Project EARTH-12-ABW2:
Crustal Structure, Flexure and Volcanic Evolution of the Shatsky Rise Oceanic Plateau, North-East Pacific Ocean

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The Ontong Java, Hess, Manihiki, and Shatsky oceanic plateau in the Pacific Ocean are among Earth's largest igneous provinces, and are thought to have erupted rapidly during surfacing of initiating mantle plumes. Yet, this significant source of volcanism remains difficult to explain by conventional plate-forming processes and, accordingly, oceanic plateau evolution remains poorly understood. Shatsky Rise (SR) in the NW Pacific Ocean is believed to have formed during the Late Jurassic at a plume influenced triple junction that involved the Pacific, Izanagi and Farallon plates. Geophysical studies and recent IODP drilling during D/V *Joides Resolution* Expedition 324 indicate that its largest edifice, Tamu Massif, is characterized by a number of massive lava flows similar to those of continental flood basalt provinces. These massive flows become thinner and are replaced by pillow lavas in the northern SR volcanoes implying a transition from sub-aerial to submarine volcanism over time. New seismic and swath bathymetry data acquired during a cruise of R/V *Marcus G. Langseth* to Tamu Massif show no evidence of sub-aerial erosion, even though dredge and drill data imply the edifice summit was in shallow water. A lack of significant emergence is contrary to that expected from a large volcanic edifice, and must reflect the interplay of crustal constructional processes (i.e. edifice building from the surface, and magmatic underplating from below), and crust and mantle (i.e. lithosphere) thermal and mechanical properties. Accordingly, the depth of emplacement of SR remains an enigma and implies that, generally, oceanic plateau eruptions are depressed by some mechanism. The aim of his project is to investigate pre- syn- and post-volcanic evolution of the SR using the new geophysical and drill core data to constrain plateau edifice subsidence histories, and thus gain insight to the broader processes of oceanic plateau initiation and development. The successful student will undertake two, 1-2 month-long, visits to IODP, College Station at Texas A & M University under the supervision of Prof. Sager, and will liaise closely with Dr. Widdowson at the Open University. The project will suit a student interested in working at the boundaries of geology and geophysics with an active sea-going group interested in submarine volcanism in arc (Tonga), ridge crest (South-West Indian) and intra-plate (Canary, Cape Verde) settings. The student will gain skills in the analysis and interpretation of IODP core and archive data, the manipulation of large marine geophysical data sets, and the crustal, flexural and subsidence/uplift modelling of large igneous provinces.

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