

# Variations of the IR Radiation Field Prior to Fault Stick-Slip in a Compressive En Echelon Structure from Laboratory Experiments

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We have studied variations of the infrared(IR) radiation field around a fault during its stick-slip processes by physical modeling experiments in the laboratory. The studied fault is one part of a compressive en echelon structure. An IR thermal image system was used to measure IR radiation values on the specimen during stick-slip events on the fault. Seven parallel sliver-like portions around a section of the fault are chosen as analysis targets, of which portion 4 is the fault, portions 5, 6, 7 and 1, 2, 3 are located on two sides of the fault, respectively. The result shows that IR radiation values(VL) around the fault section increase gradually from portion 1 to portion 7 in general, implying higher IR radiation on the inner side of the fault near the compressive jog. When impending a stick-slip event(2~3s before the event in the experiment), VL of portions 3, 4, and 5 around the fault rise relatively, with the most profound growth in portion 4 which is just the fault section itself. On the IR image, it forms obvious belts of high value and lasting about 20s. Meanwhile, about 20s before the rising of IR radiation at the portion 4, VL of portions 5 and 6 on the inner side of compressive jog drop first and then rise. It indicates that dropping of VL on the side of the compressive jog before the stick-slip is earlier than rising of VL at the fault portion. During the experiment, eight stick-slip events were recorded, among them four events occurred at the studied fault section, which were all accompanied with the phenomenon mentioned above. Therefore, it is possible to detect impending stick slip events on a fault in advance through systematic observations to variations of the IR radiation field at varied sites across a fault. These observed variations of IR radiation are closely related with failure and stress release of the jog in an en echelon structure. This result may be used as a reference in studying instability of faults by using satellite thermal infrared information.