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# 海底堆積物コアの密度解析への医療用 X 線 CT スキャナの利用
# X-ray CT analysis and density estimation using a sediment core in cold-water coral mound provinces

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Three-dimensional quantitative analysis using X-ray computerized tomography (CT) analysis combined with X-ray radiographs and line-scan digital core images of a marine sequence recovered from near Challenger Mound in the Porcupine Seabight, off western Ireland during the Integrated Ocean Drilling Program (IODP) Expedition 307, is an effective method for core characterization. This allowed three-dimensional examination of complex shapes of corals fragments, dropstones, pebbles, and ice-rafted debris in sedimentary sequences. This paper confirms that X-ray CT proves to be a relatively quick and accurate method for high-resolution and non-destructive analysis of three-dimensional internal structures of core samples without the special sample preparation. A medical CT system at relatively low resolution provides an image of the large-scale features and allows correlation with core samples, and has generally been used due to their availability and relative ease of use. CT scanning just after coring and before splitting may be efficient to avoid a degradation of cores. Effective and efficient use of X-ray CT systems allows for the possibility for rapid systematic characterization of three-dimensional structural features, and may improve sub-sampling and core-processing procedures.

Because X-ray attenuation is sensitive to density variations, X-ray CT systems also offer the possibility of quantitative density measurement. Its rapid and quantitative results can easily be used to map subtle detailed density variations in three-dimensions. A relationship between CT numbers and measured densities by the GRA and the mass/volume method is consistent with previous studies. Standard conventional techniques for bulk density analysis in sediment cores use raw data from GRA or mass/volume method. Density values by standard conventional techniques represent the gross average. Neither have a spatial resolution better than X-ray CT data-derived density. Moreover, X-ray CT data-derived density offers advantages over these standard conventional techniques as it gives a three-dimensional distribution anywhere in the sample. Also, because of the simple process of the conversion from CT number to density, it is expected to reduce the possibility of human error.
Keywords: X-ray CT, bulk density, sediment core, Integrated Ocean Drilling Program (IODP), Expedition 307