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# Attempt to estimate uplift process of outer ridge taking account of distribution and geometry of Foldback Reflectors

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The Nankai Trough is considered to be the largest methane hydrate bearing area in Japan, that is inferred from methane hydrate-related BSR (bottom simulating reflector) and a number of drilling. The BSR has been widely reported in the accretionary prism and forearc basins based on multi-channel seismic reflection surveys. Our study focuses on a series of accordion-shaped reflectors with horizontal axis of fold back on BSR margins which are observed in the 3D seismic data of "Tokai-oki to Kumano-nada" conducted by Japan's Ministry of Economy, Trade and Industry (METI) in 2002. We call the reflectors "Foldback Reflectors (FBRs)" in this study. The FBR (1st FBR) generally begins from edge of BSR and extends down to lower formation below the BSR, crossing sedimentary horizons. The following FBRs (2nd, sometimes 3rd and above) extend further forming bellows shape by folding back at the end of the previous FBR. The 1st FBR indicates normal polarity (antiphase of BSR), and the following FBRs alternate their polarities at every fold back hinge. Sedimentary horizons are successive with no fault displacement across these series of reflectors. FBR generally corresponds to a boundary of lateral seismic facies between the area of BSR distribution and the area outside the BSR. The formation beneath the BSR shows dimmed seismic facies which is characterized by relatively low amplitude and lack of high frequency components in contrast to normal facies in the area of outside the BSR. Seismic velocity analysis also suggests that the FBRs correspond to velocity boundaries, where the dimmed facies below the BSR indicates relatively lower velocity than outside the BSR. Polarity of each FBR is also consistent with such velocity changes. The dimmed facies below the BSR suggests an effect of thinkable gas components in the pore water. In this area, the FBR mostly in the simply stratified formation but not in the area highly disrupted by faults or major lateral lithological changes. The FBR markedly appears in the northern slope of uplifted outer ridges, whereas few FBRs are observed in the southern slope of the outer ridge where there are lots of compressive and strike-slip deformations related to major fault systems including the Kodaiba faults and the Tokai faults. The FBR observed in the study area basically strike NE-SW which is parallel to major strikes of surrounding formations. The FBRs, which has been observed in NW side of the Daiichi-Tenryu Knoll, strike $\sim$10 degrees north compared to the surrounding formation. We focus on this direction shift and will discuss tectonic implication, especially recent uplift process of the Daiichi-Tenryu Knoll. This study uses the data provided by the Research Consortium for Methane Hydrate Resources in Japan (MH21) and Japan Oil, Gas and Metals National Corporation (JOGMEC).