

COCCOLITHOPHORIDS FROM THE EASTERN MEDITERRANEAN: LINKING SURFACE AND EXPORT PRODUCTION. PRELIMINARY RESULTS.

E. Malinverno*, C. Corselli*, P. Ziveri^{o*}, G. J. De Lange[§]

* Dept. of Geological Sciences and Geotechnologies Milano-Bicocca University, Milano, Italy

^o Dept. of Paleocology and Paleoclimatology - Faculty of Earth and Life Sciences, Vrije Universiteit Amsterdam, The Netherlands

[§] Department of Geochemistry - Institute of Earth Sciences, Utrecht University, The Netherlands.

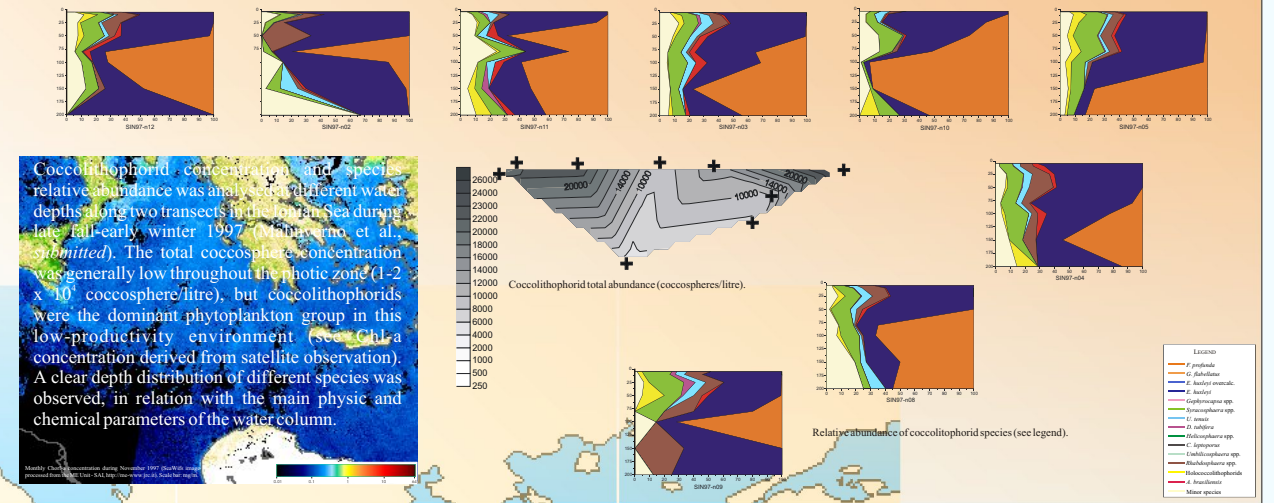
INTRODUCTION

Coccolithophorids are a major phytoplankton group in the oligotrophic pelagic eastern Mediterranean; they contribute significantly to the carbonate sedimentation in this area and they play therefore an important role in the carbon cycle.

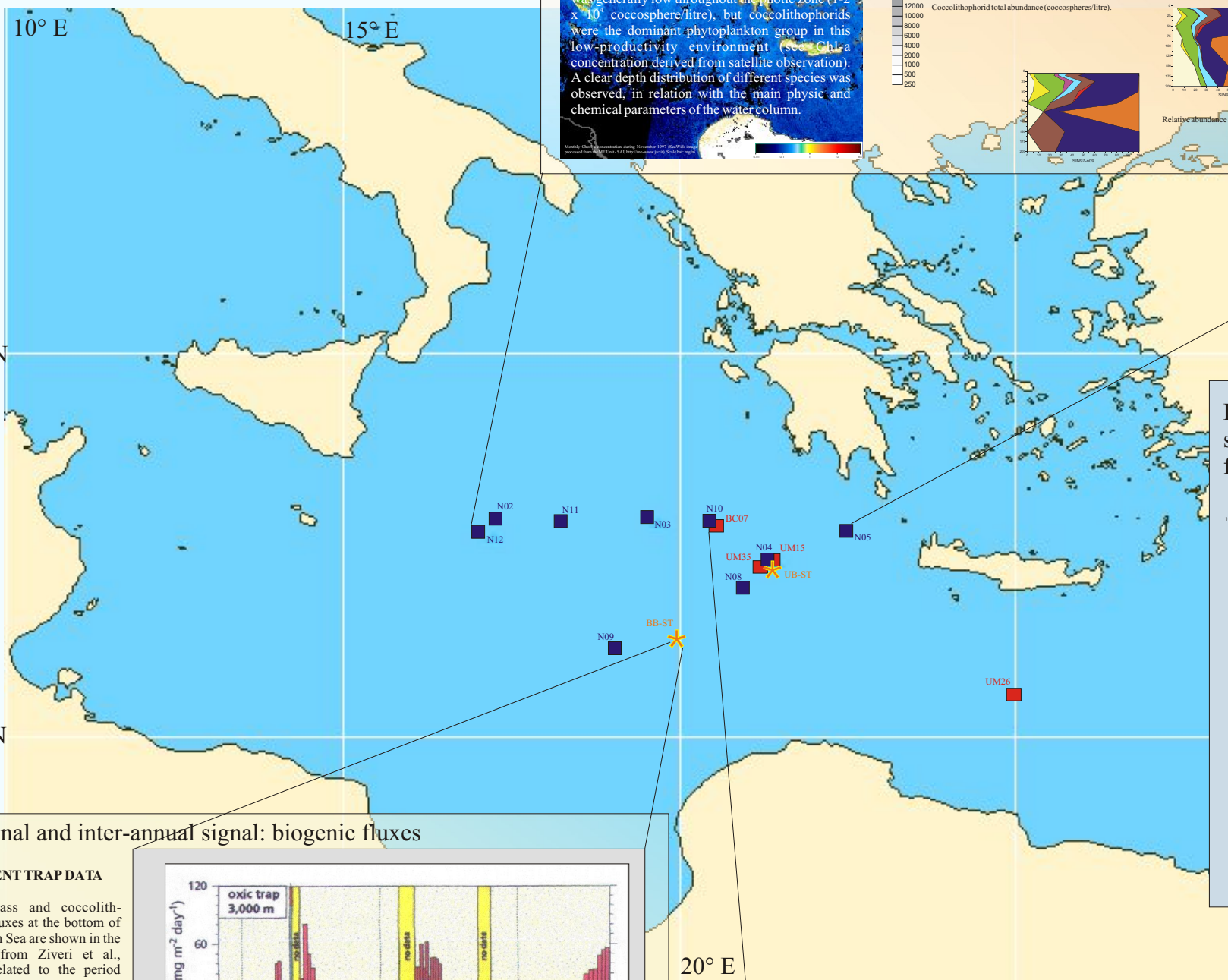
Different approaches are used in order to understand the present fluxes of coccolith-carbonate to the bottom sediments, and in particular to assess the modifications they undergo from surface production through downward transport to deposition at the bottom. Each approach focuses on different time-scales: from instantaneous to seasonal to decadal. Moreover coccolith-carbonate paleofluxes are assessed, based on sediment accumulation rates (centennial to millennial scale).

Seasonal signal: surface production

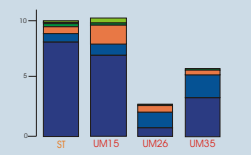
Combining satellite-derived Chlor-a concentration and phytoplankton standing stock



Coccolithophorid concentration and species relative abundance was analysed at different water depths along two transects in the Ionian Sea during late fall-early winter 1997 (Malinverno et al., submitted). The total coccosphere concentration was generally low throughout the photic zone ($1-2 \times 10^6$ coccospheres/litre), but coccolithophorids were the dominant phytoplankton group in this low-productivity environment (see Chlor-a concentration derived from satellite observation). A clear depth distribution of different species was observed, in relation with the main physic and chemical parameters of the water column.



Decadal-centennial-scale signal: surface sediment fluxes



Total coccolith fluxes calculated in the sediment trap (ST) and in three core-top (UM15, UM26, UM35) and relative abundance of major species (data from Ziveri et al., 2000).

CORE-TOPS

Core-tops represent "present" fluxes (e.g. the fluxes of the last centuries), seasonally averaged. Therefore they provide the key to link seasonal fluxes, measured by means of sediment traps, with the sedimentary record. Coccolith accumulation rate in core-tops is calculated on the base of coccolith concentration and of mean mass accumulation rate (data from Ziveri et al., 2000).

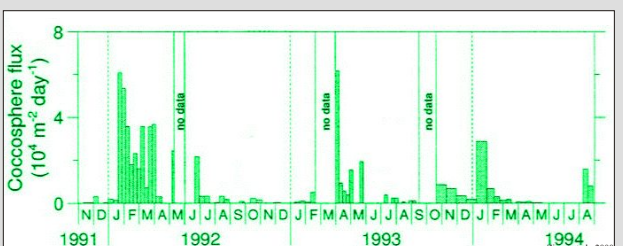
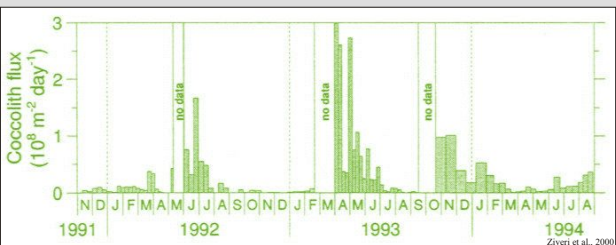
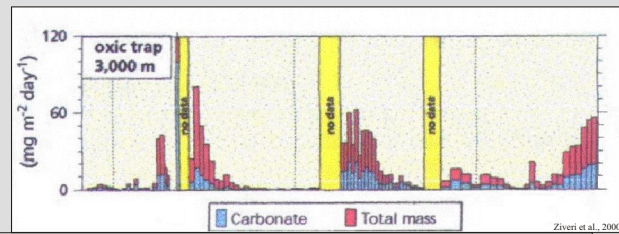
Seasonal and inter-annual signal: biogenic fluxes

SEDIMENT TRAP DATA

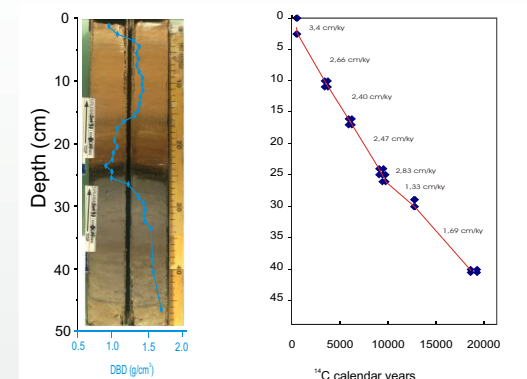
Total mass and coccolith-related fluxes at the bottom of the Ionian Sea are shown in the figures (from Ziveri et al., 2000), related to the period 1991-1994.

Current work is in progress on the continuation of this time-series (BB-ST) for the period 1999-2001, also at another site (UB-ST), in order to assess the lateral variability in export production in this area. These time-series will be continued until 2005, thanks to a bilateral co-operation between Italy and the Netherlands.

Fluxes are measured at different depth in the water column, in order to assess modifications occurring during the downward transport.

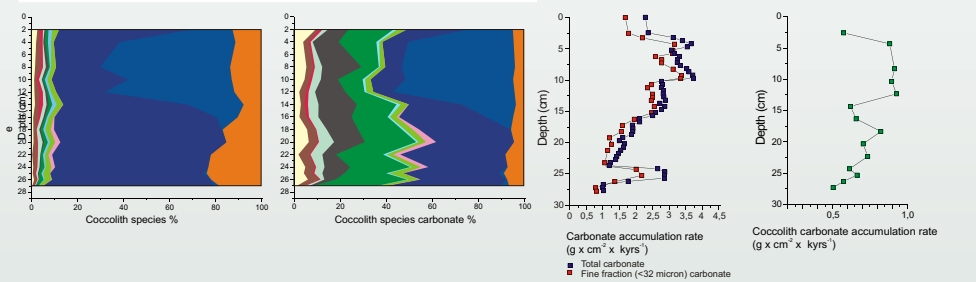


Centennial-millennial signal: past fluxes



CORE SIN'97-BC07

Core BC07 was analysed for coccolith and coccolith-carbonate paleofluxes. Core age is calculated from 7 data points and expressed as calendar years BP (intervals of 1 -probability calculated using the program Calib4 for the marine environment, with 402 years reservoir age). Coccolith accumulation rate is calculated from mass accumulation rate and coccolith concentration in the sediments. Coccolith-carbonate fluxes are then calculated from the relative abundance and the carbonate contribution of each coccolith species, following calculations from Young & Ziveri (2000).



- REFERENCES
- Malinverno E., P. Ziveri, C. Corselli - Coccolithophorid distribution in the Ionian Sea and its relationship to eastern Mediterranean circulation during late fall-early winter 1997. *Submitted to JGR.*
 - Young J.R. & P. Ziveri - 2000 - Calculation of coccolith volume and its use in calibration of carbonate flux estimates. *Deep-Sea Res. II*, 47: 1679-1700
 - Ziveri P., A. Rutten, G.J. De Lange, J. Thomson, C. Corselli - 2000 - Present-day coccolith fluxes recorded in central eastern Mediterranean sediment traps and surface sediments. *Pal. Pal.*, 158: 175-195

ACKNOWLEDGEMENTS

Water and sediment samples study was supported by the National Italian project SINAPSI - Marine Ecosystems (<http://sinapsi.cineca.it/>). Sediment trap studies are carried out through a bi-lateral co-operation between Italy and the Netherlands, and are partly supported by the EU-funded project BIODEEP (EVK3-2000-00042, <http://www.geo.uimib.it/BIODEEP/bd.htm>).