



Polar form of spherical harmonics

Diagnostic tool for global gravity field models

The Collaborative Research Centre 1667 “Advancing Technologies of Very Low-Altitude Satellites (ATLAS)”, funded by the German Research Foundation DFG, addresses the fundamental scientific and engineering challenges of rendering Very Low Earth Orbit (VLEO, about 200 km to 450 km altitude) accessible.

Earth’s gravity field is conventionally parametrised using spherical harmonic coefficients. Presently several solutions exist, developed by various institutes across the world by combining data from multiple satellite missions like CHAMP, GRACE(-FO), GOCE, SWARM, etc... Representing the spherical harmonic spectra of a field on the sphere in terms of its **amplitude** and **phase** is termed as its polar form. The polar form or specifically the phase spectra can be used as a diagnostic tool to assess the quality of gravity field solutions.

The objective of this thesis will be to diagnose available time-variable gravity field solutions through the lens of polar form (phase spectra).

Your tasks:

- Review the basics of spherical harmonics and satellite gravimetry
- Review various global gravity field solution datasets
- Generate phase spectrums of a few select gravity field datasets
- Interpret those phase spectra as a diagnostic tool
- Document the methodology and results, in a reproducible manner

Requirements:

- Curiosity about satellite geodesy and satellite gravimetry
- Basic knowledge of linear algebra, calculus, and numerical methods
- Prior programming experience with MATLAB/Octave (Julia or Python)
- Optional: Familiarity with spherical harmonics

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Bachelor Thesis Opportunity

