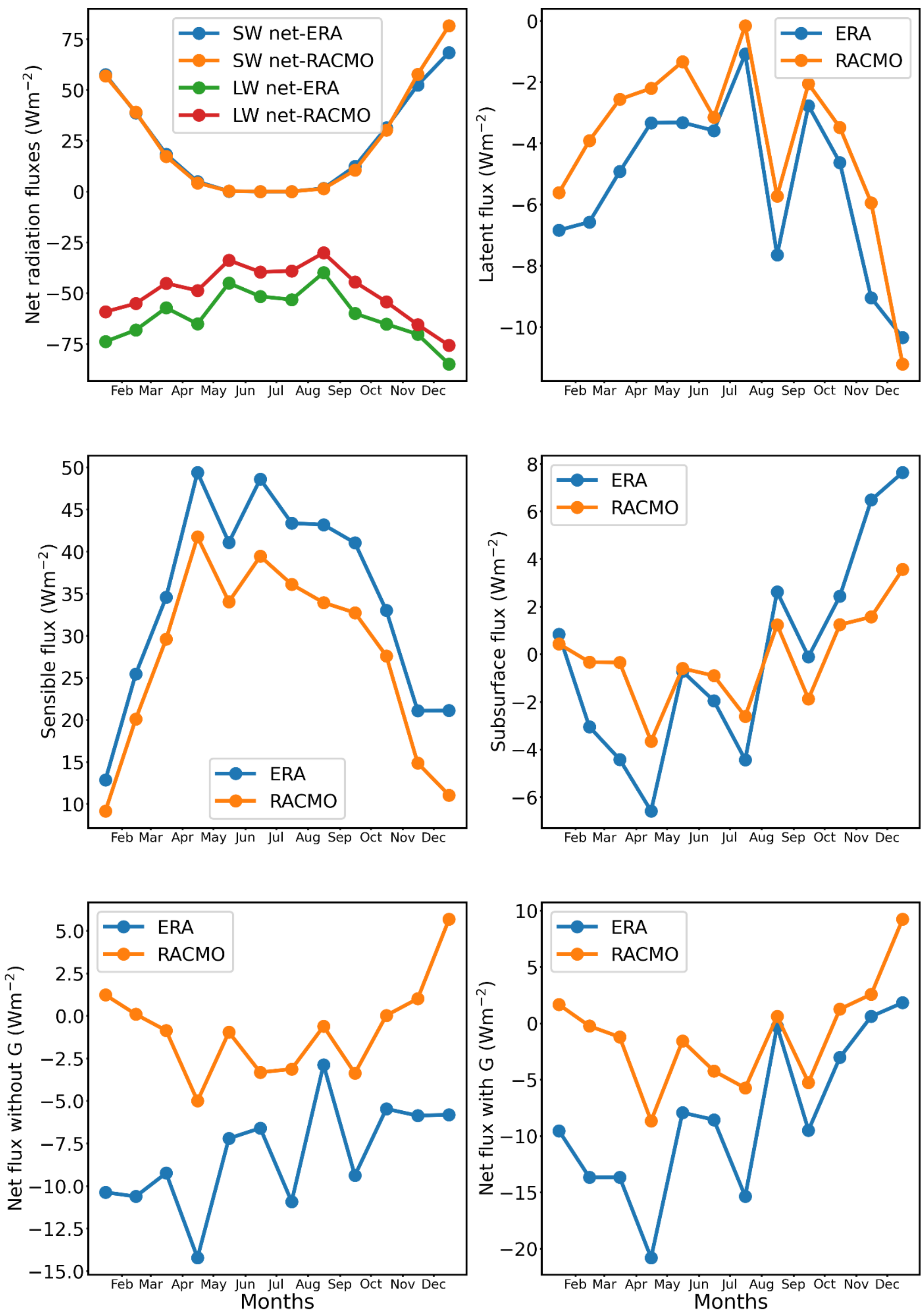

Figure 3s: The comparison of monthly timeseries of Surface Energy Balance parameters (Net longwave (LW net), Net Shortwave (SW net), latent heat flux (LHF), sensible heat flux (SHF), subsurface heat flux (G), net heat flux without G = SWnet+LWnet+SHF+LHF and net heat flux with G = SWnet+LWnet+SHF+LHF+G) from ERA 5 and RACMO data retrieved for a location near to borehole for the year 2015. Subsurface flux for ERA5 is calculated from borehole thermistor measurements. The beginning of each month is labelled in x axis

and the dots represent monthly averaged values of each month. The RACMO2.3p2 model output is available on (DOI 10.5281/zenodo.7760490, (van Wessem et al., 2023)).

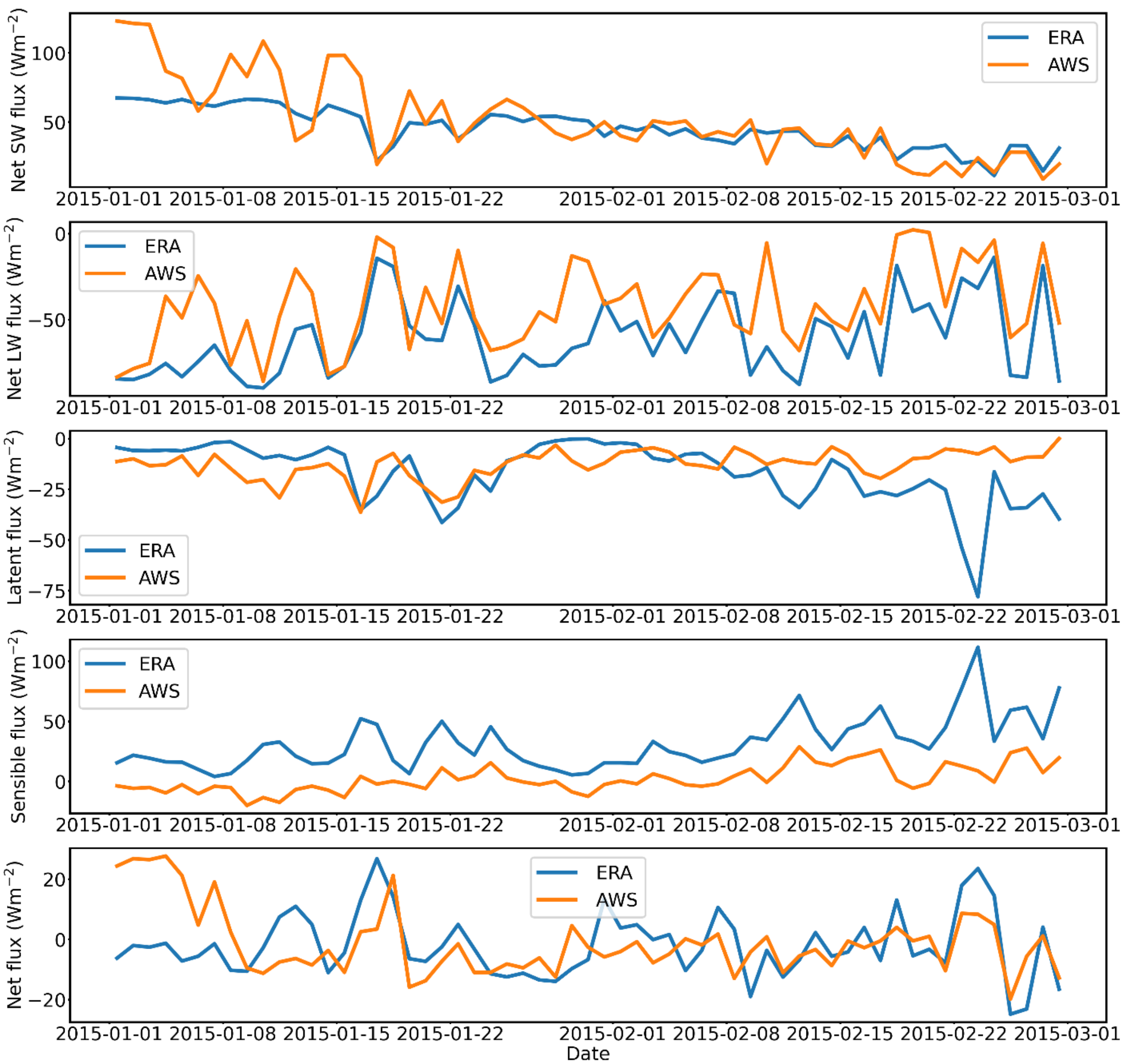

Figure 4s: The comparison of daily average time series of Surface Energy Balance parameters of an AWS situated in Roi Baudouin Ice Shelf and and ERA 5 from a nearby grid point for the summer of 2015. The panels are in order from top Net longwave (LW net), Net Shortwave (SW net), latent heat flux (LHF), sensible heat flux (SHF) and net heat flux. The AWS data for fluxes used here is available on doi: 10.1594/PANGAEA.910484, (Jakobs et al., 2020)

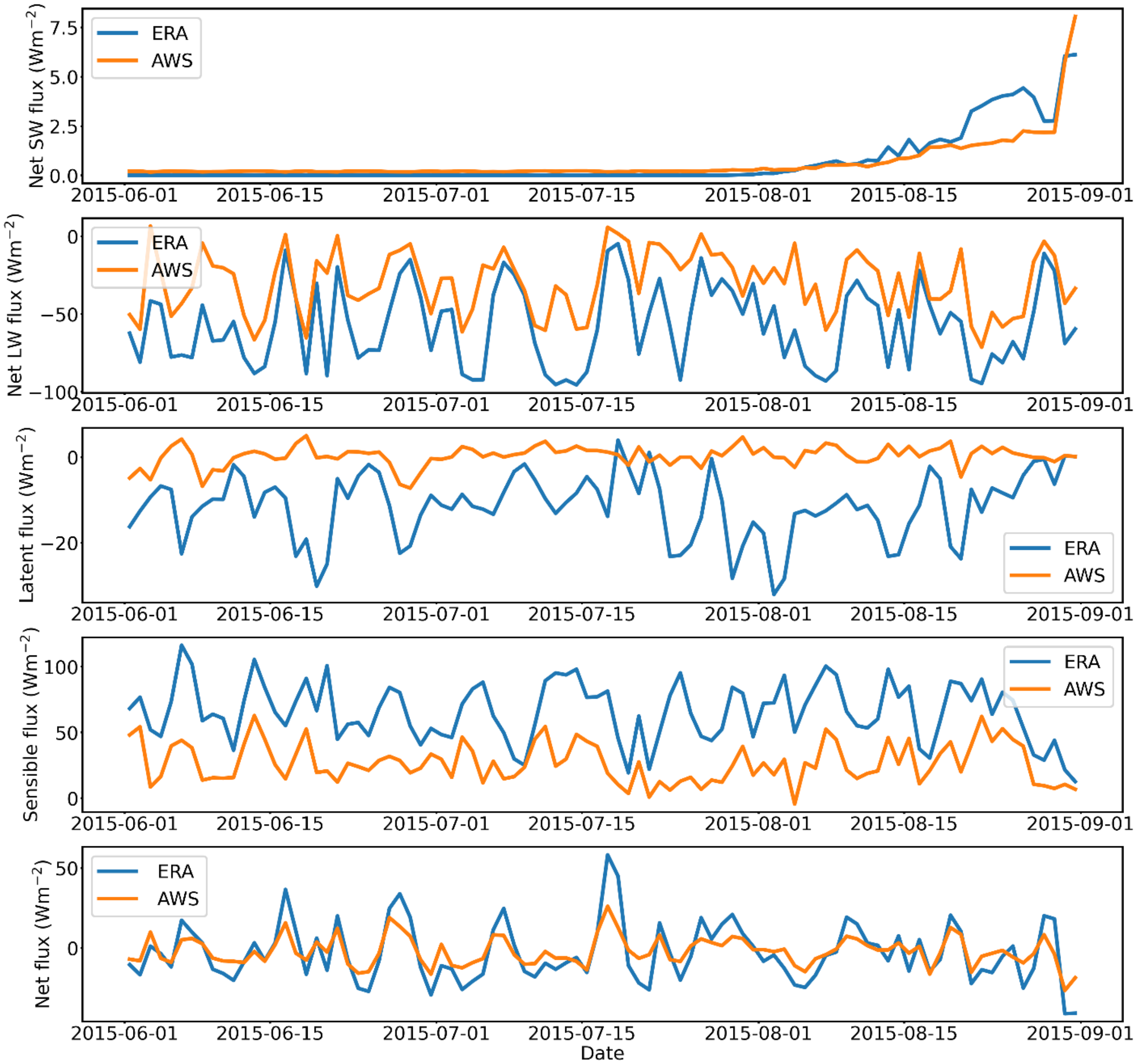

Figure 5s: Same as Fig. 4s but for winter of 2015.

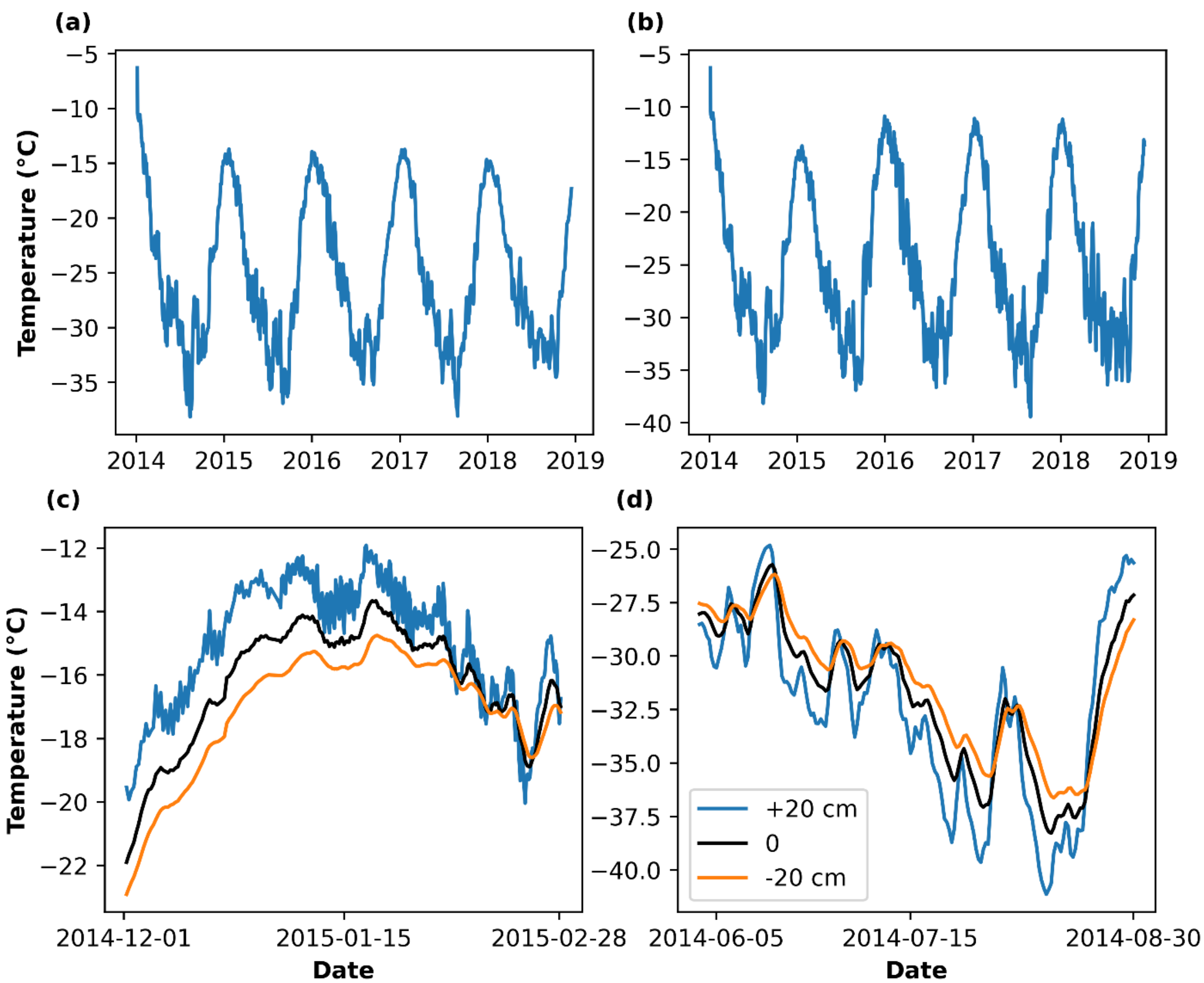

Figure 6s: (a) The surface temperature time series from the surface level thermistor without considering burial. (b) The time series of surface temperature after applying burial criteria (c-d) The time series of temperature measured by sensors at the surface level (0) and 20 cm upper (+20 cm) and lower levels (-20 cm) for summer and winter respectively.

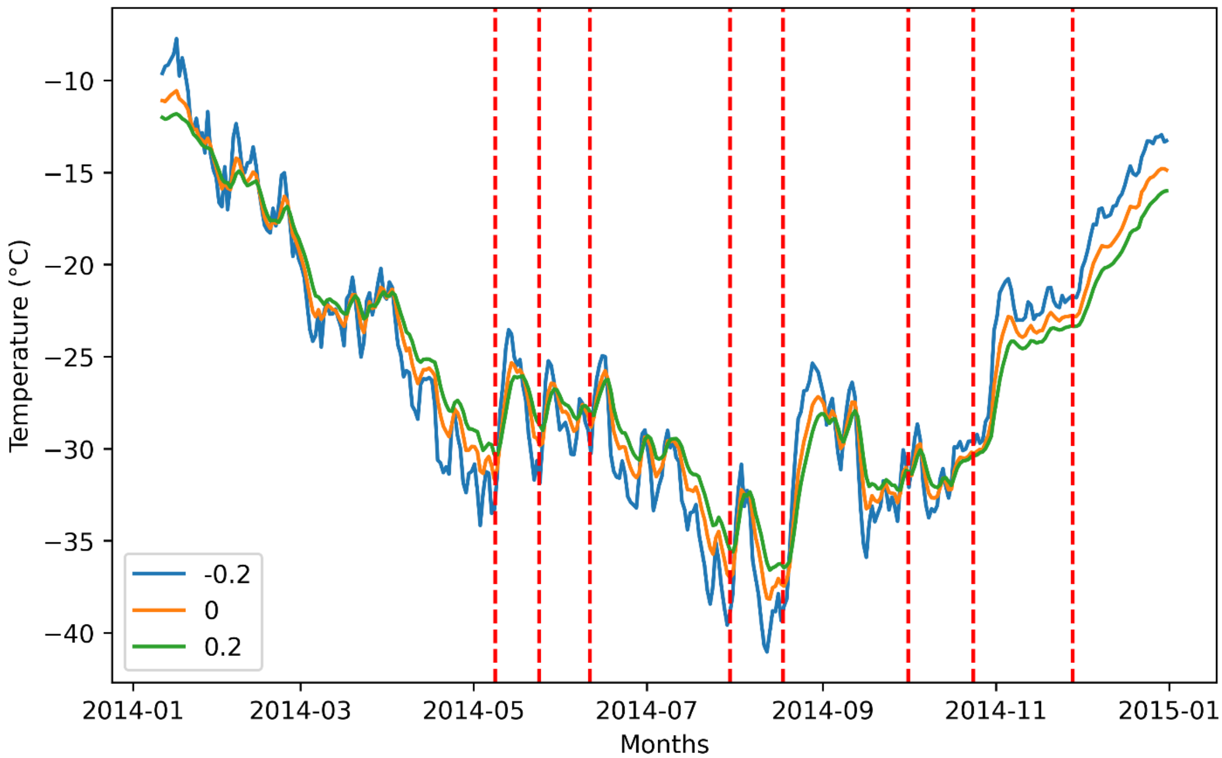

Figure 7s: The daily average time series of temperature measured at the borehole surface (after considering burial), 20 cm height (labeled as -0.2) and 20 cm depth (labeled as 0.2) for 2014. Dashed lines show the onset of ISSW events. All the 3 depths have synchronous fluctuations, but the magnitude is different.

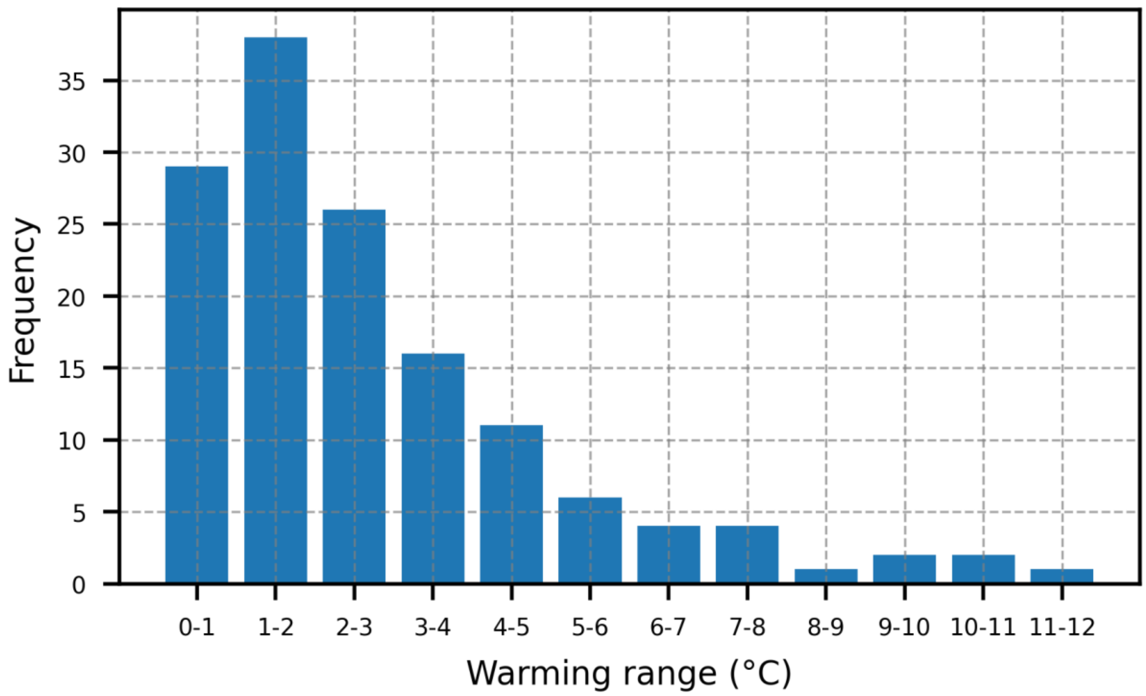

Figure 8s: Histogram of warming extent of all ISSW events over the region. The x-axis gives warming range and the y-axis gives the frequency of occurrence of that particular warming range.

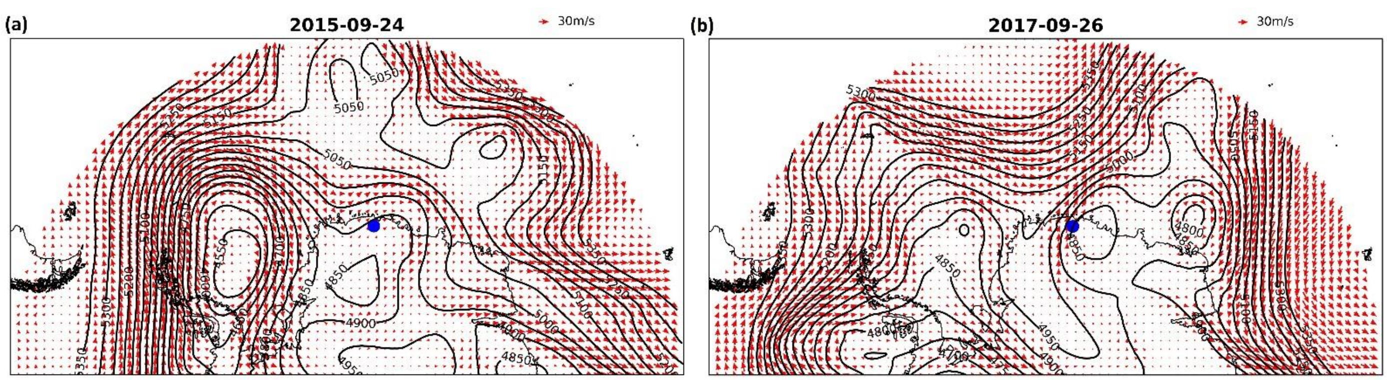

Figure 9s: The 500 hPa level geopotential height and corresponding wind vectors for two days (a) on 24-09-2015 and (b) on 26-09-2017. The blue dot represents the core location.

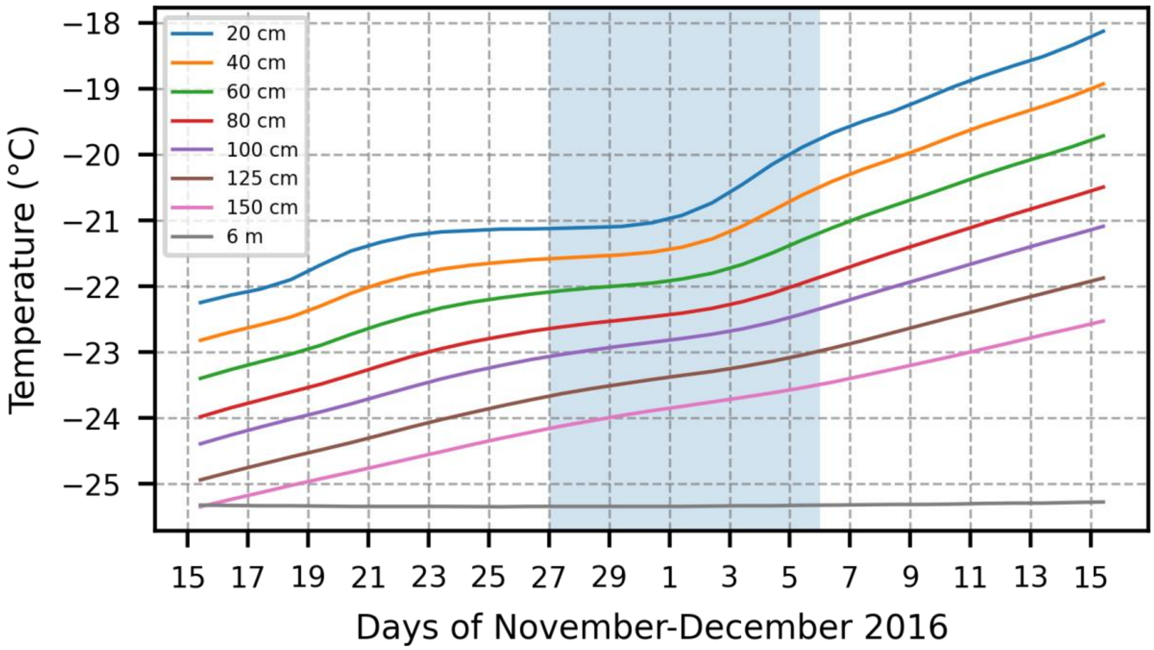

Figure 10s: The daily mean subsurface temperature time series during the ISSW event of 27 November – 06 December 2015 with shaded region marking the duration of ISSW. The event is an example of ISSW events with surface south easterly winds over the location where subsurface followed the seasonal pattern without any marked start or end dates. There were six similar ISSW events during the study period.

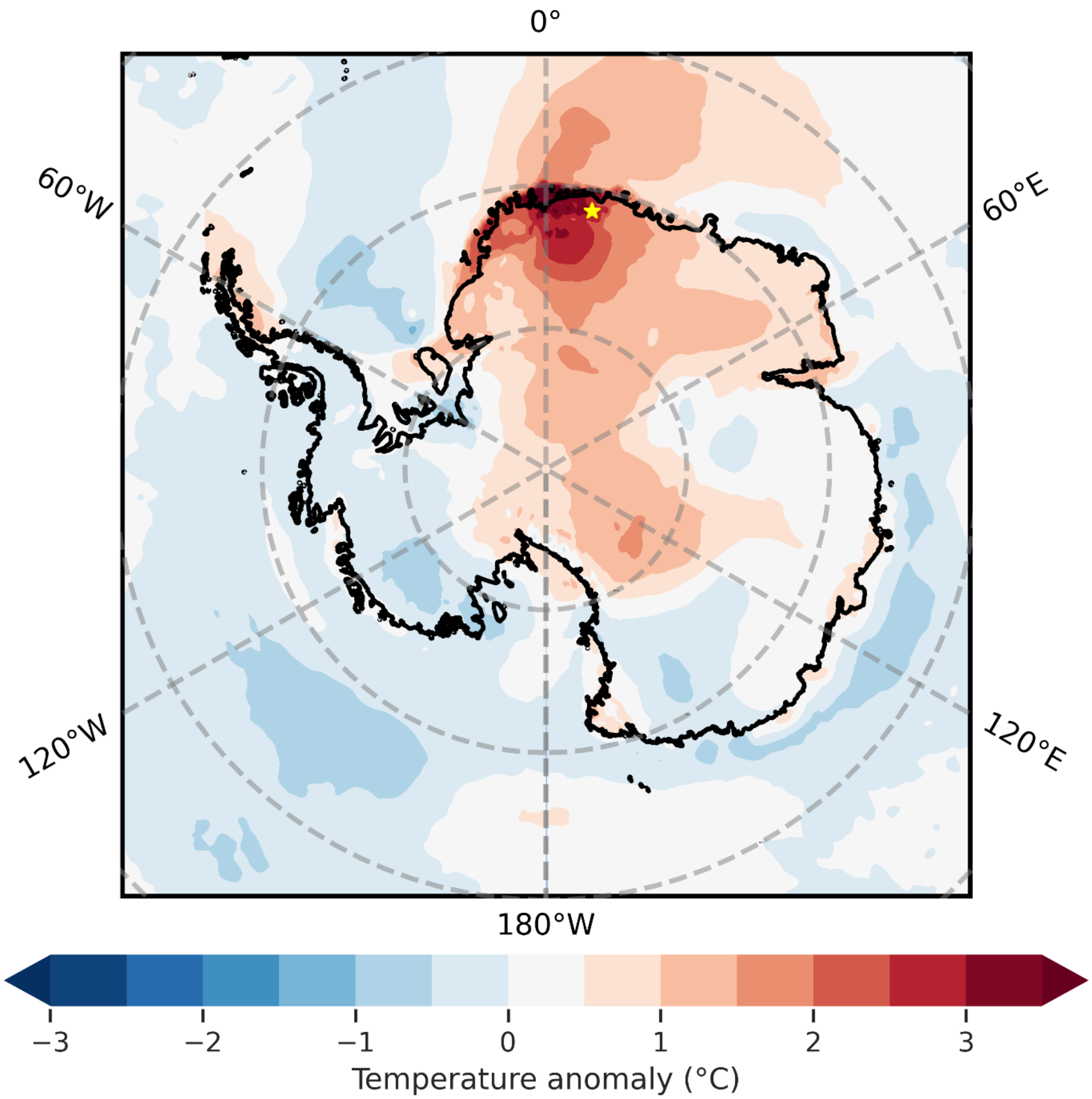

Figure 11s: The composite of 2m air temperature anomaly for all the ISSW events from ERA5 dataset with respect to a 40 year climatology (1979-2019). The yellow star represents the borehole location.

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