Geophysical Research Abstracts
Vol. 14, EGU2012-12047, 2012
EGU General Assembly 2012

Remote sensing of the coastal ocean with standard geodetic GNSS-equipment

J.S. Löfgren (1), R. Haas (1), K.M. Larson (2), and H-G. Scherneck (1)

(1) Chalmers University of Technology, Earth and Space Sciences, Sweden (johan.lofgren@chalmers.se), (2) University of Colorado, Aerospace Engineering Sciences, USA (kristinem.larson@gmail.com)

We use standard geodetic Global Navigation Satellite System (GNSS) equipment to perform remote sensing measurements of the coastal ocean. This is done by a so-called GNSS-based tide gauge that uses both direct GNSS-signals and GNSS-signals that are reflected off the sea surface. Our installation is located at the Onsala Space Observatory (OSO) at the west coast of Sweden and consists of a zenith-looking Right Hand Circularly Polarized (RHCP) and a nadir-looking Left Hand Circularly Polarized (LHCP) antenna. Each antenna is connected to a standard geodetic-type GNSS-receiver.

We applied two different analysis strategies to our GNSS data set. The first strategy is based on a traditional geodetic differential analysis [Löfgren et al., 2011] and makes use of the data from both receivers; connected to the zenith and the nadir looking antennae. This approach results in local sea level that is automatically corrected for land motion, meaning that the GNSS-based tide gauge can provide reliable sea-level estimates even in tectonic active regions. The second strategy focuses on the Signal-to-Noise Ratio (SNR) recorded with the receiver connected to the zenith-looking antenna [Larson et al., 2011]. The SNR is affected by multipath originating from the sea surface reflections. Analysis of the SNR data allows to determine the distance between the antenna and the reflecting surface, and thus to measure sea surface height.

Results from both analysis strategies are compared to independently observed sea-level data from two stilling-well gauges operated by the Swedish Meteorological and Hydrological Institute (SMHI), which lie in a distance of several km from OSO. The root-mean-square agreement between the different time series of several month's length is on the order of 5 cm and better. These results indicate the large potential for using coastal GNSS-sites for the monitoring of the coastal ocean.

References:

Löfgren J.S., Haas R., Scherneck H-G., Bos M.S., (2011), Three months of local sea level derived from reflected GNSS signals, Radio Science, 46 (RS0C05).

Larson K., Löfgren J.S., Haas R., (2011), The GPS tide gauge problem revisited, AGU Fall Meeting, 5-9 December, San Francisco, USA, Poster.