Project EARTH-16-KS1: Shear-waveform tomography and wave propagation on a global scale

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Brief description of project:
Global tomography pulls together large and rapidly growing volumes of seismological data from international data centres in order to compute 3-D maps of heterogeneities in the earth's interior, from crust to core. Technically, this amounts to numerically solving a very large geophysical inverse problem on high-performance computers. The scientific objectives are to better understand the geodynamics of the convecting mantle, and to help reconstruct the past distributions of continents and oceans, up to a few hundred million years back in time. We use novel physical approximations to seismic wave propagation to efficiently extract a maximum of information from modern broadband seismograms, up to the highest relevant frequencies, which yield the highest possible spatial resolution for tomographic imaging. The new, joint P- and S-wave data set will include unconventional phases such as triplicated, diffracted, and surface waves. This project primarily aims at conducting shear-wave tomography, complementing our prior work on finite-frequency P-waveform tomography, and will serve three primary purposes: 1) Determine the 3D bulk-/ and shear-wavespeed distribution within the Earth's mantle, to provide better constraints on the thermochemical evolution of Earth's interior. 2) Include surface waves to better illuminate the shallowest part of the mantle. 3) Develop and test novel, efficient wave propagation approaches to determine uncertainty and resolution in the tomographic models.This will include application of our existent methodologies to the tomographic models developed earlier, and could include a novel wave-based scattering approach using numerical methods on supercomputers.

Required: Solid knowledge in computer programming for scientific data analysis; strong motivation to use and develop advanced numerical methods and computational tools in seismology.

Desirable: Advanced knowledge in computer programming; experience in seismological data analysis and/or scientific computing; theoretical background in seismology and/or geodynamics.

Funding: For UK/EU applicants the position is fully funded (tuition/college fees, subsidence and moderate research expenses) for 3.5 years, to commence no later than October 2016. Applications from international students are welcome but should consult with the supervisors as additional funds for international tuition fees need to be covered from different sources.

Application deadline: January 22, 2016. This deadline is for official graduate admissions. Interested candidates should get in touch with the supervisors as early as possible by email and include relevant material (CV, possible publications, and a statement of research interests).