

Paleochannel migration history and characterization of resulting point bars, counter point bar, and abandoned channels from an Upper Cretaceous fluvial meander belt, Dinosaur Park Badlands, Alberta

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Summary

The migration history of recent meandering rivers can be discerned from successive air and satellite images, revealing insight into migration rates, meander bend evolution (rotation, translation, expansion, etc.) and channel abandonment. However, very few studies have attempted similar reconstructions using outcrop data from ancient meander belt deposits. Paleochannel migration history analysis allows for the quantification of deposit preservation in the stratigraphic record on a meander belt scale; high quality outcrop exposure provides a link between detailed sedimentological observations and meander bend

evolution. An exceptional locality in which to consider this approach is the ancient meander belt deposits of the Upper Cretaceous Dinosaur Park Formation in south east Alberta. The badlands topography offers sedimentological details and 3-D exposure of an ~8 m thick meander belt deposit over 3 km². Detailed sedimentologic characteristics were compiled from over 40 measured sections and abundant paleoflow indicators; key stratigraphic surfaces, including meander belt bounding contacts, component architectural element contacts, and intra-bar accretion and erosion surfaces, were surveyed using a high resolution (10 cm) differential GPS unit. Outcrop data was then imported into modeling software, and surfaces extrapolated and projected into the third dimension in order to constrain geometrical information (e.g., surface orientations, which reveal bar accretion directions). Architectural element and component geobody volumes are also constrained. The study area is characterized by at least five meanderbelt elements, including point bars and abandoned channel fills – emphasis is placed on characterization of a counter point bar deposit. Although counter point bars have been sporadically described from modern river systems, until recently their stratigraphic expression has not been explored. Recent identification in subsurface datasets has relied on recognition of their characteristic concave-downstream accretion surfaces in seismic reflection volumes, calibrated by well data. However, they have largely been elusive in the outcrop record. This study provides evidence for an outcropping counter point bar, supported by reconstruction of the paleochannel migration history and meander belt sedimentology to support this interpretation.

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