Evolution of real contact area between rough surfaces : toward understanding the healing mechanism of fault strength

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Evolution of real contact area is important for healing of fault strength. The real contact area increases by creep of plastic material which leads to the frictional recovery of fault. Creeping of plastic material causes enlargement of individual contacts, appearance of new contacts and coalescence of neighboring contacts. In our model, enlargement of individual contacts and apparent of new contacts is considered.

Suppose an axisymmetry rigid indenter contacts on a deformable half-space and the indenter profile approximates quadratic function of the radius from the tip. And flow law of plastic material obeys power law with the exponent n. In this case, we can apply the theory of Storakers et al. (1997) and solve this problem. We find that the evolution of real contact area is power law with the exponent approximately $1/n$. Furthermore, surface roughness does not affect the healing rate for n is large enough.

According to Storakers et al. (1997), pressure distribution of indenter is uniform for n is large enough. In this case, evolution of real contact area only depends on the average pressure acts on the contact region. As a result, surface roughness does not affect the evolution of real contact area.