

# Towards a Quantitative Understanding of Bed Structure by Turbidity Currents

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## Abstract

We are currently carrying out a series of experiments and theoretical calculations with the goal of creating a quantitative model for the structure of beds created by turbidity currents. Our research project operates on three different levels: first, on the largest scale, Jim Buttles and his colleagues in Earth and Planetary Sciences have a laboratory scale model of turbidity current deposition, where they can study both the dynamics and end-product of turbidity current flows. Our ultimate goal is to create a quantitative model for the beds they deposit. On a smaller scale, we are carrying out a set of experiments aimed at uncovering the essential mechanisms of particle deposition/layering in a bed caused by turbidity currents. These experiments are designed to be smaller scale counterparts of small "pieces" of the ERL turbidity current bed experiment. Finally, we are carrying out a theoretical investigation of how particle segregation/layering occurs in the beds laid down by turbidity currents.

The ultimate goal of this research is to provide a modeling tool that will help interpret seismic data on turbidity currents. Although our research is still in its preliminary stages, we believe that coupling an understanding of how particle layering occurs as a function of the properties of the particle/fluid flow, with the state of the art understanding of the flow structure of turbidity currents will give a powerful tool for "guessing/deducing" bed structures that are below seismic resolution. The close coupling of this modeling effort with a laboratory scale model of a turbidite bed means that we will be able to test the model quantitatively in the laboratory.

Another goal of the ongoing research is to discover physical laws which improve quantitative modeling of turbidity currents. In particular, the models of erosion by turbidity currents are *ad hoc*; the experiments we are planning will be designed to test these models, and stimulate theoretical improvements.





