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The CryoSat Interferometer after 6 years in orbit: calibration and achievable performance

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The main payload of CryoSat is a Ku-band pulse width limited radar altimeter, called SIRAL (Synthetic interferometric radar altimeter). When commanded in SARIn (synthetic aperture radar interferometry) mode, through coherent along-track processing of the returns received from two antennas, the interferometric phase related to the first arrival of the echo is used to retrieve the angle of arrival of the scattering in the across-track direction. In fact, the across-track echo direction can be derived by exploiting the precise knowledge of the baseline vector (i.e. the vector between the two antennas centers of phase) and simple geometry.
The end-to-end calibration strategy for the CryoSat interferometer consists on in-orbit calibration campaigns following the approach described in [1]. From the beginning of the CryoSat mission, about once a year the interferometer calibration campaigns have been periodically performed by rolling left and right the spacecraft of about ± 0.4 deg.
This abstract is aimed at presenting our analysis of the calibration parameters and of the achievable performance of the CryoSat interferometer over the 6 years of mission.

Additionally, some further studies have been performed to assess the accuracy of the roll angle computed on ground as function of the aberration (the apparent displacement of a celestial object from its true position, caused by the relative motion of the observer and the object) correction applied to the attitude quaternions, provided by the Star Tracker mounted on-board. In fact, being the roll information crucial to obtain an accurate estimate of the angle of arrival, the data from interferometer calibration campaigns have been used to verify how the application of the aberration correction affects the roll information and, in turns, the measured angle of arrival.

[1] Galin, N.; Wingham, D.J.; Cullen, R.; Fornari, M.; Smith, W.H.F.; Abdalla, S., "Calibration of the CryoSat-2 Interferometer and Measurement of Across-Track Ocean Slope," in Geoscience and Remote Sensing, IEEE Transactions on , vol.51, no.1, pp.57-72, Jan. 2013