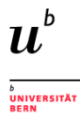# EGSIEM

Title: WP3 Validation by Ocean Bottom Pressure

Presenter: Frank Flechtner

Affiliation: GFZ

EGSIEM Kick Off Meeting
University of Bern
January 13. – 14. 2015

Same as Kick-Off Meeting

Validation by Ocean Bottom Pressure

- To validate oceanic mass transport (M25-M36) we will use OBP data
- OBP is the sum of the mass of the atmosphere and ocean in a 'cylinder' above the seafloor.
- OBP data used
  - as available from OBP archives (AWI or PSMSL (Permanent Service for Mean Sea Level)
  - as simulated by the Ocean Model for Circulation and Tides (OMCT, used to generate AOD1B)

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Validation by Ocean Bottom Pressure

- Necessary corrections to GRACE Level-2 products (GSM)
  - Degree-1 term to be added to GSM as approximated from GRACE GSM fields as demonstrated by Bergmann-Wolf et al. (2014)
  - Level-2 GAD product has to be added back to GSM
  - Continental leakage to be reduced e.g. according to Wahr et al. (1998) with a 300km Gauss filter
  - Filtering needed, e.g. with non-istropic smoothing and decorrelation filter DDK2/DDK3 (Kusche et al., 2009)
  - Synthesizing GRACE-derived ocean bottom pressure variations on a 1° by 1° grid

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Validation by Ocean Bottom Pressure

- Necessary corrections to in-situ OBP data
  - Mean, trend and annual signals has to be estimated with a least square fit and to be removed from the OBP time series
  - Provided (hourly) data are quality controlled, instrumental drift is removed by a quadratic fit and tides have been empirically removed
  - Daily averaged data are then 30days low pass filtered with a Butterworth filter of order 3 to estimate nearly monthly solutions which can be compared to the GRACE results
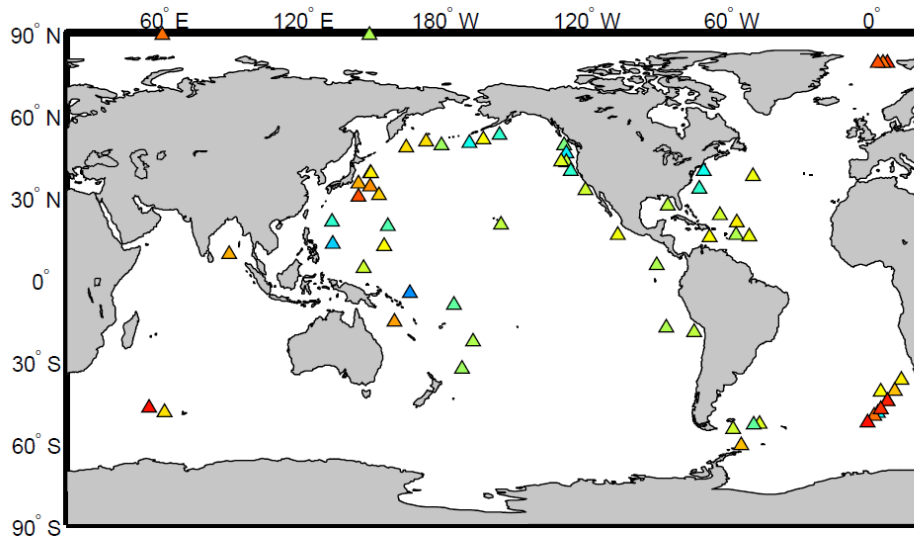
Same as Kick-Off Meeting

EGSIEM

Horizon2020

Validation by Ocean Bottom Pressure

- Necessary corrections to OMCT output:
  - 6 hourly data are 30days low pass filtered with a Butterworth filter of order 3 to estimate nearly monthly solutions which can be compared to the GRACE results

- Following results show (as an example for EGSIEM) temporal correlations of in-situ (AWI) / modelled (OMCT) and RL04/RL05 GRACE determined OBP variations computed for time periods, where both data sets are available and time series were at least 6 months long

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EGSIEM

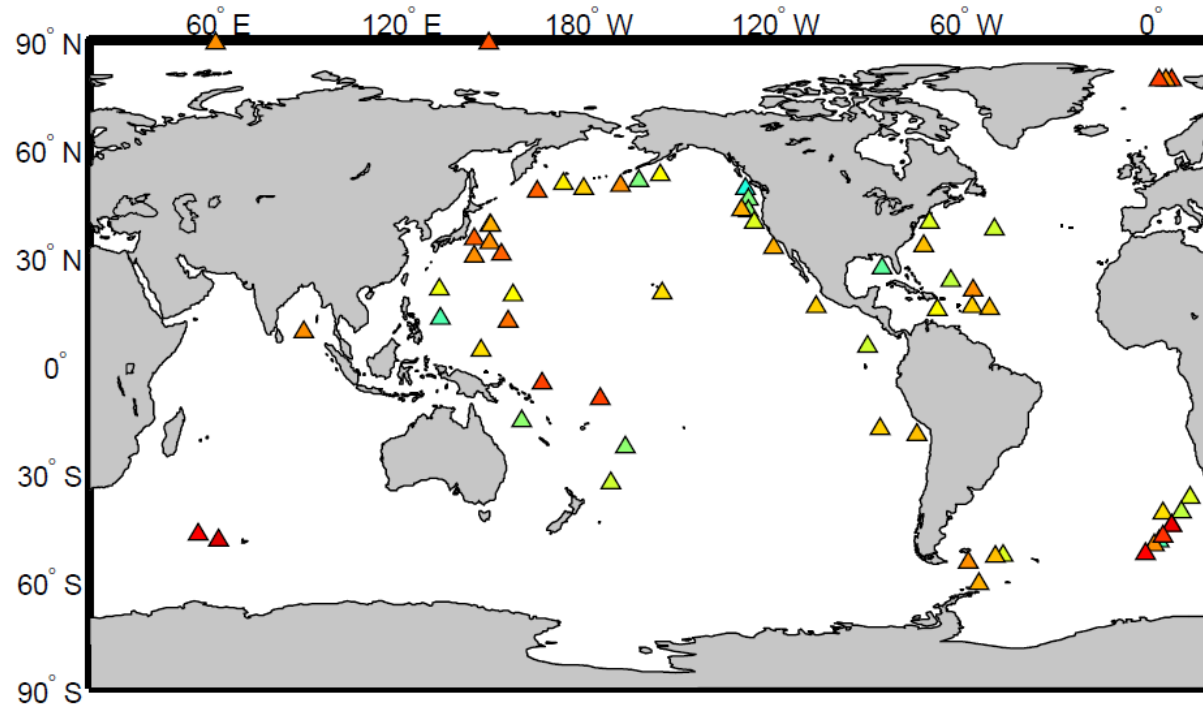Horizon2020

Validation by Ocean Bottom Pressure

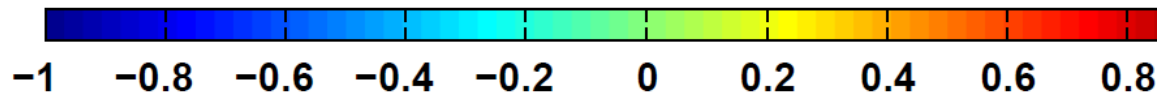Correlation GFZ RL04 – insitu (30 days low pass)
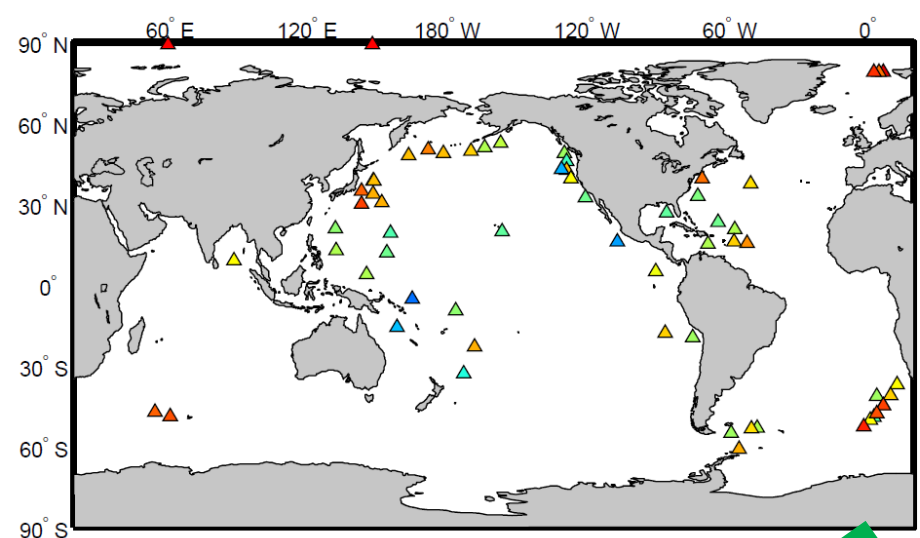
Correlation GFZ RL05 – insitu (30 days low

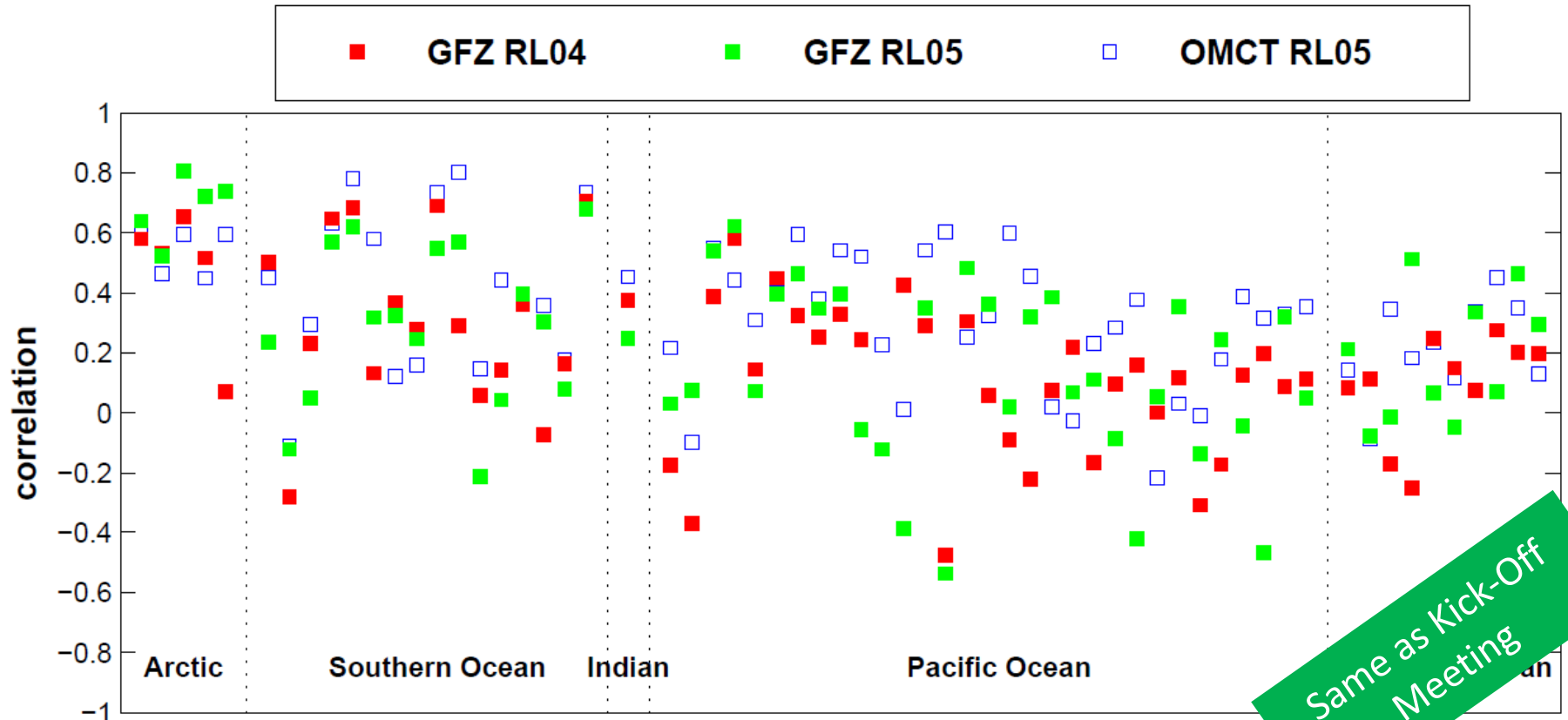Same as Kick-Off Meeting

Horizon2020

Validation by Ocean Bottom Pressure

Correlation OMCT RL05 − insitu (30 days low pass)

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Validation by Ocean Bottom Pressure

Validation by Ocean Bottom Pressure

- The validation will be automized till end of 2016 (M24):

  - Upload GSM time series on input FTP directory by EGSIEM partner

  - Regular check if new time series is available

  - Run comparisons and provide results in terms of statistics (correlations, explained variance etc.) and figures

  - Results shall also be included in the G^3 (GFZ GRACE Gravity) Browser at ICGEM (another time series to various non-EGSIEM and EGSIEM GSMs and WGHM)

G³ Browser

Example:
Sumatra Earthquake
(December 2004)

**http://icgem.
gfz-potsdam.de**

WGHM and OBP next

Select one overlay image (trend, annual, semi-annual) of equivalent water height. Use the opacity buttons to make it more/less visible. To get plots of GRACE gravity monthly solutions choose one of:
- simply **click a point** on the Earth and then update plot
- or select one of the predefined regions in the Select basin selector
- or choose one of the Example plots to see spectacular plots

The Plot Control Panel offers various options to select specific models, processing centers and other parameters.
Below the plot you find a textarea, from which you may 'cut-and-paste' the data of the last plot. Alternatively use 'export data' to access the data as text.

Earth Control Panel

Show spectacular example plot [Earthquake (Sumatra 2004, north) ▼]
Select overlay [Earthquake Sumatra ▼] Opacity [+] [−] [0.60]
Zoom and Rotate Earth [⊕] [⊖] [↻] [update plot] Automatic [ ]
Show all basins [✓] Select basin [Point ▼]
Center [(6.10°, 95.70°) r=350.0px]

Plot Control Panel

Filter [DDK5 ▼] Functional/Coeff [equivalent water height ▼]
Max degree [60 ▼] Replace C(2,0) by SLR data [✓]
Processing centers
[✓] gfz-rl05 [ ] jpl-rl05 [✓] csr-rl05 [ ] grgs [ ] tongji [ ] itg
[ ] dmt-1 [ ] ulux
[update plot] [export plot] [export data]

'equivalent water height' P = (6.10°, 95.70°) lmax = 60 C(2,0) replaced   I C G E M
GFZ
gfz-rl05 kfilter_DDK5 136
csr-rl05 kfilter_DDK5 136