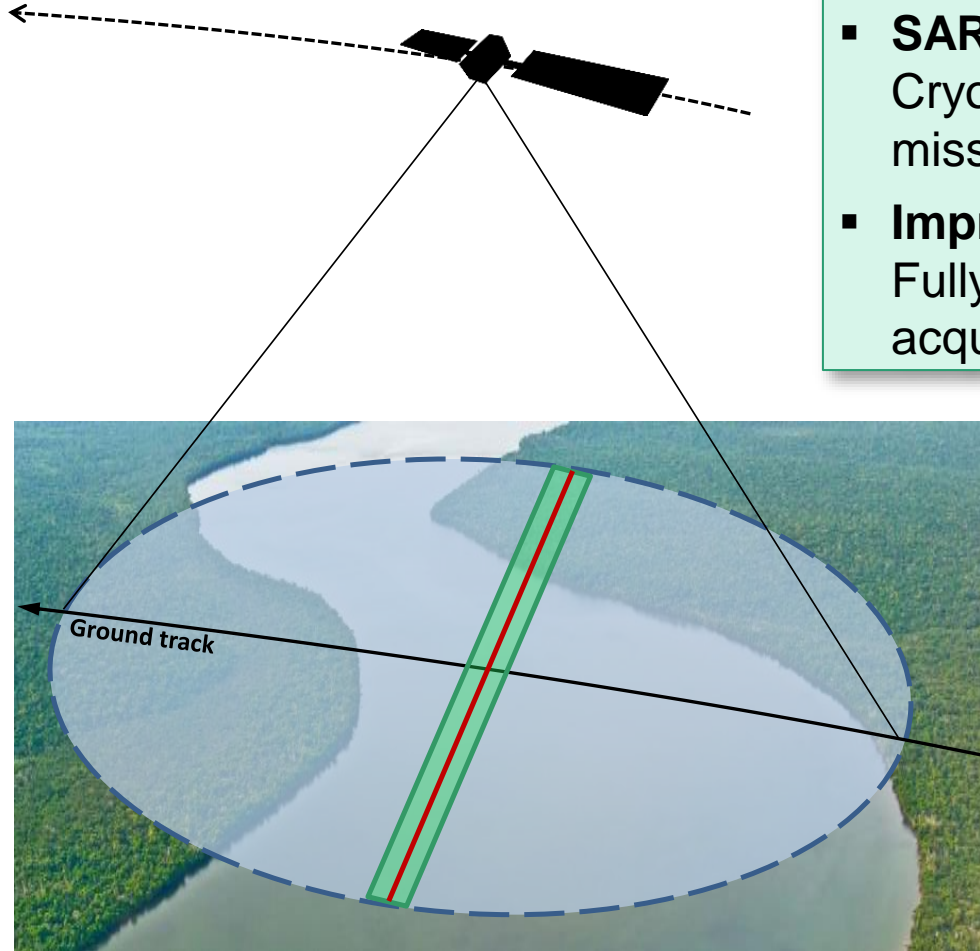


# Overview of altimetry processing over inland water

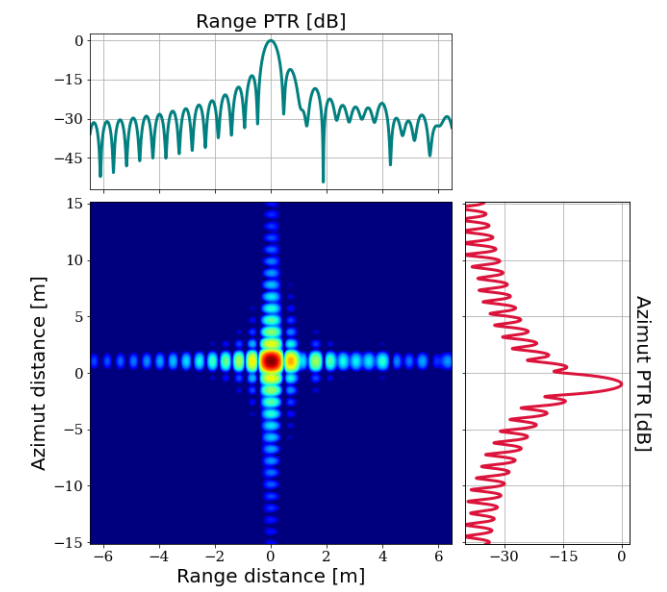


# Altimeter Data Processing

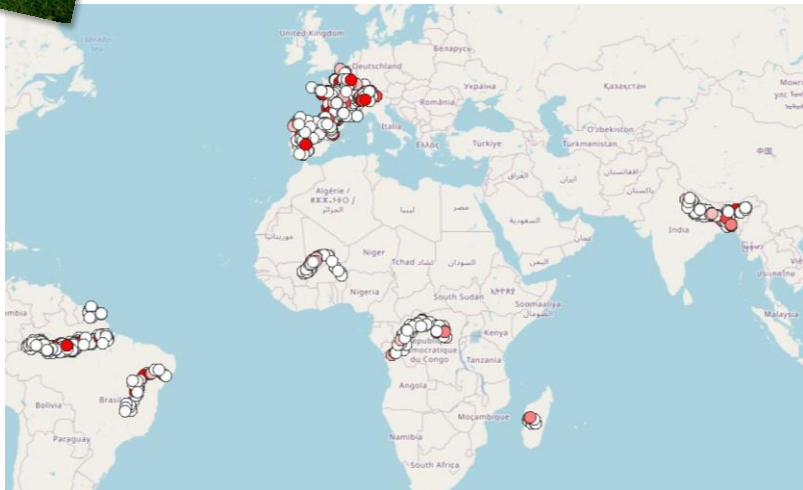


- **Low Resolution mode (LRM)**  
Jason1/2/3, SARAL ..
- **SAR mode, aka Unfocused SAR (Raney, 1998)**  
Cryosat-2, Sentinel-3A/B, Sentinel-6 and upcoming altimeter missions (S3C/D, CRISTAL, S3NG, ..)
- **Improved Doppler processing capability**  
Fully-Focused SAR (Egido & Smith, 2017) making use of SAR mode acquisition data to achieve highest along-track resolution

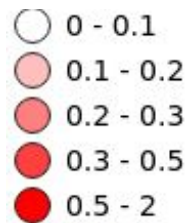
- **Conventional Altimetry**  
16 km of diameter
- ▭ **Unfocused altimeter SAR**  
~300 m in along-track direction  
16 km in across-track direction
- ▬ **FF-SAR**  
~50 cm in along-track direction  
16 km in across-track direction



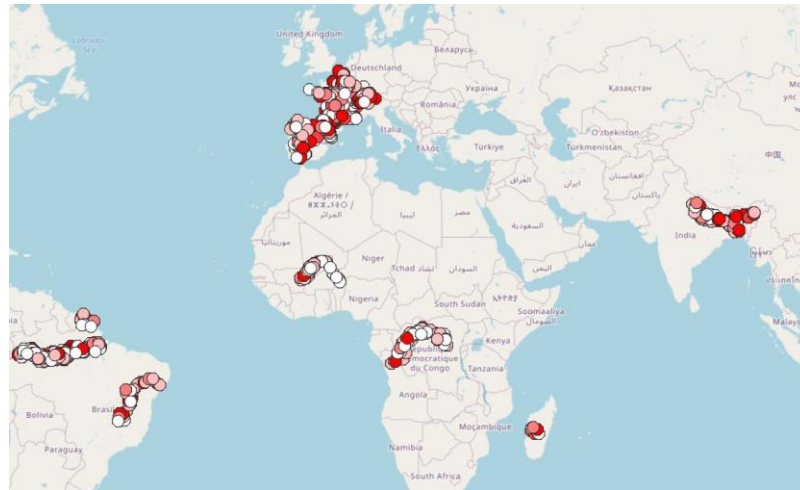
# Sentinel-3 FF-SAR assessment over inland waters



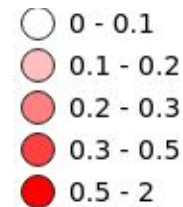
**FFSAR processing** ( $\text{sinc}^2$ )  
Mapping of the standard deviation values of WSH after editing



WSH STD median value: ~4 cm



**UFSAR processing**  
Mapping of the standard deviation values of WSH after editing



WSH STD median value : ~10 cm

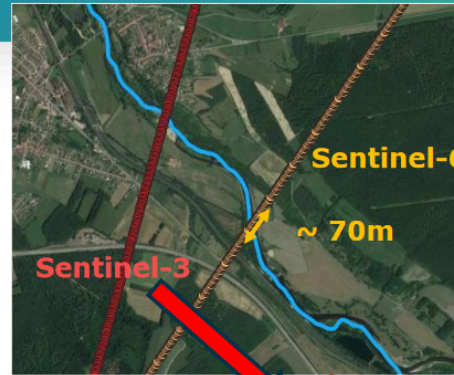
## Significant improvement of the WSH precision using FFSAR :

- influence of the along-track resolution
- much more independent measurements of a same water body (to be edited and averaged)
- especially on small watercourse

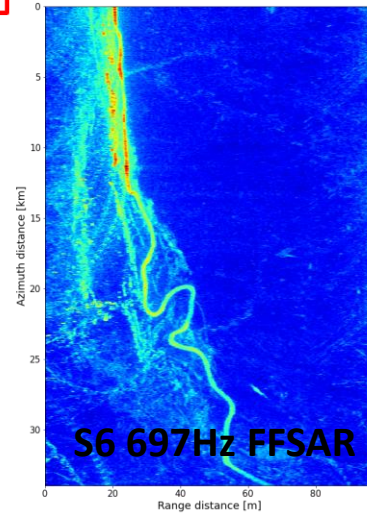
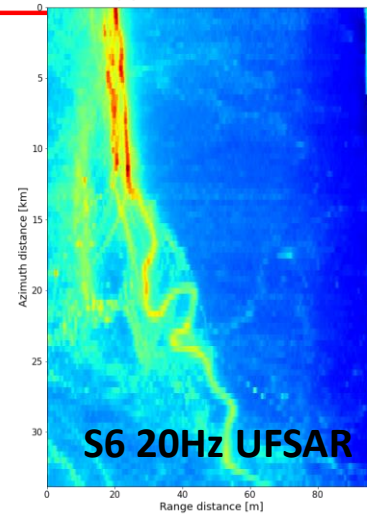
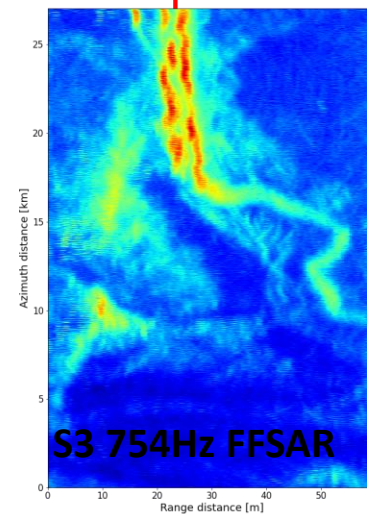
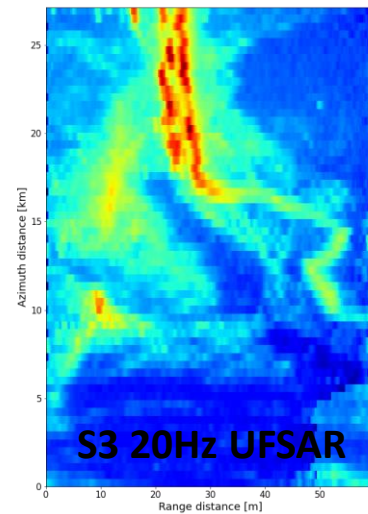
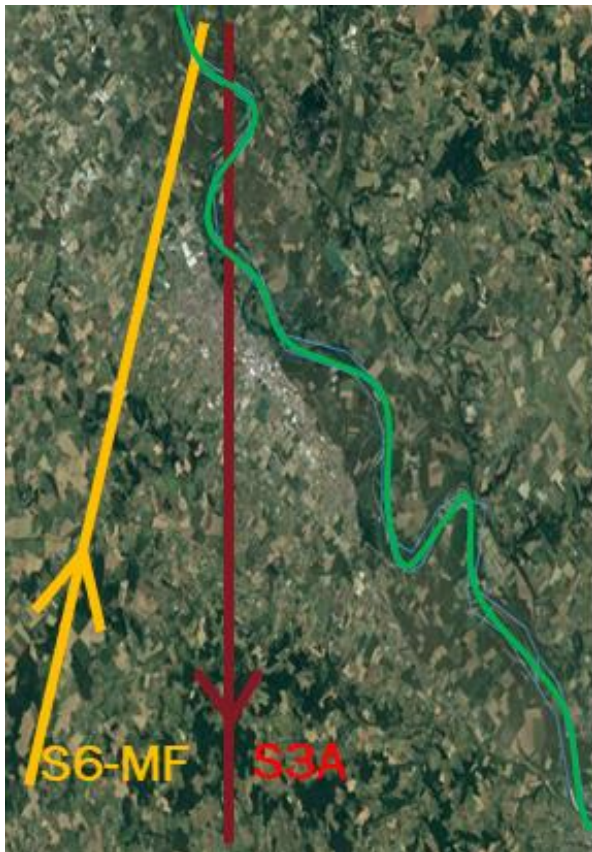
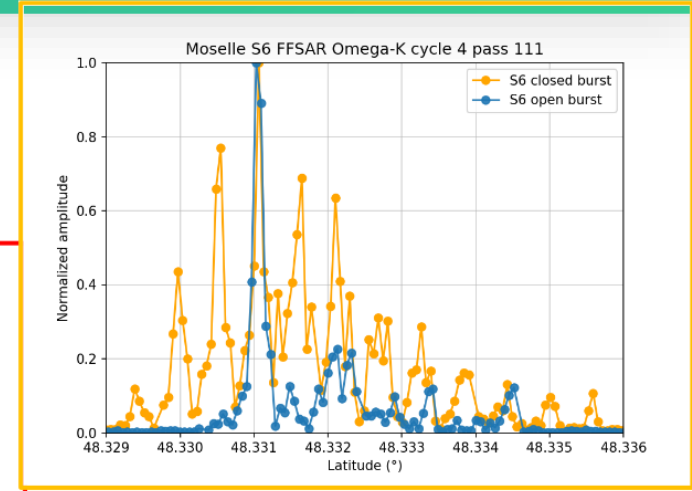
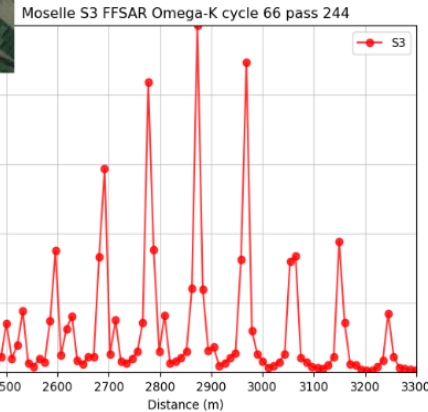
## Except where azimuth replicas are strong :

- precision may be severely degraded
- especially over high backscattered surfaces and large water bodies
- Ongoing study to tackle this issue

# Sentinel-3 FF-SAR investigations



Moselle river (France)




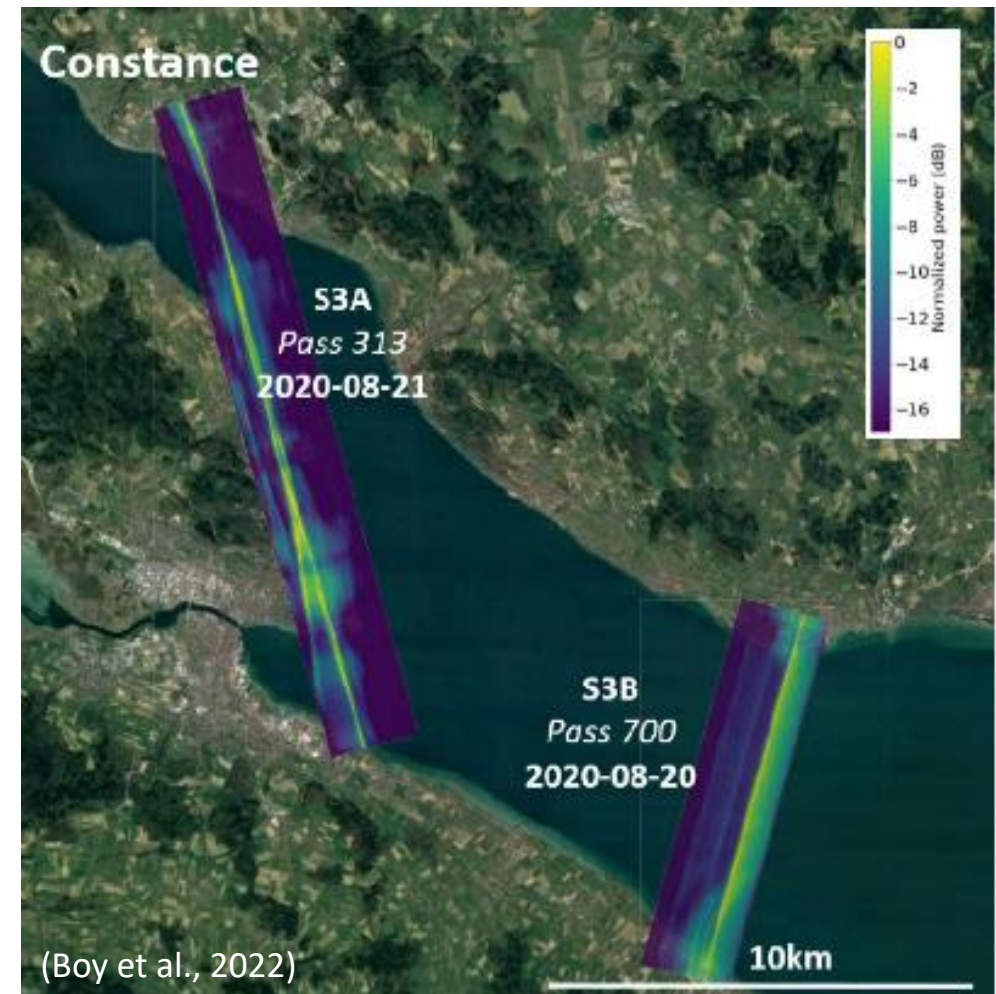
# Level-1/Level-2 Altimeter Data Processings

5

Accuracy of inland water bodies is currently limited to few tens of centimetre due to:

- the small size of these targets (wrt radar altimeter footprint),
- contamination by the surrounding land, and
- inaccurate range corrections (roughness, slope).

- 
- To fully exploit the SAR mode acquisition (increasing the along-track resolution and posting rate) to provide water surface height (river/lake) of enhanced quality (RMSE < 10cm) over the largest possible number of water bodies
  - New L2 SAR mode processing based on simulated waveforms as model inside the retracking algorithm to get improved water surface height estimates over small to middle size lakes
  - Continue use of OLTC to set properly the reception window of the return echoes



31/12/2008

16 m



The SMAP FFSAR package accessible on a public git repository  
<http://doi.org/10.5270/esa-cnes.sentinel-3.smapp>

