



Internal structures of an early stage of gravitational slope deformation on a dip slope of sedimentary rocks

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Internal structures of an early stage of gravitational slope deformation on a dip slope of sedimentary rocks of Jurassic accretion body have been investigated by using high-quality drilled cores obtained by the hybrid drilling technique. The slope surface smoothly undulates and has dimple-like depressions without gullies, suggesting that it has been gravitationally deformed. The underlying rocks, which consist mainly of shale with sandstone and subordinate chert and green stone, are deformed with brittle fractures. Tearing off of rock flakes along bedding-parallel foliations, shearing along foliations, and rotation and abrasion of rocks without major well-defined shear surfaces are dominant deformation and fracturing styles, which are very different from those of tectonic shearing made under higher confining pressures. Fractured rocks form a “jigsaw puzzle”, of which pieces gradually lose their original arrangement, disintegrated, and then pulverized. Pulverized zones are made intermittently but are not extended long across the whole slope in a slope at an early stage of gravitational deformation, which was observed by using the drilled cores and bore-hole TV images. The base of the gravitationally deformed zone descended toward valley bottom abruptly with a break at an elevation of 100 m above the present river bed, of which height is consistent with the height of convex slope breaks of nearby slopes. The slope breaks are assumed to be made by the acceleration of river incision and the coincidence of the breaks of the underground structure and the slope surface suggests that gravitational rock deformation also accelerated with the river incision.