

# Numerical simulation of sedimentary stratification by SEDFLUX

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There have been a number of attempts to simulate the process and the resultant formation of sedimentary stratification. Most of them are, however, limited to specific processes or areas, and not used publicly for general purpose. One of the reasons of the lack of applicability is that the modeling of stratigraphy requires a wide range of natural phenomenon, from local geology and tectonics to global climate changes. Cooperation and collaboration are necessary through various fields of earth science to successfully integrate the modeling of sedimentary stratification. SEDFLUX, such a numerical model now being developed mainly by a group from the University of Colorado, is introduced in this presentation with some examples of its results.

SEDFLUX predicts the stratigraphic formation, starting from estimate of amount of sediments based on the area's climate and morphological features. Transport and entrapment of sediments through rivers and lakes are calculated to give the sediment flux at the river mouth. Final stratigraphy is predicted by steady processes in shallow marine environments followed by redistribution by infrequent events such as slope failures and storms. Each of these processes can have its own initial and boundary settings, and therefore influence of each process on the final deposits can be evaluated separately. Also, a wide variety of environments can be simulated by changing these settings. The model is highly useful in evaluating the past history of climatic environments and events recorded in stratigraphic records, and in predicting the future formation of stratigraphy and changes of coastal geomorphology.

An advanced model is, on the other hand, difficult to verify due to its multi-process nature. It is necessary to utilize tank experiments in a state-of-art facility in order to verify interaction between the processes simulated in SEDFLUX. A large tank facility for the St. Anthony Falls Hydraulic Laboratory can produce such multi-process environments with automatically controlled sediment supply and subsiding floor. An example of comparison between the tank experiments and SEDFLUX predictions for turbidite sedimentation in a subsiding basin is presented.

SEDFLUX has been used in various areas to predict sedimentary stratification. However, it has yet to be applied tectonically active margin including areas around Japan. While the present version of SEDFLUX is useful in other areas, further modification is underway to simulate such features as earthquake/tectonic activities in active margin areas. This presentation introduces the modification and the attempt to apply SEDFLUX to areas around Japan.