Sesimic Imaging of a Cretaceous Fluvial System: Results from an Ongoing Study of the Potomac Formation in Northern Delaware

Claudia C. Velez[1], Peter P. McLaughlin[2], Susan McGeary[1], and Steve L. Sargent[3]
[1]*Department of Geological Sciences, University of Delaware*
[2]*Delaware Geological Survey*
[3]*Illinois State Geological Survey*

Variations in channel styles, lateral and vertical facies heterogeneity, and complex geometries in fluvial reservoirs contribute to make evaluation, production and petroleum recovery complicated. The study of ancient analogs such as the Potomac Formation, which is characterized by laterally discontinuous fluvial sand bodies, may provide realistic insights into the long-term preservation styles of fluvial deposits and their reservoir potential. A 20-km high-resolution seismic reflection dataset was collected in 2008 to precisely delineate the distribution and geometry of the Potomac sand facies. A 152-m-deep continuous-cored test hole was drilled in 2009 adjacent to one of the lines and a full suite of geophysical logs obtained. The depths of individual reflections are in good agreement with the depths of main lithologic changes seen in cores and geophysical logs at the test hole. The minimum and maximum depths imaged were ~18 m and ~ 268 m, with a resolution of ~4 m, which is sufficient to resolve sands 10 to 20 m thick in the Potomac Formation. The core, geophysical logs, and seismic data are being integrated to make a facies classification and facies maps. These will allow us to test/revise the existing facies analysis, and to test the current sequence stratigraphic model for this formation, that lowstand periods are characterized by sand-prone intervals whereas transgressive and highstand periods are characterized by more mud-prone intervals. This in turn will provide a better understanding of how the sequence stratigraphic framework, and geometry of these deposits affect the distribution of fluid flow pathways and barriers.