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

Murighiol (Danube Delta), Romania
25 September – 1 October 2009

EUROCORES Programme
European Collaborative Research

EUROPEAN SCIENCE FOUNDATION

INTRODUCTION

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 modeling 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 modelers 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 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.

ESF Eurocores Topo-Europe Project

The aim of the European Collaborative Research (EUROCORES) Scheme is to enable researchers in different European countries to develop collaboration and scientific synergy in areas where European scale and scope are required to reach the critical mass necessary for top class science in a global context.

The scheme provides a flexible framework which allows national basic research funding and performing organisations to join forces to support excellent European research in and across all scientific areas.

The European Science Foundation (ESF) provides scientific coordination and support for networking activities of funded scientists.

Research funding and the funding for the scientific coordination and networking are provided by participating national organisations.

The European Science Foundation (ESF) was established in 1974 to create a common European platform for cross-border cooperation in all aspects of scientific research.

With its emphasis on a multidisciplinary and pan-European approach, the Foundation provides the leadership necessary to open new frontiers in European science.

Its activities include providing science policy advice (Science Strategy); stimulating cooperation between researchers and organisations to explore new directions (Science Synergy); and the administration of externally funded programmes (Science Management). These take place in the following areas: Physical and engineering sciences; Medical sciences; Life, earth and environmental sciences; Humanities; Social sciences; Polar; Marine; Space; Radio astronomy frequencies; Nuclear physics.

Headquartered in Strasbourg with offices in Brussels, the ESF's membership comprises 80 national funding agencies, research performing agencies and academies from 30 European countries.

The Foundation's independence allows the ESF to objectively represent the priorities of all these members.

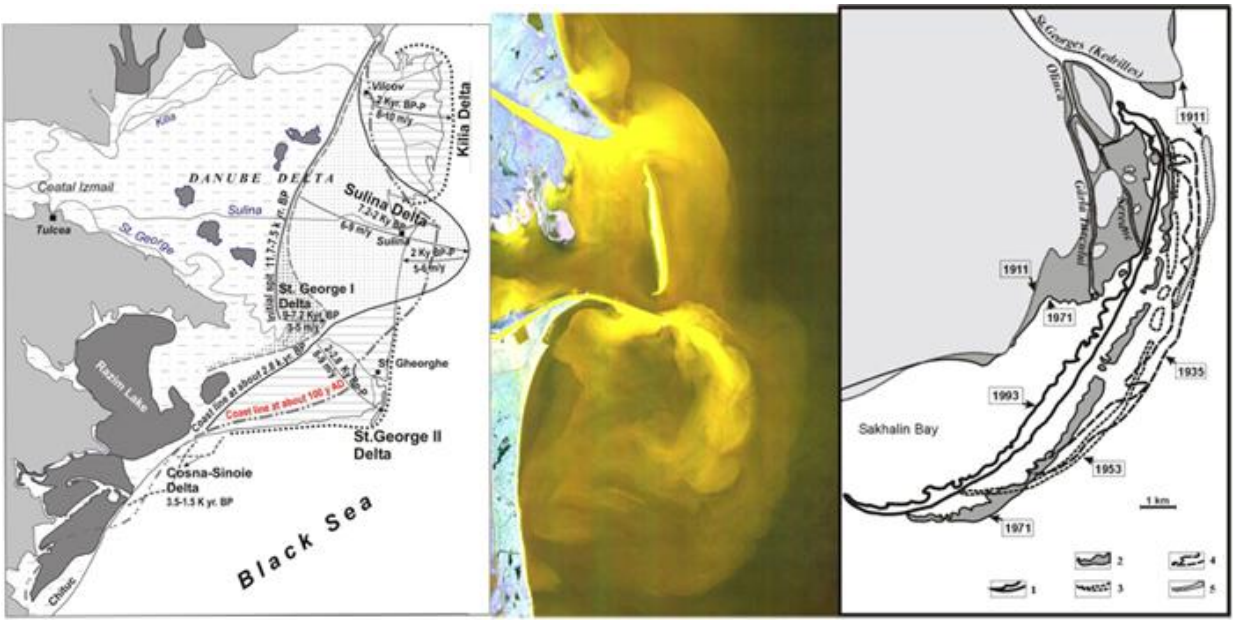
The TOPO-EUROPE Project

The topography of the continents and their margins is at the interface of deep Earth, surface and atmospheric processes. Topography influences society, not only as a result of slow landscape changes but also in terms of how it impacts on geohazards and the environment. When sea-, lake- or ground-water levels rise or land subsides, the risk of flooding increases, directly affecting the sustainability of local ecosystems and human habitats.

On the other hand, declining water levels and uplifting land may lead to higher risks of erosion and desertification. Although natural processes and human activities create geohazards and environmental changes, the relative contribution of the respective components remains poorly understood. That topography influences climate has been known since the beginning of civilization, but only recently have we been able to model its effects in regions where good (paleo-)topographic and climatologic data are available.

The present state and behaviour of the shallow Earth System is a consequence of processes operating over a wide range of temporal and spatial scales. These include the long-term effects of tectonic uplift, subsidence, climate variations and the development of river systems, the residual effects of the ice ages on crustal movement, natural climate and environmental changes over the past millennia up to the present, and the powerful anthropogenic impacts of the last century. If we are to understand the present state of the Earth System, to predict its future and to engineer our use of it, this spectrum of processes, operating concurrently but on different scales, needs to be better understood. The challenge to the Geosciences is to describe the state of the system, to monitor its changes, to forecast its evolution and, in collaboration with others, to evaluate modes of its sustainable use by human society.

One of the goals of the project is the study of the geomorphological and geo-environmental evolution of the interface between the river network and the active sink, having as the case study the Danube. The goal of the project is to investigate the factors which governed the geomorphologic and geo-environmental evolution during the last 5Ma of the Lower Danube –Danube Delta – Black Sea carrier system. The project is focussed on the lower Danube River and on the sedimentary gateway at the interface between the Dacic Basin and the Black Sea, i.e. the modern Danube Delta. The study aims a comparative analysis between the deltaic filling patterns observed during the Pliocene in the SE Carpathians foreland and the modern sedimentological processes (Upper Holocene towards the last 30 years) observed in the Danube and Danube Delta at the interface with the Black Sea. This general objective will be obtained by the means of data acquisition, interpretation and modeling focused around 5 topics.


DANUBE DELTA
Kilia
Ceatal Izmail
Sulina
Tulcea
St. George
Kilia Delta
Sulina Delta
St. George I Delta
St. Gheorghe
St.George II Delta
Cosna-Sinoie Delta
3.5-1.5 K yr. BP
Razim Lake
Black Sea
Chilia
Sakhalin Bay
1911
1971
1935
1993
1953
1 km

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SUMMER SCHOOL PROGRAMME

Networking Activity on'Carpathian-Danube Delta-Black Sea Sedimentary System' within the framework of the ESF activity entitled 'Funding initiative in the field of 4-D Topography Evolution in Europe: Uplift, Subsidence and Sea Level Change'

24th-25th of September 2009 – Arrival of participants;

25th of September, 15.00 p.m. – departure to Murighiol (Danube Delta) from Geoecomar location (Dimitrie Onciul Street, No. 23-25, Bucharest);

26th of September: key lectures

- 9.00 to 11.00: **Prof. Dr. Nicolae Panin** (Bucharest, Romania): "The Danube Delta – the mid term of the geo-system Danube River – Danube Delta – Black Sea"
- 11.00 a.m – 11.15 Coffee break
- 11.15 to 13.00 – **Dr. Cornel Olariu** (Austin, TX, USA): "Modern and ancient deltas: formation, recognition and evolution"
- 13.00-13.30 *Discussion*
- 13.00 -15.00 Lunch
- 15.00 - 17.00 **Dr. Gilles Lericolais** (Brest, France): "From Source to Sink: A Sedimentary Answer"
- 17.00 -19.00 **Prof. Dr. Cornel Dinu** (Bucharest, Romania): "Neogene and Quaternary tectonic evolution of the western Black Sea Basin"
- 19.00-19.30 *Discussion*
- 20.00 - Dinner

27th of September: key lectures

- 9.00 to 13.00: **Dr. Daniel Garcia-Castellanos** (Barcelona, Spain): "Numerical modeling of long-term landscape evolution and connectivity between basins"
- 11.00 a.m – 11.15 Coffee break
- 13.00-13.30 *Discussion*
- 13.00 -15.00 Lunch
- 15.00 - 17.00 **Dr. Juraj Francu** (Brno, Czech Republic): "Modeling of basin subsidence and uplift history: Calibration of thermal history models"

- 17.00 -19.00 **Prof. Dr. Michal Kovacs** (Bratislava, Slovakia): "Subsidence History and Tectonic Control During the Development of the Western Carpathian Neogene Basins"
- 19.00-19.30 *Discussion*
- 20.00 Dinner

28th of September 2009 – Field trip in the Danube Delta (Murighiol-Privolovca-Mila 23-Lacul Puiu-Murighiol);

29th of September 2009

9.00 a.m. Departure from Murighiol to the bend area of the Romanian Carpathians (Buzau basin);

13.00-14.00 Lunch at Pleşcoi;

14.00 – 18.00 Field trip in the Neogene deposits of the Dacic Basin;

19.00 Dinner and overnight at Berca.

30th of September

9.00 Field trip in the Neogene deposits of the Dacic Basin

13.00-14.00 Lunch in Pleşcoi

14.00 – Departure to Bucharest

20.00 Dinner in Bucharest

1st of October

Departure of the participants

Biographical sketches - summer school lecturers

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 the 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, evidences of the Musician 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.

Prof. Dr. Michal Kováč (Comenius University, Bratislava, Faculty of Earth Sciences) is an well known scientist, which have important contributions in sequence stratigraphy and depositional systems of the Neogene deposits of the Paratethys Realm, as well as on the structural analysis and evolutionary tectonic model of the Alpine-Carpathian Belt.

Dr. Juraj Francu (Czech Geological Survey, Brno Branch) graduated in 1981 the Geology and Geochemistry at the Faculty of Natural Sciences, Comenius University, Bratislava, and the PhD in 1987 at the Institute of Geology, Slovak Academy of Sciences, Bratislava, Slovakia. He is currently working at the Czech Geological Survey (Branch Brno). His research topic is related to the Basin analysis, One- and two-dimensional computer modeling of thermal history, geochemistry of organic matter in rocks and petroleum, as well as clay minerals and organic matter in respect to thermal history and basin analysis. Postdoctoral research visits at the Dept. of Earth

Sciences, University of Missouri-Columbia, USA, Institute of Organic and Petroleum Geochemistry, Research Center Juelich, Germany and Geological Survey of Canada, Calgary.

List of Participants

ESF – Funded Students

Nr.	Family Name	First Name	Country	Institute	Project
1	Briceag	Andrei	Romania	GeoEcoMar, Bucharest	SourceSink
2	Cazacu	Camelia	Romania	GeoEcoMar, Bucharest	SourceSink
3	Cojocaru	Loredana	Romania	University of Bucharest	SourceSink
4	Costriiciuc	Olga	Romania	University of Bucharest	SourceSink
5	Floroiu	Alina	Romania	University of Bucharest	SourceSink
6	Manta	Tanislav	Romania	University of Bucharest	SourceSink
7	Maximov	Gabriela	Romania	GeoEcoMar, Bucharest	SourceSink
8	Mirea	Adriana	Romania	University of Bucharest	SourceSink
9	Munteanu	Ioan	Romania	University of Bucharest	SourceSink
10	Okay	Seda	Turkey	Institute of Marine Sciences and Technology (D.E. University Izmir)	SourceSink
11	Savi	Sara	Switzerland	Institute of Geological Sciences, University of Bern	SedyMont
12	Sopkova	Bohuslava	Slovak Republic	Comenius University of Bratislava	SourceSink
13	Stojadinovič	Uros	Netherlands	Vrije Universiteit Amsterdam	SourceSink
14	Sujan	Michal	Slovak Republic	Comenius University of Bratislava	SourceSink
15	ter Borgh	Marten	Netherlands	Vrije Universiteit Amsterdam	SourceSink

Lecturers, Organizers and Senior participants

Nr.	Family Name	First Name	Country	Role	Institute
1	Dinu	Cornel	Romania	Lecturer	University of Bucharest
2	Francu	Juraj	Czech Republic	Lecturer	Czech Geological Survey
3	Garcia-Castellanos	Daniel	Spain	Lecturer	Instituto de Ciencias de la Tierra Jaume Almera (CSIC) Barcelona
4	Jipa	Dan	Romania	Organizer	GeoEcoMar, Bucharest
5	Kováč	Michal	Slovak Republic	Lecturer	Comenius University of Bratislava
6	Lericolais	Gilles	France	Lecturer	IFREMER, Brest
7	Melinte	Mihaela	Romania	Organizer	GeoEcoMar, Bucharest
8	Olariu	Cornel	USA	Lecturer	University of Texas at Austin, Jackson School of Geosciences
9	Panin	Nicolae	Romania	Lecturer	GeoEcoMar, Bucharest
10	Rădan	Silviu	Romania	Participant	GeoEcoMar, Bucharest
11	Stoica	Marius	Romania	Participant	University of Bucharest

Background reading – references

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