EGMS APPLIQUÉ AUX RISQUES NATURELS ET À L'ADAPTATION AUX CHANGEMENTS CLIMATIQUES : LA PERSPECTIVE DU BRGM

Marcello de-MICHELE

Avec la contribution de Daniel Raucoules, Natalie Marçot, Xenia Philippenko, Goneri le Cozannet, Remi Thieblemont

Géosciences pour une Terre durable
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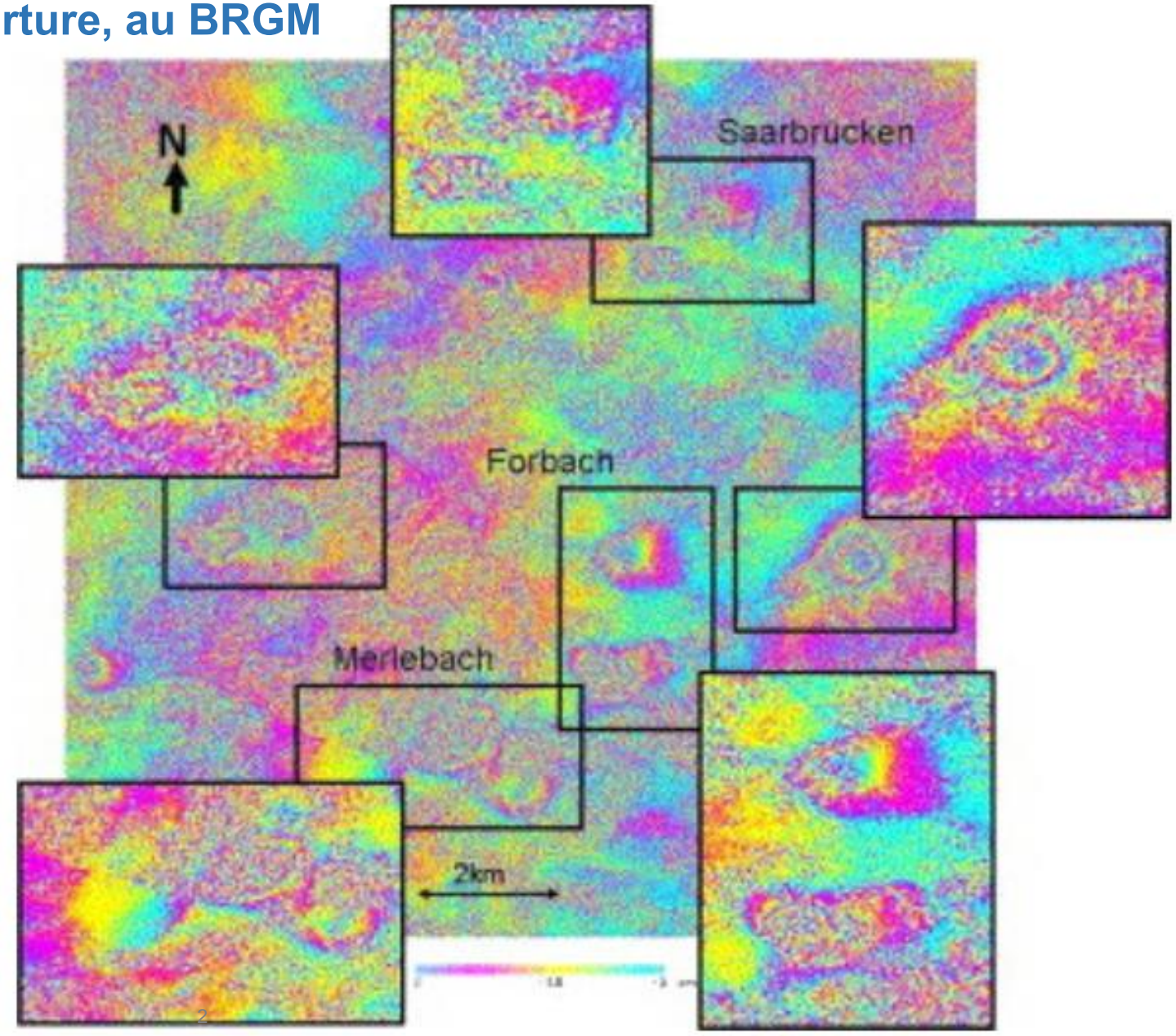
Le radar satellitaire à synthèse d'ouverture, au BRGM

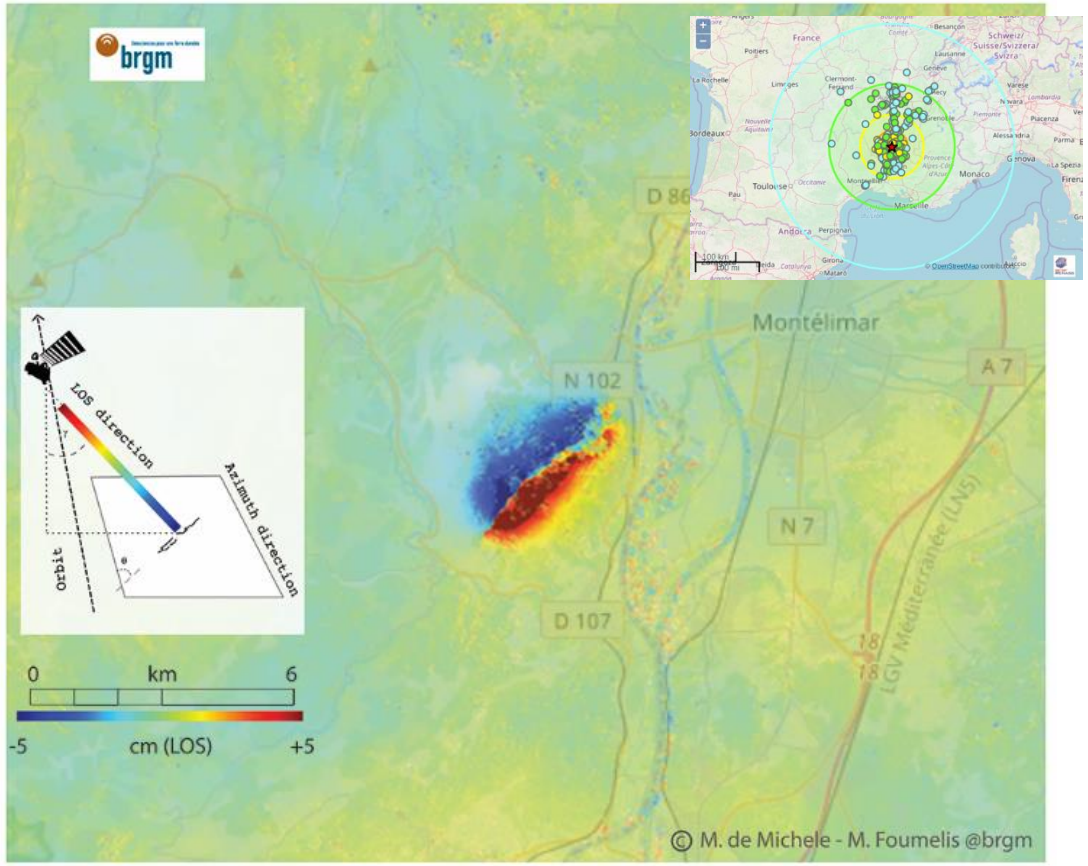
À haut : satellite ERS de l'Agence Spatiale Européenne

À droite :
–Déformation d'un site minier (Lorraine).
-Satellite JERS-1 (JAXA). Intérférogramme 03/1993-03/1994.
Publié dans Raucoules et al., 2007.

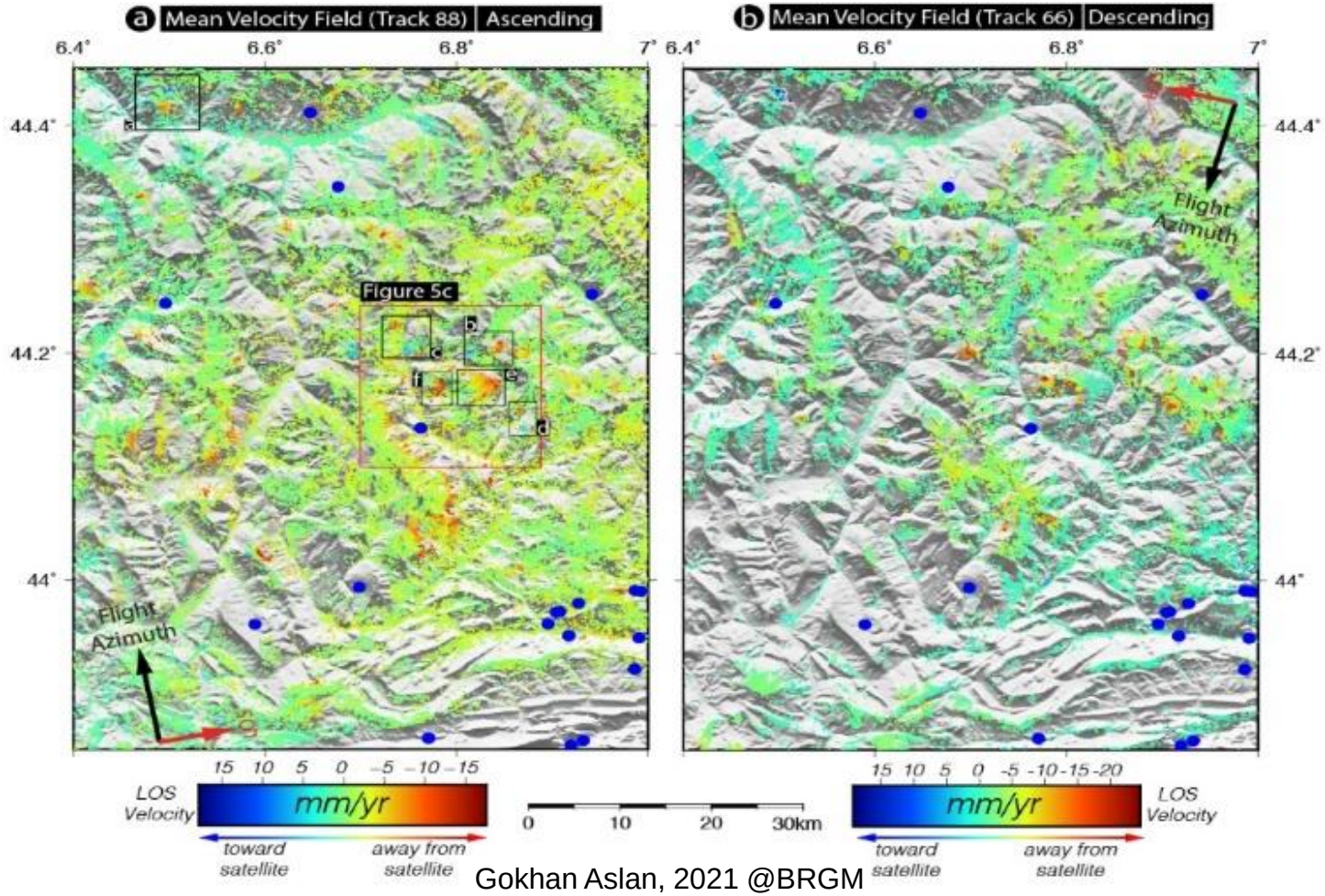


Interférométrie radar satellitaire : applications aux risques « telluriques »

Déplacement du sol généré par le séisme du Teil, (M_W 4.9, 11 novembre 2019), vu par Sentinel 1.



Glissement de terrain à l'échelle « régionale » sur les Alpes Françaises, en utilisant Sentinel 1 (2015-2020).



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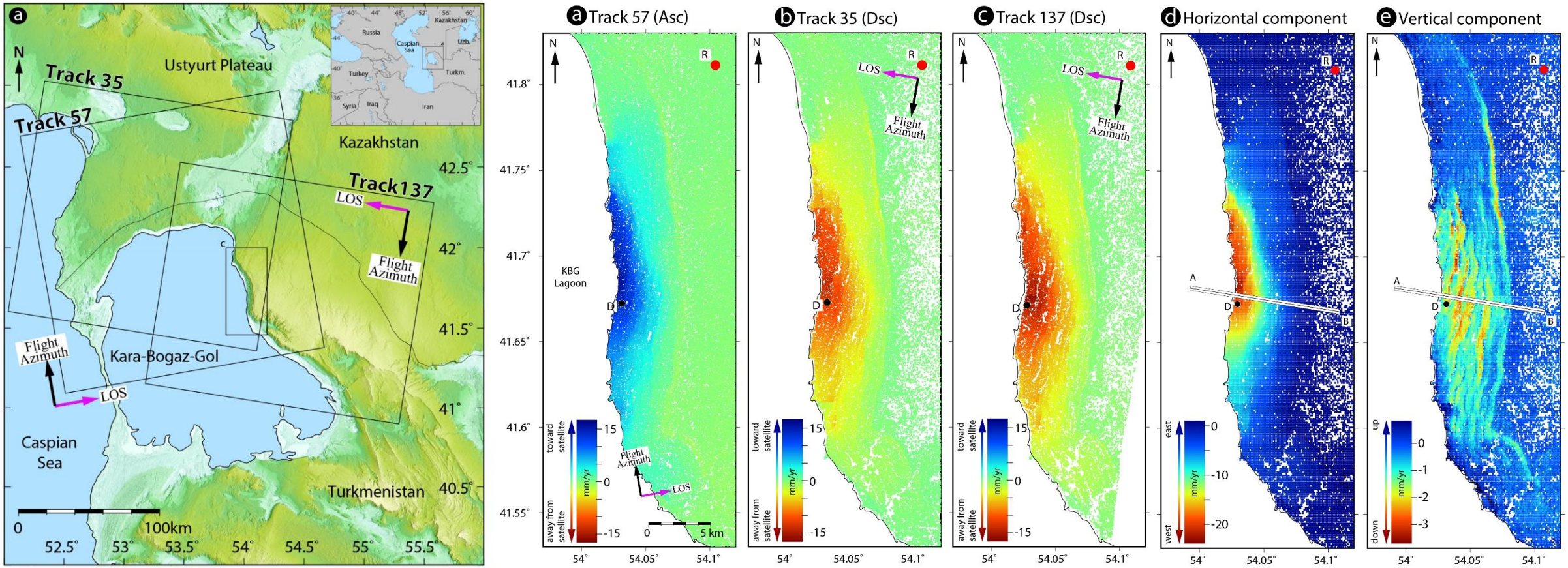
Le plus grand glissement de terrain de la planète Terre, vu par Sentinel 1.



Aslan, G., De Michele, M., Raucoules, D. *et al.* Transient motion of the largest landslide on earth, modulated by hydrological forces. *Sci Rep* **11**, 10407 (2021). https://doi.org/10.1038/s41598-021-89899-6

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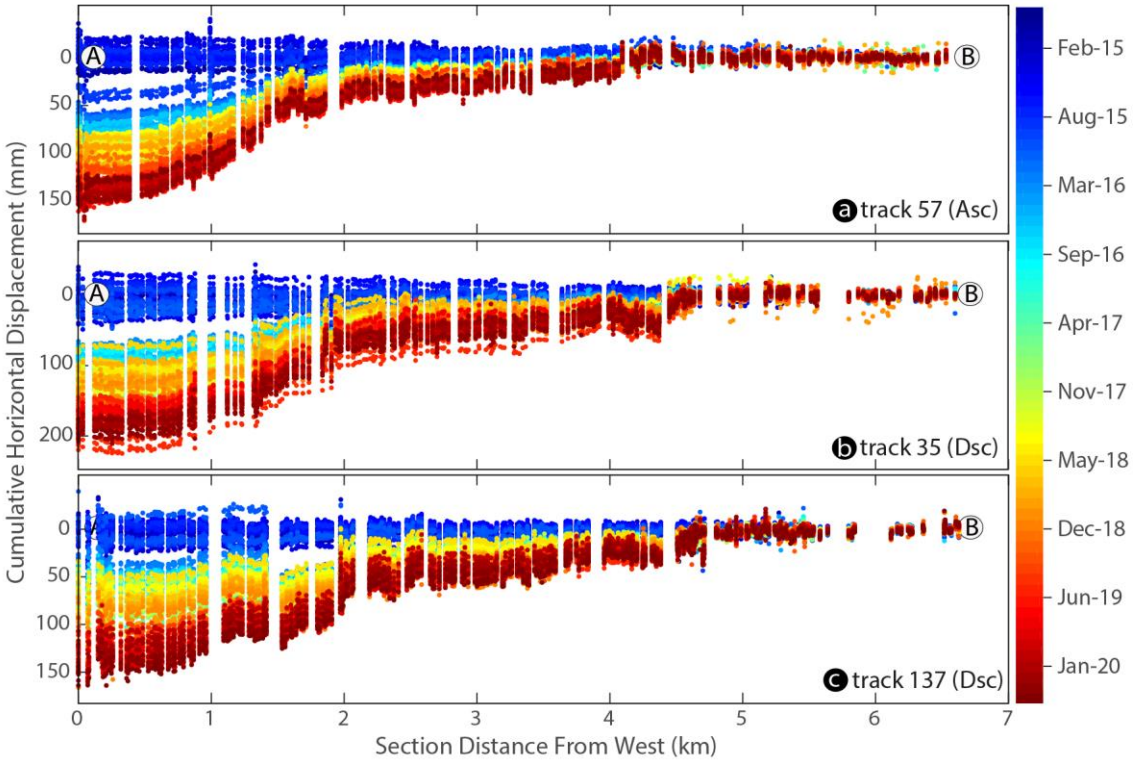
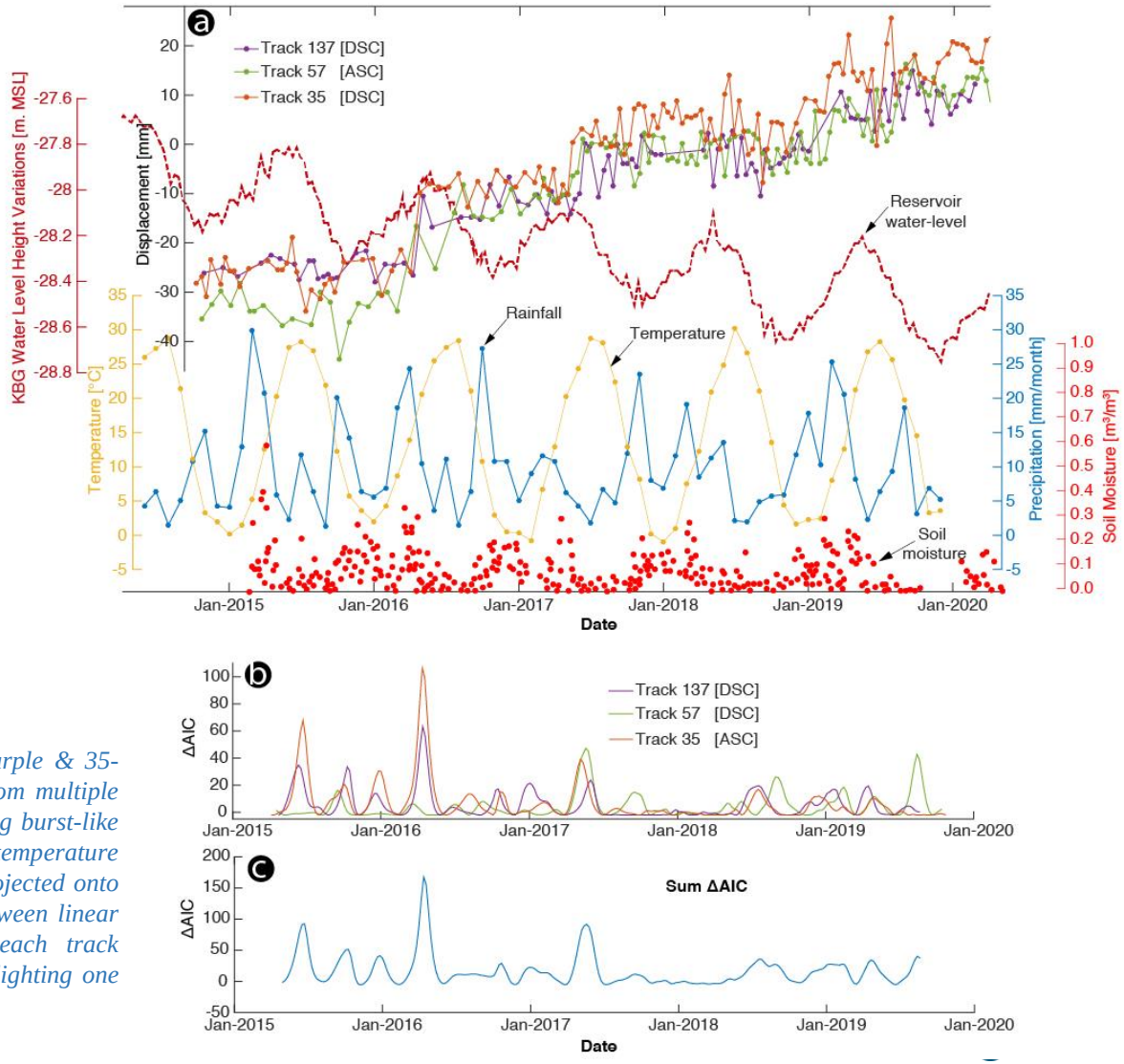
… ces mouvements transitoires sont corrélés avec le niveau d'eau de la Caspienne

Aslan, G., De Michele, M., Raucoules, D. *et al.* Transient motion of the largest landslide on earth, modulated by hydrological forces. *Sci Rep* **11**, 10407 (2021). https://doi.org/10.1038/s41598-021-89899-6





Landslide motions estimated from Sentinel-1 ascending (track 57-green) and descending (tracks 137-purple & 35-orange) InSAR time-series analysis compared with hydrological and atmospheric parameters derived from multiple satellite sensors. (a) InSAR-derived multi-annual landslide motions with a week-long transient accelerating burst-like creep events, Kara-Bogaz-Gol Lake water level height variations in m. above mean sea level (claret-red), temperature in °C (yellow), precipitation in mm/month (blue) and soil moisture in m^3/m^3 (red). Velocity time-series projected onto the horizontal direction for better comparision. (b) Difference of AIC (Akaike Information Criterian) between linear landslide sliding rate models with and without a transient accelerations events computed for each track indipendently. ΔAIC is positive when the transient model is preferred. (d) Summation of all ΔAIC highlighting one major transient event.

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CoCliCo
coastal climate core services

IDENTIFYING SUBSIDENCE COASTAL ZONES IN EUROPE FROM EGMS

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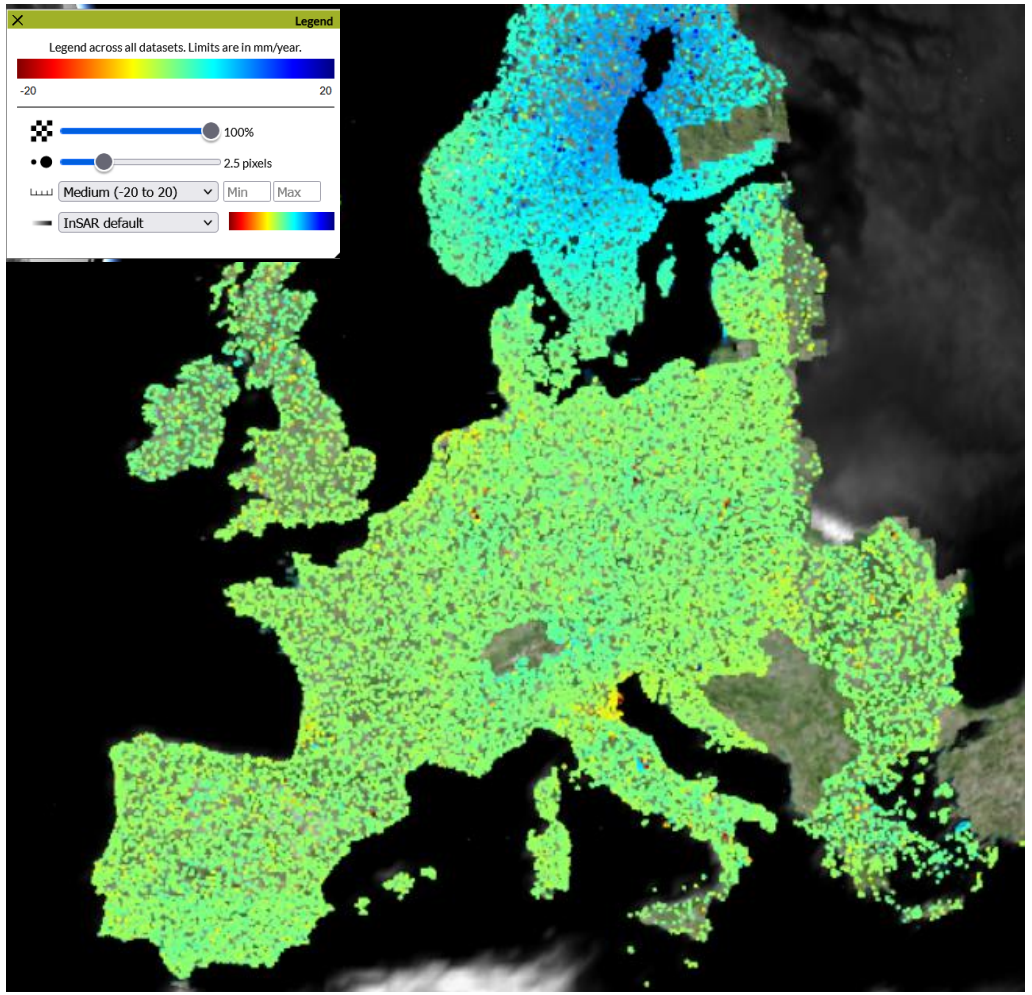
Introduction

- Land subsidence (caused by e.g. groundwater extraction, the load of infrastructure on recent sediment deposits, etc.) can strongly inflate relative sea-level rise locally;

- Coastal inhabitants are preferentially located in subsiding locations and globally experience an average relative sea-level rise up 7.8 to 9.9 mm yr^{-1} (Nicholls et al., 2021);

- Subsidence is however difficult to characterize and quantify as land motion data are mostly sparse in space and time;

- The newly released Copernicus **European Ground Motion Service** (EGMS) could help filling that gap in Europe.

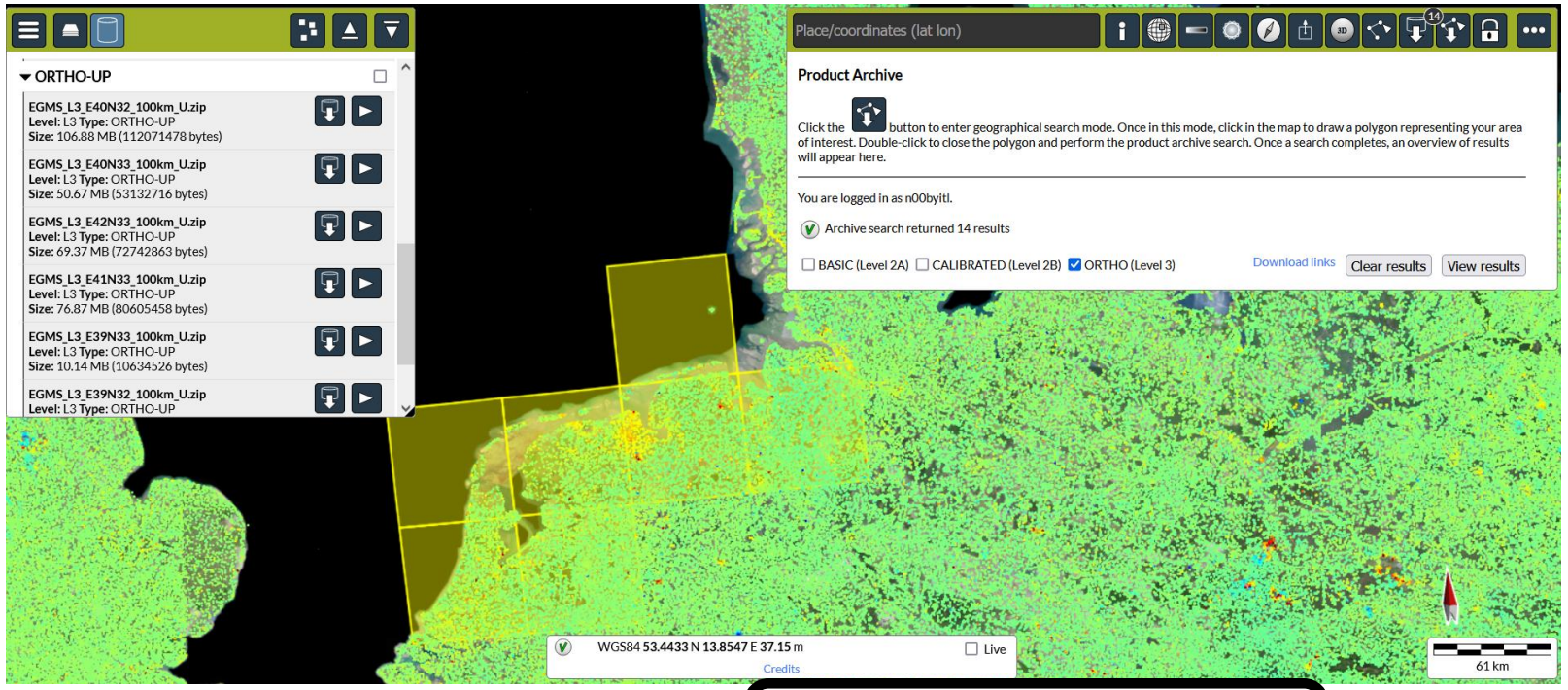


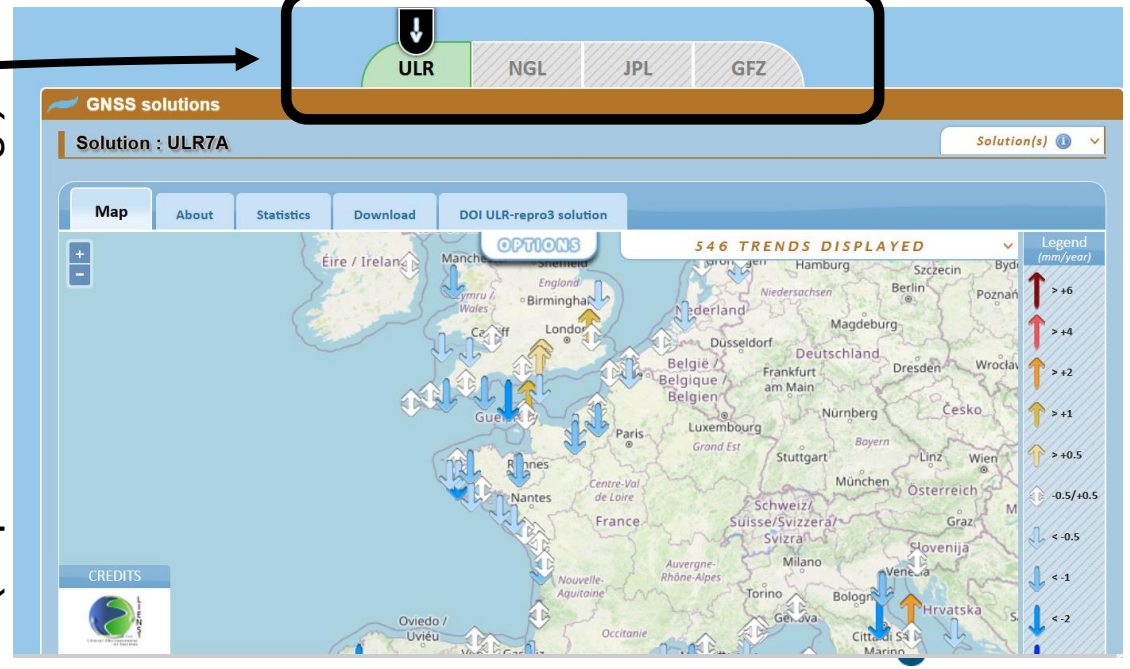
Aim of this study: using the new EGMS service to identify coastal subsidence zone in Europe

Datasets :

- **EGMS**
  - 415 coastal tiles (100 km x 100 km) of EGMS vertical ground motion are merged to cover full European coast;
- **Permanent GNSS network on SONEL**

  4 Solutions:
  - ULR 7A (Univ, La Rochelle, Fr)
  - NGL14 (Nav. Geo. Lab., USA)
  - JPL14 (Jet. Prop. Lab., USA)
  - GT3 (GFZ institute, Germany)
- **Glacial Isostatic Adjustement** (Caron et al., 2020)



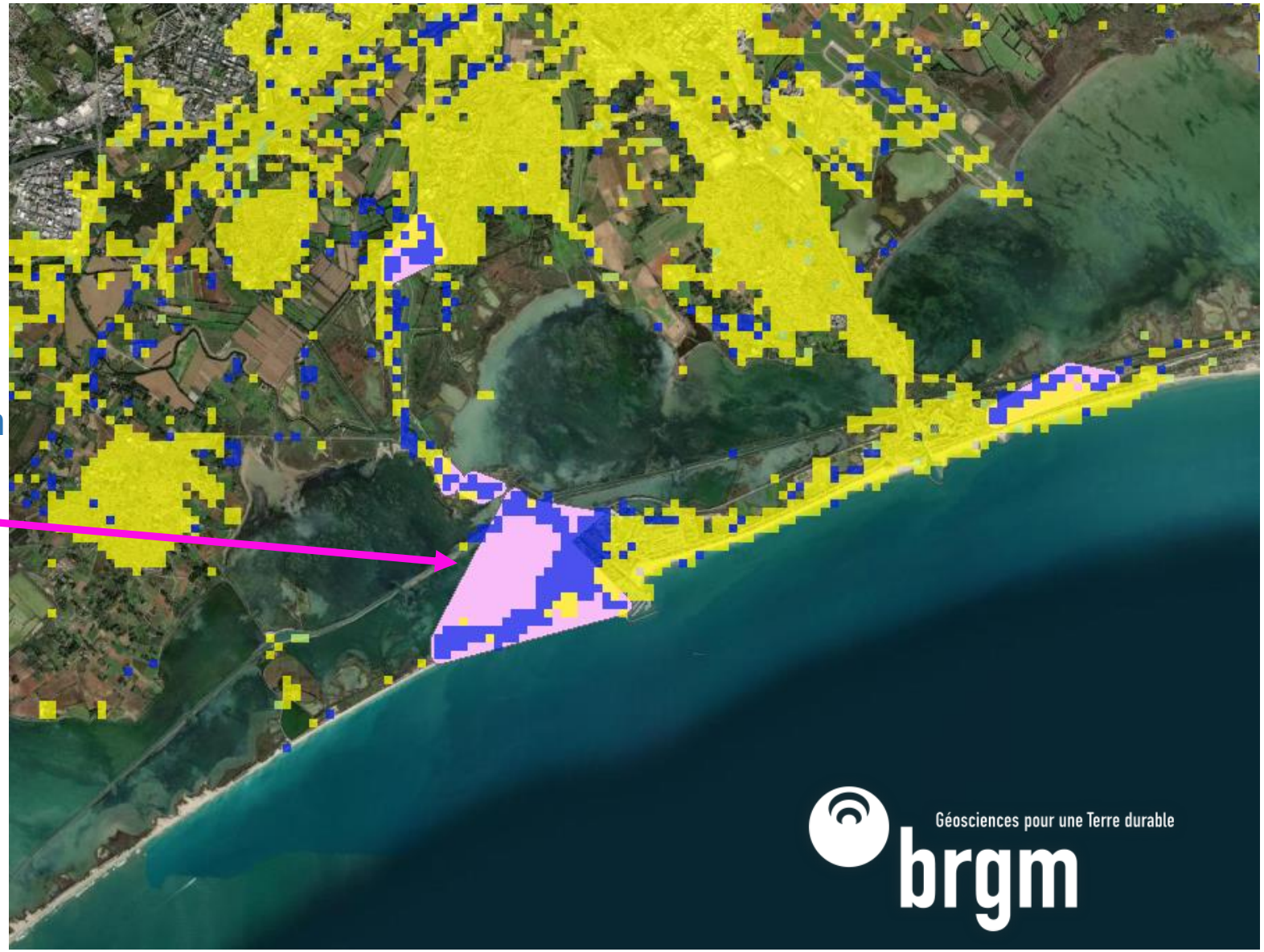


(https://www.sonel.org/)

Identifying subsidence hotspots along the EU coast

Area of Palavas (France)

Clusters of neighboured pixels are identified and used to contoured subsiding zones from EGMS.



No data

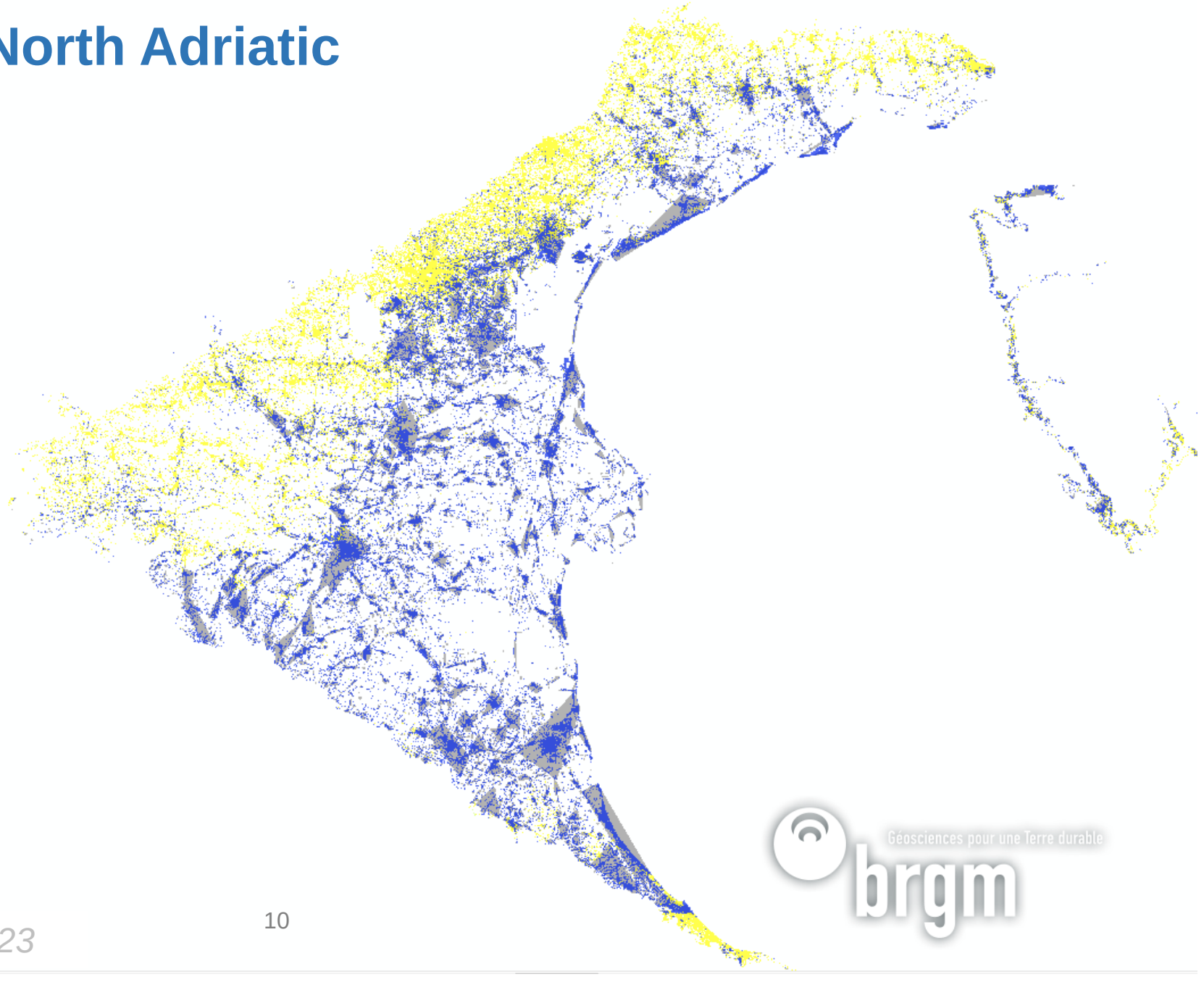
Uplift (> 2 mm/yr)

Stable (-2 to 2 mm/yr)

Subsidence (< - 2 mm/yr)

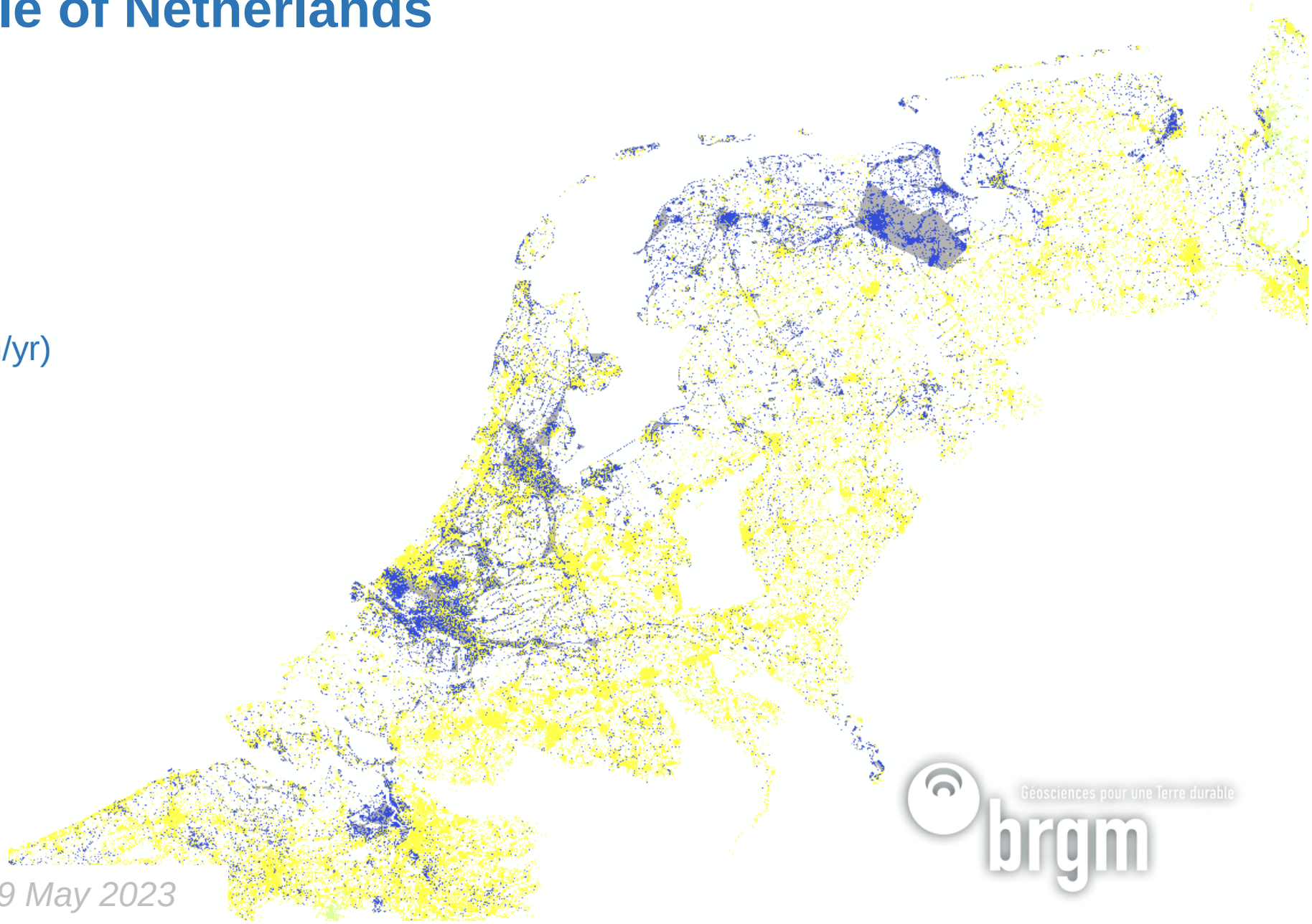
Results – Example of North Adriatic

- No data
- Uplift (> 2 mm/yr)
- Stable (-2 to 2 mm/yr)
- Subsidence (< - 2 mm/yr)



Results – Example of Netherlands

- No data
- Uplift (> 2 mm/yr)
- Stable (-2 to 2 mm/yr)
- Subsidence (< - 2 mm/yr)



CoCliCo fast-track platform

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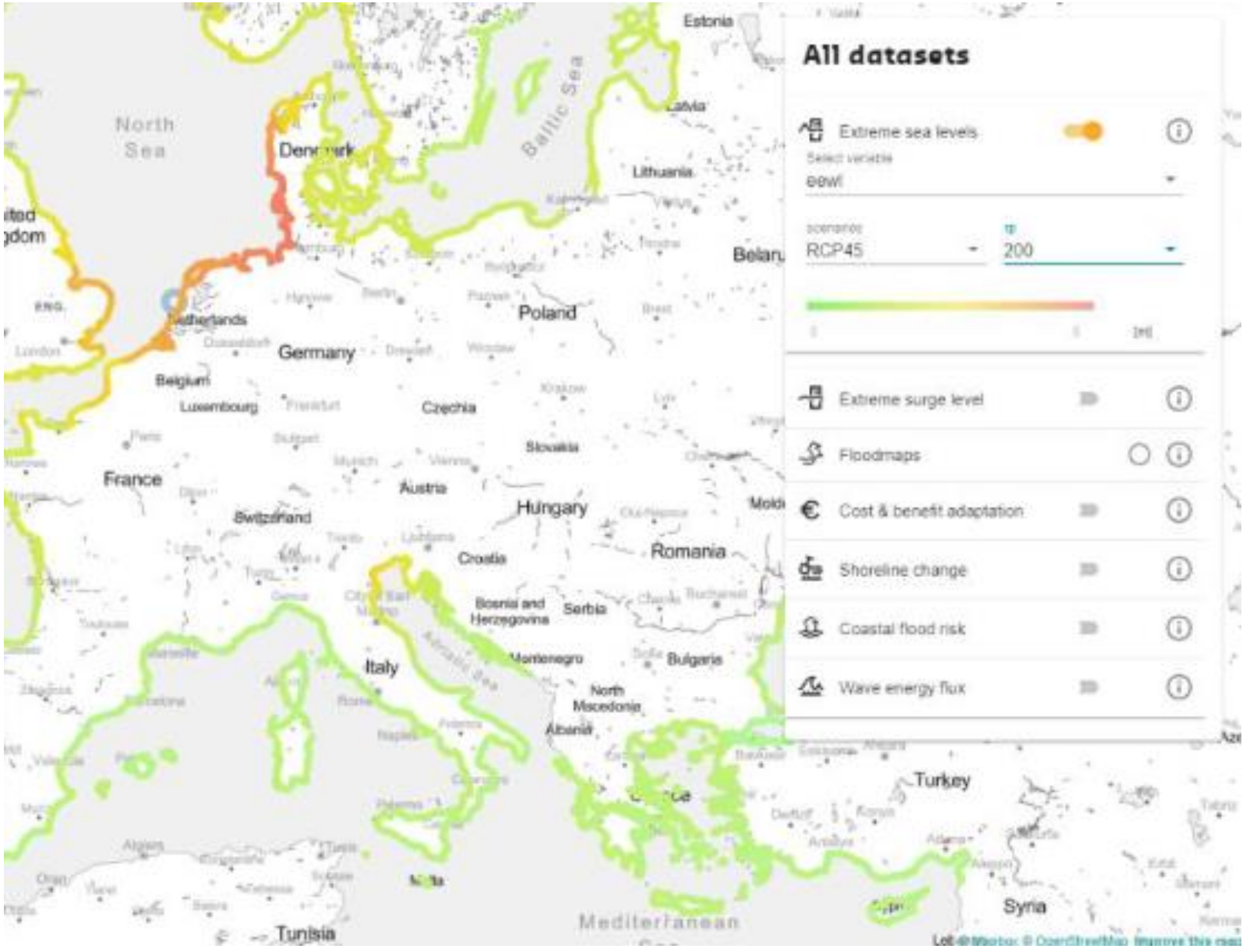
- The new EGMS service is analyzed to identify EU-coastal land subsidence zone;
- What next ?
  - Determining hot-spots of subsidence along the european coast;
  - Integrating with exposure datasets (e.g. population)
  - Implementing this information on the CoCliCo web-platform.



More info in Luijendijk et al., 2022

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