

## An Integrated Enviromagnetic and Lithogenetic Study in the Lakes of the Southern Danube Delta Wing. Evidences from Surficial Sediments and Short Cores

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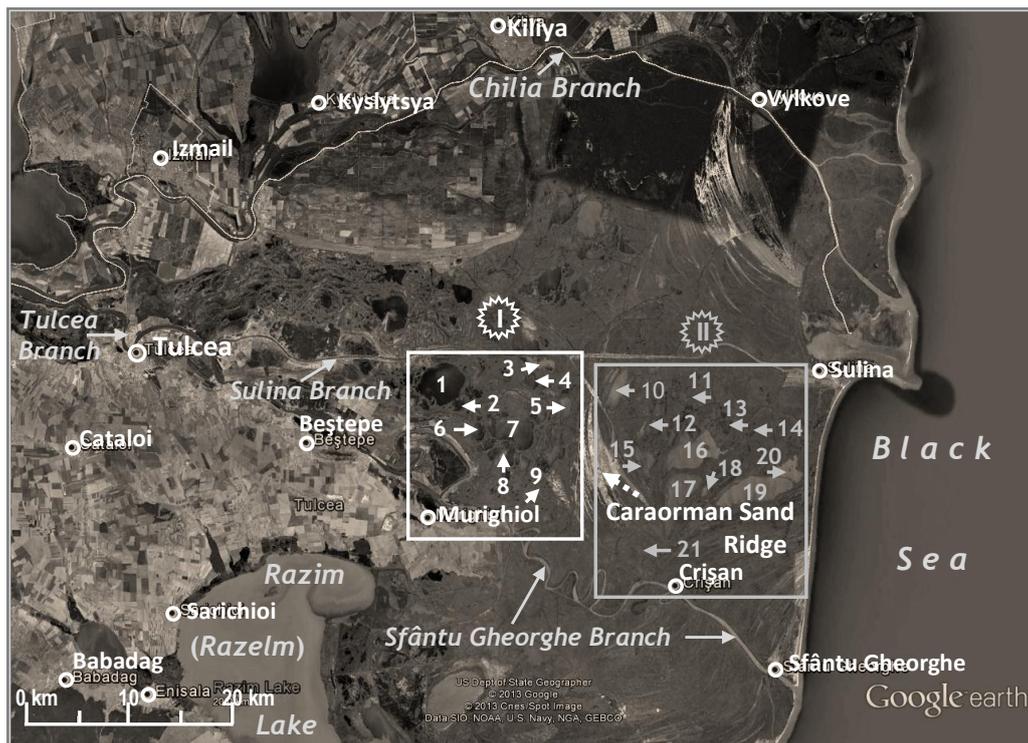
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### Abstract

The studies that we have achieved in the last 40 years in the Danube – Danube Delta – Black Sea hydrosedimentary system have revealed strong connections between the characteristics of sedimentary environment, sediment quality and their magnetic properties. The paper analyses a large magnetic susceptibility (**MS**; **k**) database resulting from *ca.* 20 expeditions carried out during 1981–2015 time period in the lakes of two aquatic units of the Danube Delta (DD), i.e., Gorgova – Uzlina and Lumina – Roșu Depressions. These are placed in the DD southern wing, westwards and respectively, eastwards of the Caraorman Sand Ridge (Fig. 1). For the **MS** characterisation of the recent sediments, an original **k** scale with 5 classes (**I** to **V**, from **k** values lower than  $10 \times 10E-06$  SI to **k** values higher than  $1000 \times 10E-06$  SI) is used. The lithological (**LITHO**) support related to the magnetic susceptibility calibration of the lake sediments is equally analysed, and it is defined by three main **LITHO** components: **SIL**iclastic/minerogenic fraction (**SIL**), **TOM** Total Organic Matter (**TOM**), and **CAR**bonates (**CAR**). The **LITHO** classification of the lake sediments is illustrated by using ternary diagrams, and a **LITHO** scale (with 5 classes), based on **SIL** contents, is applied for the lithological characterisation, as well. To assess the relationship between the magnetic and the lithological parameters, a scale with 6 ranges spanning the interval from (-1) to (+1) systematizes the calculated correlations coefficients (**r**). In the first part, the results concerning the enviromagnetic characteristics and the lithological composition of the lake sediments (surficial and cores) of the Gorgova – Uzlina Depression (**I**, in Fig. 1), placed in the Fluvial Delta Plain, are discussed. The latest **MS** results are compared with the magnetic susceptibility data achieved in the first sampling campaign in the Gorgova, Uzlina and Isacova Lakes, in 1979, relatively close of the beginning times of such types of researches in the world (e.g., Thompson *et al.* 1975). In the second part of the article, the data obtained by applying of this methodological version of environmental magnetism for a series of lakes and swamps belonging to the Lumina – Roșu Depression (**II**, in Fig. 1) are discussed. This area situated eastward of the previously approached deltaic unit is



**Fig. 1.** Location of the two inter-distributary depressions in the Danube Delta and position of the water bodies under attention in the paper. I. Gorgova – Uzlina Depression: 1 – Gorgova Lake, 2 – Gorgovăț Lake, 3 – Obretinu Mic Lake, 4 – Obretinciuc Lake, 5 – Cuibeda Lake, 6 – Isăcel Lake, 7 – Isacova Lake, 8 – Uzlina Lake, 9 – Gorgoștel Lake. II. Lumina – Roșu Depression: 10 – Iacob Lake, 11 – Lungu lake, 12 – Vătafu Lake, 13 – Lunguleț Lake, 14 – Porcu Lake, 15 – Puiuleț Lake, 16 – Lumina Lake, 17 – Puiu Lake, 18 – Potcoava Lake, 19 – Roșu Lake, 20 – Roșuleț Lake, 21 – Erenciuc Lake. Note: The figure support – Google Earth image.

particularly located in the Marine Delta Plain. The **LITHO** classification of the lake sediments is illustrated by using ternary diagrams, while the variability of the magneto-susceptibility régimes is exemplified by a series of **MS** maps. The **k** anomalies generated by the deposits from the channel entry mouths into the lakes are revealed inside of such maps. The effects of silting up or of pollution are decreasing as much as the transport distance is increasing. The presented data prove the magnetic susceptibility as a sensitive marker for monitoring the natural environmental changes or the anthropic impacts taking place in the lakes. Moreover, the capability to detect and to define – magneto-lithologically – some marine deposits, located very close of the water/sediment interface, is exemplified. The magneto-litho archive constituted for surficial sediments and cores sampled from this lacustrine area (i.e., southern Danube Delta wing) is very important in the context of deciphering of the spatial and temporal evolution of the deltaic geosystem.

**Keywords:** magnetic susceptibility, lithology, surficial lake sediments, short cores, Danube Delta (Romania).

#### References

- Thompson, R., R.W. Battarbee, P.E. O'Sullivan, and F. Oldfield (1975), Magnetic susceptibility of lake sediments, *Limnol. Oceanogr.* **20**, 5, 687–698.