Feasibility of IODP drilling at the Godzilla Megamullion

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Ocean drilling has long sought to understand the architecture of the ocean crust and processes of its origin in the upper mantle. This is being approached in large part through drilling in tectonic windows and in the development of eventual total crustal penetration.

A significant fraction of the ocean floor is created in back-arc basins where water plays a major role in generating back-arc basin basalts, strikingly contrasting to magmatic process at mid-ocean ridges. The opportunity to explore the recent formation of back-arc basin lower crust and upper mantle is, therefore, an important contribution to understanding the ocean basins. At the same time, a better understanding of the architecture of backarc basin lower crust and upper mantle will greatly aid in the interpretation of the results of ophiolite study, since much of our understanding of the architecture of oceanic lower crust and upper mantle comes from ophiolites, most of which are thought to have at least some suprasubduction zone component.

The Godzilla Megamullion is the largest oceanic core complex on Earth, located in an extinct spreading center of the Parece Vela Basin in the Philippine Sea, where substantial exposed lower crust and mantle is exposed in an area of 125 km ×55 km. The Godzilla Megamullion is unique in its huge size as well as its development in a backarc basin, a rare tectonic window to study backarc basin lithosphere. It is thus arguably the best place in the world to study the architecture of back-arc basin lithosphere and the actual crust/mantle boundary.

The Godzilla Megamullion is prepared for a full drilling proposal, with complete bathymetric data, multiple bottom samplings, and multi-channel seismic profilings as well as P-wave velocity structures. We will propose substantial riserless drilling at the Godzilla Megamullion that will provide an excellent opportunity to understand backarc basin lower crust and upper mantle. In this contribution, we will make use of this opportunity to share the general scheme of the proposal with the community.

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