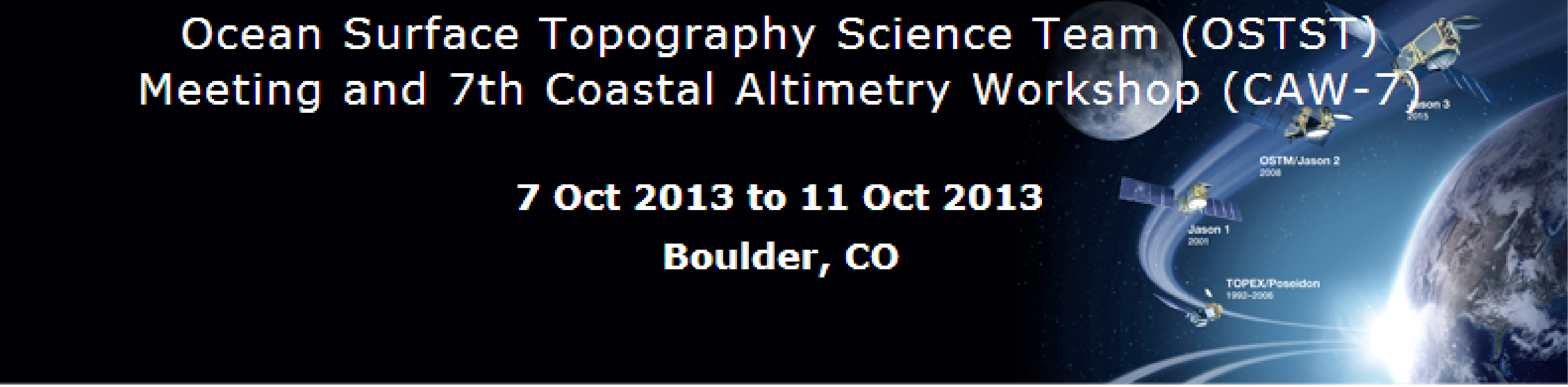


Near Real Time Products & Applications OSTST 2013, Boulder

Poster Summary

Posters are shown in Grand Ballroom (level 2)

The assimilation of CFOSAT synthetic wave data in the wave model MFWAM

L. Aouf[(1)], J-M. Lefèvre[(1)] and D. Hauser [(2)]

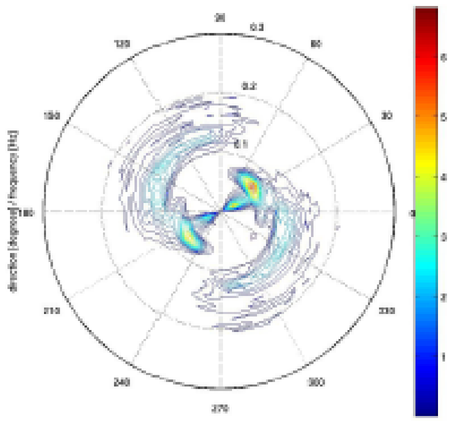
[(1)] Météo-France [(2)] LATMOS/IPSL/CNRS

Poster 10

MOTIVATION:

Perform OSSE's with synthetic data from SWIM instrument provided by FAWASSI (CNES) : in preparation to the CFOSAT mission. Evaluate the impact of using multi sources of wave observations (RaR, SAR, altimeters).

Wave spectrum from FAWASSI



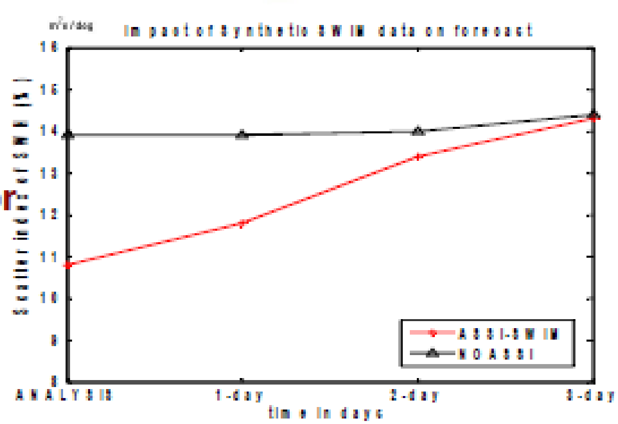
Methodology :

Truth sea state is obtained with analysed wind field, however the first guess is generated by using forecasted winds disturbed with random errors.

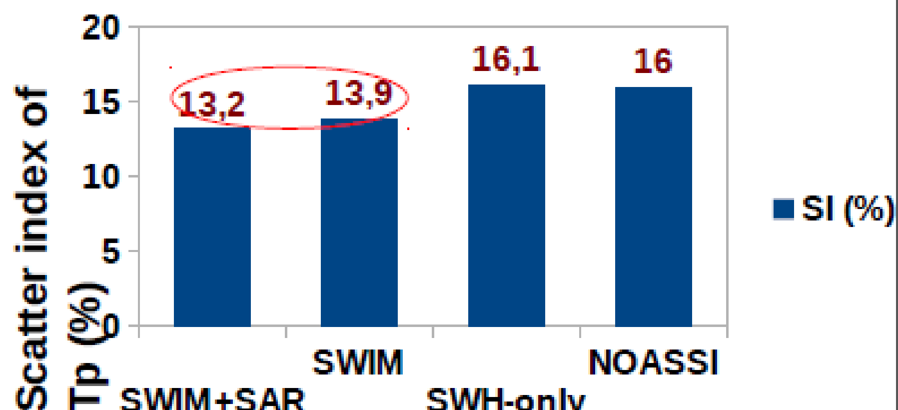
Assimilation :

Several assimilation runs have been performed from 12 to 25 September 2011. the wave data used are wave height and directional wave spectra from SWIM, and SAR wave spectra from envisat

Validation for SWH in the forecast period



Validation for peak period in the analysis



GMES PURE Poster

Poster 11

- GMES-PURE (Partnership for User Requirements Evaluation) is a EC funded Coordination and Support Action (2013/2014), supporting the EC in setting up a consistent process for the definition of user requirements, service specifications and service data requirements focussing on the medium- and long-term Copernicus evolution

- 2 Objectives: The definition of the process and its exemplary application (marine / atmosphere)

- The specific objective of the poster is to sollicit for (end) user input specifically for emerging applications

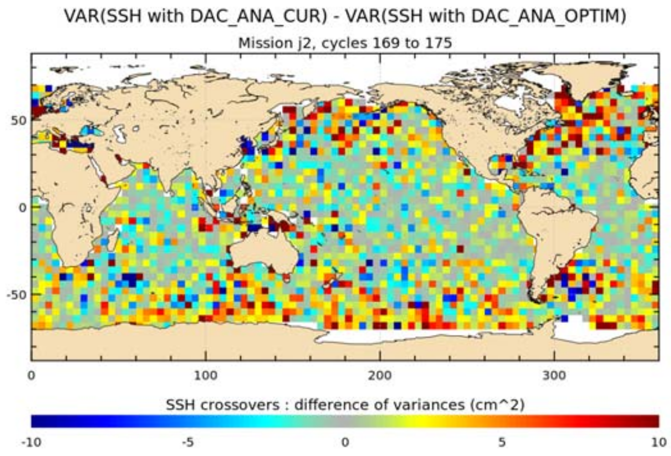
Improving the Dynamic Atmospheric Correction for operationnal altimetry (NRT and RT)

- L. Carrère, A. Delepoulle, F. Briol, Y. Faugère S. Dupuy – **CLS**
- E. Bronner – **CNES**

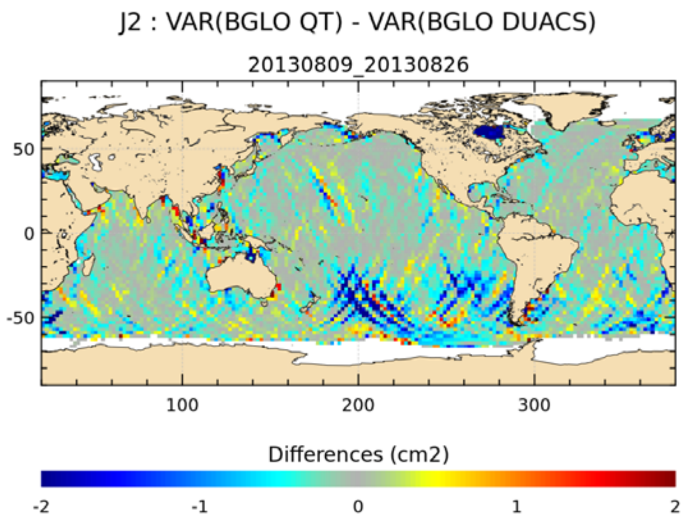
Poster 12

- Meteorological forecasts are used to improve the DAC for operational altimetry (NRT and RT)
- The impact on altimeter L2 products has been estimated: it is clearly positive.
- The impact on higher levels products (L3 and L4) has also been investigated, showing a diminution of the LWE when using the new DACs and a weak impact on ocean circulation.

Variance differences at J2 crossovers



Variance differences of LWE for J2 SLA



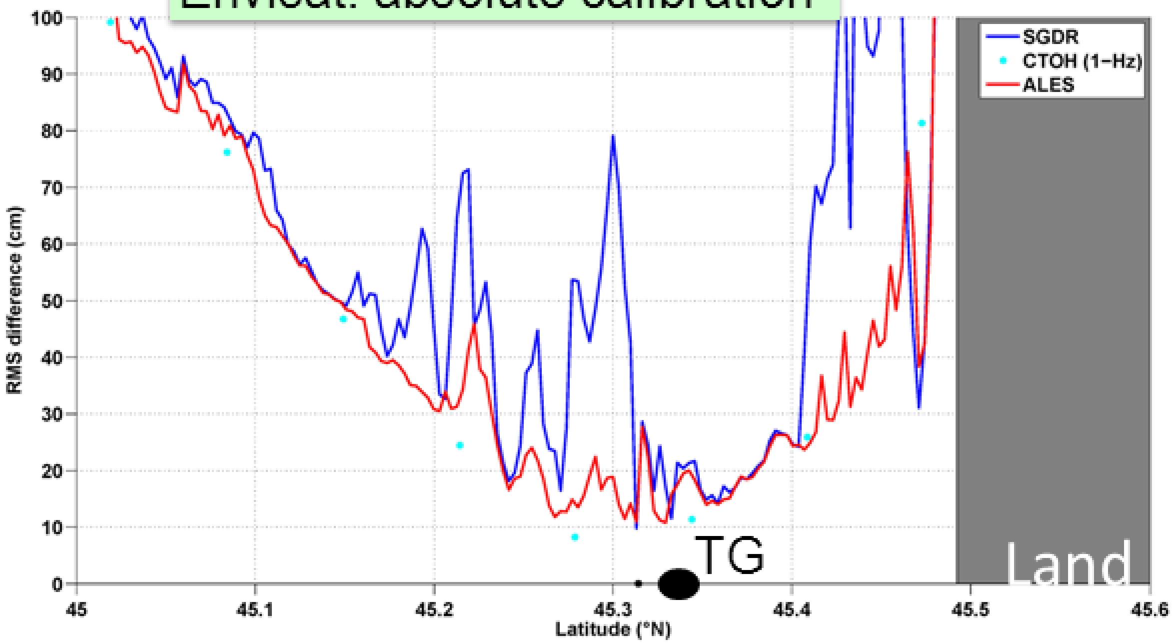
eSurge venice

Comparison and validation of multi-mission coastal altimetry around Venice

Paolo Cipollini, Marcello Passaro, Stefano Vignudelli

- The Northern Adriatic Sea is an important cal/val site for eSurge.
- reprocessed Envisat and Cryosat data in the area are compared with data from th CNR tide gauge (TG) at the “Acqua Alta” platform ~14 km from the coast of Venic Lido. (We also looked at Jason-1 and -2 over an adjacent area in the Northern Adriatic – see poster by Passaro et al)

Envisat: absolute calibration



RMS error decreases in points in close proximity to the TG
RMS error below acceptable threshold (< 15 cm near TG

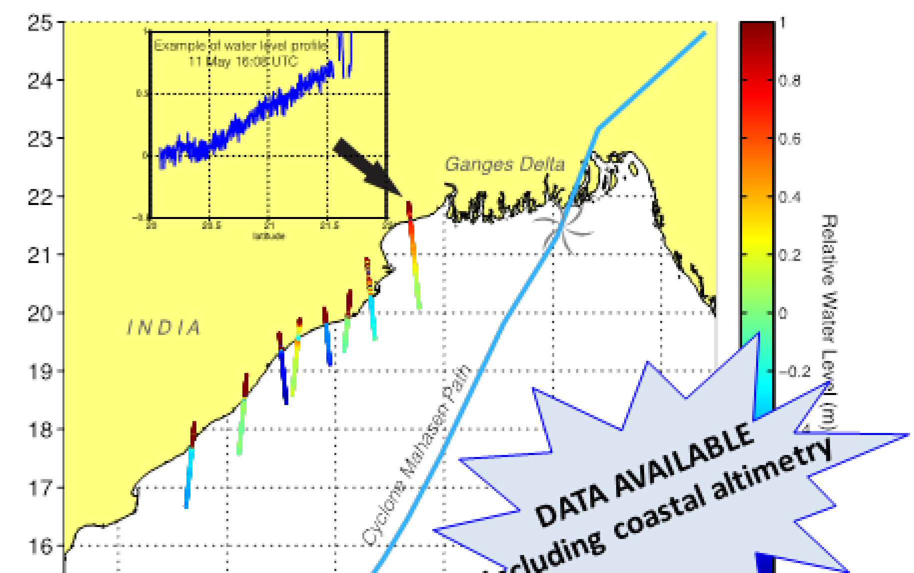
- **We found that with dedicat reprocessing techniques f Envisat (sub-waveform retrackers such as ALES) t range noise is constant un ~3 km from coast; for Cryo SAR virtually up to the coastline**
- **For Envisat we can now ca out an absolute validation, giving ~12 cm RMS differe with TG at 20Hz (not possi with Cryosat due to remain biases)**

The contribution of altimetry to storm surge modelling in the eSurge project

Phillip Harwood, Paolo Cipollini, Kevin Horsburgh, Luke West, Marcello Passaro, Helen Snaith, Jacob Høyer, Kristine Madsen, Declan Dunne, and Craig Donlon

- **Monitoring and forecasting of storm surges is emerging as a very importan application of altimetry (and reprocessed Coastal Altimetry)**
- ESA/DUE eSurge: provide access to a vast range of Earth Observation data in support of users (Environmental agencies, forecasters, scientists..)
- Coastal Altimetry is provided for surge events from pulse-limited missions retrack with ALES (*Passaro et al., see poster in Instrument Processing*) and for Cryosat-2 retracked with the SAMOSA3 retracker – **also in NRT for ongoing events** (PHAILIN-
- Alt and TG data are statistically 'blended'

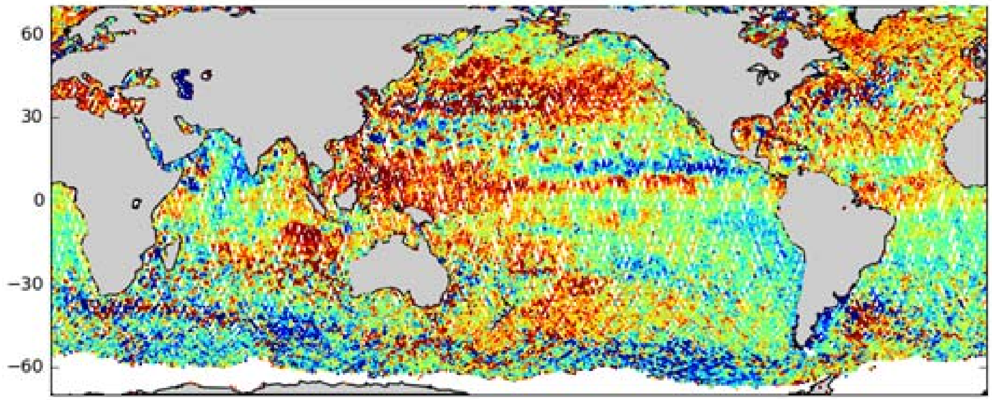
Cryosat-2 measures coastal water levels 10-17 May 2013



High-Accuracy Near-Real-Time Sea Surface Height Anomaly Measurements from Jason-2 and SARAL

- Value-added NRT SSHA products generated for Jason-2 and SARAL.
  - Improve orbit altitude accuracy for near-real-time OGDR products
    - Jason-2: GPS-based precise orbit determination.
      - **Radial orbit accuracy similar to POE (~ 1 cm RMS), 3-5 hour latency.**
    - SARAL: Inter-satellite (Jason-2/SARAL) sea surface height crossovers.
      - **Radial orbit accuracy of ~1.5 cm RMS, 7-9 hour latency.**
      - **SSHA implicitly leveled to Jason-2 from short-latency crossovers.**
  - Available at Physical Oceanography Distributed Active Archive Center: ftp://podaac.jpl.nasa.gov/SeaSurfaceTopography/

1-Hz NRT SSHA from Jason-2 and SARAL, September 29-October 8, 2013



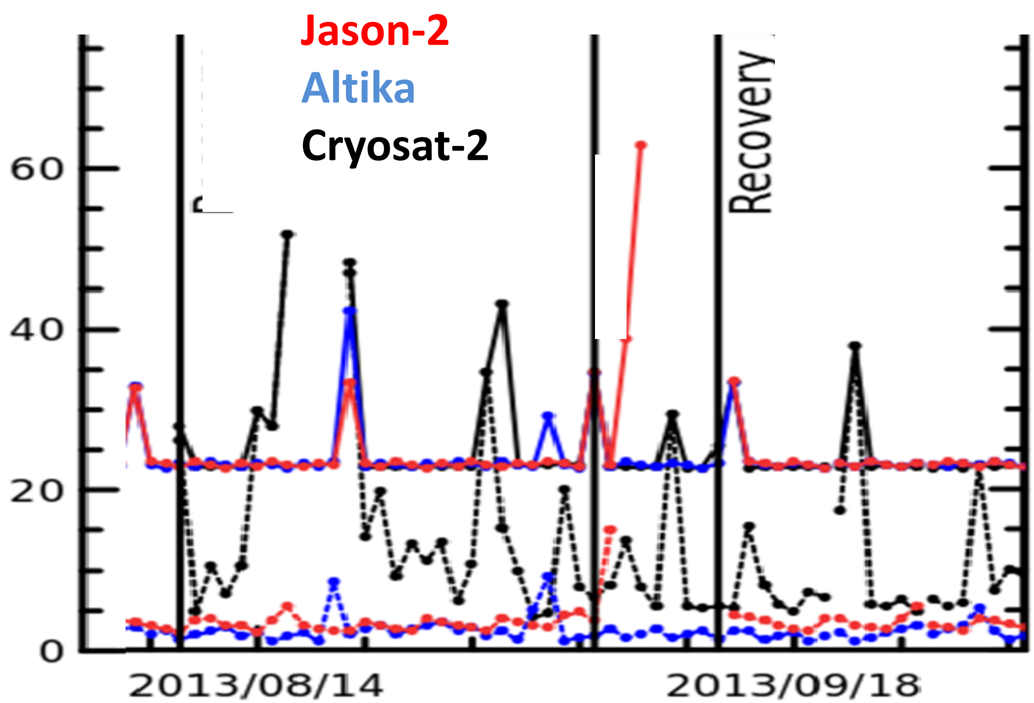
- **1-Hz SSHA directly from value-added products with no smoothing or leveling by user.**

Altika in Duacs

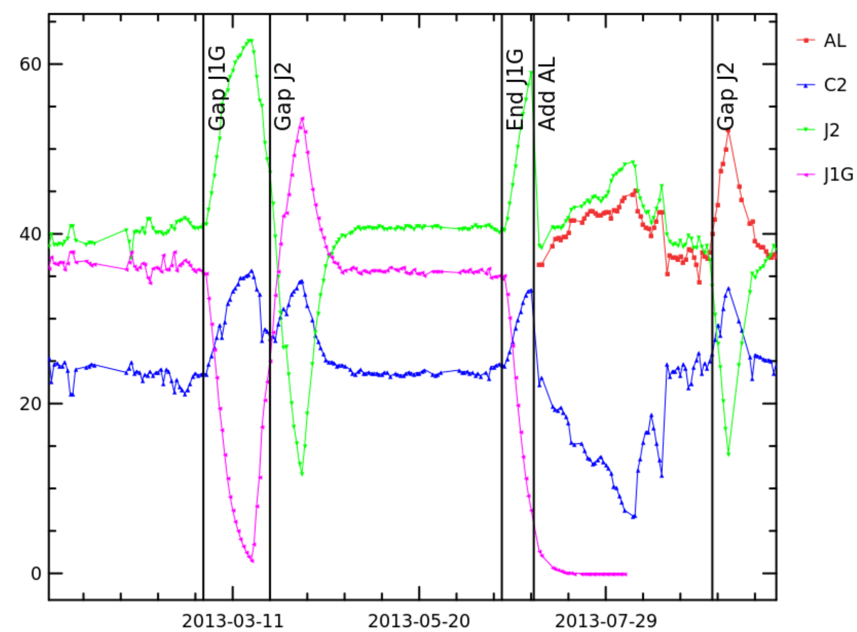
Poster 16

- SARAL/Altika has been integrated in Duacs system on the **1st of July… with an unexpected handover with Jason-1**
- First results highlights the **very good latency and performances of Altika**
- This allowed us to maintain the products to **a rather good quality despite the loss of Jason-1,** and even improve them at high latitudes.
- With the low noise level on Altika we have good perspectives to **even improve the resolution** of Duacs products

Delays (hour) at production start (OGDR in dot)



Mean contribution of each satellite (%)



Poster 17

A multiscale analysis from satellite altimeter observations

G. Jacobs – Naval Research Laboratory
M. Wooten – Qinetiq North America

Abstract:

Data-only products intend to provide information on ocean state without the presumption of a prescribed dynamical constraint. This is valuable for testing dynamical hypotheses to determine if the observations are consistent or if the observations invalidate the hypothesis. However, a regularly gridded dataset from irregularly spaced observations automatically presupposes a spatial relation. The gridding process is similar to applying a convolution integral to the observations with delta functions at their space/time locations. The most important aspect when using a regularly gridded product is to understand this convolution function, which can also be expressed as a filtering process. The filtering process imposes its own spectral response on the gridded data. In order to ensure proper conclusions are reached, the filter response function in the wavenumber/frequency domain of interest should be carefully considered.

Typically, spatial and temporal scales are prescribed and used in an optimal estimation process. In the past, such length scales have been estimated using historical altimeter observations through a binned space/time lagged autocovariance that is allowed to change over latitude and longitude. In the development process, the large scale sea surface height variations were removed so that the mesoscale characteristics would be estimated. It is possible to iterate this process. Using the mesoscale characteristics, the data may be interpolated and subtracted leaving the residuals. Residuals are subsequently used in a second time/space lagged autocovariance estimation of the next order length scales.

The results are the appropriate information to be used in a multiscale analysis, and this information may be used with either a data-only product or within a cycling numerical model assimilation system. The process of estimating the scales and application to a data-only analysis are examined in this presentation. Work is under way to use the scales in a cycling model assimilation system. The data-only analysis products from this multiscale analysis are now being generated and made available. These products include the regularly gridded information using both first mesoscale characteristics and the multiscale characteristics and both in a real time estimation and a reanalysis estimation for greater accuracy. A consistent reconstruction of the data-only products is under way.

Processing

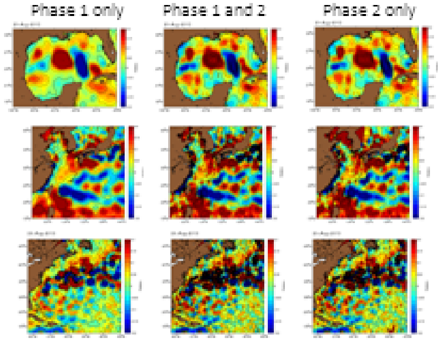
On a regular 2°x2° grid, all historical altimeter data from 2002 to 2015 within 400km is used to construct a binned lagged autocovariance. Every point is compared to every other point within the data set, and the result is added to the appropriate zonal, meridional and temporal lag bin. A Gaussian functional form is fit to the binned autocovariance to produce parameters of zonal, meridional and temporal decorrelation as well as zonal and meridional propagation speeds.

$$V = e^{-\left(\frac{(x-ut)}{Lx}+\frac{(y-vt)}{Ly}+t\right)}$$

The estimated coefficients are quality controlled for outliers, and then used to interpolate the original data using a Gaussian covariance. The interpolation is subtracted from the original data providing the input data to the next phase of estimation.

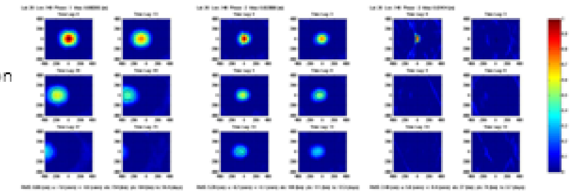
Example results

Examples below show the interpolation after using just phase 1 scales (left) adding the results of successive phase 1 and phase 2 interpolation scales (center) and interpolating the data with just phase 2 scales (right). Using successive interpolation increases the magnitude slightly over using just the phase 2 scales. The implication is that each interpolation acts as a filter. Using only one of the filters does not allow the full signal through.



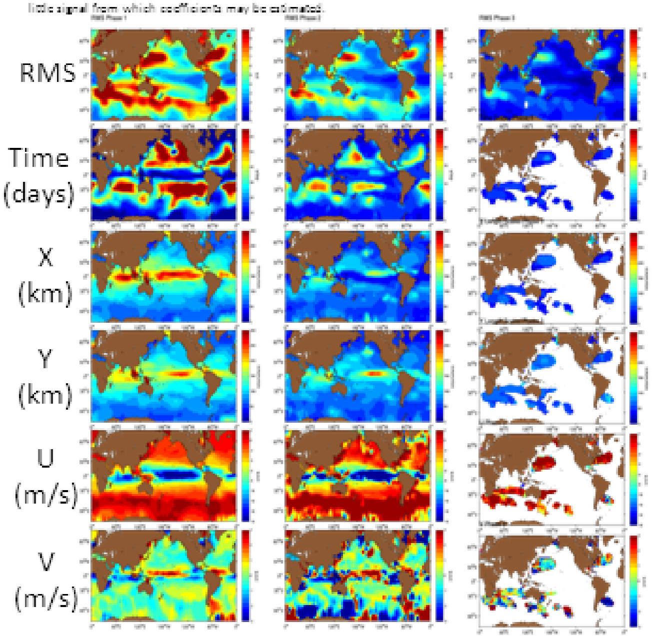
Example at one point

The binned lagged correlation at one point within each phase is shown below. The 1/e lines of the binned correlation and the fitted Gaussian are plotted.
Note the change in time lags displayed between phase 1 (every 15 days) versus phases 2 and 3 (every 2.5 days).



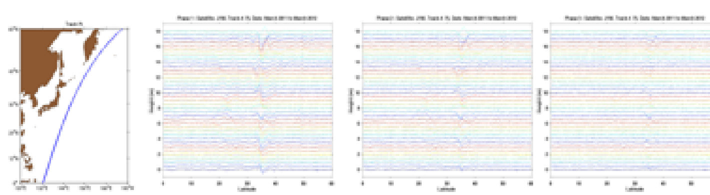
Fitted parameters

The Gaussian parameters on a 2 degree grid change markedly from the phase 1 to phase 3 results. The time scales in particular drop from 60 days in phase 1 to 20 days in phase 2. As the interpolated results from each phase are subtracted from the input data, the RMS decreases with each successive phase.
Coefficients are reliable only where the RMS variability of the input data is greater than 2cm. The results from phase 3 indicate that very little variability remains after phases 1 and 2. Much of the globe in phase 3 has very little signal from which coefficients may be estimated.



Data variability prior to each phase

The variability over one year along the Jason-1 interleaved ground track (left panel) at the beginning of each phase of processing shows the original variability (left waterfall plot). After phase 1 processing, substantial variability remains in the Kuroshio and in the subtropics around 20°N (center waterfall plot). Most of this variability is removed after phase 2 (right waterfall plot).



An EM-bias correction estimate for AltiKa

G. Jacobs, J. Richman (Naval research Laboratory)

Poster 18

The AltiKa instrument was launched on the SARAL spacecraft 25 February 2013. Initial performance indicates that instrument noise is as good or lower than Jason-2 instrument noise. The water vapor radiometer calibration remains to be completed, and ECMWF moisture estimates are used for atmospheric correction in addition to the dry troposphere correction from surface pressure estmiates. With the Ka band altimeter, ionosphere influence is minimal. Orbit solutions in near real time show 10 cm amplitude errors at 1 cycle per orbital revolution. Data latency is very good with a large fraction of observations available within 24 hours of observation time. The EM-bias correction has not yet been estimated, and a test of an automatically updating estimation algorithm has been applied to the initial data. In this algorithm, the EM-bias is initially set to 3.5% of the significant wave height. Observed sea surface height anomalies are binned as a function of significant wave height and wind speed with wind speed based on the algorithm from Abdalla, Scharroo and Lillibridge. The algorithm makes a daily estimate as new data arrives, and constructs a moving average with the prior estimate from yesterday. The weighting in the averaging results in a half amplitude in time of 30 days. The EM-bias development over the first 6 months of data indicates the instrument is quite stable and performing as expected. The EM-bias estimation algorithm for AltiKa is compared to the same algorithm applied to Jason-2 to understand the differences between performance at the Ku and Ka bands. The general shape of the corrections are similar with the Ka band showing smaller variation over significant wave height and wind speed and slightly more sensitivity to smaller surface waves as the Ka frequency of 35.75 GHz is more affected by surface gravity and capillary waves than the Ku 13.6 and 5.3 GHz on Jason-2.

Southwestern Atlantic currents from in-situ and satellite altimetry data

M. Saraceno[1], C. Provost[2], A. Piola[3] N.Sennéchael[2], A. Bianchi[4], D. Ruiz Pino[2], E. Palma[5], R. Guerrero[6], R. Boudichon[7]
[1]UMI-IFAECI 3351 (CNRS-CONICET-UBA) [2]LOCEAN-IPSL [3]UMI-IFAECI, SHN, CONICET, UBA [4]UMI-IFAECI, SHN, UBA [5]UNS, CONICET [6]INIDEP, [7]IPSL-CNRS

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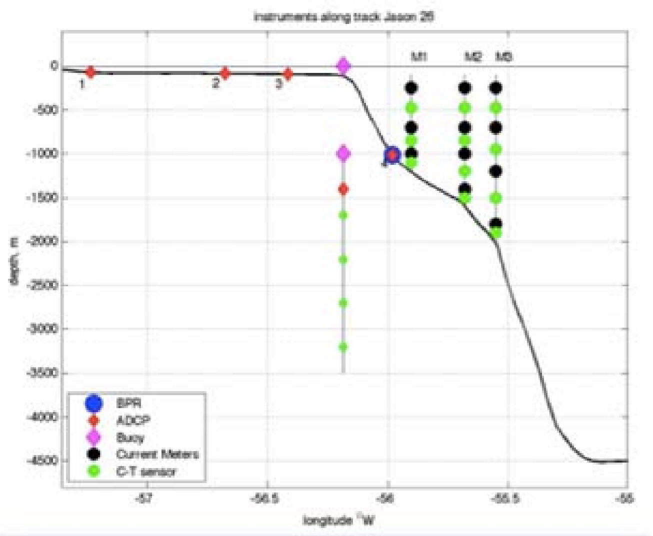
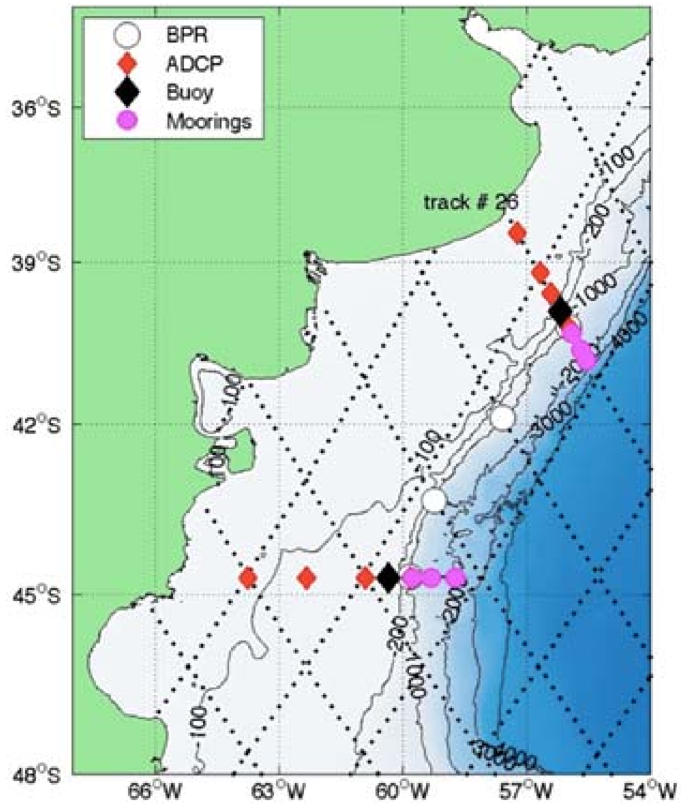
Poster 19

EUMETSAT-CNES DSP/OT/12-2118

This project has three main objectives to improve our understanding about :

- the circulation on the Patagonian continental shelf (PCS) using satellite altimetry data combined with in-situ data
- the dynamics of the Malvinas Current (MC), a mayor western boundary current
- the interactions between the MC and the circulation on the continental platform





Near-real time production of gridded SLA in the Mediterranean Sea using the Data-Interpolating Variational Analysis (DIVA)

C. Troupin, A. Lana, A. Pascual, IMEDEA (UIB-CSIC)

Poster 20

The spatial interpolation of Sea-Level Anomalies (SLA) along-track data to produce gridded map has numerous applications in oceanography, such model validation, data assimilation or eddy tracking. Optimal Interpolation (OI) is often the preferred method for this task, as it leads to the lowest expected error and provides an error field associated to the analyzed field. However, the numerical cost of the method (due to the inversion of covariance matrices) as well as the isotropic covariance function, generally employed in altimetry, may stand in the way of a systematic application to SLA data. The Data-Interpolating Variational Analysis (DIVA) is a gridding method based on the minimization of a cost function using a finite-element technique. The cost function penalizes the departure from observations, the smoothness or regularity of the gridded field and can also include physical constraints (advection, diffusion, ...). It has been shown that DIVA and OI are equivalent (provided some assumptions on the covariances are made), the main difference is that in DIVA, the covariance function is not explicitly formulated. The technique has been previously applied for the creation of regional hydrographic climatologies, which required the processing of a large number of data points. In this work we present a implementation of Diva for generating high-resolution daily maps of SLA, ADT and geostrophic currents in the Mediterranean Sea. The procedure for the productions of the gridded products is as follow: 1. The download and formatting of AVISO NetCDF data files. This step is performed with bash scripts with the help of NCO toolbox. 2. The interpolation of SLA measurements using the DIVA tool and the generation of NetCDF files. 3. The computation of geostrophic velocity using the new SOCIB-CLS Mean Dynamic Topography (MDT). 4. The preparation of graphics for the region of interest. This step is performed with a script in Python using the Matplotlib plotting library. The generated maps were used in the frame of G-ALTIKA (see poster by Pascual et al.) experiments carried out in the southwest of Ibiza island in August 2013. The results for this region show a good agreement with AVISO near-real time products for the Mediterranean Sea, while some differences are observed in the representation of eddies and meanders. HF Radar data partially covering G-ALTIKA domain as well as drifter are used for further validation and comparisons.