Evolution of recesses and salients of an orogenic belt from promontories and embayments of a rifted continental margin

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The shapes of recesses (cratonward-concave angular bends) and salients (cratonward-convex broad curves) of an orogenic belt are generally interpreted to be genetically related to promontories and embayments, respectively, of a pre-existing rifted continental margin. During rifting, promontories and embayments are framed orthogonally by rift segments and transform faults. Three-dimensional mechanical and thermal models predict distinctive structural styles and syn-rift accumulations along various rift and transform segments of a continental margin. Similarly, post-rift (passive-margin) subsidence history varies predictably along a rifted margin. During tectonic convergence and thrusting onto a passive margin, the shape of an orogenic belt adapts to the shape of the pre-existing continental margin, and part of that adaptation is reflected in the distribution of foreland-basin subsidence in response to emplacement of thrust loads. Specifics of foreland subsidence depend on several variables, including age of the post-rift, pre-orogenic lithosphere; crustal faults inherited from rifting; and composition and geometry of the thrust belt.

As an example of the genetic relation of recesses and promontories, the Alabama recess of the late Paleozoic Appalachian-Ouachita orogenic belt mimics the shape of the Alabama promontory, which was framed during the late Precambrian-Cambrian rifting by rift segments on the southeast and a transform fault on the southwest. Quantitative comparisons of crustal subsidence during late syn-rift, passive-margin, and orogenic phases around the Alabama promontory and Alabama recess document variations that are consistent with predicted differences between rift and transform segments of a rifted margin and with diachronous emplacement of separate thrust loads onto the margins of the promontory.

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