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Summer School on Carpathian-Danube Delta-Black Sea sedimentary system

1. Scientific Rational and Relevance of the Programme

The major earth surface units, -mountains, plains, and marine basins- are linked into a source to sink sedimentary system. The source-areas (mountains) erosion generates detrital material supplied to and transported by river systems to the plains, and accumulated and stored in the sink zones (sedimentary basins). Deltas play the important role of gateways between the sediment transporter and the final sediment accumulation in the sink area.

One of the most important European source to sink organisms is the Carpathians – Danube River – Danube Delta – Black Sea sedimentary system, which operated in the past and is still active to day. The Danube River Basin – Black Sea area represents a unique natural laboratory for studying the interplay between lithospheric and surface processes and the source-sink relationships.

The Carpathians to Black Sea past and modern erosion, transport and accumulation sedimentary processes will be linked by an integrated modelling approach. In this way reliable links will be established between lithosphere dynamics, neotectonics, surface and climatic processes. The models should cover different scales and aspects of the Carpathians – Black Sea source-sink sedimentary balance. Understanding the entire system balance will equip large-scale modellers for the first time with tools to analyze the higher resolution system components.

The drainage network of the Danube River system and its transition zone to the active sink area of the Black Sea responds rapidly to changes in the upper reaches of the source-sink system. As active processes provide the key link to the sedimentary balance of this system, these are influenced by the inherited memory from the Carpathians collision time, rapid sea-level changes, basin filling patterns and climatic instability.

. The SourceSink project analyze the interplay between tectonics, sea level fluctuations, sediment supply and connectivity with the upstream Paratethys basins during the recent evolution of the Black Sea, as reflected in the 3D architecture of the Upper Miocene-Quaternary sediments. An important objective of the project is to establish when, where and how was the Western Black Sea connected to these Paratethys basins, in particular the Carpathians foredeep (Dacian Basin) leading to major shifts in sediment supply and patterns of basin fill.

The Danube Delta was, and still is the sedimentary gateway at the interface between the Dacian Basin (in the past) or the lower Danube River (in the present) and the Black Sea. The SourceSink investigations aims to the comparative analysis between the deltaic filling patterns observed during the Pliocene in the Carpathian foreland and the modern sedimentological processes (Upper Holocene towards the last 30 years). The present-day space and time migration of the Danube Delta sediments, is the key

The study of the architecture and infill controls of the semi-enclosed Dacian Basin could provide knowledge leading to a general model that could also be used for adjacent basins from the Carpathians-Black Sea system. This will allow evaluating the sediment transfer at regional scale. The sedimentary architecture of the Dacian Basin will also help understanding the

connection and sediment transfer between Dacian and adjacent basins, the possible sequential infill of the basins, and location and the size of the main sediment paths (like Paleo-Danube River).

The proposed summer school is focussed on the past and recent sedimentary architecture and processes in the Carpathians-Black Sea system. A special attention will be granted to the sedimentary gateways between segments of the source to sink system. Modelling of the sedimentary architecture generated by sediment redistribution from the source to the sink is also an important objective of the proposed summer school. The summer school program includes field applications in Danube Delta and the Dacian Basin area.

2. Provisional programme/agenda of the activities

The Summer School will be organize in the Danube Delta (Romania), where lecturers will be performed, being followed by application in the filed, in the Danube Delta and in the Romanian Carpathian Bend area. In the Danube Delta, the summer school will take place on the Research vessel ISTROS of Geoecomar, at Murighiol (downstream from the Tulcea locality). The Research vessel ISTROS has full facilities to organize the proposed Summer School (including Wifi internet connections).The accommodation during the presentations will be provided on the board of ISTROS research vessel, and on the Floating Laboratory HALMYRIS of Geoecomar (located also at Murighiol). The 9 lecturers/organizers will be lodged in single rooms and the 17 students will be lodged in double rooms. The 2 days of presentations will be followed by one day application during the field-trip in the Delta Danube, and by one day field trip in the Romanian Carpathian bend area.

The provisional agenda of the school is the following;

- **Friday, 25.09.2009 – a.m**: arrival of participants (we will organize the transportation from the airport to Bucharest, at the Institute GEOECOMAR, lunch);
- **Friday, 25.09.2009 – p.m**: transportation of the participants to the Danube Delta (at Murighiol);
- **Saturday, 26.09.2009 – a.m**: Past and recent sedimentary processes. Case study: the Danube Delta (Lecturers: Prof. Dr. Nicolae Panin; Dr. Cornel Olariu);
- **Saturday, 26.09.2009 – p.m**: Tectonics and sedimentological in the Black Sea (Lecturer Prof. Dr. Cornel Dinu)
- **Sunday, 27.09.2009 – a.m**: Holocene of the Black Sea since the Last Glacial Maximum (Lecturer Dr. Gilles Lericolais)
- **Sunday, 27.09.2009 – p.m**: Numerical modelling of the sedimentary budget. Evolution of eroding areas, sediment pathways, river network and basin fill (Lecturer of Dr. Daniel Garcia-Castellanos)
- **Monday, 28.09.2009–**: Field trip in the Danube Delta for recent sedimentary processes (Field trip Instructors Prof. Dr. Nicolae Panin and Dr. Silviu Radan);
- **Tuesday, 29.09.2009 –** Departure from the Danube Delta to the Romanian Carpathian bend area – Field trip: Neogene-Quaternary tectonics (Instructor Prof. Dr. Cornel Dinu); overnight in Plescoi (near the Buzau town);

- **Wednesday, 30.09.2009 – a.m**: Field trip: Dacian Basin Neogene sedimentogenesis and stratigraphy in the Romanian Carpathian Bend area (Instructior Dr. Dan Jipa)
- **Wednesday, 30.09.2009 – p.m:** Transport to Bucharest, overnight in Bucharest and ice-breaker party;
- **Thursday, 1.10.2009** – departure of the participants.

3. List of provisional speakers and/or participants

The following scientists agreed, in principle, to give courses at the SourceSink summer school:

Dr. Daniel Garcia-Castellanos (Institut De Ciencies De La Terra Jaume Almera, (Barcelona, Spain), is concerned with scientific investigations on the interaction between erosion/sedimentation at the Earth's surface and the tectonic deformation of the lithosphere. Using computer simulation techniques, Dr. Garcia-Castellanos investigates the interplay between lithospheric-scale tectonics and erosion/sedimentation at the Earth's surface.

Dr. Cornel Olariu (The University of Texas at Austin, Department of Geological Sciences, Jackson School of Geosciences, Texas, USA) holds a Ph.D. from the University of Texas at Dallas. His main interest is in modern and ancient delta sedimentology and stratigraphy, but he also works on sequence stratigraphy and numerical modelling projects. Dr Olariu has outstanding contributions regarding the distributary channels of fluvial-dominated delta systems, the survey of delta front sediment accumulations using ground-penetrating radar, genesis and significance of deltaic individual hyperpycnal-flow beds, and others.

Dr. Gilles Lericolais (IFREMER, Brest, France). Director of several scientific projects focussed on the Black Sea, western shelf and deep sea fans. Dr. Lericolais is a prominent scientist specialized in topics related to the Black Sea, such as reconstruction of the sedimentary and tectonic evolution of the Black Sea, sea level fluctuations recorded in the Black Sea, Black Sea depositional environments since the Last Glacial Maximum, and evidences of the Messinian erosion surface in the Black Sea.

Prof. Nicolae Panin (National Institute of Marine Geology and Geoecology – Geoecomar, Bucharest, Romania) is a well-known researcher of the genesis and development of the Danube Delta. Prof. Panin was active in studies concerning the general morphology of the Danube Delta, Black Sea shelf and continental margin, Holocene evolution and facies types of the Danube Delta, environmental study of the Danube-Black Sea system, as well as sedimentological studies in Carpathian flysch and molasse deposits.

Prof. Corneliu Dinu (Bucharest University, Faculty of Geology and Geophysics). Main scientific interests in structural geology and integrated seismics, regional tectonics and basin analysis. Prof. Dinu carried out studies on structure, sedimentation and evolution of the north-western continental margin of the Black Sea, integrated fieldwork and tectonic modelling of the Romanian Carpathians and adjacent areas, paleoshorelines on the Black Sea Shelf and others.

4. Justification for the invitation of cooperating partners and external experts

The SourceSink summer school program includes the general source to sink sedimentary evolution. Taking advantage of the deltaic location of the school, the problem of sediment carrier to sediment sink transition will represent an important subject of the lecturing program. The modelling of the sediment redistribution between source to sink is a significant task of the project and will have a prominent part in the teaching schedule.

In order to achieve the goals of the summer school, experts with a variety of interests have been invited: tectonicians, sedimentologists and modellers. In this way the students will learn of the source to sink sediment transit, with emphasis on provenance, sediment budget, lithospheric structure, morphotectonics and all this factors (and others) associated into modells.

The summer school organizers will seek the collaboration of the Danube Delta Biosphere Reserve Authority and of the National Institute "Danube Delta" (Tulcea).

5 Provisional dissemination and exploitation plan.

The SourceSink summer school will be advertised on the appropriate websites. The sponsoring of the European Science Foundation will be emphasized. Materials for the registered students will be posted through the SourceSink and Geoecomar websites.

6. References

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