

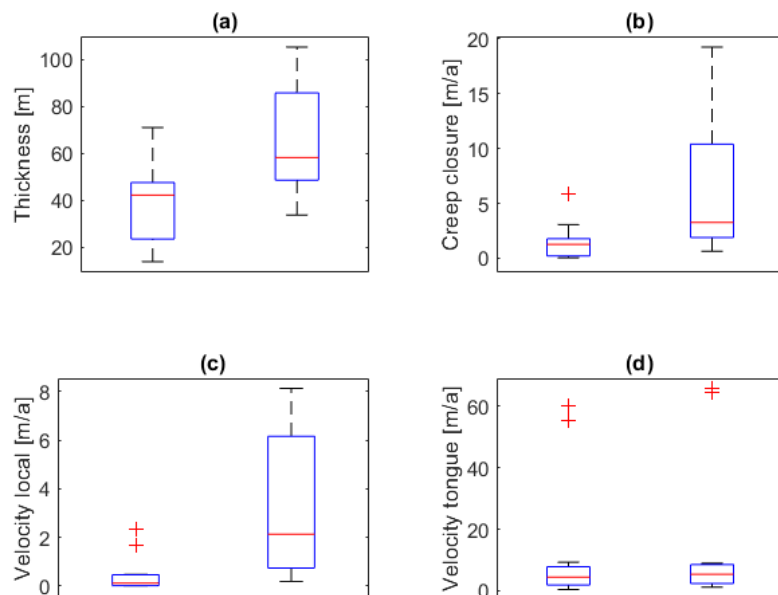
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(A) 26 swiss glaciers: with / without channel collapse

- **12 glaciers with channel collapse**, 14 without collapse in recent years
- Both groups very similar in terms of retreat rate, slope, size, aspect according to Mann-Whitney U test
- Key indicators for collapse: low **ice thickness** in the ice marginal area, low **creep closure** and near-zero ice **flow velocity**. Presence of a large non-pressurized subglacial channel.
- Mechanism: channel melt-out due to sensible heat flux, ice surface lowering and collapse due to lack of ice dynamics. «Subglacial stoping or block-caving» (Paige, 1956, JoG)

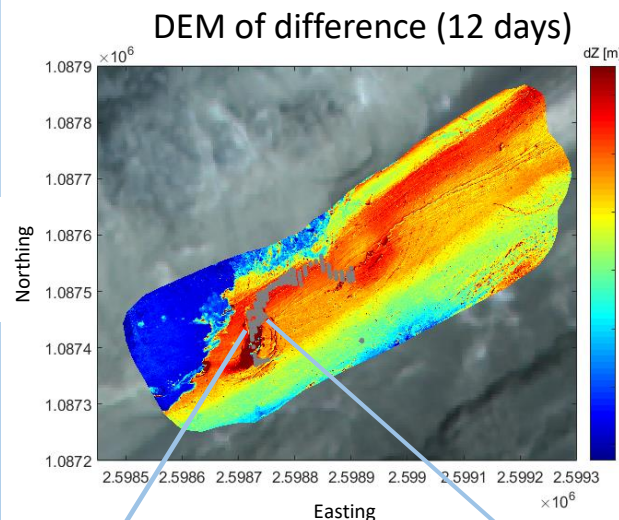
Glaciers with collapse feature vs. Glaciers without collapse feature



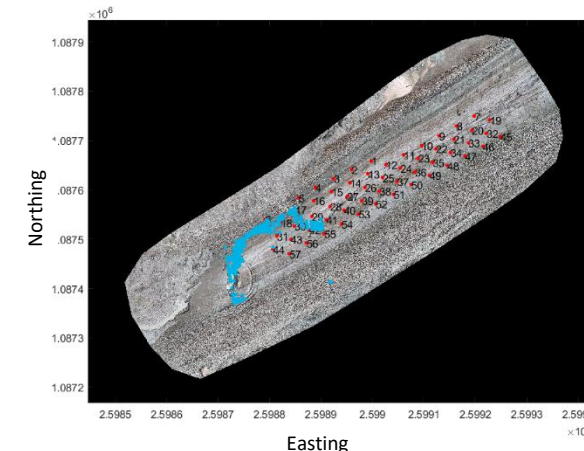
Variables (a) to (c) were computed for a circular area of 100 m radius around the center of a (hypothetical) collapse feature close to the terminus. Tongue velocity (d) is for a 2 km portion of the glacier tongue.

Data: 2021 bed topography and ice thickness dataset of Swiss glaciers by Grab et al. (submitted), VAW/ETHZ

(B) Case study at Glacier d'Otemma



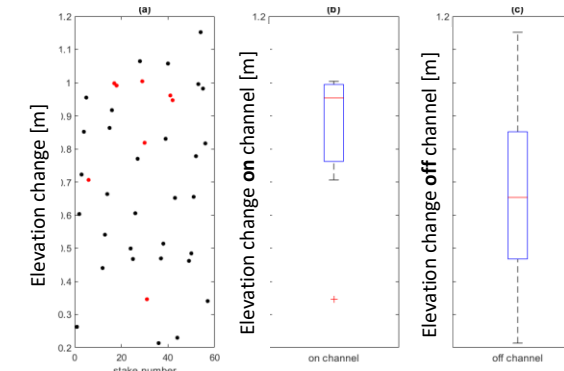
Orthophoto, channel, ablation stakes



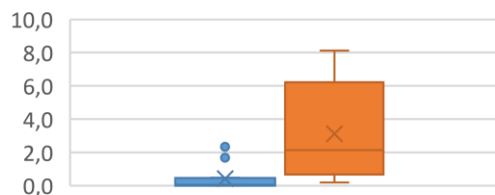
Channel position from GPR data (Egli et al., 2021, JoG). DEM from drone data.



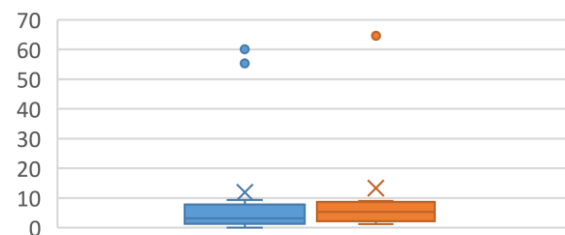
On-channel vs off-channel DoD



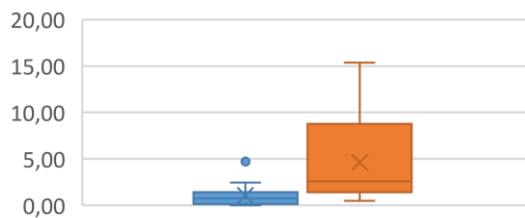
**Ice flow velocity in local
collapse area [m/a]**



**Ice flow velocity over 2 km
tongue area [m/a]**



**Creep closure in collapse area
[m / 6 months]**



**Mean ice thickness in collapse area
of 100 m radius**

