Invited personnel：Jianye Chen　(Utrecht University)
Host researcher：Hiroyuki Noda (Disaster Prevention Research Institute, Kyoto University)
Period：Aug. 1-Oct. 29, 2018
Purpose：To implement a fault constitutive law developed by Ph.D. Chen (CNS model) to a simulation code for earthquake cycles, and to give a seminar at DPRI, Kyoto University.

Seminar information：
Date and time: 25 Oct. 2018, DPRI, Kyoto University
Title: Microphysical model predicts the limit to fault re-strengthening: logarithmic vs. power-law healing
Abstract:

The maximum fault strength and rate of interseismic fault strengthening ('healing') are of primary interest to earthquake hazard assessment studies, as they directly relate to event magnitude and recurrence time. Previous laboratory studies have revealed two distinct frictional healing behaviors, referred to as Dieterich-type and non-Dieterich-type healing. These are characterized by, respectively, loglinear and power-law increase in the strength change with time. To date, there is no physical explanation for the frictional behavior of fault gouges that unifies these observations. Using a microphysical friction model recently developed for granular fault gouges, we investigate fault strengthening analytically and numerically under boundary conditions corresponding to laboratory slide-hold-slide tests. We find that both types of healing can be explained by considering the difference in grain contact creep rheology at short- and long time-scales. In other words, they are UNIFIED by the same model. We derive physically meaningful, analytical expressions for frictional healing parameters (e.g. frictional healing rate, intrinsic cutoff time, maximum healing), of which the predictions are consistent with the numerical implementation of the model. On this basis, we interpret the re-strengthening of seismogenic faults during seismic cycles.