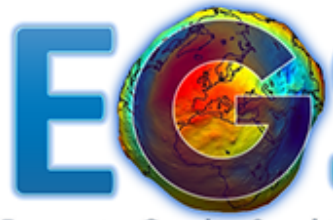


EGSIEM

European Gravity Service for Improved Emergency Management

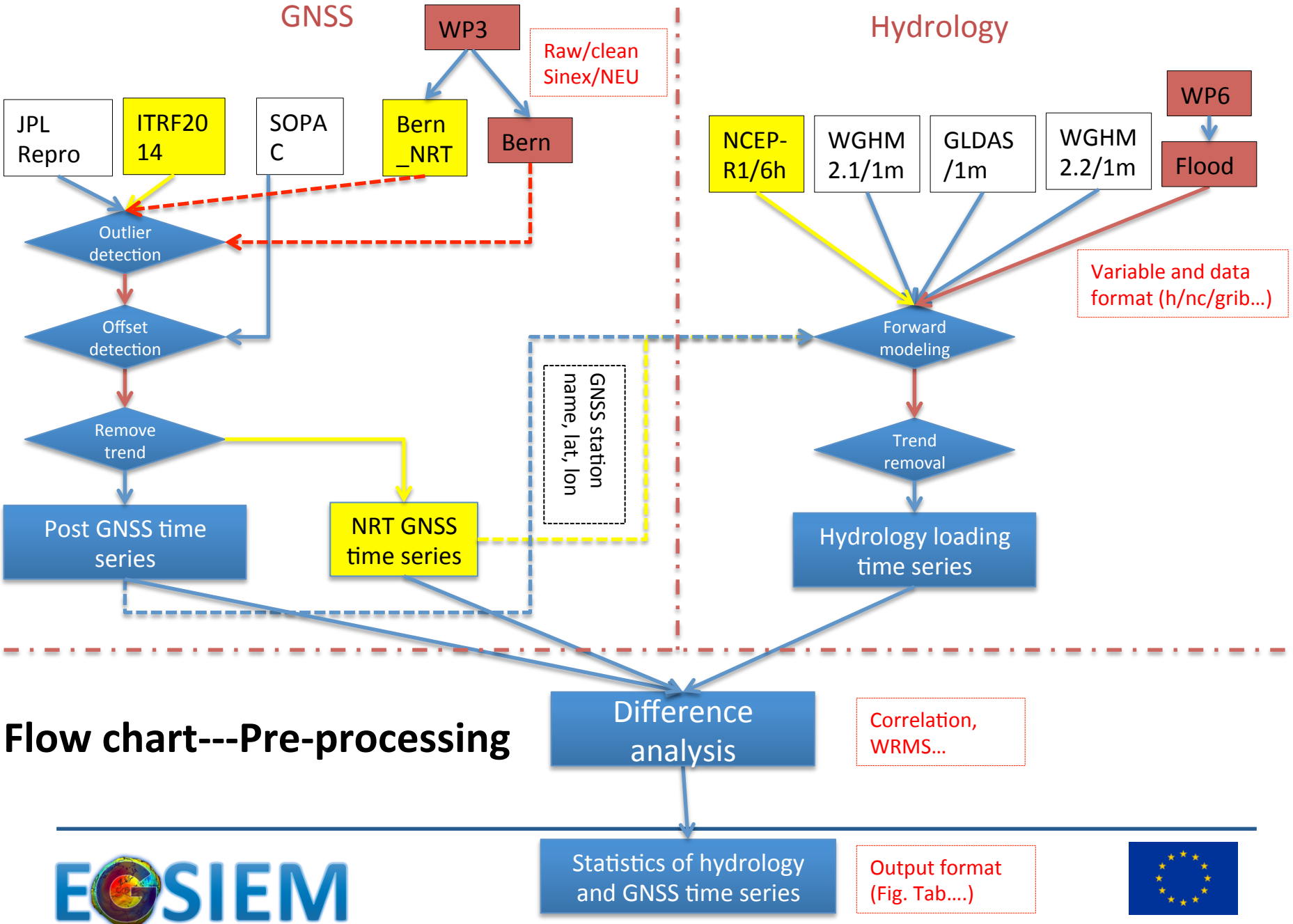
Validation with GNSS loading

Ulux progress on WP3

HORIZON 2020

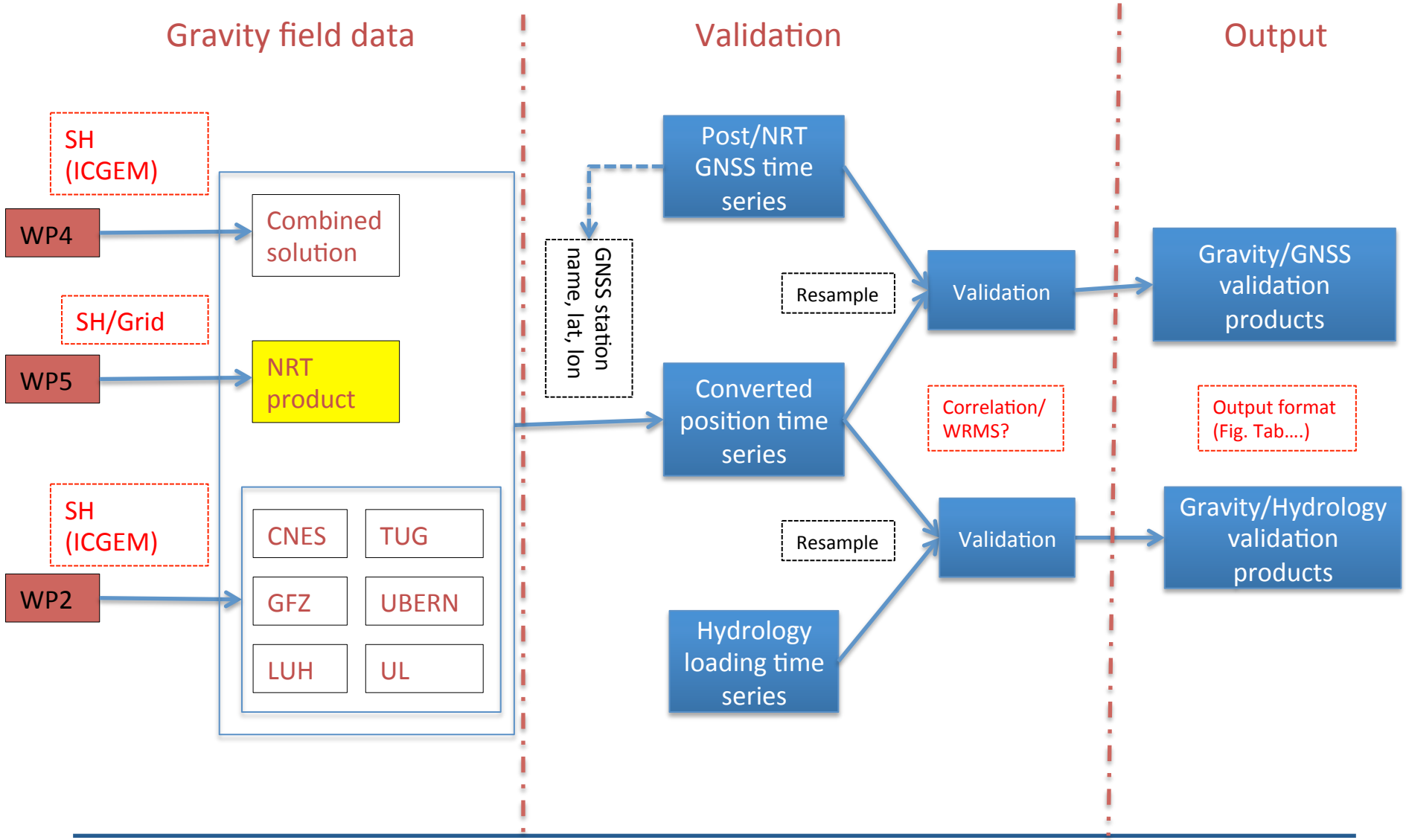
Validation with GNSS loading

- 3-step concept
  - Data pre-processing
  - Data processing
  - Output (Correlation coefficient, WRMS reduction...)



Flow chart---Pre-processing

Flow chart---Data-processing and output



Data

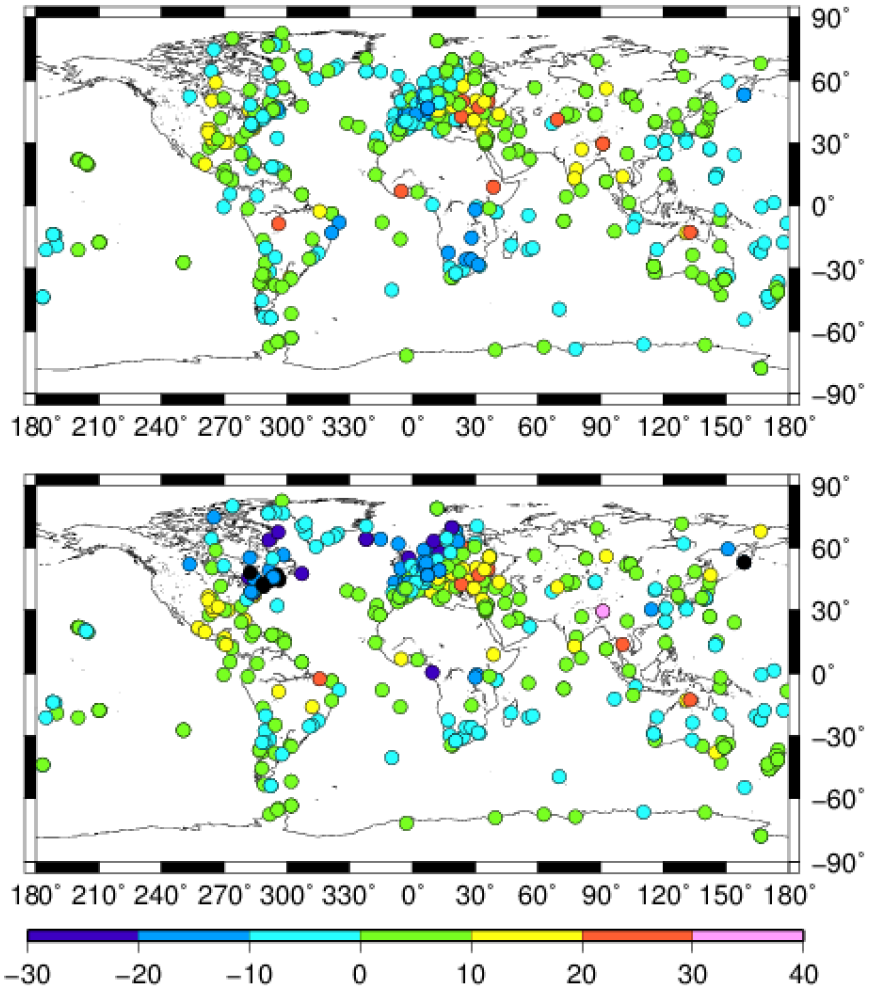
- GNSS data
  - Latest global daily GPS time series from JPL and SOPAC (ftp://garner.ucsd.edu/pub/timeseries/measures/ats/Global)
    - Cleaned,detrended, outlier removed
    - Nearly real time
  - Latest ITRF2014 GPS residuals (IGN)
    - Rigorously stacking the latest IGS repro2 solutions
- Continental Water Storage Models
  - GLDAS, monthly, 3-4m latency
  - WGHM_2.1f6, monthly, 2002-12/2013
  - WGHM_2.2_STANDARD, latest official version, 2002-10/2010, m and d
  - WGHM_2.2_STANDARD_CRU, a modification of 2.2standard, -12/2012,but not calibrated for the climate input
  - NCEP-R1
    - 3-4d latency, NRT validation only
- Gravity model
  - EGSIEM combined solution, 2003-2014
    - Global converted displacement both with GAC added back and without GAC

Hydrology .VS. GNSS

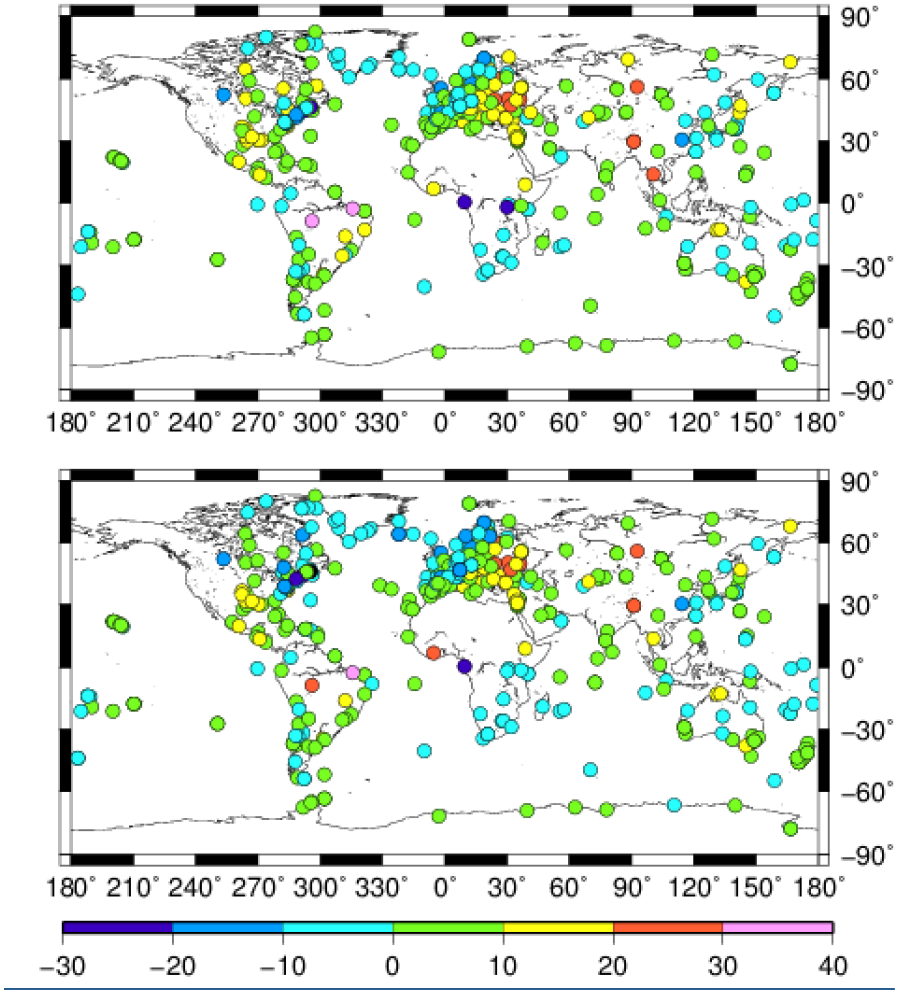
Percentage of JPL/SOPAC/ITRF stations with height WRMS reduced when GPS vertical observations are corrected for the various water storage models (528 Common stations)			
	JPL (458 effective stations)	SOPAC (408 effective stations)	ITRF2014 (494 effective stations)
GLDAS	58.73	77.94	79.55
WGHM_2.1f6	55.24	75.98	74.90
WGHM_2.2STANDARD	67.29	80.95	81.40
WGHM_2.2STANDARD_CRU	62.90	80.71	81.09

GNSS .VS. Hydrology (JPL)

gldas .vs. wghm2.1



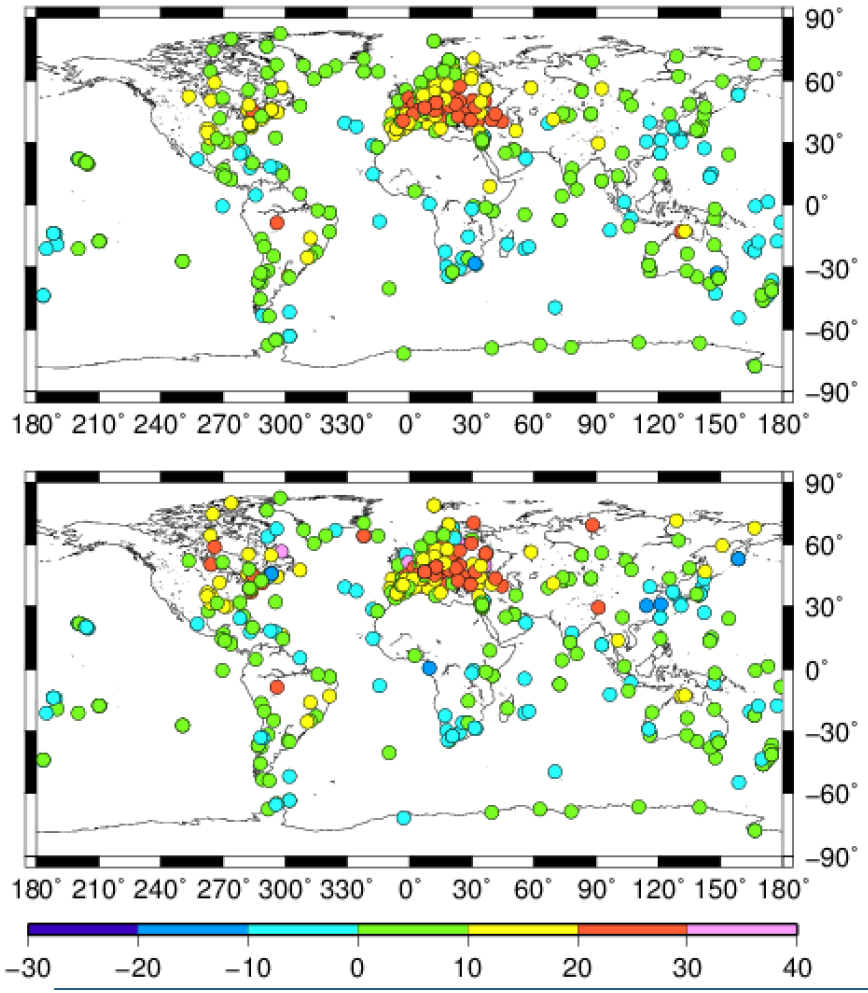
wghm2.2standard .vs. standcru



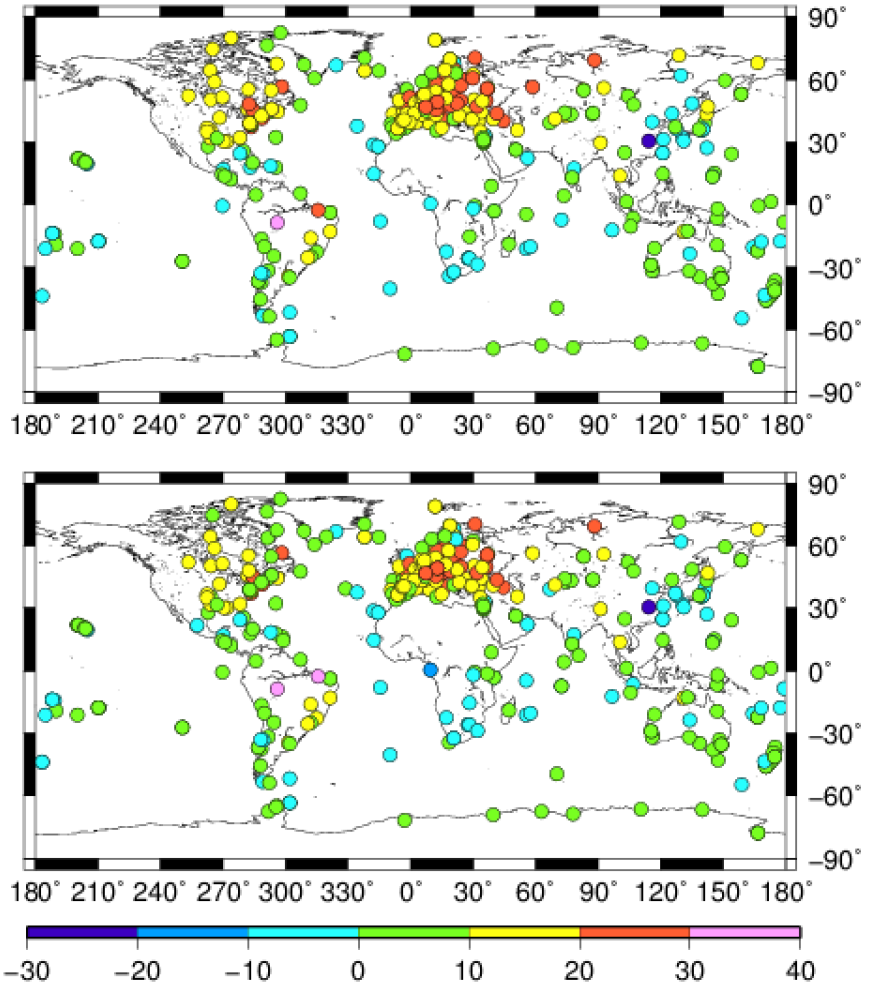
HORIZON 2020

GNSS .VS. Hydrology (SOPAC)

gldas .vs. wghm2.1



wghm2.2standard .vs. standcru



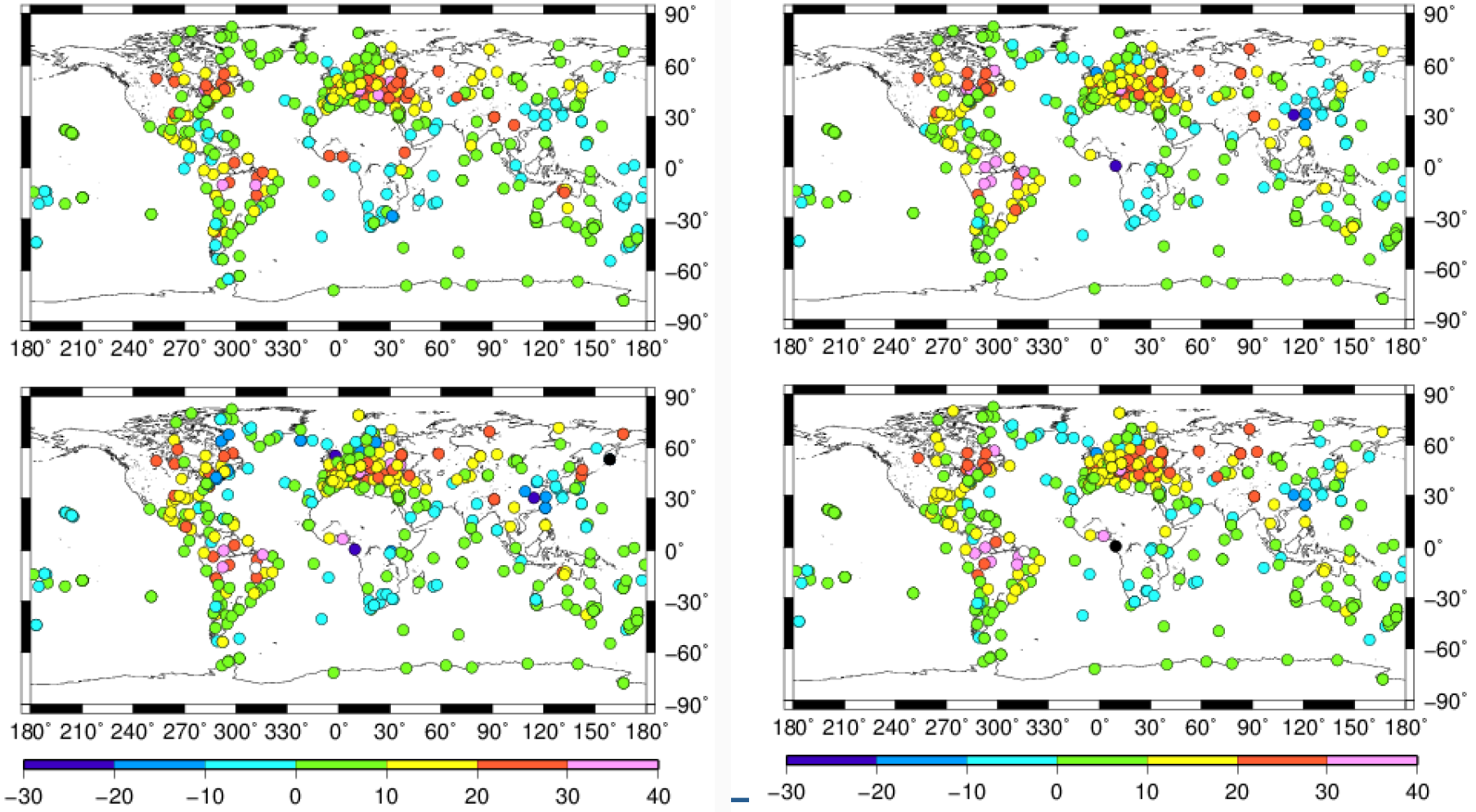
EOSIEM

HORIZON 2020

GNSS .VS. Hydrology (ITRF2014)

gldas .vs. wghm2.1

wghm2.2standard .vs. standcru



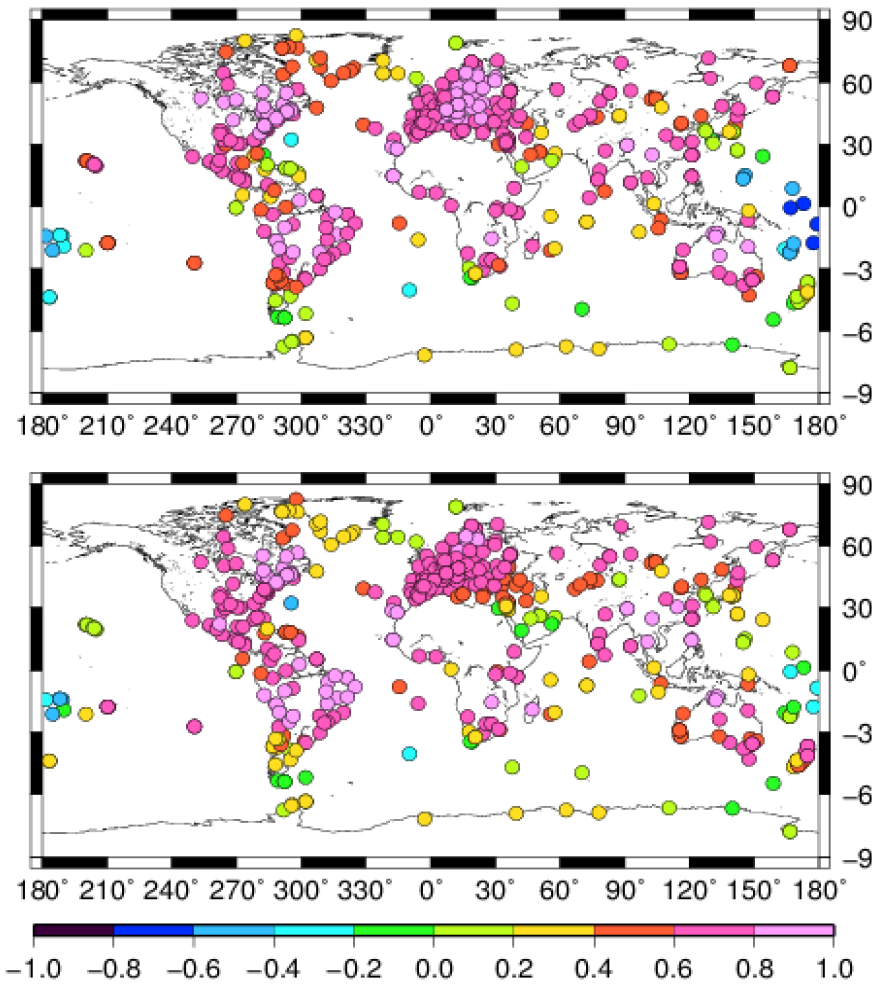
EOSIEM

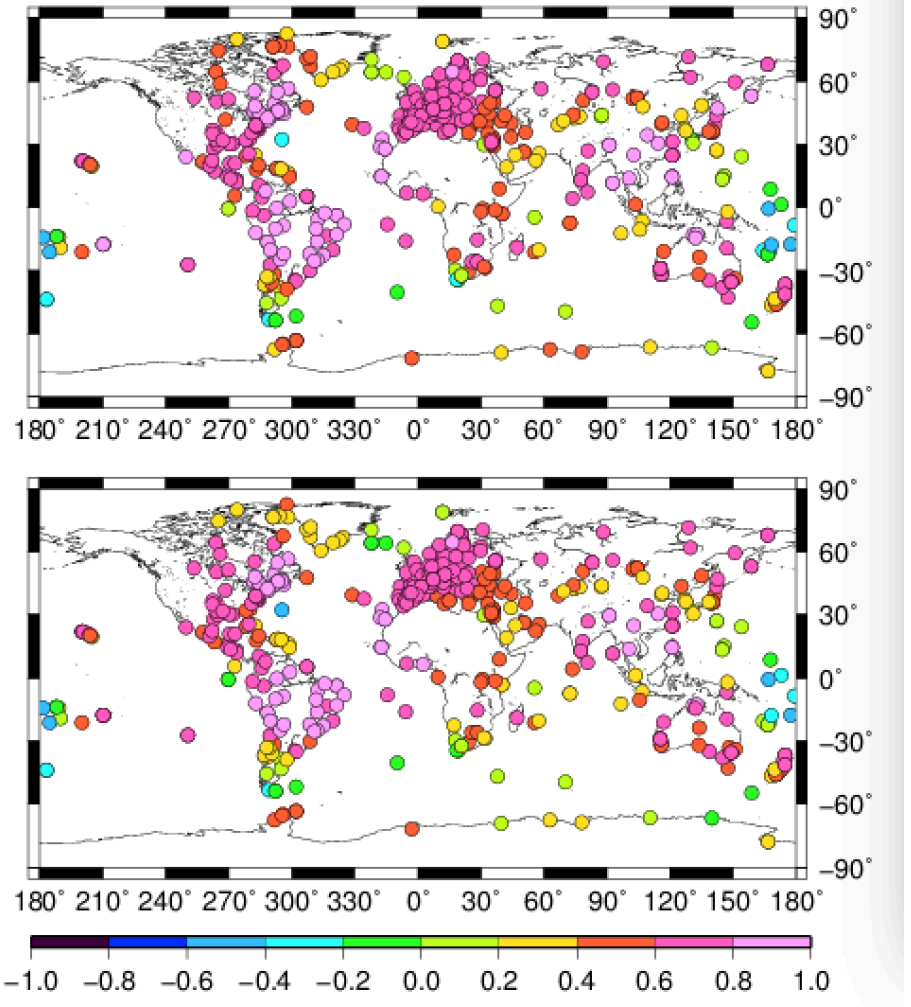
HORIZON 2020

Hydrology .VS. EGSIEM

gldas_wghm2.1 .vs. egsiem

wghm2.2standard_cru .vs. egsiem





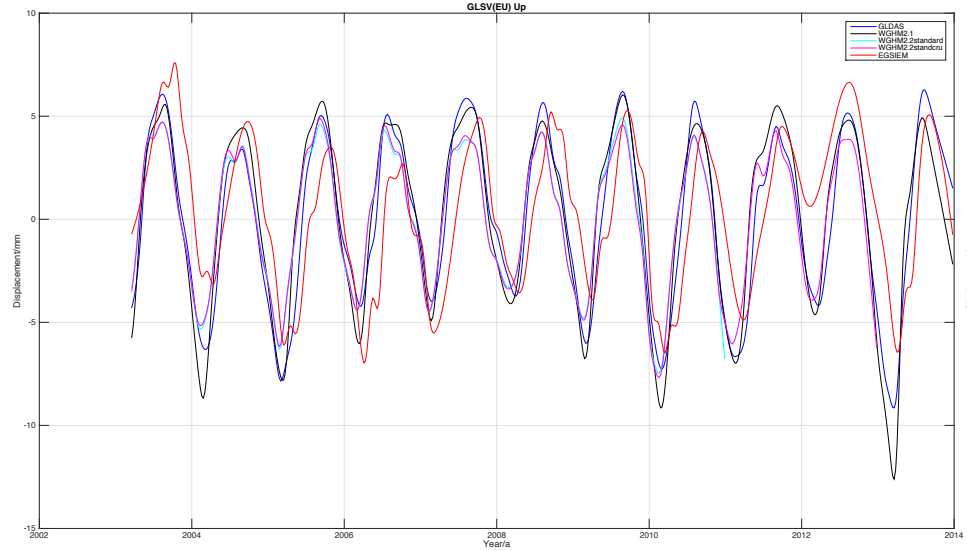
EGSIEM

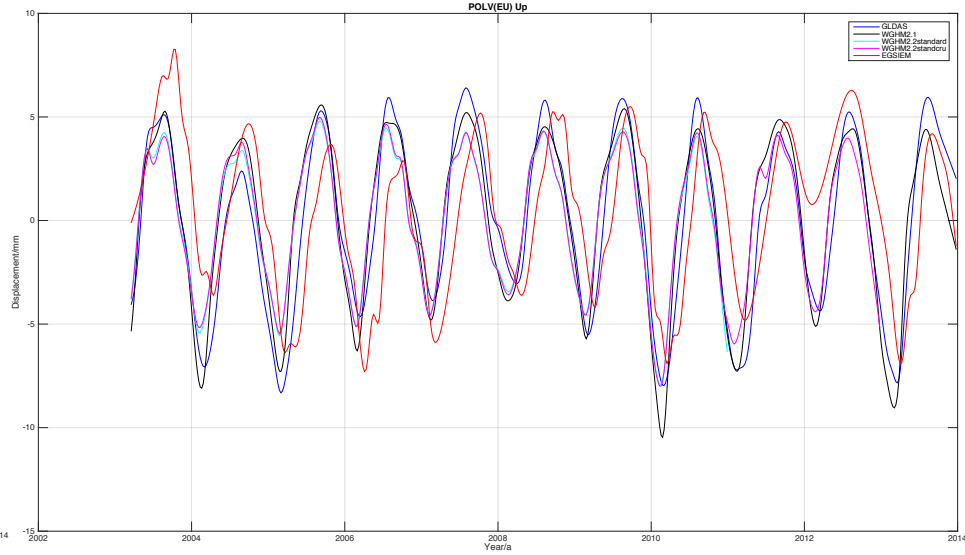
HORIZON 2020

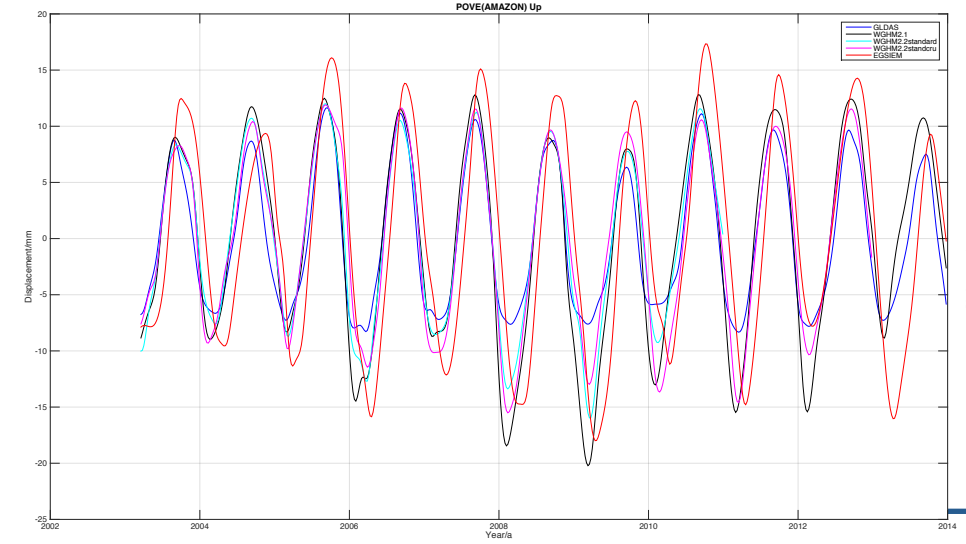
Hydrology .VS. EGSIEM

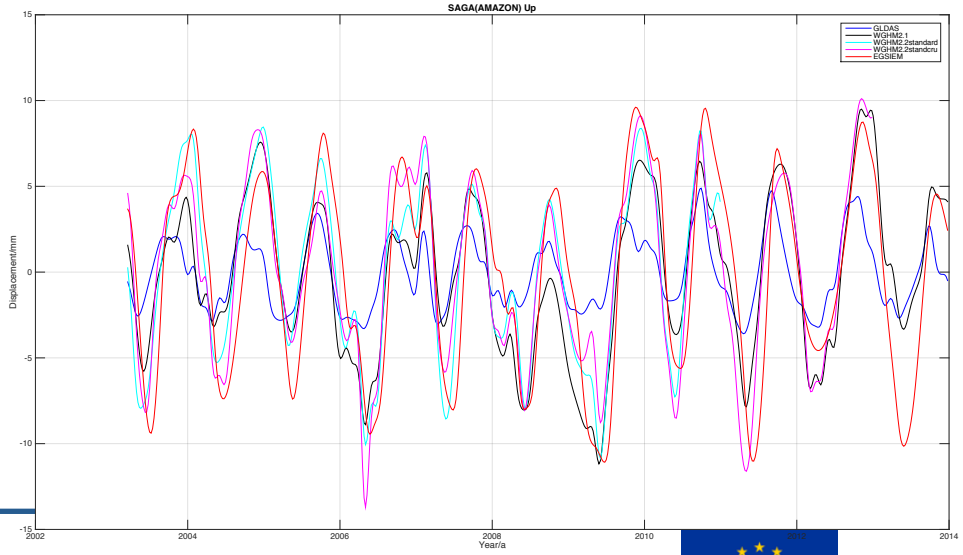
Hydrology .vs. EGSIEM (correlation coefficient)	mean	min	max	Percentage of stations with correlation > 0.6 (528 common stations totally)
GLDAS	0.5590	-0.6843	0.9079	63.45(335)
WGHM2.1	0.5489	-0.5783	0.9455	58.14(307)
WGHM2.2standard	0.5641	-0.5141	0.9425	59.66(315)
WGHM2.2standcru	0.5426	-0.5237	0.9306	55.30(292)

Hydrology .VS. EGSIEM









EGSIEM

HORIZON 2020

GNSS .VS. EGSIEM

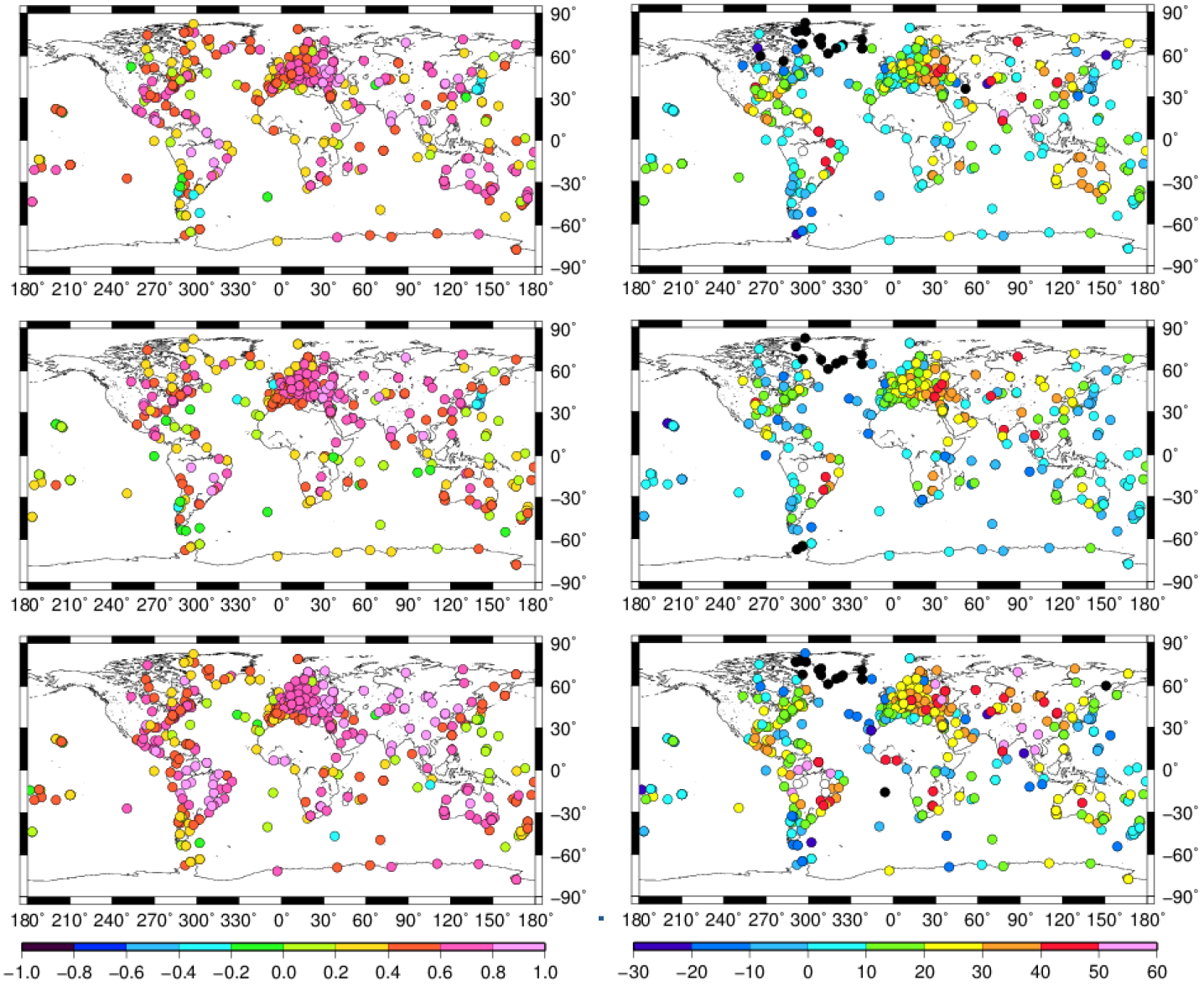
GNSS .vs. EGSIEM (correlation coefficient/wrms reduction rate)	mean	min	max	Percentage of stations with correlation > 0.6 (528 common stations totally)	Percentage of stations with wrms reduced
JPL	0.4888	-0.5549	0.9766	39.58(171/432)	80.79(349/432)
SOPAC	0.4445	-0.5534	0.9674	38.56(150/389)	76.61(298/389)
ITRF2014	0.5438	-0.3085	0.9720	49.79(233/468)	79.06(370/468)

GNSS .VS. EGSIEM

JPL

sopac

ITRF



HORIZON 2020

Conclusions

- Post validation
  - Almost done
    - GNSS .vs. Hydrology
      - ITRF2014, WGHM_2.2_STANDARD, best; Sopac the second, JPL also works
    - GNSS .vs. EGSIEM
      - Very good consistency
    - Hydrology .vs. EGSIEM
      - EGSIEM has the best consistency with GLDAS, WGHM2.2_STANDARD the second
  - Latest ITRF2014 GPS residuals
    - Rigorously stacking the latest IGS repro2 solutions
- NRT validation
  - Partly done
    - CWS- NCEP-R1, WGHM?
    - GNSS-SOPAC, JPL
    - Gravity-waiting…
- Open questions
  - Treatment of atmospheric and non-tidal ocean loading