A photomicrograph showing a dark, layered volcanic ash sample. The layers are thin and show some fracturing. A US penny is placed on the surface for scale. A white, crystalline deposit is visible in the upper right quadrant.

**Wild and Wonderful Implications of the 5 mm  
Pompton Ash of the Hartford and Newark  
Basins (Early Jurassic, Eastern  
North America)**

**Paul E. Olsen  
Anthony R. Philpotts  
Nicholas G. McDonald  
Randoph P. Steinen  
Sean T. Kinney  
Stephen J. Jaret  
E. Troy Rasbury**

# Overview

- 1) **Discovery of the Pompton Ash**
- 2) **Distribution**
- 3) **Patterns**
- 4) **Giant Lakes?**
- 5) **Tracing ashes**

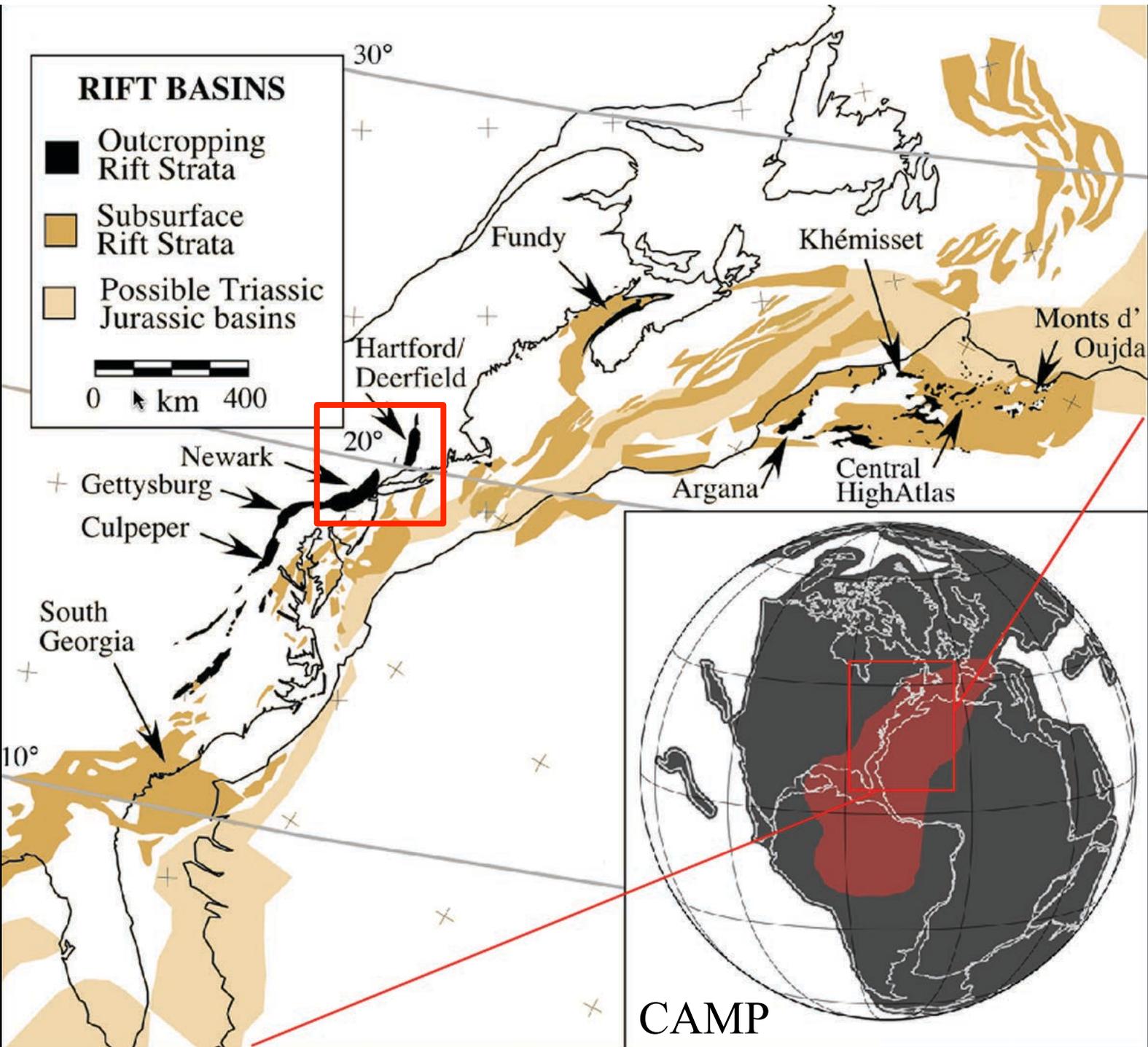
# Overview

- 1) Discovery of the Pompton Ash
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**RIFT BASINS**

-  Outcropping Rift Strata
-  Subsurface Rift Strata
-  Possible Triassic Jurassic basins

0  400 km

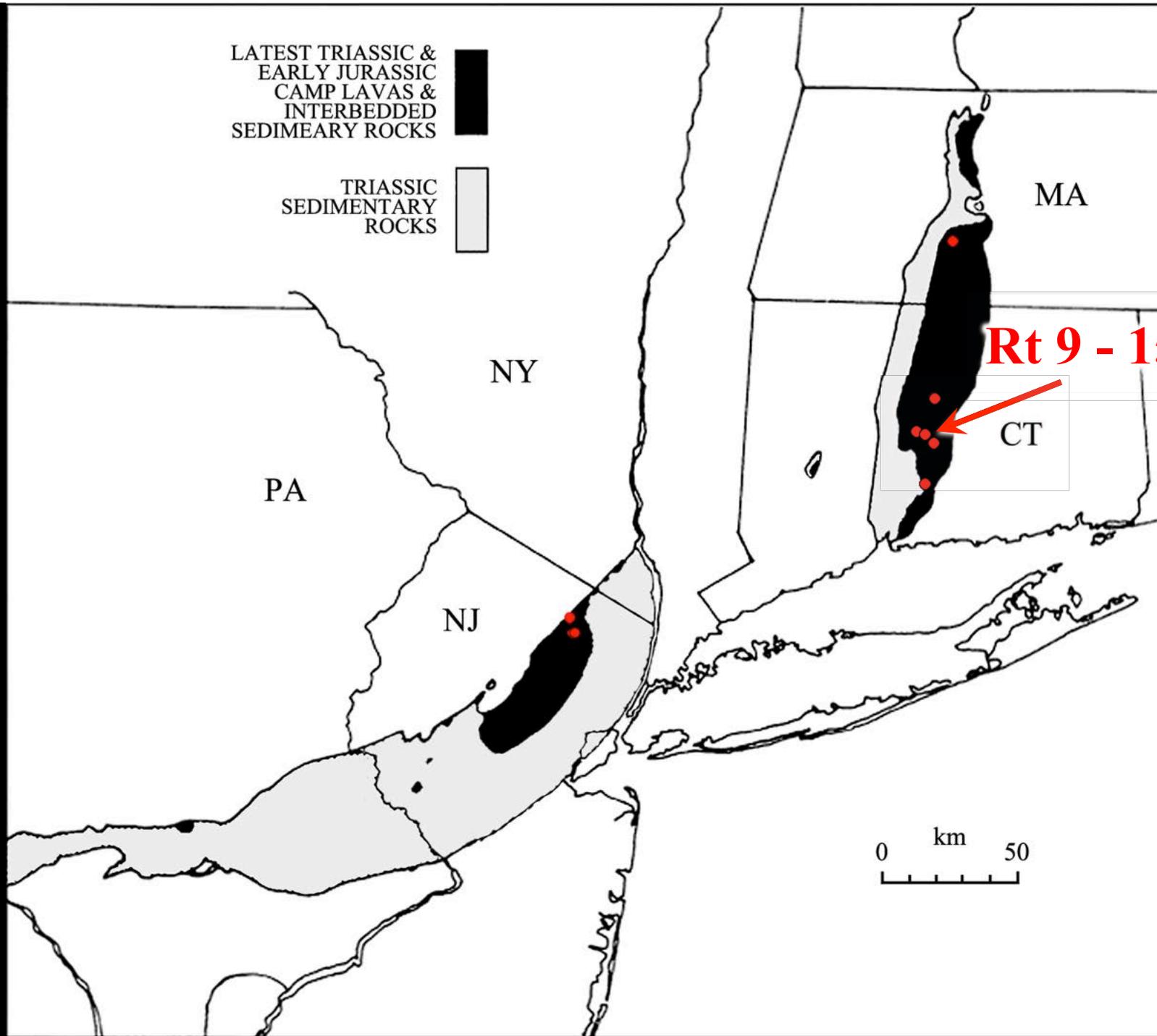


CAMP

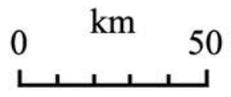
LATEST TRIASSIC &  
EARLY JURASSIC  
CAMP LAVAS &  
INTERBEDDED  
SEDIMENTARY ROCKS



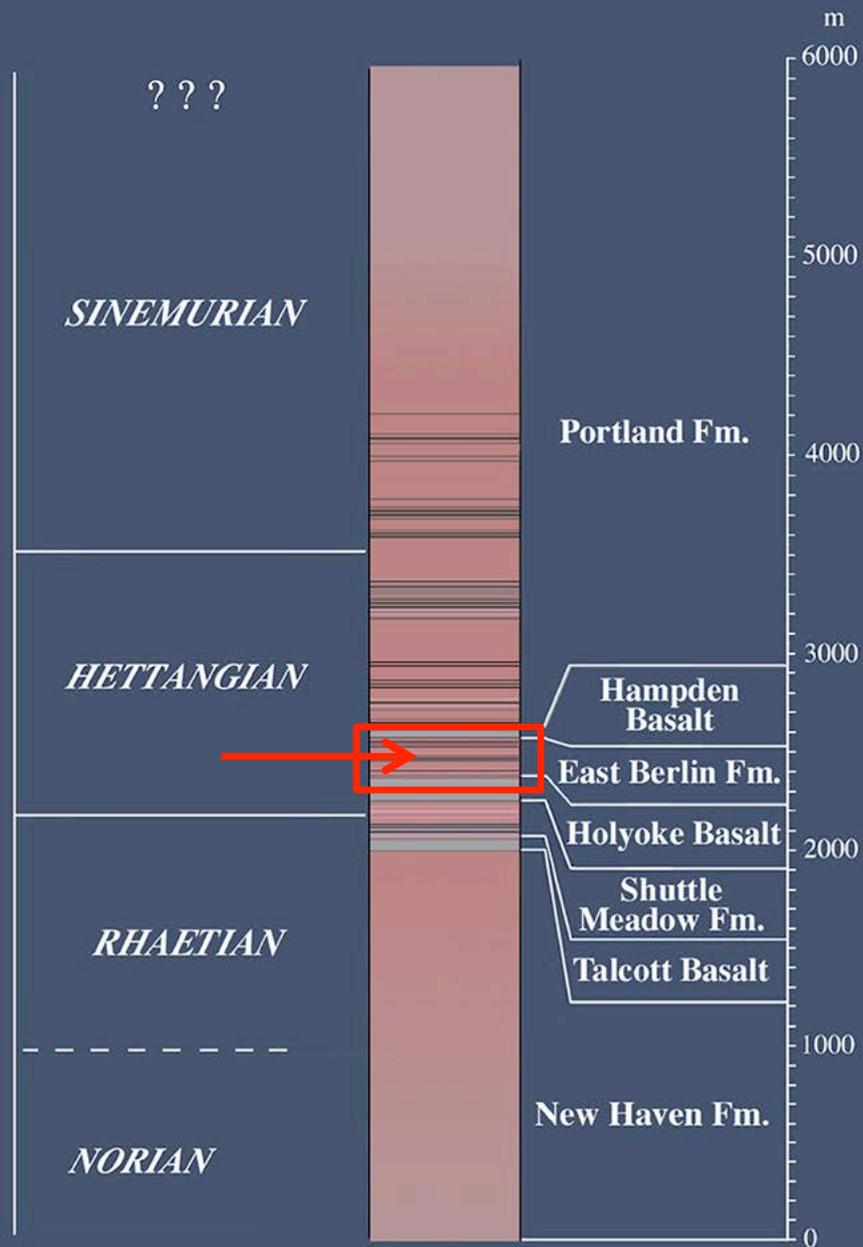
TRIASSIC  
SEDIMENTARY  
ROCKS



**Rt 9 - 15**



# Hartford Basin





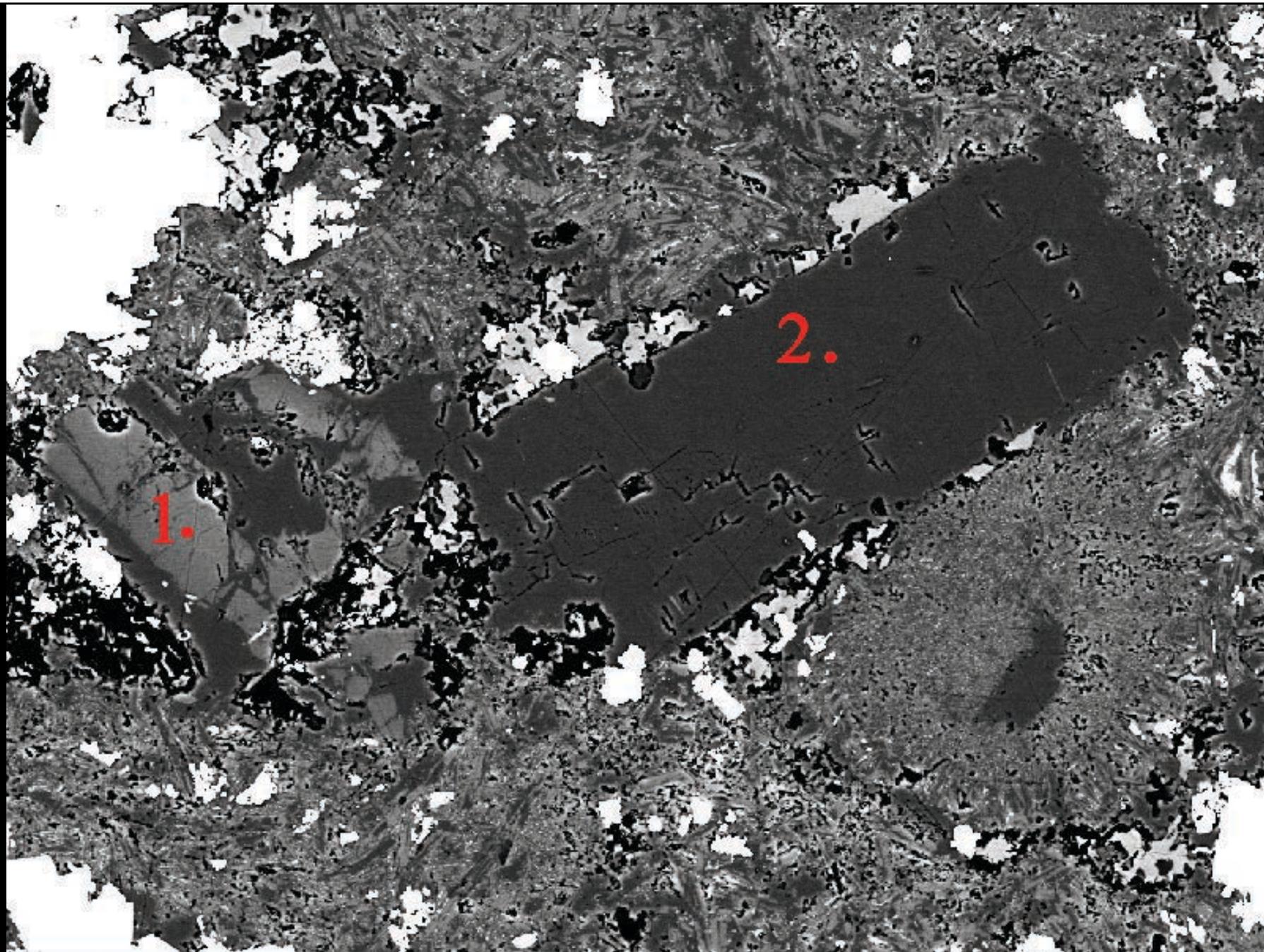
Rt 9, East Berlin Formation



Pompton Tuff, Westfield Fish Bed







Jim Ekert, 2011

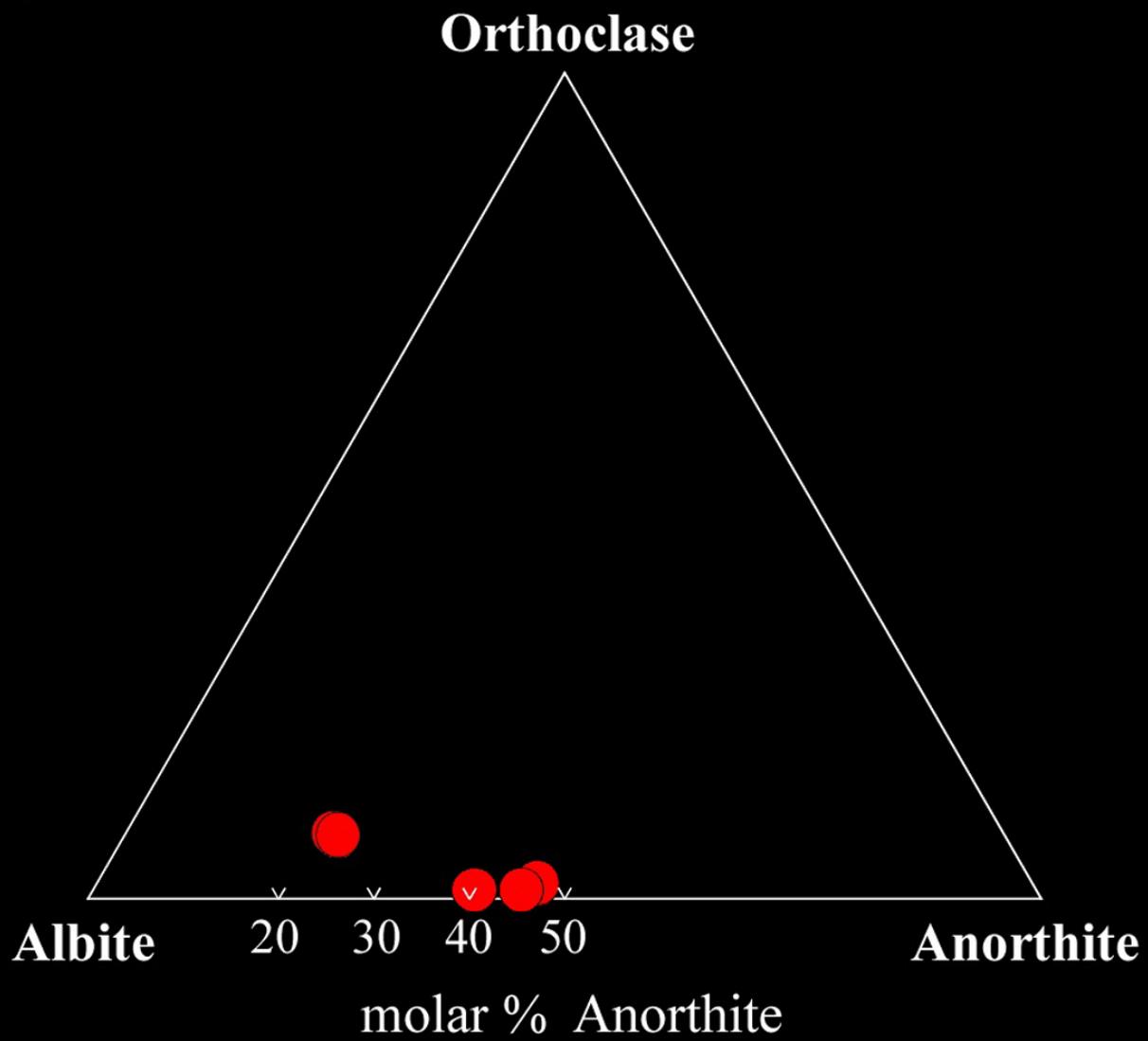
X 370

— 10µm

15.0kV BSE

JEOLB530 11/29/2011

WD 11.0mm 13:34:36

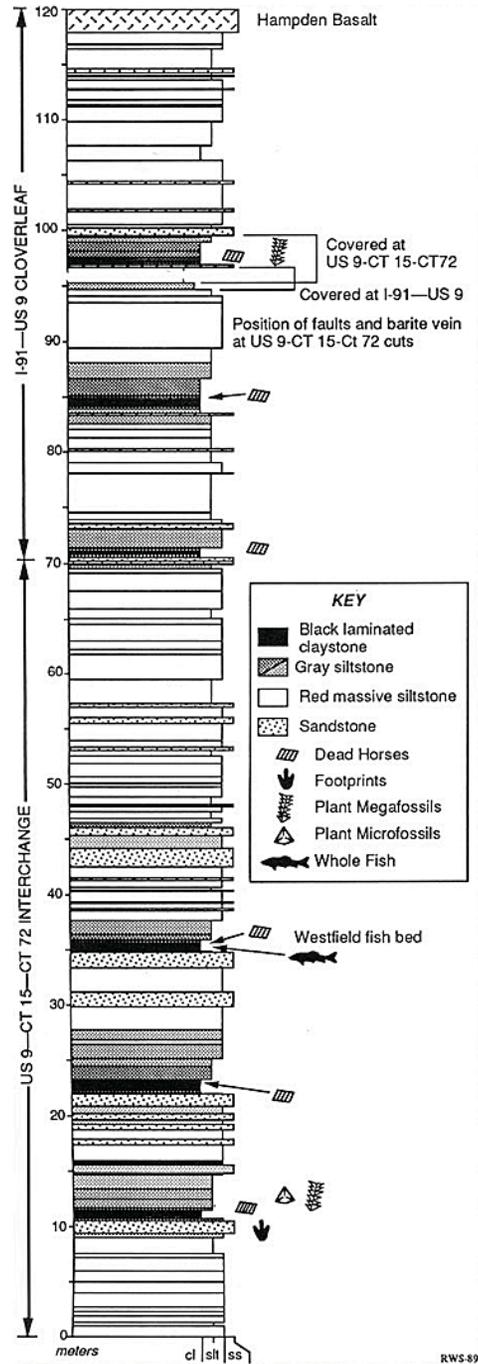


# Overview

- 1) Discovery of the Pompton Ash
- 2) Distribution
- 3) Patterns
- 4) Giant Lakes?
- 5) Tracing ashes

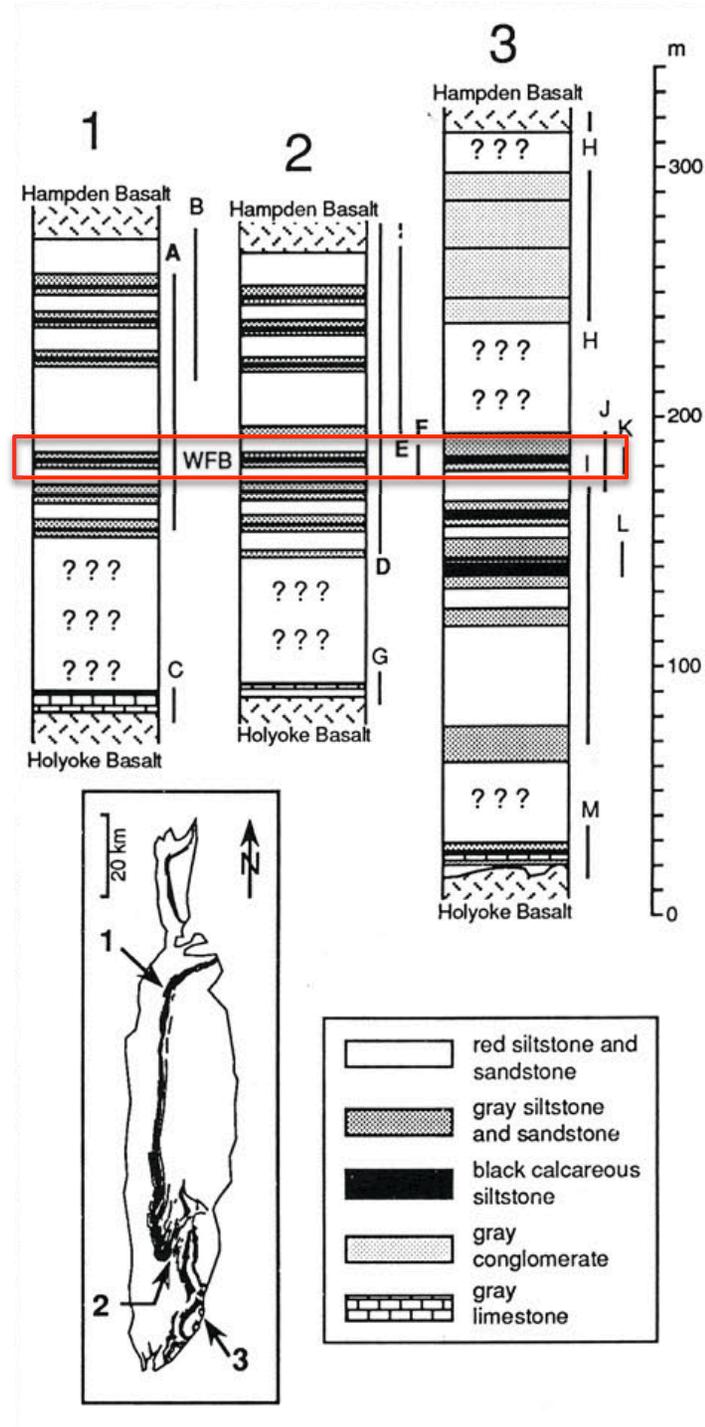
Olsen et al., 1989

**Westfield Bed** →



Olsen et al., 1989

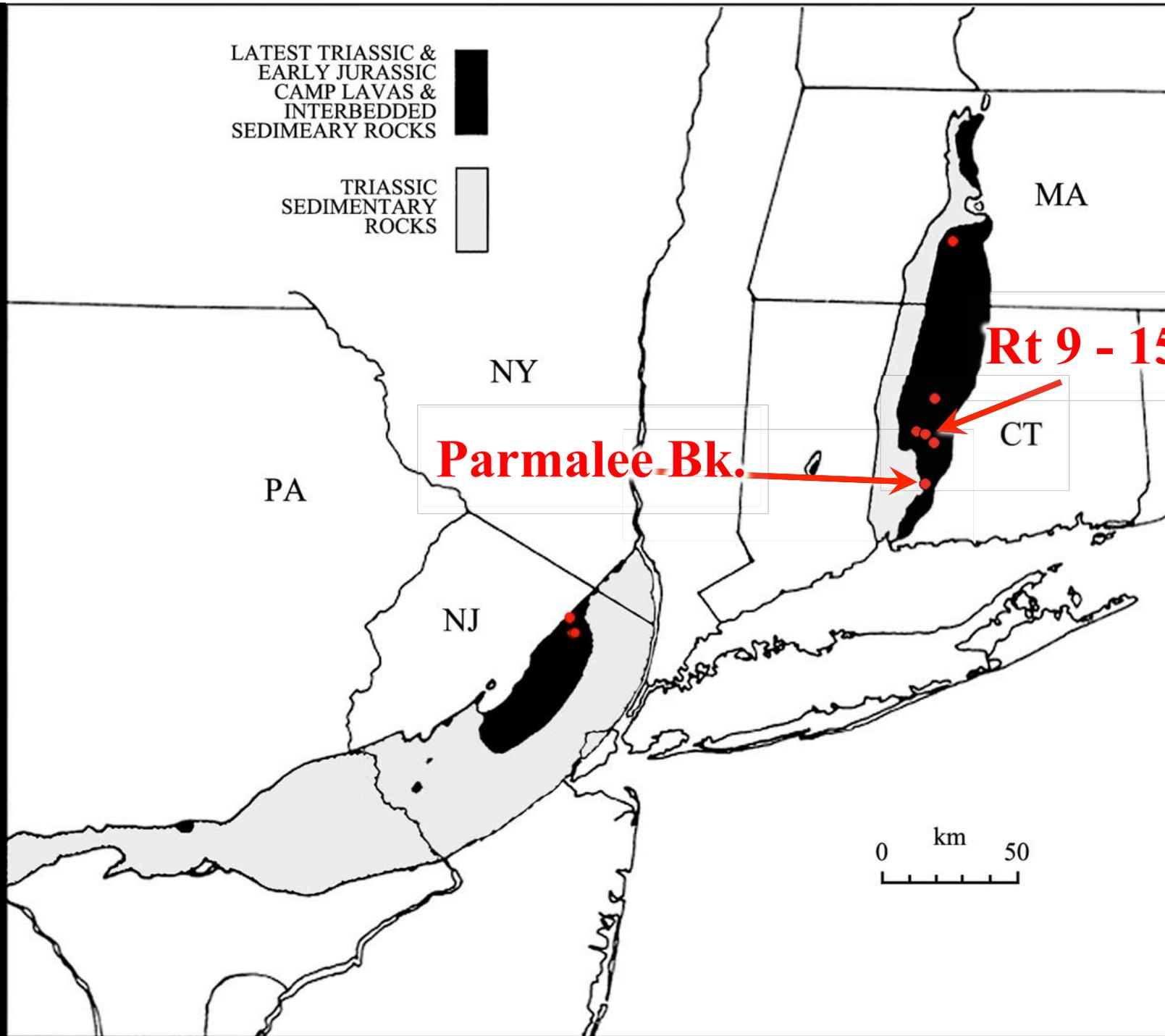
**Westfield Bed** →



LATEST TRIASSIC &  
EARLY JURASSIC  
CAMP LAVAS &  
INTERBEDDED  
SEDIMENTARY ROCKS

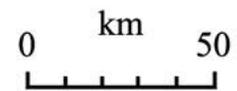


TRIASSIC  
SEDIMENTARY  
ROCKS



**Parmalee-Bk.**

**Rt 9 - 15**





# Parmalee Brook, Durham, CT



Pompton Tuff, Westfield Fish Bed

# Parmalee Brook, Durham, CT



LATEST TRIASSIC &  
EARLY JURASSIC  
CAMP LAVAS &  
INTERBEDDED  
SEDIMENTARY ROCKS



TRIASSIC  
SEDIMENTARY  
ROCKS



**Mt Tom**



MA

**Rt 9 - 15**



CT

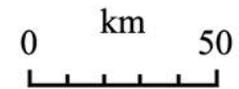
**Parmalee Bk.**



NY

PA

NJ



# Mt Tom, Holyoke, MA



Pompton Tuff, Westfield Fish Bed



Mt Tom, Holyoke, MA

# Mt Tom, Holyoke, MA



LATEST TRIASSIC &  
EARLY JURASSIC  
CAMP LAVAS &  
INTERBEDDED  
SEDIMENTARY ROCKS



TRIASSIC  
SEDIMENTARY  
ROCKS



**Mt Tom**



MA

**Rt 9 - 15**



CT

**Parmalee Bk.**



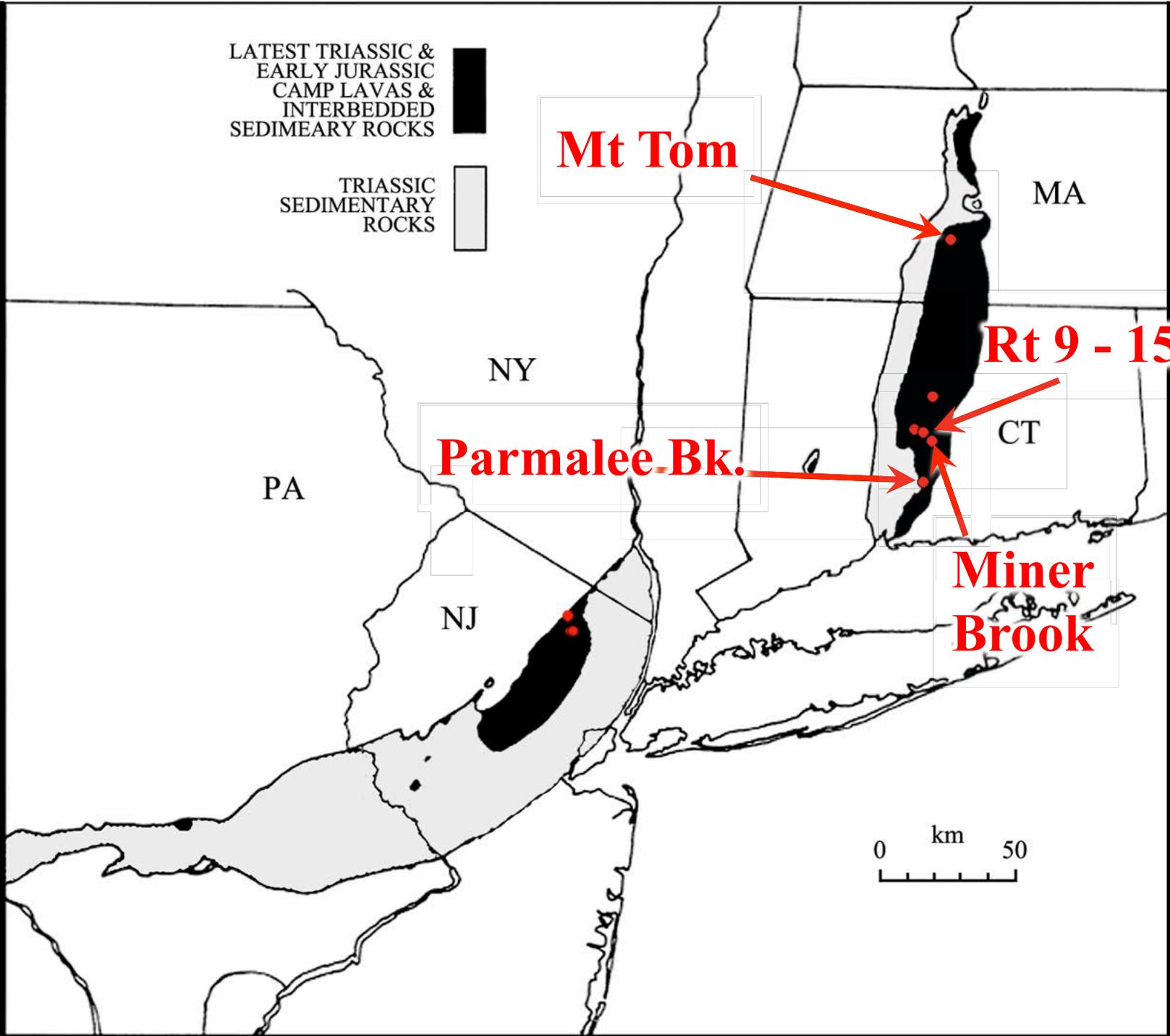
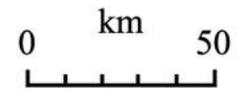
**Miner  
Brook**



PA

NY

NJ



Miner Brook, Westfield, CT



Pompton Tuff, Westfield Fish Bed

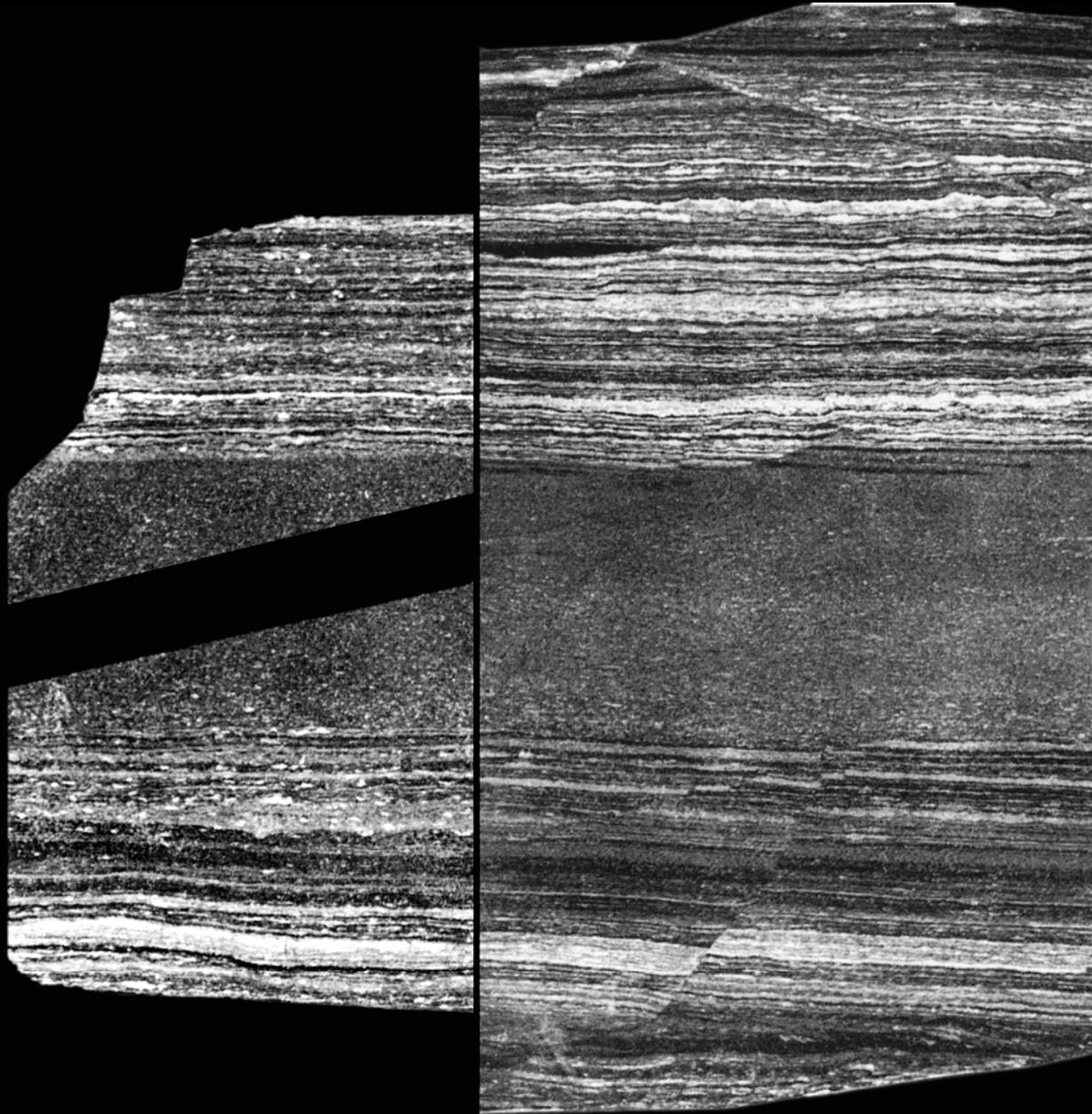
Miner Brook

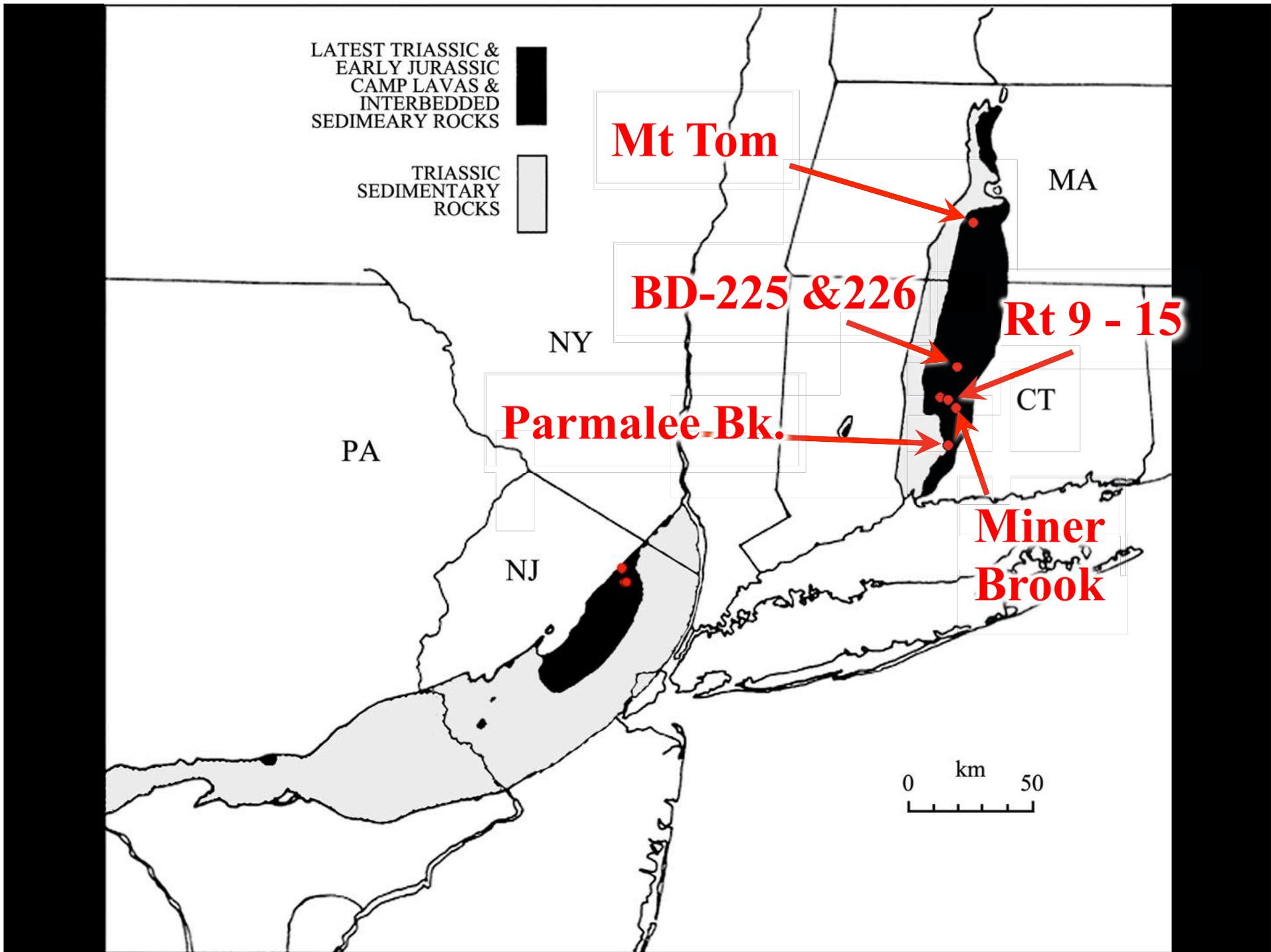
Parmalee Brook

1 cm

1 cm

Olsen, 2008





LATEST TRIASSIC &  
EARLY JURASSIC  
CAMP LAVAS &  
INTERBEDDED  
SEDIMENTARY ROCKS



TRIASSIC  
SEDIMENTARY  
ROCKS



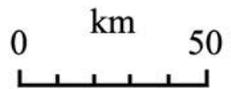
**Mt Tom**

**BD-225 & 226**

**Rt 9 - 15**

**Parmalee-Bk.**

**Miner  
Brook**

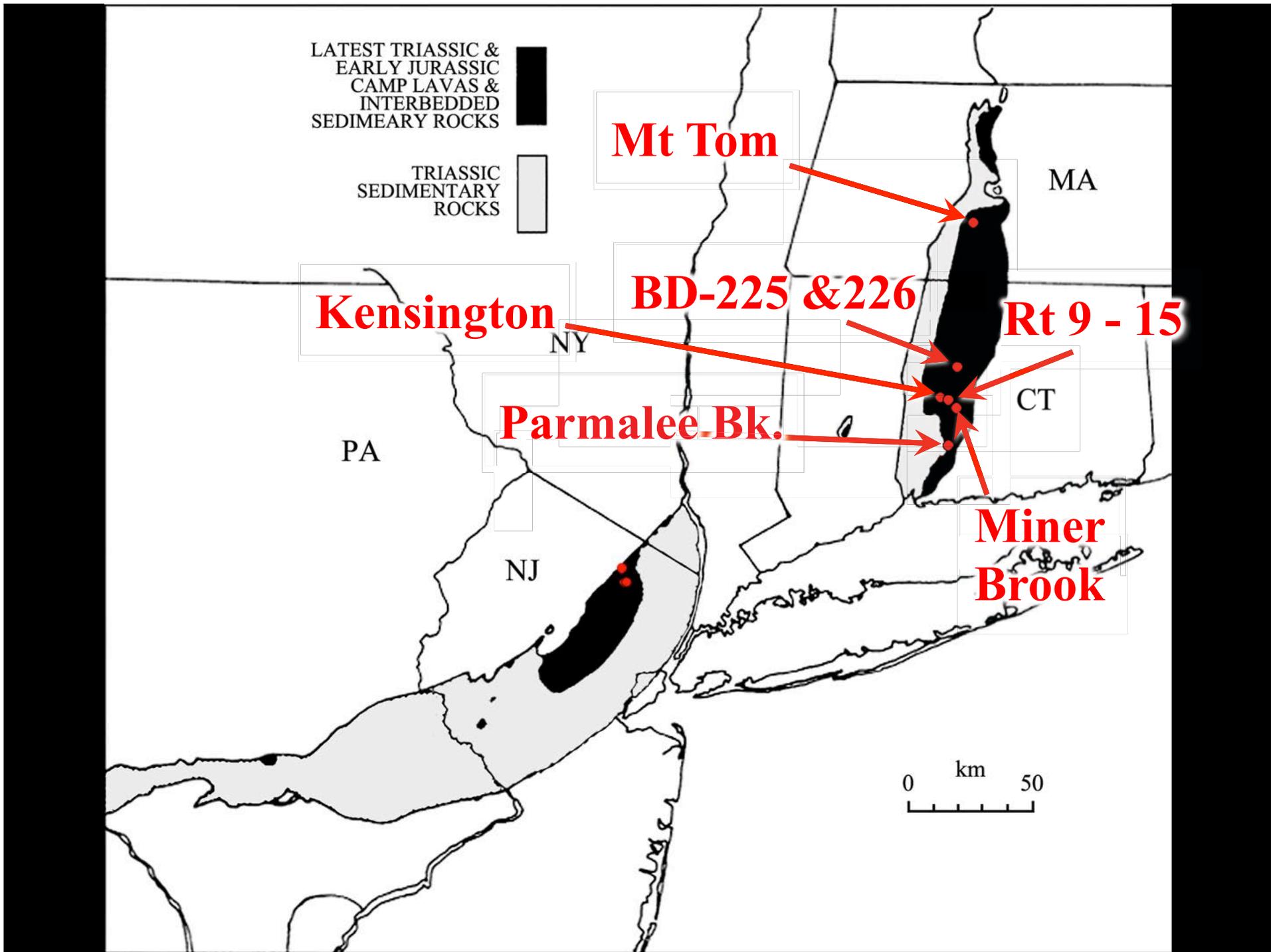


BD-226

BD-225



East Berlin Fm.  
MDC South Hartford  
Conveyance Cores



LATEST TRIASSIC &  
EARLY JURASSIC  
CAMP LAVAS &  
INTERBEDDED  
SEDIMENTARY ROCKS

TRIASSIC  
SEDIMENTARY  
ROCKS

**Mt Tom**

**Kensington**

**BD-225 & 226**

**Rt 9 - 15**

**Parmalee Bk.**

**Miner  
Brook**

0 km 50

# Kensington, CT



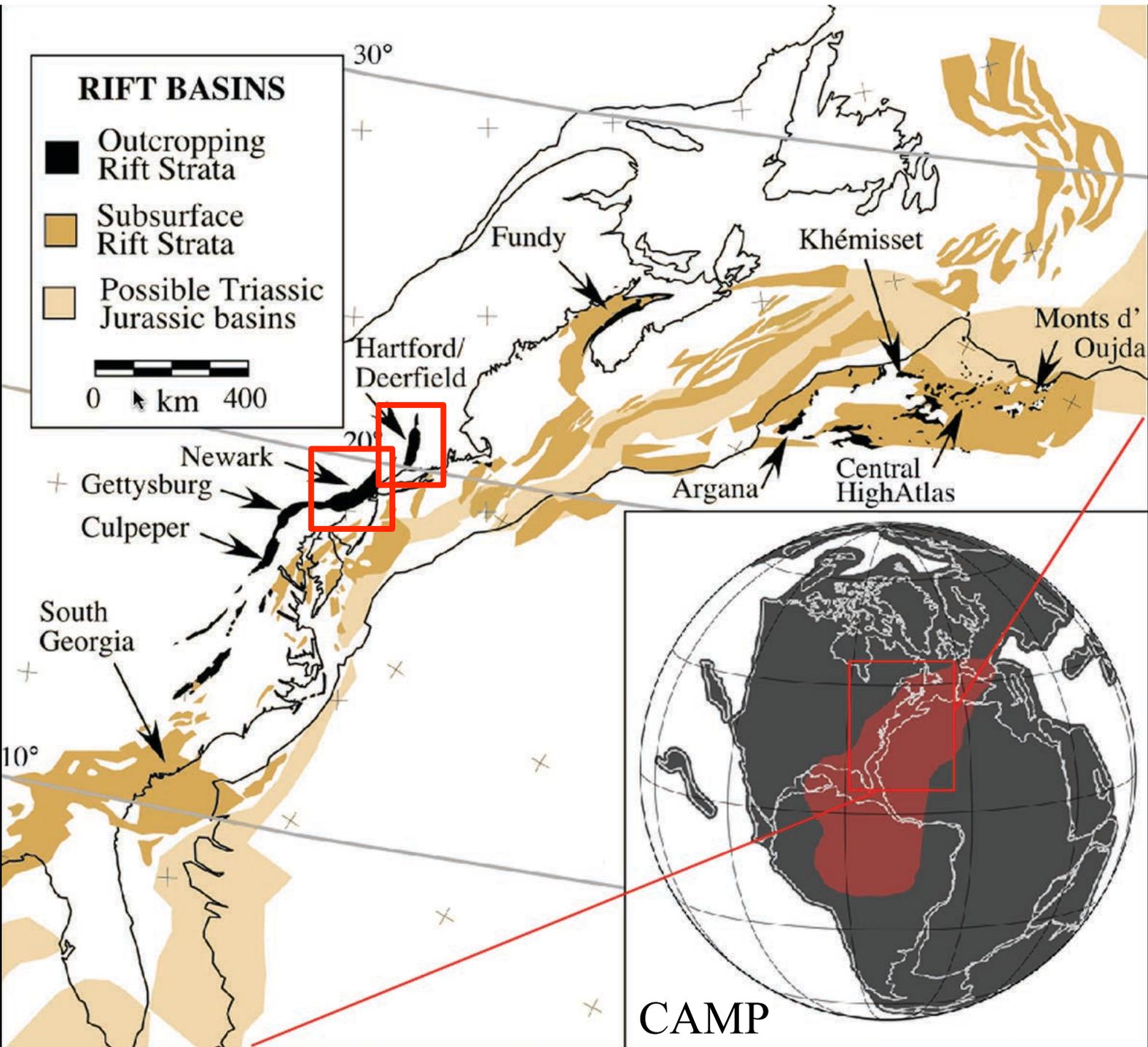
Kensington, CT



**RIFT BASINS**

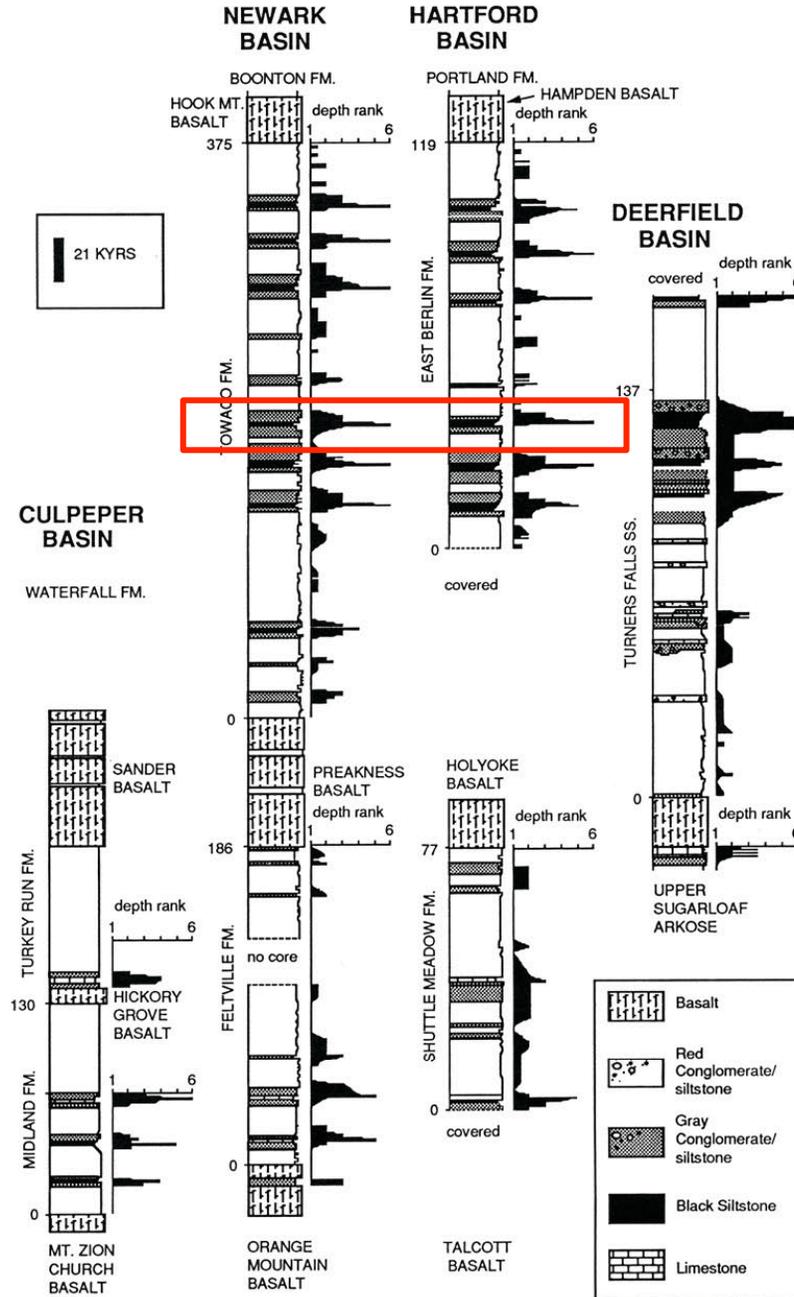
-  Outcropping Rift Strata
-  Subsurface Rift Strata
-  Possible Triassic Jurassic basins

0  km 400

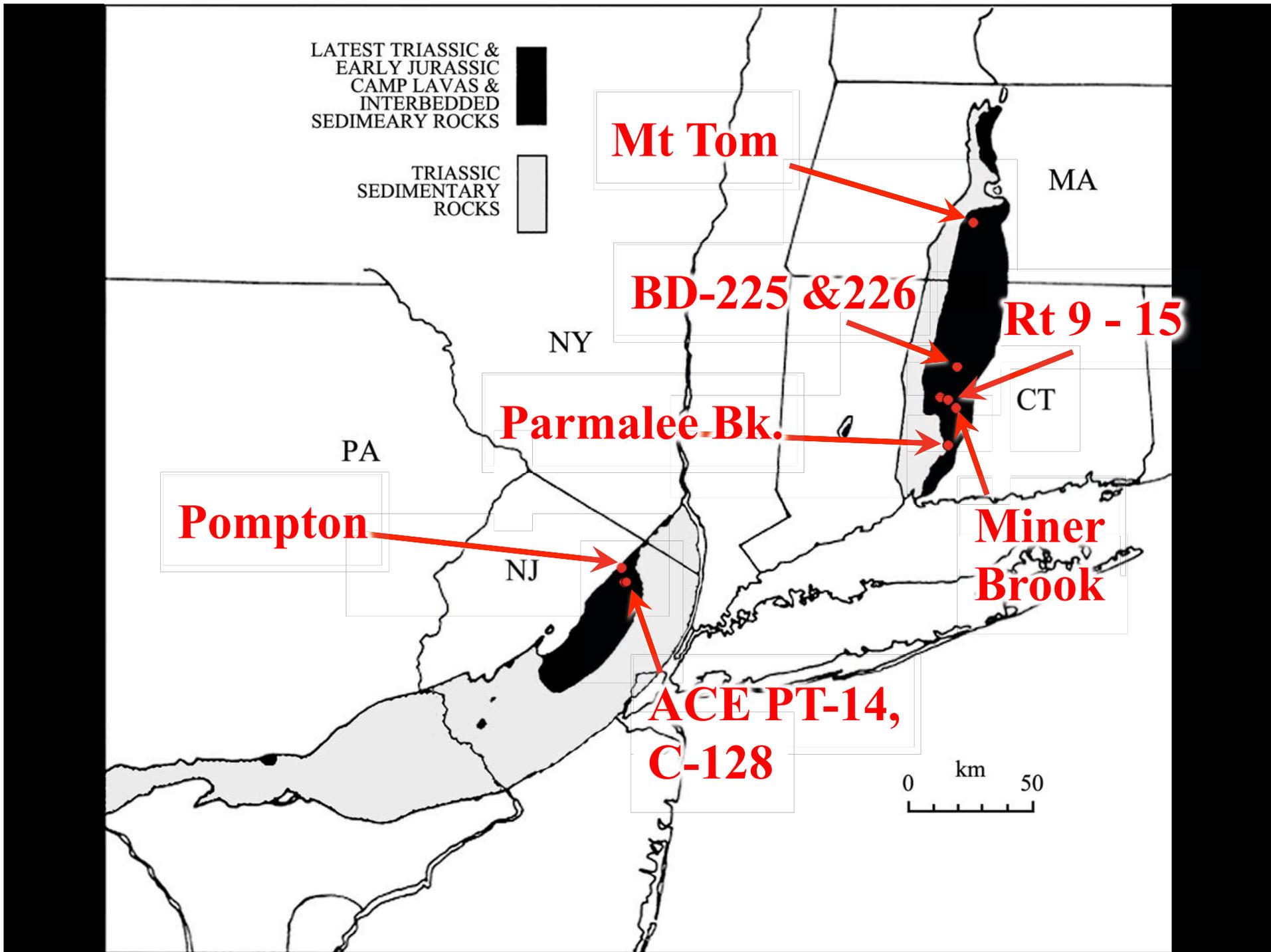


CAMP

# Newark basin Hartford basin basic correlation

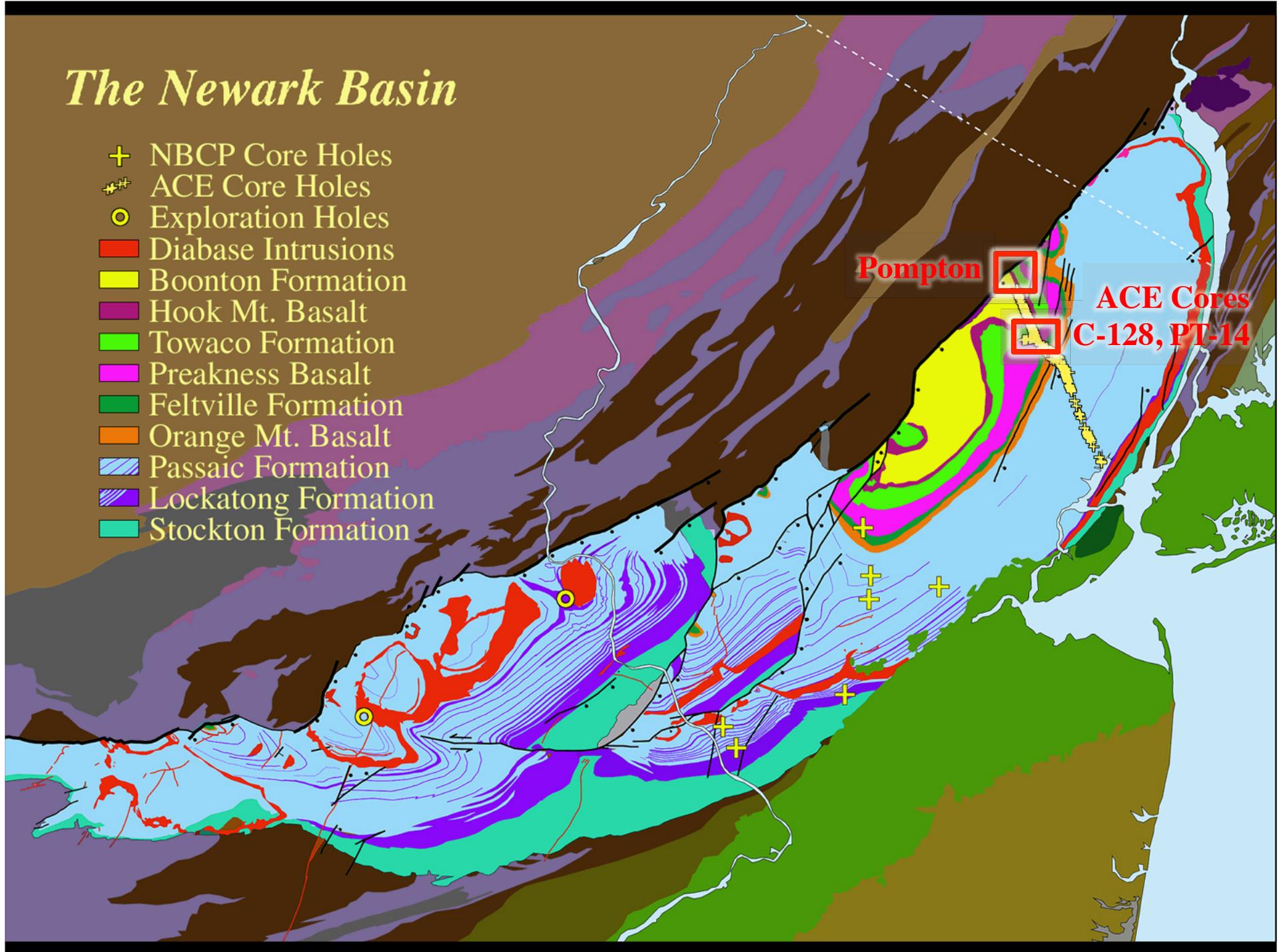


Olsen et al., 1989

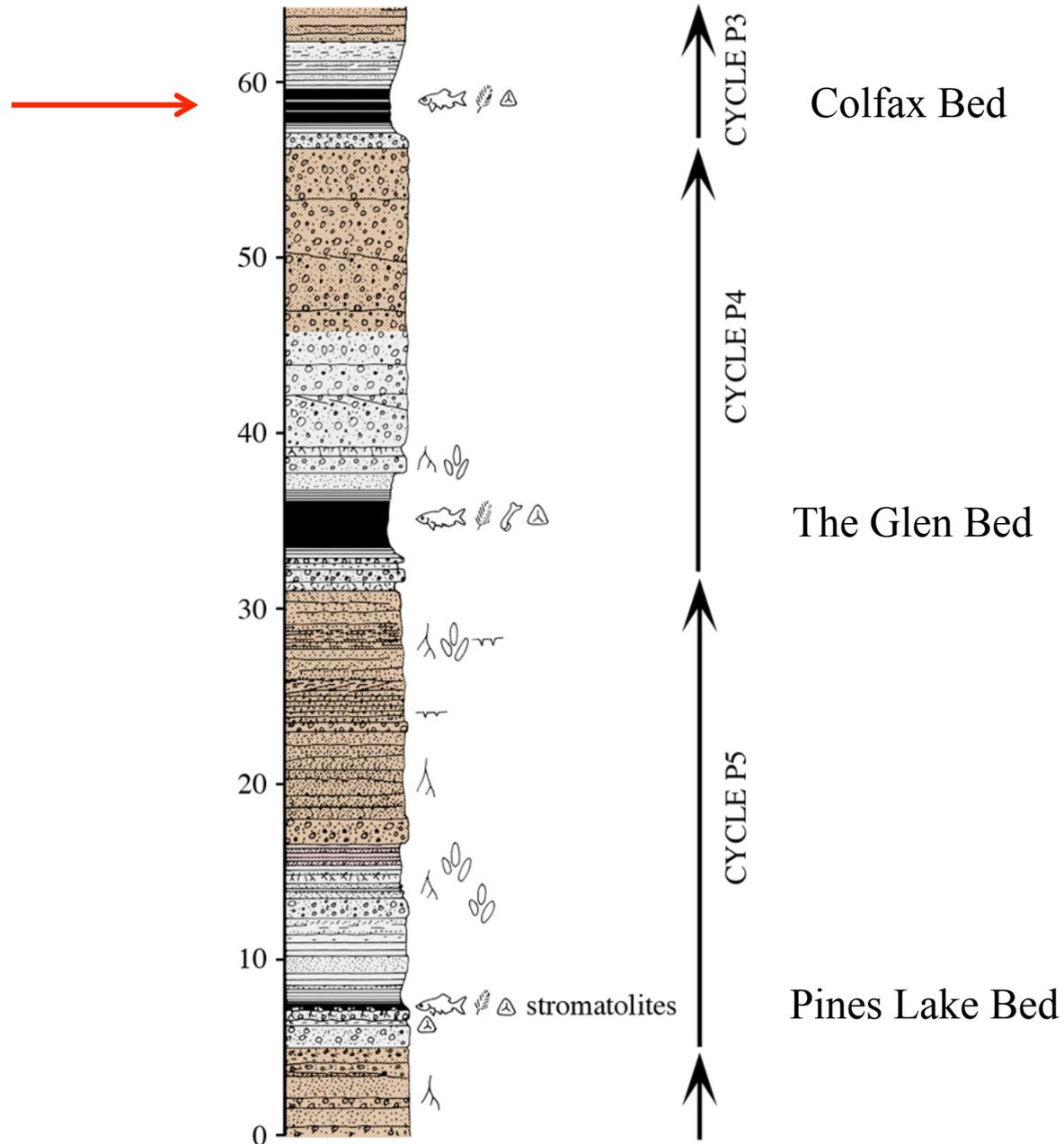


# The Newark Basin

- + NBCP Core Holes
- + ACE Core Holes
- Exploration Holes
- Diabase Intrusions
- Boonton Formation
- Hook Mt. Basalt
- Towaco Formation
- Preakness Basalt
- Feltville Formation
- Orange Mt. Basalt
- Passaic Formation
- Lockatong Formation
- Stockton Formation

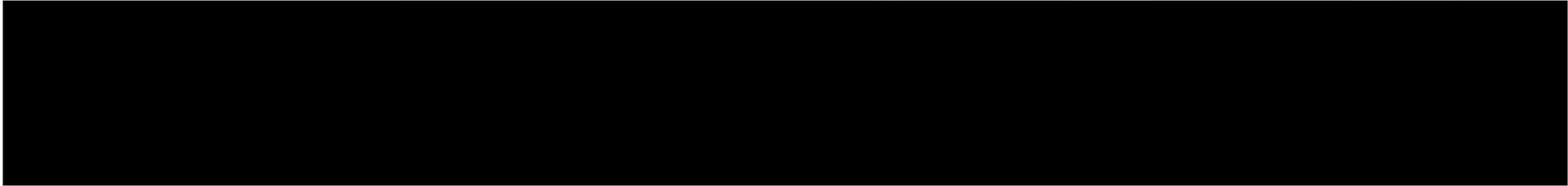
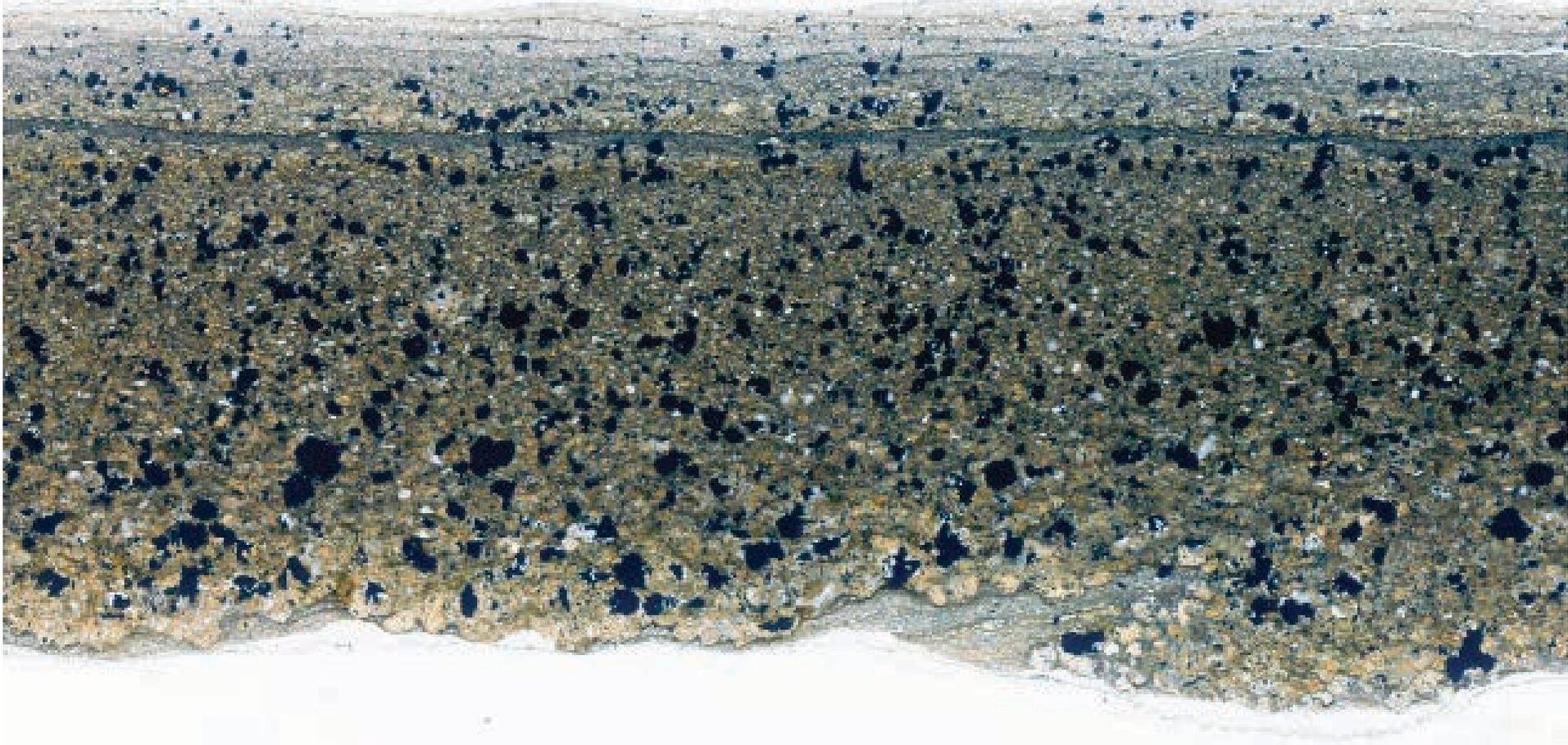
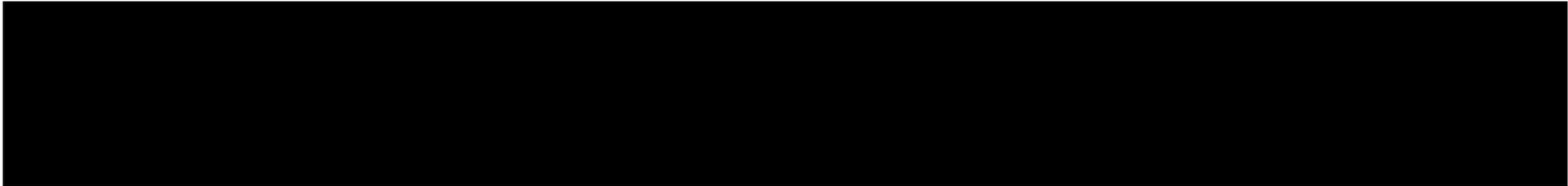


# Section at Pompton, Middle Towaco Formation



# Pompton Tuff at Pompton, NJ





0.75 km



Newark Basin

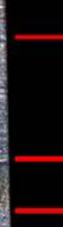
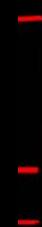
PT-14

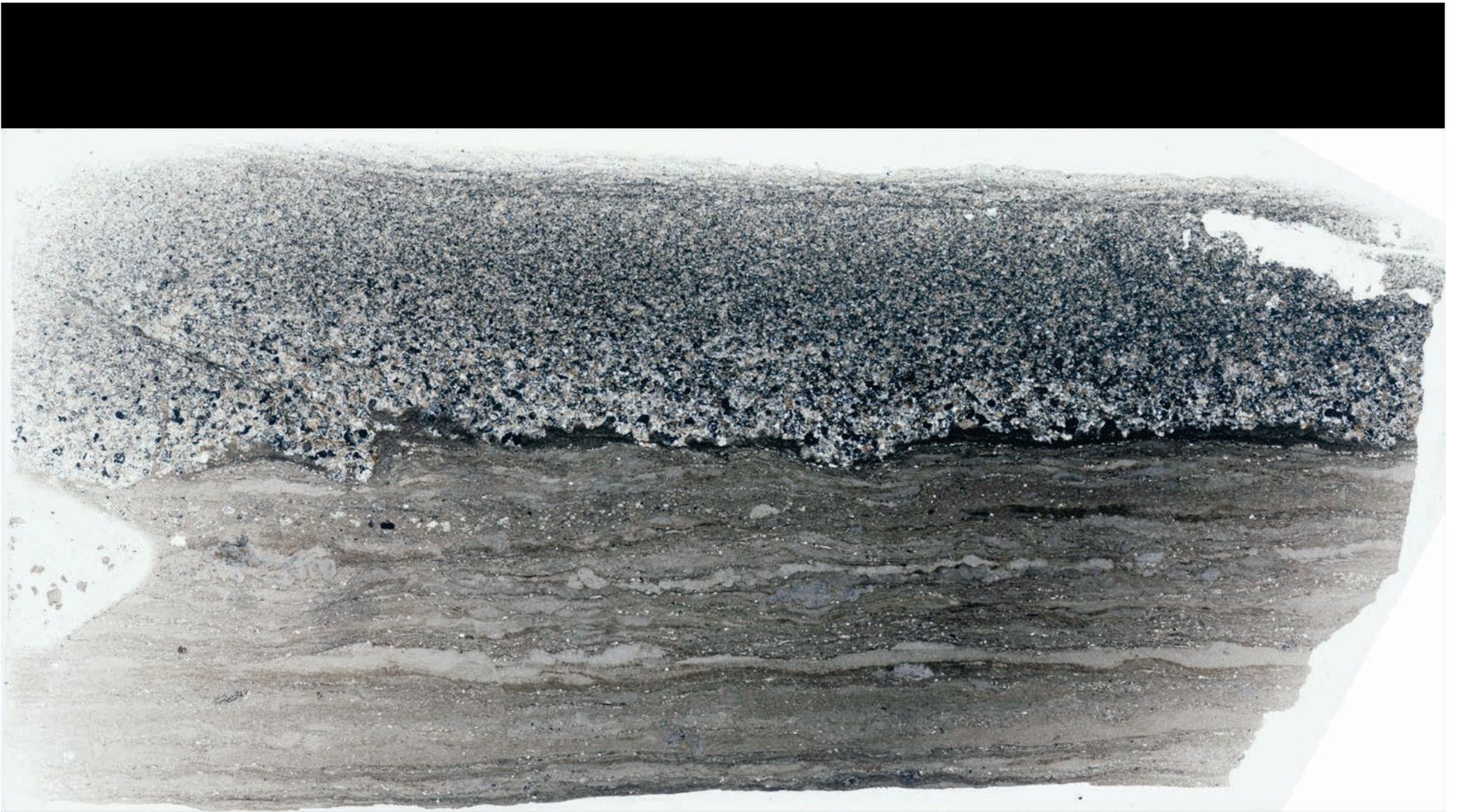
C-128



ash 2

Pompton Ash

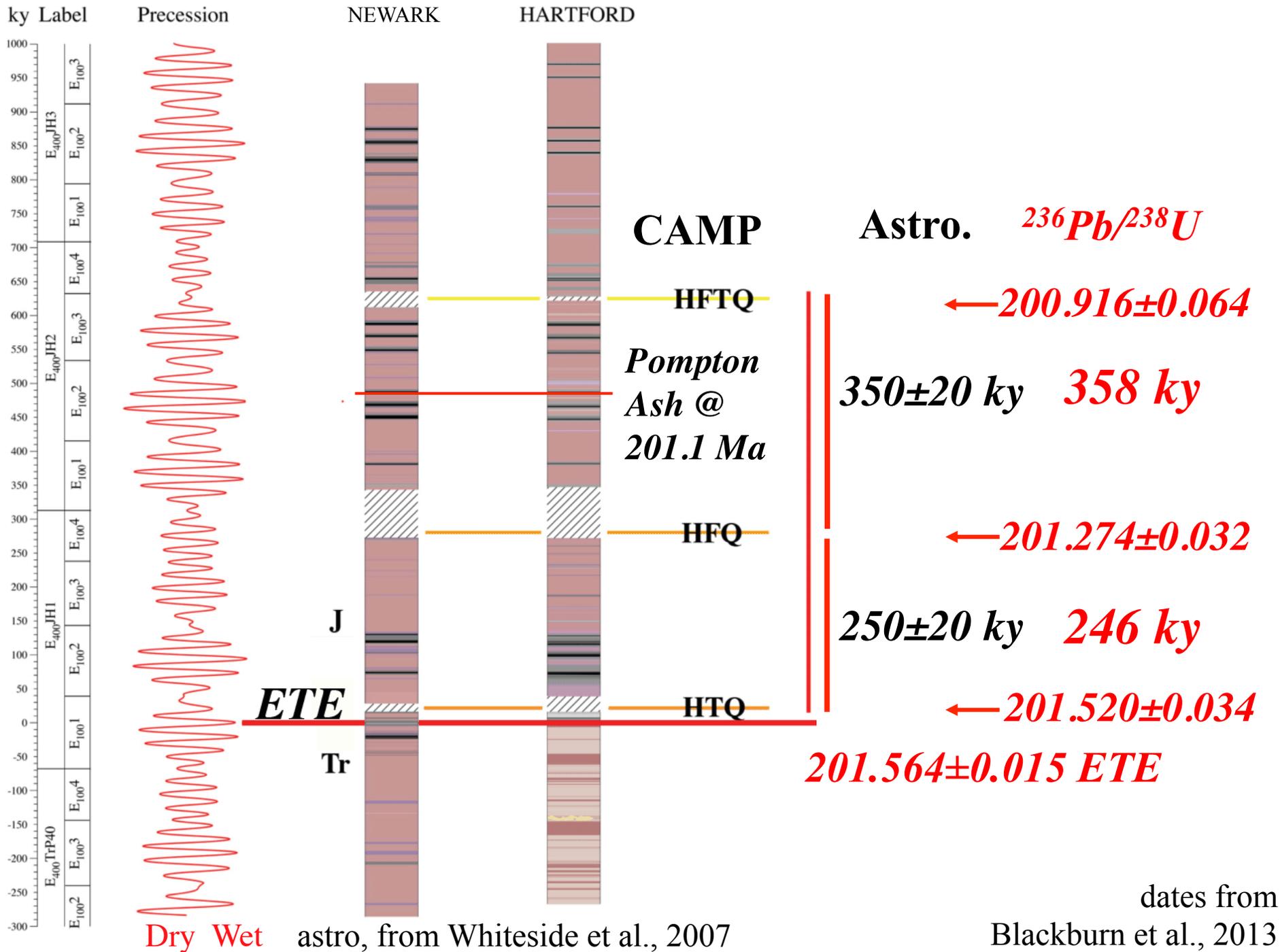




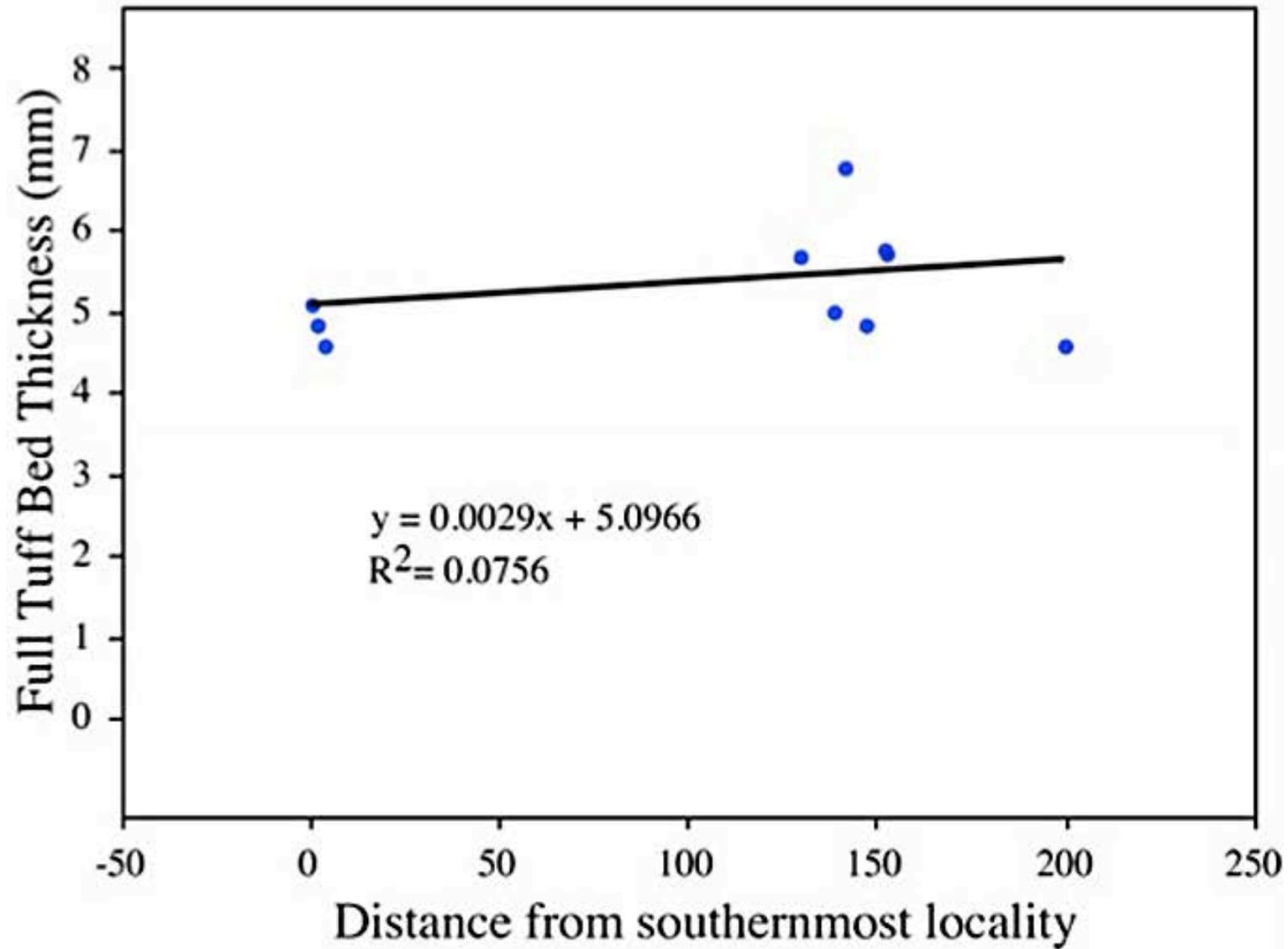
ACE Core C-128

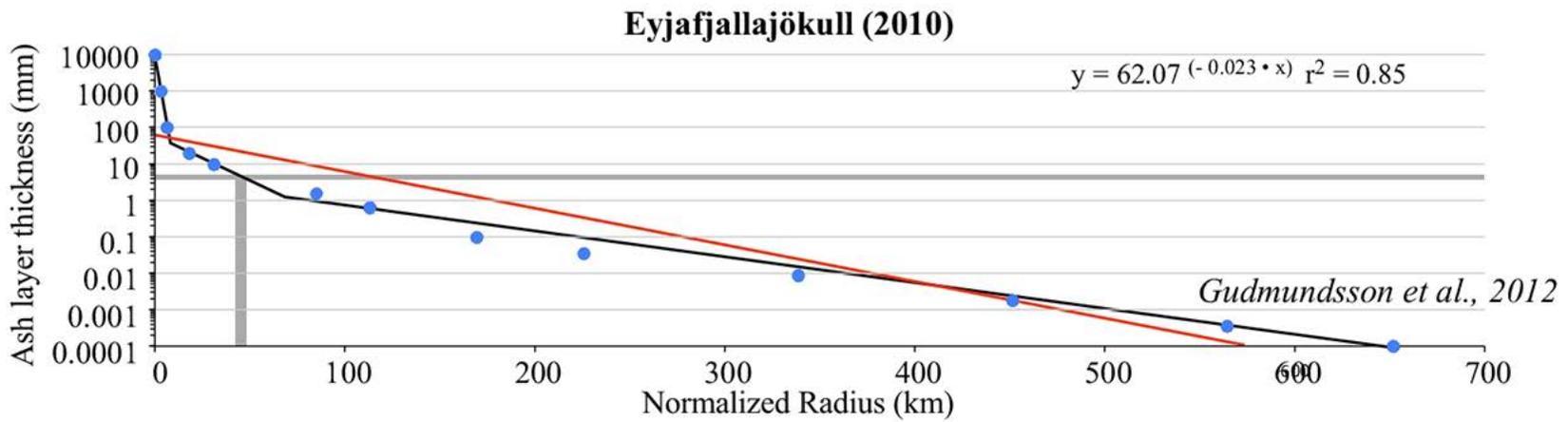
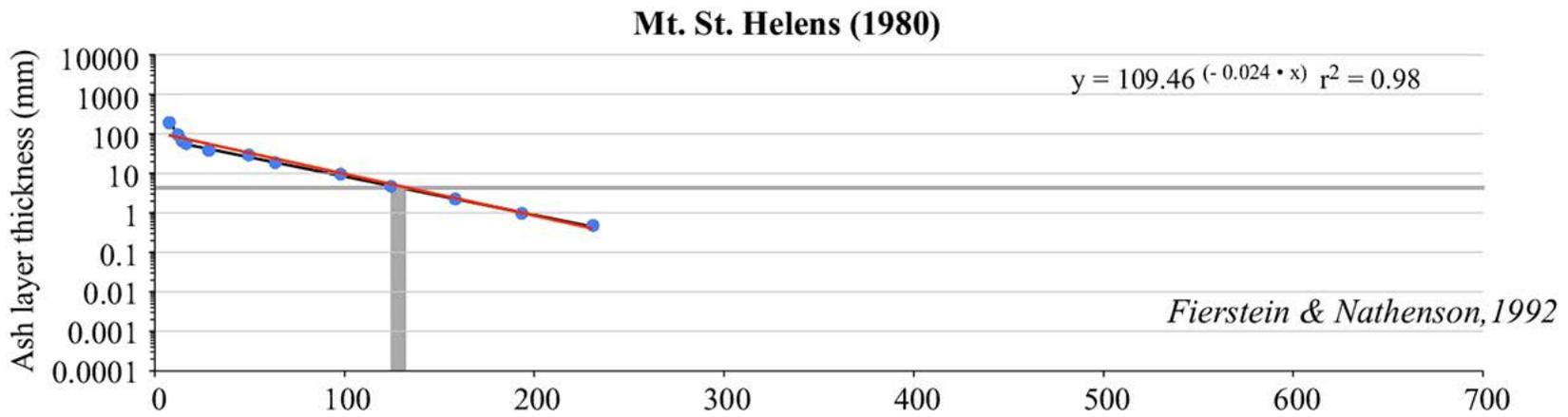
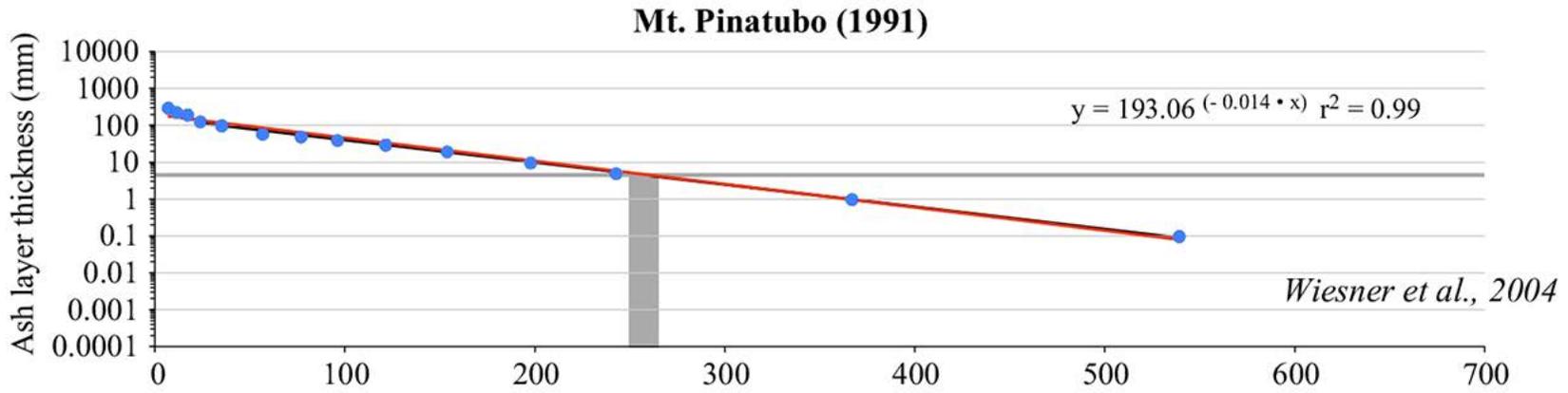
# Overview

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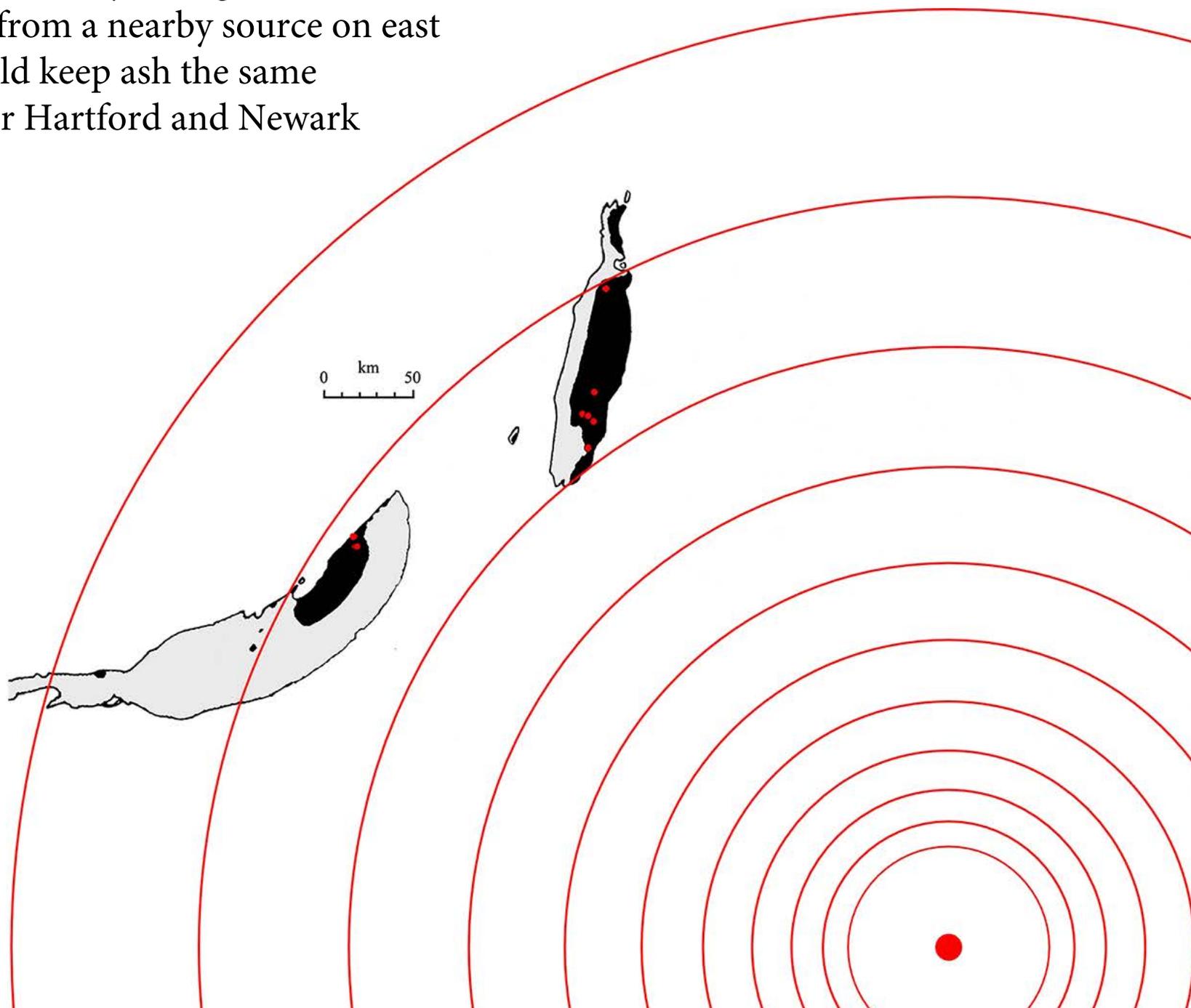


# Bed Thickness



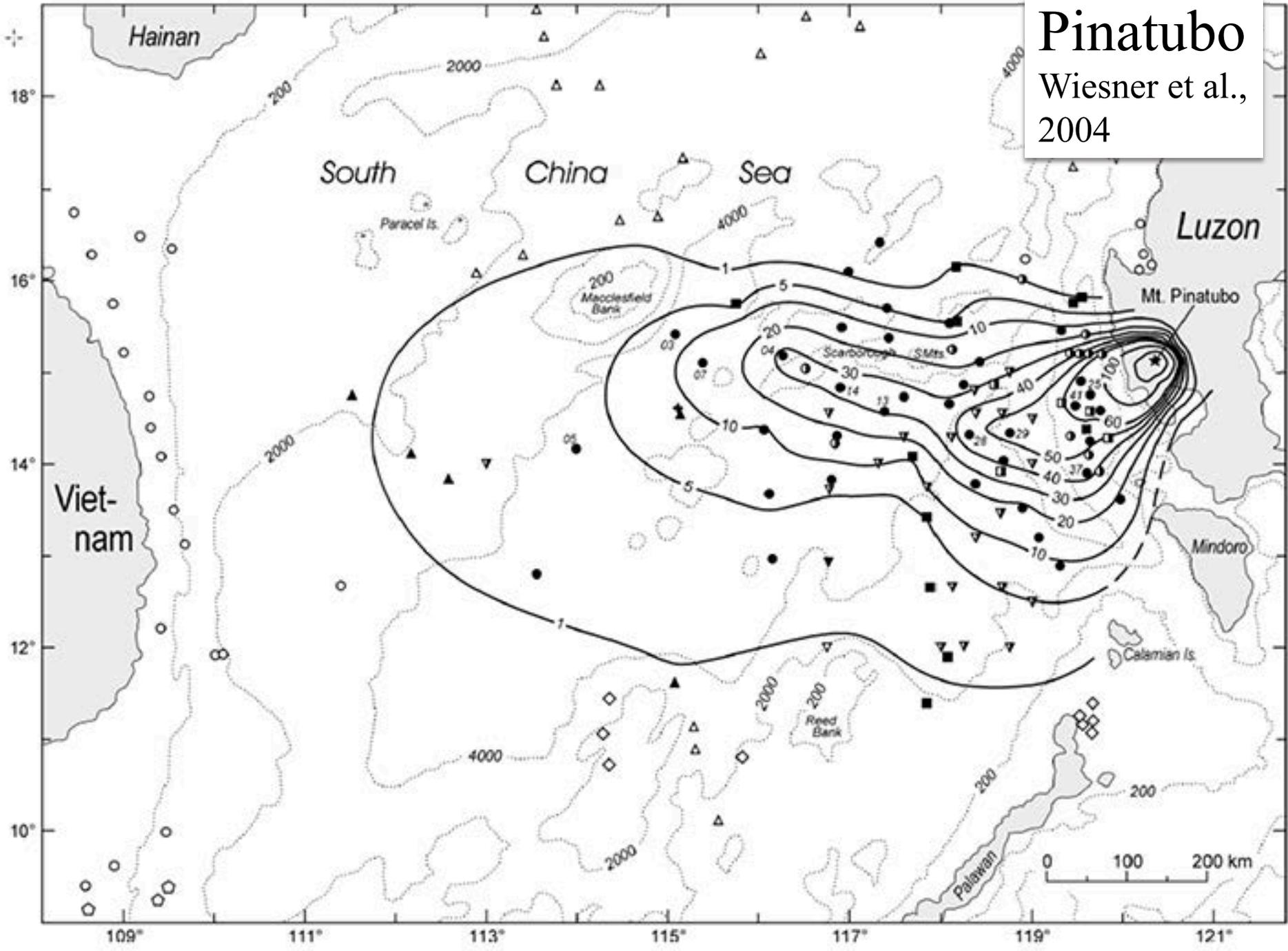


Very hard to find any configuration of ash isopachs from a nearby source on east side that would keep ash the same thickness over Hartford and Newark Basins

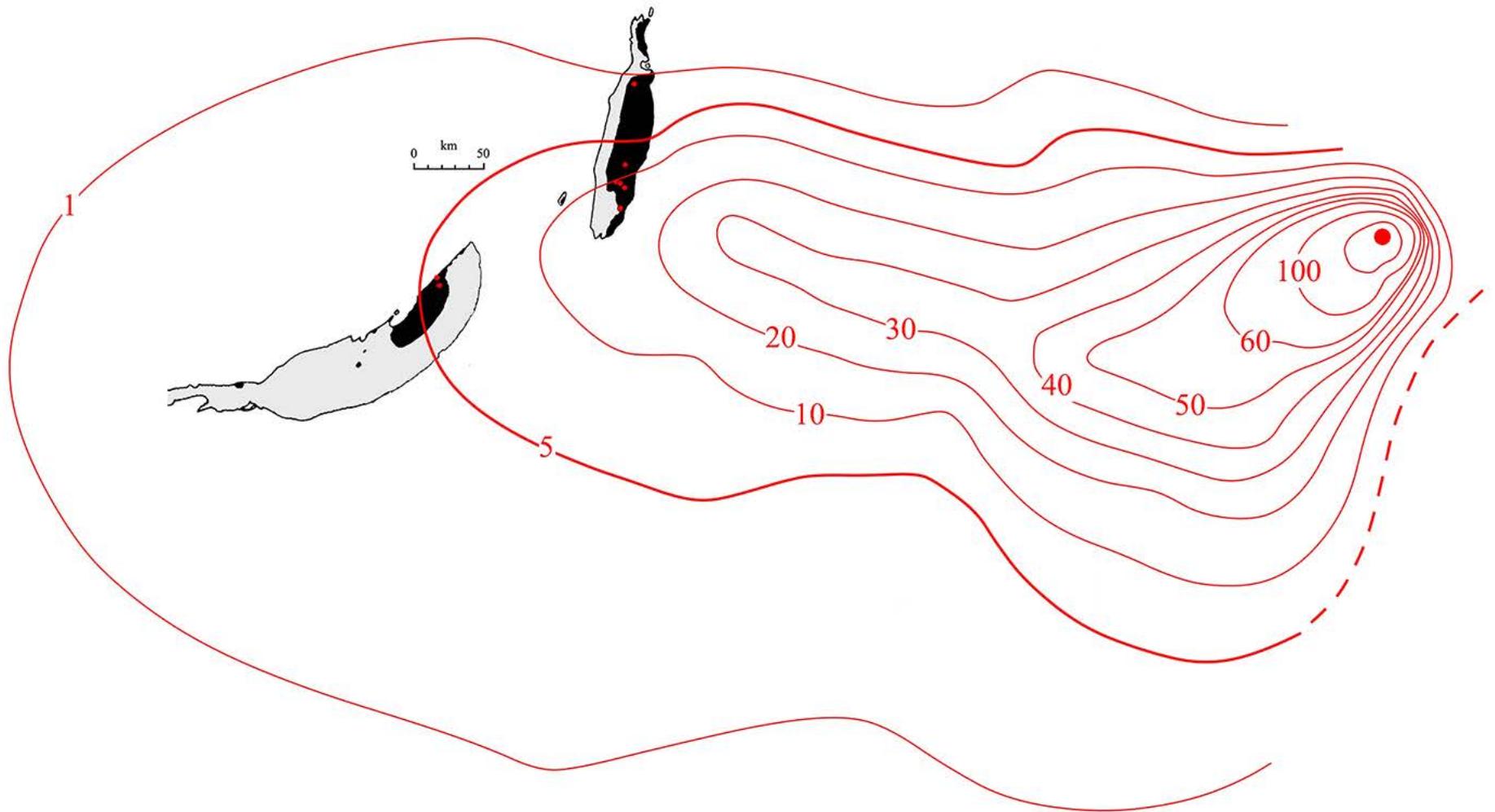


# Pinatubo

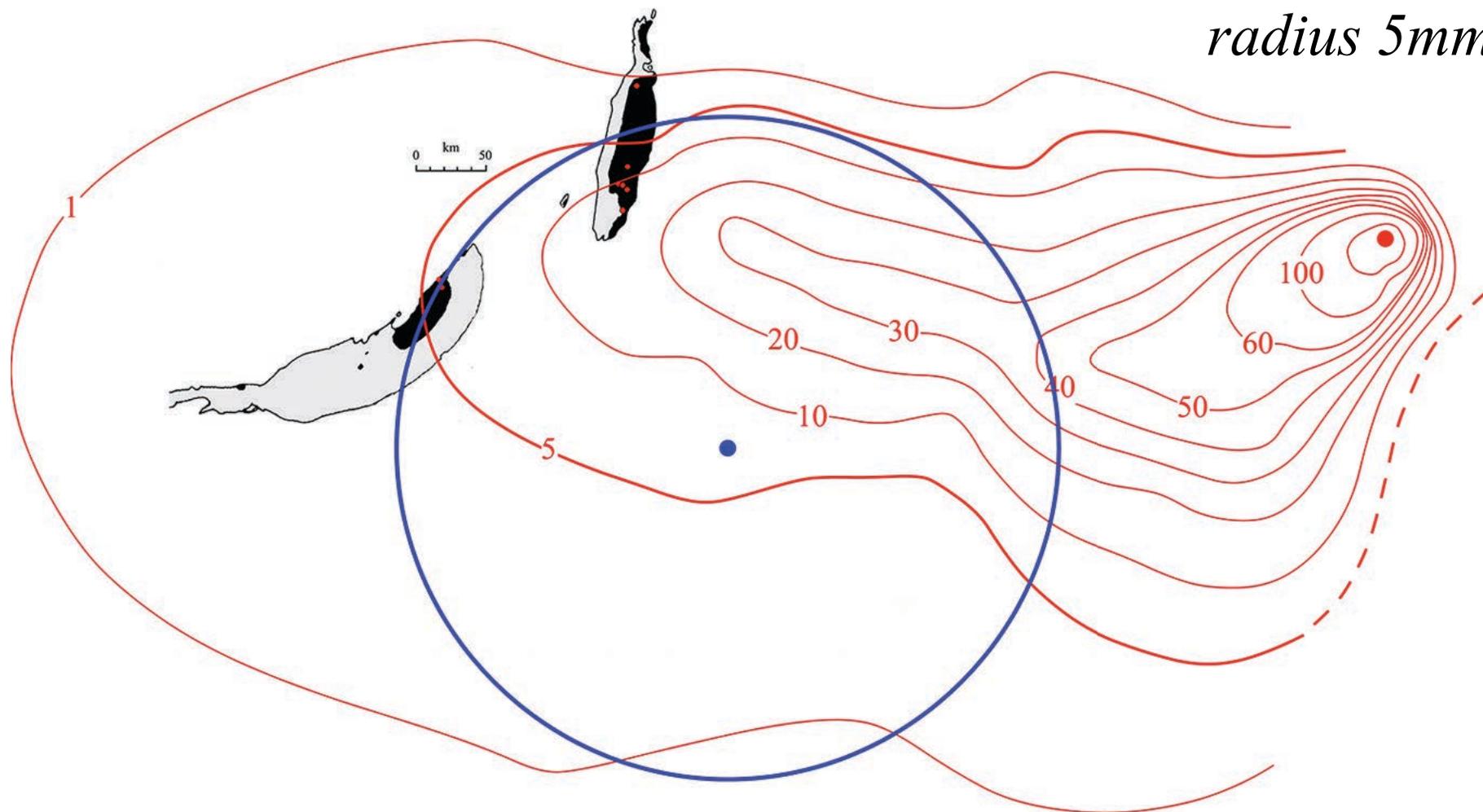
Wiesner et al.,  
2004



# Pinatubo

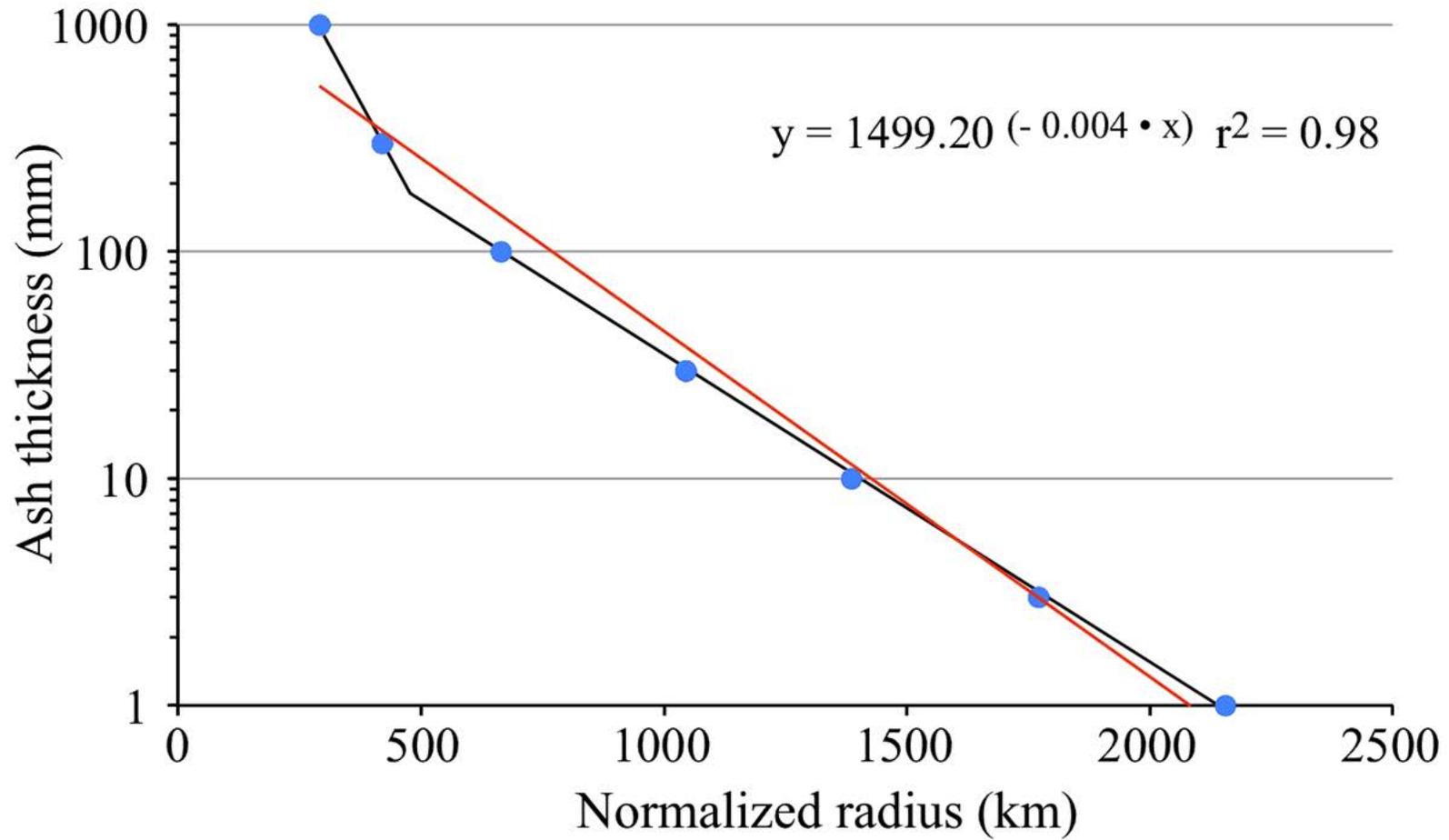


Pinatubo  
*normalized*  
*radius 5mm*



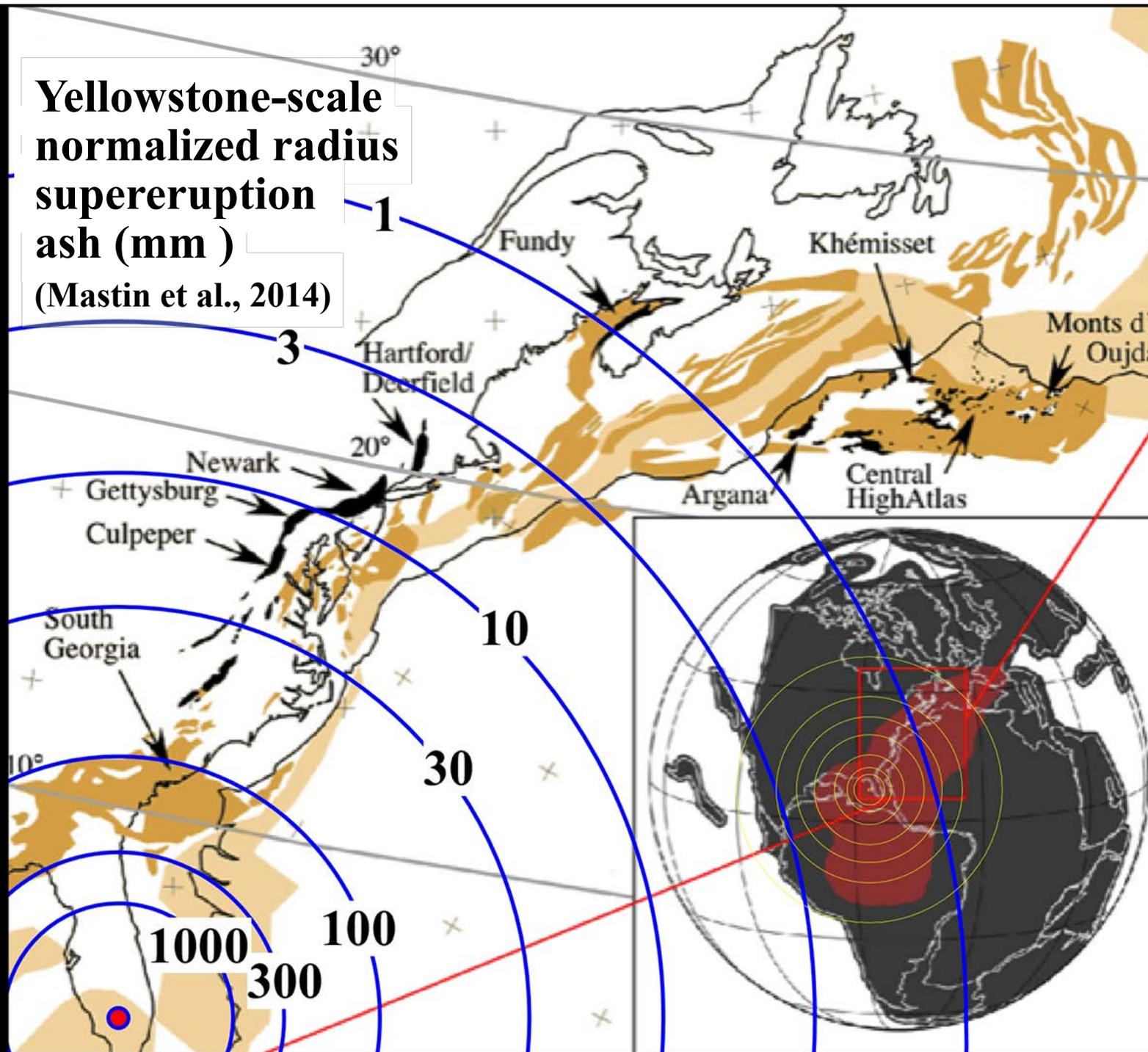
# Yellowstone-scale Supereruption

*based on Mastin et al., 2014*



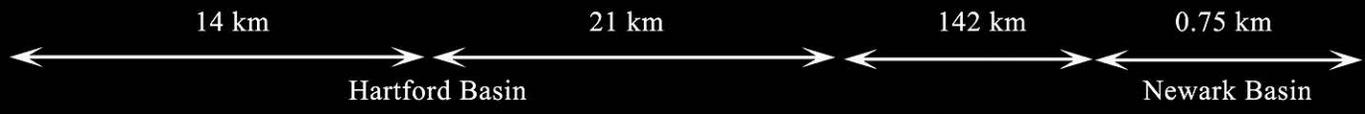
**Yellowstone-scale  
normalized radius  
supereruption  
ash (mm)**

(Mastin et al., 2014)



# Overview

- 1) Discovery of the Pompton Ash
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BD-226

Kensington

Stevens

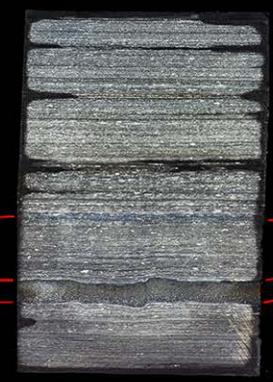
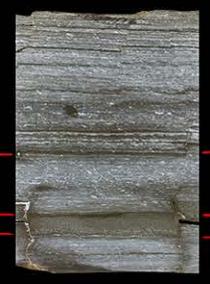
PT-14

C-128

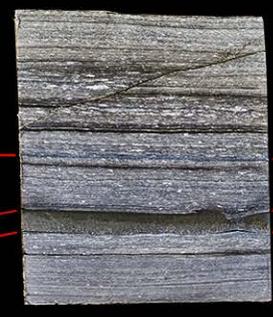


86%

?



76%



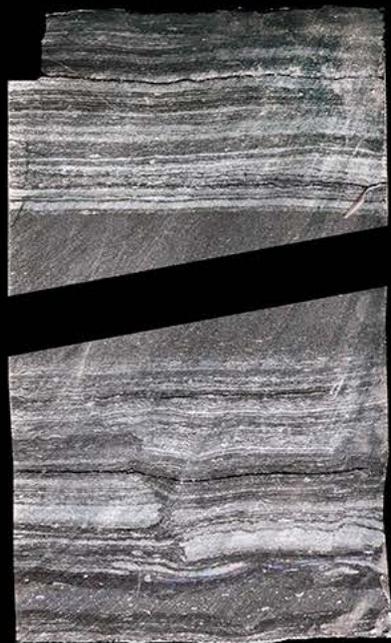
ash 2

Pompton Ash

← 0.2 km → 16.1 km → 16.2 km →



BD-226



BD-225



4 cm

Miner Brook



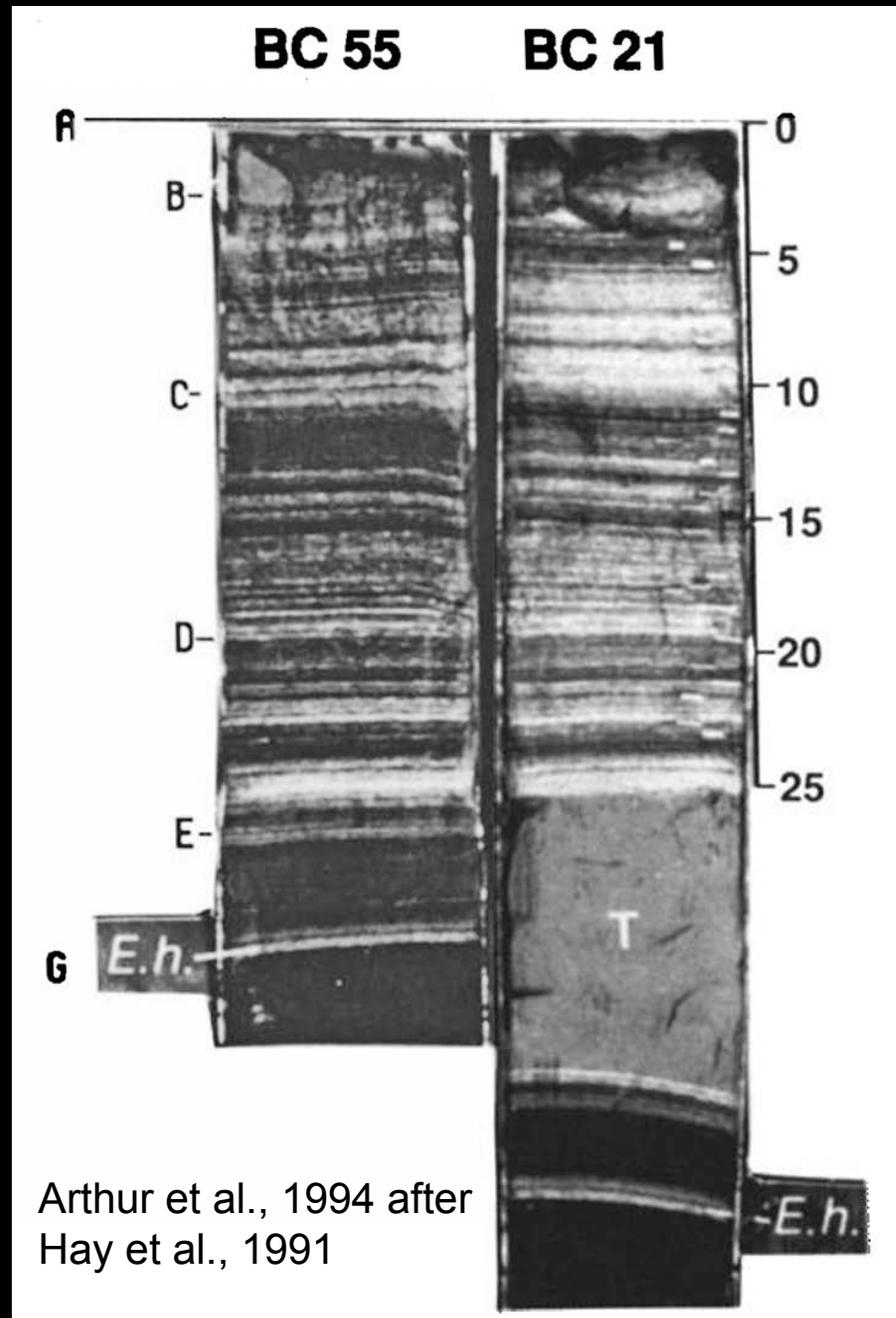
4 cm

Stevens

# East Berlin



500 km

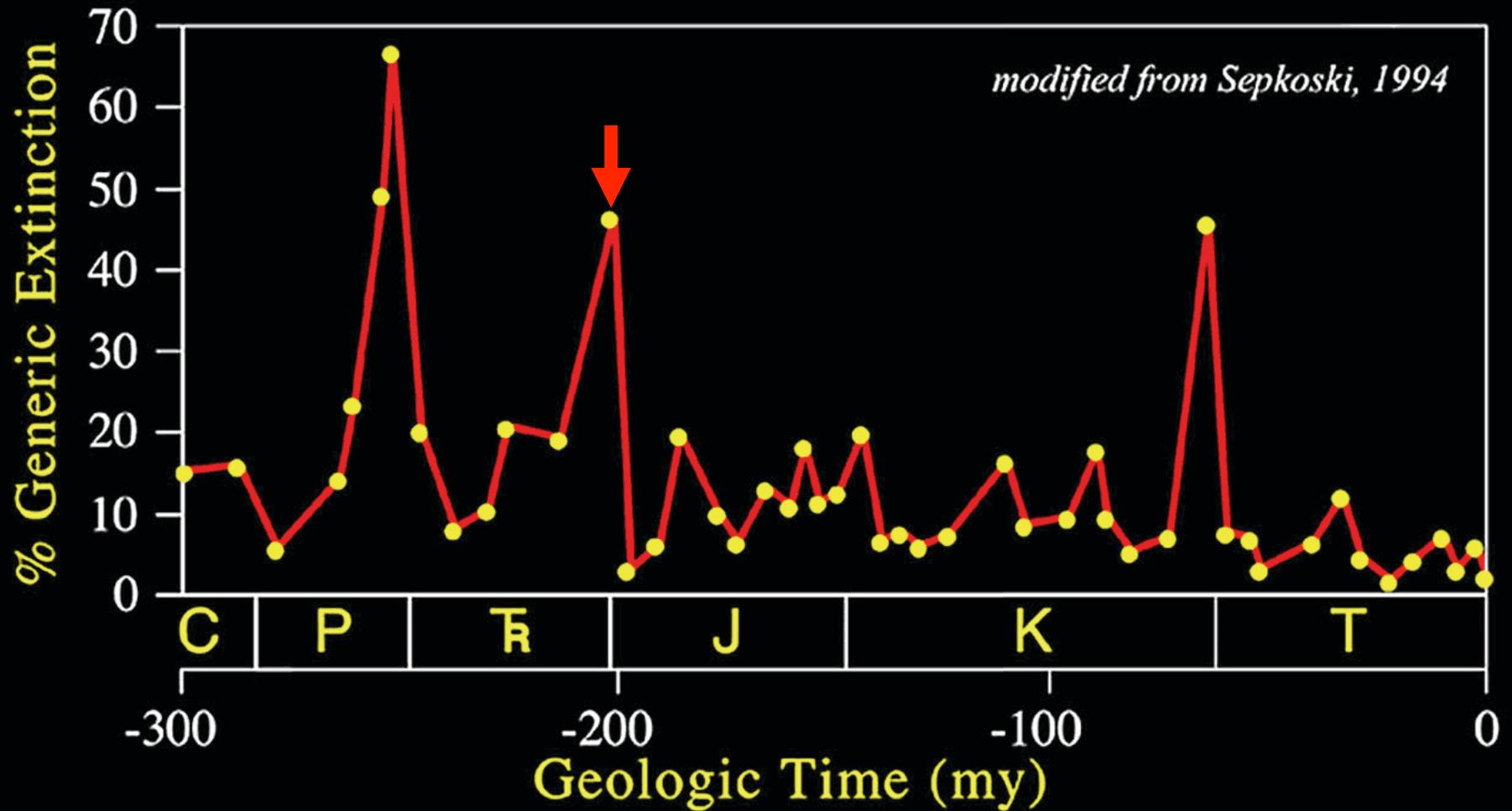


Arthur et al., 1994 after  
Hay et al., 1991

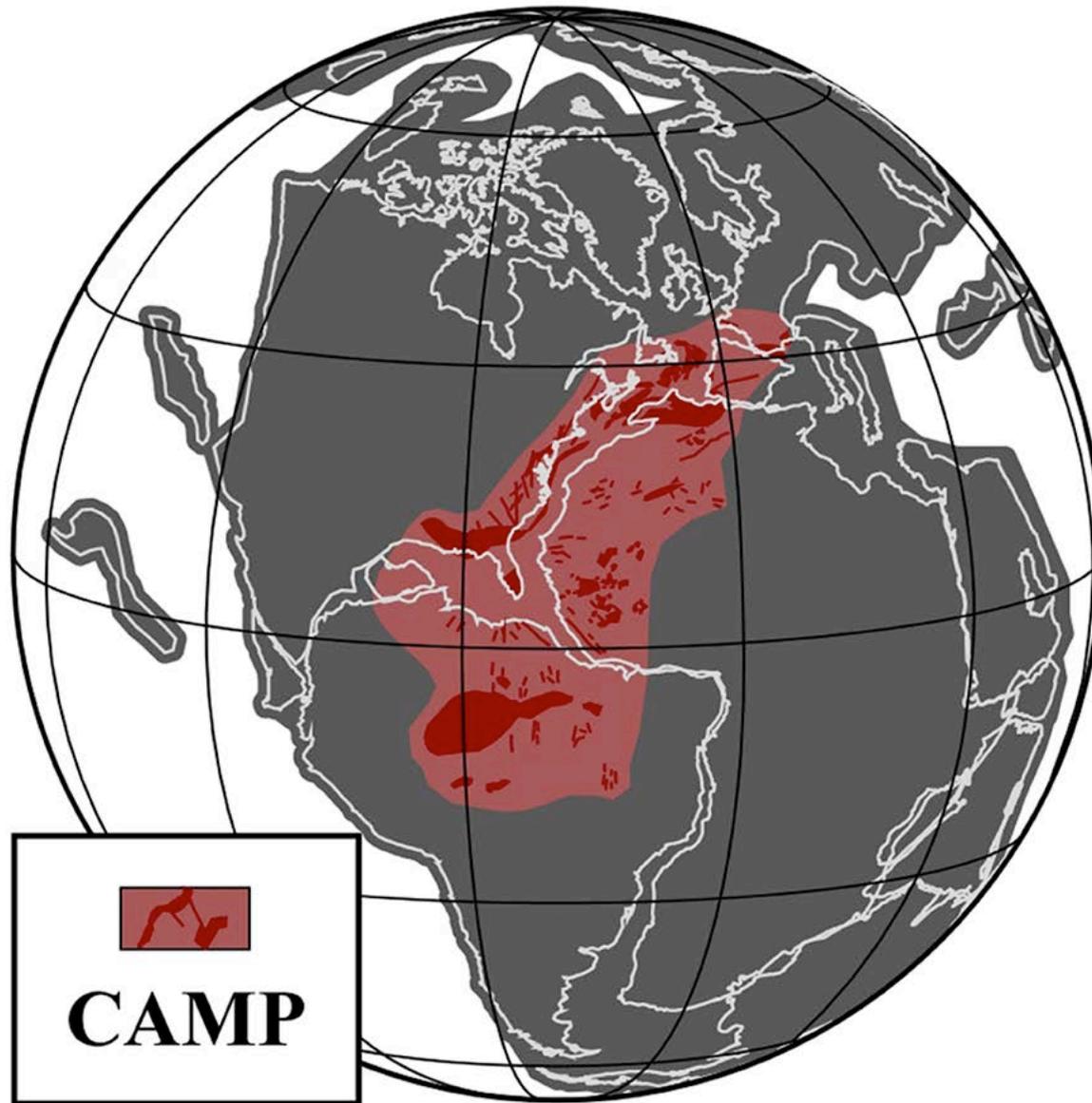
# Overview

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# Intensity of Extinction



# Central Atlantic Magmatic Province



11 million km<sup>2</sup>

Uppermost  
Passaic  
Formation  
Newark  
Basin,

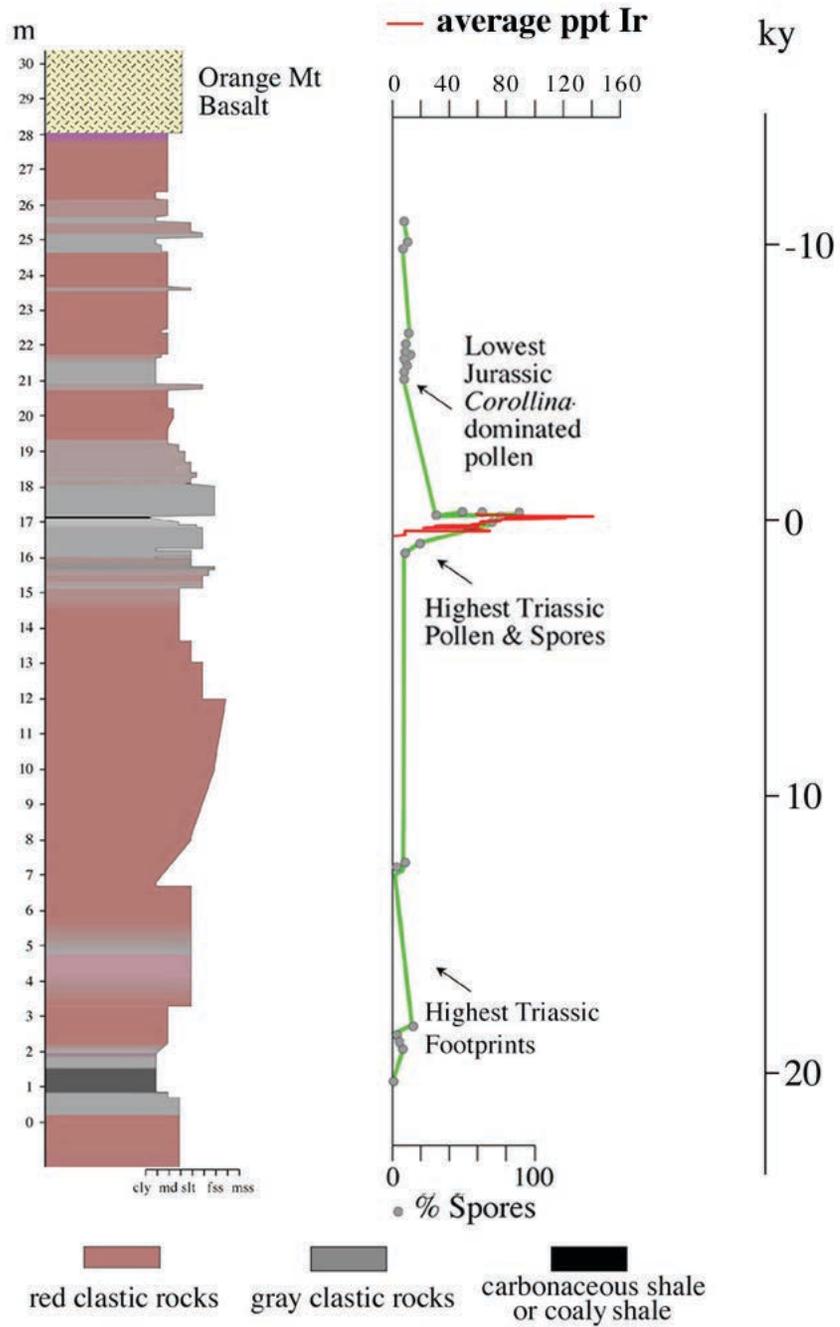


Fern  
Spore  
Spike

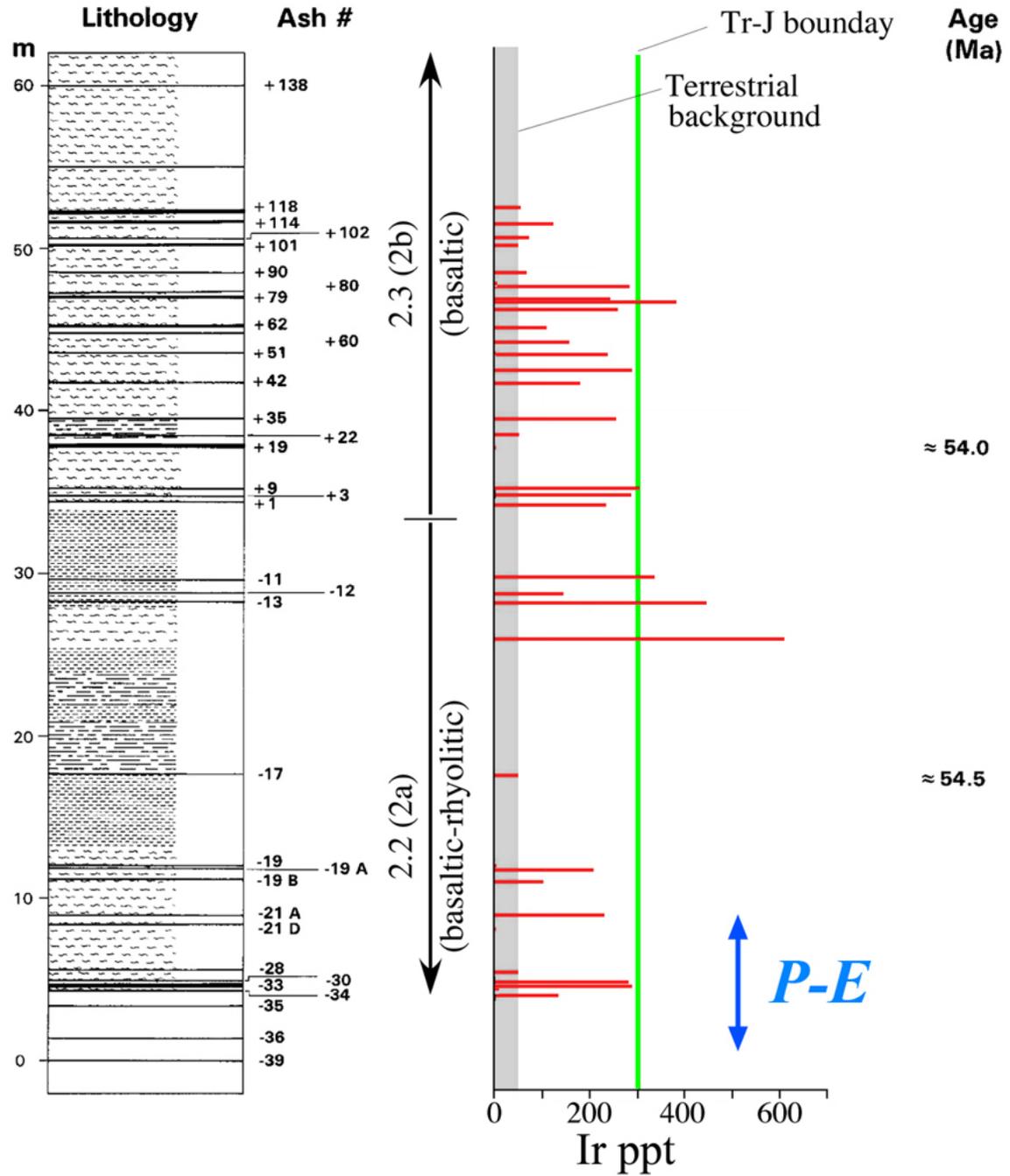
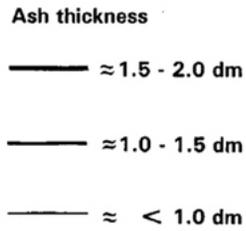
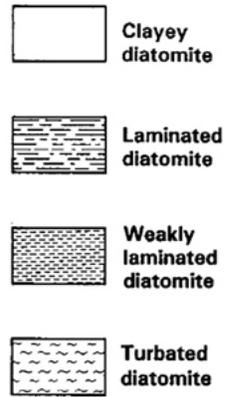
ETE

Exeter, PA  
USA

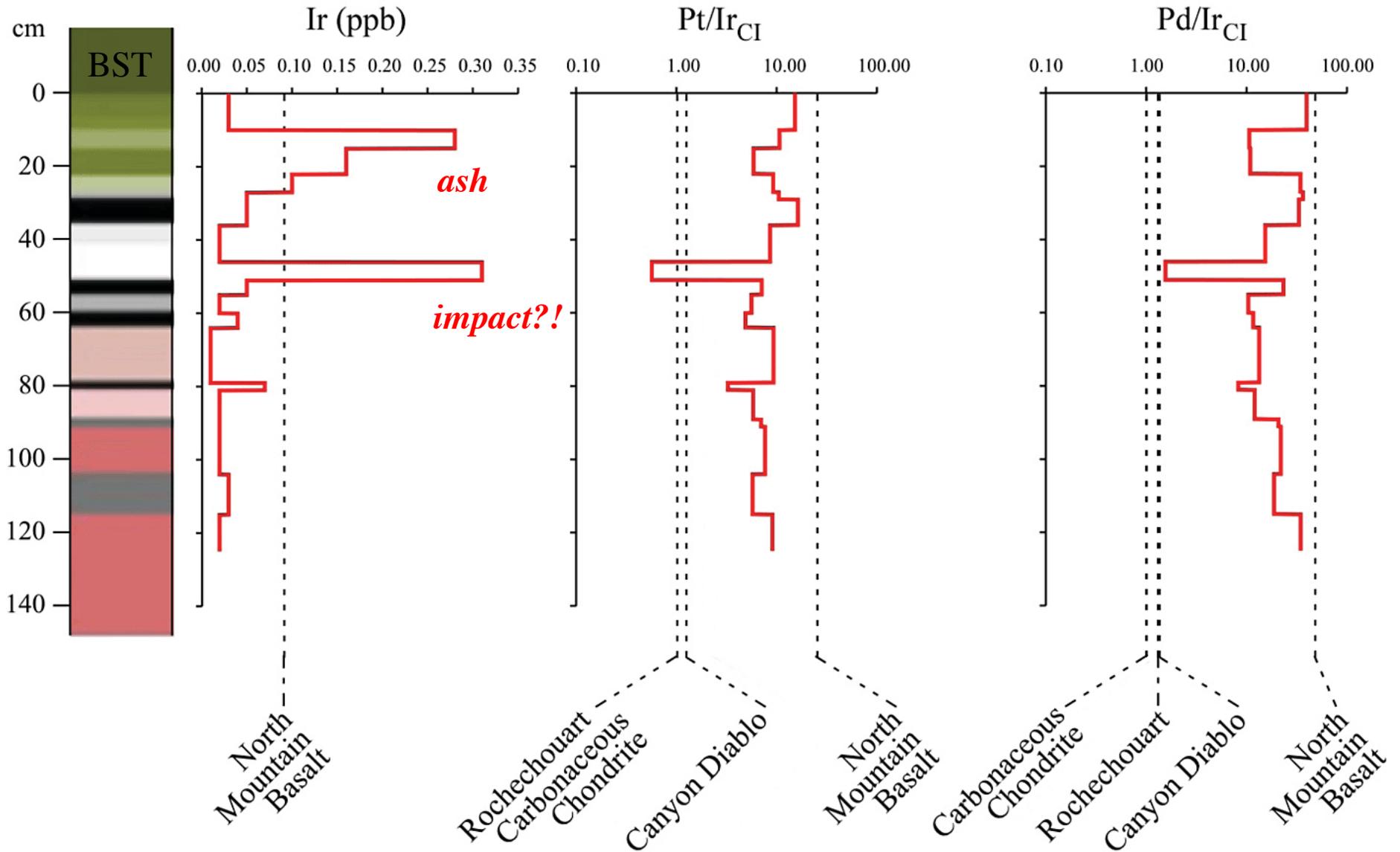
ETE

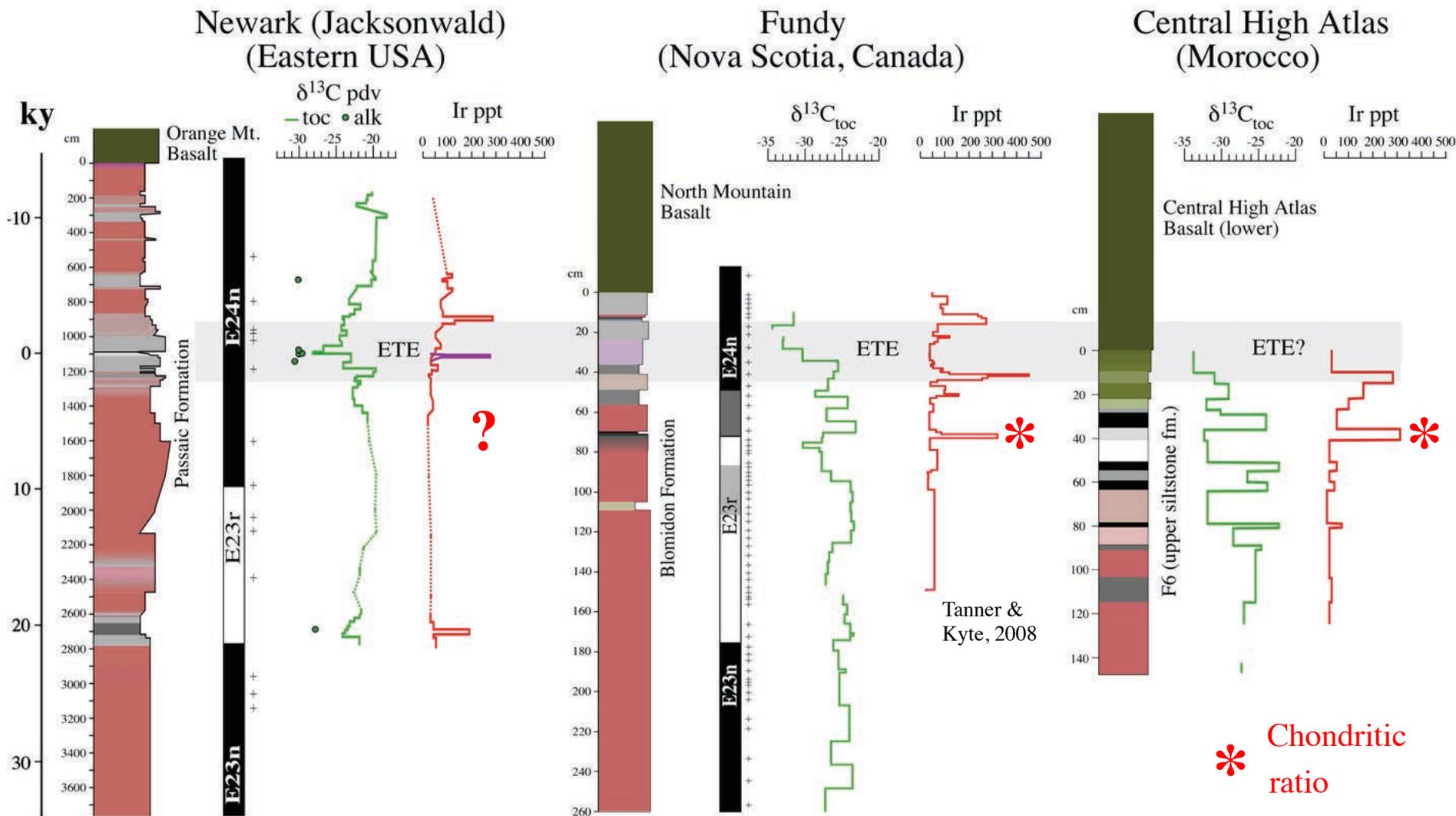


Schmitz & Asaro,  
1996

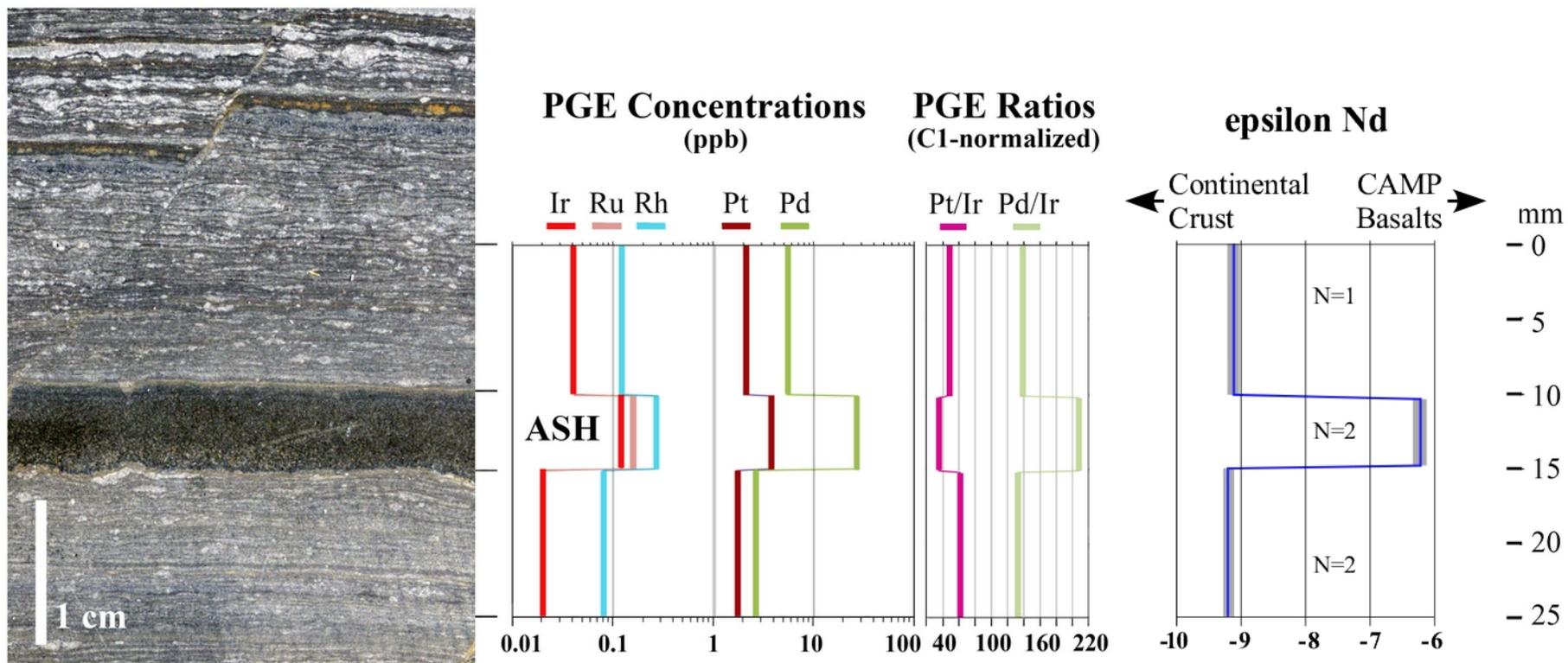


# Central High Atlas (Morocco)





## POMPTON TUFF, STEVENS LOCALITY (EAST BERLIN FM)



# Conclusions

1. Pompton Ash is a true airfall
2. Ash occurs in a deep-water phase of a lacustrine cycle at 7 localities in the East Berlin and 3 in Towaco formations of the Newark and Hartford basins over 230 km
3. Shows unequivocal correlation of cycles across Hartford basin and from Hartford to Newark basins
4. Shows presence of eruptions not represented by flows
5. Lakes remarkably in phase, may have been connected into giant great lakes
6. Explosive volcanism probably far away ?
7. Chemistry may can be tracer of weathered ashes related to ETE based on Pompton Ash experiment

Northeastern Section - 51st Annual Meeting - 2016

Paper No. 17-7

Presentation Time: 3:50 PM

WILD AND WONDERFUL IMPLICATIONS OF THE 5 MM POMPTON ASH OF THE HARTFORD AND NEWARK BASINS (EARLY JURASSIC, EASTERN NORTH AMERICA)

OLSEN, Paul, Earth and Environmental Sciences, Lamont-Doherty Earth Observatory of Columbia University, 61 Route 9W, Palisades, NY 10964-1000, PHILPOTTS, Anthony R., Department of Geosciences, University of Massachusetts, Amherst, MA 01003, MCDONALD, Nicholas G., Olde Geologist Books, 55 Asher Avenue, Pawcatuck, CT 06379, STEINEN, Randolph P., Connecticut State Geological Survey, Connecticut Department of Energy and Environmental Protection, 79 Elm Street, Hartford, CT 06106, KINNEY, Sean T., Department of Earth and Environmental Sciences, Lamont-Doherty Earth Observatory of Columbia University, 61 Route 9W, Palisades, NY 10964-1000, JARET, Steven J., Department of Geosciences, Stony Brook University, Stony Brook, NY 11794-2100 and RASBURY, E. Troy, Geosciences, SUNY Stony Brook, Stony Brook, NY 11794-2100, polsen@ldeo.columbia.edu

Airfall ashes or tuffs are extraordinarily rare in Triassic-Jurassic rift basin deposits. The Pompton Ash, named for an outcrop in Pompton, NJ, is an exception. In addition to its type locality, it is recognized in two cores in the Towaco Fm. of the Newark Basin and two cores and five outcrops in the East Berlin Fm. of the Hartford Basin. The graded, apparently andesitic ash consists of euhedral, non-rounded, plagioclase laths in clay or chalcedony matrix that was originally glass, fine-grained feathery feldspars, carbonate, and distinct sub-mm spherule-like volcanic grains at the base. Pyrite is abundant, and the ash weathers to an expanded bright orange jarositic mush. Several aspects of this ash are surprising. First, its thickness does not change over its 10 known sites and 200+ km extent, implying it is either the product of a huge, distant eruption, or a smaller eruption closer and positioned just-so. Second, there is a <1 mm ash a few cm higher that also does not change thickness. Third, while validating that ~30-year-old lake cycle correlations between basins are shown correct by the presence of these ashes, it is astounding that these ashes are enclosed by congruent patterns of microlaminae over the same distances. This implies either that the Newark and Hartford basins were connected in a single giant rift lake, or that seasonal to centennial climatic variations overrode all other sources of sediment variability, or both. It is noteworthy that no such correlation has been described for separate extant lakes. Fourth, as has been seen in some basaltic ashes, the Pompton Ash has a modest Ir anomaly, suggesting similar ashes might be the source of more cryptic Ir anomalies in other Triassic-Jurassic strata. Fifth, not only can we evidently correlate strata among various Triassic-Jurassic basins at the 20 ky cycle level, for some intervals we can confidently also correlate at the seasonal scale. Sixth, trace element chemistry, particularly Sm-Nd, should enable recognition of eruptive products in Newark Supergroup and related strata around the end-Triassic extinction where pedogenic processes and chemical weathering may have obliterated textural and mineralogical evidence of ash. Finally, while it is tempting to ascribe these ashes to the Central Atlantic Magmatic Province (CAMP), that conclusion is not yet compelling.