

Integrated Crustal Characterization with Full-Lithosphere Basin Modelling as the Key to Improved Thermal Modelling in a Complex Salt Basin: Salinas Basin and Vicinity, Mexico
Venue: GeoGulf – 2021, Thursday, Oct. 28, at 1:35 PM
Authors: Caroline Burke, John Bain, Shawn Mulcahy, Cian O'Reilly, Duncan Bate

Integrated crustal and basin modeling was performed in the Salinas Basin. Inputs to this evaluation included seismic interpretation by TGS of many horizons from the Gigante 2-D Seismic, Gravity & Magnetic Survey. Crustal surfaces were created in a joint study by Bain Geophysical Services (BainGeo) and TGS, including depth to magnetic basement, mid-crust and Moho depth. The magnetic data were further interpreted to produce Curie Depth, providing an estimate of the thickness of the magnetic crust, which becomes an important input to the full-lithosphere thermal model.

In the study area there are many controls on the thermal gradient through time, as is typical of a structurally complex salt basin. Given the paucity of thermal calibration in the deep basin, we have carefully selected from a range of datasets, including well temperatures, subsurface fluid data, seep mapping and seabed heat flow data, the more robust calibration datapoints to integrate in our modelling. The thermal structure of the Campeche basin is strongly over-printed by the transient effect of the young mini-basins and thermal anomalies related to conductive salt diapirs. Taking a broader study area and by integrating the BainGeo lithospheric model in our full-lithosphere 1D basin subsidence and thermal modelling approach, we can strip out the salt basin over-print and see how heat flow from the basement impacts the temperature and thermal stress in the overlying sediments. In addition to the improved crustal model, we are able to use the Curie depth to better guide depth to the asthenosphere, enabling us to build a more robust thermal model.

This study represents the first of its kind in the Gulf of Mexico – a truly integrated geophysical and geological study, at both the regional and prospect scale, assisting the high-grading of opportunities in a basin with great variation of play & hydrocarbon phase.

