Geophysical Research Abstracts, Vol. 9, 05865, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-05865

Analogue and numerical models of seamount subduction and its impact on methane hydrate accumulation

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Analogue models that use granular materials have been successfully applied to model the brittle behavior of the crustal deformation. The numerical simulation that approximates the geologic body as an assembly of particles (distinct element code) can also be applied to the same issue. This research employed both of the techniques and modeled the seamount subduction at a convergent margin where an accretionary wedge is developing.

The modeling configurations of the analogue and numerical models are basically the same, including the boundary conditions and the physical properties of the materials (i.e. friction coefficient).

The modeling results are very similar in the two models, apart from the reproducibility of small structures influenced by the particle size. The models suggest that a sea mount subduction causes segmentation of wedge formation corresponding to two types of fault systems; one formed before sea mount subduction and the other afterward. The paths of fluid flow along the faults should also be segmented, and this might be a strong control on the methane hydrate accumulation because methane may migrate with fluid in the sediments.

The geometry of these faults illustrates that the fluid from the deeper segment of the sedimentary pile may focus on the faults that formed after seamount sudbuction.