Development of Banding in the Deposits of Experimental Transitional Flows*

Kelsi Ustipak¹, James Buttles², David Mohrig², Mauricio Perillo², and Benjamin Cardenas²

Search and Discovery Article #51182 (2015)**
Posted October 19, 2015

*Adapted from oral presentation given at AAPG Annual Convention & Exhibition, Denver, Colorado, May 31-June 3, 2015
**Datapages © 2015 Serial rights given by author. For all other rights contact author directly.

¹Jackson School of Geosciences, University of Texas at Austin, Austin, Texas, United States (ustipak@utexas.edu)
²Jackson School of Geosciences, University of Texas at Austin, Austin, Texas, United States

Abstract

Transitional flows deposits have been described in a wide range of deepwater basins such as the Agadir Basin (offshore Morocco), Britannia Formation in the North Sea, and the ultra-deepwater sub-salt Wilcox Group (USA). These types of deposits do not follow the ‘classic’ deepwater facies models (i.e., Bouma Sequence). One of the most enigmatic aspects of transitional flow deposits lies in an alternation between clay-rich and clean sand bands. Distinguishing between laminae and true banding in argillaceous deepwater deposits is often unclear due to uncertainty in the processes controlling the development of banding. Surging within depositing sediment gravity flows may provide a process-based explanation for why banded intervals are common in facies descriptions of transitional flow deposits. To test this hypothesis, we induced intermittent surges on clay-rich, sand-laden transitional flows in a two-dimensional experimental flume. Surging produces unsteady deposition of alternating clay-rich and clean sand bands in an overall fining upward event bed. Millimeter-scale bands are connected to fluctuating bed aggradation rates which wax and wane in response to surging. High-resolution videos taken during the experiments show that rapid bed aggradation results in clay-rich bands while lower aggradation rates deposit relatively clean sands. The character of banding differs across the tested flow compositions, from high-concentration turbidity currents to strong transitional flows. Variability in the spatial distribution of clay within banded deepwater deposits has implications for predicting both permeability structure and overall reservoir quality.

Reference Cited

Development of Banding in the Deposits of Experimental Transitional Flows

Kelsi Ustipak
James Buttles, David Mohrig, Mauricio Perillo, Benjamin Cardenas
Motivation • Methodology • Results • Discussion • Conclusion

Haughton et al. (2009) *Marine and Petroleum Geology*
1. Surging of a transitional flow leads to banded deposits

2. Clean or muddy bands directly correlate to surges in flow
Motivation

Methodology

Results

Discussion

Conclusion

- 14% Sediment by Weight
  - 81.4% of Sediment is Mud

![Graph showing grain size distribution and volume density percentages.](image-url)
**Sedimentary Structures**

- Microbands, laterally continuous, variable thickness
- Laminae, laterally discontinuous

---

**Motivation**

**Methodology**

**Results**

**Discussion**

**Conclusion**

---

**Flow Direction**

INLET

---

NO vertical exaggeration

2x vertical exaggeration
Considerable variability of clay in pore spaces, especially vertically between 46-50 cm.

Motivation

Methodology

Results

Discussion

Conclusion

“Clean Band” = 12.1% Mud

“Clean Band” = 30.8% Mud

“Muddy Band” = 36.5% Mud

“Muddy Band” = 49.5% Mud

“Muddy Cap” = 99.5% Mud

Flow Direction

Each tick is 1 mm
Aggradation of Bed over Time

- **Motivation**
- **Methodology**
- **Results**
- **Discussion**
- **Conclusion**

**SURGE**

Bed Height (mm)

- **X=50 cm**
- **X=45 cm**
- **X=50 cm**

Time (sec)
Average Aggradation of Static Bed

Δ Bed Height/Δ Time (mm/s)

Time (sec)

-0.1 -0.0 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7

0 10 20 30 40 50 60 70 80

SURGE

Motivation © Methodology © Results © Discussion © Conclusion
1. Surging of a transitional flow **does** deposit a banded facies

2. Surging **is not simply** correlated to clean or muddy bands