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# The ExxonMobil Lacustrine Collaborative: Idaho Hot Springs Limestone as an Analog Addressing Lacustrine Carbonate Reservoir Presence and Quality

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Lacustrine carbonate deposits, such as those identified in the Aptian pre-salt section of offshore Brazil, have the potential to be part of highly productive hydrocarbon systems. However, despite recent success in the pre-salt, there is still much to be learned with respect to the predictability of carbonate reservoir quality and presence, porosity development, and sequence stratigraphic concepts for these systems. To address these challenges, ExxonMobil initiated the Lacustrine Carbonate Collaborative (LCC), which consists of a team of corporate carbonate and limnogeology experts, exploration staff, academic partners and consortia. Utilizing an integrated approach, the LCC has compiled a comprehensive digital lacustrine carbonate data / knowledge base, populated with an extensive literature review and targeted field mapping of relevant outcrops. To highlight the LCC's approach to better understanding the variability in lacustrine carbonate organization, we present findings from one of the outcrop analogs: the Miocene-aged Idaho Hot Springs (IHS) Limestone, Idaho USA.

Deposited in a series of lakes in the extensional basins of the proto-Snake River Plain, the IHS limestone consists primarily of microbial boundstone and grainstone lithofacies, with other minor carbonate and siliciclastic constituents. Microbial growth was robust, and perhaps even enhanced, by local syn-depositional volcanic activity. Lithofacies stack in repeated patterns on a dm to m scale, and an idealized parasequence was recognized. A typical succession consisted of a skeletal-dominated grainstone at the base, overlain by vase-like microbial bioherms that grew up and out, until coming in contact with neighboring bioherms. Lateral organization and continuity of lithofacies also followed predictable patterns, allowing for interpretation of paleobathymetry, limnologic conditions and paleogeographic conditions of the lake.

Reservoir quality was observed to be strongly influenced by lithofacies, position within a parasequence, and exposure-related diagenesis. In general, microbialites and grainstones have the best primary porosity. Microbialites were also shown to have dissolution and minor cements, most commonly associated with parasequence tops, and attributed to exposure and meteoric diagenesis.

With the recognition of these stacking patterns and lateral facies relationships, we have gained insight into the organization of this particular balanced-filled paleo-lake system. It is through these and other analogs that the LCC seeks to gain insights into the distribution and genetic organization of reservoir-prone lacustrine carbonate facies, as well as reservoir quality and diagenetic overprints, that will allow for more predictive capabilities in potentially world-class, subsurface hydrocarbon systems such as the pre-salt in offshore Brazil.