Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SIT04-06 Room:414 Time:April 28 11:25-11:40

Enhancement of slow earthquakes by geometrical irregularity of subducting oceanic crust

KATO, Aitaro[1*] ; OBARA, Kazushige[1] ; TAKEDA, Tetsuya[2]

[1]ERI University of Tokyo, [2]NIED

Along the worldwide subduction zones, slow earthquakes commonly occur on the deep extension of major tectonic boundary which hosts megathrust earthquake rupture. Slow earthquakes silently release stress to the adjacent seismogenic zone, raising the likelihood of promoting unstable fast slip. However, what controls the transitional variations in fault-slip behaviors from fast to slow modes on the deep extension of megathrust fault remains controversial. Here we use a high-resolution receiver function and seismic tomography illustrated by dense seismic arrays to analyze the structural elements in the subduction complex and fore-arc mantle wedge beneath the Shikoku Island, Japan, where episodic tremor and slow-slip events (ETS) have been most intensive for over a decade.

We find out that deformed oceanic crust with irregularity of surface geometry horizontally lies in the ETS zone, where low seismic velocity zone with high Poisson's ratio that we interpret as high pore-fluid pressure. Step-like discontinuous alignments of intra-slab seismicity support the flat-subduction of the oceanic crust with faulting structure. In contrast, at depths shallower than the ETS zone, the low velocity anomaly within the oceanic crust is weak and dipping towards the NW, implying less amount of high-pressured fluid in the tilting oceanic crust. In addition, lithology of the overlying plate changes to partially serpentinized mantle wedge in the ETS zone. Locally flat-geometry of the subducting oceanic crust combined with the contact of serpentine enhances accumulation of high-pressurized fluids along the plate interface, leading to segregation between slow and fast slip modes at the deep transition zone of mega-thrust fault.