日本地球惑星科学連合2019年大会

深度学習によるタービダイト逆解析手法の実験的検証

Inverse Analysis of Experimental Scale Turbidity Currents by Deep Learning Neural Network

*Cai Zhirong[1]、成瀬 元[1]、姚 奇峰[1]
*Cai Zhirong[1], Hajime Naruse[1], Qifeng Yao[1]

1. 京都大学
1. Kyoto University

In this study, inverse analysis of turbidite deposited in flume experiments will be performed using a new machine learning method. The results of inverse analysis will serve to verify the accuracy of the machine learning method.

Understanding of the hydraulic conditions of turbidity current remains limited due to its destructive nature and its unpredictable occurrences. Thus, the inverse analysis of turbidity currents from ancient deposits of submarine fans is required for estimating the conditions of flows in the natural environments.

In the past, inverse modeling of turbidity currents was done in a trial and error fashion by adjusting initial conditions of numerical models, which is high in calculation load, making such technique very expensive and highly impractical. Naruse (2017 AGU Fall Meeting) developed a completely new method for inverse analysis of turbidity currents using a deep learning neural network. In this method, training data is generated by a numerical model, and a neural network for reconstructing hydraulic conditions of turbidity currents from turbidite is produced by machine learning of the training dataset. However, validity of this new inverse model has not yet been tested in actual deposits. Therefore, this study aims to verify the method by flume experiments.

Currently, the initial conditions of a dataset produced by a flume experiment sized forward model program is used to test the applicability of the neural network method when applied to flume experiment size data. Three thousand sets of training data were fed into the neural network as training data. Another two hundred separate cases were used as test data to verify the accuracy of prediction by neural network. Result shows initial flow velocity can be predicted relatively accurately. The initial concentrations of the finer grain size class and the initial flow height was partially reconstructed. The flow duration, the coarser grain size classes and the slopes within the flume could not be predicted. After tuning of the neural network and the forward model, the neural network trained for flume sized data will be applied to flume experiment results.

キーワード：水槽実験、機械学習、混濁流
Keywords: Machine Learning, Flume Experiment, Turbidite