



Electromagnetic Forcing of Stick-Slip Deformation: multiple synchronization and phase shift

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It has been shown earlier experimentally that natural stick-slip process can be controlled by relatively weak mechanical or electromagnetic (EM) forcing. Acoustic pulses, accompanying slip events were registered as slip markers.

Pulse EM or mechanical forcing leads to triggering of slip and periodic forcing invokes phase synchronization. Experiment prove that application of both constant and periodic (50 Hz) voltage cause bifurcation in synchronization process, namely, if application of periodic EM forcing only leads to 1:2 synchronization (2 slips during 1 period), the mixed forcing transforms synchronization to 1:1 mode. Low frequency forcing of order of 1 Hz excites intermittent multiple synchronization, when the ratio of forcing frequency to slip events frequency reach larger values - 3:1; 4:1 or 5:1.

Besides, it has been discovered that the phase shift between synchronizing EM forcing and induced acoustic pulses (slips) depends on the amplitude of forcing. The same effect was earlier found in mechanical triggering.

Both these complicating effects, multiple synchronization and phase shift dependence on the amplitude of forcing, should evidently be taken into account during investigation of synchronization in geophysical processes.