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Revisiting the Subsalt Trap Archetype Classification Scheme After Eight More Years of Gulf of Mexico Subsalt Drilling

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Subsalt exploration in the Gulf of Mexico (GOM) remains an area of intense focus by the oil and gas industry. Successfully accessing economic hydrocarbon accumulations beneath the extensive allochthonous salt sheets in the northern GOM basin requires solving a number of geophysical, geological, and drilling challenges. In 2001, Hart and Albertin presented a geological tool which, given imaging challenges associated with complex allochthonous salt, could be used for qualitatively ranking subsalt exploration prospects according to their structural attributes.

The ranking scheme proposed by Hart and Albertin is comprised of a collection of subsalt trap archetypes, each archetype representing an important structural variation with specific trap merits and risks. These archetypes are grouped into four genetic play families, calibrated for overall prospectivity by a statistical analysis of subsalt well success rate. The statistical analysis in 2001 used a database of 69 subsalt wells; since then, at least 122 new subsalt traps have been drilled by the industry. We used this new subsalt well data to revisit the classification scheme and answer a few specific questions: does the trap family priority hold up given the subsalt successes and failures of the past eight years, do the original archetypes still represent the full range of observed salt styles, and are any revisions to the classification scheme warranted?

At a high level, the subsalt trap family prioritization still holds. All but two of the 45 new subsalt discoveries can be positively attributed to the top ranked autochthon-rooted trap family. With only two possible exceptions, where root style could not be determined, none of the other subsalt trap families yielded a single discovery in the past eight years. Further analysis of the 107 new autochthon-rooted subsalt tests suggests the following descriptive and statistical updates to the autochthon-rooted trap family:

- 1) the overall success rate of autochthon-rooted traps, which currently stands at 42%, has been favorably impacted by the emergence of the Paleogene (Wilcox) play trend,
- 2) the trap family has been broadened to include cases where traps form above deep Cretaceous salt allochthons, and above Louann salt that has crept onto younger oceanic basement,
- 3) northward and westward expansion of the deepwater subsalt play fairway necessitates the addition of new end-member archetypes within the autochthon-rooted family,
- 4) the industry will be challenged to maintain the high success rate for the autochthon-rooted trap family as subsalt exploration focus within the GOM shifts from the lower slope to more complex subsalt traps of the middle to upper slope.