

Exploring the World's Largest LIP: Testing the Ontong Java Nui hypothesis

*Takashi Sano¹, Maria Luisa Tejada², Clive R. Neal³, Millard Coffin⁴, Masao Nakanishi⁵, Peter J. Michael⁶, Jörg Geldmacher⁷, Takeshi Hanyu², Seiichi Miura², Christian Timm⁸, Anthony A. P. Koppers⁹, Daisuke Suetsugu², Takashi Tonegawa², Akira Ishikawa¹⁰, Kenji Shimizu², Paterno Castillo¹¹

1. National Museum of Nature and Science, 2. Japan Agency for Marine-Earth Science and Technology, 3. University of Notre Dame, USA, 4. University of Tasmania, Australia, 5. Chiba University, 6. The University of Tulsa, USA, 7. GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany, 8. GNS Science, New Zealand, 9. Oregon State University, USA, 10. Tokyo Institute of Technology, 11. Scripps Institution of Oceanography, UCSD, USA

Large Igneous Provinces (LIPs) such as the Ontong Java Plateau in the western central Pacific (OJP) are important because they provide information on mantle processes and composition, and because their formation may have global environmental consequences. The OJP is the largest oceanic plateau and is probably the most voluminous igneous edifice on Earth. Despite its importance, the size, volume, and formation rate of the OJP are not well constrained yet. The maximum extent of OJP-related volcanism may be even greater, as volcanological studies indicate that long lava flows (or sills) from the OJP may have reached the adjacent Nauru, East Mariana, and possibly Pigafetta basins. Moreover, the similarity in age and geochemistry of lava flows from the Ontong Java, Hikurangi, and Manihiki plateaus suggests that they may have been once part of a single LIP (Ontong Java Nui). If true, the massive volcanism may have covered >1% of Earth's surface. The lack of detailed knowledge of the size, age, and composition of the OJP has given rise to various models such as a surfacing mantle plume head, bolide impact, and fusible mantle melting, but no consensus model exists to explain its origin.

The OJP is divided into the High Plateau to the west and the Eastern Salient to the east and is presently the best sampled among Pacific oceanic plateaus. The basaltic basement of the OJP has been sampled by seven Deep Sea Drilling Project (DSDP Site 289) and Ocean Drilling Program (ODP Sites 289, 803, 807, 1183, 1185, 1186, and 1187) sites –but they are concentrated only in the High Plateau. In order to examine the true extent of the OJP (i.e., whether the flows or sills in the Nauru, East Mariana, and Pigafetta basins, as well as those from the Manihiki, and Hikurangi plateaus are parts of the Ontong Java Nui volcanism), we propose drilling at five sites on the Eastern Salient and adjacent basins to recover basement samples. We also propose drilling through the sedimentary section on the Magellan Rise, a small plateau that formed >20 Myr before the proposed Ontong Java Nui emplacement. Because of its older age, the sedimentary sequence on Magellan Plateau may preserve ash layers that cover all Ontong Java related eruption events.

Keywords: LIPs, magma, basalt