T146-005 **Room: 304** **Time: May 14 10:00-10:15**

3-D Mechanical Model of Back-Arc Spreading

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In general, the steady subduction of oceanic plates produces the characteristic topography of trench-arc system. Back-arc basins are defined as the basins formed by ocean-floor spreading in back-arc regions. The typical examples of the present active back-arc basins are the East Scotia Sea, the Lau Basin, and the Mariana Trough. A common topographic character of back-arc basins is convexity of plate boundaries to the subducting plate. According to plate tectonics, back-arc spreading implies the retreat of trench axis at the plate boundaries. This means the local increase of slip velocity at plate interfaces, which has been confirmed by recent GPS observations. The excess of slip rates at plate boundaries causes their seaward convexity. In this study we revealed the mechanism of the back-arc spreading characterized by the slip-rate excess and the seaward convexity of plate boundaries.

Mechanical interaction at plate interfaces is rationally expressed by the increase of tangential displacement discontinuity (dislocation) at plate interfaces.

The spatial change in magnitude and direction of the dislocation vector causes crustal deformation in the surrounding area.

In the case of steady plate subduction, uniform slip along curved plate interfaces acts as the source of crustal deformation. The extent of the deformation field due to steady plate subduction is scaled by the thickness of the elastic lithosphere (30 km), and extensional stress fields are gradually formed in the back-arc region.

When the accumulated extensional stress reaches a critical level, crack opening (back-arc spreading) starts at a structurally weak portion in the overriding plate. The mechanical model cannot determine where the back-arc spreading starts because the strength of the lithosphere would strongly depend on its thermal structure. In numerical simulation, we suppose that the crack opening starts at a point in the overriding plate. The horizontal deformation motion due to back-arc spreading directs to the subducting plate at the plate boundary. If the strength of the plate interface does not change, we can expect that this horizontal motion cause the slip-rate excess of the plate boundary and the local increase of plate subduction rates. The horizontal scale of slip-rate excess areas extends over 1000 km and so the slip-rate excess acts as the source of deformation in the overriding plate, especially in the back-arc basin. This mechanism makes the back-arc spreading continue.

Thus, once the spreading of back-arc basins starts, the modes of deformation converts from steady plate subduction to stable back-arc spreading by the feedback mechanism of local increase of slip velocity and acceleration of extensional stress accumulation.