

Stratigraphic Forward Modeling and the Search for Stratigraphic Traps

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ABSTRACT

Stratigraphic Forward Modeling (SFM) is a technique by which basin fill is modeled through the processes of growth, deposition, erosion, transport and rework of siliciclastic and carbonate sediments. Sea level change and subsidence play a direct role in defining the present day geometry and composition of the sequence. SFM was used in this case to assist in finding stratigraphic traps in a basin-wide setting. Statistical methods had previously determined that stratigraphic traps were underrepresented in the population of known fields in the area, leading to the speculation that many had yet to be found. Insufficient resolution hindered the role of seismic for this purpose. Although, a rich array of paleogeographic data and studies provided sufficient input for generating basin-wide SFM models. Well and seismic data were used for calibration but the model provided more detail between and beyond the data based on constraints imposed by all mechanisms of sedimentation (e.g., sediment diffusion, sediment accumulation, steady flow, wave action). Areas of likely stratigraphic trap formation were further investigated by using a petroleum systems model (PSM) to predict the effectiveness of source, seal, maturation and migration in generating realistic volumes of trapped hydrocarbons. An iterative workflow was designed for updating the mutual interaction of the SFM and PSM models. The preliminary results predicted by the SFM and integrated with the PSM show good potential for reconstructing the currently known gross depositional environments. Continued modeling and integration, together with validation using all available data, are expected to help prioritize further exploration activities in the basin and show that deterministic quantitative modeling can be used effectively for concepts heretofore left to intuition.