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Back-arc basins are a primary target to understand lithospheric evolution in extension associated with plate subduction. Most of the currently active back-arc basins host well-developed spreading centers where active seafloor spreading and creation of the oceanic crust have already occurred. However, rift structure at its initial stage, a key to understand how the continental lithosphere starts to break in a back-arc setting, is poorly documented. The Nansei-Shoto subduction zone forms a trench-arc-back-arc system from Kyushu, SW Japan, to Taiwan and provides a superb site for studying the interaction between the plate subduction and the rifting process in a continental back-arc basin. Behind this ~1,200-km-long subduction zone, the Okinawa trough forms an active continental rift zone along the southeastern end of the Eurasian plate. Although the total length of extension is estimated no more than 80 km (Sibuet et al., 1995), its rifting style is significantly variable along the trough: The northern and middle Okinawa trough is characterized by shallow bathymetry (< 1000 m) and has a wide (up to 230 km) basin structure. In the southern Okinawa trough, on the other hand, the maximum seafloor depth exceeds 2,000 m and a relatively narrow (60-100 km wide) topographic depression is formed along left-stepping en echelon rift axes. Early seismic studies suggest that crustal separation and active seafloor spreading has occurred in the central and southern Okinawa trough, whereas recent studies reveal that there exists over-15-km-thick crust beneath the rift axes even in the southern part where the deepest seafloor occurs, indicating that the whole part of the Okinawa trough is still at a stage of continental rifting (Hirata et al., 1990; Sibuet et al., 1998). Yet the fault system accommodating the crustal extension and its along-trough variation are little documented. The Okinawa trough is also known for active hydrothermal system discharging high temperature fluids, implying that the crustal rifting enhances the transfer of high-temperature magmatic bodies from the deep mantle up to near the seafloor. However, the relative roles of magmatic input and tectonic stretching in controlling the whole rifting system remain poorly understood.
Toward understanding the tectonic and volcanic processes associated with the continental back-arc rifting, JAMSTEC has been carrying out active-source seismic experiments in the Okinawa Trough. Multichannel seismic (MCS) reflection data and OBS refraction data were collected in the southern Okinawa trough (24-26ºN) in 2013 and in the northern Okinawa trough (29-30ºN) in 2015. Based on the data set, we present structural models of the Okinawa trough The MCS reflection data in the southern part show an almost symmetric rift system across the rift axis: Within the basin the sedimentary layers are highly cut by inward-dipping normal faults. Just beneath the rift axis a narrow intrusive structure is imaged, but a stable magma chamber is not observed on axis. Instead, a possible melt lens is found ~10 km horizontally away from the rift axis towards the arc. The rift structure over the possible magmatic body is disturbed, suggesting the off-axis volcanism is young or probably still active. Associated with the rifting process, the crust thins significantly from the original thickness of ~25 km and the thinnest crust of ~10 km occurs just beneath the rift axis. We interpret that the southern part of the Okinawa trough is at a transitional stage from

continental rifting to seafloor spreading. The northern part of the Okinawa Trough, on the other hand, exhibits much wider deformed zone. This structural variation may be influenced by the southward increase in rifting rate along the Okinawa trough from ~2 cm/yr to ~5 cm/yr (Argus et al., 2011).

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