Pore Pressure Controls on Turbidite Deposits

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ABSTRACT

Thick sand turbidite often contain internal cycles in grain size or bedform (Fig. 1). These cycles record waxing or waning within a long lasting turbidity flow. We present a model that describes how periodic slope failure occurs that generates these types of deposits. In our model, abrupt slope failure results in underpressures, the development of high effective stresses, and stability in the rest of the deposit where only sediment grains on the surface fall (breaching). Pore pressure dissipation then occurs until the effective stress lowers to generate a new slide, which causes pore pressure to drop, stabilizes the deposit, and resumes grain-to-grain failure. This process repeats itself periodically (Fig. 2).

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Fig. 1: Deep water turbidite outcrop from Bone Spring Canyon, Guadelupe Mountains. The turbidite consists of medium grain sized sand beds interbedded with mud/silt drapes. The sand beds contain ripples. The amplitude of the ripples decreases within a single bed then increase into the next bed.

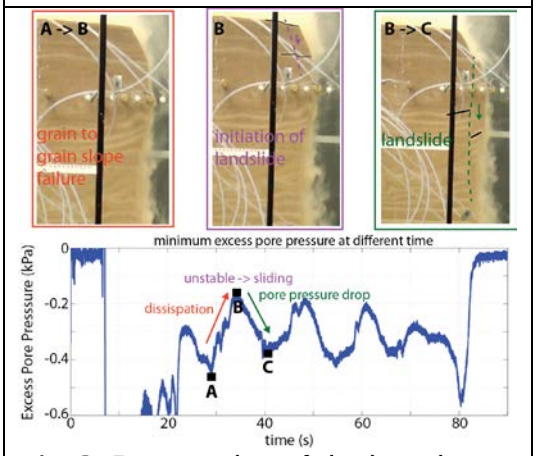

Fig. 2: Progression of dual mode slope failure and its pore pressure signal. A→B: pore pressure dissipates but still able to maintain a vertical slope, slope failure is grain-to-grain. B: pore pressure is too high for the deposit to maintain a vertical slope, landslides initiates along the dashed line. B→C: as landslide occurs (along the dashed line), pore pressure in the deposit drops due to the unloading caused by landslide.

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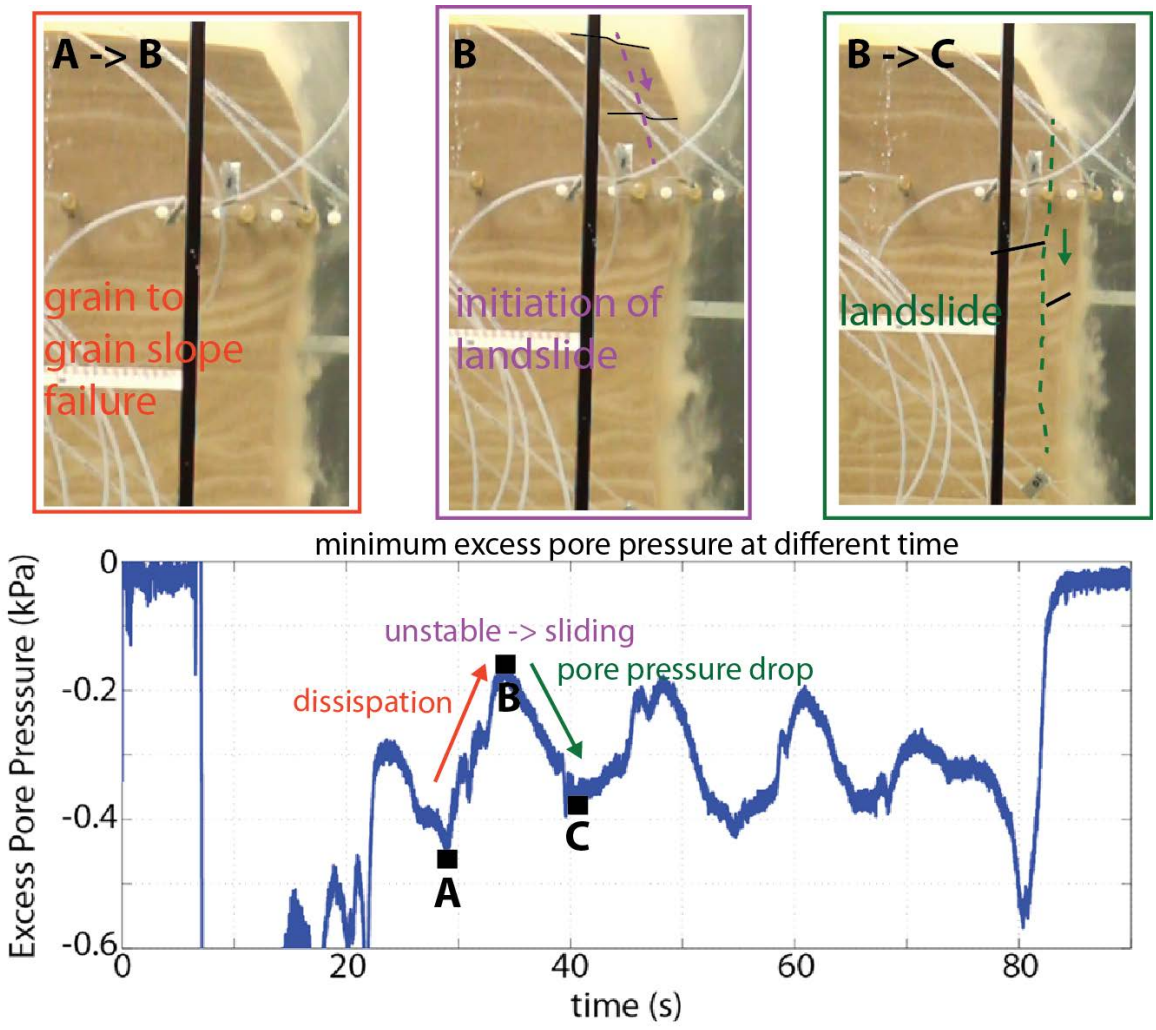

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