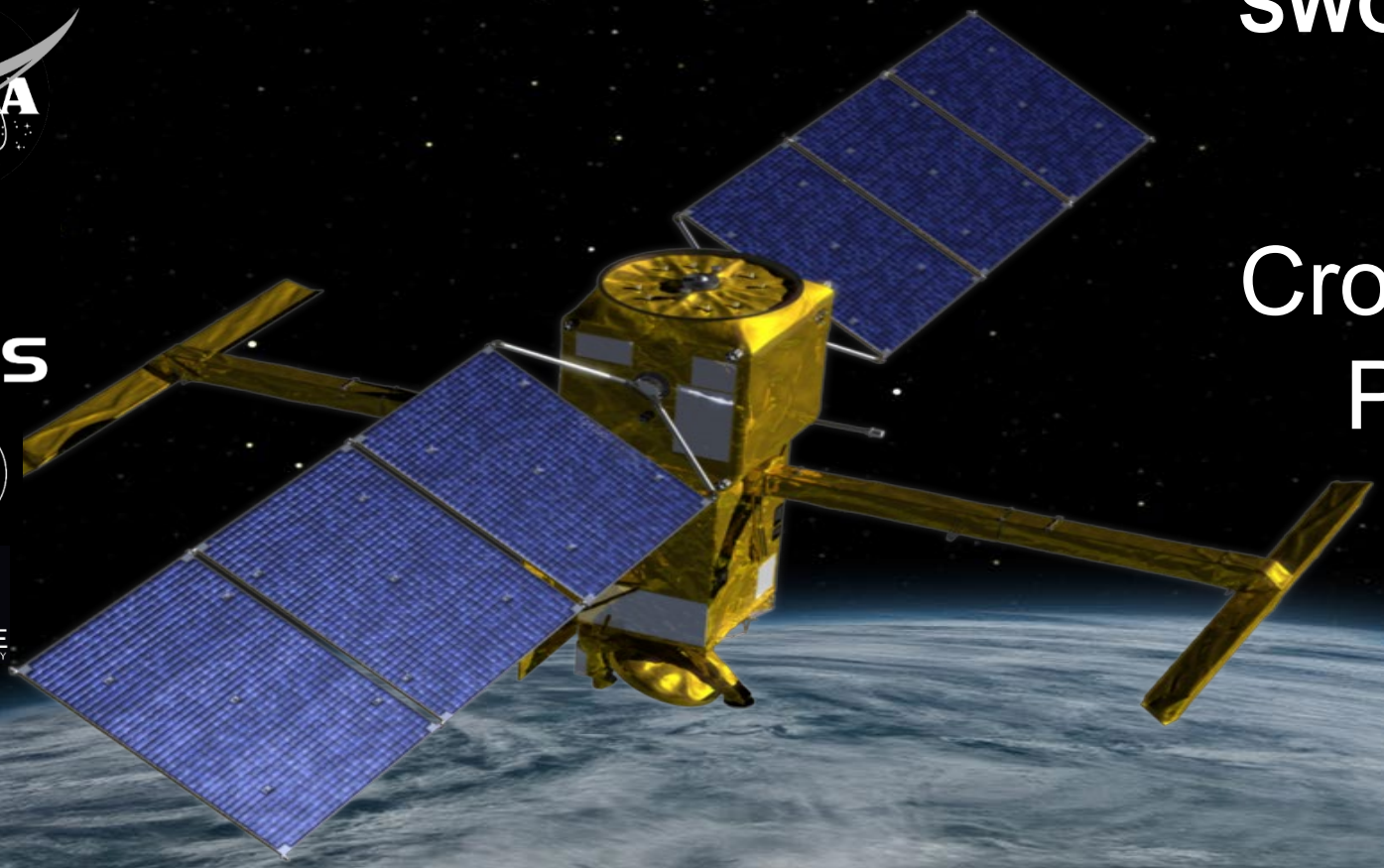
SWOT validation meeting

17-21 June 2024

Crossover Calibration Plans for Future



CNES and CLS Calval Team

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DATLAS : Clément Ubelmann

Context/Outline

Context:

- Most of the evolution between XCAL V4.2 and V4.3 (the one in operation since end Nov 2023) were mostly dedicated to the improvement of the correction
- Some limitations were identified regarding the quality flag of the correction
  - With a specific impact on HR products for LAND usage
- Next XCAL version is (mainly) dedicated to the improvement of the correction quality flag

Outline:

- List of the XCAL evolutions planned for next version
- Limitation on the current quality flag definition (focus on LAND)
- Improvement expected with next version

List of evolutions for next XCAL version

- **The quality of the current XCAL correction (V4.3) is good**
  - **Huge improvements wrt to previous version (V4.2 used in beta prevalidated products / version-B)**
  - **Expected / Nominal averaged performances estimated over Ocean & Inland waters (even if more validation still needed)**
- **However some limitations have been identified on the quality flag of the correction**
- **The main improvements expected with next XCAL release concern the quality flag definition**

Evolutions	Expected impact
Quality flag definition	**Majeure**
Refine the outliers detection (Xovers)	Minor
Anomaly identified in Xovers calculation (bug)	Minor
Refine the length of the temporal window used to fit the orbital harmonic	Minor
Timing: - Handle mission events to discard nadir measurements in specific cases - Extrapolate nearest nadir when interpolation is not possible	Minor
A priori oceanic variability information (for Xover weights)	Minor
Simplification of the code architecture	Minor

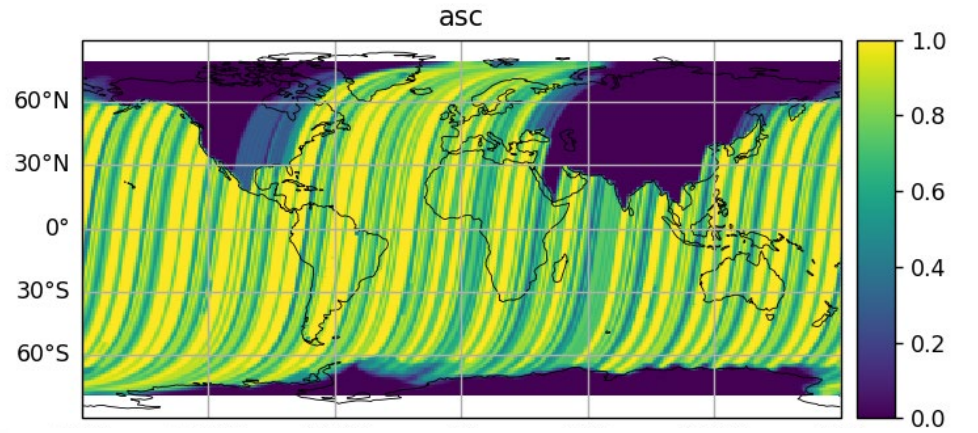
- Other evolution planned (does not concern the XCAL algo) is to add information of distances wrt prev/next xovers in the XCAL products useful for performance assessment.

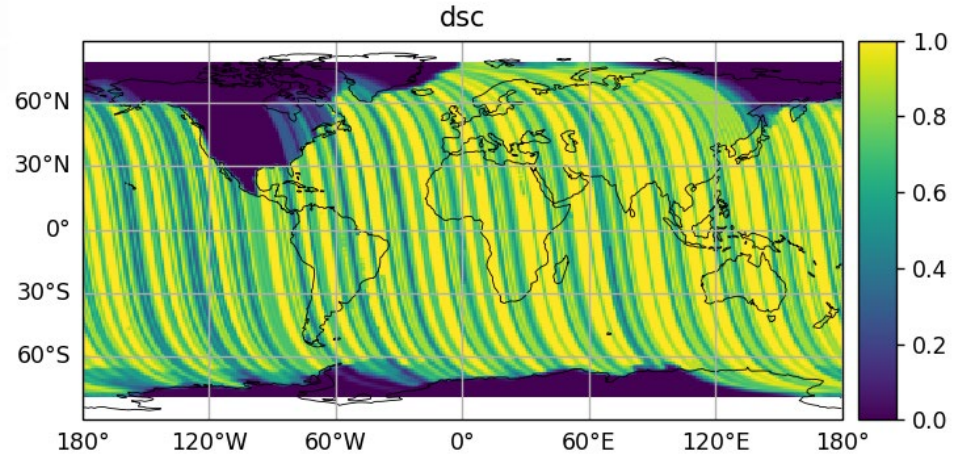
Limitations observed with XCAL V4.3

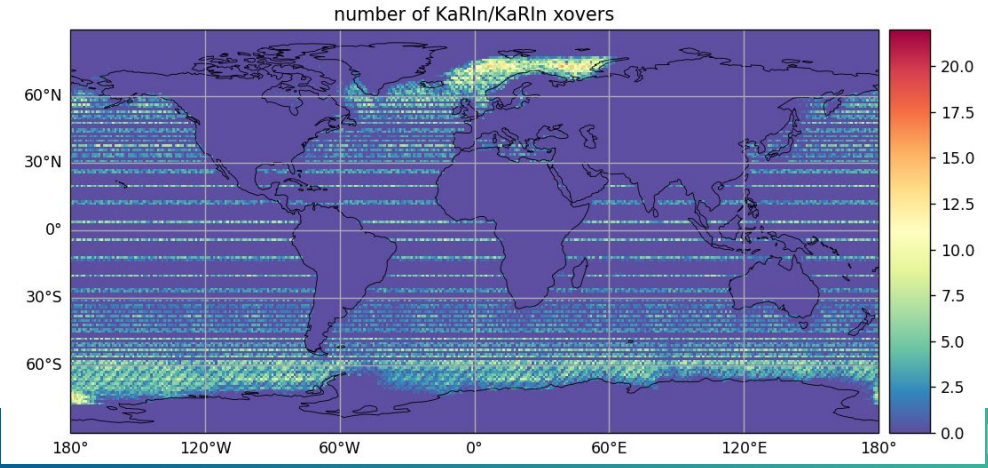
- **Mean value of the XCAL quality flag for ASC & DSC passes.**
  - **From November to February**
  - **« Version C products » in FWD mode**

- **The quality flag over continents depends on the data availability/validity over ice free surfaces at high latitudes expected**

- **The anomaly observed is more related to the sharp transition from 0 to 1 when SWOT overflights Ocean/Land transitions.**



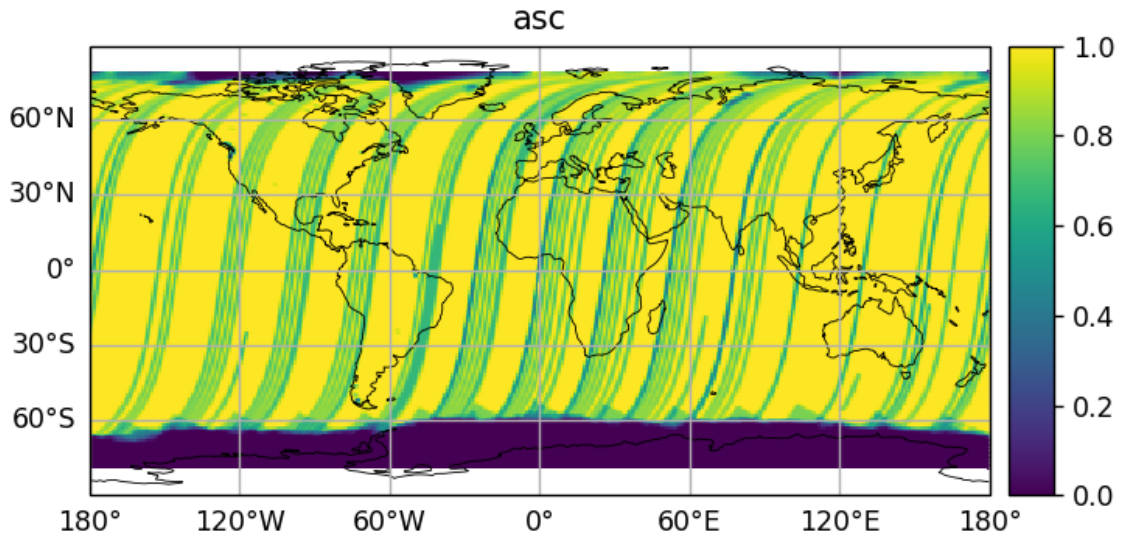


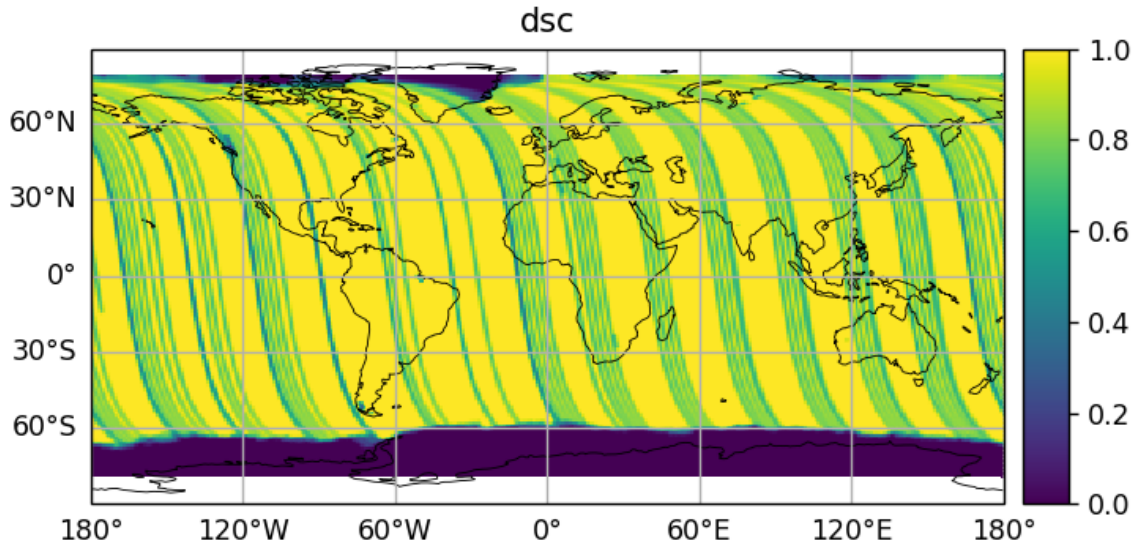


Limitations observed with XCAL V4.3

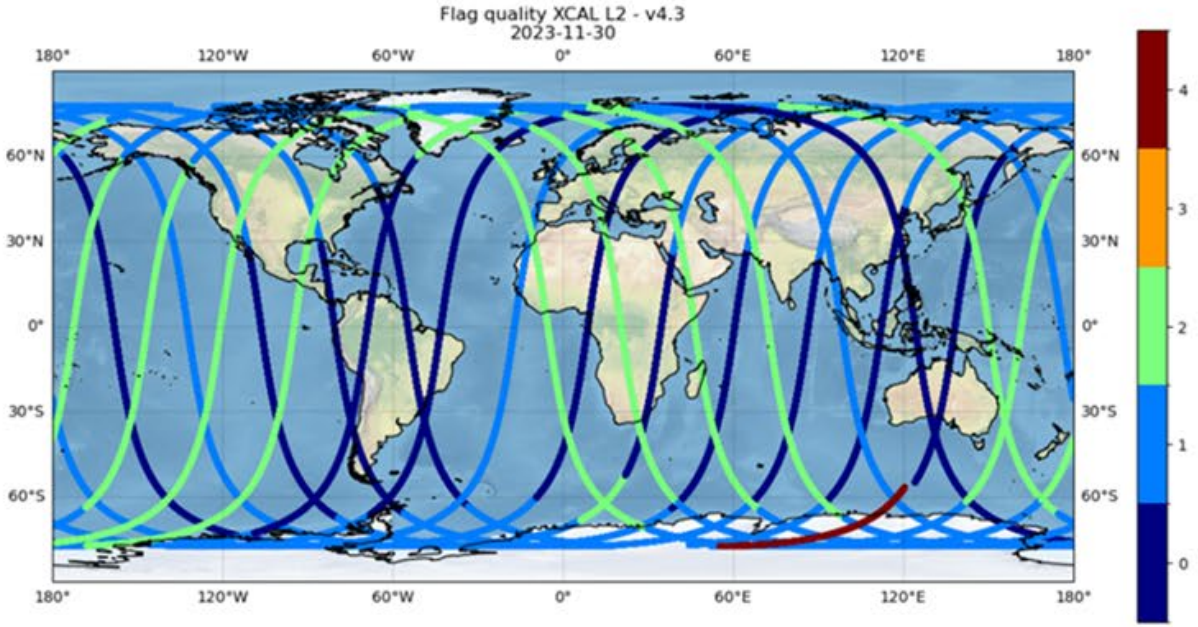
- **Mean value of the XCAL quality flag for ASC & DSC passes.**
  - From August to September
  - « Version C products » in REPROC mode

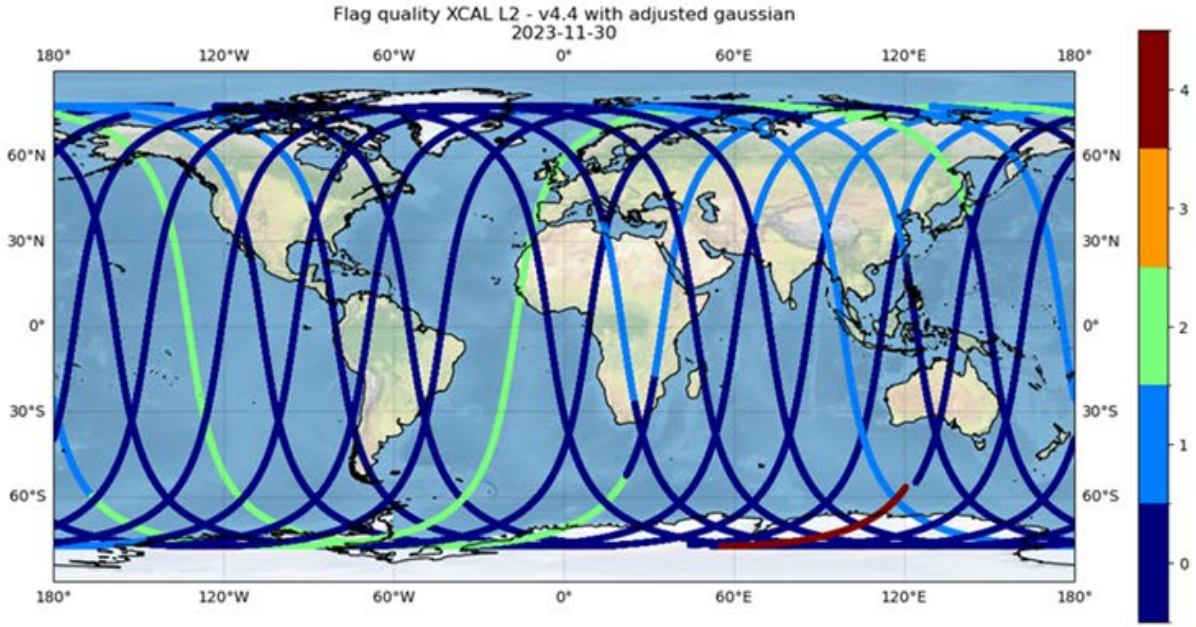
- **When crossovers are available apart from continental surfaces, the quality flag is nominal (but does not account for distance wrt nearest crossover)**





Improvement expect with next XCAL version





Current version (V4.3):

- flag defined by “amount of valid data”
- + location of these valid data impacts the flag definition over LAND

Next verions:

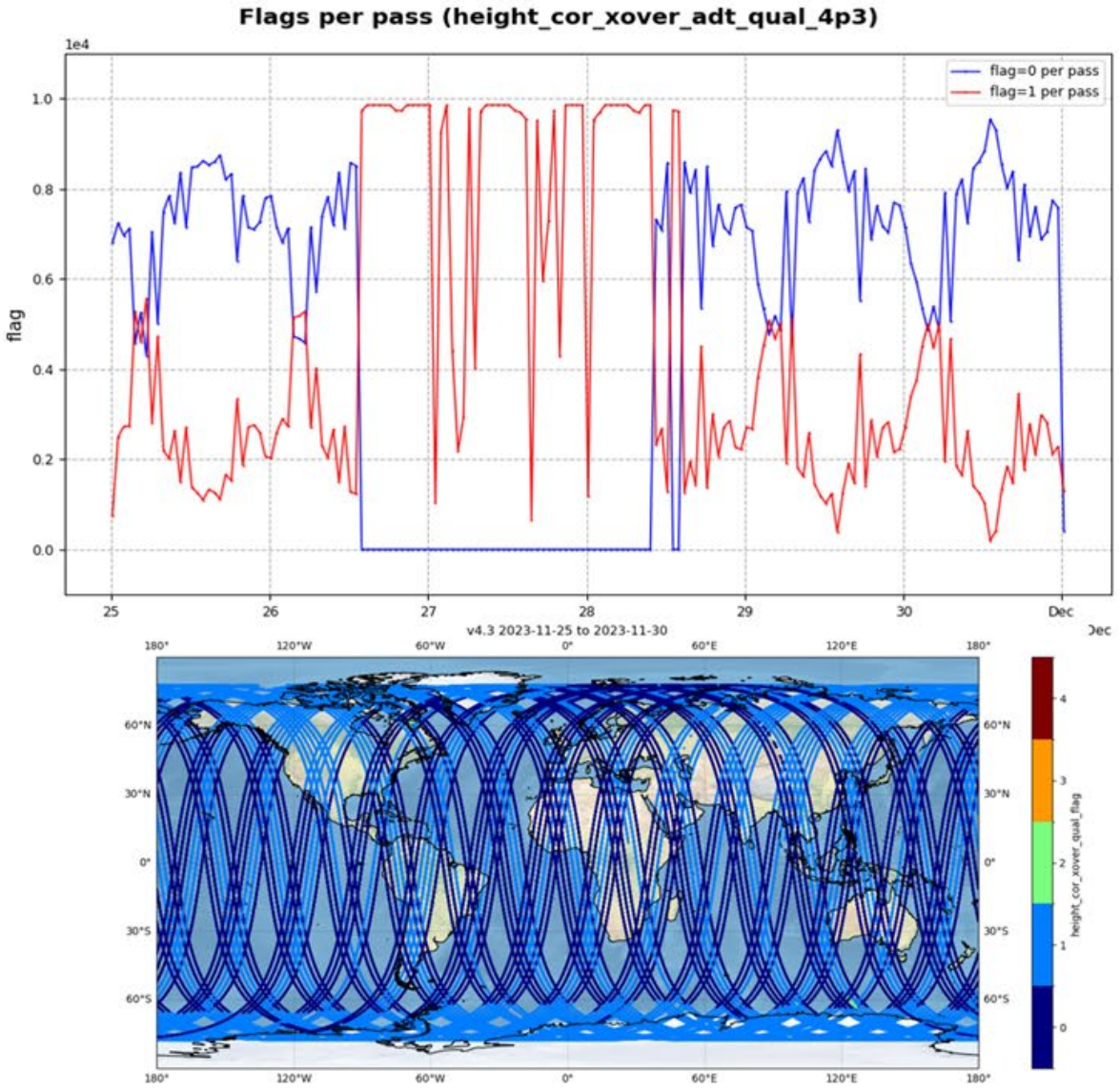
- flag is set by amount of xovers + distance between two xovers
- The threshold on the distance from nearest crossover will be determine from results based on the study of the virtual continent (presented in « XCAL performances » presentation)

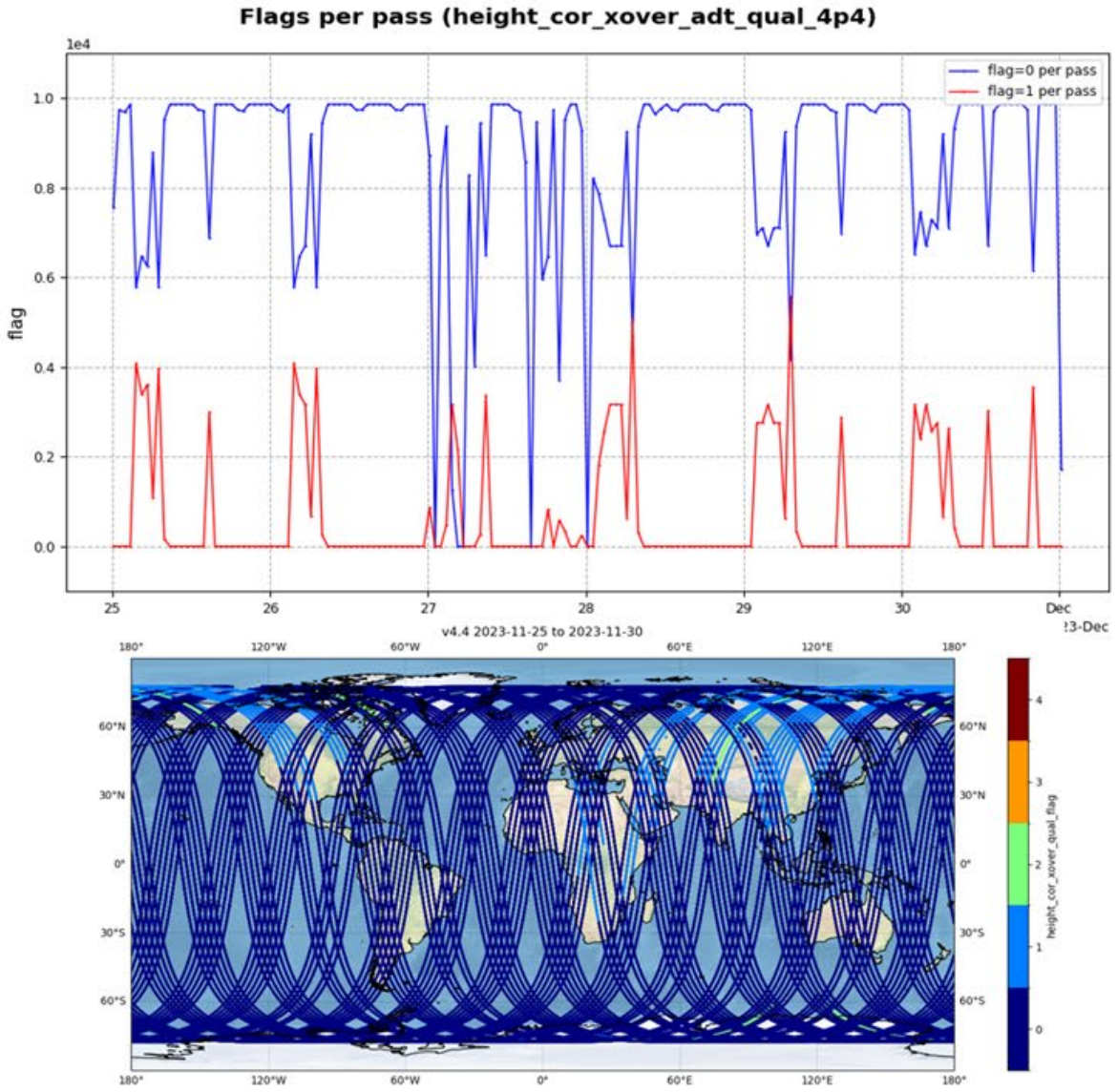
BACKUP

Limitation observed with the current XCAL over Ocean

- **3 reasons to explain the high occurrences of suspect cases over ocean**
  - **Mission manoeuvers, missing products**
  - **nominal cases of flagging.**
  - **Missing precal files when XCAL is running**
    - **corrected with a longer timeout betwen L2 PRECAL processing & XCAL processing since 16th of January 2024**
  - **Threshold on the % of Valid KaRIn SSHA measurements over a given time window**
    - The threshold definition is fixed and too sensitive to seasonal fluctuations (ice coverage) and short mission events
    - This parameter will be refined

Illustration of overflagging over Ocean





- Flag value=0 : Correction computed nominally.
- Flag value=1 : Within a 21-days window, there are more than 6 days of missing data.
- Flag value=2 : Within the centered time window of 32 passes, there are more than 10 missing passes.
- Flag value=3 : Previous pass is missing, all correction between the beginning of the pass of interest and the first crossover point inside the pass is flagged (and the symmetrical applies if the next pass is missing).
- Flag value=4 : Correction is undefined, correction values are put to zeros.

Flag value	Meaning
0	Correction valid
1	Correction computed with a significant lack of crossovers
2	Not enough data to compute a valid orbital harmonics correction
3	Previous or next pass is missing, all data until the first crossover is flagged
4	Undefined values replaced by 0

Table 12. Description of the flags for the roll-phase correction