

Reduction of 58.77-day Signal in Mean Sea Level derived from TOPEX/Poseidon, Jason-1 and Jason-2 data thanks to new ocean tide corrections

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Background

Work presented at OSTST 2010 (Lisbon) highlight a strong 58.77-day signal in Jason MSLs whereas it is smaller in T/P MSL:

1. The 58.77-day signal results from the aliasing of semi-diurnal signals
2. The strong 58.77-day signal observed in Jason MSLs is mainly due to an error in TOPEX data propagated via the tide models which assimilate altimetry data: strong impact with GOT4V7 solution.
3. The errors are reduced with FES ocean models (FES04 solution)
4. By construction, stochastic ocean tide models (GOT solutions) are more sensitive to the altimetry data assimilation than hydrodynamic ones (FES).

Results OSTST 2010

contrary to first guess, the 58.77-day error is actually in TOPEX measurements

■ TOPEX ■ Jason-1 ■ Jason-2

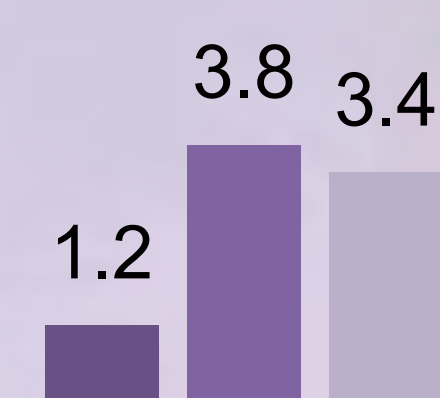


Fig 1: Amplitudes of Global MSL 58.77-day signal (mm) with GOT 4V7 ocean tide correction

Objectives

Compare the 58.77-day error in the latest ocean tide correction releases:

1. In stochastic products (GOT4V7, GOT4V8, GOT4V10)
2. In hydrodynamic products (FES04, FES2012, FES2014 intermediate solution)

Issue #1: Reduction of MSL 58.77-day error with GOT latest ocean tide solutions

GOT4V7 and GOT4V8 are based on TOPEX/Poseidon data while the latest release – GOT4V10 – uses only Jason-1 & Jason-2 data (hence no T/P measurements) in the S2-wave.

Global Analysis

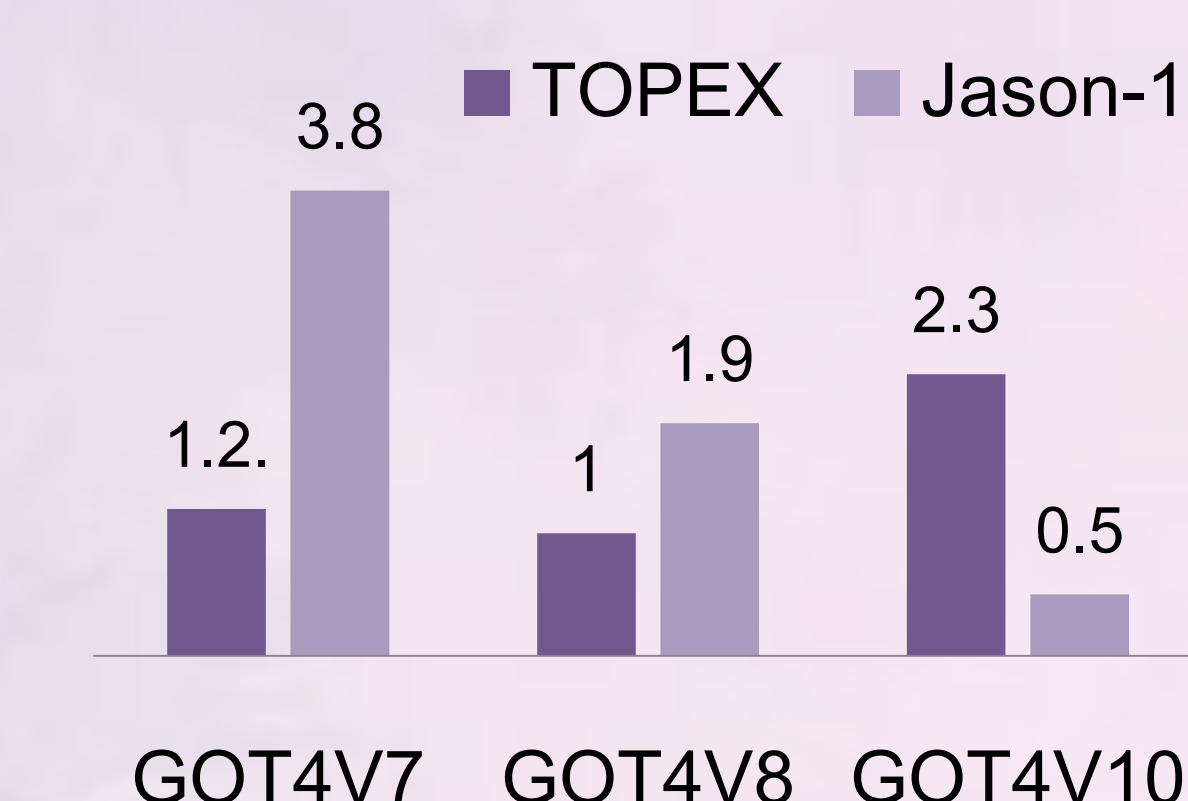


Fig 2: Amplitude of TOPEX and Jason-1 Global MSL 58.77-day signal (mm) with GOT ocean tide correction

Fig 2 and Fig 3 :

- Amplitude of 58.77-day signal on Jason-1 SLA is reduced Globally – and more specifically in the Indian, Pacific and Atlantic oceans – with latest GOT solutions.

- On the contrary, this error is apparently transferred to TOPEX SLA.

Local Analysis

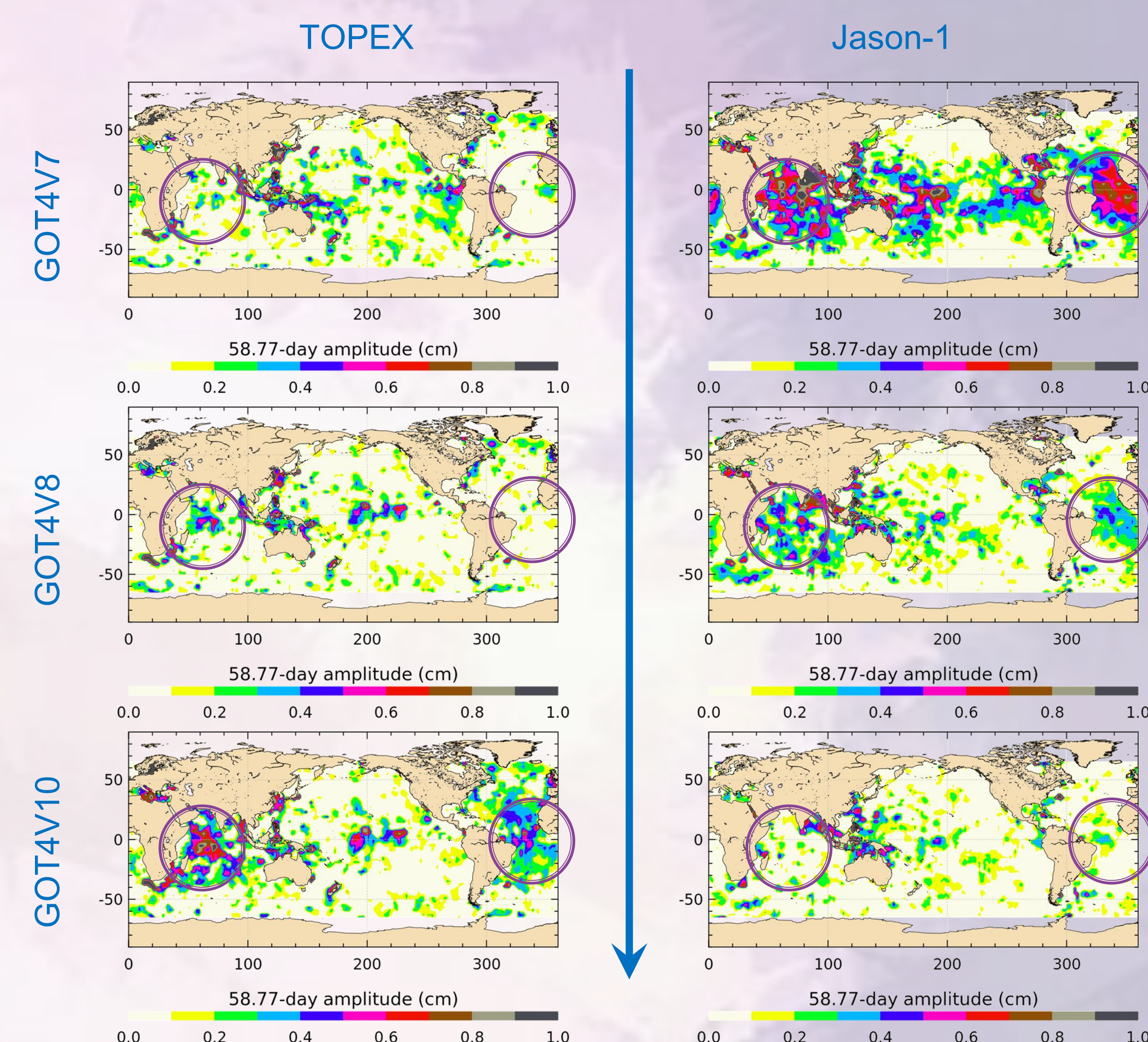


Fig 3: Local amplitudes of TOPEX and Jason-1 SLA 58.77-day signal (mm) with GOT ocean tide correction

Conclusions & Outlooks

- Latest GOT releases are enhancing: Jason-1 and Jason-2 (not shown here) SLAs are improved while TOPEX SLA is degraded.
- This conclusion is in agreement with OSTST conclusions (2010).
- As an outlook, OSTST conclusions (2010) shall be checked at a regional scale.

Issue #2: Reduction of MSL 58.77-day error with FES latest ocean tide solutions

- FES ocean tide products are based on a hydrodynamic model with assimilation of altimetric and in situ measurements.
- They are therefore less sensitive to altimetric errors.
- FES2012 and FES2014 intermediate solution assimilate Jason-1 data which is not the case in FES2004 solution.

Global Analysis

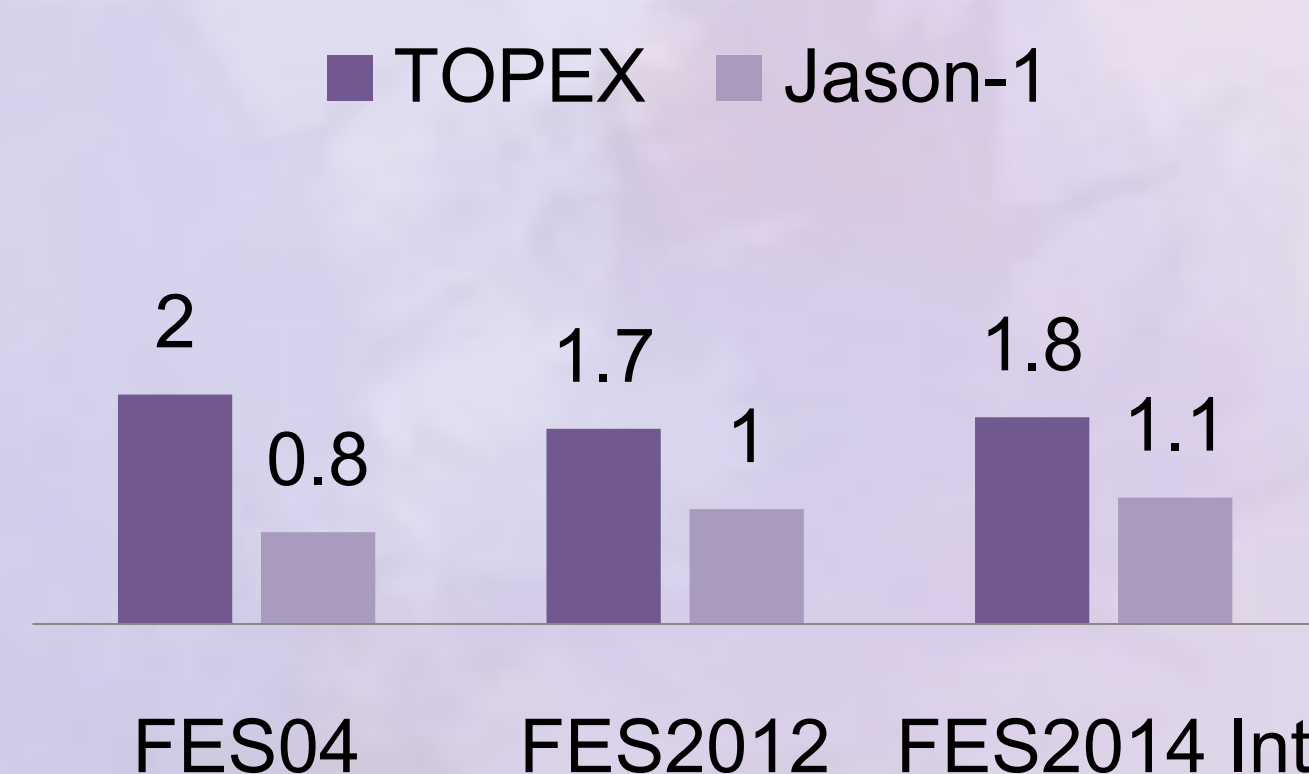


Fig 4: Amplitude of TOPEX and Jason-1 Global MSL 58.77-day signal (mm) with FES ocean tide correction

Fig 4 and Fig 5 :

- Neither significant Global improvement nor degradation on 58.77-day error (within uncertainty margin).

- However, local analysis show a reduction of Jason-1 and Jason-2 SLA error in the Indian, Pacific and Atlantic oceans with the latest FES releases.

- This error is partly transferred to TOPEX SLA

Local Analysis

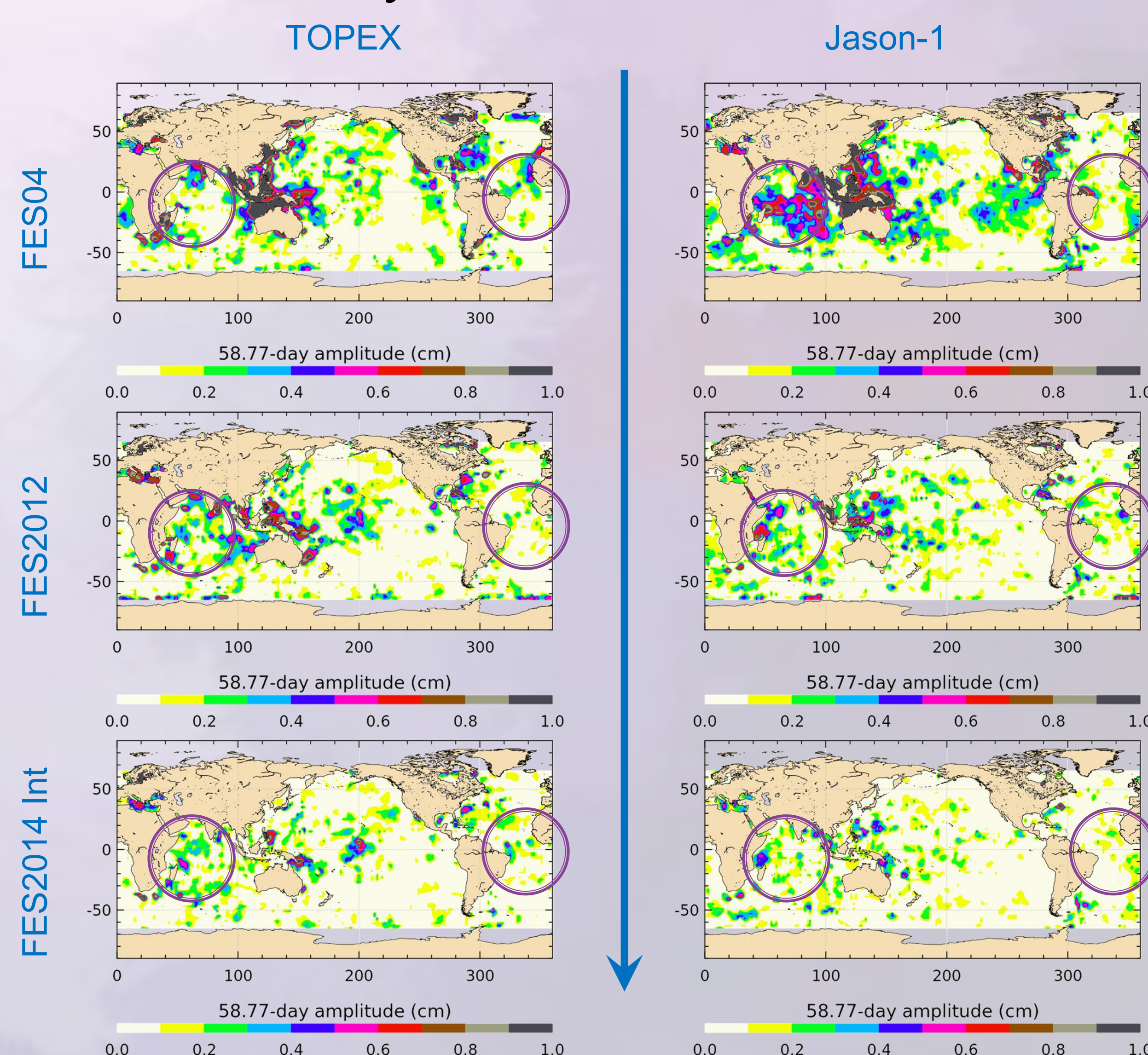


Fig 5: Local amplitudes of TOPEX and Jason-1 SLA 58.77-day signal (mm) with FES ocean tide correction

Conclusions & Outlooks

- FES latest evolutions allow a reduction of the 58.77-day error at a regional scale.
- As with GOT – however to a lesser extent – Jason-1 and Jason-2 SLAs errors are transferred to TOPEX SLA in the latest releases.
- FES seems therefore a good trade off to minimize 58.77-day errors in both TOPEX and Jason SLAs