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Stick-slip statistics of a physical slider block model

Ewald Brueckl, Stefan Lederbauer, Stefan Mertl, and Karl-Heinz Roch
Vienna University of Technology, Institut of Geodesy and Geophysics, Vienna, Austria (ebrueckl@mail.tuwien.ac.at)

An exhibition concerning the various scientific, technical, and social aspects of earthquakes has been organized as an Austrian contribution to IYPE – International Year of Planet Earth. In order to support the understanding of the elastic rebound theory a physical slider block model has been constructed. This model consists of a granite base plate and a granite slider block, connected to a lever by a leaf spring. The lever is driven parallel to the base plate with a constant speed in the range of 1 – 10 mm/s. The lever can move about 1 m in one direction. Thereafter the polarity of displacement is changed automatically. Opto-electronic distance measuring modules measure the displacement of the constantly moving lever and the stick-slip movement of the slider block. A geophone mounted on the slider block receives the vibrations of the slider block during the slip. From theory a periodic slip has to be expected. However, because of slight spatial changes of friction between the base plate and the slider block, individual slip distances vary in the range of 2 – 20 mm. Besides the speed of the lever further parameters of the physical slider block model can be varied: normal force between base plate and slider block, grain size and thickness of quartz sand simulating fault gouge, and stiffness of the leave spring. The stick slip statistics and derived quantities (e.g., stress release) will be shown and the influence of the variable parameters on the stick slip behaviour analyzed.