

## The role of faults for the formation of uphill-facing scarps

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We made a thorough geological and geomorphic mapping in a slate area with uphill-facing scarps in the Abe River catchment, where many landslides were induced by previous strong earthquakes and heavy rains. We found that the uphill-facing scarps and linear depressions were made by the displacement along steeply-dipping faults during the flexural toppling of slate with steeply dipping cleavage. Uphill-facing scarps developed with the rotation of a wedge, which was defined by the high-angle fault and cleavage that passed through the intersection of the fault and basal hinge surface of the toppling. The wedge developed up- or downslope of the fault, depending on whether the fault dipped into the slope or valleyward. During wedge rotation, displacement occurred along the fault, and an uphill-facing scarp developed along the fault. The uphill-facing scarp became higher when the cleavage dipped into the slope and the fault dipped valleyward. On the contrary, when the cleavage dipped valleyward and the fault dipped upslope, high uphill-facing scarps unlikely to be formed. Instead, downhill-facing scarps are likely to be formed. When a high-angle fault or other weak layers was not involved, flexural toppling continuously deformed the slope and was unlikely to form an uphill-facing scarp. When flexural toppling extended to the ridge top, it generally formed a ridge-top depression, regardless of whether a fault was involved.

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