

## INTRODUCTION. STUDY AREA

The case study focusses on the environmental changes detected by magnetic susceptibility (MS) measurements carried out on the lake sediments sampled in the Mesteru - Fortuna Depression (Danube Delta/DD; Fig. 1a,b,c,d) during 1980-2006. After the "Mila36" Canal was cut (Fig. 1c,d), in 1982-1983, the dynamics of the water and sediments within the western part of the depression was strongly influenced by the very significant liquid and solide riverine supplies. The sedimentary environments from three main lakes (i.e. Lungu, Mesteru and Tataru; Fig. 1c,d) were investigated in 1980, 1987, 1992-1997 and 2006. The first two above mentioned lakes underwent an intensive process of filling up with sediments; the Lungu L. (Fig. 1c,d) was most exposed to the direct fluvial inflow. The magnetic signatures identified in the bottom sediments, sampled before and after the hydrotechnical work between two DD Branches was carried out, underwent obvious modifications, showing the impact of the anthropogenic pressure on the sedimentary processes taking place in the aquatic area of the western Fluvial Delta Plain (Danube Delta).

## MATERIALS AND METHODS

Magnetic susceptibility measurements were performed on hundreds of samples collected during 11 cruises, between 1980-2006. The sampling of bottom sediments was carried out using "Van Veen" grabs (Fig. 2), which allowed to take "sediment packets" (Fig. 3), undisturbed at the upper part (Fig. 4a). When the study of thicker sedimentary sequences was aimed, in order to reveal the temporal evolution of the sedimentation environments, gravitational corers were used. The MS measurements on unconsolidated sediment samples were done with (KLY) Kappabridges. An original "Magnetic Susceptibility (k) Scale" (Radan & Radan, 2004, 2006; Fig. 4a), with a genuine lithological support, based on more than 2200 k values, was used to calibrate the lake sediments of the Danube Delta. Numerous MS patterns were performed to analyse the characteristic magnetic signatures of the various sedimentary environments. A preliminary evaluation of the trace metal contamination of the DD sediments was carried out using a "Sediment Quality Scale" (Radan & Radan, 2004; Fig. 4b). The MS data were correlated to the "Ecological Quality Scale" (Fig. 4c), as well.

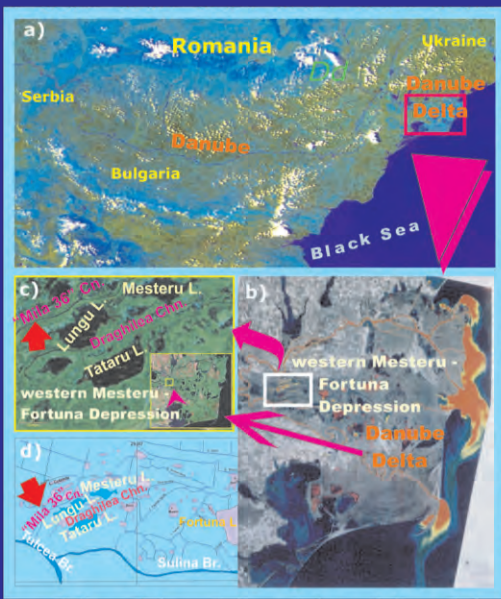


Fig. 1. Study area: western Mesteru - Fortuna Depression (Danube Delta).



Fig. 2. "Van Veen" grab sampler.



Fig. 3. Grab sampler sediment.

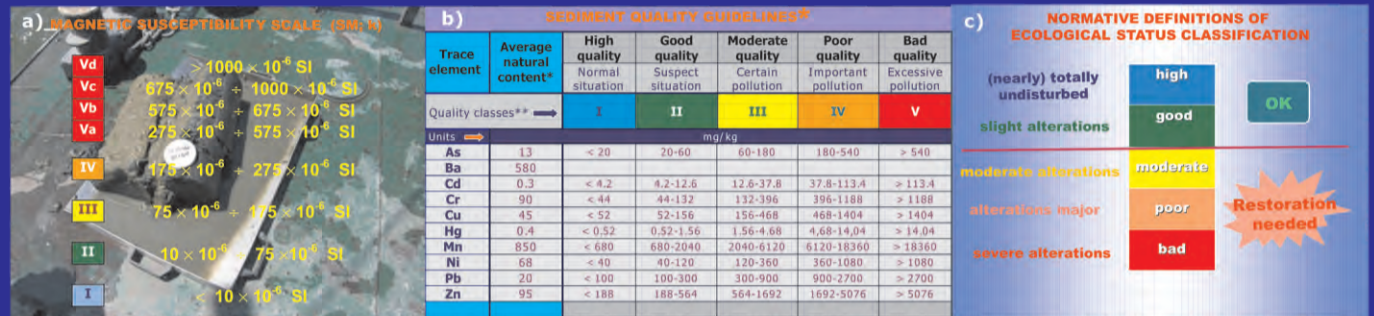


Fig. 4. Scales used to characterise the sedimentary environments of the deltaic ecosystems. a) Magnetic Susceptibility (MS; k) Scale; b) Sediment Quality Scale; c) Ecological Quality Scale.

## RESULTS AND DISCUSSION

The magnetic susceptibility measured on bottom sediment samples collected from the Lungu and Mesteru Lakes during the 1980 cruise (Fig. 5a,b) showed k values as high as  $137 \times 10^6$  SI u. (with an exception, locally explained). The sediments sampled in the two lakes during the 1987 cruise, that is after the "Mila 36" Canal was dug up (in 1982-1983), yielded k values up to  $654 \times 10^6$  SI u. for the Lungu L., and up to  $334 \times 10^6$  SI u. for the Mesteru L. (Fig. 5b,c). A confirmation of the modified magnetic signatures, in keeping with the sedimentary environment changes, has resulted from the MS monitoring cruises carried out during 1992-1997, as well as from the most recent expedition, organised in 2006 in the Lungu L. (and also in Tataru L.; Fig. 6). Consequently, according to the MS Scale (see Fig. 4a), the MS signatures identified in 1980 in the Lungu and Mesteru Lakes are characterised by k classes II and III (with the above mentioned exception, i.e. a k value assigned to class IV) (Fig. 6a4,b4). Concerning the 1987-1997 period, the MS calibration of the sediments shows obvious changes. Thus, for the Lungu L. (closer to the "Mila 36" Cn. inflow mouth; see Fig. 1d), 60% of the k values are defined by high k classes (IV, Va, Vb), while 40% by the II and III classes (Fig. 6a2; see also Fig. 6a4). In 2006, the sampling stations were placed in the eastern - south-eastern part of the Lungu Lake (Fig. 7a), an area less exposed to the fluvial inflow than the northern one (see Fig. 5b,c); the k values are defined between  $78.22 \times 10^6$  -  $226.34 \times 10^6$  SI u. (assigned to k classes III and IV; Fig. 6a1). As regards the Mesteru L. (1987-1996), the percentages are equally attributed to the II and III classes (50%) and to the higher classes IV and Va (50%) (Fig. 6b2; see Figs. 6b4 and 5a,c to compare with the data obtained in the first cruise-1980). This indicates that the deltaic environments of the Lungu and Mesteru Lakes are under anthropogenic pressure, induced by the hydrotechnical work, relating to the "Mila 36" Canal, dug up between the Tulcea and Chilia Branches, for economical reasons; zone marked by arrows in Figs. 1c,d, 7a and 9b,c).

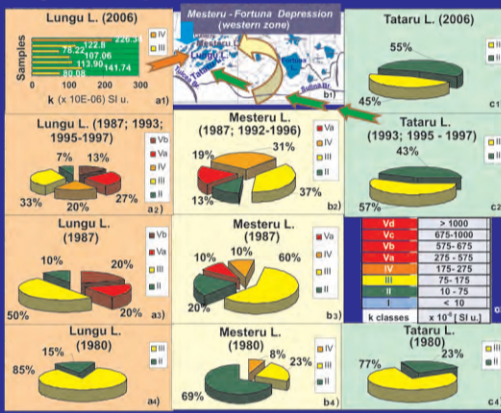


Fig. 6. Magnetic susceptibility of sediments sampled in the 1980-2006 time span.

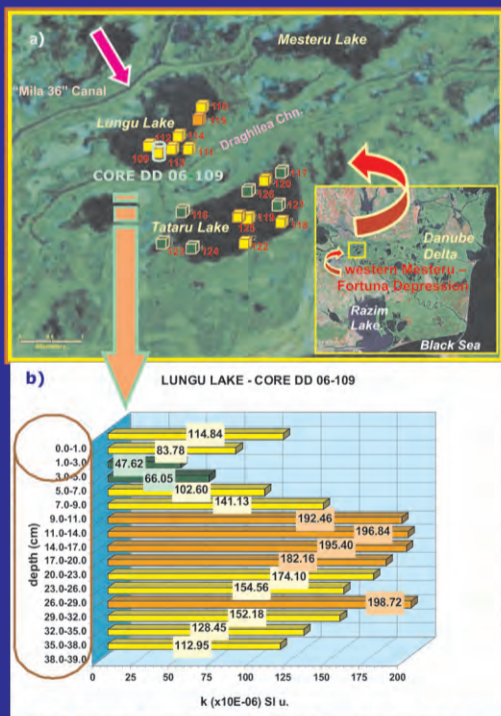


Fig. 7. Magnetic susceptibility (correlated to the k Scale) of the lake sediments (2006). a) areal distribution; b) vertical distribution.

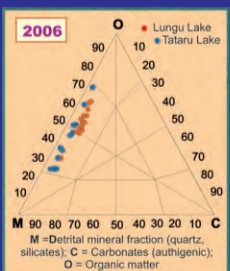


Fig. 8. Lithology of recent sediments.

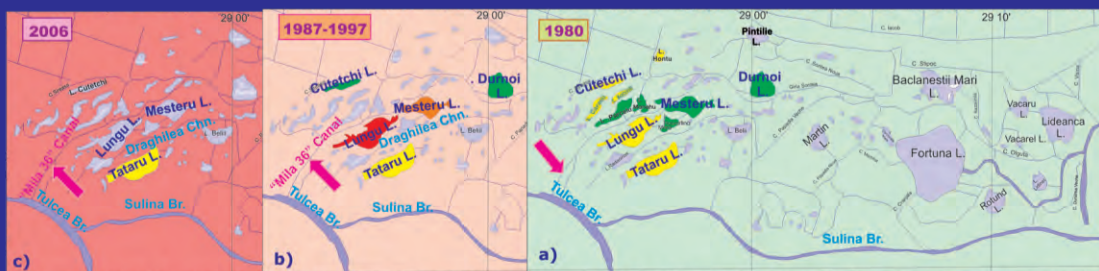
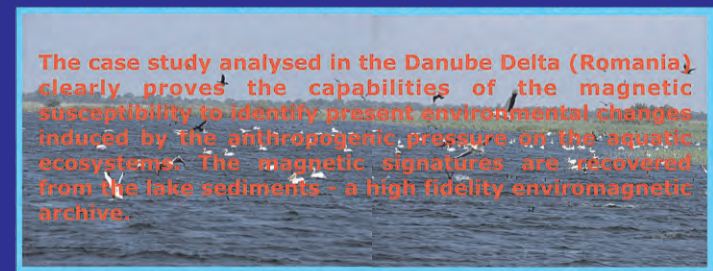


Fig. 9. Magnetic susceptibility fingerprint intensity (calibrated to the k Scale) identified within the lake sediments sampled in the western Mesteru - Fortuna Depression, in 3 different periods.



## CONCLUDING REMARK