

Scientific Report for ERI visit from April 1st to June 30th, 2015

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The primary purpose of my visit is to make progress on the seismic imaging of fine-scale structure of Earth's mantle using teleseismic migration, which holds an important key to a better understanding of convective mixing in the mantle. I have developed a new signal processing technique called dual bootstrap stacking (DBS) in 2013, and since then I have been trying to identify hitherto undetected small-scale heterogeneities in the mantle by adopting this technique in teleseismic migration. I had very productive discussions with Prof. Hitoshi Kawakatsu, who was my host, as well as Prof. Satoshi Kaneshima (Kyushu University), and as a result, I was able to develop a new clustering scheme to better utilize the results of DBS-based teleseismic migration. I am planning to write this up for publication during the summer of 2015. I was also able to make a future collaboration plan with Prof. Nozomu Takeuchi, who kindly agreed to provide an independent test on the existence of small-scale heterogeneities detected by my migration approach. I am hoping to materialize this plan in the next several months.

So far I have been using teleseismic data available through IRIS, but I was able to familiarize myself with how the Japanese seismological data have been acquired and distributed, through meetings with Prof. Hiroshi Tsuruoka (on J-Array) and Dr. Takuto Maeda (on Hi-Net). This understanding will help considerably to extend the regional coverage of my teleseismic research in near future.

During my stay, I delivered three seminars at ERI ("The origin of Shatsky Rise" for the Ocean Hemisphere Research Center Seminar, "The initiation and evolution of plate tectonics" for the Friday Seminar, and "Markov-chain Monte Carlo inversion of rock deformation data" for the Takei-Hiraga Lab Seminar) and four seminars at other institutions (Kyushu University, Kanazawa University, Institute of Space and Astronomical Science, and University of Tokyo at Komaba, all on the evolution of plate tectonics). I also attended the JpGU Meeting in May and presented a talk on the seafloor topography and the thermal budget of Earth. In addition, I gave three lectures on plate tectonics at the Komaba campus as part of "Earth and Planetary Science I".

I also benefitted from meetings with other foreign researchers whose visit overlapped with mine. In particular, conversations with Prof. Hiroo Kanamori (Caltech) and Prof. Chris Scholz (Columbia) allowed me to grasp some outstanding issues in earthquake seismology, which should prove vital in my future research in geodynamics.

Finally, my longstanding interest in the evolution of oceanic lithosphere and its role in global geodynamics turned out to resonate considerably with the future plan of the Ocean Hemisphere Research Center, and I look forward to continuing collaboration with Prof. Kawakatsu on this theme.