Determining sediment fluxes and processes in glaciated catchments

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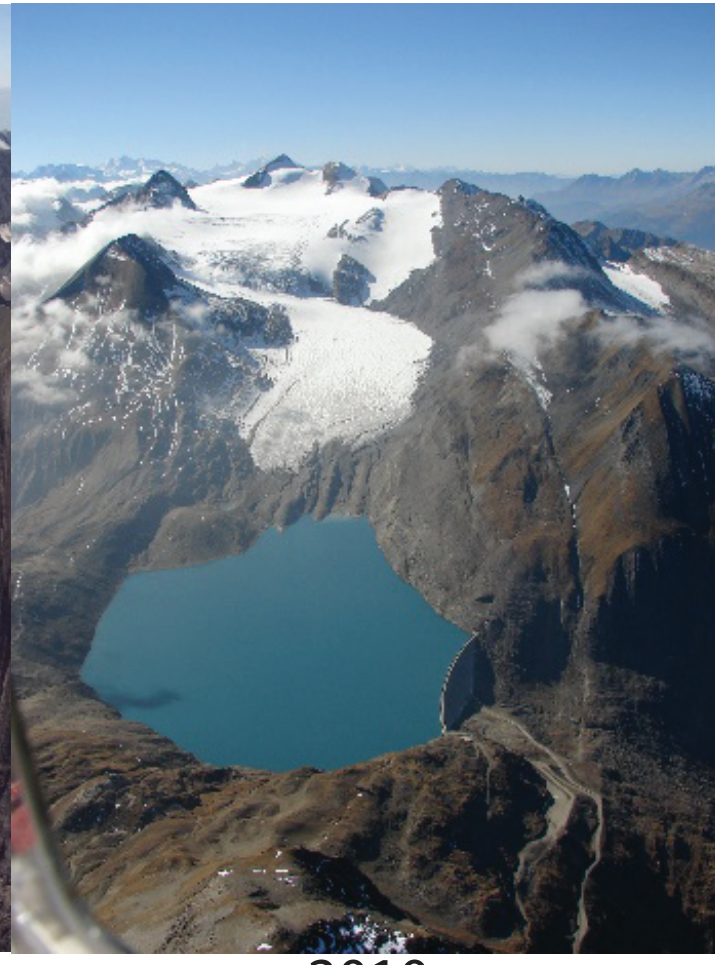
glacier change

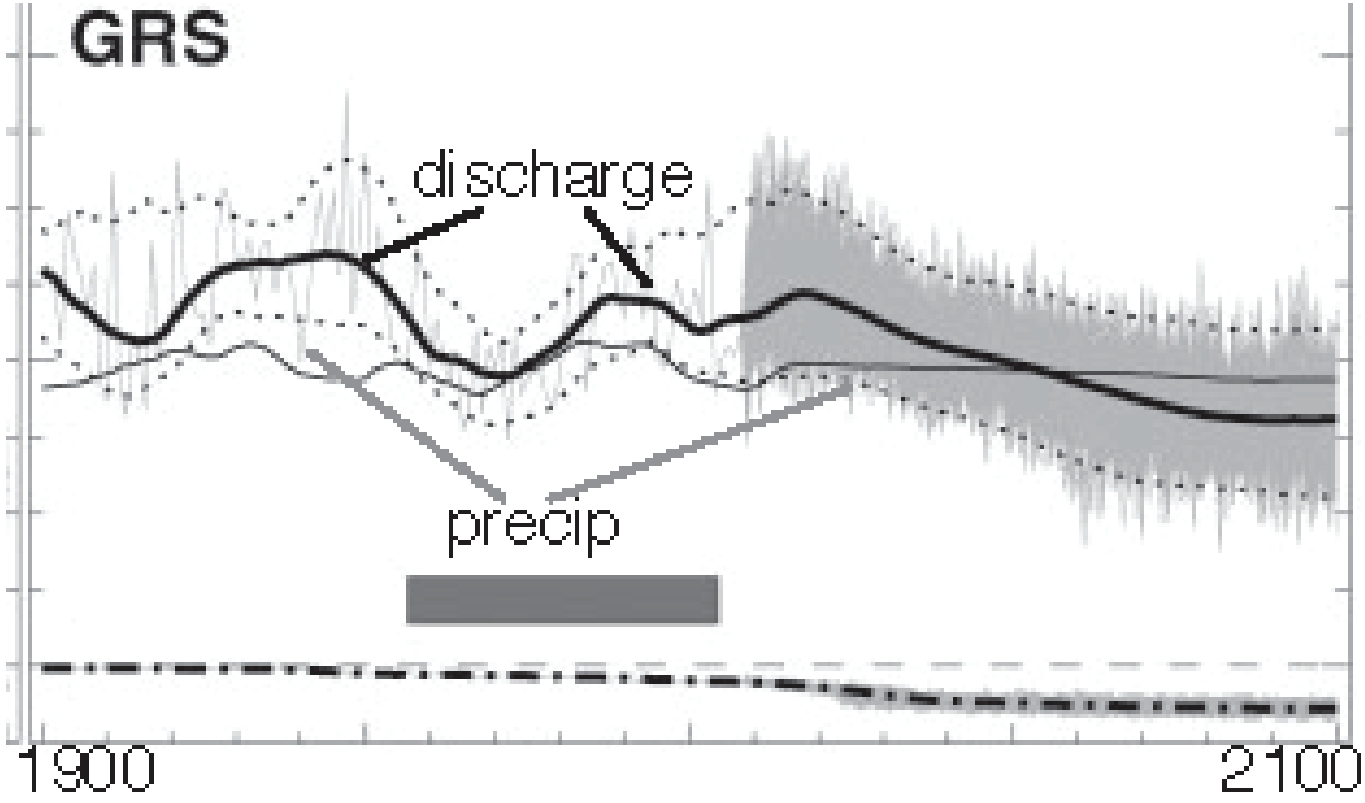
1973



2010

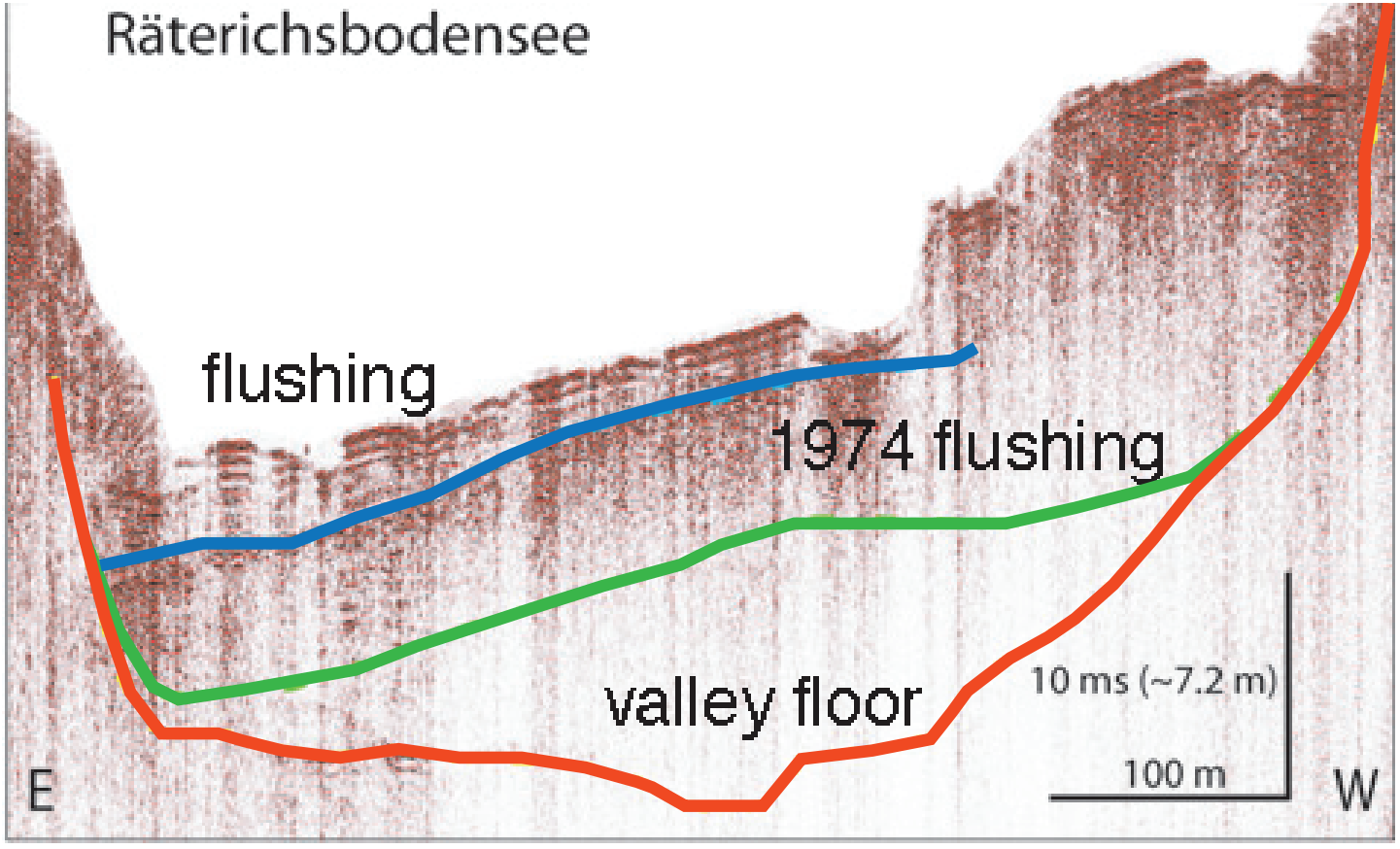
Griesgletscher
from: G. Kappenberger

glacier change: hydrology



modeled runoff from the Griesgletscher from 1900 to 2100
from Farinotti et. al., 2012

glacier change: landscape change (sedimentation)



reservoir sedimentation

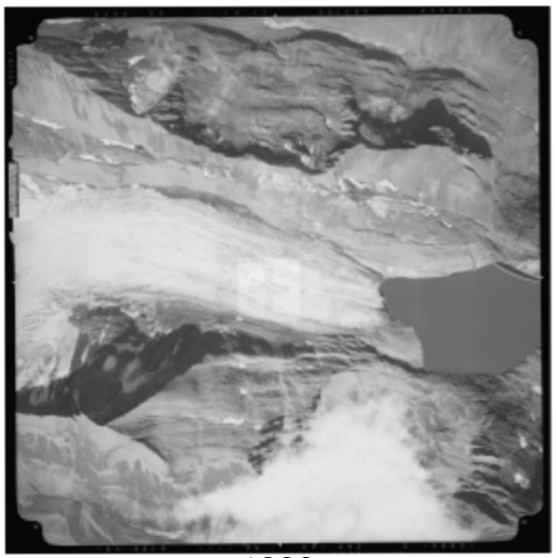
seismic section from Anselmetti et. al., 2007

sediment sources: where does it come from?

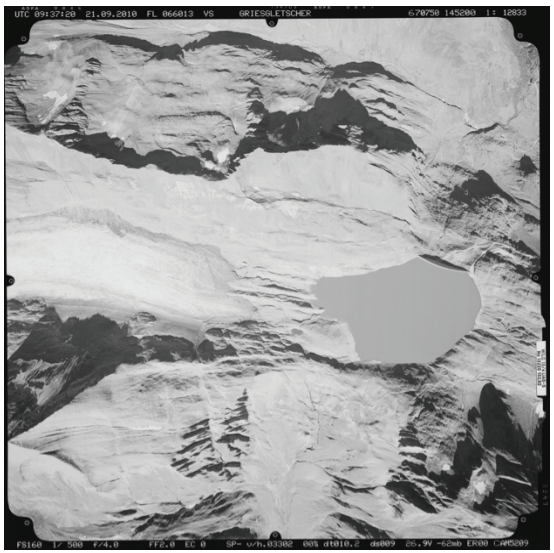
from around the glacier?

. . . or from below the glacier?

periglacial: analysis of the Griesgletscher's proglacial area over 28 years

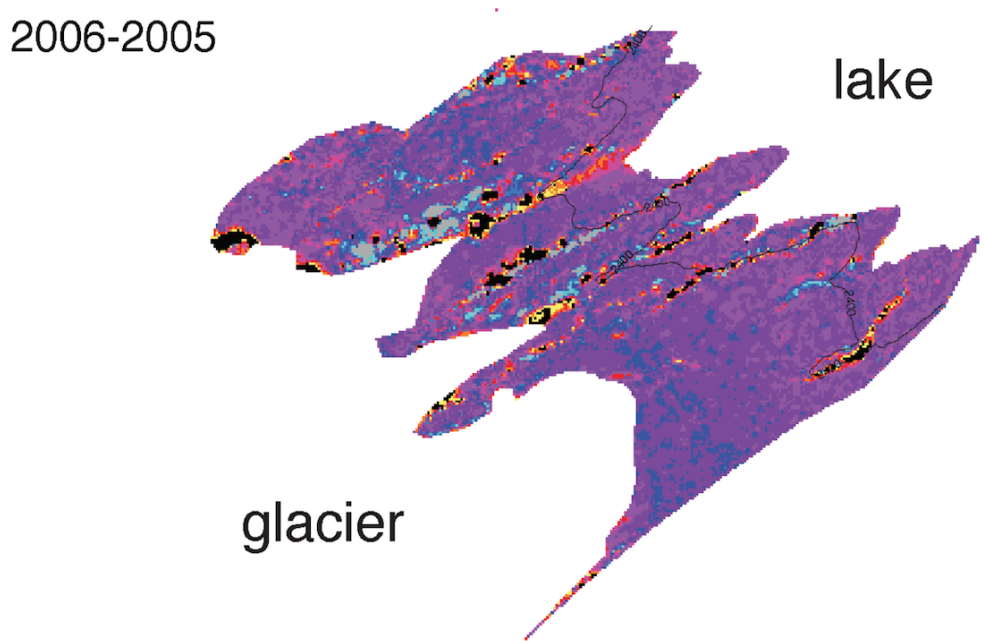


1988

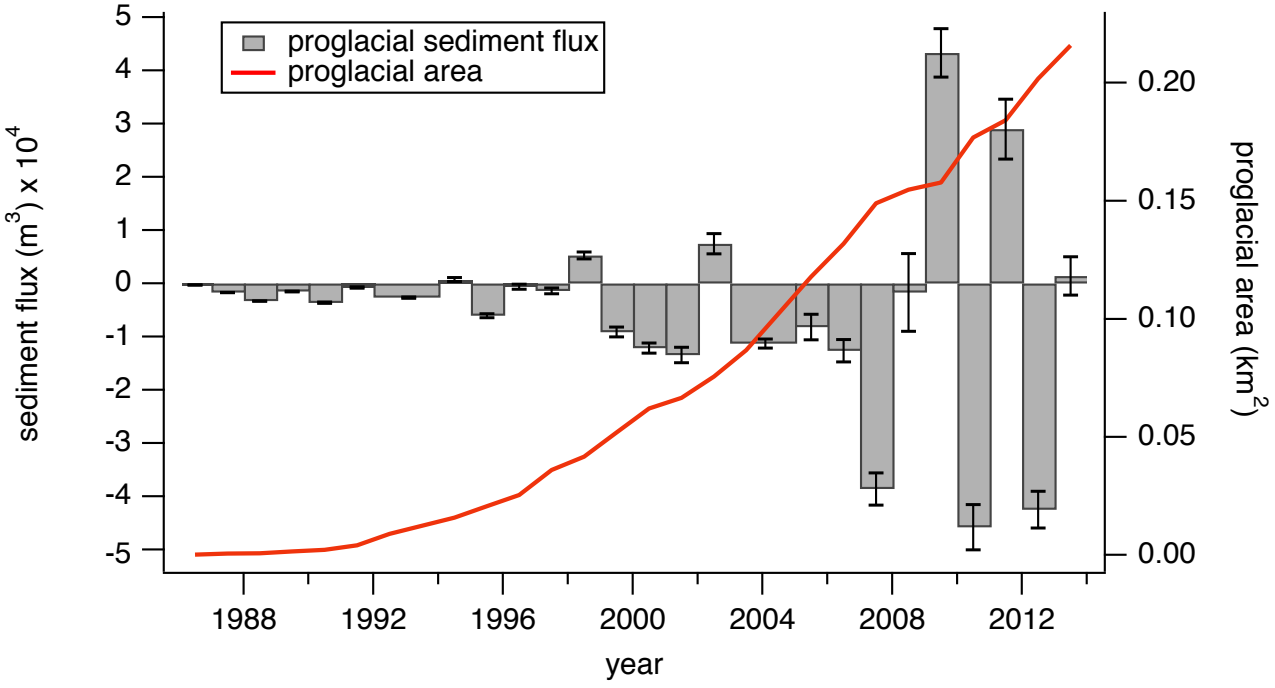


2010

- photogrammetry to create digital surface models
- begin analysis in 1986 when glacier retreats beyond the reservoir
- subtract digital surface models for volume change



periglacial: analysis of the Griesgletscher's proglacial area over 28 years

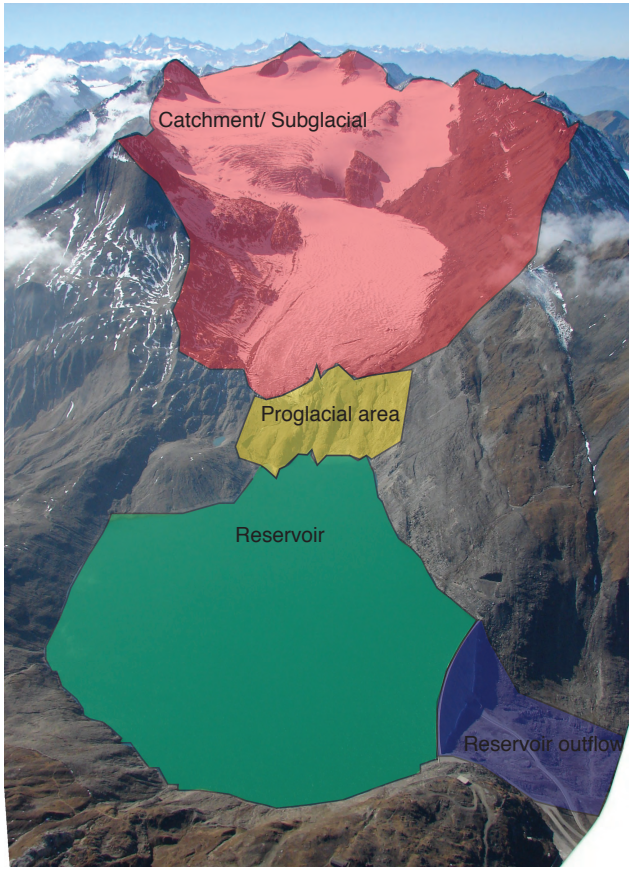


- increase in recent years
- 6 years experience deposition
- some hydrological differences between years with erosion and deposition

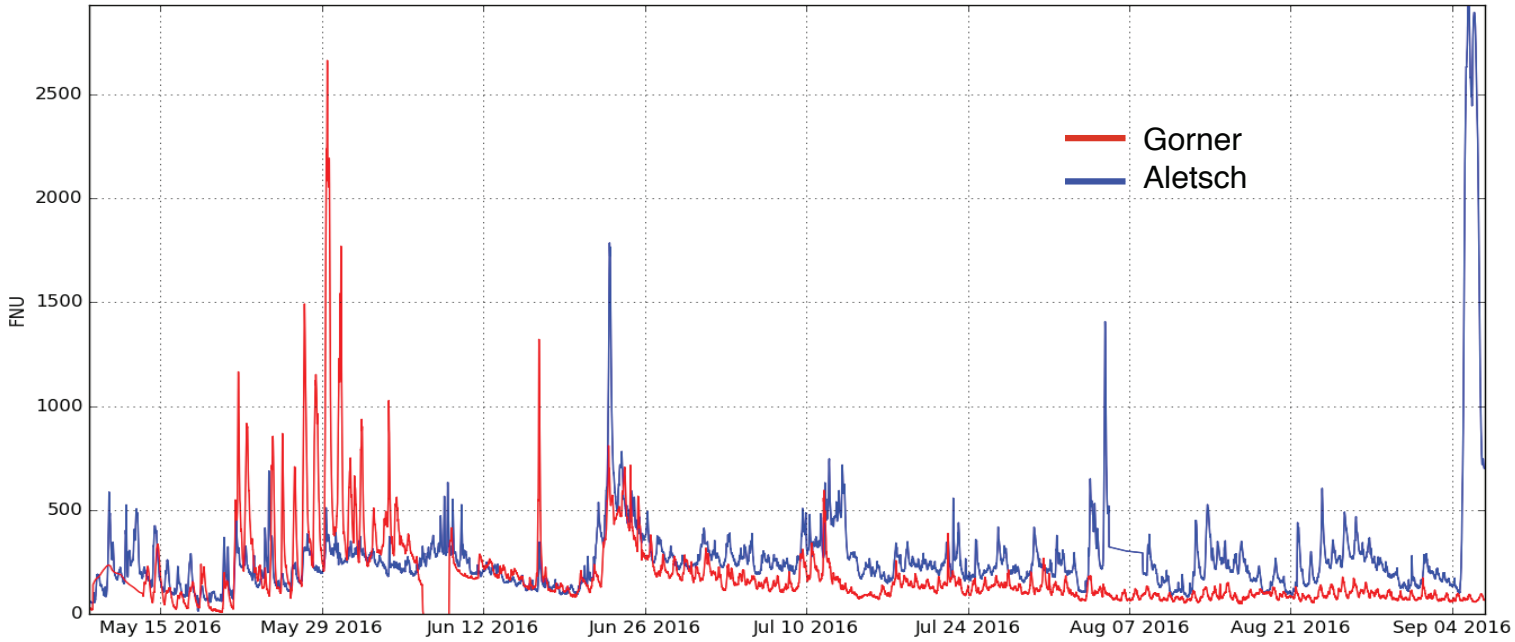
which matters more: erosion rates from bathymetry of the proglacial reservoir

Timespan	**sediment from PGA**	**eff. erosion PGA** cm a^{-1}	**eff. erosion catch** cm a^{-1}
1976 - 2014	38 %	-6.6	-0.2

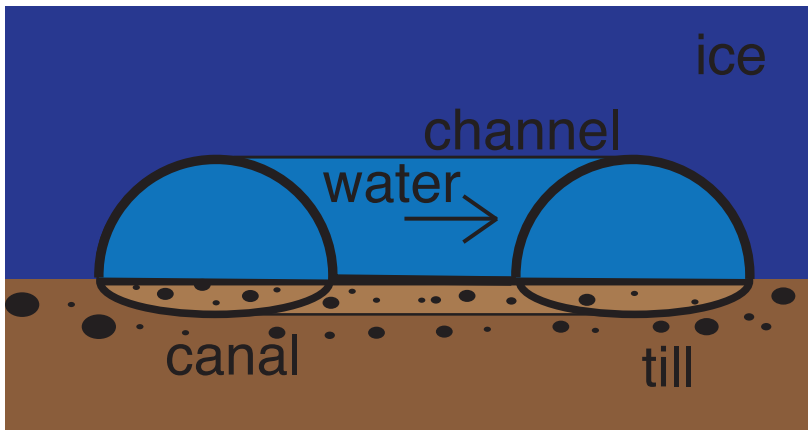
Subglacial erosion **produces more sediment**...
but periglacial erosion is **more effective per unit area**.



subglacial: seasonal analysis of Gorner and Aletsch catchments to constrain subglacial processes



- determine sediment flux. . .
- difference between meteorological signal and glaciological signal (i.e. Jökulhlaup, spring speed-ups). . .
- can this be modeled?



some final thoughts:

- the **periglacial** area can erode faster. . .
- . . . but the **subglacial** environment can expell more sediment.
- modeling **subglacial** erosion on short time scales is needed to forecast sediment fluxes.
- however, the contributions of the sediment sources will change as **periglacial** areas grow and **subglacial** areas shrink.