O-39

A slip pulse model with fault heterogeneity for slow earthquakes

Ryosuke Ando
Geological Survey of Japan, AIST
ryo-ando@aist.go.jp

With recent observational advancement in slow earthquake generation processes, these events became known to have distinctive characteristics unlike those of regular earthquakes. For instance, deep low-frequency earthquakes (LFEs) and deep nonvolcanic tremor show particular characteristics include strong anisotropy in their migration velocity and source spectra displaying 1/f decay. We show that a physical model can explain these features in a simple framework with slip pulses originating on fault heterogeneity and triggered by slow-slip events. LFE/tremor source areas in the model consist of unstable patches sparsely and heterogeneously distributed following a Gaussian distribution. The difference in their migration speeds along dip and along strike was reproduced, without anisotropic rheological properties, by introducing alignments of their sources similar to observed streaks of LFEs/tremor. The key to reproducing inverse linear spectral decay is that the slip pulse has a constant mean moment rate. In addition to the reproduction of the above phenomena, we numerically analyze the behavior of this model in a wider parameter space. Although this model has diversity in the resulting rupture processes, we can classify the rupture types based on physical properties of faults and the distribution of patches. This model will be a new tool to investigate the nature of brittle ductile transition zones by observing source processes of slow earthquakes.

Reference

Ando, R., R. Nakata and T. Hori, 2010, A slip pulse model with fault heterogeneity for low-frequency earthquakes and tremor along plate interfaces, *Geophys. Res. Lett.*, doi:10.1029/2010GL043056.