Outreaching hydrology from space & Swot

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Hydrology from space is one of the rising remote sensing field of application, with huge issues - environmental, human, economic... - to take into account. Among the issues, there's also the question of explaining how to use those data to people not so used to remote sensing, why, how they are made, etc. -- in one word, outreaching hydrology from space. Some portals exist, such as the THEIA portal for land applications through which a number of space data dedicated to land applications (including hydrology) are available (https://www.theia-land.fr/en).

SWOT will be a cornerstone of hydrology from space, and will also be a completely new concept. Some pieces of explanations exists through JPL and through the CNES space technology training courses, but more will be done, with a major focus on hydrology, but not forgetting the ocean, and the complementarity with currents techniques, including nadir altimetry.

Teaching SWOT & hydrology from space

Swot will be a very new satellite, and also one among other hydrology satellites → need to sketch the rationale of observing & monitoring land waters

→ whole overview of Earth observation techniques which can be used for hydrology

→ Stress the advantages / impacts / novelties of Swot

→ explain how it will work, for different level of expertise; for oceans and coasts as well as hydrology

→ simulation of the data, description of the products
A series of ppt files, in English and French, aimed at university / engineering school / user level, and (soon) provided on Aviso+ web site
NB. CNES TTVS animations are already available on request (with an agreement to sign)



News & updates on the web

Aviso's "Images of the Month" for technical / scientific applications. Hydrology & ocean studies preparing for Swot.





Altimetry for hydrology

A document (pdf file) explaining altimetry for hydrology in English, French, Spanish, Portuguese, on Aviso web.



News of the satellite in construction.



The SAR-altimetry mode (or Delay-Doppler altimetry) is implemented on Cryosat, the Sentinel-3A & B and in the future on Jason-CS/Sentinel-6 and the Sentinel-3 C& D. This mode enable to get higher along-track resolution at a better accuracy (see Technique > Altimetry > SAR altimetry), and is more and more used, in particular for inland water applications.

The currently SAR altimeters processing uses coherent altimeter radar echoes over a limited time (approximately 3.52 ms). However, the entire illumination time of the surface (almost 2.5 s) can be used for the synthetic aperture processing since it stays coherent for that entire period. This, called "Fully-focused SAR processing" thus achieves better along-track resolution, eventually reaching the theoretical limit of approximately 50 cm for current SAR altimeters (which is half the diameter of the antenna).

With such a finer resolution, very small water bodies crossed by the satellite ground track can be accurately observed and measured. The fullyfocused SAR processing can be applied to the three currently flying SAR altimeters (CroySat-2, Sentinel-3A & B) and also to the upcoming SAR altimeters (Sentinel-3C & D and Jason-CS/Sentinel-6). Jason-CS/Sentinel-6 should show even greater performance thanks to the interleaved mode planned on this mission, which will emit and receive the altimeter echoes alternatively, instead of emitting 256 times then going on receiving mode for a period, and so on (this latter mode have the drawback of generating ghost (??) measurements in fully-focused SAR processing, duplicating the results further along the track if not taken into account)

Those altimeters having different ground tracks, a huge dataset of water levels will be studied for itself, and will also be used i combination/comparison with Swot data when the satellite will be flying. Studies on ice, coasts and even open ocean are also ongoing.

EE ALSO: • Applications: High-resolution hydrology • Techniques: Delay-Doppler / SAR altimetry





The Solomon Sea in the South-west Pacific is a semi-enclosed sea, bordered by the island of New Guinea to the West, the islands of New Britain and New Ireland to the North, and the Solomon Islands to the East. The circulation in this basin is highly constrained by those Islands and the bathymetric features surrounding them. Moreover, the Solomon Sea is highly sensitive to the ENSO phases, which modulate mesoscale activity and stratification. The principal lunar semidiurnal constituent (M2) generates there energetic internal tides at three principal sites where strong tidal currents encounter sharp topography in the stratified ocean. Thus this Sea enables to study the diversity of internal tide signature with differences depending on the ENSO phases, in particular if looking at 1997-1998 (strong El Niño) vs 1999 (strong La Niña).

y shows that La Niña, with a high level of mesoscale activity, favors the appearance of incoherent internal tides while El Niño, with ication close to the surface, is more characterized by small scale coherent tide-induced sea surface heights.

A global view of internal tide generation, propagation, and dissipation has emerged in recent years, mainly from satellite al observations and global high-resolution numerical models. However, a better knowledge of internal tides, both coherent and incoher primordial for Swot altimetry mission. This study in the Solomon Sea shows the complexity in predicting internal tides. This knowledge mandatory to access meso and submesoscale signatures from the future Swot mission.

cations/ocean: Internal tides e of the Month, November 2007: The ocean is going up and down around the Solomon Islands 2007: The ocean is going up and down around the Solomon IslandsMissions: Swot A ppt version (in validation), in English and in French, on nadir altimetry for hydrology (Swot being the aim of another ppt series, see above)



Feedbacks are welcomed, ask for a demo

Swot for general public

What all this about? The finer details of Swot technique might be difficult to broach to a general public, but it can still be explained, and the whys and hows of the mission are of a definite interest for everybody on Earth.



Swot products

What will be the Swot products?: formats, parameters, resolution, latencies, ...



We are trying to address this aim in another support, in storymap format and ppts.



Users and would-be users need to really understand what they will have, at first on a broad sense.

Basis for Area/Height Calculations Final Product Appearance A Basis for Area/Height Calculations Basis for Area/Height Calculations Calcu



