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Periodic development of slope failures due to thrust displacement in physical models: application to submarine landslides

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We performed a series of shortening physical experiments and analyzed time-lapse digital pictures of the deformation using the Digital Image Correlation (DIC) technique. A number of slope failures were detected in the models and can be classified as follows, Type I developing at the lower half of the slope, and Type II covering the entire slope. Detailed observations reveal that the failure process can be divided into four stages. The minor Type I slides act as precursors of major Type II failures. Each slope failure produces a topographic undulation, triggering events in adjacent areas and a lateral migration of discrete slope failures.

From the experimental conditions, we believe this result can be applied to submarine landslides, a common feature along convergent margins and have recently been recognized as one of the most serious geohazards. Such experiments provide useful insight into slope failure processes, and suggest a detailed 3D analysis of the failed sediment is vital if we are to understand the precise history of thrust activity. Recent and Miocene accretionary prisms around Japanese subduction margins show the geometric and lithologic characteristics of Type I and Type II failures in their slide outcrops and topography.