SSALTO/DUACS : High precision quartet in 2004

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Abstract

An overview of the SSALTO/DUACS Near Real Time (NRT) multiple satellite processing system is given : input data, processing needed to ensure homogeneity in Sea Level Anomaly (SLA) products based on heterogeneous altimeter data sets. The main applications and users are described, as well as the evolutions that one may expect in 2004.

Input Data

To produce SLA and MSLA in Near Real Time, the SSALTO/DUACS system uses the latest high-quality altimeter data based on **CNES**, **ESA**, **NASA**, and **NOAA** products.

Data Source	Mission/Model	Data Type	Delay	Robustness
CNES/NASA	JASON	IGDR	24/48h	Operational
ESA/CNES	ENVISAT	IGDR	48h	Operational
NOAA	GFO	IGDR	72h	Best Effort
NASA/CNES	T/P	IGDR	>72h	Best Effort

SYSTEM OVERVIEW

INPUT DATA

Heterogeneous input data sets from multiple missions and centers

SSALTO/DUACS

- ACQUISITION
- HOMOGENIZATION
- PRODUCT GENERATION

Homogeneous products for experimented users and newcomers to altimetry

PRODUCTS

Processing

The main processing steps of SSALTO/DUACS are :

- Acquisition of altimeter data and auxiliary data
- Product homogenization : update with the state of the art corrections, models…
- Complex Data Editing (threshold, splines, slope detection…)
- Orbit error reduction through global crossover minimization
- Local inverse method to reduce long wavelength errors
- Production of along-track Sea Level Anomaly (SLA)
- Mono and Multi-satellite Mapping (MSLA product)
- Detailed Quality Assessment (Daily & Weekly Reports)
- Off-line validation (comparison with delayed mode data)
- Wind and Sea Wave Height data available in real time (Fig. 1)

Figure 1 : The hurricane ISABEL's signature can be seen on altimetric measurements in Near Real Time : wind speed map based on Jason-1 data from SSALTO/DUACS (centered on September 15, 2003).

Long Term Monitoring of NRT data

Beyond the day to day quality assessment needed to ensure its high quality NRT data delivery, the SSALTO/DUACS system also provides a long term monitoring of NRT data it has processed to detect anomalies, drifts and discontinuities. This may trigger further investigations on NRT and delayed mode data when needed.

Figure 2 : Attitude issues on GFO. Daily average of the attitude field in IGDR products (based on waveform information) from late October 2002 to September 2003. Y range is from 0.08 deg to 0.15 deg

Twice a week, the following products are generated by SSALTO/DUACS :

- Along-track Sea Level Anomalies (SLA)
- High resolution Maps of SLA (MSLA) and their formal errors.

These products are distributed by the AVISO user service on FTP, Web, and through a Live Access Server (a poster on this feature is available). SSALTO/DUACS products are available for scientific applications, and data older than 30 days are available for all applications.

Figure 3a : Screenshot from the DUACS Website. http://www.aviso.oceanobs.com/duacs

Figure 3b : Screenshot from the Live Access Server feature of the AVISO User Service Website. http://las.aviso.oceanobs.com/

Applications and Users

The main objective of SSALTO/DUACS is to provide operational and scientific NRT applications with directly usable high quality NRT altimeter data. Current applications include GODAE (MERCATOR, FOAM, TOPAZ) and MFS models, seasonal and climate forecasting centers, offshore and fisheries…

Using common processing facilities to jointly serve scientific (e.g. scientific cruise optimization), operational (mesoscale and climate) and commercial customers has many advantages and benefits to all users.

Figure 4a : APPLICATION ON GODAE Sea level and ocean circulation forecast from the first MERCATOR prototype.

About 30 systems from 30 countries are currently using SSALTO/DUACS products. This number has been growing steadily since the beginning of the project (about 1 or 2 new users per month).

The Live Access Server provides all users with gridded data older than 30 days. The number of users has been increasing quickly since its opening (January 2003). More than 1000 maps per month are currently distributed through the AVISO Live Access Server. The DUACS website receives about 2000 hits and 200 visitors per month.

Figure 4b : NRT Map of SSH based on Jason ENVISAT and GFO data (Faroe Island & Shetland Island) used as a prototype for offshore applications (EMOFOR project).

Figure 4c : CLIMATE APPLICATION - Real time monitoring of the 1997/1998 El Nino event.

Figure 4d : COMMERCIAL APPLICATION - Screenshot from on-board software CATSAT : displaying SSALTO/DUACS MSLA+Velocities.

Enhancements and Upgrades

From the initial duo to the high precision quartet

1997

T/P & ERS-2

2001

T/P & ERS-2 & GFO

2002

T/P moved to its current ground track (tandem mission). Mean profile no longer available to compute high precision (M)SLA.

Jason-1 & ERS-2 & GFO

2003

Loss of ERS-2 recorders

End of the global altimetry mission on ERS-2

Jason-1 & ENVISAT & GFO

2004

Cross-calibrat° J1/TP and Mean Profile developed for T/P (new ground track) ⇒ T/P SLA can be produced again

Jason-1 & T/P & ENVISAT & GFO

SSALTO/DUACS IS READY TO USE THE HIGH PRECISION ALTIMETER QUARTET

Upgrades in 2003/2004

In 2003, the main upgrades were :

- Second production per week
- ERS-2 replaced by ENVISAT
- Live Access Server
- Anonymous FTP for data older than 30d
- Start of the long term monitoring of NRT data

Upgrades scheduled for 2004 :

- New mean profile for T/P
- T/P back in the system (4th mission)
- MDT of ENACT (see below)
- Use of the latest corrections and models chosen for Jason or ENVISAT
- Use of GIM ionosphere correction if GIM TEC grids are available in NRT.

Figure 5 : MSLA map based on J1 data (top) or J1+TP data (middle) compared to independent measurements from ERS-2 (bottom)

Mean Dynamic Topography

As part of the EC ENACT and MERCATOR projects, a 7-year mean dynamic topography (MDT) has been computed.

The SSALTO/DUACS system will use this MDT in early 2004 to produce absolute dynamic topography measurements based on its current (M)SLA products.

Figure 6 : Absolute dynamic topography using the CLS mean dynamic topography (Rio et al.) and DUACS MSLA products.

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