CANYON INCISION MODEL FOR PROGRADING CONTINENTAL SLOPES

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Continental slopes have a number of features in common with subaerial landscapes, which suggest that some concepts and methodologies for representing landscape form and process developed in subaerial quantitative geomorphology could be adapted for studying them. As part of that general effort, we have developed a model for deep canyons on the USA East coast continental slope, which are believed to have been carved by sedimentary mass flows, primarily turbidity currents. An analogy can be developed with fluvial incision based on the assumptions that turbidity currents erode their beds in a similar manner to rivers on land and that the currents are initiated by slope failure in over-steepened hemipelagic material continually deposited on the continental slope. In such a model, the progradation of the margin continually elevates the continental slope surface in a way that is analogous to tectonic uplift in subaerial mountainous regions. We construct graphs of thalweg slope as a function of hemipelagic catchment area to compare with slope-area graphs for subaerial mountain rivers. Whereas some analogous behaviour emerges, we find some important differences such as a lack of a continuous power-law relation between slope and area across a significant range of area.