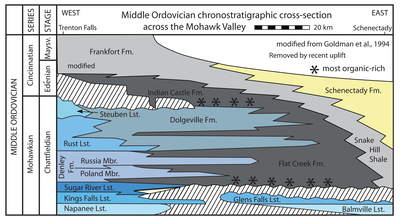
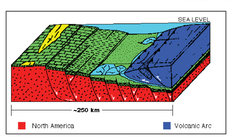
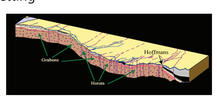


Utica Formations in Gray, Trenton Limestone Formations in blue. Organic-rich shales include the Flat Creek and Indian Castle Formations and there are Interbeds of organic rich shale within the Dolgeville and Rust Formations. The most organic-rich shales immediately overlie unconformities.

Tectonic Setting

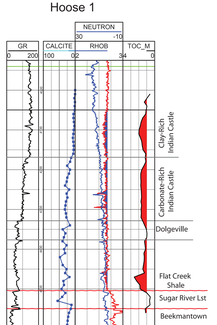


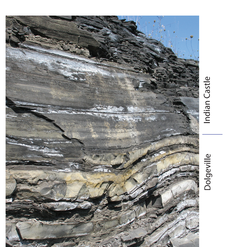
Thrust loading to east caused subsidence and normal faulting (from Bradley and Kidd, 1991) during deposition of Utica Shale



The organic rich Utica thickens into grabens that formed on the upthrown side of the major Hoffmans Fault which has several thousand feet of throw. The deep basin is on the downhrown side of the fault and there is little black shale there in the well studied.

Hoose 1

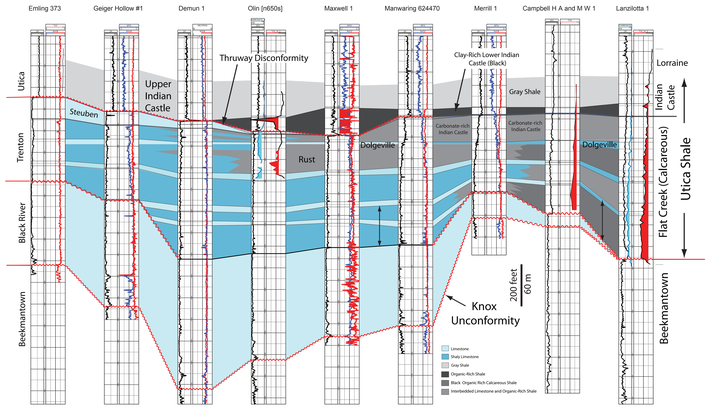


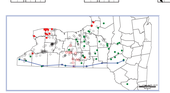


Dolgeville is a cm-scale bedded limestone and black shale and the overlying Indian Castle is a calcareous black shale at this location

As with the Marcellus, the gamma ray follows the limestone percentage and the density is lower in the organic-rich intervals. The Utica is less organic-rich than the Marcellus with most values less than 3% TOC.

Black River-Trenton-Utica Cross Section



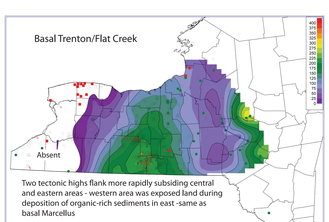


Area of greatest organic-rich mudrock accumulation was a tectonic high and exposed land prior to deposition or the most organic-rich strata (Flat Creek sits directly on Knox Unconformity in eastenmost wells)

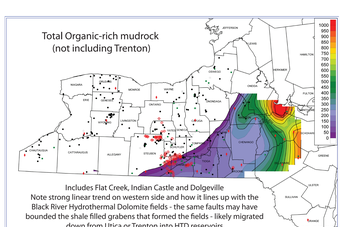
Basal Trenton pinches out to west and on high in east (see map below) - most organic-rich part of Flat Creek deposited when western NY was land

Organic-rich interbeds occur within Dolgeville and Trenton to west - there is an old overpressured Trenton Limestone gas play and it is probably from these interbeds that the gas is sourced

The Lower carbonate-rich part of the Indian Castle is probably Trenton equivalent - it is in this interval and in the transition to the clay-rich Indian castle that the highest TOC values are commonly found

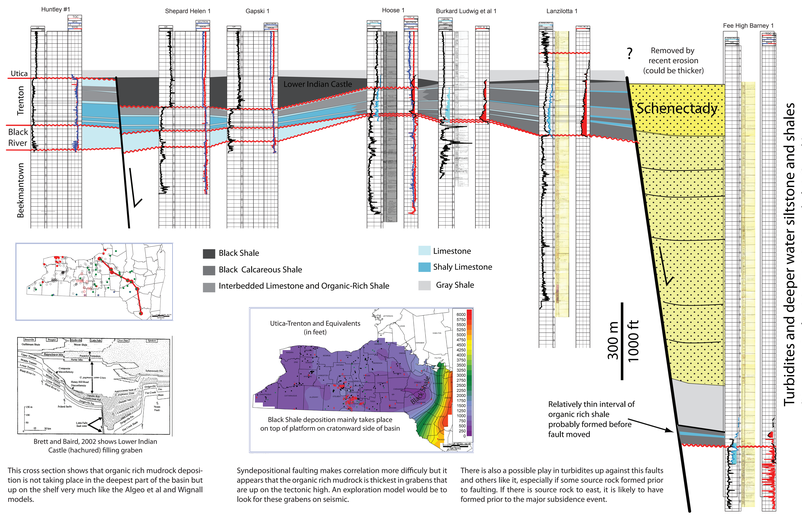


Two tectonic highs flank more rapidly subsiding central and eastern areas - western area was exposed land during deposition of organic-rich sediments in east -same as basal Marcellus



Includes Flat Creek, Indian Castle and Dolgeville
Note strong linear trend on western side and how it lines up with the Black River Hydrothermal Dolomite fields - the same faults may have bounded the shale filled grabens that formed the fields - likely migrated down from Utica or Trenton into HTD reservoirs

Platform Top To Deep Basin Cross Section



Brett and Baird, 2002 shows Lower Indian Castle (hachured) filling graben

Black Shale deposition mainly takes place on top of platform on cratonward side of basin

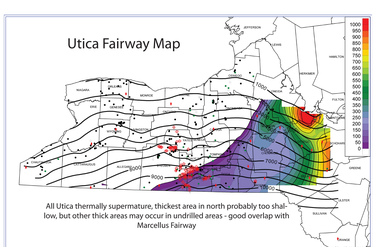
This cross section shows that organic rich mudrock deposition is not taking place in the deepest part of the basin but up on the shelf very much like the Algeo et al and Wignall models.

Syndepositional faulting makes correlation more difficuly but it appears that the organic rich mudrock is thickest in grabens that are up on the tectonic high. An exploration model would be to look for these grabens on seismic.

There is also a possible play in turbidites up against this faults and others like it, especially if some source rock formed prior to faulting. If there is source rock to east, it is likely to have formed prior to the major subsidence event.

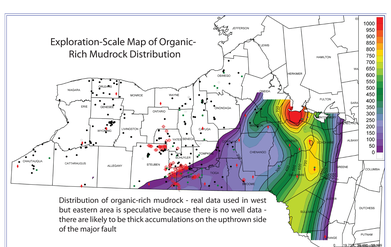
Relatively thin interval of organic rich shale probably formed before fault moved

Utica Fairway Map



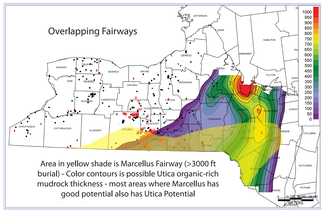
All Utica thermally supermature, thickest area in north probably too shallow, but other thick areas may occur in undrilled areas - good overlap with Marcellus Fairway

Exploration-Scale Map of Organic-Rich Mudrock Distribution

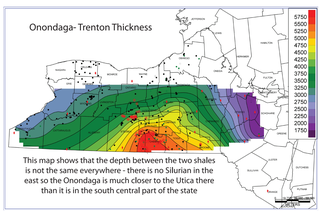


Distribution of organic-rich mudrock - real data used in west but eastern area is speculative because there is no well data - there are likely to be thick accumulations on the upthrown side of the major fault

Two For One



Area in yellow shade is Marcellus Fairway (>3000 ft burial) - Color contours is possible Utica organic-rich mudrock thickness - most areas where Marcellus has good potential also has Utica Potential



This map shows that the depth between the two shales is not the same everywhere - there is no Silurian in the east so the Onondaga is much closer to the Utica there than it is in the south central part of the state

TOC Study

We are currently conducting an intensive analysis of TOC and calcite percentage from cuttings in the Utica, Marcellus and other Devonian Shales

We will analyze more than 50 wells in the Utica and Marcellus and make the data available in las format

We have NYSERDA and seven companies supporting the work and are still looking for more sponsorship to help cover costs

Please ask for a flyer

Conclusions

Black organic-rich mudrocks and shales in both the Utica and Marcellus Shales appear to have formed in relatively shallow water (<50 meters) on the cratonward side of the foreland basin rather than in the deepest part of the basin

There was probably not a great eustatic sea level rise associated with either shale but a major increase in subsidence to the east that created relief on the platform and helps to produce a transgressive onlap of hte margin

Other organic-rich mudrocks in other parts of the world also overlie unconformities and may have formed in similar conditions