

Subsurface Structure in Niigata oil and gas fields, North-east Japan

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In the Chuetsu-region, Niigata, Northeast Japan, the NNE-SSW trending anticlinal structures, Amaze (Nishiyama-yutai), Oginojo (Chuo-yutai), Hachikoku and Katakai/Matto, are arranged with a right-echelon pattern from west to east. The oil and gas fields were discovered on some of the anticlines. Katakai/Matto and Hachikoku anticlines develop in the deeper part of basin.

Meanwhile the deep subsurface structure is gentle anticline in Katakai gas field, the shallow subsurface structure is deformed by some reverse faults with steep drag and repeats of several tens to a hundred meters. The reverse faults become detachment faults in the Lower Teradomari to Nanatani formations and the 'Green Tuff' formation distributes over 4,000 meters below the surface. The horizontal shortening length of the shallow part is longer than 100 meters compared with the deep part. It is interpreted that the difference of shortening length is distorted by underlying some lateral faults below the detachment faults. The lateral faults are expected to lie concealed in the deep part under crooks of the fold structures.

The subsurface 'Green Tuff' formation in the Chuetsu-region, consists of volcanic and pyroclastic rocks, of which thickness is over 1,000 meters in the Katakai Gas field. Shuto et al. (1997) and Yagi et al. (2001) divided volcanic rocks of the 'Green Tuff' into 3 stages on the basis of their composition, and made connection with rifting events during opening of the Japan sea.

In the Tsugawa basin where the 'Green Tuff' chops up the surface, there is a trend that the age of volcanic rocks gets younger toward depositional center. In the Kushigata range, there are two WNW-ESE trending half grabens filled by sediments with intrusion and eruption of acidic volcanic rocks, cutting across a NNE-SSW trending granite horst. In view of these facts, distributions of different stage volcanic rocks on an anticline suggest possible volcanism across the trend of anticline in the early stage of rifting.

It's hoped that the seismic survey project in the Niigata strain-stress accumulation zone search out structural form in the early stage of rifting.