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

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Turbidite deposits have been an active area of study due to its close association with petroleum resources and their role in the destruction of sea-floor equipment. Through studies of turbidity currents, the depositional process of turbidite, understanding of specific characteristics of turbidite deposits can be improved. However, knowledge in this area remains limited due to difficulties in the direct observation of turbidity currents. In order to better understand the structure of turbidity current, inverse analysis of turbidity current had been used to reconstruct the initial flow conditions from its turbidite deposits. However, past optimization methods had been computationally over expensive, making it impractical to be applied to actual turbidite deposits in nature. In order to resolve this issue, a new method for the inverse analysis of turbidity current using deep learning neural network (DNN) was proposed, and this research verified the method using artificial data and actual flume experiment data. In this study, DNN was applied to two different types of experiments. One using two different types of plastic particles and the other using a mixture of siliciclastic sand and plastic particles. Our results demonstrate that inverse analysis using DNN can reconstruct the hydraulic conditions and deposit profiles of both types of flume experiments with good accuracy. However, some variation in performance can be observed from the results of application for different types of experiments.

Keywords: Machine Learning, Turbidite, Flume Experiment

