インド洋におけるゴンドワナ大陸初期分裂過程

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Initial breakup process of Gondwana in Indian Ocean

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The initial break-up of Gondwana is one of the most significant geological events to have affected the southern hemisphere in the past 200 Myr. The evolution of seafloor spreading in Indian Ocean is key to understanding the break-up process of Gondwana. Reconstruction models of Gondwana based on the geophysical data set have been proposed, however, the detailed initial break-up process of Gondwana is poorly understood because of the sparse geophysical data around the continental margins of Indian Ocean. For revealing the initial break-up process of Gondwana, systematic vector geomagnetic surveys were conducted in the Natal Valley and Mozambique Ridge, off South Africa, and the Cosmonauts Sea, off Antarctica (Figure 1).

The Natal Valley and Mozambique Ridge were considered to be formed as a result of opening between Africa, South America and Antarctica during initial stage of Gondwana break-up, and there was an unsolved problem whether the underlying crust is continental and/or oceanic one in this region. We summarized the nature of the crust using the results of the multiple analytical results of the dense vector geomagnetic anomaly, as well as satellite gravity data. We identified magnetic isochrons M10–M0 with NE-SW spreading direction in the southern Natal Valley and those are well correlated with the isochrones proposed in previous study. The location of the continental-ocean boundary and detailed evolution processes of the Natal Valley and Mozambique Ridge since about 183 Ma are newly proposed based on our results.

The Cosmonauts Sea in the western Enderby Basin was considered to be formed as a result of opening between Antarctica and Sri Lanka/India/Madagascar, however, the seafloor spreading history of this region is still poorly understood because of the sparse marine geophysical data. Systematic vector geomagnetic survey of SE-NW oriented four observation lines was carried out in the Cosmonauts Sea using the icebreaker *Shirase* during the 54th Japanese Antarctic Research Expedition (JARE). Vector geomagnetic data acquired in the Cosmonauts Sea during other JARE marine surveys were also used. The isochrons M10N–M3n with SE-NW spreading direction in the Cosmonauts Sea were newly identified with several smaller segments. Moreover, the wide-spreading continental-ocean transition zone was inferred from the results of the multiple analytical results of the vector geomagnetic anomalies, as well as satellite gravity data.

Seafloor spreading was initiated during chron M10 in above-mentioned regions. Between Africa, South America, and Antarctica, continental extension was occurred before the seafloor spreading. The intense basaltic magma activity, which was probably related to the hotspot, was suggested around the continental margins prior to the seafloor spreading off South Africa. In contrast, there is no evidence of the intense magmatic activity around continental margin between Antarctica, Sri Lanka/India, and Australia. We will discuss about the initial break-up process of Gondwana in Indian Ocean, especially around chron M10.

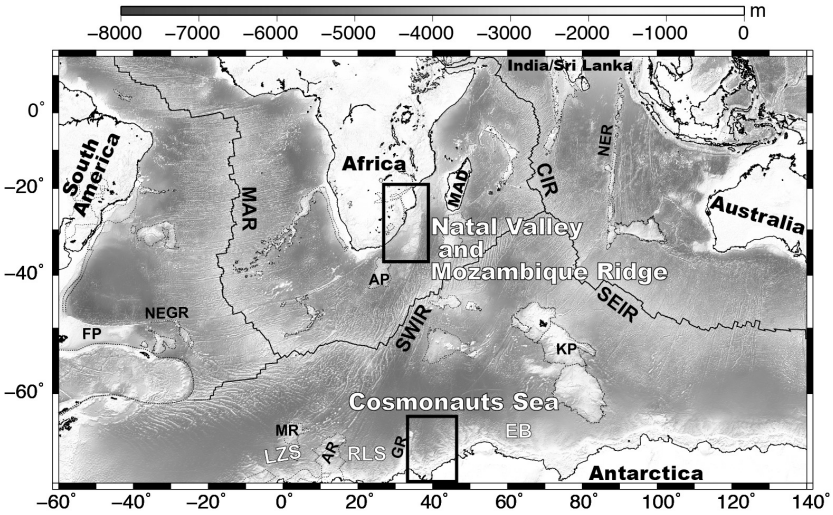

Figure 1. The overview of study areas superimposed on the topographic map (ETOPO1). MAD, Madagascar; AP, Agulhas Plateau; AR, Astrid Ridge; FP, Falkland Plateau; GR, Gunnerus Ridge; KP, Kerguelen Plateau; MR, Maud Rise; NEGR, Northeast Georgia Rise; NER, Ninety East Ridge; EB, Enderby Basin; LZS, Lazarev Sea; RLS, Riiser Larsen Sea; CIR, Central Indian Ridge; SEIR, Southeast Indian Ridge; SWIR, Southwest Indian Ridge; MAR, Mid Atlantic Ridge.