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# Development of Detachment Folds in the Mexican Ridges Foldbelt, Western Gulf of Mexico Basin

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Examples of natural folds growing in a homogenous mechanical stratigraphy of alternating competent and incompetent thin layers of fine- and coarse-grained sediments are examined, and the fold growth process is quantified. Our analysis reveals that the overall response to loading of siliciclastic sequences corresponds to that of flexural flow and parallel-to-bedding heterogeneous pure shear. Folds start out as low-amplitude sinusoidal disturbances that rapidly become finite-amplitude folds of heterogeneous strain. We also derive the following scaling relations: (i) degree of amplification scales with both the height above the detachment and strain, (ii) wavelength selectivity broadens with increasing strain, and (iii) deposition of syn-sedimentary geometries is function of strain. These relations are a natural consequence of idealized area-preserving laws of fold growth. From these results we devise a method to estimate fold strain by means of an amplitude versus depth diagram. We are also able to define a progression of fold shape change as a function of the fundamental parameter strain. Initially, structures grow by limb rotation and the selective amplification of a single dominant wavelength giving rise to sinusoidal folds. When strain reaches ~8%, softening/plastic yielding around hinges results in the development of sharp fold profiles. Limbs lock their dips at 35°–45°, suggesting that growth in this stage is permitted by hinge mobility along ramps and blind faults. Moreover, hinge migration causes fold development to accelerate spontaneously. These findings suggest that conclusions relating periods of accelerated erosion/uplift in contractional structures to tectonic processes should be treated with caution.