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# Hitherto undescribed pattern of rock cliff/talus development: The 'breach concept'.

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The conventional concept of rock cliff/talus-slope development predicts that (1) the talus onlaps and oversteps a convex truncation surface (developed by cliff retreat) with a dip striving towards the mean angle of residual shear of the proximal segment of the talus-slope surface, and (2) that talus accumulation rate decreases exponentially in time, in proportion to decline of free cliff area. This concept rests on the prerequisites that: (a) the initial cliff is rectangular in frontal view, and remains of rectangular shape while degrading, (b) the scree derived from the cliff is delivered to the slope exclusively by rockfall, (c) the accumulation of a talus slope must not interact with an adjacent one, and (d) all the scree stays on the slope.

In the Eastern Alps, at a few locations, large scree slopes are supplied mainly from cliffs up to a few hundreds of meters in height flanking deeply incised 'breaches' that cross-cut the crestline of a mountain range. The breaches develop by preferential backweathering along subvertical faults and joint sets or, more rarely, in vertically-tilted heterolithic successions. The breaches are filled by talus ('breach talus') supplied mainly by its flanking cliffs. As a result of scree shedding from two closely opposite cliffs, to sustain the mean angle of residual shear, the aggrading talus sheds out laterally; in result, the crestline of breach talus is in line with the crestline trend of the mountain range, and the breach-facing cliffs develop an asymmetric, subtriangular free face. For breaches, the conventional concept of cliff/talus development can not apply, because prerequisites (a) to (c) and, with limitations, also (d) as mentioned above are violated.

For breach talus, the geometrical constraint outlined in item (1) above still holds, but the resulting truncation surface should develop in a more complex three-dimensional shape. Because breach cliffs supply scree slopes that extend beyond the cliffs, constraint (2) of the conventional concept is not necessarily met. Upon cliff degradation, the breaches do not widen significantly. Although the long-term development of breach-supplied (or parallel) talus differs from conventional (rectangular) talus, the final stage of both types is identical: two scree slopes meet from opposite sides along a crest in line with the trend of the mountain range.