

Marine Magnetic Investigations on the Australian-Antarctic Ridge

호주-남극 중앙해령에서의 해양 지자기 연구

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Since 2011, R/VIB Araon conducted a series of scientific expeditions on the segments of the Australian-Antarctic Ridge (AAR). The AAR is roughly located at the east of the Southeast Indian Ridge (SEIR), and extending to the Macquarie Triple Junction (MTJ) of Australian-Antarctic-Pacific plates. The each segment has been named as KR1, KR2, KR3 and KR4 in order northwestward from the MTJ. The KR1 and KR2, the easternmost segments of the AAR system, are separated by the Balleny Fracture Zone (FZ), and play an important role in constrains of the tectonics between the Australian and Antarctic plates. According to the previous studies, the Macquarie plate, which is regarded as the intraplate inside the Australian plate and bounded by the northern flank of the KR1 and KR2, has been rotated relative to the Antarctic plate since about 6 Ma. Based on the magnetic data obtained by R/VIB Araon, we estimated the spreading rates of the segments, and determined the finite rotation parameters of the MacquarieAntarctic and AustralianAntarctic motions for eight anomalies (1o, 2, 2Ay, 2Ao, 3y, 3o, 3Ay, and 3Ao). These new finite rotations indicate that the Macquarie Plate since its creation ~6.24 million years ago behaved as an independent and rigid plate. The change in the AustralianAntarctic spreading direction from NS to NWSE appears to coincide with the formation of the Macquarie Plate at ~6.24 Ma. The estimated plate motions indicate that the initiation and growth stages of the Macquarie Plate resemble the kinematic evolution of other microplates. In addition, using new shipboard bathymetric and magnetic data, we identified 3-volcanic seamount chains aligned roughly perpendicular to the KR1 ridge axis. Height of the seamounts varies from a few hundreds of meters up to ~2 km, and the largest seamount has a volume of ~300 km³. The forward magnetic model for the

seamount chains shows that each edifice of the seamounts were formed within the last ~3 Myrs, and they had been constructed by off-axis volcanic activity approximately lasted for 250~600 kyrs. Especially, all the off-axis volcanisms in the KR1 seem to have been concentrated on ~0.52 Ma, ~1.02 Ma, ~1.86 Ma, and ~2.45 Ma.