Geophysical Research Abstracts
Vol. 18, EGU2016-14659-1, 2016
EGU General Assembly 2016

Earthquake cycles in complex geometries

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Our understanding of earthquake cycles, from a modelling perspective, comes mainly from theoretical, and numerical, work on a single straight fault. However, natural fault systems are geometrically complex. Modelling complex fault geometry (bends, kinks and multiple faults) is in itself a challenge as it is computationally intensive. To overcome this difficulty, we appeal to the Fast Multipole Method which was developed in the context of modelling N-body problems. This method is then used to model the quasi-dynamic response of multiple faults, with complex geometries, that are governed by rate and state friction laws. Our preliminary findings tell us that when stress interaction between faults, due to complex geometry, is accounted then even strongly rate-weakening faults (a-b)<0 show a complex spectrum of slow slip and dynamic ruptures.