Aviso one-satellite-based Mean Sea Level reprocessing

In September 2016, the Mean Sea Level (MSL) products have been reprocessed to take into account improvements performed on altimeter standards. The changes impact both the global and the regional one-satellite time series. The Multimission gridded products (and the corresponding Regional MSL trend map) will be reprocessed with the same standards in 2018.

1. Altimeter Standards

The changes to the geophysical corrections have been made according to studies performed within the SALP (Service d'Altimétrie et Localisation Précise, CNES) and SL_CCI (Sea Level - Climate Change Initiative, ESA) projects in order to improve the accuracy of the Aviso MSL indicator.

Table 1 summarizes the changes to the corrections for the three consecutive missions used in the reference Global MSL computation: TOPEX/Poseidon, Jason-1 and Jason-2.

	TOPEX/ Poseidon	Jason-1	Jason-2
Orbit	GFSC STD12/15	GDR-E	GDR-E
Sea State Bias (SSB)		GDR-E	
Ionosphere			SLOOP filter after SSB band C update
Dry troposphere			
Wet troposphere	GPD+ (Fernandes et al. 2015)	JMR reproc	NN correction (3tB)
DAC			
Polar Tide	(Desai et al. 2015)		
Ocean tide	FES 2014		
Mean Sea Surface	CNES-CLS 2015		

Tab. 1: Modified altimeter standards in reprocessed Aviso MSL by comparison to former ones.

2. Impact of the new standards

Fig. 1 below plots the Global Mean Sea Level (GMSL) records with 2014 and 2016 standards along with the difference. Fig. 2 plots the same data but seasonal signals have been removed.

The trends of the GMSL records with 2014 and 2016 standards are estimated to 3.37mm.yr^{-1} and 3.21mm.yr^{-1} respectively with ±0.5 mm.yr^{-1} uncertainty (Ablain et al. 2015). In other word the reprocessing induces a non significant reduction of the GMSL trend by 0.16mm.yr^{-1}. This reduction over the 1993-2016 period is mainly driven by a 0.2mm.yr^{-1} trend reduction over TOPEX/Poseidon era (1993-2002). It is attributable to the use of the GPD+ wet troposphere correction (cf. Tab. 1)(Fernandes et al. 2015). Tidal gauges analyses suggest this trend reduction over TOPEX/Poseidon era is an improvement (Watson et al. 2015).

The switch from TOPEX/Poseidon to Jason-1 occurs in May 2002. The estimated relative bias changes from 5.46 cm (Standards 2014) to 3.90 (Standards 2016) with an uncertainty of 2mm (Ablain et al. 2009). The switch from Jason-1 to Jason-2 occurs in October 2008. The estimated relative bias changes from -7.34 cm (Standards 2014) to -2.26 (Standards 2016) with an uncertainty of 1mm (Ablain et al. 2009)(Zawadzki & Ablain 2016).

A 60-day signal is also detected in the records difference. It is attributed to the change of ocean tide correction in the reprocessed product (Zawadzki et al. n.d.).

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Further information

AVISO+: new interface to plot the MSL and download the product.

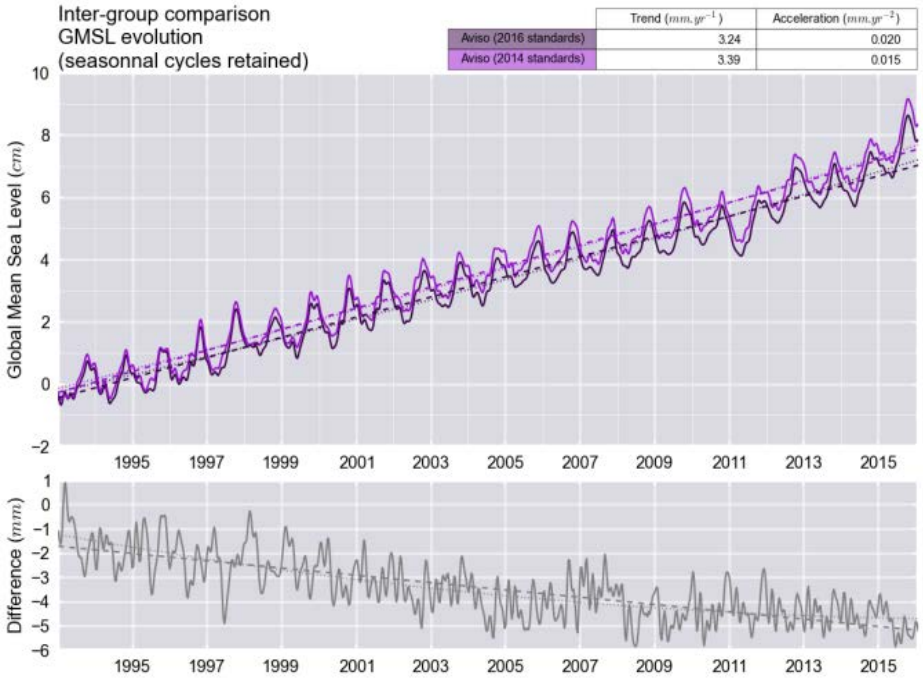

Fig. 1: (upper panel) Global MSL continuous records with old (purple) and new (grey) standards. A 2-month low pass filter and the GIA correction are applied. (lower panel) Difference between old and new Global MSL continuous records (no filter).

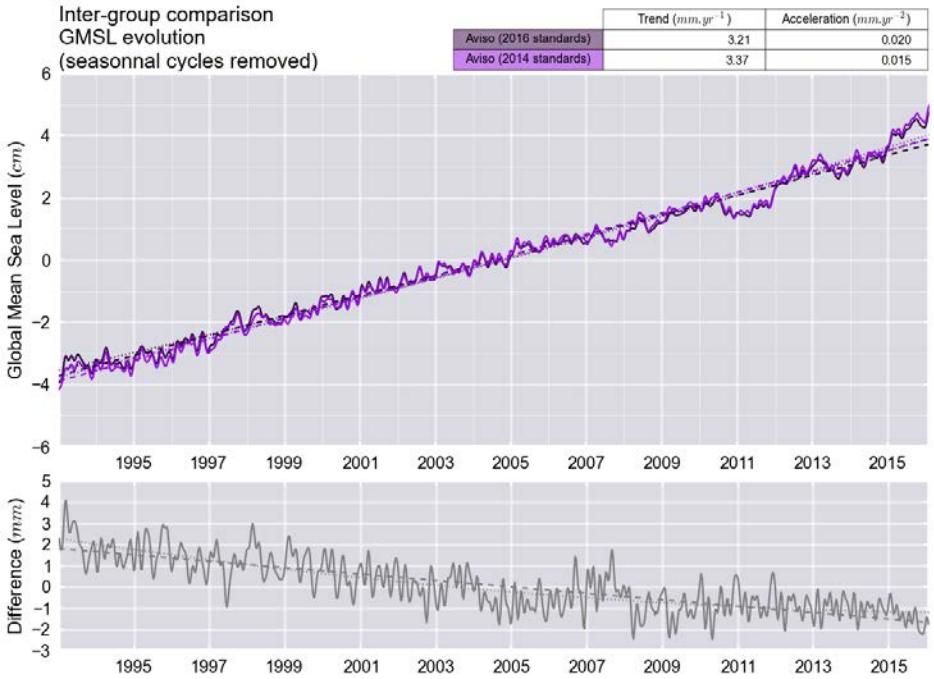

Fig. 2 : (upper panel) Global MSL continuous records with old (purple) and new (grey) standards. A 2-month low pass filter and the GIA correction are applied. Biases and seasonal signals are removed. (lower panel) Difference between old and new Global MSL continuous records (no filter).