Jason-1 and Jason-2 altimeter validation activities over ocean in the framework of the SALP project

Sabine Philipps (CLS), Michaël Ablain (CLS), Hélène Roinard (CLS), J. Legeais (CLS), Nicolas Picot (CNES)
CLS, Space Oceanography Division, Toulouse, France, (mablain@cls.fr)
CNES, Centre National d'Etudes Spatiales, Toulouse, France

Overview

Global data quality assessment of Jason-1 and Jason-2 data are performed by CNES and CLS in the framework of the SALP project since the Jason-1 launch in 2002.
Our purpose is to underline the importance and the complexity of performance missions activities ("Cal/Val") through 3 relevant examples.

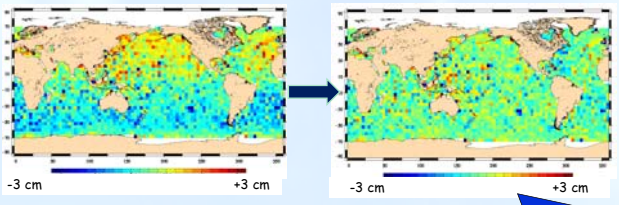
Cal/Val objectives are :
- -To check the data availability and validity
- -To analyze the physical content quality of product parameters
- -To estimate the system performances
- -To contribute to a better knowledge of the sea-level physical content
- -To check the system improvement
- -To provide information for users and production centre (My Ocean/DUCAS)

Example 1 : Mono-mission analyses

Check the internal consistency of an altimetric system by analysing the Sea Surface Height (SSH), its parameters and geophysical corrections

TIME

- 2005: detection of an hemispheric north/south bias on mono-mission crossover maps due to a time-tag bias of ~0.28 ms
- 2008: reprocessing of Jason-1 data in GDR-C version including a new parameter to correct empirically this time-tag bias, time-tag bias is also observable on Jason-2 data
- 2010: CNES experts find the explanation for the time-tag bias on Jason
- 2012: Reprocessing of Jason-2 data in GDR-D version: the datation in the GDR product is corrected for this time-tag bias

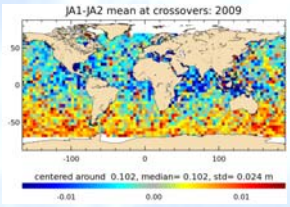


Example 2: Altimeter missions cross comparisons

Evaluate the coherence between two altimeter systems by comparing their SSH and estimate the potential improvement of the computation of a new altimeter standard in the SSH calculation.

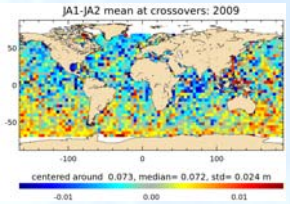
TIME

- 2008: detection of an hemispheric north/south bias between JA1 and JA2 during flight formation phase for CNES POE_C - range - MSS. This bias was reduced using GSFC Doris/Laser orbit
- 2012: reprocessing of Jason-2 in GDR-D standard. Outside of formation flight phase geographically correlated bias observable on JA1-JA2 crossover points using : POE-D, GOT4V8, model WTC, SSB from products



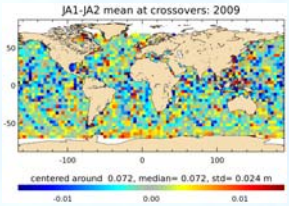
Hemispheric SSH bias: +/- 1 cm

- POE-D, GOT4V8, model WTC, **2012 SSB**: amplitude of geographically correlated bias is reduced (around Indonesia, around 50° S). Small North/South bias remains



Hemispheric SSH bias: +/- 0.5 cm

- **Doris only orbit (without down-weighting of SAA stations for JA1)**, GOT4V8, model WTC, 2012 SSB



Hemispheric SSH bias: not detectable

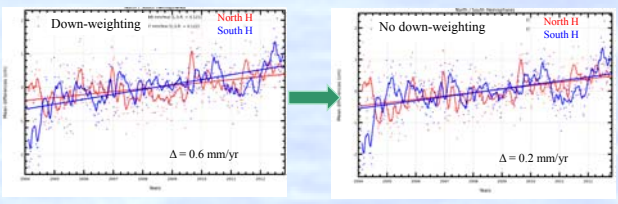
Mono-mission analyses
Cross-comparisons
Cal/Val
In-Situ comparisons

Example 3 : In-Situ Comparisons

Compute the SSH differences between altimeter data and in-situ measurements (tide gauges, Argo T/S profiles,...) to detect potential drifts or jumps on the long-term time series

TIME

- 2005: Down-weighting of SAA stations for JA1 orbit solution improves performances at mesoscale, but creates a small North/South bias between JA1 and JA2 data. Compared to insitu data (T/S profile), which weighting solution is more coherent?
- 2013: Down-weighting of SAA stations for JA1 Doris only orbit shows North/South trend differences (between JA1 and T/S) of 0.6 mm/yr
- 2013: Without down-weighting of SAA stations for JA1 Doris only orbit the North/South trend differences (between JA1 and T/S) is reduced to 0.2 mm/yr



Conclusions

- Jason-1 and Jason-2 altimeter ocean validation activities performed by CNES and CLS have allowed us to strongly contribute to the improvement and the very good data quality
- The 3 examples presented here show that :
  - Altimeter Validation activities over ocean is not a "simple" data quality control but a very complex and exhaustive activity
  - The communication with experts is crucial to understand and correct the anomalies
- The key of success of these validation activities are :
  - Use other altimetry missions in operation
  - Use independent external data sources
  - Agility: iterate quickly : reactivity is essential in crises and commissioning
  - Skill diversity: integrating a wide panel of scientific & technical skills in the validation
  - Skills maintained on time : over all the altimetry period

- For future altimeter missions, 2 main recommendations should be applied for ocean validation activities:

Recommendation 1 "A strong effort is mandatory for the altimeter ocean validation activities"
- To provide for users and productions centers (My Ocean/DUACS, ECMWF) the best altimeter datasets possible for all the applications: oceanic variability, climate studies,...

- **Recommendation 2:** "An integrated team gathering validation & instrumental experts is necessary"
  - To have short feedback loops
  - To correct/validate the anomalies as soon as possible

These recommendations are emphasized with the upcoming launch of Sentinel-3A:
The SARM altimeter on board provides a new potential for high resolution topography but also many questions and challenges for Calibration / Validation activities.

Collecte Localisation Satellites
8-10 rue Hermes
31520 Ramonville Saint-Agne - France

OSTST
8-11 October 2013 | Boulder, US