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泥質片岩における萌芽的滑り層の形成条件
Formative conditions of incipient sliding zones in pelitic schist

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Large landslides frequently occur in pelitic schist areas, with the structure of the failing mass often being separated into smaller blocks. However, the reasons why landslides occur so readily in pelitic schist, and why their morphology separates into minor blocks, are not clear.

The texture of pelitic schist is strongly anisotropic, which means that it typically has low strength. In addition, landslides commonly occur on dip slopes in pelitic schist areas. These facts suggest that preferable conditions for landslide are related to schistosity within the pelitic schist.

In order to clarify the ways in which the mechanical behavior of pelitic schist controls landslide occurrence, we analyzed the microscopic texture and composition of pelitic schist, and then directly measured the shear behavior of analog materials of pelitic schist using a direct shear machine. Pelitic schist consists of alternating thin black layers, abundant in pyrite and graphite grains, and quartz-rich layers. The black layers are typically weaker than the quartz-rich layers, as has been tested using an Equotip rebound tester. Relatively thick, continuous black layers were found to have low hardness values. So unevenly distributed graphite layers are likely to determine the potential location of microscopic slip in a rock mass. To investigate the behavior of these systems we generated analog materials formed from layers made of artificial graphite sheets, to simulate the black layers, and plaster of Paris to simulate the quartz-rich layers. These systems were sheared parallel to the graphite layer at a constant rate in the direct shear machine at Durham University, allowing measurement of the shear strength. The results suggest that both the peak and the residual frictional strength between a graphite sheet and the plaster surface were about half of the strength of a joint within the plaster. Analog materials having continuous graphite sheets failed at a low shear strength. These results suggest that graphite layers likely reduce strength of the rock, and continuous graphite layers are likely important to determine slips in the rock mass.

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