The Cryosphere Discussions

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# Glacial Melting over the South Col Glacier: Observations from S1-SAR

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Community comment on "Everest South Col Glacier did not thin during the period 1984–2017" by Fanny Brun et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-166-CC4, 2022

As a contribution to this discussion, I would like to submit some observations from remote sensing that may aid in interpretation of annual surface melting from modeling in Brun et al. (2002). In Scher et al. (2021) we created a record of surface melting over glaciers in the Himalayas from a time series Sentinel-1 synthetic aperture radar (S1-SAR). Melt is detected where annual backscatter is reduced as liquid surface water obscures the radar scattering from the glacier interior, resulting in a marked reduction in backscatter. For the South Col glacier, we observe radar signatures that indicate surface melting is occurring in 2019 over areas of exposed ice in the southern extent of the glacier (Figure 1, attached). From time series S1-SAR, we observe continuous indications of surface melting from June 26, 2019, until October 6, 2019, with approximately biweekly repeat observations during this period. Since seasonal snow over areas that are exposed on an interannual basis are not deep enough to contribute substantially to radar scattering, we infer that the melting signal originates from structural features (e.g., laying) in the glacier interior that result in enhanced backscatter during colder winter months. It is important to note that at C band frequencies backscatter is extremely sensitive to liquid water and it is difficult to differentiate very small amounts of surface melting from more extensive melting, and therefore our methodologies are not well suited to evaluate the amount of melting that may be occurring. For more details on our methodologies, please refer to Scher et al., (2021).

Scher, C., Steiner, N. C., & McDonald, K. C. (2021). Mapping seasonal glacier melt across the Hindu Kush Himalaya with time series synthetic aperture radar (SAR). *The Cryosphere*, *15*(9), 4465-4482.

Please also note the supplement to this comment:
https://tc.copernicus.org/preprints/tc-2022-166/tc-2022-166-CC4-supplement.pdf