CryoSat-2 SARin mode over great rivers

CryoSat Third Users Workshop, 12-14 March 2013, Dresden, Germany

S. Calmant\(^{(1)}\), N. Bercher\(^{(1)}\), S. Fleury\(^{(1)}\), S. Dinardo\(^{(2)}\), B. Lucas\(^{(2)}\), P. Femenias\(^{(2)}\), F. Boy\(^{(3)}\), N. Picot\(^{(3)}\) and J. Benveniste\(^{(2)}\)

*Presented by Nicolas Bercher*

Contact: {stephane.calmant,nicolas.bercher}@legos.obs-mip.fr

(1) LEGOS, Toulouse, France ; (2) ESA, Frascati, Italy ; (3) CNES, Toulouse, France

Thursday 14th March 2013
Questions & Objectives

What’s the quality of the CryoSat-2 data? For the 3 modes.

Calmant et al. CryoSat-2 SARin mode over great rivers
Questions & Objectives

- What’s the quality of the CryoSat-2 data? For the 3 modes
- How to extract, edit & filter to get the best from the data?
Questions & Objectives

- What’s the quality of the CryoSat-2 data? For the 3 modes
- How to extract, edit & filter to get the best from the data?
- Use CryoSat-2 data as input for hydrological models
Questions & Objectives

- What’s the quality of the CryoSat-2 data? For the 3 modes
- How to extract, edit & filter to get the best from the data?
- Use CryoSat-2 data as input for hydrological models

- Merge multi-mission data products to build “alti-hydrological” products
On going study areas

Amazon basin rivers (SAR & SARin)
Mekong river (SAR)
Congo river (SARin)

Downstream Amazon & Solimões rivers (SARin)
Downstream Amazon & Solimões rivers (SARin)
Downstream Amazon & Solimões rivers (SARin)
Downstream Amazon & Solimões rivers (SARin)
Downstream Amazon & Solimões rivers (SARin)
Downstream Amazon & Solimões rivers (SARin)
Downstream Amazon & Solimões rivers (SARin)

Extracted data
Downstream Amazon & Solimões rivers (SARin)

Extracted data + main river bed boundaries (SWBD)
CryoSat-2 - Z (m) map - Amazon-Solimões
River Water level profile (not filtered)
River Water level profile (filtered)
River Water level time series (not filtered)
Downstream Amazon & Solimões rivers (SARin)

River Water level time series (filtered)
River Water level pseudo-time series (spatial variations removed, Jason-2)
Upstream Amazon river (Solimões) (SARin)
Upstream Amazon river (Solimões) (SARin)
Upstream Amazon river (Solimões) (SARin)
Upstream Amazon river (Solimões) (SARin)
Extracted data

CryoSat-2 - Z (m) map - Upstream Amazon
Upstream Amazon river (Solimões) (SARin)

Extracted data + main river bed boundaries (SWBD)
Upstream Amazon river (Solimões) (SARin)

Extracted data within main river bed boundaries (SWBD)
CryoSat-2 - Z (m) profile - Upstream Amazon

River Water level elevation profile (filtered)
River Water level elevation time series (filtered)
Mekong river (SAR)
Mekong river (SAR)

River Water level profile (filtered)
Mekong river (SAR)

CryoSat-2 SAR - Mekong river water level $Z(x,t)$

- CryoSat-2 interpolated $Z$ (cubic)
- CryoSat-2 $Z$
Congo river (SARin)
Congo river (SARin)
Congo river (SARin)

River Water level profile (edited, not filtered)
Congo river (SARin)

River Water level profile (edited, filtered)
Early days, work in progress. . . .
Early days, work in progress. . . .
But a lot of exciting work to come!
Early days, work in progress. . . . .
But a lot of exciting work to come!

Baseline B products seem to perform quite well!
Conclusion

- Early days, work in progress...
- But a lot of exciting work to come!
- Baseline B products seem to perform quite well!
- However needs validation against in situ data and comparisons to other missions (Jason-2, AltiKa)
Conclusion

- Early days, work in progress. . . .
- But a lot of exciting work to come!

- Baseline B products seem to perform quite well!
- However needs validation against in situ data and comparisons to other missions (Jason-2, AltiKa)
- CryoSat-2 has an amazing potential for hydrology, it is a major steps toward Swot mission in terms of applications in hydrology
Perspectives

CryoSat-2 data processing

- Implement custom editing for each product

Forthcoming applications

Other study areas

Calmant et al. CryoSat-2 SARin mode over great rivers
CryoSat-2 data processing

- Implement custom editing for each product
- Develop physical interpolation method and filters routines

Forthcoming applications

Other study areas
CryoSat-2 data processing

- Implement custom editing for each product
- Develop physical interpolation method and filters routines

Forthcoming applications

- River discharge forcing in models

Other study areas

Calmant et al.
CryoSat-2 SARin mode over great rivers
Perspectives

CryoSat-2 data processing
- Implement custom editing for each product
- Develop physical interpolation method and filters routines

Forthcoming applications
- River discharge forcing in models
- Water propagation modeling

Other study areas

Perspectives

CryoSat-2 data processing
- Implement custom editing for each product
- Develop physical interpolation method and filters routines

Forthcoming applications
- River discharge forcing in models
- Water propagation modeling

Other study areas
CryoSat-2 data processing

- Implement custom editing for each product
- Develop physical interpolation method and filters routines

Forthcoming applications

- River discharge forcing in models
- Water propagation modeling
- Validation against in situ water level measurements (2014)

Other study areas

Calmant et al.
CryoSat-2 SARin mode over great rivers
Perspectives

CryoSat-2 data processing
- Implement custom editing for each product
- Develop physical interpolation method and filters routines

Forthcoming applications
- River discharge forcing in models
- Water propagation modeling
- Validation against in situ water level measurements (2014)

Other study areas
- Niger (desert & inner delta, LRM & SARin)
## Perspectives

### CryoSat-2 data processing
- Implement custom editing for each product
- Develop physical interpolation method and filters routines

### Forthcoming applications
- River discharge forcing in models
- Water propagation modeling
- Validation against in situ water level measurements (2014)

### Other study areas
- Niger (desert & inner delta, LRM & SARin)
- Amazon source (alt. approx. 700 m, SARin)