I received my M.Tech. (Master in technology) degree in Geo-exploration, supported by a Schlumberger Fellowship; my thesis was entitled "A geological and geophysical analysis of seismic data attributes from the post rift stratigraphy of a North Sea 3D seismic dataset". Later I joined University of New Orleans where I am currently pursuing my PhD research on "Channel- fill architecture and paleo-channel morphometry of the Cretaceous Blackhawk Formation, Wasatch Plateau, Utah: Implications for improved fluvial reservoir modeling". Ongoing PhD research has been awarded 2009 ExxonMobil Geoscience Grant, 2010 Kenneth H. Crandall Memorial Grant from AAPG, 2010 Ed Picou Fellowship Grant from GCSSEPM (Gulf Coast Section SEPM), and 2010 Postgraduate Grant from IAS (International Association of Sedimentologists). I have been awarded 2010 graduate scholarship from New Orleans Geological Society.

Delineating paleo-channel morphometry of the Cretaceous Blackhawk Formation in the Western Interior Seaway: A regional-scale approach

Hiranya Sahoo, Earth and Environmental Sciences, GP 1065 , University of New Orleans, 2000 Lakeshore Drive, New Orleans, LA, 70148. Email: hsahoo@uno.edu, hiranyasahoo@gmail.com

1 PROBLEMS, AND OBJECTIVES

Firstly, some latest critical reviews on fluvial studies (e.g. Schumm, 2005; Bridge, 2006; Ethridge, 2011) indicate that modern fluvial systems (comparing to ancient counterparts) manifest a far more complex heterogeneities ranging from continuum of planform (straight to meandering to braided) along with wide sedimentologic variation (grain size, mud content, bedform) at a spatiotemporal scale grossly discordant of any particular endmember stream character, and that the range and potential of these complexities have been poorly appreciated in rock record interpretation. To bridge this inadequacy of ancient fluvial description, Ethridge (2011) categorically recommends intensive documentation of all scalevariant sedimentologic attributes from fluvial preserved strata focusing evolution of river system at spatiotemporal scale that will generate firstapproximations of range of fluvial heterogeneities as reflected in modern analog studies. Secondly, recent comprehension on modern fluvial depositional systems of continental sedimentary basins (e.g. Hartley et al., 2010; Weissmann et al., 2010) reveal that they are overwhelmingly distributive in character, and thus, this standpoint invokes for similar proposition to be scrutinized in fluvial rock record which has not been well constrained so far. To explore these two specifics, the proposed study attempts a regionalscale paleohyadraulic analysis from outcrop data of coastalplain succession in the Wasatch Plateau, Utah.

2 REGIONAL/THEMATIC CONTEXT:

Wasatch Plateau of central Utah is NS elongated, being contiguous and perpendicular to WE oriented Book Cliffs of Utah and Colorado (Figure 1). Here, study of the Cretaceous Blackhawk Formation is topical in context that 1) it embodies c. 3.5–4.0 Myr depositional history accumulating both non-marine and marine sedimentation, and 2) it is c. 300 m thick mud- and coal-prone succession persistently been subjected to petroleum industry attention (e.g. Krystinik and Dejarnett, 1995; Adams and Bhattacharya, 2005; Hampson et al., 2011). At the length of the plateau (i.e. c. 120 km), the Blackhawk Formation superbly crops out as a coastal plain complex comprising fluvial-channel sandbodies encased within coastal-plain mudstones, in addition to numerous intervening coal seams (e.g. Flores et al., 1984).

Fluvial rock record analysis of the Blackhawk Formation in the Wasatch plateau has been sparsely attempted so far, only providing localized description (at one canyon of the plateau) of marginal marine coastal-plain character at the lower part to more continental-fluvial nature at the upper part (e.g. Adams and Bhattacharya, 2005). In regard to the far-larger length of the plateau (i.e. c. 120 km), this description tends to be inadequate to fully constrain paleo-channel dynamics at a regional-scale. To supplement to the paucity of outcrop documentation and their interpretation, our ongoing study focuses a comprehensive outcrop data collection from preserved fluvial strata in the entire plateau and their subsequent paleohudraulic estimation to delineate paleo-channel morphometry of the formative river at different stratigraphic interval (lower, middle and upper) of the Blackhawk Formation that will shed critical lights on the river system evolution of the Formation at a spatio-temporal scale. This evolved sedimentologic knowledge, as analogous dataset, will be paramount to evaluate, validate and calibrate modern fluvial system heterogeneities. Moreover, ongoing fluvial

characterization on a coastalplain paleolandscape (Figure 2) is advantageous to establish the distributive nature of formative rivers in rock record (i.e. width, depth, discharge estimates of major trunk river visàvis its distributive threads) as adequately invoked by latest modern fluvial studies (e.g. Hartley et al., 2010; Weissmann et al., 2010).

3 METHOD & PRELIMINARY RESULTS

The ongoing outcrop documentation is being executed with detailed spatial documentation of grain size, bedform proportion (dunescale and ripplescale), dunescale cross set thickness, preserved bar height, accretion bedding dip, paleoindicators etc. Collected dataset is being employed to established paleohyadraulic computational procedures (e.g. Schumm, 1972; Leclair and Bridge, 2001; Bhattacharya and Tye, 2004) that is helping us to derive paleochannel morphometry (channelwidth, flow depth, channelbelt width and depth, discharge, sinuosity) of formative rivers flowed on this coastalplain paleolandscape (Figure 2). Azimuthal readings from paleocurrent indicators are being synthesized to deduce overall paleoflow pattern. At the length of the entire plateau (i.e. c. 120 km), all these derived informations are being gleaned for each unit (lower, middle and upper) of the Blackhawk Formation in order to unravel formative river characteristics with varying distance from coeval shoreline. Additionally, these evolved paleochannel morphometric informations of the costalplain paleolandscape (Figure 2) are being investigated to explore the type and degree of river system organized in accordance with distributive stream behavior. However, continued field documentation and subsequent interpretation are necessary for robust characterization of these paleochannel dynamics at a regionalscale (along ~120 km outcrop belt). It will also be pertinent to correlate these fluvial

sedimentologic knowledge to the Book Cliffs at its eastward downdip reach for a broader regional understanding.

REFERENCES:

Adams, M.M., and Bhattacharya, J.P., 2005, No change in fluvial style across a sequence boundary, Creatceous Blackhawk and Castlegate Formations of central Utah, USA: Journal of Sedimentary Research, v. 75, p. 10381051.

Bhattacharya, J. P., and Tye, R. S., 2004, Searching for modern Ferron analogs and application to subsurface interpretation, *in* T. C. Chidsey Jr., R. D. Adams and T. H. Morris, eds., Regional to wellbore analog fro fluvialdeltaic reservoir modeling: The Ferron Sandstone of Utah: American Association of Petroleum Geologists, Studies in Geology 50, p. 3957.

Bridge, J. S., 2006, Fluvial facies models: Recent developments, *in* H. W. Posamentier, and R. G. Walker,, eds., Facies Models revisited: Society for Sedimentary Geologists, Special Publication 84, p. 85 170.

Dubiel, R. F., Kischbaum, M.A., Roberts, N. R., Mercier, T. J., and Heinrich, A., 2000, Geology and Coal Resources of the Blackhawk Formation in the Southern Wasatch Plateau, Central Utah: U.S. Geological Survey Professional Paper 1625–B.

Ethridge, F. G., 2011, Interpretaion of ancient fluvial channel deposits: Review and Recommendations, *in* S. K. Davidson, S. Leleu and C. P. North, eds., From river to rock record: Society for Sedimentary Geologists, Special Publication 97, p. 936.

Flores, R. M., Blanchard, L. F., Sanchez, J. D., Marley, W. E. and Muldoon, W. J., 1984, Paleogeographic controls of coal accumulation, Cretaceous Blackhawk Formation and Star Point Sandstone, Wasatch Plateau, Utah: Geological Society of America Bulletin, v. 95, 540550.

Hampson, G. J., Gani, M. R., Sharman, K. E., Irfan, N., and Bracken, B., 2011, Alongstrike and downdip variations in shallowmarine sequence stratigraphic architecture: Upper Cretaceous Star Point Sandstone, Wasatch Plateau, central Utah, U.S.A: Journal of Sedimentary Research, v. 81, p. 159 184.

Hartley, A. J., Weissmann, G. S., Nichols, G. J. and Warwick, G. L., 2010, Large distributive fluvial systems: Characteristics, distribution, and controls on development: Journal of Sedimentary Research, v. 80, p. 167183.

Krystinik, L. F. and DeJarnett, B. B. 1995, Lateral variability of sequence stratigraphic framework in the Campanian and Lower Maastrichtian of the Western Interior Seaway, in J. C. Van Wagoner and G. T. Bertram), eds., Sequence stratigraphy of foreland basin deposits: outcrop and subsurface

examples from the Cretaceous of North America: American Association of Petroleum Geologists, Memoir 64, p. 11-26.

Leclair, S. F., and Bridge, J. S., 2001, Quantitative interpretation of sedimentary structures formed by river dunes: Journal of Sedimentary Research, v. 71, p.714-717.

Schumm, S. A., 1972, Fluvial paleochannels, in J.K. Rigby and W.K. Hamblin, eds., Recognition of Ancient Sedimentary Environments: SEPM Special Publication, no. 16, p. 98–107.

Schumm, S. A., 2005, River variability and complexity: Cambridge, U. K., Cambridge University Press, 220 p.

Wiessmann, G. S., Hartley, A. J., Nichols, G. J., Scuderi, L. A., Olson, M., Buehler, H., and Banteah, R., 2010, Fluvial form in modern continental sedimentary basins: Distributive fluvial systems: Geology, v. 38, p. 39-42.

FIGURES:

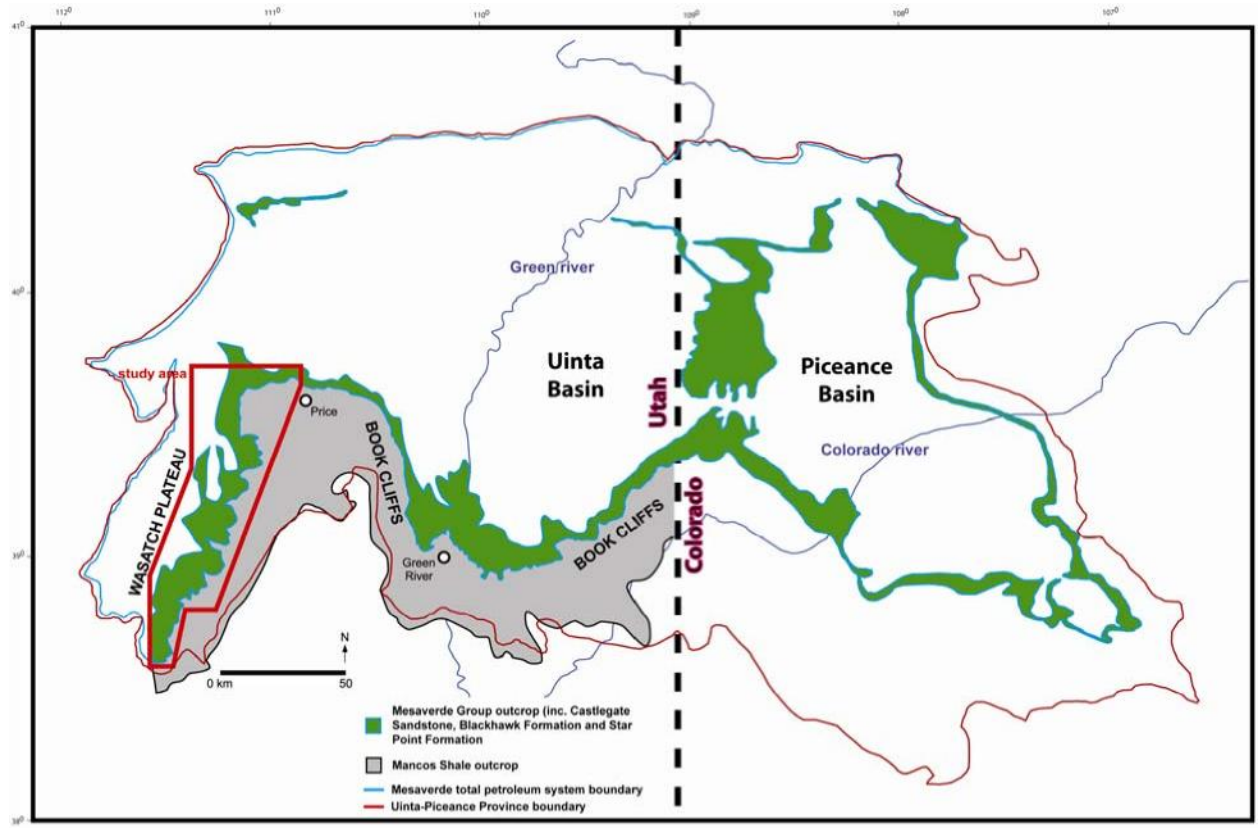

Figure 1. Location of the study area, Wasatch Plateau (marked as red polygon), orienting perpendicular to the Book Cliffs in central Utah. The Upper Cretaceous Blackhawk Formation (belongs to Mesaverde Group, green color) has been outcropped in the study area in a coastal-plain depositional setting.

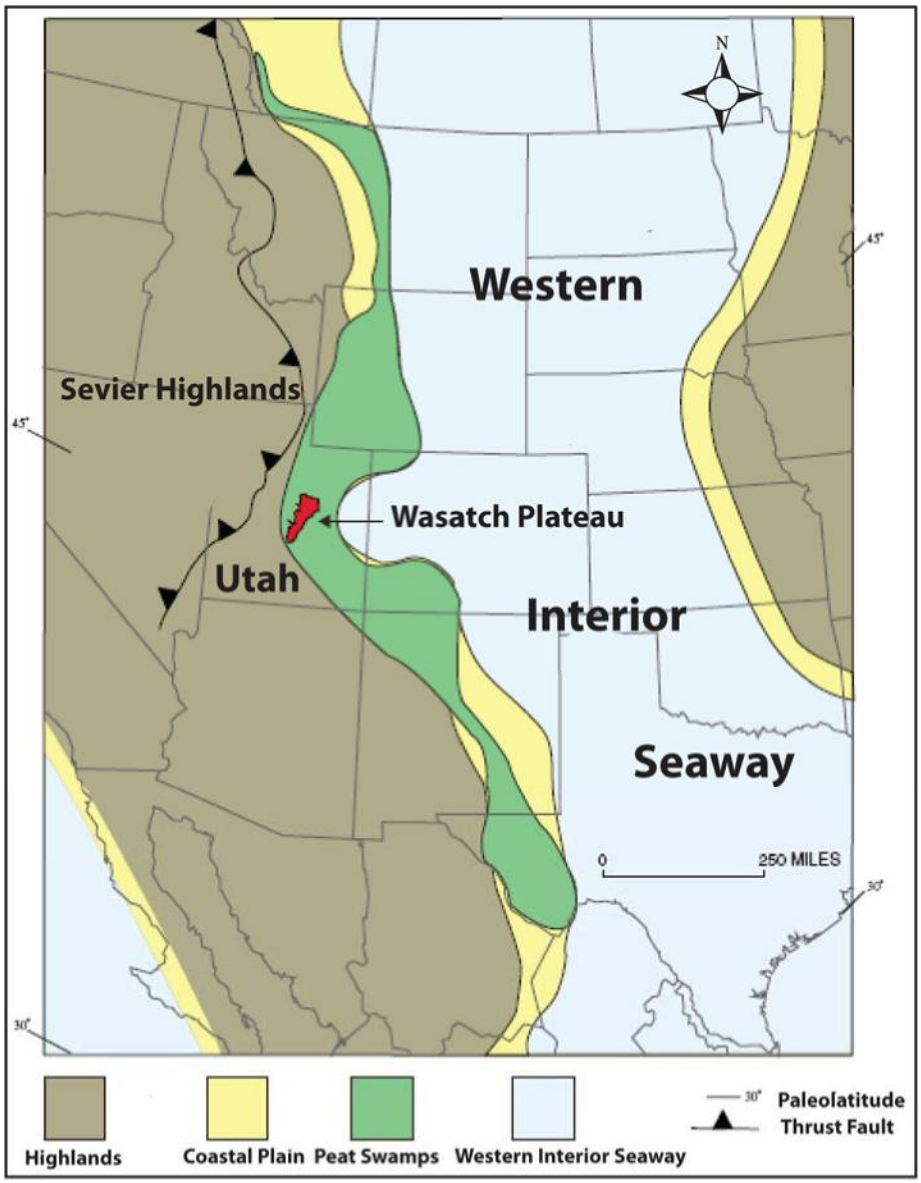

Figure 2. Late Cretaceous Western Interior Seaway and Wasatch Plateau location (Modified after Dubiel et al., 2000). During this period, coastal-plain and swampy conditions prevailed over the Plateau. Fluvial systems, being sourced from Sevier Highlands in the West, traversed through the Plateau before flowed down to the Western Interior Seaway Basin at eastward direction of the Plateau.