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Geodetic SAR for Height System Unification and Sea Level Research - Observation Concept and Results in the Baltic Sea

Thomas Gruber <sup>1 \*</sup>, Jonas Ågren <sup>2</sup>, Detlef Angermann <sup>3</sup>, Artu Ellmann <sup>4</sup>, Christoph Gisinger <sup>5</sup>, Jolanta Nastula <sup>6</sup>, Markku Poutanen <sup>7</sup>, Marius Schlaak <sup>1</sup>, Faramarz Nilfouroushan <sup>2</sup>, Sander Varbla <sup>4</sup>, Ryszard Zdunek <sup>6</sup>, Simo Marila <sup>7</sup>, Andreas Engfeldt <sup>2</sup>, Timo Saari <sup>7</sup>, Anna Świątek <sup>6</sup>, Xanthi Oikonomidou <sup>1</sup>

1. Technical University of Munich, Institute of Astronomical and Physical Geodesy
2. Lantmäteriet, Swedish Mapping, Cadastral and Land Registration Authority
3. Technical University of Munich, German Geodetic Research Institute
4. Tallinn University of Technology, School of Engineering
5. German Aerospace Center, Remote Sensing Technology
6. Centrum Badań Kosmicznych, Polskiej Akademii Nauk
7. Finnish Geospatial Research Institute

Abstract Content :

Traditionally, sea level is observed at tide gauge stations, which usually also serve as height reference stations for national leveling networks and therefore define a height system of a country. Thus, sea level research across countries is closely linked to height system unification and needs to be regarded jointly. One of the main deficiencies to use tide gauge data for geodetic sea level research and height systems unification is that only a few stations are connected to permanent GNSS receivers next to the tide gauge in order to systematically observe vertical land motion. As a new observation technique, absolute positioning by SAR using active transponders on ground can fill this gap by systematically observing time series of geometric heights at tide gauge stations. By additionally knowing the tide gauge geoid heights in a global height reference frame, one can finally obtain absolute sea level heights at each tide gauge. With this information the impact of climate change on the sea level can be quantified in an absolute manner and height systems can be connected across the oceans. First results from applying this technique at selected tide gauges at the Baltic coasts are promising but also exhibit some problems related to the new technique. The paper presents the concept of using the new observation type in an integrated sea level observing system and provides results for a test network in the Baltic sea area by combining geometric and physical heights with tide gauge readings.

Key words : Height Systems Unification, SAR, Sea Level