Izu-Ogasawara (Bonin) Arc as integrated Subduction Zone Observatory
- *Is there aseismic subduction zone after all?*

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We propose to organize an integrated observational science program focusing on the Izu-Ogasawara (Bonin) arc as a subduction zone observatory. One of the fundamental scientific questions with social interest raised after the 2011 Tohoku earthquake is whether there are any “aseismic” subduction zones as advocated by the conventional “comparative subductology” view (e.g., Uyeda & Kanamori, 1978). In order to understand subduction zone megathrust seismogenesis, it is necessary to understand why some megathrusts seemingly show no large subduction zone earthquakes. Does the entire shallow thrust zone move by aseismic creep? Does some of the motion take place as slow slip events, perhaps accompanied by tremor and very low frequency earthquakes?

The IO-arc is considered the type example of an “aseismic” subduction zone, and is also located in a highly accessible area (geographically/politically) from Japan suitable for sea-floor observations (geodesy, OBS, OBEM, etc.). It also poses a threat for those who live around the arc for possible tsunami disasters due to potential megathrust earthquakes that might be expected if it is a seismic arc instead. With help of the recent advances of the seafloor geodesy technology, we should be able to solve this problem within a concentrated 10 year research program. A combination of seafloor geodesy and broadband OBSs will clarify the mode of slip and possible presence of tremor and slow earthquakes. Further, the IO-arc offers a variety of interesting scientific objectives, e.g., a newly formed volcanic island (Nishino-shima), an active volcanic arc, forearc serpentine diapirs, and other targets for detailed active source seismic (FWI) and EM (CSEM) imaging; also the entire arc itself offers a perfect seismological/geodynamical target for detailed investigations (e.g., origin of mantle wedge/sub-slab anisotropy, volatile cycling, deep seismicity, effects of changing subduction dip and double subduction, etc.). The IO-arc is a perfect target for SZO, as it offers a wide variety of scientific themes, not limited to the arc magmatism (e.g., Kodaira et al., 2010).

We welcome any interested parties to participate this exciting scientific endeavor, possibly expanding the target area with inclusion of the Mariana arc, etc.
List of themes and figures:

(1) Is there any aseismic subduction zone?
We attempt to “solve” this question via sea-floor geodesy (e.g., Yokota et al, 2016, Nature).

(2) High resolution imaging of fore-arc and volcanoes

i) Serpentine diapirs

Kamimura et al. (2002)
ii) Izu-Oshima volcano magma chamber

(3) Volcanic island formation (Nishi-no-shima)
This is a great target for geophysical, geological, volcanological, biological and environmental investigations

(4) Arc scale seismology and geodynamics
IO-arc also offers lots interesting geodynamical problems with the entire-arc can be fully accessed via ocean bottom instruments (OBS, OBEM, etc.).
References:


