



Correcting the hooking effect in satellite altimetry data for time series estimation over smaller rivers

Eva Boergens, Denise Dettmering, and Christian Schwatke

Deutsches Geodätisches Forschungsinstitut der Technische Universität München, Germany

Since many years the numbers of in-situ gauging stations are declining. Satellite altimetry can be used as a gap-filler even over smaller inland waters like rivers. However, since altimetry measurements are not designed for inland water bodies a special data handling is necessary in order to estimate reliable water level heights over inland waters. We developed a new routine for estimating water level heights over smaller inland waters with satellite altimetry by correcting the hooking effect.

The hooking effect occurs when the altimeter is not measuring in nadir before and after passing a water body due to the stronger reflectance of the water than the surrounding land surface. These off-nadir measurements, together with the motion of the satellite, lead to overlong ranges and heights declining in a parabolic shape. The vertex of this parabola is on the water surface. Therefore, by estimating the parabola we are able to determine the water level height without the need of any point over the water body itself.

For estimating the parabola we only use selected measurements which are effected by the hooking effect. The applied search approach is based on the RANSAC algorithm (random sample consensus) which is a non-deterministic algorithm especially designed for finding geometric entities in point clouds with many outliers.

With the hooking effect correction we are able to retrieve water level height time series from the Mekong River from Envisat and Saral/Altika high frequency data. It is possible to determine reliable time series even if the river has only a width of 500m or less. The expected annual variations are clearly depicted and the comparison of the time series with available in-situ gauging data shows a very good agreement.