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

Lirer Fabrizio

Istituto per l’Ambiente Costiero, IAMC - CNR, Napoli, Italia

fabrizio.lirer@iamc.cnr.it
Climate is changing?

Are there evidences of this changing?

Schroeder et al., 2017
Are there projections of future changes in temperature?

Are there evidences of recent past climatic changes?

Is it possible to document the impact of these past climate changes on marine ecosystems?

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

Meritxell Cámara1, Isabel Cacho, Júlia Frigola, Miguel Canals, Pere Naquet2,3, Belen Martínez1, Maria Casado1, Juan D. Alemán1, Leopoldo B. Pena1, Guilia Margheriti2, and Fabio Cerioli2
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
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
Paleoclimate Mediterranean DATABASE

6000 cores
200 scientific papers
Paleoclimate Mediterranean DATABASE

G. bulloides

G. ruber
### 2017-2018 NextData: Tephra

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

#### TEPHRA
- id_sample
- depth
- tephra code
- eruption name
- composition
- age (k/Ar)
- modelled age
- id-reference

#### CORRELATED TEPHRA
- id-tephra
- type
- eruption code
- source
- age (Ar/Ar)
- age (AMS$^{14}$C)
- proximal age
- interpolated age

#### Planning
- id_sample
- sample
- lat/long

#### Volcanic Forcing
- id_site
- id_reference

#### Correlation/Chronology
- id reference
- id author
- author
- year
- tephra name
- source
- age

#### Hazard

| REF00A389 | BAN-86 23 01 | 280-288 | macro | Y-5 | CI | Campi Flegrei | 39.28±0.11 (Ar/Ar) |
| REF00A389 | BAN-86 23 02 | 68 | macro | Y-1 | BMI | Braccione (Monte) | Elba | 16,465±7,679 cal years BP |

*Protohistoric eruptions (ca. 3.2Ka)*

*Pomici Princali+Soccavo1 (ca. 12.5Ka)*

*Y-5 (ca. 39Ka)*
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.