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Digital radiography and X-ray computer tomography investigations of unconsolidated geological samples (Danube River, Danube Delta and Black Sea sediments)

M. Iovea (1), G. Oaie (2), **O.G. Duliu** (1), M. Neagu (1), G. Mateiasi (3)

(1) University of Bucharest, Dia Research Center, Mãgurele,P.O. Box MG-11, RO-077125 Bucharest, Romania (duliu@pcnet.ro), (2) National Institute of Marine Geology and Geoecology, 23-25 Dimitrie Onciu Street, RO-024053, Bucharet, Romania (goaie@geoecomar.ro), (3) The Politehnica University, Bucharest, 313, Splaiul Independentei, RO-060032, Bucharest, Romania (miovea@pcnet.ro)

Different cores, collected from the Danube River (km 294 – 296, Cernavoda area), Danube Delta (Sulina Canal mouth) and from the Black Sea Continental shelf (biotic and abiotic zones, east of Constanta harbor), have been investigated by means of a multi-purpose dual energy Computer Tomograph (CT) and by using a medical CT. CTs have been used to obtain digital radiographies, as well as CT images of the cross-sectional area of interest. Both kinds of images reveal various details of investigated cores with a spatial resolution of 0.4 to 1.0 mm. Using a proper version of filtered back projection reconstruction algorithms, as well as an appropriate set of standard materials, two images depicting effective atomic number, as density distribution function, have been obtained for each section. Medical CT has been used to obtain 3D representations of entire cores. CT images and digital radiographs allowed characterizing the internal structure of investigated objects. The Danube River cores consisted of unconsolidated sediments without any fragments of shell or other macroscopic debris but presenting different lithofacies types and facieses associations such as trough cross bedded laminated sand as tabular sets, ripple cross laminations in medium to very fine sand with an irregular base, the foreset position indicating the water current direction, horizontally bedded sand showing a parallel lamination, planar cross bedded sand formed by dunes migration, etc. while the vertical associations of different lithofacies indicate changes in the flow regime of the river.

Similar structures have been observed for the sediments collected from the Danube

Delta but, some of them presented a set of almost parallel laminae consisting of a mixture of sand significantly enriched in heavy minerals, such as rutile and zircon.

The Black Sea cores, collected from the biotic zone, were characterized by massive accumulation of *Mytilus galloprovincialis* shell debris, while those collected at a depth of about 600 m, from the abiotic zone, consisted of about 250 horizontal, undisturbed coccolithic laminae whose thickness varied between 1.5 and 3.9 mm.

Excepting the heavy mineral laminations, the sediment densities varied between 2.10 g/cm^3 and 2.54 g/cm^3 while the corresponding values of effective atomic numbers values fluctuated between 7.20 and 15.0 suggesting the presence of quartz (SiO_2) and calcium carbonate ($CaCO_3$) as major components.