MONITORING SURFACE DEFORMATION USING SATELLITE DATA

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IOGP Geomatics / Statoil Industry Day

Stavanger, Norway

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Overview

- Context
- Background radar satellites
- Methodology and techniques
- Product samples
    - Kuwait
    - Iceland
- Accuracy on measurements

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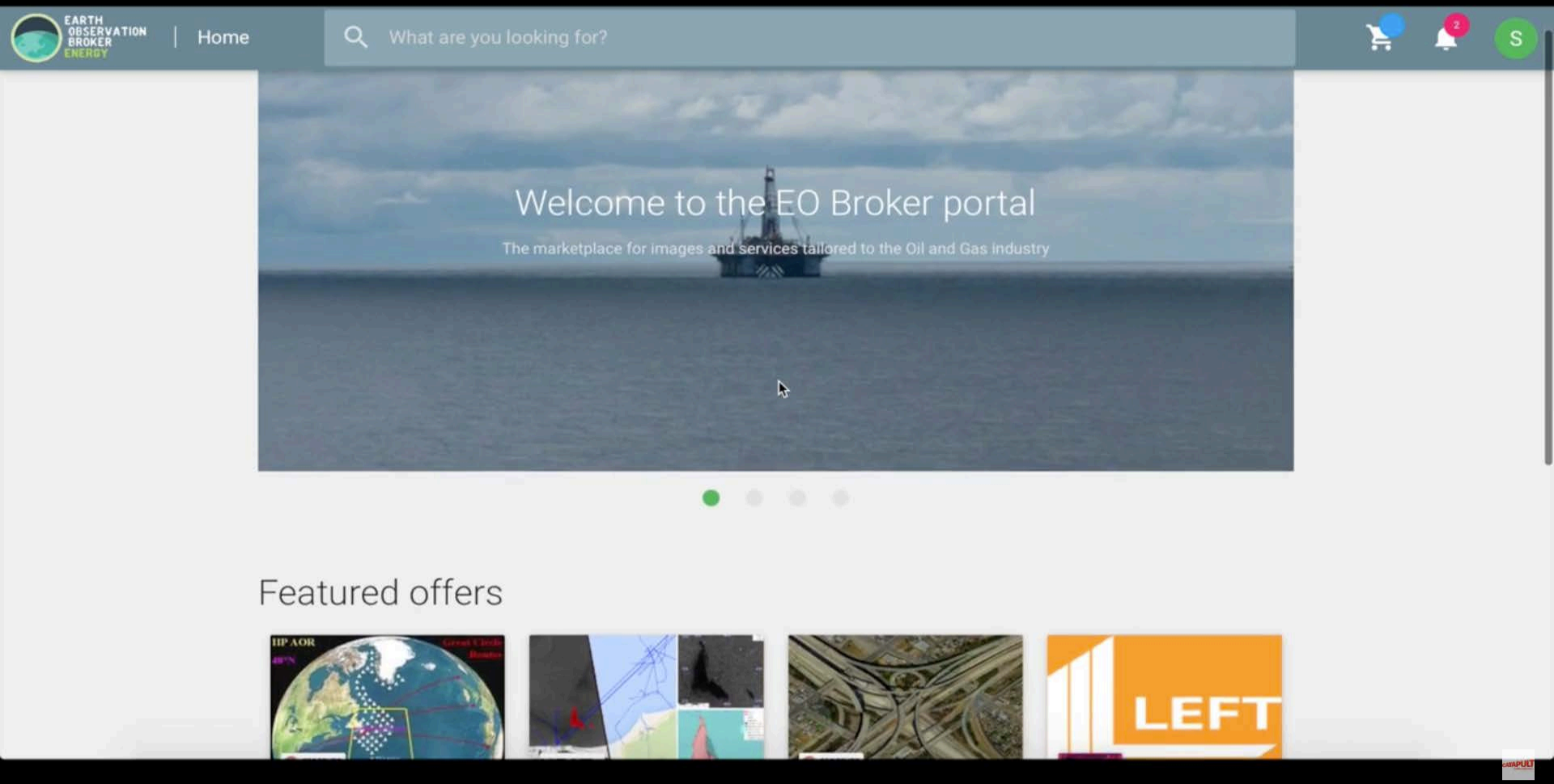

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Prototype version available for evaluation this summer

Register your interest or check out the video at

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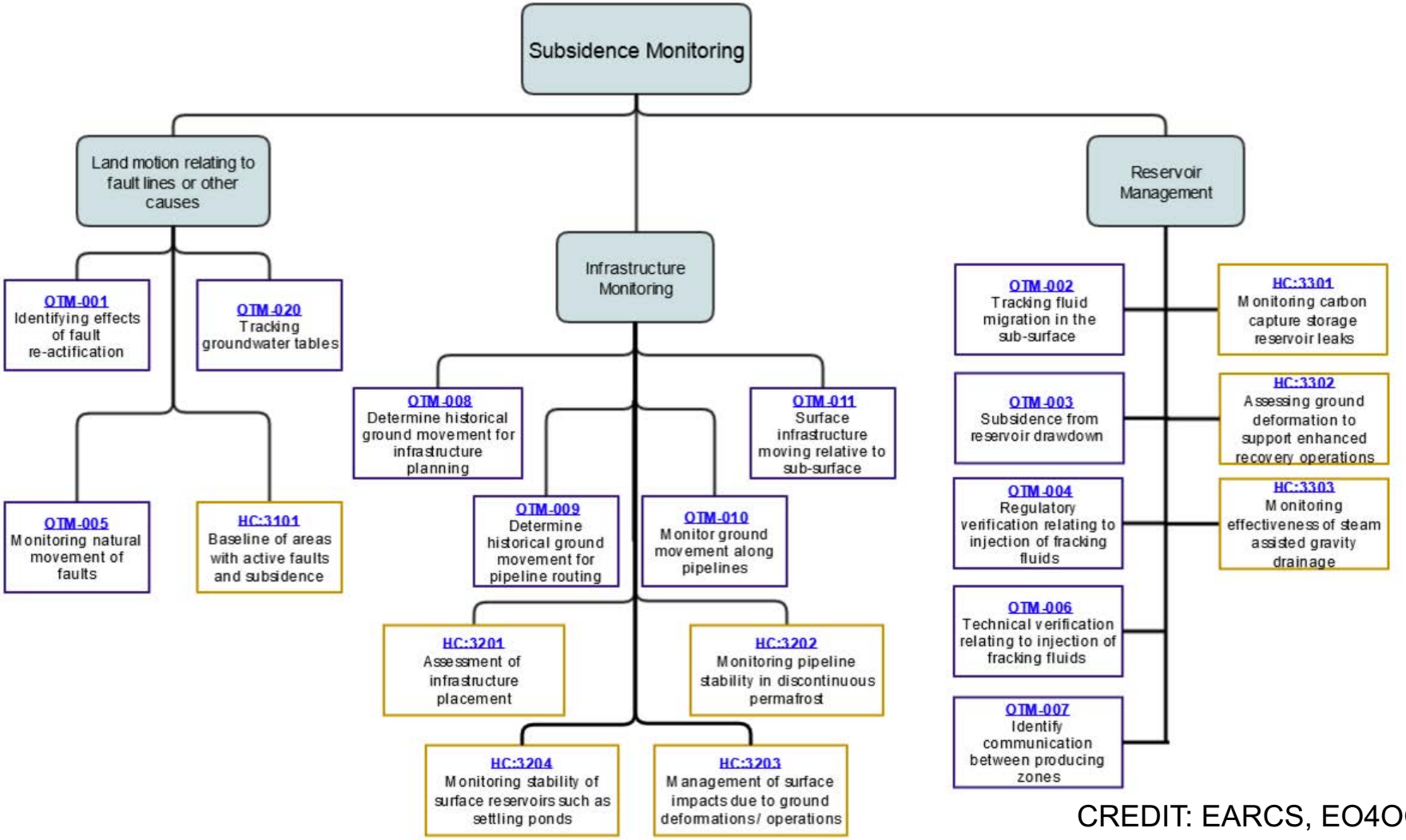
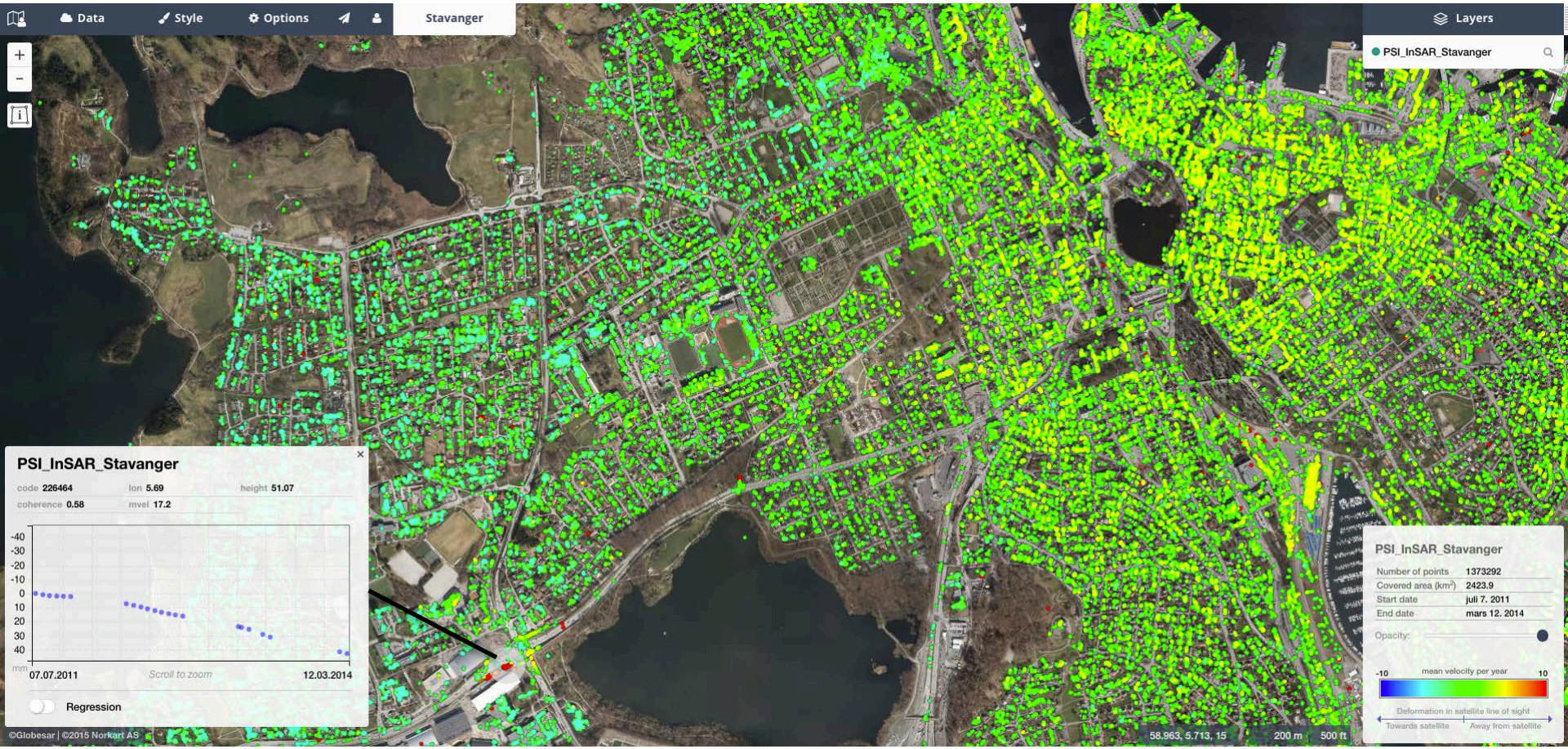
Challenge Tree linked to Subsidence Monitoring



CREDIT: EARCS, EO4OG

Example Surface Deformation product covering Stavanger



Satellite source: TerraSAR-/TanDEM-X, Airbus

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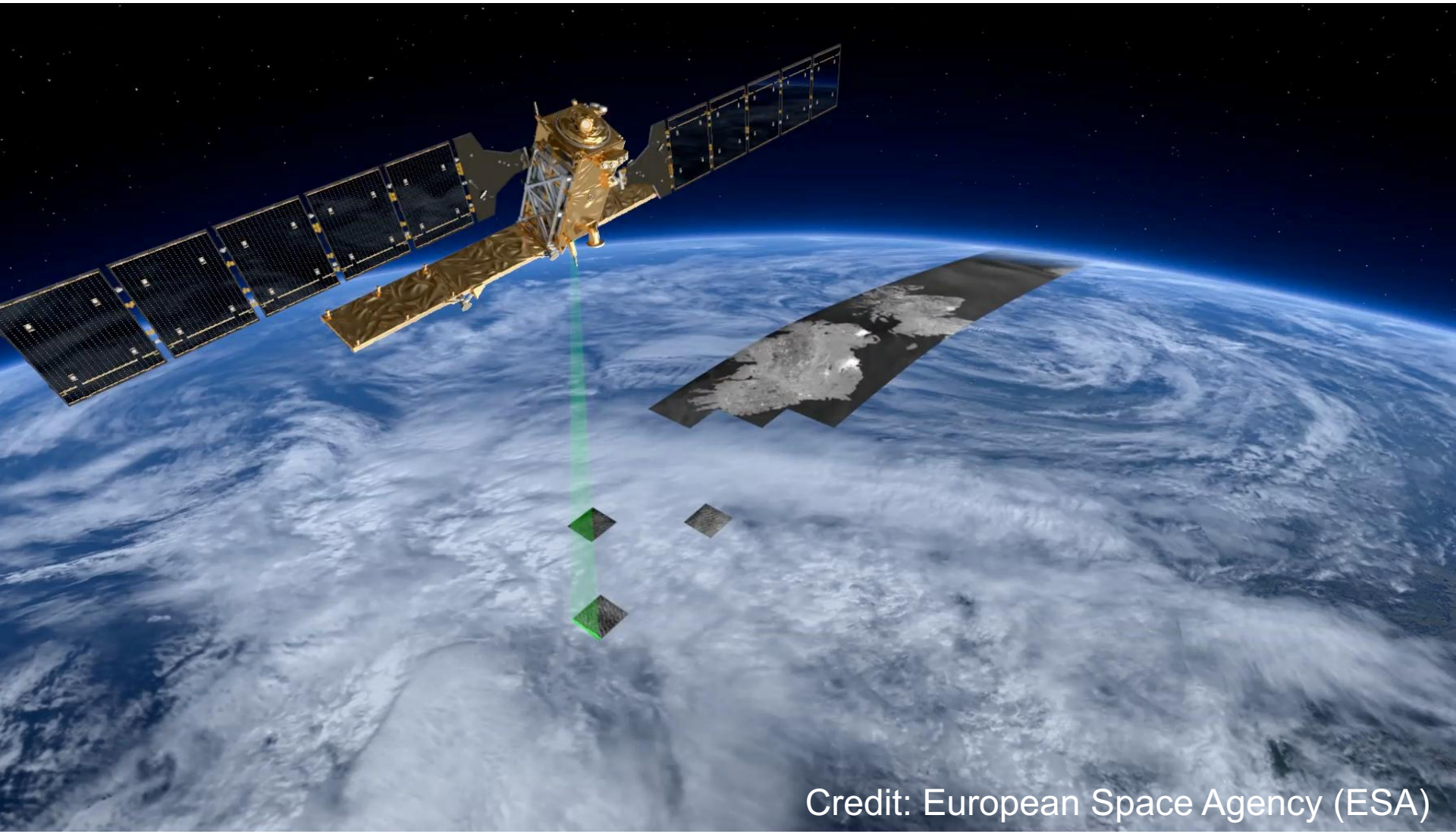
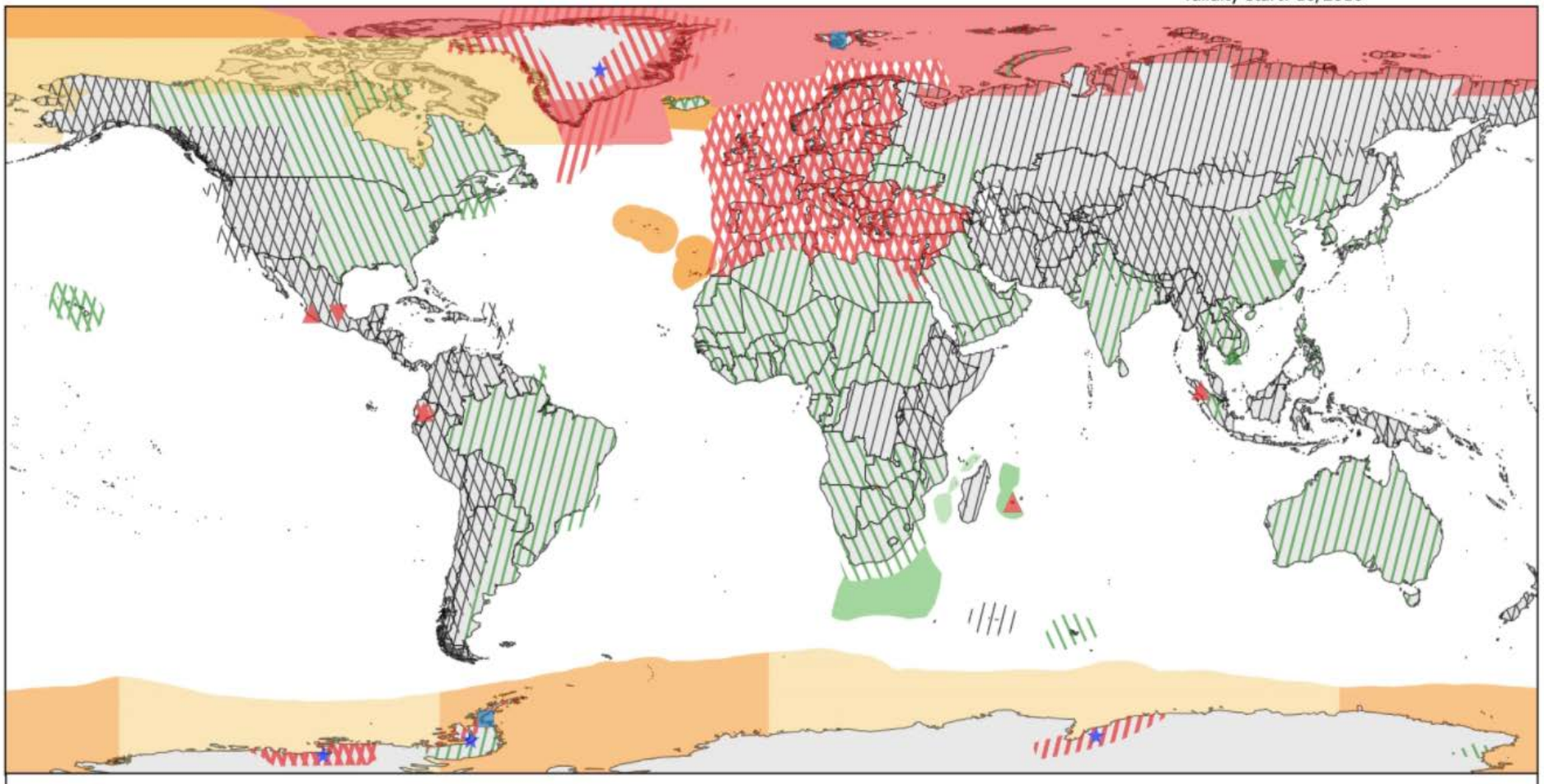
Background radar Synthetic Aperture Radar (SAR) satellites 1(3)



Sentinel-1 Constellation Observation Scenario: Revisit & Coverage Frequency

sentinel-1

validity start: 10/2016



PASS
- ASCENDING
- DESCENDING

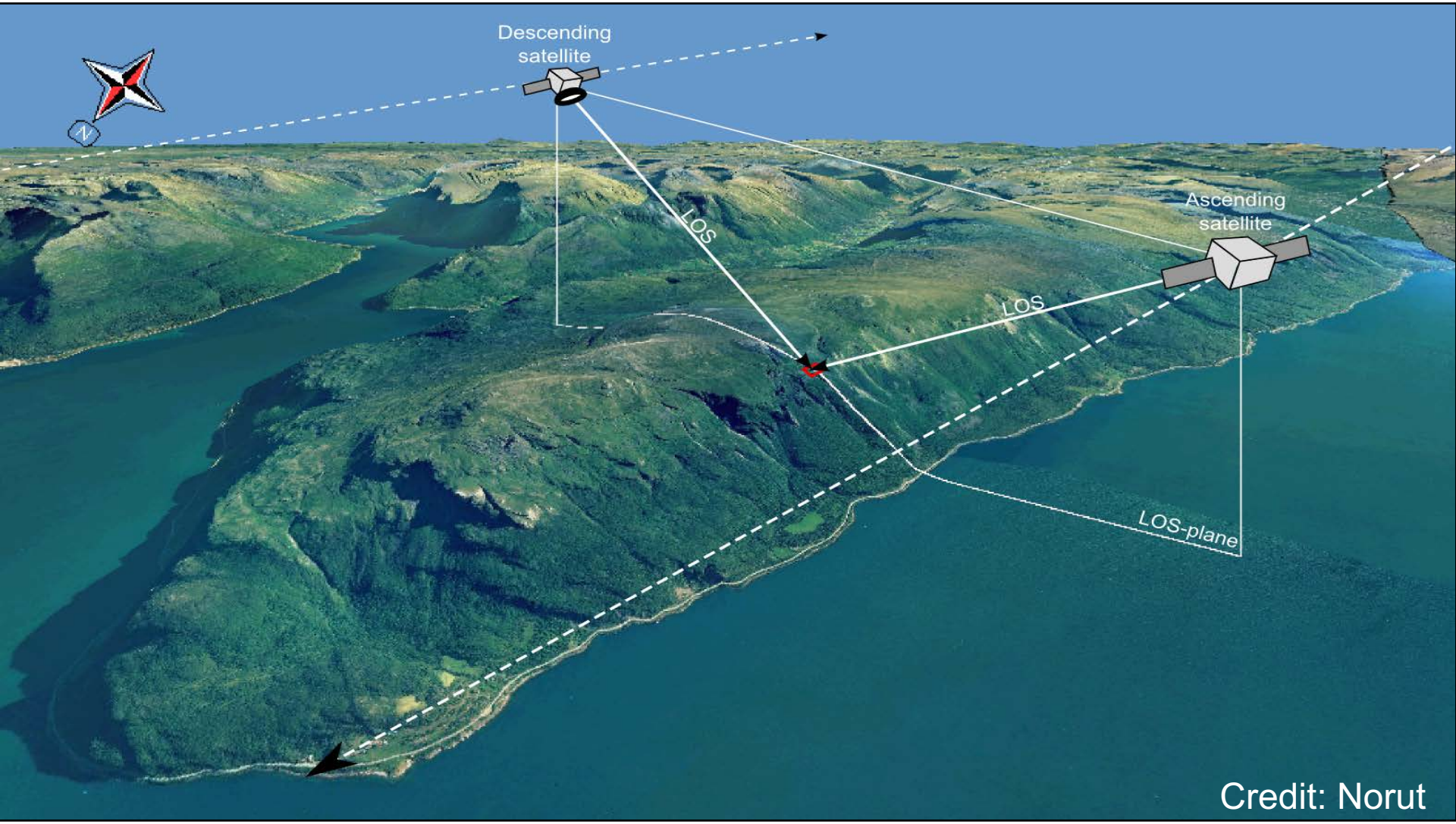
REVISIT FREQUENCY *
- 6 days
- 12 days
- 24 days

COVERAGE FREQUENCY **
- 1-2 days
- 3 days
- 6 days
- 12 days

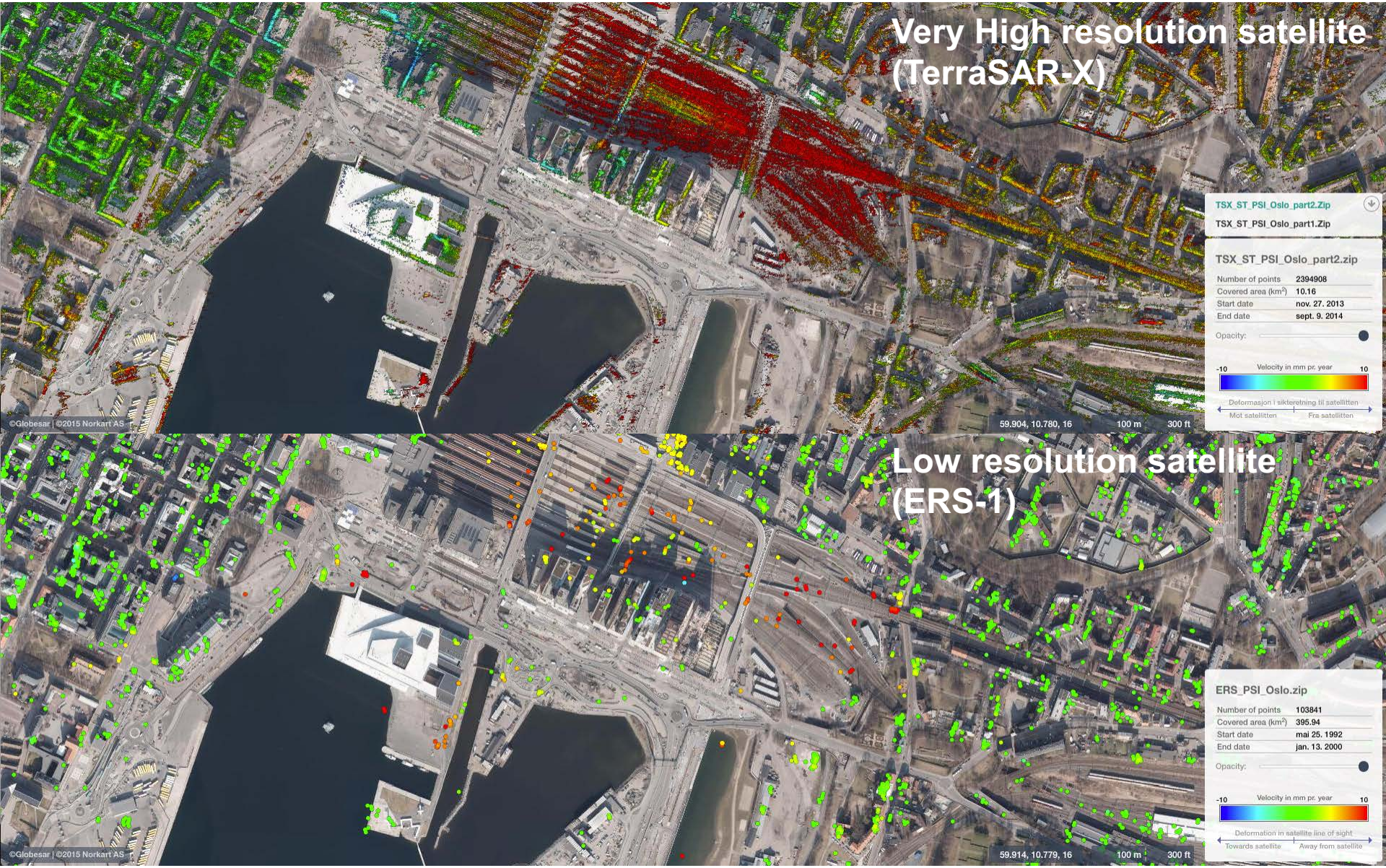
REFERENCE DATA SITES (6d repeat)
- Highly active volcanism
- Fast subsidence
- Short growth cycle, intensive agriculture
- Fast changing wetlands
- Fast moving outlet glaciers
- Permafrost & glaciers

* coverage ensured from same, repetitive relative orbits
** coverage not considering repetitiveness of relative orbits

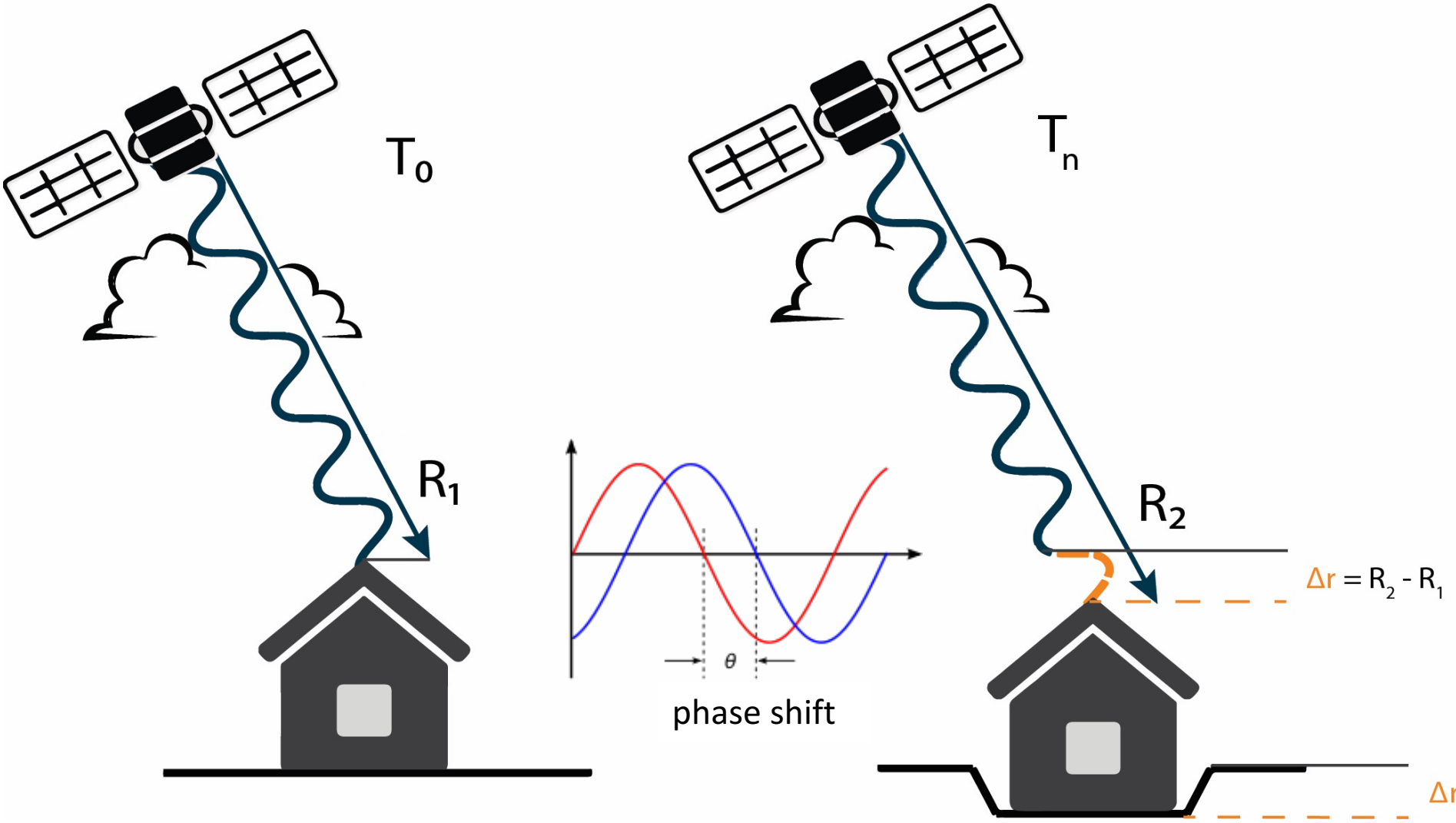
Background radar (SAR) satellites 3(3)



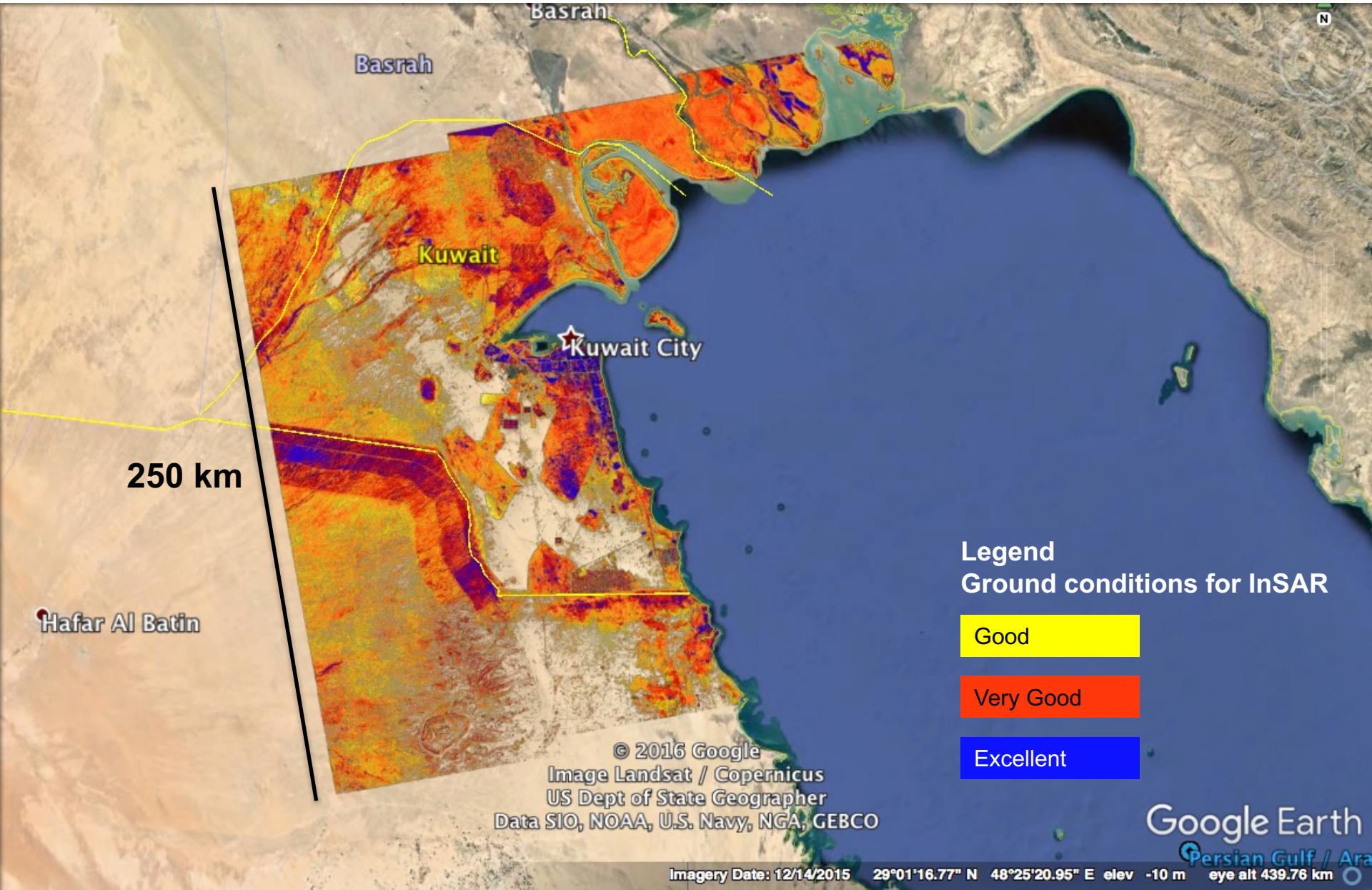
Data density is related to resolution of satellite imagery



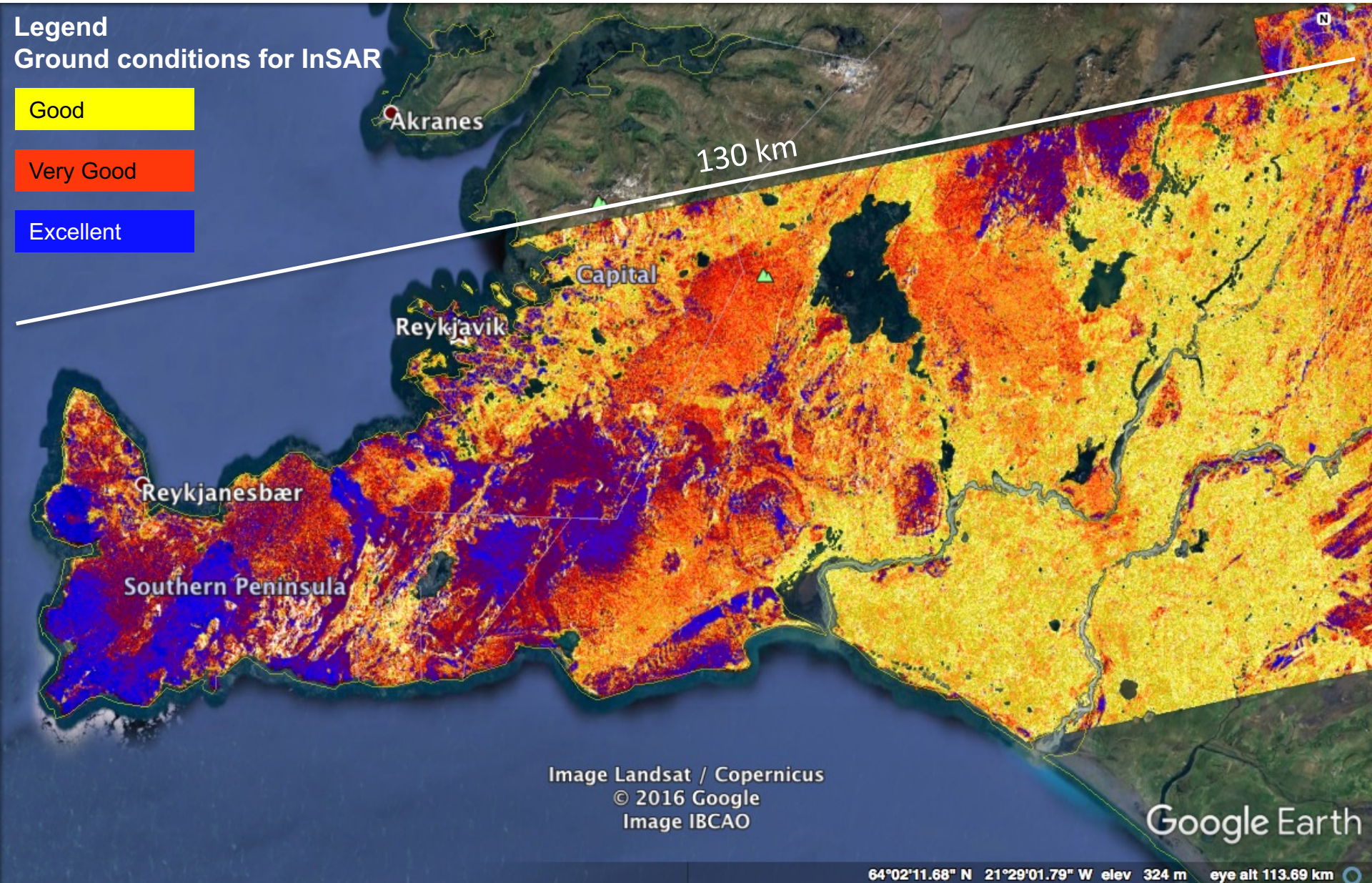
Principles of Interferometric SAR (InSAR)



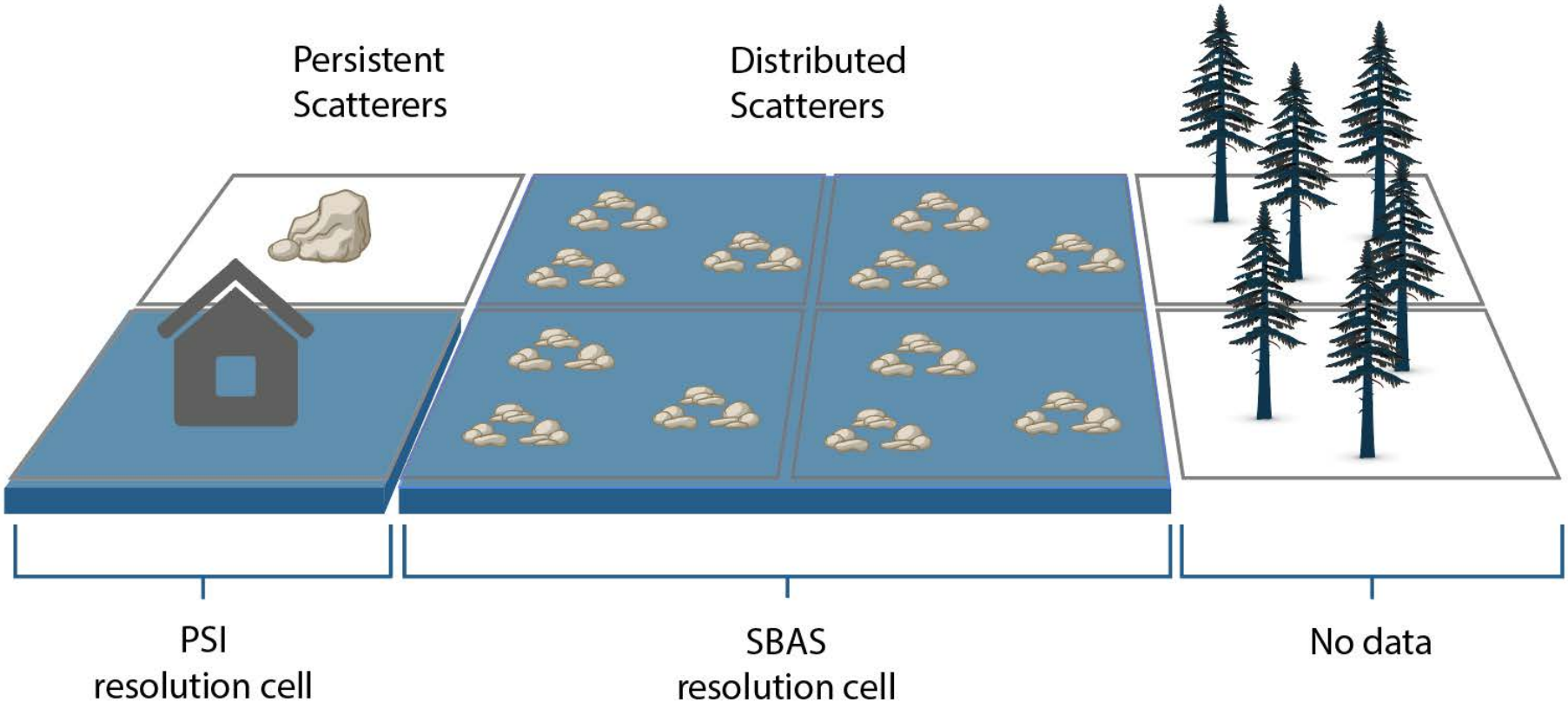
Example 1: Sentinel-1, InSAR Feasibility (Coherence) Map, Kuwait



Example 2: Sentinel-1, InSAR Feasibility (Coherence) Map, Iceland



Different InSAR time-series techniques can be applied, depending on ground conditions



Example 3: IDDP Geothermal R&D project, Reykjanes, Iceland

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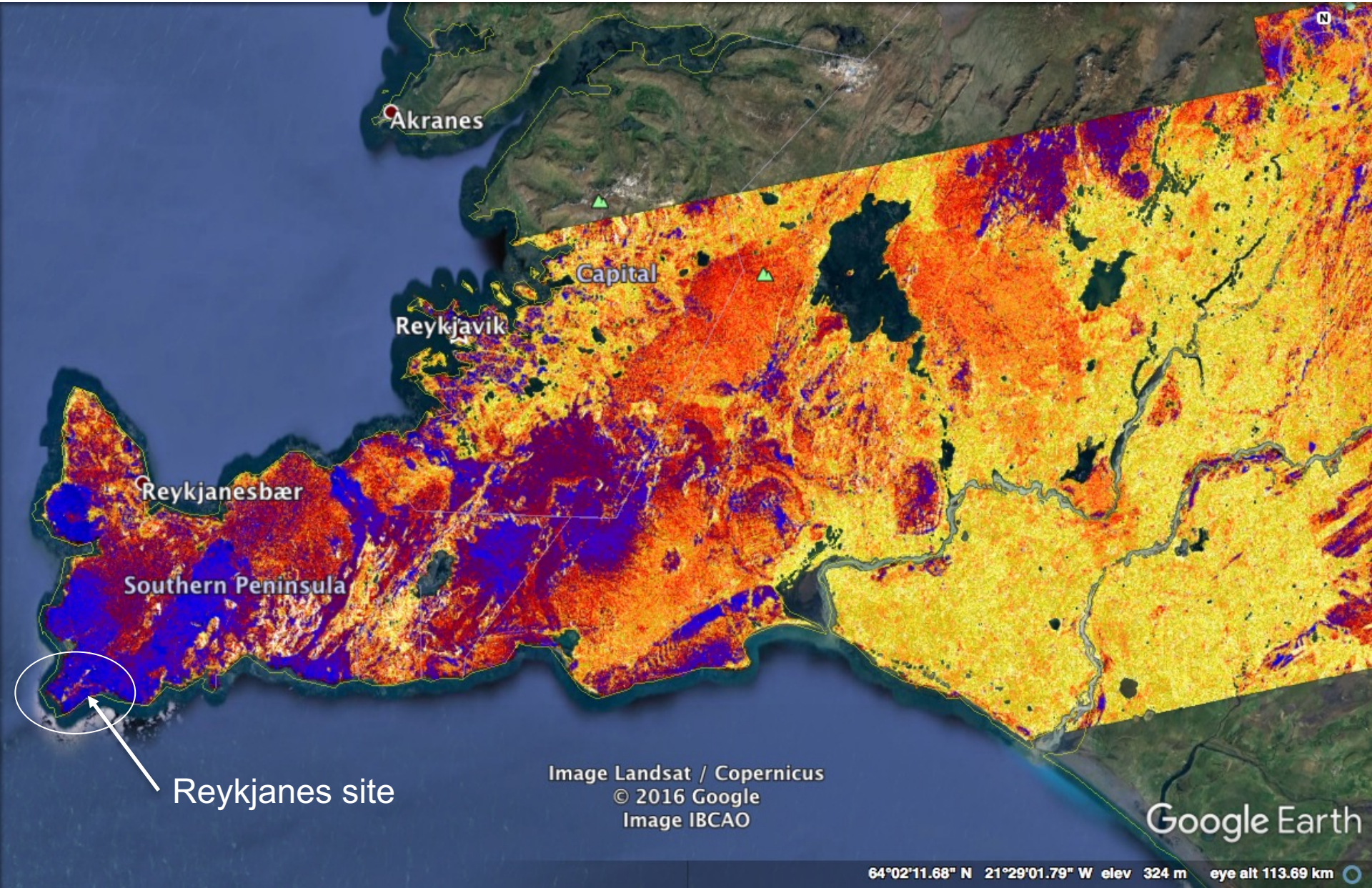
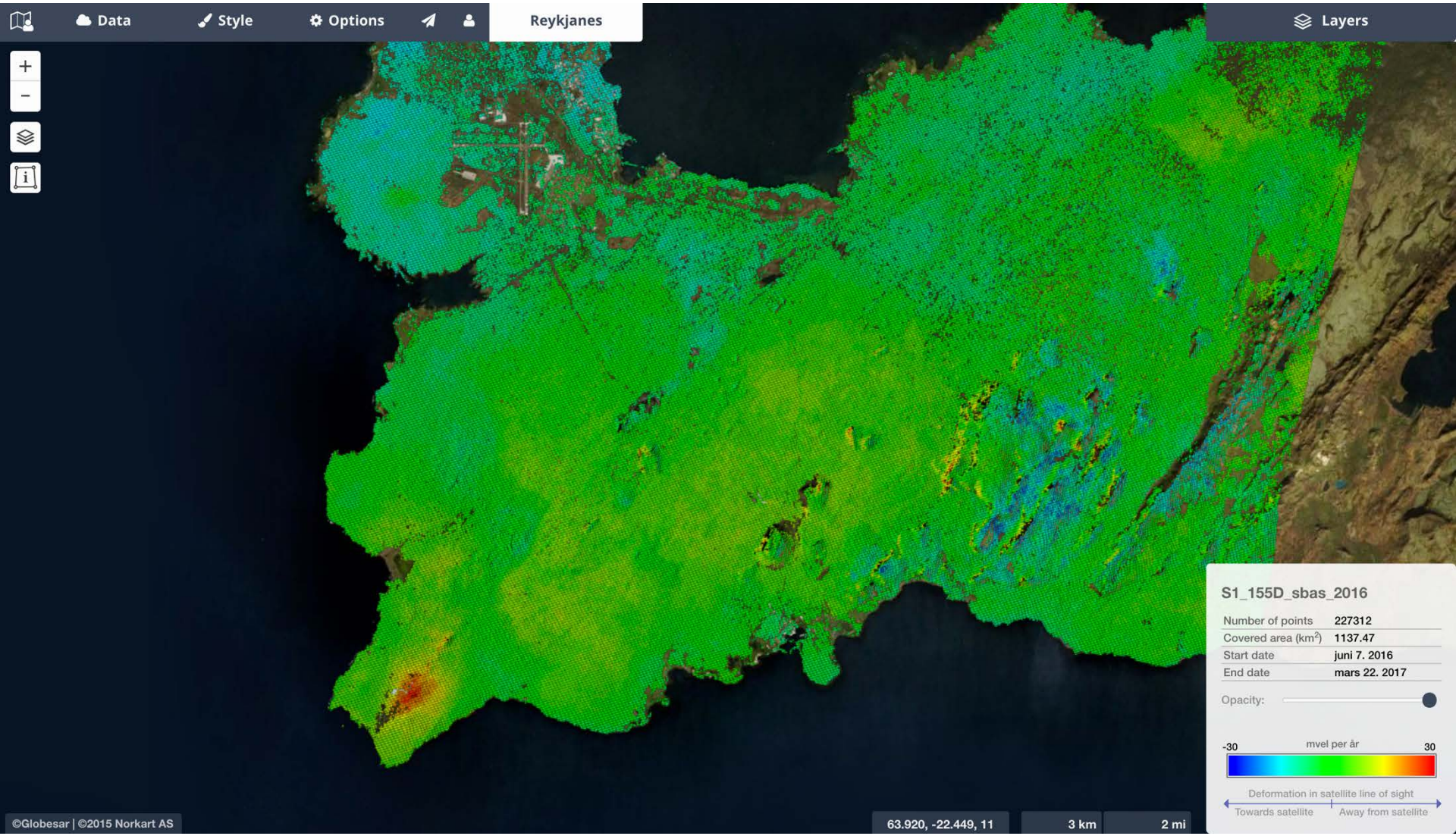
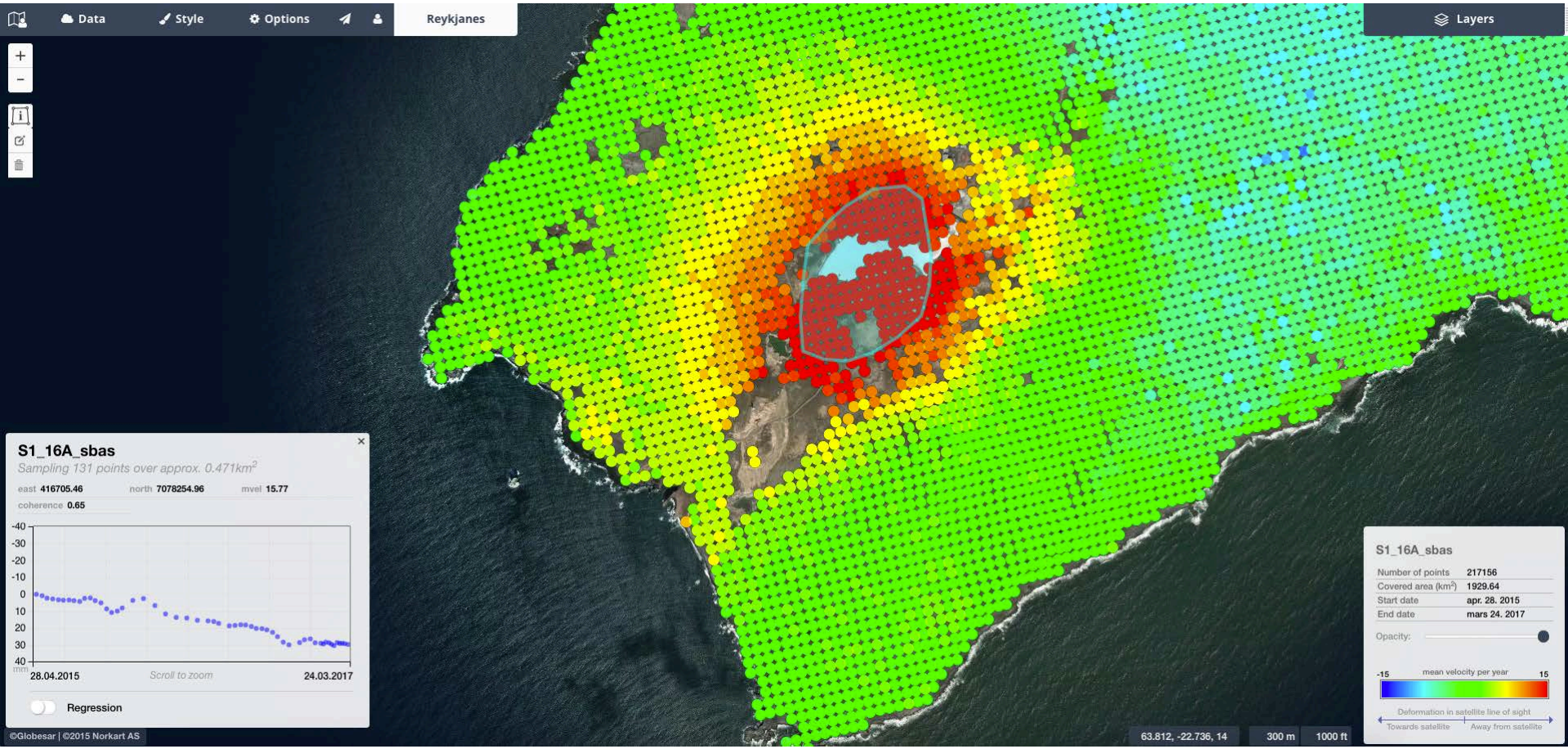


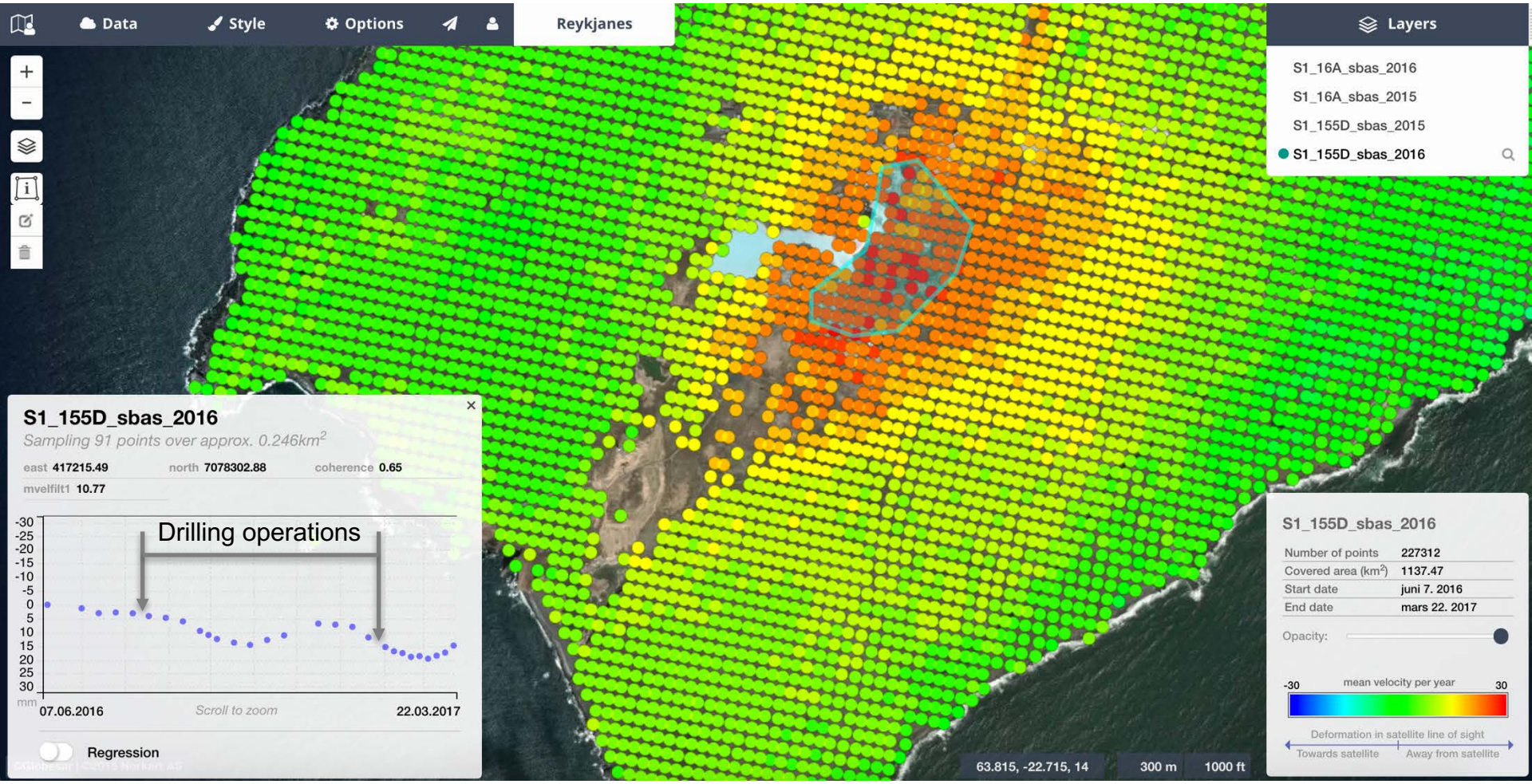
Example 3: Sentinel-1, Time-series Surface Deformation data, Reykjanes, Iceland



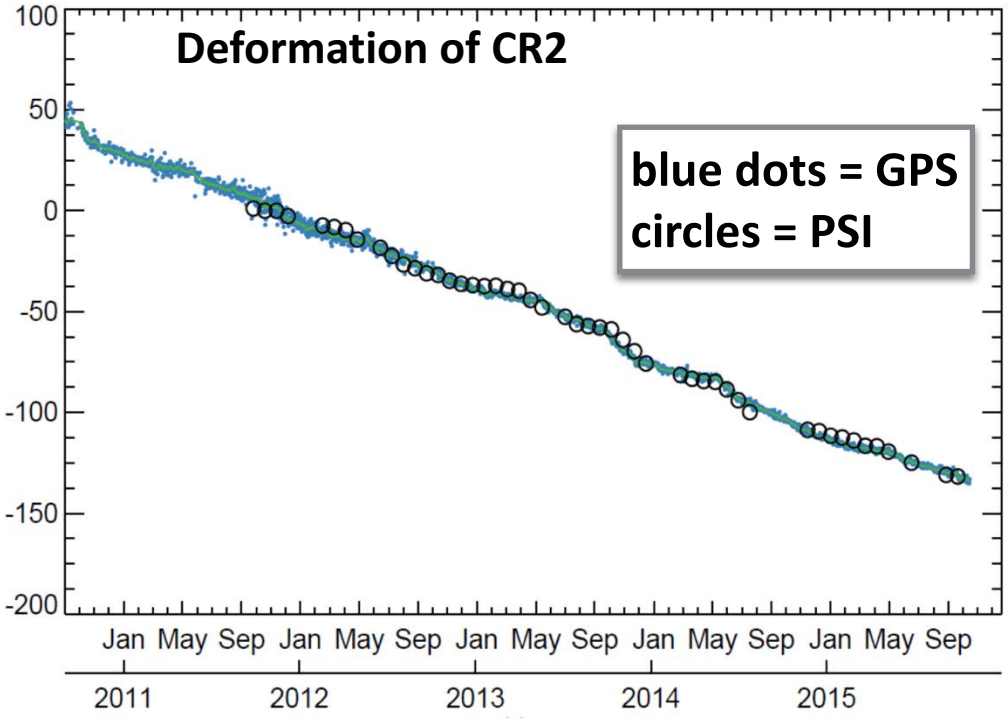
Example 3: Sentinel-1, Time-series Surface Deformation data, Reykjanes, Iceland, **2015-2017**



Example 3: Sentinel-1,Time-series Surface Deformation data, Reykjanes, Iceland, **2016-2017**



Millimetre to sub-millimetre accuracy on measurements can be achieved



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