

Tephrostratigraphy and provenance from IODP Expedition 352, Izu-Bonin arc: variable tephra sources from the Oligocene to the Holocene

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Provenance studies of tephra, integrated in a temporal framework, are very important to deduce possible systematic changes in regional magmatism reflected by the respective explosive volcanism at the surface. Tephra are normally widely distributed and when deposited in the ocean, a nearly erosional-free environment, provide a perfect, near complete time series to investigate possible variabilities.

IBM Expedition 352, drilled four sites with a total of 1.22 km of igneous basement and 0.46 km of sediment rocks. Overall, the drilled sediments range in age from Eocene to recent and major lithologies include nannofossil ooze, mud and coarse sand, and volcanoclastic material, including a total of 132 air fall tephra layers that record at least three major episodes of highly explosive volcanism (latest Pliocene to Pleistocene, late Miocene to earliest Pliocene, and Oligocene).

We established a combined tephrostratigraphy for these sites using major and trace element glass shard compositions, determined by electron microprobe and LA-ICP-MS and complemented by age constraints from calcareous nannofossils and radiolarians. The tephra compositions will further be used to determine the provenance of each eruptive event recorded in the sediments.

Preliminary results suggest an equivalent mixture of tephra sources from the (palaeo)Honshu and Izu-Bonin arc within the last ~5 Ma, an exclusively occurring tephra inventory from the Izu-Bonin arc from 15-5 Ma, and after a ~7 M.y. gap, a group of tephra between 30 to 22 Ma that show an overall Izu-Bonin signature but also exhibit a slightly different chemical signal than the Miocene to Pleistocene Izu-Bonin arc.