

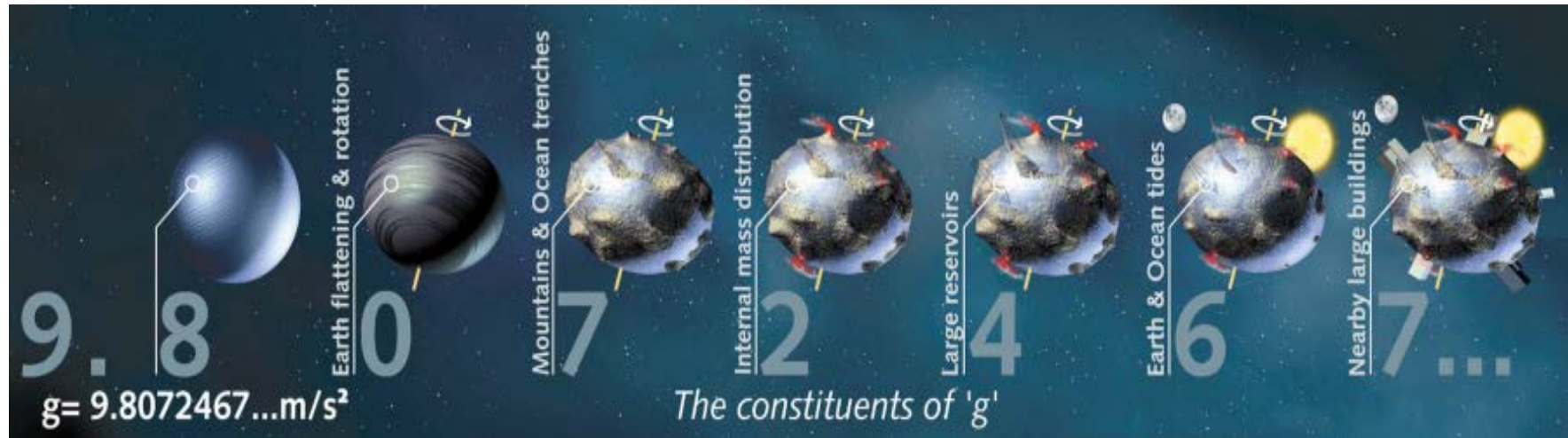


**Sensing total mass change by
gravity observations –
a (missing) key element of ECVs**

**Dr. Matthias Weigelt
on behalf of the EGSIEM team**

What is gravity and
how do we observe ECVs with it?

You already know gravity ...

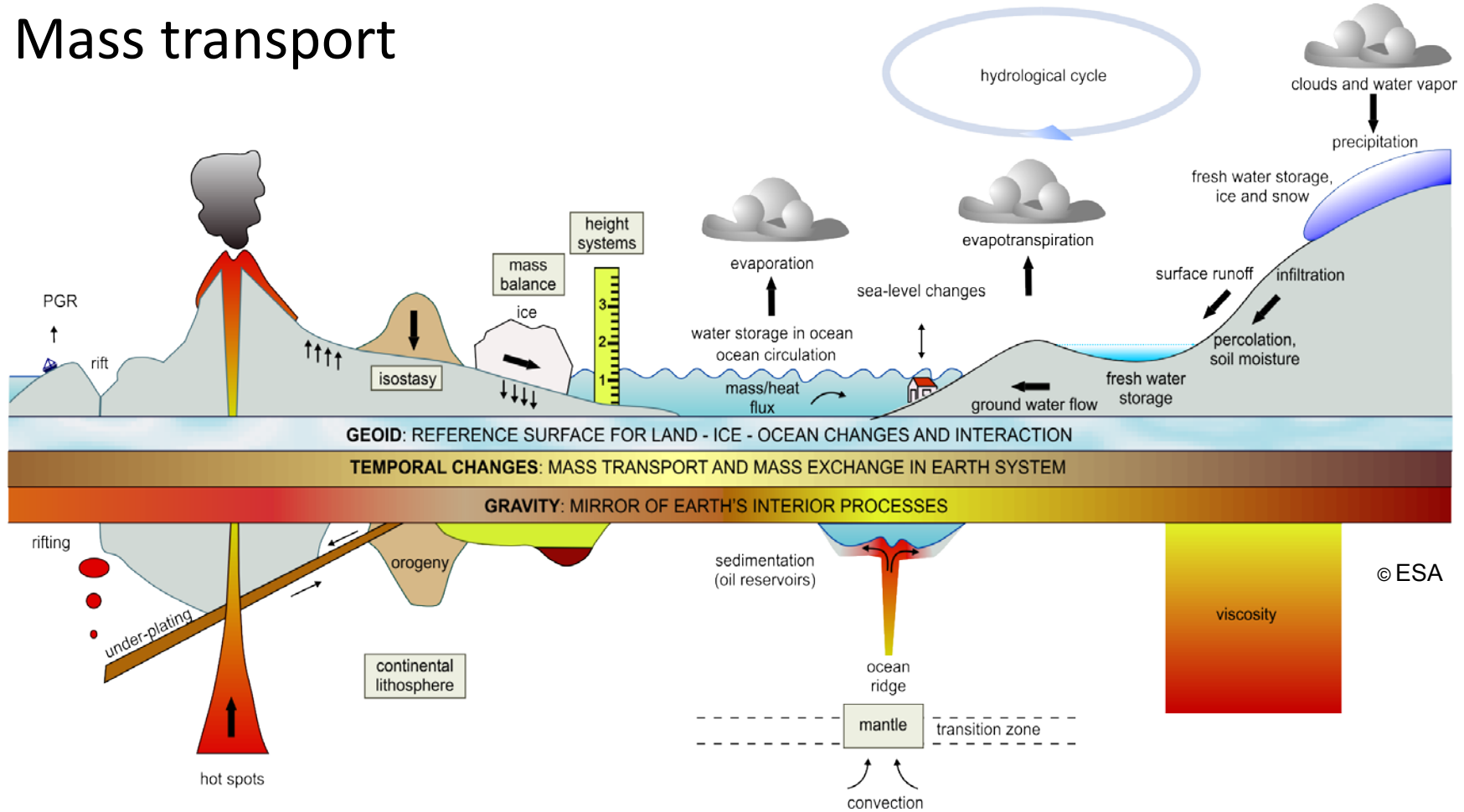


© ESA

Gravity describes the
mass distribution of the Earth

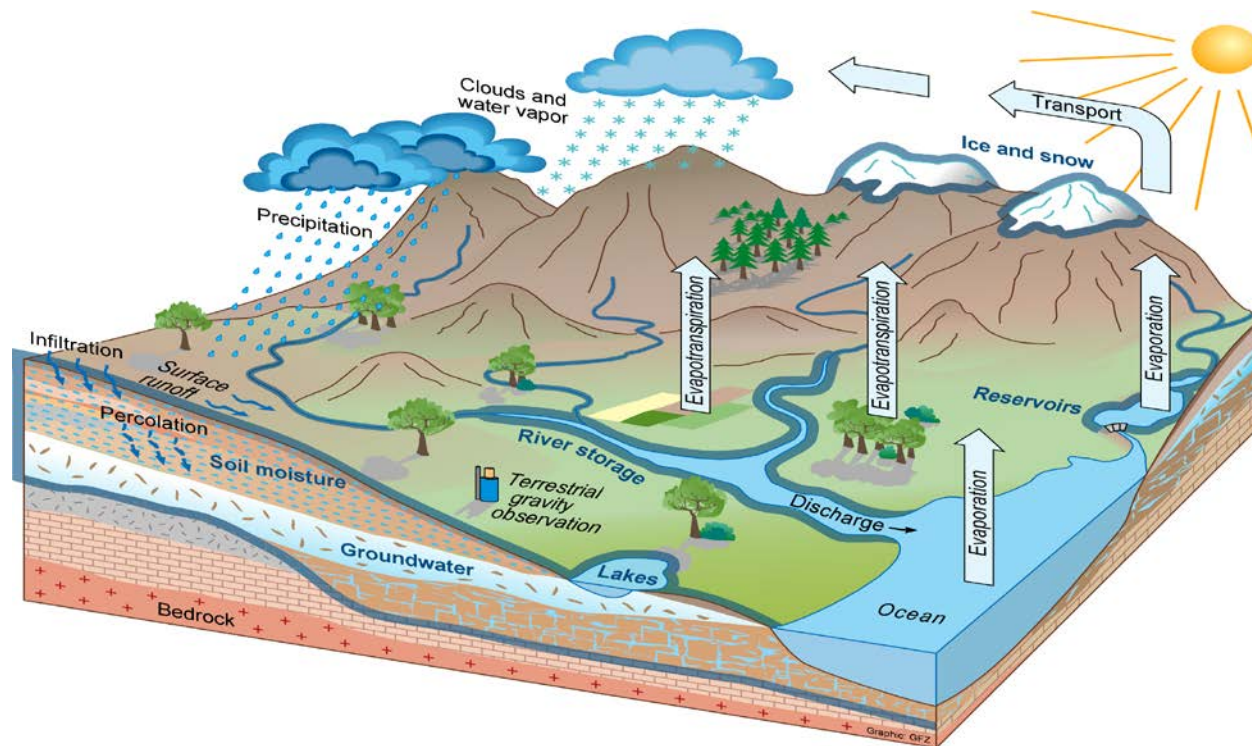
Mass **RE-distribution (=transport)** causes
variations in the gravity field

Mass transport



On short time scales, mass transport is almost exclusively caused by water transport

The global water cycle

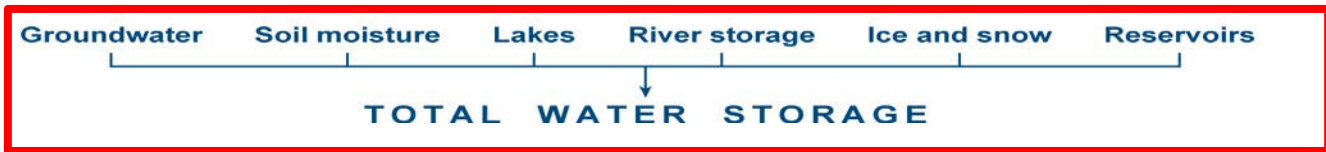
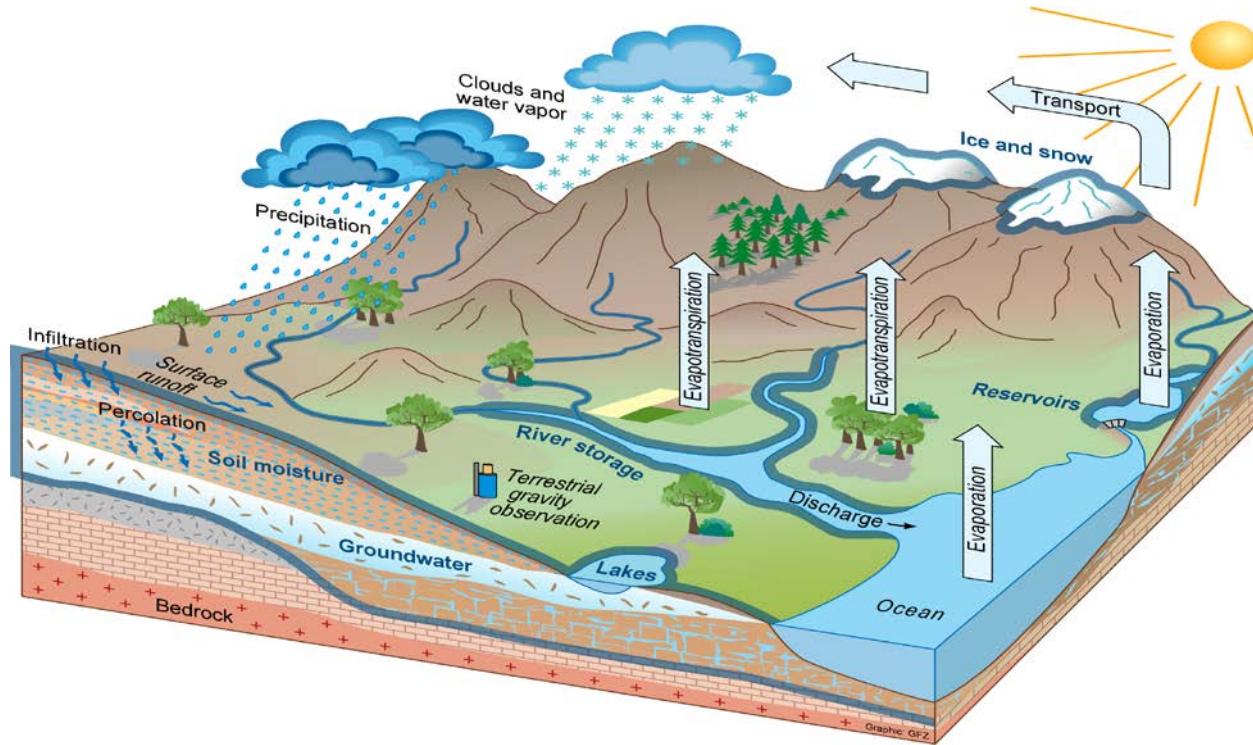


Continental water balance

$$P = ET + Q + \Delta S$$

- P: Precipitation
ET: Evapotranspiration
Q: Runoff
 ΔS : Storage change

Continental water storage variations



Local to global water balances:

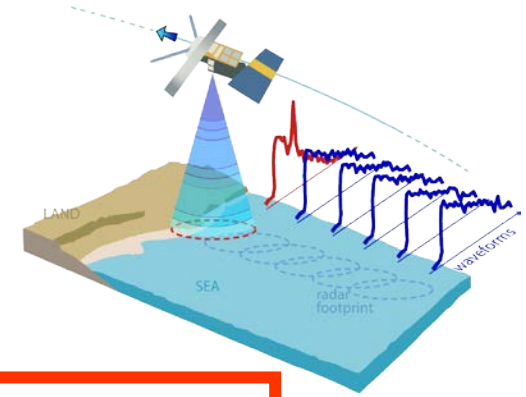
- ➔ Water resources
- ➔ Flood generation
- ➔ Sea level change
- ➔ Weathering, gas fluxes

Continental water balance

$$P = ET + Q + \Delta S$$

P: Precipitation
 ET: Evapotranspiration
 Q: Runoff
 ΔS : Storage change

Monitoring water storage



Soil m

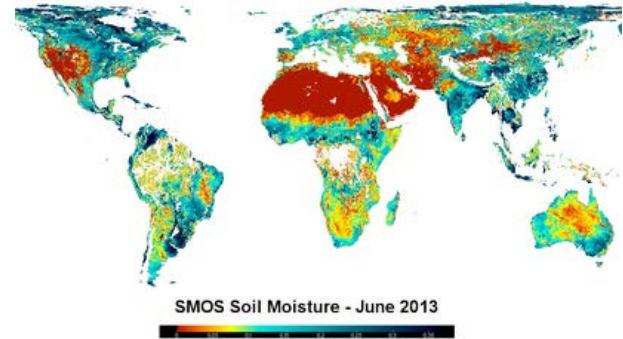
Limitation:

- single storage compartments
- point measurements

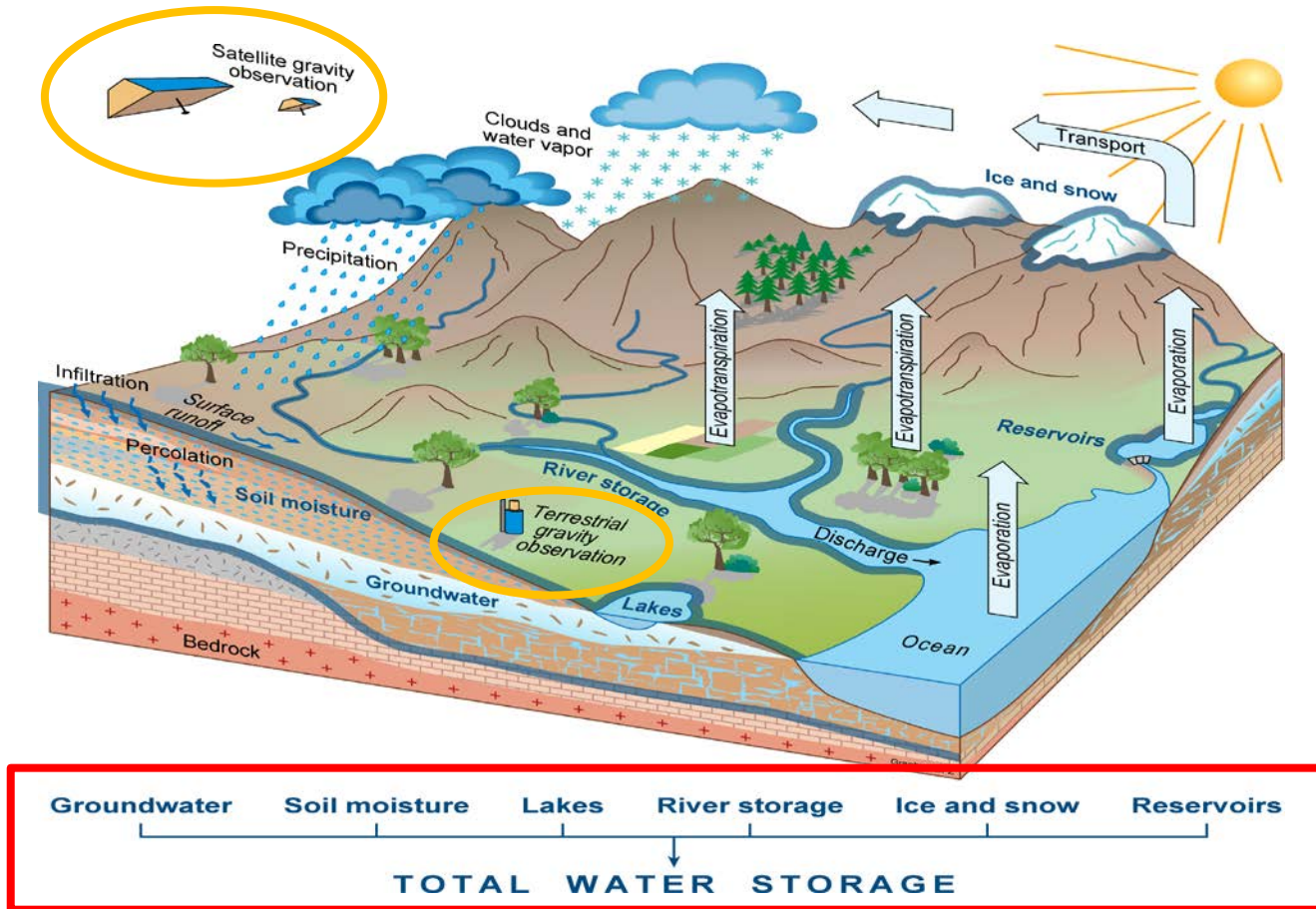
land water
es



moisture



The global water cycle



Continental water balance

$$P = ET + Q + \Delta S$$

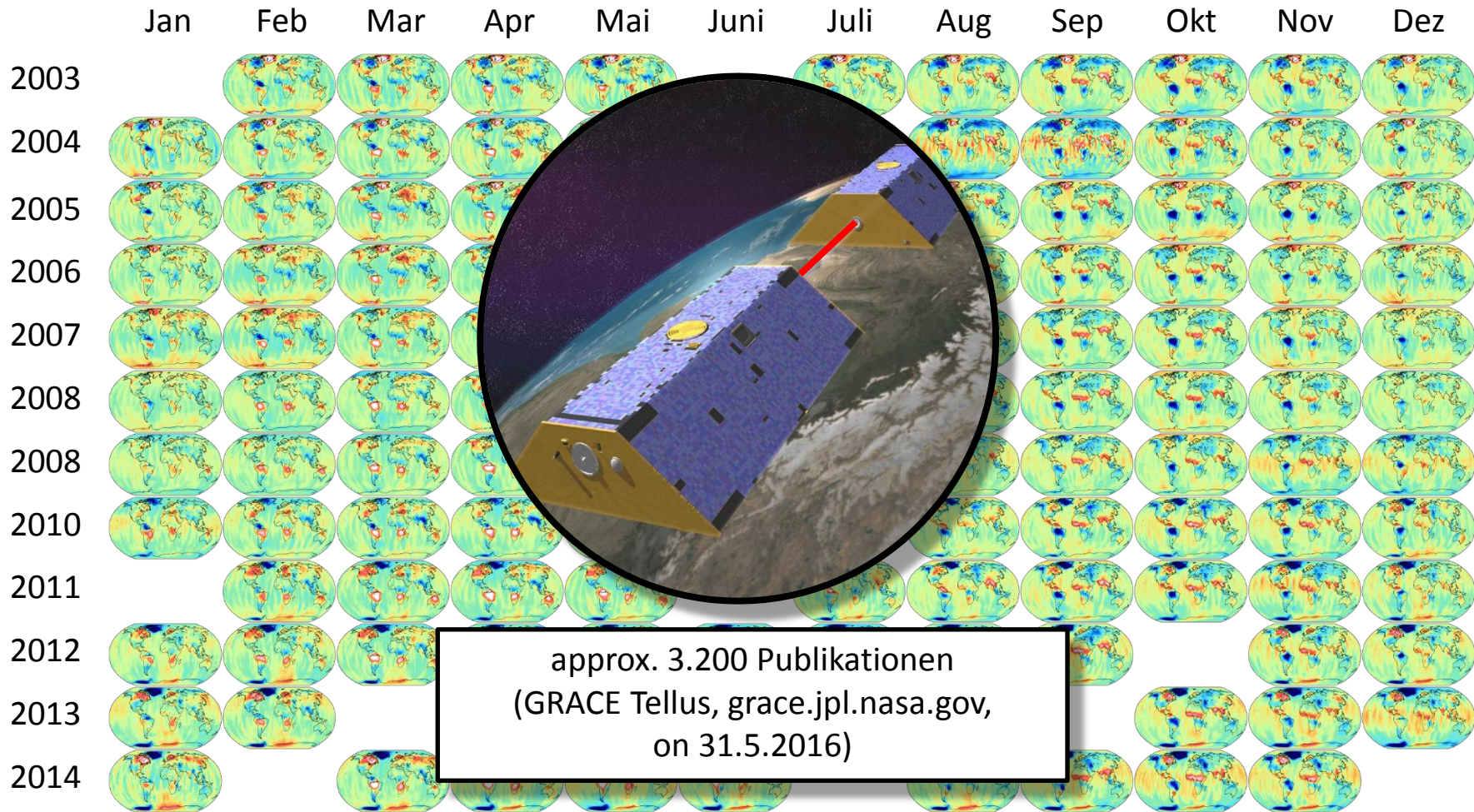
- P: Precipitation
- AET: Evapotranspiration
- Q: Runoff
- ΔS : Storage change

How to observe it?

GRACE – Gravity Recovery And Climate Experiment

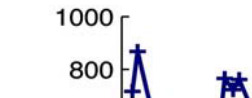


GRACE products

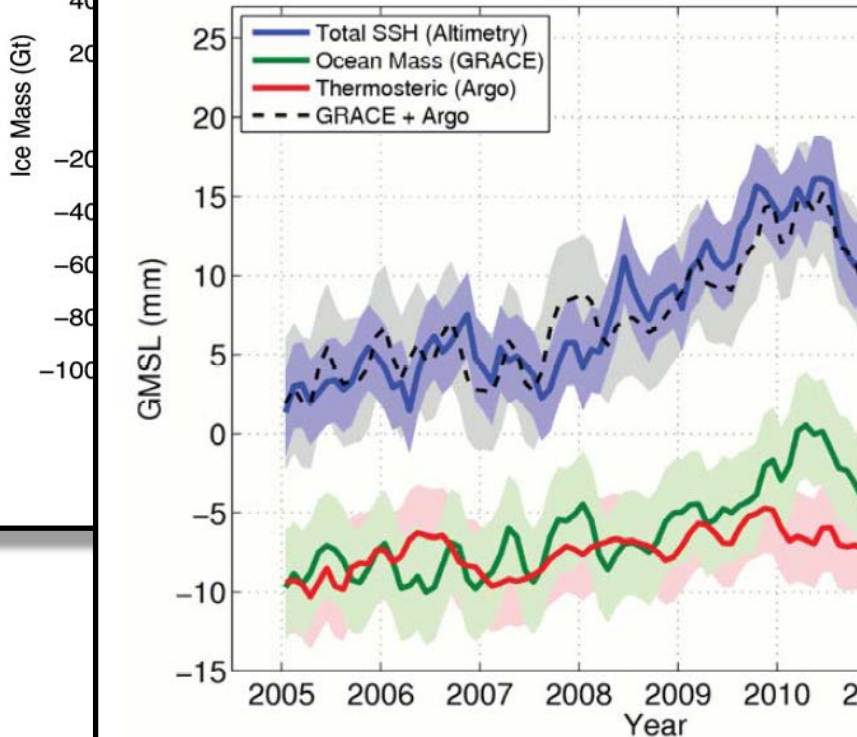


Applications, applications, applications ...

Ice mass balance in Greenland

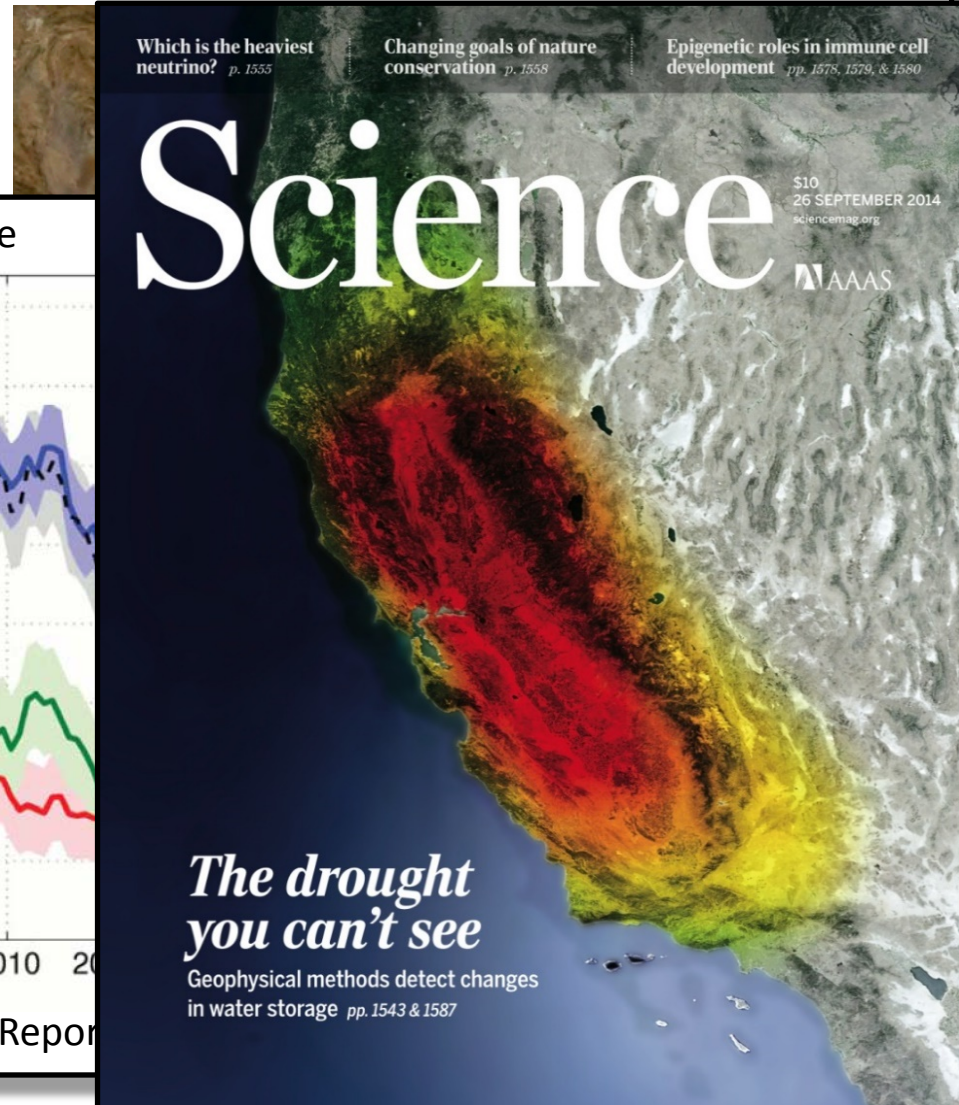


Global sea level rise

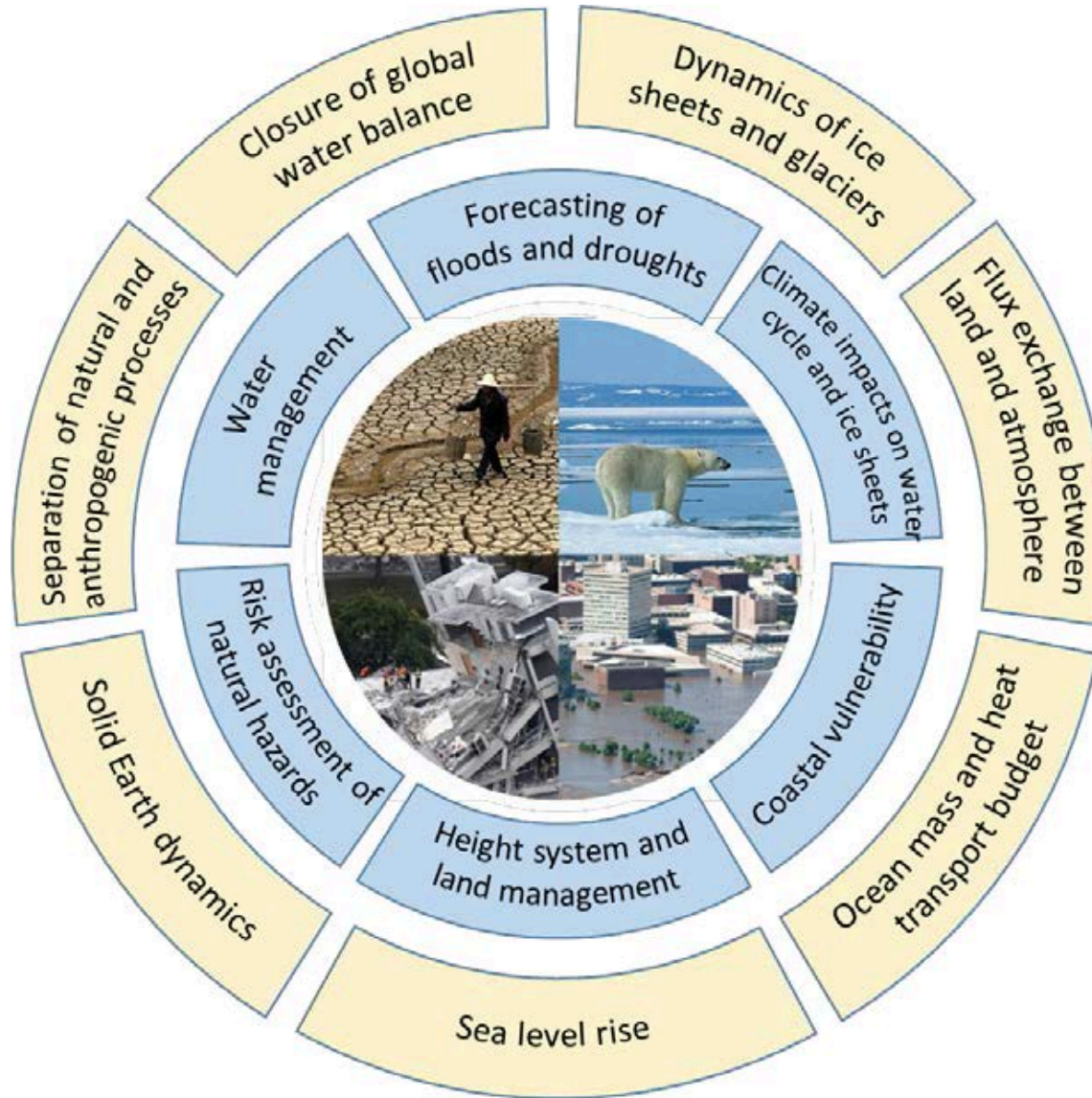


IPCC WGI Fifth Assessment Report

Ground water retrieval in India



Numerous benefits ...



Challenges

- Limited spatial (> 250 km) and temporal (1 month) resolution
- Latency of 2-3 month
- Complex post-processing necessary (gridding, filtering, ...)
- Multiple processing centers with inhomogeneous processing

EOSIEM

European Gravity Service for Improved Emergency Management

is our response to the challenges ...

A proposal for the project

EGSIEM European Gravity Service for Improved Emergency Management

has been submitted last spring to the EO-1 Space Call of the Horizon 2020 Framework Program for Research and Innovation.



EGSIEM project overview

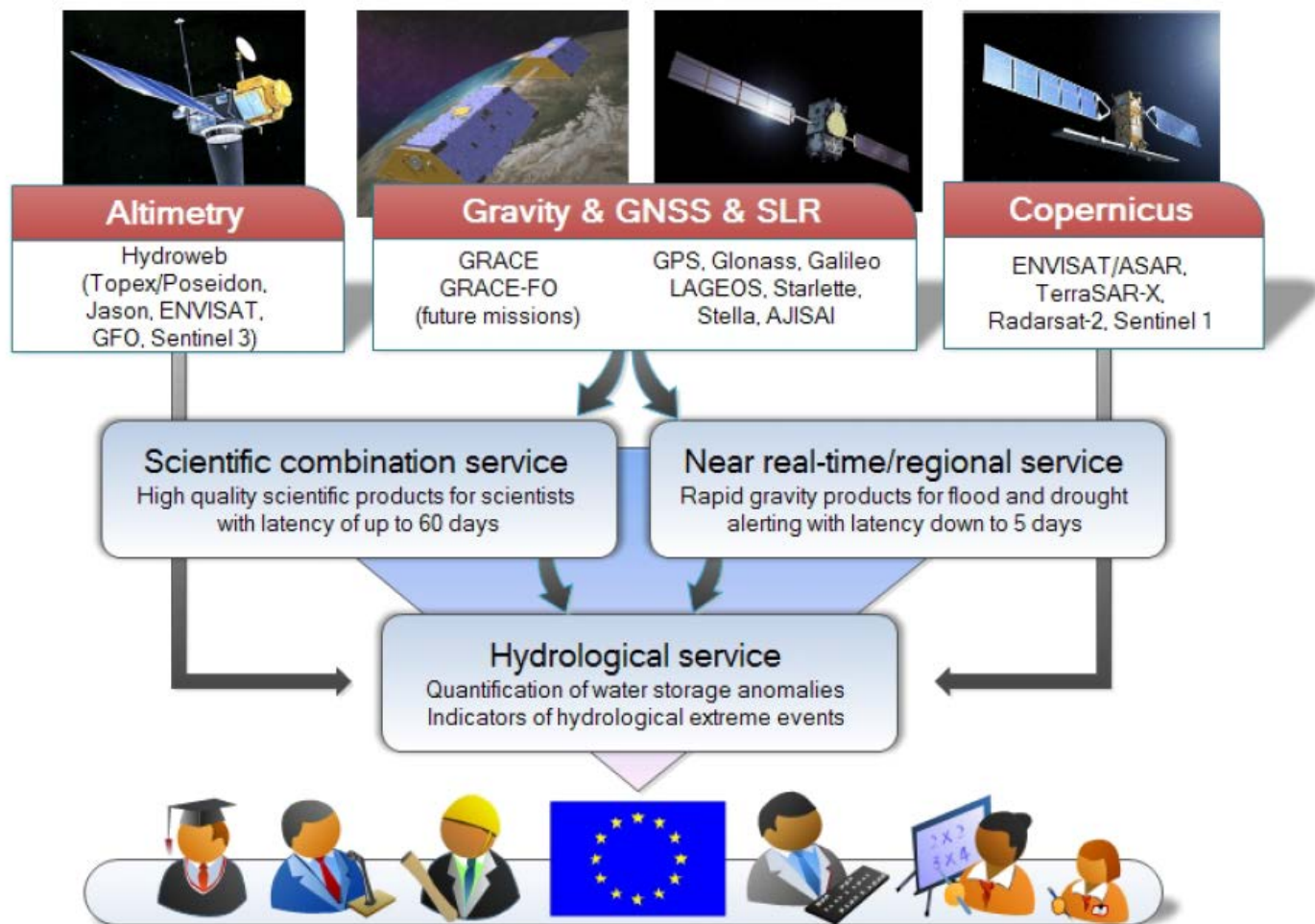
EGSIEM is a EU Horizon 2020 project and has officially started on January 1, 2015.

The three main objectives of EGSIEM are to

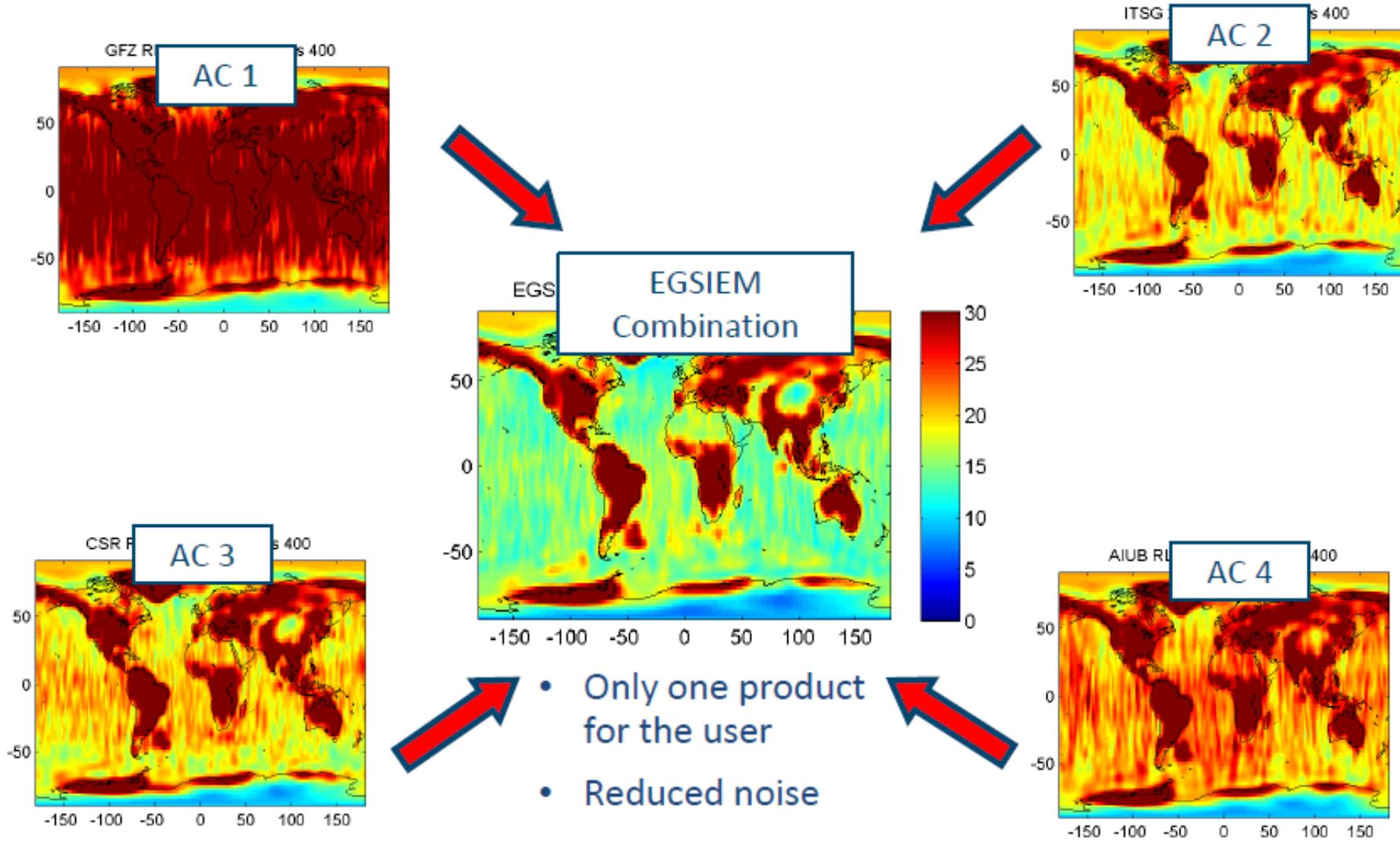
- deliver the best gravity products for applications in Earth and environmental science research
- reduce the latency and increase the temporal resolution of the gravity and therefore mass redistribution products
- develop gravity-based indicators for extreme hydrological events and demonstrate their value for flood and drought forecasting and monitoring services

EGSIEM project overview

Three dedicated services shall be established:

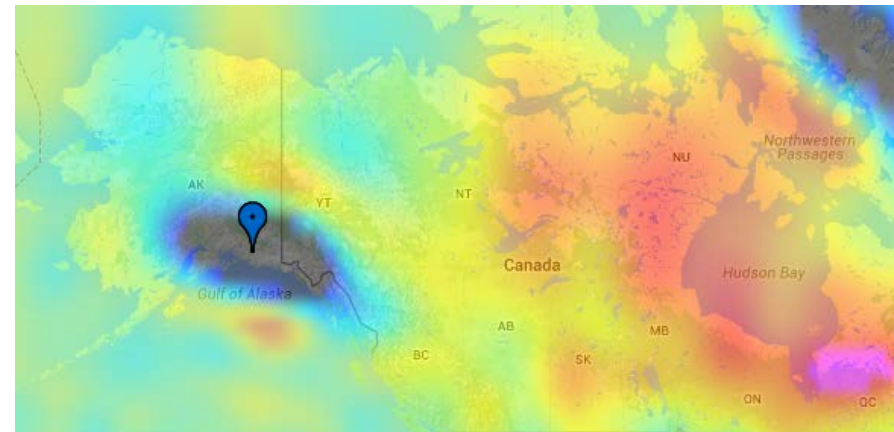
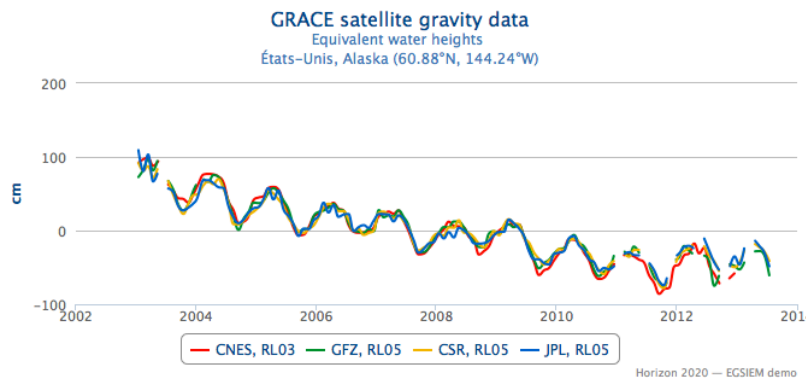
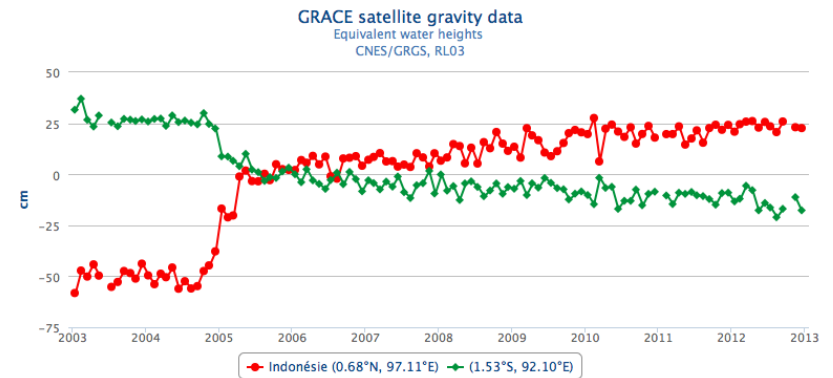
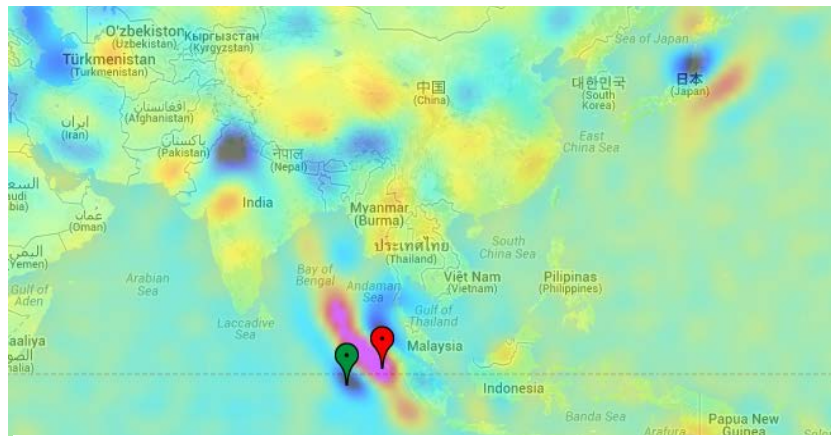


Scientific service



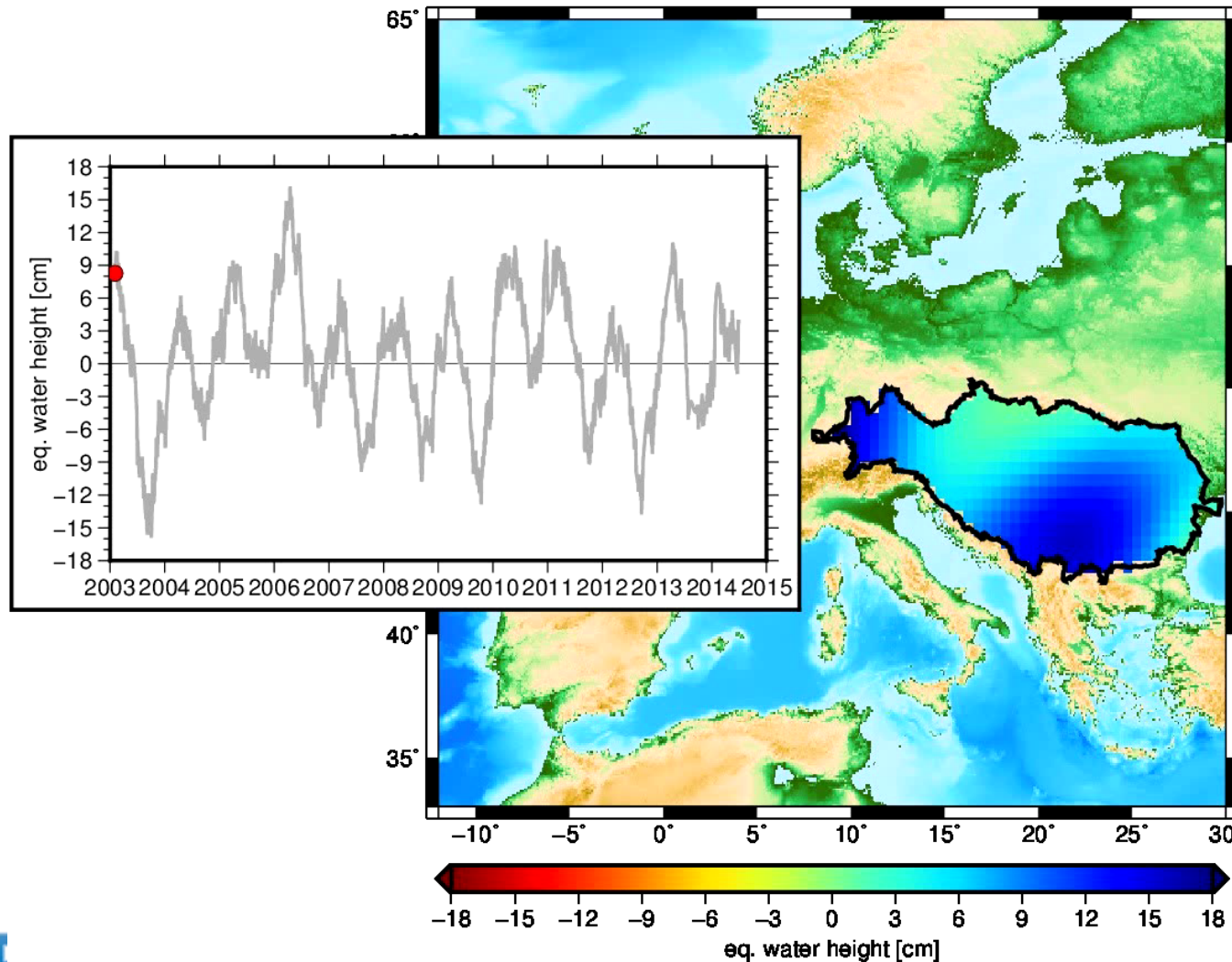
Dissemination and Exploitation

EGSIEM plotter: interactive, fast and user-friendly visualization of results for scientific evaluation.



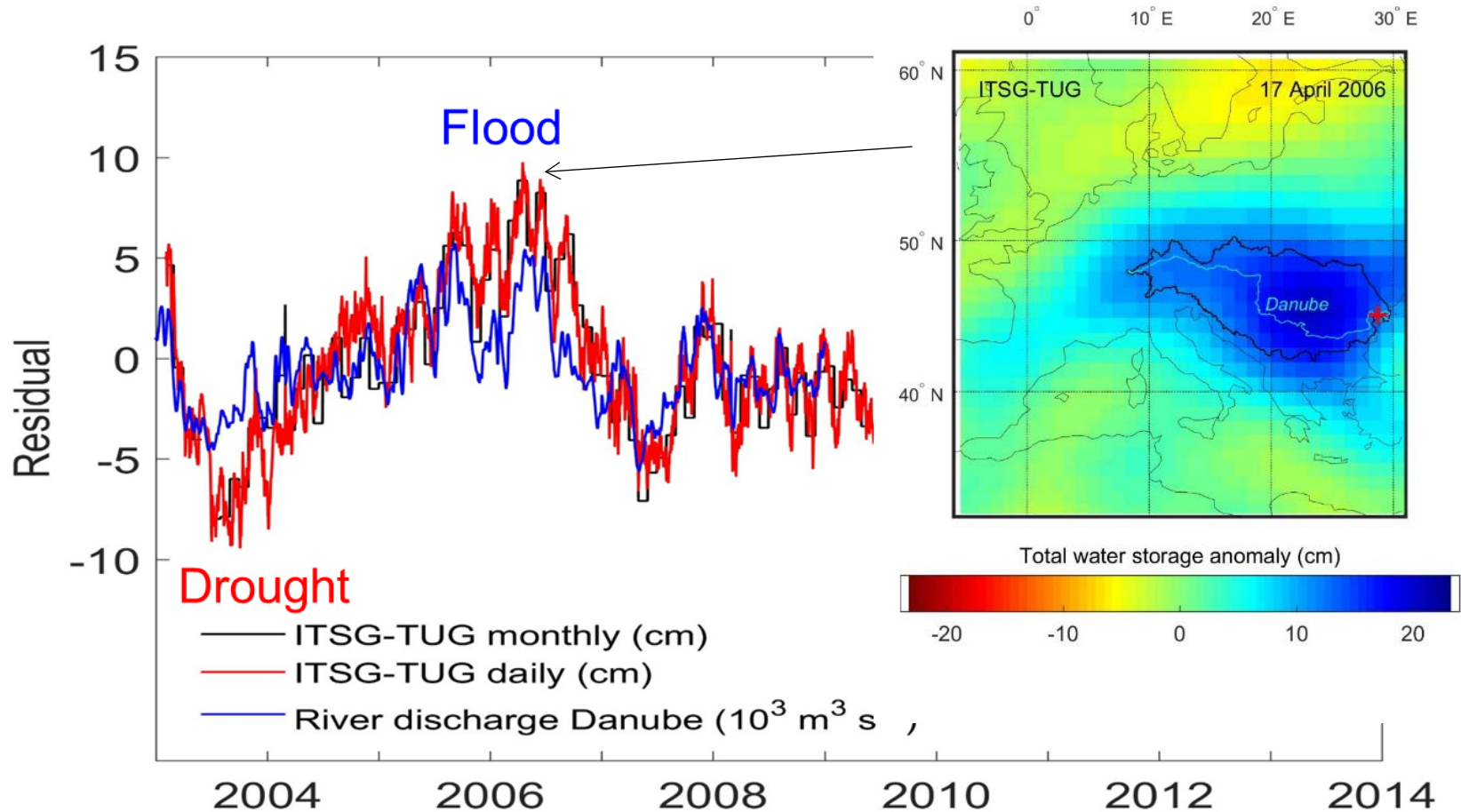
Near-realtime service

Daily updated solution with max. 5 days delay

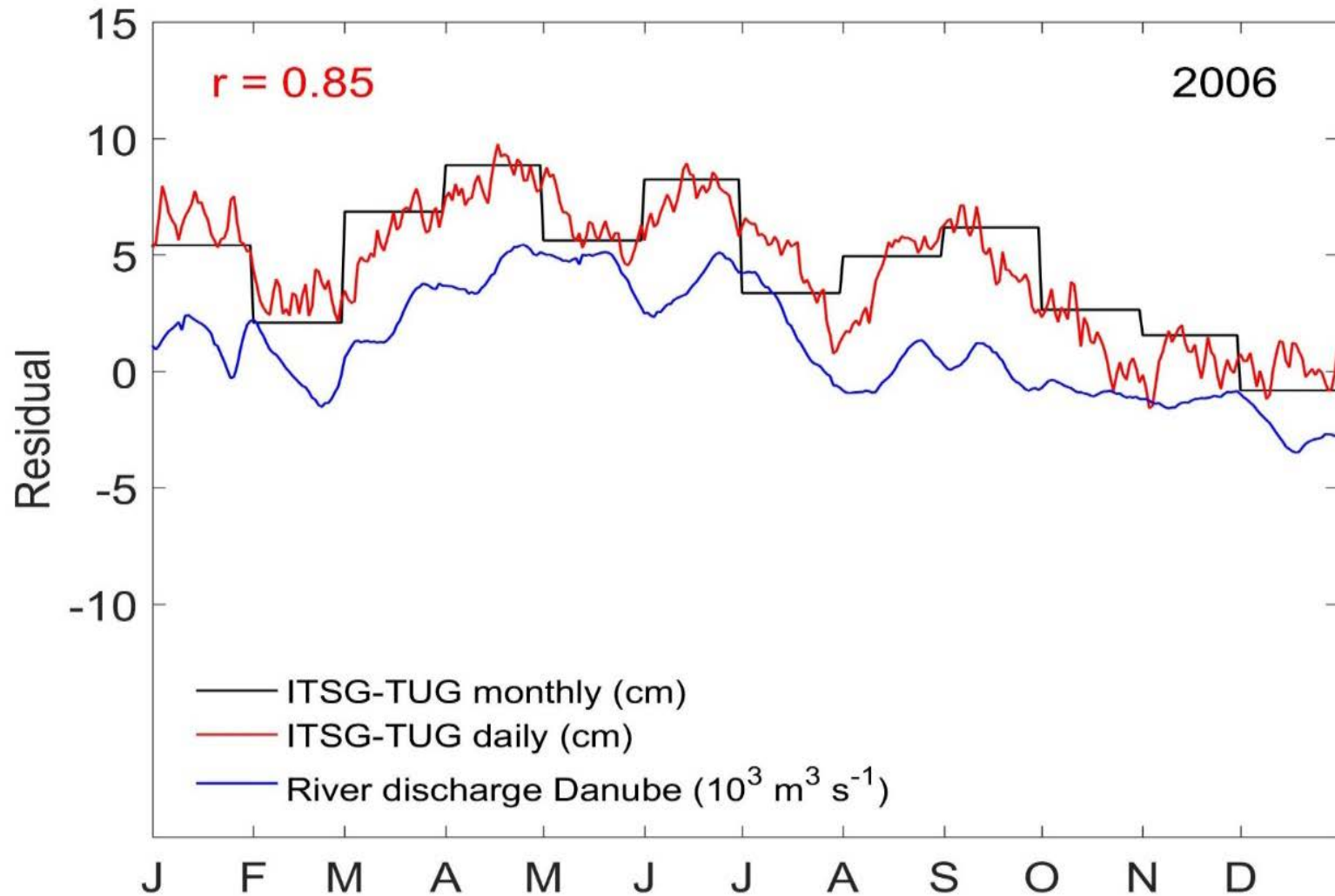


Daily total water storage in the Danube basin based on ITSG-Grace2014, TU Graz

Near-realtime service: flood and drought



Hydrological service



Hydrological Service

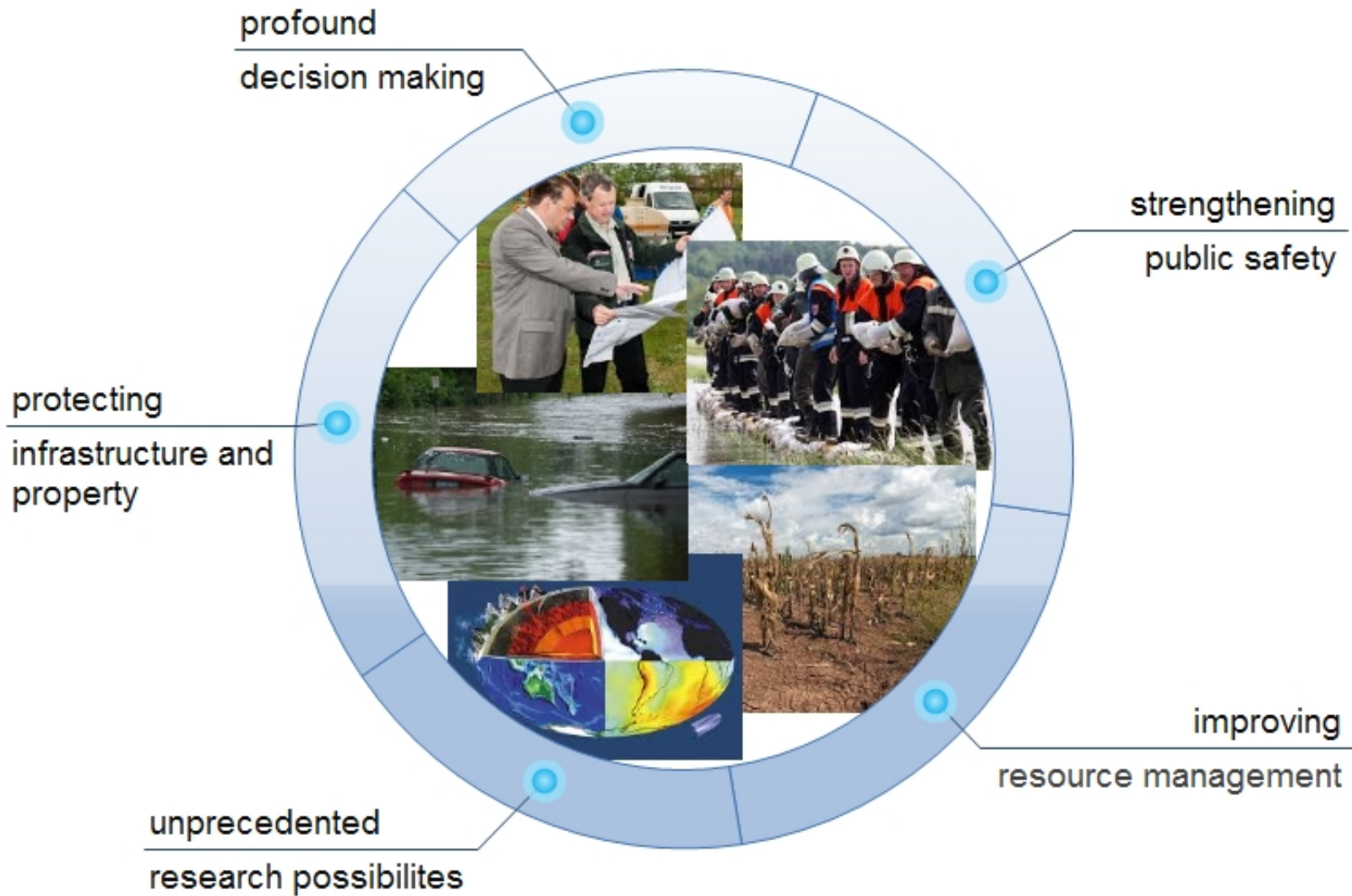
- Improved rapid mapping using on-demand satellite acquisitions
- Integration into automatic flood emergency management services

- The performance of the NRT service will be tested using historical hydrological extreme events.

- An operational test run of half a year is foreseen in the frame of DLR's Center for Satellite Based Crisis Information.



Impact to society



Take home messages

- Observing gravity changes allows to observe water/mass transport and thus contributes substantially to a number of essential climate variables.
- EGSiem dedicates its efforts to deliver the best gravity products with reduced latency and higher temporal and spatial resolutions.
- EGSiem products are freely available to the public and have diverse impact on the society, especially disaster resilience and water resource management

Stay in touch ...



Blog Entry: Ensuring the quality of EGSIEM products

Matthias Weigelt 07 April 2015

How do we ensure the quality of our products?

Within the EGSIEM project, gravity-based products are being developed for v. The objective is for our scientific service to provide the best possible time-vari and to develop other completely new near-realtime products. Obviously the q products needs to be evaluated. This validation will not only allow us to identifi importantly will also increases users' confidence in our data products.

How do we know that the product is better than any other product?

The group in Luxembourg has the responsibility for validating the gravity prod extensive experience in satellite gravity data processing and applications and ULux will begin by using GNSS observations to test the quality of the products for testing the gravity products include using existing models of continental wa bottom pressure data, but these will be evaluated at a later date.

Read more ... Add new comment

EGSIEM Newsletter

Tamara Baniškova 06 April 2015

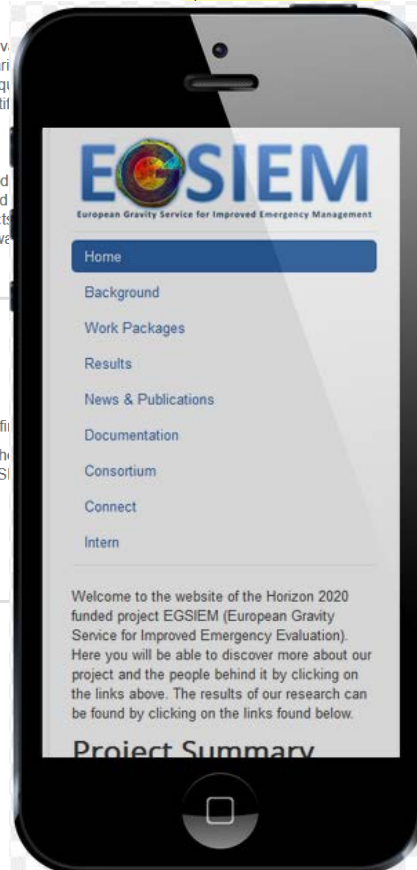
The EGSIEM Consortium is pleased to announce the publishing of our very fi The Newsletters will appear quarterly throughout the three year duration of th will give the reader an insight into the products, people & projects within EGSI We hope you enjoy reading our first issue and we welcome any feedback.

Newsletter No.1 (Link)

Add new comment

Latest News

Blog Entry: Ensuring the quality of EGSIEM products



EGSIEM will have an open data policy with respect to all data generated within the project. Accessibility to all levels will be guaranteed via the project website:

www.egsiem.eu

EGSIEM is also present on social media:

<https://twitter.com/EGSIEM>

www.facebook.com/egsiem

<https://egsiem.wordpress.com>