

# Instrument processing splinter

OSTST 08

Shannon Brown

Phil Callahan

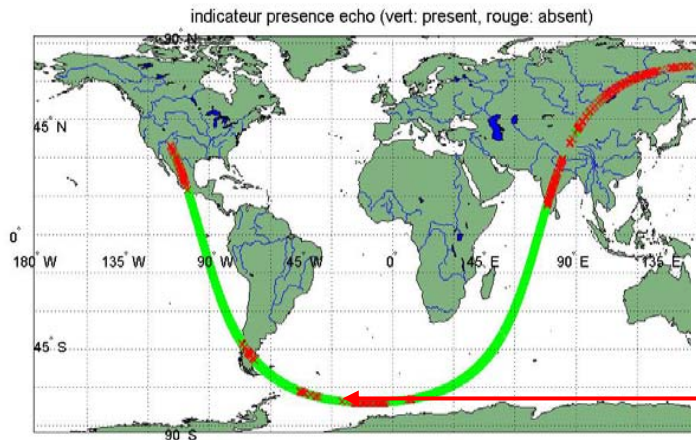
Julliette Lambin

# Orals schedule

- 11:00 **OBLIGIS Estelle** *New generation of wet tropospheric correction retrieval algorithms*
- 11:12 **BROWN Shannon** *Novel Near-Land Radiometer Wet Path Delay Retrieval Algorithm: Application to the Advanced Microwave Radiometer*
- 11:24 **SMITH Walter** *Monte Carlo demonstrations of a sea state bias induced during altimeter waveform retracking*
- 11:36 **DESJONQUERES Jean-Damien** *Poseidon-3 in-flight results and tracking mode*
- 11:48 **CALLAHAN Philip** *JPL Retracking Results for TOPEX and Jason*
- 12:00 **THIBAUT Pierre** *Jason-2 coastal and hydrological waveform processing*
- 12:12 **LABROUE Sylvie** *Comparison of Jason-1 and Jason-2 sea state bias*
- 12:24 **TOURNADRE Jean** *Cloud and rain effect on AltiKa/SARAL Ka band radar altimeter: data availability and rain/cloud flag*

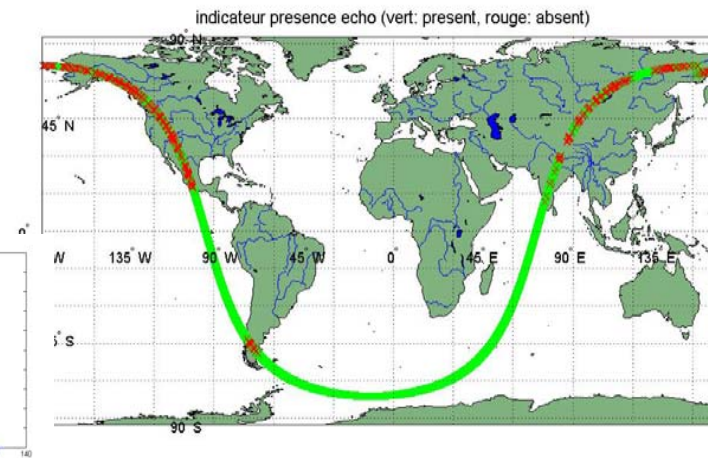
Everything is OK, range accuracy within specs ( $< 1.5$  cm rms )  
Tracking superior to Jason-1: DIODE/DEM and Median  
So-called “AGC anomaly”: understood (less than 1% loss over ocean) => correction being planned

## Tracking Algorithms Performances Illustration



Autonomous Mode

SGT



Autonomous Mode

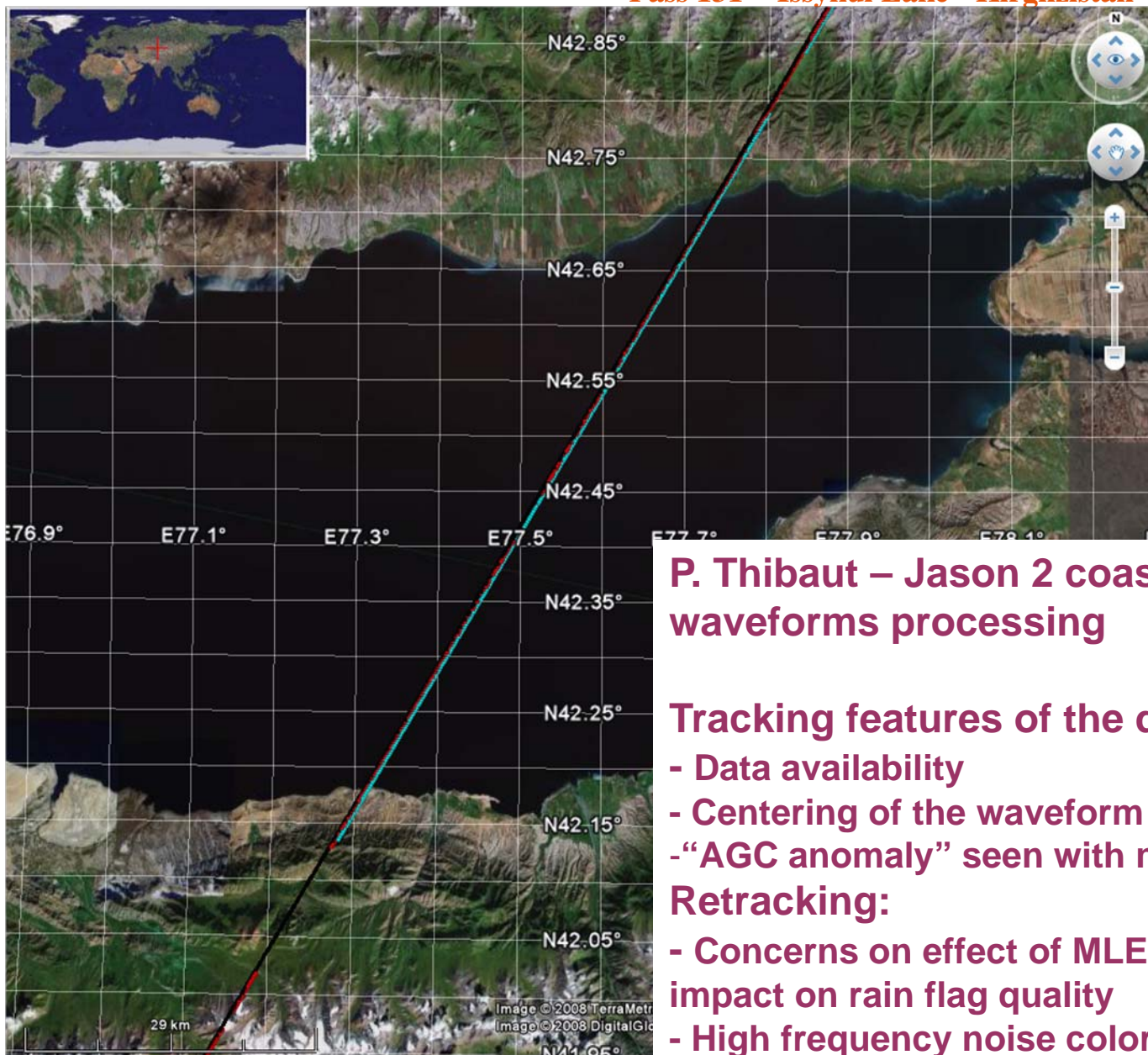
Median

Data Availability Comparison

-> The Median Algorithm gives better results  
-> default algorithm for JASON2

# Waveforms over lakes

Pass 131 - Issykul Lake - Kirghizistan – Cycle 1, 2 and 3 Jason-2



**P. Thibaut – Jason 2 coastal and hydrological waveforms processing**

**Tracking features of the different modes**

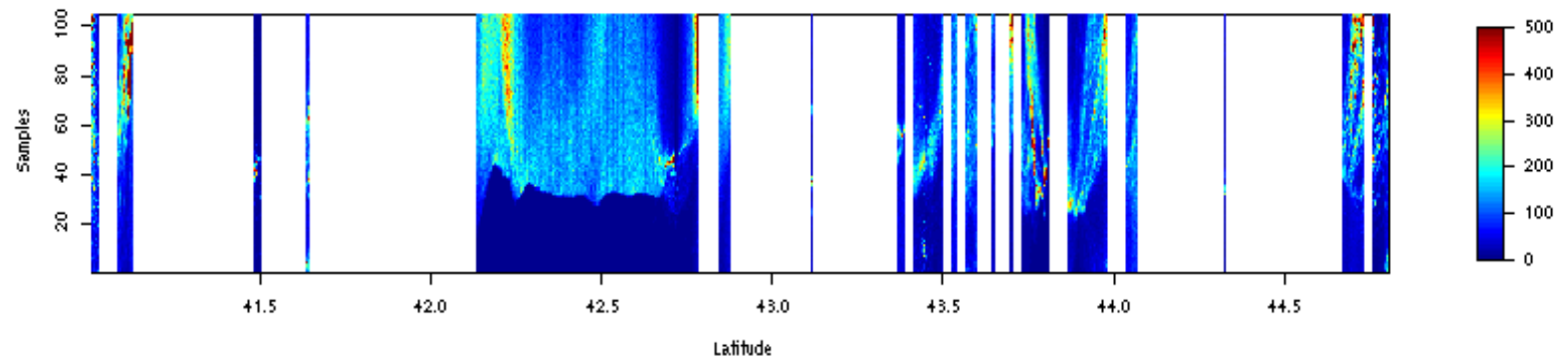
- Data availability
- Centering of the waveform
- “AGC anomaly” seen with median tracking

**Retracking:**

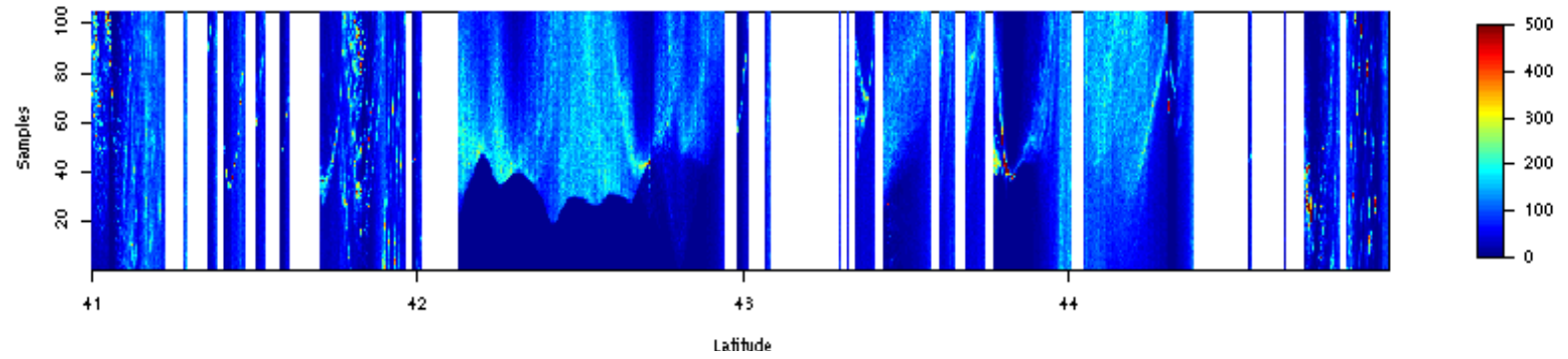
- Concerns on effect of MLE4 scheme, in particular impact on rain flag quality
- High frequency noise colored on J2 (lower HF noise)?

# Waveforms over lakes

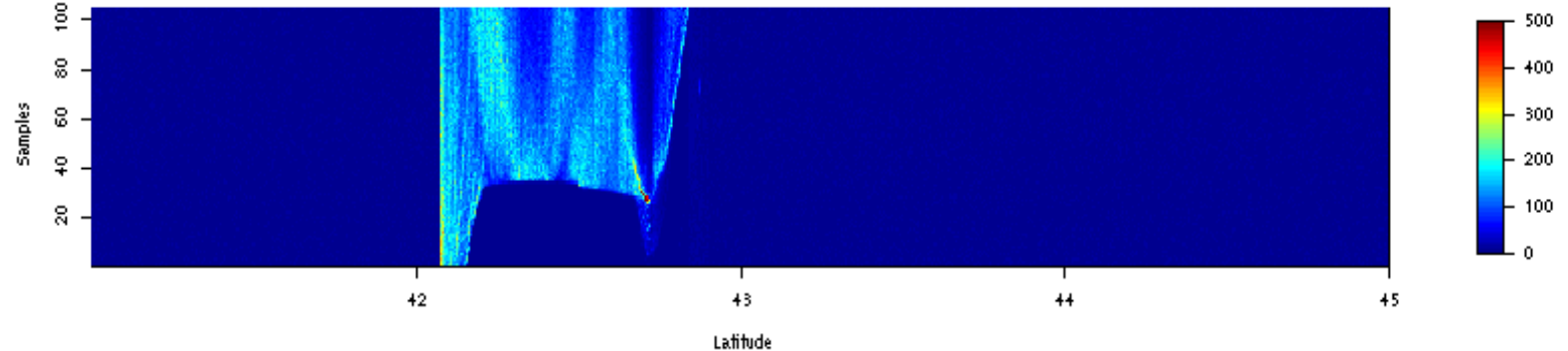
Jason-2  
SGT  
Cycle 1



Jason-2  
Median  
Cycle 2



Jason-2  
DIODE/DEM  
Cycle 3

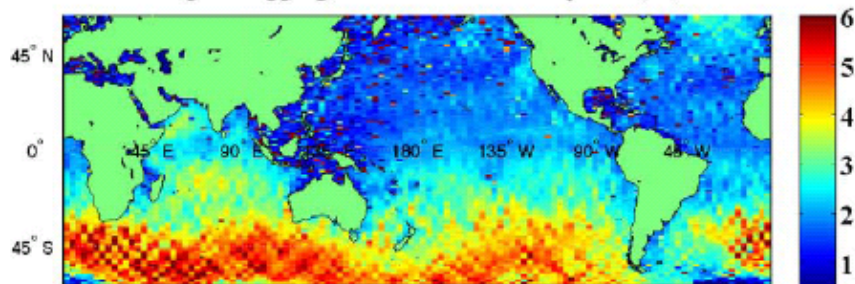




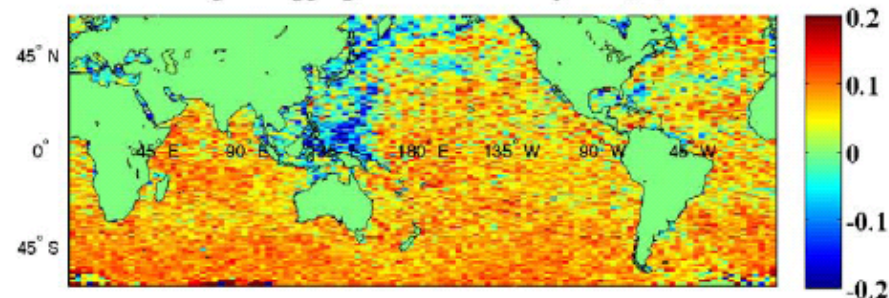


## Jason SGDR compared to LSE Retracking

Average of Aggregate swk new for J2 cycles 1, 2, 6



Average of Aggregate skew for J2 cycles 1, 2, 6



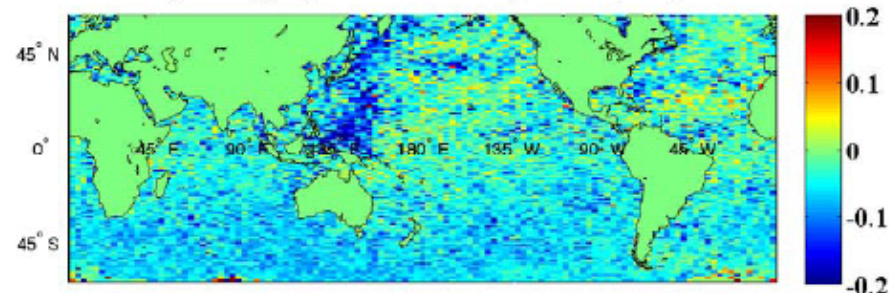
**P. Callahan – Retracking results J1, J2, TP**

**Comparisons of JPL ‘TOPEX’ retracking on Jason1 and OSTM/Jason2 data**

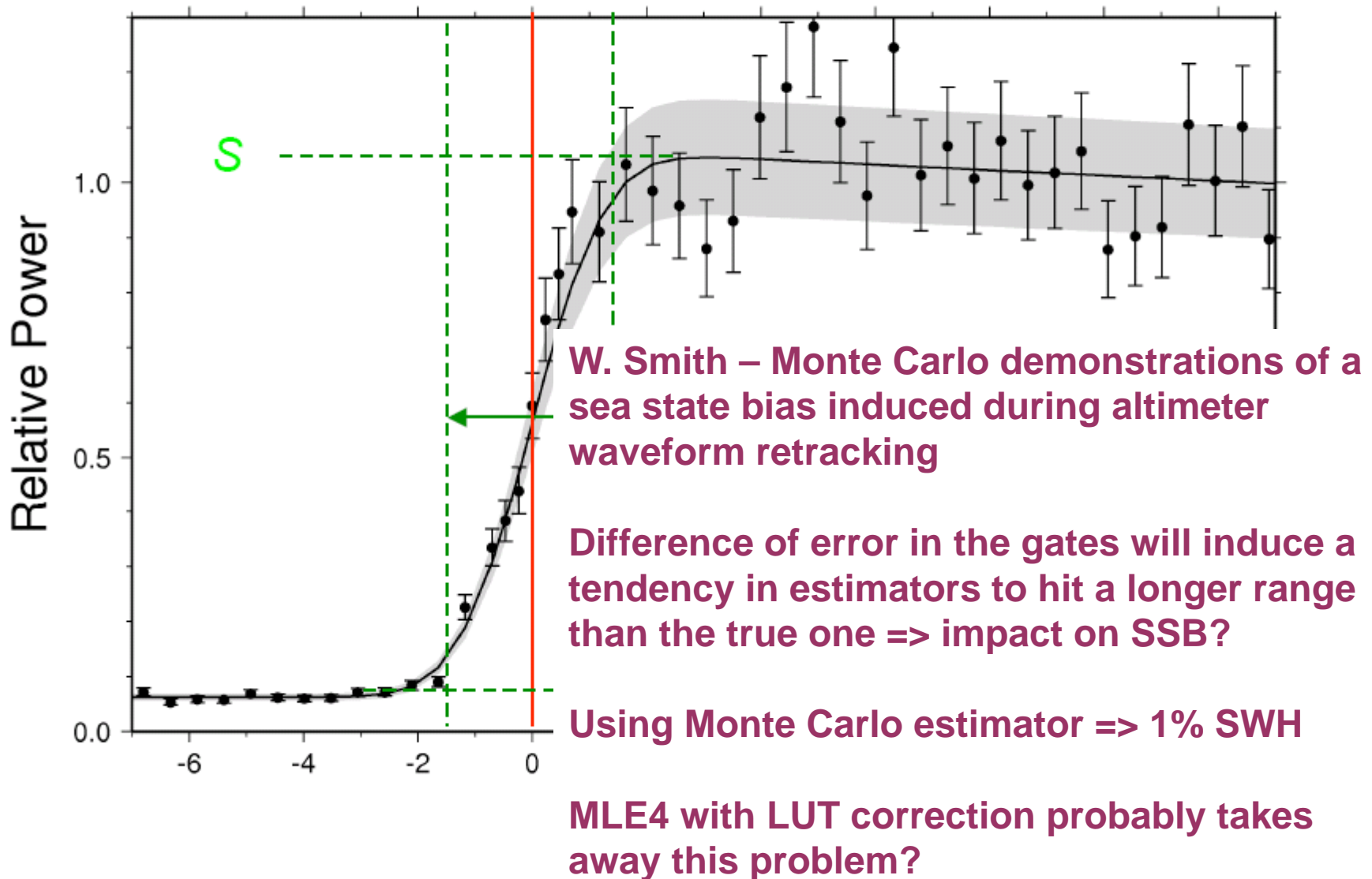
**-Not really applicable on DIODE/DEM mode (the waveforms are moving in the acquisition window)**

**-Unexplained features on skewness estimates for Jason-2**

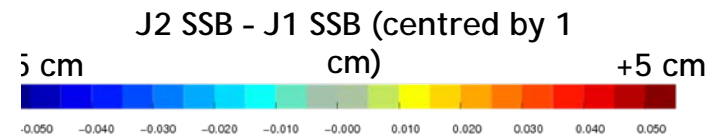
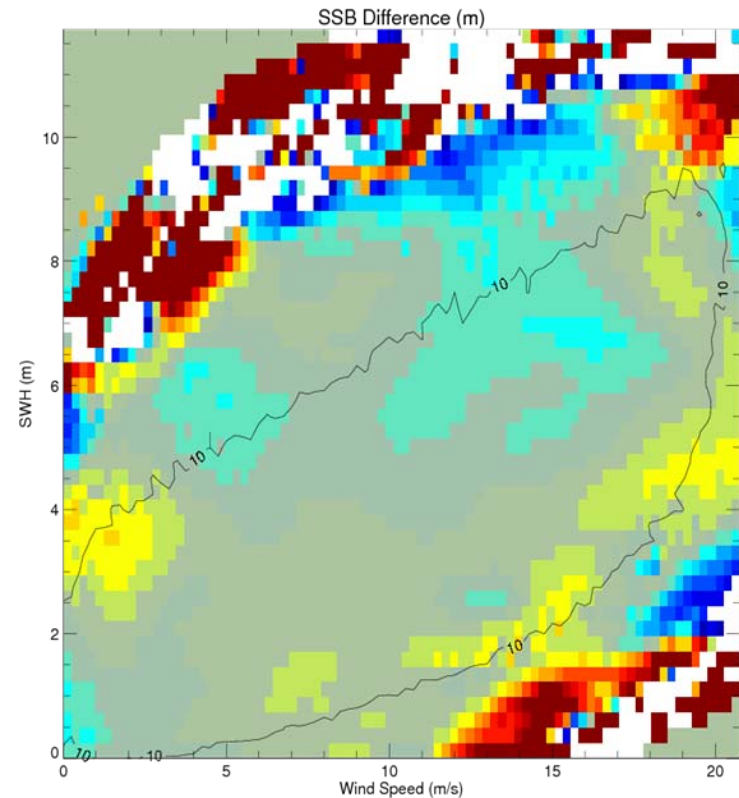
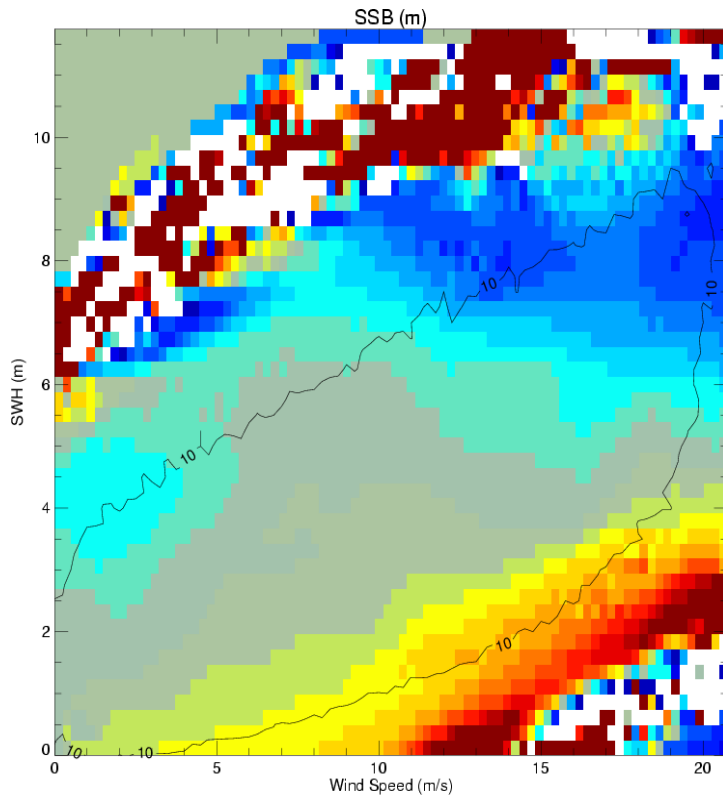
Avg Aggregate skew K for J1 cycles 240, 241, 245



# Waveform realization



## Status on J1 and J2 SSB consistency - Conclusion



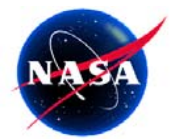
: the same level of agreement than  
ars of studies ....

### S. Labroue – J1, J2 Sea State Bias

SSB models for J2: very similar to J1 (same level as TP/J1 consistency)

Study on differences in SSB model with respect to the technique used = explained by the correlation between SLA and SWH





# Correlation with oceanic variability

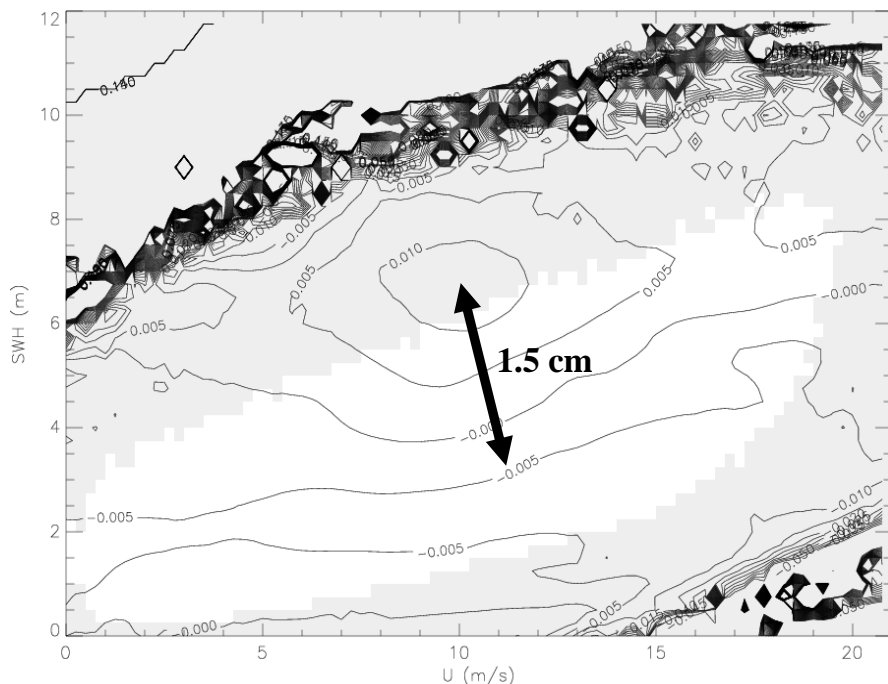
Analysis of the MSLA products from DUACS

MSLA= Map of  $\eta - \hat{\eta}$

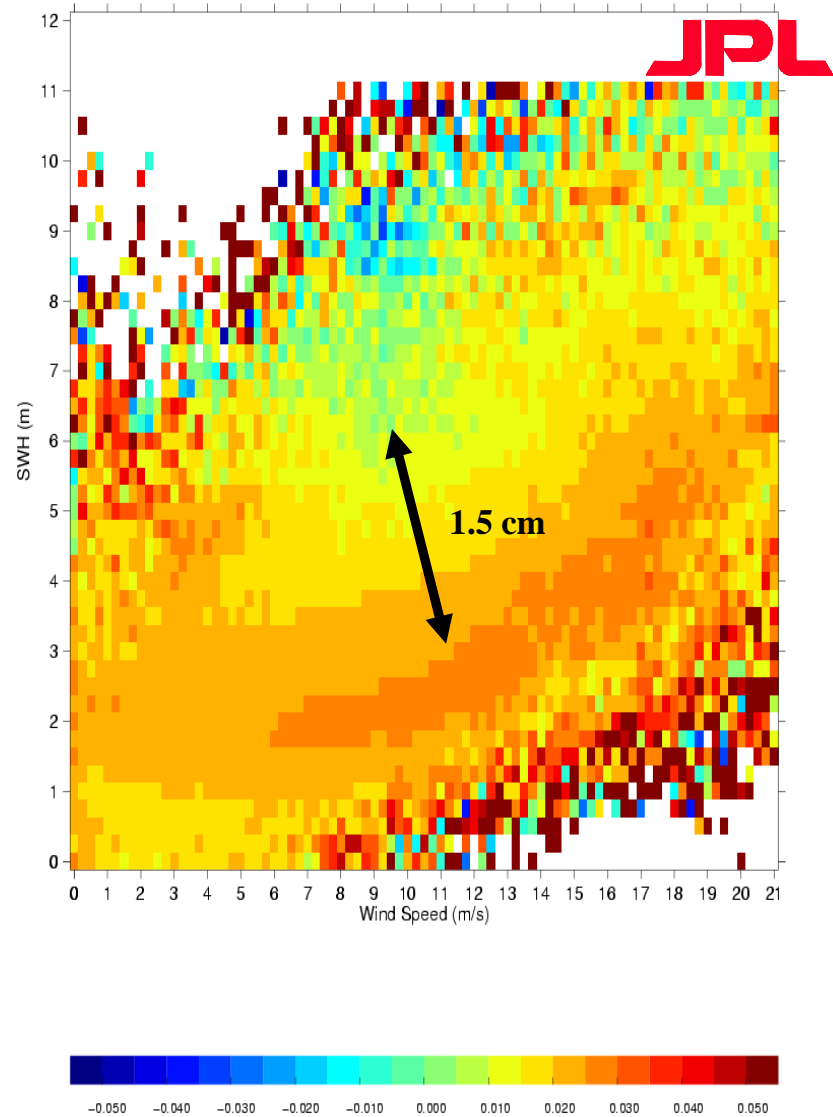
Multi mission products (TP,J1,EN,GFO) => SSH minus mean profile

Recent analysis in 2008 (off line products)

Interpolation of the maps at J1 location and time tag

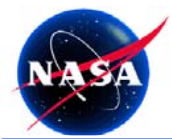


SSB difference : Collinear - Direct Jason (1-111)



MSLA, Jason-1 (1-110)

$$E[(\eta - \hat{\eta}) | (U, SWH)] \neq 0$$



# Radiometer

OSTST, Nice France 11 Nov 2008

## three categories

### Far sidelobe contamination (> 75 km)

Correctable to acceptable levels (~)

### Near sidelobe contamination (30 – 75 km from coast)

More difficult, but correction is possible (~2-4 mm)

### Main beam contamination (0 – 30 km from coast)

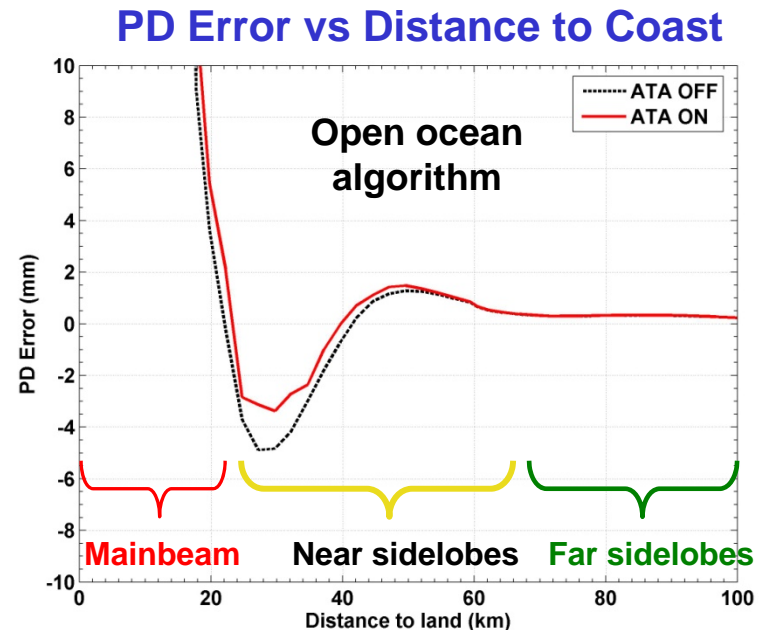
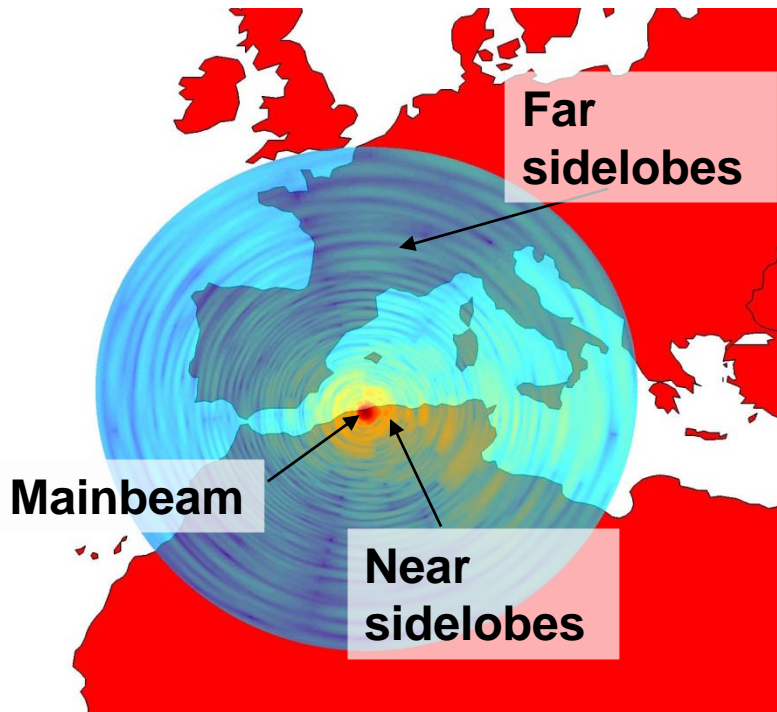
Very difficult to correct (20-40 mm)

## S. Brown – Near-land Radiometer wet path delay

**Aim:** correct main lobe contamination by land  
**Idea:** adding land fraction parameter in the PD retrieval algorithm (keeps it simple)

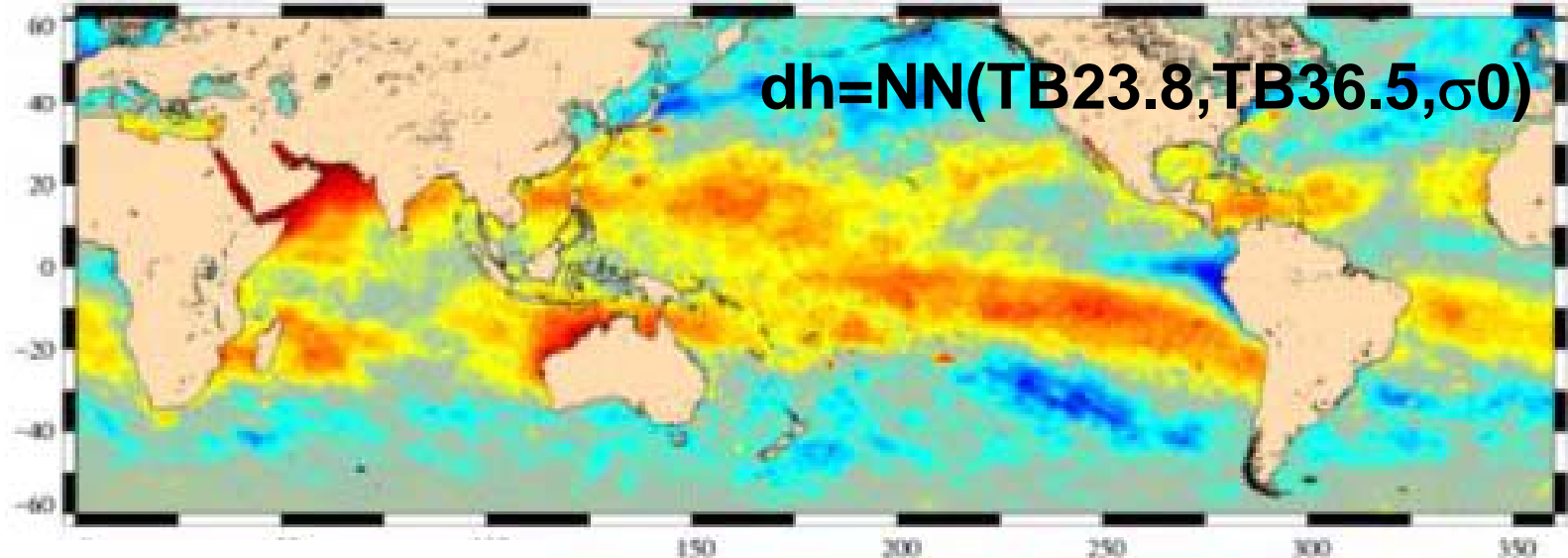
**Performance:** good: < 1.5 cm error up to the coast

**Addressed here**



# Validation on an independent dataset

## 2005 algorithm applied over 2003 simulations...

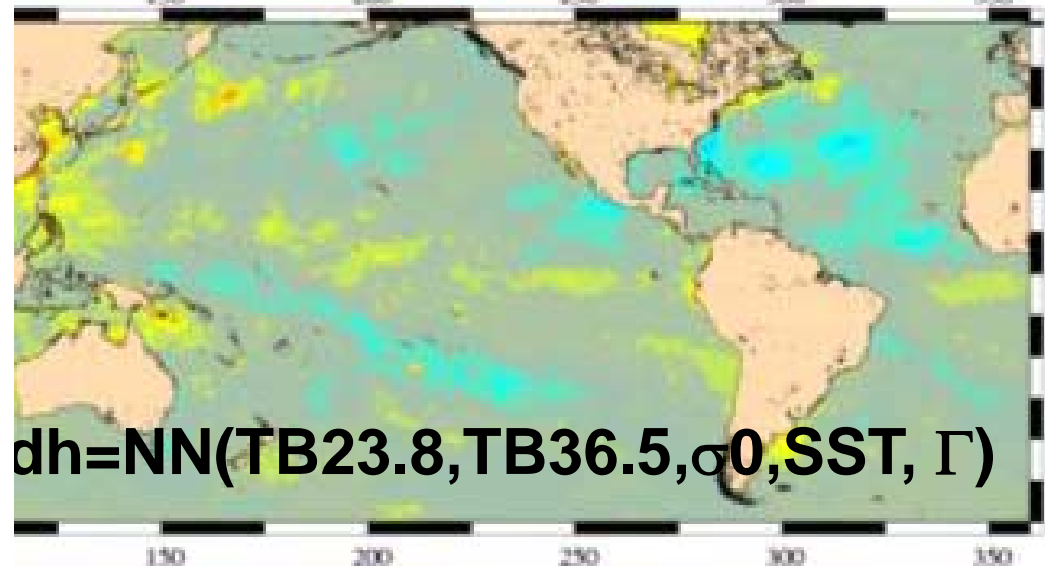


### E. Obligis – New generation of wet tropo correction

-idea: add new parameters in the retrieval algorithm (starting from ENVISAT NN algo)

-Most efficient parameters:

- SST
- $\Gamma = dT/dh$  in the lower atmosphere



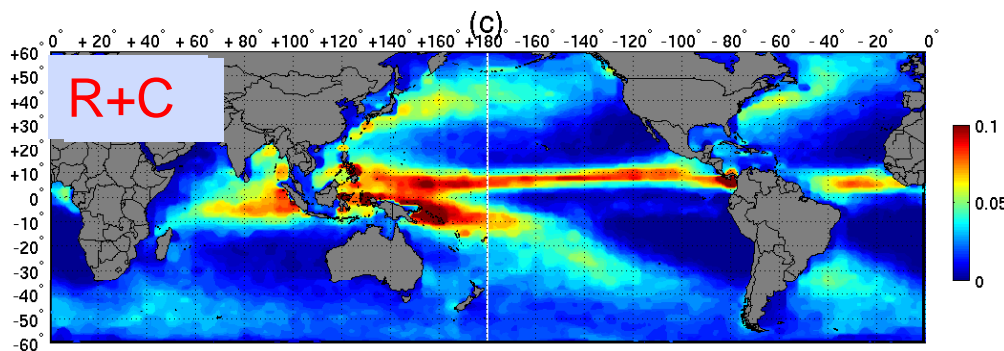
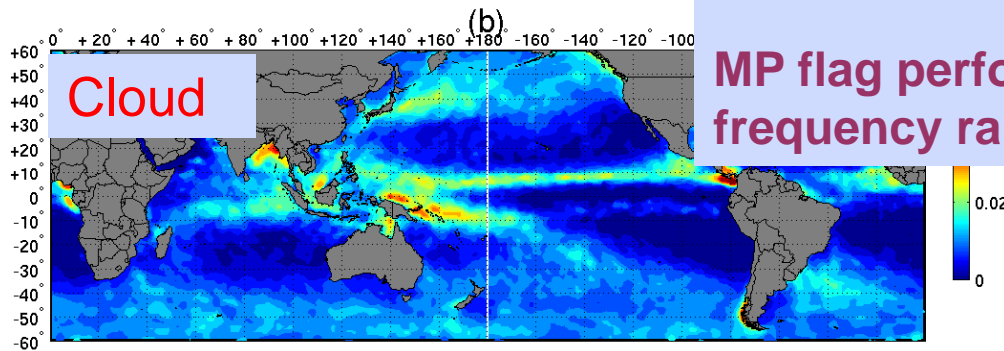
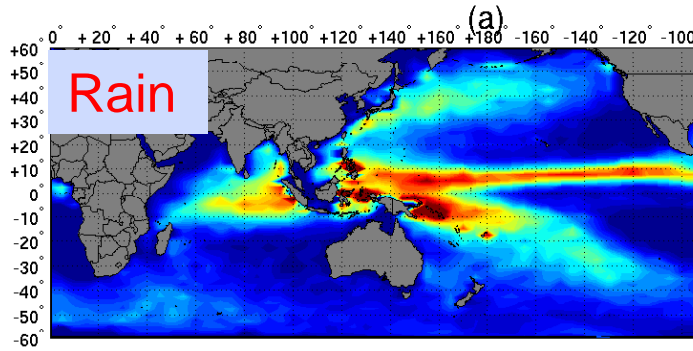
# 1-sec averaged

J. Tournadre – Cloud and rain effect on Ka-band altimeter

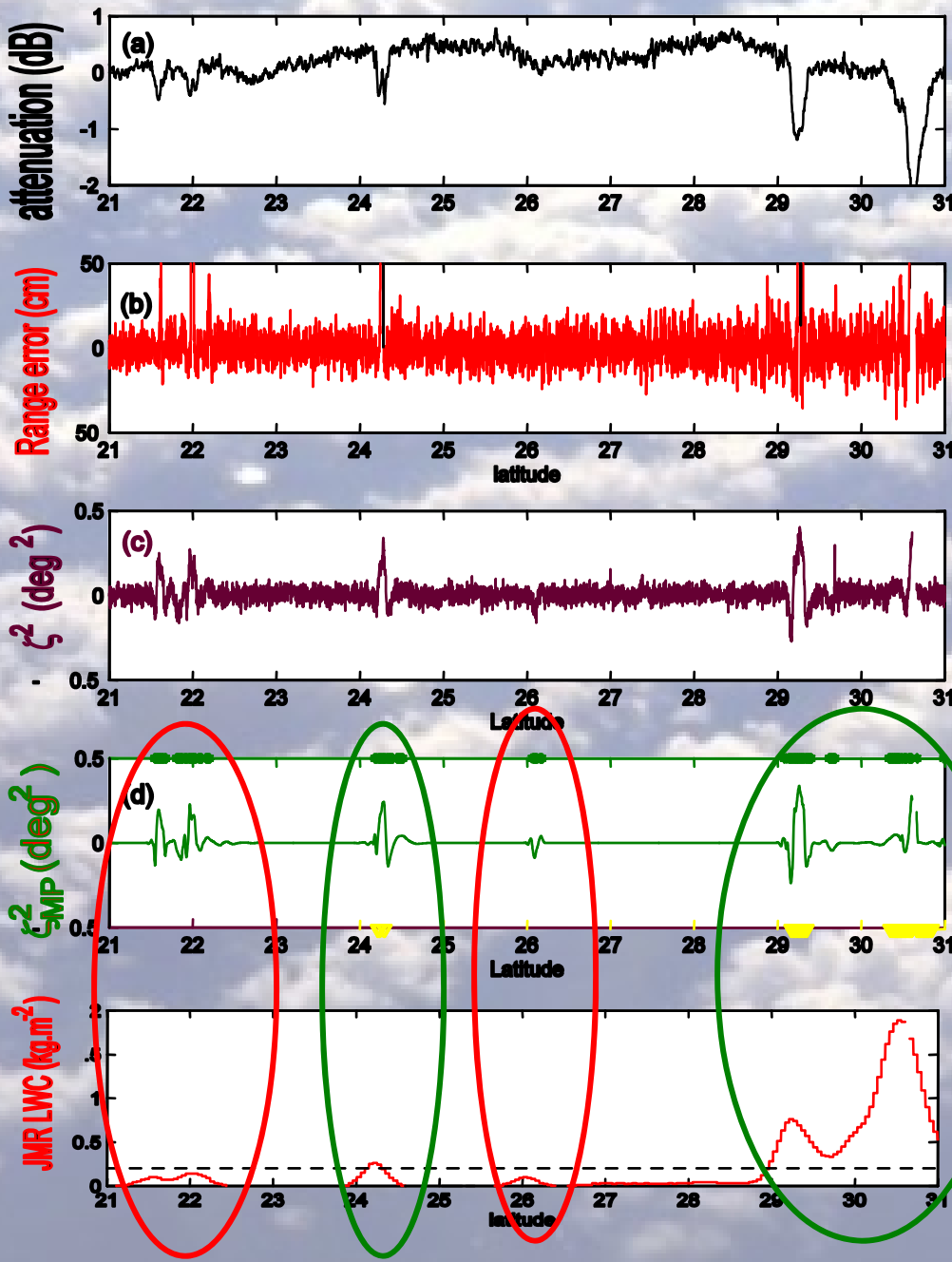
Model impact of cloud and rain on waveforms, then on data availability

New Rain/cloud flag based on the analysis of the off-nadir angle variation (Matching Pursuit)

MP flag performs as well as Jason dual frequency rain flag



- Secondary maxima in storm tracks regions
- Data loss proba. Maximum in ITCZ
  - R ~6%
  - CI ~ 3%
  - Total ~10%
- ~3-4%



MP flag

MP performs as well as the operational flag

Better for small rain cells with low ILWC



# Processing Overview (1 of 2)

- Some things to remember about Retracking
  - Everything is correlated !!
  - Fit is non-linear, iterative so effects of noise, correlation cannot necessarily be eliminated by averaging later
  - Length scales of everything except Range are much longer than 20 Hz  $\approx$  300 meters. Retracking could be improved by taking account of this, but beyond 1 frame (1 sec) is probably too difficult
- Sigma0 processing, “features” may not be fully understood by users
  - Sigma0 is harder to mechanize for Jason-2 because waveform moves in window
  - Effects from enforced attitude in MLE3 – sigma0 maybe particularly sensitive to attitude
  - What sigma0 to use for Rain Flag? Or, how to do Rain Flag, in general?
    - K-C sigma0 difference with liquid threshold was very effective for TOPEX

# Processing Overview (2 of 2)

- SSB Overview
  - Any error that has a geographic distribution that looks like SWH will affect SSB
  - (Corollary) Good orbits are key to getting good SSB
  - (Corollary) To make good TOPEX SSB, RGDR must include all other corrections first, then solve for SSB, then put new SSB on RGDR
- JPL Retracking shows that Jason-2 has opposite sign skewness to Jason-1 (both Median and DEM trackers). Should be investigated

# Conclusions / Future plans

- *Altimeter:*
  - *Fix the “AGC anomaly” problem,*
  - *Upload improved DEM whenever available*
  - *Investigate J1 – J2 relative bias*
- *Radiometer:*
  - *Implement S. Brown algorithm (at least in “PISTACH” coastal products)*
- *Processing:*
  - *Fix the rain flag issue and/or problems related to MLE4*
  - *Indeed, as Jason-2 does not suffer from platform mispointing, do we need MLE4?*
  - *Investigate the high frequency noise coloration*