Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

MIS27-P11 Room:Convention Hall Time:May 24 17:15-18:30

3-dimensional imaging service of X ray CT scan data obtained from deep-sea core sample

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Recently, X-ray CT scanning on cored sediment sample has been frequently performing in several institutes before splitting the core sample to research internal structure of the sediment. These scanned data produces 3-dimensional graphic on screen after processing the data using rendering software. Researcher can cut the graphic freely and to see inner structures of sediment sample without physical destruction as like actual discrete sampling from split half of a core section. Additionally, the visualized graphic can be easily reconstructed again using original data and that is great advantage on visual sampling for many scientists in future. Integrated Ocean Drilling Program (IODP) has added the X-ray CT scanning of the core section to standard measurement on board D/V Chikyu in order to record digital archive of core samples and to search geological structures before splitting.

Scanned data are stored into special file of which format is DICOM (Digital Image and Communication in Medicine) with several information of scanning, setting and inventory of sample. DICOM format has been developed along to innovation of medical scanners such as X-ray CT and MRI to accommodate patient information and scan settings. The characteristic format of DICOM produces and helps quick and easy scanning in a hospital, however, the format lost general compatibility among different model of scanners instead of individual settings of each patient and equipment. Generally, researcher uses a software, DICOM viewer, to handle the file on personal computer so that purchasing personally control assembly of a scanner is not realistic. Drawing 3-dimensional graphic requires high speed processing unit and big size of memory, although the viewer software makes it possible to create easily visualized image from DICOM files. Another problem is that a file size of a core section of which standard length is 150cm becomes to be huge, from ten to hundred MB, although it depends on scanning resolution. Consequently, total size of scanned files at a coring hole will be from hundreds MB to a few TB. Therefore, contriving adequate plan to download files based on several measurement results is required to save time to research files and resources of personal hardware.

Can’t we create more suitable, quick and easy method to handle huge number of the digital archives of core samples scanned in each expedition and/or coring ? Researcher’s burdens to create 3-dimensional graphic of samples such as time and cost will be resolved, if brand-new drawing technique is released. We study the innovative-drawing method of DICOM file for geology by developing a new algorism of high-spec GPU to calculate 3-dimensional information ordered from user. In this method, user sends request information of rotation and/or cut through special browser on PC, then, GPU creates 3-dimensional image from a DICOM file and sends back a JPEG file of a snapshot of the image to user. The communication speed on network to create a 3-dimensional graphic will be fast and quick, and quality of a snapshot of the image on screen is expected to be almost same as a DICOM viewer. We also aim to research a method to access the DICOM files via handy tablet PC and smart phone for an interactive-imaging service of geological core samples everywhere.

Keywords: core sample, X-ray CT image, 3-dimensional graphic, virtual core, DICOM format, cloud