

Initial state seafloor spreading near propagating spreading tip at Southern Lau Basin, based on geophysical surveys

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The Lau Basin is a back-arc basin associated with Pacific-Australian plate convergence in the SW Pacific. It comprises oceanic crust that separates the remnant Lau Ridge volcanic arc from the active Tonga Ridge. Between the ridges, the basin area narrows to the south with a trapezoidal shape. This was formed by crustal extension causing the basin to open progressively from north to south. The opening has two tectonic stages. First, rifting of the forearc formed a series of half-grabens that were partly overlain by sediments and basaltic flows. The second stage of opening was by a southward propagating rift system producing new oceanic crust by seafloor spreading.

Previous surveys have suggested that the ongoing crustal rifting progresses southward. This makes the basin an active system comprising various stages of rifting to true oceanic spreading. At present, new seafloor is being accreted from 19-20S to 22-50S along the East Lau Spreading Center (ELSC) and the Valu Fa Ridge (VFR). The VFR is located at the southern end of the ELSC and is one of the well-studied areas. The spreading rate is intermediate, 60 mm/yr at around 22S. Its morphology shows segmented axial highs similar to the East Pacific Rise indicating localized spreading along the ridge. On the other hand, in the area between the southern VFR and the Havre Trough where the backarc extension is in a rifting stage, no continuous spreading axis is recognized and the off-axis seafloor shows relatively rough topography. The linearity of the ridge loses its morphological identity into the zone of rough topography. Grabens with steep scarps are observed in this zone. The trend of these grabens is consistent with the trend of VFR. Considering this trend and location of these grabens, continuous extension can be suggested in this zone. A recent survey has defined a deep graben structure as the southernmost tip of seafloor spreading center. It is located at 24-00S where oceanic crust is being generated at a discrete spreading center. The spreading at the VFR is localized along a ridge axis, but how the spreading propagated to this graben structure (discrete spreading center tip) is still unclear. To reveal the characteristics of this extensional zone, a geophysical mapping survey was carried out from 21-30S to 24-30S. Mapping during cruise YK04-09 includes swath bathymetry, magnetics, and gravity. This presentation mainly focuses on the preliminary result of this survey and what can be discussed from the obtained data.

Bathymetry of the survey area shows several deep grabens along the line between the spreading center tip and the VFR. This suggests spreading at multiple discrete centers. Many knolls are scattered around the off-axis area where the VFR ends. Larger numbers of these knolls were observed on the trench side nearer to the active Tonga arc. The eastern and western basins are divided by a graben structure located around 22-30S. Some survey lines cover the foot of the remnant Lau Ridge in the west to the Tonga Ridge in the east. The western basin is flat indicating a sedimented inactive region in contrast to the active rifting structure in the east. We will present the interpretation on how the initial seafloor spreading propagated from localized to dispersed spreading based on topographic segmentation and magnetic anomalies.