

Title: WP6 (Hydrological Service)

Ben Gouweleeuw (GFZ)

**EGSIEM Project Meeting**

**DLR, Oberpfaffenhofen**

**8-9 June 2017**

## Focus on

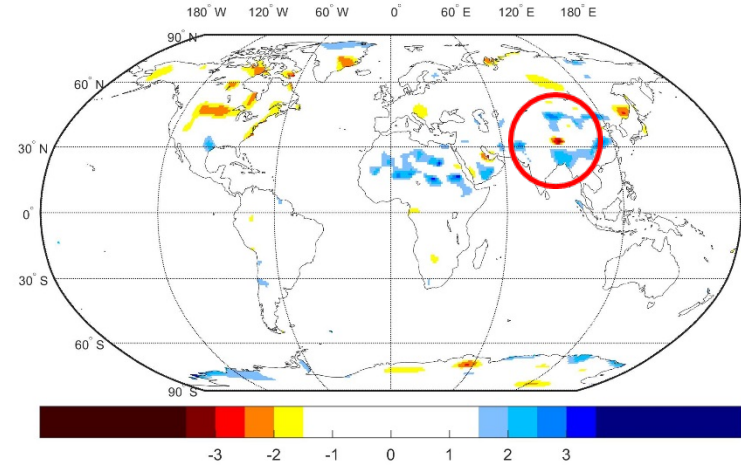
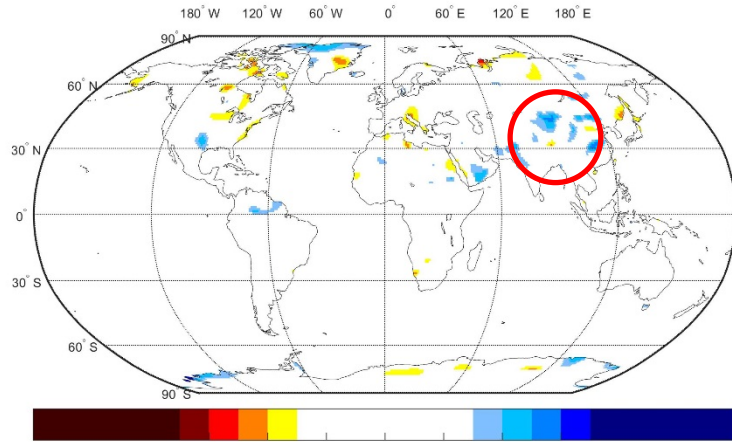
- Development/refinement of gravity-based Wetness Index (G-b WI).
- **Retrospectively:** Evaluation of global G-b WI against other databases (e.g., DFO).
- **In NRT:** Visualisation on relevant platforms (e.g., GloFAS, GDO).

# Flood and drought indicator – normalized TWSA

19 July 2007

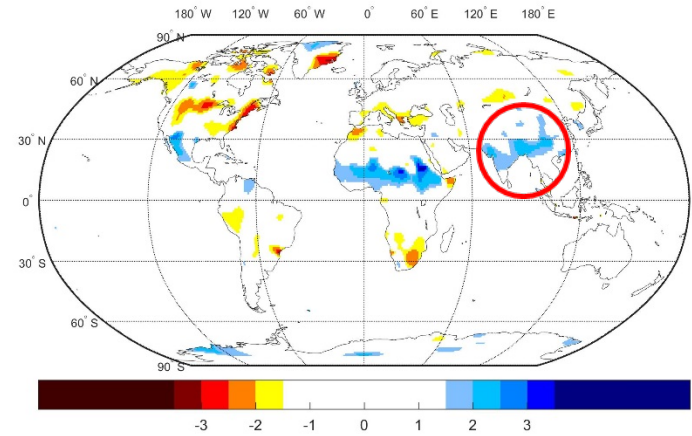
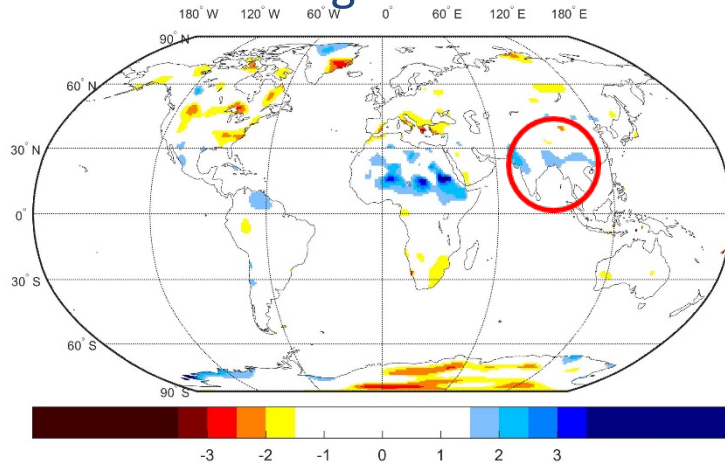
Last meeting

3 August 2007



28 August 2007

12 September 2007



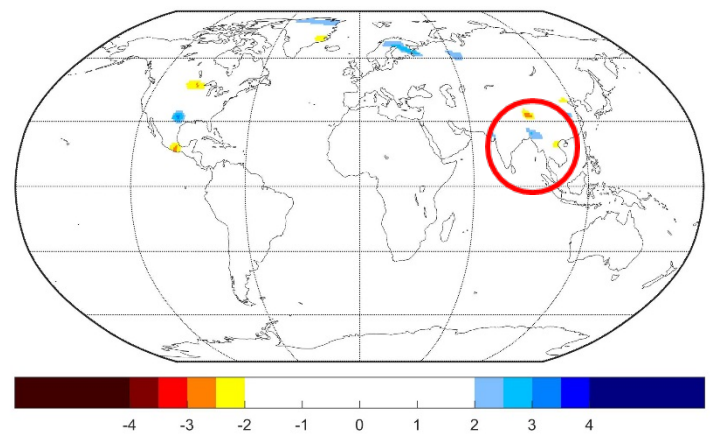
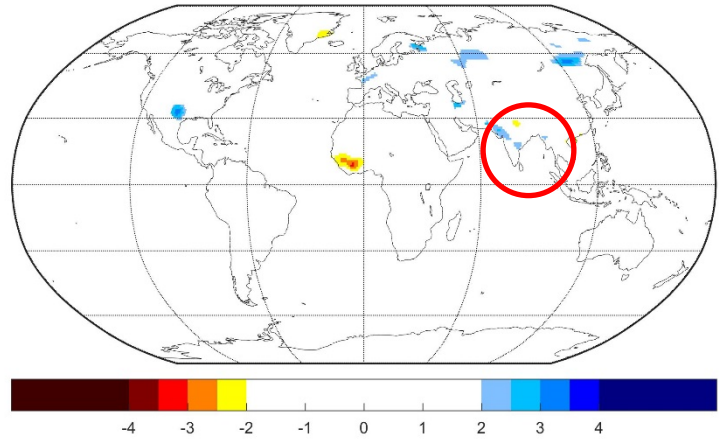


# Flood and drought indicator – normalized TWSA

19 July 2007

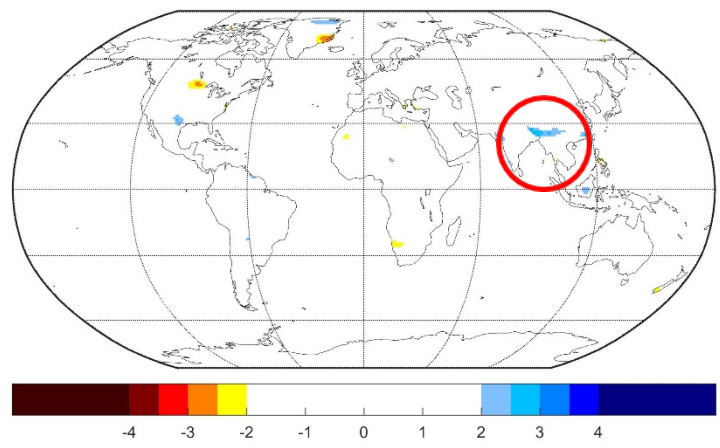
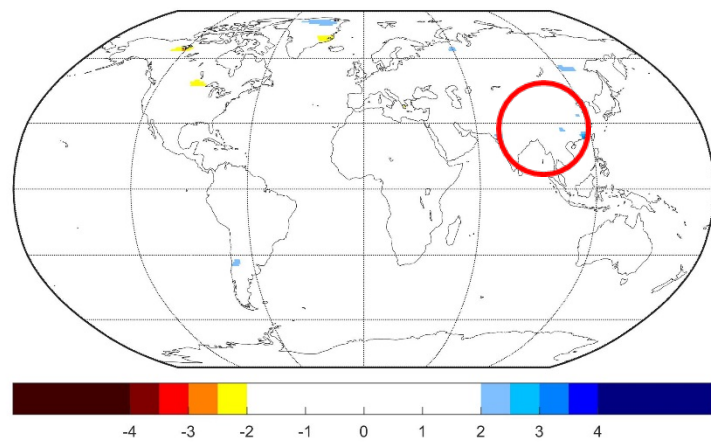
Current Index

3 August 2007



28 August 2007

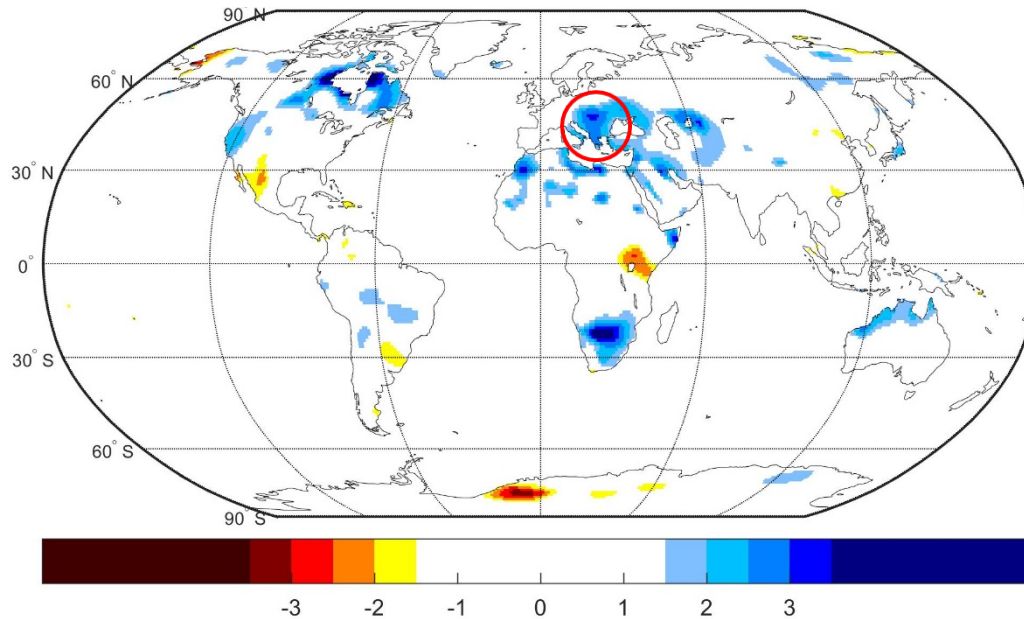
12 September 2007



# Danube basin

Last meeting

**Normalized TWSA, 19 March 2006**

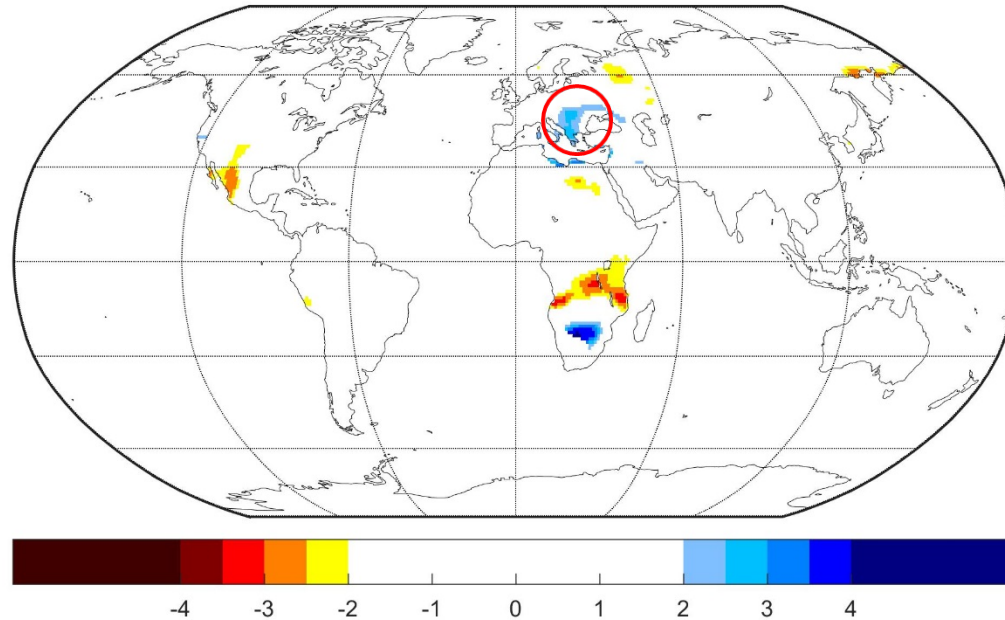


Wetter than normal conditions (2.5-3 times the standard deviation) are indicated for the Danube basin in March 2006, just before the April 2006 flood.

# Danube basin

## Current Index

Normalized TWSA, 19 March 2006

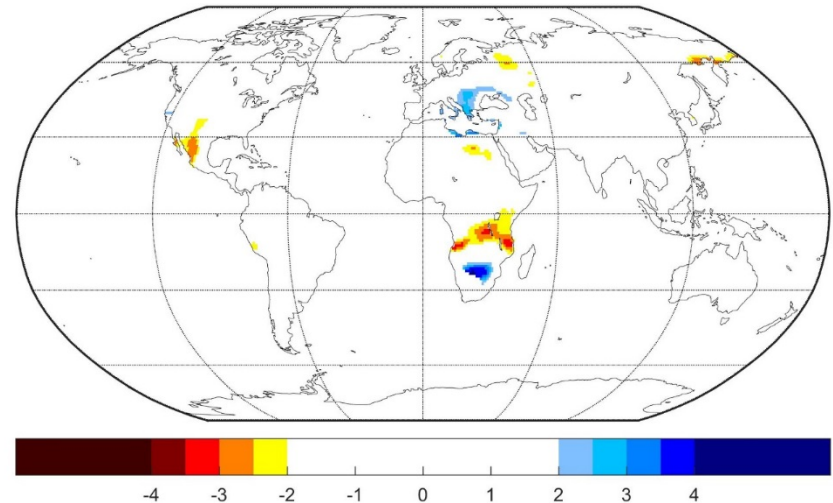


Wetter than normal conditions (2.5-3 times the standard deviation) are indicated for the Danube basin in March 2006, just before the April 2006 flood.

# Gravity-based Wetness Index (1)

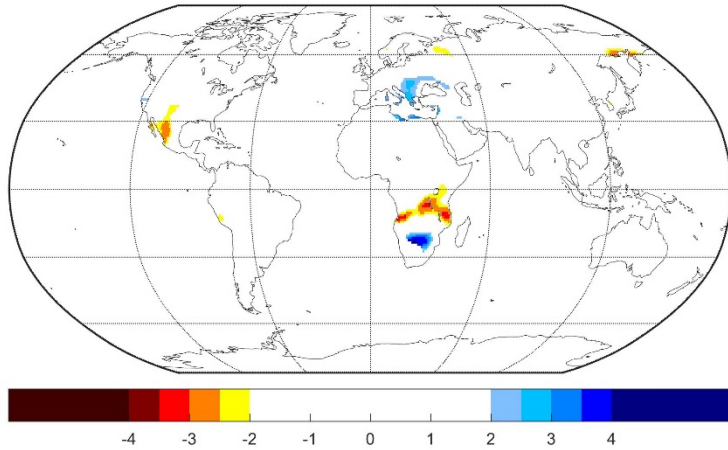
- Based on the daily gravity field solutions, a wetness index is computed
- Input: gridded total water storage anomaly in center of figure, GIA reduced
- For each pixel
  - Correct seasonal cycle and secular variations
  - Divide pixel by standard deviation
- Result: unit-less index for each pixel
- Deviation from the seasonal cycle is the sum of
  - long-term trend (Inter-annual)
  - + the residual/rest (Intra-annual)

EGSIEM Wetness Index, 19 March 2006

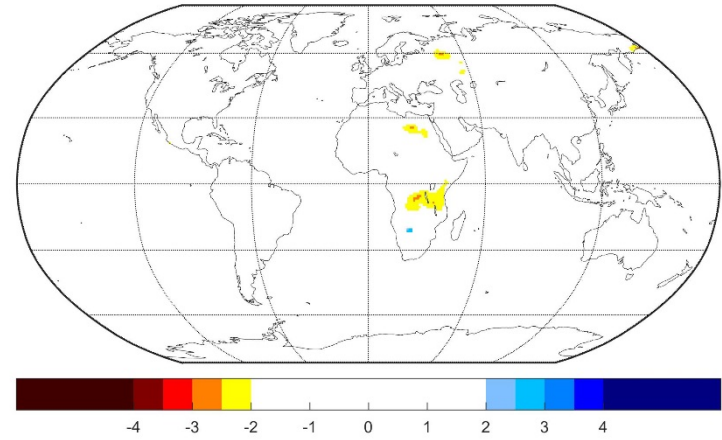


# Gravity-based Wetness Index (2)

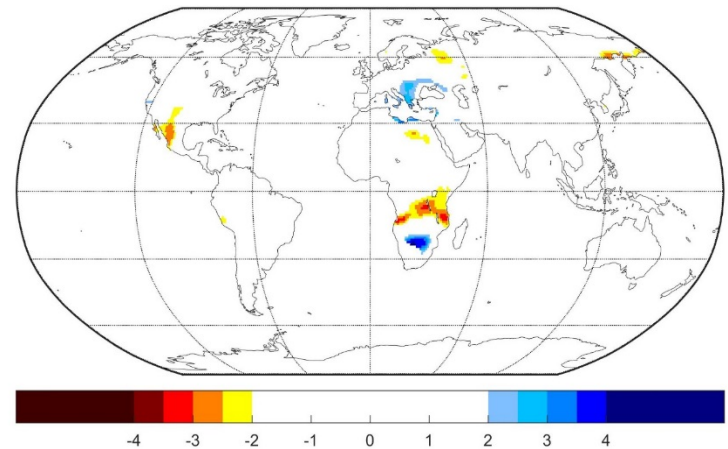
TUG Wetness Index, 19 March 2006



GFZ Wetness Index, 19 March 2006



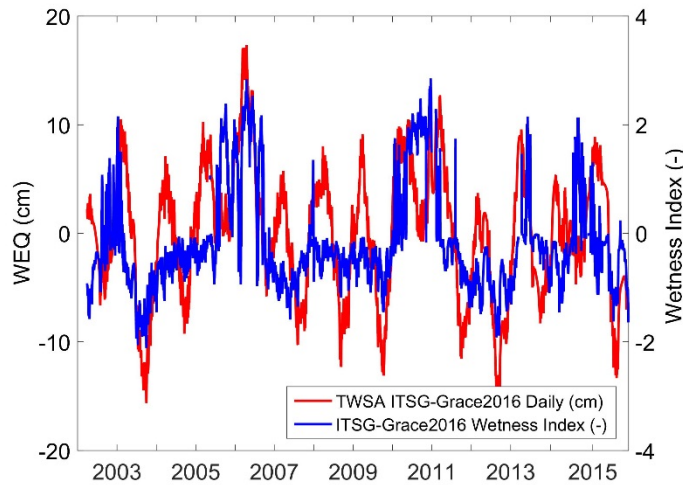
EGSIEM Wetness Index, 19 March 2006



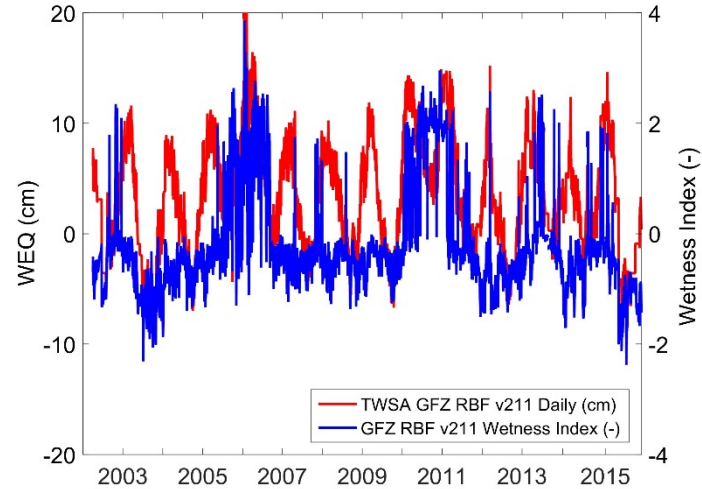
The combined Index takes the most extreme index value of either index



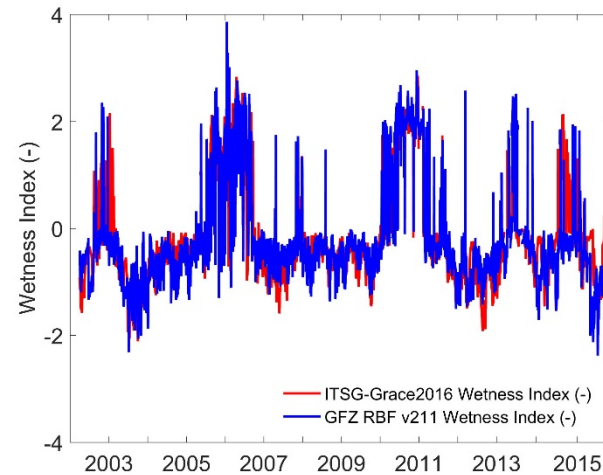
**TUG Wetness Index, 2002-2015**



**GFZ Wetness Index, 2002-2015**



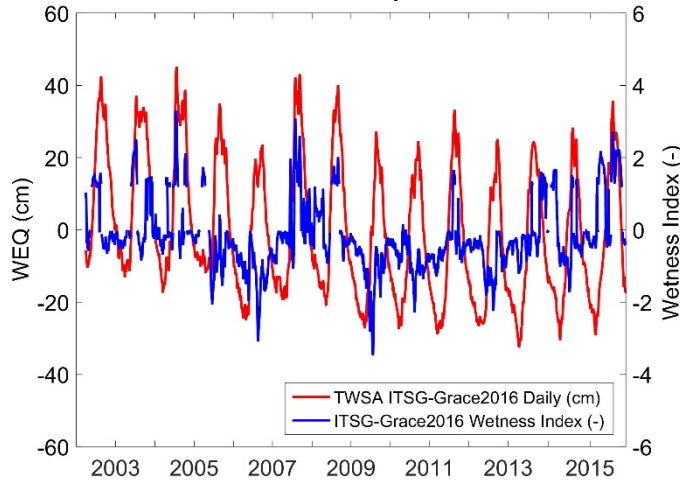
**Both Wetness Index, 2002-2015**



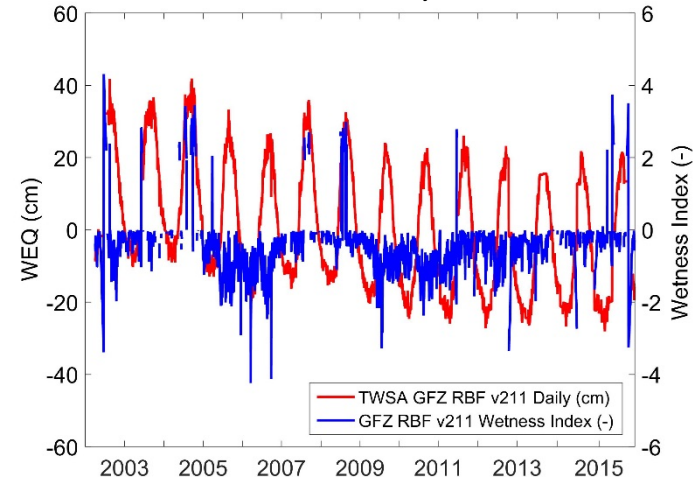
Wetness Indices seem to show very similar pattern in time for the Danube basin

# Bangladesh Gravity-based Wetness Index (3)

TUG Wetness Index, 2002-2015

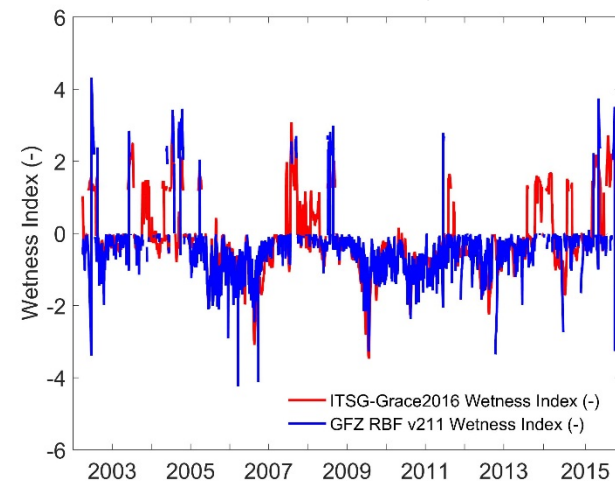


GFZ Wetness Index, 2002-2015



Wetness Indices look fairly different in time for the Ganges-Brahmaputra Delta

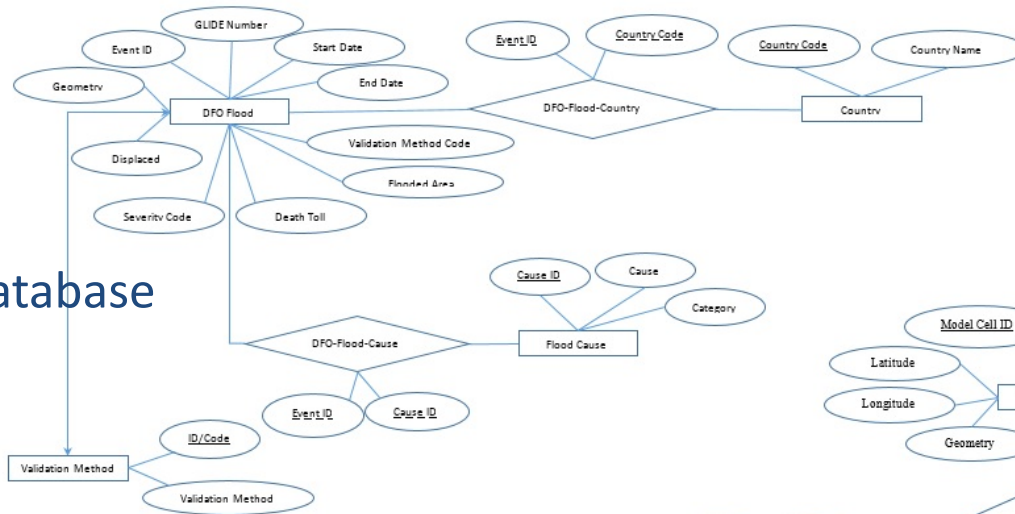
Both Wetness Indices, 2002-2015



# WP6: Hydrological Service

## SQL database GLOBAL validation

DFO database



Daily Wetness Index

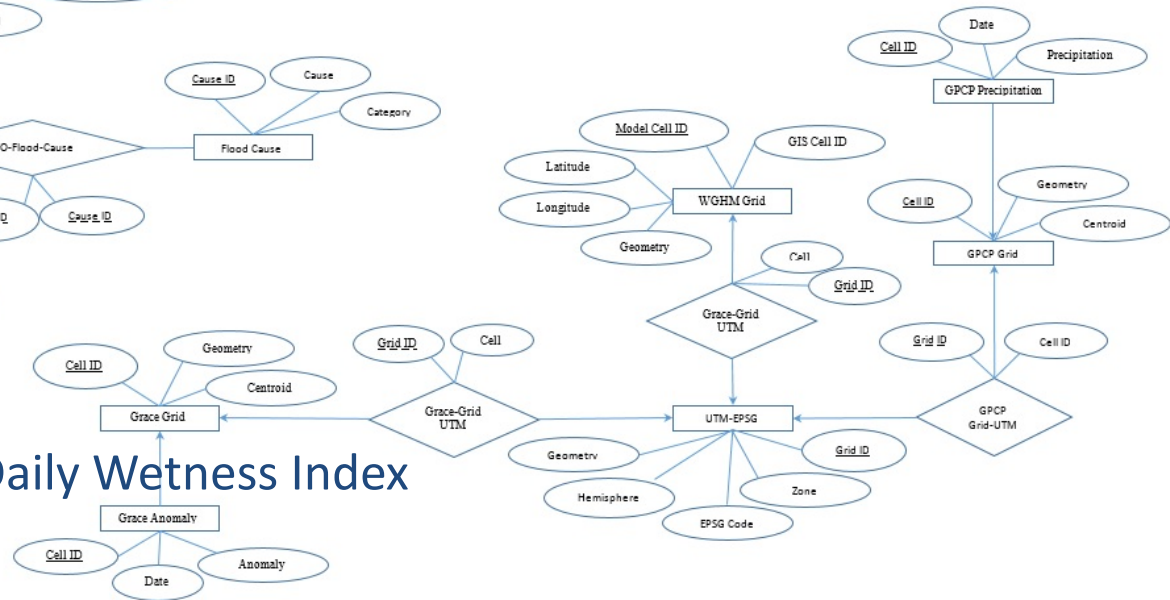


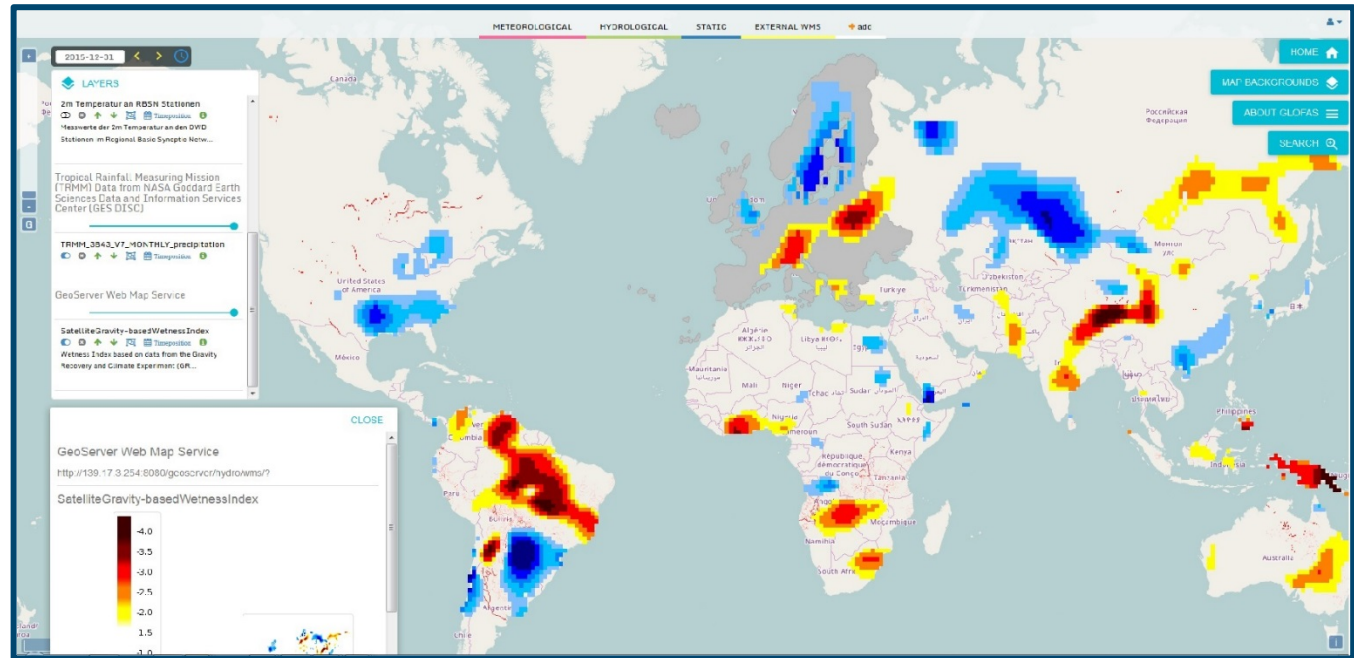
Figure-1: E-R Diagram of Flood Database

## Preliminary results

- Signals for large extreme floods related to heavy/monsoonal rainfall in the Southern Hemisphere and lower Northern Hemisphere (Africa, S-America, Australia, S-Asia) picked up very well.
- Extreme floods in Northern Hemisphere (Russia) related to snow melt often not flagged. Possibly related to lack of mass movement over long distances, e.g. due to river ice blocking.

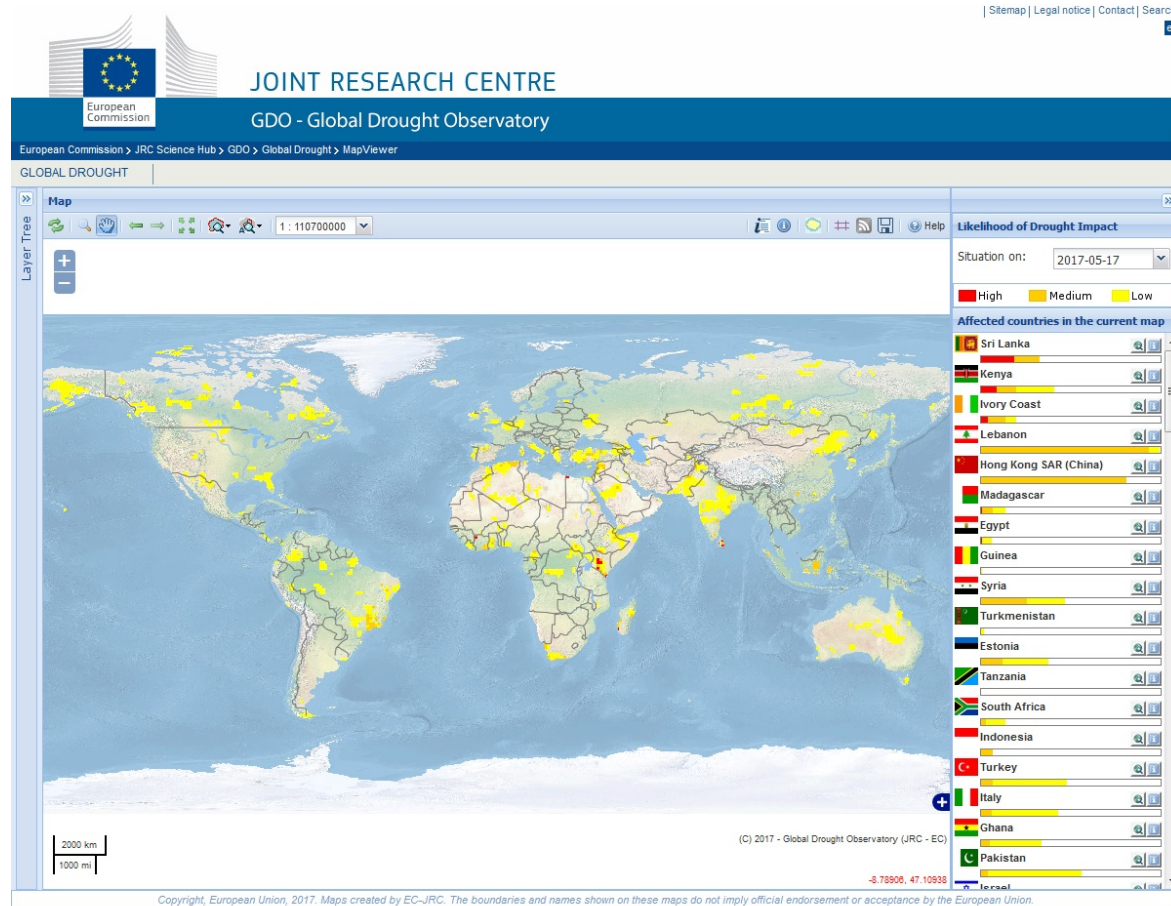
# NRT service data flow – Use of indicators at JRC

- Ongoing testing in GloFAS comparing flood occurrences/warnings with increased water storage conditions
- NRT products implemented



# NRT service data flow – Use of indicators at JRC

- Projected testing in GDO comparing drought occurrences/warnings with low water storage conditions
- To be continued..



# WP6: Hydrological Service



## Further testing & visualisation in NRT

- GloFAS through WMS-T (near-real time test, DLR)
- Other databases (GDO, EM-DAT)

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All I M P

**Real-time Integrated Global Flood Map** monitoring  
The Critch Web Map Viewer offers an intuitive Web interface. Real-time Integrated Global Flood Map (Experimental).

**Global Flood Monitoring System (GFMS)** prediction  
it is a NASA-funded experimental system using real-time TRMM Multi-satellite Precipitation Analysis (TMPa) precipitation information.

**Tropical Rainfall Measuring Mission (TRMM)** monitoring  
The TRMM is a joint mission between NASA and the Japan Aerospace Exploration Agency (JAXA) designed to monitor and study tropical rainfall.

**Floods in Nigeria (Jul-Nov 2012)** Global Flood Detection System monitoring  
The Global Flood Detection System monitors floods worldwide using near-real time satellite data. GFDS currently monitors around 10000 areas.

**Dartmouth Flood Observatory** monitoring  
Space-based Measurement and Modeling of Surface Water Extent

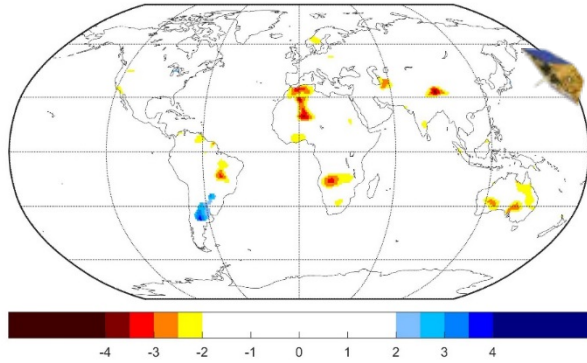
**Flood List** information  
Aims to bring information about floods and flooding from around the world, with the hope that it will inspire helpful discussion and collaboration in preparing for and dealing with the effects of flooding.

**GLOBAL FLOOD NEWS** information  
Monitoring of media is fairly common in many larger organisations. The use of social media in natural disasters has also demonstrated benefits. The same technologies can be used to monitor main stream and social media reports of floods.

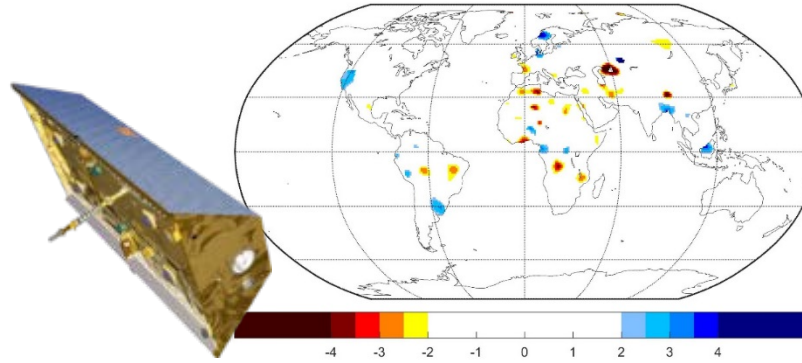
**HEPEX** information  
To demonstrate the added value of hydrological ensemble predictions (HEPS) for emergency management and water resources sectors to make decisions that have important consequences for economy, public health and safety.

# Near-real time daily flood and drought info from the GRACE satellite mission

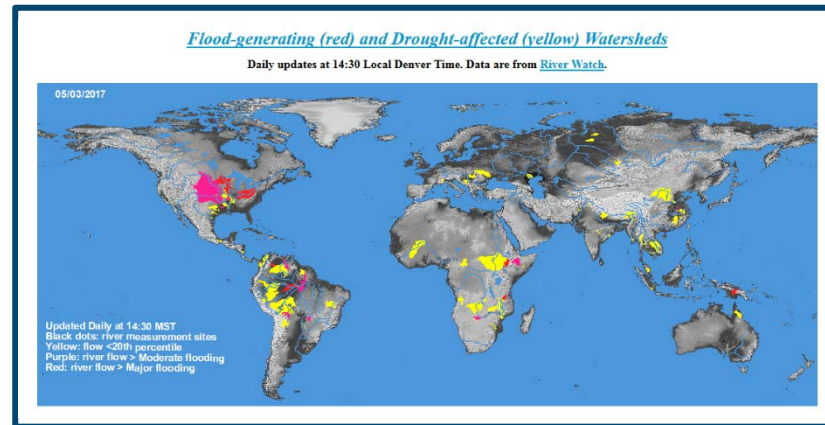
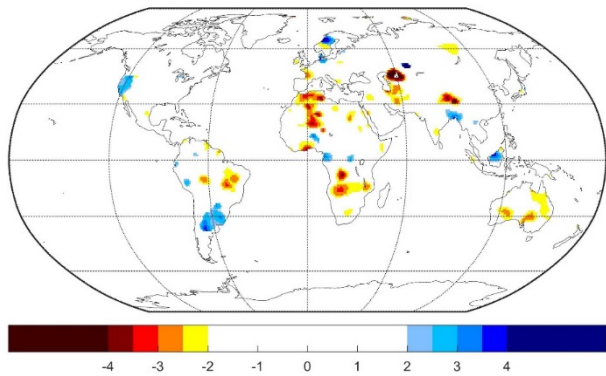
GFZ 03.05.2017



TU Graz 03.05.2017



Combination 03.05.2017

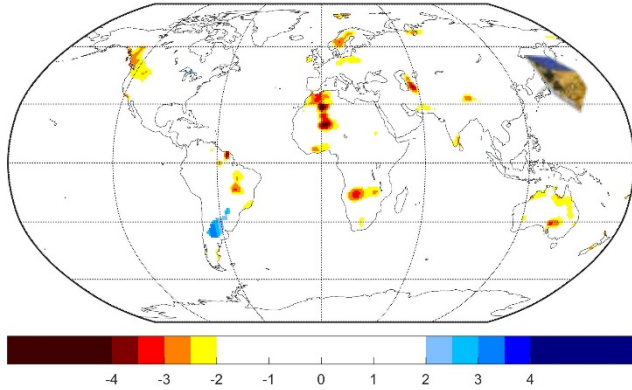


Dartmouth  
Flood Observatory

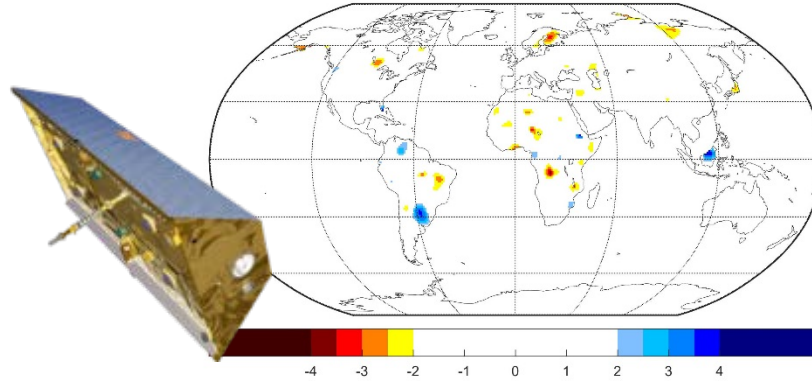


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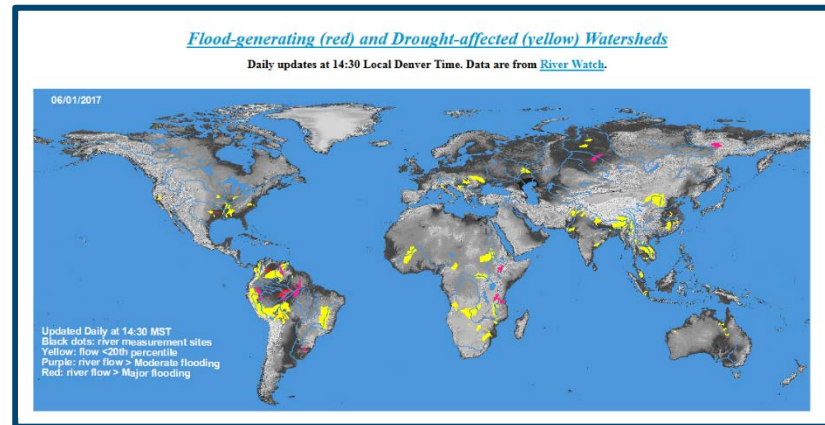
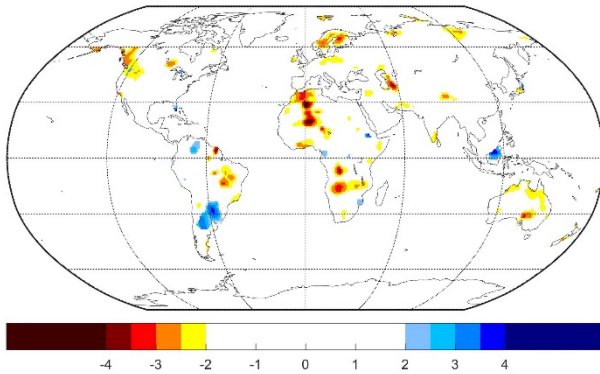
GFZ 30.05.2017



TU Graz 30.05.2017



Combination 30.05.2017



Dartmouth  
Flood Observatory

## Other activities & outlook

- Further development and testing (SQL, GloFAS, GDO) of global gravity-based wetness index, both retrospectively & in NRT.