

A new approach to correct satellite sea surface height measurements from atmospheric water vapor : The 1-D variational approach

Laura Hermozo¹ (lhermozo@cls.fr), Laurence Eymard², Bruno Picard¹, Estelle Obligis¹, Fatima Karbou³
1. CLS 2. LOCEAN, CNRS 3. CNRM/GAME, CNRS/Météo-France

Overview

What is Wet Tropospheric Correction (WTC) ?

Corrects the altimeter range from water vapor in the troposphere
 $WTC [cm] \approx 6.4 \times TCWV [g/cm^2]$, $0 cm < WTC < 50 cm$

How is it retrieved currently ?

Empirical approach

Atmospheric profiles (measured or from Numerical Weather Prediction model)

Radiative transfer model

Simulated brightness temperatures (TBs)

→ $WTC = f(TBs)$

- ✓ Retrieval of an integrated value of WTC
- ✓ Method valid for mean ocean conditions
- ✓ Specific regional corrections needed over heterogeneous surfaces (upwelling regions, coastal regions, land waters, sea ice)

How else can we retrieve it ? : Aim of the PhD

Geophysical approach

1D variational assimilation of radiometer measurements (1D-Var)

Model atmospheric profiles (NWP model) + Measured TBs

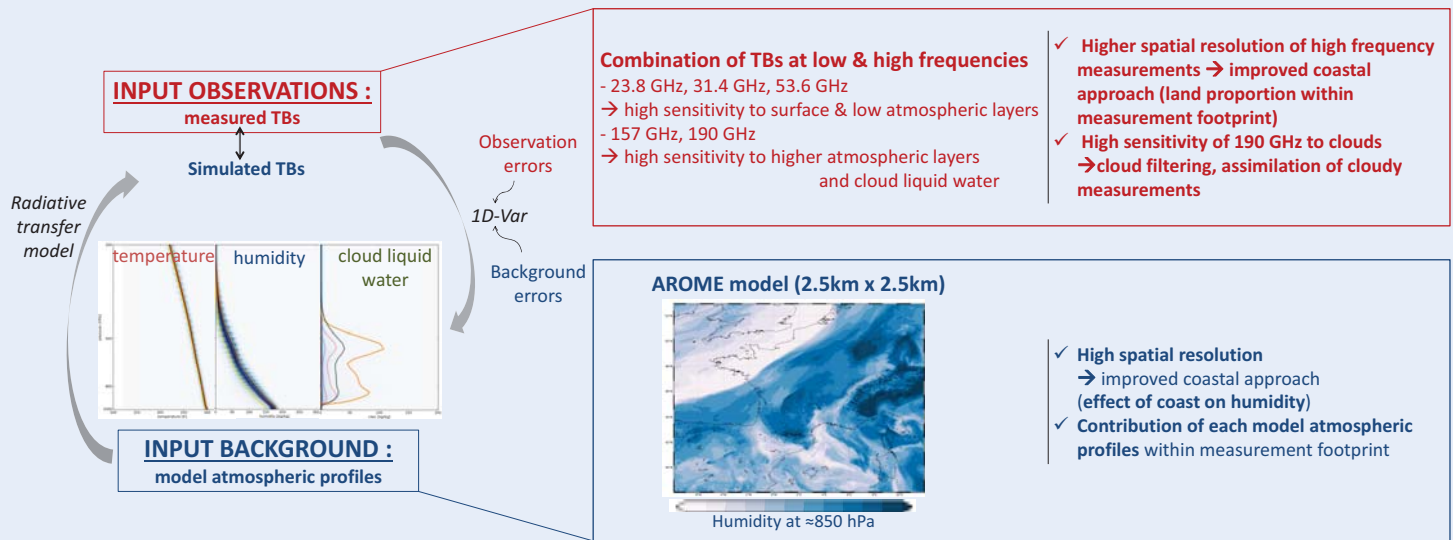
1D-Var

Most probable atmospheric profiles (temperature, humidity)

→ $WTC = \int_{surface}^{atmosphere} (atmospheric\ profiles)$

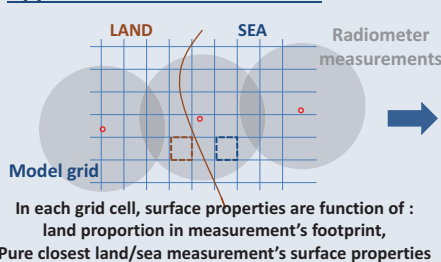
- ✓ Retrieval of WTC derived from vertical atmospheric profiles integration
- ✓ Use of multiple radiometer TB measurements at different frequencies : high surface sensitivity, high horizontal resolution → Method valid over various heterogeneous surfaces

The 1D-Var scheme

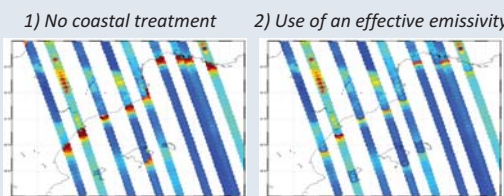


Application

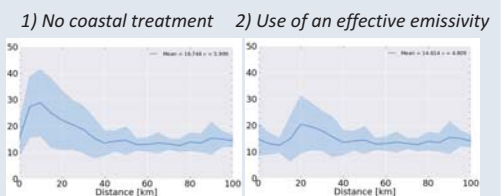
Application over coastal areas



Retrieved WTC [cm]



Retrieved WTC [cm] = f(distance to coast [km])



CONCLUSIONS

- ✓ High spatial resolution WTC retrievals (at model high resolution)
- ✓ Use of high surface sensitive measurements for additional surface information → Improvement of WTC retrievals towards coast when specific coastal treatment

IMPROVEMENTS, PERSPECTIVES

- ✓ Use of measurement footprint overlap to avoid land contamination towards coast
- ✓ Use of input background more representative of measurement to avoid discontinuities towards coast
- ✓ Use of high frequency measurements for cloud filtering and cloudy retrievals