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Nonlinear waves in earth crust faults: application to regular and slow earthquakes

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The genesis, development and cessation of regular earthquakes continue to be major problems of modern geophysics. How are earthquakes initiated? What factors determine the rapture velocity, slip velocity, rise time and geometry of rupture? How do accumulated stresses relax after the main shock? These and other questions still need to be answered. In addition, slow slip events have attracted much attention as an additional source for monitoring fault dynamics. Recently discovered phenomena such as deep non-volcanic tremor (NVT), low frequency earthquakes (LFE), very low frequency earthquakes (VLF), and episodic tremor and slip (ETS) have enhanced and complemented our knowledge of fault dynamic. At the same time, these phenomena give rise to new questions about their genesis, properties and relation to regular earthquakes. We have developed a model of macroscopic dry friction which efficiently describes laboratory frictional experiments [1], basic properties of regular earthquakes including post-seismic stress relaxation [3], the occurrence of ambient and triggered NVT [4], and ETS events [5, 6]. Here we will discuss the basics of the model and its geophysical applications.

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