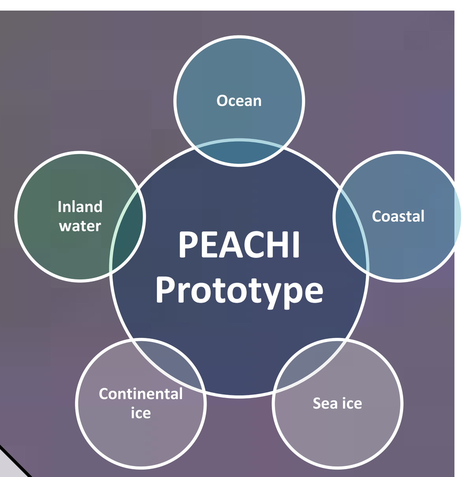
First year of the microwave radiometer aboard SARAL/AltiKa : In flight calibration, processing and validation

M-L.Frery (CLS), B.Picard (CLS), E.Obligis (CLS),N. Steunou (CNES), N. Picot (CNES)



Assessment of MWR measurements

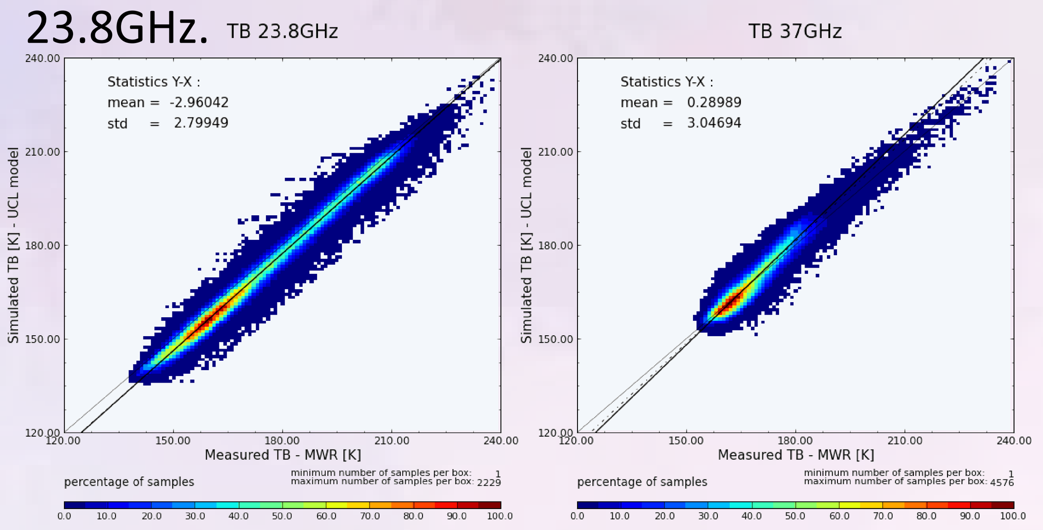
Comparison to simulations over ocean

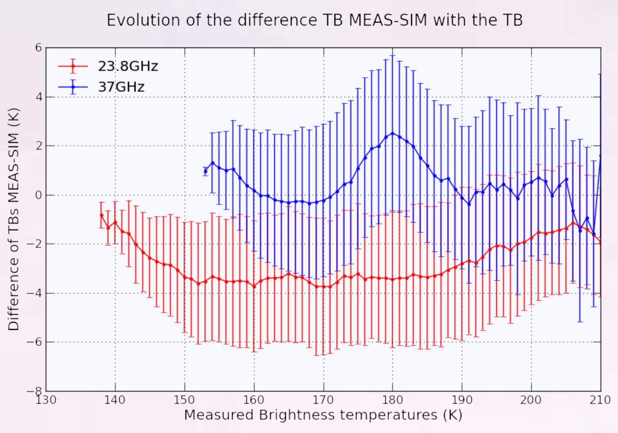
Profiles from ECMWF model analyses were used to simulate brightness temperatures over ocean. A space-time threshold of ±0.25° ±30min was taken for the four daily analyses for the first five cycles of SARAL/AltiKa. A selection of open ocean situations is performed by filtering altogether measurements and simulations. Cloudy situations are kept when consistent between measurements and simulations.

The scatterplots show a good consistency between measurements and simulations for both channels with a mean (std) of the differences (SIM-MEAS) :

- channel 23.8GHz : -3K (2.8K)
- channel 37GHz : 0.3K (3K)

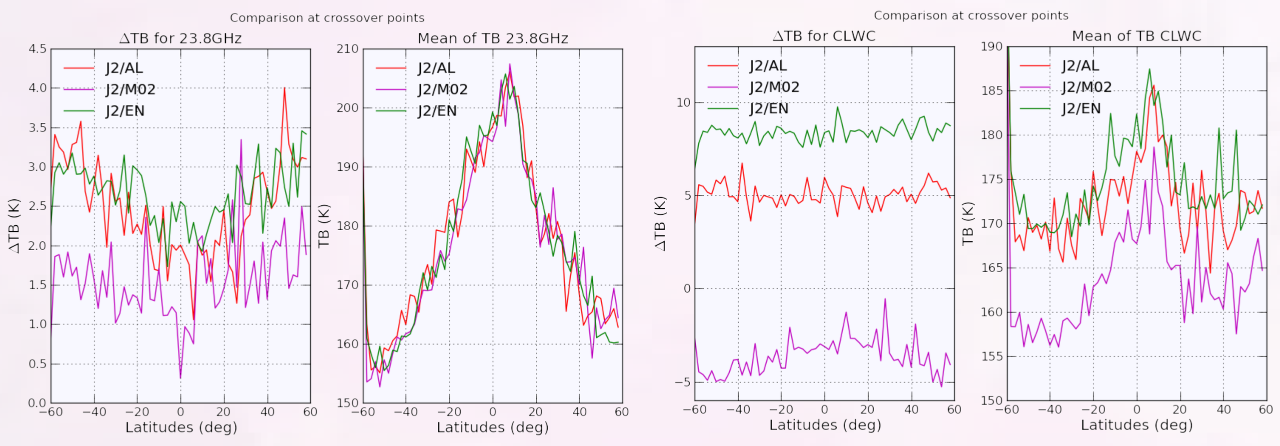
Looking at the differences TB MEAS-SIM with respect to the measured BT, this difference depends of the temperature with stronger values for channel 23.8GHz.





Cross-over points with other missions (mes/sim vs Lat)

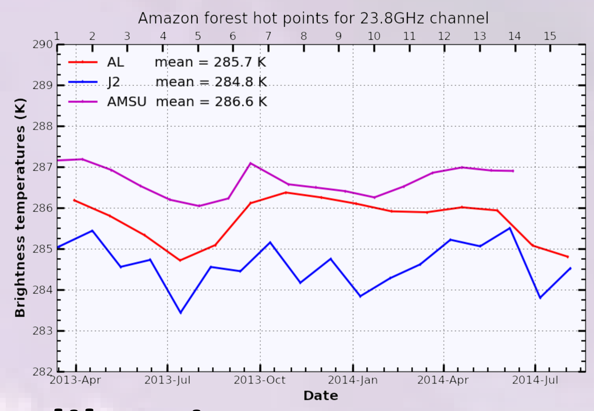
The comparison to Jason-2 BTs at cross-over points at +/-30min over 11 cycles of SARAL/AltiKa for AL and AMSU and 1 year (2009) for Envisat shows a dependency of ΔBT with the latitudes ie with the brightness temperature for the 23.8GHz channel.

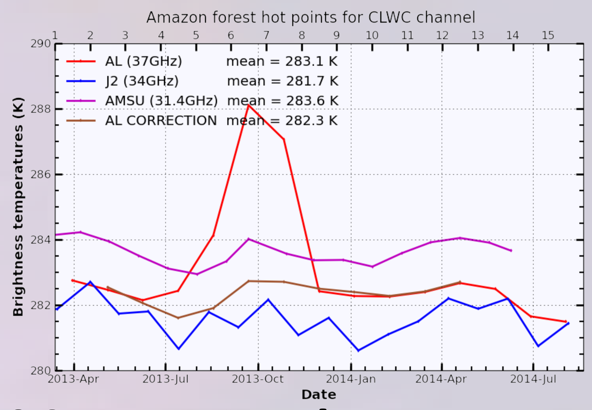


Vicarious calibration over amazon forest

GlobCover data have been used to filter the pixels not fully covered by dense forest. This analysis is also performed with other in-flight instruments. AltiKa shows a very good consistency with other instruments for both channels:

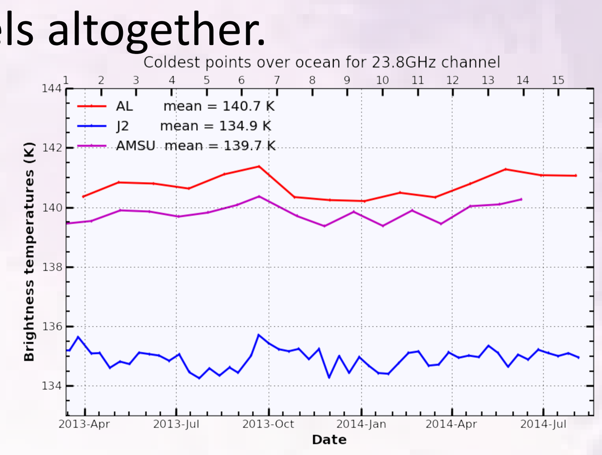
- 23.8GHz channel : AL is +0.9K/-1.1K with respect to Jason2/AMSU
- CLWC channel : AL is +1.4K/-0.5K with respect to Jason2/AMSU

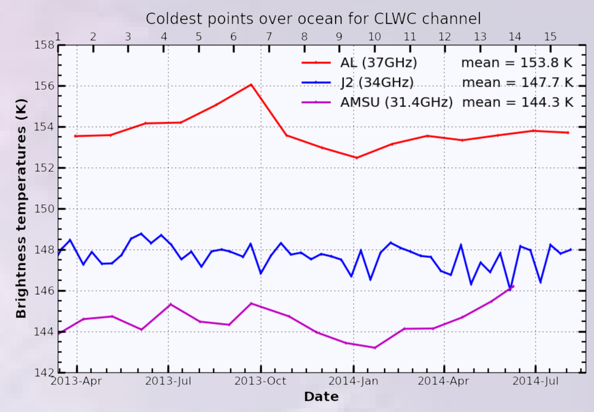




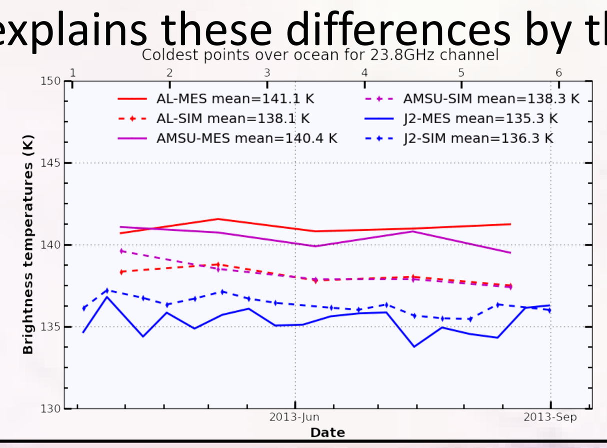
Vicarious calibration over ocean (coldest points)

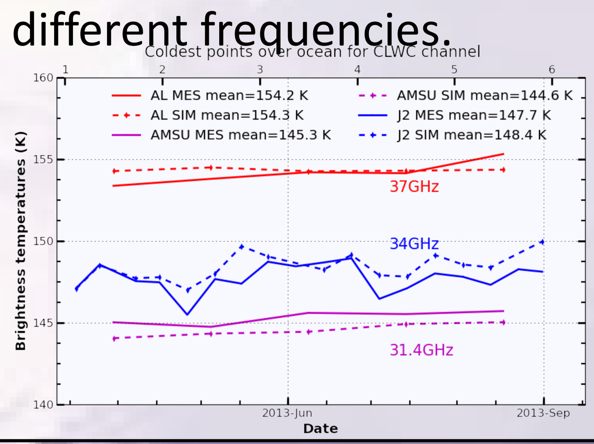
For this analysis, we implemented Eymard method (derived from Ruf's one). This method performs a statistical selection of the coldest point by filtering both channels altogether.





- For the WV channel, significant differences can be observed between Jason-2 and AMSU/AL despite the use of the same frequency (23.8GHz): AL is +5.8K/+1.K with respect to Jason2/AMSU. The different strategy of calibrations may be invoked. Simulations colocated with measurements show also a different behaviour between AL/AMSU and J2.
- For the CLWC channel, the differences are the strongest AL= +9.5K/+6.1K wrt J2/AMSU. The coldest ocean points of colocated measurements and simulations explains these differences by the different frequencies.

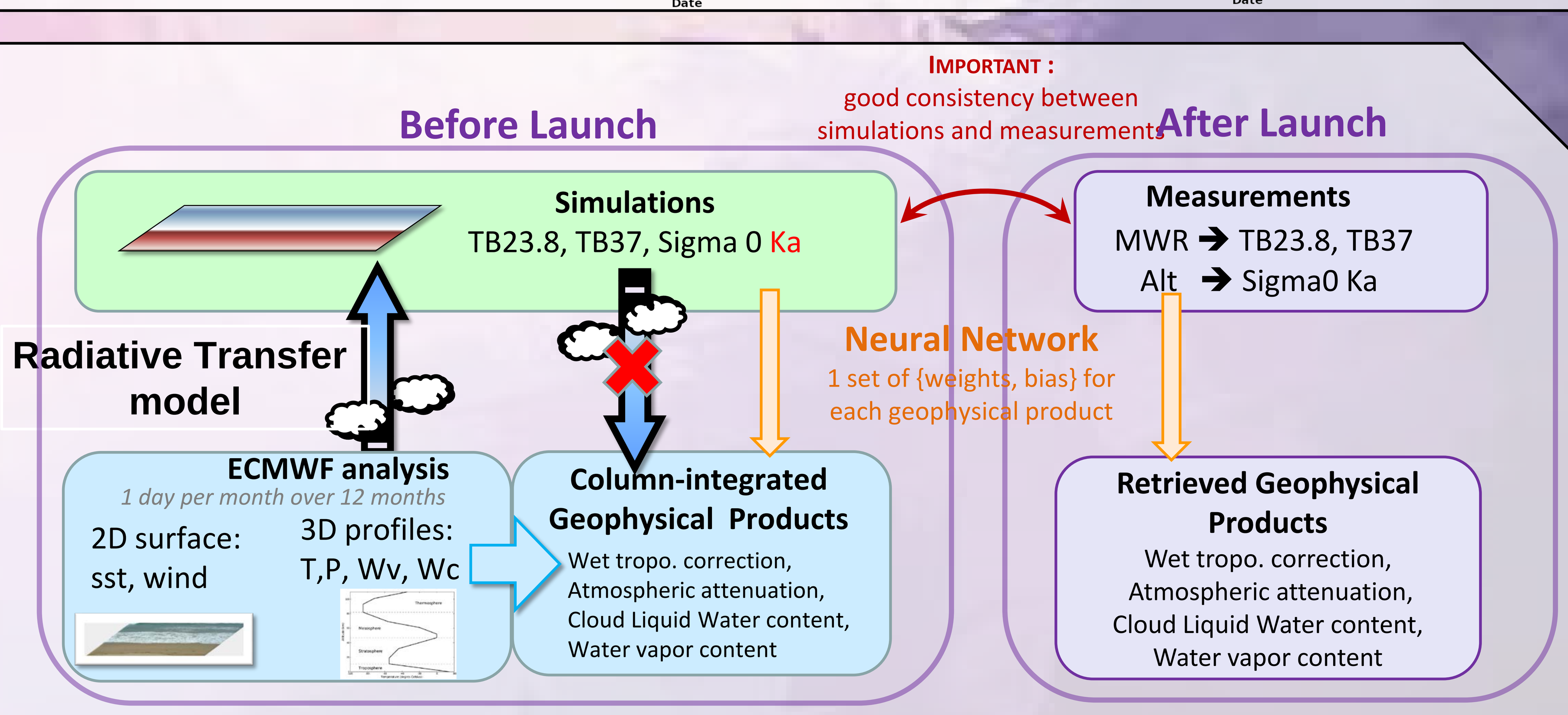




Inversion algorithm

Classical approach

- SARAL/AltiKa MWR being a two channels radiometer (23.8GHz, 37GHz), it doesn't have a low frequency channel to characterize the surface. This is why the Sigma0 is used as the third parameter of the inversion algorithm.
- Simulations of brightness temperatures and Sigma0 using a Radiative Transfer model and ECMWF analysis The RTM can not be inverted to retrieve the geophysical products from the (TBs, Sigma0). The neural network will learn the complex and non linear relation between the inputs (here simulated Tbs and σ_0) and the outputs (geophysical products).
- After launch, it is important to assure a good consistency between the measurements and the simulations to provide a good quality of the geophysical products. A linear relation is applied to the (TBs, Sigma0) in input of the inversion algorithm.

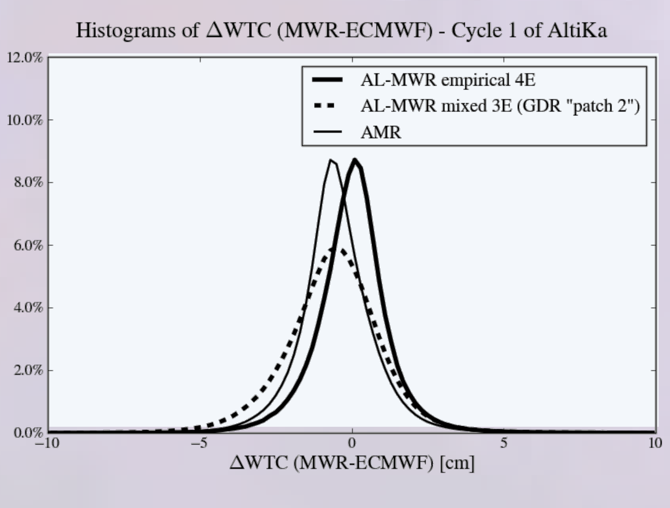


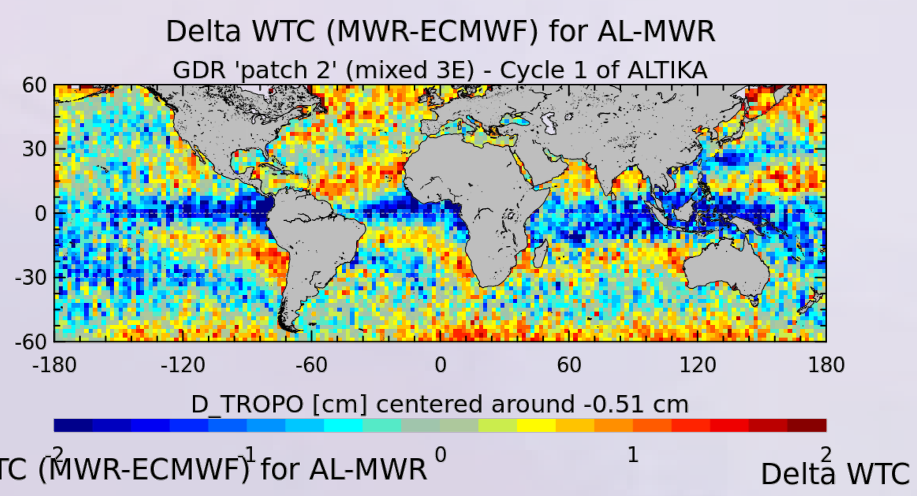
- This approach has been successfully applied on ERS-1/2 and Envisat with Sigma0 in Ku band. For the Ka band, the simulation of Sigma0 is challenging.

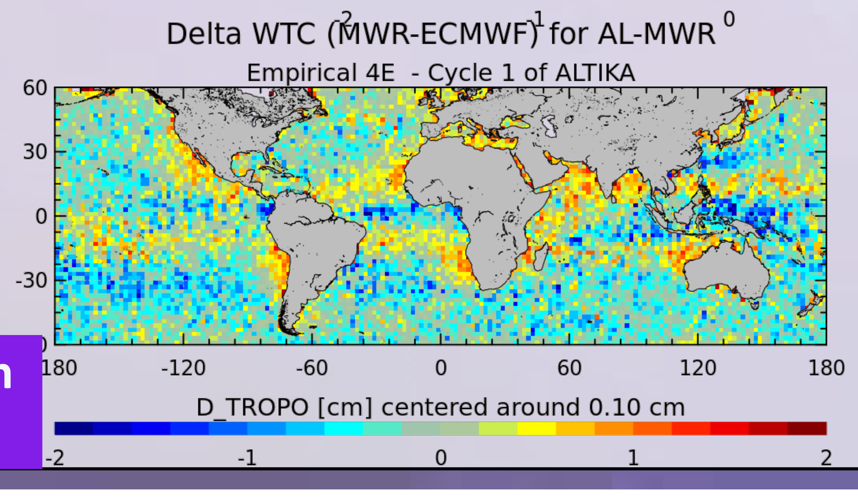
Empirical approach (future Patch 3)

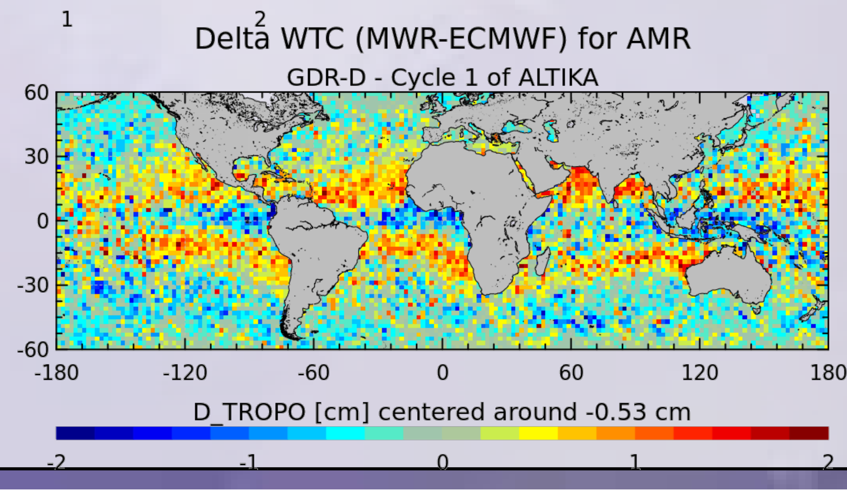
A new version of the inversion algorithm is under development. This new algorithm is an empirical one and is based on measurements for the BTs, σ0 and an additional parameter (SST). This empirical algorithm improves significantly the performances.

➢ **Improvement of the retrieval of the WTC**



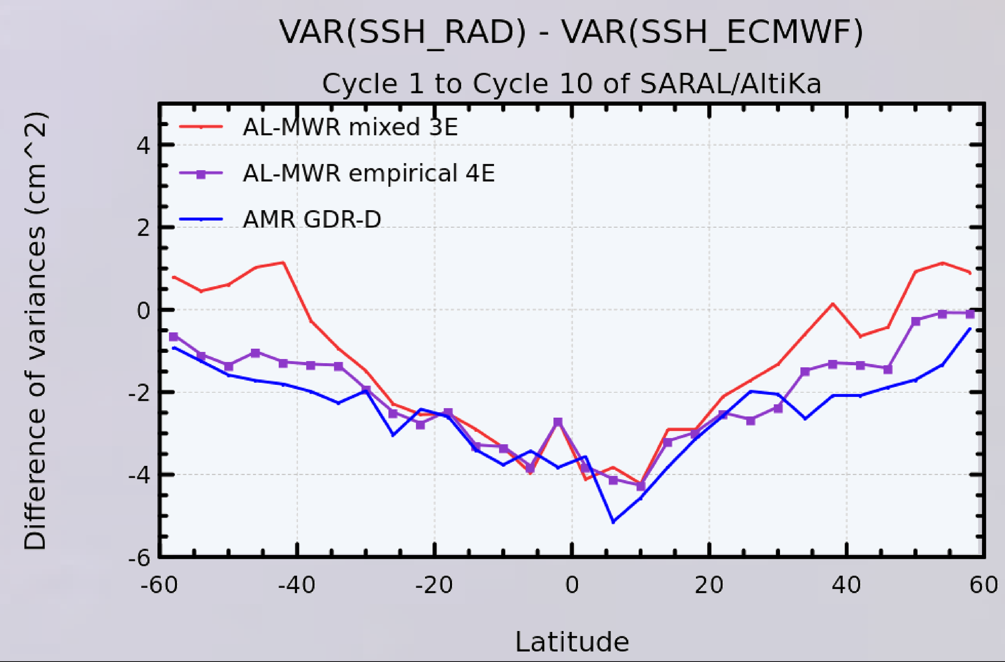






➢ **Reduction of the variance of the SSH at crossover points**

Δvar SSH (cm^2)	AL/MWR Mixed 3E	AL/MWR Emp 4E	J2/AMR GDR
	-1.352	-2.081	-2.497



Advanced availability on ODES system soon , thanks to PEACHI project!