

WP4. Scientific Combination Service Combination of GRACE Monthly Gravity Field Solutions

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Introduction

- In **WP4** at **Univeristy of Bern**
 - Scientific Combination Service:
Combination of GRACE Monthly Gravity Field Solutions
- Contents
 - **EGSIEM Combined Solutions on Solution Level**
 - **Evaluation** of Combined Solutions using **Reservoir Cases**

Input from the EGSiEM Analysis Centers

GRACE Monthly Gravity Field Solutions (L2) referred to the *EGSiEM Processing Standard*:

| Analysis Center | Max. Degree | Period |
|-----------------|-------------|--|
| AIUB | 90 | 2006/01 – 2007/12 (2 years) |
| GFZ | 90 | |
| GRGS | <i>80</i> | |
| ITSG | 90 | |

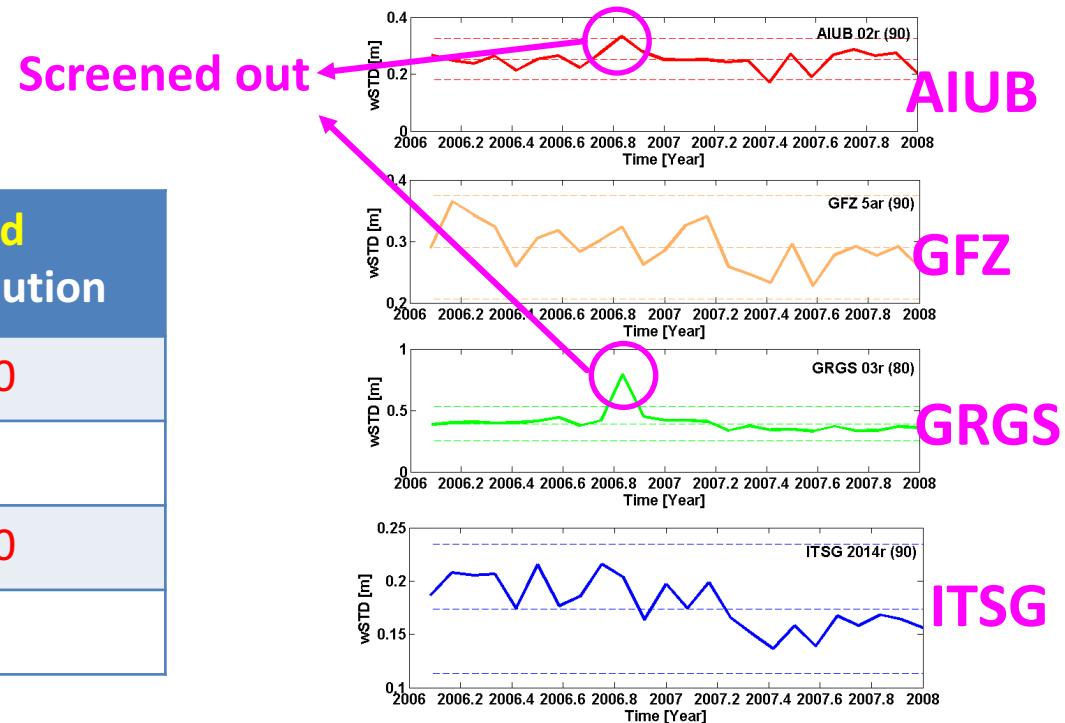
FTP Server:

<http://dl.aiub.unibe.ch/data/egsiem/private/Gravity/>

Preprocessing (1): Scaling and Screening

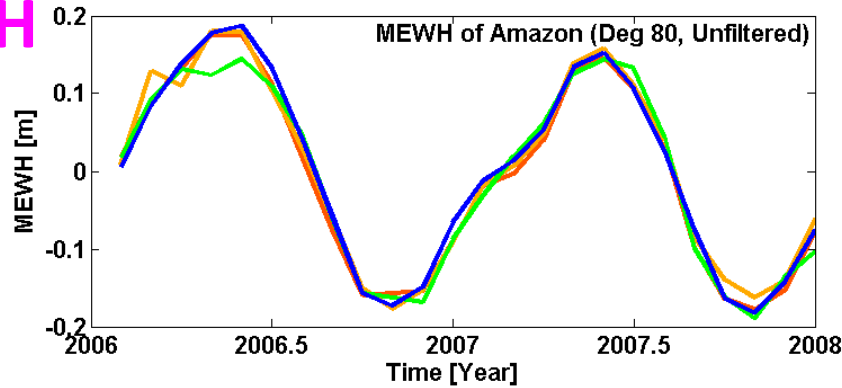
- Rescaling of *Earth radius, Gravitational parameter*
- Correction of **C20 bias** (w.r.t. Tide-free system)
- Screening of outliers
 - Criterion: Median + 3MAD using *wSTD* over the oceans (Quality Measure)

| Analysis Center | Max. Degree | Screened Monthly Solution |
|-----------------|-------------|---------------------------|
| AIUB | 90 | 2006/10 |
| GFZ | 90 | None |
| GRGS | 80 | 2006/10 |
| ITSG | 90 | None |

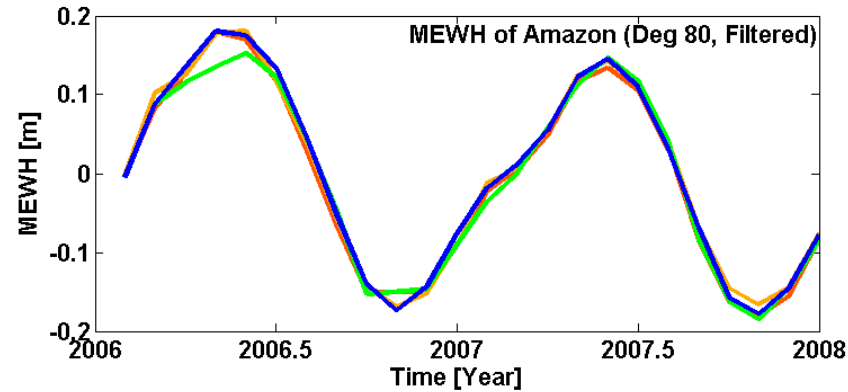


Preprocessing (2): Signal and Noise Comparison

MEWH

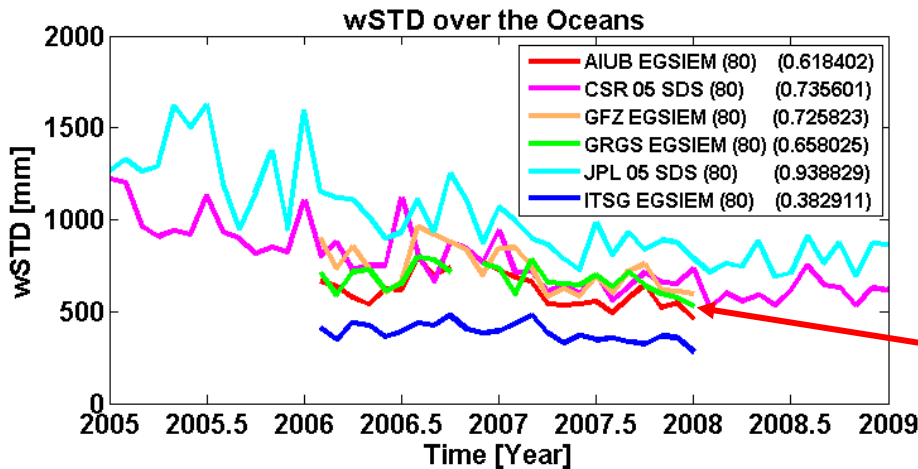


| | |
|---------------|-------------------|
| AIUB 02R (80) | (0.1555+/-0.0180) |
| GFZ 5aR (80) | (0.1565+/-0.0192) |
| GRGS 03R (80) | (0.1555+/-0.0169) |
| ITSG2016R(80) | (0.1579+/-0.0177) |



| | |
|---------------|-------------------|
| AIUB 02R (80) | (0.1518+/-0.0156) |
| GFZ 5aR (80) | (0.1543+/-0.0160) |
| GRGS 03R (80) | (0.1497+/-0.0164) |
| ITSG2016R(80) | (0.1544+/-0.0161) |

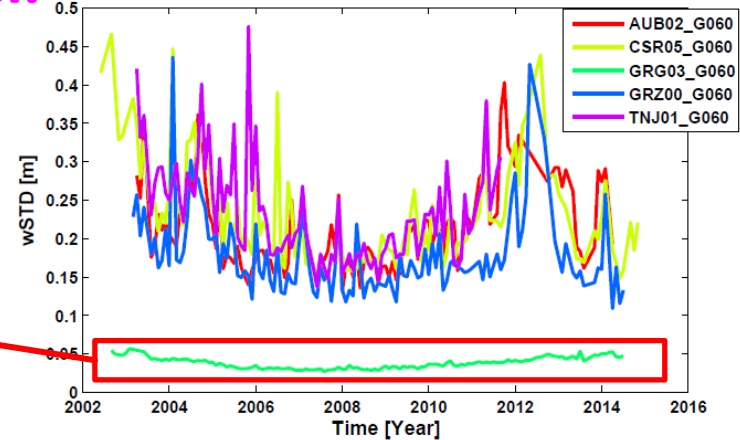
wSTD Oceans



| | |
|-----------------|------------|
| AIUB EGSIM (80) | (0.618402) |
| CSR 05 SDS (80) | (0.735601) |
| GFZ EGSIM (80) | (0.725823) |
| GRGS EGSIM (80) | (0.658025) |
| JPL 05 SDS (80) | (0.938829) |
| ITSG EGSIM (80) | (0.382911) |

cf.

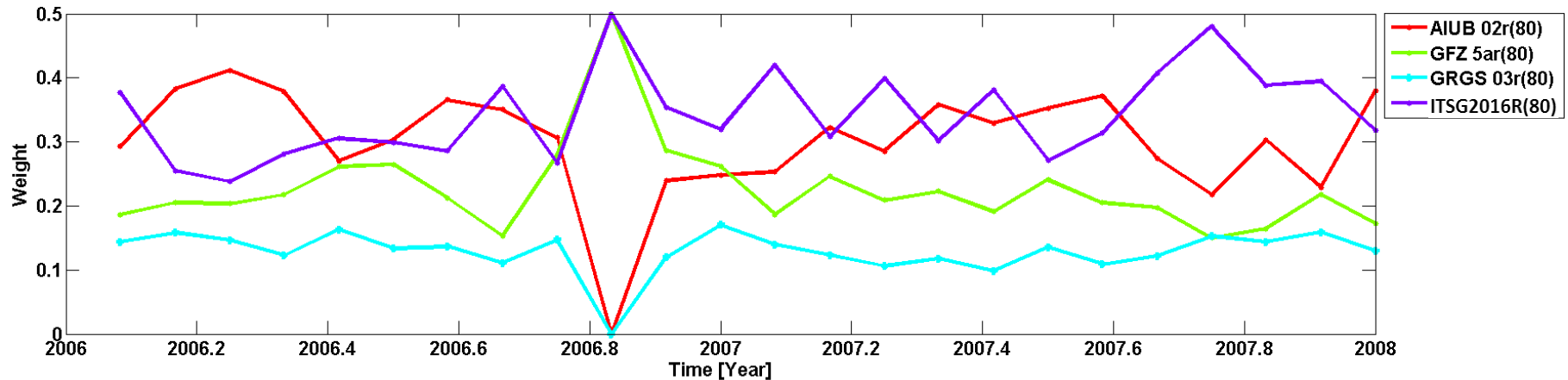
Weighted Standard Deviation over the Oceans (max 60, Unfiltered)



| |
|------------|
| AUB02_G060 |
| CSR05_G060 |
| GRG03_G060 |
| GRZ00_G060 |
| TNJ01_G060 |

Weights

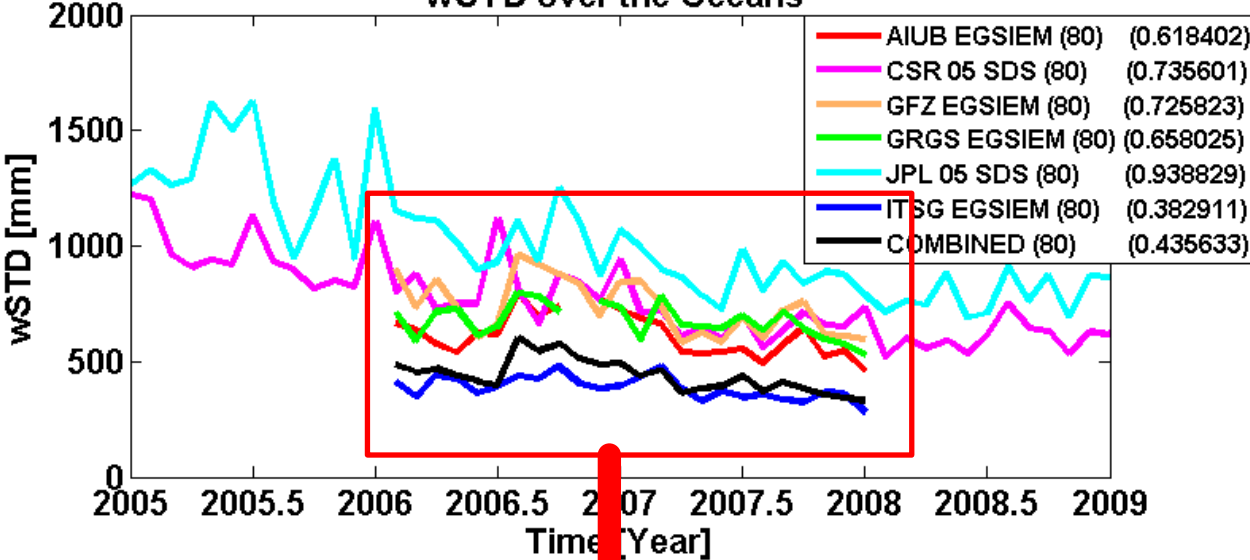
- Weights from *iterative* process using the *Variance Component Estimation (VCE)* method



↓
Screened out: AIUB, GRGS in October 2006 =2006.833 [year]
→ Only GFZ and ITSG solutions were combined in this month.

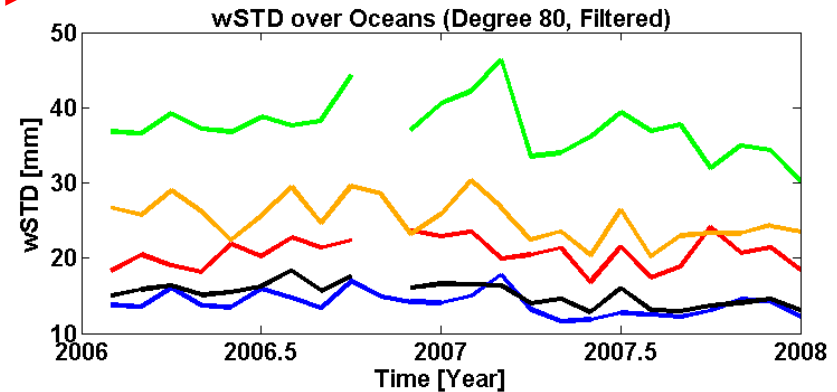
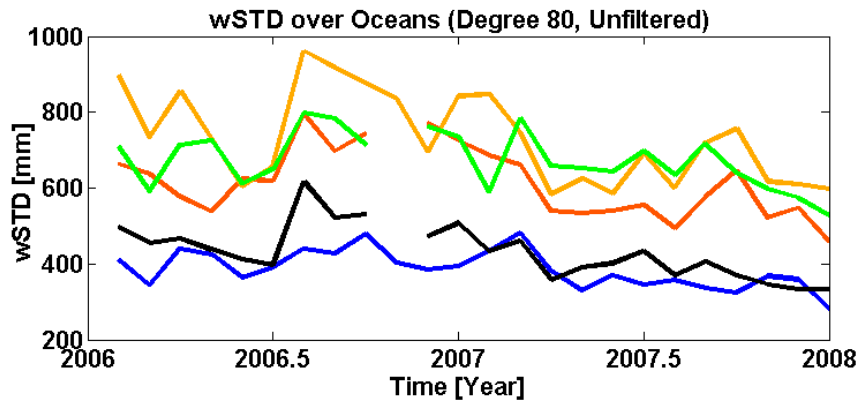
Combined Solutions: wSTD over Oceans

wSTD over the Oceans



Zoom In

Filtered



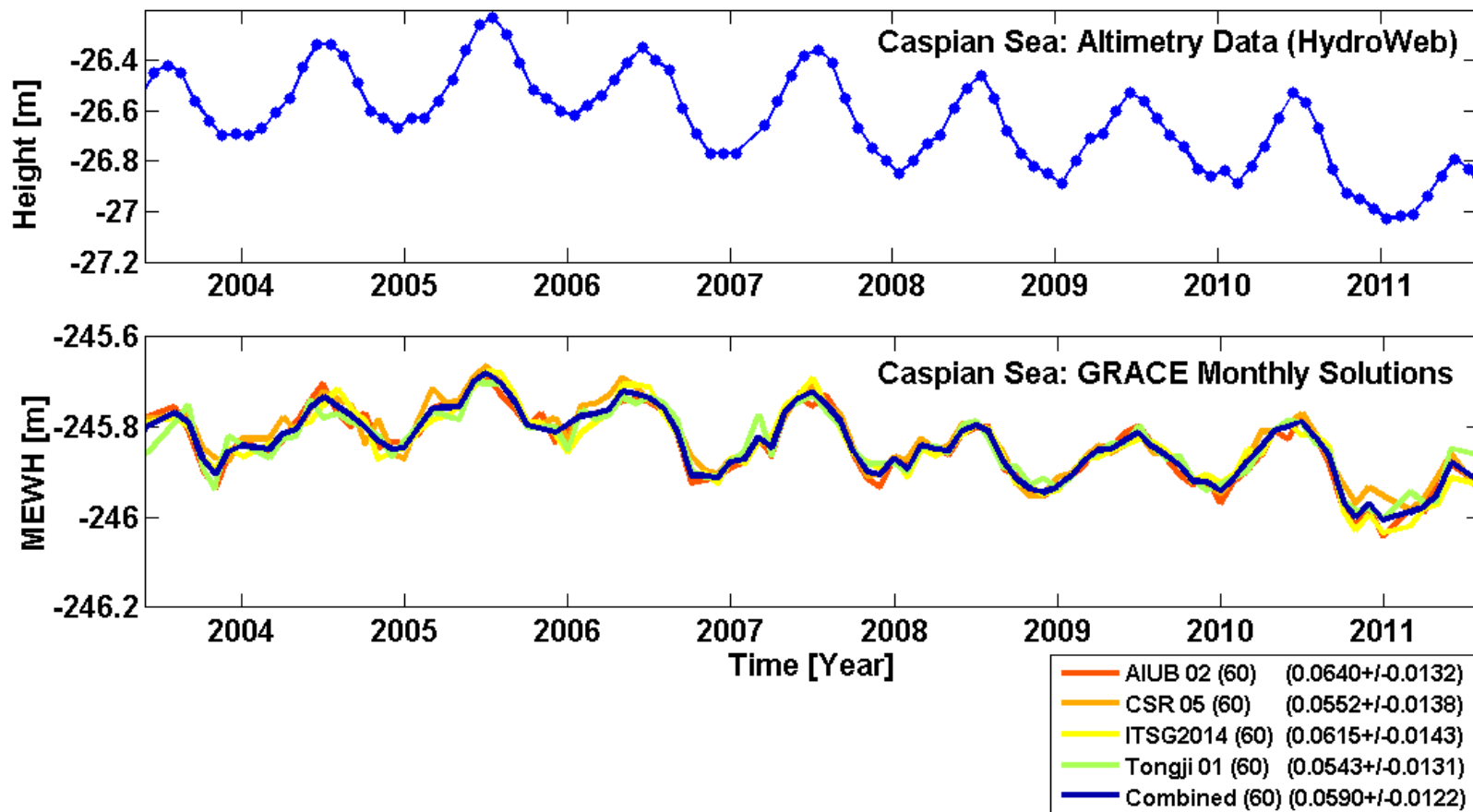
Evaluation using Reservoir Cases

- Suggestion by Prof. J. Kusche (Advisory Board) in last meeting in January 2016
 - Evaluation using **reservoir** cases:
 - **Caspian Sea**: huge signal
 - **Lake Volta**: much smaller, but still visible signal
 - Altimetry data by **Hydroweb**
 - From **satellite images + radar altimetry**
 - TOPEX/POSEIDON, Jason (1,2,3), GFO, ENVISAT, SARAL
 - By **Legos**, Toulouse, France
- Combined GRACE monthly gravity field solutions
 - (Solution level) AIUB, GFZ, GRGS, ITSG



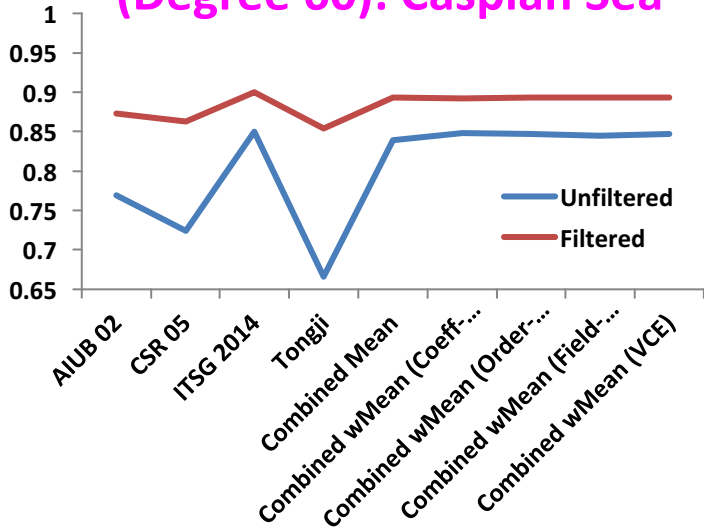
Water Heights by Altimetry and GRACE (1)

- Caspian Sea

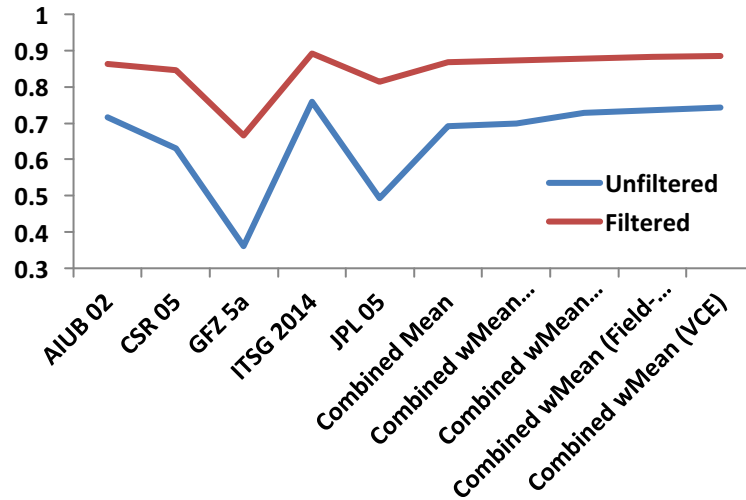


Correlation Coefficients: Caspian Sea

(Degree 60): Caspian Sea



Degree 90: Caspian Sea



EGSIEM (Degree 80): Caspian Sea

