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PAIRED HALF-GRABEN/CRESTAL COLLAPSE GRABEN: EXAMPLES FROM THE EARLY MESOZOIC OF EASTERN NORTH AMERICA

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Standard balanced kinematic models for the development of half-graben with listric or kinked normal faults do not account for the geometry of rift basin fill in eastern North America. Younger strata within the Newark basin show a progressive decrease in dip and also progressively onlap the basement in the hanging wall (HW) block. Inspired by the sandbox modeling of McClay and Ellis (1987), we hypothesize that half-graben formation and HW block rotation are geometrically required to fill the void which develops between HW and footwall blocks as a result of slip on faults which shallow with depth. Strata which fill the developing half-graben are also rotated, the oldest strata being tilted the most. The rotation of the HW block must be accomodated elsewhere in the HW through the development of antithetic normal faults and crestal collapse graben. According to our hypothesis, the Pomperaug basin and associated structures are the eroded remnants of the crestal collapse graben for the Hartford basin, the New York Bight basin for the Newark basin, and the Farmville basin and associated structures for the Culpeper-Danville and Deep River basins.

A consequence of the rotation of the HW block is the uplift of basement material adjacent to the developing graben. Erosion of this uplifted basement block explains the west-directed paleocurrents and HW block provenance of a majority of the sediments filling the Newark basin. The lag time between the erosion of the upturned HW basement block and the filling of the half-graben explains the onlap relationships of the sedimentary strata. This model also allows for in-basin loading to cause adjacent compensating uplift of the HW basement block, which seems otherwise inexplicable.