Paleomagnetic and rock magnetic studies of subsurface deposits with volcanic materials in Beppu City, Kyushu.

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We are conducting paleomagnetic and rock magnetic analyses on subsurface deposits consisting of volcaniclastic materials and their secondary eolian deposits in order to reveal geomagnetic field variation, environmental fluctuation and climate change for the last several ten-thousand-years, and to investigate variations in rock magnetic parameters associated with sedimentation processes of the eolian deposits and soil formation. Samples were obtained from a black soil profile at Tsukahara area and a sediment core drilled at Higashiishimatu area in Beppu City. We will report results from the Tsukahara soil profile in this time.

In the Tsukahara soil profile (1m height), three ash layers (Ash I, II and III in the descending order) are observed. Ash II (16cm thick) at 27 cm below the surface (bs) is Yufudake tephra (2.2ky.B.P.) and Ash III (9cm thick) at 67 cmbs is Kikai-Akahoya tephra (6.3ky.B.P.). Regarded the ash layers as boundaries, black soils are divided into the following four units, Soil I to IV in the descending order. Magnetic-orientated 60 samples were collected continuously by pushing 7cc plastic cubes.

We performed progressive alternating filed demagnetization (PAFD) experiments to investigate the stability of natural remanent magnetizations. Eight samples among 60 ones provided stable magnetic components isolated at PAFD levels above 14mT. Mean directions of the stable component for the lower part of Ash II was Dec=-3.9 degrees, Inc=48.2 degrees and alpha95=8.3 degrees and for Soil IV was Dec=-6.0 degrees, Inc=50.6 degrees and alpha95=9.8 degrees. The inclination value of lower part of Ash II is consistent with the geomagnetic inclination record from sediment cores in Beppu Bay (Ohno *et al.*,1991).

We performed measurements of initial susceptibility (X) measurement and hysteresis parameters and acquisition experiments of anhysteretic remanence (ARM) and isothermal one.

X, ARM susceptibility (X_{ARM}) and saturation remanence (M_r) values show downward increases in Soil I and II, and downward decreases in Soil III. Soil IV has different trends; X values are constant, M_r values decrease downward, and X_{ARM} values gradually increase downward and then decrease. These values are higher in the upper part of Ash II, and lower in Ash III than the other layers. S-ratios are slightly lower in the lower parts of Ash II and Soil IV, which also show higher values of *hard IRM* ($HIRM$) .

The upper and lower parts of Ash II show similar values in ARM/M_r, while X_{ARM}/X and M_r/X values are higher in the lower part, implying that the grain size of magnetic minerals is finer in the lower part consisting of fine-grained materials. In Ash III with homogenous lithofacies, the three ratios decrease downward, suggesting a downward grain-size decrease of magnetic minerals.

In Soil I and II showing downward increase of magnetic minerals, have constant values of X_{ARM}/X, ARM/M_r and M_r/X values. In Soil III and IV, X_{ARM}/X and ARM/M_r values increase downward and then decrease, while M_r/X values increase downward. Variations in the concentration and size of magnetic minerals carrying ARM seem to control magnetic properties of Soil III and IV principally. A contribution of high-coercivity magnetic minerals in Soil IV might have been also considered.