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Doppler Scanning of Sediment Cores: A Useful Method for Studying Sedimentary Structures and Defining the Cutting Angle for Half Cores

Dursun Acar (1,2), Namik Cagatay (1), Demet Biltekin (1), Kadir Eris (1,3), Gulum Albut (1), Nazik Ogretmen (1), Tugce Arslan (3), and Erol Sari (2)

(1) Eastern Mediterranean Centre for Oceanography and Limnology (EMCOL) , Istanbul Technical University Turkey (dursunacaracar@hotmail.com), (2) Institute of Marine Sciences and Management (IMSM) Istanbul University, Turkey, (3) Faculty of Engineering, Geology Department, Firat University, Elazig, Turkey

We tested the doppler ultrasound scanning of sediment cores in PVC liners using 8 megahertz ultrasonic waves for detection of angular laminations. The method was tested with artificially prepared cores as well as marine and lake sediment cores, and proven to be a useful and fast technique for imaging and determining the vertical angularity of sedimentary structures, such as laminations and beddings. Random cutting axes provide two angularities on X and Y dimensions. In this study, the main scientific problem is 'sequential angular disconformity'. Importance of detection of these anomalies on whole cores before dividing into half cores based on determining the right cutting axes. Successful imaging was obtained from top three centimeter depth of the sediments below the PVC liner, using a linear Doppler probe. Other Doppler probes (e.g., convex probe) did not work for core scanning because of their wave-form and reflection characteristics. Longitudinal and rotational scanning with gap filler and ultrasonic wave conductive gel material for keeping energy range of wave is necessary for detecting the variation in the dip of the bedding and laminae in the cores before separation. Another angular reasoned problem is about horizontal surface and can be easily solved with adjustable position of sensor or ray source placement. Border of sampling points between two different lithology must be stay with regard to neighbour sediment angles. Vertical angularity correction is not easy and its effect on signal propagation, detection biases and effectible to mixed samples contamination during physical sampling (particle size analyzing). Determining the attitude of angled bedding before core splitting is important for further core analyses such as elemental analysis and digital X-ray radiography. After Doppler scanning, the splitting direction (i.e. vertical to bedding and lamination) can be determined. The method is cheap, quick and non- hazardous to health, unlike the x-ray rotary radiography scanning.