Session 21

Physics of earthquake preparation process: From laboratory experiments to earthquake forecast

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The skepticism connected with earthquake forecasting, both deterministic and probabilistic, is related with the complexity of earthquake generation process that puts limitations in scientific knowledge and incomplete insights. These latter prevent a reliable estimation of the occurrence place, time and magnitude of an ensuing earthquake. Meanwhile, it is known that the earthquake process is not momentary, but on the contrary there are several gradually evolving stages that take place in time and space. Before the main rupture occurs, the destruction process is going through a number of levels (stages), starting with the micro–scale and ending on macro–scale, including earthquake focal area. In this session, we invite researchers to discuss the results and directions for further studies on the physics of the seismic process – from experiments in laboratory conditions, to rock bursts in mines and seismically active regions during the preparation phase of strong earthquakes.

Special emphasis will be given to quantitative physical models of the seismic process at different scales, observations on earthquake triggering by other earthquakes or nearby faults, and synchronization between nearby faults with positive stress coupling, fault system interactions controlling earthquake occurrence, the connection of smaller magnitude seismicity with stress changes as expressed through the Rate/State model, calculation of stress changes from changes in earthquake occurrence. Modeling and simulations across a wide range of spatial and temporal scales provide a better understanding of the source processes and interactions, and advance predictive capabilities.