

Determination of the significant wave height at the FINO2 station using GNSS reflectometry

Roggenbuck, Ole; Becker, Jan Michael; Schröder, Ludwig

BKG, Germany

Keywords *GNSS reflectometry, SNR, Inverse modelling, Significant wave height*

Abstract

The significant wave height (SWH) is a statistical parameter used to describe the sea state, i.e. the oscillation of the sea surface generated by wind energy. The parameter is an important quantity e.g. in oceanography and meteorology. Among other in-situ sensors and remote sensing methods, terrestrial GNSS reflectometry can be used for SWH observations. GNSS signals reflected at the water surface in the direction of the receiving antenna interfere with the directly received signal and an oscillating interference pattern is formed. The rougher the water surface, the more noisy this pattern is. In an inverse modeling, this causes a stronger attenuation of the estimated signal. If suitable reference data are available, the correlation between the estimated damping coefficients and the SWH can be used to formulate a functional relationship between these two parameters. If this relationship is known the antenna/receiver setup can be used for SWH observation.

SNR observations from a GNSS receiver installed at the FINO2 research platform are used to demonstrate this approach. FINO2 is located in the Baltic Sea. It is well suited for GNSS reflectometry due to its location and shadowing characteristics. Observations between August 2020 and December 2021 were processed of which a part was used for calibration. The determined SWH values are compared with in-situ observations of a wave sensor and with satellite altimetry data.