Drill Core Analysis the Rhode Island Formation, Narragansett Basin, Eastern Massachsuetts: Lithologic and Petrographic Observations

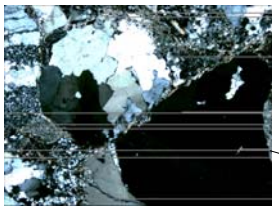
ROBBINS, Michael P. and KROL, Michael A.

Department of Earth Sciences & Geography, Bridgewater State College, Bridgewater, MA 02325, m1robbins@bridgew.edu

ABSTRACT

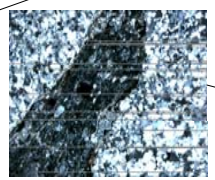
The Narragansett Basin of eastern Massachusetts represents a transtensional basin developed within the Avalon Terrane primarily during the Alleghanian Orogeny. The basin received detrital sediment, accumulating a total thickness of >5000 meters. Following deposition, the basin experienced several phases of intense deformation and metamorphism during continued orogenesis. This event is marked by the final collision of Africa with North America about 280 Ma.

This study investigated the lithology and microstructural characteristics of the Rhode Island Formation obtained from a drill core along the eastern margin of the basin near Halifax, MA. The core contains tilted layers of interbedded sandstone, shale, and conglomerate with minor amounts of anthracite coal. Microstructural analysis reveal the presence of pressure solution cleavage, quartz fibers on opaque minerals, dissolved fold limbs, and antitaxial veins, all indicative of diffusional mass transfer. Compared to the southern basin which experienced high temperature deformation and metamorphism, our results suggest deformation under significantly lower temperature conditions.



Well-Rounded sand grain showing the recrystallization of quartz and clay minerals (4X, XPL)

Typical sandstone of this lithology



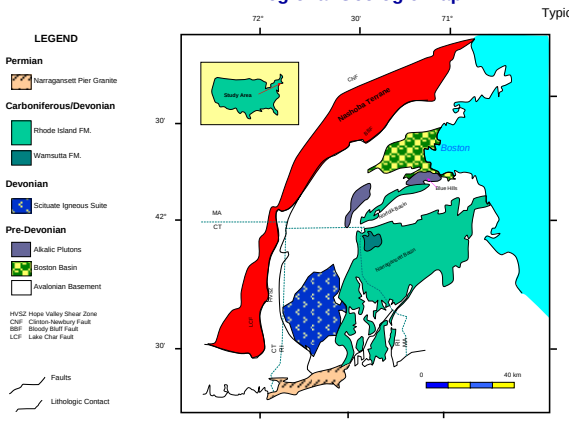
Boundary between conglomerate quartzite clasts (4X, XPL)

Finely bedded Sandy Siltstone (4X, PPL)

Typical sandstone of this lithology

Graphic phyllite showing foliation development across buckled quartz vein (4X, PPL)

Regional Geologic Map



100 ft.

200 ft.

300 ft.

400 ft.

500 ft.

600 ft.

700 ft.

800 ft.

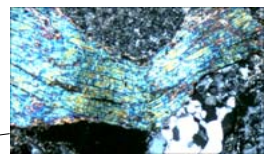
900 ft.

Typical sandstone of upper core

Mudstone clast in medium grained sandstone

Clast-dominated, polymict conglomerate

Finely bedded Sandy Siltstone (Dividers are ~5 mm in thickness)



Deformed detrital muscovite (10X, XPL)

Graphic phyllite showing foliation development across quartz vein (4X, XPL)

Graphic Phyllite in hand sample showing folitation

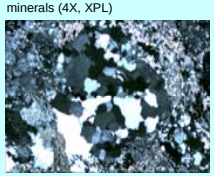
Stratigraphic Legend

- Interbedded Sandstone
- Conglomerate
- Finely Bedded Sandy Siltstone
- Sandstone
- Graphitic Phyllite
- Highly Concentrated Mudstone Inclusions

Evidence of Pressure Solution & Mass Transfer

Pressure fibers surrounding opaque minerals (4X, XPL)

Pressure fiber material in hand sample



Well-rounded quartz grain showing recrystallization of both quartz and clay minerals (4X, XPL)

Development of antitaxial quartz vein (4X, XPL)