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Marine Science and Technology Programme



**Advanced study courses
in marine science
and technology**

1998 programme



EUROPEAN COMMISSION
Directorate General for Science, Research and Development
Directorate for Environment

Advanced Study Courses in Marine Science and Technology



1998 programme

Advanced study course on hydro- and morphodynamic processes
in coastal seas
28 June - 11 July

Insights on the formation and evolution of Mediterranean Basins
6 - 24 July

Concepts and models of marine microbial food webs
27 September - 9 October

INSIGHTS ON THE FORMATION AND EVOLUTION OF MEDITERRANEAN BASINS

Director of the course : Dr Jacques Deverchère, Géosciences Azur, Villefranche-sur-Mer, France

The course will be held at the Observatory of **Villefranche-sur-Mer, France**, near Nice. Participants will arrive on **6 July** and **depart on 24 July, 1998**. Maximum of 25 students.

Applications must be sent before **31 March 1998** to :

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Géosciences Azur (UMR 6526)
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Programme

Important improvements in our understanding of Tertiary-Quaternary plate tectonics in the Mediterranean sea have been made very recently: for instance, the role of the "roll-back" of the subduction zone in the formation of back-arc basins, the mantle delamination, the dating and interpretation of syn- and post-orogenic extension, the nature and extent of magmatism, constitute several new advances in the geodynamics of this complex area. Of particular importance are the time and space relationships of the forces (gravitational collapse, convergence of African and European plates, and roll-back) responsible for extension. Organizers of the course wish to pass the latest knowledge in the geodynamics of the Mediterranean sea to graduate students and young scientists.

The course is based on the expertise of 20 scientists, representing 17 organisations from six European countries. It will combine lectures, interactive discussions, and a land /marine practical training. It aims at :

- Transferring recent improvements on the understanding of the Tertiary-Quaternary evolution of Mediterranean back-arc basins, with a special emphasis on the Liguro-Provencal and Tyrrhenian domains within the Alpine orogen, considered as case studies in the processes of Tertiary-Quaternary evolution of Mediterranean basins;
- Providing students with an opportunity to directly observe offshore and land evidences for Tertiary deformations depicting time-space relationships between basin, subduction, and orogen evolutions, thanks to a practical training in the Ligurian sea and in Corsica ;
- Offering a combined methodological approach based on a full purchase, analysis and processing of marine seismic reflection data and on a detailed tectonic field study.

Offshore practical training in the Ligurian basin will introduce the major tools in seismic-reflection exploration thanks to the Research Vessel *TETHYS II* (INSU/CNRS, France), and will consist of realizing several cross-sections from the deep basin to the upper Corsica margin, which will be processed and interpreted by participants. A link between offshore and land observations of extensional processes will be simultaneously attempted through field

training in Alpine Corsica, aiming at evidencing back-arc rifting and post-orogenic extension, Miocene deep crustal deformations, strain localization within the brittle-ductile transition, time evolution from ductile to brittle, exhumation of high pressure metamorphic rocks, PTt paths and the history of exhumation, and scale transfer in structural field studies.

This course is also supported by the MERCATOR network in Marine Geosciences, led by Dr Marc de Batist (ERASMUS Project "Mercator" in marine geosciences, <http://allserv.rug.ac.be/~mdbatist>).

Lectures

Introduction

- Welcome and course overview
- Break-up of continents and initiation of sea-floor spreading

The conceptual framework of formation and evolution of deep basins in the Mediterranean sea

- Mechanics of subduction and the mechanisms controlling the stress regime in back-arc basins
- Plate boundary evolution in the Alpine-Mediterranean region from deep structure and dynamic constraints
- The nature, extent, and significance of recent volcanic activity in the Mediterranean
- Kinematic constraints for a tentative reconstruction of the recent Mediterranean deformation pattern
- From rifting to open oceans in the Mediterranean : the deep structure of passive margins

Cenozoic key events in the Mediterranean sea and surroundings (with a special emphasis on the Tyrrhenian and Ligurian cases)

- Seismotectonics of the Apennines and Tyrrhenian Sea: New insights from the Mw=6.0 Umbria 1997 normal faulting earthquake
- Volcanic activity in Italy and geodynamic implications
- Extension history in the Tyrrhenian sea
- A model of evolution of the Tyrrhenian sea from experimental modelling
- Constraints on the Ligurian sea formation and evolution
- Insights from historical and instrumental seismicity in the Alps, Liguria, and North Apennines
- The Messinian salinity crisis: a view from land
- Deep sedimentary processes in the Ligurian sea
- Evolution of the Valencia trough and the Gulf of Lions during the upper Neogene
- The Pannonian basin and its geodynamical significance in the Mediterranean evolution
- Extensional tectonics and sense of shear in Mediterranean regions

Practical training

Sea cruise

- Positioning at sea: GPS navigation, continuous control of navigation accuracy with time ;
- Bathymetry: continuous control of a 12Hz transducer recorded profile;
- Seismics: deployment with an engineer of the streamer and the guns; choice of the volume of the guns, the distance source-receiver, control of the frequency band on the seismic recording, influence of depth of gun and streamer on the vertical resolution,

Seismic reflection processing and interpretation

- Scales, vertical exaggeration, correlations between profiles ;
- Analysis of artifacts : multiples, bubble, hyperbolas, pull-up and pull-down effects ;
- Data processing : filtering, stack, deconvolution, pre-stack migration ;
- Data interpretation: Messinian erosional surface, Messinian detritic fan, upper evaporites, infra-evaporitic Miocene sediments ; geometry of the basement, correlations with multichannel profiles and ECORS-Gulf of Lions profile ; isobath and structural maps.

Field study in Alpine Corsica

- First day: Excursion around Cap Corse from Bastia to Patrimonio : the various deformations and associated metamorphic parageneses from greenschists to eclogites.
- Second day: A cross-section from Bastia to Casta across the East Tenda Extensional Shear Zone and the St Florent Miocene basin.
- Third day: Cross-section in the Lancone Gorges : the ophiolite and its HP-LTmetamorphism, the early "obduction" stage. Excursion south of Corte: crustal-scale brittle normal faults.

Course Lecturers

Prof. G. Boillot	Observatoire, Univ. Paris 6, Villefranche, France
Prof. A. Chemenda	Univ. Nice, France
Prof. M. Canals	Univ. Barcelona, Spain
Prof. G. Clauzon	Univ. Aix-en-Provence, France
Dr. J. Deverchère	Observatoire, Univ. Paris 6, Villefranche, France
Prof. C. Eva	Di.S.Ter., Univ. Genova, Italy
Dr. C. Faccenna	Dip. Sc. Terra, Roma, Italy
Prof. P. Gasparini	Univ. Napoli, Italy
Prof. L. Jolivet	Paris 6, France
Prof. E. Mantovani	Univ. Siena, Italy
Dr. F. Michaud	Observatoire, Univ. Paris 6, Villefranche, France
Prof. J-P. Réhault	U.B.O. Brest, France
Dr. F. Sage	Observatoire, Univ. Paris 6, Villefranche, France
Dr. B. Savoye	IFREMER, Brest, France
Dr. G. Selvaggi	ING, Roma, Italy
Prof.. G. Spadini	Amsterdam, The Netherlands
Dr. T. Toth	Budapest, Hungary
Dr. A.B. Watts	Oxford, United Kingdom
Dr. M. Wilson	Leeds, United Kingdom
Prof. M.J.R. Wortel	Utrecht, The Netherlands

Organizing Committee

Dr. Jacques Deverchère	Villefranche sur Mer, France
Prof. L. Jolivet	Univ. Paris 6, France
Dr. Françoise Sage	Villefranche sur Mer, France
Dr. François Michaud	Villefranche sur Mer, France
Prof. G. Boillot	Villefranche sur Mer, France

A great deal of additional information on the European Union is available on the Internet. It can be accessed through the Europa server (<http://europa.eu.int>).

Cataloguing data can be found at the end of this publication.

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