

Development of Satellite Altimetry Algorithm for determining accurate sea surface heights using a synergy of in-situ and marine model data

Summary

School of Engineering, Department of Civil Engineering and Architecture, Research Group of Geodesy and Road Engineering offers a 4-year PhD position in Satellite Altimetry.

Research field:	Building and civil engineering and architecture
Supervisors:	Prof. Dr. Artu Ellmann Dr. Nicole Camille Delpeche-Ellmann
Availability:	This position is available.
Offered by:	School of Engineering Department of Civil Engineering and Architecture
Application deadline:	Applications are accepted between November 16, 2020 00:00 and December 16, 2020 23:59 (Europe/Zurich)

Description

Background

Modern satellite altimetry (SA) missions (Sentinel, Cryosat, Jason) have the potential for determining accurate sea surface heights (SSH). It is known however that SA data products over coastal areas contain certain limitations, e.g. due to under-examined wet tropospheric correction, land and calm water interference, heterogeneous atmospheric forcings, etc. This project focuses on improving the range estimation by applying specialized developed retracking schemes. Retracking is necessary for the methodology employed in processing the range, can be study area dependant. For instance, reflected radar pulses are usually recorded against time in waveforms. Over the open ocean, waveforms normally conform well to the Brown model by the least squares estimation. Fitting to this waveform usually yields the required measurements of range (from which SSH is measured). It has been found that about 5-10 km off the coastline a significant portion of the radar waveforms depart from the Brown model (increasing toward the coast). The factors that influence this anomaly includes land contamination, 'bright targets' in the footprint (patches of very calm water in sheltered areas) etc. At coast it is influenced by archipelagos, areas of calm waters and many other processes (e.g upwelling jets, filaments etc.) that may influence the range that is calculated. Thus the necessity for a retracking methodology designed for the coastal area is required in order to obtain accurate SA-SSH estimates.

Tasks

The PhD candidate shall develop an improved Satellite Altimetry (SA) retracker using a synergy of in-situ and marine model data. This development requires examining the sea surface heights (SSH) from various satellite altimetry (SA) missions (Sentinel, Cryosat, Jason-2 etc.) using the raw measurements along with different retracking methods. Detailed examination of the altimeter radar echoes and corrections applied shall be performed. Validation of SA derived SSH with in-situ data (tide gauges, airborne laser scanner, GNSS) is expected with utilisation of the marine geoid. Signal processing and statistical techniques (in terms of RMS error, stand. dev, uncertainty estimates, error budgets etc.) of the various data sets shall be performed. From these results a specific algorithm shall be developed to fit radar signals from different satellite missions and under different sea state (e.g. waves, sea ice, upwellings, fonts etc.). The candidate is expected to assist in project related field campaigns.

Requirements

The applicants should fulfill the following requirements:

- University degree (M.Sc.) in geodesy or geomatics. Consideration will be given to applicants whose previous degrees are in appropriate related disciplines, such as Earth Sciences, Mathematics, Physics or software engineering.
- Skills in signal processing (to be trained), data analysis, mathematical and statistics (to be trained).
- Ability for independent research as part of a team, interest in the presentation and publication of scientific results.
- Advanced computer literacy and programming skills.

- Good command of the English language (speaking and writing).

The PhD candidate is expected to be at full time position for a duration of 4 years. The candidate is obligated to participate and fulfil the requirements of Tallinn University of Technology PhD programme. Additional funds will be provided (and whence applicable the associated funding can be applied for) for research trainings, conferences and international mobility/stays abroad with durations of up to 6 months. The research group wishes to increase the number of women interested in Geomatics. Qualified women are therefore also encouraged to apply. Do not hesitate to contact us for questions regarding the position. We look forward to receiving your application.



To get more information or to apply online, visit <https://taltech.glowbase.com/positions/195> or scan the the code on the left with your smartphone.