

## Rectangular toppled blocks of sandstones distributed at the foot of the northwestern cliff of Mt. Boroishiyama, Miyazaki, Japan

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Many rectangle blocks of sandstones, of which height attains to 10 meters, are distributed at the foot of the northwestern cliff of the Mt. Boroishiyama, Miyazaki, Japan. Some of blocks are separated by vertical slits with several meters width from the cliff. The cliff and blocks are composed of coarse sandstone and conglomerate of the Miocene Miyazaki Group, whereas the foot of the cliff is composed of the Paleogene Nichinan Group. The Miyazaki Group shows a gentle synclinal structure with ENE-WSW axis and eastward plunge in the mountains. The strata in cliff located in the north wing of the syncline show NE-SW trend with 10 to 20 degrees dips southward. Therefore, the cliff is mostly inward slope.

Joint planes separating blocks are almost vertical and perpendicular to the bedding planes. They are parallel or normal to the cliff trend elongating in ENE-WSW. The former transverses the synclinal structure, whereas the latter radial trend for it. Therefore, they may be closely related to the formation of the structure.

Based on the configuration of blocks and direction of the bedding planes within individual blocks, rotational movements are estimated. Assuming that the average direction of the bedding plane N63E/16S at stable exposures did not change, it is possible to estimate rotational axes and angles of individual blocks. As a result, rotation of ten to twenty degrees was estimated, and dips toward the direction of NNW to NE trend. These directions may depend on local topography of the foot. This means that some of blocks were separated by vertical joints from the cliff, and were toppled outer ward by seismic vibration or others. However, the rotation movements of blocks stopped before their failures.

Depth of axis of rotation is estimated to be from 20 to 100meters beneath the foot of the cliff. This almost corresponds to the boundary depth between the Miyazaki Group and Nichinan Group as basement. Horizontal sliding is also estimated in the movements of some blocks.

Many large blocks distributed on gentle slopes below the cliff means that these toppling and failures have continued during a geologic time. Considering that sandstone rock mass composing the cliff are loosened as a whole, the rotation and failures may occur under the slight seismic vibration in the future.