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Measured CryoSat SAR/SARIn Signal to Noise Ratio from in-orbit acquisitions

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CryoSat was launched on the 8th April 2010 and it is the first European ice mission dedicated to monitoring precise changes in the thickness of polar ice sheets and floating sea ice. The main payload of CryoSat is a Ku-band radar altimeter, called SIRAL (Synthetic interferometric radar altimeter), that transmits pulses at a high pulse repetition frequency thus making the received echoes phase coherent and suitable for along-track processing. SIRAL is capable of operating in three main measurements modes: Low Resolution Mode (LRM), Synthetic Aperture Radar (SAR) mode and SAR Interferometric (SARIn) mode. While in LRM the instrument acts as a conventional pulsewidth-limited altimeter, in SAR mode and in SARIn mode the along-track resolution of the altimeter is enhanced by exploiting the Doppler properties of the pulses.

This abstract presents the outcome of the analysis on the CryoSat Signal to Noise Ratio (SNR) in SAR/SARin modes, aiming at verifying that the radiometric requirements (SNR) are currently met. In fact, a system requirement for CryoSat was defined to guarantee a signal-to-noise ratio higher than 18 dB on single-look Doppler processed echoes in the most favorable synthetic beam (nadir beam) and assuming a diffuse, flat surface orthogonal to the antenna boresight.

The requirement on SNR has been verified by analysis of CryoSat acquisitions over open ocean (with an average sigma0 of 11 dB), considering the sea surface approximately as a uniformly rough flat surface. The conducted analysis has revealed an average SNR on the single-look echoes of about 32 dB for SAR and 38 dB for SARin.
Being the system requirements for ocean specified for a sigma0 between 6dB and 25dB, the radiometric requirement is fully achieved.

Moreover, a similar analysis has been conducted on the 20Hz multilooked waveforms, that are contained in the CryoSat Level1b products, aiming at verifying the performance in the sense of SNR on the delivered products.

This poster details the outcome of the analysis on the measured SNR for CryoSat in SAR/SARin modes for both single-look and multilooked echoes.