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Summary

I am a researcher in the field of satellite geodesy, with a background in Aerospace Engineering.

During my PhD, I have worked with different types of satellite gravimetric data, namely High-low Satellite-to-Satellite tracking (Kinematic Orbits), low-low Satellite-to-Satellite Tracking (Inter-Satellite Ranges), and Satellite Gravity Gradient (differential accelerometer measurements). My PhD research focused on:

- modelling the data errors accurately and how its amplitude and spectra influences the quality of the resulting gravity field models;
- quantifying the error budget of future gravimetric satellite missions, to an unprecedented level of detail;
- analysing several mission concepts and modelled their error budget in terms of the observations and gravity field parameters;
- establishing that a constellation of numerous non-dedicated satellites make it possible to measure fast mass transport processes;
- demonstrating that some mission concepts (those with large radial distances, e.g. the cartwheel formation) are very sensitive to particular types of errors (specifically errors connected with Global Positioning System (GPS) observations);
- proved that alternative mission concepts (the cross-track pendulum formation) are much better suited to complement planned future gravimetric missions.

This has allowed me to study future gravimetric missions in detail, even unconventional ones such as augmenting dedicated gravimetric missions with a large constellation of non-dedicated satellites. My expertise on this topic has been noted by peers, who have invited me to participate in numerous research projects involving international teams.

As a Post-doctoral Fellow at Delft University of Technology (TU Delft), I dedicated my efforts to implement the Level 2 data processing facility of the Swarm satellite mission, concerning the Precise Orbit Determination and Thermospheric Neutral Density processing streams. I have acquired expertise in Digital Signal Processing (DSP) techniques and contributed to the processing of Swarm accelerometer data, by combining non-gravitational accelerations derived from GPS data and the accelerometer measurements. In doing so, I have greatly removed the long-term bias in the accelerometer data. During this time, I also matured my skills in data management and automated processing.

Currently as a Scientist Associate at Center for Space Research (CSR) of the University of Texas at Austin (UTexas), I am studying ways of exploiting the maximum resolution and accuracy of the measurements collected by the Gravity Recovery And Climate Experiment (GRACE) satellites. My work focuses on:

- the calibration of the accelerometers, particular relevant after 2011, when the thermal control on the satellites was switched off;
- testing large number of unconventional parametrization schemes;
- developing time-series analysis methods and processing suitable gravimetric data to predict the long-term trends in the GRACE gravity field models over the GRACE/GRACE Follow On (GRACE-FO) gap; and
- developing novel methods of connecting the L1B data directly to parameters describing hydrological, solid Earth and glaciological models.

I have developed a wide and strong network (AT, CH, CZ, DE, NL, PT and US). I took the lead in coordinating with several European and US institutes the research and promotion the gravity field models estimated from the GPS data gathered by the Swarm satellite mission. I also successfully applied for funding to the Data, Innovation and Science Cluster (DISC) consortium, allowing these activities to proceed smoothly. In an effort to promote the use of nano-satellites for collecting gravimetric data, I am currently cooperating with Universidade do Minho (UMinho) and CSR to develop a Micro Electro-Mechanical System (MEMS)-based micro accelerometer and investigate practical CubeSat architectures. The objective of this work is

to demonstrate the feasibility of a CubeSat to vastly increase the spatial and temporal sampling of the collected gravimetric data.

I have studied and worked in numerous areas, including Structural Mechanics, Aerodynamics, Preliminary Vehicle Design, Single Stage to Orbit and Laser Propulsion, which have given me the opportunity to broaden my understanding of Physics. I am an avid programmer, actively learning new languages and techniques in order to better implement the algorithms and procedures required to develop my research. I openly share the code I developed in GitHub.