PALEO-STREAM COMPETENCY AS A TEST OF THE DISTRIBUTUBLY FLUVIAL SYSTEM MODEL: UPER DEVONIAN CATSKILL FORMATION, CENTRAL PENNSYLVANIA

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1. Abstract

Evaluating incision and aggradation in basins is essential to understanding the evolution of tectonically active regions. Fluvial deposition is a major mechanism for incision and aggradation, and the development of incised valleys is a characteristic example. The Catskill Formation (Dvennian) is a distal地区's fluvial deposition dominated by channel and overbank deposits. Channel bodies in the Catskill Formation are characteristic of distal regions. A prograding DFS will result in a vertical accretionary facies with channel bodies, and overbank deposition. The Catskill Formation has been interpreted as a DFS based on variability in detrital and non-detrital components. This study aims to evaluate the utility of paleo-stream competence analysis in identifying DFS in the fluvial sedimentary record.

2. Methods

Site and Sample Locations

Oriented samples were taken from channel and overbank sandstone from the base, middle, and top of each fluvial wedge unit at the Catskill Formation outcrop near Susquehanna and Duncannon, PA. Twenty one oriented samples were collected and cut into thin sections perpendicular to bedding. Twenty one oriented samples were collected and cut into thin sections perpendicular to bedding. Oriented samples were taken from channel sandstones from the base, middle, and top of the section to assess variability in paleo-flow competency through time. We show that, although median grain size does not substantially decrease downstream, change, D90 and maximum grain sizes increase up-section.

3. Study Locations

Devonian Outcrop

4. Generalized Stratigraphy

5. Textural Trends

6. Shear Stress

7. Conceptual Model

8. Conclusions

- Although median grain size does not substantially change, D90 and maximum grain sizes increase up-section.
- As grain size increases, critical shear stress necessary to entrain sediment also increases.
- Increased grain size and shear stress can be attributed to greater stream competency as channels transition from bifurcated, wide, shallow, and poorly-confined- to isolated, wide, relatively deeper, and well-confined up-section.

9. References

Modified from Miles and Whitfield, 2001

10. Acknowledgments

Channel size, confinement, and sand/mud ratio decrease with stratigraphic up-section, and overbank deposition dominating proximal DFS environments and channel deposition dominating coastal DFS environments and coastal deposition channels of distal regions. A prograding DFS will result in a vertical accretionary facies with channel bodies, and overbank deposition.

- Increased grain size and shear stress can be attributed to greater stream competency as channels transition from bifurcated, wide, shallow, and poorly-confined- to isolated, wide, relatively deeper, and well-confined up-section.
- These trends are consistent with distributary fluvial systems, where channel depth and water velocity decrease downstream.