High-Resolution Sequence Stratigraphic and Chronostratigraphic Investigations of the Lower Shelf and Basinal Lithofacies of the Mississippian Subsystem in the southern Midcontinent U.S.A.

W. Lynn Watney¹, Evan K. Franseen¹, John H. Doveton¹, Thomas L. Thompson², Darwin R. Boardman³, E. Troy Rasbury⁴, K. David Newell¹, John Victorine¹, Neil H. Suneson⁵, Edith Starbuck²

^¹Kansas Geological Survey, Lawrence, Kansas; ^²Division of Geology and Land Survey, Rolla, MO; ³Oklahoma State University; ^⁴Stillwater, OK, SUNY, Stony Brook U., Stony Brook, NY; ^⁵Oklahoma Geological Survey, Norman, OK

PURPOSE

Chert-rich, primarily Osagean Mississippian carbonate strata form important reservoirs, especially in shelf/ramp margin locations bordering the northern margin of the Anadarko and Arkoma Basins.

However, important questions remain regarding the temporal and spatial distribution of lithofacies along the shelf-to-basin transition that could be important to delineating additional conventional and unconventional gas resources.

Overall goals of this on-going study are:

To better understand the sequence-stratigraphic framework of shelf-margin to basinal chert-rich Osagean strata by integrating subsurface (well log, core) data, surface exposures, biostratigraphy isotope geochronology, and gas geochemistry.

To evaluate controls on stratigraphic architecture and facies distribution including the controls of sea level fluctuations and syndepositional tectonism, both of which appear to be major controls on, and timing of, silica distribution.

To provide predictive capabilities for distribution of resources housed in these rocks including traditional oil and gas, unconventional gas in tight rocks, and Mississippi Valley Pb-Zn deposits.

INTRODUCTION

Osagean strata in the study area are characterized by siliceous sponge-dominated and heterozoa carbonate facies that developed in inner shelf, shelf margin, and basinal settings under subtropical/tropical conditions.

Our previous work indicated the presence of unconformity-bounded Osagean seguences in sequences between areas remained uncertain; that high-frequency, high-magnitude sea-level and facies distribution; and that the dominance of siliceous sponge and heterozoan carbonate facies suggested paleoceanographic conditions that provided excess nutrients and dissolved silica.

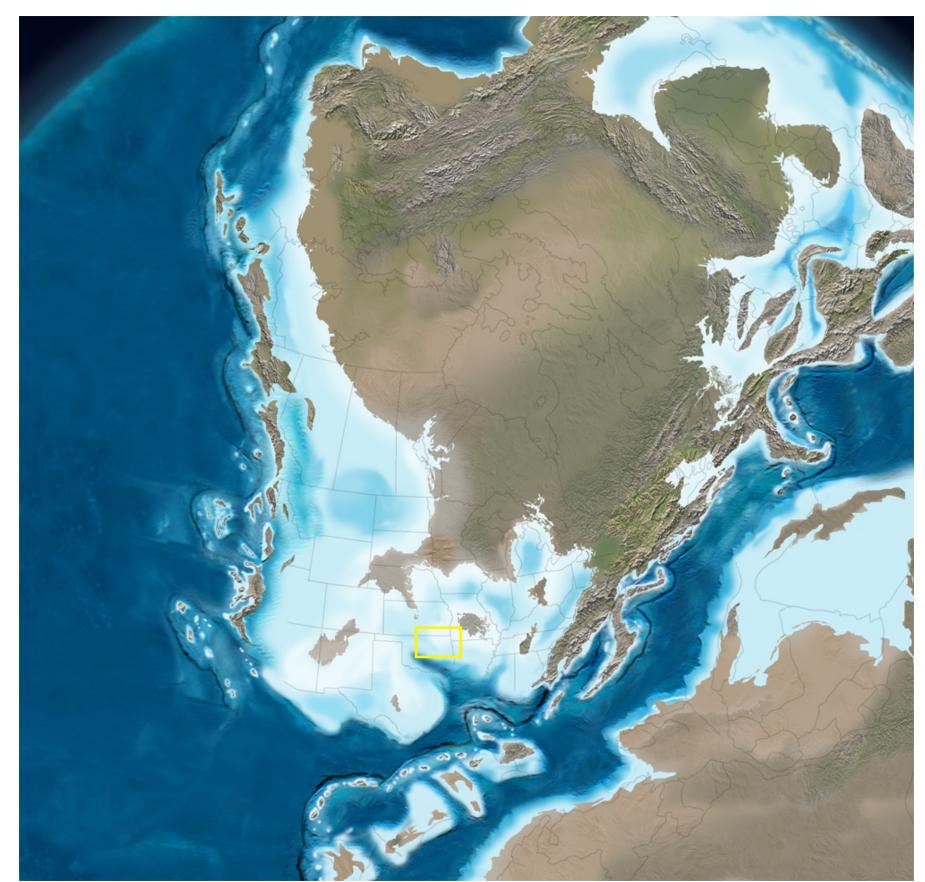
Initial results presented here suggest that the distinct chert-dominated sequences at the shelfmargin can be correlated basinward to sequences dominated by dark chert, limestone, and dark,

Mississippian Substage Stratigraphy in Kansas
 reflecting general consensus of surrounding states in Midcontinent (From Franseen, 2006)

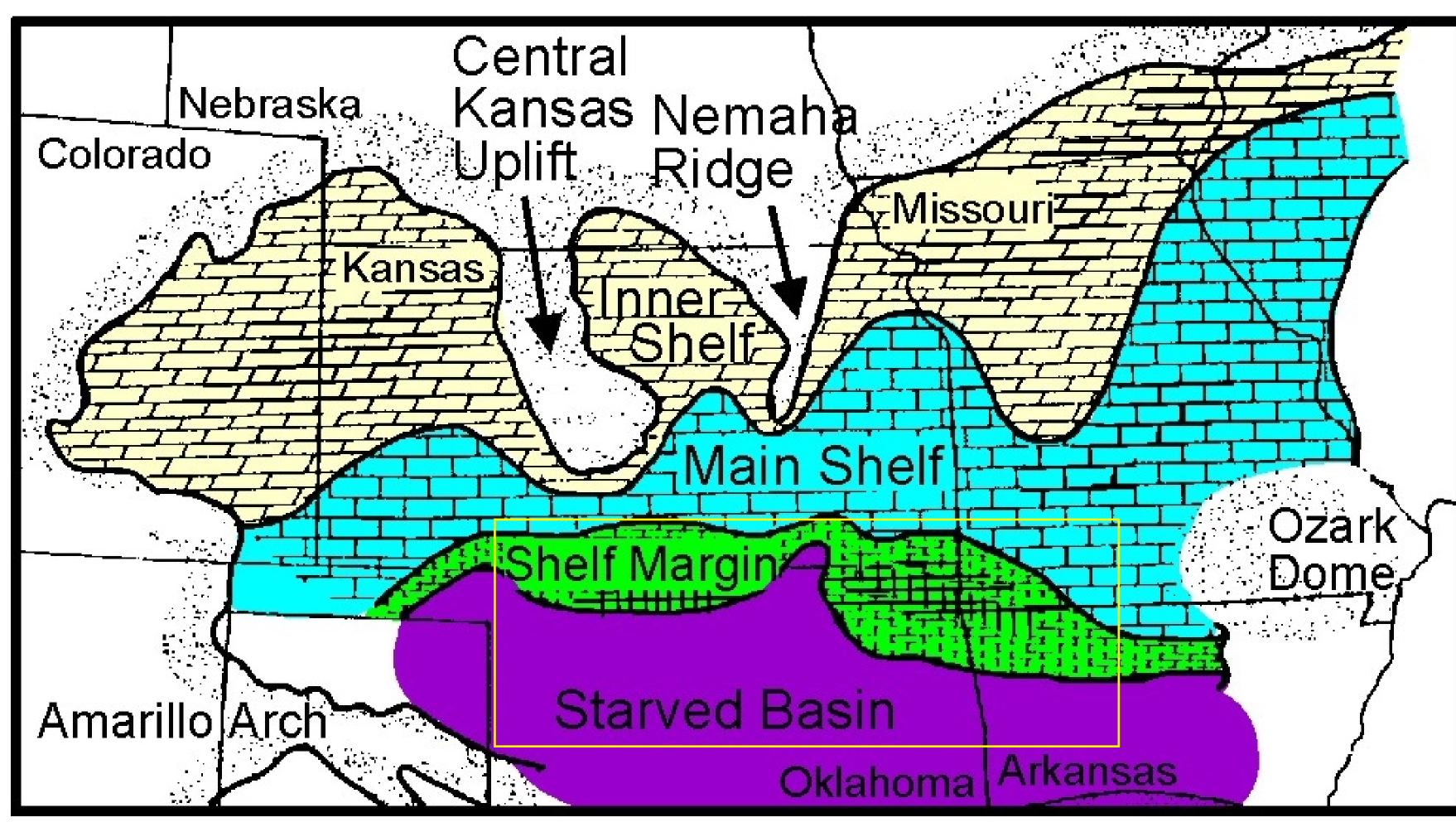
	MISSISSIPPIAN	Chestera	unamed unit(s)		Shore Airport Formation			1
		Meramecian	St. Genevieve Limestone		St. Genevieve Limestone			١
			St. Louis Limestone		St. Louis Stevens Mbr. Limestone Hugoton Mbr.		۰٬۶۰	
			Salem Limestone		Salem Limestone			
			Warsaw Limestone		Warsaw Limestone			ŀ
		Osagean	Keokuk Limestone	Burlington- Keokuk Limestone	Short C Keokuk Limestone	Burlington- Keokuk	on	
			Burlington Limestone		Burlington Limestone	Limestone	Cowley Formation	
			Fern Glen Limestone	Reed Spring Ls. Mbr.	Reed Spri	ing Ls. Mbr. Fm.	ey Fo	
				St. Joe Ls. Mbr.	Piersor	Limestone] Sow	L
		Kinderhookian	Gilmore City Limestone		Gilmore City Limestone			
			Sedalia Dolomite (Northview Shale)		Sedalia Formation			a oivio
			Chouteau Limestone (Compton Limestone)		Compton Limestone			duckei
			Boice Shale		Hannibal Shale		$\prod_{?}$	
	DEVONIAN 3	- ?-	Chattanoo	oga Shale	Chattanooga Shale			_

(Maples, 1994)

PALEOGEOGRAPHIC SETTING



Paleogeographic reconstruction of early Mississippian for North America Yellow box identifies location of the area under investigation. have provided silica from ash carried by the prevailing easterlies in th low southern lattitude setting. Tectonic subsidence also led to foundering and drowning of the southern shelf including shelf margin reported on in this presentation. Systematics of the subsidence are recorded in these rocks and appears to be important controls on their distribution.



a broad inner shelf, main shelf, and shelf margin comprising a large carbonate platform that developed along the southern edge of the Transcontinental Arch. In particular, the shelf margin

PROJECT STATUS

geochemistry of the Osagean shelf-to-basin in the Midcontinent U.S. The focus of this poster is on the shelf margin stratigraphy along a transect from western Kansas to surface exposures in southwestern Missouri. Coring of the sediment starved deep basin shales will be done near Ada, Oklahoma during the summer of 2008. Detailed study of this core will establish a refined geochronology in what is believed to be a nearly continuous sedimentation record through the n Subsystem. Additional biostratigraphic and geochronologic work on this and other cores and surface locations along the shelf margin will provide a more robust stratigraphic framework from which to interpret causal mechanisms of shelf development and to aid in lithofacies prediction.

Chert Sequences on the Western Kansas Shelf and Shelf Margin

