ShortTitle: StratigraphicComplexity

Title: Introducing Time Series Complexity Analysis to Submarine Fan Stratigraphy

Project lead and contact details: Zane Jobe and Pengfei Hou, Colorado School of Mines
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Suggested team size: 2-4

Logistics: Can work from anywhere, but an office on Mines campus will be available for use.

Project description:

Nature is fractal, nonlinear, and complex, but these features are often overlooked in the interpretation of rock record. This project is a cross-disciplinary study of complex system science and stratigraphy. The goal is twofold. First, develop a comprehensive metric to quantify the degree of complexity in stratigraphy, using theories and methods of fractal, nonlinear dynamics, and information entropy. Second, to explore the distribution patterns and mechanisms of stratigraphic complexity within depositional systems and compare these patterns between outcrops and numerical models. The methods and results of this project can provide a new way to evaluate the effectiveness of numerical models, quantify the propagation of environmental signals, and reconstruct the nonlinear characteristics of the underlying mechanisms on stratigraphy. You will be involved in every step of the project, from design to implementation. You will utilize your computational skills to transform mathematical theories to comprehensive algorithms, solve real-world problems, and push forward the limit of knowledge.

In particular, you will:

- Manipulate existing forward numerical models in stratigraphy written in MATLAB and Python,
- Design a comprehensive 'complexity analyzer' for stratigraphic time series analysis and visualization.
- Ideally create an open-source, user-friendly software for the complexity analyzer in MATLAB or Python and co-author the software and the associated paper.