New insights into the Earth's interior through the MoHole

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We mantle petrologists dream of in-situ observations and sampling of the upper mantle wherever we want as freely as on exposed surface rocks. The ocean floor is expected to serve as a window to the earth's interior because of its relatively thin crust. As expected, mantle derived rocks are available there, but only from limited situations due to geological and technological limitations, i.e., particular parts of slow (or ultraslow) spreading system. Harzburgite to lherzolite have been obtained with an increase in the depth (below the sea level) of sampling. Harzburgite, depleted in melt components, has been obtained from the Pacific Ocean, although very poorly explored for deep-seated rocks. Those peridotites are tectonized and uplifted and incorporated in the crust, being altered to various extents to loose fine primary mantle features.

The MoHole, i.e., drilling the ocean floor to the upper mantle through seismically visible Moho will provide us with active sampling and observations of in-situ mantle materials. This will definitely give us petrologic nature of the Moho. The target area should be the Pacific Ocean because of its predominant distribution. Exciting is that all processes observed on the materials obtained below Moho are undoubted mantle processes!

Our "pre-MoHole" study on the Oman ophiolite has provided us with several issues that should be examine in MoHole as follows. (1) Lateral heterogeneity in transition from mantle harzburgite to layered gabbros is prominent. Lithological feature of the Moho transition should be correlated with seismic features obtained from the ocean floor. (2) Elemental mobility by hydrothermal solutions through Moho is prominent; chloritites and diopsidites are formed replacing gabbro and peridotite, respectively. Budget of Ca, Mg, Fe and Cr by such hydrothermalism should be examined. (3) Vertical heterogeneity of mantle peridotite below should be checked, if possible.