# The Isolated M7.9 Deep Earthquake of 30 May 2015 Under the Present Bonin Wadati-Benioff Zone: Evidence from the New ISC-EHB Earthquake Catalogue (1930-2015) and CMT Focal Mechanisms

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The M7.9 deep earthquake of 30 May 2015 at a depth of about 680 km was surprising in that it occurred more that 150 km distant from any event in the main Bonin sector Wadati-Benioff Zone (WBZ) above it and more than 120 km deeper than any well-recorded event in the Bonin subduction system. We applied the recently developed ISC-EHB methodology (GJI, 2018, v. 214, 474-484) to produce a comprehensive catalogue of hypocenters for the Izu-Bonin-Marianas region from 1904 to 2015. This methodology, which utilizes only events well-recorded telesesismically along with reported depth phases, ensures that the hypocenters in any given region are relatively well constrained in both location and depth. Individual trench-normal cross sections though the Southern-Bonin/Northern-Marianas subduction systems (including the transition through the Ogasawara Plateau collision zone) display a very sharply defined Bonin inclined seismic zone with no ISC-EHB events at depths and positions between the 2015 deep event and the Izu-Bonin Wadati Benioff Zone (WBZ) above it. Moreover the 2015 deep event occurred at least 200 km north of a possible tear in the main slab at about latitude about 25-26 ˚N where the deep WBZ bends back under the intermediate-depth segment. Most of the CMT focal mechanisms deeper than 300 km within the Bonin WBZ have normal-faulting mechanisms. Some published papers have claimed that the 2015 deep Bonin earthquake occurred in a steeply-dipping sector of the Bonin slab based largely on seismic tomography, but none of these studies have demonstrated sufficient resolution for convincing evidence of high-wave-speed slab material clearly linking the 2015 hypocenter with the main Bonin WBZ. Other published papers show independent evidence that the 2105 event occurred below the Bonin WBZ. We are left with the interpretation that the 2015 event occurred in a slab fragment separated from the main Bonin WBZ. We offer a possible fragmentation scenario involving a oceanic plateau collision, a consequent slab detachment, and an eastward trench stepback. Isolated deep earthquakes in slab fragments can rupture by transformational faulting in metastable olivine (MO) where stresses can originate by the residual stresses caused by heterogeneous volume changes associated with the MO->Spinel transformation (Okal and Kirby, PEPI, 1998).

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