

ENVIRONMENTAL PARAMETERS AFFECTING COMPOSITION OF MODERN MEDITERRANEAN PLANKTONIC FORAMINIFERA ASSEMBLAGES

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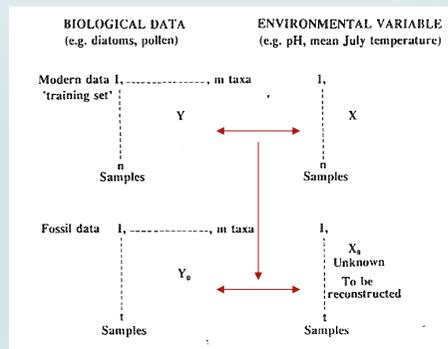


INTRODUCTION

- ▶ Sea surface temperature (SST) reconstruction has long been in the centre of paleoceanographic research.
- ▶ In the Mediterranean, a semi-enclosed basin, quantitative SST reconstruction is crucial to understand past climate change in the region.
- ▶ Many of these methods were based on planktonic foraminifera, both in their shell geochemistry (e.g. Mg/Ca) and in the composition of the assemblages (e.g. transfer functions).

INTRODUCTION

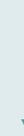
- ▶ Understanding and modelling the relationships between current census and environmental variables is the base for transforming fossil data into quantitative estimates of these variables.



Principles of quantitative palaeoenvironmental reconstruction showing X_0 , the unknown environmental variable to be reconstructed from fossil assemblage Y_0 , and the role of a modern training set consisting of modern biological X and environmental data Y (Birks, 1995).

OBJECTIVES

- ▶ Although globally, foraminifer assemblages appear to be determined mainly by temperature, in marginal basins like the Mediterranean, the assemblage composition could potentially respond to other environmental factors in addition to temperature.



Which may control the variability of planktonic foraminifer assemblages in the modern Mediterranean?

METHODS

- ▶ **BIOLOGICAL DATA:** census counts of planktonic foraminifera assemblages from Mediterranean coretops (ForCenS data base) (Siccha & Kucera, 2017). Sp. with maximum abundances > 1%.

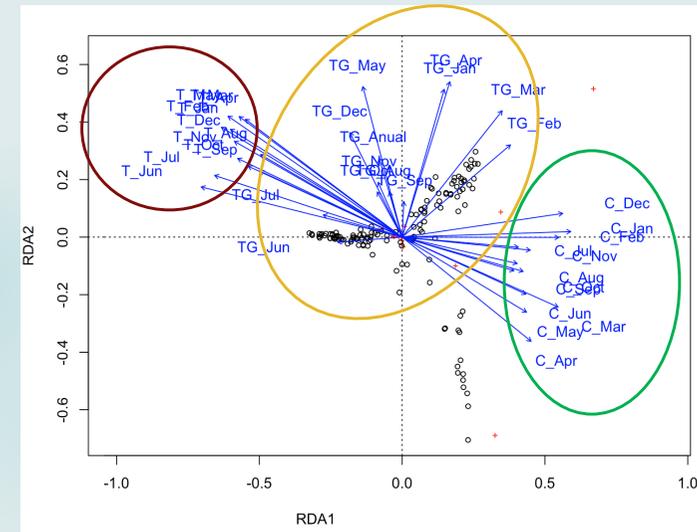


- Redundancy Analysis (RDA) – Forward selection of variables: evaluating the explanatory power and the collinearity among tested environmental parameters and identify those explaining independently the largest share of the variance in the composition of planktonic foraminifera assemblages.

- ▶ **ENVIRONMENTAL VARIABLE:** monthly and annual estimates of SST, surface chlorophyll concentration (SSC), and vertical 100 m thermal gradient (TG) from the World Ocean Atlas 1998 (WOA98).

RESULTS

MULTICOLLINEARITY!



RESULTS

- ▶ Significant variables were identified:

VARIABLES	R2	F	Pvalue.Holm
SST_Jun	0,43	99,89	0,001
TG_Dec	0,15	46,03	0,001
SST_May	0,08	31,23	0,001
TG_Aug	0,03	11,39	0,001
TG_Sep	0,03	12,00	0,001
SSC_Feb	0,02	10,34	0,001
SST_Feb	0,02	9,10	0,001
SSC_Jan	0,02	8,09	0,002
TG_Apr	0,01	6,02	0,006
TG_Jul	0,01	4,92	0,044
	0,79		

TAKE HOME

- ▶ Planktonic foraminifer assemblages in the Mediterranean appear to be determined, also, by different environmental variables than surface temperature.
- ▶ Three of the significant variables correspond to SST while the other seven are distributed among surface chlorophyll concentrations (2) and vertical thermal gradients (5). The most explanatory variables of the assemblage variability are June SST (R^2 0.43) and December vertical thermal gradient (R^2 0.15).
- ▶ Significant variables explain together up to ~80 % of the assemblage variability and show high collinearity.
- ▶ After a variance' inflation analysis, it is possible to determine the largest number of independent variables and develop transfer functions for their reconstruction thought fossil biological data.