Report on the stations Sutherland (South Africa) and Zugspitze (Germany)

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1st IGETS Workshop

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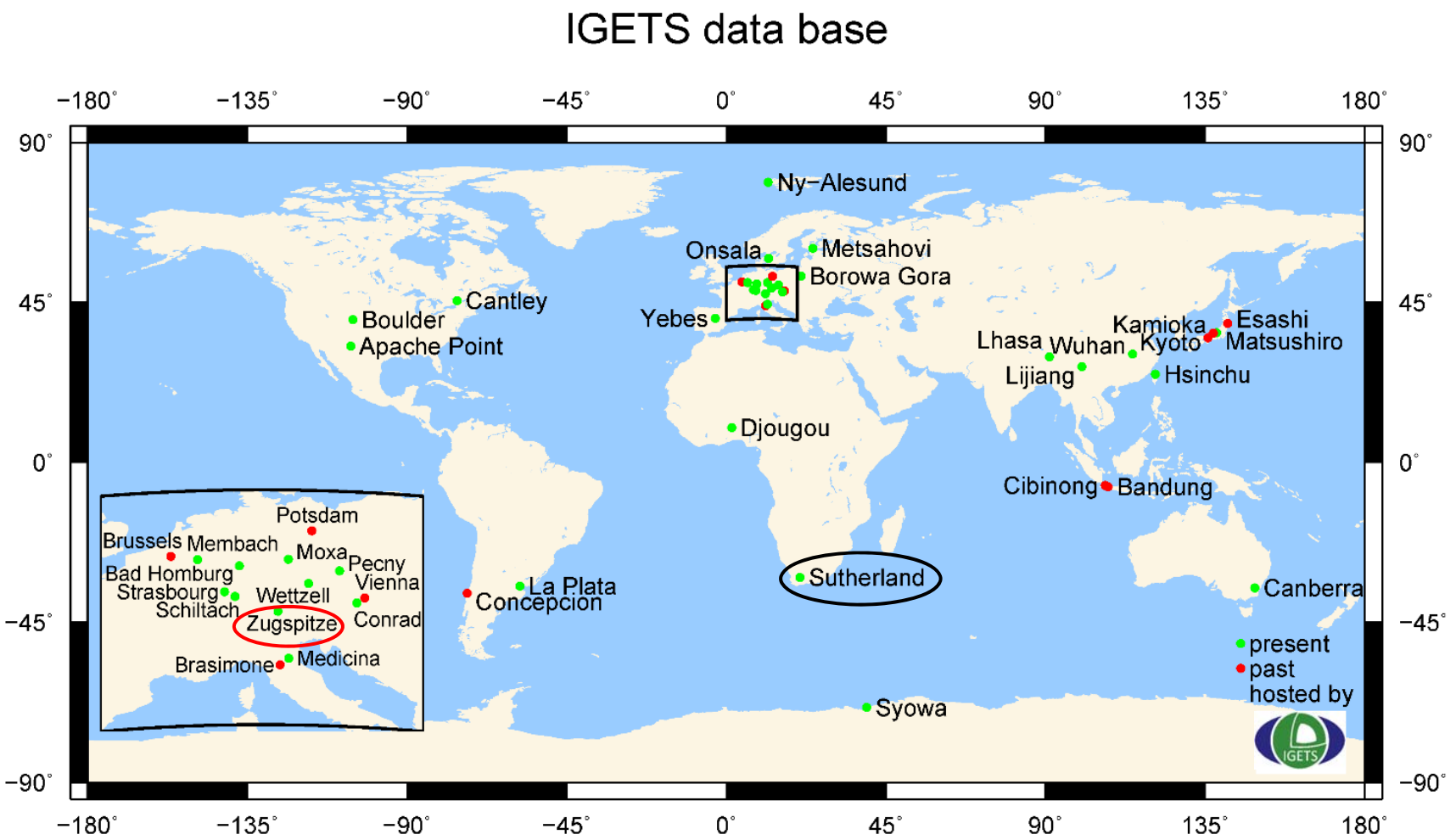
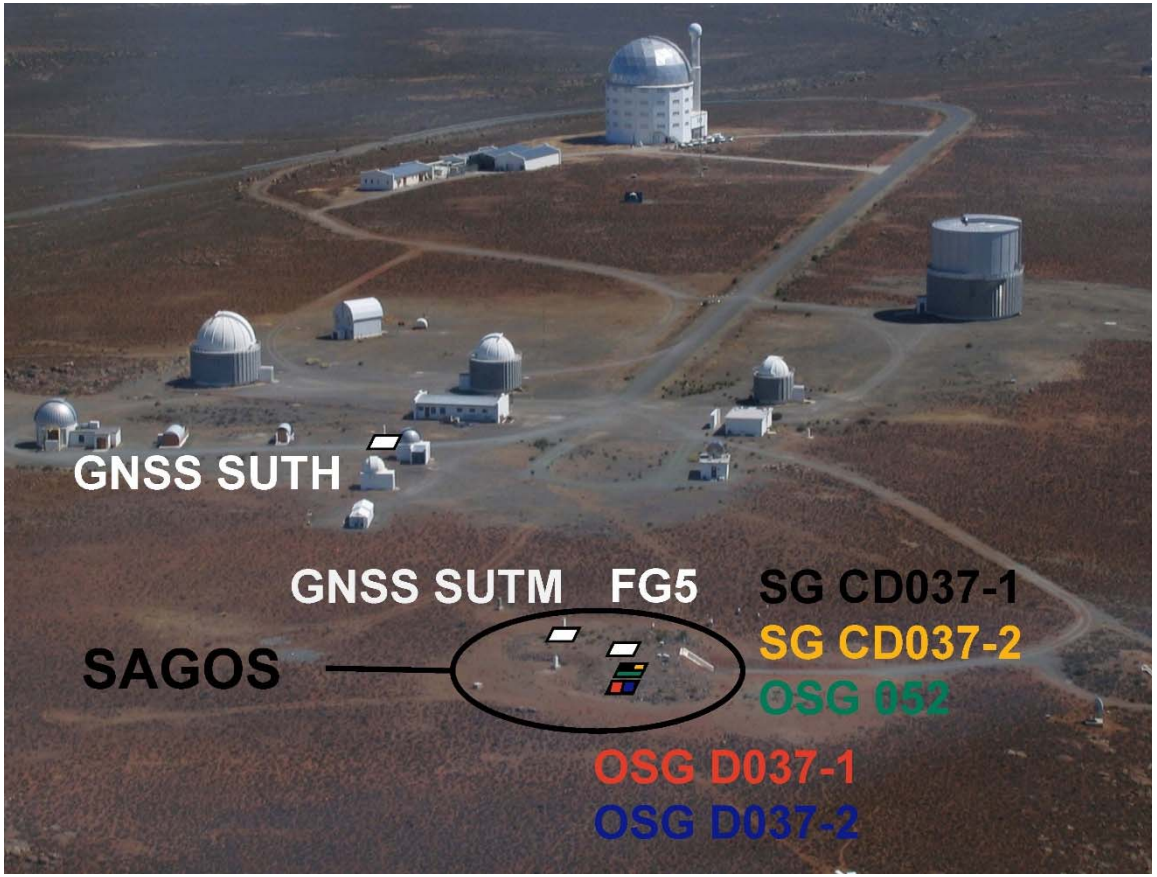
18 June 2018

IGETS Stations



South African Geodynamic Observatory Sutherland (SAGOS)



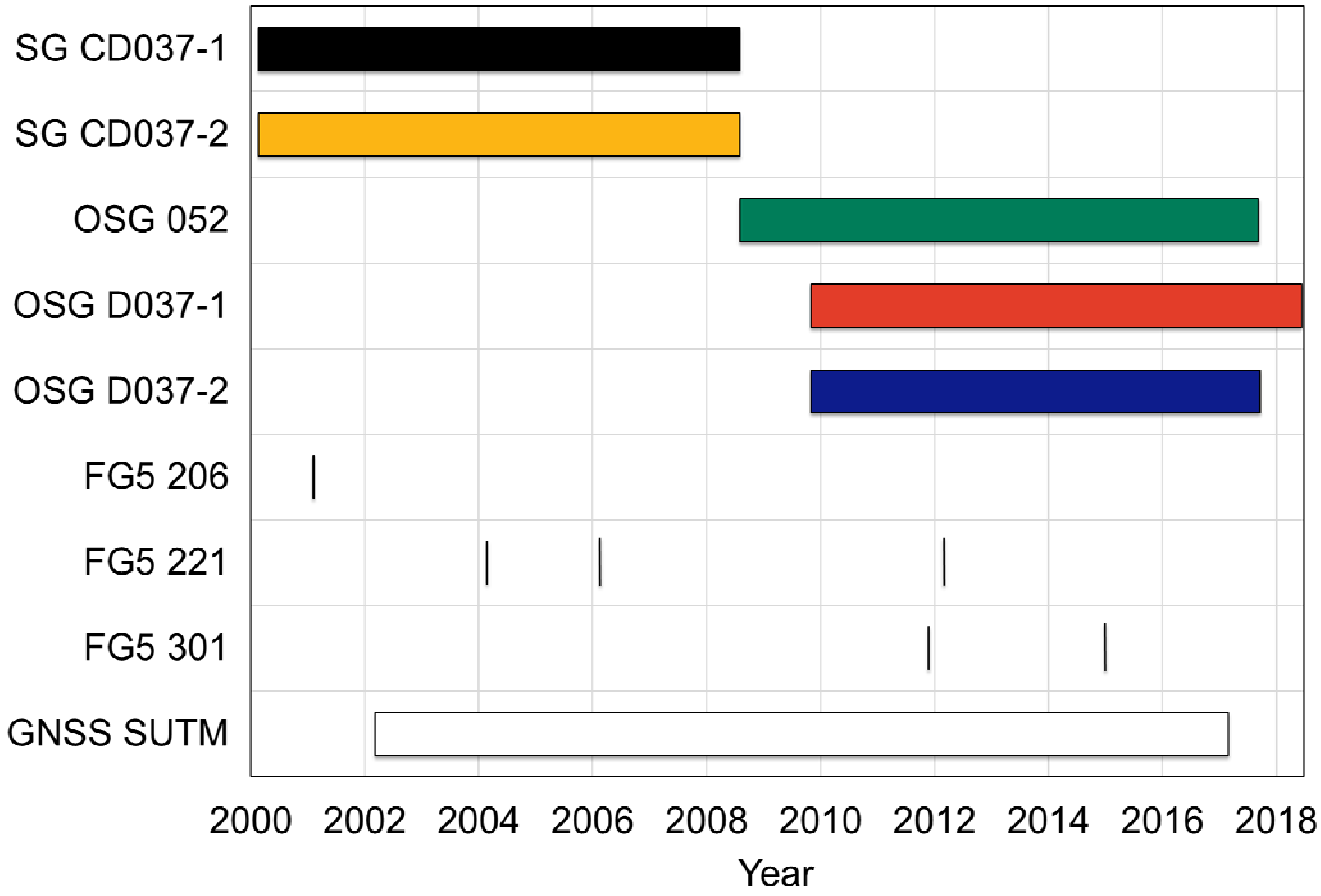
Sensors and observation periods

OSG 052 and SG CD037 in 2008

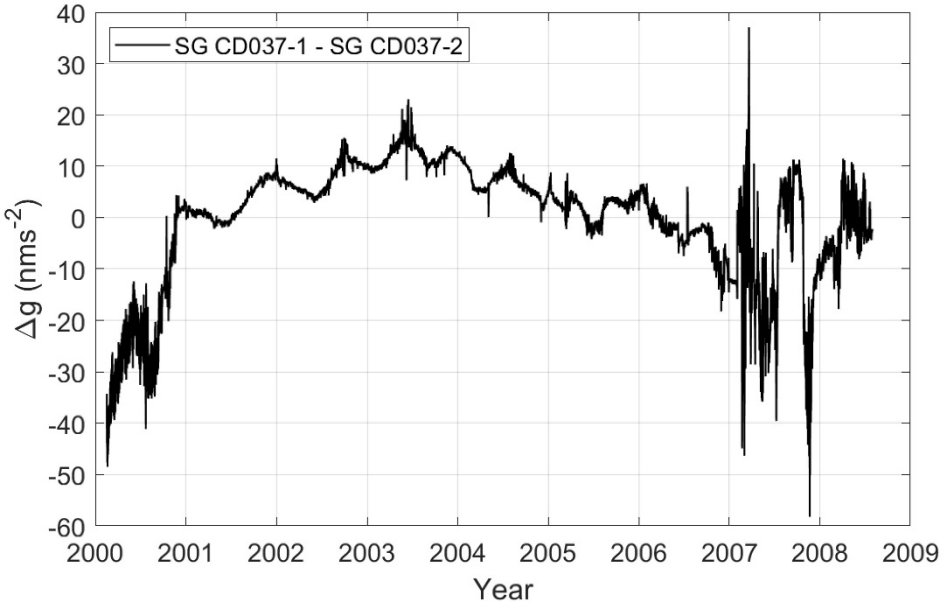
OSG 052 and OSG D037 from 2009 to 2017

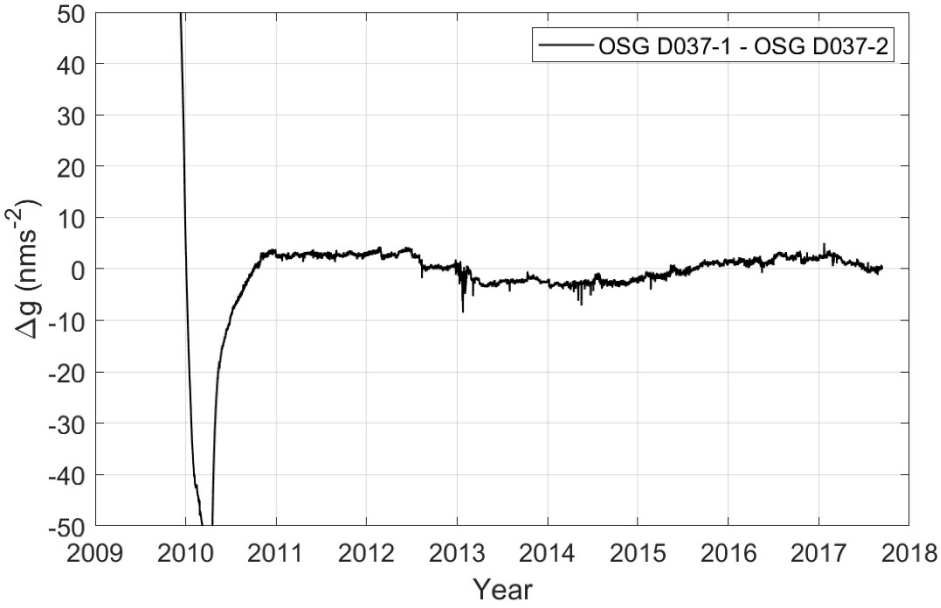
FG5 301 in 2011 (BKG)

GNSS SUTM since 2002

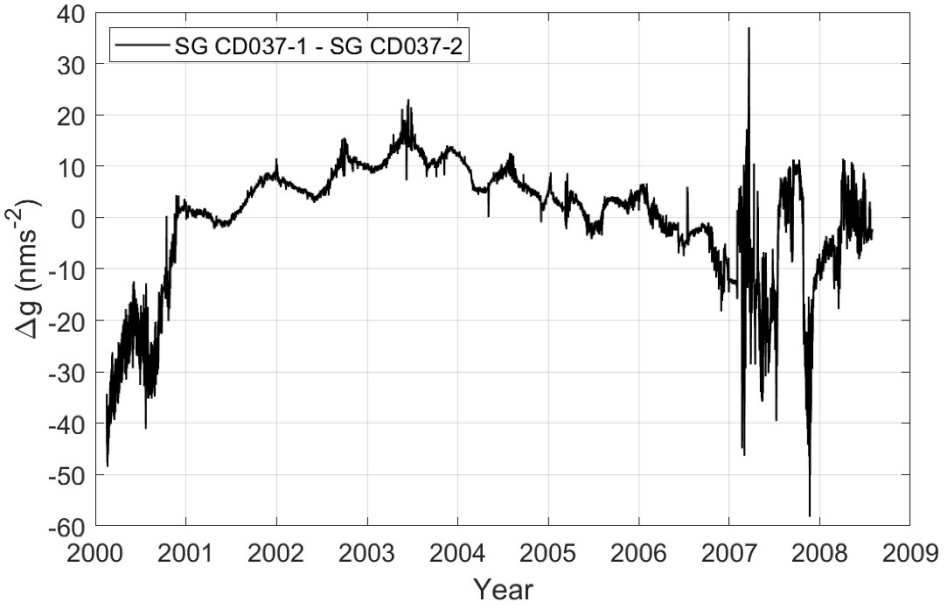


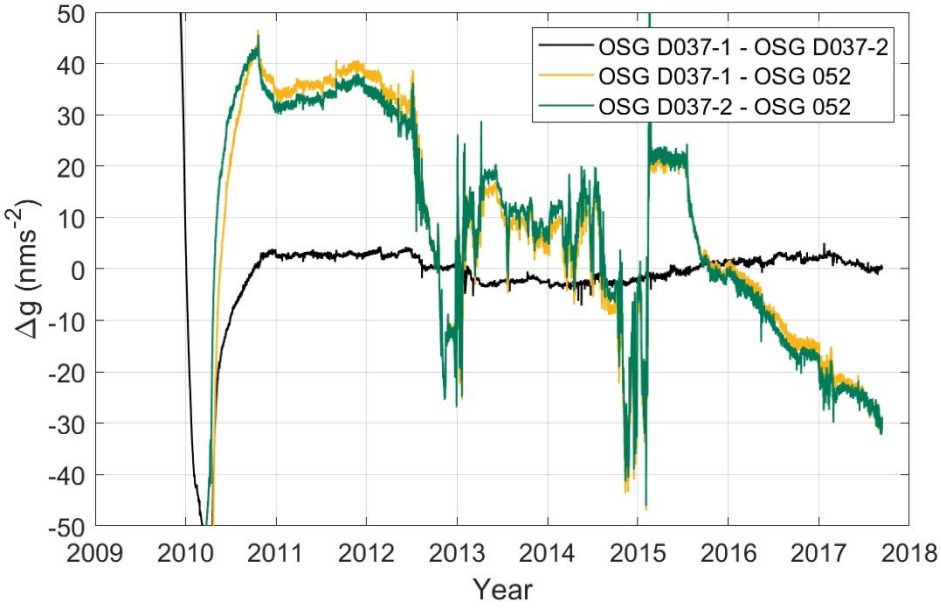
Gravity differences





Gravity differences





5 SG sensors in 3 periods to be used for tidal analysis:

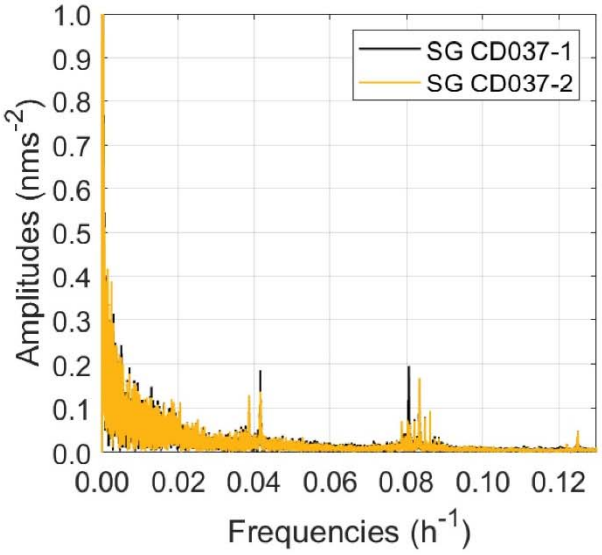
1. **SG CD037-1** and **SG CD037-2** from 2001-01-01 to 2006-09-30
2. **OSG 052** from 2008-08-01 to 2012-06-30
3. **OSG D037-1** and **OSG D037-2** from 2011-01-01 to 2017-09-22

Amplitude spectra of gravity residuals

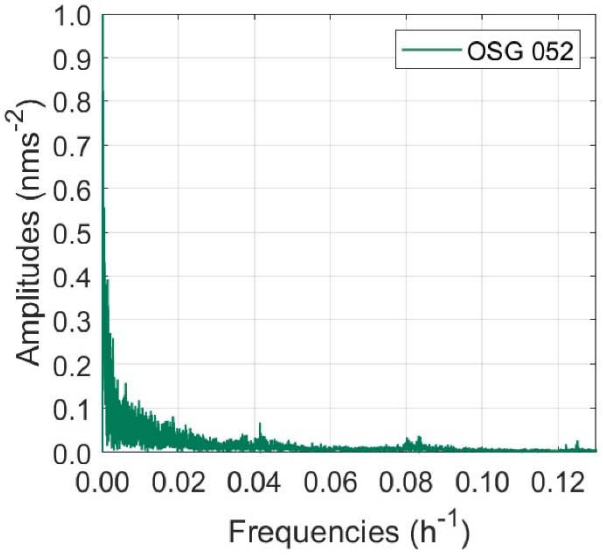
Reduction procedure:

1. Solid Earth and ocean tides from tidal analysis ET34-ANA-V61-A
2. Polar motion and LOD variations from IERS
3. 3D atmosphere from ERA Interim (mGlobe) + atmospheric pressure observations
4. Special consideration of atmospheric tides S1,S2,S3

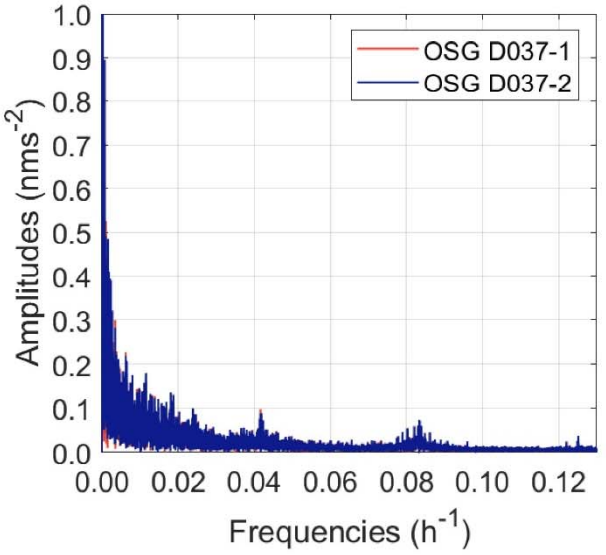
2001-01-01 to 2006-09-30



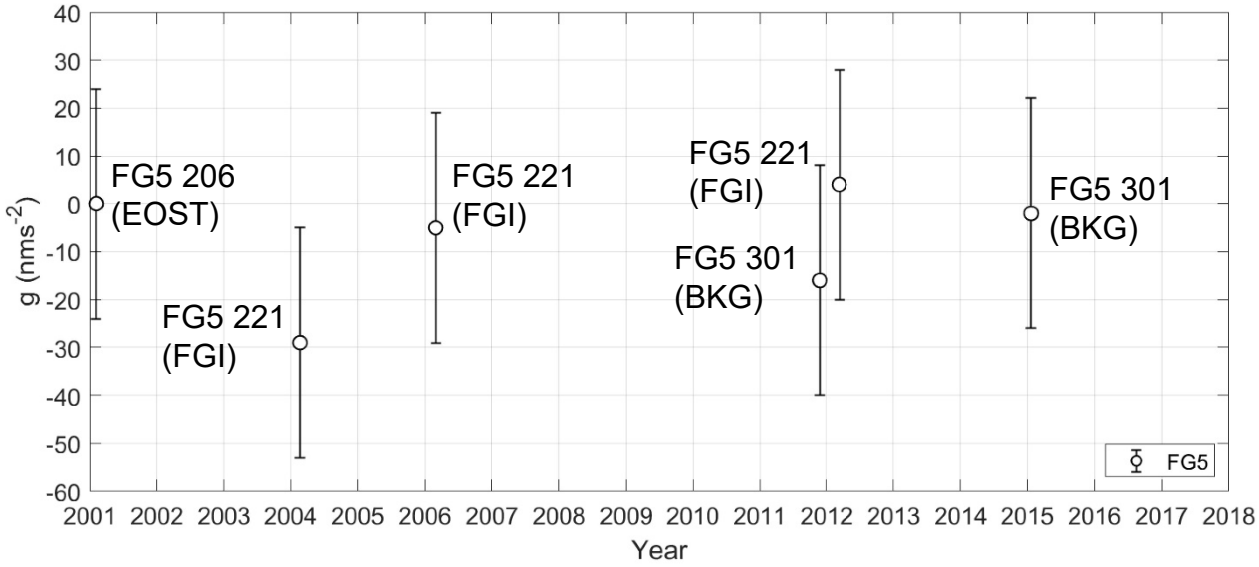
2008-08-01 to 2012-06-30



2011-01-01 to 2017-09-22

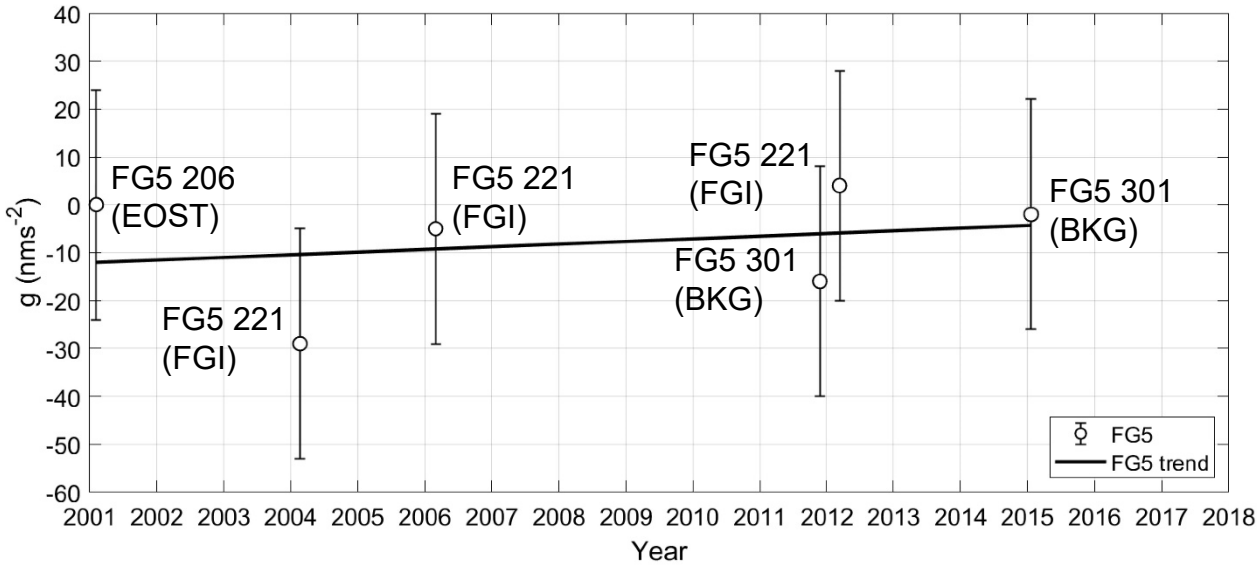


FG5 observations



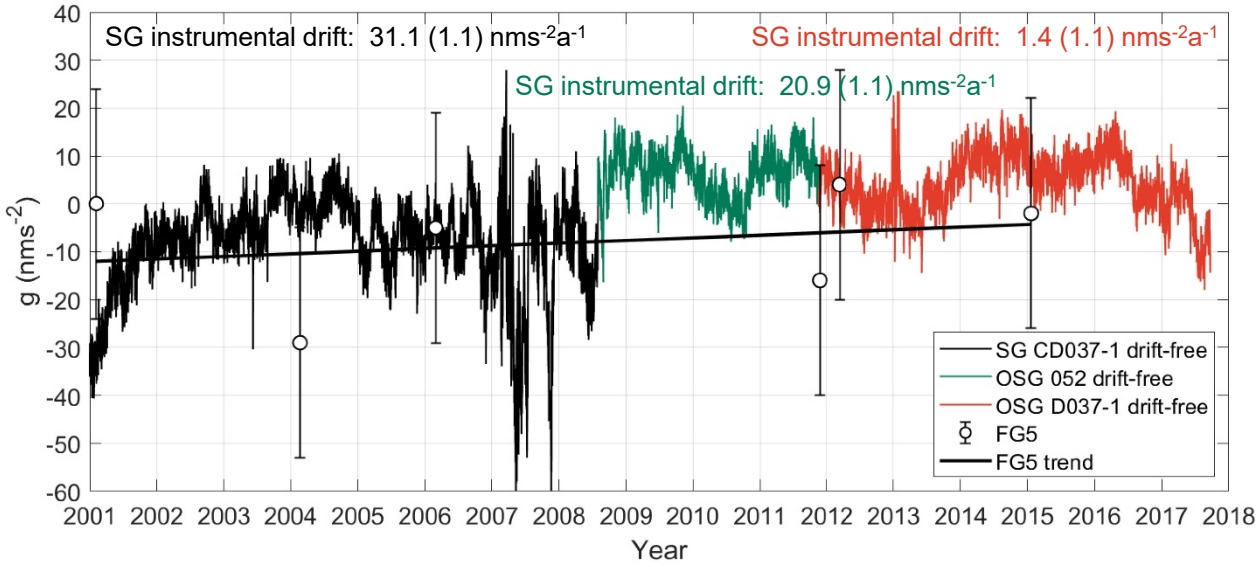
Acknowledgments to Reinhard Falk, Hartmut Wziontek, Jaakko Mäkinen and Jacques Hinderer

Linear geophysical trend

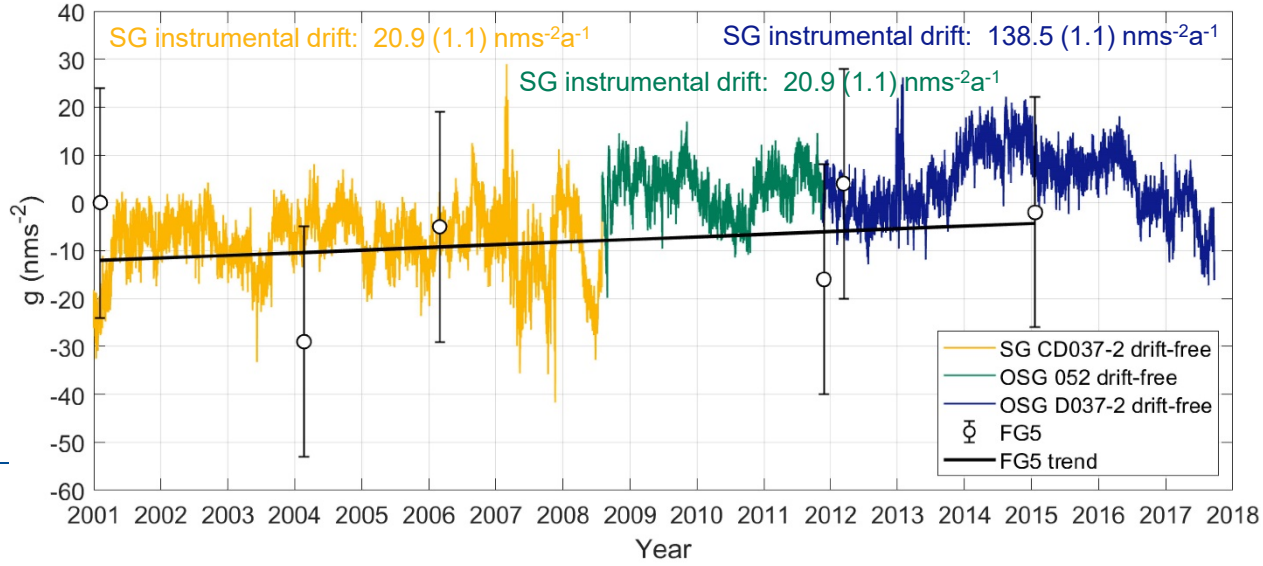


Geophysical trend:
0.55 (1.1) nms^{-2}a^{-1}

AG-SG adjustment (1 trend)



Geophysical trend:
0.55 (1.1) nms^{-2}a^{-1}



Geophysical trend:
0.55 (1.1) nms^{-2}a^{-1}

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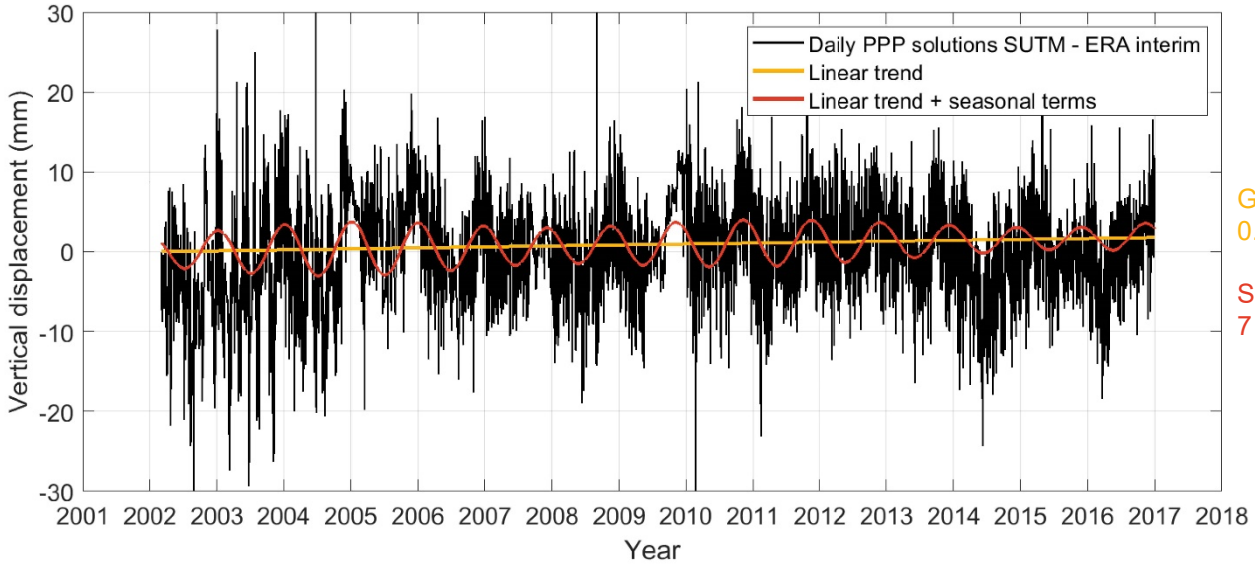
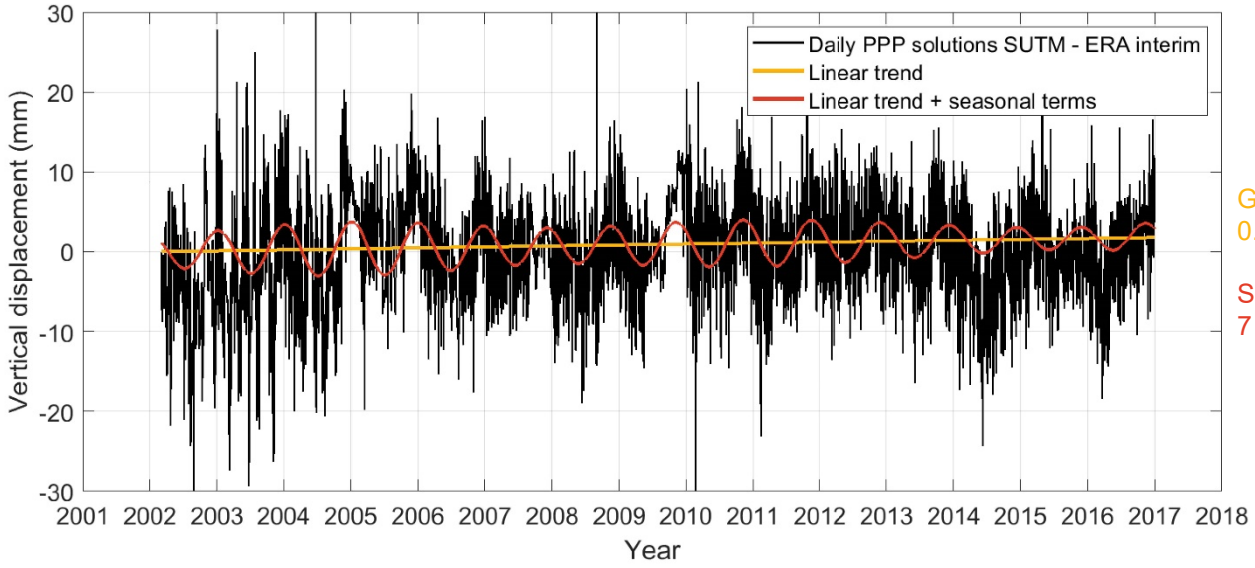
Vertical displacements



Geophysical trend:
0.12 (0.02) mma^{-1}

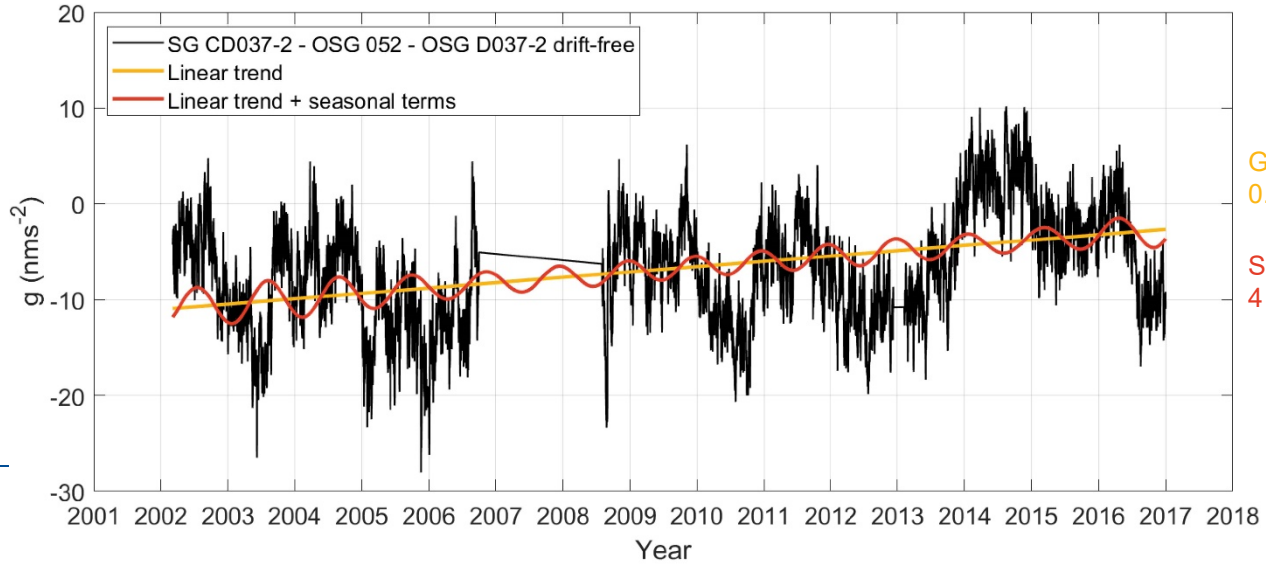
Seasonal amplitudes up to
7 mm peak to peak

Vertical displacements and gravity



Geophysical trend:
0.12 (0.02) mma^{-1}

Seasonal amplitudes up to
7 mm peak to peak



Geophysical trend:
0.55 (1.1) nms^2/a

Seasonal amplitudes up to
4 nms^{-2} peak to peak

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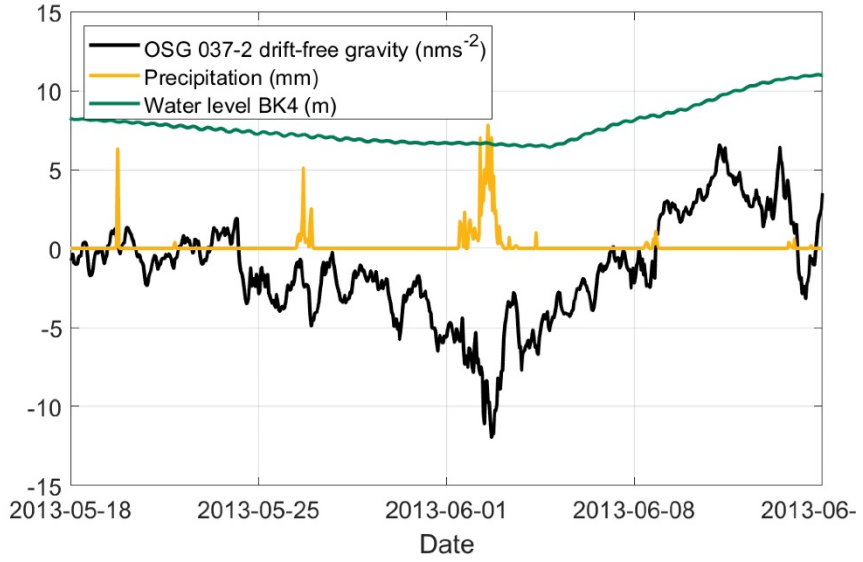
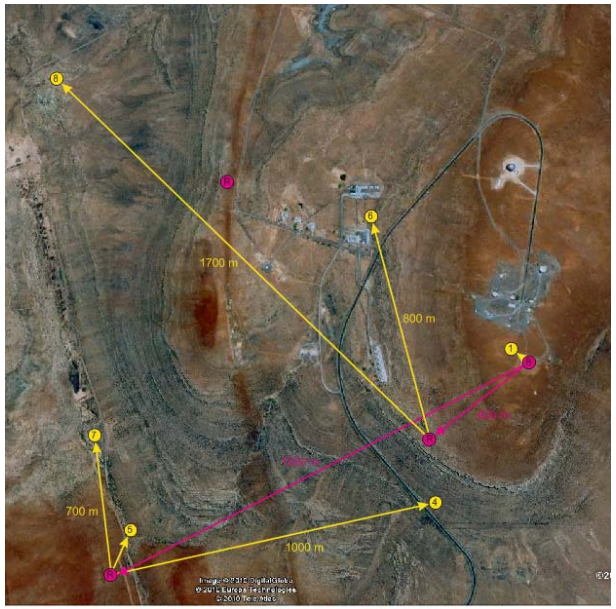
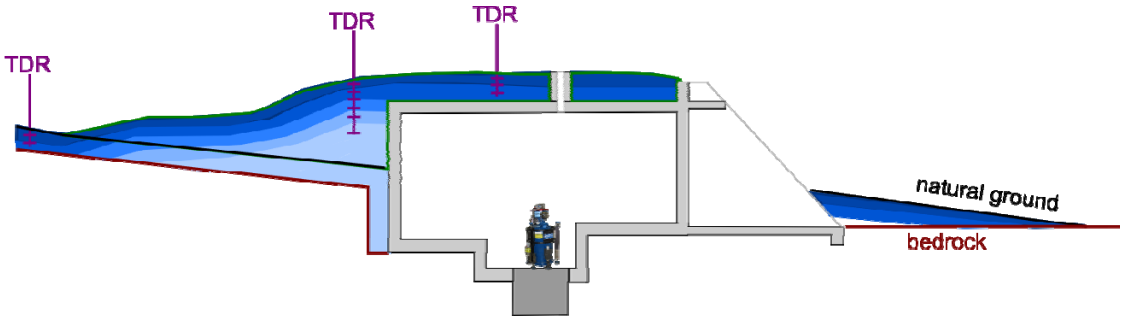
Local hydrological analysis



Groundwater level meters

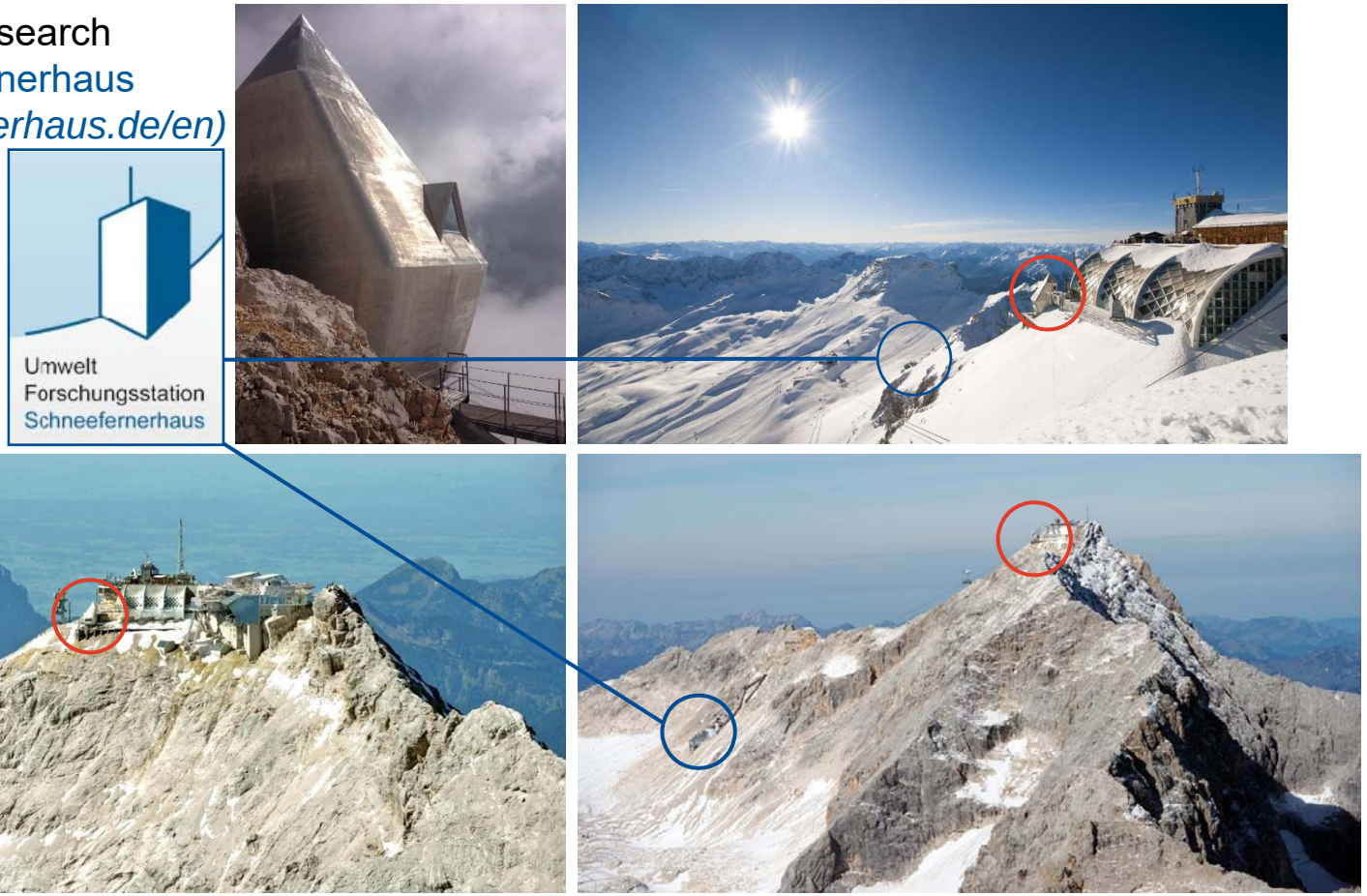


TDR soil moisture probes



Zugspitze Geodynamic Observatory Germany (ZUGOG)

Environmental Research Station Schneefernerhaus *(http://schneefernerhaus.de/en)*



Cooperation partners

Environmental Research Station:

- Technical support and infrastructure
- Key scientific activities (e.g.):
  - hydrology of the Zugspitze area (Augsburg University, Landesamt für Umwelt)
  - snowhydrological modelling (LMU Munich)
  - alpine snow and water processes (BOKU University Vienna),
  - permafrost and climate change (TU Munich et al.),
  - Bavarian Seismic Network (LMU et al.),
  - meteorological station on the summit (DWD)

Gravimetry:

- Absolute measurements with FG5X-220 since 2004 (Leibniz University Hannover)
- Monthly relative gravimetric measurements in a tunnel for permafrost studies since 2014 (TU Munich)

GFZ:

- AlpArray/4D-MB: Mountain Building Processes in 4 Dimensions
- ...

Environmental Research Station

DWD mountain weather station

Objectives and status

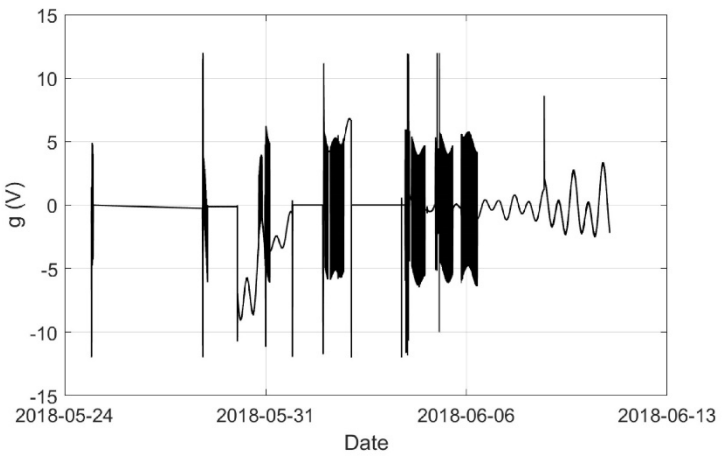
Scientific objectives:

- continuous and long-term gravimetric monitoring of the Zugspitze area
- hydrological analysis from local to large scales including snow, water and ice masses (glaciers, permafrost)
- calibration and validation of time series from GRACE Follow-On (launched in May 2018)
- analysis of mountain building processes

Status:

- OSG 052 sent to GWR in Sep 2017 for upgrade of electronics and refurbish, expected to be back soon
- currently ongoing installation measures
- OSG 052 to be moved to ZUGOG

OSG 052 “back to life”



OSG 052 on its way to GWR

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