Timing and Structural Framework of the Ozarks Uplift

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Missouri State University and USGS EDMAP Program: 
Geologic Map of the Jane, Missouri 7.5-Minute Quadrangle, Southwestern Missouri [2014]

Geologic Map of the Noel, Missouri 7.5-Minute Quadrangle, Southwestern Missouri [in progress]
Ozarks Plateaus (AR, OK, KS, and MO)

INTRODUCTION
When was the onset of the Ozark Uplift?
1. Pennsylvanian uplift model (King 1959; Cox 2009)
2. High Ozarks model (McCracken 1971)
3. Mid-Devonian uplift model (Huffman 1959; Koenig 1967; Evans and Bassett 2013)

What is the framework of the Ozark Uplift?
1. Hudson (2000) strike-slip on southern edge of Laurentia
2. Cox (2009) conjugate strike-slip faults across southern Laurentia

Take-aways:
1. Tectonostratigraphic sequences indicate onset Mid-Devonian, continued through Mississippian with culmination and docking of Ouachita allochthon in Pennsylvanian
2. Textbook example of syntectonic sedimentation
3. Surface analogue for Mississippi Lime Play (OK; KS)
4. Fault relays with hard and soft linkages between strike-slip faults; grabens!
Significance
Small “Waulsortian” mud mounds may be better for interpreting and understanding the origin of these features.
Dinant, Belgium

Muleshoe Mound, NM

Google Earth
Neoproterozoic Rifting
Southern Laurentia

Thomas (2011)
Mud cracks in Cotter Dolomite, Jane, Missouri

Early Paleozoic Passive Margin Sedimentation

Cauthon et al. (2014)
Sandstones in Cotter Dolomite, Mincy, Missouri

Karst Ages:
- M. Ordovician
- M. Devonian
- Mississippian
- Pennsylvanian

Evans (2010)
Bouguer Gravity Anomaly Map

Mickus in Evans and Bassett (2013)
Base of Noel (Chattanooga) Shale, Caverna, Missouri
Sub-Upper Devonian Unconformity, northern Arkansas

Sketch in Bush et al. (1980) after Miser?
Sub-Upper Devonian Unconformity, Oklahoma

Modified from Huffman (1959)
Spavinaw Granite, Spavinaw, OK
Delaware Islands of Chenowith (1968)
Wise and Caplan (1962); Haley and Hendricks (1968, 1972); Van Lieu (1959 in Nuelle and Sumner (1981))
Noel (Chattanooga) Shale, Highlandville Fault

MoDOT-SMSU
Vista 1 core (86.1 ft)
Mid-Mississippian Backstepping Sedimentation on Southern Laurentia

modified from Lane and Dekeyser (1980)
Evans and Bassett (2013)

En masse Slumps and Slides; Not Reefs!

- Few locations next to faults
- Breccias at base
- Structureless lime mudstone; spar-filled cracks in breccia
- No flank beds
- Some cut bedding
- Folding preserved
- Penecontemporaneous movement with slickened sides
- Reoriented geopetal structure
- Water escape structures(?)

from Evans et al. (2010)  
Childress and Grammer (2019)
Jelly-roll slump in upper Compton Limestone, Jane, Missouri
Bella Vista Quarry, Caverna, Missouri
Erosional Truncation
Wolf Pen Gap
Anticline
Chaotic strata upper Pierson Limestone

Evans and Bassett (2013)
Slide Masses in Compton Ls. Near Lampe Fault (on downthrown side)

Koenig (1960) and Thomson (1975)
REVISING THE STRUCTURAL MODEL

Reverse Fault,
Goodman, MO
Fault Relays — Hard and Soft Linkages

Modified from Missouri Geological Survey GeoSTRAT
Contractional and Extensional Structures in Strike-Slip Fault Systems

Massironi and Kim (2015)
Structure Contour Map
Sub-Mississippian Unconformity
• Mid-continent southern Laurentia was passive margin late Neoproterozoic to Middle Devonian

• Uplift and denudation during early to middle Devonian; Arkansas Novaculite foredeep developed, and convergence on southern margin of Laurentia

• Mississippian convergence and renewed uplift; faulting and syn-tectonic sedimentation; major influence on sequence stratigraphy

• Renewed uplift in late Mississippian and early Pennsylvanian; development and filling of Arkoma Basin