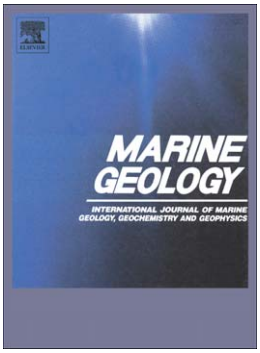

Multistage, progressive slope failure in the Pleistocene pro-deltaic slope of the West Nile Delta (Eastern Mediterranean)

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Multistage, progressive slope failure in the Pleistocene pro-deltaic slope of the West Nile Delta (Eastern Mediterranean)

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Abstract

The vast majority of submarine mass transport deposits (MTDs) have been attributed to retrogressive slope failure processes whereby an initial rupture zone migrates in a generally upslope direction towards the position of the ultimate headwall. Here we use 3D seismic data from the prodelta slope of the Western Nile delta to describe a series of volumetrically extensive MTDs (termed MTDs A, B and C) that are part of a linked sequence that failed progressively but with retrogressive modifications of the lateral and headwall margins. The MTDs have c. 500 - 1000 ms of relief on their marginal scarps with a minimum total volume of remobilised sediments of 750 km^3.

By comparing their motion histories, and by correlating their basal surfaces, we demonstrate that MTDs B and C are remnants of a single original body that was later cut by MTD A. This sequence is confirmed by cross-cutting relationships at the lateral boundaries between the three MTDs and the absence of any significant infill and burial of residual topography at the tops of MTDs B and C prior to the incision of MTD A. This implies that these two major submarine failures (MTD B/C, and then MTD A) were closely grouped in time. We suggest a mechanistic model whereby rapid load redistribution resulting from the initial failure led to localization of a deeper cutting failure, and the unloading in the headwall region then led to