

WP4. Scientific Service

Validating two-year EGSIEM combined GRACE products

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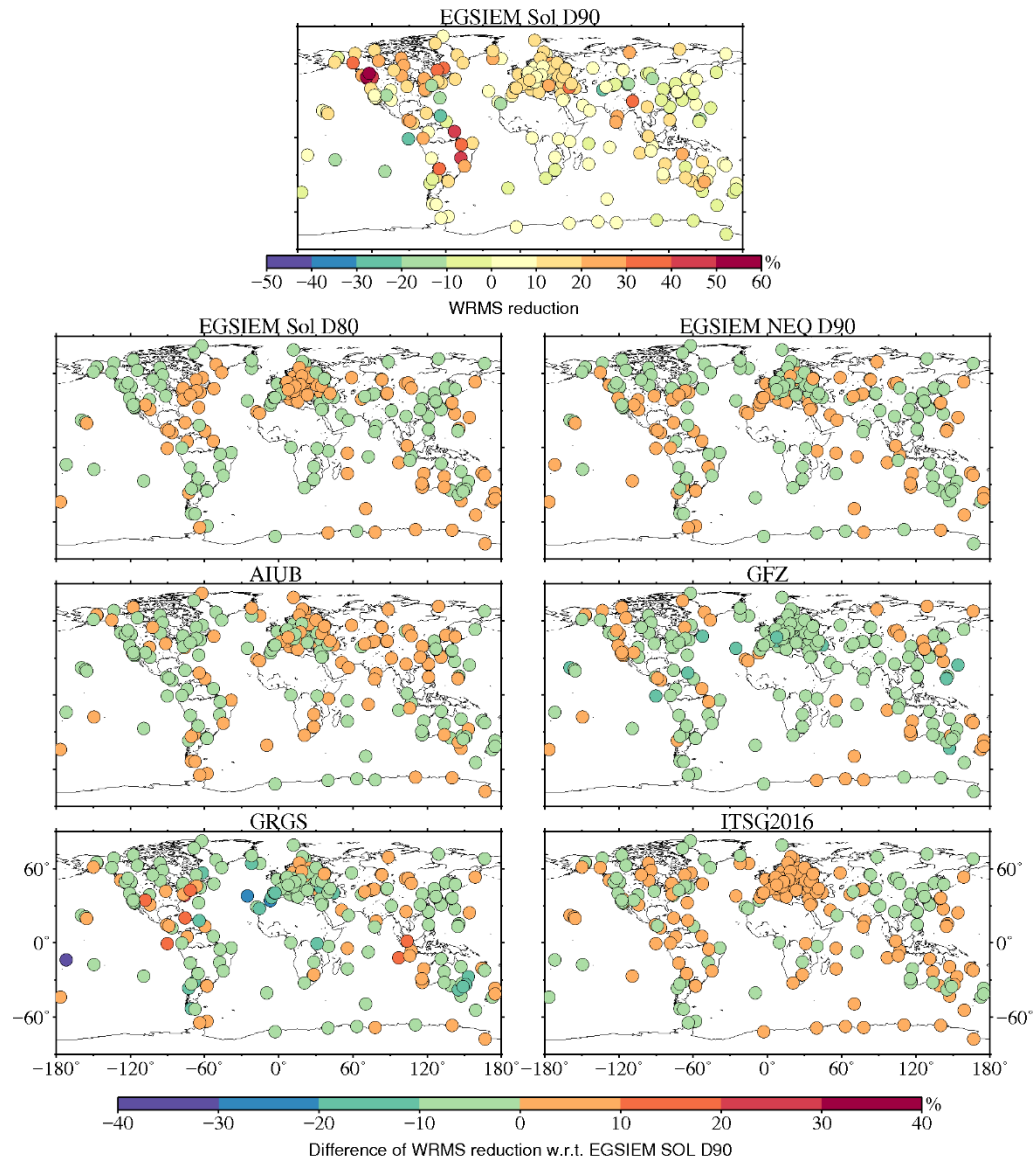
EGSIEM Progress Meeting # 4
January 19 – 20, 2017

Data

- GNSS data
 - Reprocessed daily UBERN GNSS time series (Repro3)
 - Cleaned, detrended, outlier and offsets removed, averaged into monthly
 - Latest daily ITRF2014 GNSS residuals (IGN)
 - Rigorously stacking the latest IGS repro2 solutions, averaged into monthly
- Gravity models
 - 4 two-year (2006&2007) GRACE gravity models from 4 ACs (AIUB, GFZ, ITSG, GRGS)
 - 3 two-year (2006&2007) combined EGSIM solutions both at NEQ level and Solution level (max degree 80&90)
 - Standard GRACE data processing
 - Replacing C20 term (Cheng et al., SLR) and adding back degree-1 coefficients (Swenson et al., 2008)
 - The Gaussian filtering with a smoothing radius of 500 km
 - Converting spherical harmonics into displacements in the vertical component at GNSS stations

GRACE .VS. Repro3

- In a comparison to 258 GNSS stations: **WRMS reduction**
- Differences of WRMS reduction w.r.t EGSIM Sol D90 are within the range of $\pm 10\%$ for EGSIM Sol D80, EGSIM NEQ D90, AIUB and ITSG2016
- Bigger differences are seen for GFZ and GRGS
- More negative than positive differences of WRMS reduction are observed for all except ITSG2016



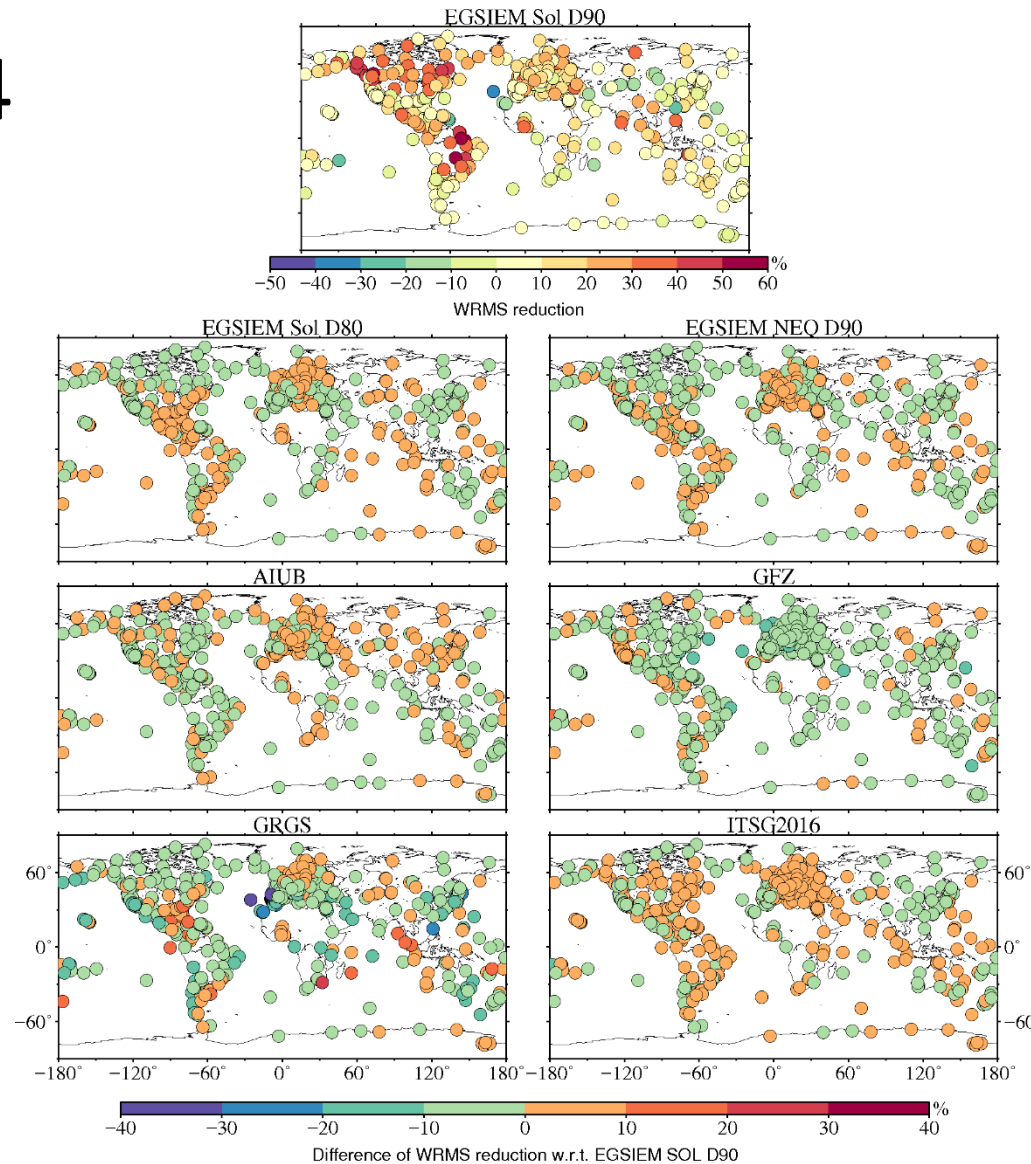
GRACE .VS. Repro3

	WRMS reduction [%]				Positive WRMS reduction [%]
	min	max	mean	median	
AIUB	-27.88	54.07	7.71	7.24	75.19
GFZ	-41.08	55.41	4.82	3.69	65.89
GRGS	-43.64	51.54	5.11	4.68	64.34
ITSG	-27.21	54.75	8.24	8.28	74.03
EGSIEM Sol D80	-30.91	54.12	7.85	7.52	74.42
EGSIEM Sol D90	-29.57	54.78	7.78	7.56	75.58
EGSIEM NEQ D90	-34.13	53.37	7.42	7.05	72.48

- ITSG performs slightly better than the EGSIME combined solutions
- EGSIM NEQ D90 seems to not provide better statistics than the combined solution level
- Two-year GFZ and GRGS solutions seem to slightly worse than other solutions

GRACE .VS. ITRF2014

- In a comparison to 626 GNSS stations: **WRMS reduction**
- Differences of WRMS reduction w.r.t EGSIM Sol D90 are within the range of $\pm 10\%$ for EGSIM Sol D80, EGSIM NEQ D90, AIUB and ITSG2016
- Bigger differences are seen for GFZ and GRGS
- More negative than positive differences of WRMS reduction are observed for all except ITSG2016



GRACE .VS. ITRF2014

	WRMS reduction [%]				Positive WRMS reduction [%]
	min	max	mean	median	
AIUB	-40.97	57.43	11.24	10.09	81.15
GFZ	-54.68	59.54	8.62	8.03	73.96
GRGS	-74.08	56.37	7.90	8.29	69.65
ITSG	-47.13	59.67	12.10	11.58	82.11
EGSIEM Sol D80	-42.56	58.49	11.69	10.77	81.47
EGSIEM Sol D90	-39.84	58.82	11.63	10.83	81.79
EGSIEM NEQ D90	-43.20	58.52	11.38	10.59	81.31

- Slightly better statistics than Repro3 but with the same conclusions as Repro3

Future work

- Validation with improved version of the combined solutions
 - NEQ level
 - Solution level
- Longer time span for better validation?

Thanks for your attention!