Contribution of gelogy and geomorphology to safety moutaineering: a lesson of rockfall hazard in the Daissekkei Valley

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Recently, alpine landscapes in the Hida Range (Japanese Alps), which can be accessed easily from the Tokyo and Osaka metropolitan areas, have enchanted many climbers. On the early morning of 11 August 2005, mesoscale rockfall occurred from a high cliff facing the Daisekkei (meaning a large snowpatch) Valley with a large number of climbers to Mt. Shirouma-dake (2932 m ASL) in the northern Hida Range; this resulted in one death and one injury.

The outline of the rockfall is as follows (J. Jpn. Landslide Soc. 168). The collapsed cliff was comprising well-jointed felsites and debris of ca. 8,000 mˆ3 was produced. The source area was 250 m above the valley floor and its angle was no less than 60 degrees (partly perpendicular). Most debris was deposited on a snowpatch located just beneath the cliff. The rockfall could be due to the differential retreat of rockwall, comprising high- and low-density joints. An intensive rainfall on 10 August might be a trigger of the failure. Additionally, a large rock block glided 1 km over the snowpatch. Some rock blocks that can recollapse remain on the rockwall.

A closed trail due to this rockfall has been recovered. The mountaineering situation around the Daisekkei Valley seems to be settled. However, similar accidents might recur in the valley because significant geomorphic changes described below will take place and craze for mountaineering is expected to continue in Japan. Since few geohazard maps for mountaineering have been published in Japan, providing basic informations on geohazard is needed for sustainable and safety mountaineering. In this regard, the Daisekkei Valley and its surrounding areas can provide good opportunity for preparing a trial version of hazard map because the fundamental studies on both local geology and geomorphology have been carried out. In this meeting, we point out possible changes in landforms in the Daisekkei Valley that might cause serious geohezards. We also propose a tentative hazard map.

Three types of geomorphic changes are possible, except for frequent snow avalanches. First is rockfall. Detailed investigation for rockfall from felsite walls is required because well-jointed felsite is widely distributed in and around the Daisekkei Valley. Second is supranival rock block gliding derived from rockfall activities. Several tributaries of the Daisekkei Valley have steep cliffs in their uppermost reaches. Third is debris flow. For example, glacial diamicton in the cirque bottoms, located in the upperreach of the Daisekkei Valley, was extremely washed by an intensive rainfall in the summer of 1995. As a result, a total of 25000 mˆ3 debris was supplied into the Daisekkei Valley. Similar debris flow occurred in both 1952 and 1959, resulting in formation of remarkable deposition forms.

A tentative version of geohazard map for the Daisekkei Valley, which includes various information on previous and future geomorphic changes as well as physiographic attributions (e.g., 1952/59/98 debris flow, 2005 rockfall and supranival rock block sliding, microlandforms, local geology, vegetation cover, snow accumulation) demonstrates that rockwalls without vegetation cover and unconsoildated sandy/gravelly deposits exists widely in the Daisekkei Valley.