

## EROS 2000 (EUROPEAN RIVER OCEAN SYSTEM) : AN OVERVIEW

Jean-Marie MARTIN

Institut de biogéochimie marine, URA CNRS 386, Ecole normale supérieure,  
1 rue Maurice Arnaud, 92120 Montrouge, France

The EROS 2000 project is an attempt to understand the biogeochemical processes affecting chemical elements and compounds and their alteration by human activities in European coastal waters. During the first phase of this project, eight major cruises onboard research vessels belonging to seven countries of the European Union were carried out in the western Mediterranean. Special attention was paid to the Gulf of Lions, the Straits of Sicily and Gibraltar and the central western Mediterranean. Major rivers such as the Rhone and the Ebro have been monitored and a network of atmospheric sampling stations has been implemented.

This lecture will mainly focus on results concerning trace metals (T.M.) and artificial radionuclides. Key examples will be given so as to exemplify the following aspects :

- i. Relative importance of the various sources of T.M. to the western Mediterranean. The dissolved input of atmospheric trace elements (Pu-238 excepted) is larger than the river input, however for most T.M. the fluxes at the Straits predominate.
- ii. Most T.M. behave conservatively in the estuarine mixing zone, a result conflicting with most observations carried out in macrotidal estuaries.
- iii. Examples of T.M. exceeding natural concentrations are given indicating some clear perturbation of man-made origin. For some elements (Zn, Pb) the system is no more at steady state.
- iv. The significance of total dissolved concentration measurements is challenged. The role of colloidal phase is highlighted.
- v. The distribution of mercury species gives some new insight in the understanding of the very high mercury levels measured in some pelagic fishes of the Mediterranean.
- vi. Some examples of input-output budgets of T.M. show a remarkably well-balance situation.

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## THE "EGAMES" EXPEDITION IN THE EASTERN MEDITERRANEAN SEA

S. RAPSOMANIKIS<sup>1</sup>, H. BANGE<sup>1</sup>, V. ULSHOEFER<sup>1</sup>, O. FLOECK<sup>1</sup>,  
T. KENNTHNER<sup>1</sup>, D. AMOUROUX<sup>2</sup>, O. F. X. DONARD<sup>2</sup>, J. ENGLEZOU<sup>3</sup>,  
V. TSELENTIS<sup>4</sup> and I. CIGLENECKI.

<sup>1</sup> Biogeochemistry Depart., Max Planck Inst. for Chemistry, 55020 Mainz, Germany

<sup>2</sup> Lab. de Photophysique et Photochimie Moléculaire, CNRS, Univ. de Bordeaux,  
351 Cours de la Libération, 33405 Talence Cedex, France

<sup>3</sup> Depart. of Maritime Studies, Univ. of Piraeus, Karaoli & Dimitriou 40, 185 32, Greece

<sup>4</sup> Rudjer Boskovic Institute, Center for Marine Research, P.O. Box 1016, 41001  
Zagreb, Croatia

The expedition EGAMES (Evasion of GAses from the MEiterranean Sea) took place in the eastern Mediterranean Sea during July 1993 with the aim to study fluxes of climatic relevant gases to the atmosphere, during a period of high insolation and to establish the region's contribution to the global budget of these gases. A number of physical and chemical parameters necessary for the calculation of these fluxes were also measured.

The continuous CTD recordings during the cruise track indicate that four distinct areas were studied. The northern Aegean, which is influenced by incoming Black Sea waters, the open Aegean and Ionian Seas, an upwelling area and an enclosed bay. The recorded meteorological data showed north westerly winds throughout the cruise.

Surface waters fluorescence recordings suggest generally photobleached Chromophoric Dissolved Organic Matter (exudates and humics). The CDOM stratification depends on the mixed layer depth. Humic material was observed mainly in the Black Sea influenced waters, whilst biogenic exudates were mainly observed in the eutrophic bay and the upwelling waters (DONARD *et al.*, 1989)

Results of the analyses of surface waters for H<sub>2</sub>O<sub>2</sub> indicate high photochemical reactivity. The average [H<sub>2</sub>O<sub>2</sub>] was ca. 250 nmol/l, which suggests a high concentration of reactive oxygen species (AMOUROUX *et al.*, 1993)

Our measurements, of surface sea waters for carbonyl sulfide (COS) concentration and *in situ* production, show that they were always supersaturated with respect to the equilibrium concentration, based on the atmospheric COS mixing ratio. The mean saturation ratio was 3.2. Average COS water concentrations were 27 +/- 16 pmol/l and varied diurnally. With an atmospheric mixing ratio of 523 +/- 107 pptv a positive sea to air flux of 55 nmol/m<sup>2</sup>/day could be estimated for the area studied. *In situ* production experiments using collected water samples indicate a photoproduction of COS with concurrent decline in [CH<sub>3</sub>SH] (ULSHOEFER *et al.*, 1994).

High CH<sub>4</sub> saturation ratios were observed in the Black Sea influenced north Aegean and in the eutrophic bay waters (1.4 - 5.2). Saturation ratios of N<sub>2</sub>O were uniform throughout the cruise at 1.05. Atmospheric concentrations of both CH<sub>4</sub> and N<sub>2</sub>O remained practically constant during the course of the cruise (BANGE *et al.*, 1994).

A number of different Se species were identified in surface sea waters and in the atmosphere; namely (CH<sub>3</sub>)<sub>2</sub>Se, CH<sub>3</sub>SeH, and (CH<sub>3</sub>)<sub>2</sub>Se<sub>2</sub>. Their concentrations were higher in the eutrophic bay than in the upwelling area which in turn were higher than in the oligotrophic waters. The degree of saturation was on the average higher than 10.0, giving an estimated, positive, sea to air flux for the area, of 20 nmol Se /m<sup>2</sup>/yr.

Sulphur dioxide atmospheric mixing ratios of eastern Mediterranean marine air, ranged between 10 - 200 pptv. Surface sea water concentrations of (CH<sub>3</sub>)<sub>2</sub>S averaged at 3 nmol/l (RAPSOMANIKIS *et al.*, 1994)

Surface water samples were also analysed, using an electrochemical method, for surface active substances and their activity is expressed in units of "Triton-X-100" mg/l (PLAVSIC *et al.*, 1993). The mean surfactant activity for surface samples was 0.122 mg/l as T-X-100 which is comparable with Adriatic Sea values for the summer of 1992. The preliminary results show that more hydrophobic organic material was present in the Aegean Sea than in the turbulent waters of the Levantine or the open sea.

A number of other atmospheric and meteorological parameters were also measured, to help us in our biogenic fluxes estimations.

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