

The project aims to conduct a numerical and field experiment that makes use of satellite radar altimetry over inland waters to forecast water levels at ungauged sections of narrow rivers. Originally, satellite altimetry was designed to observe sea level, but along with technological development it is now used to measure water levels of lakes and rivers. Recent advances in the altimetric technology include monitoring of small inland water bodies, including narrow rivers, with widths even smaller than 200 metres. These advances open new perspectives for hydrological forecasting on narrow rivers where terrestrial sensor-based river monitoring is unavailable.

The research explores the new opportunities offered by the Sentinel-3A satellite altimetry to predict water levels within test sites located along the Odra River in western Poland. Hydrologic models provide forecasts for river gauges, however usually the satellite does not fly over these sites. Its orbit enables the observation of the adjacent sites along the river, located from a few kilometres to several dozen of kilometres downstream. Such ungauged, but altimetry-monitored places are known as virtual stations. Predictions of water levels based on hydrologic modelling will be computationally moved to eight virtual stations located downstream *in situ* gauges, and – in other words – they will be moved to places where water levels are measured by the satellite. Thus, the new predictions will be determined for the ungauged sections of the river. Since satellite data for the virtual stations are less accurate than those measured by highly precise terrestrial water level sensors, the quality evaluation of the satellite observation is needed. It is difficult to carry out such a data assessment at ungauged sites, and therefore a few techniques need to be adopted. The quality check of hydrometric data will be carried out with the support of unmanned aerial vehicles, commonly known as drones, which will be utilized to measure water level at the virtual stations.

The motivation for investigating the potentials of satellite altimetry for monitoring narrow rivers, to provide new data from ungauged locations for hydrologic prediction systems, is the need for improving flood early warning strategies. Assimilating new water level data from yet unexplored locations to the prediction systems will enable to improve the skills of hydrologic prognoses and, as a consequence, to offer more reliable warnings against floods. The study may also serve as a proof of concept of establishing new hydrologic prediction systems in ungauged basin, for instance in developing countries where terrestrial river monitoring is not widespread.