

DOE/INDUSTRY SPONSORED TRENTON CONSORTIUM

10/05/05

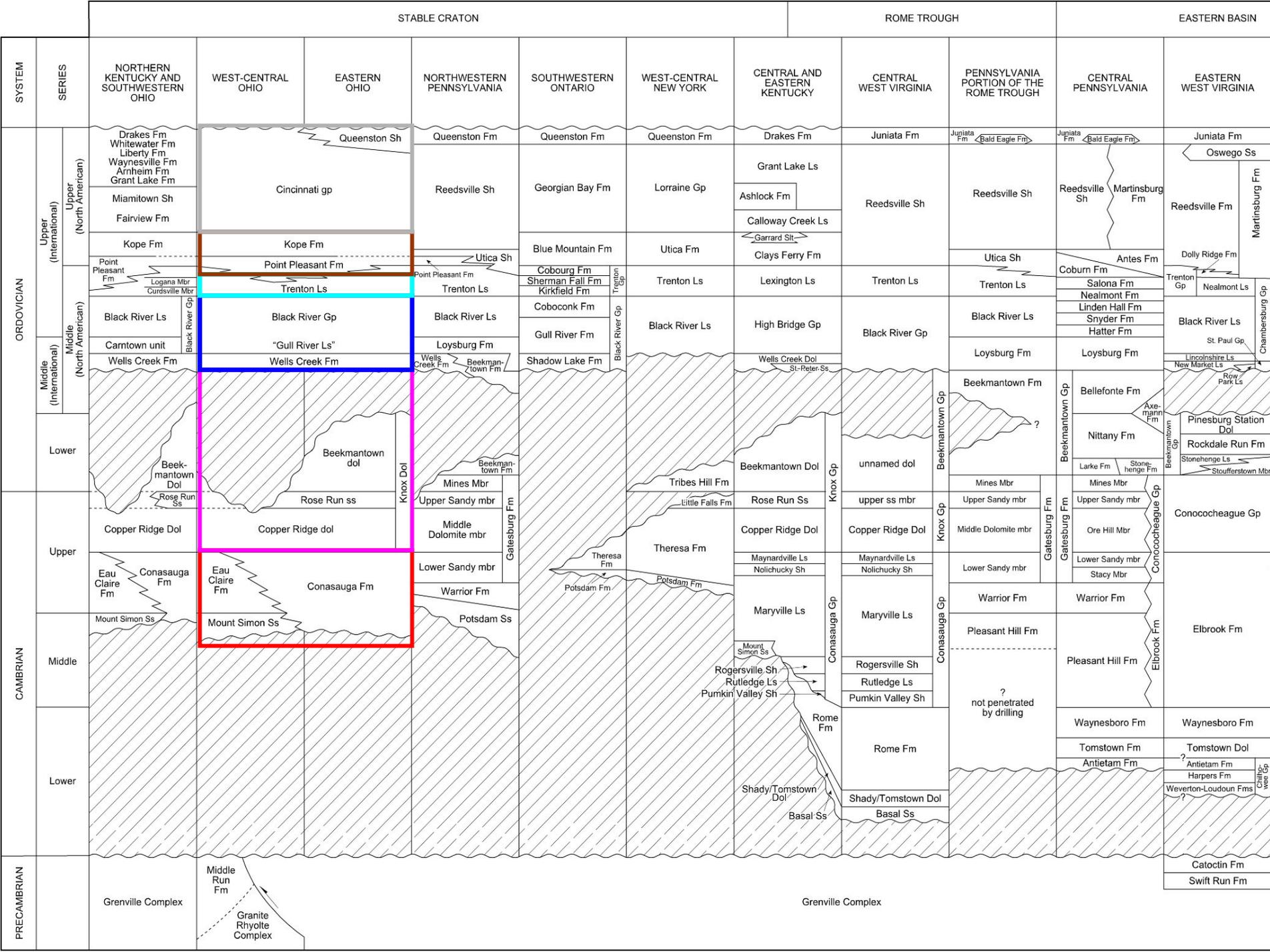
Pittsburgh, PA

**Creating a Geologic Play Book for
Appalachian Basin Trenton-Black
River Exploration**

BASIN
GEOMETRY &
ARCHITECTURE

METHODS OF ANALYSIS

- Use mappable units from existing core descriptions, core photos and tie to wireline logs.
- Establish depositional dip of basin and build cross section network.
- Quasi-parasequence boundaries (additional marine marker beds).
- Develop correlations of mappable units along dip lines.
- Tie strike lines to dip lines.
- **Isopach selected units.**



➤ **Tectonic elements affecting Cambrian and Ordovician deposition**

- **(1) Precambrian Provinces: EGR, ECRB, GP**
- (2) Rome Trough**

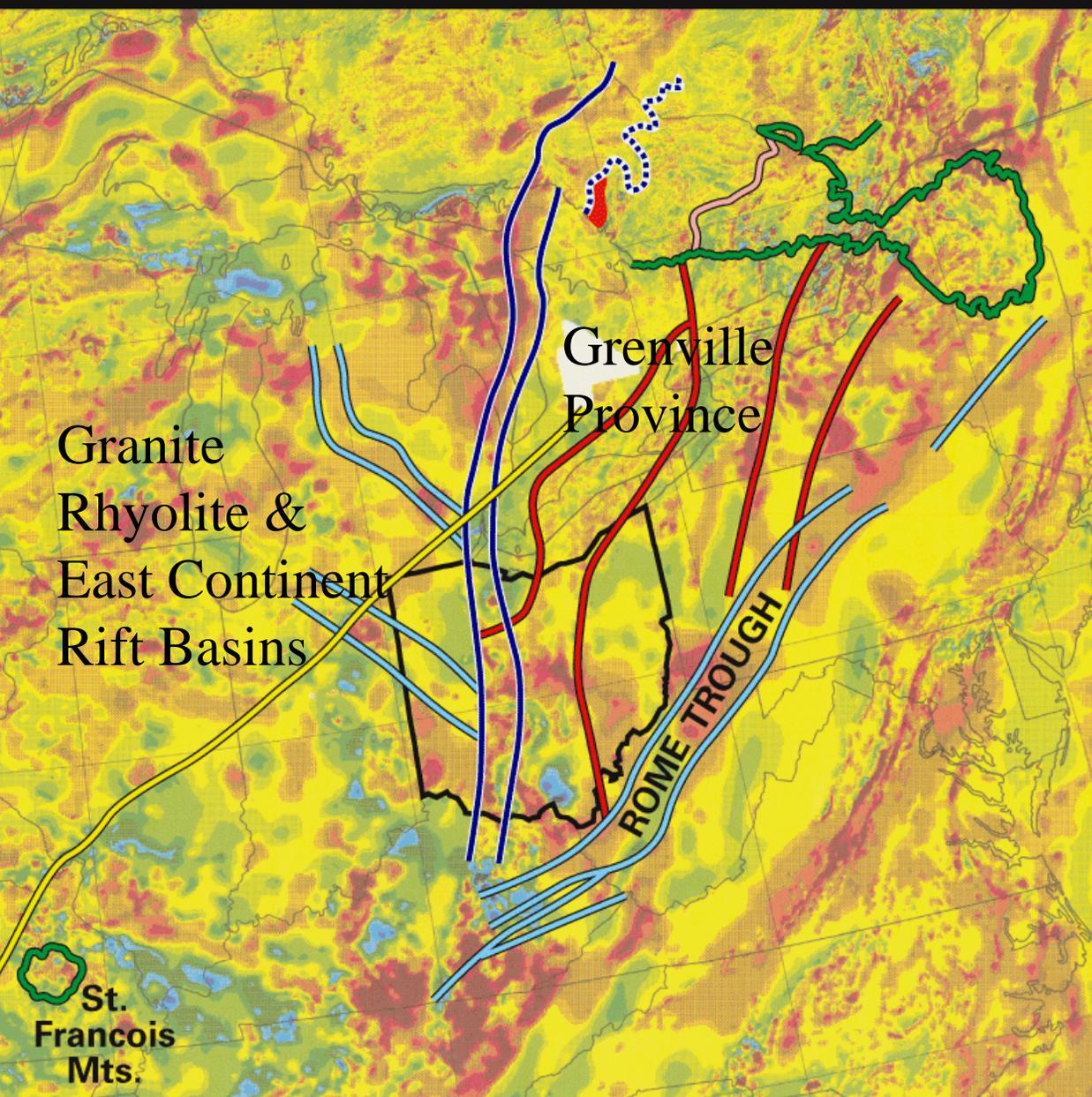
Basin Geometries Resulting from underpinning Precambrian features and far-field stresses and crustal loading.

Proto-APPALACHIAN BASIN

Ohio Platform.

APPALACHIAN BASIN

Indiana/Ohio, Lexington and ONT/NY Platforms; Ohio Sub-basin.



MAGNETIC ANOMALY MAP

Modified from GSA DNAG (1987), Carr et al (2000), Reed (1993), White et al (2000), Van Schmus (1996)

Granite
Rhyolite &
East Continent
Rift Basins

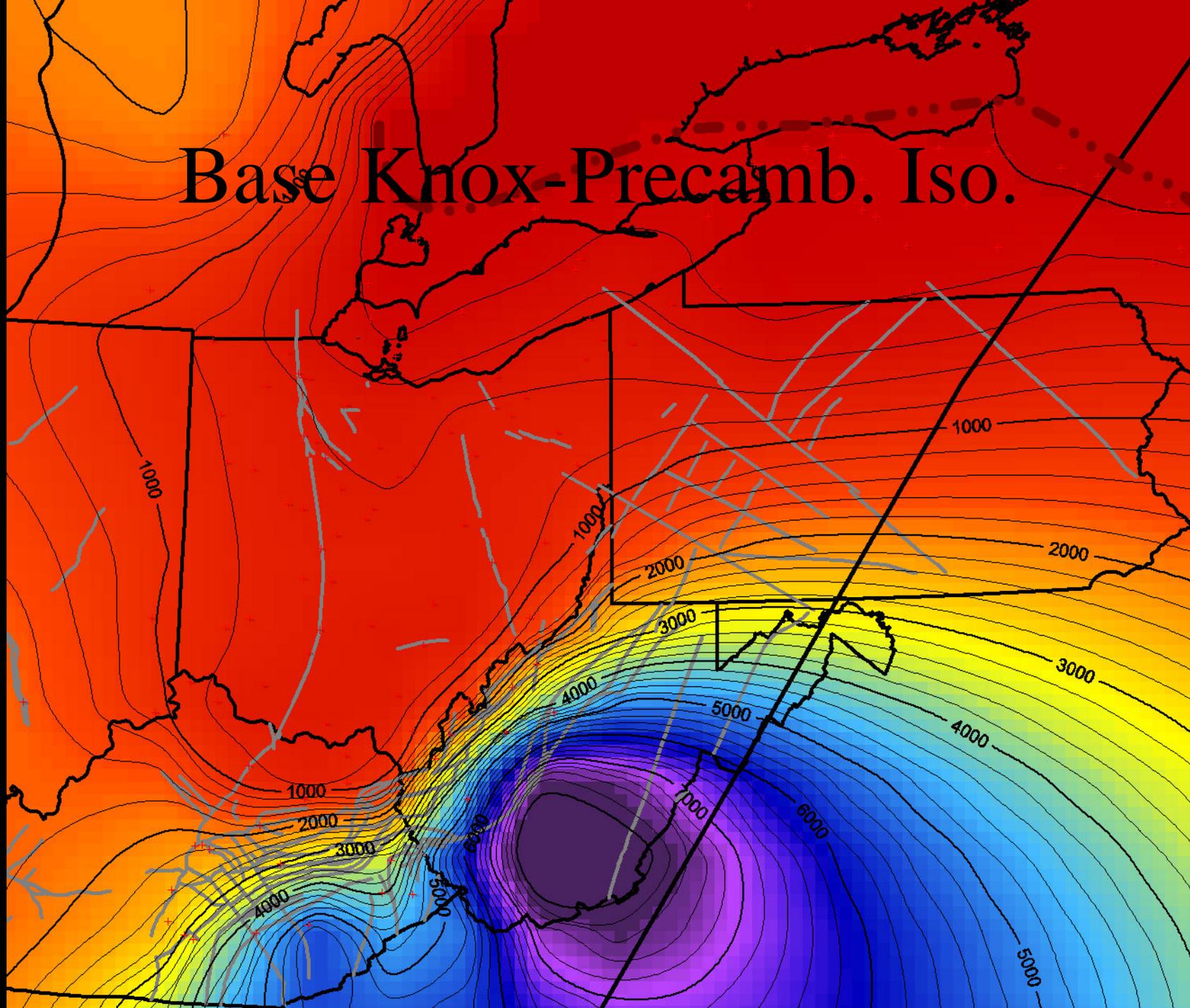
Grenville
Province

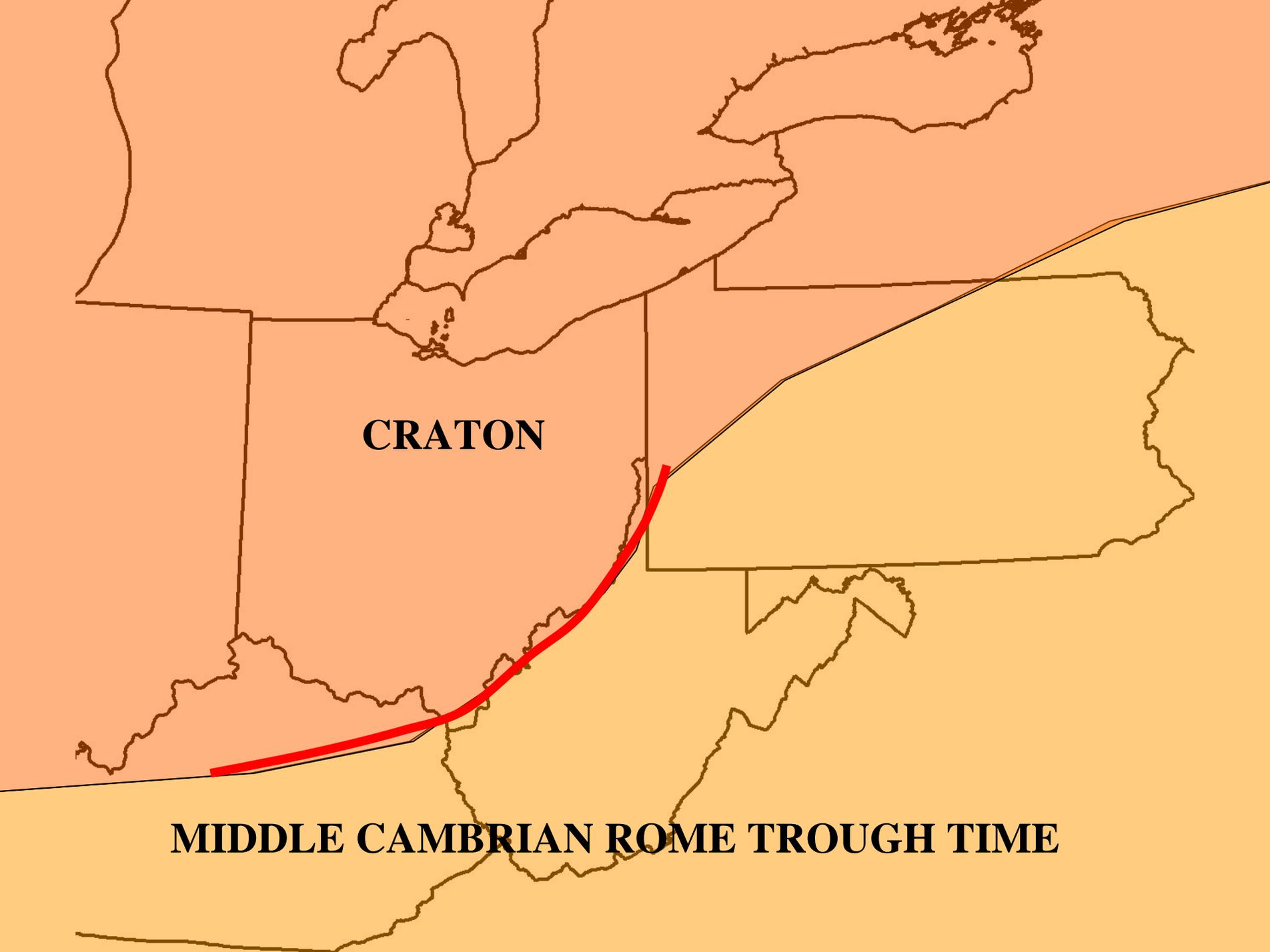
ROME TROUGH

St.
Francois
Mts.

- Precambrian/Paleozoic contact exposed
- Grenville Front/GFTZ
- ⋯ Allochthon boundary thrust
- Western central meta-sedimentary belt boundary thrust zone
- Nd pre-1,600 eastern limit continental crust
- Rift zones
- Grenville domains beneath Paleozoic cover
- Parry Sound

Base Knox-Precamb. Iso.

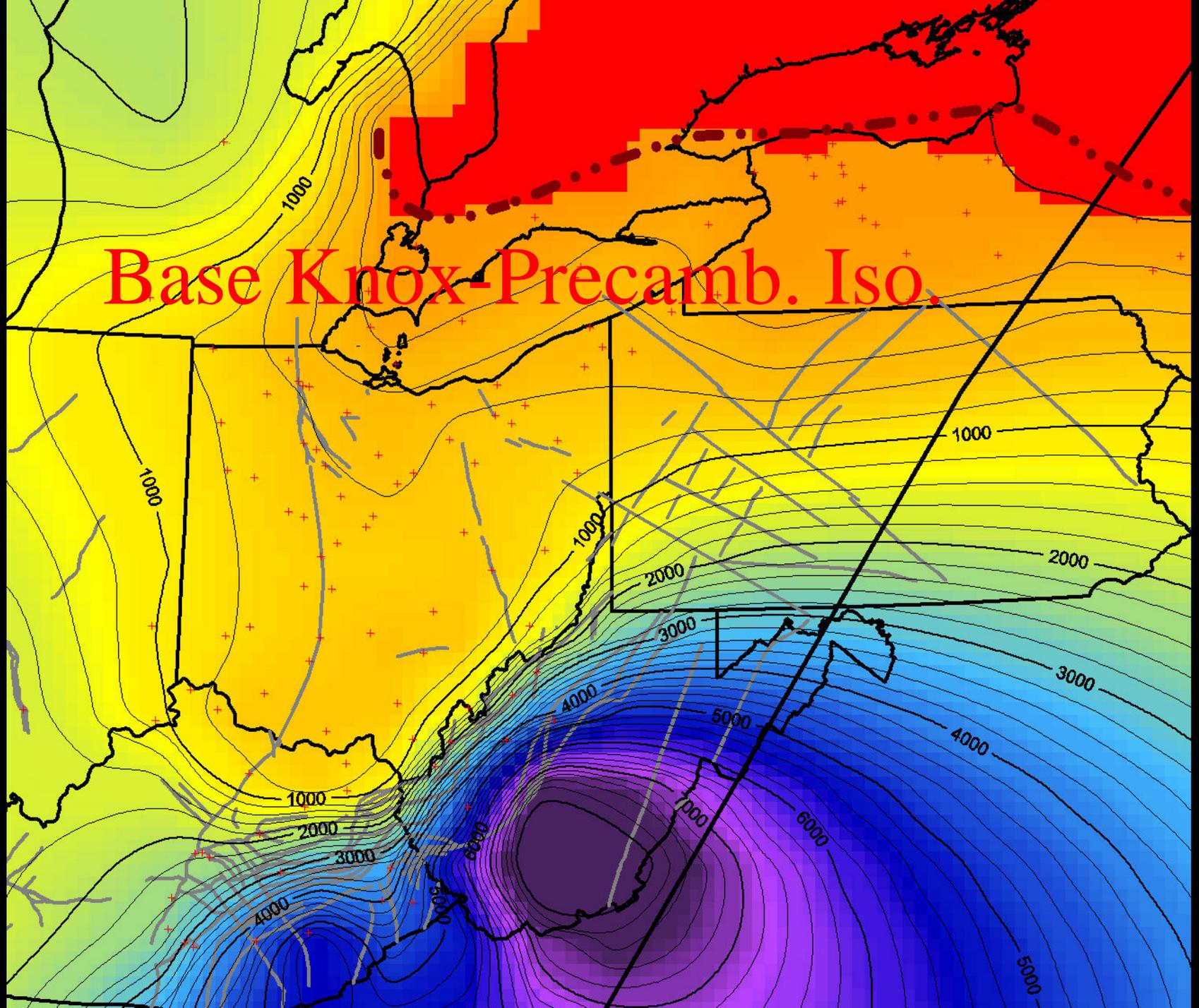


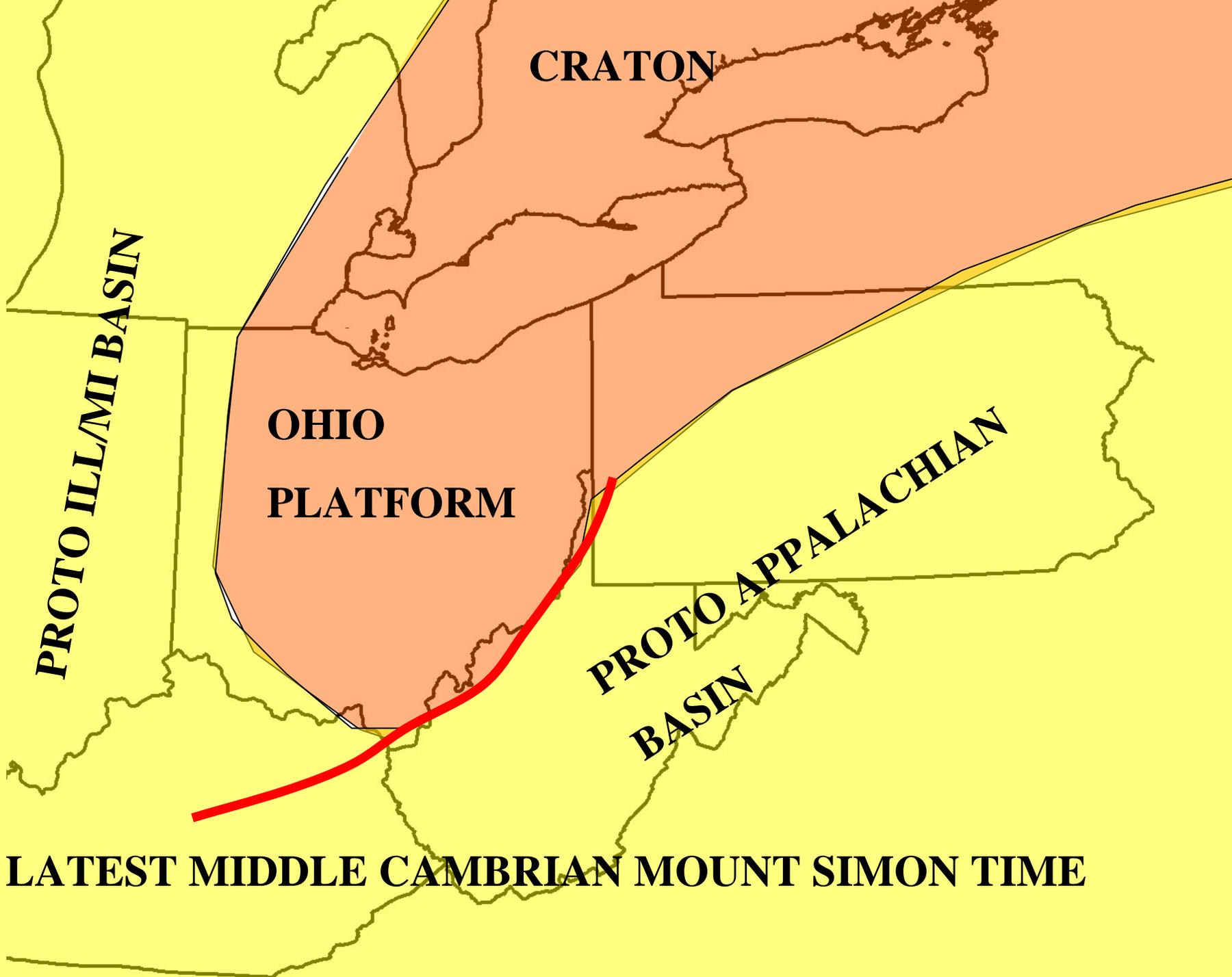


CRATON

MIDDLE CAMBRIAN TROUGH TIME

Base Knox-Precamb. Iso.





CRATON

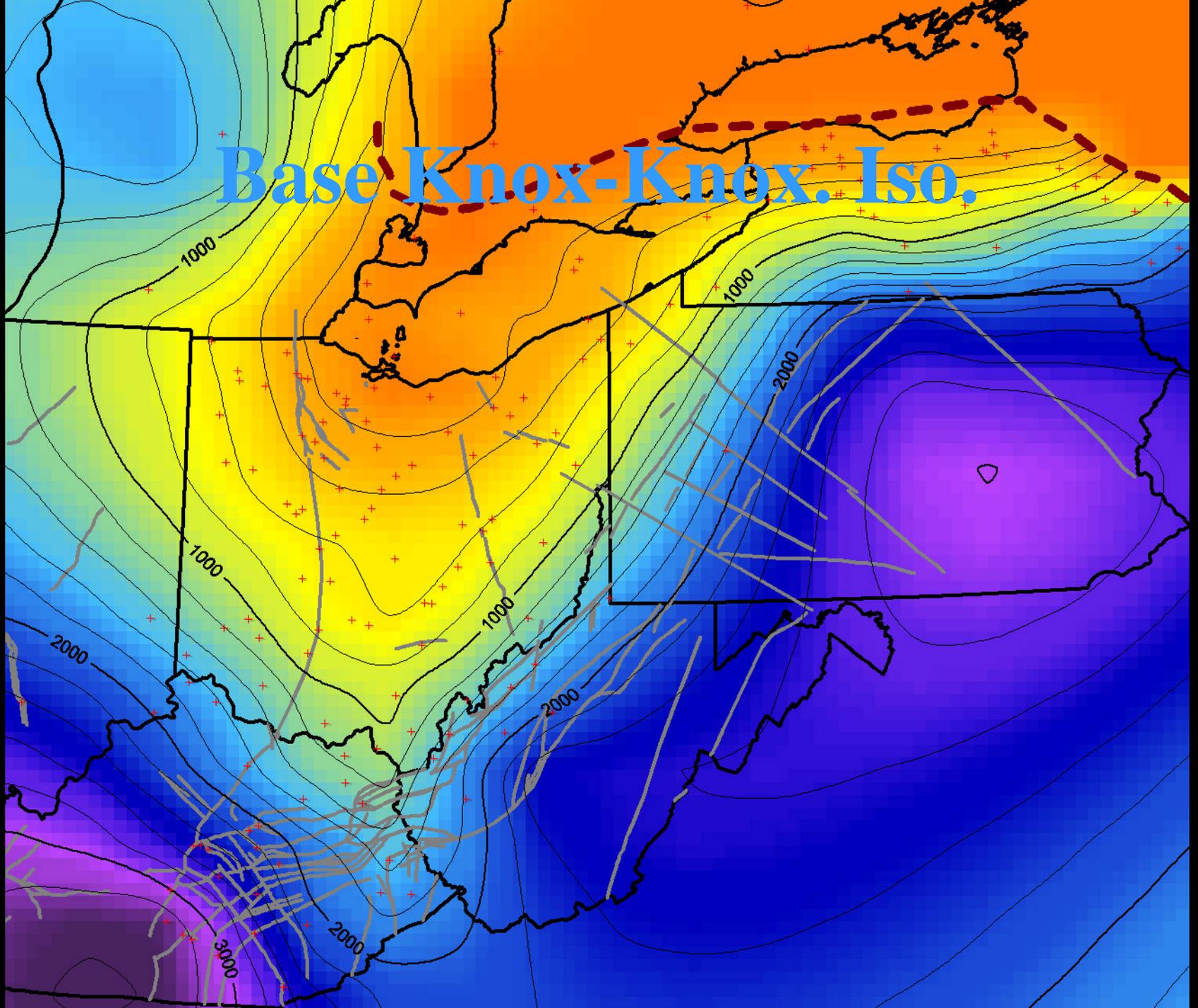
PROTO ILL/MI BASIN

**OHIO
PLATFORM**

**PROTO APPALACHIAN
BASIN**

LATEST MIDDLE CAMBRIAN MOUNT SIMON TIME

Base Knox-Knox. Iso.

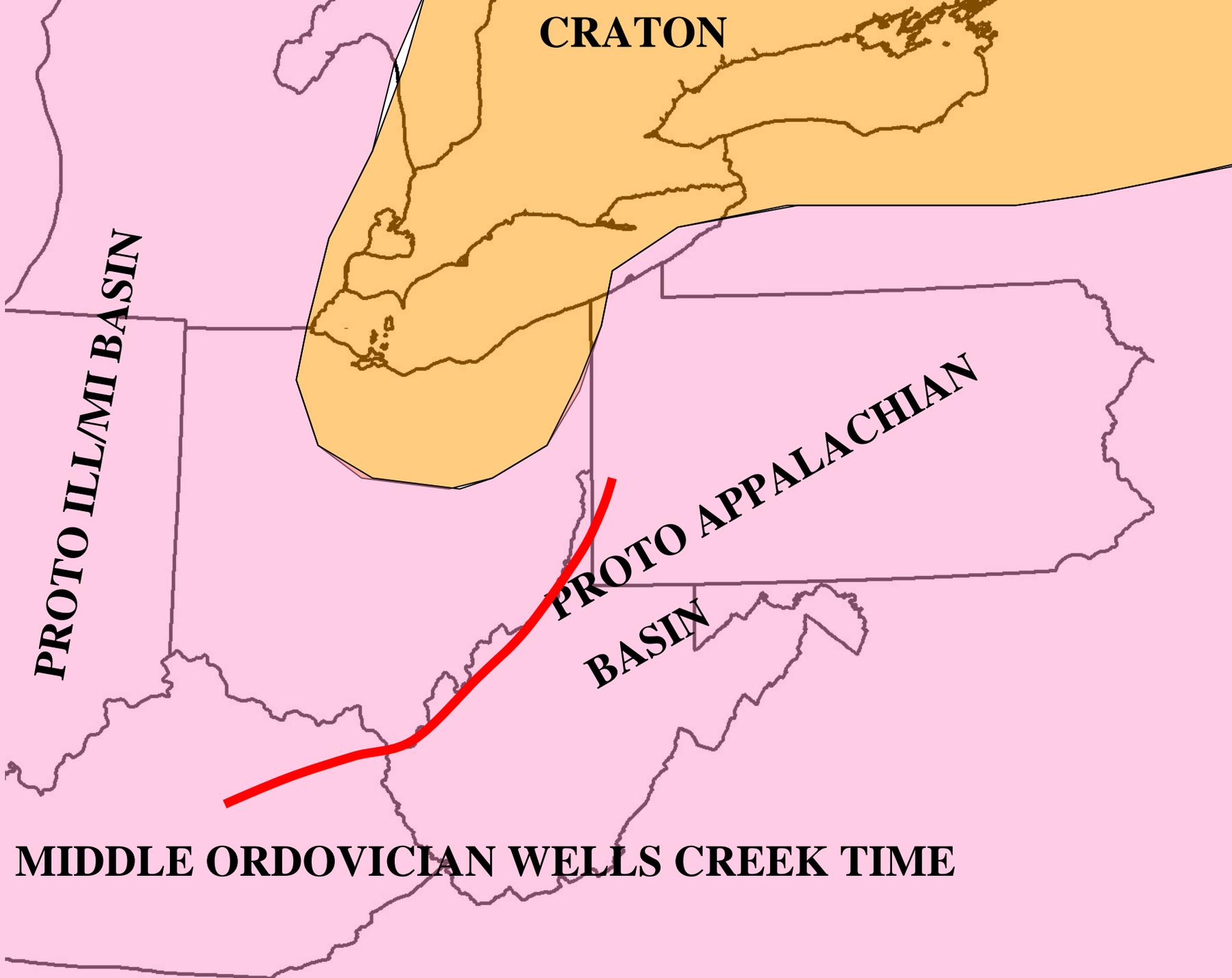


CRATON

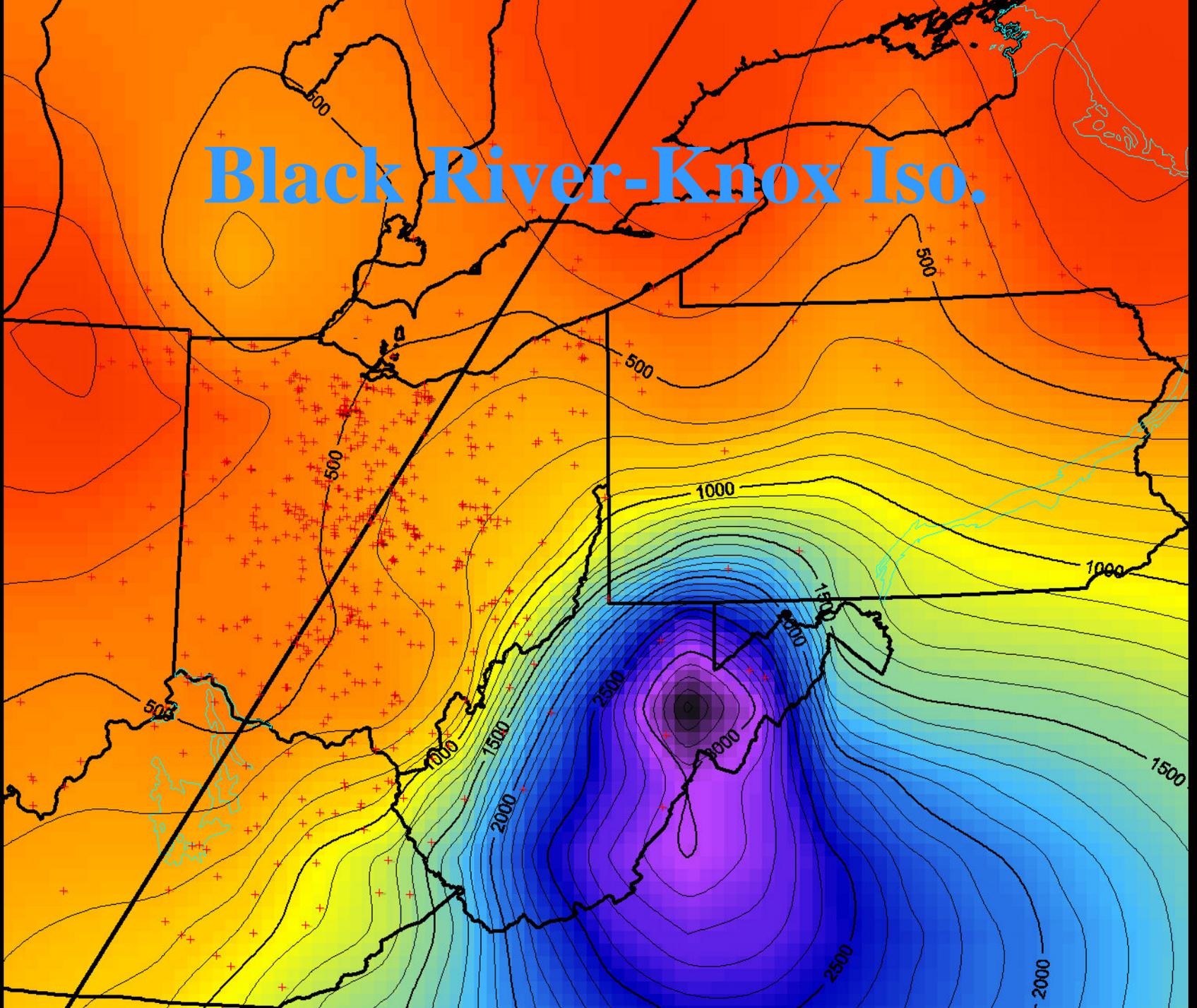
PROTO ILL/MI BASIN

**PROTO APPALACHIAN
BASIN**

MIDDLE ORDOVICIAN WELLS CREEK TIME



Black River-Knox Iso.



MIDDLE ORDOVICIAN BLACK RIVER TIME

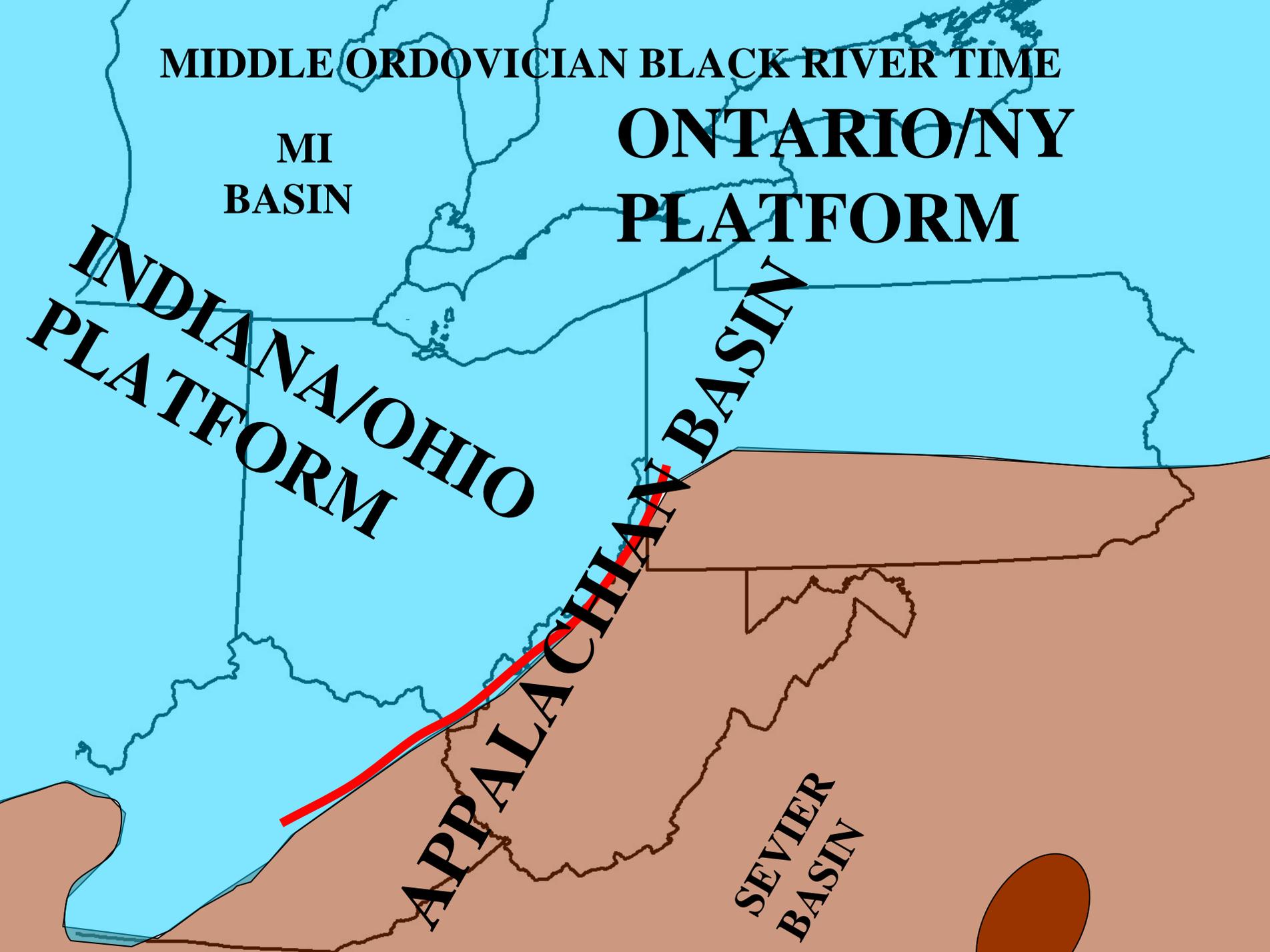
MI
BASIN

ONTARIO/NY
PLATFORM

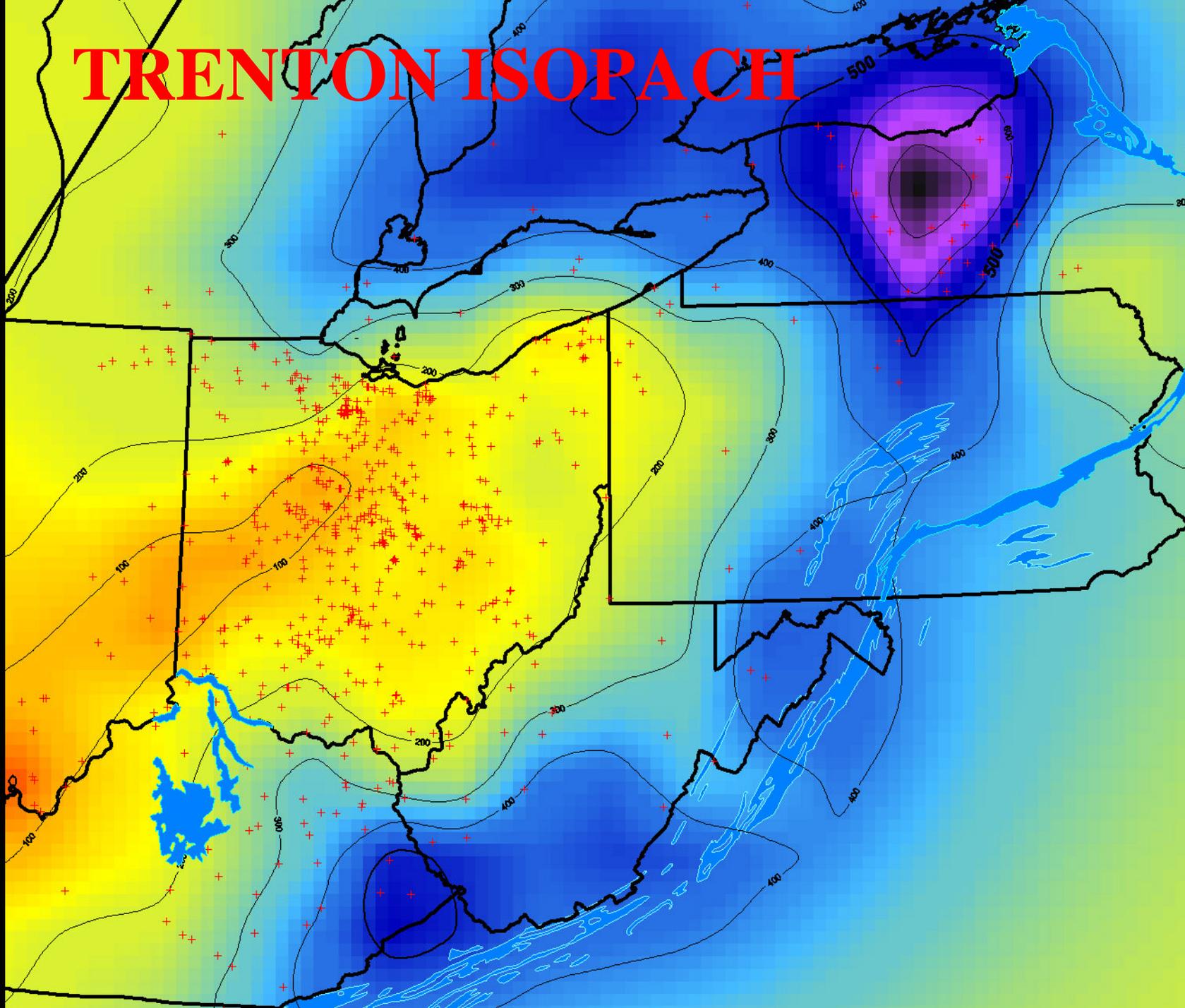
INDIANA/OHIO
PLATFORM

APPALACHIAN BASIN

SEVIER
BASIN



TRENTON ISOPACH



MIDDLE ORDOVICIAN TRENTON TIME

**MI
BASIN**

**ONTARIO/NY
PLATFORM**

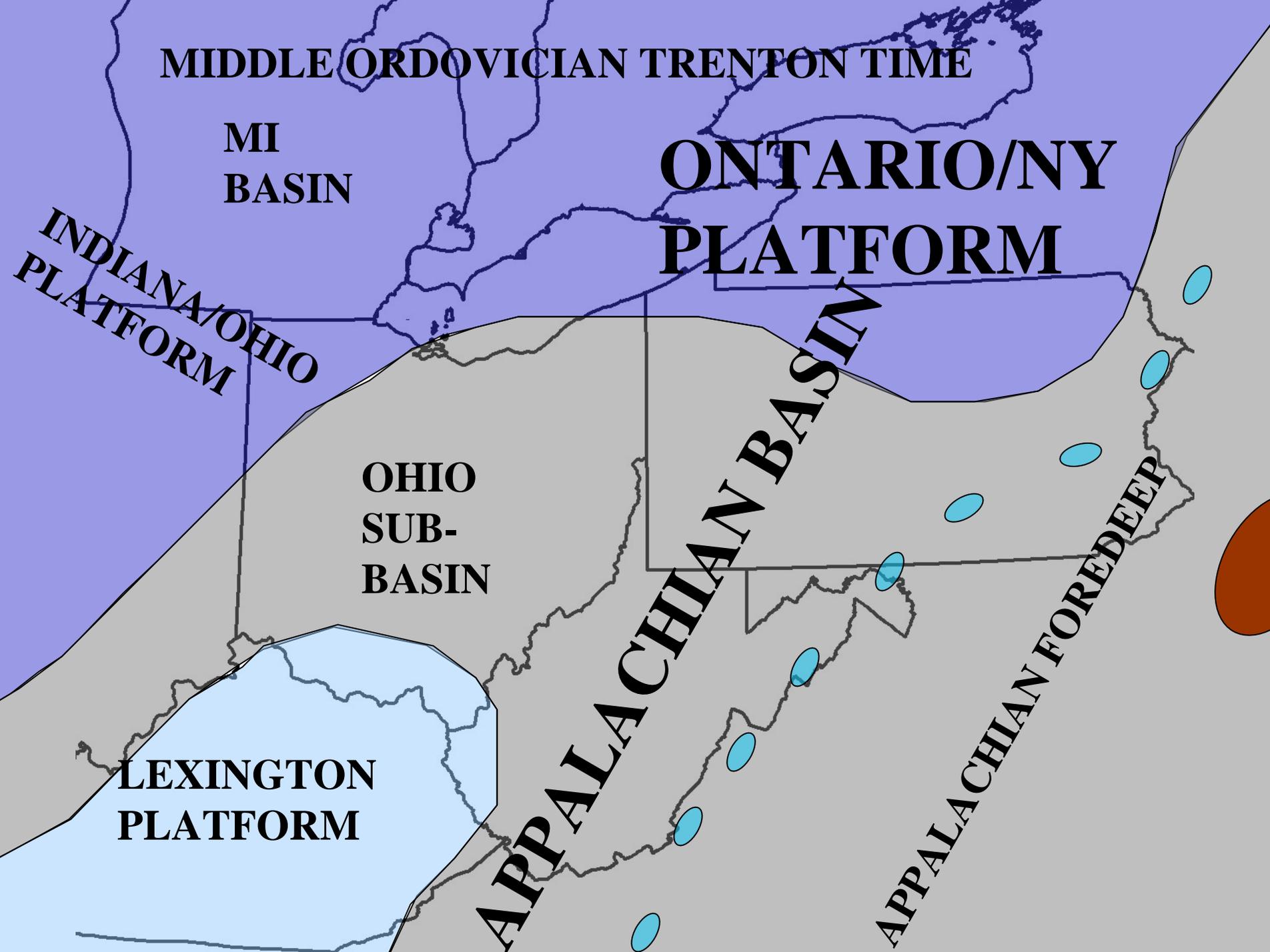
**INDIANA/OHIO
PLATFORM**

**OHIO
SUB-
BASIN**

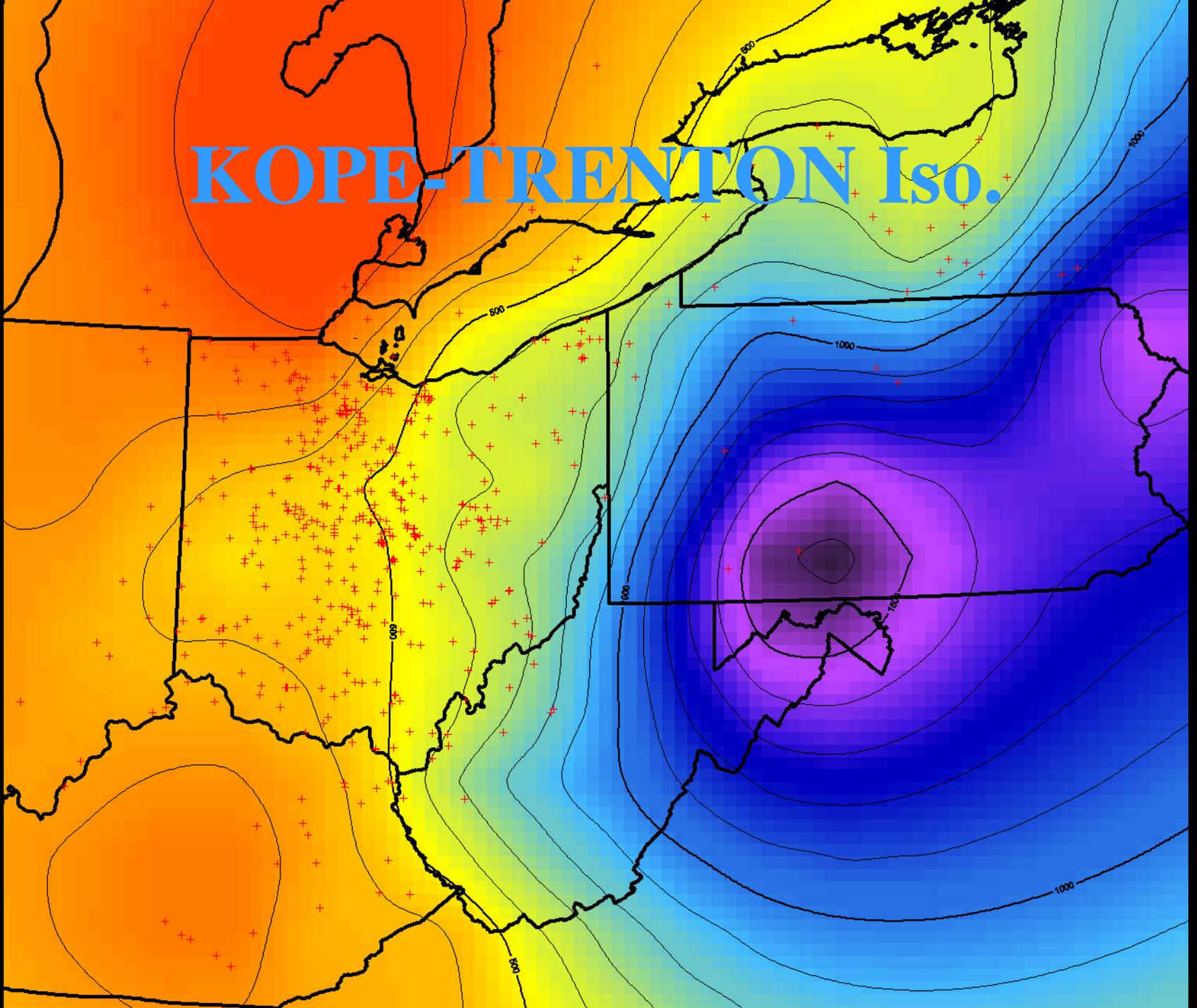
**LEXINGTON
PLATFORM**

APPALACHIAN BASIN

APPALACHIAN FOREDEEP



KOPE-TRENTON Iso.



UPPER ORDOVICIAN KOPE TIME

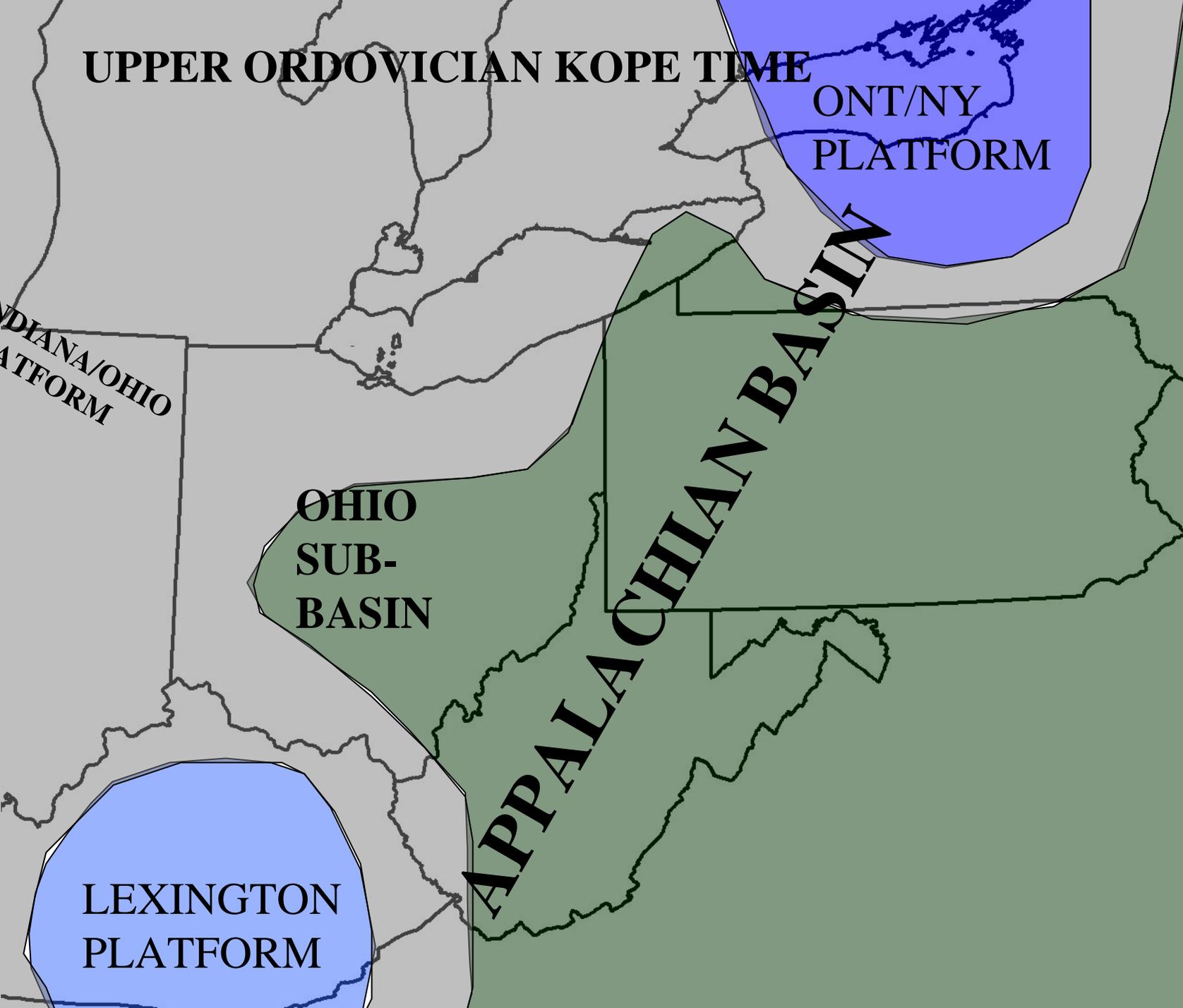
**ONT/NY
PLATFORM**

**INDIANA/OHIO
PLATFORM**

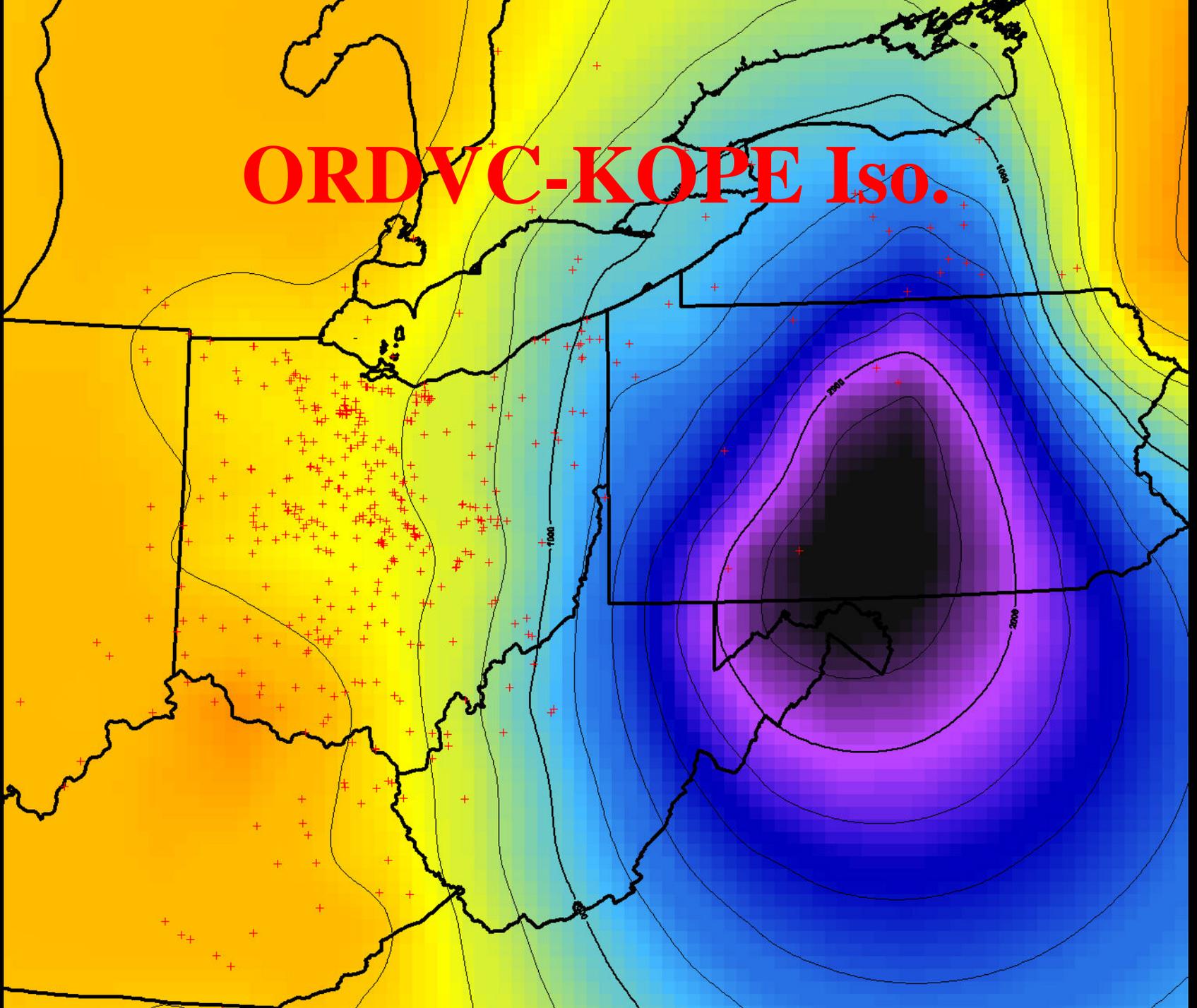
**OHIO
SUB-
BASIN**

APPALACHIAN BASIN

**LEXINGTON
PLATFORM**



ORDVC-KOPE Iso.



UPPER ORDOVICIAN POST-KOPE TIME



**OHIO
SUB-
BASIN**

APPALACHIAN BASIN

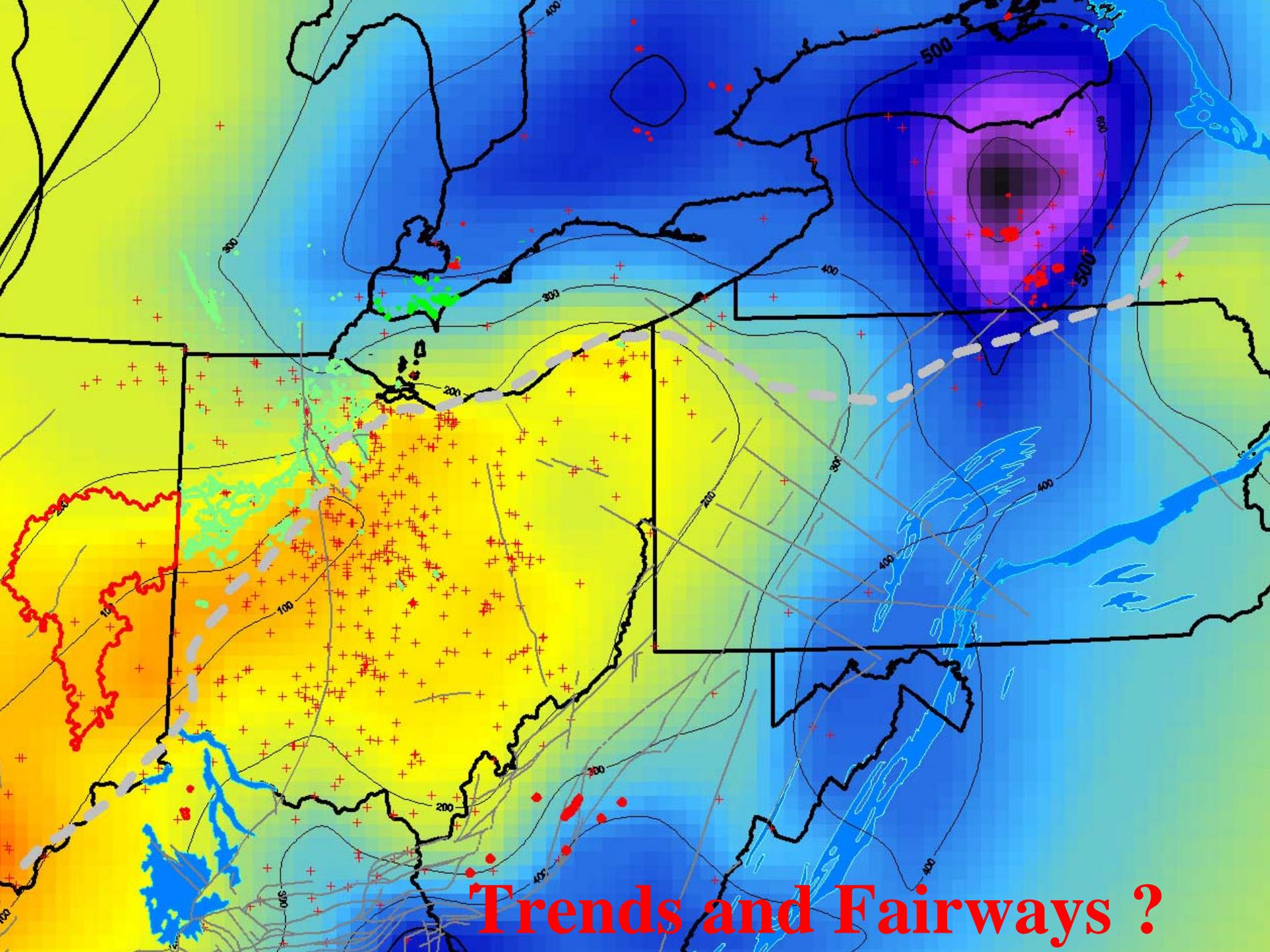
Sequence Scenario

- Grenville & ECRB/Granite Rhyolite terranes.
- Rome Trough
- Proto-Appalachian Basin
- Appalachian Basin

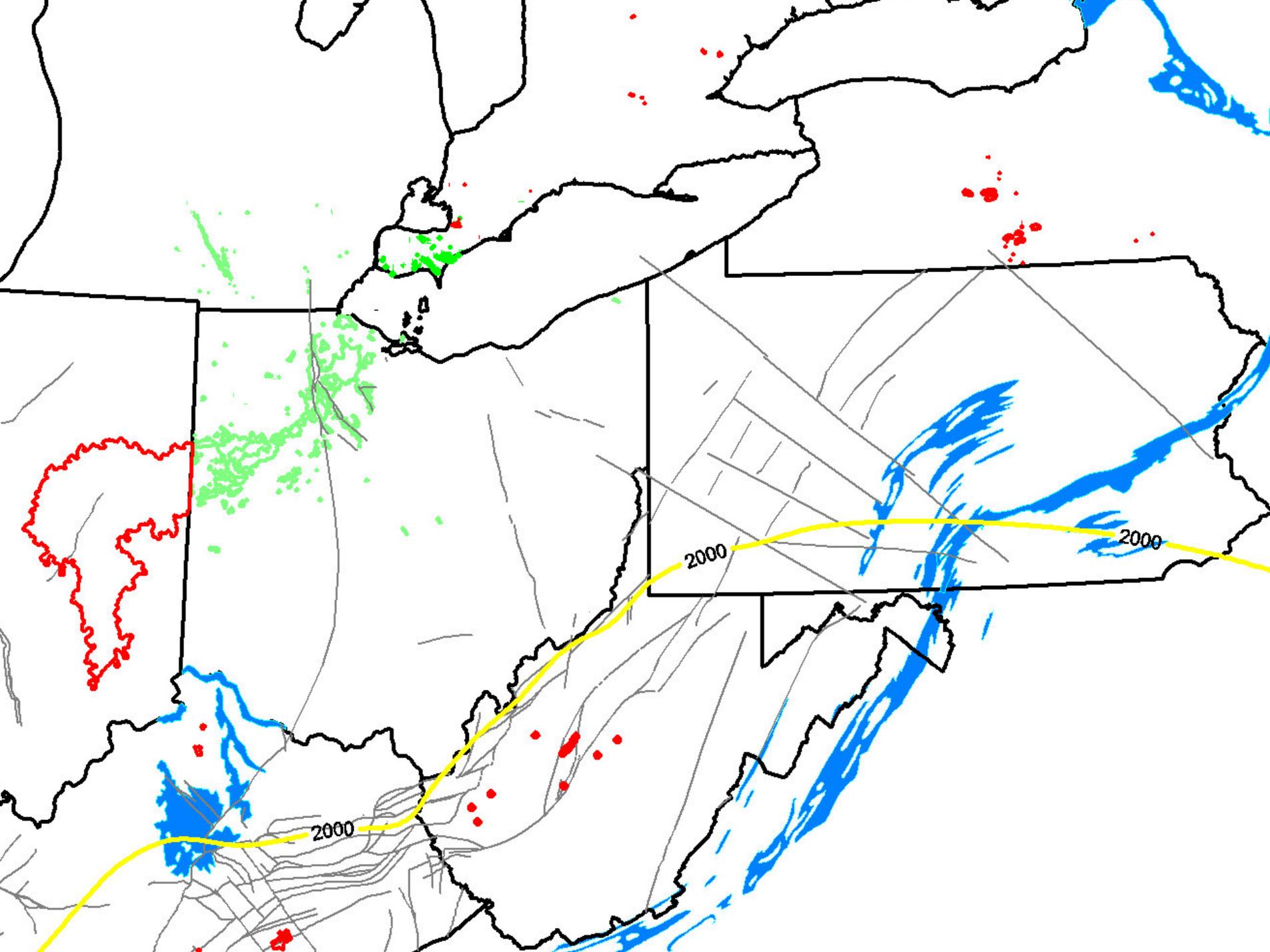
Ohio and Indiana/Ohio Platform

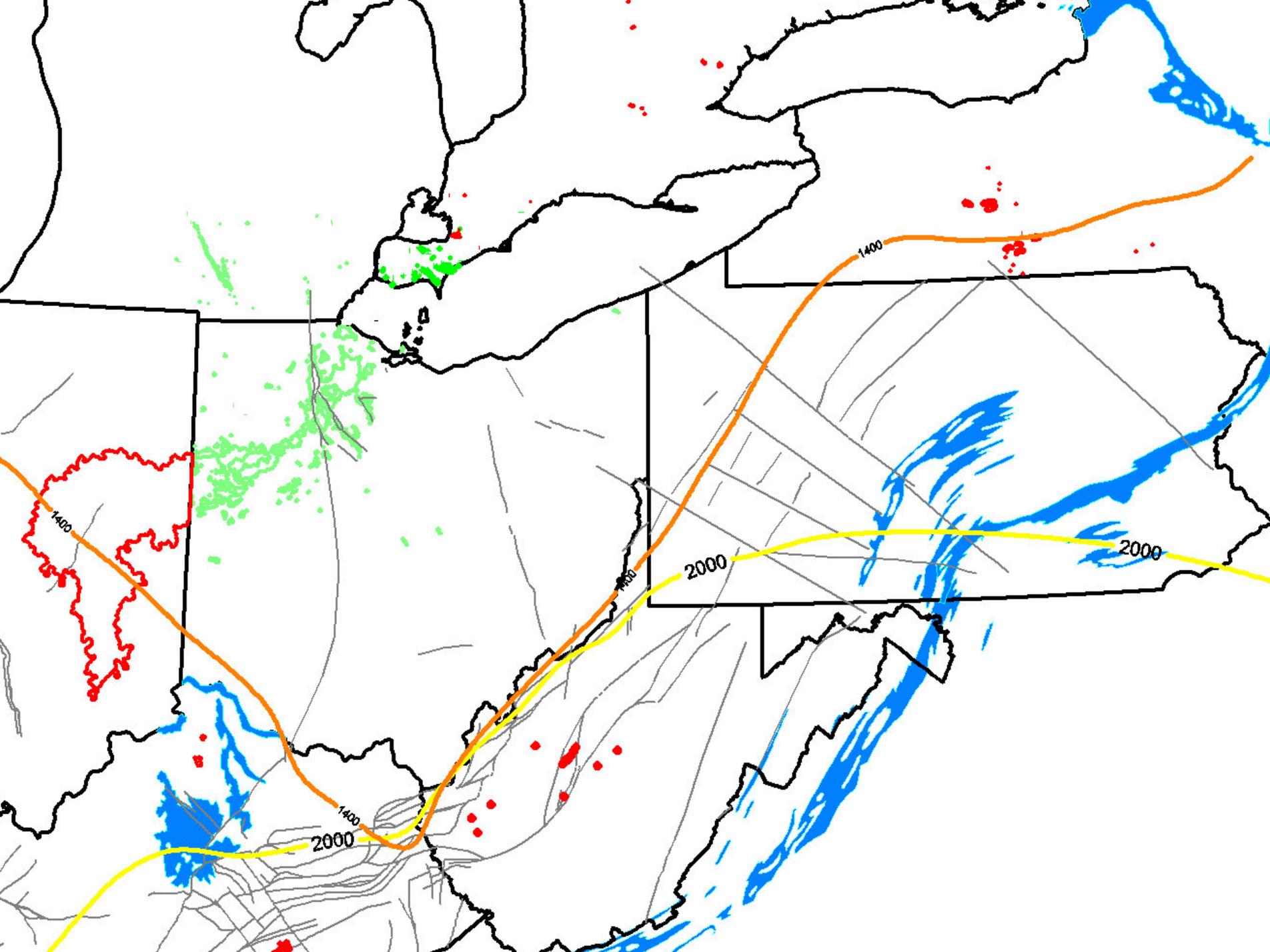
Lexington; Ontario/New York Platforms

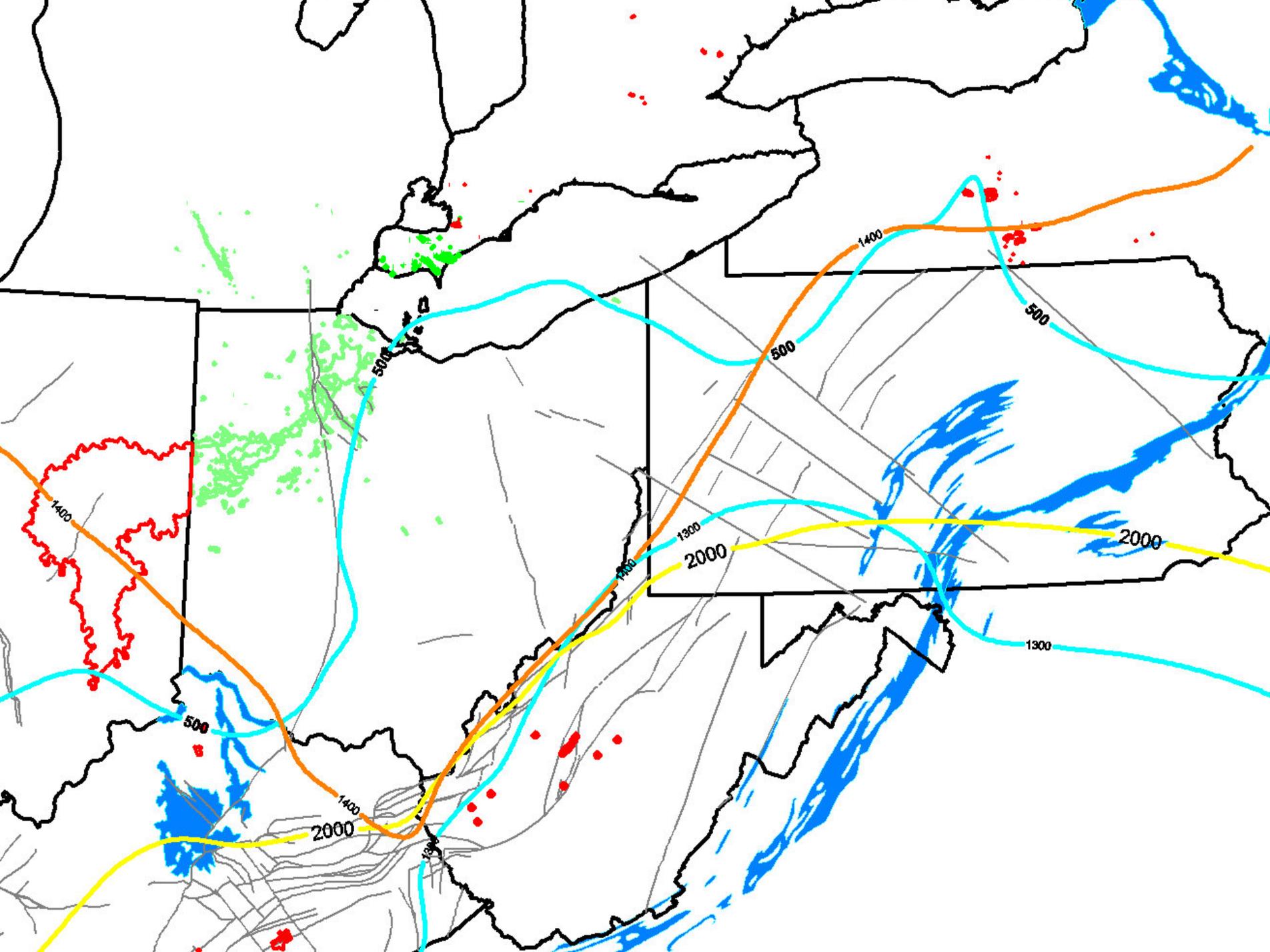
Ohio Sub-basin

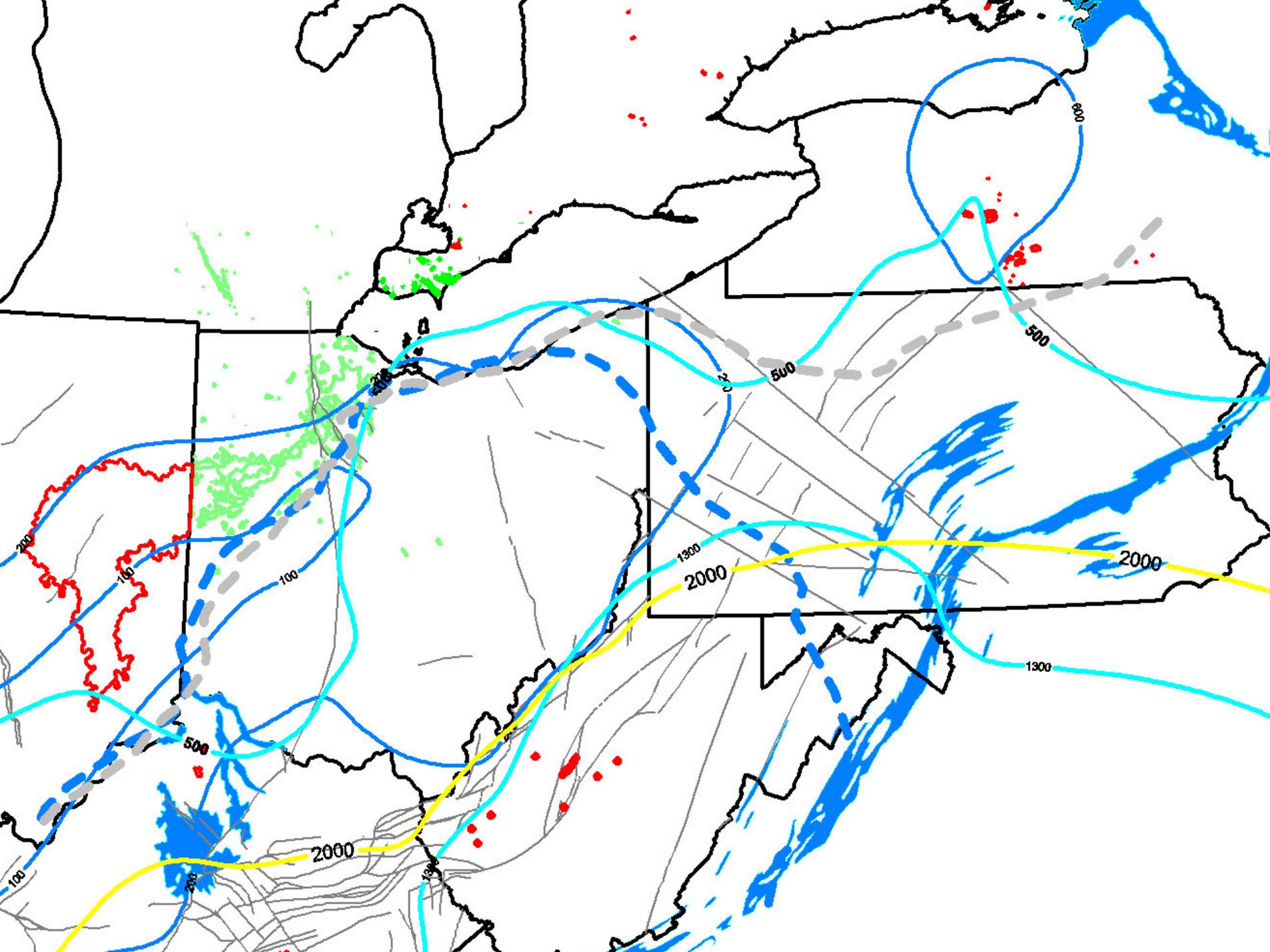


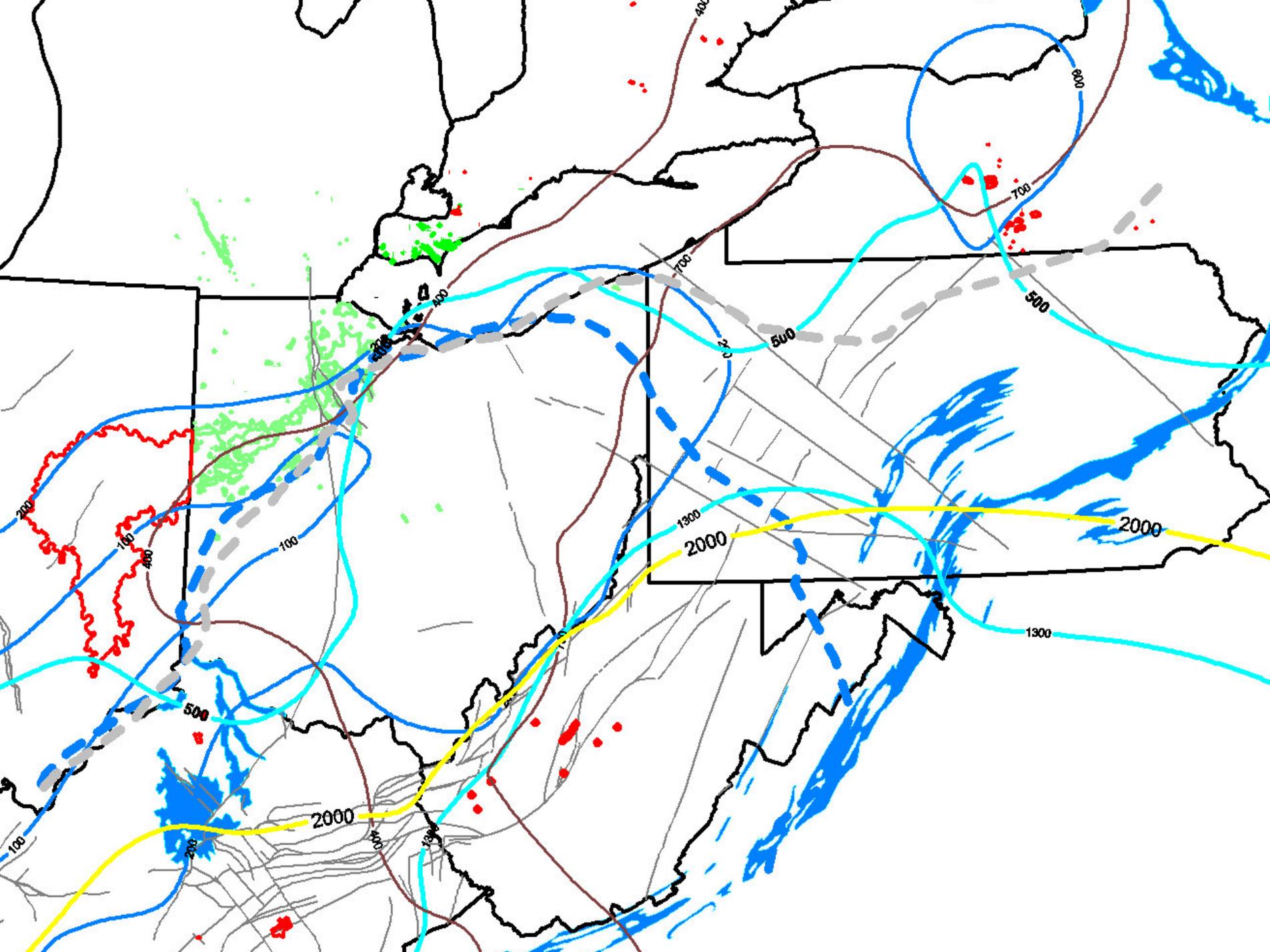
Trends and Fairways ?

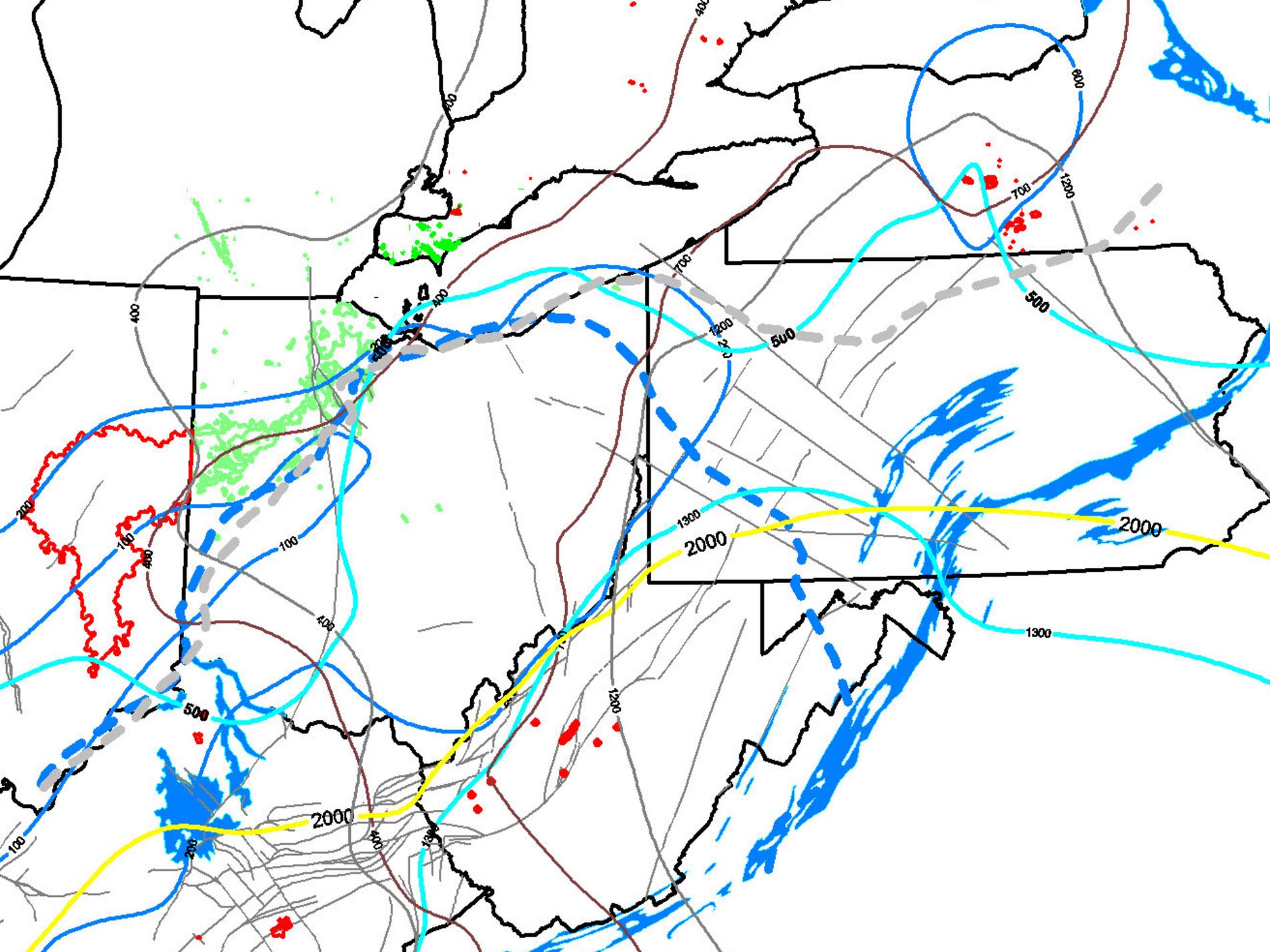


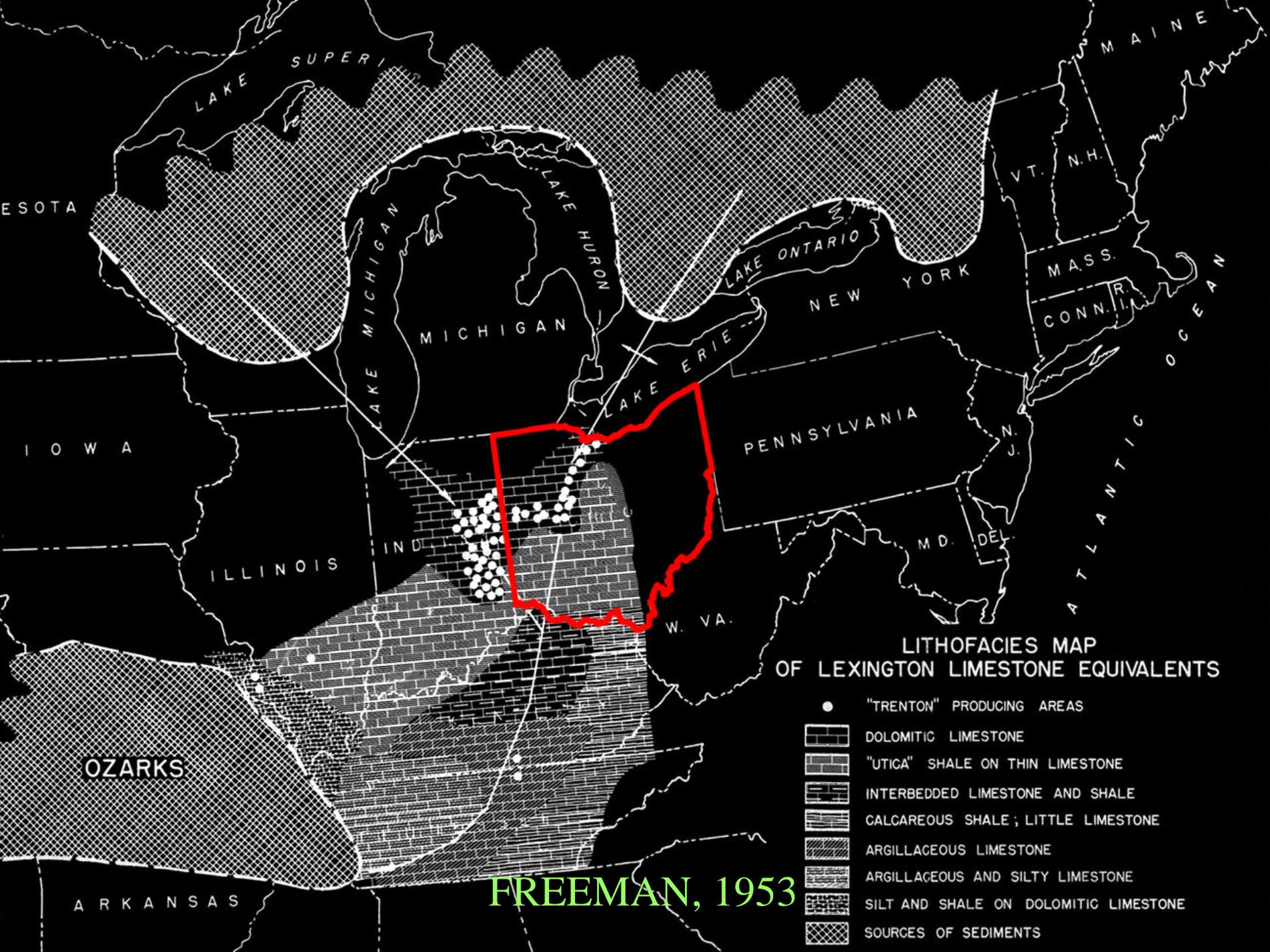








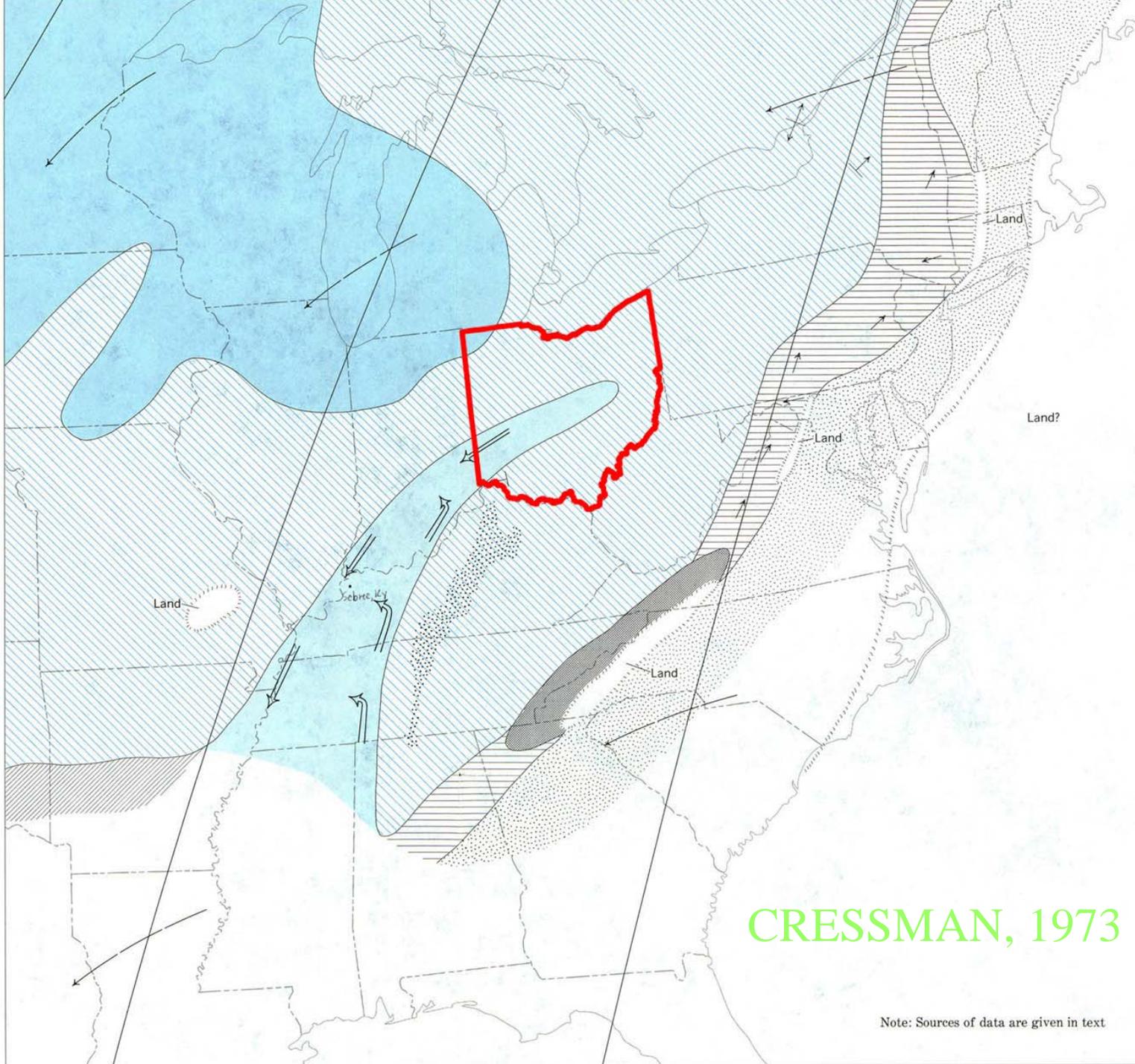




LITHOFACIES MAP
OF LEXINGTON LIMESTONE EQUIVALENTS

- "TRENTON" PRODUCING AREAS
- [Pattern: Horizontal lines] DOLOMITIC LIMESTONE
- [Pattern: Vertical lines] "UTICA" SHALE ON THIN LIMESTONE
- [Pattern: Diagonal lines (top-left to bottom-right)] INTERBEDDED LIMESTONE AND SHALE
- [Pattern: Diagonal lines (top-right to bottom-left)] CALCAREOUS SHALE; LITTLE LIMESTONE
- [Pattern: Dotted] ARGILLACEOUS LIMESTONE
- [Pattern: Horizontal lines with dots] ARGILLACEOUS AND SILTY LIMESTONE
- [Pattern: Vertical lines with dots] SILT AND SHALE ON DOLOMITIC LIMESTONE
- [Pattern: Cross-hatch] SOURCES OF SEDIMENTS

FREEMAN, 1953



EXPLANATION

DEPOSITS ON PLATFORM

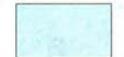


Limestone

Stippled where phosphatic



Dolomite



Shale and argillaceous limestone

DEPOSITS IN MIOGEOSYNCLINE



Flysch



Shallow-water sand and silt

DEPOSITS IN LEPTOGEOSYNCLINE
(King, 1969, p. 85)

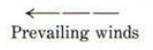


Chert and shale

DEPOSITS IN EUGEOSYNCLINE



Shale, volcanic rocks, and chert

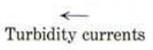


Prevailing winds

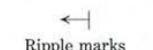


Ocean currents

DIRECTION OF SEDIMENT TRANSPORT



Turbidity currents



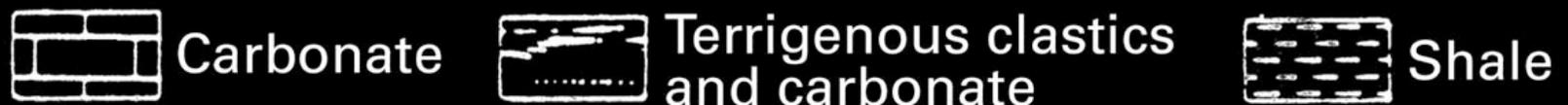
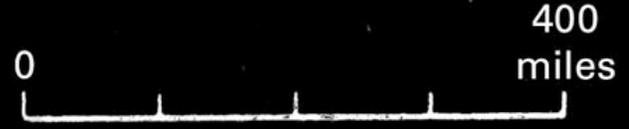
Ripple marks

CRESSMAN, 1973

Note: Sources of data are given in text

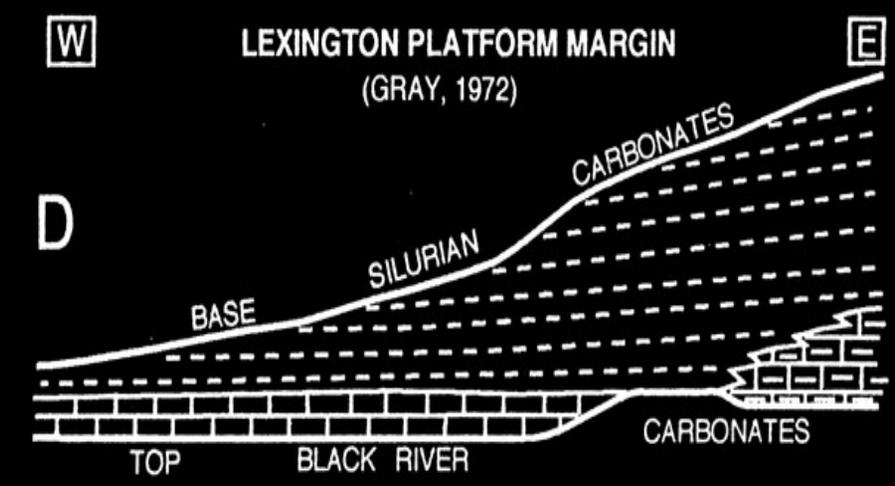
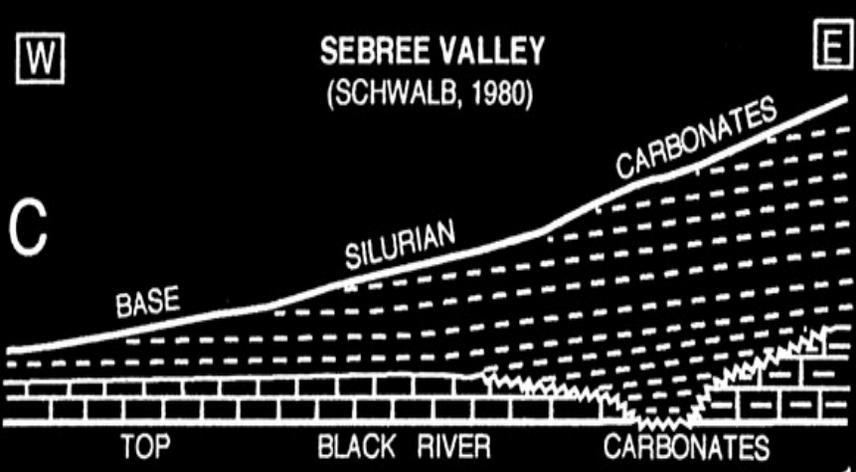
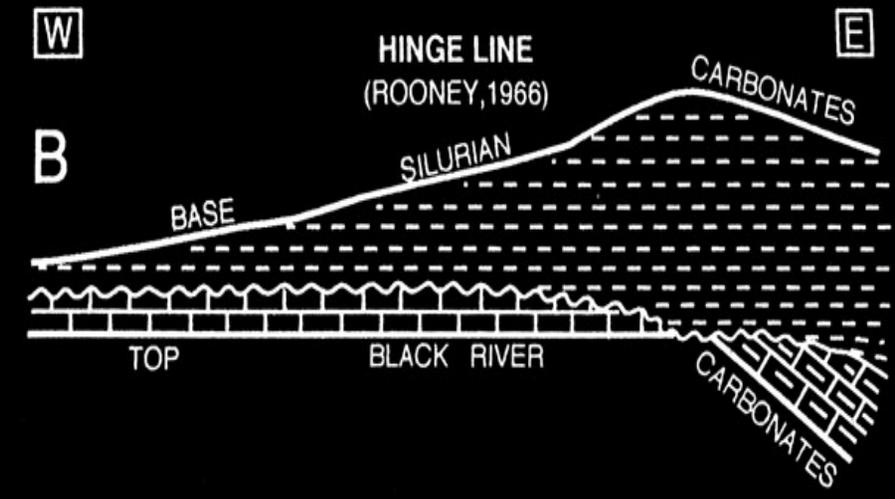
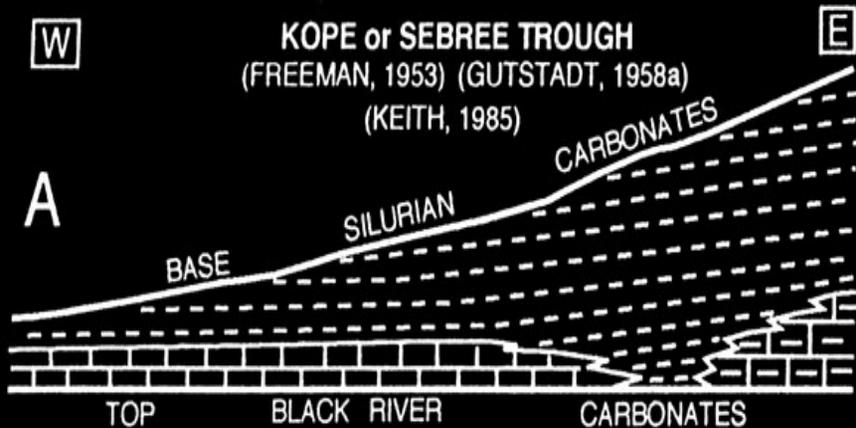


KEITH, 1985





WICKSTROM, ET AL., 1992

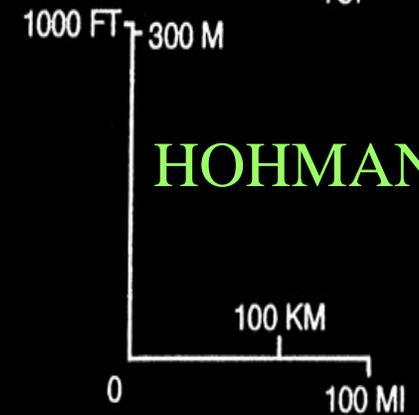
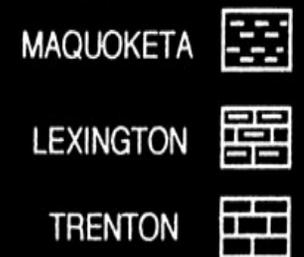


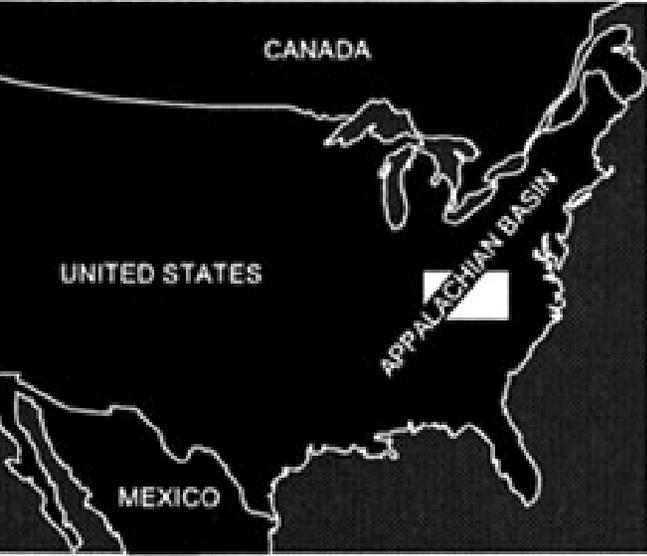
HOHMAN, 1998

STRATIGRAPHIC RELATIONSHIPS

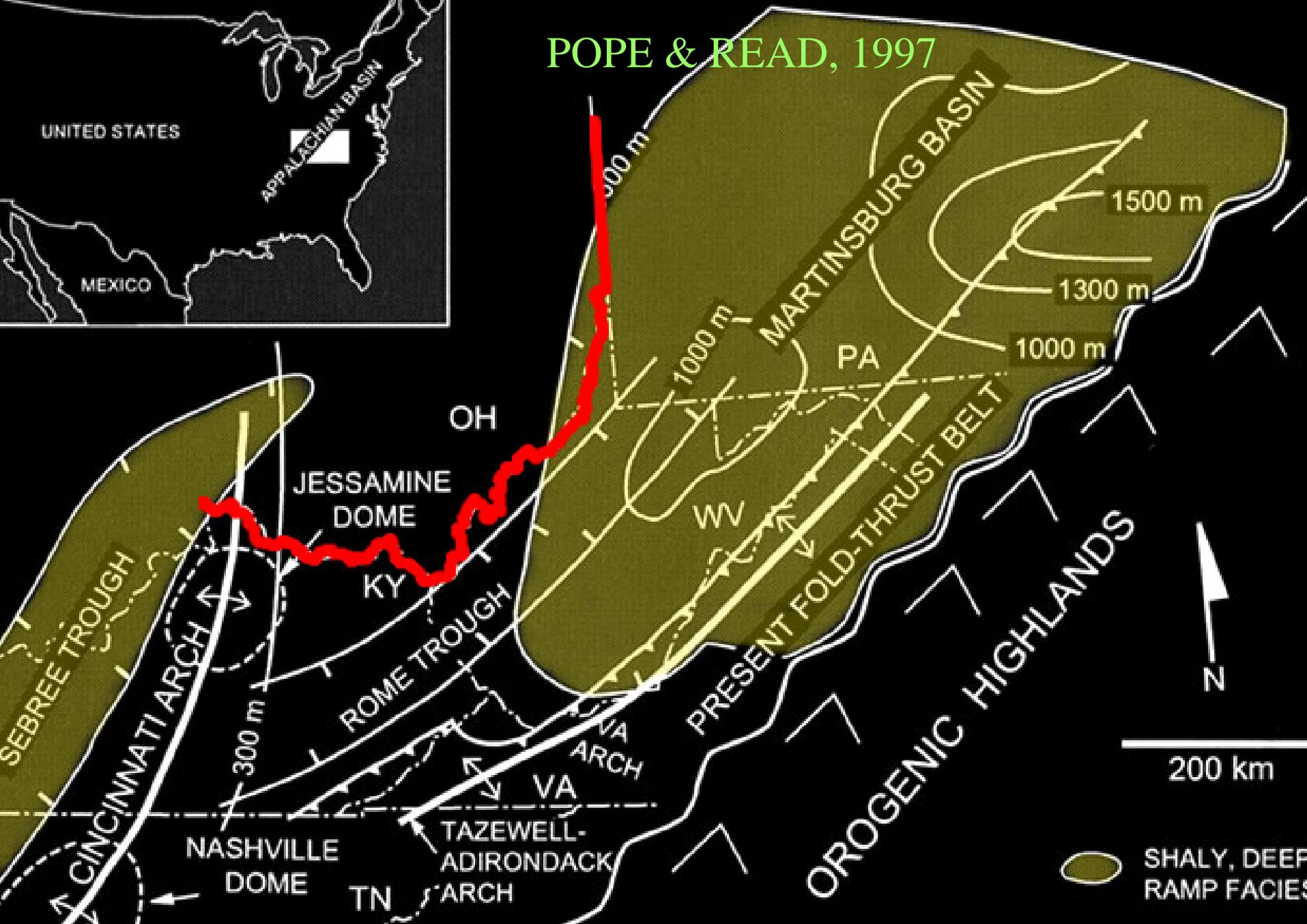


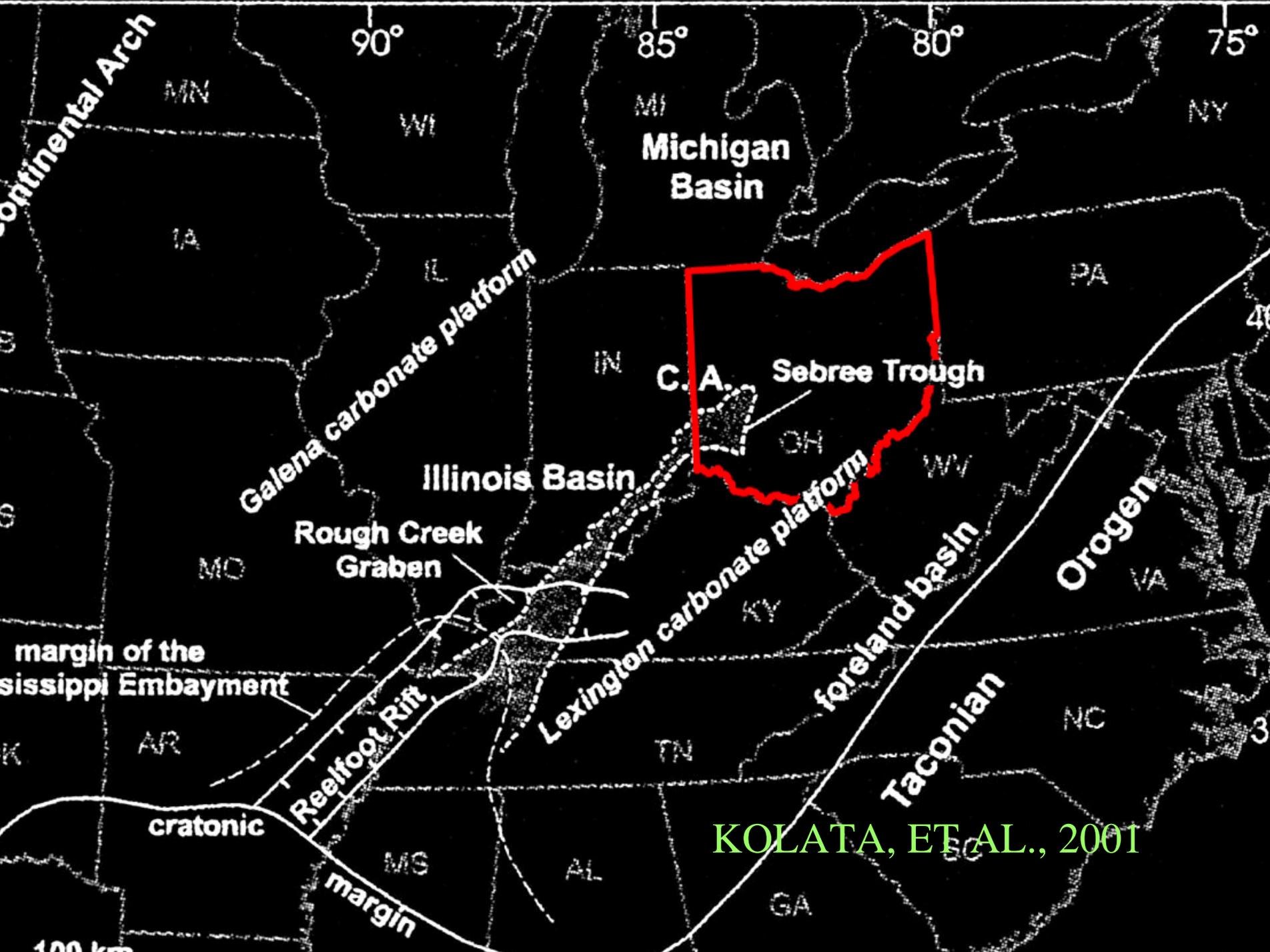
STRATIGRAPHY





POPE & READ, 1997





KOLATA, ET AL., 2001

IL

IN

OH

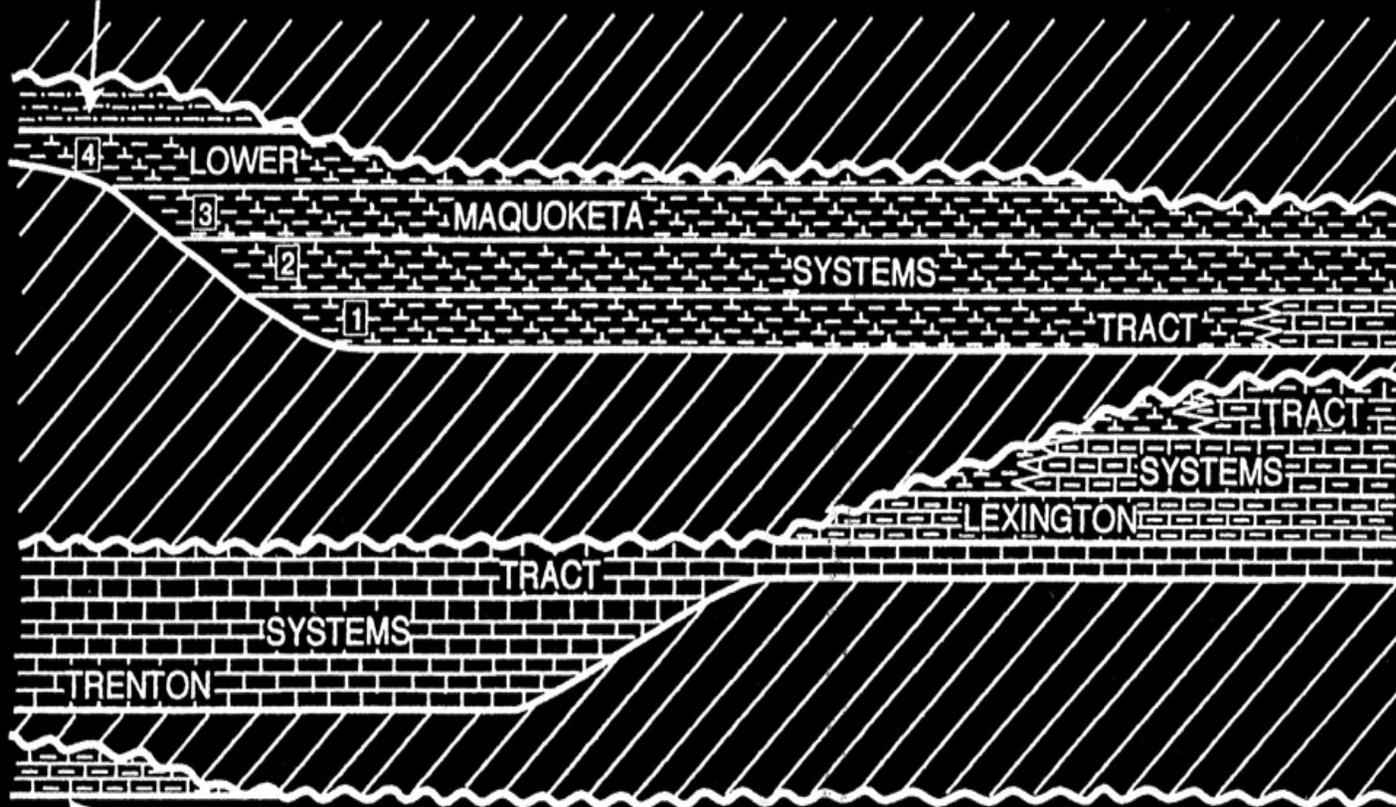
KY

UPPER MAQUOKETA
SYSTEMS TRACTORDOVICIAN
STAGES

MAQUOKETA
DEPOSITIONAL
SEQUENCE

TRENTON/
LEXINGTON
DEPOSITIONAL
SEQUENCE

DECORAH/
BLACK RIVER
DEPOSITIONAL
SEQUENCE



RICHMONDIAN
MAYSVILLIAN
EDENIAN

SHERMANIAN
KIRKFIELDIAN

ROCKLANDIAN

BLACKRIVERIAN

CINCINNATIAN

CHATFIELDIAN

UPPER DECORAH
SYSTEMS TRACT
 MISSING
SECTION

HOHMAN, 1998

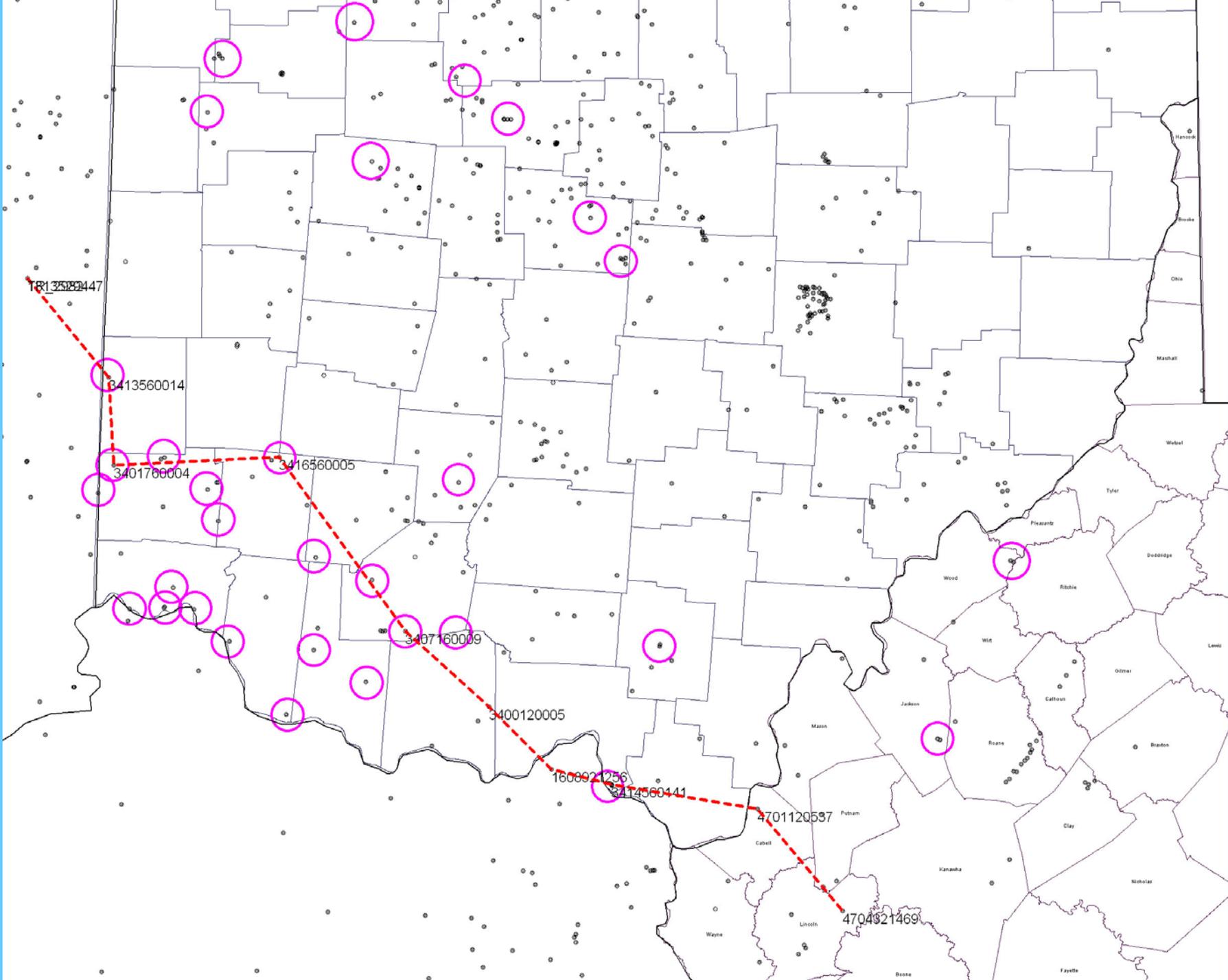
PARASEQUENCE SETS

- 4 UPPER RICHMOND
- 3 LOWER RICHMOND
- 2 MAYSVILLE
- 1 UPPER LEXINGTON



CARBONATE

SHALY
CARBONATESHALE WITH
CARBONATESHALE WITH
SANDSTONEMARINE-FLOODING
SURFACESEQUENCE
BOUNDARY



LEXINGTON PLATFORM MARGIN



2982 BLACK RIVER, MILLBRIG K-BENT; TRENTON/CURDSVILLE

GEOLOGICAL
SURVEY
OHIO DEPARTMENT OF
NATURAL RESOURCES
ROCK AND

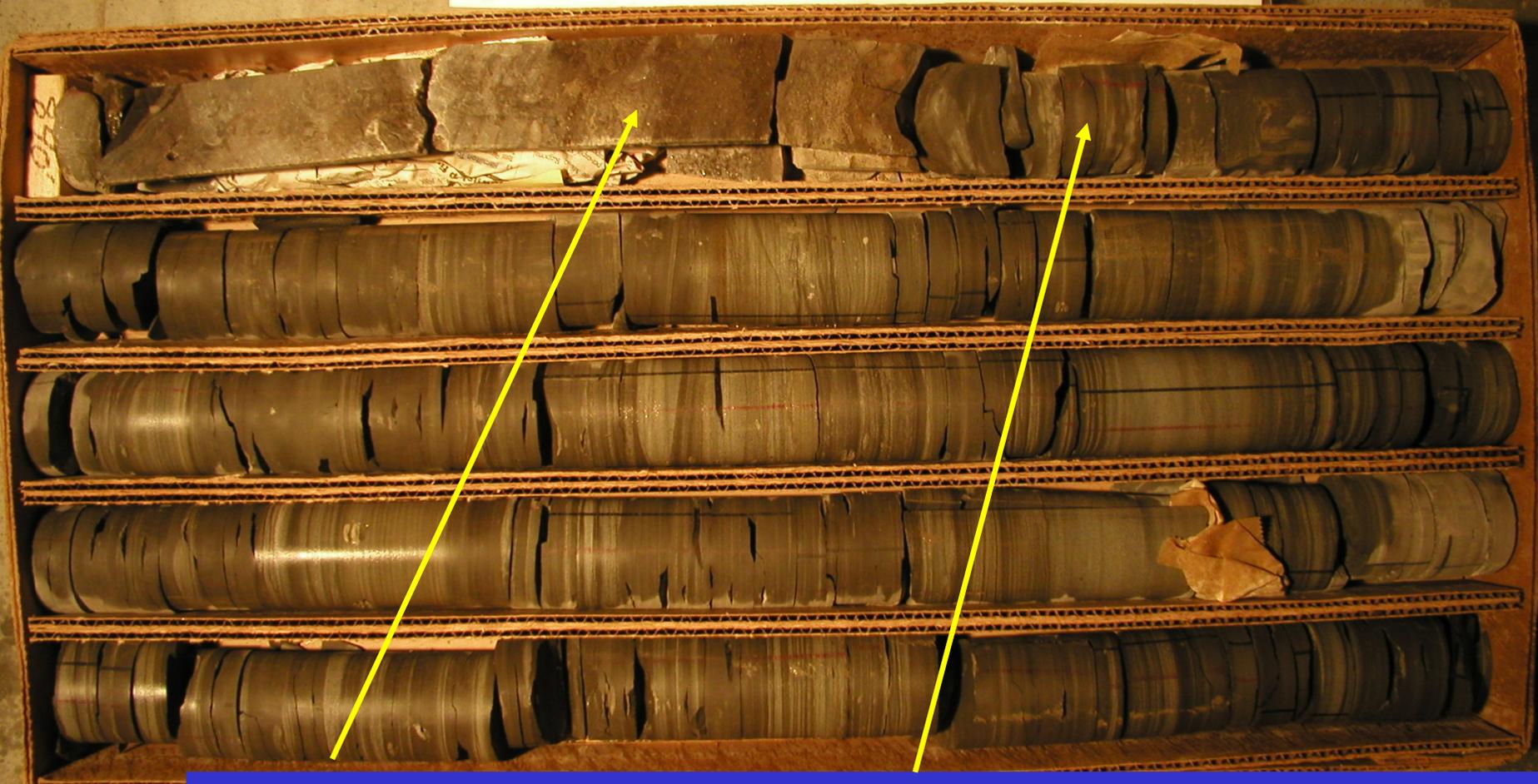
LEXINGTON PLATFORM MARGIN

2982 TRENTON/CURDSVILLE



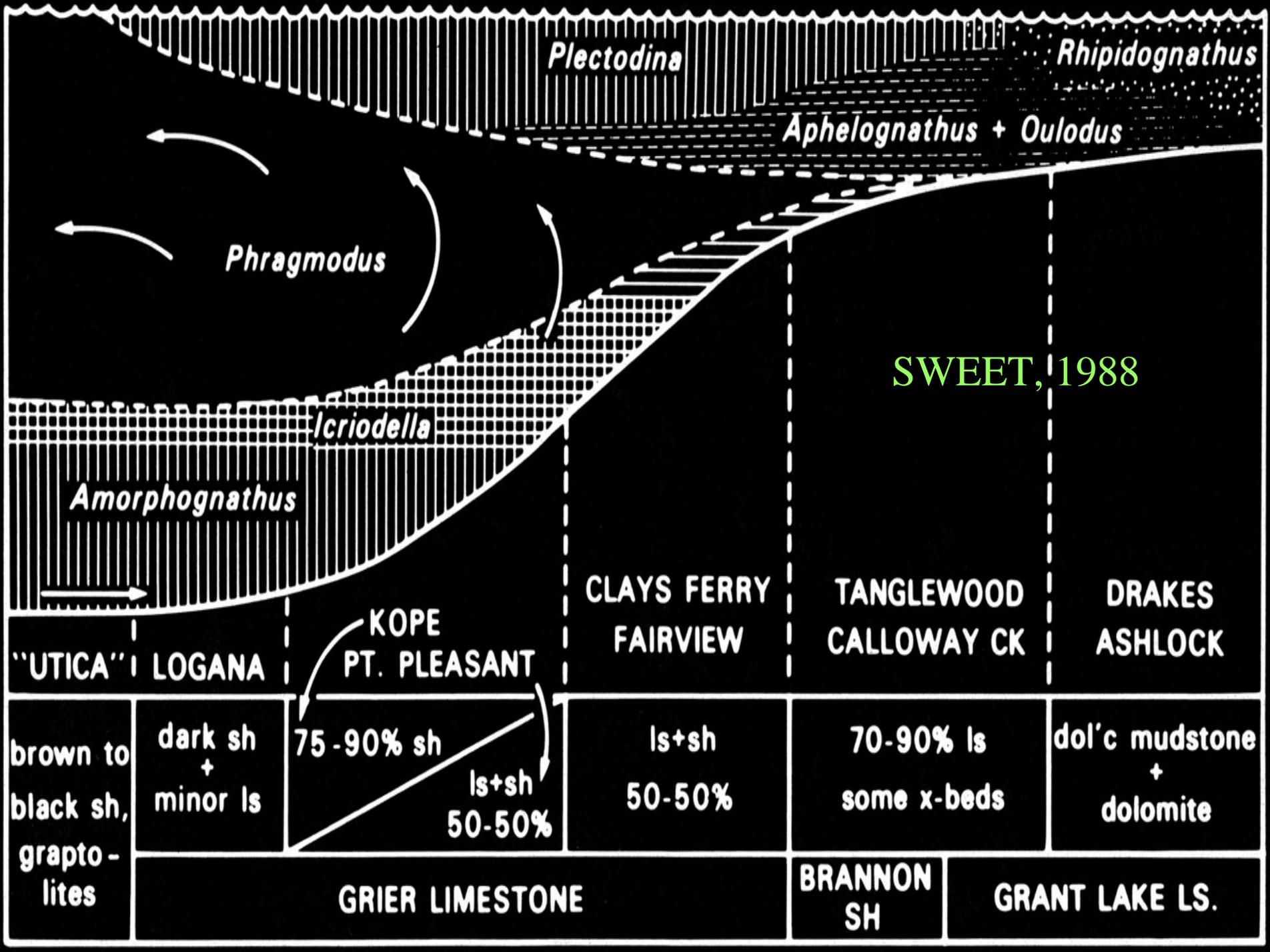
GEOLOGICAL SURVEY
OHIO DEPARTMENT OF NATURAL RESOURCES
ROCK AND

LEXINGTON PLATFORM MARGIN



2982 TRENTON/CURDSVILLE; UTICA





Plectodina

Rhipidognathus

Aphelognathus + Oulodus

Phragmodus

Icriodella

Amorphognathus

SWEET, 1988

CLAYS FERRY
FAIRVIEW

TANGLEWOOD
CALLOWAY CK

DRAKES
ASHLOCK

"UTICA" LOGANA

KOPE
PT. PLEASANT

brown to
black sh,
grapto-
lites

dark sh
+
minor ls

75-90% sh

ls+sh
50-50%

ls+sh
50-50%

70-90% ls
some x-beds

dol'c mudstone
+
dolomite

GRIER LIMESTONE

BRANNON
SH

GRANT LAKE LS.

LEXINGTON PLATFORM



3409 BLACK RIVER; MILLBRIG; TRENTON/CURDSVILLE

LEXINGTON PLATFORM

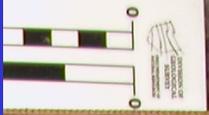


3409 TRENTON/CURDSVILLE; LOGANA

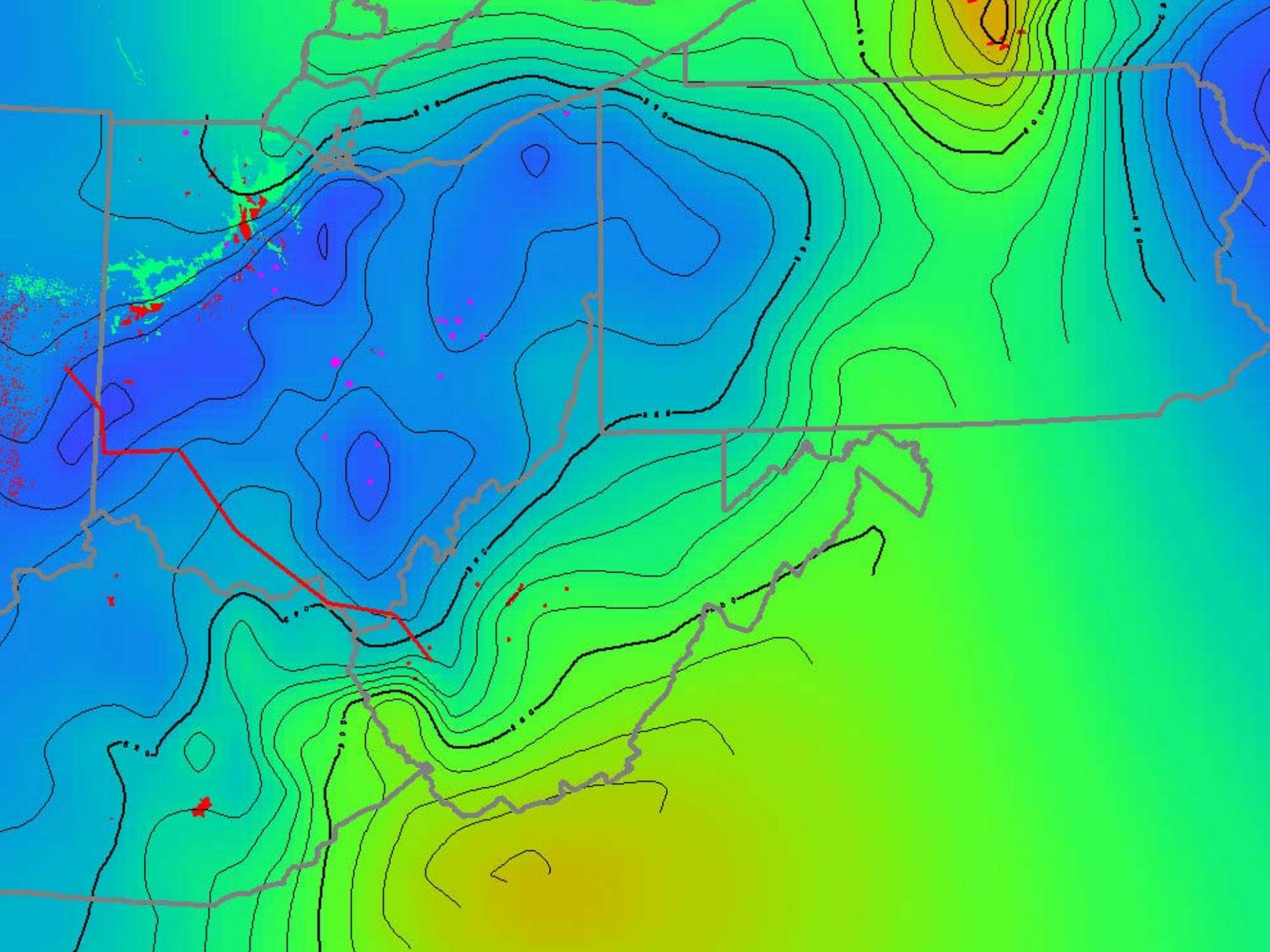
LEXINGTON PLATFORM

ROCK AND

3 2 1 1



3409 LEXINGTON UNDIFFERENTIATED



CROSS SECTION NETWORK COMPLETED

ISOPACH MAPPING UNDERWAY

DEVELOP DEPOSITIONAL MODELS

INTEGRATE OTHER STUDIES

