Breaching: a slope failure driven by pore pressure dissipation

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ABSTRACT

Breaching is a type of slope failure associated with water-saturated sediment that, because of the pore pressure response, produces very slow, but retrogressive sediment release. We study the connection between the pore pressure and the retrogressive slope failure through a combination of flume experiments and numerical modeling. The flume measurements suggest the retrogressive slope failure acts as a sink for the pore pressure and the strength of the sink decays exponentially with distance from the free surface. The numerical model suggests the erosion rate of breaching is proportional to the coefficient of consolidation of the deposit. We find breaching can occur in any dilative material, like silty sand that is common on the continental shelf.

CLICK ON IMAGE FOR LARGER VIEW

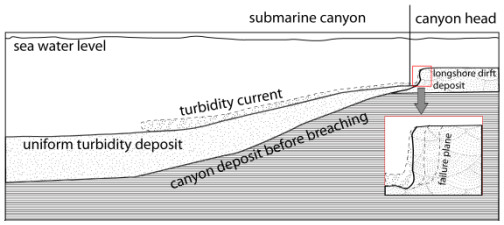


Fig. 1: Cartoon of a transection of a submarine canyon during breaching. The breaching at the head of the canyon generates turbidity currents and distributes the coarse material down canyon.

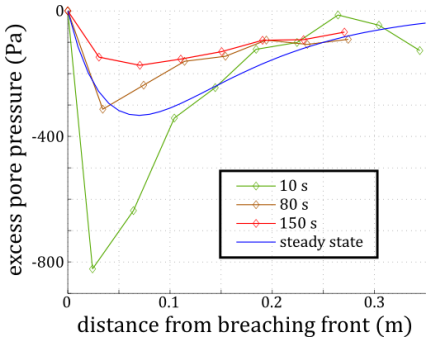
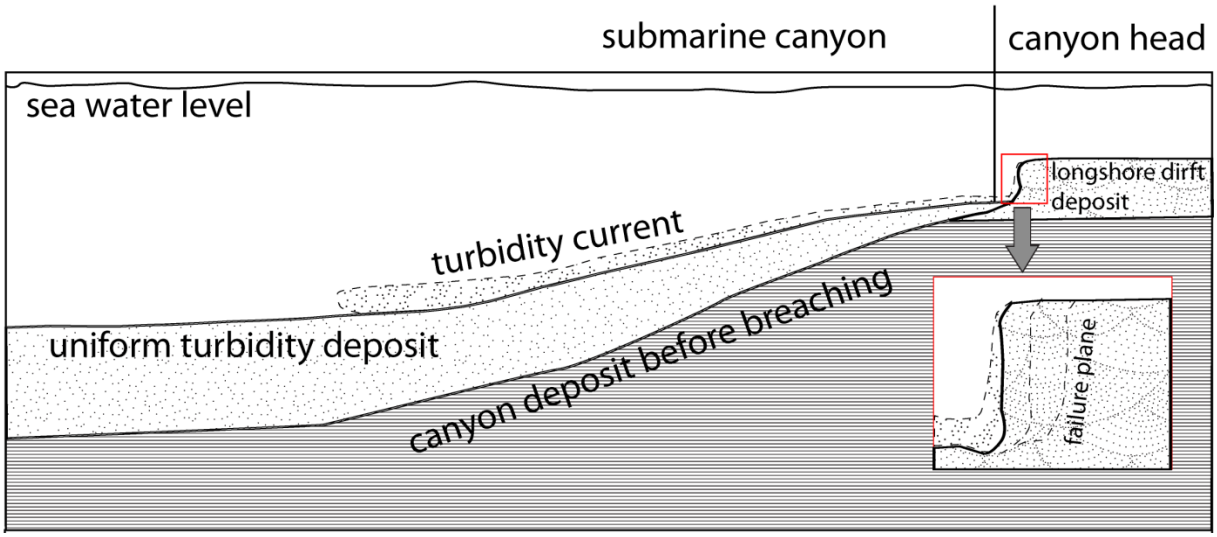


Fig. 2: Measured spatial excess pore pressure profile at three time steps (10s, 80s, and 150s) comparing with the steady state pore pressure solution (blue line). The three measured profiles are similar.



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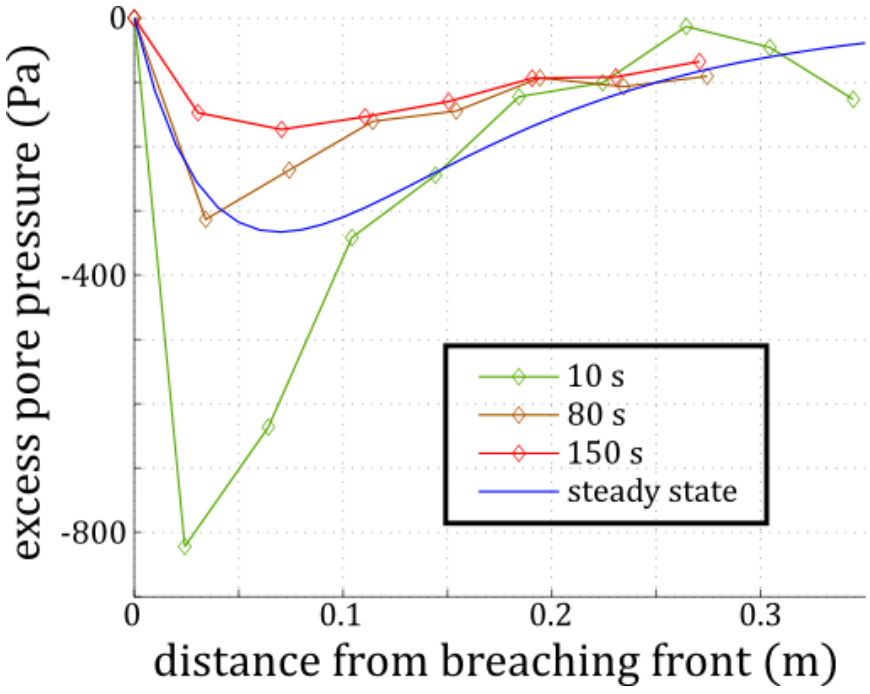
Back



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Back