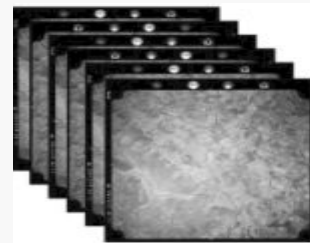


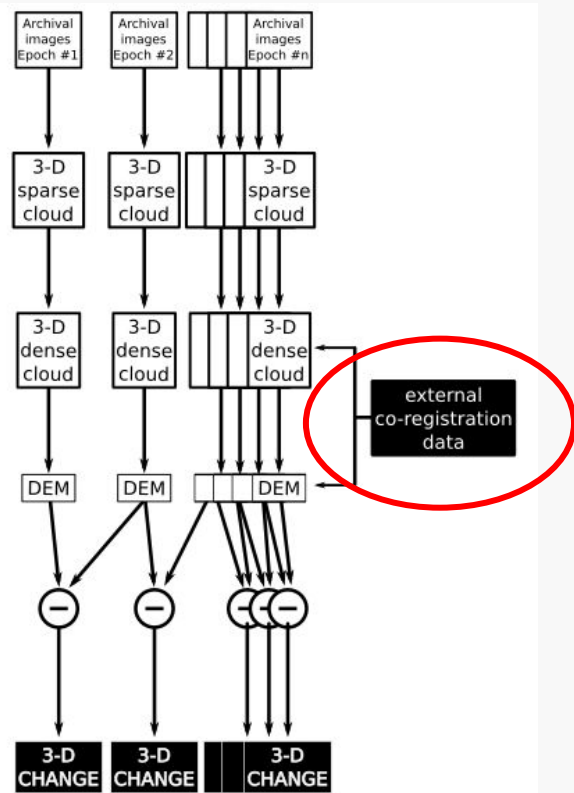
Time-SIFT : a frugal method for leveraging multi-temporal photogrammetric data without ancillary data

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

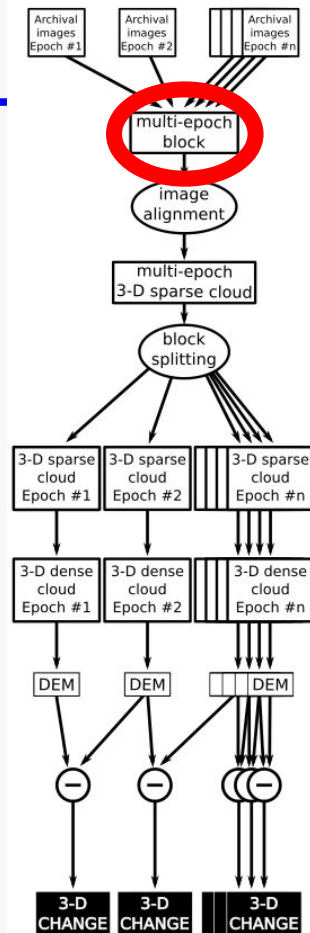
- Structure from Motion : 3-D photogrammetry *directly from images*
- Wealth of stereoscopic imagery, both archive and contemporaneous
- Need for multi-temporal analysis
- Issues with multi-date registration



The Time-SIFT method, in 2 words



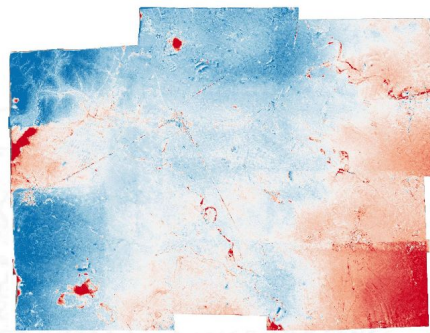
Classical methods



Time-SIFT



Previous results



$DEM_{1981} - DEM_{1971}$ (+/-)

Feurer et al., 2016

Cornell University

We gratefully acknowledge support from the Simons Foundation and member institutions.

arXiv.org > cs > arXiv:1807.09700

Search or Article ID All fields

(Help | Advanced search)

Computer Science > Computer Vision and Pattern Recognition

The Time-SIFT method : detecting 3-D changes from archival photogrammetric analysis with almost exclusively image information

Download:

- PDF
- Other formats

Current browse context:

cs.CV

< prev | next >

new | recent | 1807

Denis Feuer, Fabrice Vinatier

(Submitted on 25 Jul 2018)

Feurer et Vinatier, 2018

ISPRS Journal of Photogrammetry and Remote Sensing 146 (2018) 495–506

Contents lists available at ScienceDirect

ISPRS Journal of Photogrammetry and Remote Sensing

journal homepage: www.elsevier.com/locate/isprsjrs

Joining multi-epoch archival aerial images in a single SfM block allows 3-D change detection with almost exclusively image information

D. Feuer^a, F. Vinatier^a

^a LISAH, Univ Montpellier, IRD, Montpellier SupAgro, Montpellier, France

ARTICLE INFO

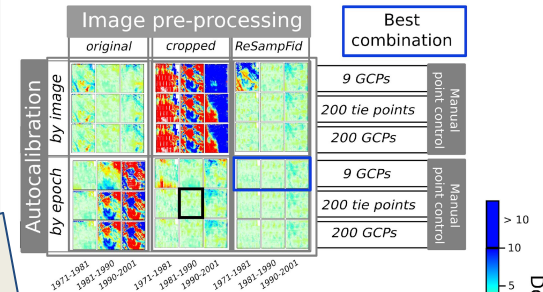
ABSTRACT

Archival aerial imagery is a worldwide resource for documenting past 3-D change at very high-resolution. However, external information is normally required so that accurate 3-D models can be computed from archival aerial imagery. In this research, we propose and test a new method which joins multi-epoch images in a single block in the first steps of the structure from motion (SfM) processing. It allows for computing coherent multi-temporal digital elevation models (DEMs) using just image information. This method is based on the invariance properties of the feature detection procedures that are at the root of the SfM algorithms.

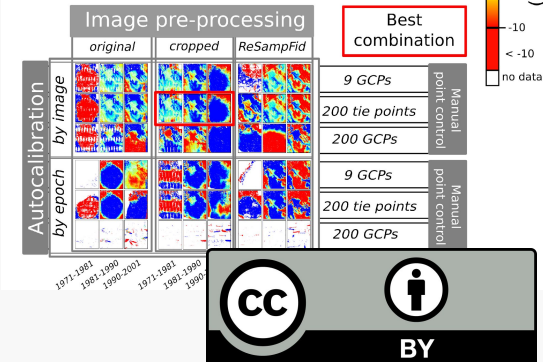
On a test site covering 170 km², we applied SfM algorithms to a single image block consisting of all images

Feurer et Vinatier, 2018

(a) with our method



(b) without our method



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 ?

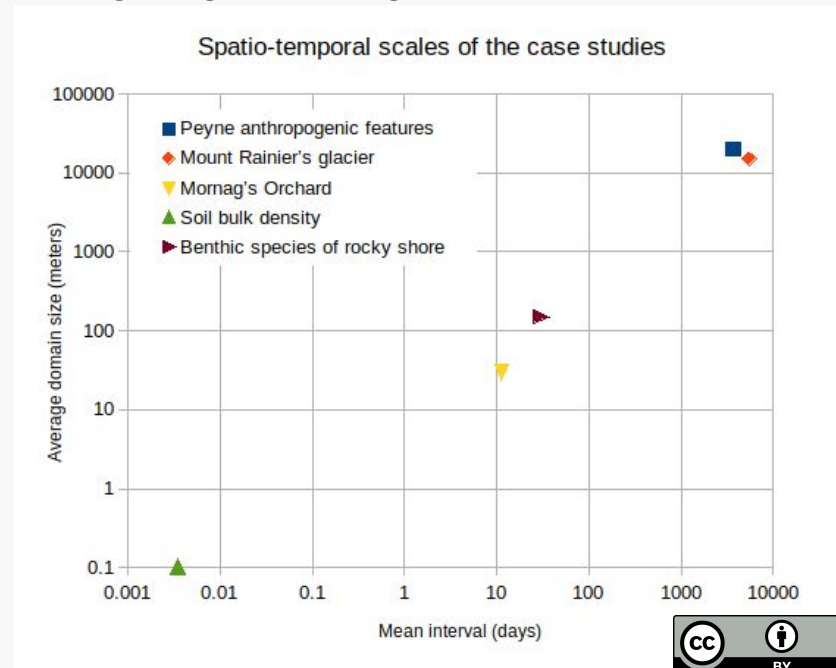


orchard

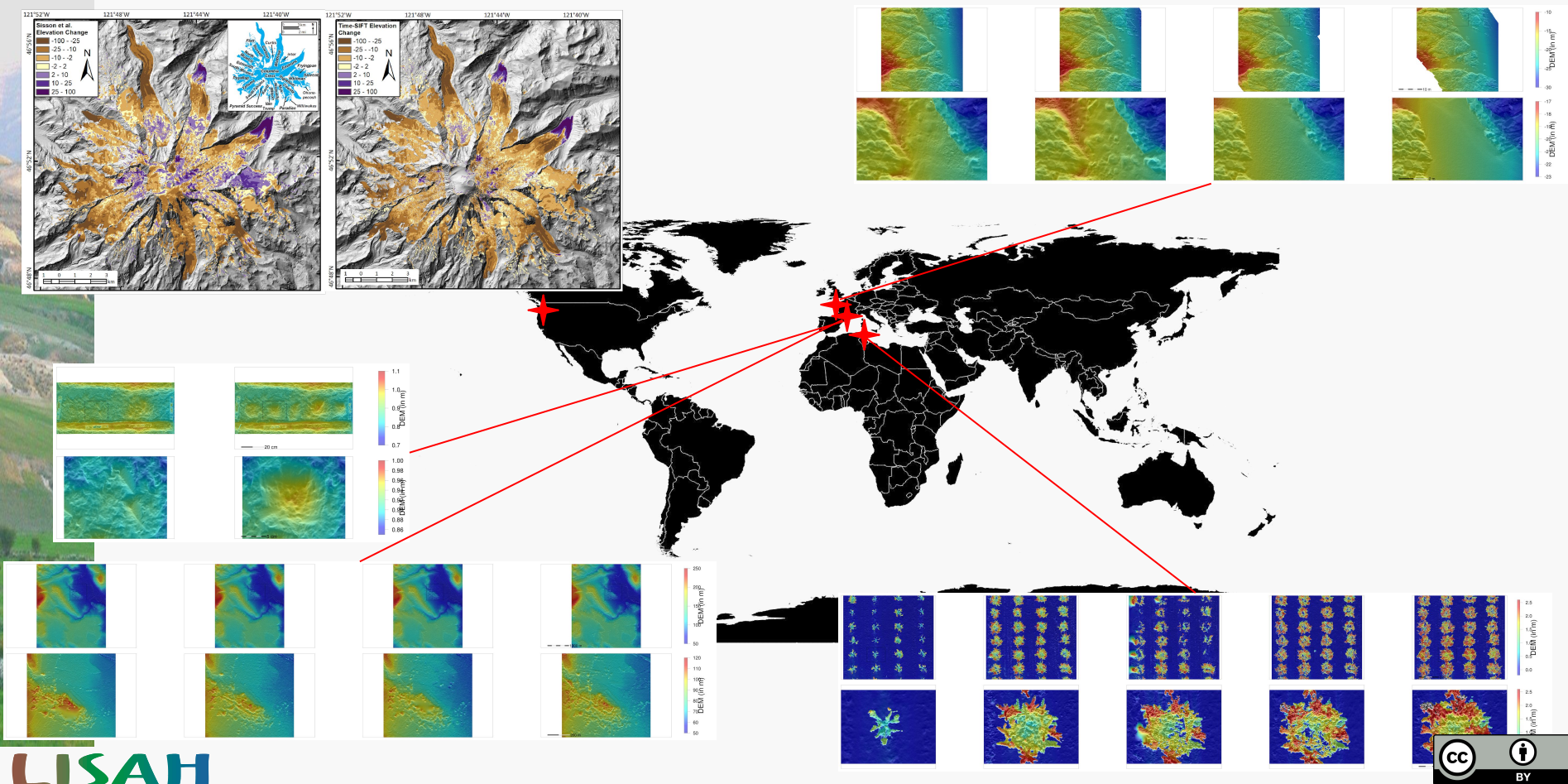


soil bulk density

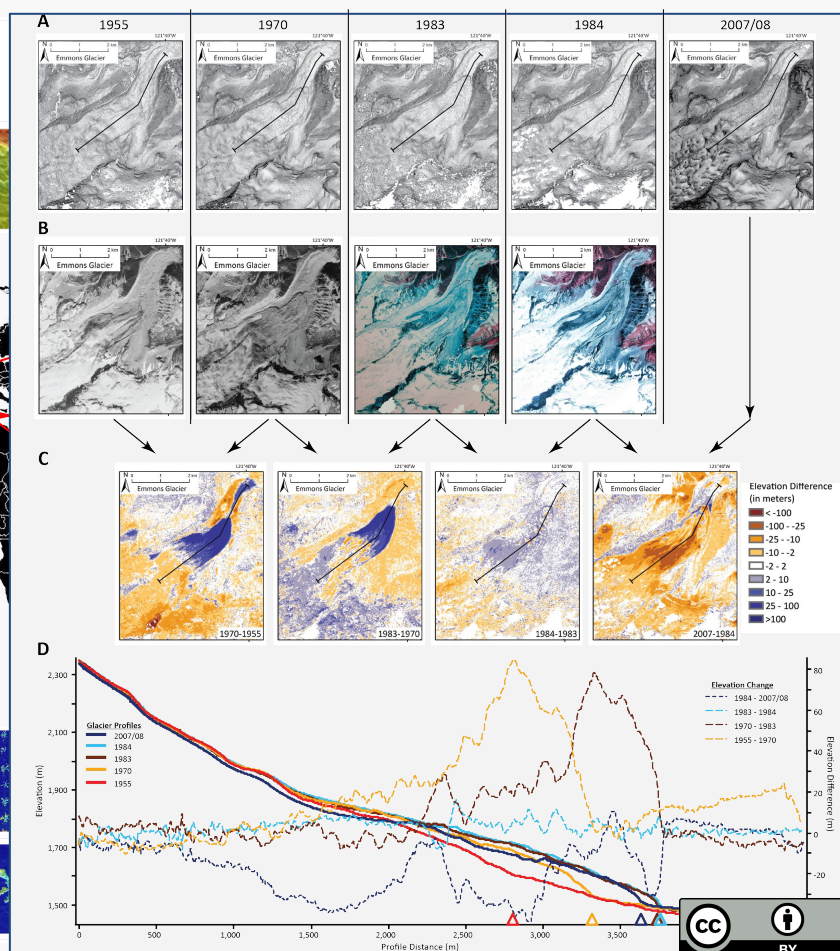
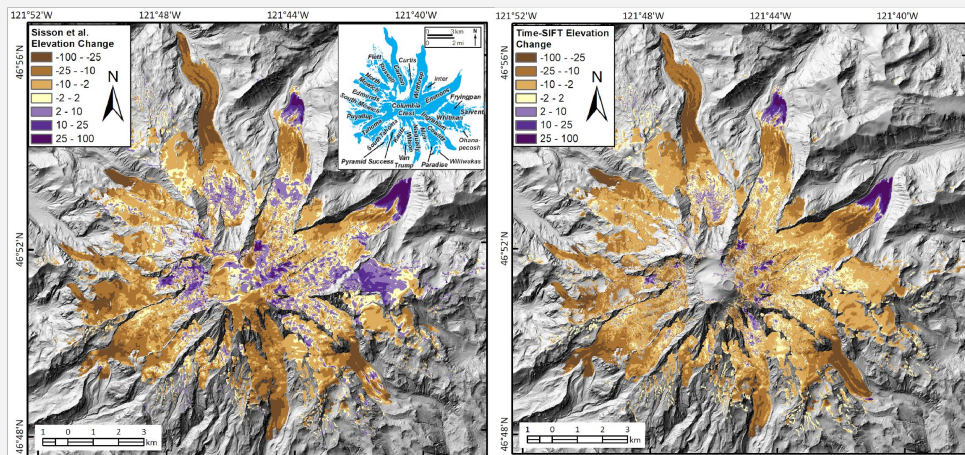
⇒ multi-sites, multi-scales,
multi-cases study



Five test cases - three focuses

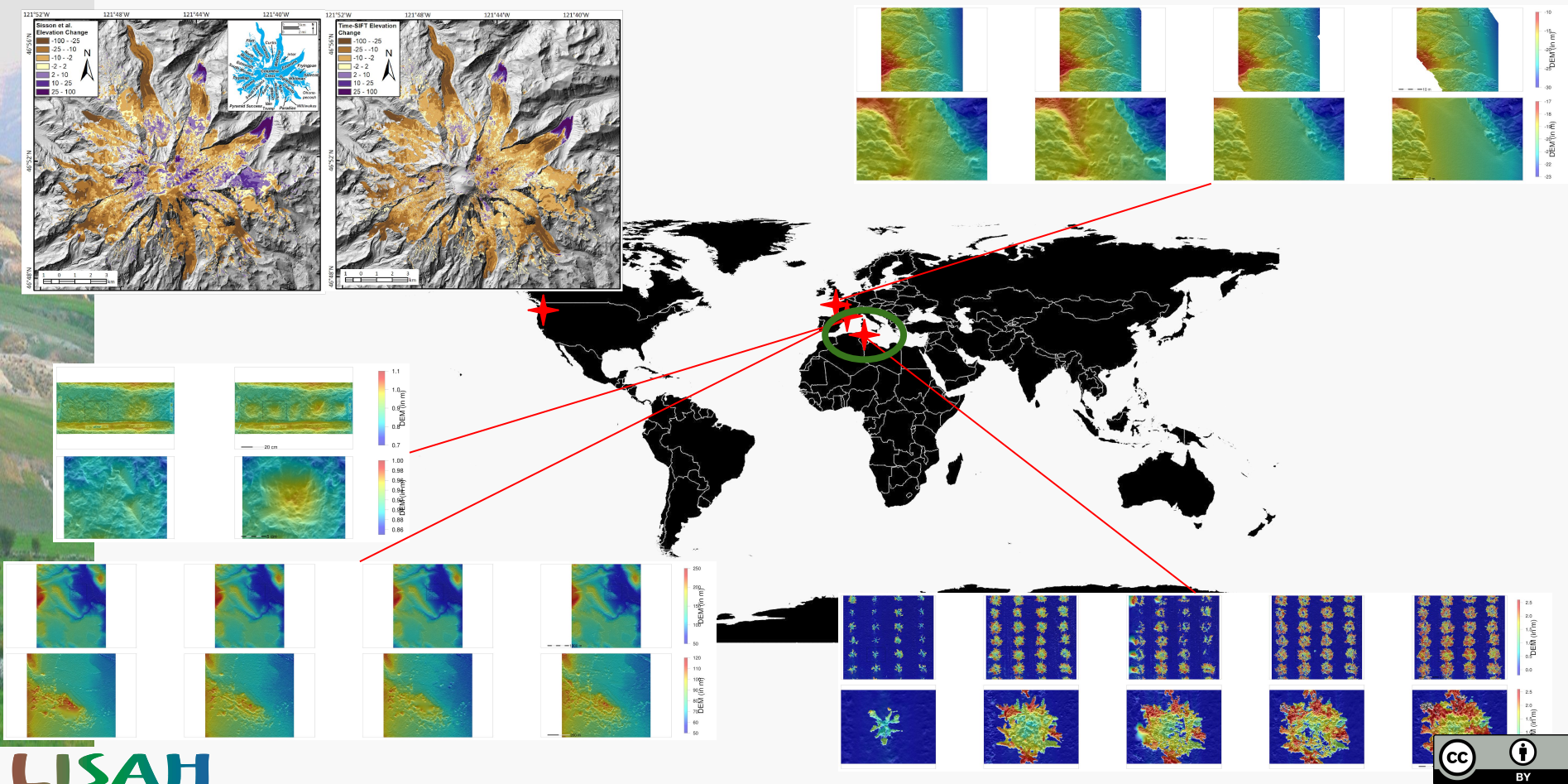


Test cases - Mount Rainier

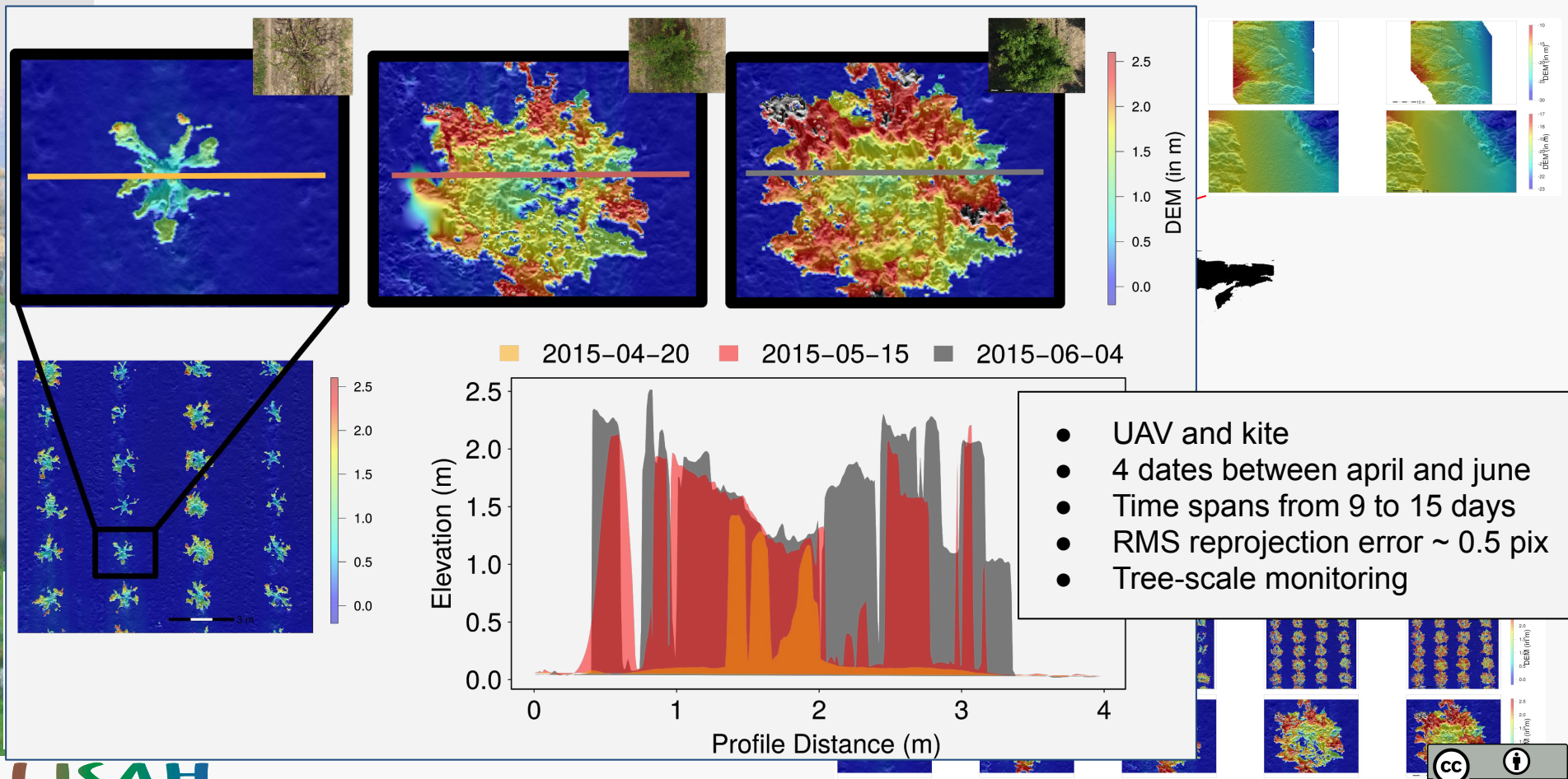


- Archival aerial imagery
- 4 dates from 1955 to 1984
- Time spans from 11 years to 15 years
- RMS reprojection error ~ 1pix
- Noise ~ 2 meters

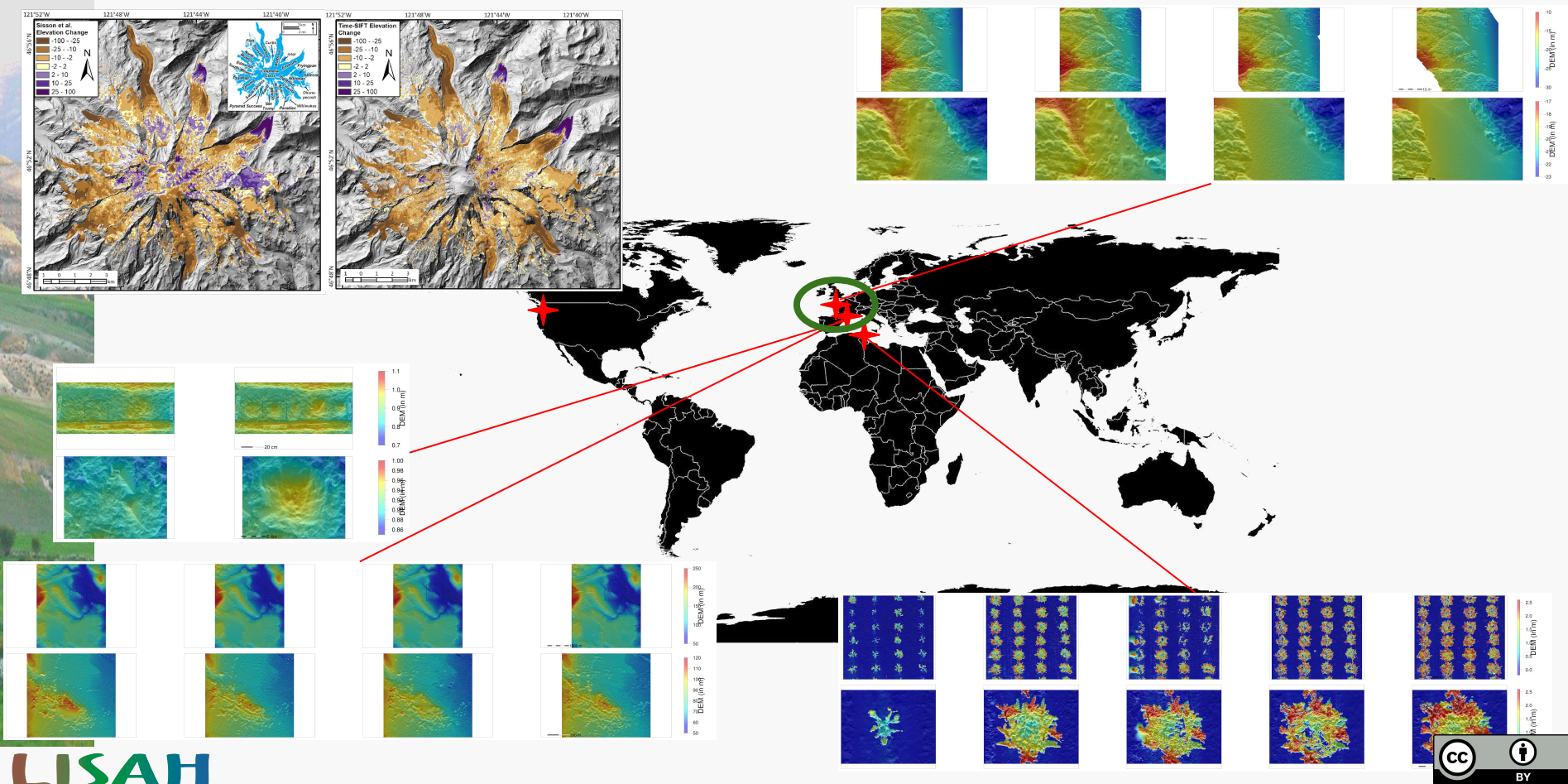
Test cases - continued (2)



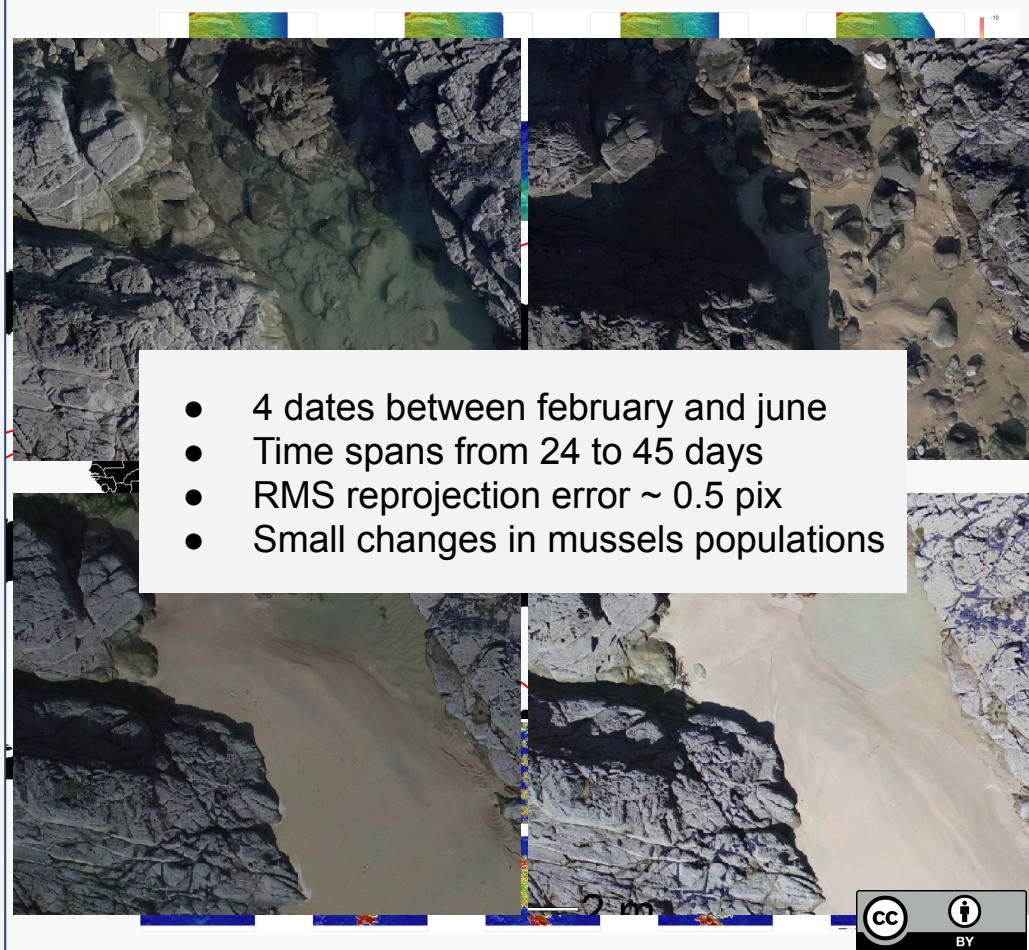
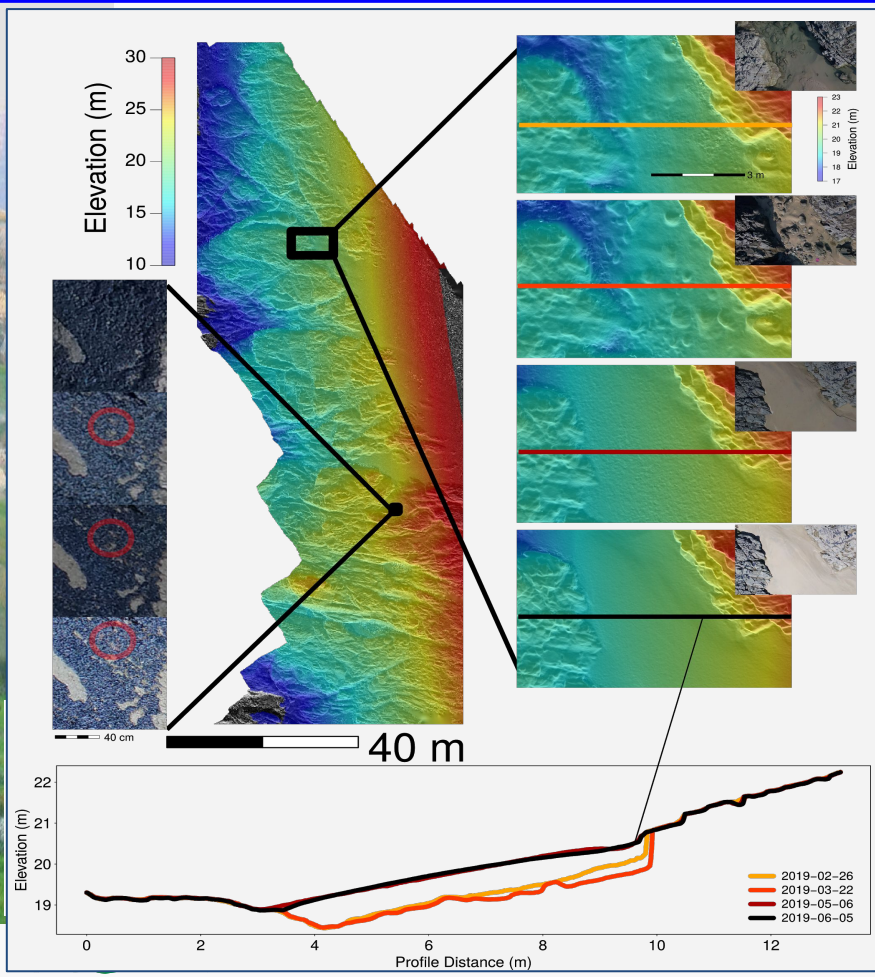
Test cases - Mornag's orchard



Test cases - continued (3)



Test cases - rocky shore



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 ?

⇒ denis.feurer@ird.fr