



## **Spatial and temporal evolution of Fantangisña Mud Volcano, Mariana Forearc**

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Mud volcanoes (MVs) are expulsion features ubiquitously present in subduction zones, whose fluid and solid products can be traced at kilometers depths in the seafloor, close or at subducting plate interface. On the brink of the Mariana Trench, in the western North Pacific, more than 20 MVs exist, with unique characteristics: they are the biggest such structures in the world and the only ones composed mainly of blue serpentine mud and harzburgite clasts. Despite their importance as preferential conduits for exhumation of deep materials and two ODP (Ocean Drilling Program) expeditions in the area targeting the MVs (ODP125 and ODP195), their extrusion dynamics are still largely unknown.

In late 2016, IODP366 drilled 21 holes on summits and flanks of three MVs of the Mariana Forearc: Yinazao (Blue Moon), Fantangisña (Celestial), and Asùt Tesoru (Big Blue). According to this research, at Site U1498, the biostratigraphic age of Fantangisña appears to be well constrained, with a pelagic cover on top of the serpentine mud flows of 0.6 Myr and an age of the forearc sediments underneath the MV of 11.3 Myr. The whole MV edifice is then dated approx. 10.7 Myr and was consequently actively erupting mud until 0.6 Myr ago. For the first time, rheology tests of natural samples of serpentine mud have been performed. These tests not only confirm the thixotropic characteristic of the mud breccia, but also identify different muds' mineralogical compositions (i.e. clay-rich vs clay-barren sediments) and water contents as responsible for the main rheological changes. The viscosity values, together with the physical properties of the mud breccia and the clasts measured onboard IODP366, under several assumptions, allow estimations of flow velocities and depth of the mud source. Moreover, comparison of erupted mud breccia volumes from bathymetry, seismic data and calculations show how the MV evolution is linked to episodic events, highlighting that Fantangisña is actively expelling sediments during merely 1% of its life span.

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