A new way of using altimetry waveform data over continental waters

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Agenda

Recall of altimeter main product

- Waveforms
- Main difficulties on continental waters

A new processing philosophy over continental waters

- Get out of the current ways of processing individual waveforms
- Preliminary development of a retracking tool
- Data necessary as entries

First applications over two rivers: Meuse and Lena

Conclusions and perspectives

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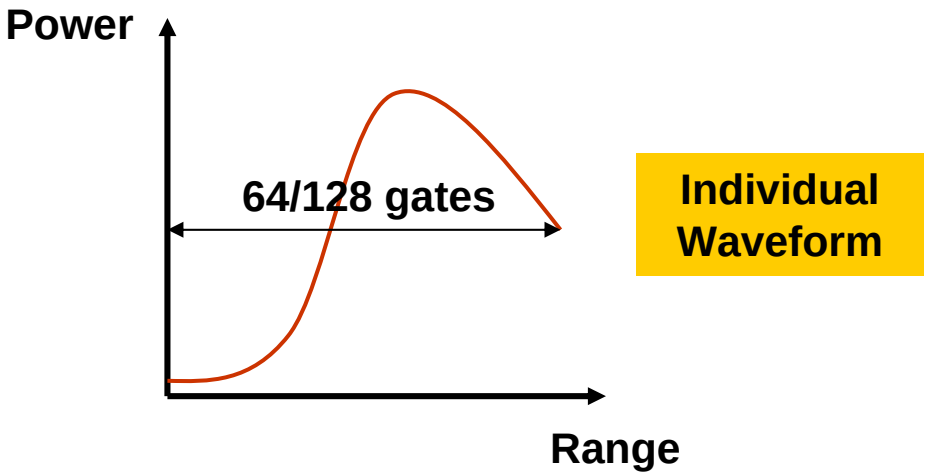
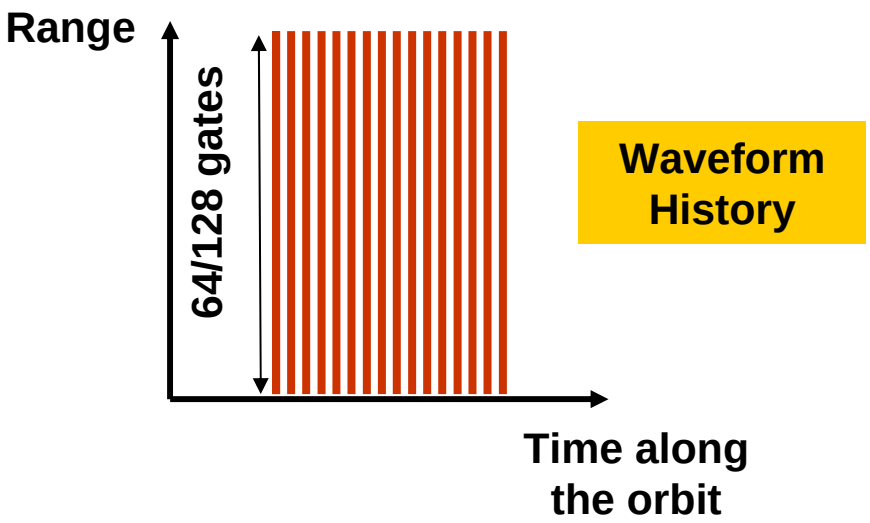
Altimeter main product

- Power with respect to distance: a waveform
- Waveform sampling related to the radar characteristics





Analysis of the individual averaged waveform (50 ms - 1 s)

- Fitting to an analytical waveform model
- Estimation of surface parameters

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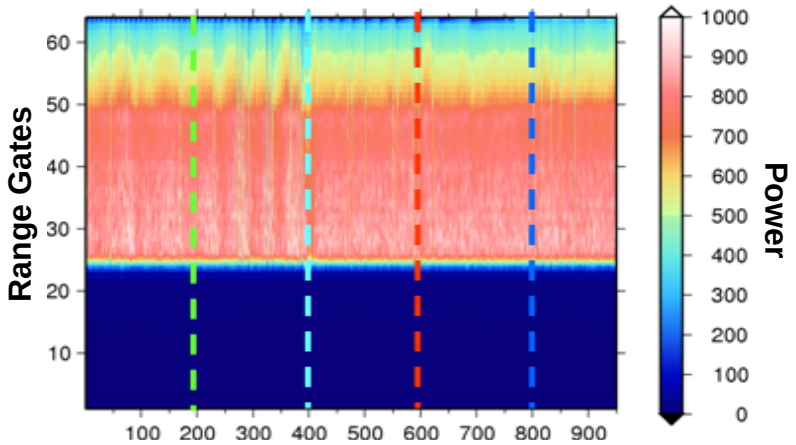
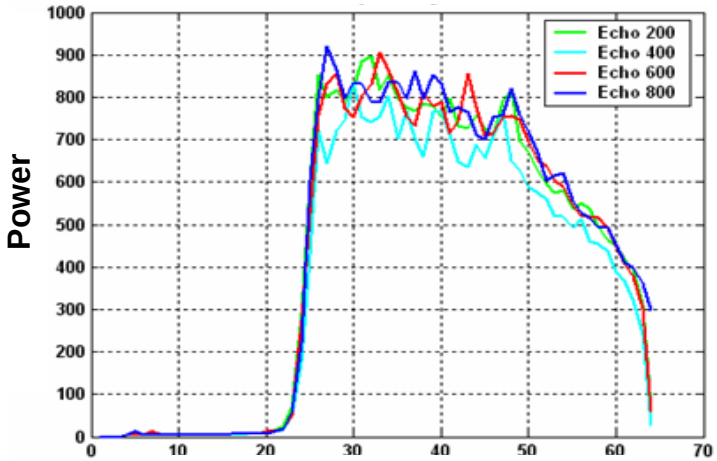
Heterogeneous waveforms

T/P Cycle 430 track 058

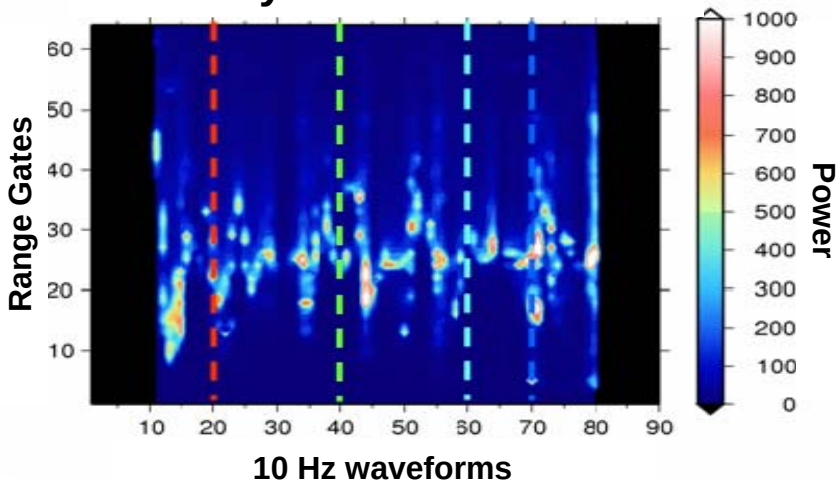


Sea waveforms

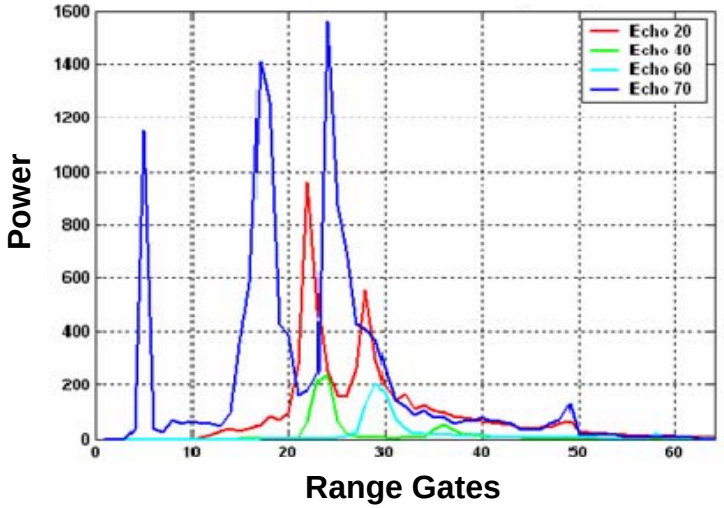


Ocean (Brown model)

T/P Cycle 430 track 058



Continental waters waveforms



Continental waters (no model)

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A new processing philosophy

OCEAN	ICE LARGE CONTINENTAL WATERS	CONTINENTAL WATERS
Individual Waveforms Brown model	Individual Waveforms Theoretical model	**History** of Waveforms **Empirical** model

Empirical model : use the maximum information available

- **Numerical model relying on ancillary data** (DEM, masks)
- Target area parametrization:
  - Heigth and slope
  - Type of surface (backscattering coefficient)
- Simulation of radar waveforms histories over the area for different sets of parameters (**templates**)

Goal is to fit the empirical model to the data to estimate the rigth parameters

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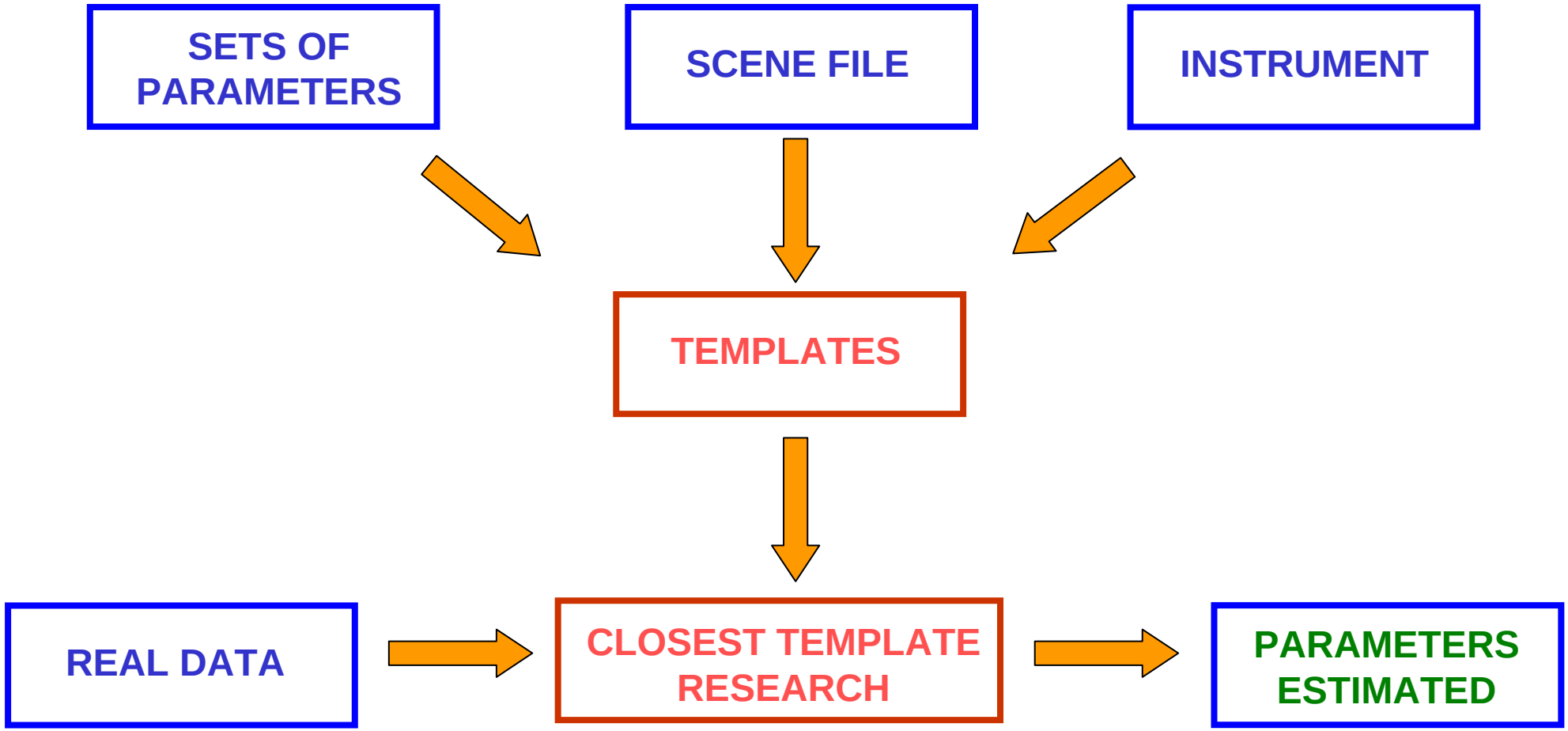
Retracking simulator chart



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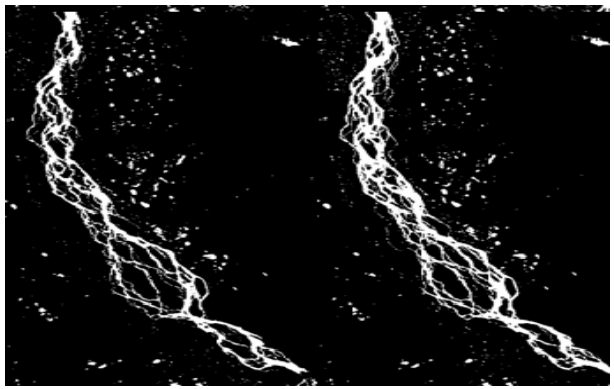
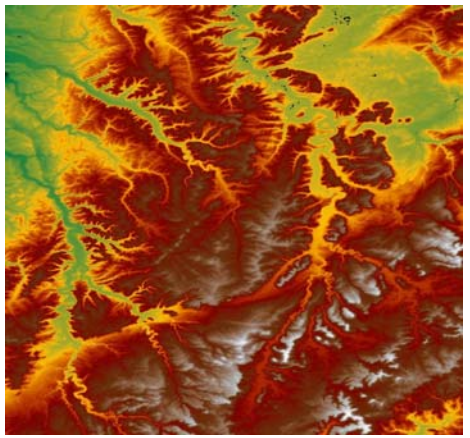
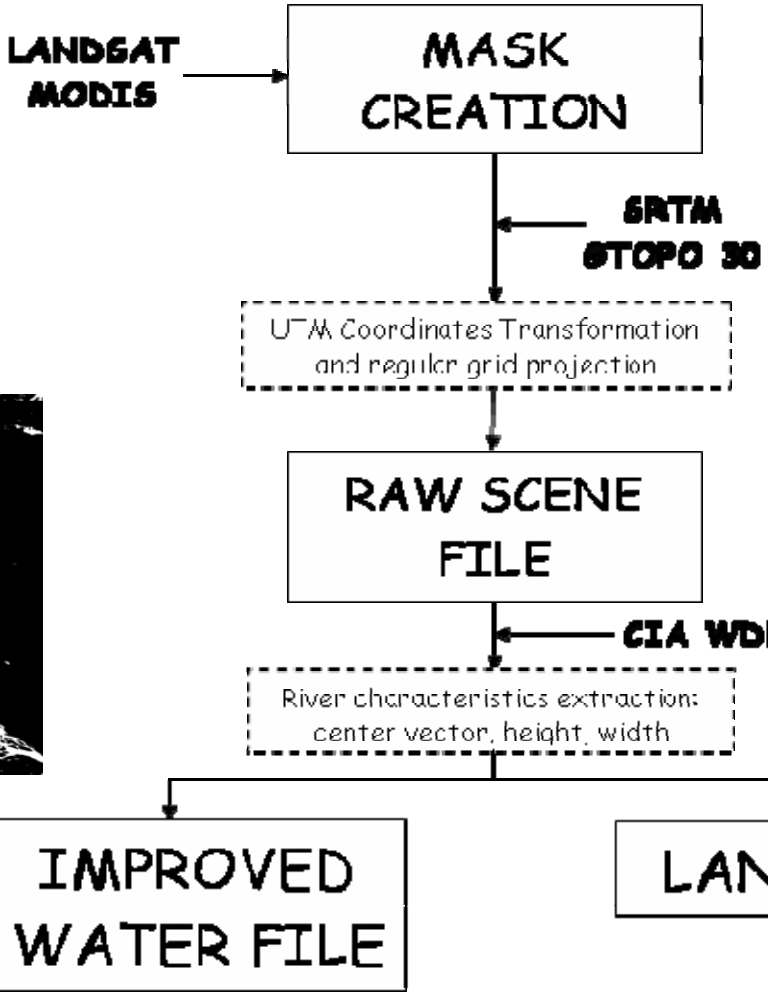
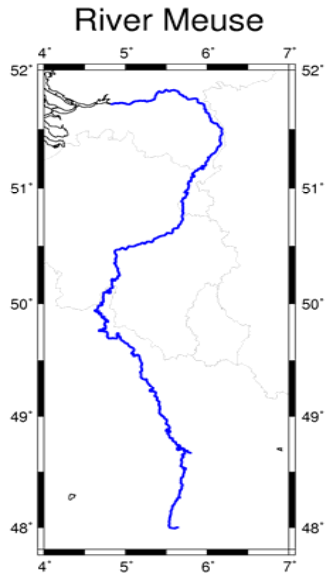
Scene File Creation









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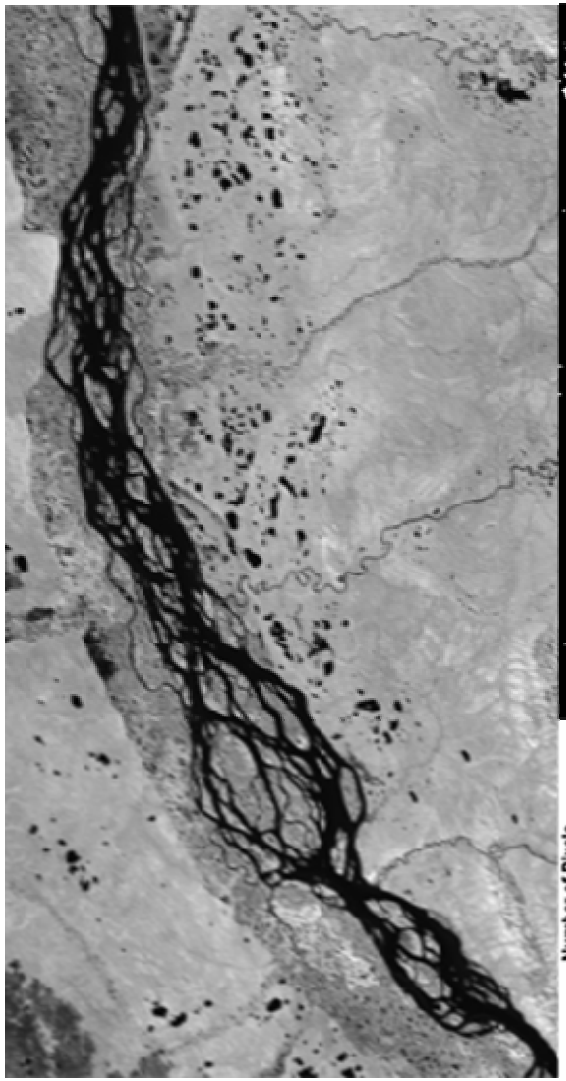
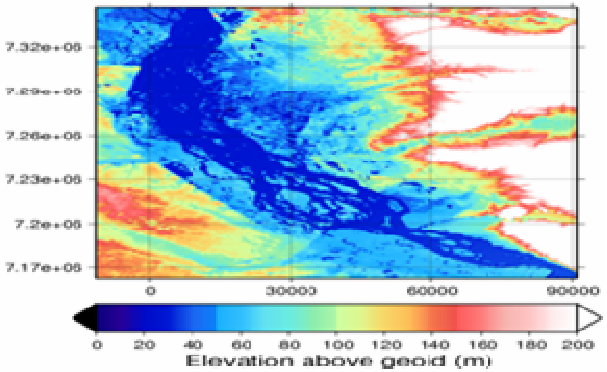
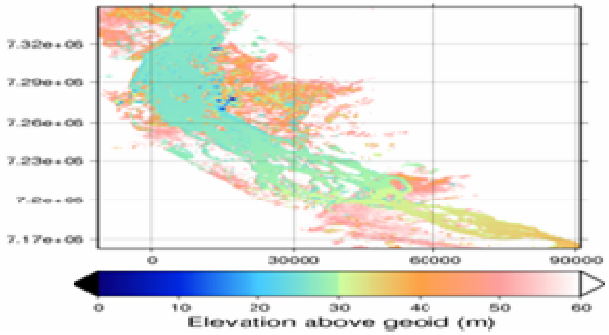
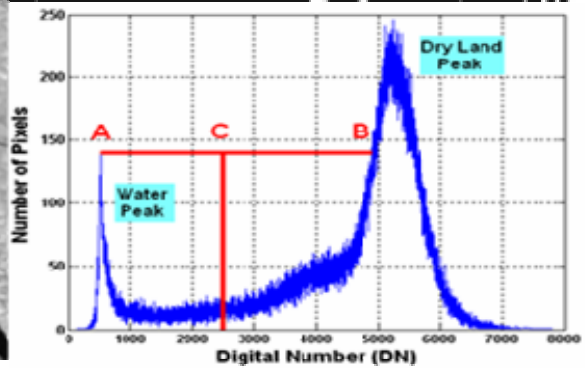
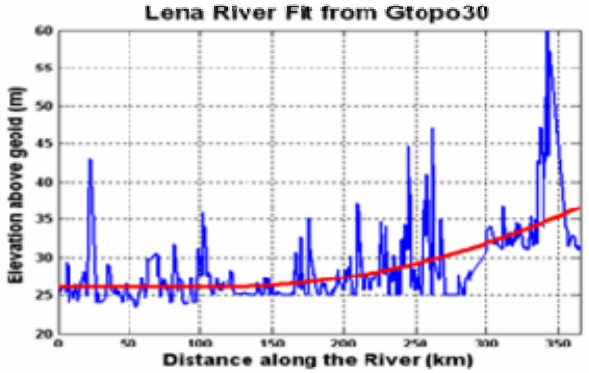
Scene file over Lena River











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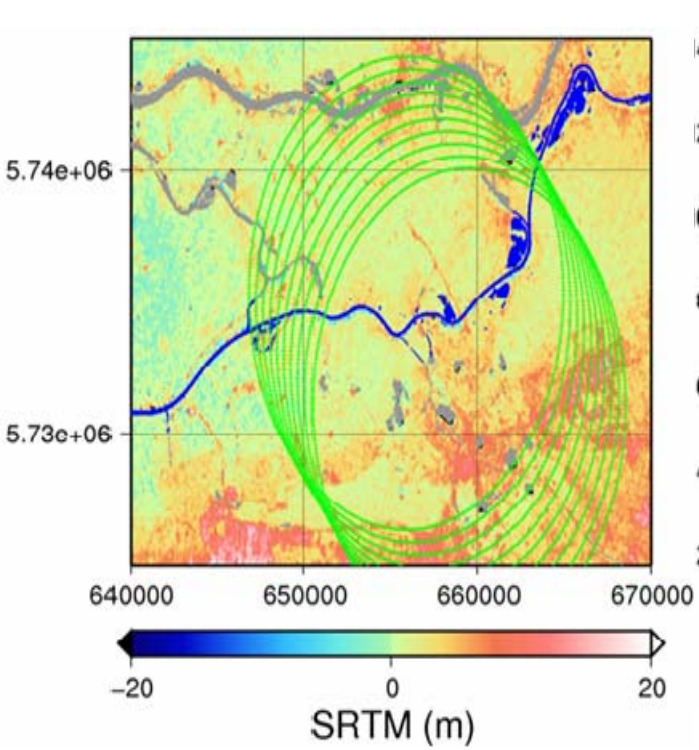
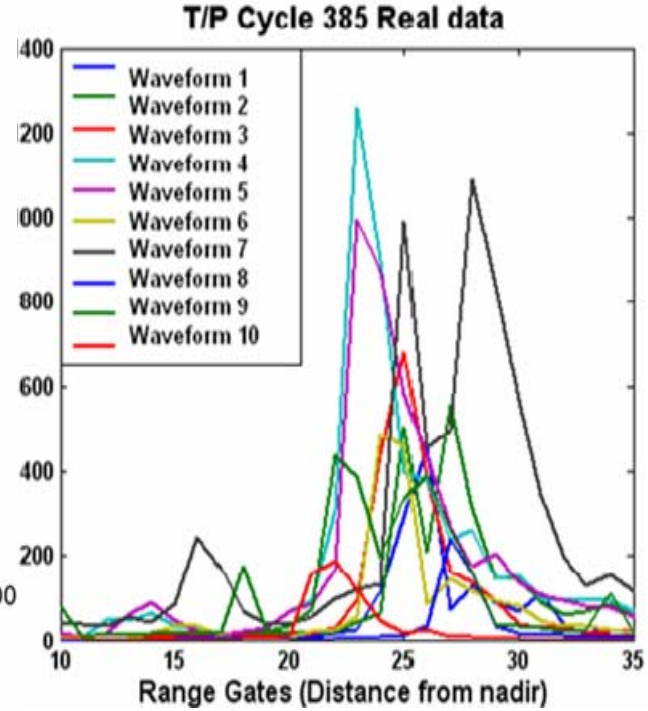
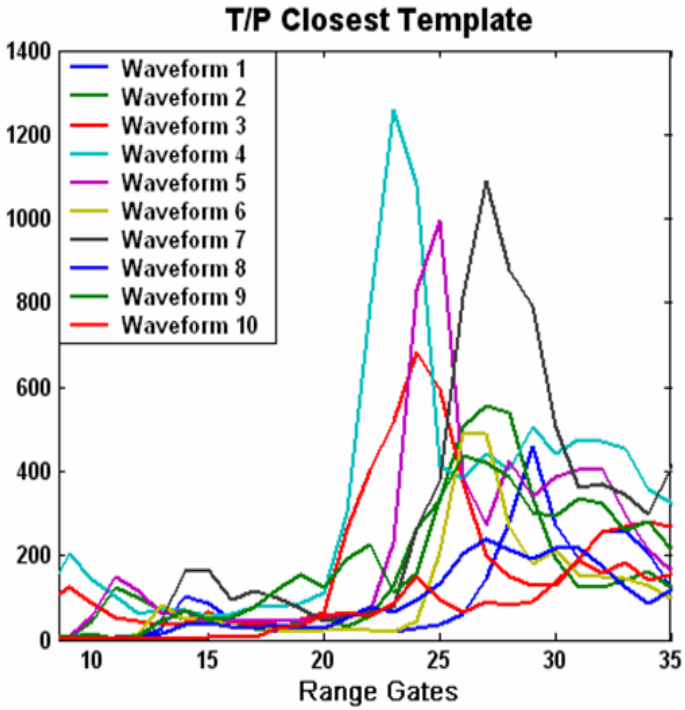
Real Data Processing over Meuse







Heigth Estimation	In Situ Data
0.5 m	0.45 m

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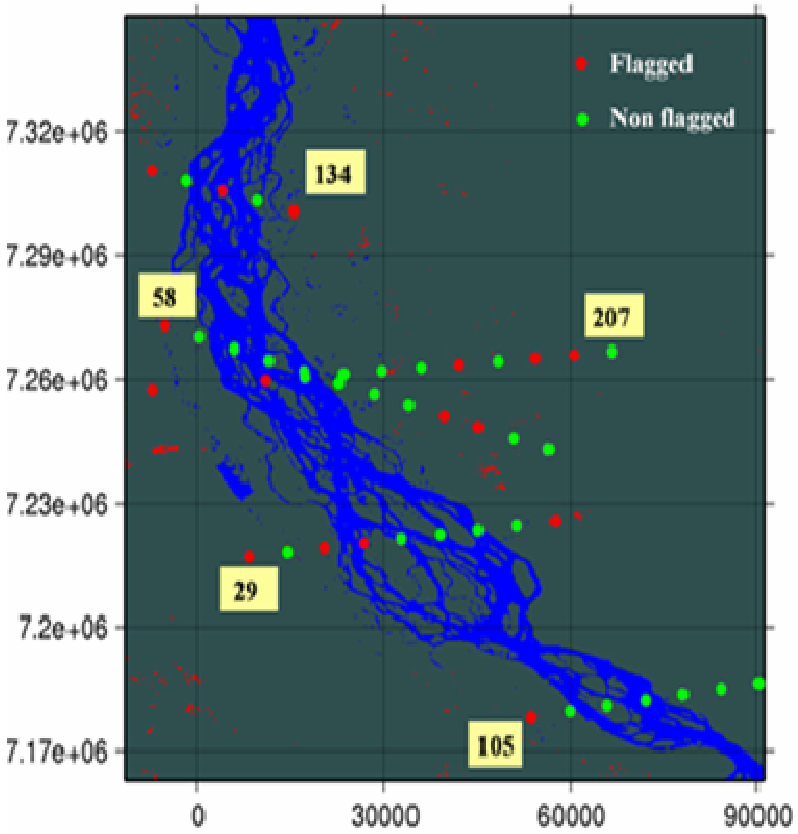
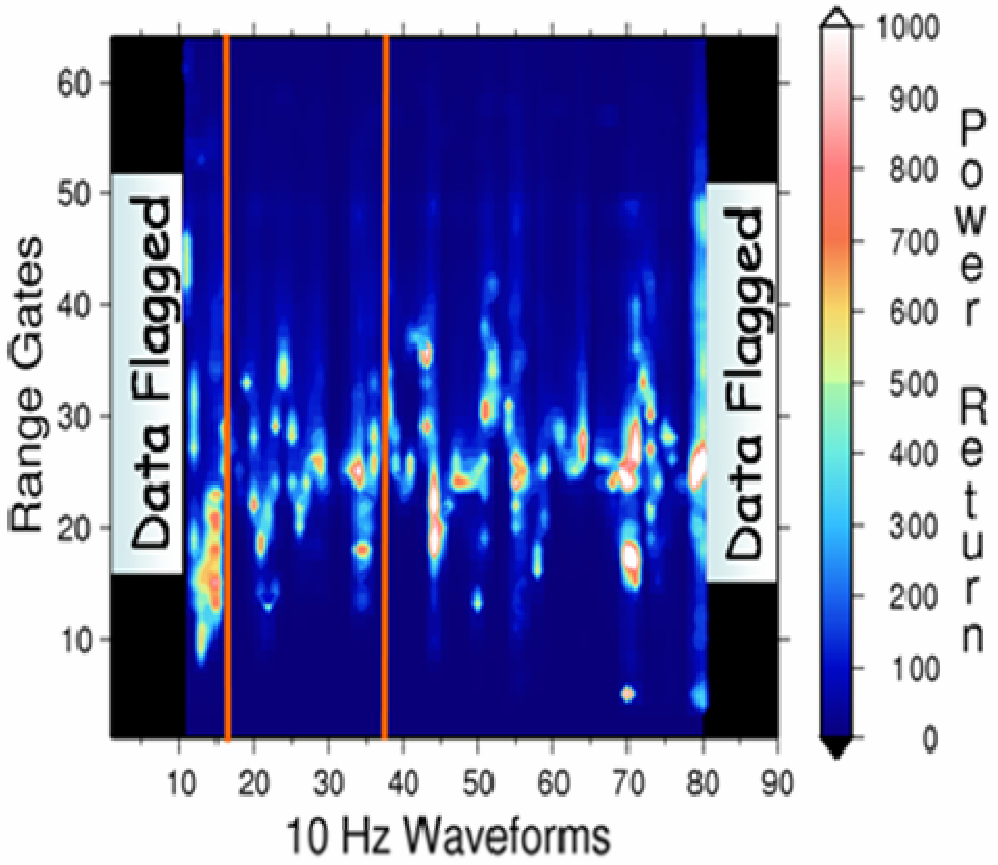
Real Data Processing over Lena (1/2)

T/P on Lena cycle 430



T/P Cycle 430 Pass 058



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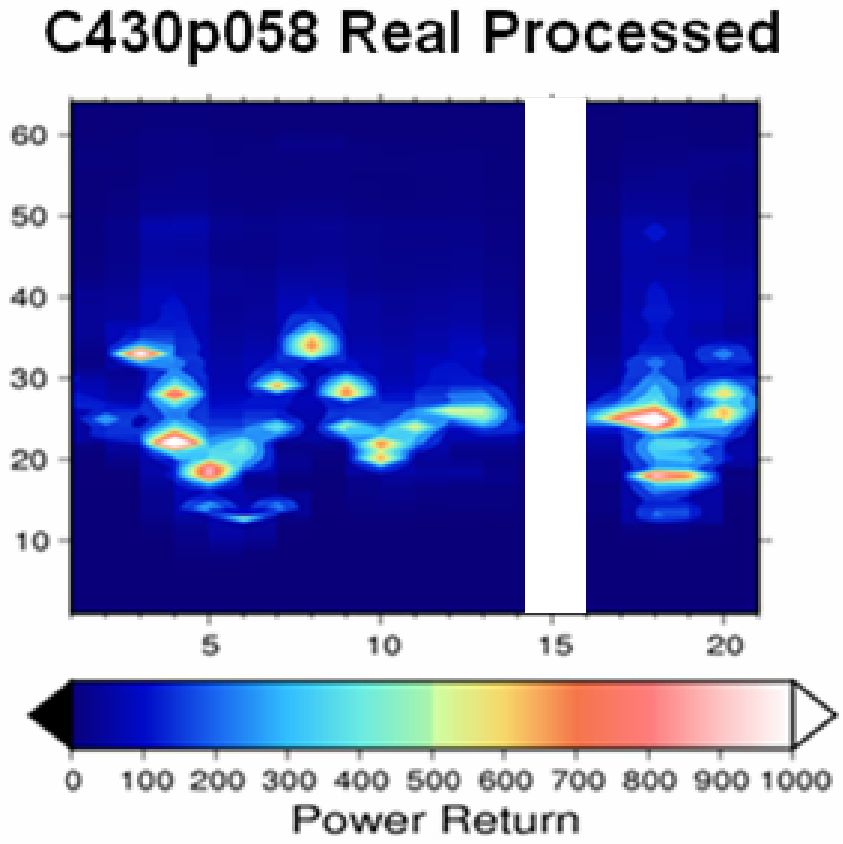
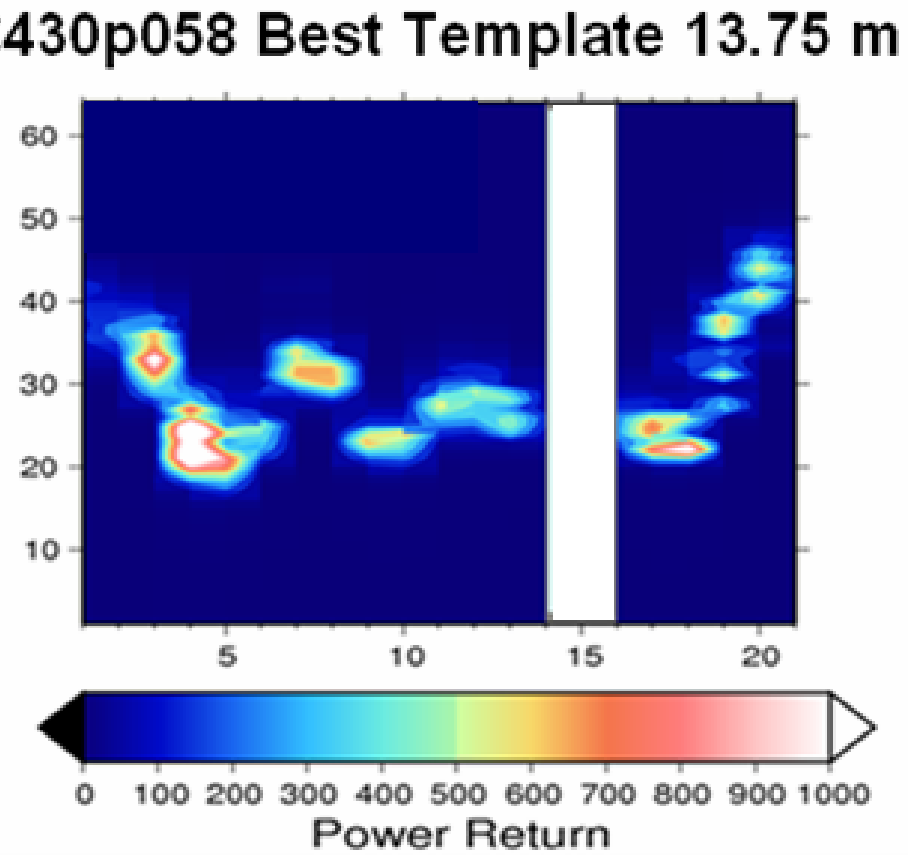
Real Data Processing over Lena (2/2)





Very significant correlation between real data and template

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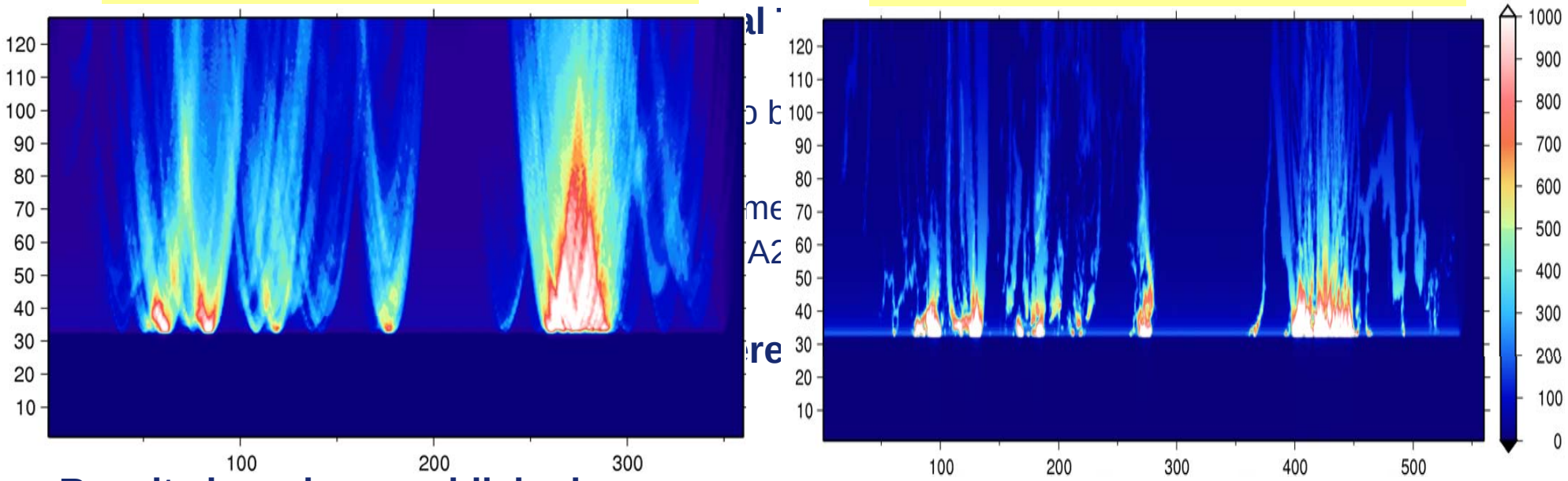
Low Resolution Mode

SAR Mode



Results have been published:

- Enjolras, V. Evaluation of the performances of interferometric imaging radar altimeters – application to oceanography and hydrology, PhD, January 2007.
- Enjolras, V. ; Rodriguez, E. Using Altimetry Waveform Data and Ancillary Information from SRTM, Landsat and MODIS to retrieve River Characteristics (submitted to IEEE TGRS)

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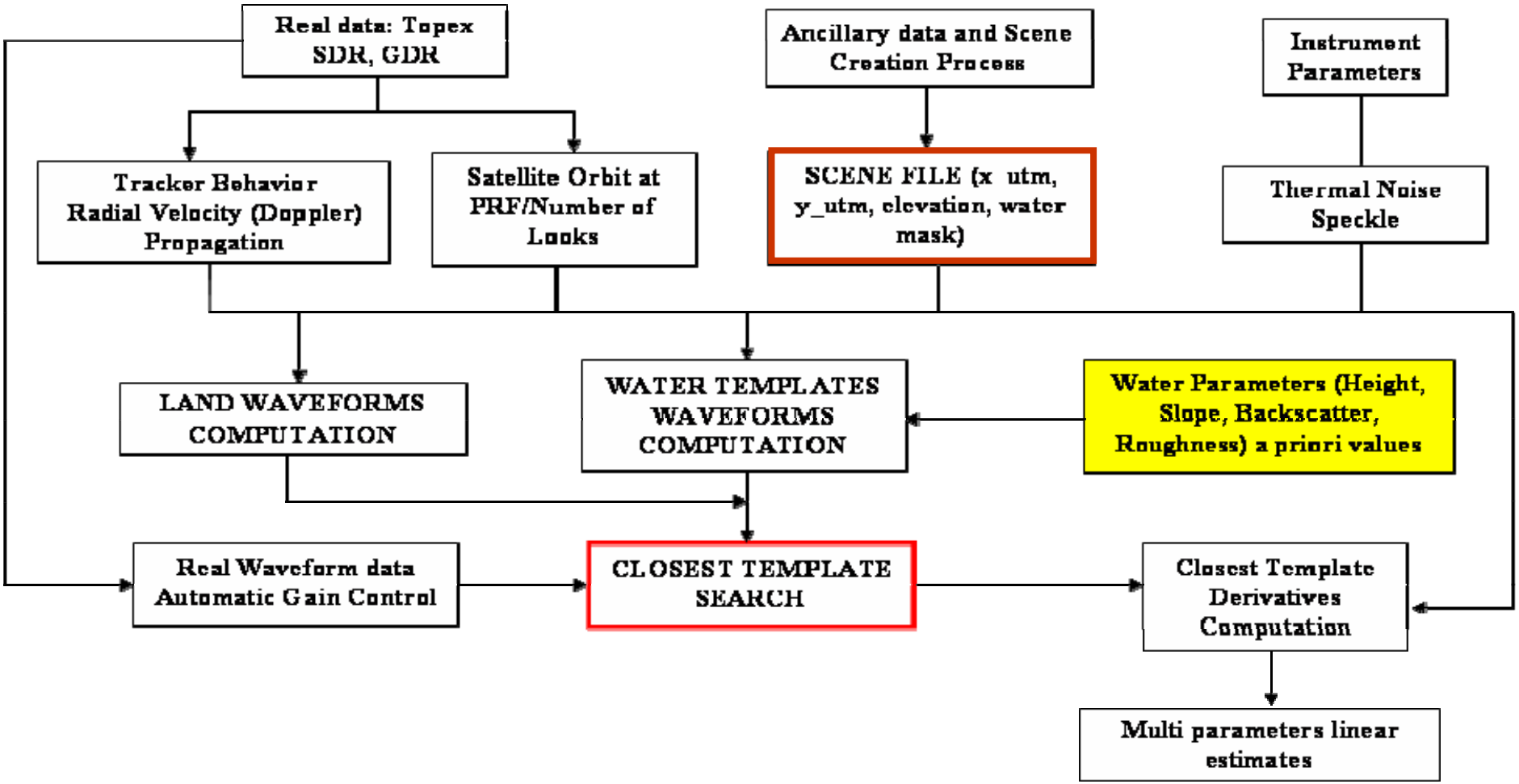
Retracking simulator chart



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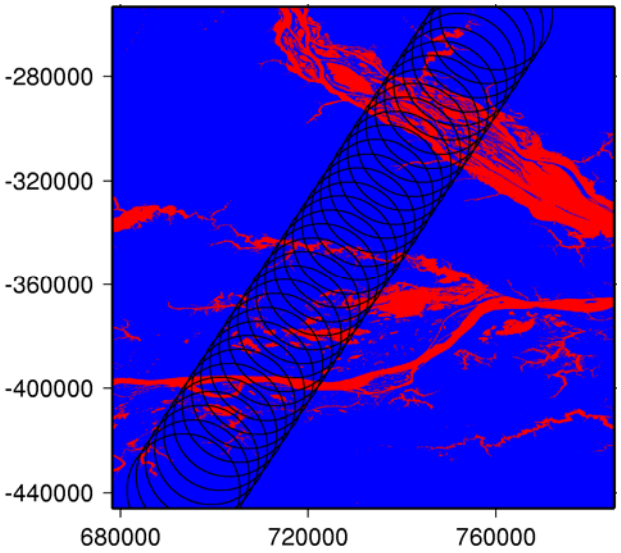
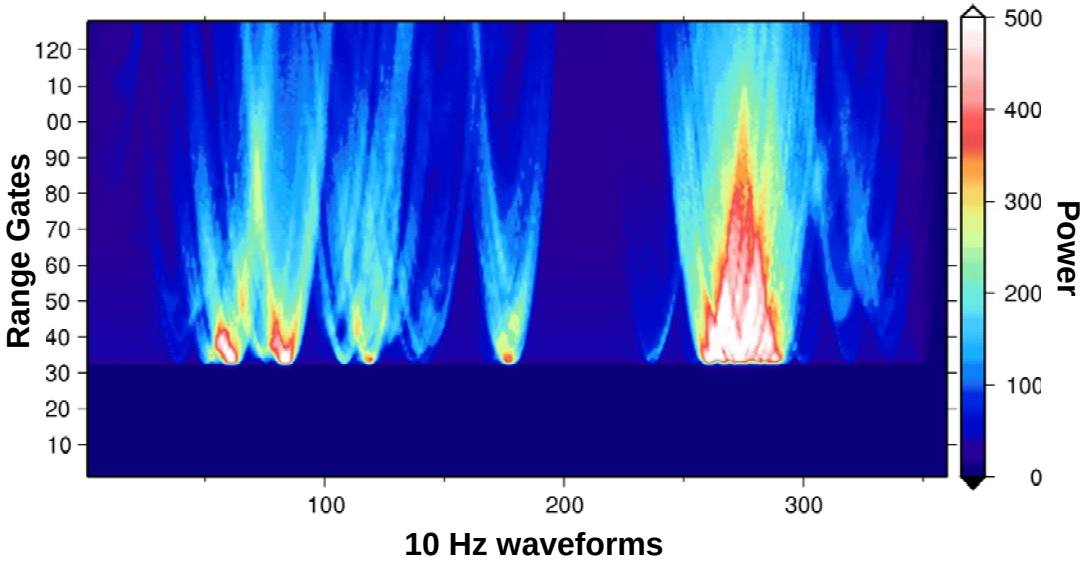
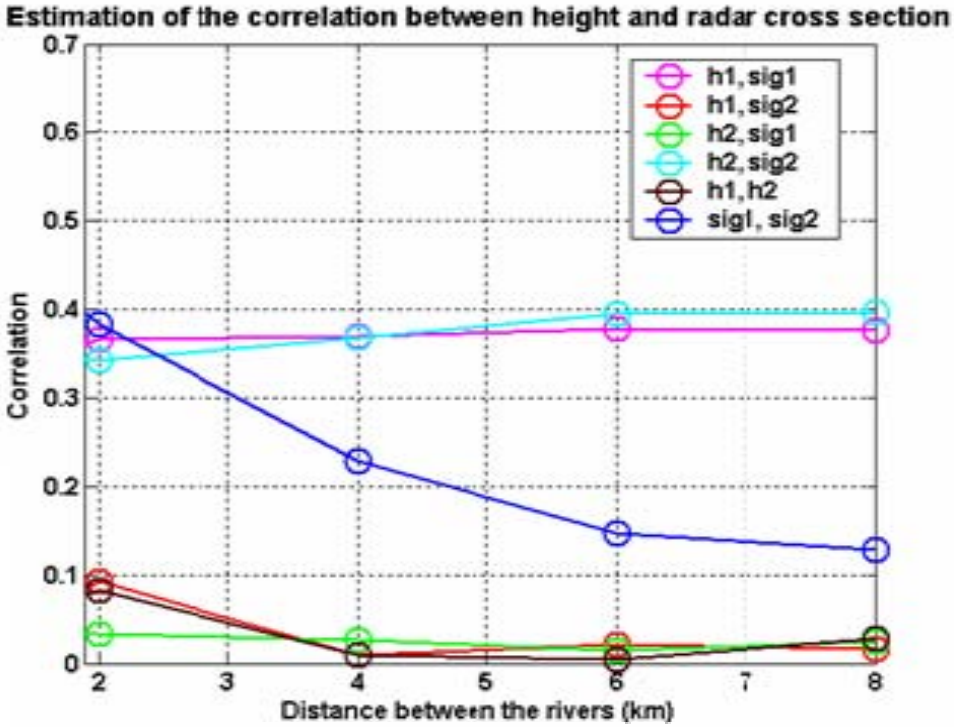
Theoretical Validation







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