

Proposed Research Studentship



Thermochemical anomalies in the Earth's lowermost mantle

Supervisor(s): Saswata Hier-Majumder

Project Description:

The base of the Earth's mantle is marked by a patchwork of seismically anomalous structures named UltraLow Velocity Zones (ULVZs), most commonly observed along the edges of two larger antipodal structures, termed Large Low Shear Velocity Provinces (LLSVPs). The ULVZs are typically 8 to 10% denser than the surrounding mantle and are marked by up to 30% and 10% reductions in shear and compressional wave speeds, respectively. Narrow, elongated ULVZs can span up to several hundreds of kilometers in length while reaching only a few tens of kilometers of height above the CMB. The larger LLSVPs, characterized by up to 3% reduction in shear wave speed, are dynamic and likely chemically distinct structures.

Two key unresolved questions regarding ULVZs are their internal structure, and the ability to retain a distinct chemical signature over geological time periods. This project will focus on using high performance computational tools to study the melt migration and storage within the ULVZs, the resulting seismic signature, and the interaction between ULVZs and flow in the ambient mantle. The work will be carried out in collaboration with the geodynamics and mineral physics group at the University College of London.

Interested candidates are encouraged to contact Dr. Hier-Majumder directly (Saswata.Hier-Majumder@rhul.ac.uk)

References:

- **Hier-Majumder, S. (2014)** Melt redistribution by pulsed compaction within the ultralow velocity zone, *Physics of Earth and Planetary Interiors*, 229, 134-143, doi:10.1016/j.pepi.2014.01.004.
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- Wimert, J., and **S. Hier-Majumder (2012)**, A three-dimensional microgeodynamic model of melt geometry in the Earth's deep interior, *J. Geophys. Res.*, 117, B04203, doi:10.1029/2011JB009012.
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- **Hier-Majumder, S.** and J. Revenaugh, (2010) Relationship between the viscosity and the topography of the ultralow-velocity zone near the core-mantle boundary, *Earth and Planetary Science Letters*, 299,382-386, doi:10.1016/j.epsl.2010.09.018.
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- **Hier-Majumder, S., (2008)**, Influence of contiguity on seismic velocities of partially molten aggregates, *J. Geophys. Res.*, 113, B12205, doi:10.1029/2008JB005662.

Details on how to apply can be found here www.rhul.ac.uk/studyhere/postgraduate/applying

Please contact the Postgraduate Programmes Co-ordinator, if you have additional questions about the department or application procedures (email: pgadmin@es.rhul.ac.uk ; fax: 01784-471780; tel: 01784-443581).

Applicants are requested to send an additional copy of their CV directly to the lead supervisor of the project in which they are interested. Please also contact the supervisor if you have any questions about the project itself