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IODP Expedition 351 Izu-Bonin-Mariana Arc Origins: Age model for Site U1438

Antony Morris (1), Marco Maffione (2), Sev Kender (3), Mohammed Aljahdali (4), Alexandre Bandini (5), Rodrigo do Monte Guerra (6), and the IODP Expedition 351 Scientists Team

(1) School of Geography, Earth & Environmental Sciences, Plymouth University, Plymouth, United Kingdom (amorris@plymouth.ac.uk), (2) Department of Earth Sciences, Utrecht University, Utrecht, The Netherlands, (3) Department of Geography, University of Nottingham, UK, (4) Department of Earth, Ocean and Atmospheric Sciences, Florida State University, USA, (5) School of Earth & Environment, University of Western Australia, Perth, Australia, (6) IttFossil, Instituto Tecnológico de Micropaleontologia, Unisinos, Brazil

We report preliminary paleomagnetic and paleontological results from International Ocean Discovery Program (IODP) Expedition 351, which recovered an unprecedented ∼1.4 km thick volcaniclastic sedimentary record documenting the initiation and subsequent evolution of the Izu-Bonin-Mariana (IBM) intra-oceanic arc-basin system. Magnetostratigraphic and biostratigraphic constraints provide a high-resolution temporal framework for interpretation of this record.

Paleomagnetic analyses of archive half core samples provide a continuous record of the geomagnetic field inclination down to 847 mbsf that allows construction of a detailed site magnetostratigraphy that closely matches the Geomagnetic Polarity Timescale (Gradstein et al., 2012). A total of 87 geomagnetic reversals have been recognized in the studied succession, extending back to ∼36 Ma.

Despite sporadic microfossil occurrences in parts, calcareous nannofossils, planktonic foraminifera and radiolarians each contribute to the age model for the entire Site. All nannofossil marker species for Oligocene to Eocene Zones NP25 to NP19/20 are recognised. Beneath paleomagnetic control (847–1449 mbsf), foraminifera and radiolarians provide the only age control.

The most salient features of the age model are that: (i) average linear sedimentation rates during the Plio-Pleistocene range from 1.4 to 2.2 cm/ka; (ii) there was a reduction in sedimentation rates to 0.25 – 0.5 cm/ka throughout the Miocene; and (iii) sedimentation rates sharply increase again in the Oligocene to Late Eocene to a maximum of ∼20 cm/ka. These quantitative constraints closely match (non-quantitative) inferences based on the lithostratigraphy of the site, with fine-grained/coarse-grained sediments dominating in periods with low/high sedimentation rates respectively.