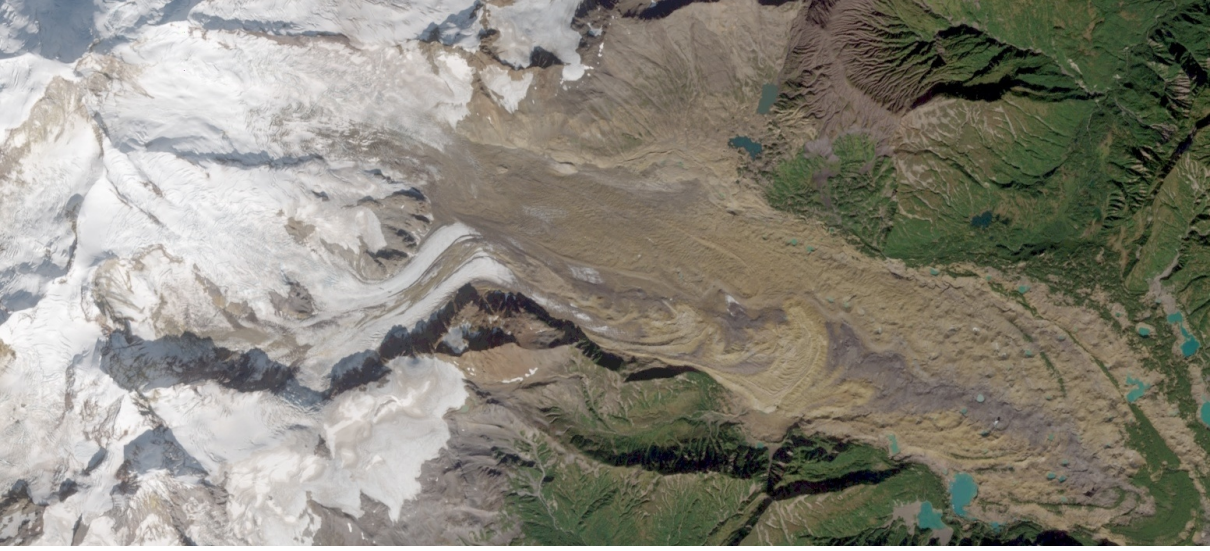
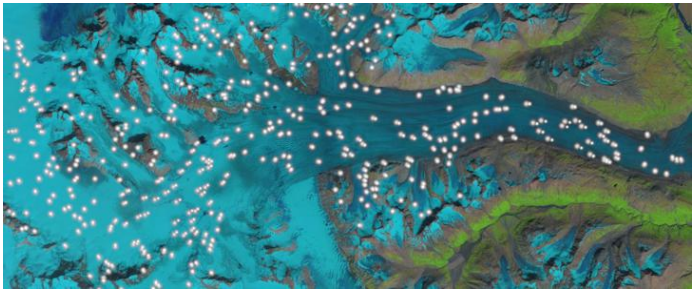


Topographic elevation change through tracking shadow cast from mountain ridges. Showcasing Red Glacier, Mt. Iliamna

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*Utrecht University - Institute for Marine and Atmospheric research (IMAU) & †eScience center - team Atlas

Optical remote sensing is able to generate ice dynamics at great detail



animations in this presentation
seem to work best with Acrobat reader

this animation can also be seen here:
https://youtu.be/a48WM1maLvo

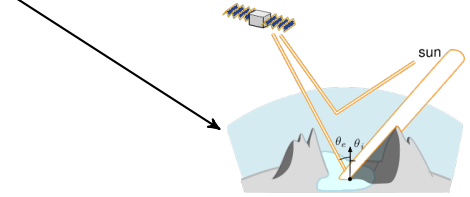
Here Fisher Glacier surges within four years time.
but the data is also corrupted by systematic seasonal North-South movements
it is very challenging to remove this artifacts...

Velocity data based on Landsat GoLIVE data, processing as in [Altena et al.] 10.5194/tc-13-795-2019

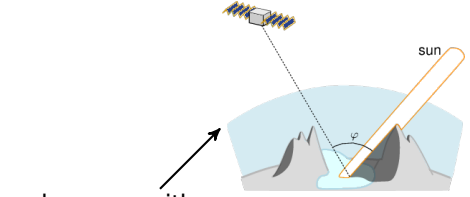
but it can also be a datasource!



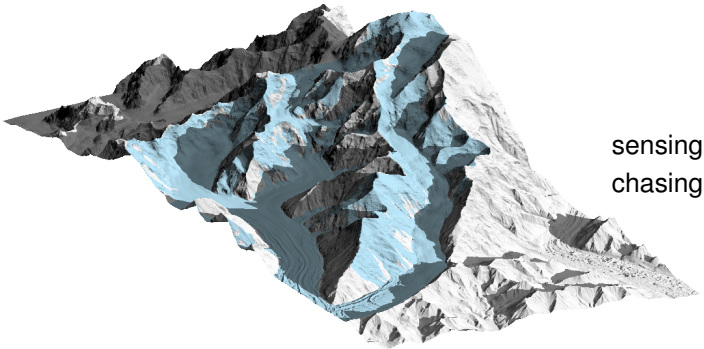
not correcting for topography

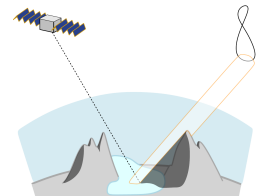


let's reverse the problem



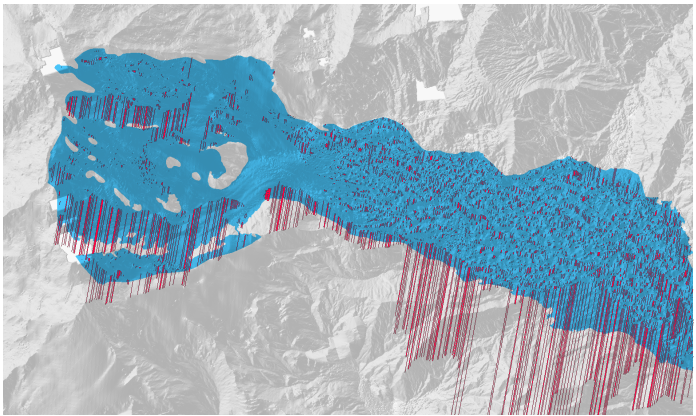
and measure it!





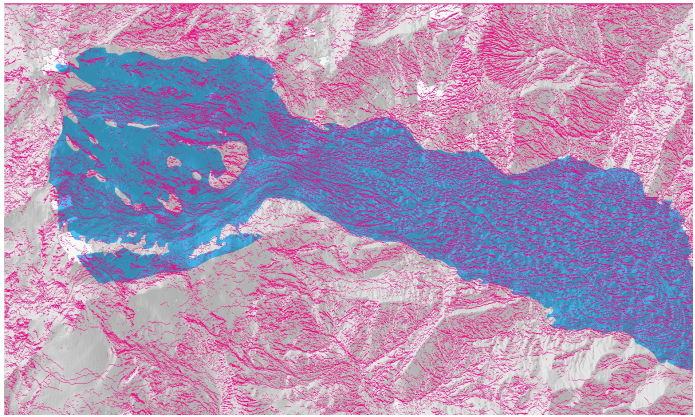
sensing throughout the seasons,
chasing shadows.

Thus we do pattern matching (or feature tracking).
but instead looking at the whole glacier surface
we solely focus on the ridges of the shadow cast.



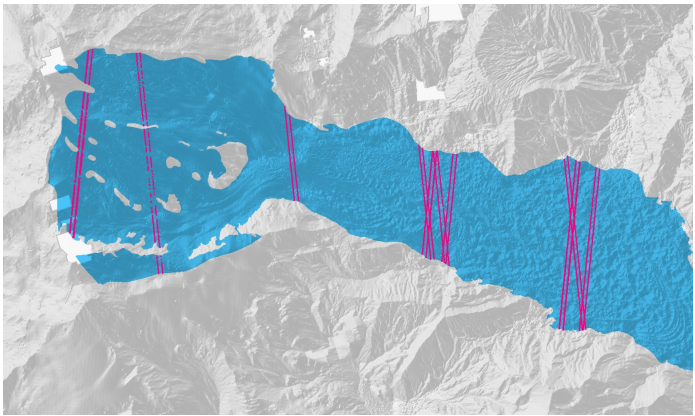
shadow casts from mountains or glacial topography

tracking gives relative elevation change



four years of Sentinel-2 imagery
1 image = 1 year of data

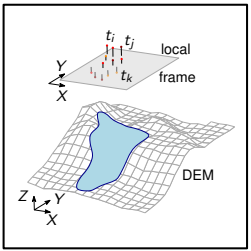
many points sampled
especially at accum. area

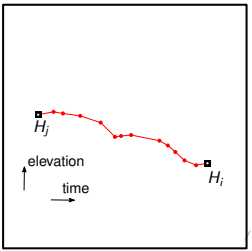


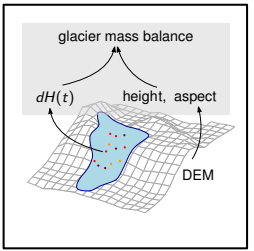
same sampling from ICESat-2 2018-2020

but data can complement eachother nicely!

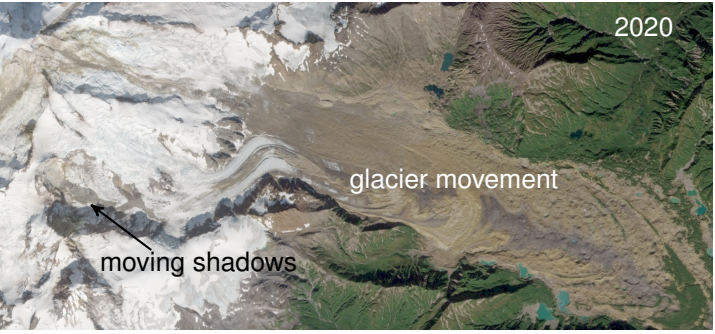
We call this technique **photohypsometry**, and see it as a gapfiller.
No stereoscopic system is needed, thus 40 years of data can be used. It creates elevation change over time and space, and can thus be converted to an hypsometric profile.







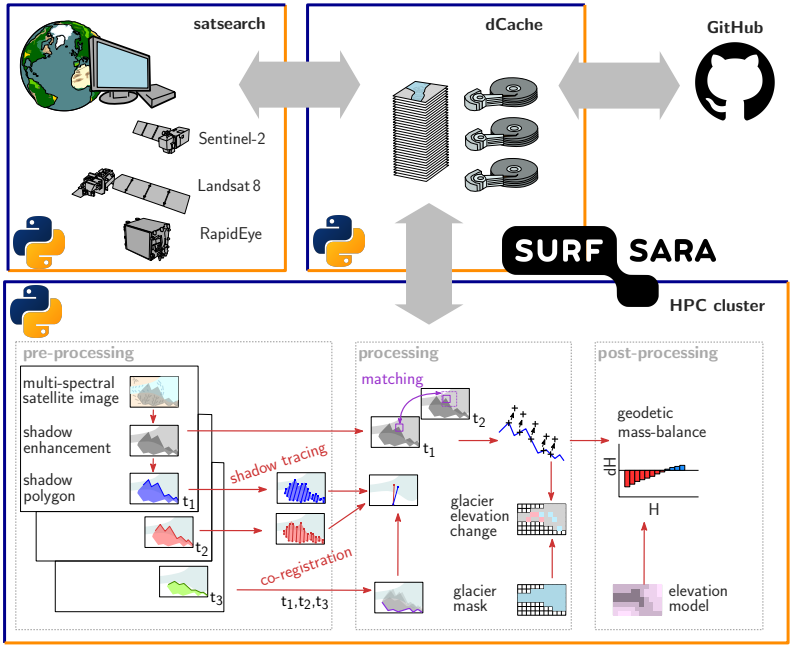




knowing this,
information can be seen:

lowering accumulation area
and much movement at snout

but how to do this for sentinel,
the landsat legacy, etc.?!



We are building a library that makes it possible to do large scale photohypsometric processing!

If you are interested, come talk to us in the PICO chat or send me an e-mail: b.altena@uu.nl