[EE] Evening Poster | S (Solid Earth Sciences) | S-CG Complex & General

[S-CG53]Science of slow earthquakes: Toward unified understandings of whole earthquake process

convener:Satoshi Ide(Department of Earth an Planetary Science, University of Tokyo), Hitoshi Hirose(Research Center for Urban Safety and Security, Kobe University), Kohtaro Ujiie(筑波大学生命環境 系, 共同), Takahiro Hatano(Earthquake Research Institute, University of Tokyo) Wed. May 23, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

Accumulating observational studies on various types of slow deformation events, such as tectonic tremors, very low frequency events, and slow slip events, portrays some universal characteristics in generally complex behavior, including interaction among events and influence by various outer loadings. Some of these phenomena seem to have causal relation with the occurrence of very large earthquakes. A unified understanding of these slow and fast earthquake processes requires an approach integrating geophysics, seismology, geodesy, geology, and non-equilibrium statistical physics. We welcome presentations based on, but not limited to, geophysical observation, data analysis, analytical theory, numerical simulation, field study, and laboratory experiments.

[SCG53-P18]Estimation of pore fluid overpressures for tensile cracking at depth of shallow slow earthquakes

*Makoto Otsubo¹, Kohtaro Ujiie², Jeanne L. Hardebeck³, Hanae Saishu¹, Ayumu Miyakawa¹, Asuka Yamaguchi⁴ (1.Geological Survey of Japan/AIST, 2.University of Tsukuba, 3.U.S. Geological Survey, 4.The University of Tokyo)

Keywords:Slow earthquake, Stress, Crack, Fluid, Subduction

Pore fluid pressure P_{ϵ} is important for understanding slow earthquake mechanics. In this study, we estimated the pore fluid pressure during the formation of foliation-parallel quartz veins filling mode I cracks in the Makimine mé langes, eastern Kyushu, SW Japan. In the coastal region of the Makimine mé langes (Late Cretaceous Shimanto accretionary complex of SW Japan; temperature = 300–350°C, Palazzin et al., 2016), the mélange preserves quartz-filled shear, foliation-parallel veins and tension vein arrays. We applied the stress tensor inversion approach proposed by Sato et al. (2013) to estimate stress regimes by using foliation-parallel vein orientations. The estimated stress is a reverse faulting stress regime with a sub-horizontal σ₁-axis trending NW–SE and a sub-vertical σ -axis, and the driving pore fluid pressure ratio P^* ($P^* = (P_f)$ – σ₃) / (σ₁ – σ₃)) is ~0.1. When the pore fluid pressure exceeds σ₃ , veins filling mode I cracks are constructed (Jolly and Sanderson, 1997). The pore fluid pressure that exceeds & sigma; is the pore fluid overpressure & Delta; P_f (& Delta; $P_f = P_f$ & ndash; & sigma;). To estimate the pore fluid overpressure, we used the poro-elastic model for extension quartz vein formation (Gudmundsson, 1999). P_f in the case of the Makimine mé langes are ~280 MPa (assuming depth = 10 km, density = 2750 kg/m³, tensile strength = 5 MPa and Young’s modulus = 7.5–15 GPa). The normalized pore pressure ratio λ* (λ* = (P_f – P_h) / (P_l – P_h), P_l : lithostatic pressure; $P_{\rm h}$: hydrostatic pressure) is ~1.03 ($P_{\rm f} > P_{\rm l}$).