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Improved Mapping of the Subsalt, Continent-Ocean Boundary in the U.S. Gulf of Mexico and Implications for the Structural Relief for Overlying Folds of the Passive Margin Fold-Thrust Belt

David Lankford-Bravo[1] and Paul Mann[1]

[1]Department of Earth and Atmospheric Sciences, University of Houston, Houston, Texas

ABSTRACT

The continent-ocean boundary of the Gulf of Mexico (GOM) is a fundamental crustal boundary separating Jurassic oceanic crust from thinned continental crust in the northern, U.S. GOM and the southern Mexican GOM. We integrate satellite and ship-derived gravity and magnetic data with deep-penetration seismic reflection lines to improve the location of the continent-ocean boundary (COB) in the salt area of the U.S.GOM. The COB is arcuate in the northern GOM where it changes its orientation from an east-west trend in the north-central GOM to a north-northwest trend in the northwestern GOM consistent with: (1) the Jurassic, north-south opening direction known from fracture zones and spreading center trends in Jurassic oceanic crust to the south; and (2) the north-northwest shear direction along the Western Main transform fault forming the sheared, Jurassic continental margin of Mexico. In this area of the northern GOM, our mapping supports previous workers who have identified the distinctive 'stepup fault' to delineate the COB by a downthrown continental edge and an upthrown oceanic edge. To investigate the role of the stepup of the COB for the overlying structural evolution of the convergent structures in the above passive margin foldbelt, we display sequential sections from deep-penetrating seismic lines showing that the ‘step-up’ character of the COB forms a basement footwall ramp controlling the elevation of the largest folds of the Perdido passive margin foldbelt. However, as the COB changes its orientation into the north-northwest shear direction of the Western Main transform, the vertical offset of the step-up diminishes and thereby reduces the amplitude of the overlying folds of the Perdido foldbelt. We plot dimensions of passive margin folds in relation to the vertical relief and orientation of the step-up at the COB to support this interpretation.