Supplement to "Brief communication: First NISAR interferometric snow water equivalent change retrieval evaluated against airborne lidar"

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S1 Candidate pairs

The NIVAL lidar flights were timed to coincide with NISAR ascending track 077 frame 024, so we drew candidate pairs from the operational interferograms on that track. Pairing each available 077 acquisition over Mores Creek Summit with its neighbor, and keeping the pairs with a lidar flight within a few days of each acquisition, gives seven candidates between November 15, 2025 and March 27, 2026 (Table S1, Fig. S1).

Liquid water in the snowpack breaks the dry-snow phase relation assumed in Eq. (1) of the main text and decorrelates the pair, so we require a dry snowpack at both acquisitions. We check for wet snow using automated snow temperature measurements at two instrumented sites, which sit near the bottom and the top of the scene's 1477 to 2451 m elevation range (Sect. S2).

Six of the seven candidates are wet at one or both acquisitions, as water year (WY) 2026 was historically warm. The November 15–December 9 and March 15–27 pairs are wet at both acquisitions. The December 9–21, December 21–January 14, January 14–February 7 and February 19–March 15 pairs are wet during one overpass (Table S1). The February 7–19 pair is dry at both sites at both acquisitions, and is the pair analyzed in the main text.

Two of the wet pairs also lack an accumulation signal to retrieve: the SNOTEL gained only 8 mm of SWE over January 14–February 7 and lost 104 mm over March 15–27.

No NISAR acquisition was made over the frame on November 27, January 2, January 26 or March 3. Four of the seven pairs are therefore 24-day rather than 12-day pairs. Those four have median coherence between 0.08 and 0.19, compared to 0.26 for the analyzed pair, and the two wet 12-day pairs have medians of 0.18 and 0.16. The need for dry snow and some accumulation signal is why we focus on the February 7–19 pair analyzed in the main text.

S2 Snowpack wetness

A snowpack holding liquid water sits at the melting point, so we infer wetness directly from the snowpack temperature profile (Fig. S2). We take the warmest reading from 5 cm to 0.5 m below

Table S1: The seven candidate pairs on track 077, in date order. Δt is the repeat interval, $\bar{\gamma}$ the median scene coherence, "wet at" names the acquisitions at which either site was at the melting point, ΔSWE the SNOTEL SWE change over the radar interval, and r the correlation between NISAR and lidar SWE change over all common pixels. The pair analyzed in the main text is the only one dry at both acquisitions, in bold.

Pair	Δt (d)	$\bar{\gamma}$	wet at	ΔSWE (mm)	r
Nov 15–Dec 9	24	0.15	both	+61	+0.42
Dec 9–Dec 21	12	0.18	first	+30	+0.56
Dec 21–Jan 14	24	0.08	second	+107	−0.03
Jan 14–Feb 7	24	0.08	first	+8	−0.12
Feb 7–Feb 19	12	0.26	–	+56	+0.82
Feb 19–Mar 15	24	0.19	second	+69	−0.13
Mar 15–Mar 27	12	0.16	both	−104	+0.00

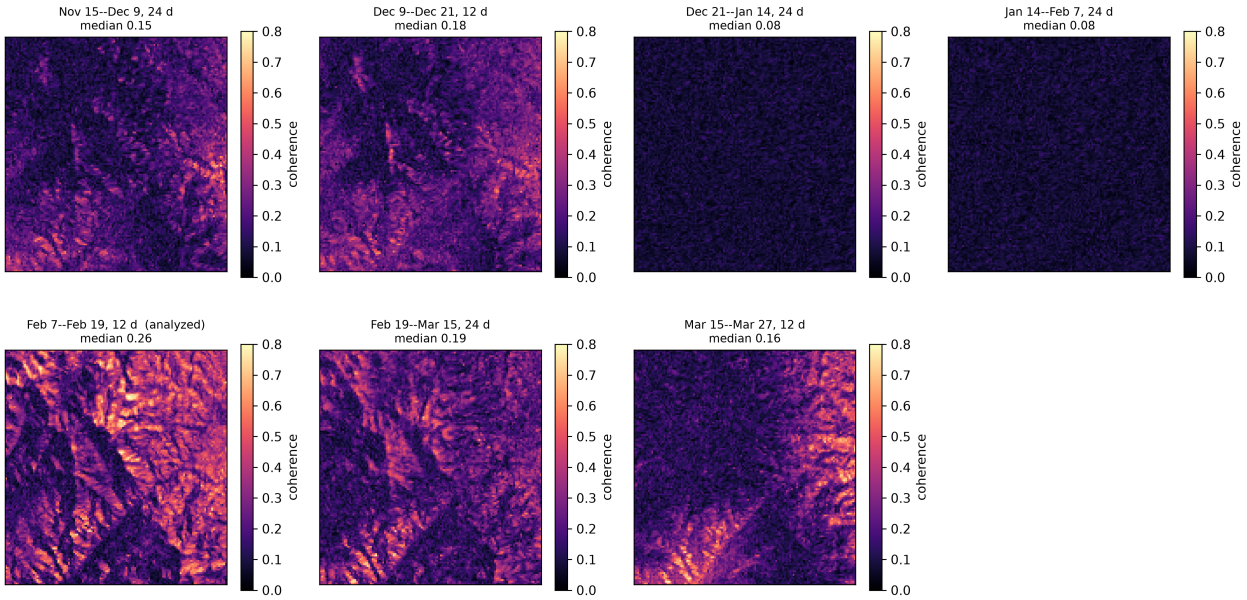

Figure S1: Coherence for the seven candidate pairs on track 077, unmasked, at the 80 m product posting. The analyzed pair has the highest median of the seven.

the observed snow surface and call it at the melting point when it is within 0.1 °C of zero, as the snow temperature array has a typical accuracy of 0.1 °C. The depth restrictions matter: the top of the pack follows the air temperature, and the snow-ground interface is held near zero all winter by geothermal heat, so a criterion that reaches either boundary calls more acquisitions wet than the pack itself warrants. Both profiles are sampled at the overpass hour, 05:46 local for track 077, rather than across the interval. We call an acquisition wet when either profile reaches the melting point, and a pair wet when either acquisition is wet. The two sites disagree once, on March 15, when only the SNOTEL pack is at the melting point, likely due to the higher elevation snow being colder. We note that a snow temperature near 0 °C is a necessary condition for wet snow conditions, but does not guarantee that the snow is wet, therefore this is a conservative approach to flagging wet snow conditions.

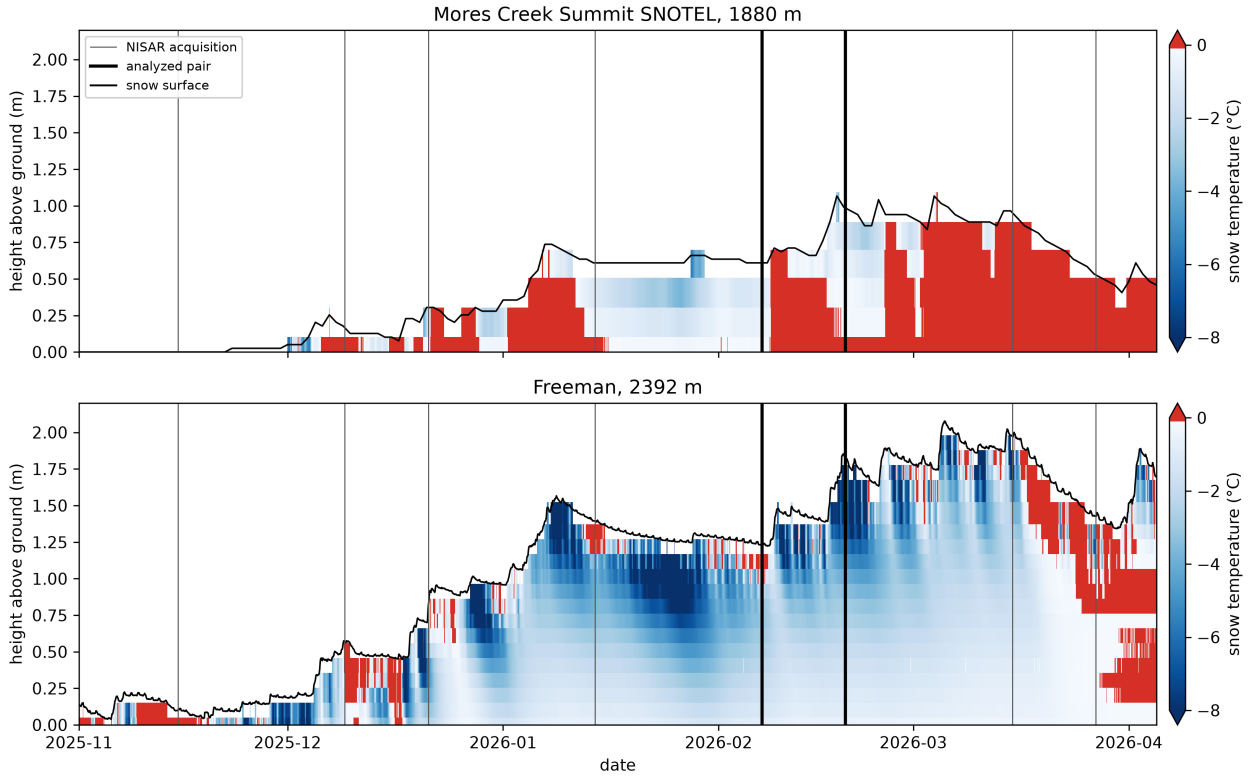

Figure S2: Snowpack temperature through the study winter at the two instrumented sites. Sensors above the snow surface are blanked. Thin vertical lines mark every NISAR acquisition on track 077, and the two heavy lines mark the analyzed pair. Red marks snow within 0.1 °C of the melting point, the wet-snow criterion applied here.