Main achievements of the 6 years of the SL_cci project

CLS, LEGOS, CGI, GFZ

Improvements in precise orbit determination of altimetry satellites

=> Two sets of improved precise orbits of altimetry satelites were derived at GFZ:

- VER6 orbits of ERS-1, ERS-2, TOPEX/Poseidon and Envisat (totally at 1991 – 2011, Rudenko et al., Advances in Space Research, vol. 54, pp. 92-118, 2014, access at ftp://ftp.gfz-potsdam.de/pub/home/kg/orbit/SLCCI/Readme_GFZ_SLCCI_orbits)
- VER11 orbits of ERS-1, ERS-2, TOPEX/Poseidon, Envisat, Jason-1 and Jason-2 (totally at 1991-2015, Rudenko et al., IEEE Transcations on Geoscience and Remote Sensing, 2017, accepted, DOI: 10.1109/TGRS.2017.2670061, access at ftp: ftp://ftp.gfz-potsdam.de/pub/home/kg/orbit/SLCCI/Readme_GFZ_VER11_SLCCI_orbits.

=> The major improvements in the last 6 years include using the following models:

- ITRF2008 terrestrial reference frame instead of ITRF2005,
- IERS Conventions 2010 instead of IERS Conventions 2003,
- new Earth's time variable geopotential models, such as EIGEN-6S2 and EIGEN-6S4,
- true attitude modelling for Jason-1 and Jason-2 instead of nominal attitude,
- improvements of TOPEX/Poseidon, Jason-1, Jason-2 macromodels,
- a tropospheric correction of DORIS measurements based on the Vienna Mapping Functions,
- Atmospheric and Oceanic De-aliasing Level-1B (AOD1B) release 5 product.

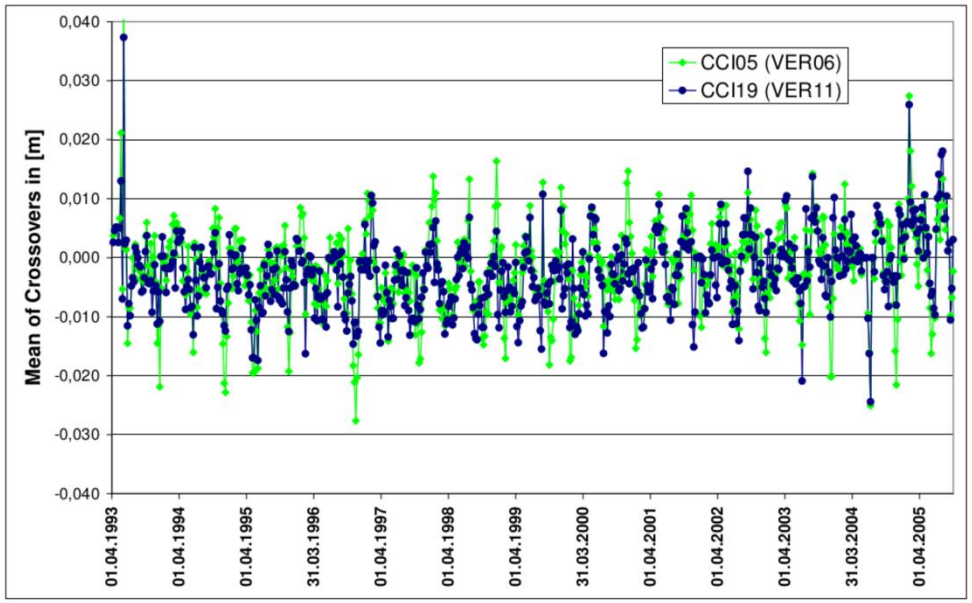
The mean values of the RMS observation fits and two-day orbital arc overlaps for GFZ VER6 and VER11 orbits

Satellite and orbit version	SLR RMS fits (cm)	DORIS RMS fits (mm/s)	Radial arc overlap (cm)	Cross-track arc overlap (cm)	Along-track arc overlap (cm)
ERS-1 VER6	2.15	----	1.84	17.14	12.14
ERS-1 VER11	2.13 (-0.9%)	----	1.82 (-0.7%)	16.46 (-4.0%)	12.09 (-0.4%)
ERS-2 VER6	1.70	----	1.84	7.11	10.69
ERS-2 VER11	1.69 (-0.2%)	----	1.85 (+0.9%)	7.24 (+1.8%)	10.63 (-0.5%)
TOPEX VER6	2.02	0.4797	1.02	6.53	3.59
TOPEX VER11	1.96 (-2.9%)	0.4778 (-0.4%)	0.89 (-12.8%)	6.49 (-0.6%)	3.48 (-3.2%)
Envisat VER6	1.30	0.4314	0.52	2.09	2.16
Envisat VER11	1.27 (-2.3%)	0.4214 (-2.3%)	0.53 (+3.1%)	1.98 (-5.3%)	1.93 (-10.4%)
Jason-1 VER6	1.63	0.3641	0.95	5.96	4.52
Jason-1 VER11	1.19 (-27.3%)	0.3532 (-3.0%)	0.79 (-17.0%)	4.17 (-30.0%)	2.48 (-45.1%)
Jason-2 VER6	1.62	0.3510	0.82	4.04	3.94
Jason-2 VER11	1.23 (-24.3%)	0.3490 (-0.6%)	0.56 (-31.8%)	3.34 (-17.2%)	1.46 (-63.1%)

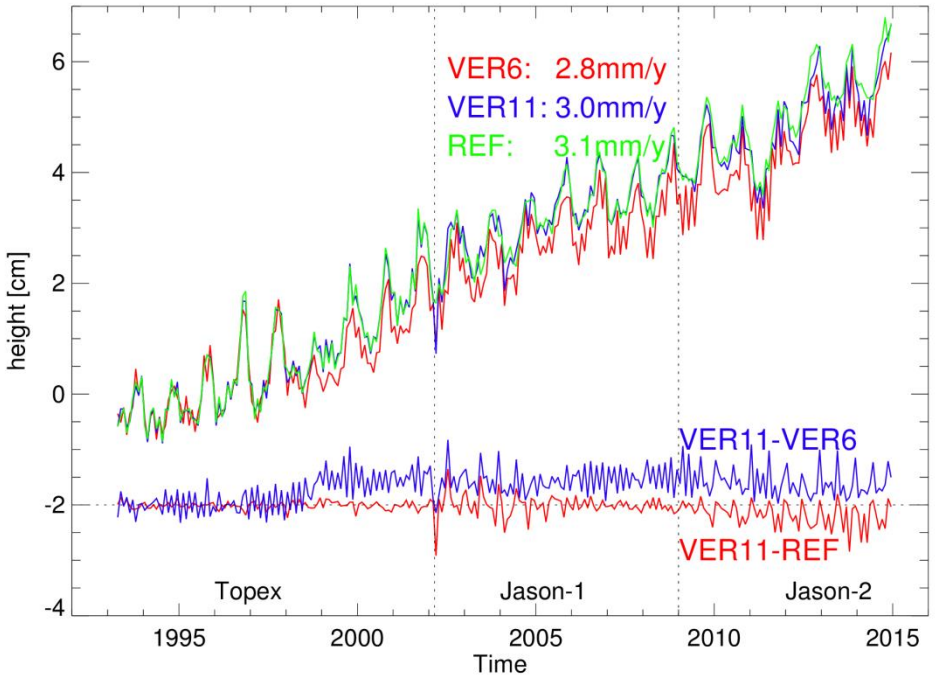
Improvements for the most parameters, a few minor degradations are marked in red.

Improvements in precise orbit determination of altimetry satellites

Rudenko S., Neumayer K.-H., Dettmering D., Esselborn S., Schöne T., Raimondo J.-C.
Improvements in precise orbits of altimetry satellites and their impact on mean sea level monitoring, IEEE Transcations on Geoscience and Remote Sensing, accepted, 2017, DOI: 10.1109/TGRS.2017.2670061,



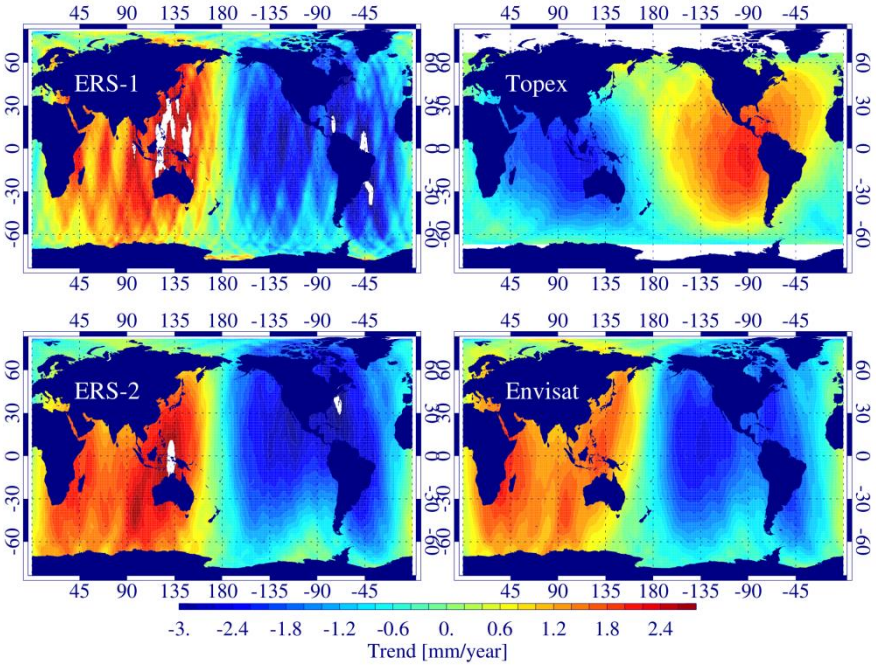
Improvements of the TOPEX/Poseidon single-satellite crossover differences of the GFZ VER11 orbit with respect to GFZ VER6 orbit.



Top: global mean sea level (±60°) based on the VER6, VER11 and reference orbits. Bottom: the GMSL differences for VER11-VER6 and VER11-REF series.

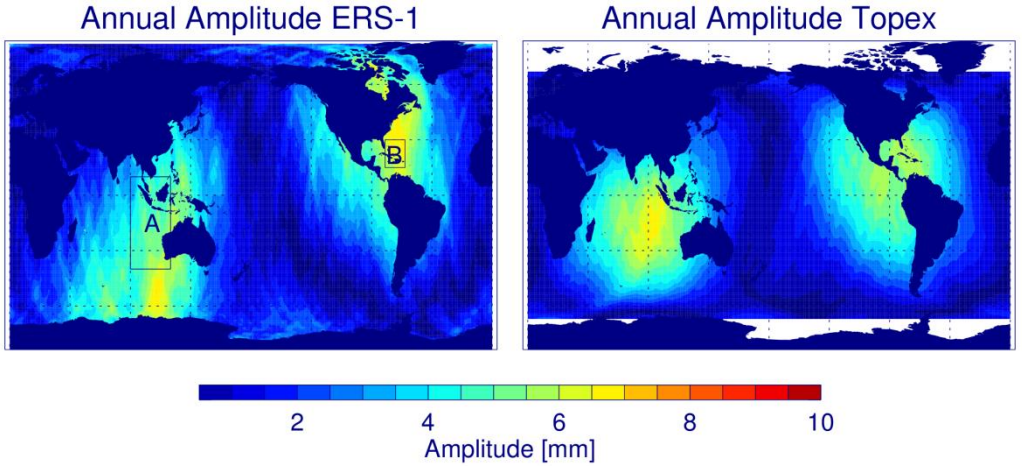
Improvements in precise orbit determination of altimetry satellites

A study on the impact of the Earth's time variable gravity models on the global and regional sea level trends: up to 3 mm/yr as compared to the static gravity field models (Rudenko et al., Adv. Space Res., 2014)



Impact on the radial MSL trend when orbits computed using EIGEN-6S2 and EIGEN-GL04S gravity models

Investigation of the Impact of Atmospheric and Oceanic De-aliasing Level-1B (AOD1B) products on precise orbits of altimetry satellites and altimetry results (Rudenko et al., Geophys. Journal International, 2016)



Annual amplitudes of the radial orbit differences of ERS-1 (left) and TOPEX (right) orbits computed using AOD1B RL05 and no AOD product