A model for evolution of AE activity and friction during steady-state sliding on bear surfaces in granite

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I propose a hypothetical model for evolution of AE activity and friction behavior observed for steady-state frictional sliding on bear fault surfaces in granite observed for laboratory experiments. I divide the way of asperity contact into two types. One is interlocking-type, and the other is welding-type. Because there exist a number of short wavelength asperities on the artificially prepared surfaces in granite, the interlocking-type contact between the asperities should be easily to occur. It is known from comparison between fault surface topographies before and after experiment that the short wavelength asperities are more effectively worn than long wavelength ones during sliding. As a result, welding-type contact may be dominant source of frictional resistance for worn surfaces. By assuming that the interlocking-type contact exhibits a rate-strengthening behavior and welding-type one does a rate-weakening behavior, the alternation of dominant contact-type of short wavelength asperities due to wear qualitatively explains observed evolution of AE activity, rate dependence of AE activity and rate dependence of friction. The former assumption should be justified by the direct rate dependence of strength of intact rocks observed in failure experiments. The latter one is related to the inverse dependence of contact area on the sliding rate.