

Use of altimetry data to determine the height of inland water surface – the case study

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SUMMARY

The first satellite missions were intended to measure the open ocean globally and partially to study the presence of ice. Along with the progress, altimetry began to provide the necessary information in the field of geodesy, oceanography, and continental hydrology. The obtained data is used to study the impact of human activity on water resources, to determine the gravitational field and its changes over time, or to conduct scientific and research works necessary for the functioning of meteorological services and hydrological. Satellite radar altimetry is an effective technique for monitoring the seas and oceans.

The advantage of this technique is the possibility of systematic data acquisition with the simultaneous lack of disturbances resulting from the presence of vegetation in the study area or the time of day. Satellite altimetry focuses not only on the observation of seas and oceans but also on the study of continental waters.

In the research part, the BRAT (Broadview Radar Altimetry Toolbox) application was used to measure the height of the lake surface for experimental studies. The program allows performing various analyses of products from Sentinel-3, TOPEX/Poseidon, Jason-2, and many other satellites. The subject of this study is the largest lake in Poland – Śniardwy. The acquired PISTACH (fr. Prototype Innovant de Système de Traitement pour les Applications Côtières et l'Hydrologie) data, which is an extension of the basic OSTM/Jason-2 products along with the software, is freely available and completely free. Further work on satellite altimetry could contribute to the global survey of lakes with centimeter accuracy.

The results of the calculations showed annual and seasonal changes in the level of the tested object. To compare the possibilities of the results with other sources of information, the mean level of Lake

Śniardwy was calculated relative to the global geoid model. The average heights calculated in the period from 2008 to 2016 are in the range from 115.57 m to 115.9 m. These values coincide with the actual heights, so the purpose of this work can be considered achieved.

Since PISTACH products are in the experimental phase, the results can be improved with a different selection of data classification. It is also possible to combine PISTACH products with other altimeter missions to reduce measurement errors.

This paper is proof that free and open-source software is being used successfully to conduct research using products derived from satellite missions. The method of performing research in this work can be used to conduct scientific and research work related to the functioning of meteorological and hydrological services. Altimetric missions represent a promising future in the global exploration of both oceans and inland waters with centimeter accuracy.

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