

Detailed Sedimentology and Inorganic Geochemistry of the Dolgeville Formation and Utica Group of the Central Mohawk Valley, NY

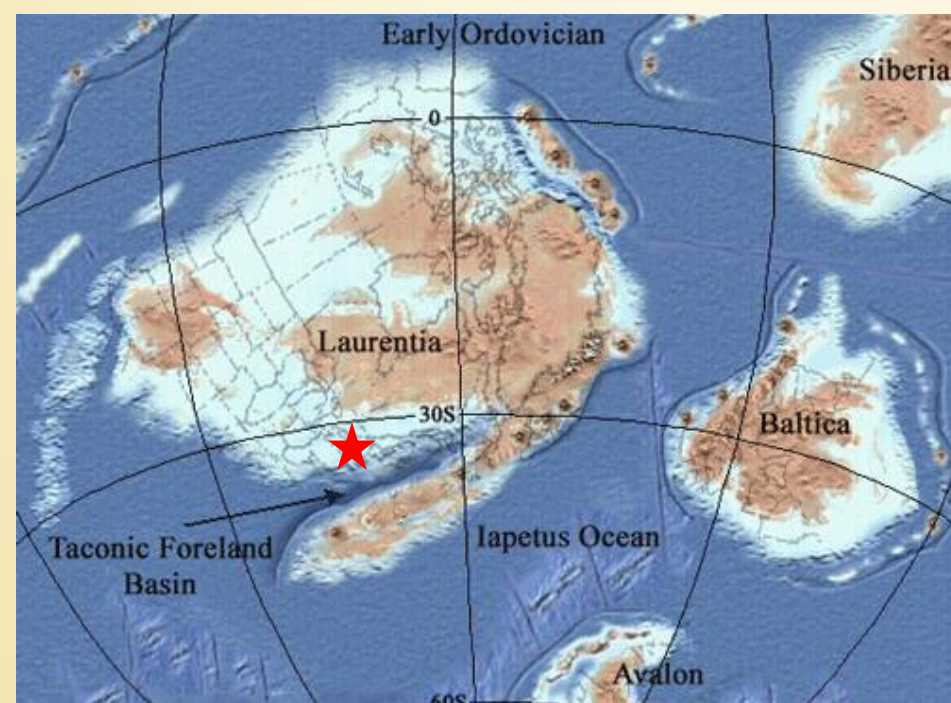
Daniel Miserendino

Jeffrey T. Pietras

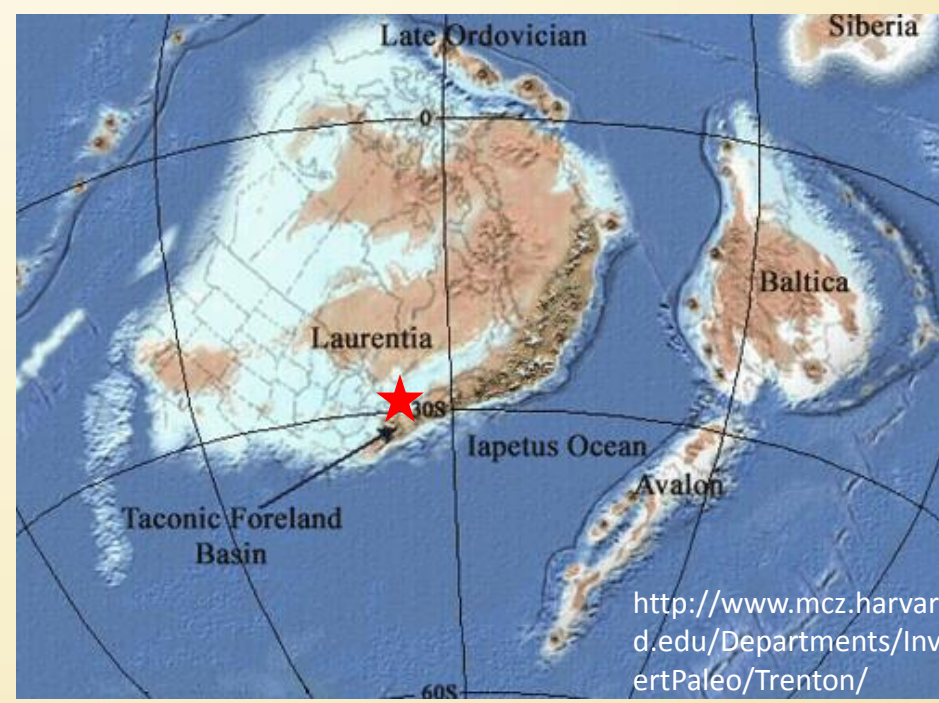
Introduction and Purpose

- Drill cores present continuous, unweathered rock record ideal for detailed sedimentologic and geochemical studies
- Utica Group (Indian Castle Shale and Flat Creek Shale)
- Trenton Group (Dolgeville Fm.)
- Study the evolution of Ordovician foreland basin by investigating:
 - Source terrain
 - Seawater chemistry
 - Sea level changes
 - Depositional processes
 - Tectonic processes

Geologic Setting

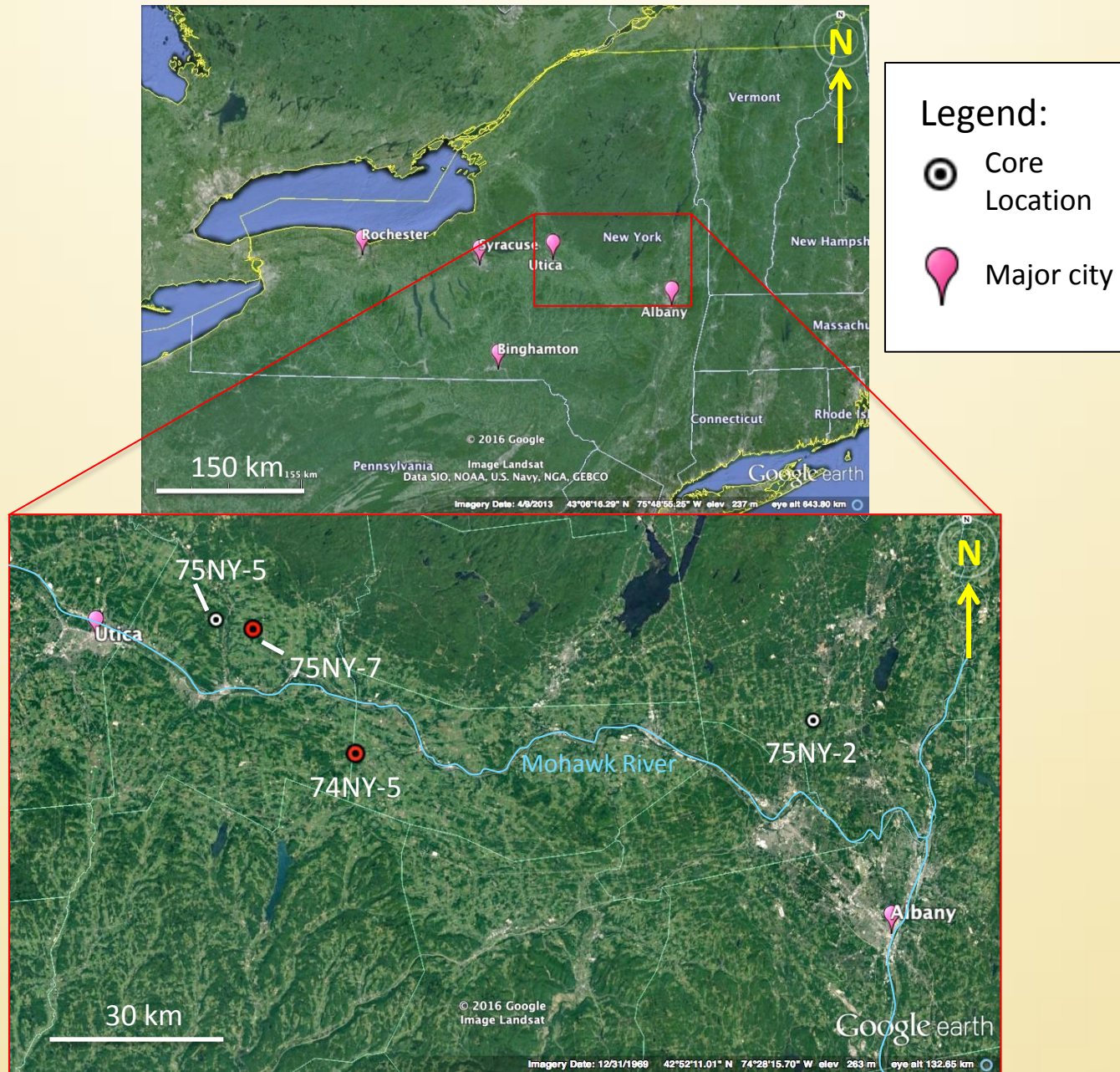


Early Ordovician: Passive margin off southwest Laurentia formed.

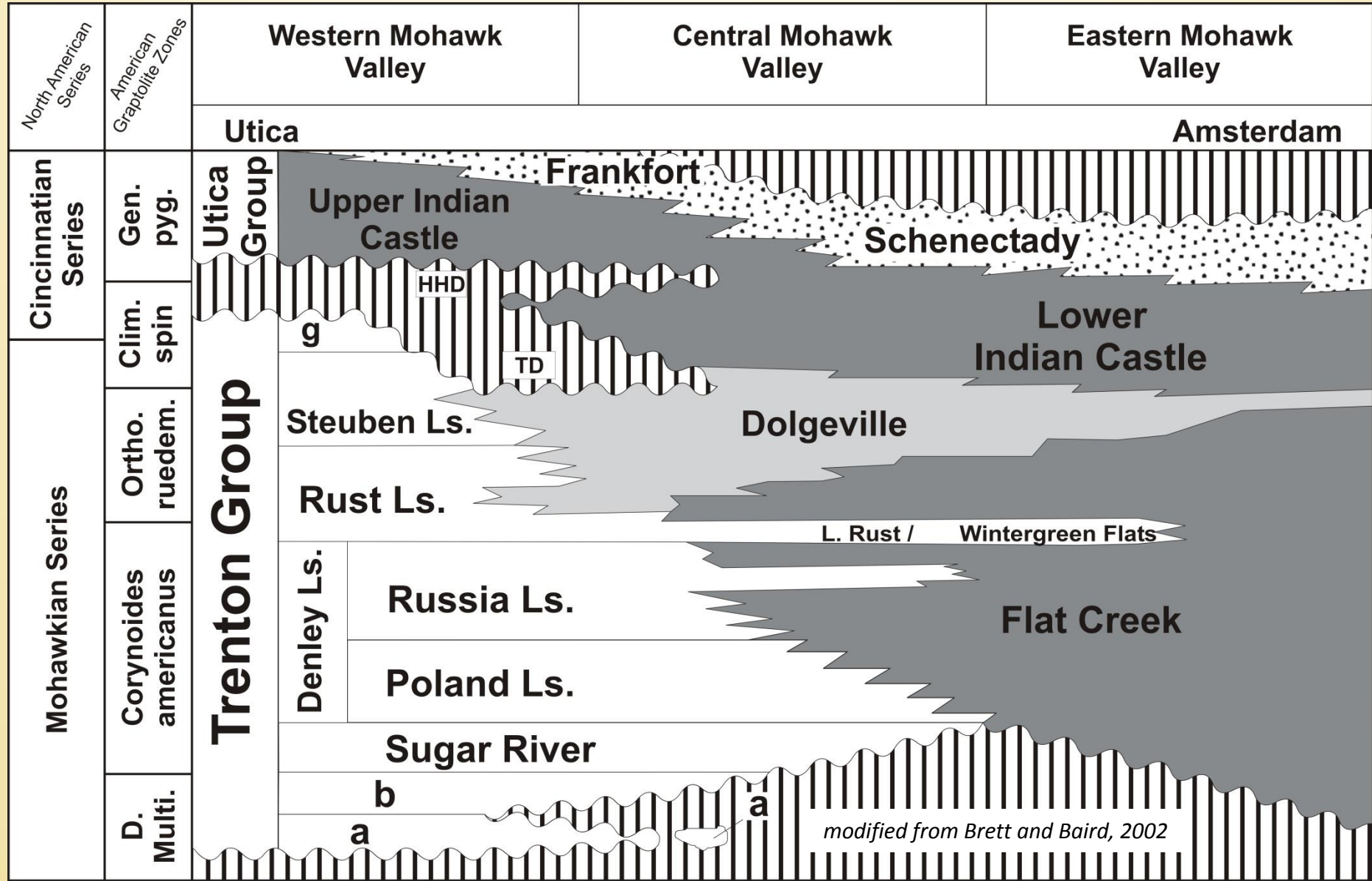


Mid-Late Ordovician: Carbonate platform developed. Onset of Taconic Orogeny.

Study Area

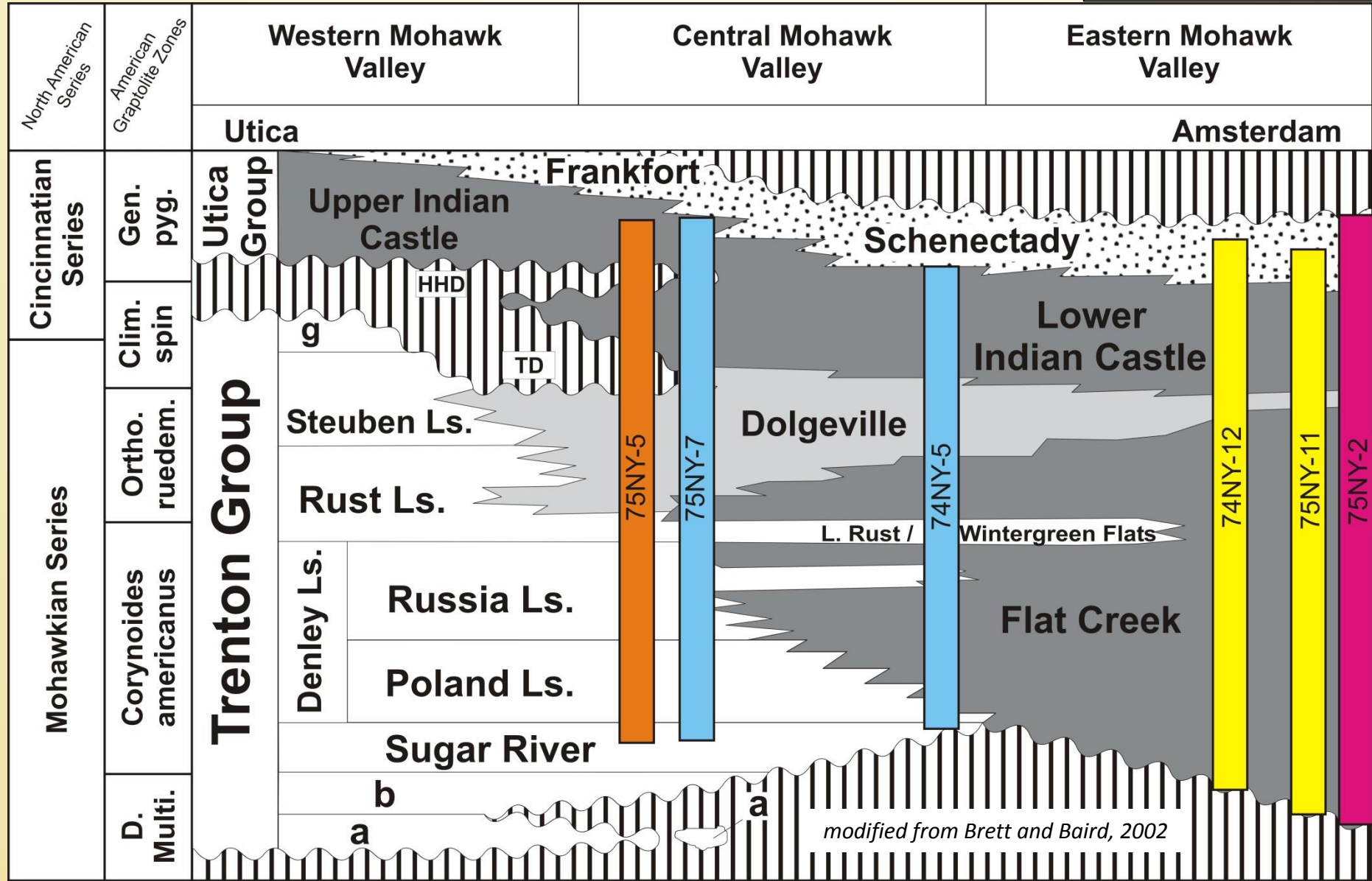


Stratigraphy

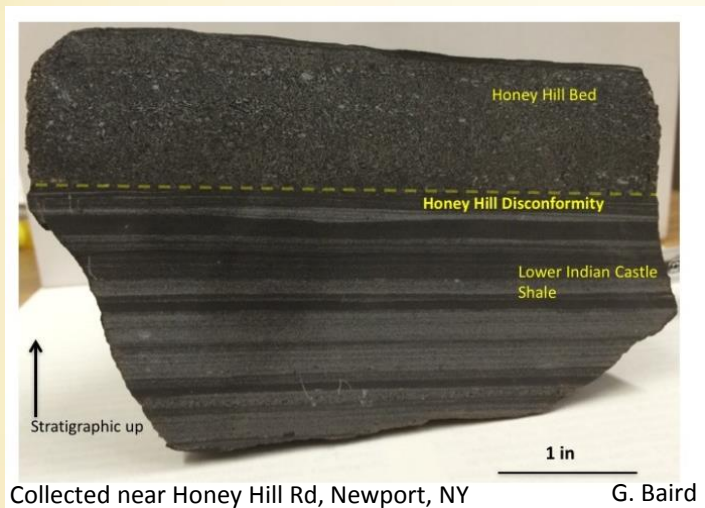


Stratigraphy

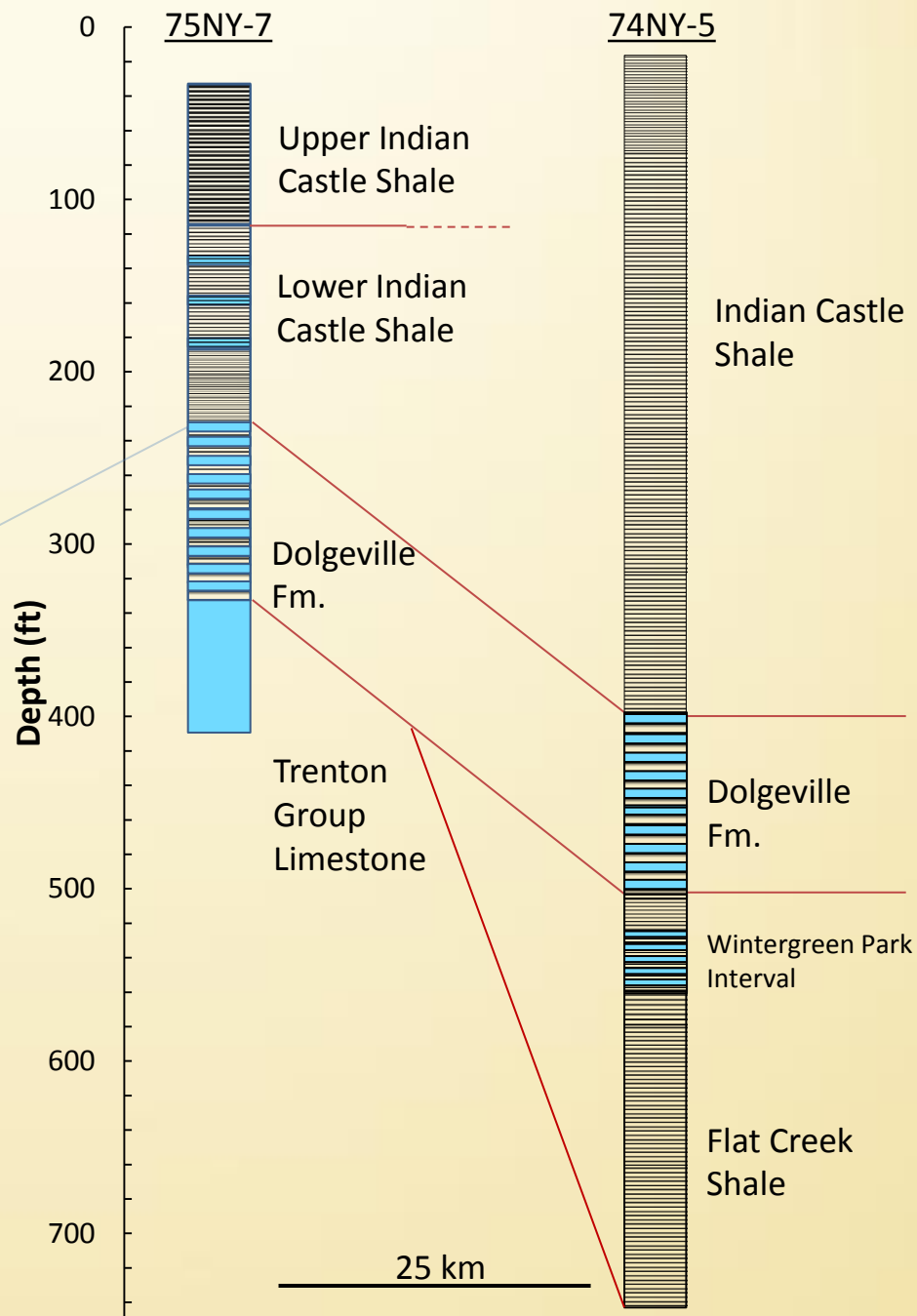
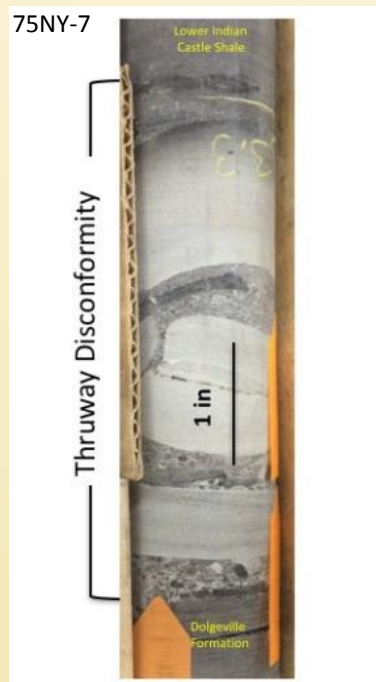
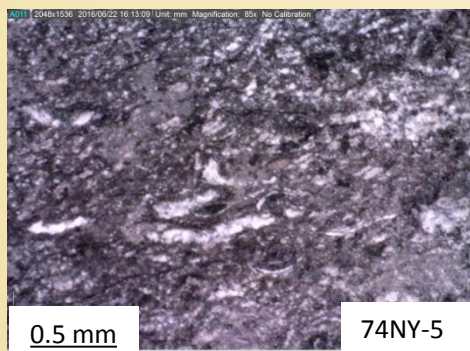
- -This Study
- -Spiegel, expected 2016
- -Jones, 2013
- -Saboda and Lash, 2014



Honey Hill Disconformity



Thruway Disconformity



Dolgeville Formation

Interbedded limestone and black mudstone



Near County Home, NY



Core 75NY-7

Interpretation:

- Alternating turbidites and low energy, pelagic mud deposition



E. Spiegel

Utica Group

Black mudstone



Dino-Lite Edge Digital Microscope



Interpretation:

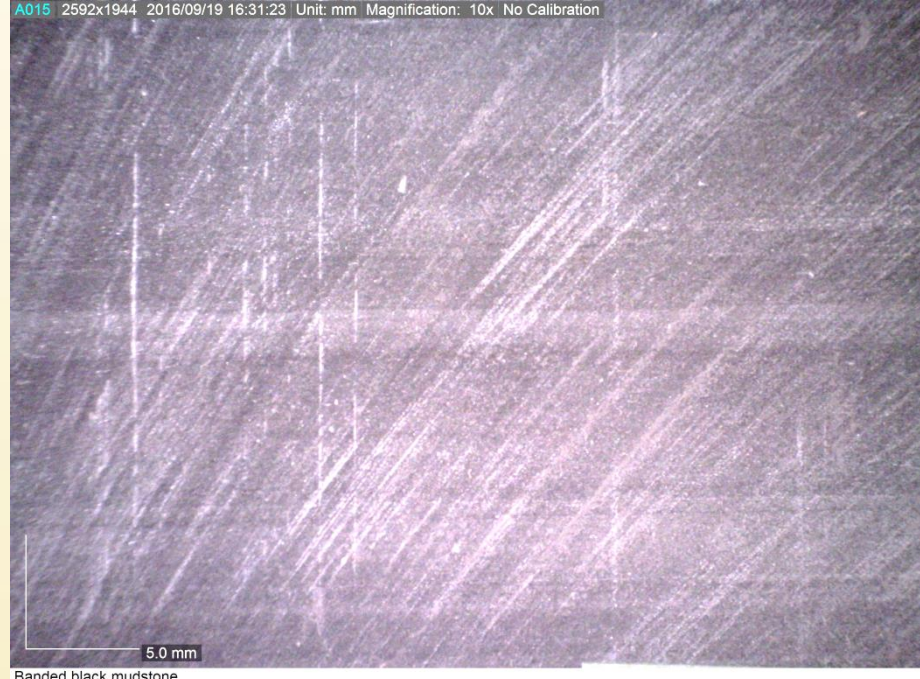
- Low energy
- Pelagic
- Organic matter accumulation and pyrite

Banded black mudstone

A005 2592x1944 2016/08/30 19:45:17 Unit: mm Magnification: 10x No Calibration



A015 2592x1944 2016/09/19 16:31:23 Unit: mm Magnification: 10x No Calibration

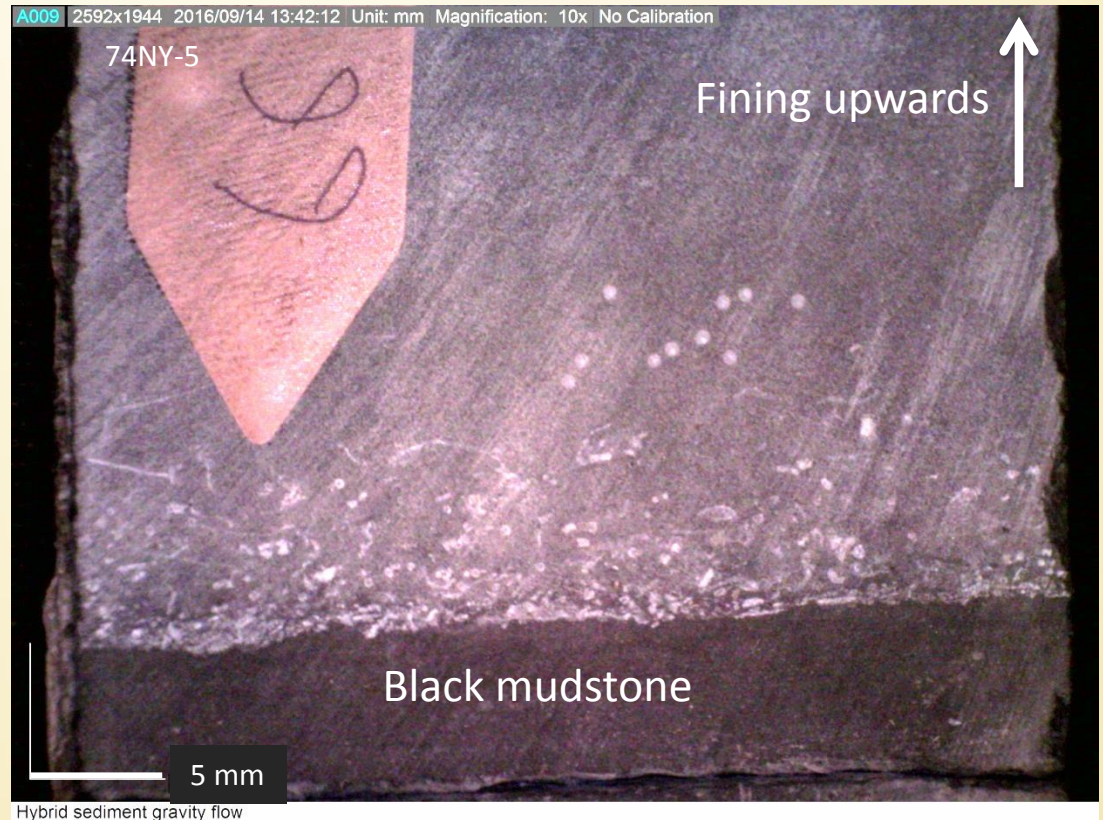


Banded black mudstone

Interpretation:

- Thin turbidites
- Change in pelagic sediment

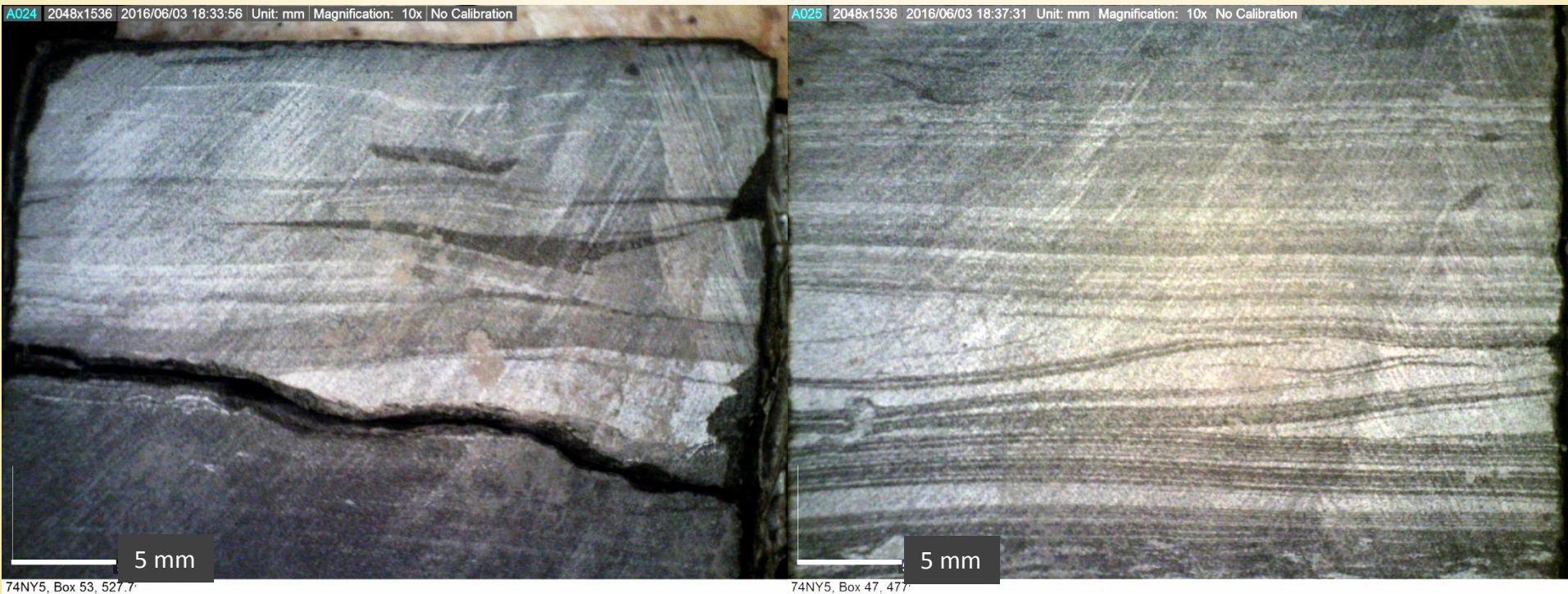
Graded gray calcareous silty mudstone



Interpretation:

- Turbidites

Cross-stratified calcareous silty mudstone



Interpretation:

- Turbidites
- Contourites

Dark gray silty mudstone

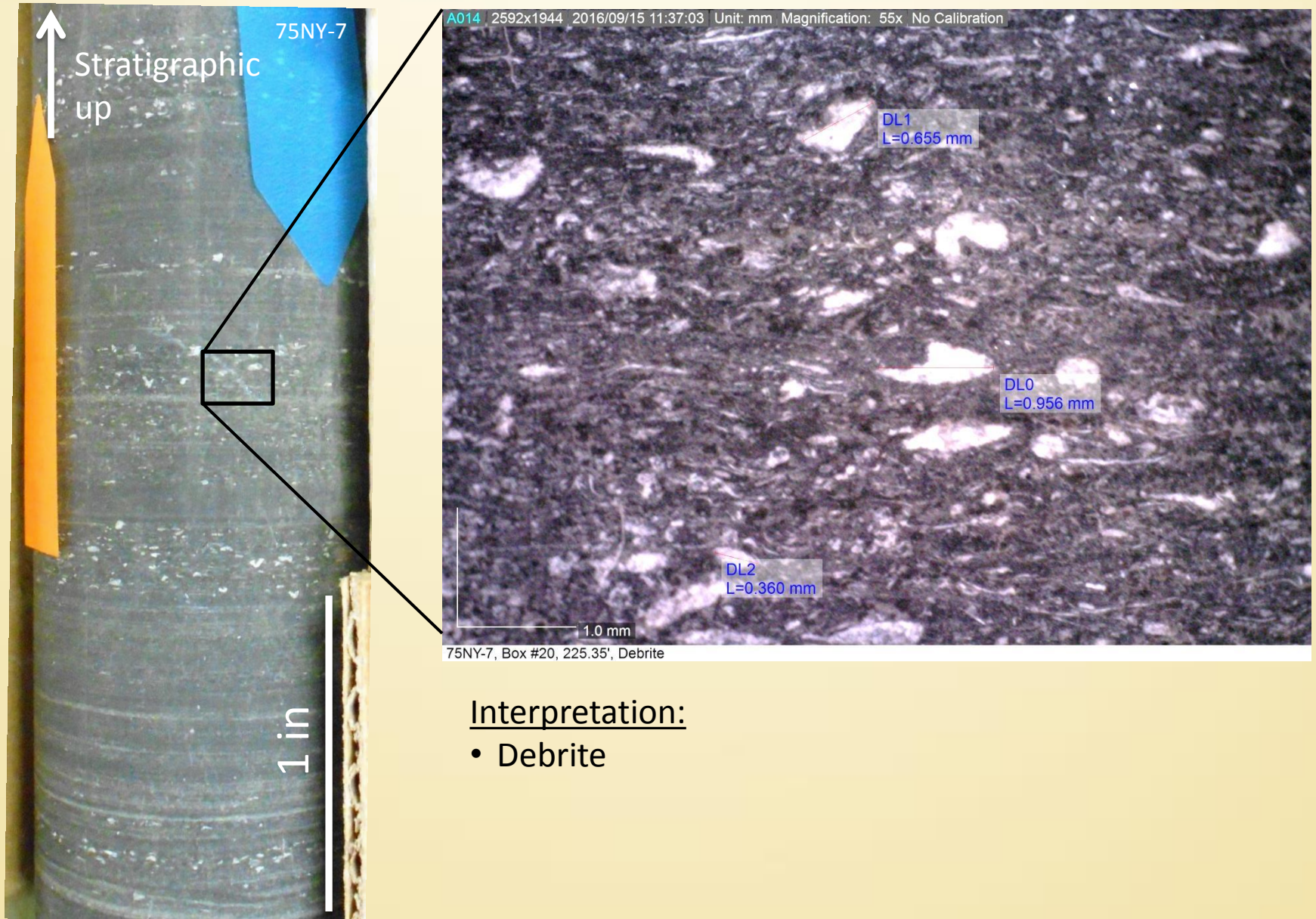


Dark gray medium-coarse mudstone

Interpretation:

- Increased silt and sand input
- More siliciclastic input, less carbonates

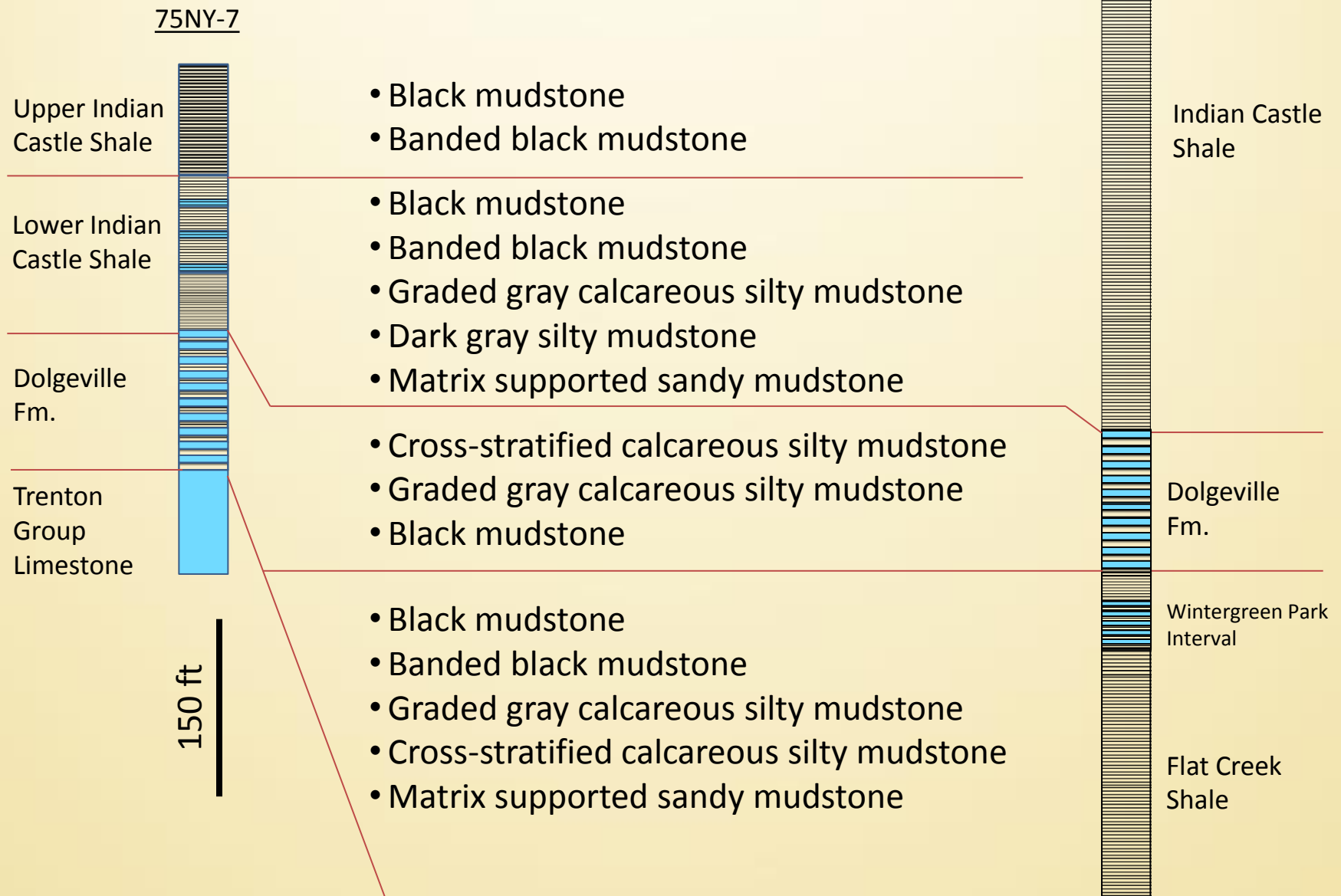
Matrix supported sandy mudstone



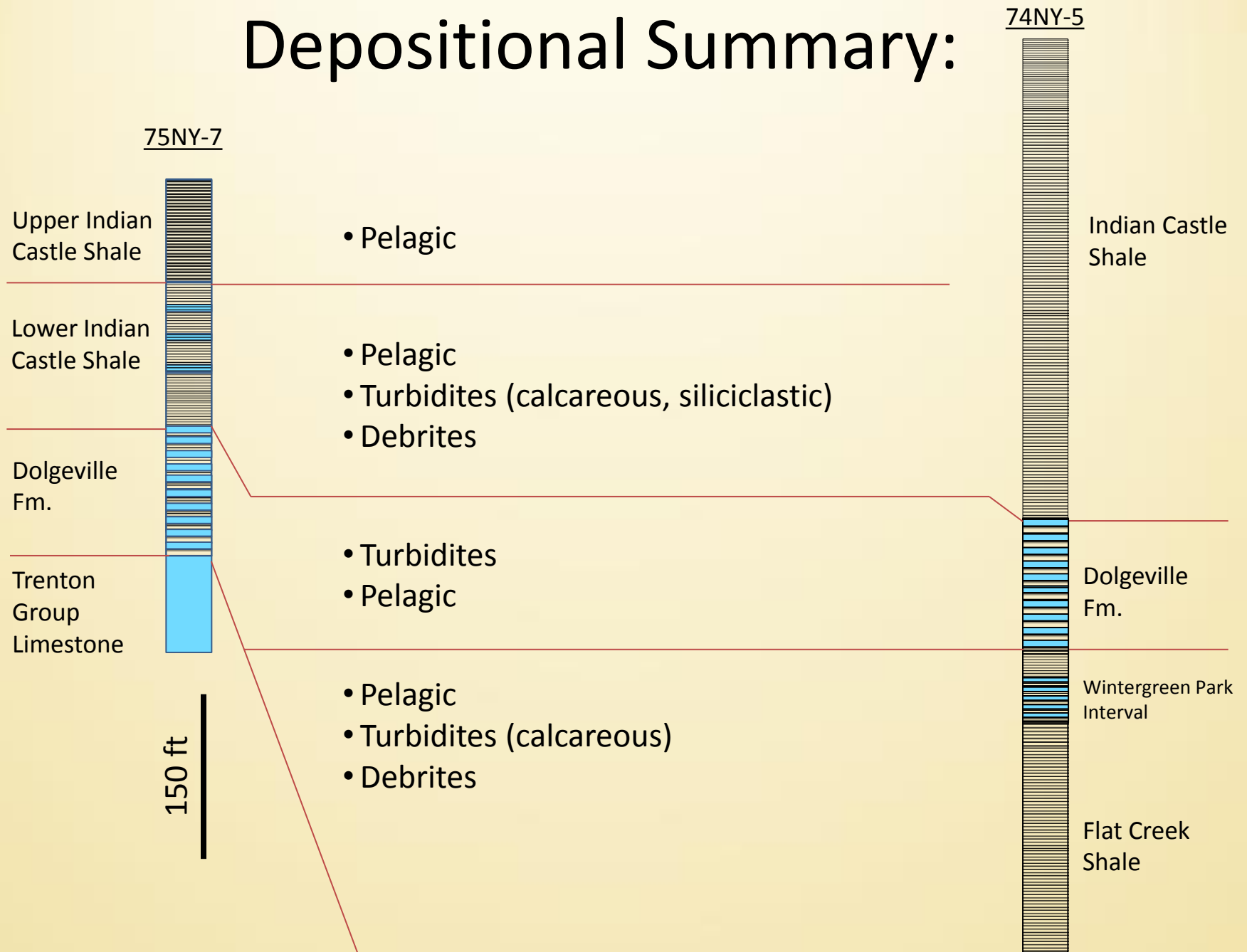
Interpretation:

- Debrite

Facies Summary:



Depositional Summary:



XRF and Rock Hardness



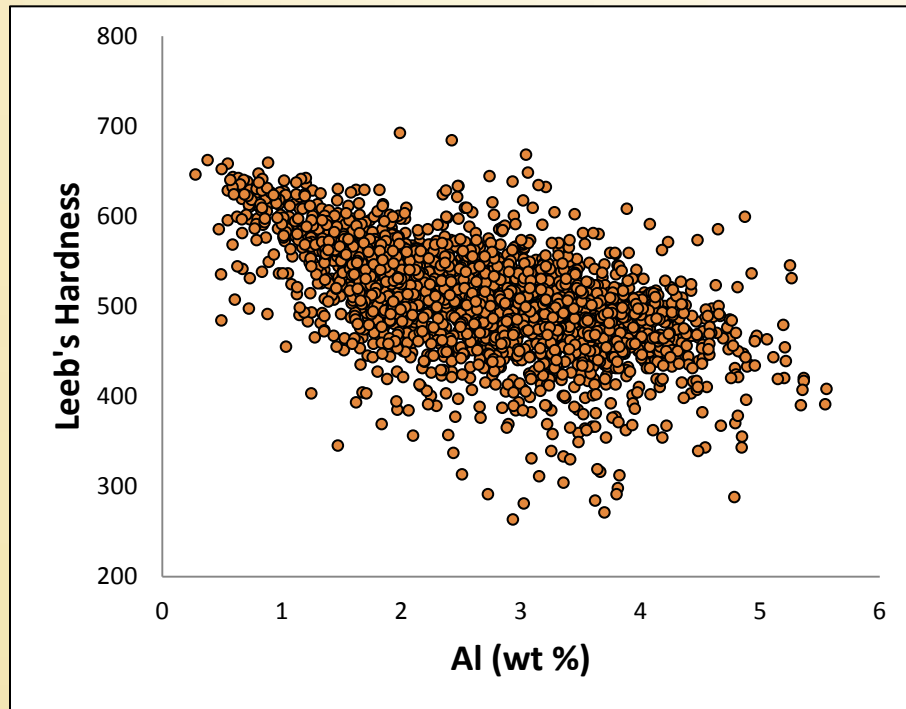
Settings	Mg to Mn	Fe to Mo
kV	15	40
μ A	25	30
Other	Helium	Yellow Filter

Measured elements: Mg, Al, Si, P, S, K, Ca, Ba, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Pb, Se, Th, Rb, U, Sr, Y, Zr, Nb, Mo



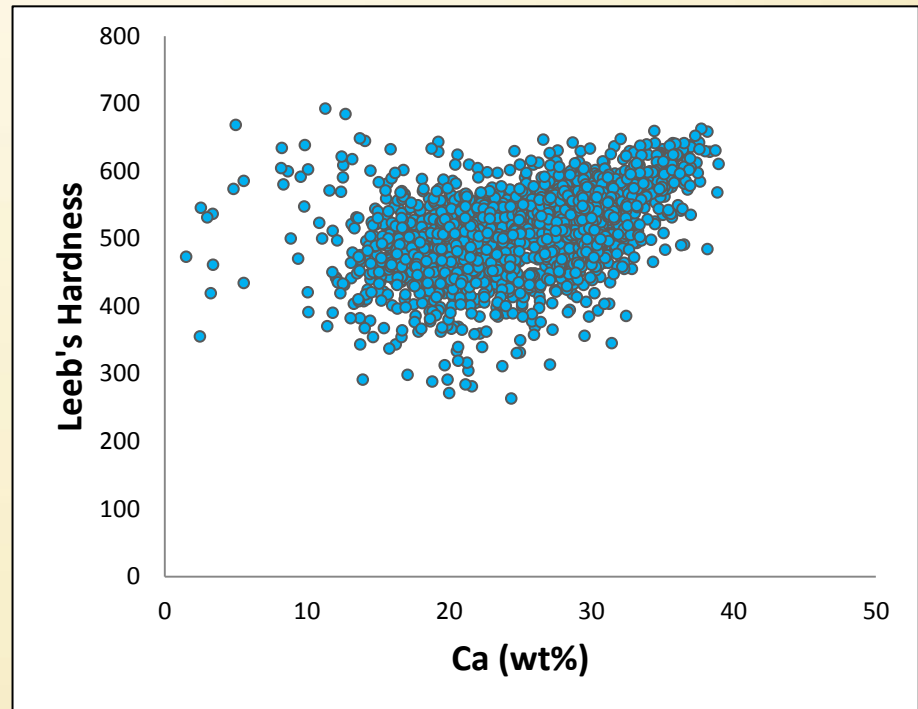
Leeb's Hardness: Indentation hardness measures resistance to material deformation

Leeb's Hardness Crossplots



Similar trend for K, Th, and Si

Soft= Clay



Hard= Carbonate



Core 75NY-7

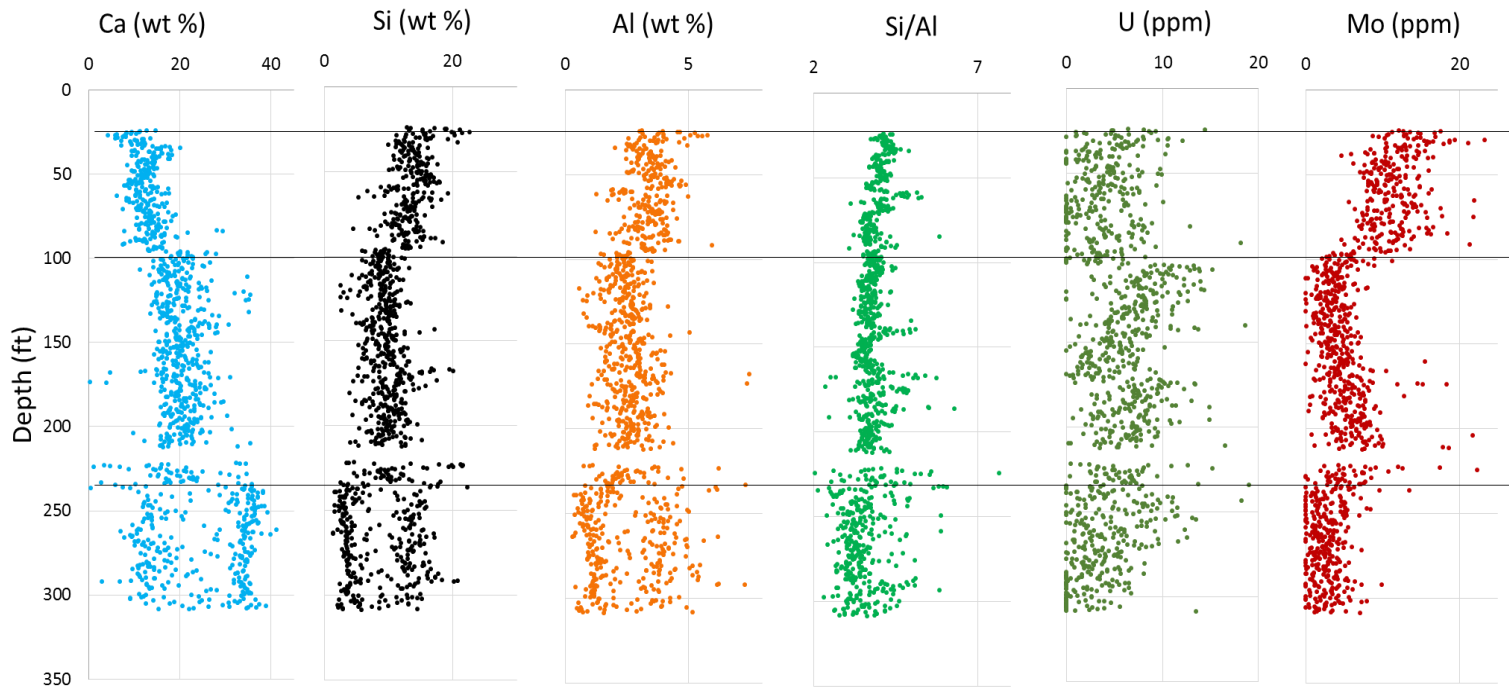
**Upper Indian
Castle Shale**

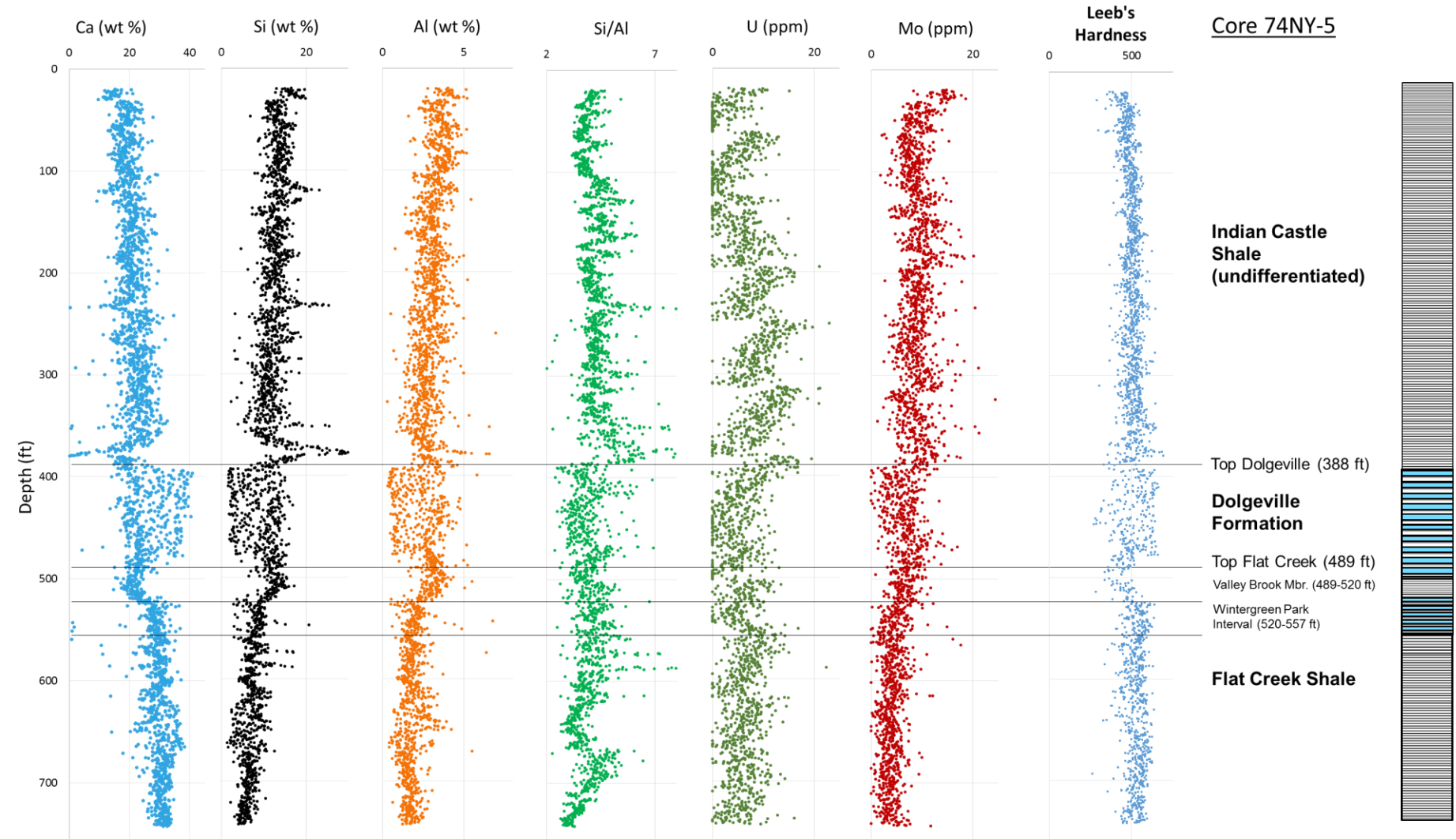
Honey Hill
Discontinuity (96 ft)

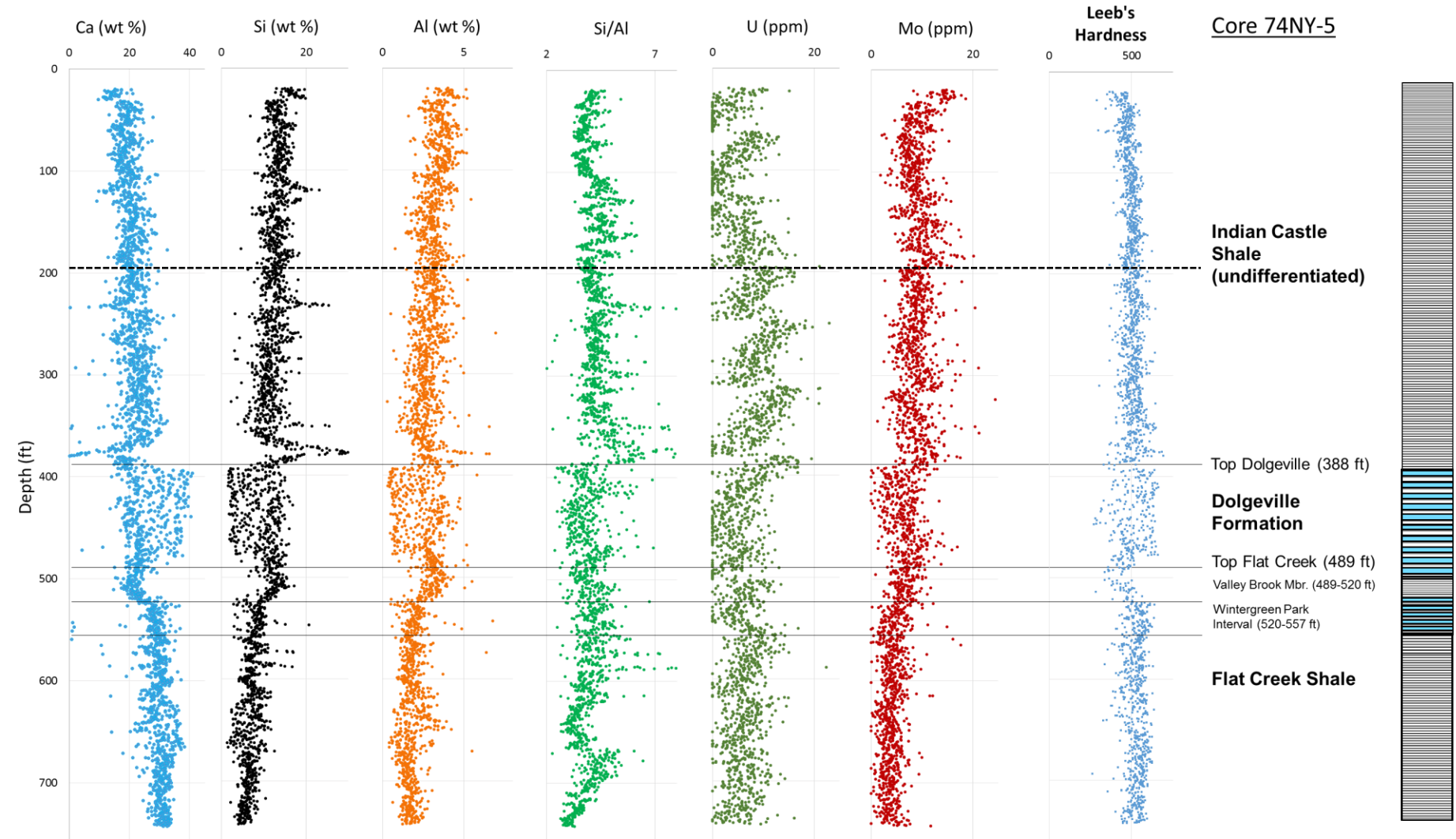
**Lower Indian
Castle Shale**

Thruway
Discontinuity (233 ft)

**Dolgeville
Formation**







Summary and Future Work

- Sub-centimeter lithologic description of the entire Utica Group in NY has revealed a variety of unique facies
- Pelagic deposition, turbidity currents, debris flows and possible contour currents contributed to deposition of the Utica Group and Dolgeville Fm
- Chemostratigraphy at 3-inch intervals may help elucidate cryptic, chronostratigraphic horizons such as the lower and upper Indian Castle Shale contact
- Leeb's Hardness values have a negative correlation with Al, K, Th, and Si (clay mineral rich → softer), and a positive correlation with Ca (carbonate beds → harder)

Future Work:

- Build stratigraphic columns to compare to XRF and hardness data
- Millimeter-scale XRF analysis with core scanning table
- Correlate litho- and chemostratigraphy to other cores
- Investigate patterns and cyclicity in XRF data (Fourier Analysis)

Thank You

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Gordon C. Baird, for general discussions and donating hand samples

Proceq, for letting us borrow the Equotip Piccolo 2 for rock hardness testing

