COASTAL AND INLAND ALTIMETRY SESSION SUMMARY

OSTST 2009 – Seattle – 22-24 June

Coastal and Inland Altimetry session

- ***28 abstracts received !***
- **Result of the ongoing effort to structure the community:**
  - Coastal Altimetry workshops in Silver Spring (Feb08) and Pisa (Nov08)
  - Hydrology from Space Meetings (Toulouse03, Geneva07)
  - COASTALT/ESA and PISTACH/CNES initiatives

- ***COASTAL:***

  18 abstracts received → 4 oral pres. + 14 posters

- ***INLAND:***

  8 abstracts received → 2 oral pres. + 6 posters

- ***INSTRUMENT:***

  2 abstracts → 1 oral pres. + 1 poster

Coastal and Inland Altimetry session

Oral Programme (Tuesday 23/06/09)

- ***COASTAL***
  - 4:30 Florence Birol: CTOH regional altimetry products: Example of applications
  - 4:40 Ananda Pascual: Synergy between glider and coastal altimetry: Case study in the Balearic Sea
  - 4:50 Graham Quartly: Singular reflections on the Golfo della Botte
  - 5:00 Tracy Haack: High-resolution models of wet-troposphere path delay fields in coastal regions
- ***INLAND***
  - 5:10 Franck Mercier: The PISTACH project for Hydrology: project status, products and early results
  - 5:20 Stephane Calmant/ Ana Emilia Souza: Validation of JASON-2 over the Amazon basin rivers
- ***INSTRUMENT***
  - 5:30 Jean-Damien Desjonqueres: POSEIDON Diode/DEM coupling mode
- ***SUMMARY OF POSTER PRESENTATIONS 5:40***
- ***DISCUSSION 5:50***

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Poster Programme

- ***COASTAL (1/2)***

Paolo Cipollini: Advances in Coastal Altimetry: the COASTALT project

William (Bill) Emery: Improved altimetric retrievals in the coastal zone

Hui Feng: Exploiting ocean altimeter data in the Gulf of Maine and Middle Atlantic Bight region

Joana Fernandes: GNSS derived path delay, a method to obtain the wet tropospheric correction for coastal altimetry

Guoqi Han: Mean dynamical topography and surface circulation off Atlantic Canada

Florent Lyard: Robust methods for high accuracy tidal modelling in coastal and shelf seas

Juan Jose Martinez-Benjamin: Operational monitoring level at Barcelona and l'Estartit harbours

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Poster Programme

- ***COASTAL (2/2)***

Franck Mercier: The PISTACH project for coastal altimetry: status, products and early results

Anne-Charlotte Peter: Thermal impact of the coastal waves in the coastal African upwelling areas

Laurent Roblou: The contribution of improved altimetry to a study of NW Mediterranean sea coastal dynamics

Simon Ruiz: Merging altimetry and glider data to estimate vertical motion in the upper ocean

Y. Tony Song: Strait And Inter-Ocean Transport Estimation Using Altimetry SSH And Gravimetry OBP

Alexandre Kurapov: Assimilation of along-track altimeter SSH into a coastal ocean model

Javier Zavala-Garay: Development of an operational analysis /forecast system for the Mid Atlantic Bight.

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Poster Programme

- ***INLAND***

Charon Birkett: Performance of the Jason-2/OSTM instrument over inland waters

Marie-Claude Gennero: Water level on rivers & lakes using Jason-2 altimetry data

Jinyun Guo: Correlation of El Niño and water level variations of Hulun Lake monitored with TOPEX/POSEIDON

Hyongki Lee: Assessment of retracked Jason-2 measurements over Louisiana wetland

Frederique Seyler: Cross-comparison of Jason2 data with ENVISAT RA2 and ICESAT data over Amazon basin

Stéphane Calmant: JASON-2 IGDRs for flood alert in the Amazon basin

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Poster Programme

- ***INSTRUMENT***

  Nathalie Steunou: AltiKa: a new concept of altimeter for the SARAL mission

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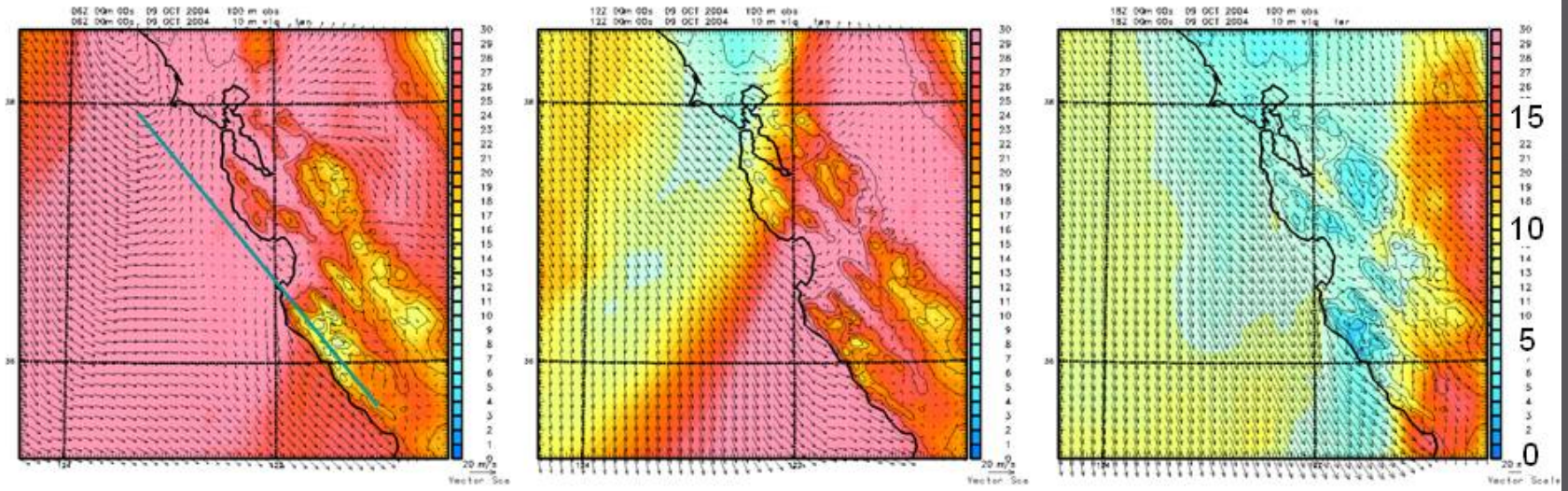
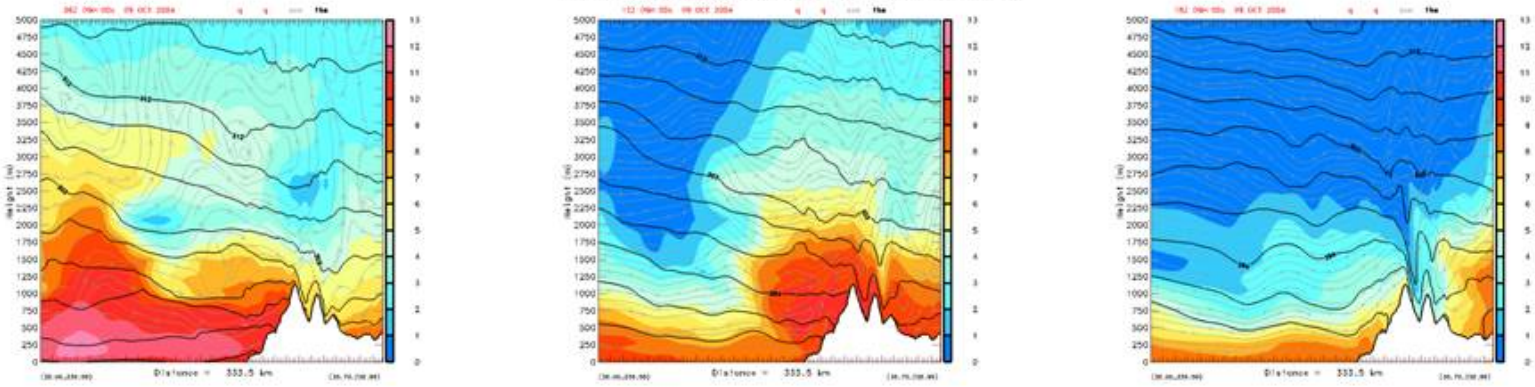
COAMPS Water Vapor Forecasts
9 Oct 2009 6-18 UTC

IWVP (kg m^{-2}) ➡ Path Delay (cm)

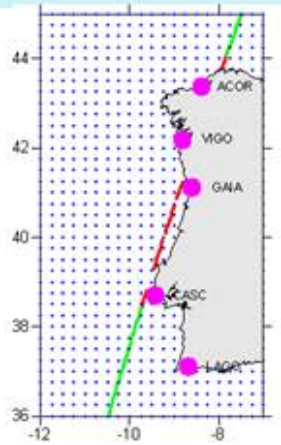


Water Vapor (g kg^{-1}) &Theta (K)



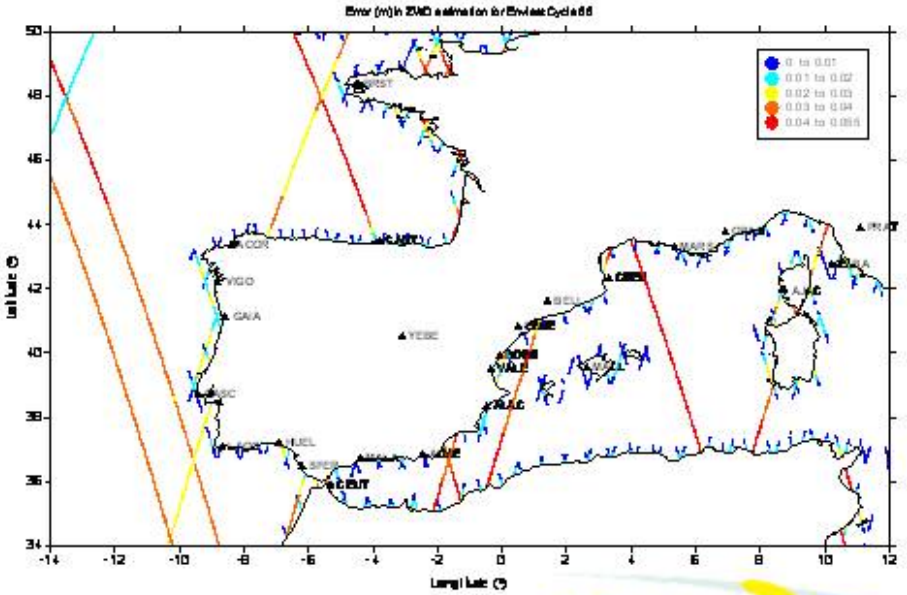
GNSS-derived Path Delay (GPD): a method to obtain the wet tropospheric correction for coastal altimetry

Joana Fernandes et al. , Univ. Porto, Portugal



- GPD estimates the wet tropospheric correction at altimeter points with invalid microwave radiometer (MWR) measurements (red points) by combining the following data types (top figure):
  - GNSS-derived zenith wet delays (ZWD) determined at a network of coastal stations, reduced to sea level (pink circles)
  - ZWD values computed from ECMWF global grid fields (blue points)
  - valid MWR measurements (green points)

- Data are combined by using a linear space-time objective analysis technique.
- Bottom figure shows an error map for Envisat cycle 58 (green and light blue points have errors below 2 cm)



See the poster for details!

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Wet Tropo Correction

- **Global « Coastal » corrections now exist:**
  - S. Brown :→ to be included in the GDR ?
  - 2 WTC in the PISTACH products (+ 1 for Hydro)
- **Development of regional corrections:**
  - GNSS based corrections (Fernandes)
- **Improvement of Regional Atmospheric models**
  - →to retrieve high space / time variability (Haack)

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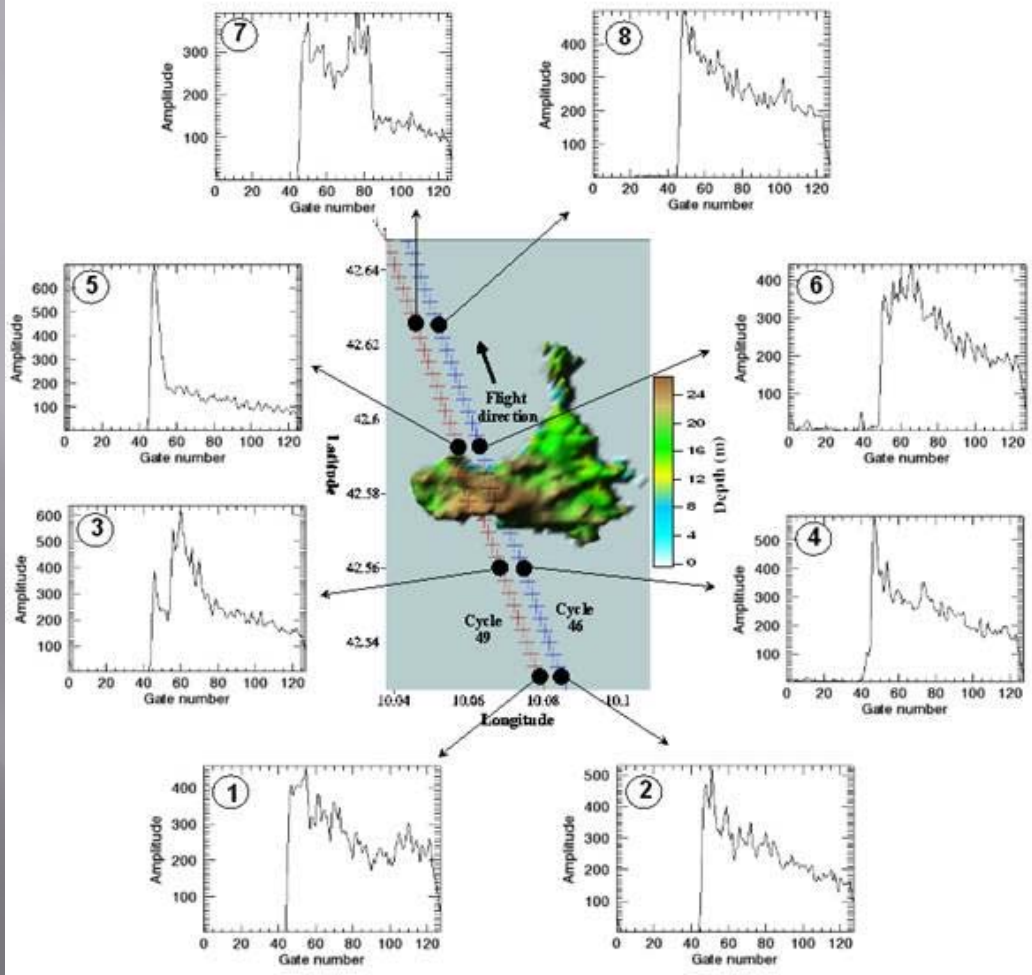
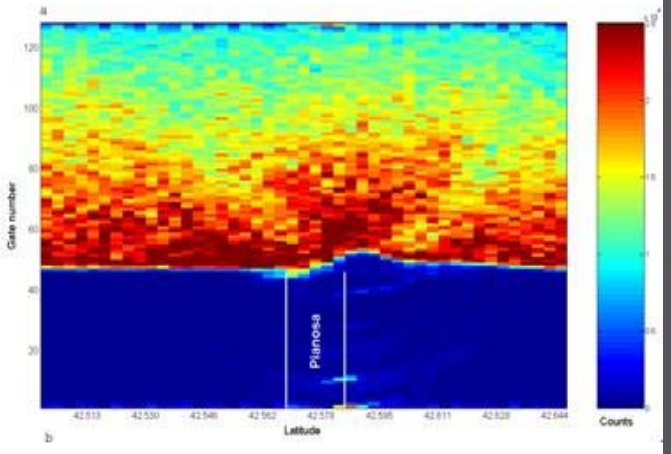
Waveform analysis





Ongoing work

Understand physical causes

Simulate and remove effects

Achieve altimetry up to coast

Simple, but common, example

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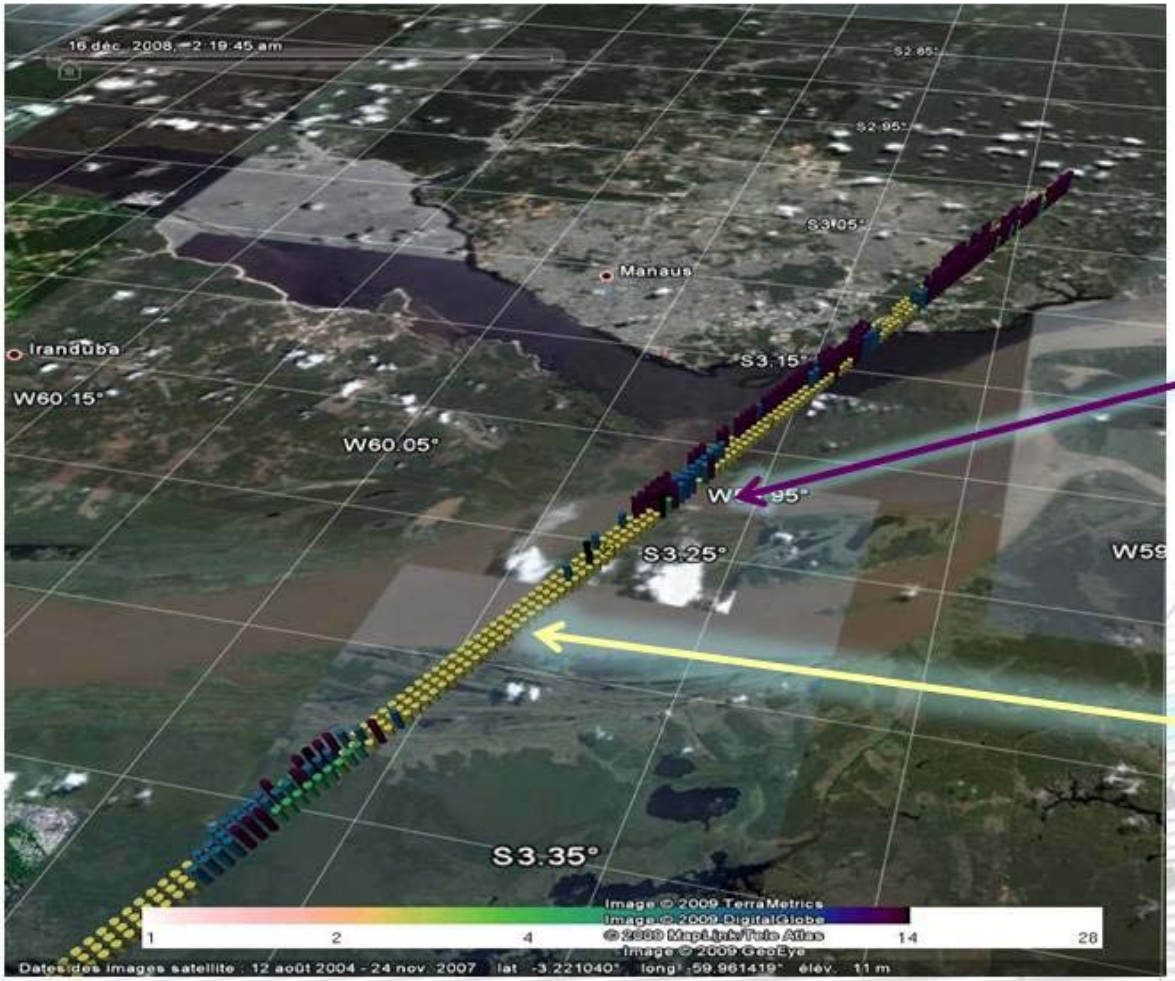
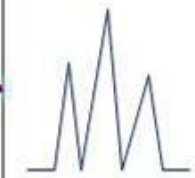
WF Classification: Amazon (Manaus)

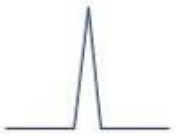


Class 23



Peak + Noise

Class 2



Peak echos

ftp://ftpsedr.cls.fr/pub/oceano/pistach/

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Waveform Analysis / Retracking

- **A (The) key issue for inland and near shore altimetry:**
  - **Significant effort in PISTACH and COASTALT projects**
  - **Local and regional studies also develop retracking strategies (posters by Emery, Lee)**

→ Still a lot of work to do on retracking….

  - **But feasible with Jason-2 data since waveforms are acquired almost everywhere ! (not the case for Jason-1)**

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Other corrections

- **Tides, atmospheric loading, …:**

  - Regional solutions exist (FES, GOT, MOG2D, T-UGO, Webtide…). Local solutions too!
  - See presentation / Poster: Birol, Roblou, Lyard, Feng …

  → How to compile / merge these solutions inside a global altimetry product?

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Data distribution:

http://www.legos.obs-mip.fr/en/observations/ctoh/COTIER

Data available via ftp

HF and regional products can be provided for other
ctoh_products@legos.obs-mip.fr

Conclusion

- ✓ Ongoing project: other applications under analysis
- ✓ Strong connection with different scientific groups/projects
- ✓ The feedback we get from CTOH coastal data users for marginal/coastal applications helps us:
  - → to understand the users needs
  - → to identify the problems to solve
  - → to analyze the potential applications and/or limitations
- ✓ If you have new corrections or scientific applications you want to test, do not hesitate to contact us!!!

ctoh_products@legos.obs-mip.fr

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Conclusion

- The **PISTACH products** include **several** new **state of the art** corrections and geophysical information: retracking, wet tropo, geoid, DEM, surface classification ….20Hz sampling
- V1.0 products are freely available since **cycle 1, in NRT**.
- **Validation & Evaluation** during next months. They will provide us feedback for improving future versions.
- A **light** version of the products is under reach more easily non-expert users
- **Possible evolution of the prototype** T/P, AltiKa ?
- **Feedback, comments, questions**:
  - Claire.Dufau@cls.fr (Coastal
  - Franck.Mercier@cls.fr (Hydro

ftp://ftpsedr.cls.fr/pub/oceano/pistac

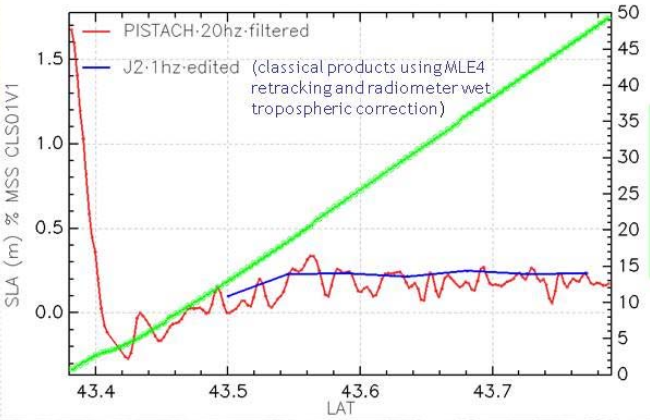
http://www.cls.fr

High-resolution & coastal coverage

Using Jason2-PISTACH 20Hz fields provide a better spatial coverage and a higher resolution in the coastal ocean

Cycle 24

SLA Jason 2 PISTACH vs SLA Jason2



some noise still remains to be filtered on PISTACH SLA

http://www.cls.fr

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Products available

- **Dedicated processings / products:**
  - CTOH (LEGOS): post-processing (editing, …)
  - PISTACH (CNES): JASON-2, pre-processing (retracking, Wet, SSB, local/global corrections …) → IGDR-like products in NRT, available on FTP
  - COASTALT (ESA): Envisat, pre-processing (retracking, corrections, ….) → soon

- **It's up to users to use these products (+feedback) and make good science !**
  - « InSitu Calval »: Birkett, Seyler, Calmant
  - Regional/local studies/applications: Pascual, Ruiz, Feng, Peter, Han, Song, Kurapov, Zaval-Garay, Gennero

tmoos tecnología marina oceanografía operacional y sostenibilidad

UIB I·M·E·D·E·A Institut Mediterrani d'Estudis Avançats CSIC

Summary & Future Work

- Gliders are useful platforms for exploring limitations of coastal altimetry.
- New methodology and data processing in the velocity computation improves the altimetry-glider comparisons.
- The impact of usig HF along track altimetric data is tremendous in the coastal zone (correlation = 0.97, error variance = 5%).
- Future work:
  - Dedicated mean dynamic topography
  - Multi-sensor approach experiments
  - Data assimilation into numerical models to better understand coastal and mesoscale dynamics (collaboration with J. Zavala – Univ. Rutgers).

OSTST 2009

SEATTLE, WASHINGTON

June 23

Coastal and Inland Altimetry

Poster

J.J. Martinez-Benjamin et al.

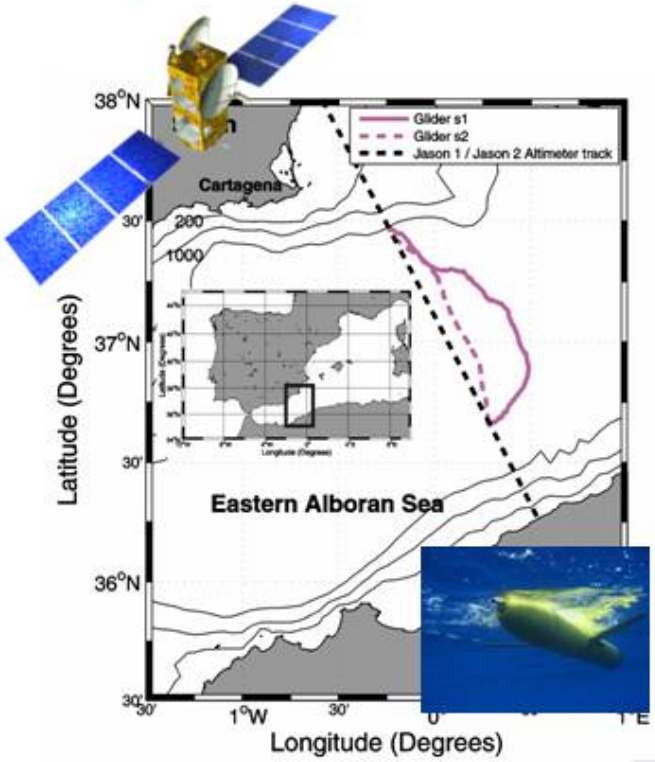
tmoos tecnología marina oceanografía operacional y sostenibilidad

http://www.imedea.csic.es/tmoos

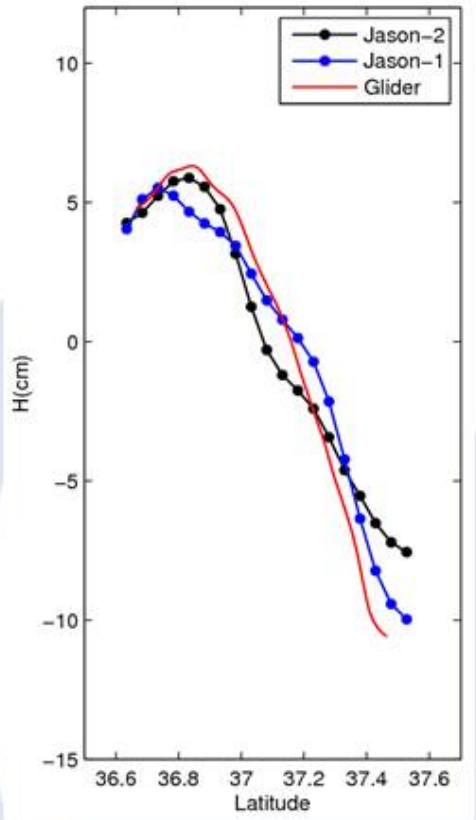
Vertical motion in the upper ocean from glider and altimetry data

Simon Ruiz, Ananda Pascual, Batolome Garau, Isabelle Pujol; Joaquin Tintore

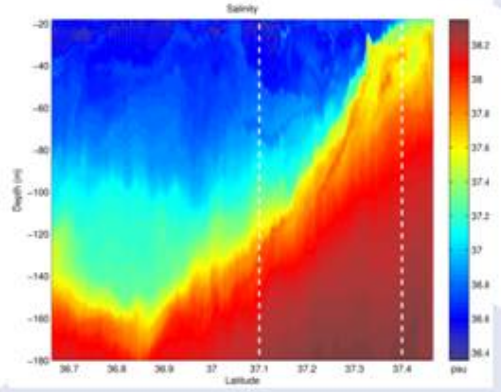
(GRL, June 16, accepted)

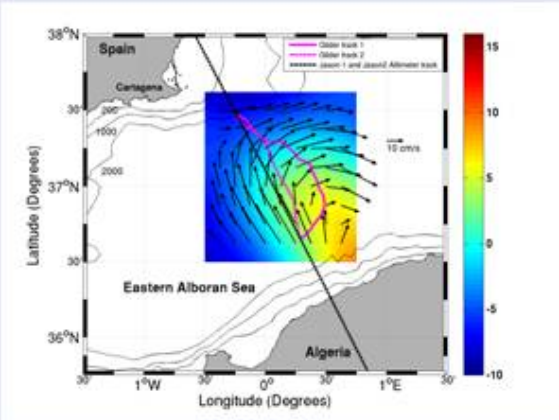


Western Mediterranean, Data from glider, Jason 1 and Jason 2



DH from glider and ADT from Jason-1 & Jason-2 tandem mission ($r > 0.97$, rms differences < 1.6 cm).





Vertical section from glider (top) and reconstructed DH field from glider and altimetry at 75 m depth (bottom).

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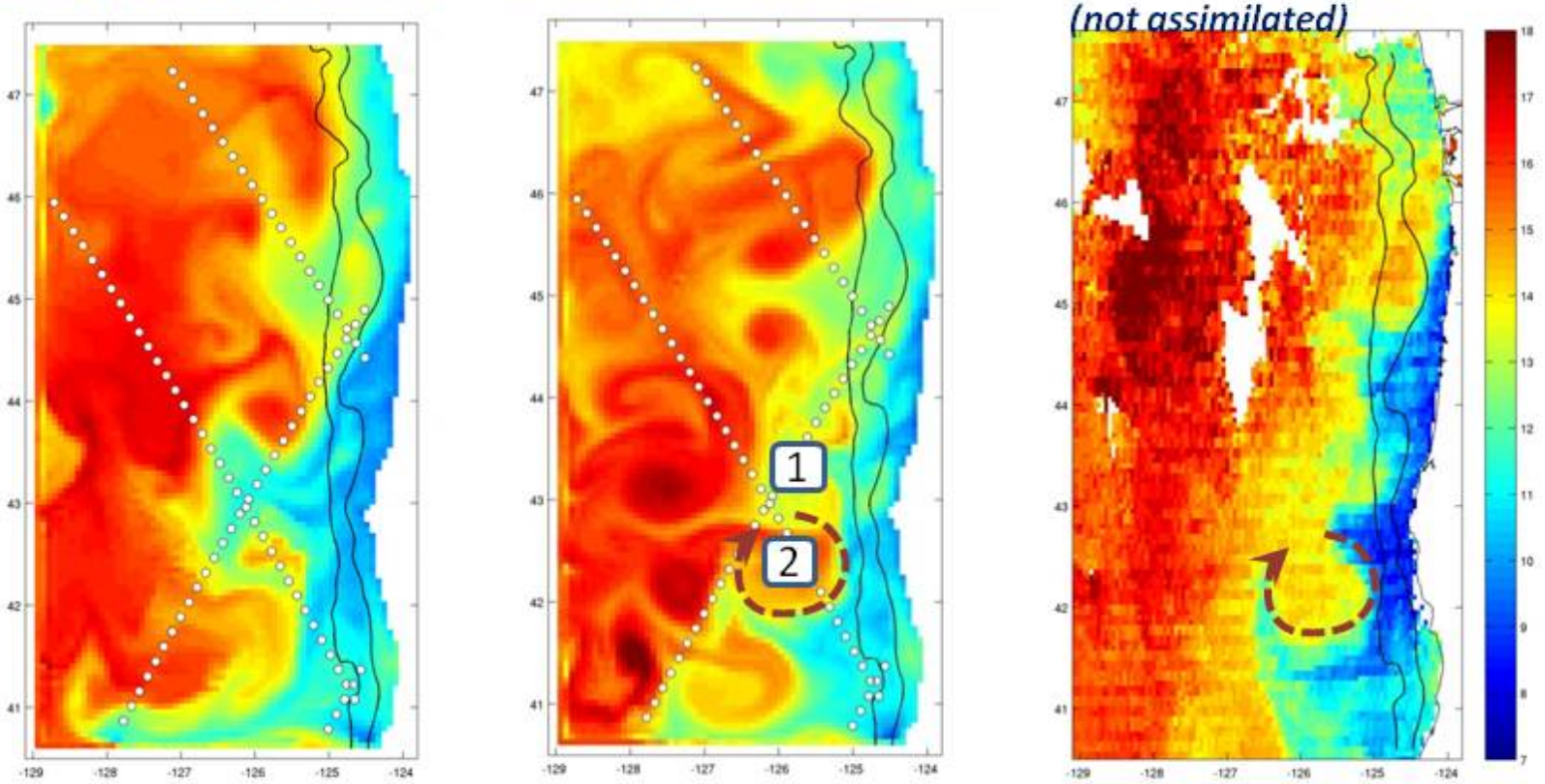
CLS

Assimilation of Along-Track Altimeter SSH into a Coastal Ocean Prediction Model

A. Kurapov, G. Egbert, J.S. Allen, P. T. Strub (Oregon State U.)

SST Fields from Model (left, middle) and Satellite (right) – July 24, 2008

prior (free-run) model | model after SSH assim. | GOES daily composite (not assimilated)



1: extent of separation at 43-44N is reduced; 2: eddy is formed; both effects are consistent with GOES SST

Assimilation of alongtrack SSH altimetry, using a multivariate variational approach, improves prediction of SST – compare SST on left (no SSH assimilation) and middle (SSH assimilation) to right (SST that was not assimilated). Will increased date from interleaved orbits improve the fields further?

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Conclusion

- **Costal and Inland Altimetry: increasing interest**
  - **Promising good performances of Jason-2, even in NRT**
  - **Dedicated altimetry products/solutions already exist**
    - **Use them !**
  - **Improvements still necessary/possible (retracking, DEM tracking mode…)**

Third Coastal Altimetry Workshop (Roma, Sept 2009)