

Lithospheric Flexure and Related Stratigraphic Cycles in the Putumayo Basin, Colombia

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In continental forelands basins the response of the underlying elastic lithosphere via flexure to tectonic and sedimentary loads ultimately controls base-level related sedimentary-cycles in upstream fluvial-deposits, in addition to the regional geometry of the basin. Seismic and well data from the Putumayo basin in Colombia suggest a testable model showing how the nature, amount, distribution and timing of loading produce a variable, but identifiable, set of seismo-stratigraphic architecture related to each flexural event. Four chronostratigraphic units from the basin, reduced to decompacted-thickness profiles, are forward-modeled to reproduce the successive deflections throughout the evolution of the basin. Tectonic-related deflections are then calculated as the residual flexure of the first-order compensation due to sediments. Results suggest that most of subsidence in the basin is caused by sediment loading (~75% of the total) and subsidence rate varies between 60 to 140 m/m.y. Additionally, the elastic thickness of the crust in the area (~ 25 to 35 km) did not change during basin history. Seismic-reflector geometry can be indicative of the dominant subsidence regime. Hinterland-onlap shifts, for example, probably reflect changes in the subsidence rate near to the thrust belt due to tectonic loading, while continuous foreland-onlap probably reflects subsidence due mostly to sediment loading. However, forebulges, which are developed individually for each loading event, and their characteristic flanking pinch-outs, are not recognizable in the Putumayo seismic data.