日本海の高精度サイスミックストラチグラフィとその地質学的意義

High-resolution seismic stratigraphy of the Japan Sea and it's geologic application

 # Moe Kyaw Thu [1]，倉本 真一 [2]，斎藤 実篤 [3]，玉木 賢策 [3]，多田 隆治 [4]
Moe Kyaw Thu [1], Shin'ichi Kuramoto [2], Saneatsu Saito [3], Kensaku Tamaki [4], Ryuji Tada [5]

[1] 東大海洋研大洋底，[2] 地質調査所，[3] 東大・海洋研，[4] 東大・理・地質
[1] Todai, Kaiyoken, Taiyotei, [2] GSJ, [3] ORI Univ. of Tokyo, [4] ORI,Univ of Tokyo, [5] Geol. Inst., Univ. of Tokyo

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During the last three decades, many scientists had done studies on tectonic structure and evolution of the Yamato Basin based on the reflection seismic data. But the basin seismic stratigraphy which comes not only from the reflection seismic interpretations but also integrated with high resolution core and well-log data sets, and seismic stratigraphic units which have closer relationship with their representative lithology is needed for a long time. The first recovery of complete sedimentary sequences in the Yamato Basin during the Ocean Drilling Program (ODP) Leg 127 provided good opportunity to study the integration of core, log and seismic data.

In this study, core lithologic description, physical properties of core samples data, borehole well-logging data and enhanced seismic reflection data from ODP Leg 127 are used to establish the seismic stratigraphy. After confirming the processed seismic results represent the insitu properties of the sedimentary by matching the seismic and synthetic seismograms, seismic units were defined from the correlation of seismic profiles and synthetic results. Both Sites 797 and 794 finally achieved ten seismic stratigraphic units from the integration analyses, and lithologic and physical properties' characterization of each units had continued.

Seismic stratigraphic results and well-log cross-plots clearly show silica diagenesis process and their diagenetic history in detail. Unlike the previous studies, opal-A/CT boundary is in different appearances at different places with strong to weak and mostly discontinuous signatures. The boundary locates at 30 m above the very strong reflector which is correlatable as isochronous reflector rather than opal-A/CT BSR.

Strong, well-stratified reflectors from units 1, 2 and 8 are assumed to have related with glacio-eustatic sea-level changes in tens of thousand year cycles and may get more precise age and events of the each reflectors by correlating with high resolution Gamma-ray attenuation porosity evaluator (GRAPE) density and with high resolution resistivity logs.