Paleoclimatic reconstruction from marine records of central and western Mediterranean area over last millennia

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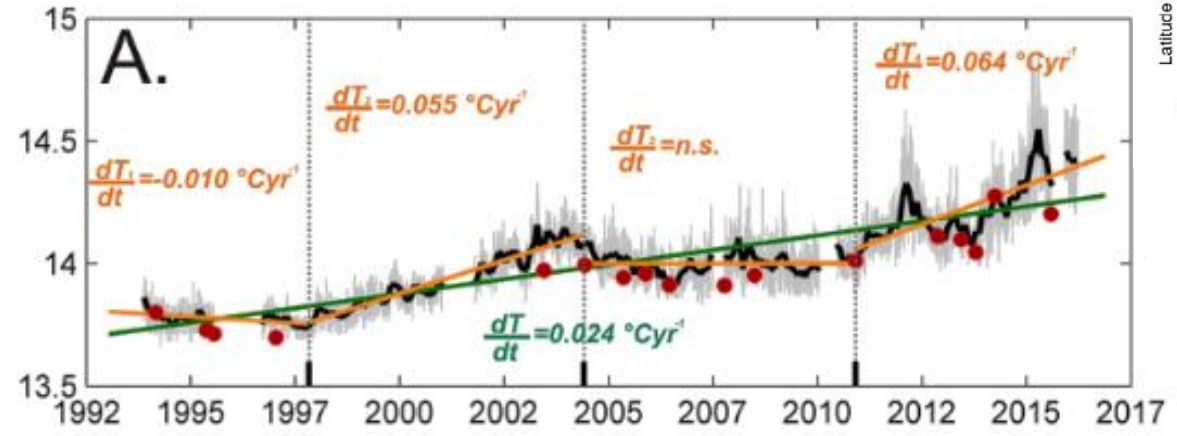
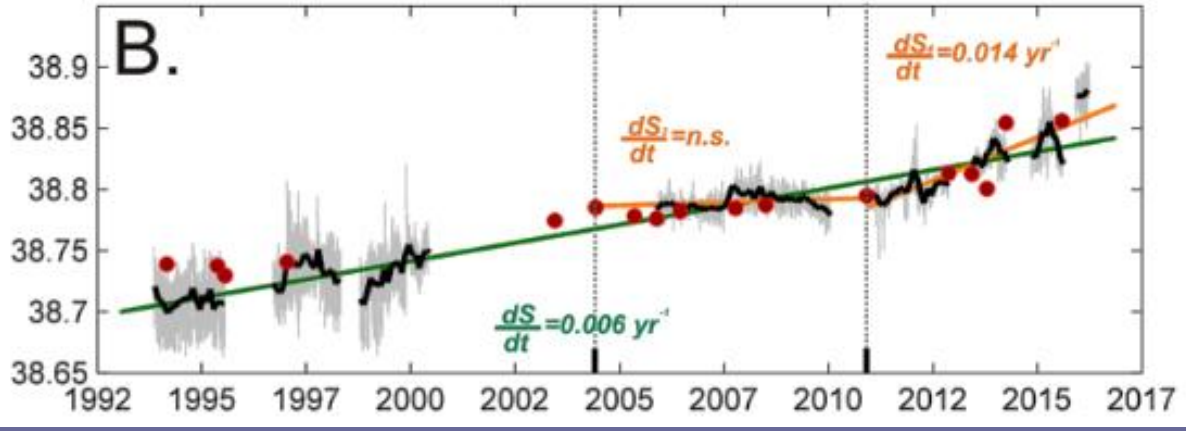
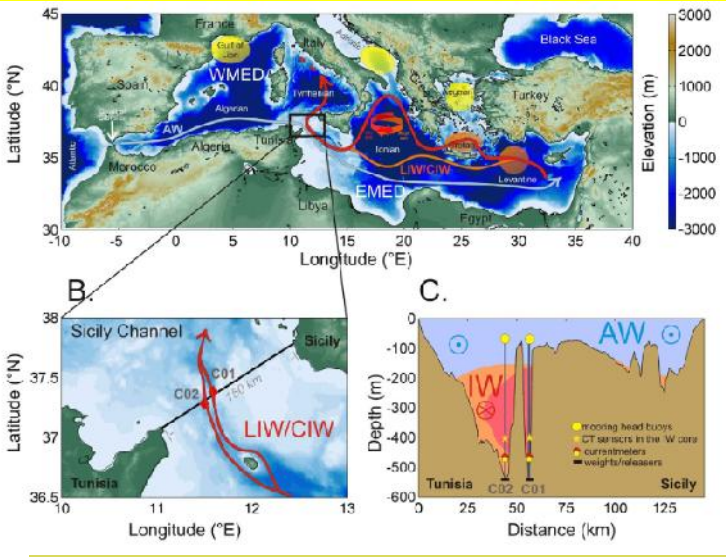
Climate is changing?

Are there evidences of this changing?





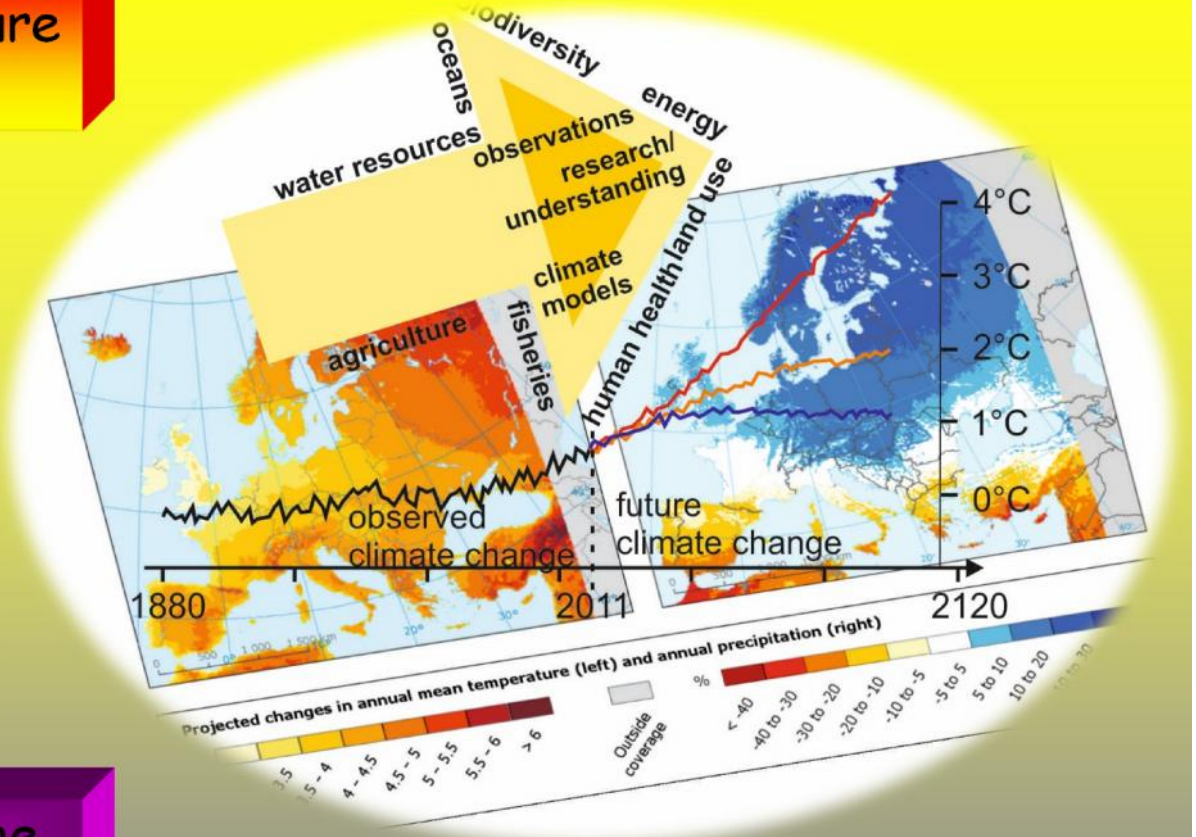


Schroeder et al., 2017

Are there projection of future changes in temperature?

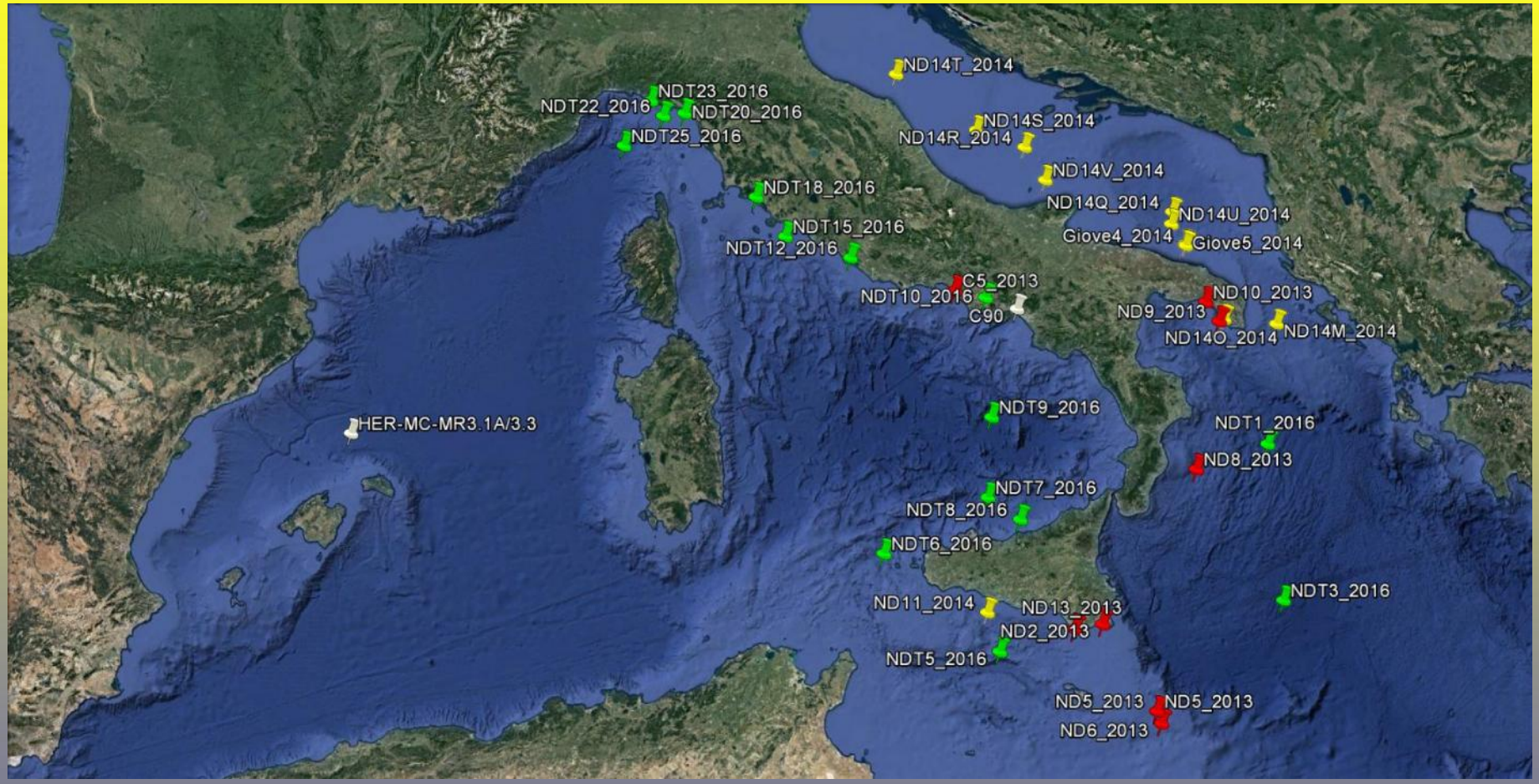
Are there evidences of recent past climatic changes?

Is it possible to document the impact of these past climate change on marine ecosystem?

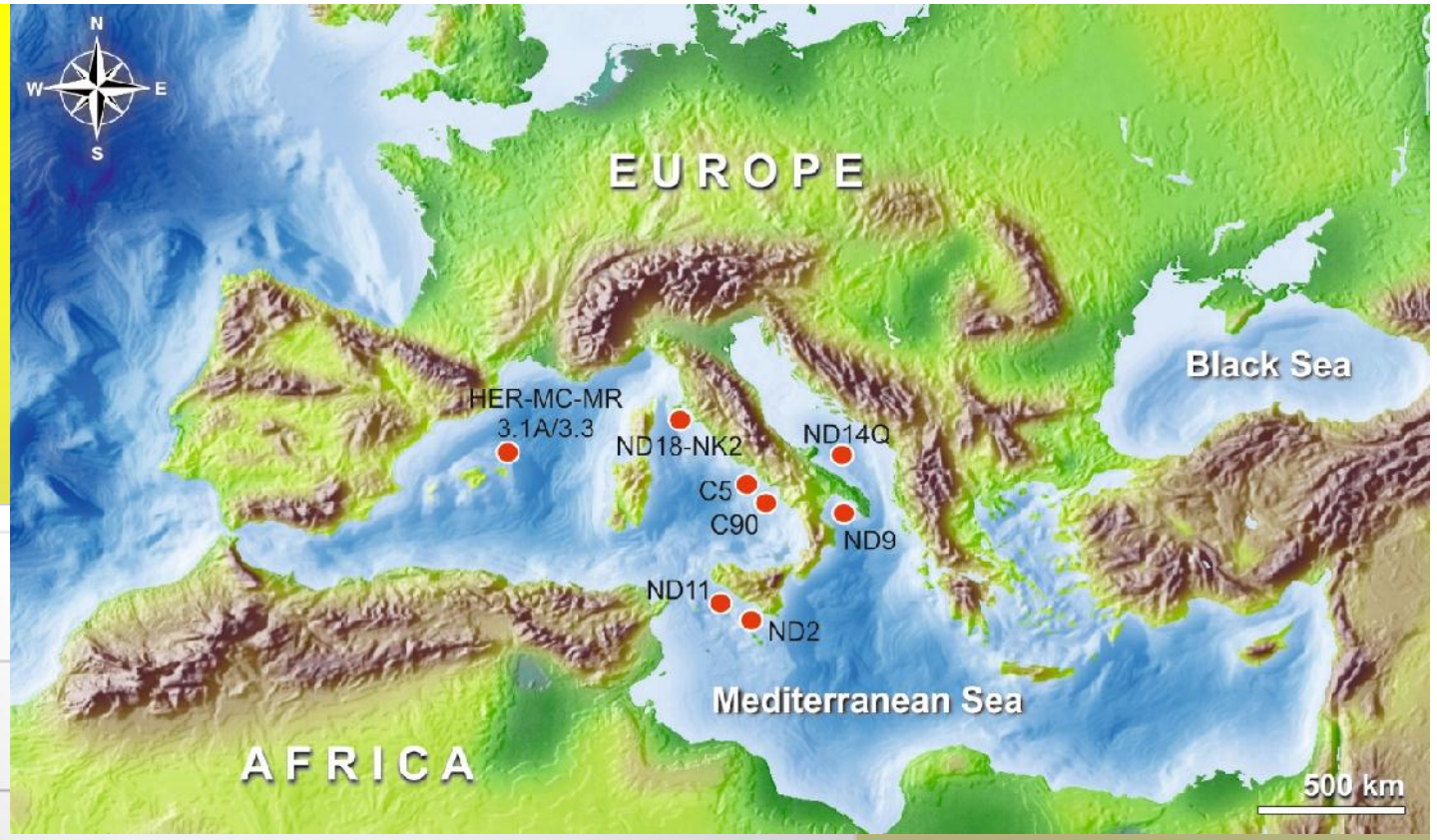


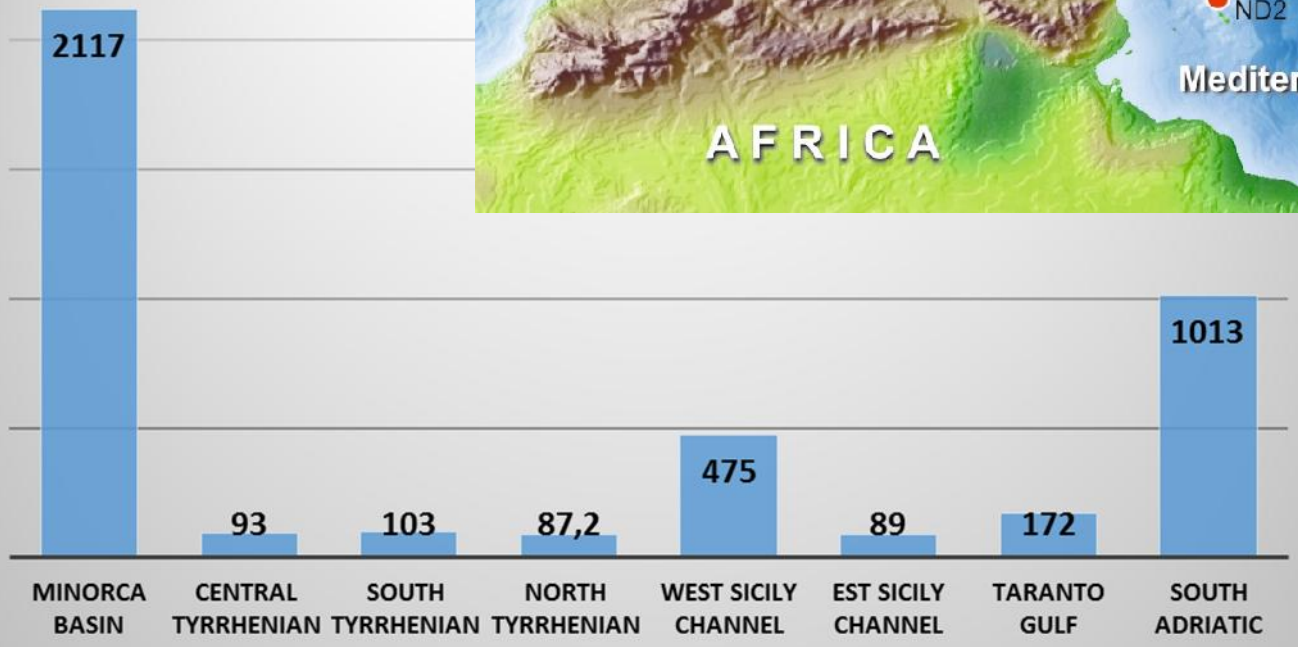
Necessity: urderstanding the past is the key to understand the present

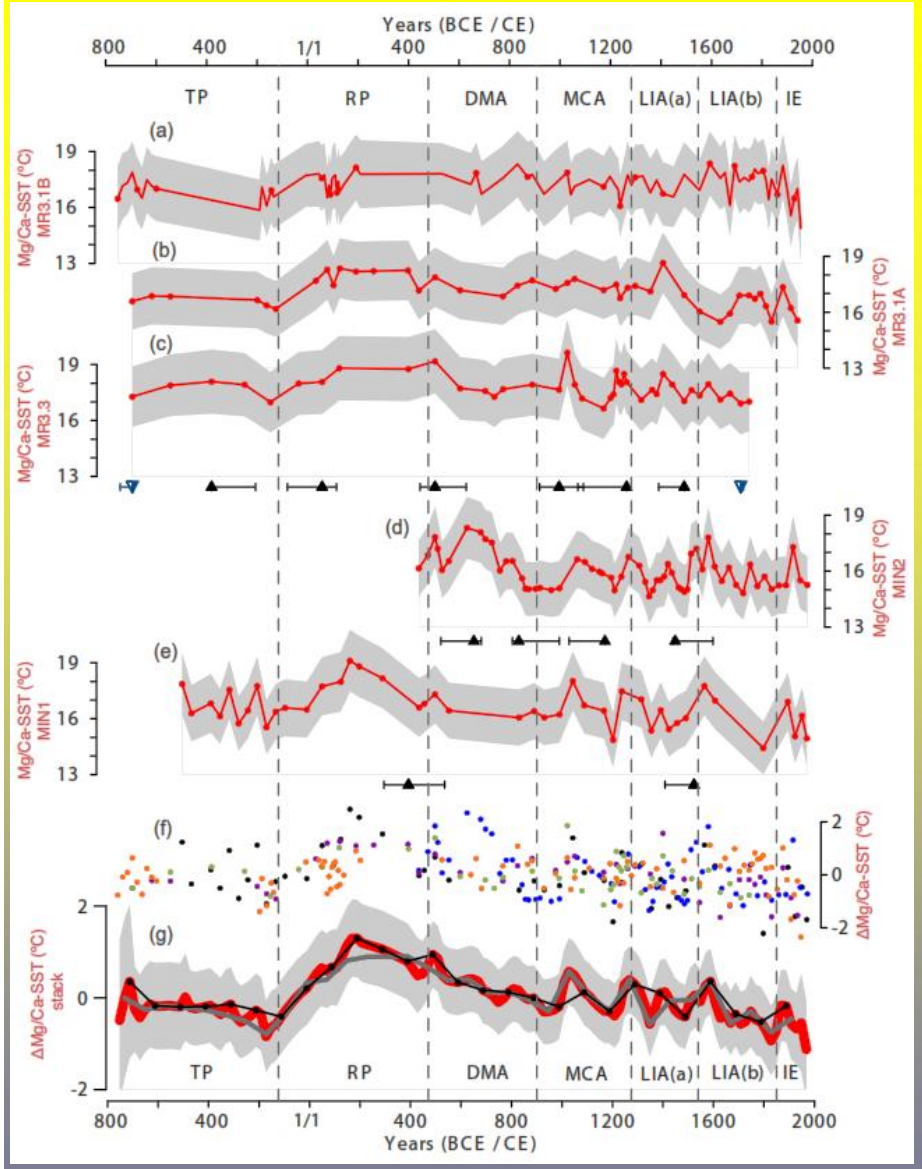
Marine cores recovered for NextData project (http://www.nextdataproject.it/) during three oceanographic cruises: NextData-2013; NextData-2014; NextData-2016



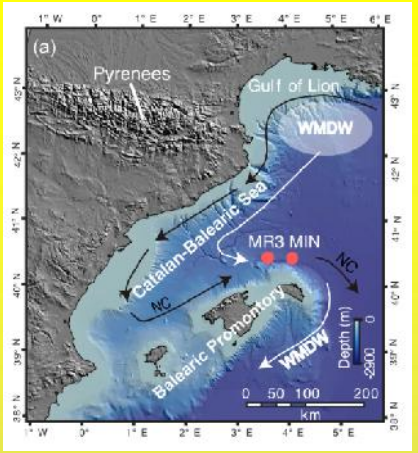
- Climatic variability over the last two millennia in Italy
- Construction of a Mediterranean marine core database


N
W
E
S
EUROPE
Black Sea
HER-MC-MR
3.1A/3.3
ND18-NK2
ND14Q
C5
C90
ND9
ND11
ND2
Mediterranean Sea
AFRICA
500 km


meter water depth
2117
93
103
87,2
475
89
172
1013
MINORCA BASIN
CENTRAL TYRRHENIAN
SOUTH TYRRHENIAN
NORTH TYRRHENIAN
WEST SICILY CHANNEL
EST SICILY CHANNEL
TARANTO GULF
SOUTH ADRIATIC



Globigerina bulloides



Clim. Past, 12, 849–869, 2016
www.clim-past.net/12/849/2016/
doi:10.5194/cp-12-849-2016

Climate of the Past
Open Access
EGU

Sea surface temperature variability in the central-western Mediterranean Sea during the last 2700 years: a multi-proxy and multi-record approach

Mercè Cisneros[1], Isabel Cacho[1], Jaime Frigola[1], Miquel Canals[1], Pere Masqué[2,3,4], Belen Martrat[5], Marta Casado[5], Joan O. Grimalt[5], Leopoldo D. Pena[1], Giulia Margaritelli[6], and Fabrizio Lirer[6]

Gaeta Gulf (central Tyrrhenian Sea)

when the NAO index is positive south Europe climate is mild and dry; a negative NAO index is associated with the reverse pattern

Contents lists available at ScienceDirect
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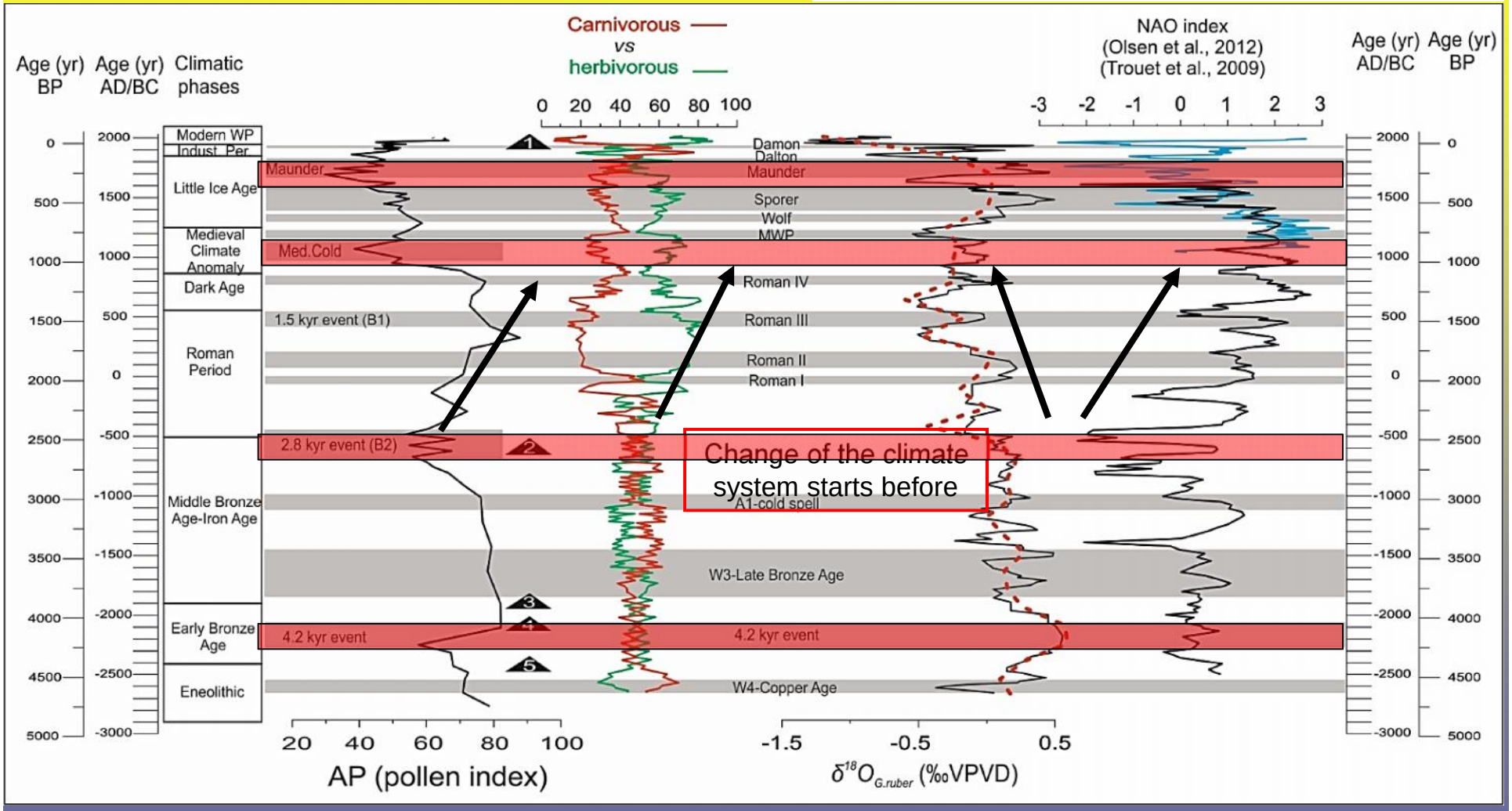
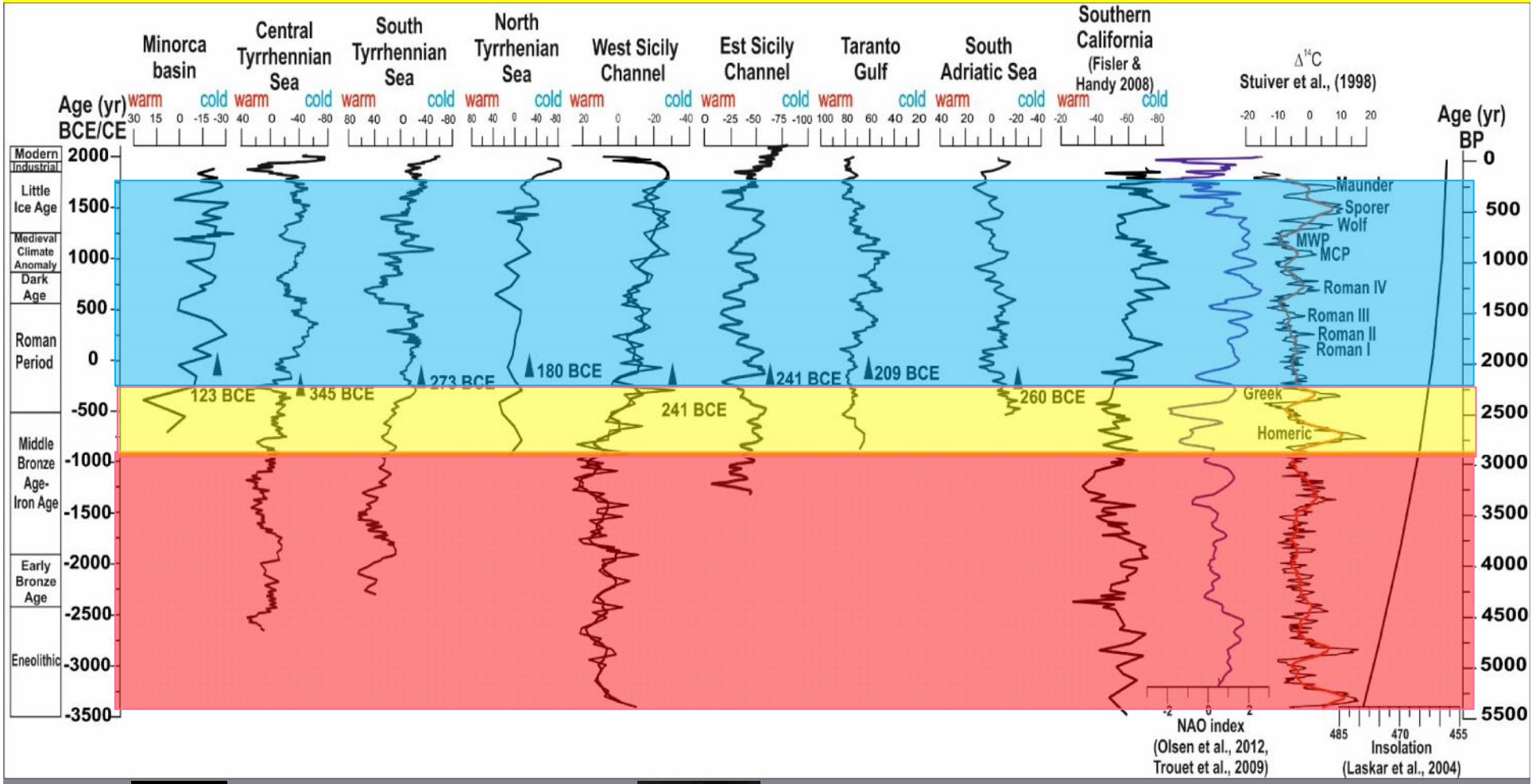
journal homepage: www.elsevier.com/locate/gloplacha

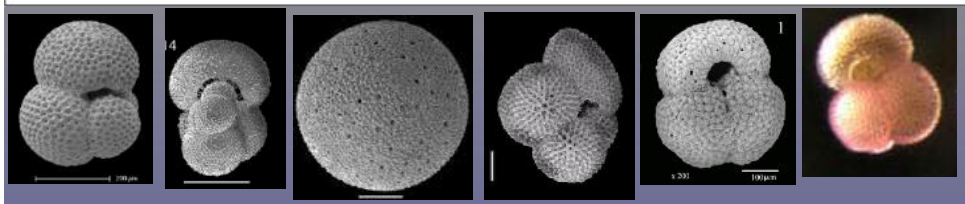
Marine response to climate changes during the last five millennia in the central Mediterranean Sea

G. Margaritelli [a,b,*], M. Vallefuoco [a], F. Di Rita [c], L. Capotondi [d], L.G. Bellucci [d], D.D. Insinga [a], P. Petrosino [e], S. Bonomo [a], I. Cacho [f], A. Cascella [g], L. Ferraro [a], F. Florindo [h], C. Lubritto [i], P.C. Turcock [h], D. Magri [c], N. Pelosi [a], R. Rettori [b], F. Lirer [a]



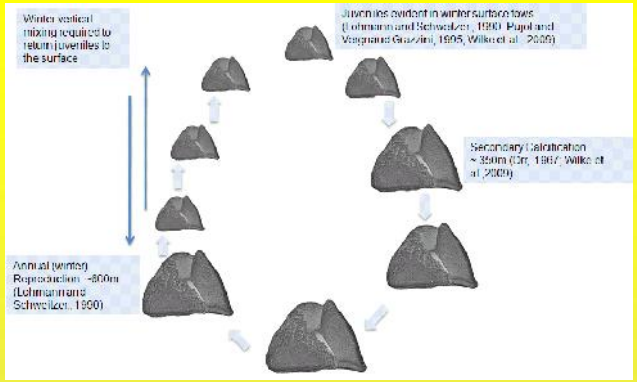
Mediterranean climatic oscillation over the last three millennia

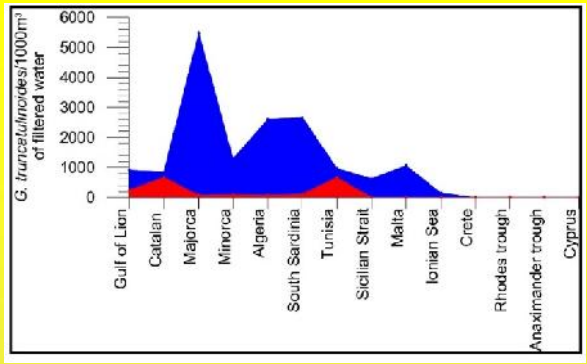




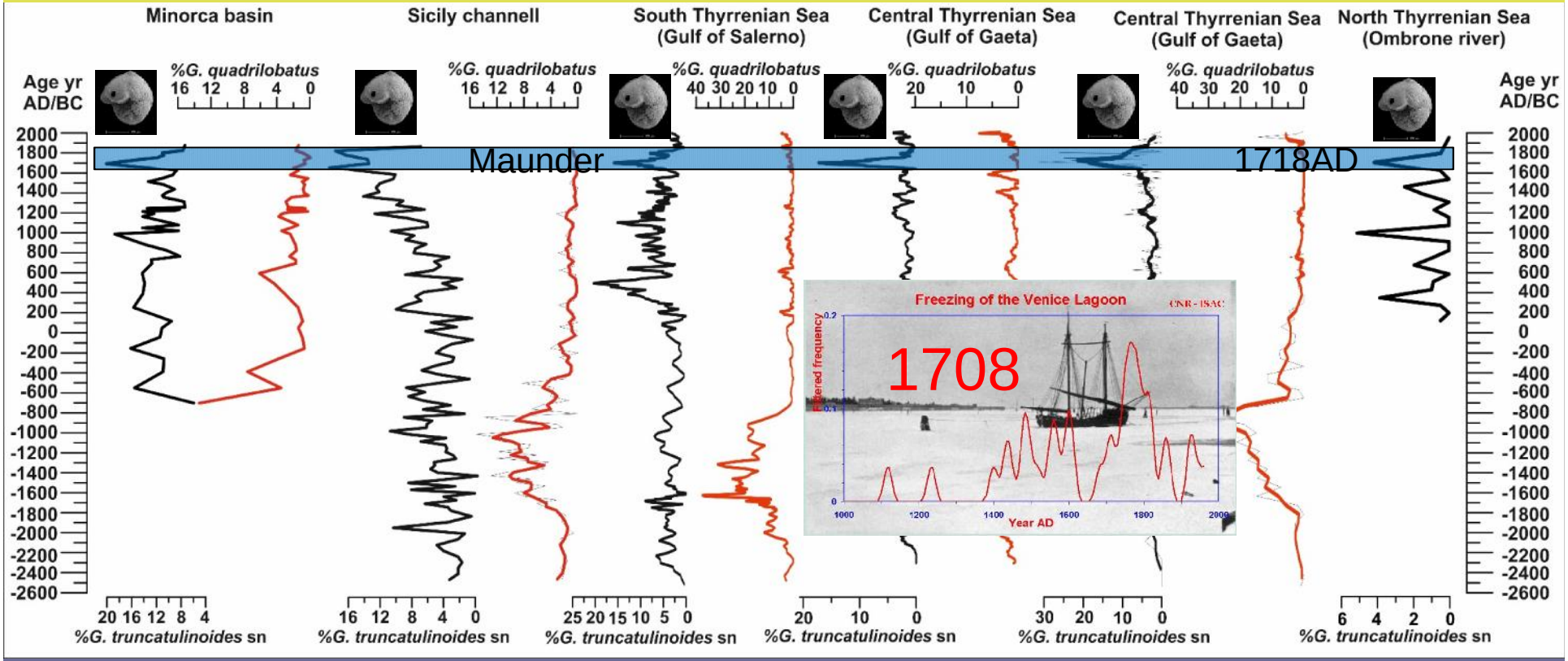
Warm water species

Cold water species

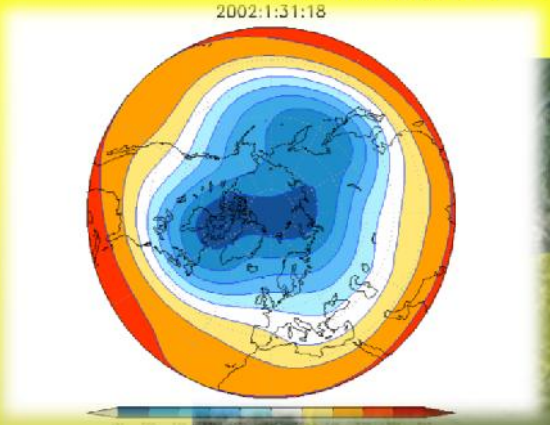




Atlantic blocking vs *Globorotalia truncatulinoides* (Margaritelli et al. 2016)



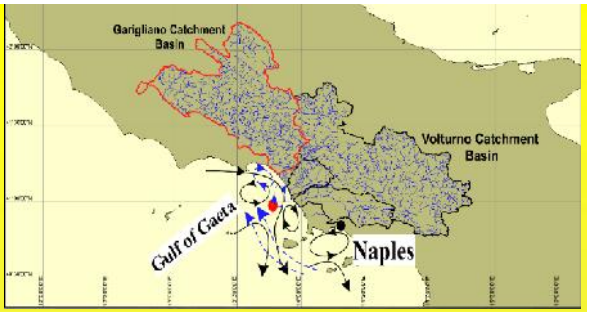
Geographic distribution of *G. truncatulinoides* during Maunder event in the western Mediterranean

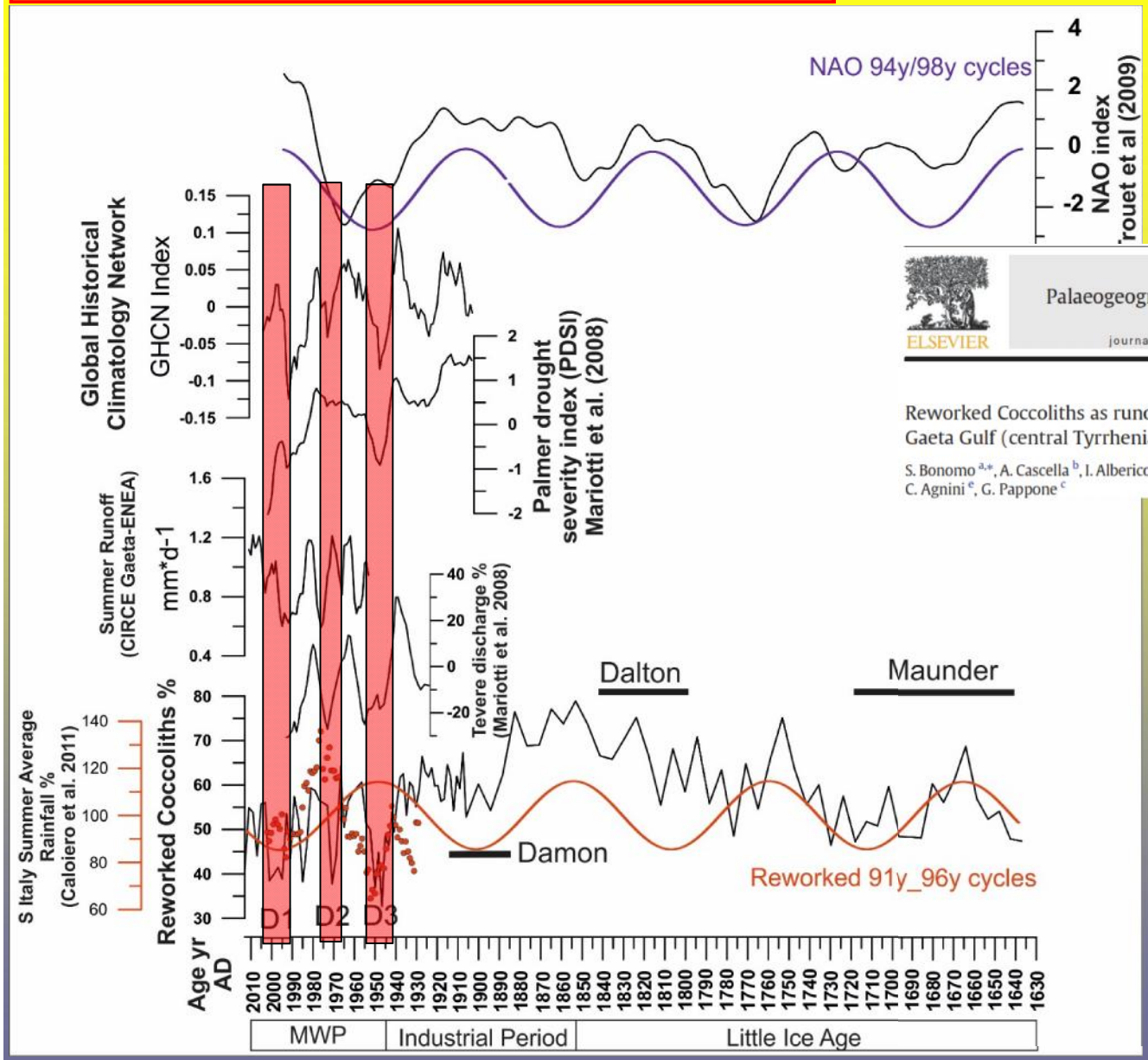


Strong winds caused by Atlantic blocking may be responsible for mixing water and this can be result in the rapid spread of ***G. truncatulinoides*** ***(Margaritelli et al. (2016)***

G. truncatulinoides indicates the presence of a deep mixed layer during winter

positive NAO index is associated with decrease in runoff;
negative NAO index with reverse pattern





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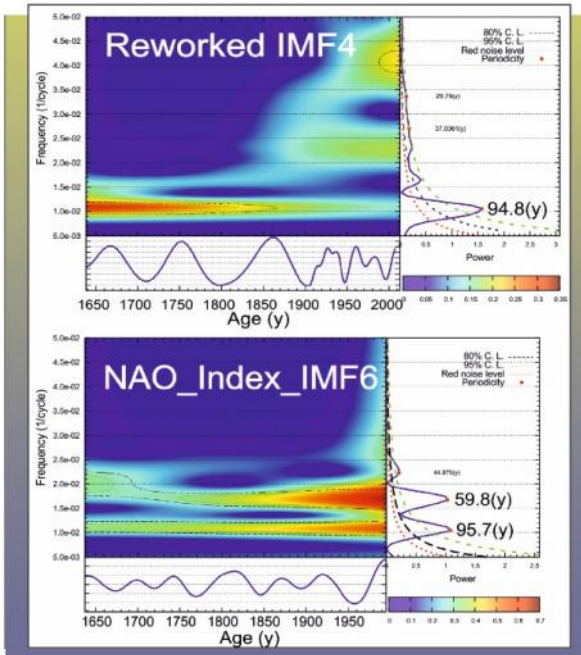
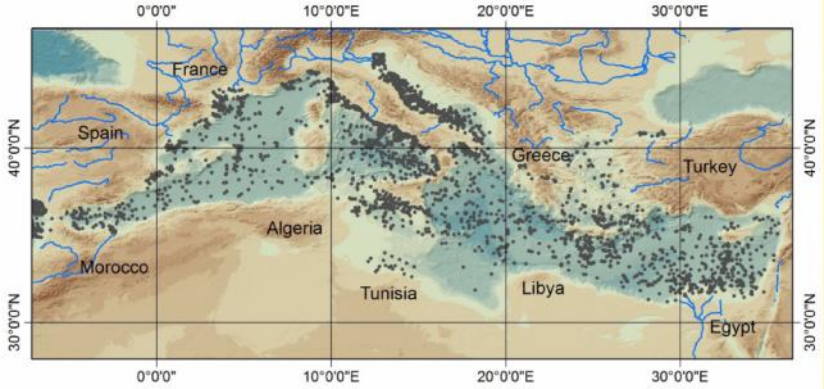
journal homepage: www.elsevier.com/locate/palaeo

Reworked Coccoliths as runoff proxy for the last 400 years: The case of Gaeta Gulf (central Tyrrhenian Sea, Central Italy)

S. Bonomo [a,*], A. Cascella [b], I. Alberico [a], S. Sorgato [c], N. Pelosi [a], L. Ferraro [a], F. Lirer [a], M. Vallefuoco [a], L. Bellucci [d], C. Agnini [e], G. Pappone [c]



Paleoclimate Mediterranean DATABASE



Sea/Ocean	Cores (%)	Sea/Ocean	Cores (%)
Adriatic Sea	11,93	Marmara Sea	1,15
Aegean Sea	4,09	Mediterranean Sea-Eastern Basin	29,77
Alboran Sea	2,77	Mediterranean Sea-Western Basin	13,71
Balearic Sea	1,98	Tyrrhenian Sea	28,79
Ionian Sea	4,70	Strait of Gibraltar	0,02
Ligurian Sea	1,12		

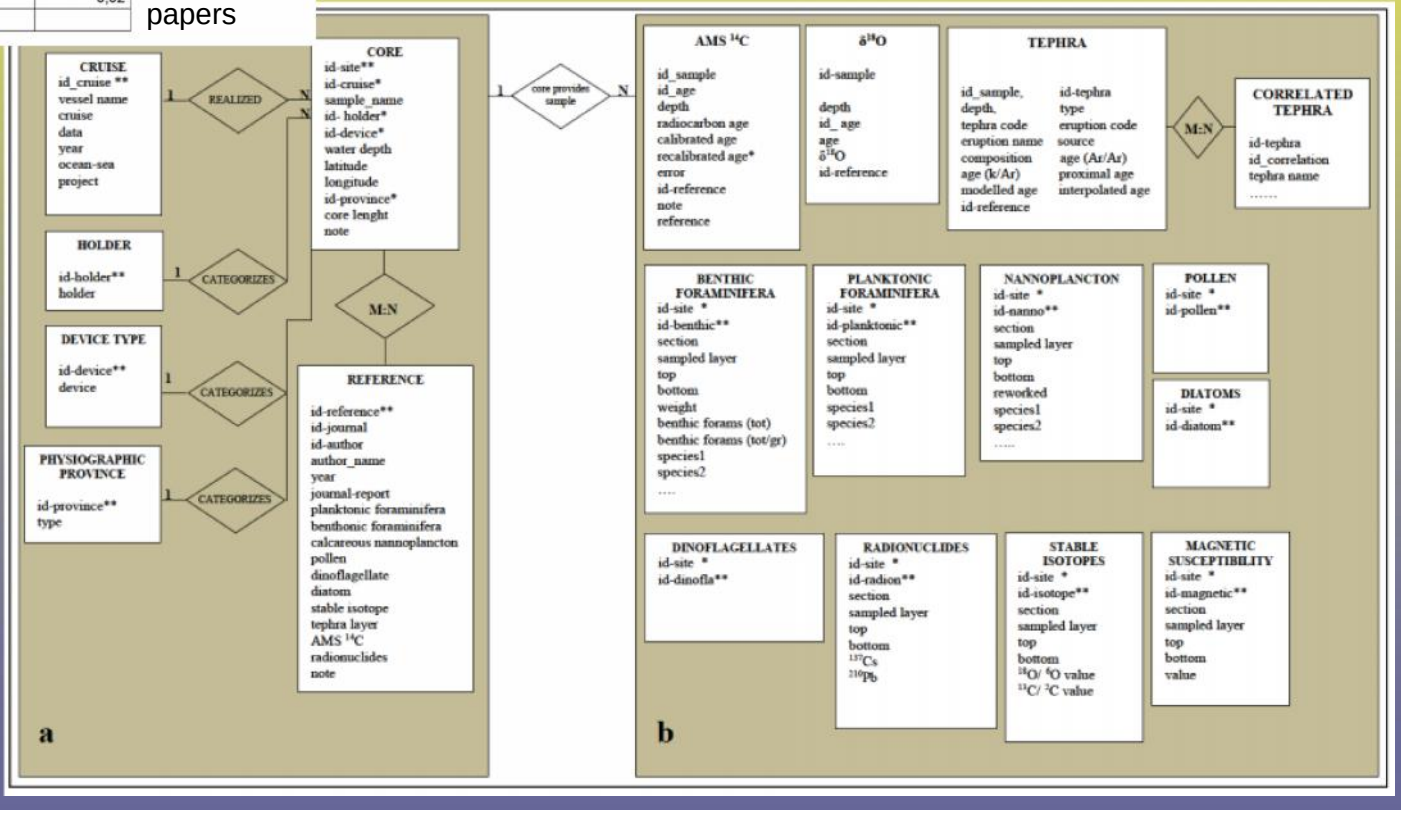
6000 cores
200 scientific papers

DE GRUYTER OPEN Open Geosci. 2017; 9:221–239

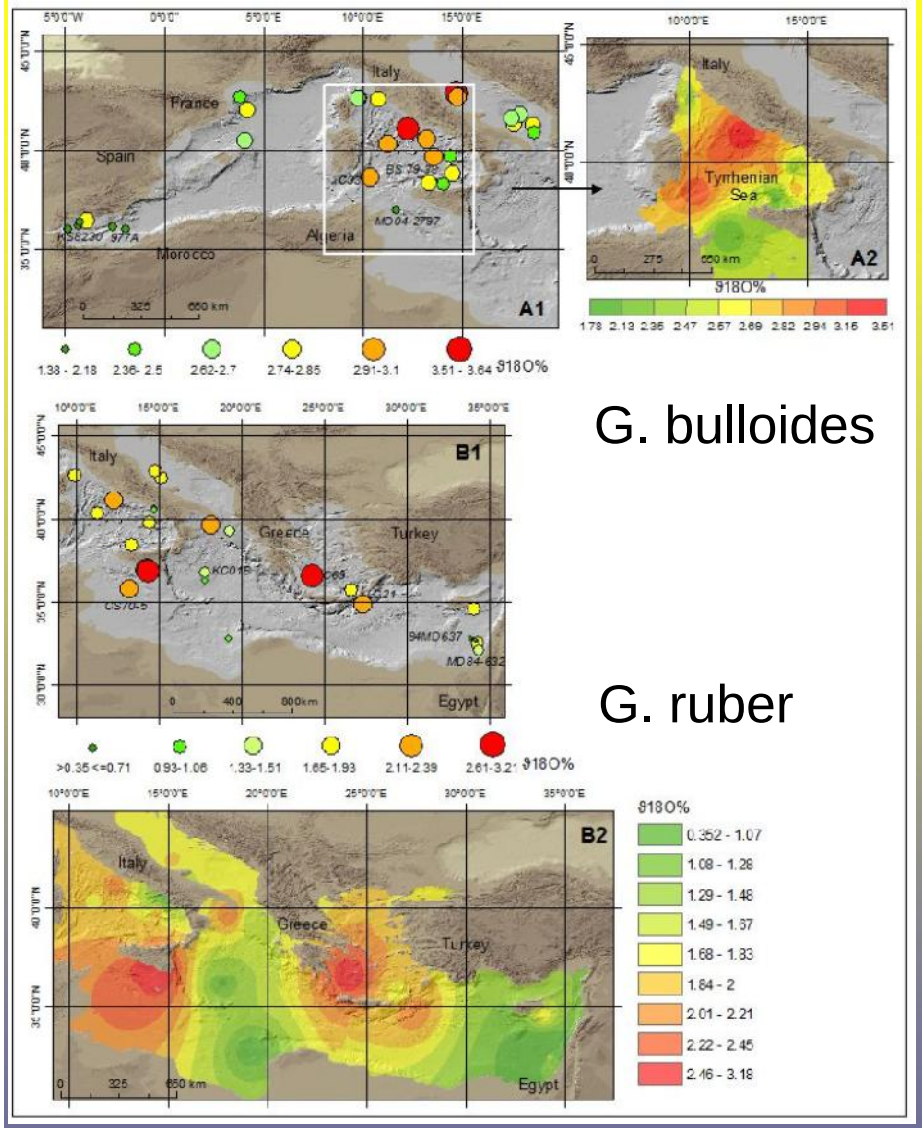
Research Article Open Access

I. Alberico*, I. Giliberti, D.D. Insinga, P. Petrosino, M. Vallefuoco, F. Lirer, S. Bonomo, A. Cascella, E. Anzalone, R. Barra, E. Marsella, and L. Ferraro

Marine sediment cores database for the Mediterranean Basin: a tool for past climatic and environmental studies



Paleoclimate Mediterranean DATABASE



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Research Article
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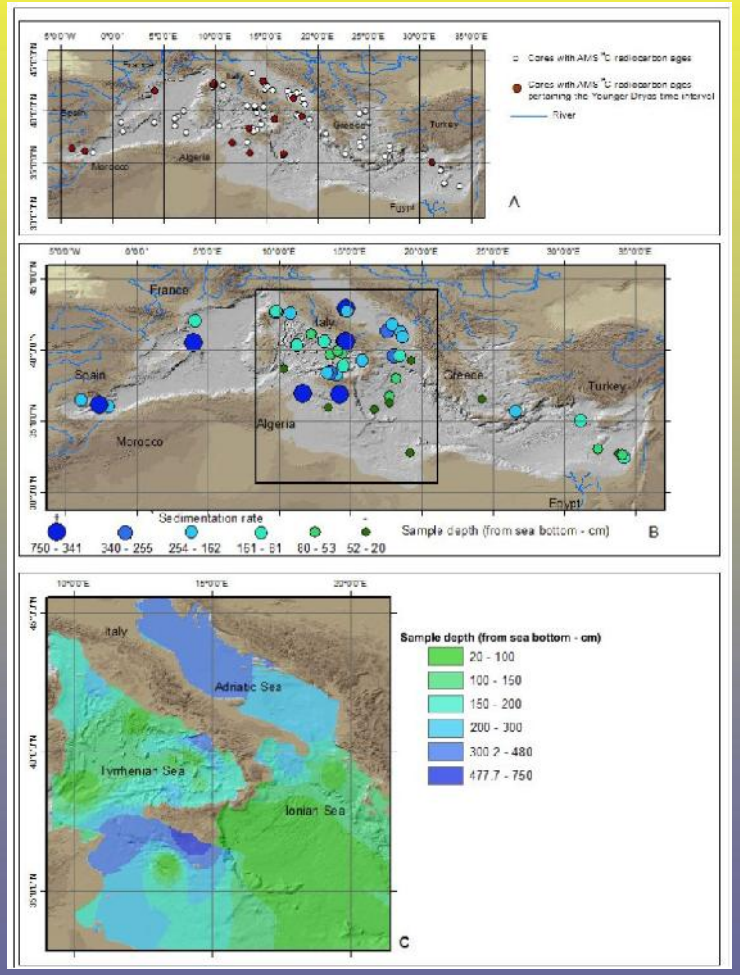


2017-2018 NextData: Tephra

SITE
id-site
type record (marine; continental)
location
site_name
…….

TEPHRA

id_sample	id-tephra
depth	type
tephra code	eruption code
eruption name	source
composition	age (Ar/Ar)
age (k/Ar)	age (AMS ^{14}C)
modelled age	proximal age
id-reference	interpolated age

CORRELATED TEPHRA
id-tephra
id_correlation
tephra name
……

Correlation/Chronology

Volcanic Forcing

Hazard

Planning

id_site	sample	latitude	longitude
REF00A389	BAN-86 25	34.259	19.1108

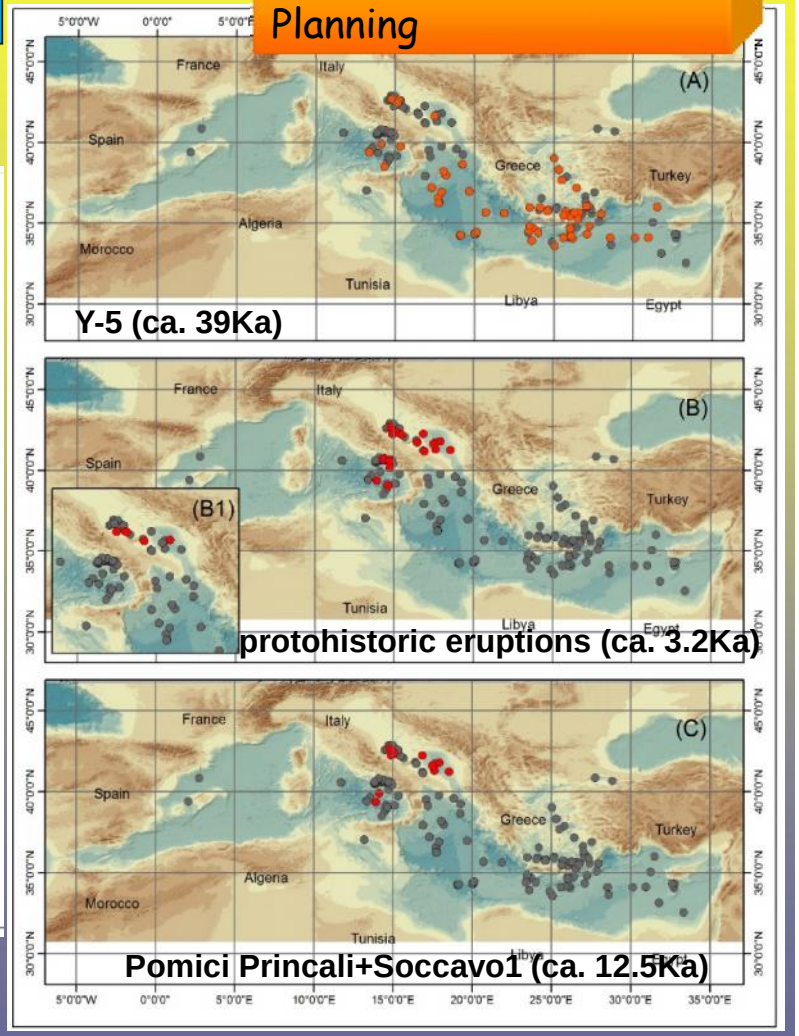
id_site	id_reference
REF00A389	692

id_reference	id_author	author	year	journal - report	tephra layer	……. …
692	22	Vezzoli,	1991	Marine Geology 100, 21-34	x	

id_site	id_tephra	depth	type	tephra code	eruption code	eruption name	source	age	……
REF00A389	BAN-86 25_01	289-288	macro	Y-5	CI	Campanian Ignimbrite	Campi Flegrei	39.28±0.11 (Ar/Ar)	
REF00A389	BAN-86 25_02	68	macro	Y-1	BMI	Biancavilla-Montalto Ignimbrite	Etna	16.965-17.670 cal years BP	

id_tephra	Id_correlation	correlated tephra
BAN-86 25_01	BAN-86 25_01_02	C-13
BAN-86 25_01	BAN-86 25_01_03	I-3
BAN-86 25_01	BAN-86 25_01_04	PRAD 1653
BAN-86 25_01	BAN-86 25_01_01	T1598
BAN-86 25_02	BAN-86 25_02	I-1

A



Conclusion

- Paleoclimatic trend
  - Planktonic foraminiferal paleoclimatic curve represents an useful tool to document past climate oscillation over the last millennia;
  - The short time interval between 750 BCE and 250 BCE, separates the warm/stable climatic condition, documented in the last two millennia BCE, from the progressive cooling over the last two millennia;
  - Between 200 and 400 CE, SST anomaly documents a warm Roman Period with a increase in temperature of ca. 2° C;
  - At ca. 600-700 CE paleoclimate curves show a progressive cooling phase up to the Maunder event;
  - The correlation between pollen concentration (AP index) and oxygen stable isotope documents that Early Bronze Age, Iron Age, Medieval Cold, and Maunder, are characterised by cold and dry climate condition. These short phases correspond with positive NAO oscillation.