

ABIOGENIC CARBONATE RADIAL FANS AND SPHERULITES - IMPORTANT COMPONENTS OF MICROBIALITE PRE-SALT RESERVOIRS; INSIGHTS FROM THE LOWER CRETACEOUS APTIAN YUCCA FORMATION, EASTERN MARGIN OF THE CHIHUAHUA TROUGH, WEST TEXAS, USA

Andre Llanos

University of Texas at El Paso, Geological Sciences, El Paso, TX, USA
aallanos2@miners.utep.edu

ABSTRACT

In the South Atlantic pre-salt reservoirs carbonate features, such as radial fans and spherulites, have been described as commonly associated with predominately microbialite mound reservoir facies. Little is known about the conditions under which these carbonate features form, and the question arises if they could be key indicators about the geologic history of pre-salt sedimentary deposits, and their propensity to become hydrocarbon reservoirs. The Indio Mountains of West Texas provide well-exposed outcrops of Lower Cretaceous lacustrine-fluvial/deltaic rift basin strata that are a direct outcrop analog to the South Atlantic Margin pre-salt facies in terms of age, tectonic setting, and climate. We studied the geological context of both microbialites and other carbonate features (radial fans, spherulites and septarian nodules) present in lacustrine rocks of the Lower Cretaceous Yucca Formation. At our field analogue site, we identified ten stratigraphic cycles that correspond to alternating fluvial and lake deposits. Radial fan-shaped carbonates (ranging in size from cm to .5m) accreted onto septarian nodules (ranging from 2cm – 10cm), were found only in a limited area within the lowermost lake cycle. No microbialites were documented within this cycle. However, both microbialites and septarian nodules were found in the overlying cycles, where they could be correlated over distances of several kms. All together, septarian nodules, fan-shaped carbonates and microbialites correspond to only a minor portion of the entire sediment package, which is mostly calcareous siltstones and mudstones and our findings demonstrate that the fan-shaped carbonates and microbialites do not occur together in the same stratigraphic cycle. Field observations reveal that the lacustrine radial fan-like carbonates are associated with active syndepositional faults, as they are located within a distance of up to 250 m from the fault, whereas septarian nodules are found much further away (>2km) from the faults in the correlative bed. We infer that the syndepositional faults acted as conduits for calcium-rich waters reaching the surface along fault-related seeps, causing precipitation of calcite radial fans/spherulites on an alkaline lake floor, and that these conditions only prevailed during the deposition of the lowermost lake cycle.