

X-ray CT core imaging of Oman Drilling Project on D/V CHIKYU

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We obtained X-ray computed tomography (X-ray CT) images for all cores (GT1A, GT2A, GT3A and BT1A) in Oman Drilling Project Phase 1 (OmanDP cores), since X-ray CT scanning is a routine measurement of the IODP measurement plan onboard Chikyu, which enables the non-destructive observation of the internal structure of core samples. X-ray CT images provide information about chemical compositions and densities of the cores and is useful for assessing sample locations and the quality of the whole-round samples. The X-ray CT scanner (Discovery CT 750HD, GE Medical Systems) on *Chikyu* scans and reconstructs the image of a 1.4 m section in 10 minutes and produces a series of scan images, each 0.625 mm thick. The X-ray tube (as an X-ray source) and the X-ray detector are installed inside of the gantry at an opposing position to each other. The excitation voltage and current for X-ray tube are 140kV and 100 mA, respectively. The core sample is scanned in the gantry with the scanning rate of 20 mm/sec. The distribution of attenuation values mapped to an individual slice comprises the raw data that are used for subsequent image processing. Successive two-dimensional (2-D) slices of 512 x 512 pixels yield a representation of attenuation values in three-dimensional (3-D) voxels of 512 x 512 by ~1600 in length. Data generated for each core consist of core-axis-normal planes (XY planes) of X-ray attenuation values with dimensions of 512 x 512 pixels in 9 cm x 9 cm cross-section, meaning at the dimensions of a core section, the resolution is 0.176 mm/pixel. X-ray intensity varies as a function of X-ray path length and the linear attenuation coefficient (LAC) of the target material is a function of the chemical composition and density of the target material. The basic measure of attenuation, or radiodensity, is the CT number given in Hounsfield units (HU). CT numbers of air and water are -1000 and 0, respectively. Our preliminary results show that CT numbers of OmanDP cores are well correlated to gamma ray attenuation density (GRA density) as a function of chemical composition and mineral density, so that their profiles with respect to the core depth provide quick lithological information such as mineral identification and phase boundary etc. Moreover, X-ray CT images can be used for 3-D fabric analyses of the whole core even after core cutting into halves for individual analyses.

Keywords: D/V Chikyu, Oman Drilling Project, X-ray CT, Crust, Ophiolite

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