High Resolution Stratigraphy and Structure of an Unusual Woodford Outcrop, Arbuckle Mountains, Oklahoma

Caleb Bontempi and Roger Slatt
University of Oklahoma

Abstract

Detailed facies analysis and high resolution sequence stratigraphy were investigated at a previously un-described outcrop of the Woodford Shale in the Arbuckle Mountains, Oklahoma, which contains a complete stratigraphic section of the Woodford with associated bounding unconformities at the top of the Hunton Limestone and base of the Sycamore Lime-stone. This outcrop is unusual in that the upper Woodford is highly deformed, containing numerous tight folds, abundant fractures, and a significant intra-formational fault. Intense deformation is likely the combined result of regional Arbuckle tectonism and the thinly bedded and chert-rich nature of the upper Woodford. The unconformity at the top of the Wood-ford is marked by a well-developed paleosol, previously undocumented in other outcrops.

The Woodford Shale has been interpreted to have been deposited over an approximately 29 my time interval, making it a second order depositional sequence. Measurement of thin individual bed thick-nesses, coupled with an outcrop gamma ray log, re-veal a repetitive set of higher frequency thinning- and thickening-upward sequences that can be confidently correlated to the chemostratigraphic trends seen in the nearby Hunton Anticline Quarry. Based on spectral analysis, these sequences probably represent 3rd, 4th, and potentially 5th order cycles superimposed onto the larger 2nd order eustatic cycle. Such higher order cyclicity is consistent with MIlankovitch-scale cycles, containing 10-40 ky and 405 ky periodicities, while larger order cycles (~28 my) are interpreted to represent fluctuations in sea floor spreading rate and global tectonism.