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

[S-CG63]Rheology, fracture and friction in Earth and planetary sciences

convener:Osamu Kuwano(Japan Agency for Marine-Earth Science and Technology), Ichiko Shimizu(Department of Earth and Planetary Science, Graduate School of Science, University of Tokyo), Hidemi Ishibashi(静岡大学理学部地球科学専攻, 共同), Miki Tasaka(Shimane University)

Sun. May 20, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

The aim of this session is to join people from various research area in the earth and planetary sciences and to stimulate discussion beyond the boundaries of each research area. Our goal is to deepen our understanding of dynamics in geosciences by looking over whole areas in the earth and planetary sciences from the viewpoint of PHYSICS OF DEFORMATION, FLOW, AND FRACTURE. We welcome any field (e.g., earthquake, volcano, earth surface, crust, mantle and the core, and other planets and satellites) and any approach (e.g., laboratory experiments, numerical simulations, field observations, and theories).

[SCG63-P09]Multifractal analysis of X-ray CT images of liquefied boring cores with seismically-induced deformation structures

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Keywords:liquefaction, multifractal, soft-sediment deformation, X-ray CT

Unconsolidated soft sediments deform and mix complexly like Sumi-Nagashi marbling patterns [1] by seismically induced fluidization. Such geological soft-sediment deformation structures (SSDSs) recorded in boring cores were imaged by X-ray computed tomography (CT), which enables visualization of the inhomogeneous spatial distribution of iron-bearing mineral grains as strong X-ray absorbers in the deformed strata. Multifractal analysis was applied to the two-dimensional CT images with various degrees of deformation and mixing (Fig. 1). The results show that the distribution of the iron-bearing mineral grains is multifractal for less deformed/mixed strata and almost monofractal for fully mixed (i.e., almost homogenized) strata. Computer simulations of the deformation of real and synthetic digital images were performed using the egg-beater flow model. The simulations successfully reproduced the transformation from the multifractal spectra into almost monofractal spectra with an increase in the degree of deformation/mixing. The present study demonstrates that multifractal analysis coupled with X-ray CT and the mixing flow model is useful to quantify the complexity of seismically induced SSDSs, and is thus a novel method for the evaluation of cores for seismic risk assessment.

References:

[1] Terada,Torahiko et al., (1934) Experimental studies on colloid nature of Chinese black ink. Part I, Sci. Pap. Inst. Phys. Chem. Res. 23(482) 173-184.

[2] Nakashima, Yoshito and Komatsubara, Junko (2018) MULTIFRACTAL ANALYSIS OF SEISMICALLY INDUCED SOFT-SEDIMENT DEFORMATION STRUCTURES IMAGED BY X-RAY COMPUTED TOMOGRAPHY. Fractals, vol. 26, article ID 1850018 (open access at https://doi.org/10.1142/S0218348X18500184).