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Global and regional altimetry CAL/VAL: a closer look at Cryosat-2

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CryoSat-2, in orbit since April 2010, maps the cryosphere with a dedicated altimeter system, with SAR and SARin capability. It now already surpassed its nominal 3 year mission of observing sea ice freeboard and ice sheet elevation change. Precision orbit determination (POD) of CryoSat-2 relies on DORIS Doppler tracking and ground based satellite laser ranging (SLR). We show an update of the results of our POD computations. These CryoSat-2 orbits compare very well with the trajectories computed by CNES and by ESOC and are of Jason-class. We find RMS of SLR residuals around 2cm and RMS of radial differences around 1.5cm. We address data sources, availability, latency, quality and editing, software, standards and methods and focus on the differences with CNES POE, MOE and DIODE navigator orbits, on the empirical acceleration parameters, and on the thermospheric density scale factors.

We also show an update of the results of our CryoSat-2 LRM and pseudo-LRM CAL/VAL efforts. In addition to ice, the SIRAL 2 altimeter onboard CryoSat-2 perfectly samples the global ocean surface. To be able to exploit these data it is necessary to assess and validate them. Another reason is that we want to to complement the Radar Altimeter Database System RADS with this dataset to improve the combined altimeter sampling resolution both in time and space. This has become important now Envisat and Jason-1 stopped providing data and meanwhile successors like Sentinel-3 and Jason-3 are not yet in place. So, we validate and calibrate the LRM data, add and improve corrections (including modeling of corrections that are not directly available from the CryoSat-2 platform), add pseudo-LRM (compressed SAR) to complement the global coverage, and verify the orbit accuracy. The present status of the absolute and relative calibration of LRM data is discussed, also by comparison of CryoSat-2 with other satellites (crossover analyses) and with tide gauge data. We focus on the latest ESA version of the ocean product and compare that with our own efforts to improve the product, which incorporates re-tracking of the wave forms and the determination of a dedicated hybrid sea state model. In addition we review the capacity of Cryosat-2 data and recent AltiKa data to reestablish the altimetric mesoscale variability measuring capability from before the demise of Envisat and Jason-1.