

European Ground Motion Service (EGMS)



Dr. Veronika Strnadová

Česká geologická služba

Earth Observation and Geohazard Expert Group (EOEG EGS)



European
Commission



Copernicus
Europe's eyes on Earth



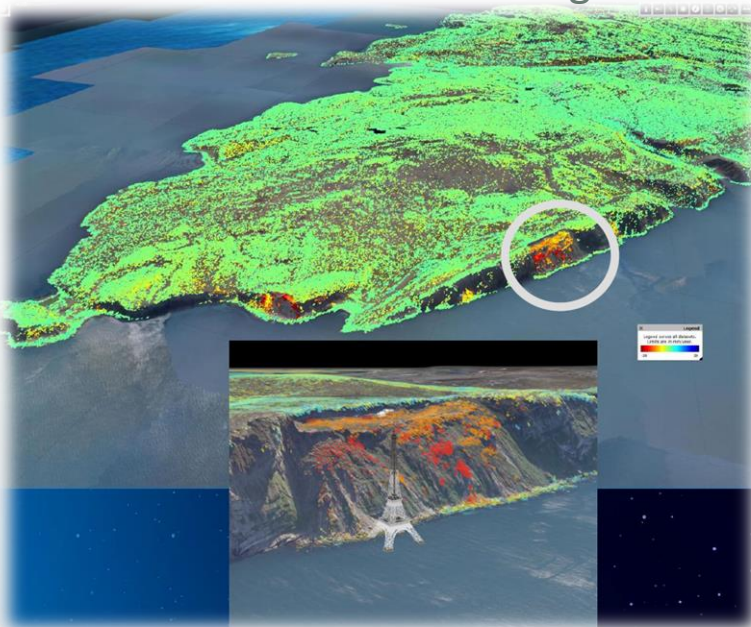
European
Environment
Agency



Land Monitoring
Service

European Ground Motion Service (EGMS)

- Celoevropská služba, detekce vertikálních pohybů a deformací terénu na mm škále
- Využití metody radarové interferometrie InSAR a dat Sentinel-1 (ESA Copernicus, od roku **2014, Sentinel-1A/B: 2016**)
 - Pokrytí rozsáhlého území v relativně dobrém prostorovém rozlišení s vynikající časovou frekvencí „From a global outlook up to individual structures and buildings“



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Summary

| Mission | Bands | Resolutions | Key Instruments | Applications |
|------------|--------|--|-----------------|--------------------------|
| Sentinel-1 | Band C | <ul style="list-style-type: none">• Strip map mode 80km and one swath 5x5 m spatial resolution.• Interferometric wide swath mode 240km and 5x20 m spatial resolution.• Extra wide swath mode 410km and 20x40 m spatial resolution.• Wave mode every 100km interval and having 5x20m resolution. | SAR | Monitoring of land cover |



Blackfriars Bridge in London.

<https://site.tre-altamira.com/industry/civil-engineering/>

Historie

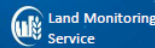
The rationale behind and justification for the EGMS and overarching user requirements

InSAR based Supra National Copernicus Ground Motion Service

Important Steps

- Supra-national User-Workshop; BGR, 2./3.11.2016 (80 Participants,16 Countries)
- 13th Copernicus User Forum - Commission invited Germany to lead the proposal process for Ground Motion according to the agreed procedure (CUF-201 6-37, rev3).
- BGR has taken the initiative and set up a "Task Force Supra National Ground Motion Service " .
- 1.Task Force Meeting 28.03.2017, concept development for a potential Copernicus Ground Motion Service.
- 2.Task Force Meeting 4./5.07.2017, set up of technical requirements, development of the 'White Paper - European Ground Motion Service'
- September 25th, 2017, after approval of the White Paper by the Task Force and Task Force interest group (75 Members, 19 countries):

White paper delivered to the EU-COM for further decision



"European Ground Motion Service with Copernicus"
21 & 22 October 2020

Historie

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The rationale behind and justification for the EGMS and overarching user requirements

InSAR based Supra National Copernicus Ground Motion Service

Important Steps

White paper

European Ground Motion Service - A proposed Copernicus service element

Issue: 01

Date: 21-Sep-2017

The custodian of this document is:

- Dr. Michaela Frei (BGR, DE)

The authors of this document are:

- Members of the Task Force Supra National Ground Motion Service

<https://land.copernicus.eu/user-corner/technical-library/egms-white-paper>



"European Ground Motion Service with Copernicus"
21 & 22 October 2020

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The rationale behind and justification for the EGMS and overarching user requirements

InSAR based Supra National Copernicus Ground Motion Service

Important Steps

The rationale behind and justification for the EGMS and overarching user requirements

InSAR based Supra National Copernicus Ground Motion Service

Important Steps

- Acceptance and uptake of the European Ground Motion Service into the Workprogram 2018 (C(2018) 2 final; 10.01.2018)
- Copernicus User Forum on October 13th, 2017
With unanimous assent the Copernicus User Forum recommends the European Ground Motion Service for immediate realization in Copernicus Portfolio.
- The Commission authorized EEA (European Environment Agency as entrusted entity) with the implementation of the EGMS and informs the Member States accordingly.

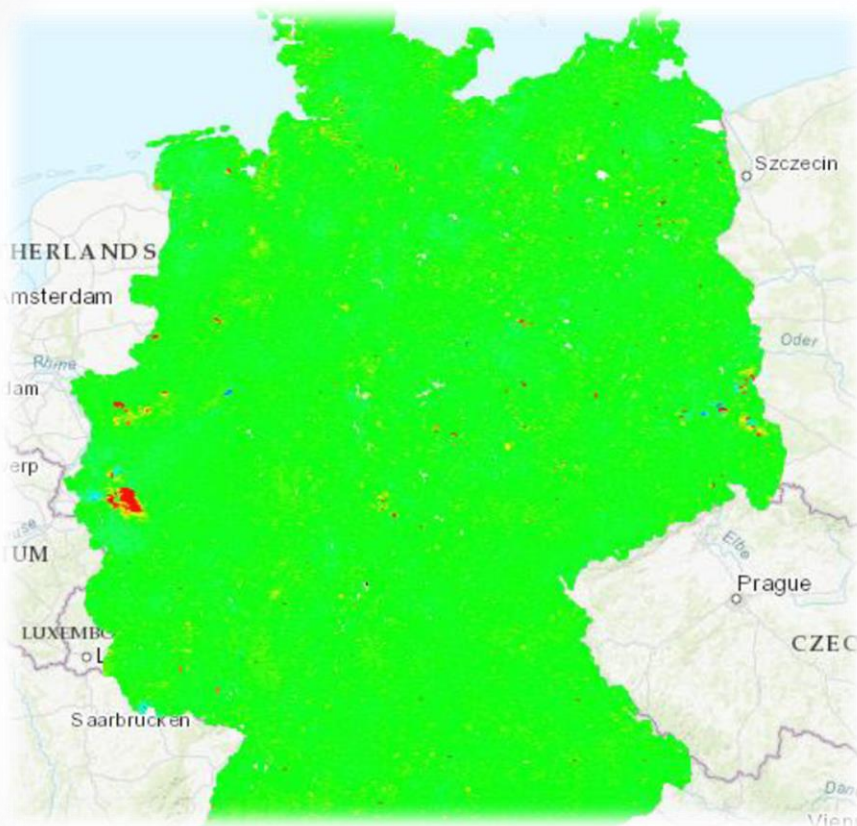


h Copernicus"
October 2020

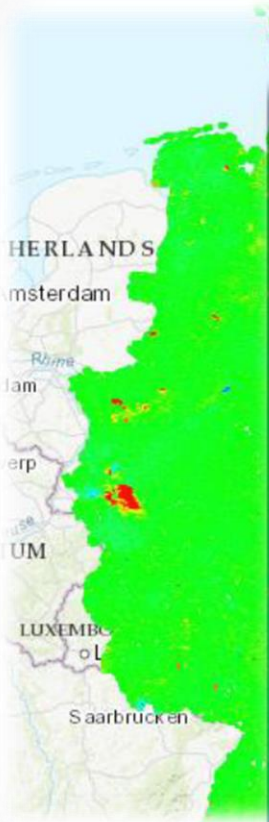


"European Ground Motion Service with Copernicus"
21 & 22 October 2020

GMS v Evropě

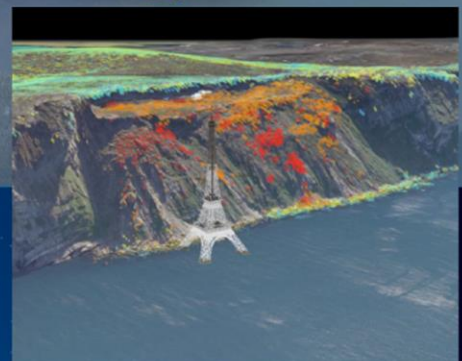
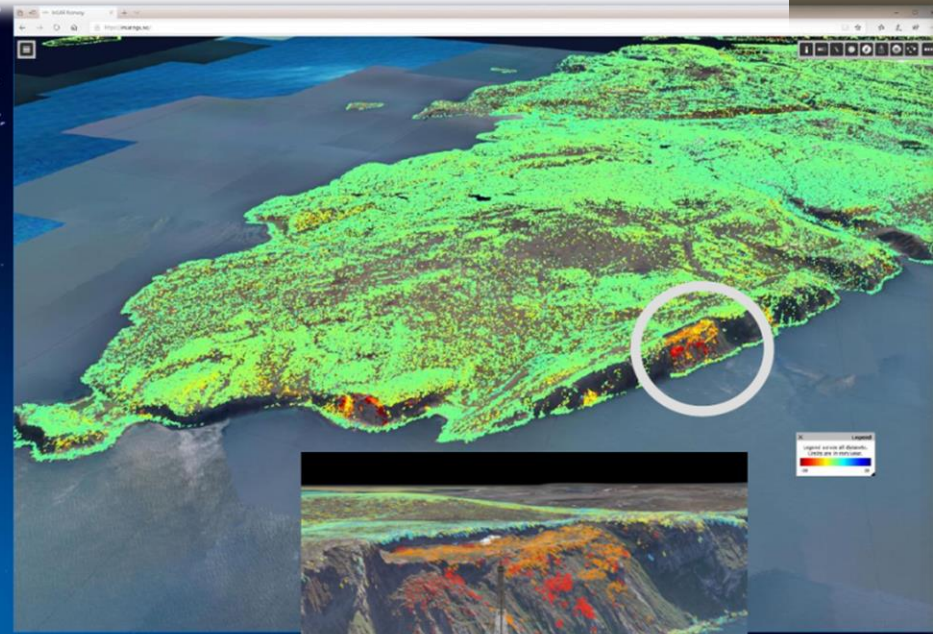
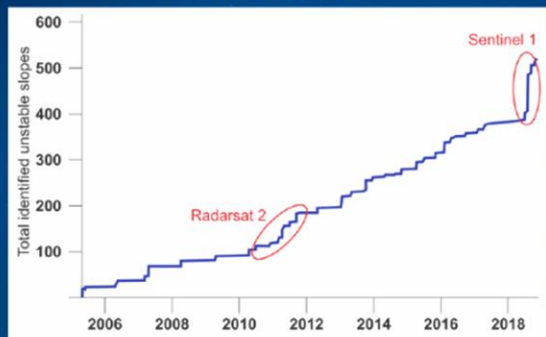


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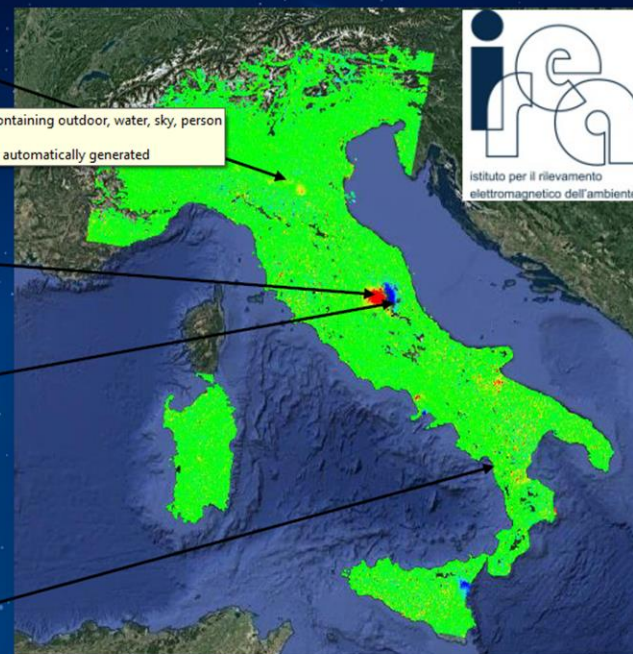
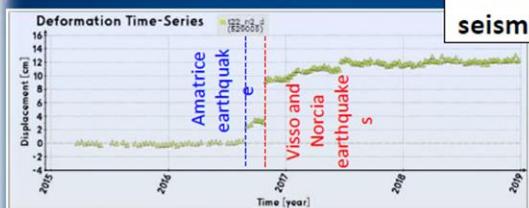
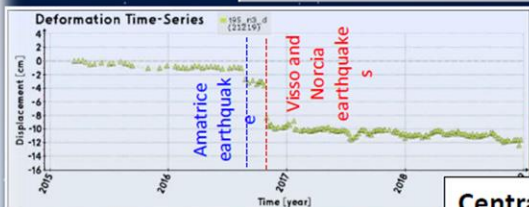
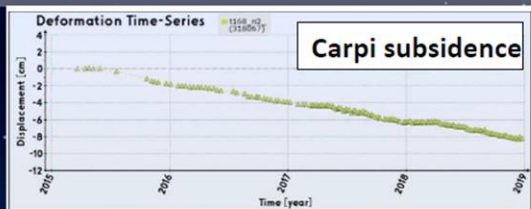
Prepare for a huge influx of data!

Within one month of the release of our first nationwide dataset in 2018, over 100 new unstable rocklopes were identified, such as this massive moving block along Porsangerfjord.



GMS v Evropě

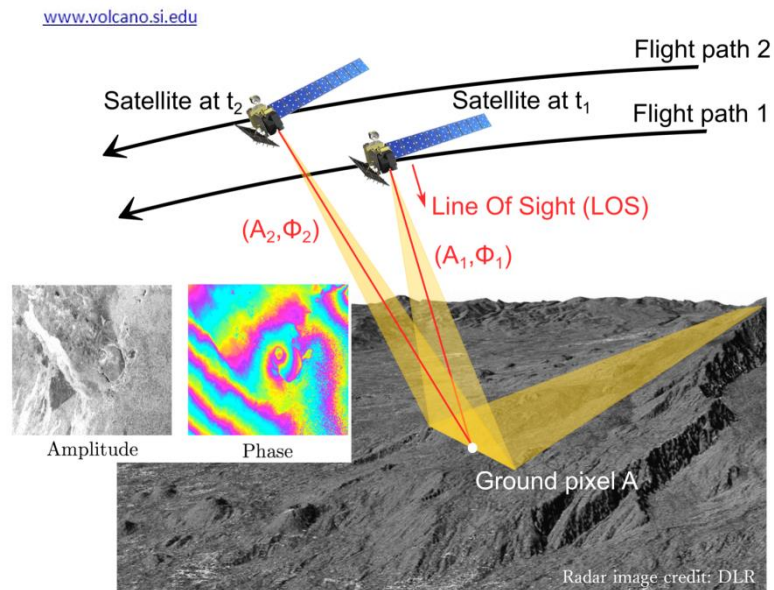
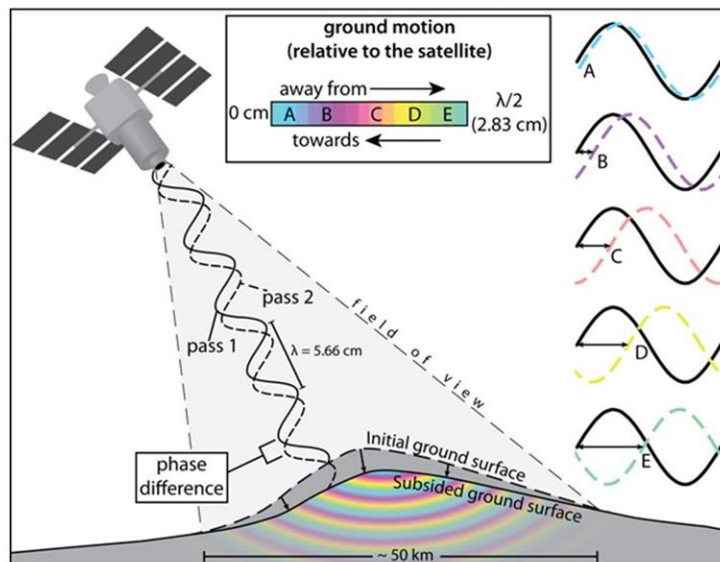
analysis



Interferometric Synthetic Aperture Radar (InSAR)

- Vyhodnocení mikrovlnné fáze emitovanou satelitním senzorem
- Deformace a pohyby v čase na mm škále
- Sentinel-1A/B (Copernicus)
 - Akvizice nových dat každých 6 dní dvěma družicemi (SAR)
 - VOLNĚ DOSTUPNÁ

InSAR - Theory



EGMS: produkty

- **Level 2a**
 - Základní produkt
 - „Deformation maps + deformation time series“
 - Produkt v plném prostorovém rozlišení
 - Hustota bodů v závislosti na vegetačním pokryvu, většinou budou body pokrývat antropogenní výstavbu a holý povrch bez vegetace

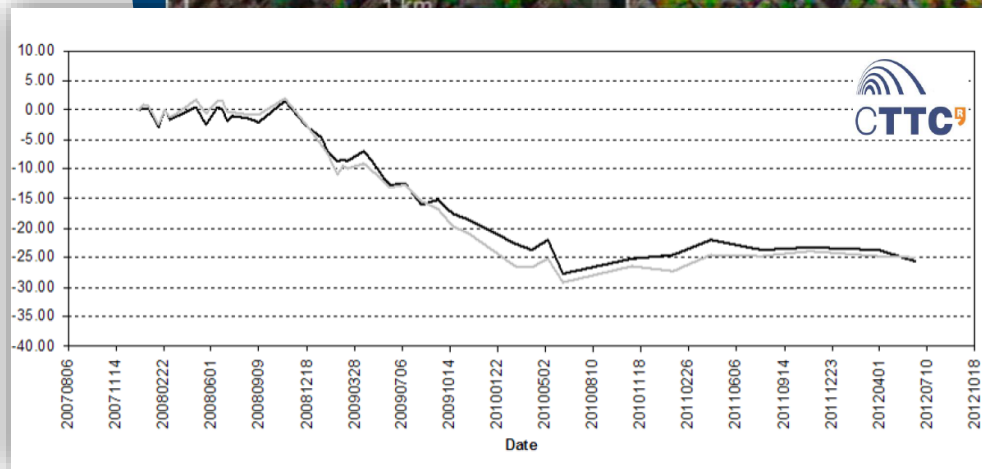


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EGMS products: Level 2a

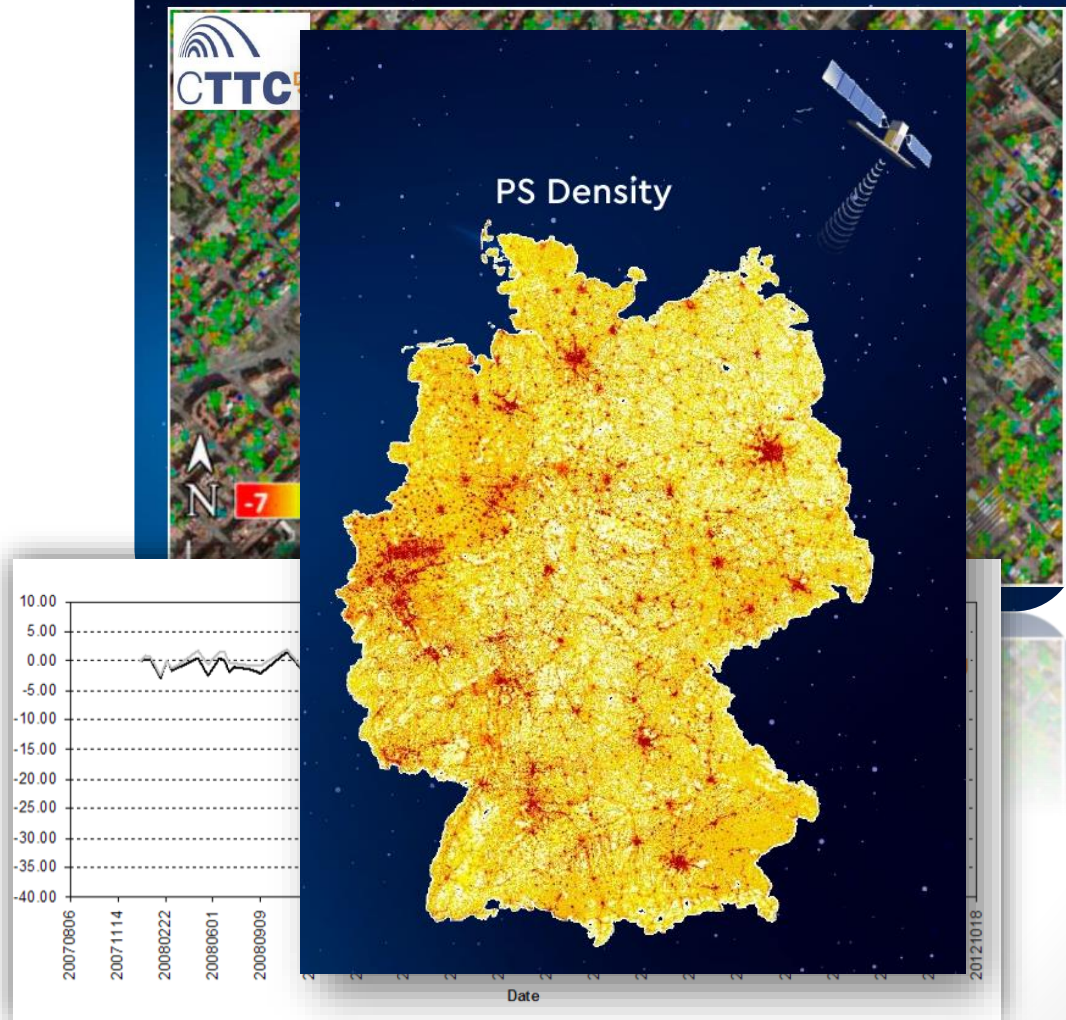


EGMS: produkty

- **Level 2a**

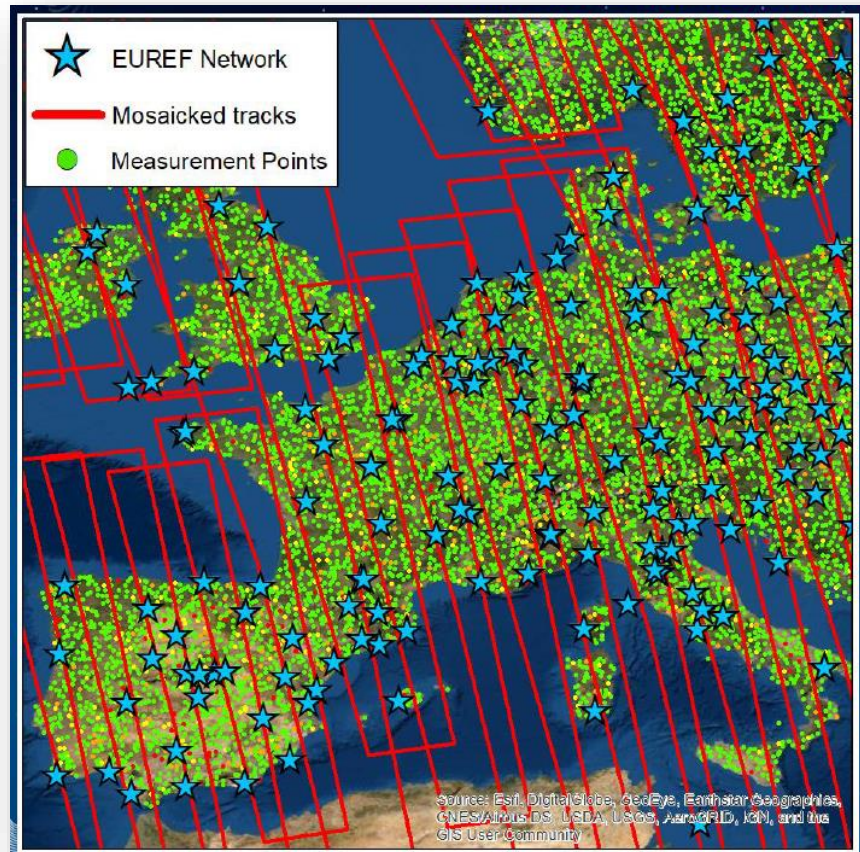
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EGMS products: Level 2a



EGMS: produkty

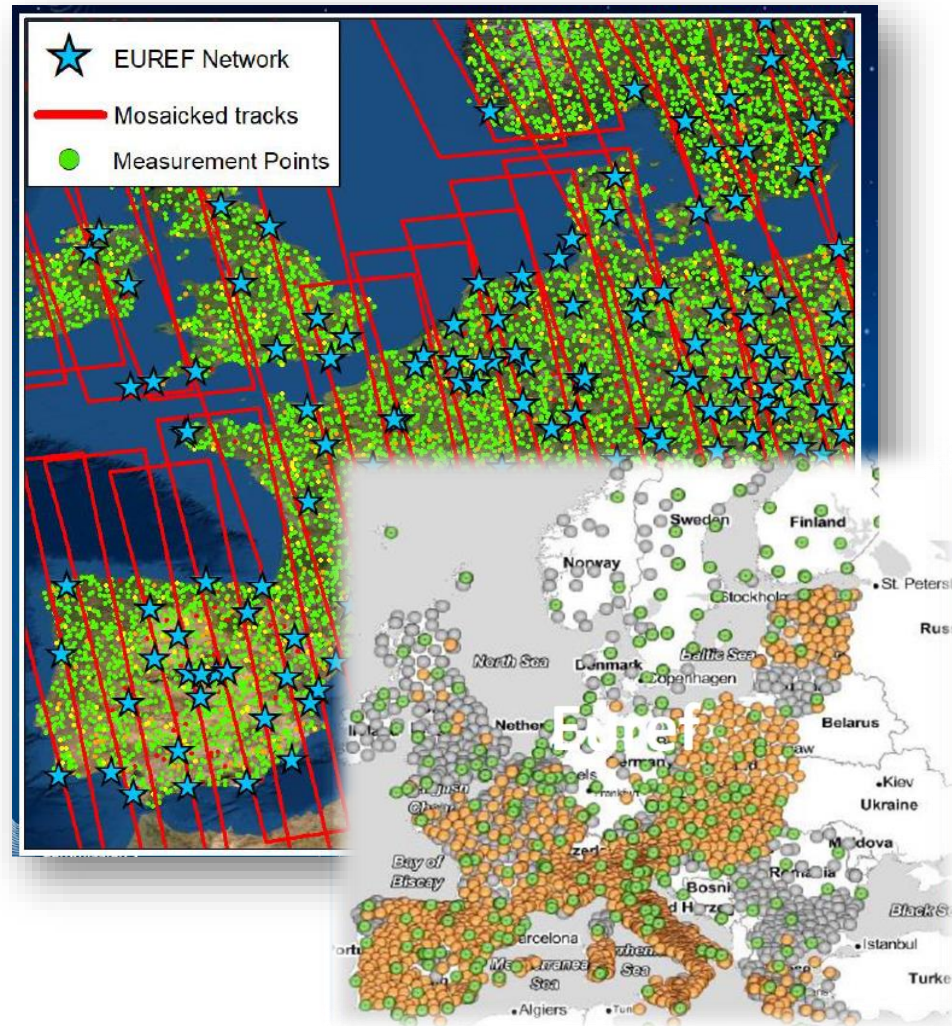
- **Level 2b**
 - mozikovaný produkt 2a, plné rozlišení dat Sentinel-1
 - Mapy deformací kalibrované na měření z referenčních GNSS stanic



EGMS: produkty

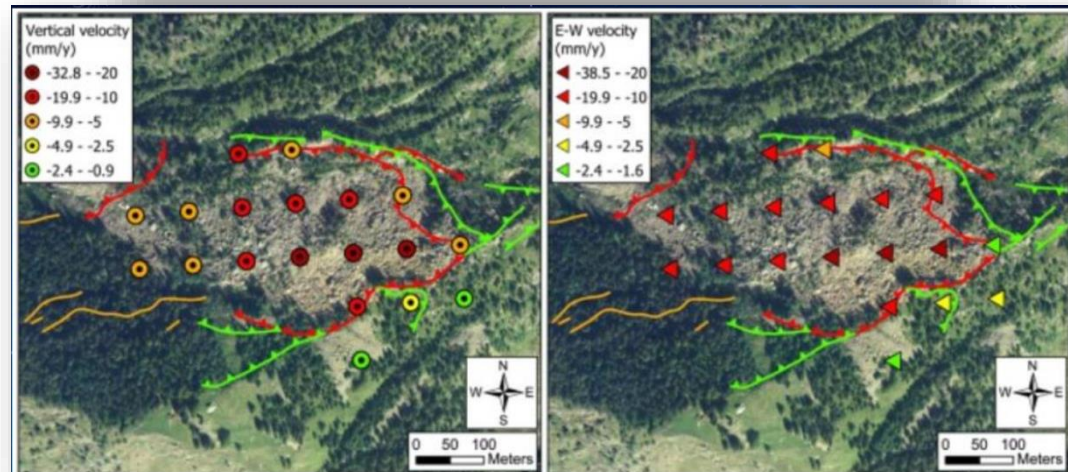
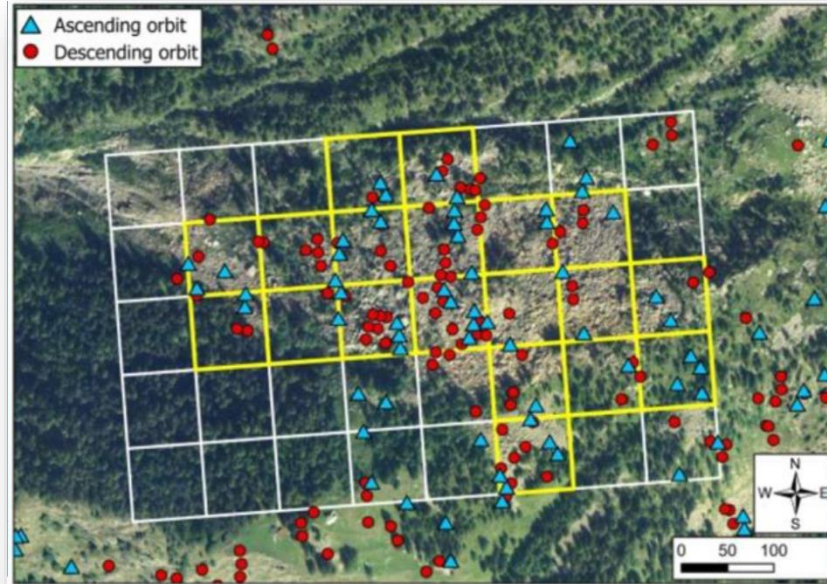
- **Level 2b**

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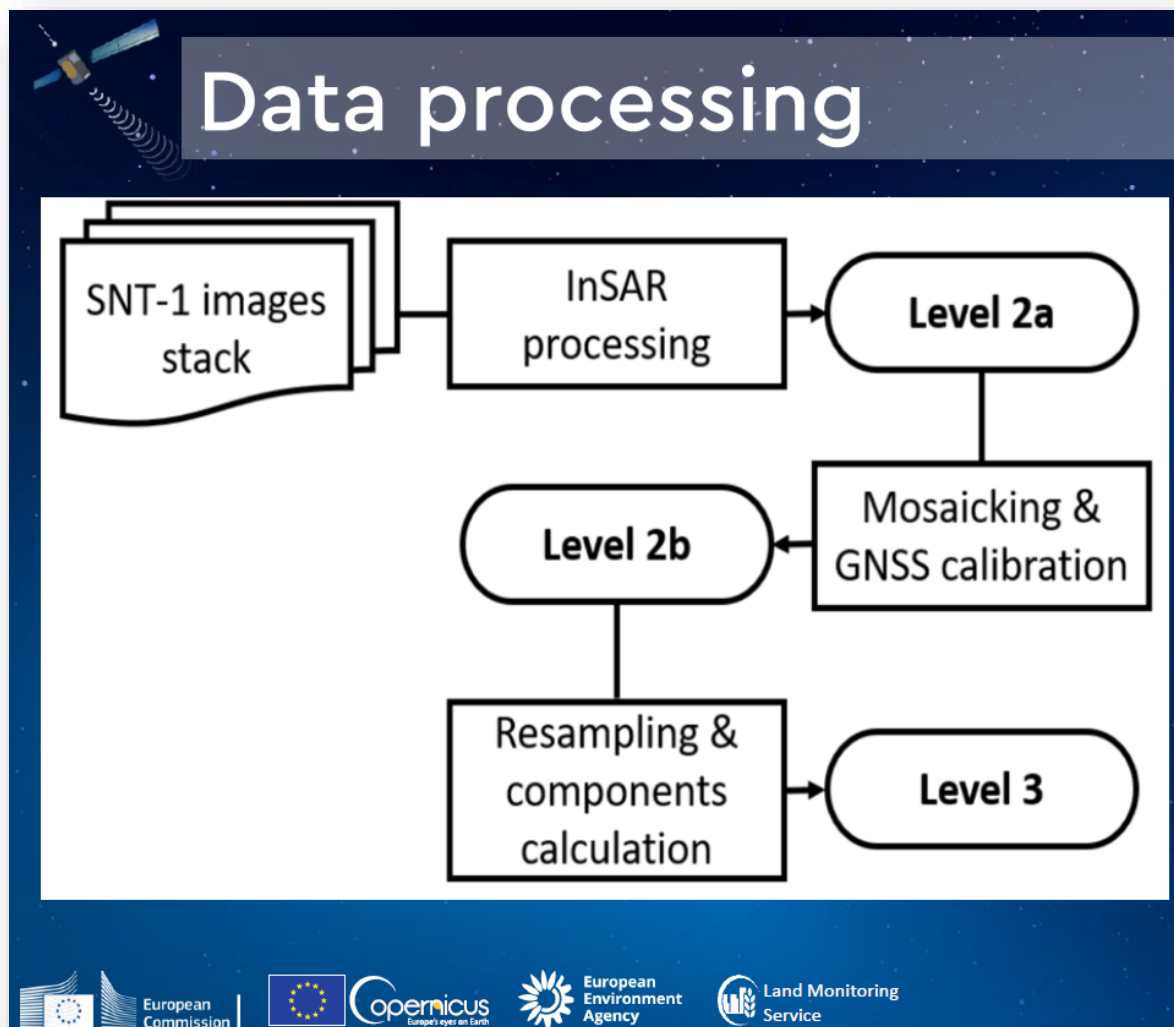


EGMS: produkty

- **Level 3** (ascending/
descending orbit:
vzestupná/sestupná
dráha)
 - 2 komponenty:
**horizontální a
vertikální deformace**
 - Degradované
prostorové rozlišení
(100x100m)



Zpracování dat



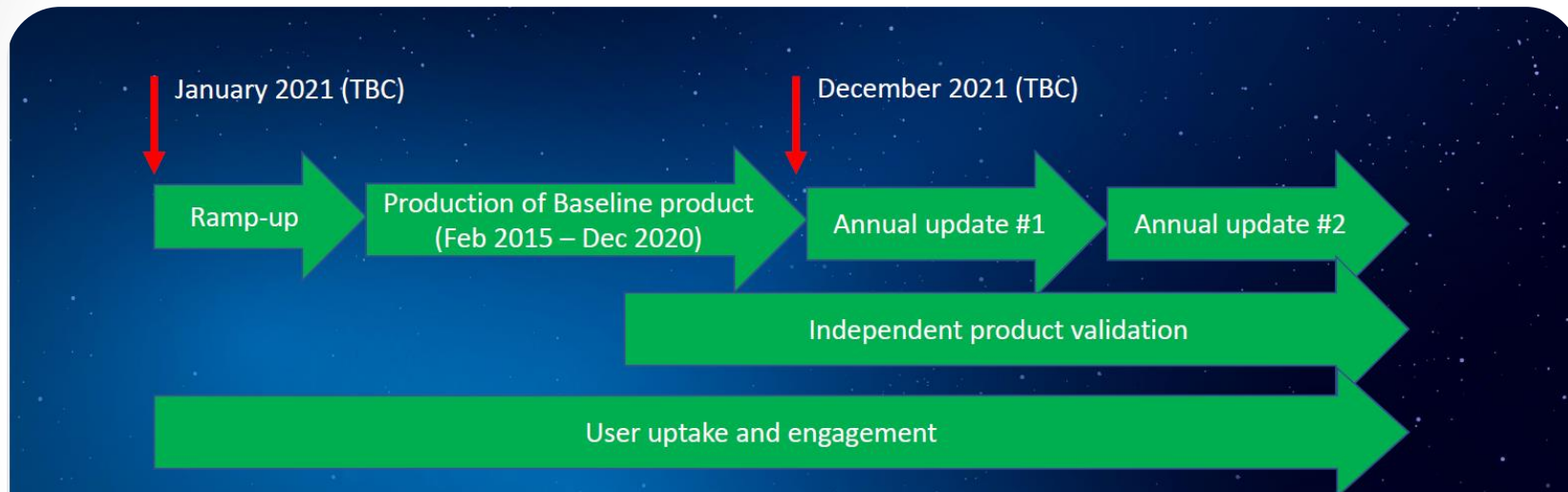
Kontrola kvality dat

- Koherence
- Měřící body
- Konzistence výsledků v rámci dvou orbitů
- Pozemní odražeče

Validace produktů

- Aplikační potenciál
- Poradní komise pracuje na definici a specifikacích tendrů na validaci koncových produktů EGMS

Časový plán

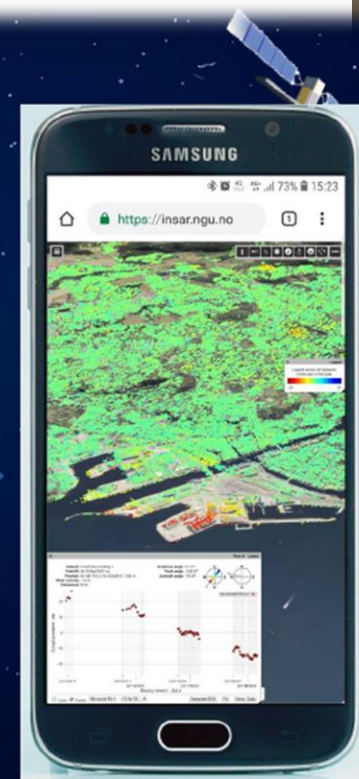


"European Ground Motion Service with Copernicus"
21 & 22 October 2020

Koncoví uživatelé

- Geologické služby, firmy (hydrogeologie, inženýrská geologie)
- Územní plánování, samospráva, MŽP, MD
- Správa železnic a silnic
- Těžební společnosti, neziskové organizace
- Vědecké instituce, univerzity

Use Cases



Currently yearly updates

Zdroj informací



EUROPEAN GROUND MOTION SERVICE WITH COPERNICUS

Agenda Day 1 — October 21

Networking via Conversation Starter app*
09:00

09:30 Welcome note
Mauro Facchini, DG DEFIS, and Hans Dufourmont, European Environment Agency

09:45 Keynote
The rationale behind and justification for the EGMS and overarching user requirements.
Dr. Michaela Frei, EGMS Advisory Board and on the EU-GMS Task force, European Commission
Eleftheria Poyiadji, EuroGeoSurveys, Earth Observation - Geohazard group, Hellenic Survey of Geology and Mineral Exploration.

10:45 Coffee Break

11:00 Session 1
The European Ground Motion Service: plans, products, and users.
Henrik Steen Andersen, European Environment Agency
Dr. Michele Crosetto, EGMS Advisory Board, Centre Tecnològic de Telecomunicacions de Catalunya.

Q&A
Chair: Ivan Konaktchiev, DG DEFIS, European Commission

Networking via Conversation Starter app*
12:30

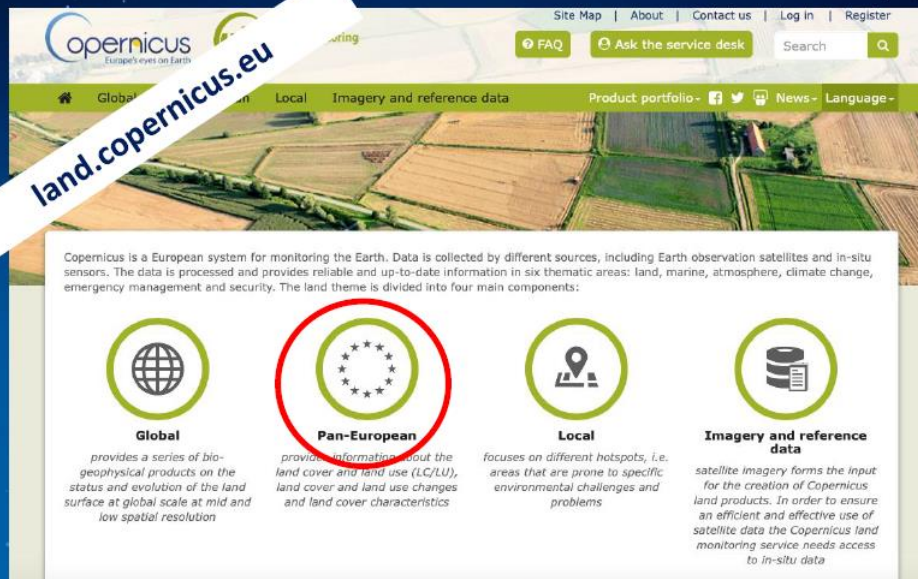


Zdroj informací

Where to find more information?

In the next presentation:

- Products;
- Quality targets;
- Methods;
- Data.



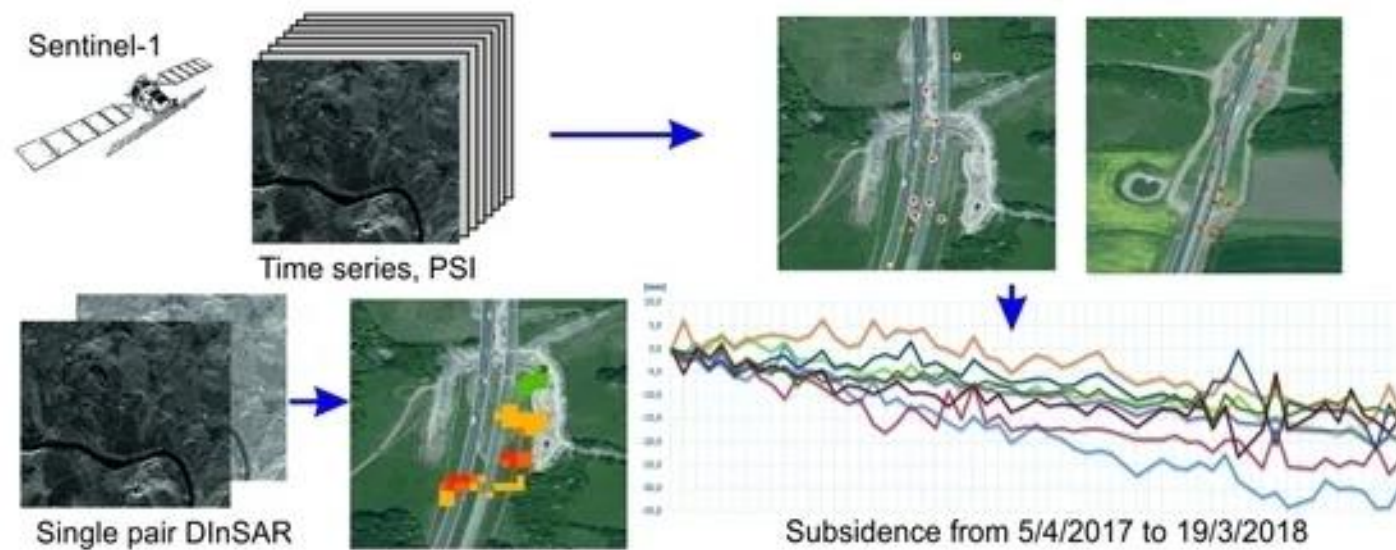
The screenshot shows the Copernicus website interface. At the top, there is a navigation bar with links for Site Map, About, Contact us, Log in, and Register. Below this is a search bar and a menu with options like FAQ, Ask the service desk, and a search icon. The main content area features a green header with navigation links: Home, Global, Local, Imagery and reference data, Product portfolio, News, and Language. The background of the page is an aerial view of agricultural fields. A white banner with the text 'land.copernicus.eu' is overlaid on the page. Below the banner, there is a section titled 'Copernicus is a European system for monitoring the Earth. Data is collected by different sources, including Earth observation satellites and in-situ sensors. The data is processed and provides reliable and up-to-date information in six thematic areas: land, marine, atmosphere, climate change, emergency management and security. The land theme is divided into four main components:'. This section contains four icons in green circles: a globe for 'Global', the European Union flag for 'Pan-European', a location pin for 'Local', and a server rack for 'Imagery and reference data'. Each icon is accompanied by a brief description of the component's focus.

land.copernicus.eu

Copernicus is a European system for monitoring the Earth. Data is collected by different sources, including Earth observation satellites and in-situ sensors. The data is processed and provides reliable and up-to-date information in six thematic areas: land, marine, atmosphere, climate change, emergency management and security. The land theme is divided into four main components:

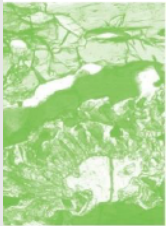
- Global**
provides a series of biogeophysical products on the status and evolution of the land surface at global scale at mid and low spatial resolution
- Pan-European**
provides information about the land cover and land use (LC/LU), land cover and land use changes and land cover characteristics
- Local**
focuses on different hotspots, i.e. areas that are prone to specific environmental challenges and problems
- Imagery and reference data**
satellite imagery forms the input for the creation of Copernicus land products. In order to ensure an efficient and effective use of satellite data the Copernicus land monitoring service needs access to in-situ data

SAR aplikace v ČGS



Fárová K, Jelének J, Kopačková-Strnadová V, Kycl P. Comparing DInSAR and PSI Techniques Employed to Sentinel-1 Data to Monitor Highway Stability: A Case Study of a Massive Dobkovičky Landslide, Czech Republic. *Remote Sensing*. 2019; 11(22):2670. <https://doi.org/10.3390/rs11222670>

SAR aplikace v ČGS



Číslo úkolu ČGS: 636200

Závěrečná zpráva

DETEKCE SUBSIDENCE POMOCÍ METODY PSI NA DRUŽICOVÝCH DATECH SENTINEL-1 V BLÍZKÉM OKOLÍ POVRCHOVÉHO DOLU TURÓW

Odpovědní řešitelé:

Mgr. Kateřina Fárová

Mgr. Jan Jelének

Mgr. Veronika Strnadová, Ph.D.

Mgr. Tomáš Hroch

Předkládá ředitel České geologické služby Zdeněk Venera

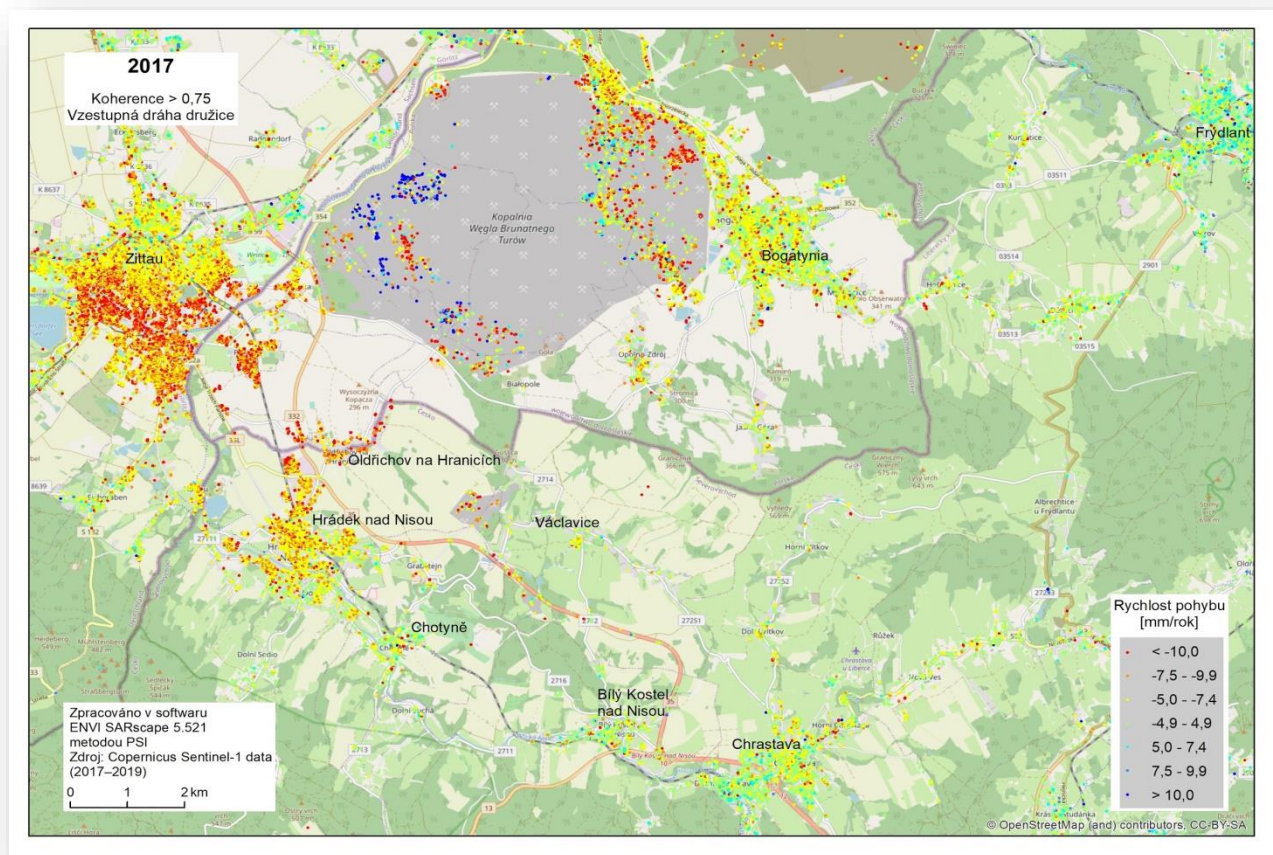
Česká geologická služba/ Czech Geological Survey

Klárov 131/ 3, 118 21 Praha 1

IČO 00025798, DIČ CZ 00025798

www.geology.cz

SAR aplikace v ČGS



Děkuji za pozornost 😊

veronika.strnadova@geology.cz