Tuesday, January 31, 2011

Joint HGS International and North American Dinner Meeting

Westchase Hilton • 9999 Westheimer
Social Hour 5:30–6:30 p.m.
Dinner 6:30–7:30 p.m.

Cost: $28 Preregistered members; $35 non-members & walk-ups

To guarantee a seat, you must pre-register on the HGS website and pre-pay with a credit card.
Pre-registration without payment will not be accepted.
You may still walk up and pay at the door, if extra seats are available.

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Recognition of and Regional Controls on Syn-halokinetic Growth Stratal Patterns in Carbonate Platforms from Extensional Basins

Carbonate platform facies that form above actively deforming salt comprise an important play type in many sedimentary basins, although the timing, location, intensity, and style of salt deformation relative to platform growth create a vast array of syn- and post-kinematic stratal patterns within the platforms. Recognition of syn-halokinetic stratal patterns is critical for predicting facies within these platforms, which will be the focus of this presentation. Syn-halokinetic stratal patterns within individual platform systems depend on many factors, including the styles and kinematic history of salt structures, the volume of original salt available, background eustatic fluctuations, longer-wavelength tectonic subsidence patterns, the types of carbonate sediment created within all parts of the platforms, and accumulation rates for sediment that fills depocenters adjacent to the platforms.

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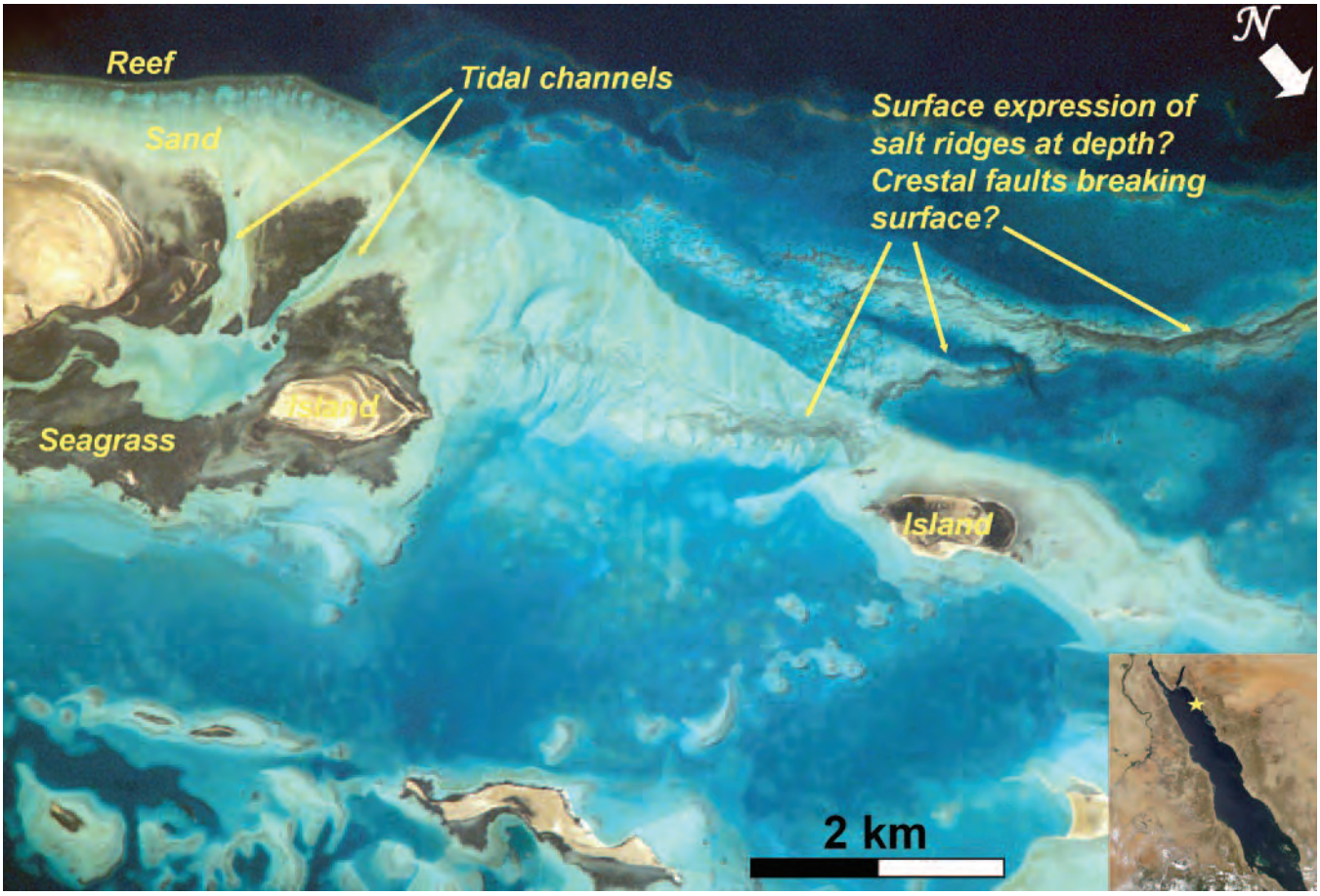

Saudi Arabian Shelf, Red Sea

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Salt structures also vary depending on tectonic setting, with many syn-halokinetic carbonate platforms forming in extensional basins (i.e., sag basins, rifts, and passive margins). Incipient salt diapirs typically create broad domal highs at the seafloor, with plan-view shapes that initially reflect the width and depth of the initial perturbation on the top salt surface. For any given size/shape of the initial salt diapir, seafloor deformation will be expressed over a wider area if there is a thicker pre-halokinetic stratigraphic succession above the salt. As diapirs rise, however, and salt withdraws from adjacent depocenters, platforms may form fringing systems around the diapir or the platforms may shift laterally into the area of salt withdrawal. In extensional salt provinces, detailed analysis of growth stratal patterns within syn-halokinetic platforms also indicates when salt welds form. Several examples will be shown to provide archetypes for understanding syn-halokinetic strata.

Recognition of syn-halokinetic stratal patterns is critical for predicting facies within these platforms

Salt structures in sag basins are dominated by salt diapirs and pillows; regional extension or contraction is limited because initial salt volumes are typically small or are spatially restricted across the basin and "regional" basement dip is gentle. In rift basins and along passive margins, however, rift-related basement topography and original salt thickness influence salt-related deformation, with gravity sliding/detachment becoming important along passive margins. Near the updip depositional limits of original salt, small salt diapirs/pillows and minor salt-withdrawal features are typical; along-strike variations are related to regional variations in the amount of syn-rift extension. The zone of limited salt updip changes downdip into an extensional province. Typical syn-halokinetic carbonate platforms in the extensional province include: (1) isolated platforms on rotated fault blocks (i.e., "rafts") with internal growth strata that grossly mimic patterns observed in syn-rift carbonate platforms; (2) isolated platforms on turtle structures with internal growth strata that can record growth of the turtle; and (3) land-attached, mixed siliciclastic-carbonate ramps and shelves that form in fault-bounded withdrawal depocenters or over crests of late-stage turtle structures.

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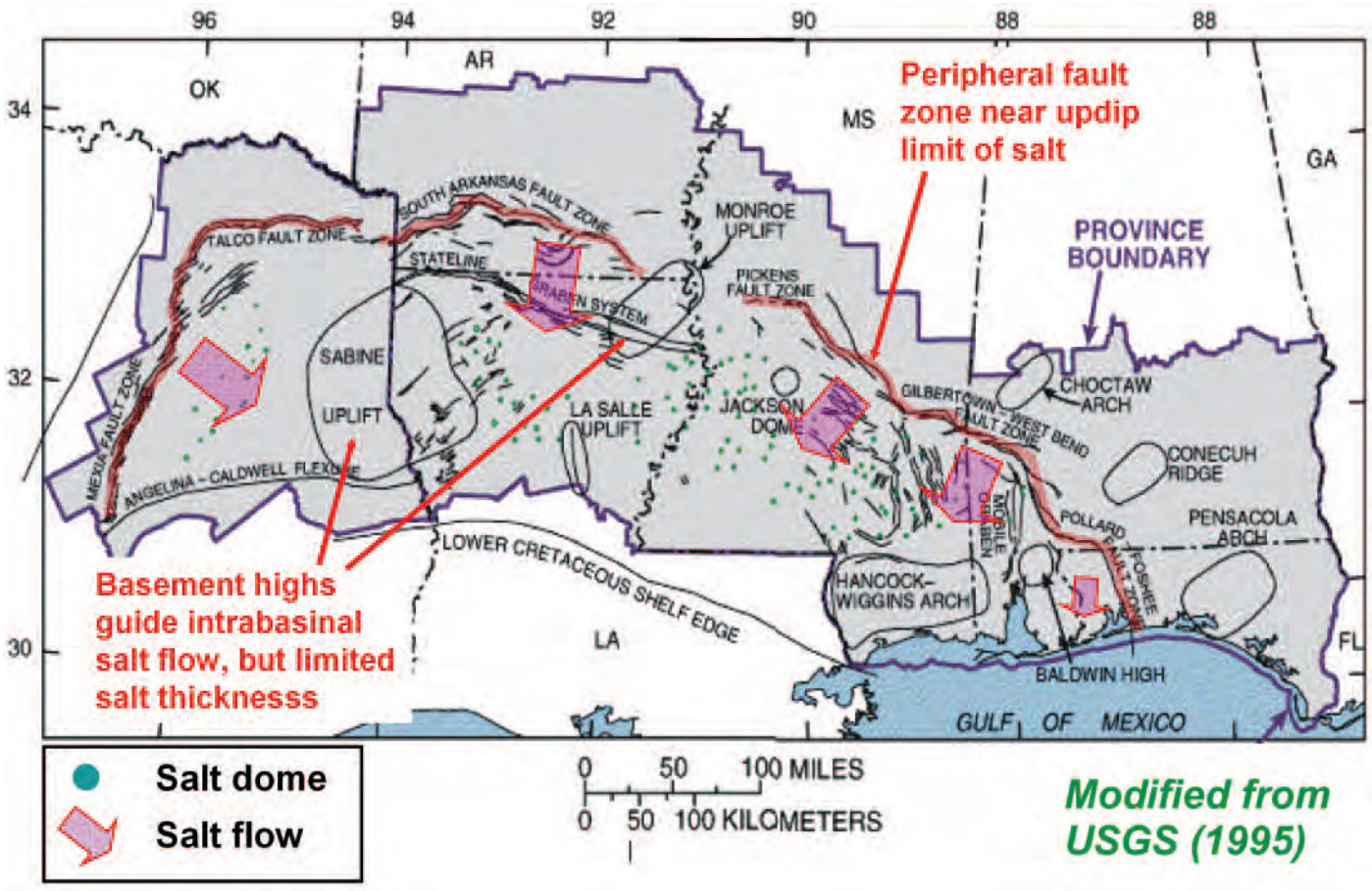

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Extensional deformation changes downdip into a transitional (or translational) province, which is characterized by large salt diapirs, ridges, and some allochthonous salt bodies, and ultimately, a contractional province at the downdip limit of salt deformation. The seaward limit of syn-halokinetic platform facies is generally found within the transitional province, where water depths typically become sub-photic and shallow-marine carbonate facies are unable to form. Significant salt-related uplift of the seafloor, however, can provide local shallow-water substrates for isolated carbonate platform development, even far offshore. Syn-halokinetic carbonate platform facies are rarely associated with allochthonous salt bodies because water depths in the zone of contraction are simply too great for shallow-marine carbonate sedimentation.

Examples of syn-halokinetic carbonate platform reservoirs are found in the Upper Jurassic Smackover Formation of the Gulf of Mexico, middle Cretaceous units of the South Atlantic conjugate margins, and in the Miocene of the Red Sea region. Accumulations of oil and gas can be significant (>250 MMBOE) in syn-halokinetic platforms, but special conditions may be necessary to form large accumulations, which will be discussed during the presentation. ■

Biographical Sketch

Steve Dorobek is a carbonate sedimentologist and stratigrapher with BP America in Houston. He provides technical services and assessment to various business units within BP, with emphasis on pre-salt reservoirs and petroleum systems of the South Atlantic margins. Dr. Dorobek received his B.S. in geology from Ohio University and his Ph.D. in geology from Virginia Tech. He previously was a professor at Washington State University and Texas A&M University and was with Maersk Oil and Gas in Copenhagen, Denmark, prior to joining BP. He has served on numerous committees for AAPG, SEPM, and GSA, and as an Associate Editor for the *GSA Bulletin* and *Journal of Sedimentary Research.*