Assessment of limits and potentials of SWOT data for inland water bodies characterization and monitoring based on simulated data: Application to the Yangtze river complex

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Capability of altimetry to be a powerful tool for inland water surfaces survey has already been demonstrated. Therefore, the SWOT mission expected for 2020, due to its innovative concept in term of swath and INSAR technology, will provide a major improvement for the understanding of inland water bodies spatial and temporal behaviors allowing a large range of applications in terms of reservoirs monitoring, flood hydraulics as well as drought episode characterizations or wetlands mapping and monitoring.

Within the CNES SURFAC SWOT programme, it is proposed to explore the potential and limits of SWOT data for water elevations maps derivation. To succeed in this task, SWOT data will be simulated thank to a JPL-CNES simulator, integrating HR DEM developed from Tandem X data and Pleiades HR tri-stereo set, collection of water masks acquired with a high temporal frequency up to 5 days, HR and VHR land cover masks, historical Altimetric mission measurements and in situ gauge measurements.

The Yangzte watershed has been selected due to its unique characteristics and human, economic and biodiversity stakes. Indeed intermediate and lower reaches of the Yangtze can be schematized as 600km long, very narrow, ie 1 to 2km, reservoir, with about 15 to 20 meters of water height dynamic within a year. Yangtze river by itself can be resumed as a 1000 km long river, with a 1 km rived bed. One of interest of the area in term of SWOT mission assessment is the lakes; the two first fresh water bodies of China, Dongting and Poyang lakes, as well as the smaller Anhui province lakes. Dongting and Poyang lakes are connecting with Yangtze and are controlled by its behaviors. These lakes' surfaces vary from dry to wet season respectively from 500 to 2500 km2, and 700 to 3500 km2, with water height variations of about 5 to 12 meters. The Anhui lakes will be the smallest targeted water bodies within the project, with surfaces about 100 km2 and less, with a width of a few kilometers. One interesting parameters is that depending of the surrounding topography, some present only height variations whereas others presents the same behaviors but at a very small scale than the Poyang and Dongting lakes. In addition, the Anhui lakes are more of less disconnected from Yangtze flow as controlled by sluices, and present more submerged and floating vegetation which could disrupt the measurements.

A rich database is under construction thanks to large EO data access through the ESA MOST Dragon project, CNES Take Five initiative simulating Sentinel 2 acquisition every 5 days, as well as ORFEO CNES Pleiades project, DEIMOS and, ASI initiatives as well as DLR Tandem X and TerraSAR Science Calls. From this database, already listed inputs needful for the SWOT simulation. Finally this project would have allowed at its term to assess the potentials and limits of SWOT mission for water level elevations with an accuracy of 10 cm and a slope accuracy of 1 cm/1 km.