

Computed Tomography of Biological Structures in Marine Sediments

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Abstract

X-ray computed tomography (x-ray CT) images of a bioturbated sediment from the northern Gulf of Mexico continental shelf reveal clear evidence of two worm tubes, one circular and the other elliptical in plan view. Application of a segmentation technique using (CT number, gradient) feature space permitted a volumetric characterization of the tubes, which obtained results in good agreement with physical measurements. Although the tubes appear to be relict structures, a numerical exercise demonstrates that the tubes can increase the

effective surface area of the seafloor locally by up to 23%. From this and through visualization of the dramatic modifications in the spatial density structure of the sediments, the importance of tubificid structures is clear: seafloor characterizations conducted in support of biogeochemical, geotechnical, and geoaoustic studies of bioturbated sediments are largely incomplete without a consideration of these features. The combination of x-ray CTR and digital image analysis is a powerful means to examine these features nondestructively and provide the necessary quantitative information for such purposes.