# SSALTO DUACS

# 15 years of precise and consistent multi-mission altimetry data

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## A bstract

An overview of the SSALTO/DUACS system is given : Project overview and architecture, Processing used to ensure stability and homogeneity and accuracy, Products and users, Upgrades scheduled for 2006 …

## P roject Overview

**Objectives**: to provide operational applications with homogeneous and directly usable high quality altimeter data from **all** missions (Jason-1, T/P, ENVISAT, GFO, ERS1/2 and even GEOSAT).

The system uses common processing facilities (see Fig 1 & 2) for global and regional applications. It ensures that upgrades are consistently applied on all products to better serve the altimetry user community.

**Delayed Time:** In 2005 the SSALTO/DUACS system has performed a complete re-analysis of all altimeter data (6 missions) with the corrections, models and references recommended for the new generation of Jason/ENVISAT GDRs, as well as the best cross calibration algorithms.

It is the first time in altimetry history that an homogeneous and consistent merging of all missions is carried out.

**Near Real Time:** Twice per week, DUACS provides GODAE and climate forecasting centers with global Near Real Time altimeter data (see Fig 3). Regional products are delivered on a daily basis to operational projects such as MFSTEP or MERSEA.

The DUACS system also provides a long term monitoring of NRT data it has used. Quality Control reports are released twice per week
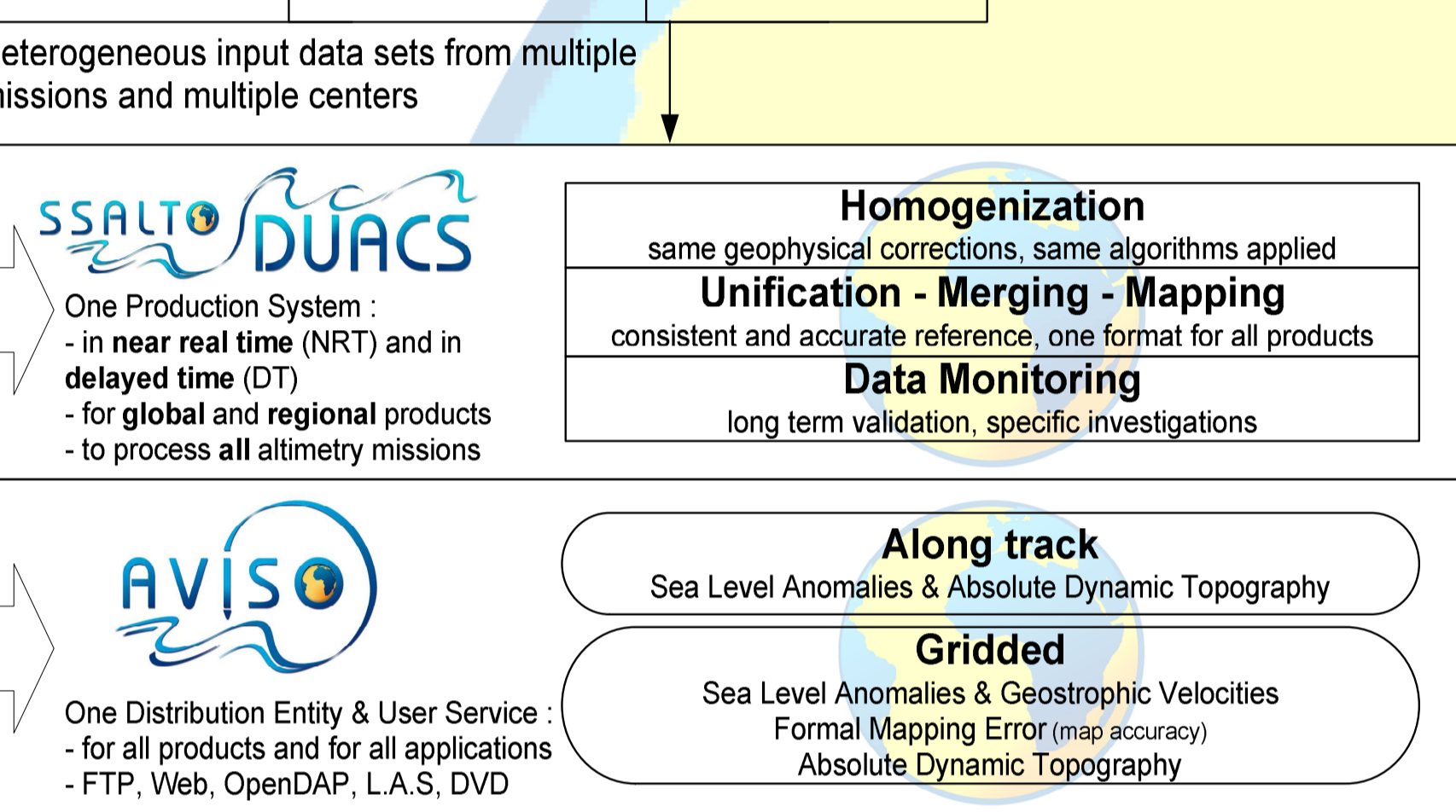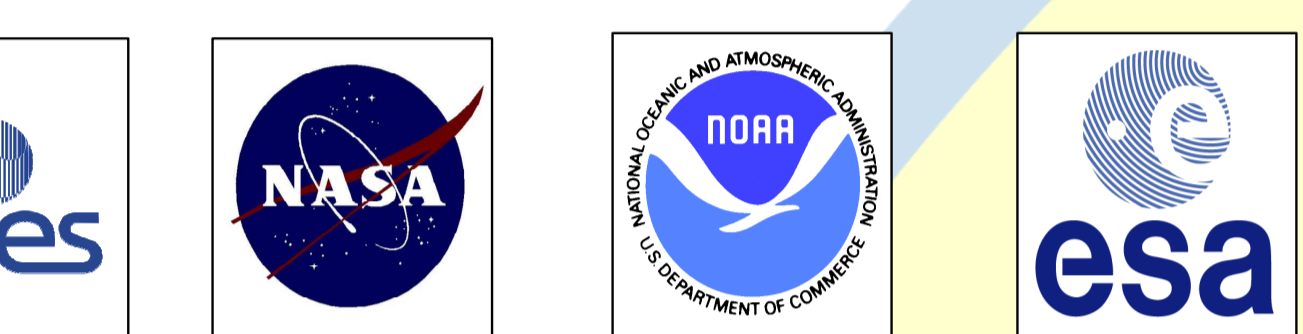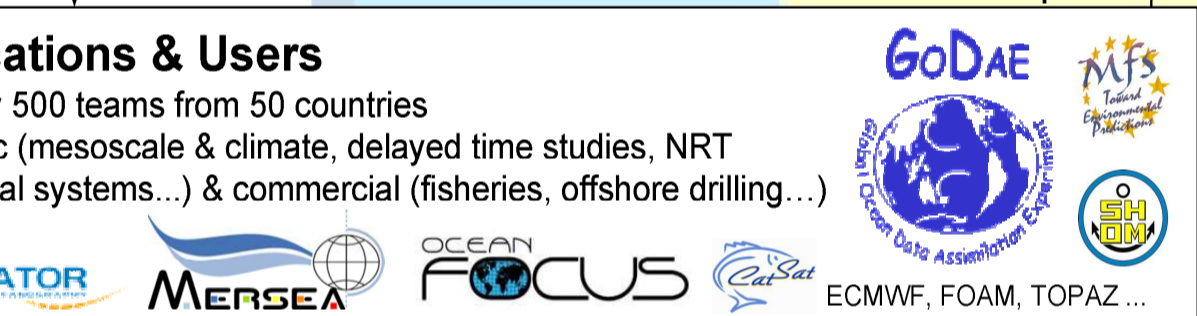
A unique system for near real time and delayed time altimetry products based on all missions: T/P, Jason, ERS, ENVISAT, GFO and GEOSAT



Fig 1 : DUACS Keywords

Fig 2 : DUACS and AVISO, a user-driven altimetry service



Fig 3 : Global MSLA product (upper figure) and zoom on the Absolute Topography and Currents in the Gulf Stream (lower figure)

## B etter Products

The current DUACS products are based on the 2005 reprocessing of all altimeter data since 1992, using state-of-the-art corrections, models, and algorithms.

This 13 year series uses a full sampling of up to four satellites (see Fig 9) for a significant improvement of the observing capability of altimetry (see Fig 8).

Merging more missions with better processing significantly improved the comparison of altimeter and in-situ data (see Fig 6 and Fig 7).
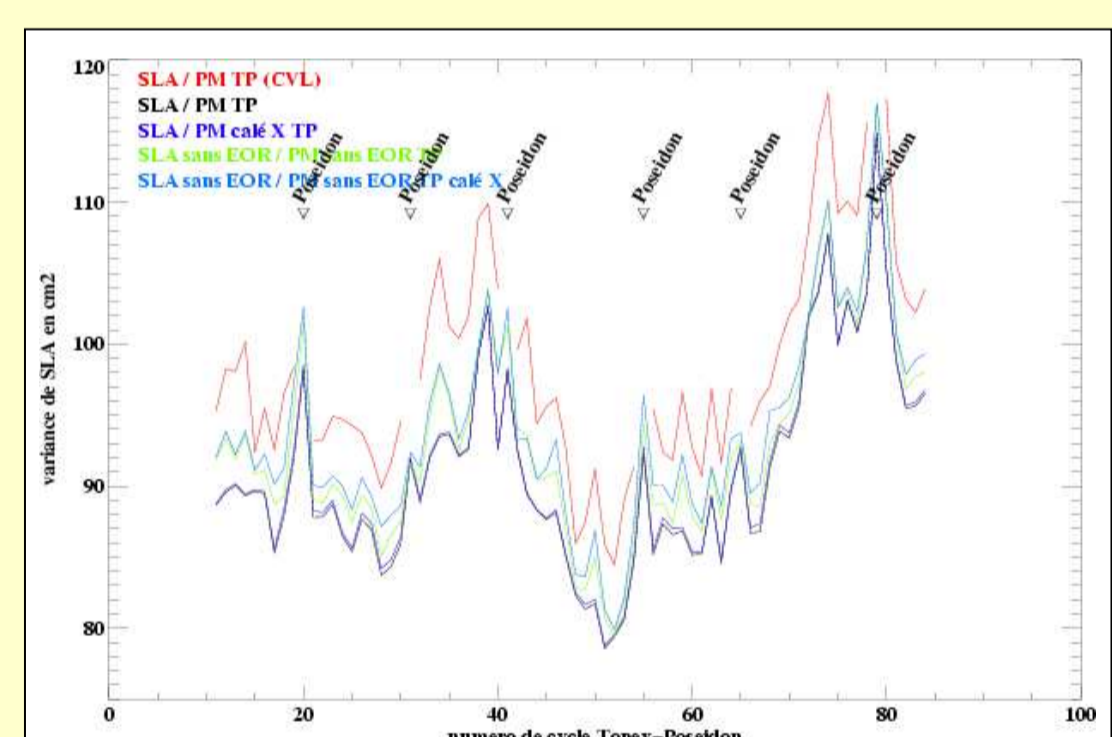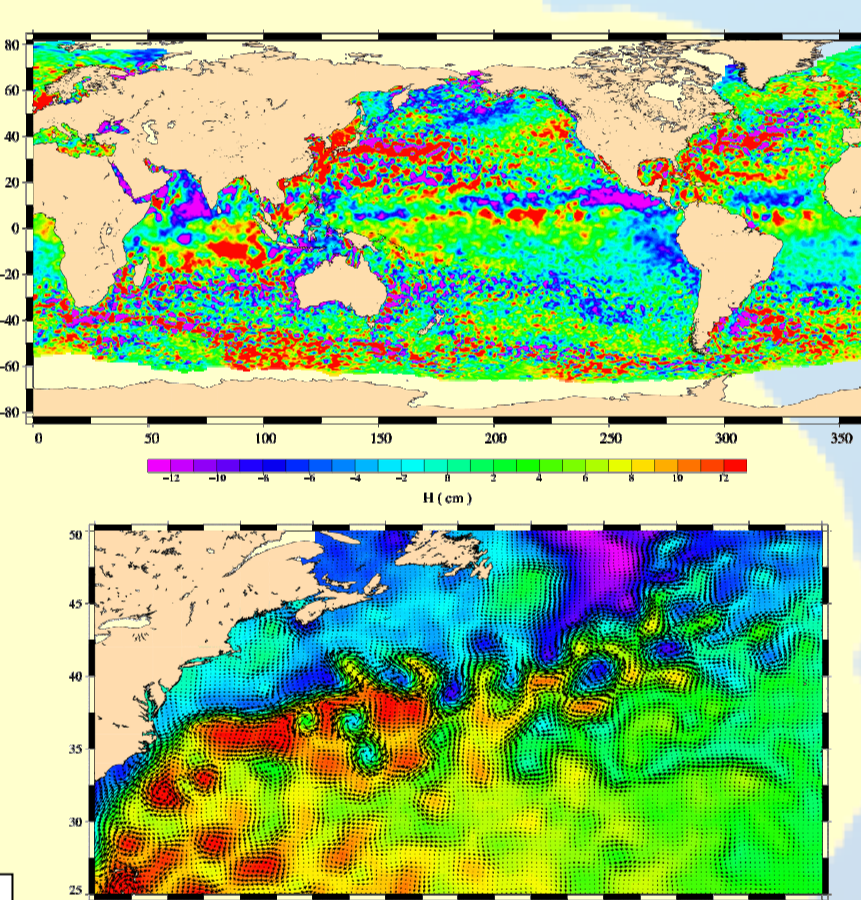
Fig 5 : Removing variance artefacts with new processing. SLA variance for old products (red), and future products (black, dark blue) with new mean profiles. Impact of orbit error reduction (light green, light blue).

| | 2 missions | 4 missions |
|---|---|---|
| MSLA v1 | 46.7% | 35.3% |
| MSLA v2 | 36.7% | 29.7% |

Fig 6 : Mean square differences between tide gauge data and old (v1) and new (v2) generation of MSLA products (% of TG variance). Courtesy of Pascual et al.
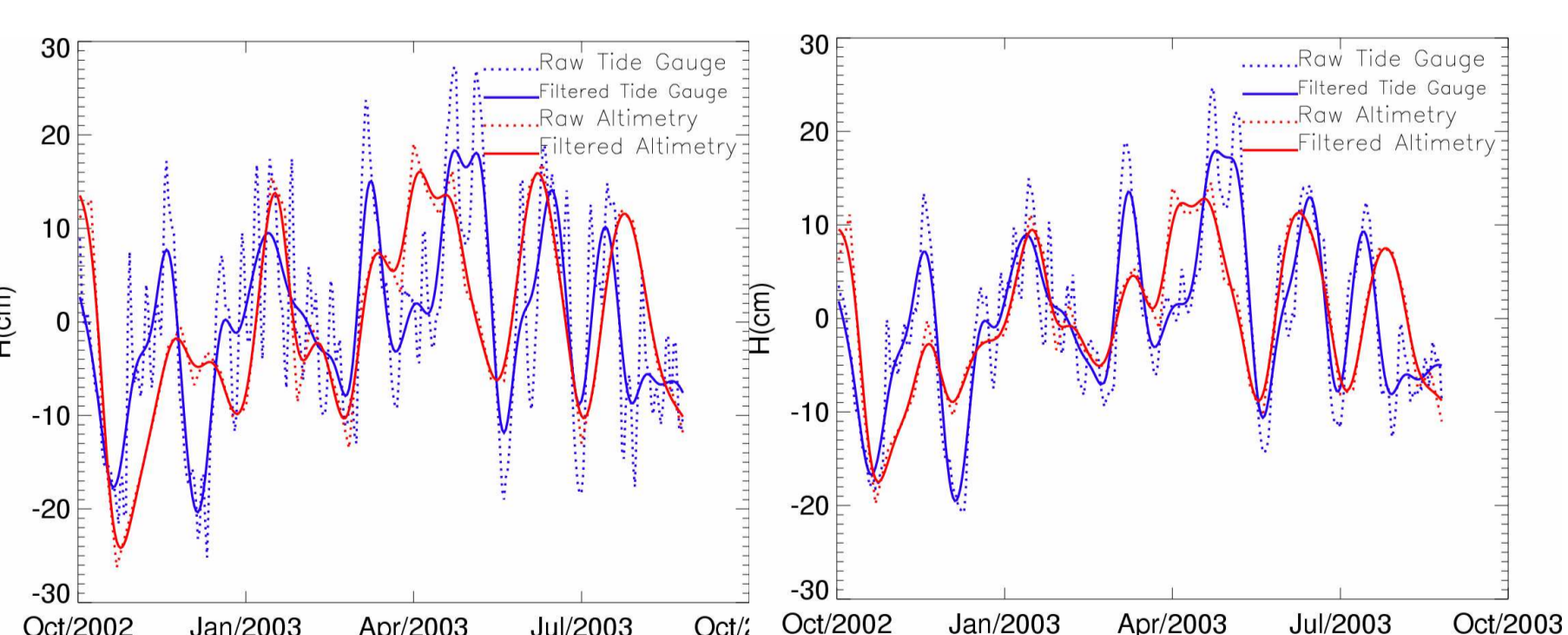
Fig 7 : Comparison of SLA and Townsville tide gauge with old (left) and new (right) generation of DUACS maps. Courtesy of Pascual et al.
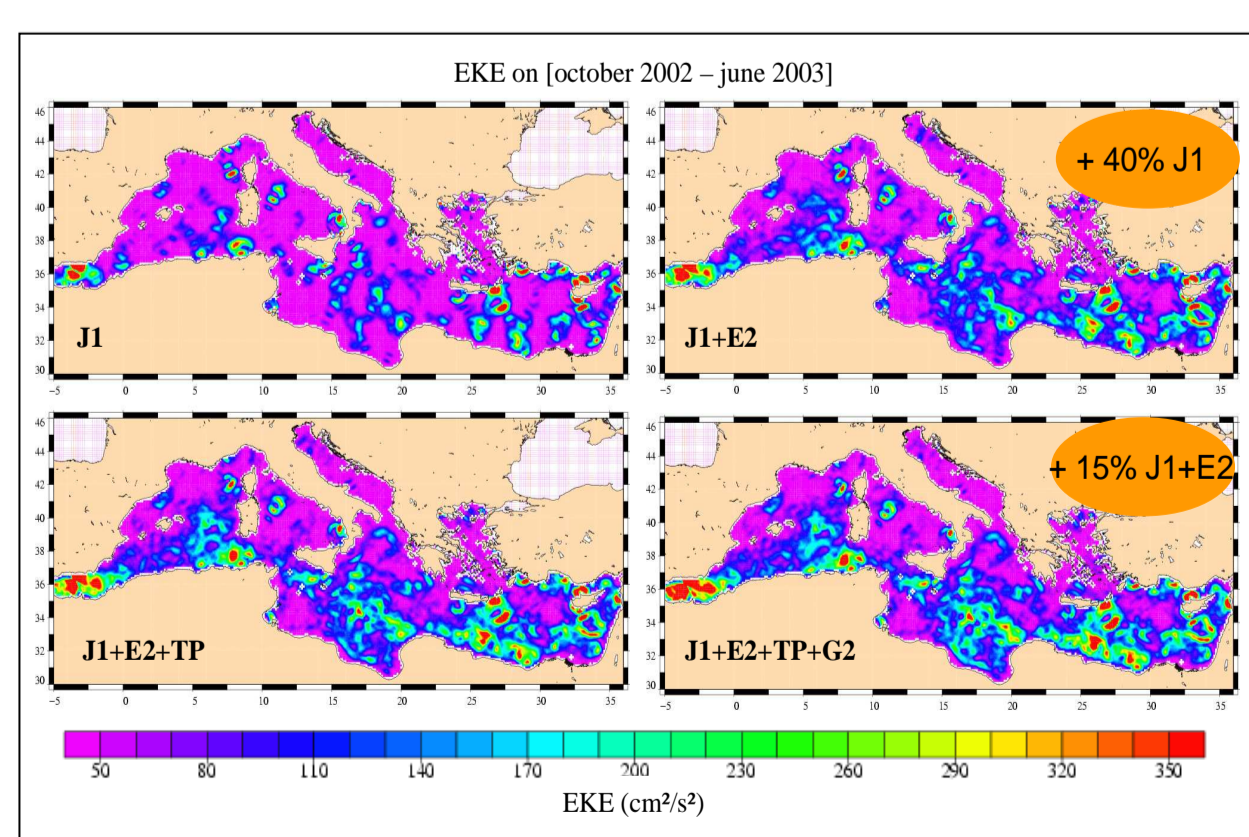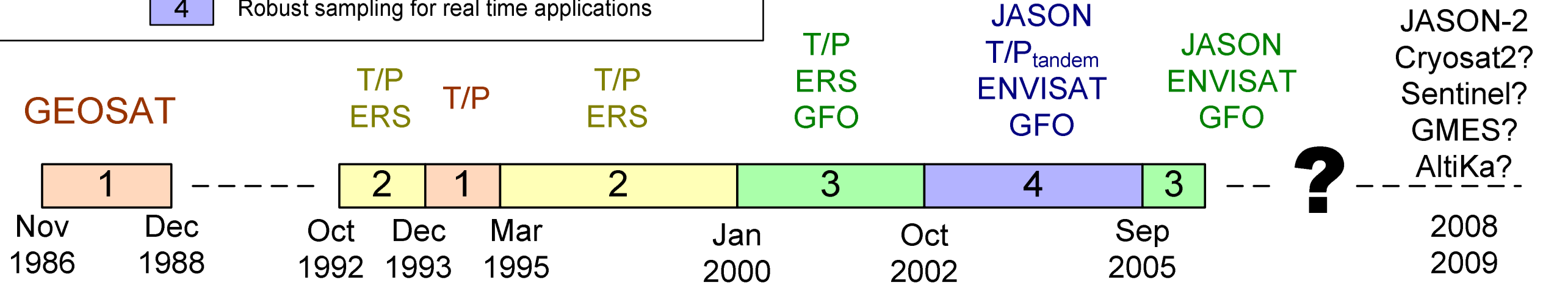
Fig 8 : Merging multiple satellites significantly improves our ability to study the EKE. Illustration on the Mediterranean Sea. Courtesy of Pascual et al.

## B ehind the Scene

The DUACS processing engine is intricately linked with Cal/Val activities carried out by CLS and CNES with support from ESA. End users benefit from this synergy with systematic detailed analyses, off-line studies, software upgrades... Using a common base of algorithms, corrections, software, tools, and data bases ensures that DUACS products take into account the latest recommendations for altimeter processing (see Fig 4).
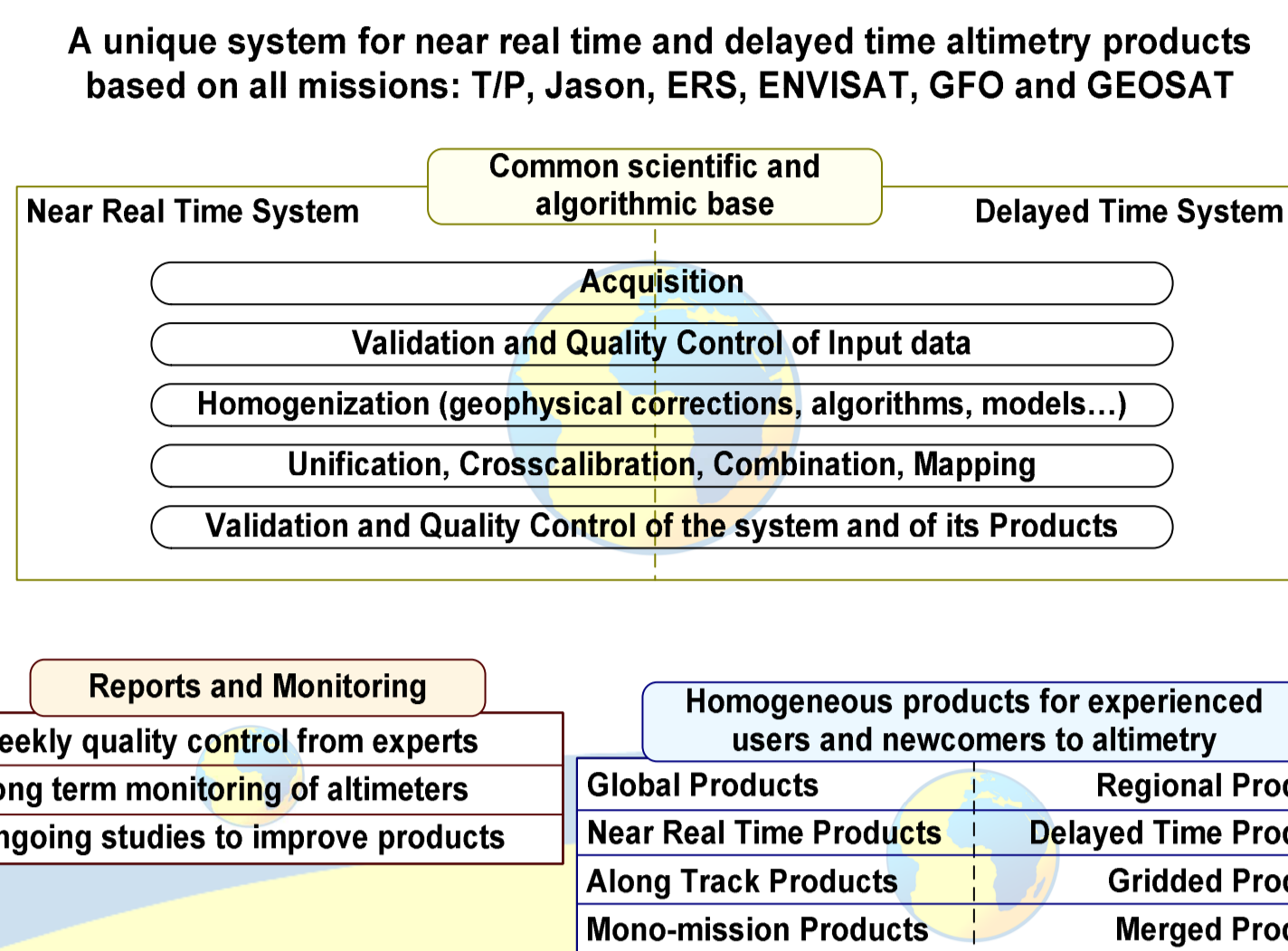
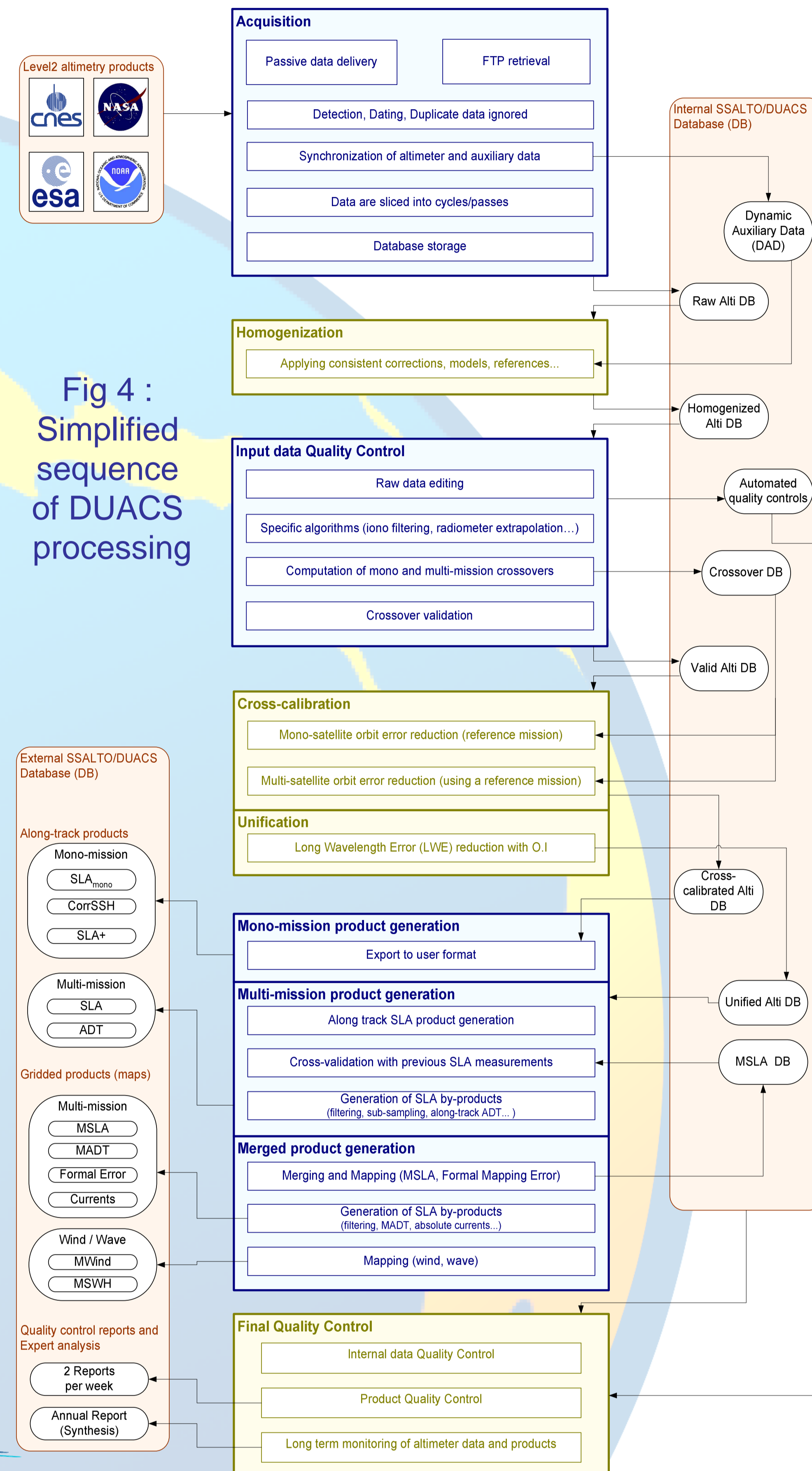Fig 4 : Simplified sequence of DUACS processing



## P rocessing Upgrades 2006

**Data delivery delay:** user feedback proved that data timeliness was critical for some applications. As a user-driven system DUACS will be upgraded to meet these user requirements:

❖ The offline products used to be updated every 4 to 6 months. As of 2006, they will be updated every month (upon reception of new data)

❖ The main NRT product generation is currently activated twice per week. It will be performed on a **daily** basis to reduce the NRT delay.

❖ In an effort to give satisfaction to applications incompatible with the current IGDR delay (2/3d), preliminary work on fast delivery altimeter data (<10h) will be carried out to combine the accuracy of NRT data and the innovative information available in Real Time data sets.

**Continuous improvements on DUACS in 2006 :**

❖ A new 7-year mean dynamic topography (**MDT**) has been computed using GRACE data (Rio & al, 2005). DUACS will use this MDT in early 2006 to produce better ADT data (see Fig. 3). To prevent potential discrepancies between old and new ADT, a complete reanalysis of existing data sets will be carried out.

❖ An extensive computation of new mean profiles (with the latest corrections) will be carried out to improve the SLA quality (see Fig 5). New processing will be used for coastal areas as recommended for the MERSEA project.

❖ User interfaces will be consolidated with an easy and browser-controlled access to the OpenDAP (gridded and along-track data).

❖ And more… The next upgrade could be based on YOUR input.

Fig 9 : Altimeter sampling, applications and risks

**Color Legend**

| 1 | Insufficient for offline meso-scale applications |
|---|---|
| 2 | Minimum for off-line applications |
| 3 | Robust for offline applications (barely for real time) |
| 4 | Robust sampling for real time applications |

| GEOSAT | T/P ERS | T/P | T/P ERS | T/P ERS GFO | JASON T/P_tandem ENVISAT GFO | JASON ENVISAT GFO | JASON-2 Cryosat2? Sentinel? GMES? AltiKa? |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 1 | 2 | 3 | 4 | 3 | ? |
| Nov 1986 - Dec 1988 | Oct 1992 - Dec 1993 | Mar 1995 | | Jan 2000 | Oct 2002 | Sep 2005 | 2008 2009 |

More information on the AVISO website
**www.jason.oceanobs.com**
**www.cls.fr/duacs (mirror)**