Rock and Paleomagnetic studies on igneous rock and acrreting sediments at Costa Rica subduction zone.

Toshio Hisamitsu[1]

[1] IFREE, JAMSTEC

http://www.kochi-u.ac.jp/marine-core/

Ocean Drilling Program (ODP) Leg 205 aimed at to drill and obtain igneous basement near plate boundary between the Eastern Pacific Rise crust and the Cocos-Nazca plate, and to investigate physical and chemical properties of pore fluid flow within tectonic deformation zone at the Costa Rica Prism. To understand subducting sysytem at the Costa Rica plate margin will reveal to tectonic and volcanic mechanics to build the Middle America, and to accretional processes of hemipelagic sediments through the Middle America Trench. This cruise and previous ODP Leg 131 interpreted the prism sediments forms consist mainly detrital supplement from the land that means most of hemipelagic sediments above the basement subduct under the Mddle American Arc without remarkable accretion. Additionally, the igneous basement were interpreted to consist of some Gabbro layers that suggest at least three or four volcanic activities had happened near the Eastern Pacific Rise. In this time, the theoretical results where the igneous basement had been formed is not clear because characteristic volcanic ash layer which probably came from Galapagos Island was identified just above the basement. Here, we report initial cruise results and method of rock magnetic approach to study magnetic properties of the Gabbro layers and sediments obtained from the decollement zone at the prism. These data will be useful to investigate what kind of effect of chemical composition within the pore fluid on the igneous rocks and deformation zone around the Costa Rica Prism.

The Gabbro samples were drilled about 200 m below the surface of the basement at Site 1253, located Pasific sea ward of the Costa Rica Arc. Hemipelagic sediments and volcanic ash layers, inter bedded from 430 to 450 mbsf, indicate relatively long time gap had been affected on forming processes of the igneous basement. Magnetic inclination, showing positive polarity from 400 to ~450 mbsf, changes suddenly to negative polarity at 450 mbsf. At ~500 mbsf, remarkable boundary of the magnetic inclination were found which corresponds to lithological boundary of the igneous rock. Rapid negative swing of the magnetic inclination at 560 mbsf also corresponds to the depth of the thin igneous layer found 560 mbsf. Rock magnetic investigation about NRM and IRM indicates that at least four layers exist within the igneous drilling core sample. Discrete samples taken from surface of each igneous layers have high magnetic intensity, however, other samples show very weak magnetic intensity. ARM acquisition test on all igneous samples indicate that grain size of the magnetic minerals may be relate with the magnetic stability and intensity changes.

Decolllement zone at Site 1254, located at the front of the prism, show high magnetic susceptibility and magnetic intensity. These values are ten times high against other hemipelagic sediments above and below the decollement zone. Additionally, some samples obtained from the decollement and fault zones indicate significant increase of the magnetic intensity along to the demagnetization steps, that suggest they indicates the samples had been remagnetized after development of those deformation zones. As an important result, the samples also show characteristic GRM (Gyro Remananet Magnetization) during demagnetization using alternating field that indicates some iron sulfide are mainly included within sediments at the deformation zone.

Consequently, rock magnetic investigations on igneous Gabbro reveal to layer boundaries connecting with erupting history of the basement of the plate. Significant high magnetic intensity peaks will be useful to identify basaltic rocks including the Gabbro rocks. Secondary, unique and characteristic curves during AF demagnetization of sedimentary samples that obtained from deformation zone probably indicate recrystallization of magnetic minerals due to changes in chemical component of pore water.