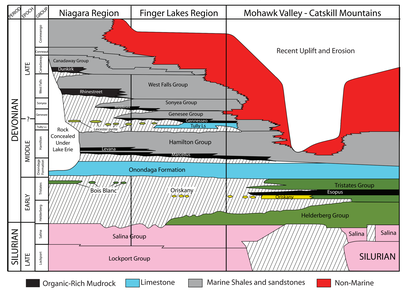
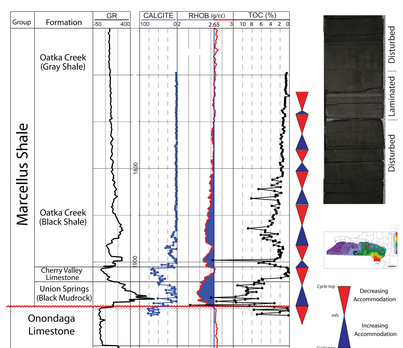
Devonian Stratigraphy



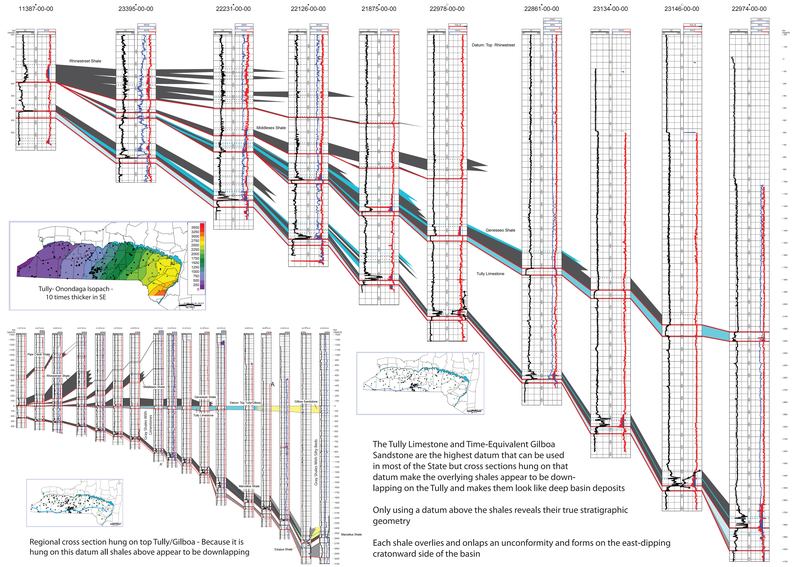
Devonian Stratigraphy showing proximity of multiple black shales to unconformities - They overlie unconformities and appear to form when there is exposed land just to the west (modified from NYSGS map)

Beaver Meadows #1 Core



Logs from Beaver Meadows # 1 which has a 300 foot core in the Marcellus. Samples were taken every 1-2 feet and analyzed for TOC and carbonate content. Density log matches TOC log very closely with values <2.65 g/cc correlating with TOC>1%. Calcite log matches the gamma ray log in the Union Springs, Cherry Valley and lower carbonate-rich Oatka Creek. Cycles can be picked with organic rich shale bases and limestone or lower TOC/gray shale caps. Limestone is common in the interval with the highest TOC values at the base.

Devonian Shale Cross Section - What A Difference a Datum Makes



Regional cross section hung on top Tully/Gilboa - Because it is hung on this datum all shales above appear to be downlapping

The Tully Limestone and Time-Equivalent Gilboa Sandstone are the highest datum that can be used in most of the State but cross sections hung on that datum make the overlying shales appear to be down-lapping on the Tully and makes them look like deep basin deposits

Only using a datum above the shales reveals their true stratigraphic geometry

Each shale overlies and onlaps an unconformity and forms on the east-dipping cratonward side of the basin

Same Data, Very Different Stratigraphic Geometries and Inferred Environments

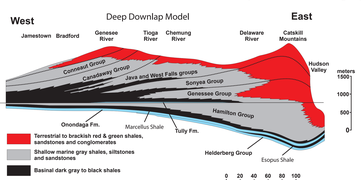
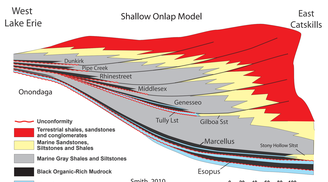
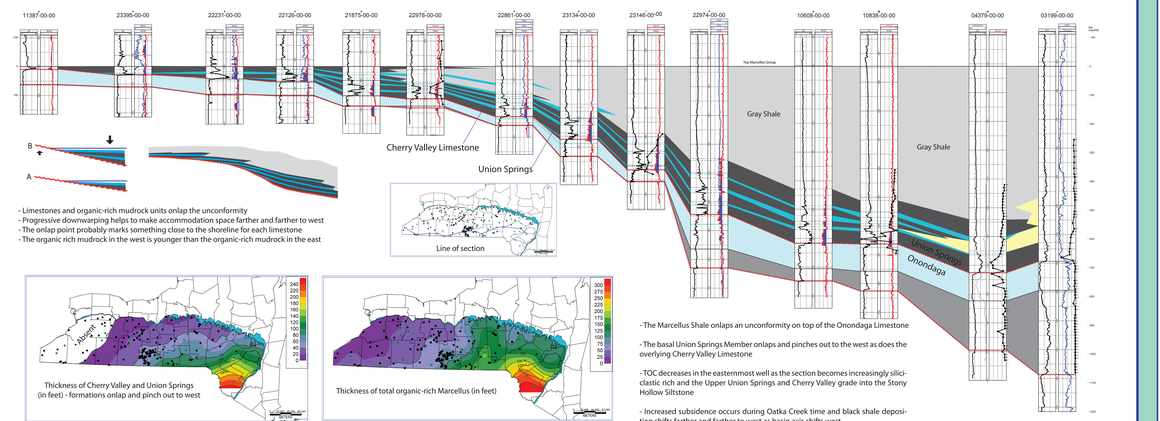


Figure modified from House and Kirchgasser (1993) for Devonian of NY is hung on Tully shows organic-rich shales forming at toe of slope and presumably the deepest part of the basin



This cross section is not hung on a datum because there is not a good datum that is above all of the black shales - it is constructed to make the black shales dip eastward - the organic rich shales are now onlapping rather than downlapping

Marcellus Cross Section



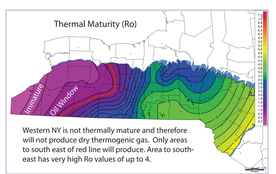
- Limestones and organic-rich mudrock units onlap the unconformity
- Progressive downwarping helps to make accommodation space farther and farther to west
- The onlap point probably marks something close to the shoreline for each limestone
- The organic rich mudrock in the west is younger than the organic-rich mudrock in the east

- The Marcellus Shale onlaps an unconformity on top of the Onondaga Limestone

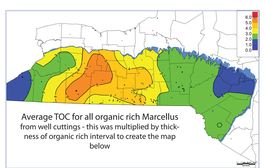
- The basal Union Springs Member onlaps and pinches out to the west as does the overlying Cherry Valley Limestone

- TOC decreases in the easternmost well as the section becomes increasingly silliclastic rich and the Upper Union Springs and Cherry Valley grade into the Stony Hollow Siltstone

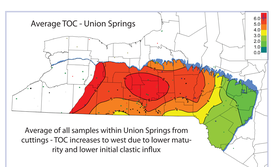
- Increased subsidence occurs during Oatka Creek time and black shale deposition shifts farther and farther to west as basin axis shifts west



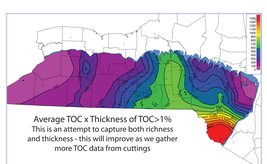
Western NY is not thermally mature and therefore will not produce dry thermogenic gas. Only areas to south east of red line will produce. Area to south-east has very high Ro values of up to 4.



Average TOC for all organic rich Marcellus from well cuttings - this was multiplied by thickness of organic rich interval to create the map below

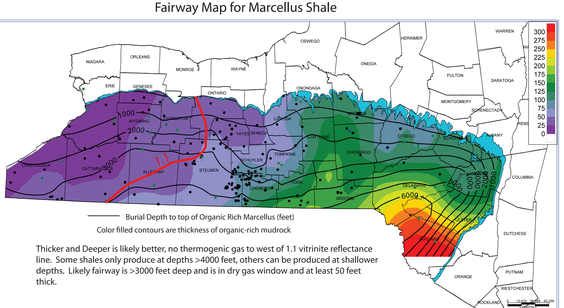


Average of all samples within Union Springs from cuttings - TOC increases to west due to lower maturity and lower initial clastic influx



Average TOC x Thickness of TOC>1%
This is an attempt to capture both richness and thickness - this will improve as we gather more TOC data from cuttings

Fairway Map for Marcellus Shale



Thicker and Deeper is likely better, no thermogenic gas to west of 1.1 vitrinite reflectance line. Some shales only produce at depths >4000 feet, others can be produced at shallower depths. Likely fairway is >3000 feet deep and is in dry gas window and at least 50 feet thick.