

the Danube basin at the Rišďovce and at the transition of the Komjatice and •eliezovce depression.

In the •eliezovce and Komjatice depresions depositional environment passes from the brakish to the lacustrine and swamp during Midlde and Upper Miocene, in the Rišďovce depression sedimentation was fresh water, deltaic. Pliocene cycle is characterized by lacustrine, deltaic and fluvial depositional environment.

In the Komjatice and•eliezovce depression sedimentological study of Sarmatian sea-shore deposits were done on the outcrops and brought a possibility to reconstruct the relative sea-level changes, strongly influenced by volcanic supply from the Štiavnica stratovolcano.

During Sarmatian the tectonic impulse caused the mobilization of coarse sandy gravity flows in the frontal part of the shoreface in the •eliezovce depression. The mass flows eroded the silty-clayey basinal sediments and forming then mud-clasts rich sandy breccias, finger like reaching into the marly-sandy laminated basinal facies. Some soft sediment deformations, found in the gravity flow related bodies originated due to frictional freezing of mass flow. The relief instability is reflected in slump folds.

The NE part of the Komjatice depression is characterized by very dynamic sedimentation of sandy and gravelly fan-deltaic system. Sandy deposits of the Pliocene in the Rišďovce depression probably represent sandy deposits of rivers entering the fresh-water lake. Palaeoflow direction, detected from vector measurements of cross lamination, is from NW to SE. Heavy mineral analysis suggests two possible source areas. Crystalline source area, which is according to the palaeoflow direction (from NW to SE) located in the Povašský Inovec Mts. The occurrence of b quartz suggests source area with volcanic material which might have been delivered by tributaries from the volcanic deposits found in the northern part of Rišďovce depression.

A reflection about sedimentology and paleontology - Argentine example

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It is very common to look a lot of eager follower paleontologists looking for fossil remains at the sedimentary rocks or unconsolidated sediments. In general, it is assumed that these fossil remains may be very useful in order to defining environments in which such rocks were deposited large time ago. This is absolutely true in almost geological cases.

Also, it is very frequent (at least in the last two decades in Argentine) to look, on the other hand, many sedimentologists looking for internal structures both at ancient and recent sediments. They think that these arrange of structures may give outstanding information or evidence about of the depositional environment of such sediments.

This idea looks like very simple.

In most Argentinian cases, the fossil records are fragmentary, non-existence, non-characteristics, its spatial position may be obscured or masked, non-singenetics with sediments and the like.

Diagnostics internal sedimentary structures, if present, are not definitively accepted as an indicative evidence of environment deposition by many paleontologists at Argentine. In the conflictive situation between these two ways (fossils or internal structures), the problem led to dramatic controversial situations.

'Nobody like to turn off the leg'.

Based on the studies of outstanding bibliography elsewhere, should be not great discussion in accept the assumption of that herringbone cross beddings associated altogether with tidal bundles and lenticular tidal rhythmic beddings present into sorted, white, very

fine grains, very well rounded, plagued of reactivation surfaces sandy lithofacies (TORRA 1999, 2000a, b). This is an association a little bit more significant that some non-characteristic fluvial (lagoon?) mollusks of extended biochron from Lower Tertiary to Late Holocene. This is the case of the conflictive Ituzaingó Formation located at the northeastern region of the Argentina for which a 'platte braided fluvial model' was proposed by paleontologist (HERBST 1971, HERBST & SANTA CRUZ 1985, JALFIN 1988).

I concluded that the way of the science is always the same. In order to produce improvements and to prove the essence of the investigations, it is necessary a severe ethic performance. The pride may be forgot for a little time (when working at the field and laboratory), so the geological sciences will go ahead very quickly.

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Geochemical characterization of the heterolithic succession of the Ituzaingó Formation (Middle Miocene), Northeastern Argentina

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The Ituzaingó Formation constitutes a typical succession of interstratified sandy-muddy beds. They outcrop in natural slopes, many ravines and gullies at the left margin of the Paraná and Paraguay rivers (Argentine and Paraguay Republic).

TORRA (1998, 1999, 2000) interpreted this sequence as a heterolithic succession deposited under a tide-dominated peritidal environment during the intracratonic Paranaense shallow marine onlap of Middle Miocene age, all synchronous with the extensive so called 'Paranaense transgression'.

Thirty-five selected samples were analyzed by the technique of fluorescence X-ray spectrometry (FRX). Twenty samples were picked up from very fine sand lithofacies. The remainder fifteen samples were taken from mud beds and 'mudrock' beds. The boron was analyzed using an inductively emission coupled plasma spectrometry (ICP-AES). None fusion was used in the samples in order to prevent boron-tourmaline contamination, which is extremely common.

The elements analyzed were the following, major elements: CO₃Ca, P₂O₅, Fe₂O₃, TiO₂, SiO₂, Al₂O₃, CaO, K₂O, MnO. These molecules were measured by a percentage. Trace elements analyzed were: Rb, Cs, Ga, Zr, Ta, Nb, Sr, Ba, Cr, Ni, Zn, Pb, Cu, V and Boron. The study carried out by means of simple plotting in cartesian axis using common softwares reveals that several elements act as markers and concentrate according with different lithofacies among very fine sand, mud and mudrock. Ten selected samples of loessial beds were used as regional background and confront values.

Lithofacies of very fine sand are characterized by high concentration in zirconium, barium, chromium and copper. Boron is present in low concentration but always appears. High values of TiO_2 are present and niobium is scarce, but highly concentrated in these samples. Values of gallium and cesium are similar to loessial samples. The silica average is 72.59 %.

Lithofacies of mud layers are characterized by a little height boron concentration. The values of zirconium, barium chromium and copper are high but minor than very fine sand values. Gallium and cesium are higher than very fine sand. The silica value is constant and differs from mudrock and very fine sand. They are the lowest (66.43 % average).

Lithofacies of mudrock layers are very similar to mud layers. However, significant differences in silica values mark the contrast (76.61 % average). Other study indicate that this lithofacies are tempestites (TORRA 2000).

These results shown clearly that different lithofacies can be geochemically recognized in this sequence. This fact should be very useful in order to identify underground beds in future drill-holes and regional correlation at the 'Chaco-Paranense intracratonic basin'.

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Paleocurrents analysis in siliciclastic arenaceous sediments (sandy beach lithofacies) as a marker to paleoenvironmental systems, Northeastern Argentina

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The Ituzaingó Formation Sands is a significant sedimentary unit that scarcely outcrops in ravines and gullies near the Paraná river at the northeastern Mesopotamia region of Argentina. Several researchers studied it since 1848 to 1995. They concluded, upon paleontological basis, that the sandy-muddy lithofacies are of fluvial origin and Pliocene to upper Pleistocene in age. The fossils used as an indicator are of broad biochron, overall Cenozoic age. Two unconformities were proposed both on top and bottom of this unit, without determine exactly its potency (HERBST 1971, HERBST & SANTA CRUZ 1985, 1995, JALFIN 1988).

Recent studies concluded that none unconformities are present. The contact between sand and mud is conformable, resembling a lithofacies change. Fossil fauna is not representative and contacts were not observed until the present study (TORRA 1997a, b, 1998a, h, c).

I made, since 1994 to 1999, a detailed sedimentologic study about paleocurrents (over 450 measurements) on the planar cross stratification and tangential-sigmoidal cross-stratification, which are always present in the sandy lithofacies, both ferricretized (reddish) and non ferricretized (white) ones plagued of diagnostics internal intertidal-to-subtidal structures.

I found it a repeated simple and unequivocal bimodal bipolar design along more than 1,000 km at the Mesopotamia region, Northeastern Argentina. Recent bibliography, accept that bimodal bipolar design indicates more than one direction of the flow currents (i.e. reversal

flows as tidal currents). Previous studies considered these sediments as deposited like a fluvial system (i.e. a "braided platee" in JALFIN 1988).

After the study of the design of the paleocurrents roses, I proposed a shallow marine intertidal to subtidal environment system for these sandy-muddy sediments, roughly 230 meters in thickness at depths. This was texturally study by means of logs of most hydrogeologic drill-holes (TORRA 1999).

The age proposed is Middle Miocene synchronous with the 'Paranense Sea transgression deposits' (RASÄNEN et al. 1995, TORRA 1997a, b, 1998a, b, c, 1999).

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Spatial relation between tempestites (typical non-tidal offshore sand bodies deposits) and heterolithic succession in shallow marine littoral environment. The case of the Ituzaingó, Toropí and Yupoí Formations (Middle Miocene), Northeastern Argentina

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The Toropí and Yupoí Formations are stratigraphic units created in order to solve the presence of mixed silty-very fine sandy mud soft sediment beds (typical "mudrocks" as proposed by TORRA 1998a, 1999a, b). They are outcroppings in a large region of the Mesopotamia Argentina (about 117,000 km²), always overlying Miocene marine sediments (i.e. Ituzaingó Formation). The