



Geomorphology of continental slope canyons

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Preliminary work on USA slope canyons reveals some remarkably analogous geomorphological properties to subaerial surfaces. Although the processes creating and modifying submarine slopes are different to those affecting landscapes above sea level, these geometrical similarities suggest that it may become possible to model slope evolution by analogous methods to those in subaerial geomorphology. Canyons in the USA Atlantic continental slope, for example, have similar "concavity" to bedrock eroding rivers (upwards-curved longitudinal profiles). As with many rivers, submarine tributaries can join main channels at confluences with smoothly converging elevations (i.e., obeying Playfair's Law) and tributaries with smaller contributing area tend to be steeper than their associated principal channels. Knickpoints in channels of tectonically active slopes also show fluvial-like tendencies, for example, there is evidence that they can either advect up-stream or smooth out like in alluvial channels. Based on these observations, work has concentrated on assessing whether the "flow power" erosion models of fluvial geomorphology can be adapted to model submarine canyons. Other features of the Atlantic slope canyons can also be analogous to subaerial systems, for example, inter-canyon ridges can be sharp where bounded by steep, linear hillslopes analogous to threshold slopes on land. Many weakly incised areas of the uppermost continental slope in the USA Atlantic are smooth and upwards-convex between channels, much like in lowland landscapes where surface processes lead to soil topography obeying a diffusion equation. While some of this correspondence is fortuitous, the gravity effect on saltating sand can produce a down-slope movement proportional to local bed gradient that leads to a diffusive-like evolution of the surface topography in the absence of other influences.