



SARAL/AltiKa MWR

Wet tropospheric correction

Performances and Retrieval Strategies

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SARAL/AltiKa radiometer characteristics:

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

Patch 2 product includes updated Neural Network coefficients set from a 2012 learning database:

- performances similar to J2 for $LAT \in [-20^\circ, +20^\circ]$
- degraded performances for $ABS(LAT) > 20^\circ$

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

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

É. Obligis, L. Eymard, et al,

“First three years of the microwave radiometer aboard ENVISAT: In-flight calibration, processing, and validation of the geophysical products,”

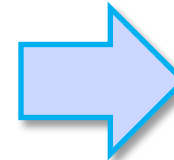
J. Atmos. Ocean. Technol., vol. 23, no. 6, pp. 802–814, Jun. 2006.

Brightness Temperature

Simulated
TB23.8, TB36.5

+

Radiative Transfert model



Sigma-0

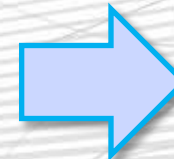
BEFORE LAUNCH

NN

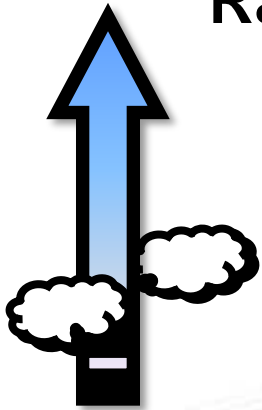
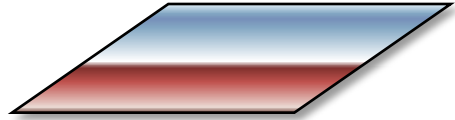
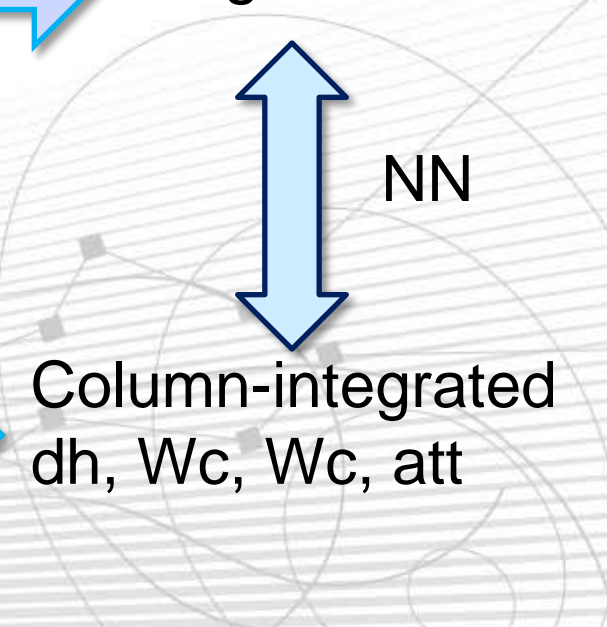
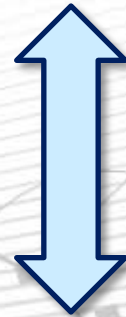
ECMWF analysis:

2D surface: sst, wind

3D profiles: T, P, Wv, Wc



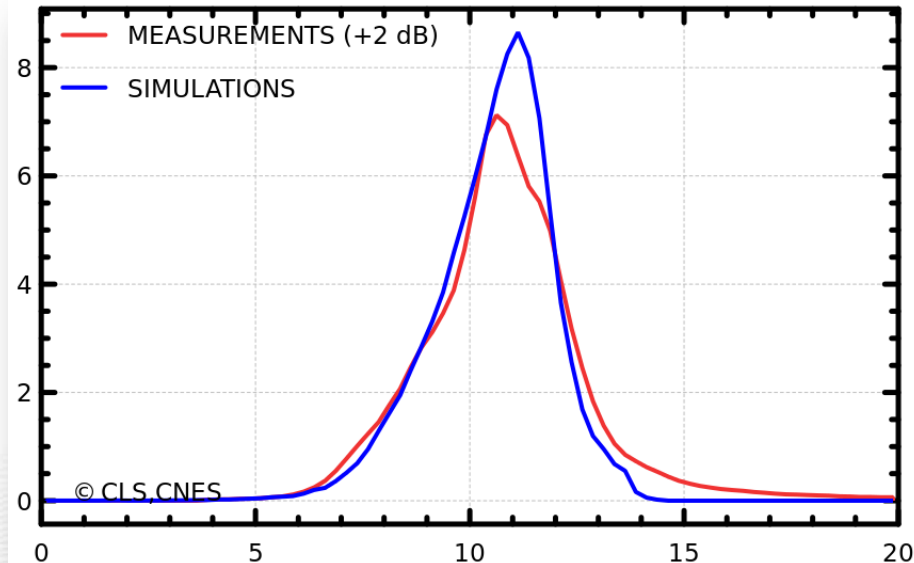
Column-integrated
dh, Wc, Wc, att



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

BUT

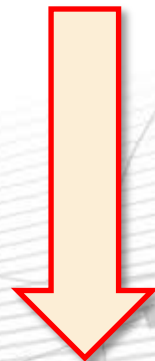
The simulation of Ka sig0 is challenging



AFTER LAUNCH



Rad → TB23.8, TB36.5

Alt → Sigma0

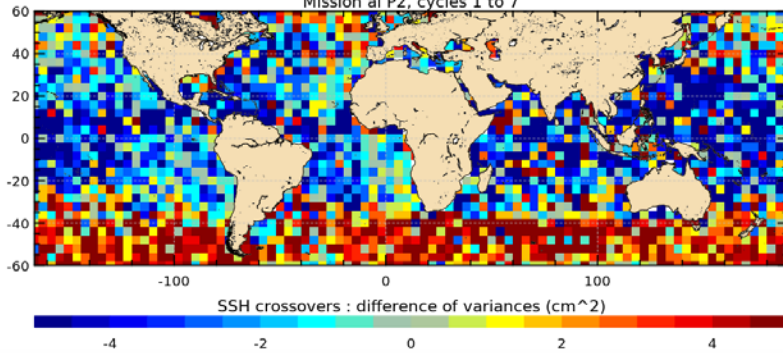


Weights, Bias
(from NN)

dh, Wc, Wc, att

 improvement
 degradation

VAR_SSH(RAD) - VAR_SSH(ECMWF)
Mission al P2, cycles 1 to 7



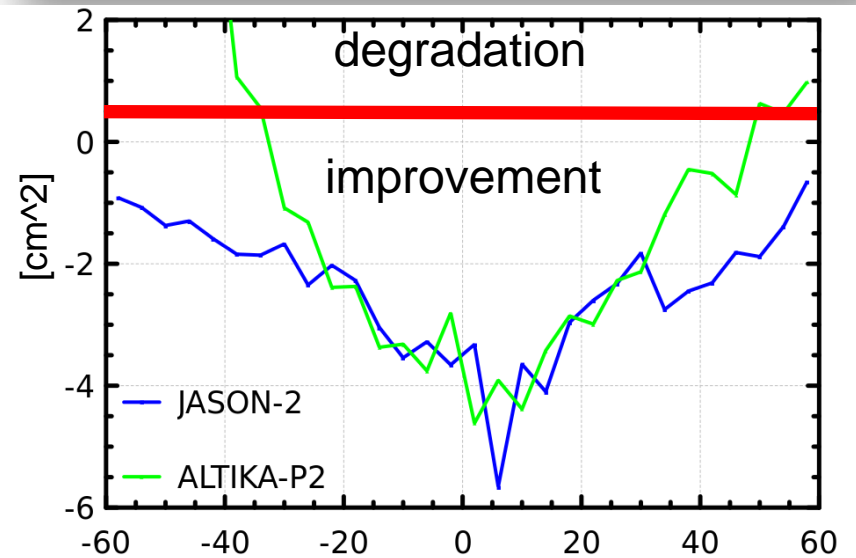
Quality of wet tropospheric is evaluated against differences of variances at SSH Xovers (radiometer vs ECMWF dh)

The better the correction, the smaller the variance

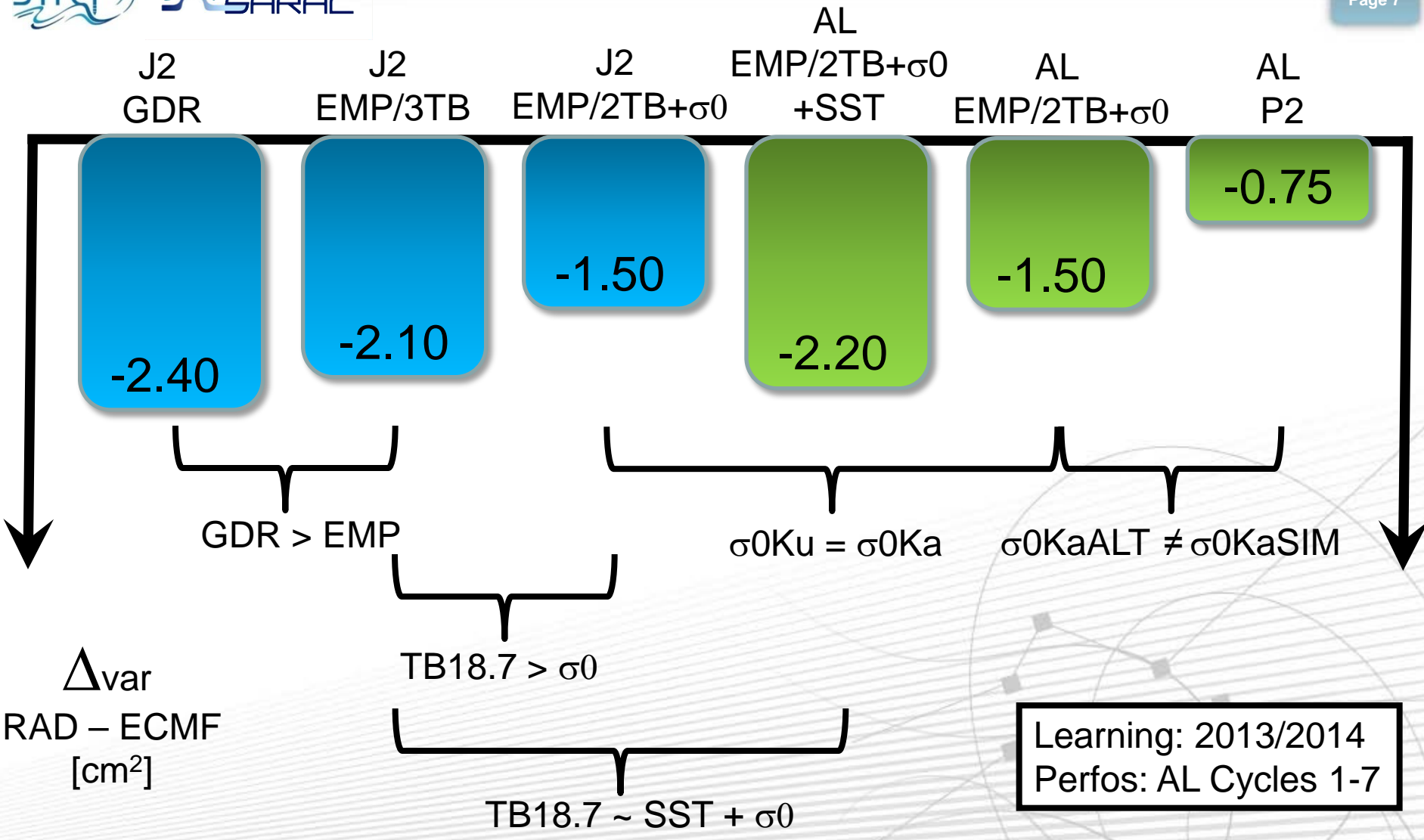
Radiometer wet tropo. corr. is expected to reduce the variance at Xovers compared to ECMWF wet tropo. corr.

P2 dh quality is similar to AMR Jason-2 dh for LAT [-20 ,20]

The quality is degraded for ABS(LAT) > 20

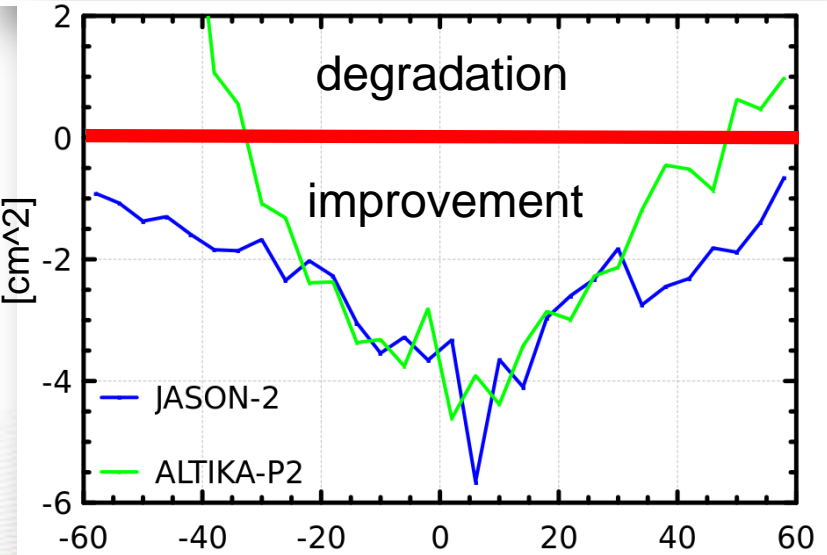
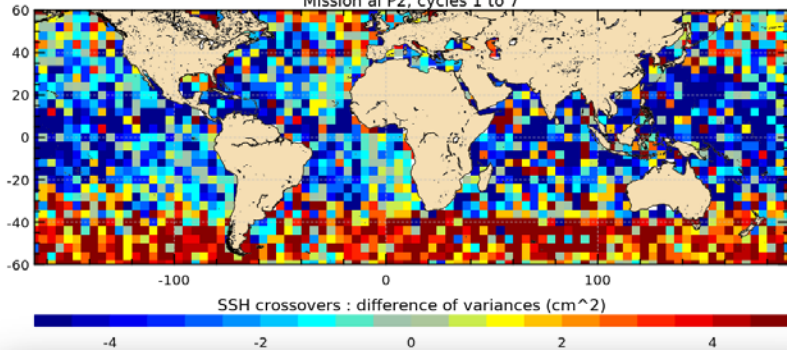




- The “classical” approach, based on ECMWF analyses and simulations, is a **physical** approach, the physic being contained in the Radiative Transfer Model
 - dielectric properties of salt water, including foam effect
 - surface roughness : double scale spectrum
 - frequency / inclination / polarization effects
 - atmospheric integration of EM signal
 - The **empirical** approach is based on:
 - inputs = measurements (TBs, sigma0) → no physic
 - output = ECMWF wet. tropo. Interpolated on AL track
- due to the spatial/temporal interpolation and physical limitation of the model, measured TBs/sigma0 will not be consistent with the wet tropo
- CONS** : quality is not expected to be as good as with classical approach
- PROS** : we do not rely on the simulations

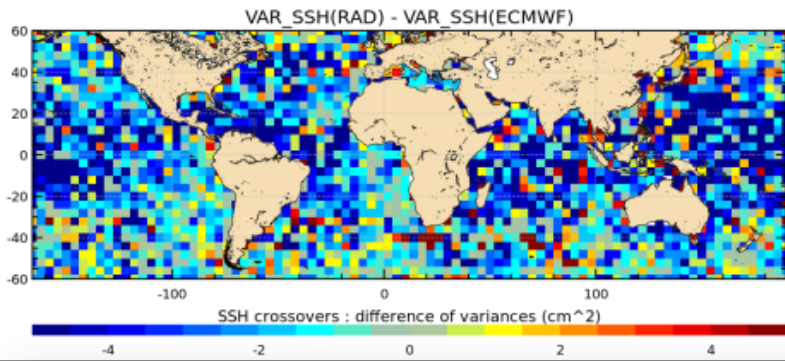


■ improvement
■ degradation

VAR_SSH(RAD) - VAR_SSH(ECMWF)
 Mission al P2, cycles 1 to 7

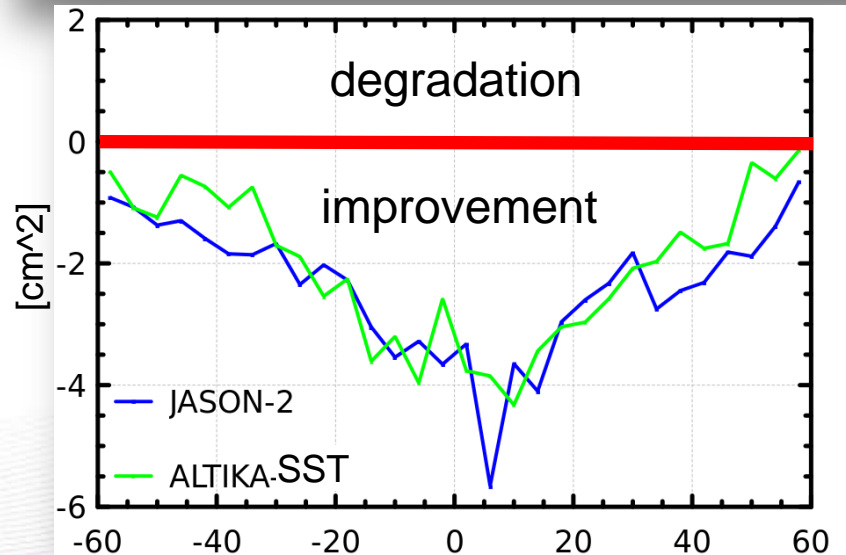


 improvement
 degradation



- Performances of empirical approach with TBs + sig0 + SST for AltiKA are close to Jason-2

- some place for improvement for LAT ~ 5 and ABS(LAT) ~ 40



Conclusion & Perspectives

- Empirical SST+sig0 retrieval performance are close to Jason-2; further improvements are foreseen combining physical and empirical approach
- Instrumental performances of SARAL/AltiKa radiometer are **excellent** and we are now in position to provide **even better geophysical products.**