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

SSS29-04 会場:304 時間:5 月 24 日 09:45-10:00

混合破壊モードを考慮した分岐断層形成の動的シミュレーション：天然断層との比較
Dynamic Ssimulation of Bbranch Ffault Fformation Cconsidering Mmix Mmode Rrupture: Comparison with Natural Examples

安藤 亮輔 [1*], 氏家 恒太郎 [2], 斎藤 翼 [2]
Ryosuke Ando[1*], Kohtaro Ujiie[2], Tsubasa Saito[2]

[1] 産業技術総合研究所, [2] 筑波大学
[1]Geological Survey of Japan, [2]University of Tsukuba

We investigate the formation process of wing-crack like sequentially occurring branch faults. Such branch faults are found in field examples of exhumed fault rocks [e.g., Di Toro et al., 2005, Nature] and laboratory examples formed during dynamic rupture propagation [e.g., Griffith et al., 2009, Geology]. Recent theoretical studies suggested that the angles and lengths of branch faults reflect dynamic rupture processes of main faults, which the branches are grown from, and the rupture velocities [Rice et al., 2005, BSSA] and the length [Ando and Yamashita, 2007, JGR] of the main faults can be estimated by using these geometrical parameters. In fact, Di Toro et al. (2005) used the theory and the model of Rice et al. (2005) to infer the condition for exhumed branches filed by pseudotachylyte. However, these physical models lack some ingredients such as actual dislocations due to branching [Rice et al., 2005] or the mix mode rupture [Ando and Yamashita, 2007]. In this study we extend the numerical simulation method developed by Ando and Yamashita (2007) using the boundary integral equation method (BIEM) in order to deal with the mode I rupture as well as the previously implemented mode II. We perform the spontaneous rupture simulation to track the self-chosen fault growth path under various conditions of model parameters including the rupture velocity, the frictional coefficients and the stress angle. The results are compared with the field example of the extension cracks branched from the 1-mm-thick ultracataclasite, which are found in the Late Cretaceous Shimanto accretionary complex in eastern Kyushu, southwest Japan. The extension cracks having the length of a few mm exhibit a peak in the distribution of the branch angles around 60 degrees from the ultractaclasite, which is much higher than the numerical prediction only considering the mode II with the Coulomb criterion, 30 degrees.

キーワード: 分岐断層, ウィングクラック, 断層帯, 高速破壊, 付加体, シミュレーション
Keywords: branch fault, wing crack, fault zone, dynamic rupture, accretionary complex, simulation