Influence of Deep Fluids on Mountain Degradation Processes of the Neogene Sedimentary Rocks in Japan Sea Side

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Numerous numbers of landslides have occurred in the areas of Neogene sedimentary rocks in the southern Niigata Prefecture along the Japan Sea coast. They have been called Tertiary type landslides and their occurrence has been attributed to the weakness of those rocks, but recent studies have found highly saline groundwaters beneath some landslides and suggested those groundwaters may be related to landslide activity. However, distribution of highly saline groundwater in wide areas is not known and the actual relationship between highly saline groundwater and landslides has not been elucidated. We have conducted geomorphological analysis, geological surveys, geochemical surveys and the CSAMT geophysical exploration in and around the Nagakurayama anticline, where many landslides and gravitational slope deformations are recognized.

The Nagakurayama anticline consists of Neogene massive tuff, mudstone, and alternation of sandstone and mudstone beds, which are folded with an axis trending NNE-SSW and plunging to the north and the south. There are many landslide units on both wings of the anticline, and there are linear depressions along the ridge. In a part, main scarps are recognized across the ridge. These landslides are tuff caprock landslide because outcrop of the mudstone below the tuff located in bottom of the scarp.
Our CSAMT survey showed that the surveyed area is widely underlain by zones of low resistivities (<10 Ω m) generally deeper than about 100 m and that much higher resistivity areas are present shallower than the level. High resistivity zones extend much deeper just beneath the linear depression. Comparing with the results with geological cross sections, higher resistivity zones may correspond to tuff and the linear depression. The interstitial water of mudstone may be highly saline water in the depth and might be replaced by fresh water at shallower zones. The replacement could deteriorate rocks and likely be a basic cause of landslide occurrence.

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