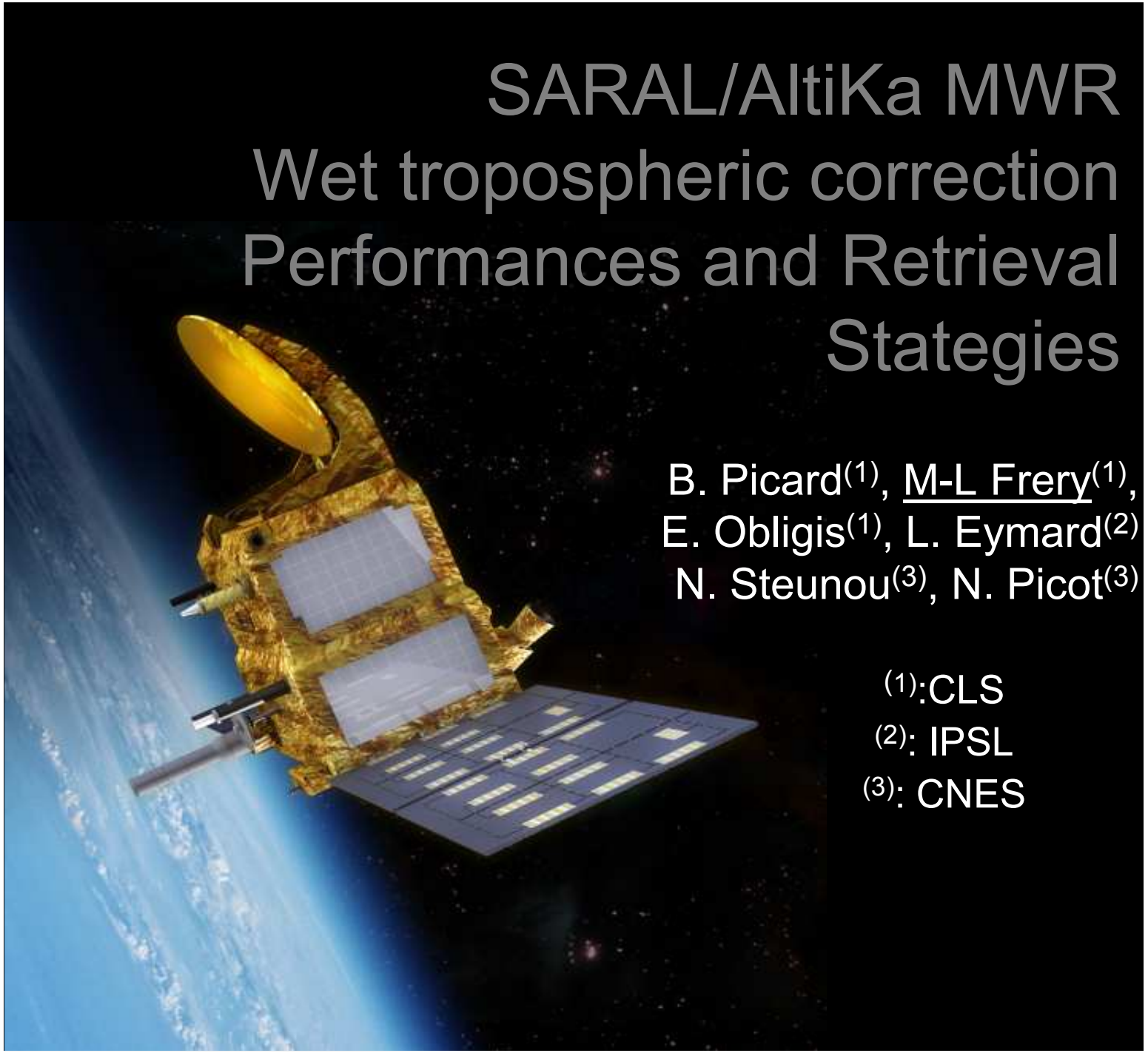
SARAL/AltiKa MWR Wet tropospheric correction Performances and Retrieval Stategies



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CENTRE NATIONAL D'ÉTUDES SPATIALES

SALP
SERVICE ALTIMETRIE & LOCALISATION PRECISE

PEACHI Prototype

SARAL/AltiKa Workshop

October, 2014
Konstanz, Germany

Context

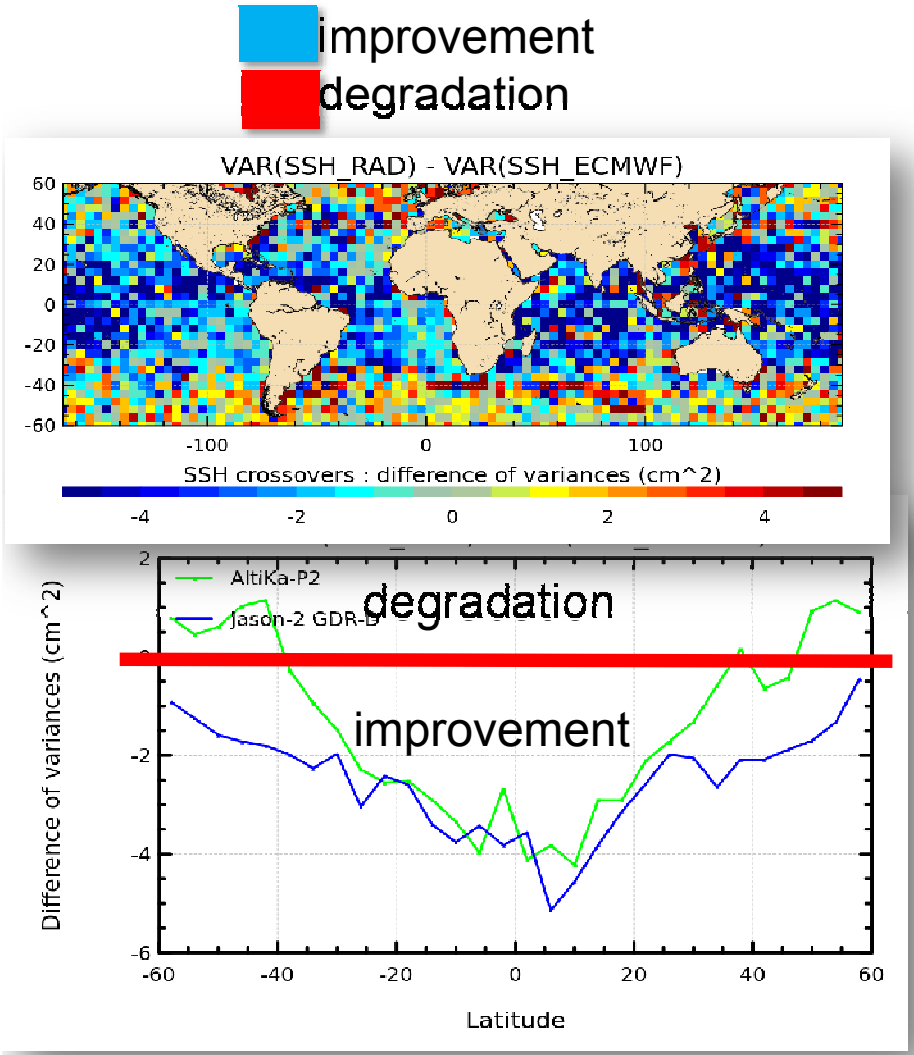
SARAL/AltiKa radiometer characteristics:

- dual frequency 23.8 GHz / 37 GHz (total power)
- fine spatial resolution : 8km / 12km
- very good thermal stability

ref: Steunou et al 2014, MG special issue

Patch 2 GDR product (Jan 2014) includes updated Neural Network coefficients set from a 2012 learning database:

Context



Quality of wet tropospheric correction (WTC) is evaluated by differences of variances of SSH at Xovers (radiometer vs ECMWF WTC)

The better the correction, the smaller the variance

Radiometer wet tropo. corr. (WTC) is expected t reduce the variance at Xovers compared to ECMWF wet tropo. corr.

Patch2 WTC quality is similar to AMR Jason-2 WTC for LAT [-20°,20°]

The quality is not optimal for ABS(LAT) > 20°

Context

SARAL/AltiKa radiometer characteristics:

- dual frequency 23.8 GHz / 37 GHz (total power)
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Patch 2 GDR product (Jan 2014) updated Neural Network coefficients set from a 2012 learning database:

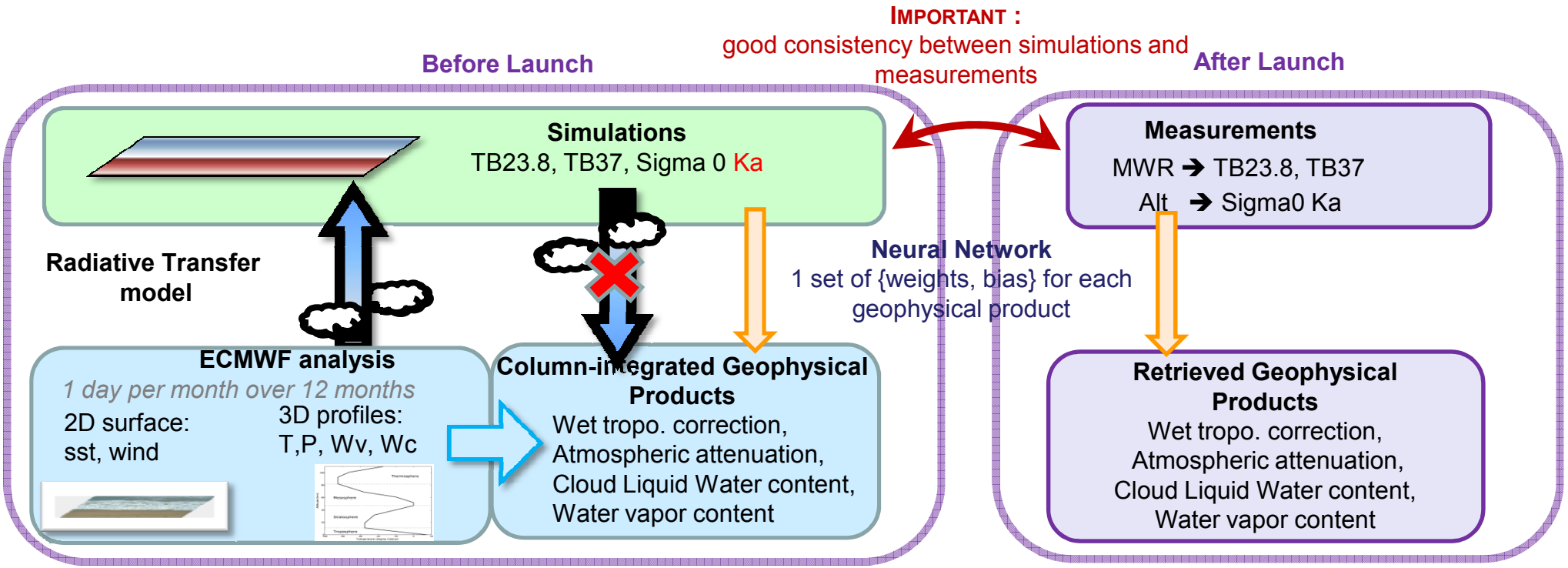
- performances similar to J2 for LAT $\in$ [-20°, +20°]
- not optimal performances for ABS(LAT) > 20°

Classical approach for L2 retrieval do not lead to the expected quality:

- **Can we explain the specificities for AltiKa ?**
- **Can we propose an alternative ?**

The classical approach

- Simulated TBs and sig0 are completely consistent with the atmospheric conditions of the model within the limit of the Radiative Transfer Model
- The learning dataset is statistically representative of all realistic atmospheric conditions

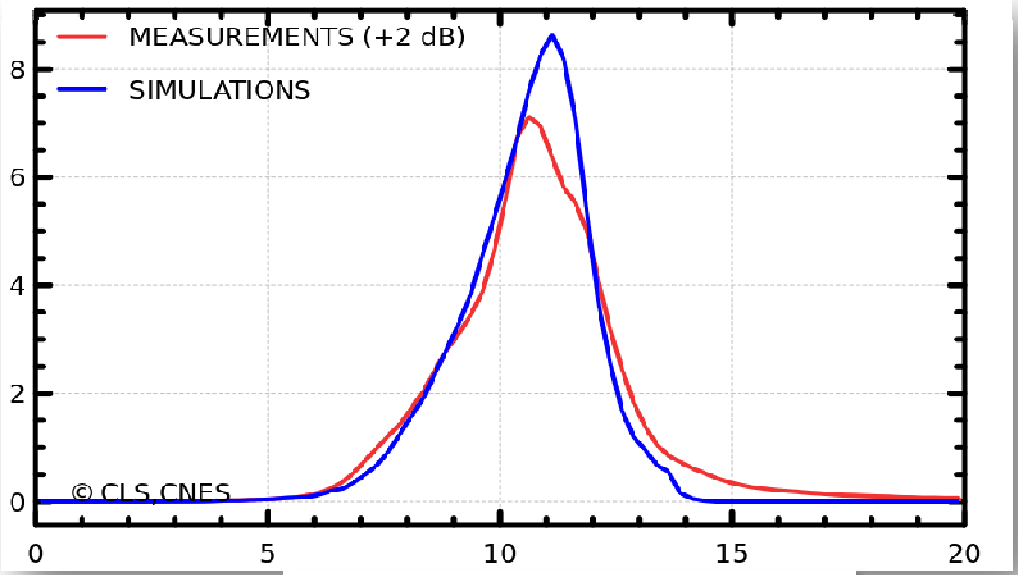


This approach has been successfully applied for ERS1/2 and Envisat (σ_0 in Ku band).

The classical approach

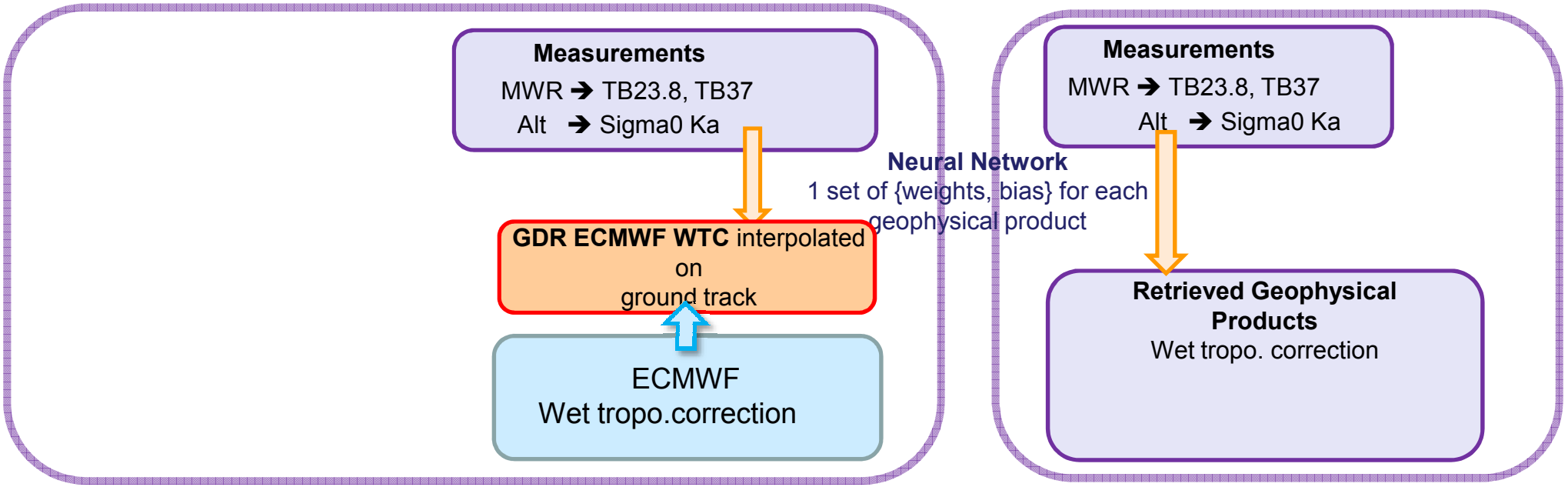
The quality of the retrieval is insured by the **consistency** between **simulations** (used for learning) and **measurements** (used for retrieval)

BUT
The simulation of Ka sig0 is challenging:



Empirical approach

- The **empirical** approach is based on:
  - learning database = simulation = measurements (TBs, sigma0)
    ➔ no simulation = no physic
  - output = ECMWF wet. tropo. **interpolated** on AL track



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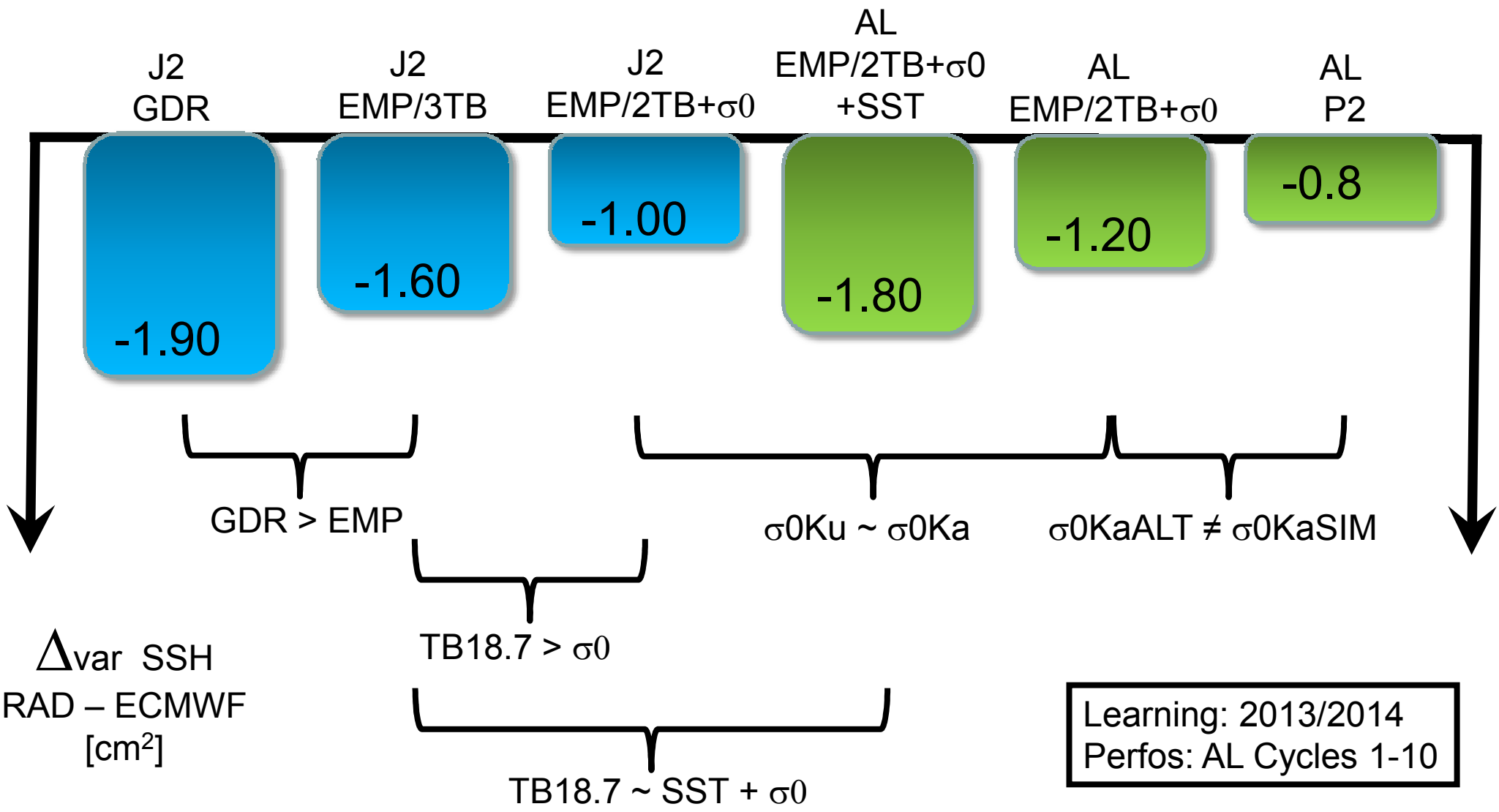
➔ due to the spatial/temporal interpolation and physical limitation of the model, measured TBs/sigma0 will **not** be consistent with the wet tropo. (for instance location and intensity of clouds)

CONS : quality is not expected to be as good as with classical approach

PROS : we do not rely on the simulations

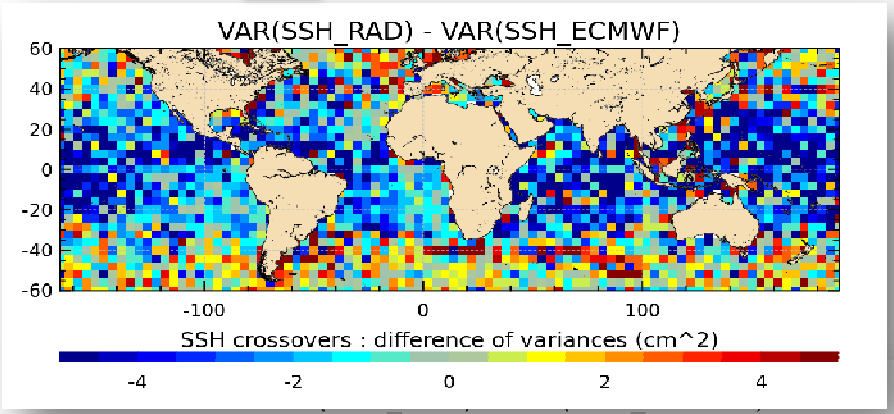
Empirical approach

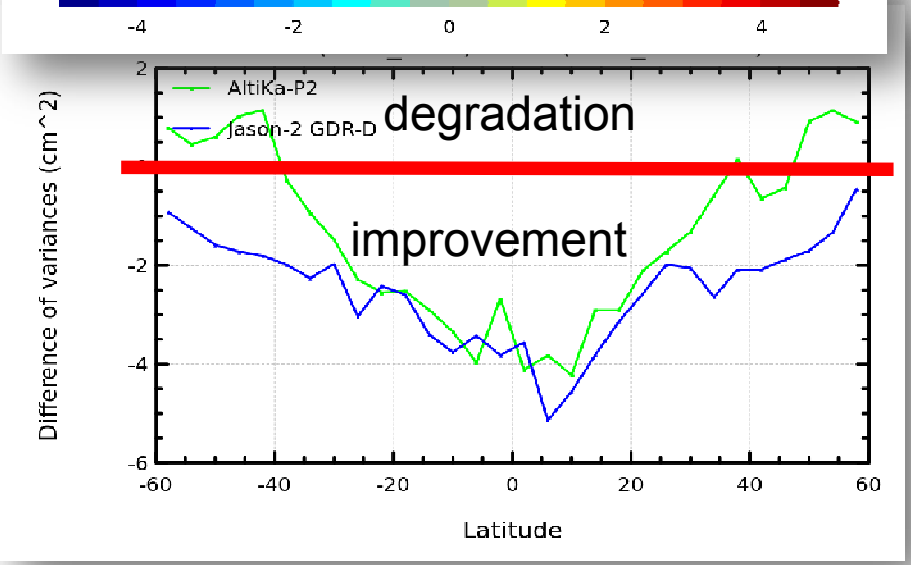


Performances of Patch 2 GDR

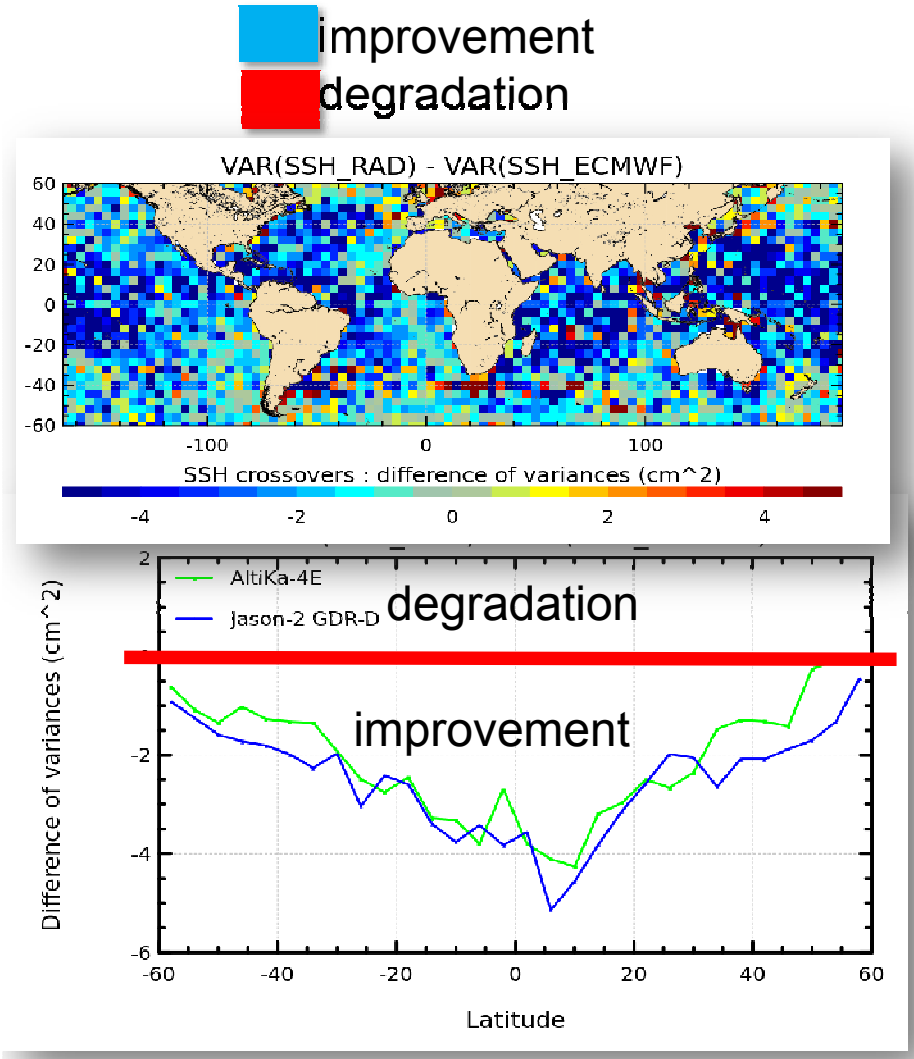
improvement

degradation



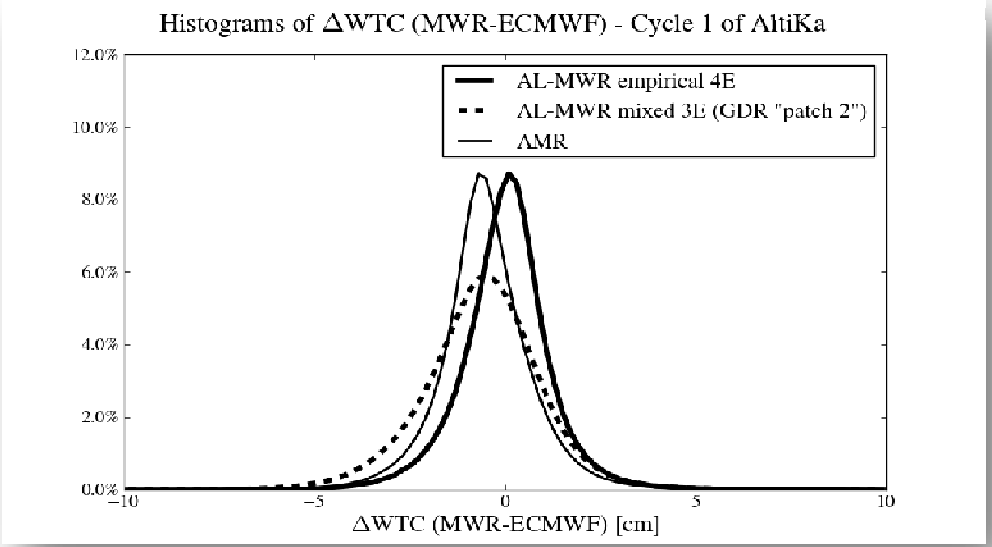


Empirical 4E = TBx2 + sig0 + SST



- Performances of empirical approach with '4E' = 4 inputs = TBs + sig0 + SST for AltiKA are close to Jason-2

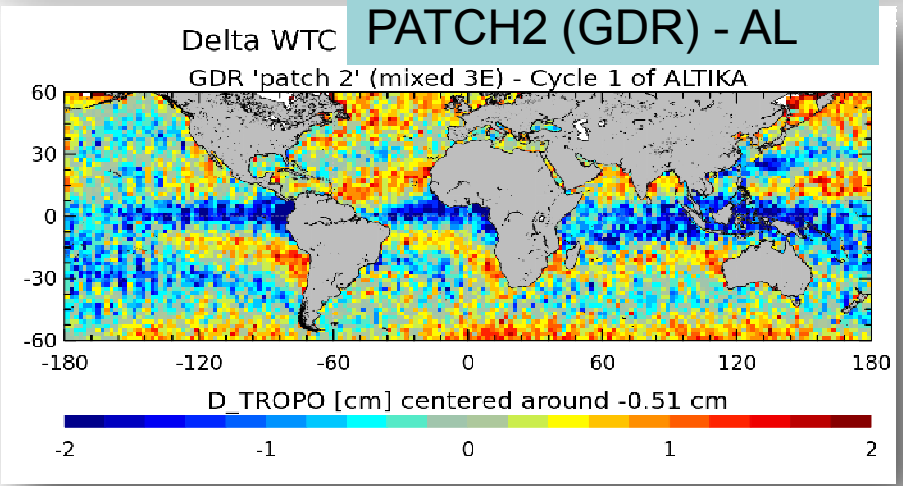
Empirical TBx2 + sig0 + SST



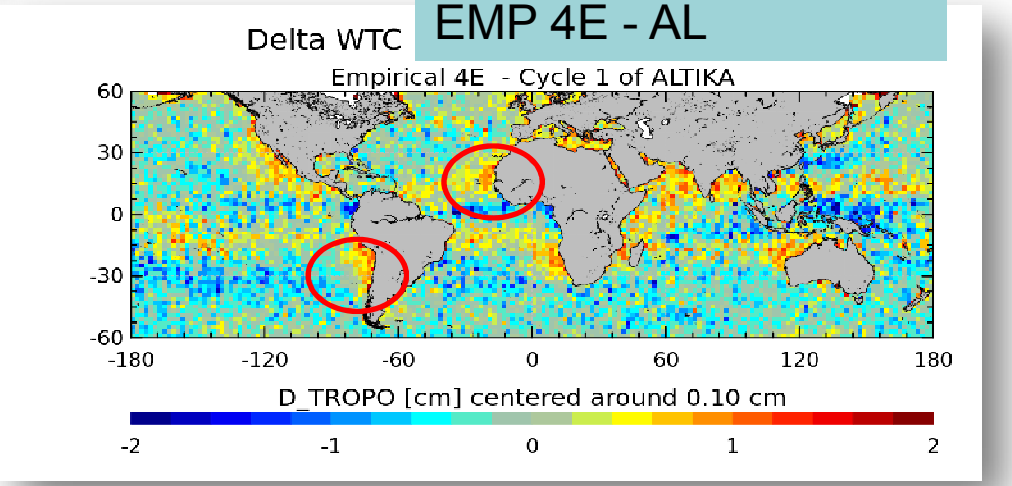
- Performances of empirical approach with '4E' = 4 inputs = TBs + sig0 + SST for AltiKA are close to Jason-2

- further improvements are foreseen adding temperature lapse rate for upwelling areas

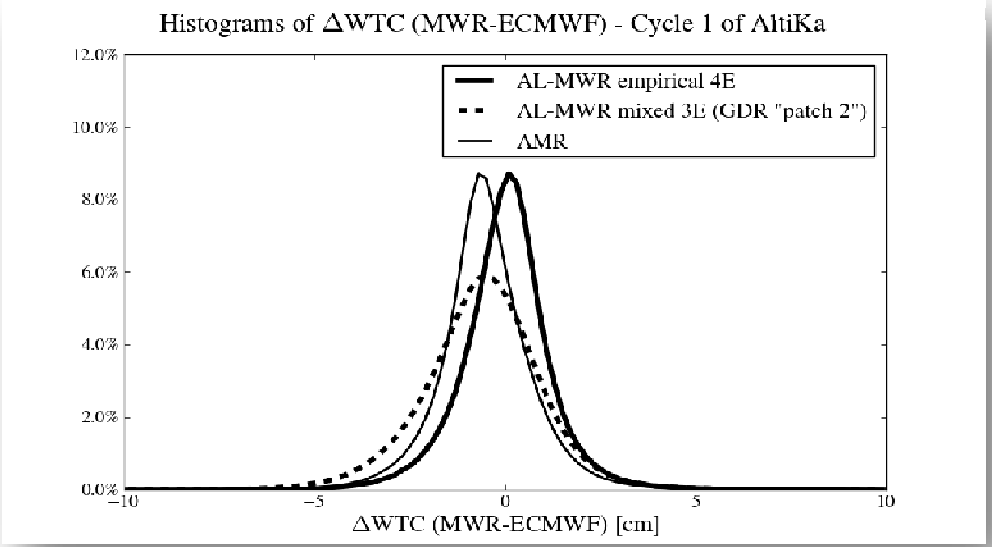
PATCH2 (GDR) - AL



EMP 4E - AL



Empirical TBx2 + sig0 + SST



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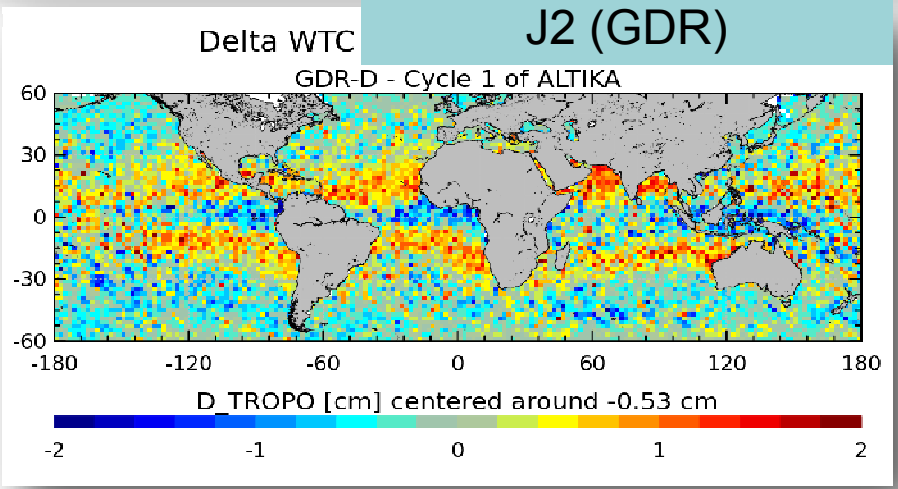
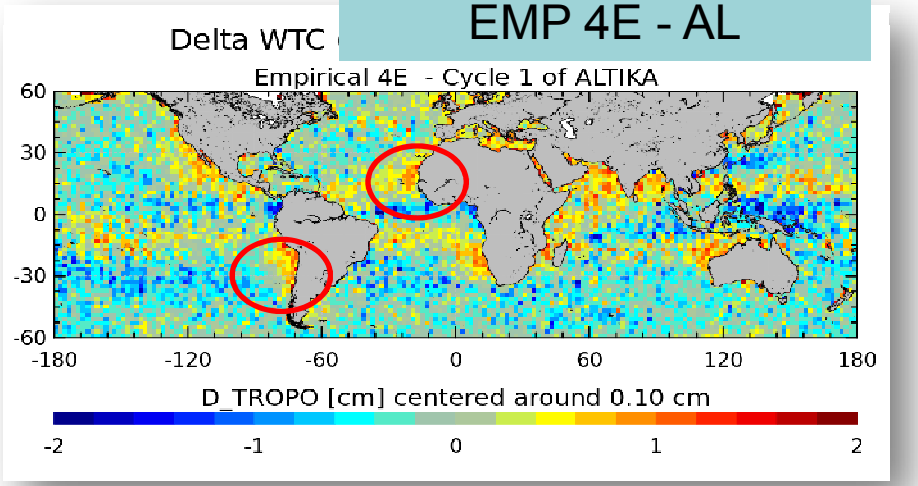
J2 (GDR)



EMP 4E - AL



Conclusion & Perspectives

- Empirical ‘4E’ retrieval performances are close to Jason-2; further improvements are foreseen adding temperature lapse rate
- Instrumental performances of SARAL/AltiKa radiometer are **excellent** and we are now in position to provide **even better geophysical products.**

➔ same approach should be applied to atm. attenuation

- Ref: **Picard et al**, *Marine Geodesy Saral Special Issue*, 2014
- Empirical ‘4E’ WTC will be available on PEACHI dataset on http://odes.altimetry.cnes.fr

Conclusion & Perspectives

- Empirical approach is a very good alternative to the classical approach but not entirely satisfactory
- An effort should be put on the simulation of the backscattering coefficient in Ka band in order to:
  - improve our knowledge on atmospheric & surface interaction at this frequency
  - continue to improve our understanding of the statistics of the Sigma0 in Ka band in the perspective of the SWOT mission