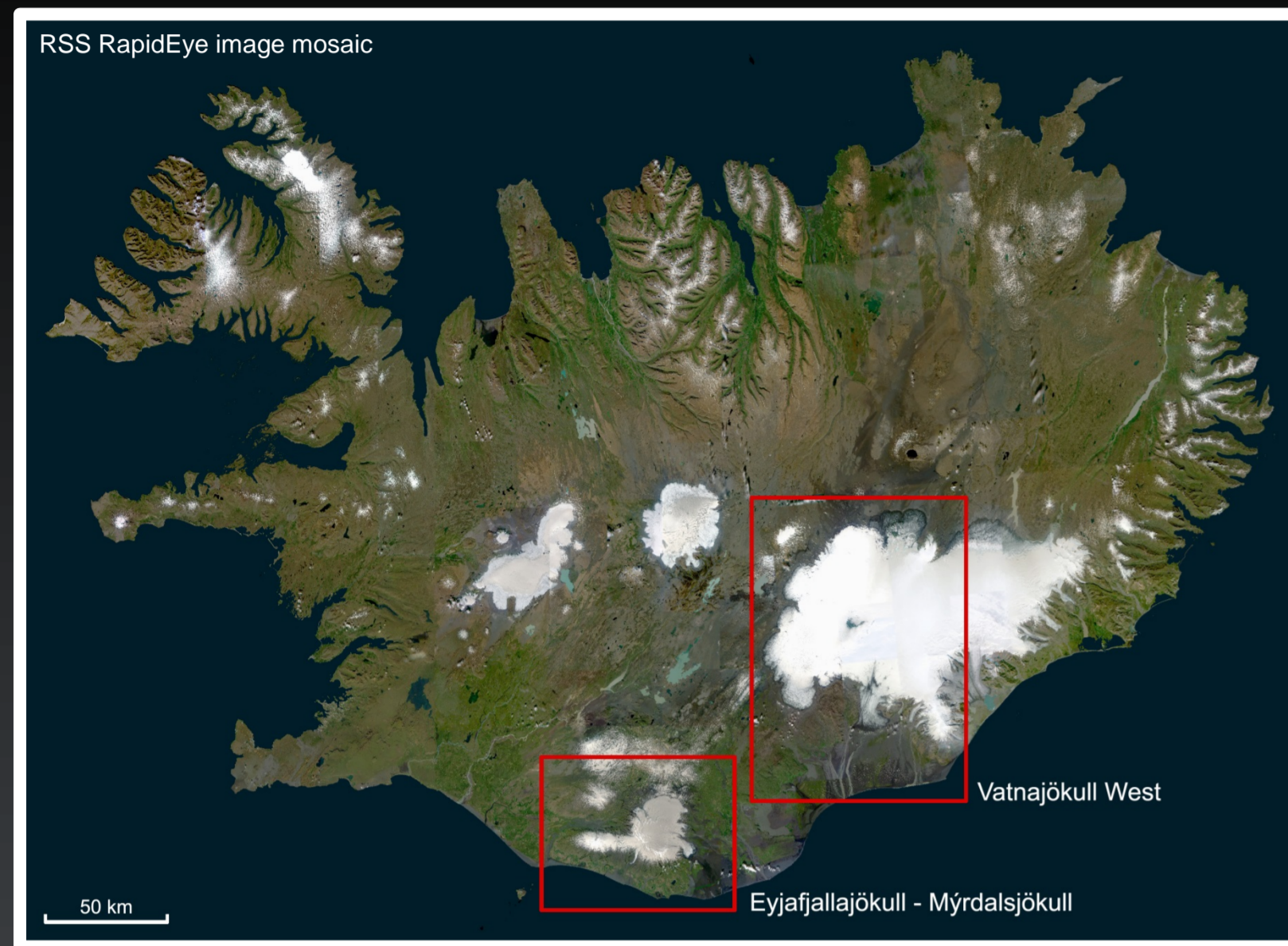




Monitoring of Icelandic volcanoes with innovative remote sensing technologies and 3D visualisation

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Research areas

Early detection

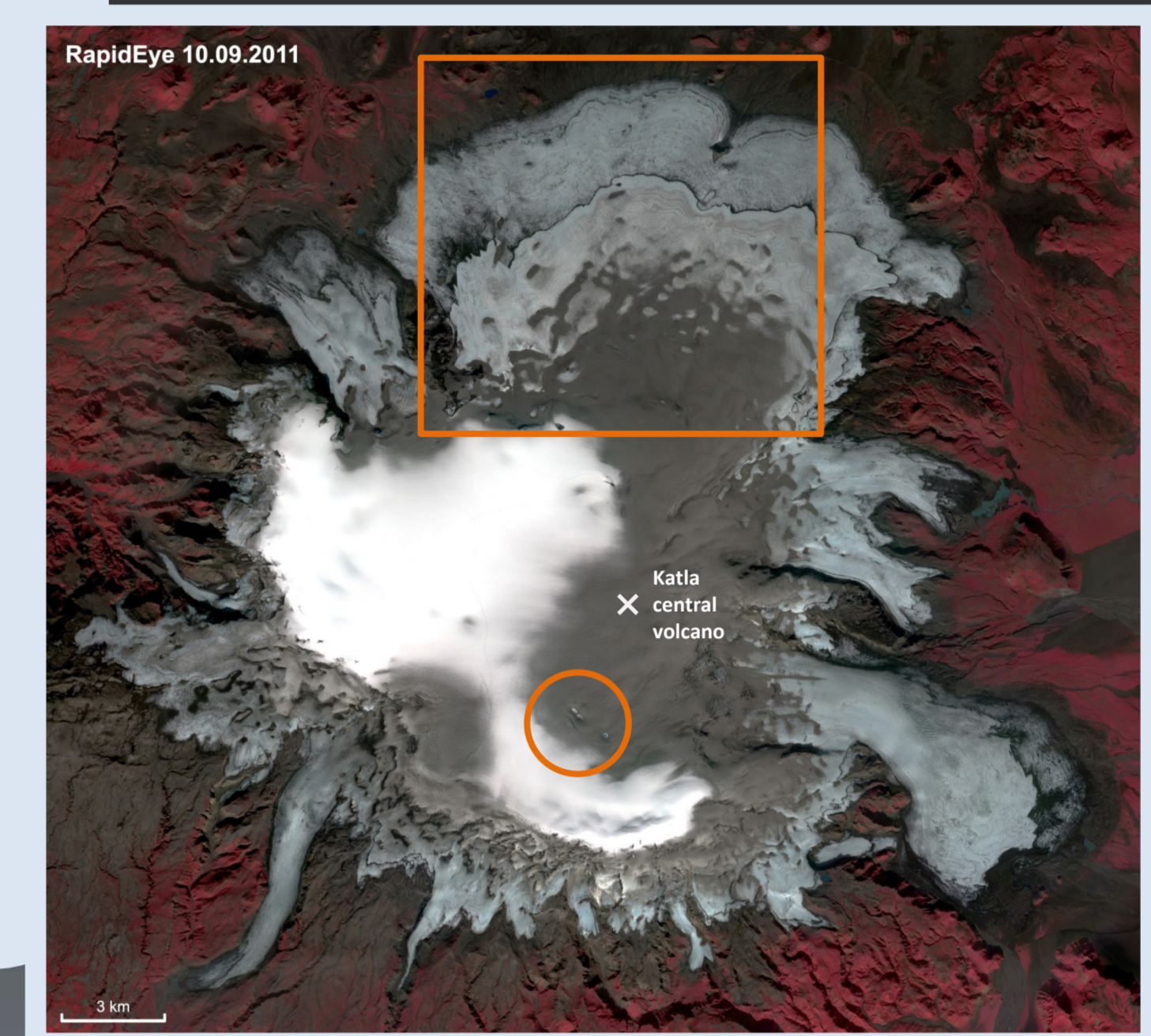
Subglacial volcanic eruptions often provide indications of activity before the actual catastrophic event:

- **Ice cauldrons**, i.e. surface depressions appear on top of the ice cap due to subglacial volcanic heat
- **Glacial outburst floods** (Ic. Jökulhlaups), i.e. meltwater torrents occur at the glacier margin



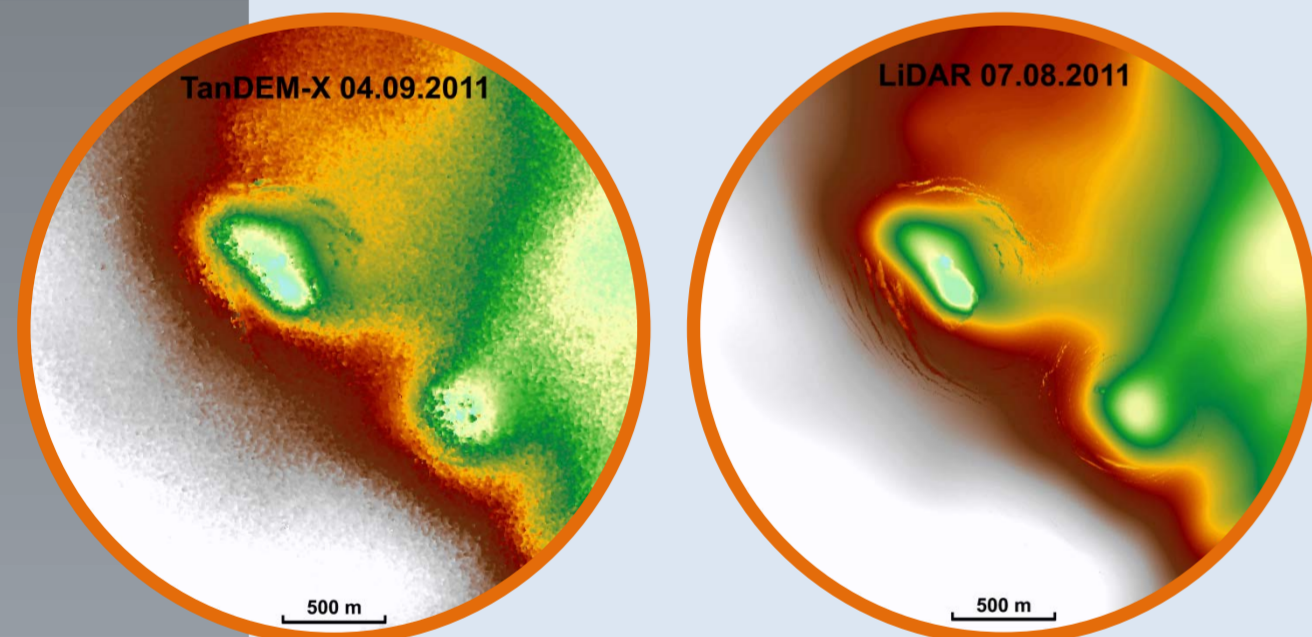
A process chain is developed in order to automatically identify such early indications, based on high spatially and temporally resolved remote sensing imagery (TerraSAR-X, TanDEM-X, RapidEye, LiDAR, HRSC, UltraCam).

Baseline monitoring: In August 2013 two permanent GPS stations, three stick gauges and four Top-Hat reflectors were installed on the northern part of Mýrdalsjökull to measure glacier flow velocity and melting rates.



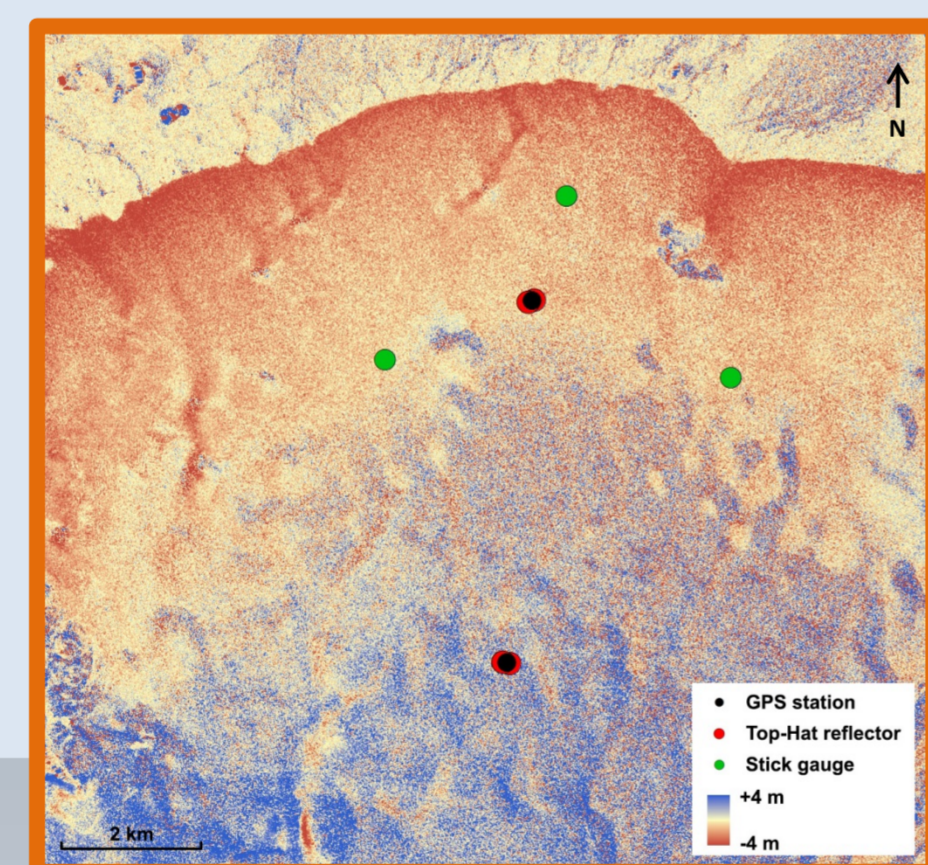
TanDEM-X

A **time series** of high resolution TanDEM-X data since 2011 allows detailed and innovative glacier studies.



A comparison of TanDEM-X elevation data (RawDEMs) with very high resolution LiDAR data shows very good agreement. Shown are two ice cauldrons (up to 140 m deep) which developed during a Jökulhlaup in July 2011.

TanDEM-X **image differentiation** (19.07.2012 minus 04.09.2011) detects ice melting (red) and firn snow accumulation (blue) on Sléttjökull outlet glacier.



3D Viewer

- In view of operational Copernicus services a user-friendly, high resolution **3D visualisation environment** was created by RSS GmbH.
- Basis of the 3D map is a RapidEye image mosaic of whole Iceland, generated with 267 nearly cloud-free image tiles.
- Project results (e.g. image analysis, field data, **hazard zones**) are integrated into the 3D Viewer.



Fieldwork on Mýrdalsjökull in August 2013



KEG ice drill



DLR Top-Hat reflector



Ash cover on Sléttjökull



Permanent GPS station

