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The transform faults connecting subduction and collision of the northwestern corner of the Philippine Sea Plate

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Subducting beneath the westernmost Ryukyu Arc, the northwestern corner of the Philippine Sea Plate is tectonically complicated. This area is considered as a high potential area for large earthquakes, such as the Mw 7.7 earthquake in 1920 – the largest earthquake ever recorded off eastern Taiwan. To the east of the collision/subduction boundary, the Ryukyu forearc sliver is moving southward and the velocity increases westward, while the adjacent eastern Central Range of Taiwan to the west of the boundary has rotated clockwise. These two opposite motions generate right-lateral transform faults zone beneath the southern Ryukyu forearc. Two parallel right-lateral transform faults beneath the Nanao basin have induced a local deformation on subducting PSP slab and produced a constrained stress. The upper part of the subducting PSP is therefore locally arching by the faults and causes a series of normal faults on overriding plate, while the lower part of the subducting plate has generated numerous large earthquakes.

In order to better understand the tectonics of the westernmost Ryukyu subduction zone, we have deployed 5 Ocean Bottom Seismometers (OBS) for two weeks in 2015 after a Mw 6.3 earthquake. Seven onshore seismic stations were jointly used to determine a more detailed and accurate distribution of the aftershocks. We relocated earthquakes by using HypoDD and the results reveal two major structures. The deeper earthquakes located at depths between 20 and 30 km beneath Nanao Basin are aligned with the subducting plate interface. Base on the distribution of the aftershocks and focal mechanisms, the deeper events are closely related to subduction system. Another seismicity is beneath the NW Nanao Basin and Hoping Rise with focal depth shallower than 20 km. The shallow cluster shows a NE-SW trending with a high-angle south-dipping that is totally different with deeper cluster.