

Ssalto/Duacs system processes data from all altimeter missions to provide a consistent and homogeneous catalogue of products for varied applications, both for near real time applications and offline studies in the framework of the SALP/CNES and MyOcean/SL TAC project.

We present here a focus on the **recent and future improvements of the SSALTO/DUACS production**. They concern the coming data reprocessing as well as the NRT production.

## Secure the altimeter constellation

DUACS system accuracy and resilience are strongly depending on the number of altimeter data available. Lower quality measurement (orbit determination) combined with non-centered processing time-windows make the NRT processing strongly sensitive to the number of altimeter missions involved in the system. The sensitivity of the system was clearly underlined by Pascual and al. (2008). If two altimeters are acknowledged as the bare minimum needed to observe mesoscale signals in delayed time (offline) maps, three or even four missions are needed to obtain equivalent accuracy in NRT.

During the last years, important changes occurred in the constellation, and **at this time DUACS is using three different altimeters**: Jason-2 that is the reference mission; Cryosat that was introduced in early 2012, just four month before the end of Envisat; Altika, introduced mid 2013 only few days after the end of Jason-1.

System and algorithm upgrades are being worked on to use additional dataset in the multi-satellite system as soon as they are available.

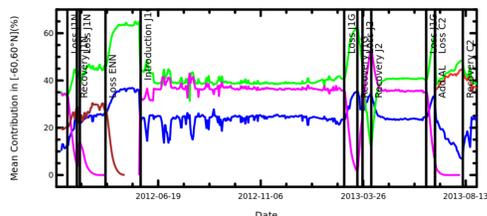


Fig : Evolution of the contribution (DFS) of the different altimeter to the merged product.

## Improved altimeter standards

Concerning past data: Envisat has been reprocessed in GDR-2.1 with improved standards and Jason-2 GDR-D reprocessing is also finished. For other altimeters, improved parameters are also available (e.g. improved orbits and DAC solutions for old missions). The new altimetric standards will lead to a more precise observation of the signal at mesoscales as well as climatic scales.

Concerning real time data: Duacs RT products have also been improved with the use of a new real time DAC solution rather than simple Inverse Barometer.

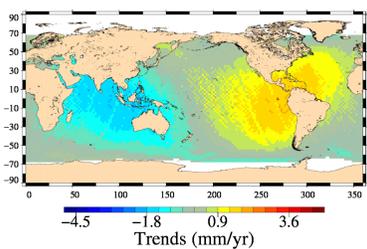


Fig : Regional MSL trends differences between CNES GDR-C (Eigen-GLO4S) and GDR-D (Eigen GRGS) orbit solutions for Jason-1

The improved orbit solution improves the regional Mean Sea Level trend estimation (signature of improved gravity field at basin scales)

VAR(SSh with DAC\_ERA) - VAR(SSh with DAC\_ECMWF)  
Mission tp, cycles 11 to 481

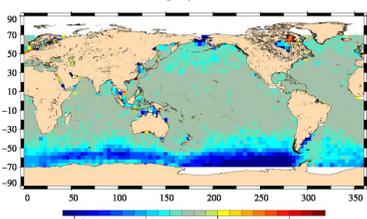


Fig : Maps of SSH variance differences at crossovers using successively the ERA-interim and reference DAC solutions in the SSH calculation for Topex/Poseidon (cycles 1 to 481).

The DAC solution derived from ERA-interim allows reducing the residual variance at cross-overs by 10 cm<sup>2</sup> in the Southern Ocean

## Change of the reference period

The Ssalto/Duacs SL Anomalies products are historically referenced to the 7-year period [1993, 1999]. As nearly 20 years of altimeter measurements are now available it is of high interest to change the reference period for a longer period which will allow us to have interannual signals with more relevant intensities and spatial signatures. It is thus proposed to compute anomalies relatively to the [1993, 2012] period.

### Main Impacts of this change on the products:

- ✓ The reference change will impact the mean of the SLA at regional scales
- ✓ The along track and gridded anomalies will be impacted but not the Absolute products
- ✓ The DT products will be entirely reprocessed in 2013 with this new reference
- ✓ The change will also be implemented on NRT products early 2014. **More information in Aviso website, Newsletter #9 (may 2013)**

Fig : the reference change will impact the mean of the SLA at regional scales

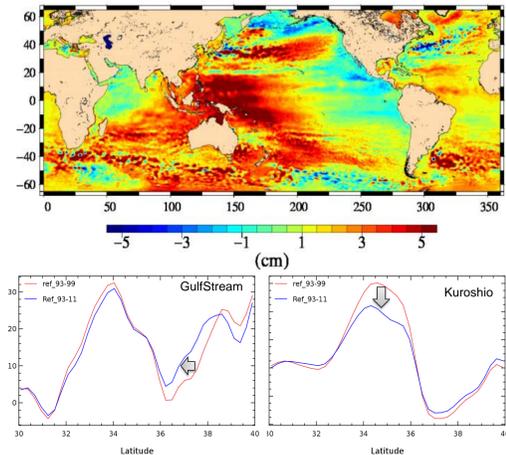


Fig: SLA along a meridional section crossing the GulfStream or the Kuroshio in December 2011. SLA referenced to the [1993, 1999] period (red) and [1993, 2011] period (blue).

Changing the reference period can modify the SLA instantaneous signature of the specific structures of the global surface circulation. It does not modify the Absolute Dynamic Topography.

## Improved data Processing

The data processing, allowing to estimate a calibrated SLA and merge the measurements from the different altimeters in a gridded product, will be reviewed.

The SLA calibration, i.e. correction of the bias between the different altimeters, will be improved in order to take into account the geographically variable part of the bias (DT production).

The parameterization of the merging algorithm will be tuned: new correlation scales, better taking into account the geographical variability of the signal, and tuned a priori measurement errors will also be improved by considering the specificities of the different altimeters.

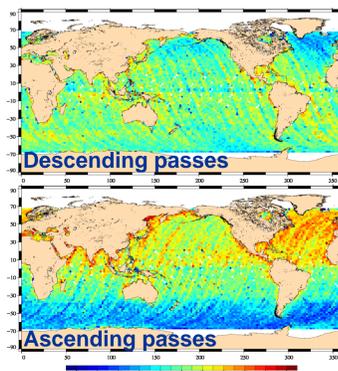


Fig : Map of SLA differences centered on the average between TOPEX and Jason-1 during the Jason-1 verification phase.

The correction of the geographically correlated bias observed between Topex and Jason-1, and between Jason-1 and Jason-2, allows us to estimate more precisely the regional mean sea level trend. Local differences of near 0.3 mm/y are observed with the MSL trend estimated from the products non corrected from the geographical bias.

Moreover along-track products will be processed to optimally observe the mesoscales signals. They will thus be delivered with a **higher spatial resolution**. The measurement noise reduction will be optimally adjusted in order to keep as much as possible the short wave along-track signal.

The SLA maps will be delivered only on a 1/4° Cartesian grids and the 1/3° Mercator maps delivery will be stopped.

VAR(GFO - Merged(J1,EN)) - VAR(GFO - Merged(J1,EN))  
New Correlations - Old Correlations

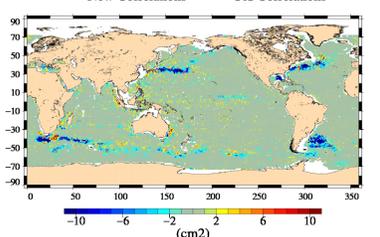


Fig : Maps of SLA, merging Jason-1 and Envisat data, were compared with independent GFO along-track data over the period [2003, 2004]. The figure shows the variance differences of the results obtained when current correlations scales and improved correlation scales are used for the mapping process.

The new version of the correlation scales improves (in blue) the coherence between the SLA maps and independent along-track data. The variance of the differences is reduced by near 10 cm<sup>2</sup> in high variability areas.

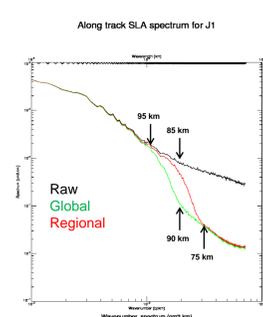


Fig : Power spectrum of Jason-1 data over the Europe area and for year 2008.

The optimisation of the noise reduction processing leads to a better resolution of the short wavelengths. In the European seas, 95 to 85 km wavelengths can be resolved whereas they are nearly absent in the current global product.

## And also ...

The reprocessing of **The Mean Dynamic Topography** is on going. It takes into account the latest Geoid model, an improved Ekman model, and additional in situ measurements. This new version of the MDT will also be referenced to the [1993,2012] period rather than the historical 7-year period.

In collaboration with the MyOcean project, **new regional products** has been developed in Near Real Time conditions : the Arctic and the European Seas were added to the Near Real Time production in 2012.

The evolution of the altimeter products will be completed with **changes in the nomenclature**. The objective is to make easier the identification of the product that correspond to your need.

The data format will also be modified in order to generalize the **NetCDF "CF"** convention for all the products (including grids).

## In Summary

Early 2014 different changes will be included in the NRT products and in a complete reprocessing of DT Products:

- ✓ Change of the reference period
- ✓ Improved standards and processing
- ✓ New regional products
- ✓ New nomenclature and format

PLEASE SEND US YOUR FEEDBACKS!

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