Three-satellite quality level restored in NRT

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Abstract

An overview of the SSALTO/DUACS system is given : key features and processing used to ensure stability, homogeneity and accuracy, Jason tandem performances, upgrades scheduled for 2009/2010 …

Project Overview

Objectives: To provide operational applications with homogeneous and directly usable high quality altimeter data from all missions (Jason-1, Jason-2, T/P, ENVISAT, GFO, ERS1/2 and even GEOSAT). The system uses common processing facilities for global and regional applications. It ensures that upgrades are consistently applied on all products to better serve the altimetry user community.

Delayed Time (DT): The second generation of DUACS-DT products is composed of global data sets of along track and gridded Sea Level Anomaly, Absolute Dynamic Topography, and geostrophic currents, but also of regional-specific products (higher resolution, optimized parameters). DUACS reprocessed all past altimeter data. These delayed time products are regularly updated when new GDR are released.

Near Real Time (NRT): DUACS-NRT provides GODAE and climate forecasting centers with global Near Real Time altimeter data. The products are generated and distributed on a daily basis to reduce the NRT delay.

The DUACS system also provides a long term monitoring of NRT data it has used. Quality Control reports are released twice per week.

Real Time (RT): OGDR/FDGDR Jason-2, Jason-1 and Envisat data (lower quality but faster delivery) were integrated in the NRT system in an experimental way in order to improve the resilience and quality of the system.

Operational Jason tandem in 10 days

The DUACS system was modified to integrate Jason-2 data as reference mission. After a successful experimental phase done during the temporary absence of Jason-1 in August 2008, Jason-2 definitively became the reference mission of the system since January 21,2009. In the early March, after Jason-1 has been moved on its new orbit, data from the latter have been reintegrated in DUACS. Thanks to the excellent consistency of the Jason tandem data, this upgrade was made operational only 10 days after Jason-1 reached its interleaved orbit.

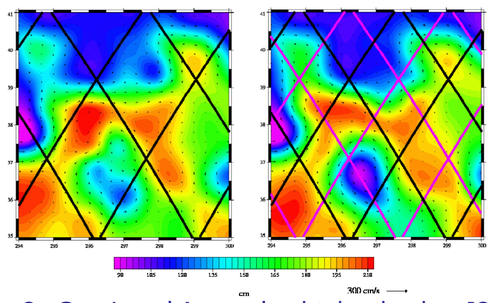


Fig 2 : Sea Level Anomaly obtained using J2 and merging J2 and J1 data. J2 (J1) tracks are presented in black (purple) lines.

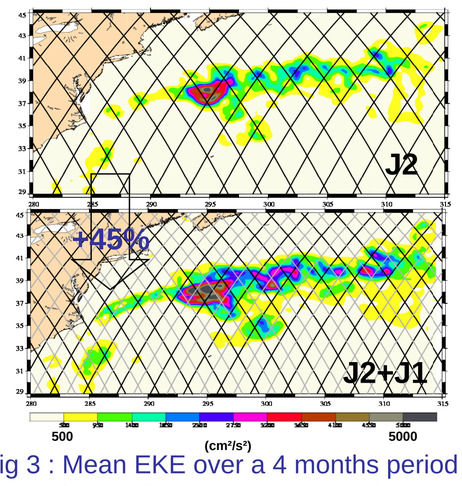
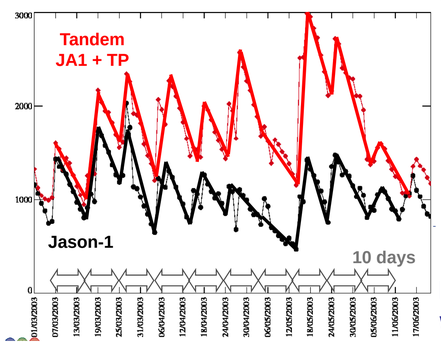


Fig 3 : Mean EKE over a 4 months period (Jason2 vs Tandem maps)

The performances of the multi-satellite system were greatly improved with the Jason-2/Jason-1 tandem. The tandem thus allowed a reduction of the formal mapping error from 60 to 20% of the variance of the signal and assuring an improved restitution of mesoscale structures especially in high energetic areas (Fig. 2) where the mean gain in EKE is ~45%. This increase can locally reach more than 75% (Fig. 3).

Moreover, with NRT processing, SLA observed with the Jason tandem shows a temporal coherency strongly improved in comparison to historical Jason-1/Topex tandem. Actually, the 10-day repetitivity of each of the satellite affect the signal restitution with an artificial 10-day cycle. It is strongly reduced thanks to the temporal shift between Jason-1 and Jason-2 satellites (Fig. 4 to 6).

Fig 4 : Mean EKE on a 500km wide zone (Jason2 vs Jason2/Jason1 tandem).



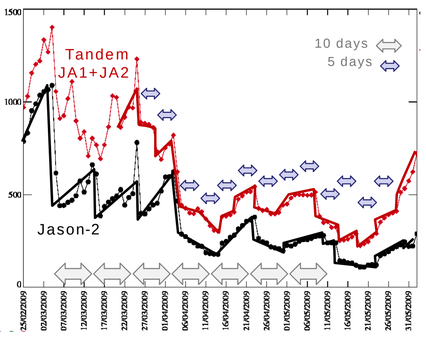


Fig 5 : Mean EKE on a 500km wide zone (Jason1 vs Jason1/Topex-Poseidon tandem)

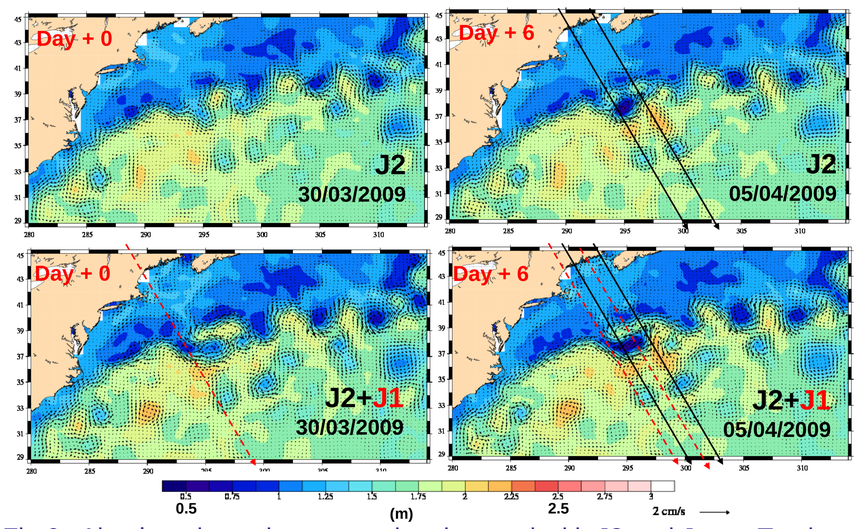


Fig 6 : Absolute dynamic topography observed with J2 and Jason Tandem.

Processing Upgrades 2008-2009

Key Performance Indicators (KPI) : In the context of the MyOcean project, preliminary studies were carried out to define a new way to provide to the users a quick and easy access to the system performances with the release user-friendly KPI. They gather most of the quality information available, from upfront data delivery delays to SLA statistics. (Fig. 7)

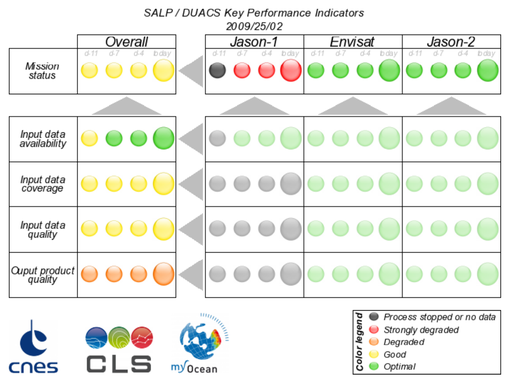


Fig 7 : example of SALP KPI Produced during the transition period of reintegration of Jason-1into DUACS

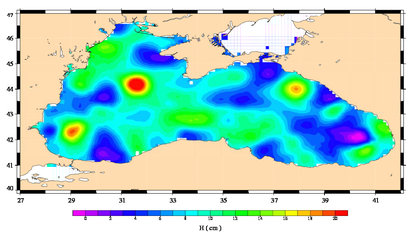


Fig 8 : NRT Sea Level Anomaly in the Black Sea. (Map of the 04/06/209)

Regional products : Efforts were done to improve quality and availability of regional products. Black Sea products, already distributed in DT are now added to the NRT product generation for an operational demonstration. (Fig 8)

New Orbit Error reduction process : System performances also depend on quality of the missions used, and more precisely quality of the reference mission currently used for multi-mission cross-calibration processing. In order to minimize the impact of an anomaly on the reference mission, a new orbit error (OE) reduction scheme is being developed in order to take avantage of the improved POD with existing and future mission, since no mission brows the obsolute truth. It is based on multiple reference missions rather than single reference mission.

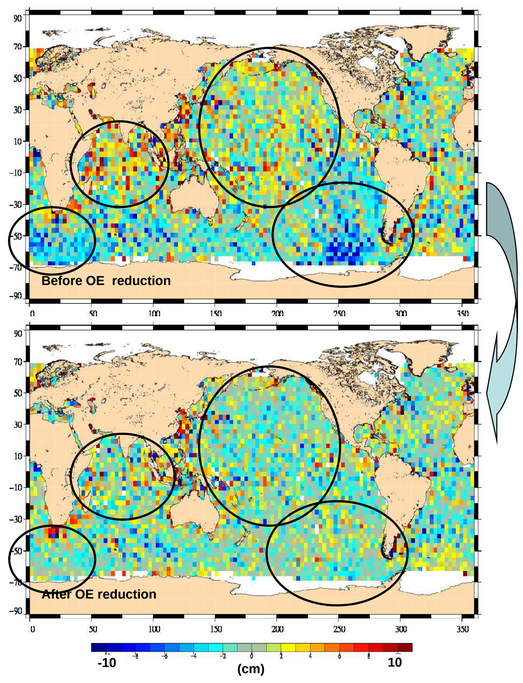


Fig 9 : EN/J1 crossover SLA differences before (up) and after (down) OE reduction based on new multiple reference method.

No OE correction	OE correction on both J1 and EN	OE correction on Envisat only	OE correction on Jason-1 only
7.35	6.14	6.92	6.62

Fig 10: EN/J1 crossover SLA standard deviation before and after OE reduction based on new multiple reference method and applied on both or only one of the satellite.

First results show that this new OE leads to a significant reduction of crossover SLA variance even if only one satellite is corrected (Fig. 9 & 10). The performances are even slightly better than with the current OE correction (monomission referenced).

More details on the poster “SSALTO/DUACS: Innovate method to reduce the orbit error simultaneously on several satellites”.

System resilience and limitations

DUACS system accuracy and resilience (ex: against data gaps or temporary delay) are depending on number of altimeter data available. Lower quality measurements (orbit determination) combined with non-centered processing time-windows make the NRT processing more sensitive to the number of altimeter missions involved in the system. If two altimeters are acknowledged as the bare minimum needed to observe mesoscale signals in DT (offline) maps, three or even four missions are needed to obtain equivalent accuracy in NRT (Pascual & al., 2008).

Integration of OGDR data and the recent introduction of Jason-2/Jason-1 tandem increased the resilience and precision of the system. A better restitution of ocean variability is observed, especially in high energetic areas (Fig. 1).

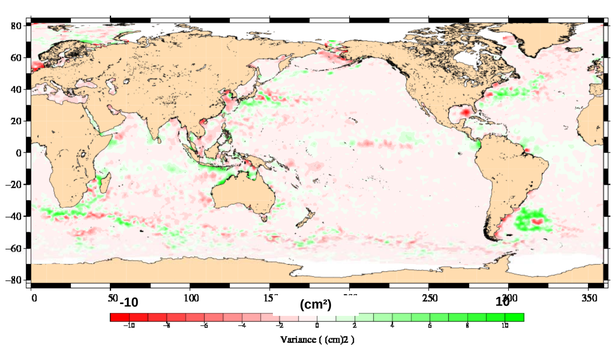


Fig 1 : MSLA variance added when OGDR products are combined with IGDR data in NRT processing (observed on current operational data from July 2007 to July 2008).

At this time DUACS is using three different altimeters. Cryosat is scheduled for launch in November 2009. It may provide opportunity data on ocean. System and algorithm upgrades are being worked on to use this additional dataset in the multi-satellite system by mid-2010 (pending green light from the CalVal phase)

More information on the AVISO website
www.aviso.oceanobs.com