AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003

Jennifer A. Elder Brady, Roy W. Schlische, and Martha Oliver Withjack, Rutgers University, Piscataway, NJ

Rift-Basin Inversion: Evidence from Small-Scale Structures

Geologists have recognized evidence of rift-basin inversion from seismic and outcrop studies worldwide (e.g., northwest shelf of Australia, northeastern Europe, offshore Brazil, eastern North America, and Morocco). Rift-basin inversion can be difficult to identify because many inversion structures are subtle, even with large amounts of shortening. Furthermore, widespread erosion caused by uplift associated with basin inversion may remove evidence of inversion. Our work shows that the structural geometry and spatial distribution of small-scale structures may provide critical information about the tectonic evolution of a rift basin, including basin inversion. Data collection and analysis of small-scale structures from ten field areas in the Fundy rift basin of Maritime Canada provide strong evidence of a common extensional history. Structures studied in the field include faults and slickenlines, deformation bands, calcite veins, and folds. Structures in syn-rift strata along the NE-trending, low-angle, dip-slip faulted margin of the northwestern Fundy basin; the E-trending, variable angle, oblique-slip faulted margin of the northern Fundy basin; and the hinged margin of the southern Fundy basin all indicate NW-SE extension during Mesozoic rifting. Anomalous orientations of bedding, fault, and slickenline orientations along the E-trending faulted margin, however, indicate a second episode of deformation after rifting. Evidence includes steep to overturned beds, tight folds, rotated bedding and fault populations, faults with reverse separation, cross-cutting relationships, and overprinted slickenlines. We interpret these features as products of an episode of NE-SW shortening that affected the Fundy rift basin sometime after deposition of the youngest syn-rift strata.