Innovative 4D imaging of subduction-zones through real-time observatories, ultra-deep drilling and high-pressure experiments

*Naoshi Hirata[1], Masataka Kinoshita[1], Masanao Shinohara[1], Harue Masuda[3], Natsue Abe[2], Katsuyoshi Michibayashi[4], Ikuo Katayama[5], Kohtaro Ujiie[6], Kentaro Omura[11], Osamu Fujiwara[7], Fumio Inagaki[2], Yuki Morono[2], Tetsuo Irifune[8], Hiroyuki Kagi[9], Hiroshi Nishi[10], Teruyuki Kato[1], Keisuke Ariyoshi[2], Kazushige Obara[1]

1. ERI, Univ. Tokyo, 2. JAMSTEC, 3. Osaka City Univ., 4. Shizuoka Univ., 5. Hiroshima Univ., 6. Tsukubai Univ., 7. AIST, 8. Ehime Univ., 9. EPS, Univ. Tokyo, 10. Tohoku Univ., 11. NIED

In 2017, we submitted a proposal for the Masterplan for Advancing Major Academic Research, entitled “Earthquake and volcanic eruption prediction science through integrated onland, seafloor and ocean drilling observations -Challenge of the spatio-temporal informatics in subduction zones- “, to the Science Council of Japan. Here, we integrate this plan with the ocean-buoy GNSS observatory project and high-pressure (down to the mantle) experiments project to create a high-precision, time-lapse imaging around the subduction zones, in order to delineate the earthquake and volcanic eruption scenarios and eventually to predict the far fate of the Earth and ocean.

For this purpose, we propose to construct a real-time observatory network for earthquake and crustal deformation monitoring through seafloor cables and GNSS buoys. We also propose to obtain (and try to reproduce) the state and property around the subduction zones and in the mantle, by means of ultra-deep drilling and ultra-high pressure experiments. We are extremely interested in the mantle rheology, which is primarily controlled by the thermal structure and the abundance in volatiles (e.g. water), which we believe is only possible by integration of geophysical observation and by ground-truthing, insitu experiments.

Keywords: Seafloor cable network, Ultra-deep drilling, Ultra-high pressure experiments, GNSS buoy, Subduction zone, Mantle rheology

