

Large Scale High Precision Sandbox Experiments and Large Scale Numerical Sandbox Experiments - Precursory Signal Preceding to Frontal Thrust Formation

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To find out the mechanism of the three-dimensional complex shape formation in sequential thrust and uplift of an accretion prism, we have developed a large-scale high precision sandbox experimental apparatus since 2011. After a number of modifications in the experimental apparatus and experimental procedure, we developed a prototype of the apparatus in 2014. In specimen preparation, the thickness of a sand layer is controlled with the precision of less than single particle size. As a result, we obtained high reproducibility of the thrust formation including its position. With such a well-controlled experimental system, we found the precursory signal prior to thrust formation. To grab and understand the signal, we further improved the apparatus by installing the laser displacement sensor (resolution $0.1 \mu\text{m}$, span 800mm), a force sensor, and camera array for surface measurement. In addition to the lab experiments, in which we can observe surface phenomena, we conducted the Discrete Element Method (DEM) simulations of the sandbox experiment. In the DEM simulation, we found similar preceding phenomena. We will discuss the mechanism of these preceding phenomena, comparing the lab experiment and the simulation.

Keywords: precursor, earthquake, sandbox experiment, DEM simulation