Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

STT11-05 Room:203 Time:May 21 15:15-15:30

Numerical simulation of dynamic fracturing using a particle method

Yuki Imai[1*], Hitoshi Mikada[2], Tada-nori Goto[2], Junichi Takekawa[2]

[1]JAPEX, [2]Kyoto Univ.

Better understanding of failure mechanism of rocks benefits researches in many fields from rock engineering to earth sciences. Especially, it is essential to understand how fractures are initiated and to propagate under various loading conditions in order to clarify real rock fracture processes. For the interpretation of rock failure, many attempts have been made experimentally or using theories in fracture mechanics. Although much of the knowledge available today is based on experimental observations and the theory successfully represented the propagation of predefined cracks, the failure mechanics are not fully understood by experimental results and it is difficult to describe the initiation and coalescence of cracks using existing theories. Thus, in the recent years, numerical modeling, which might be less restrictive, has been often applied to study crack behaviors, and we also approach to the rock failure based on numerical simulations. To represent rock failure, we use a Hamiltonian Particle method (HPM), one of particle methods. In the HPM, we do not need to use grids or meshes to discretize the rock model, and thus we could deal with the failure relatively in a simple way. In spite of this advantage of the HPM, the applicability of the method to the failure phenomena has yet to be revealed fully. In the present study, we apply the HPM to rock failure under some different specimens and different loading conditions. As a result of our simulations, the HPM successfully reproduces failure patterns of brittle fractures observed at rock fracture experiments, and can indicates micro cracks initiation and propagation. This suggests that the HPM is the useful tool to analyze rock failure.