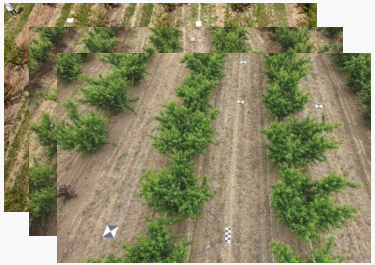
Time-SIFT : a frugal method for leveraging multi-temporal photogrammetric data without ancillary data

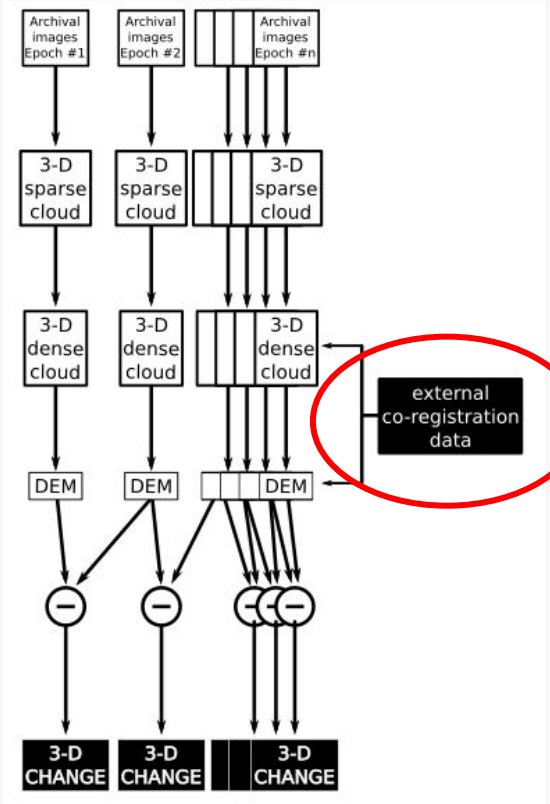
Feurer D., Bemis, S., Coulouma, G., Mabrouk, H., Massuel, S., Barbosa, R. V., Thomas, Y., Ammann, J. and Vinatier, F.

Context

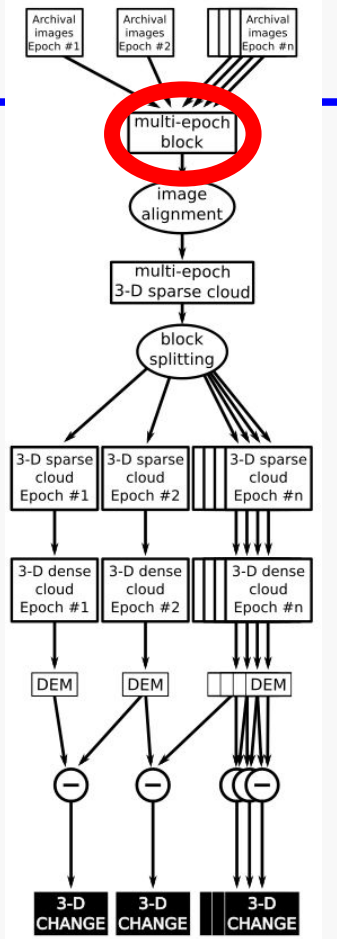
- Structure from Motion : 3-D photogrammetry *directly from images*
- Wealth of stereoscopic imagery, both archive and contemporaneous
- Need for multi-temporal analysis
- Issues with multi-date registration



The Time-SIFT method, in 2 words

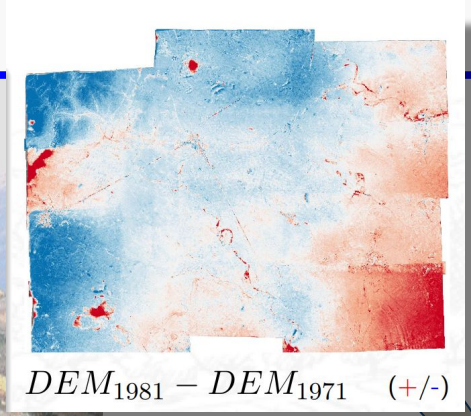


Classical methods

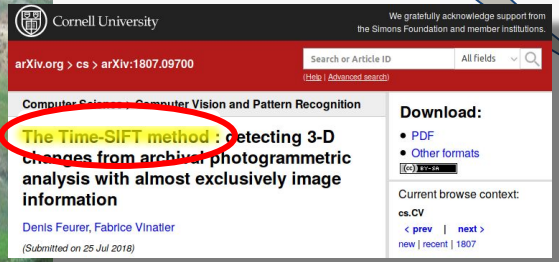


Time-SIFT

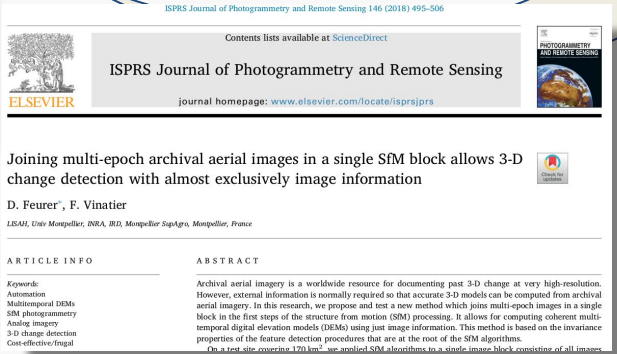
Previous results



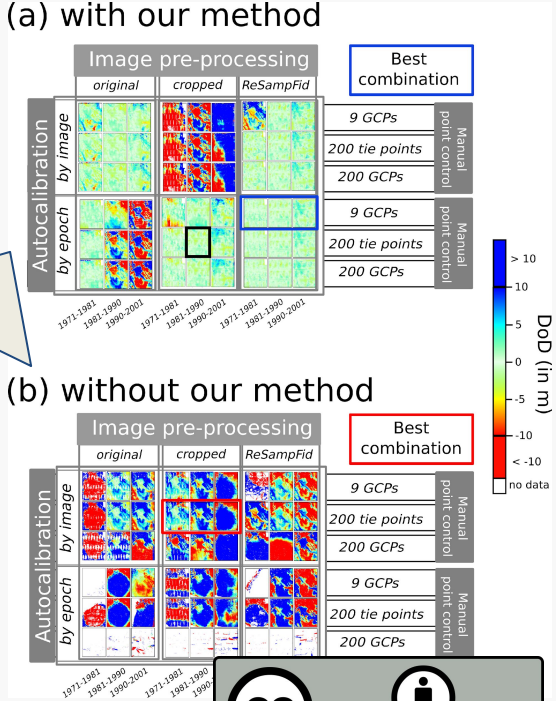
Feurer et al., 2016



Feurer et Vinatier, 2018



Feurer et Vinatier, 2018



LISAH

Aim of *this* study

Time-SIFT was developed and validated on aerial archival imagery.

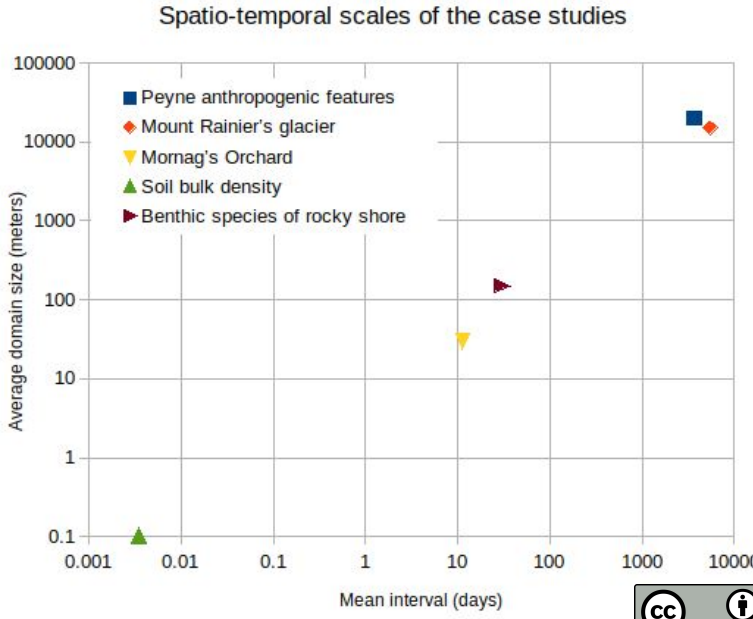
Is the Time-SIFT method robust to :

- Other test cases => more change, including vegetation growth ?
- Other time spans => larger, shorter ?
- Other scales => greater, smaller ?

orchard

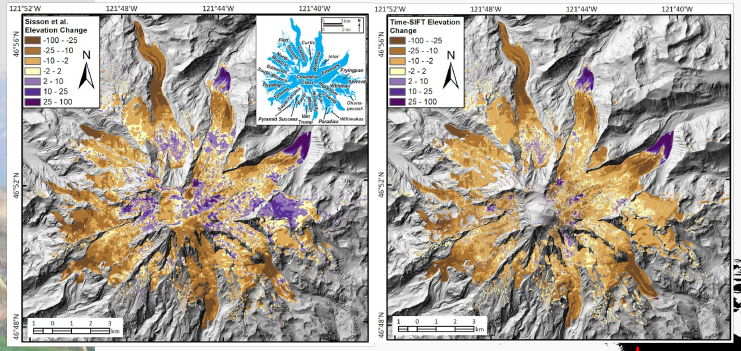
soil bulk density

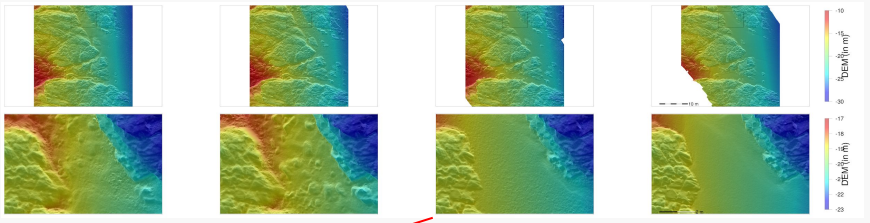
⇒ multi-sites, multi-scales, multi-cases study

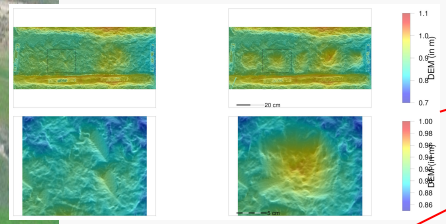


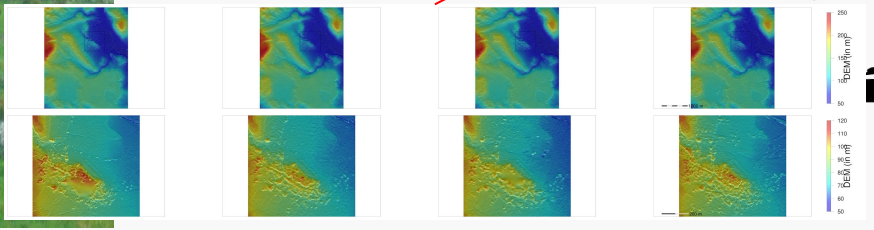
LISAH

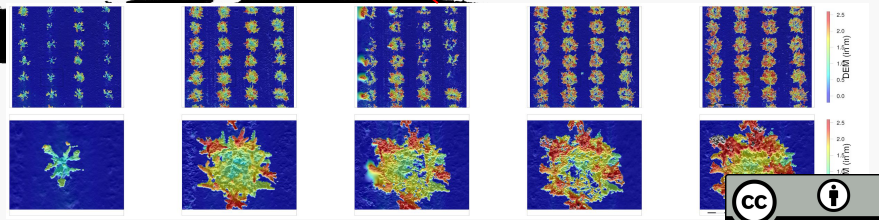
Five test cases - three focuses











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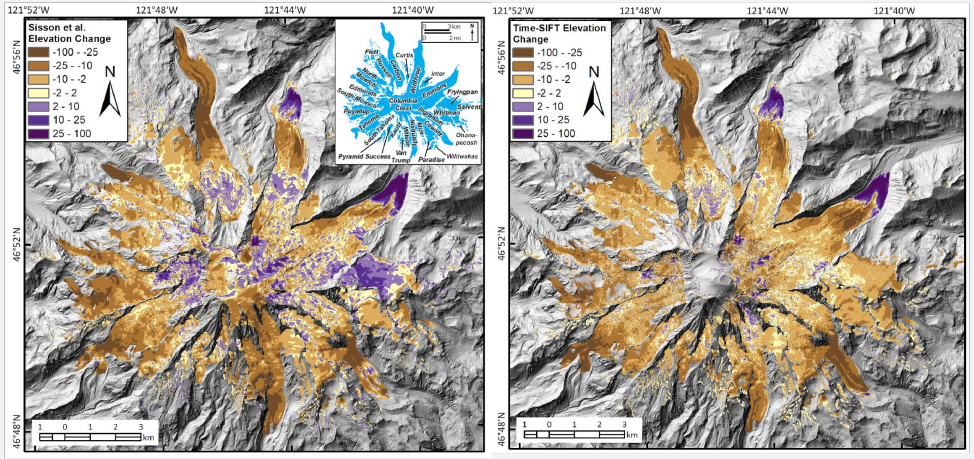
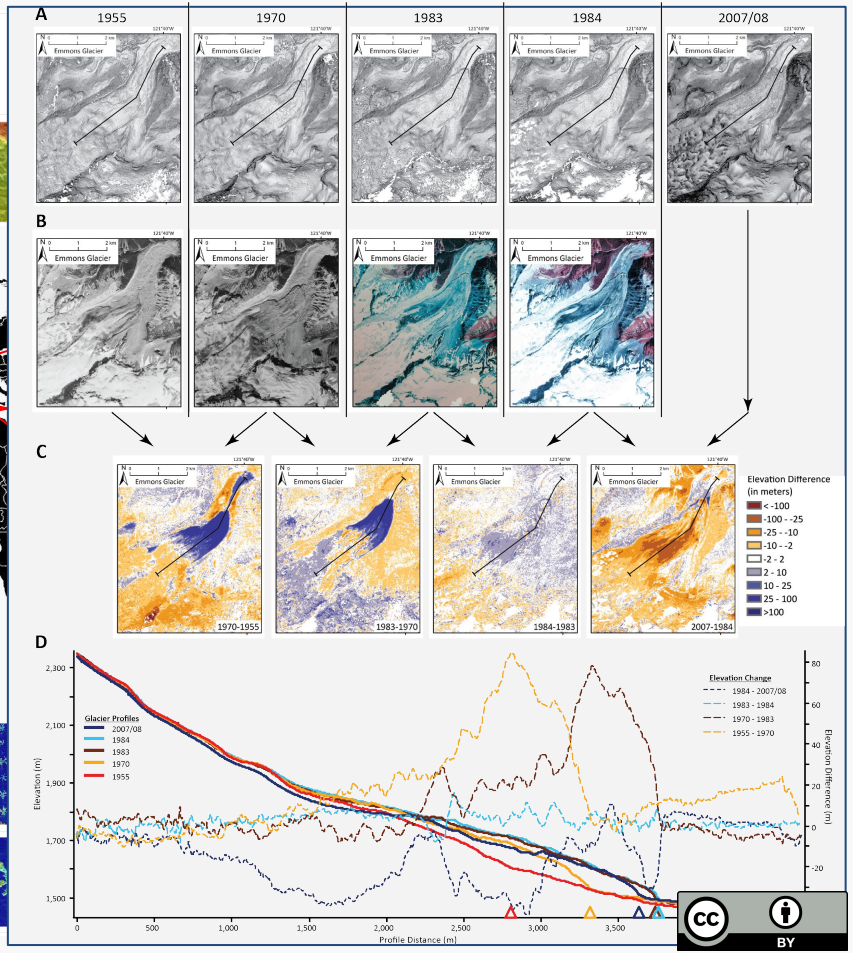
Test cases - Mount Rainier





- Archival aerial imagery
- 4 dates from 1955 to 1984
- Time spans from 11 years to 15 years
- RMS reprojection error ~ 1pix
- Noise ~ 2 meters

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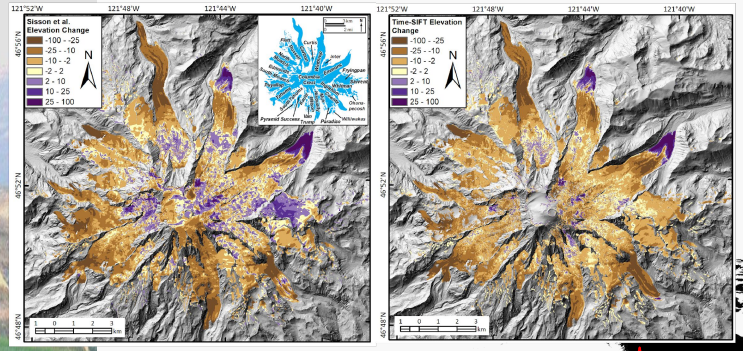
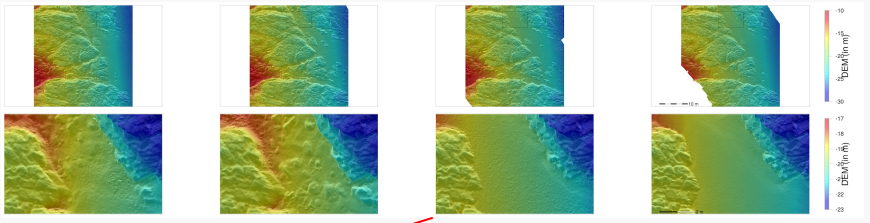
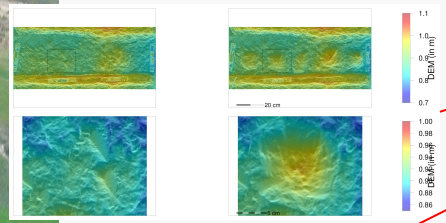
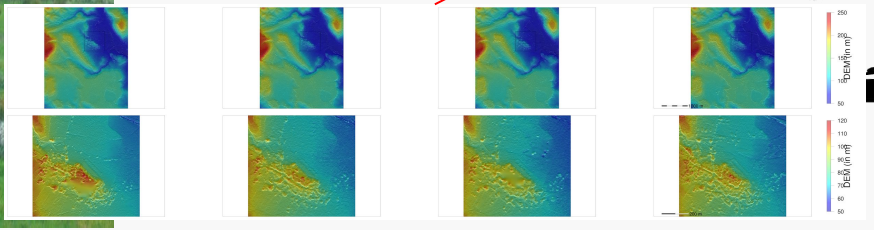
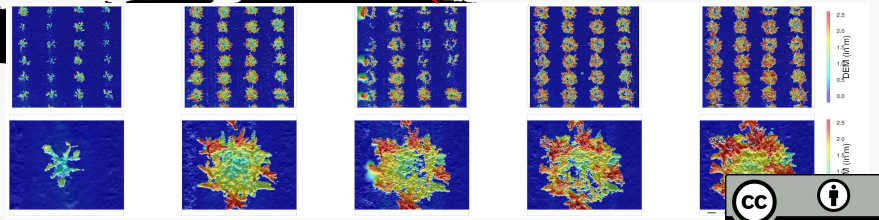
Test cases - continued (2)



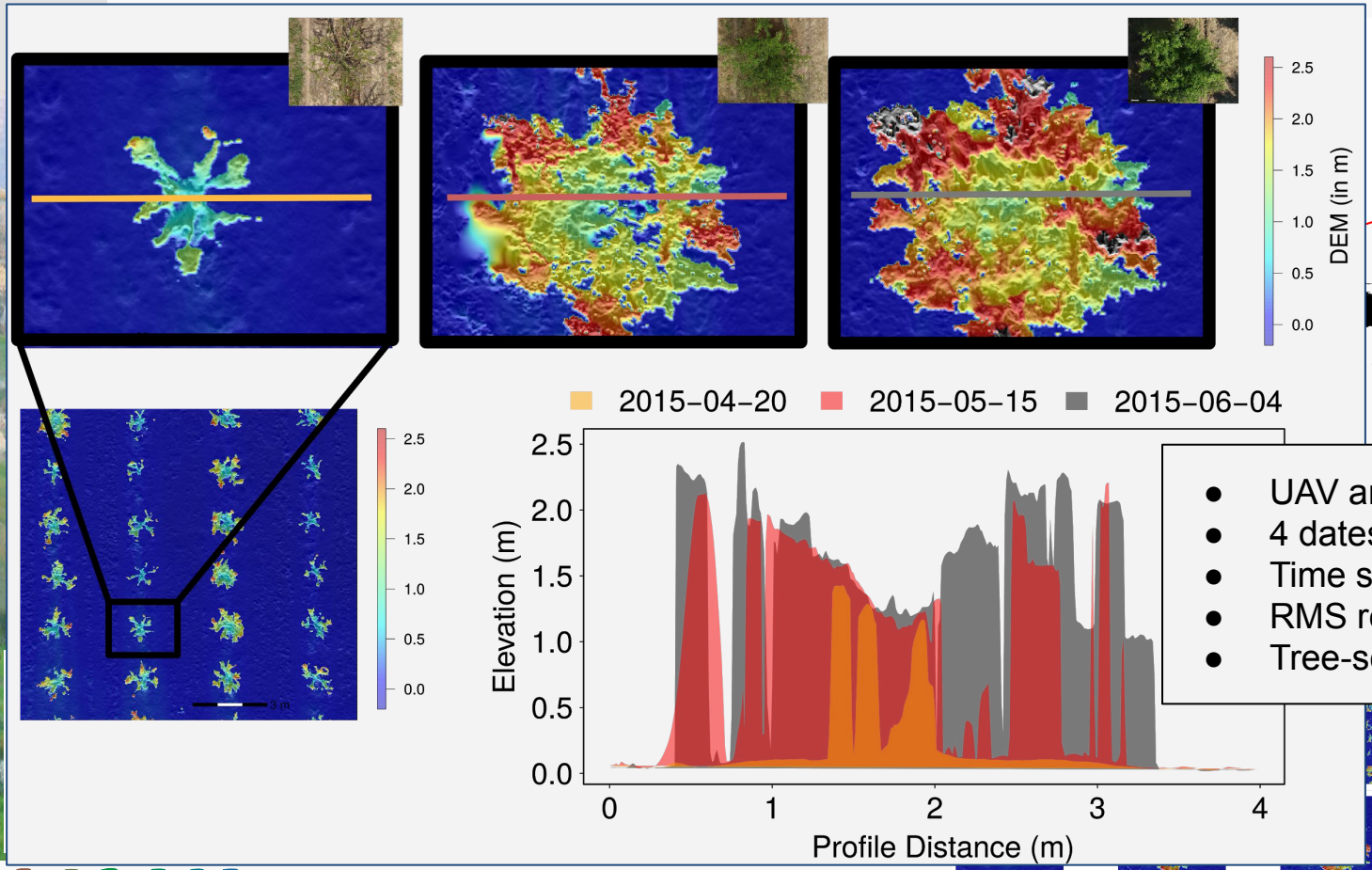






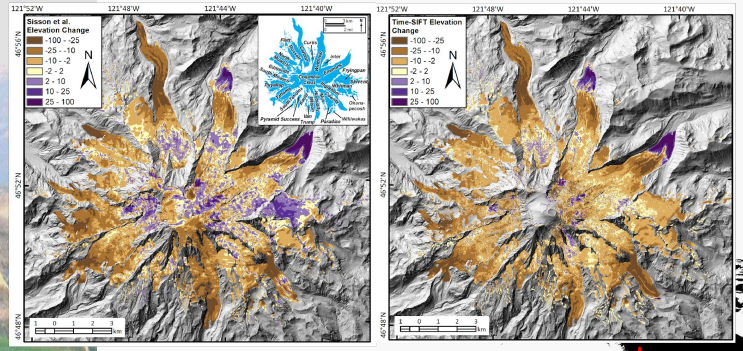


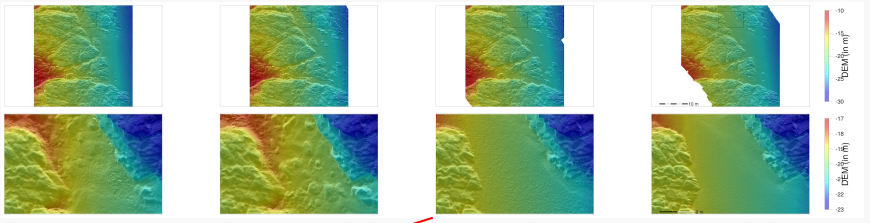
Test cases - Mornag's orchard

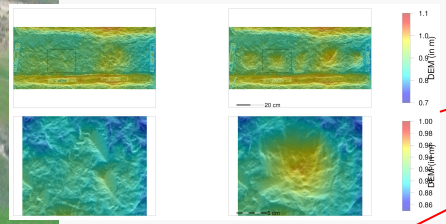


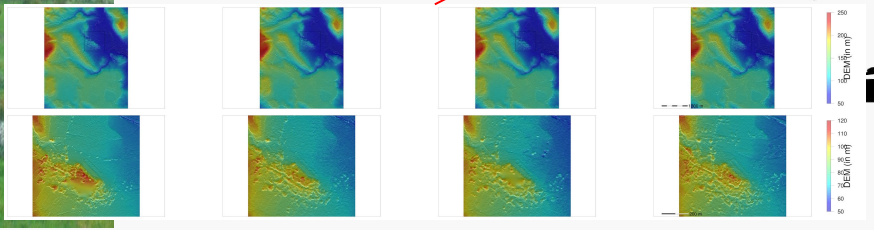
- UAV and kite
- 4 dates between april and june
- Time spans from 9 to 15 days
- RMS reprojection error ~ 0.5 pix
- Tree-scale monitoring

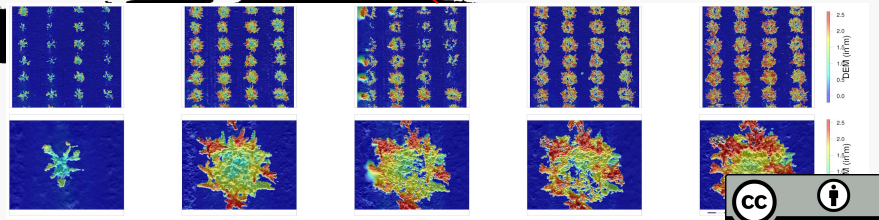
Test cases - continued (3)



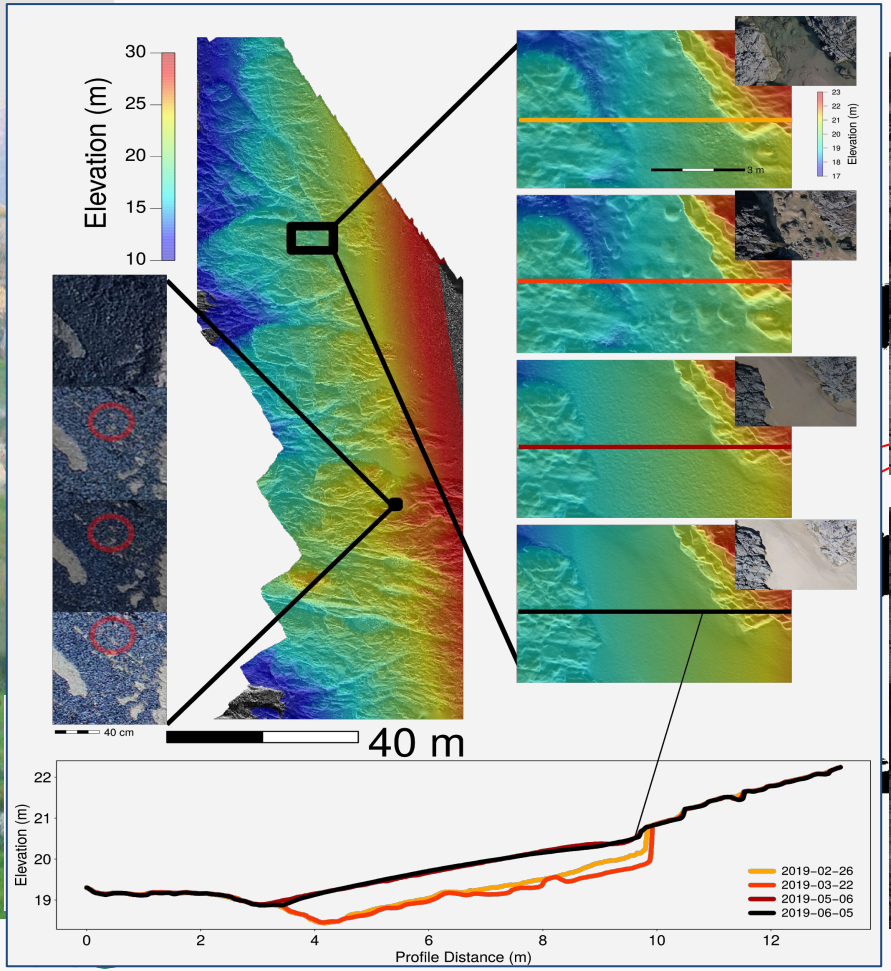








Test cases - rocky shore



- 4 dates between february and june
- Time spans from 24 to 45 days
- RMS reprojection error ~ 0.5 pix
- Small changes in mussels populations

Many thanks for your attention

Main results :

- Time-SIFT works for a wide variety of spatio-temporal scales
- Time-SIFT succeeds even with large changes (vegetation growth)
- Would be interesting to *predict* the conditions for which the Time-SIFT method succeeds or fails => need for larger benchmarking

Questions ?

Interested in testing the Time-SIFT method
and further assessing its capabilities ?
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