Improvement of 3D MCS data processing by advanced technology in Nankai trough
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*白石 和也[1]、木下 正高[2]、ムーア グレゴリー[3]、真田 佳典[1]、山田 泰広[1]、木村 学[4]
*Kazuya Shiraishi[1], Masataka Kinoshita[2], Gregory Moore[3], Yoshinori Sanada[1], Yasuhiro Yamada[1], Gaku Kimura[4]

1.海洋研究開発機構、2.東京大学地震研究所、3.ハワイ大学、4.東京大学大学院理学系研究科地球惑星科学専攻
1.Japan Agency for Marine-Earth Science and Technology, 2.Earthquake Research Institute,The University of Tokyo, 3.Department of Geology and Geophysics, University of Hawaii , 4.Department of Earth and Planetary Science, Graduate School of Science, The University of Tokyo

For the next stage of the deep scientific drilling in Nankai trough seismogenic zone, it is essential to know exactly shapes and depths of the mega-splay and the subducting oceanic plate, and fine structures in accreted sediments around the drilling site. Three dimensional multi-channel seismic (3D MCS) survey data were acquired in Kumano nada, and original data processing were also carried out in 2006. The 3D geometry of megasplay fault system in the Nankai trough subduction zone and detail structures in the frontal accretionary prism were revealed. However, any detail structures are not clear in the old accretionary prism between Kumano forearc basin and the megasplay fault, which are essential information for the successful deep drilling. The most difficult problem of the 3D seismic data is strong water-period surface related multiples which highly decrease the image quality. Especially in the deeper part than about 5 km, the resolution of the reflection image is very low with bandlimited signals by applying the specific processing to eliminate the multiples and noise with the technology of the day.
In order to obtain the clearer depth image for the next deep drilling target, reprocessing of the 3D data is highly required with advanced technology in a decade after the original data processing. There are three major scientific goals on the reprocessing of the 3D MCS data. First, 3D geometry and relationship between megasplay and plate interface beneath outer ridge, where multiples obscure clear imaging, to reveal whether decollement steps down to the plate interface or connects to the megasplay. Second, the fine scale imaging is required in the old accretionary prism beneath Kumano Basin. Distribution of faults, folds, or fractures, should be revealed to compare the seismic scale dipping structures to the nearly vertical fractures obtained at C0002 hole drilled by D/V Chikyu. Third, the reliability and the resolution of the velocity model should be improved to prove whether the low velocity zone (LVZ) in the outer wedge continue to that beneath the megasplay beneath Kumano Basin, and how much this velocity contrast contributes to the negative polarity in the megasplay fault.
The combination of the recent surface-related multiple elimination (SRME) and other noise attenuation techniques for better multiple attenuation, and broadband processing will contribute to enhancement of the deep reflection signals. Then, the sophisticated velocity model building to improve resolution and reliability, and the recent pre-stack migration method in depth domain with the updated data improve the depth image for mega-splay fault and the subducting plate. The advanced beam migration technique beyond the conventional Kirchhoff migration helps to image the steep dip fold and fault structures inside the old accretionary prism beneath the Kumano basin.

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