Regional Sequence Stratigraphic Interpretation of the Marcellus Shale

Ashley S. B. Douds, David R. Blood, and Christopher G. Willan
EQT Production, Pittsburgh, PA 15222, adouds@eqt.com

The Middle Devonian Marcellus Shale was deposited in relatively shallow water in the Acadian foredeep of the Appalachian Basin and is a proven gas source and reservoir. Several regional correlative surfaces have been identified from standard triple combo well log data and interpreted within the Marcellus. Regional correlations, incorporated with core analysis, have led to the development of a sequence stratigraphic framework for the Marcellus.

The Marcellus rests disconformably on the Onondaga Limestone and contains a minimum of two third order sequences and several higher-order, sub-regional sequences. Accommodation space for the sequences is created by subsidence in the foreland basin. The base of each sequence is represented by black, laminated shale with large amounts of detrital shell material, which, in turn, is overlain by transgressive black, organic rich shale. The black shales grade upward, as well as in a proximal direction, into gray shale which is occasionally capped by a shallow water limestone. This sequence is repeated through the deposition of the Tully Limestone, after which Acadian clastics replace the carbonates.

Identification of the systems tracts and mapping their regional distribution has highlighted differences in the nature of the grey and black shales and allowed for the creation of a depositional model. The sequence stratigraphic framework, wireline log data, core data, and petrophysical and geochemical analyses have been integrated to predict key parameters such as porosity, organic carbon content, and mineralogy and then incorporated into a general basin model to determine burial and thermal maturation history.