Geophysical Research Abstracts
Vol. 20, EGU2018-1054, 2018
EGU General Assembly 2018

Natural Subduction Zone Interface Rheology: Insights from "Digital" Griggs Experiments

Paraskevi Io Ioannidi (1), Laetitia Le Pourhiet (2), Onno Oncken (1), Philippe Agard (2), and Samuel Angiboust (3)

(1) GFZ Potsdam, 4.1 Lithosphere Dynamics, Potsdam, Germany, (2) University Pierre and Marie Curie Paris VI, ISTeP, Paris, France, (3) Institut de Physique du Globe de Paris, Paris, France

The physical nature of plate locking and its relation to surface deformation patterns at different time scales (e.g. GPS displacements during the seismic cycle) can be better understood by determining the rheological parameters of the subduction interface. However, since direct rheological measurements are not possible, numerical modelling helps determine the effective rheological parameters of the subduction interface. Using the open source finite element code pTatin, we implemented a 2D model to simulate simple shearing of a two-phase medium in order to quantify the effect of heterogeneous rheology on stress and strain localization. This heterogeneity results from field observations, where shear zone outcrops are often composites of multiple phases: strong crustal blocks embedded within a sedimentary and/or serpentinized matrix have been reported for several exhumed subduction zones. We tested several boundary conditions that mimic simple shear and chose the one that best describes the Grigg's type simple shear experiments. Preliminary results show different strain accumulation and strength in the models, depending on the block-to-matrix ratio. We applied our method to outcrop scale block-in-matrix geometries and by testing the same geometry at different P-T conditions, and therefore depth, we expect to provide effective friction and viscosity estimates of a natural interface. Using these effective parameters as input into seismic cycle models could help evaluate the possible effect of field heterogeneities on the slip behaviour of the plate interface.