RMS-SEPM talk February 2010

Stratigraphy and Depositional Controls on the Juana Lopez Member of the Mancos Shale, southeastern Uinta basin, Utah

Donna S. Anderson

Department of Geology and Geological Engineering, Colorado School of Mines, Golden, CO, and EOG Resources, Inc., Denver, CO

The early Late Turonian Juana Lopez Member of the Mancos Shale, defined by the ammonite zone of *Scaphites warreni*, is a widespread unit across the central and southern Rocky Mountains region, representing < 250,000 years of sedimentation. The unit spans a time of sedimentation influenced by tectonics and eustasy: 1) forebulge migration across the Western Interior Cretaceous seaway (WICS) related to Sevier thrusting and 2) eustatic and associated chemical changes across the Tethyan seaway. In this study, lithofacies and biostratigraphic data from two outcrop sections correlated to over 300 wells are combined into a stratigraphic framework and integrated with organic geochemical analyses to interpret the Juana Lopez in a study area encompassing a portion of the Book Cliffs of Utah, the southern and eastern Uinta basin, and the western flank of the Douglas Creek Arch of Colorado.

The Juana Lopez interval ranges from about 175 to 110-ft thick from north to south, respectively, across the study area. Thicker intervals lie in greater proximity to the deltaic complexes feeding the offshore system. Proximal facies contain higher net-gross sandstone with higher facies diversity including plane-parallel, swaley to hummocky cross-stratification and wave-, current and combined-flow ripple stratified sandstone interbedded with silty to clay-rich mudrocks. Proximal gamma-ray log successions show coarsening-upwards trends reflecting cycles of basal mudrocks overlain by rippled sandstone, and ultimately capped by plane-parallel and swaley cross-stratified sandstone. In distal positions, facies are completely dominated by varying and alternating proportions of organic-rich claystone and thin, discontinuous successions of combined-flow ripples. Gamma-ray log successions show spiky indistinct patterns in these distal positions. Paleocurrents at distal locations show dominantly SSW, or shoreline-parallel, paleoflow likely reflecting storm-induced geostrophic currents.

Juana Lopez facies in the study area are of entirely marine origin and, in distal positions, were deposited under dysoxic to anoxic conditions. Marine inoceramids and ammonites are common in both proximal and distal study locations. In the distal outcrop at Westwater, Utah, monospecific (prionocyclid) clusters of juvenile ammonites commonly are concentrated on scour surfaces at the bases of ripple-formset beds, much like death assemblages. Palynological studies near the distal outcrop succession show that the microfauna in the Juana Lopez are highly restricted (low-diversity) compared to older and younger Mancos units. In addition, the Juana Lopez mudrocks typically have TOC >3 wt % and hydrogen index values between 350 and 450, which are much higher than those of under- and overlying marine mudrock units.

Depositional controls on the Juana Lopez across the study area reflect interplay of tectonics and eustasy. First, the Juana Lopez in the study area was deposited across an embayment on the western side of the WICS. Coalesced coeval deltas to the west, northwest and north that received sediment from the rising Sevier thrust wedge created the landward margin of the embayment. The seaward margin may have been constrained by forebulge-related low-relief submarine sill that restricted circulation in the embayment, leading to dysoxia. Second, the Juana Lopez interval was deposited during a 2nd to 3rd-order transgression of the Tethyan seaway into the WICS. Associated with the eustatic sea-level rise was an early late Turonian global oceanic anoxic event (OAE) in the Tethyan seaway termed the “Hitch Wood” event (Jarvis et al., 2006). The combination of factors may have enhanced the conditions necessary to deposit and preserve significant amounts of organic carbon in Juana Lopez marine mudrocks.

Back to the RMS-SEPM Luncheon Abstract Archive