

Norfolk Basin Pseudo Well Modeling: Lessons Applicable to Triassic–Jurassic Syn-rift Prospectivity

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The seismically defined, undrilled Norfolk basin on the Virginia continental shelf is a Triassic–Jurassic(?) rift basin that formed during Pangea breakup through reactivation of an Iapetus closure structural element.

Using reprocessed time-migrated seismic data, syn-rift lithologies, thicknesses and age from wells in the onshore Taylorsville rift basin, a 1D geohistory model at a pseudo well location in the Norfolk basin was constructed. At this location, the thickness of syn-rift sediment deposited and subsequently eroded during Norfolk basin reactivation was consistent with that calculated for the deepest wells in the Taylorsville basin.

A “base case” model used the present-day post-rift thermal gradient of 1.44°F/100’ and ~9,900’ of syn-rift section eroded prior to the post-rift sedimentation. Other models used different thermal histories and thicknesses of missing syn-rift section.

The most geologically reasonable model indicates Triassic-sourced hydrocarbons were expelled primarily prior to the onset of the post-rift/breakup unconformity and either trapped in units subsequently inverted and eroded, or lost to paleo surface.

Applying this methodology to other eastern U.S. offshore syn-rift basins suggests that basins with less inversion and subsequent erosion of Triassic–Jurassic syn-rift may provide valid exploration opportunities.