

Title: WP6 (Hydrological Service)

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EGSIEM Project Meeting GFZ potsdam June 2-3.2016





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Other activities & outlook

 Paper on evaluation of GRACE daily gravity solutions for hydrological extremes in selected river basins (Gouweleeuw et al., GRL, in prep.)







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EGSIEM

Gouweleeuw et al. (in review): Daily GRACE gravity solutions track major flood events in the GB Delta





Key reviewers' comments

- Demonstrate (quantitatively) additional value of the daily solutions
- Information GRACE observations vs. hydrological model
- Noise level of the daily solutions
- Flood monitoring vs. flood forecasting







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WP6: Hydrological Service

Gouweleeuw et al. (in review): Daily GRACE gravity solutions track major flood events in the GB Delta



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Other activities & outlook of last meeting

• Collection of complimentary hydrological data (groundwater level, surface water level, river discharge) for Ganges-Brahmaputra Delta.







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Other activities & outlook of last meeting

 Planned research stay at IGG, Bonn to set up DA framework for assimilation of EGSIEM data products into WGHM for Ganges-Brahmaputra Basin.















Ganges









Brahmaputra













Meghna















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Global Flood Awareness System (GloFAS)

Flood early warnings for large river basins around the world

Developed by: Joint Research Center of the European Commission & European Center for Medium Range Weather Forecasting





Minimum river basin size: 10.000 km²

Forecast frequency: Daily

> Forecast type: Probabilistic

> > 2







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Wettest Year on record, 2003-2014 (threshold > 10 cm) Year of maximum monthly TWS of the EGSIEM combined product, linear trend and seasonal cycle removed 180[°] W 120° W 60° W 0° 60° F 120[°] F 180[°] F 2011: Record flooding across the Aug 2013: Flooding in NE China **U.S.** Northern Plains April 2006 and May 2010: Major March 2010: Heavy rain and flooding in central and lower snowmelt cause flooding in Danube river basin Upper Mid-West U.S. Aug-Sept 2007: Major flooding in Ganges-Brahmaputra Delta June-Aug 2007: Heavy rain and flooding in Texas 30[°] S August 2014: Widespread flooding in northern India 2009: Devastating floods in NE 60° Brazil 2011: Summer 2010-2011 90 5 second wettest on record across Jan-May 2014: Torrential rain Australia and floods in Bolivia 2011 2012 2003 2004 2007 2008 2009 2010 2013 2014 2005 2006 2004: Major flooding in Eastern 2003: Flooding in Ebro river March-April 2011: Severe **Brazil in Jan-Feb** basin (March) and heavy rain in flooding in Namibia and Angola southern Spain (Nov)

E SIEM

The wettest year observed by GRACE may reflect an exceptionally wet period or flood





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Drought periods (3 months and longer), 2003-2014 Year of maximum TWS deficit of the EGSIEM combined product (threshold -10 cm) 180[°]W 120[°]W 60° W 0° 60[°] E 120[°] E 180[°] E 2010: Record heat exacerbates 2012: Widespread drought grips worst drought since 1972 in the U.S. and persists in Central Russia U.S. in 2013 30° N 2003: Heatwave and dry 2014: Continuing extreme conditions in Europe drought in California 2004: Worst drought in 50 years 2007: Severe drought in threatens drinking water 30° S Southern and Eastern U.S. supplies in SE China 2010: Drought in SE Asia 2004: Drought in western prior to onset of heavy Amazonia monsoon rains 003 2004 2005 2008 2009 2010 2011 2012 2013 2014 2006 2007 2009-2010: Drought conditions 2008-2009: Drought in the La 2005-2006: Near end of long in northern India Plata basin, Argentina term drought in East Central Africa

EESIEM

Water storage deficit is the negative residual of the de-trended GRACE TWS and the seasonal cycle



Flood and drought indicator – normalized TWSA



3 August 2007



12 September 2007



EGSIEM Ganges-Brahmaputra Delta flood



Danube basin



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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.







Other activities & outlook

- Revise and re-submit paper on evaluation of GRACE daily gravity solutions for hydrological extremes in selected river basins (Gouweleeuw et al., GRL, in review)
- Analyse and extend DA assimilation for Ganges-Brahmaputra-Meghna basin incl. analysis of complimentary hydrological data (groundwater level, surface water level, river discharge).
- Further development and refinement of global drought and flood indexing in preparation of real-time test.



