THE ALTIMETRY DPQC TEAM: 2 YEARS OF QUALITY CONTROL

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ABSTRACT

Since 2005, the performances and quality of the ESA Altimetry instruments and products are continuously assessed by the altimetry DPQC (Data Processing & Quality Control) team. The role of this team includes the routine data quality control at near real time (NRT) level, advanced instrument performances assessment, anomaly investigation and solving, etc. The first objective of this paper is to present these activities and the main associated results.

DPQC ACTIVITIES

The DPQC is a consortium of specialized companies collecting engineering and scientific expertise all over Europe. The DPQC role is to provide on behalf of ESA the service of product monitoring and processor implementation for the ERS and ENVISAT missions and for future ESA missions. While performing these tasks the DPQC interacts with ESA and the science user community (QWG). Whenever an anomaly is detected during the quality check an investigation is started by involving all the necessary expertise. The outcome of the investigation is a remedy that could imply a workaround solution or a re-processing instance; in some cases the solution could drive the evolution of the processor baseline and/or the review of the calibration and validation plan. The final outputs of the DPQC service are the daily and monthly reports this last is delivered to the science user community. Furthermore the DPQC contributes to workshop and meetings in support to the mission. A schema showing the activities performed by the DPQC and the main entities involved in this process is shown on the right.

Main Anomalies Detected, Investigated and Solved Since 2005 up to Now

ULTRA STABLE OSCILLATOR (USO) ANOMALY

Observations: The figures below report the USO clock anomaly, figure 1, and the impact in the range, easily visible on SLA jump (about 6 meters), figure 2 and figure 3.

Investigation and Remedy: A method was proposed by DPQC team (see paper Faugère et al., “AN OPERATIONAL CORRECTION FOR THE RA2 SIDE A USO ANOMALY: METHOD AND PERFORMANCE ASSESSMENT”). Figure 4 shows the Sea Level Anomalies after applying the delta range correction.

Figure 1: USO Clock period with respect to nominal
Figure 2: Ku and S Band Sea Level Anomalies
Figure 4: Sea Level Anomalies after applying the delta range correction

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S-Band waveforms accumulation anomaly

Observations: Example of a starting of an S-band anomaly on pass 991, cycle 16. Sigma0 difference between Ku and S Band, Figure 5.

Investigation and Remedy:
Since beginning of cycle 31, IF CAL procedure is implemented twice per day over Himalaya region in order to decrease the number of occurrences of S Band Anomaly from a mean 4% to 2%.

IPF version 5.03 includes an algorithm that can detect the presence of the so-called “S-Band anomaly” over any surface. In case of S-Band anomaly detection, bit 1 of the L1b products MCD and bit 7 of L2 product MCD are set to one. [RA-2 S-Band Anomaly Investigation, PO-TN-ESA-RA-1342 and Algorithm for Flag identification and waveforms reconstruction of RA-2 data affected by “S-Band anomaly”, ENVI-GSEG-TN-04-0004, Issue 1.4 ]

On Feb 2007, a patch has been uploaded to solve the S Band Anomaly. No occurrence has been registered of the anomaly but due to some additional investigations the patch was not to uploaded since 9 April.

Misapply of Doris Navigator inside the processing chain

Observations: Since the 24th of October, with IPF V5.02, an improvement has been reached in the quality of the orbit evaluation processed in Near Real Time. SLA (Sea Level Anomaly) variability has decreased from 20m to about 50cm.

Today the goal is to increase the Doris navigator usage.
Investigation and Remedy:
About 30% of NRT data is being processed without DORIS due to problems identified in the ground segment (IPF, EPS Facility):
1. IPF failures correspond to about 18% and are due to the coverage check currently performed on DORIS wrt RA2. The new version of IPF, currently under development, will include a higher threshold to allow a higher usage of DORIS;
2. EPS problem correspond to about 7% and will be solved in the following weeks with the usage of a new CFI Function recently delivered CFI 5.6;
3. The remaining 5% is due to systematic Gaps in DOR_NAV_0P wrt RA2 data of around 5 minutes per orbit. This problem cannot be fixed since it depends on the dump of DORIS data.

The goal is to have only 5% of NRT data processed without DORIS in the next months.

Auxiliary Files wrongly generated
Observations: A datation problem occurred on November 2006, the 30th due to a wrong value in a auxiliary file used by the IPF processing chain. The datation error (around 4s), Figure 9, caused a high impact on RA2 data: SLA jump 100m, Figure 10.

Investigation and Remedy:
The affected data have been reprocessed with the proper UTC/SBT correlation and the SLA was nominal. The picture below, Figure 11, is on one reference orbit. Thanks to this procedure, 1 day of Envisat Ra-2 data was saved.

Monitoring results: Long Loop Performance
On a cyclic basis, one of our interest is to follow the long loop performance of some chosen parameters to detect any drift inside the data. All the outputs are collected on a dedicated chapter, the Cyclic Reports available in the web: http://earth.esa.int/pcs/envisat/ra2/reports/pcs_cyclic/
Below some examples of long term plots.
- Mispointing estimated from the waveforms, Figure 12. The first jump is due to the usage of a new IF Mask, the second jump is due to a new algorithm that avoid the waveform bump to estimate the mispointing.

- Sigma 0 in Ku-band, Figure 13.

- Significant wave height in Ku Band

**Conclusions**

The aim of the DPQC activity is to assess the data quality and to detect as soon as possible any anomaly that could affect the data, in order to react quickly to find solutions and to keep users informed.

Various activities have been set up within the DPQC to provide the data user with data of good quality as well as quality information through:

- Daily monitoring
- Cyclic Monitoring http://earth.esa.int/pcs/envisat/ra2/reports/pcs_cyclic/
- Documentation resources available on line http://earth.esa.int/pcs/envisat/ra2/events/
  http://earth.esa.int/pcs/envisat/ra2/articles/
  http://ra2qa.mssl.ucl.ac.uk/cgi-bin/main.pl
  http://envisat.esa.int/dataproducts/availability/disclaimers/
- Data specific calibrations
- Data corrections http://earth.esa.int/pcs/envisat/ra2/auxdata/