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Stack Characterization in CryoSat Level1b SAR/SARin Baseline C

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CryoSat was launched on the 8th April 2010 and is the first European ice mission dedicated to the monitoring of precise changes in the thickness of polar ice sheets and floating sea ice. CryoSat is the first altimetry mission operating in SAR mode and it carries an innovative radar altimeter called the Synthetic Aperture Interferometric Altimeter (SIRAL), that transmits pulses at a high pulse repetition frequency thus making the received echoes phase coherent and suitable for azimuth processing.

The current CryoSat IPF (Instrument Processing Facility), Baseline B, was released in operation in February 2012. After more than 2 years of development, the release in operations of the Baseline C is expected in the first half of 2015.

It is worth recalling here that the CryoSat SAR/SARin IPF1 generates 20Hz waveforms in correspondence of an approximately equally spaced set of ground locations on the Earth surface, i.e. surface samples, and that a surface sample gathers a collection of single-look echoes coming from the processed bursts during the time of visibility. Thus, for a given surface sample, the stack can be defined as the collection of all the single-look echoes pointing to the current surface sample, after applying all the necessary range corrections.

The L1B product contains the power average of all the single-look echoes in the stack: the multi-looked L1B waveform. This reduces the data volume, while removing some information contained in the single looks, useful for characterizing the surface and modelling the L1B waveform. To recover such information, a set of parameters has been added to the L1B product: the stack characterization or beam behaviour parameters. The stack characterization, already included in previous Baselines, has been reviewed and expanded in Baseline C.

This poster describes all the stack characterization parameters, detailing what they represent and how they have been computed. In details, such parameters can be summarized in:
- Stack statistical parameters, such as skewness and kurtosis
- Look angle (i.e. the angle at which the surfaces sample is seen with respect to the nadir direction of the satellite) and Doppler angle (i.e. the angle at which the surfaces sample is seen with respect to the normal to the velocity vector) for the first and the last single-look echoes in the stack.
- Number of single-looks averaged in the stack (in Baseline C a stack-weighting has been applied that reduces the number of looks).

With the correct use of these parameters, users will be able to retrieve some of the ‘lost’ information contained within the stack and fully exploit the L1B product.