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Foreland-basin carbonate systems: an overview

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Shallow-marine carbonate platform systems are sensitive recorders of progressive tectonic deformation in many foreland basin settings. Carbonate platform facies may form in virtually any part of a foreland-basin system, although the areal dimensions, internal growth stratal patterns, and longevity of the carbonate platforms at any location are strongly influenced by patterns and styles of deformation, subsidence history, and interactions with siliciclastic depositional systems.

Isolated carbonate platforms in the wedge-top depozone are generally small in scale ($<$50 sq km in area, $<$200 m thick) and have grossly elliptical plan-view outlines. These platforms are typically short-lived because of rapid subsidence and drowning, rapid uplift and subaerial exposure, or burial by siliciclastic sediment eroded from the orogenic wedge. Isolated buildups in the proximal foredeep depozone are rare, but may form on salt or shale diapiric structures that provide shallow-water bathymetric highs that are surrounded by deeper-water settings. Backstepping ramps are most common along the distal side of the foredeep and likely record progressive flexural drowning of older platforms. Exceptions include foreland basin settings where: 1) a platform with a steeper profile already existed on the distal side of the foredeep and was able to continue to aggrade as flexural subsidence rates increased; 2) flexural extension or fault-reactivation created step-like bathymetric profiles along the crest and orogen-facing flank of the forebulge; or 3) other styles of deformation created complex bathymetric profiles that control the location and geometries of carbonate platforms and their margins. Carbonate platforms in back-bulge depocenters form where tectonic accommodation is typically limited and undergoes subtle, but rapid changes that may be expressed over long horizontal distances. In addition, mixed carbonate-siliciclastic (and -evaporite?) facies successions are common in back-bulge depocenter. Thus, back-bulge carbonate systems may exhibit very complex tectonostratigraphic relation-

ships that are difficult to document in outcrop and on seismic profiles.

Tectonically enhanced, subaerial unconformities are likely to develop in the wedge-top depozone and on the crest of the forebulge. To first-order, flexural models might explain porosity distribution in subunconformity carbonate strata, especially where the foreland plate has high rigidity and fault reactivation/creation is minimal, but detailed, regional mapping of unconformity surfaces, establishment of high-resolution chronostratigraphic relationships, and 3D porosity distributions are typically poorly known.