

# WP1 Understanding and evaluating climatic changes and natural hazards

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CEREGE, Centre Européen de Recherche et d'Enseignement des  
Géosciences de l'Environnement, **Aix en Pce**

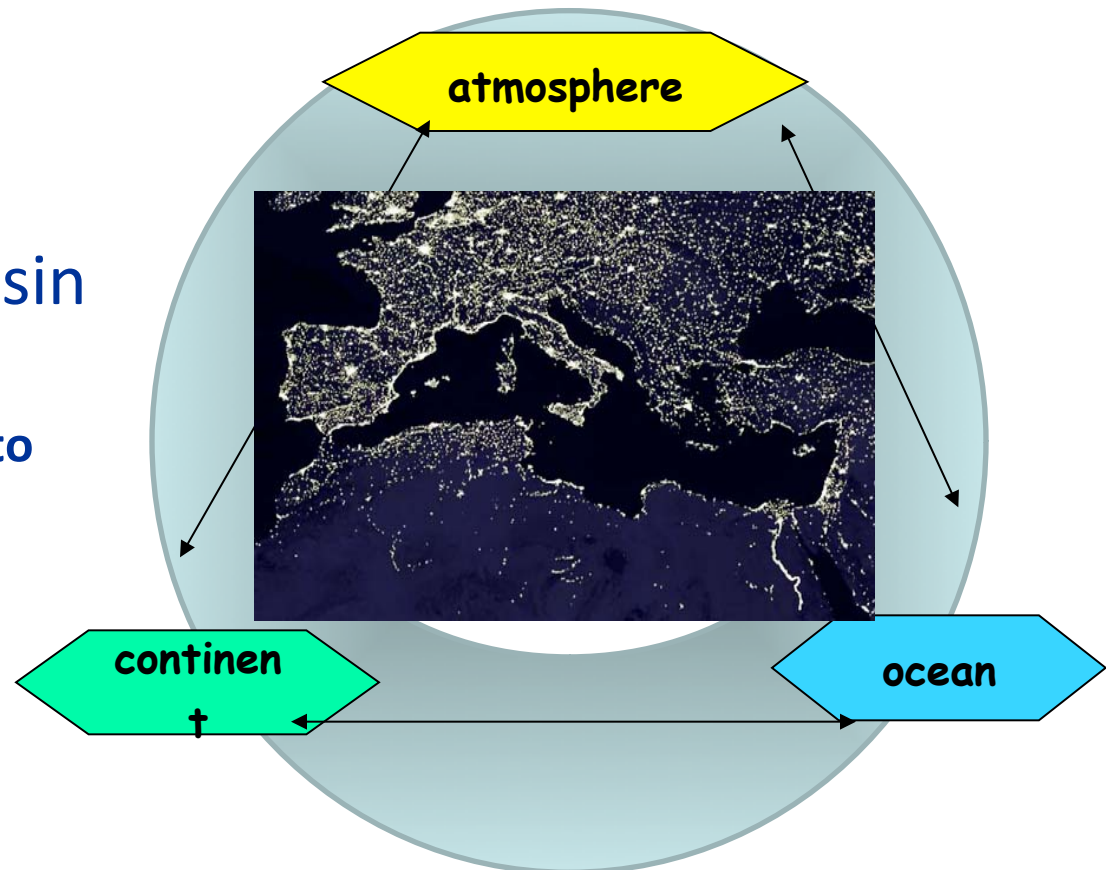
# Objectives

## ☐ Climatic changes & natural hazard assessment:

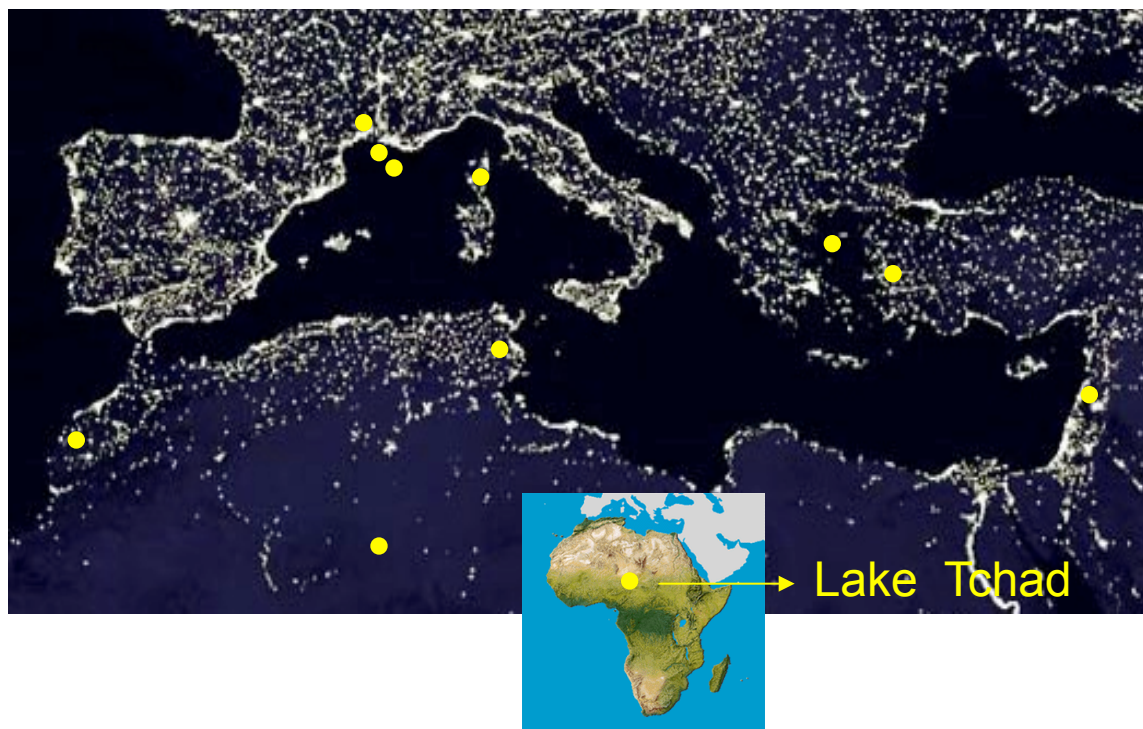
- Observing
- Evaluating and analysing variabilities at different time scales
- Modelling

## ☐ Context: Mediterranean basin

- integration from continent to the Sea
- amplification factors:  
urbanised area, high  
population densities, big  
cities, industries,  
contaminants



## Projects funded since 2012



- France, Marocco,  
Tunisia, Tchad,  
Greece, Turkey, Liban  
- seismology,  
climatology,  
hydrology,  
oceanography

- 4 thesis Benjamin Mary, Rachid Adallal, Chloé Poulin, Kahina Djaoudi
- 4 post docs 'OT-Med' funds : Mattéo Vacchi, Camille Contoux, Virginie Rioux, 'Fernand Braudel' funds : Braudel Wallid Chouari & Constantin Athanasas
- 16 projects

## Survey and rupture of dikes

Detection of woody roots growing in earth dikes  
using geophysical investigations *PhD Benjamin Mary*  
PIs Laurent Peyras & Ginette Saracco (IRSTEA,  
CEREGE)

- next WP1 talk



Liquefaction risk assessment of embankment  
dikes in lower Rhône valley PI Claudio  
Carvajal (IRSTEA, ESPACES, CEREGE,  
GREQAM)

- look at the poster



Historical, geophysical and mechanical surveys / economic  
impacts of ruptures

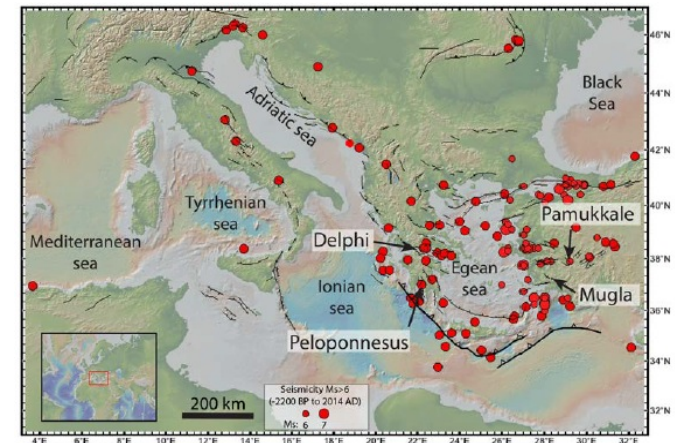
## Geodynamic processes and related natural risks



Outlining the “battleground of the Titans”: assessing the impact of the Minoan volcanic eruption of Santorini, Aegean, on the Bronze Age civilizations of the Eastern Mediterranean through state-of-the-art geochronological techniques (cosmogenic dating).

*Fernand Braudel-IFER fellowship Constantin Athanassas*  
PI Didier Bourles (CEREGE, NCSR Demokritos Athens)

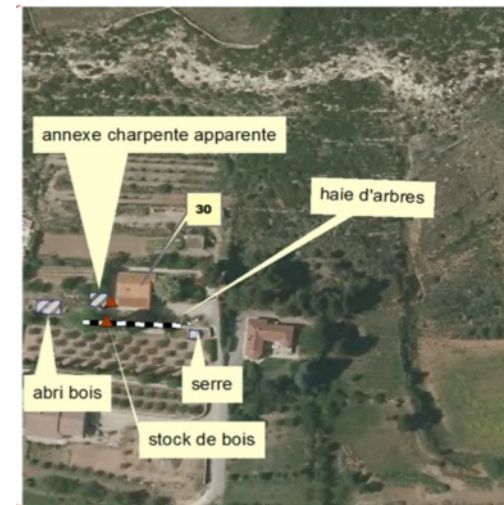
Frequency of large past earthquakes in the Aegean and associated risk susceptibility. Combining cosmogenic dating, historical data, and spatial analysis (FEARS) PI Lucilla Benedetti (CEREGE, ESPACES, coll ITU & Mugla univ. Turkey, GFZ Postdam)  
- Next WP1 talk



Lessons from past (including antic societies) to future : volcanic, seismic and tsnunamic risk, from hazard to vulnerability

## Fire risks

**Human Factors of Vulnerability to Forest Fires in Mediterranean Wildland Urban Interfaces (FAVUL)** PI Eric Mallé (IRSTEA, IMBE, LPED)



- ✓ Relationship between vulnerability criteria and local sociological traits.
- ✓ Physical multi-criteria analysis-model of vulnerability & subjective assesement of vulnerability, culture of risk, diffusion through social networks

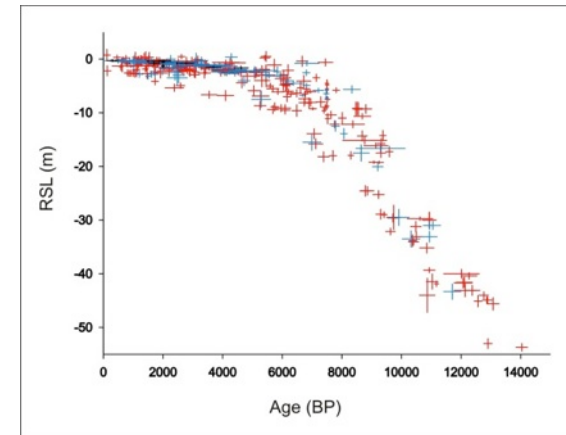
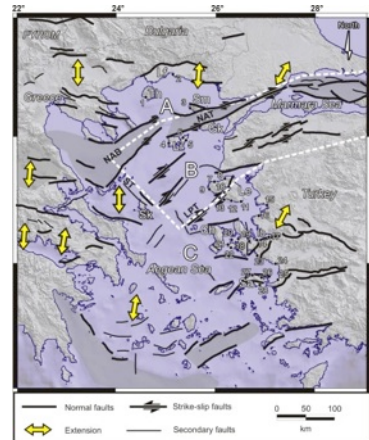
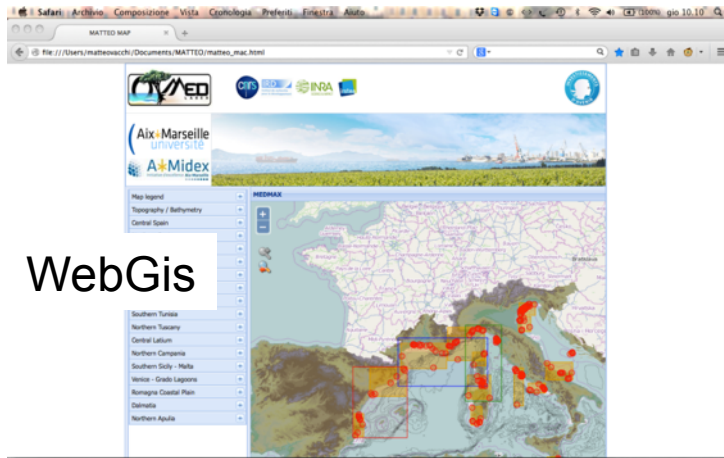
# Interaction between climate and natural hazard

MedMax. Relative sea level history of the Mediterranean since the last glacial Maximum : lessons from past to future. *Postdoct Matteo Vacchi*  
PI Christophe Morhange (CEREGE)  
- look at web site and poster



East Med  
NAT fault

800 RSL data

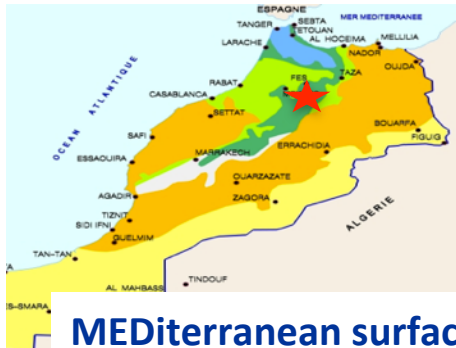


Coast line change, paleoclimatology and hazards  
A good example for an OT-Med Web data base

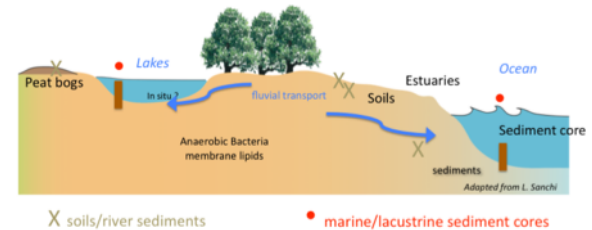
# Lessons from past to present: applications in paleoenvironment and paleoclimate

**Hydrological variability (modern and past) in Morocco since the Holocene** *PhD Rachid Adallal* PI Laurence Vidal (CEREGE, Marakech univ.)

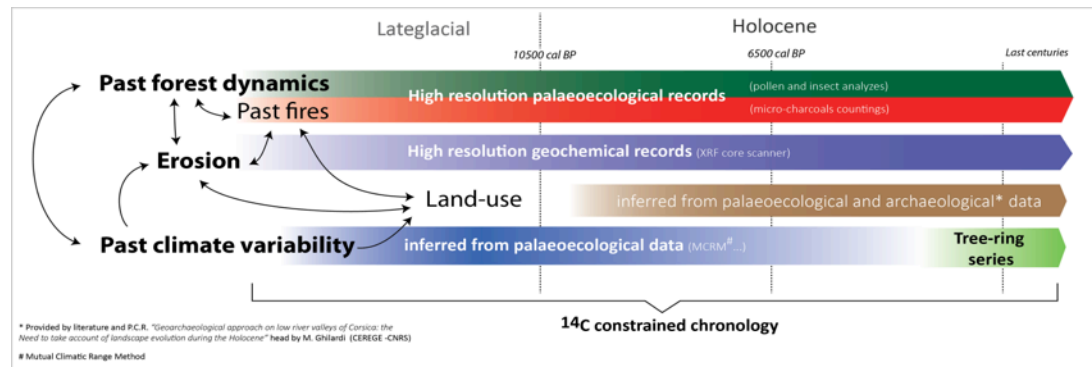
- next WP1 talk



**MEDiterranean surface Hydrology during abrupt climatic events (MEDHY)** An Econometric approach to build a new calibration model for Continental TEMPerature proxy? (ECCOTEMP) PI: Guillemette Ménot (CEREGE, GRECAM, GeoAzur)



**Corsican Palaeoclimate, Palaeoenvironments & Anthropization (COPPA)** PI Frédéric Guiter (IMBE, CEREGE, conservatoire de Corse)



- ✓ Simultaneous use of different proxies in the same archives - effort of calibration
- ✓ Simultaneous estimates of past precipitation, hydrology, temperatures, landscapes, ecosystems.
- ✓ Parametrization for modelling the future.

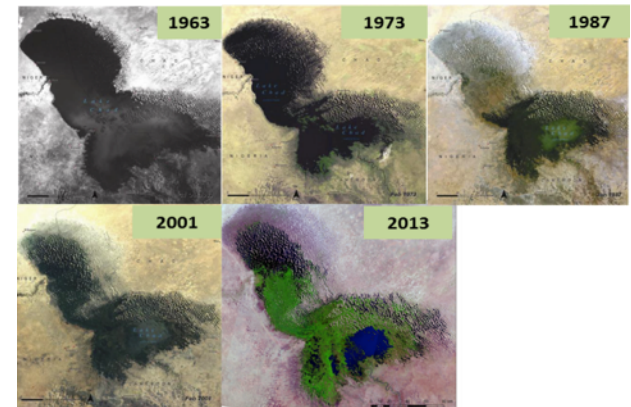


## Water resource and crisis, hydrogeology and flooding

Modern and Past recharge of the Saharan Aquifer Systems by coupling geochemical tracers ( $^{14}\text{C}$ ,  $^{36}\text{Cl}$ ,...) and hydrological modeling. *PhD Chloé Poulin* PIs Pierre Deschamps, Christophe Muller (CEREGE, GREQAM)

Understanding the Long-Term variability of Lake Chad environments: a paleoclimate modelling approach for a better assessment of future change. (CHAD-UNITE) *Postdoct Camille Contoux* PI Florence Sylvestre (CEREGE, IMBE, LSCE)

- look at the poster



Wetlands in Tunisia : Cartography of the spatio-temporal dynamics and the natural systems deterioration. *F. Braudel fellowship Walid Chouari*

PIs Aurélie Arnaud, Jean-Claude Raynal (LIEU, OHM Bassin Minier de Provence)

- next WP1 talk

Lessons from past to present

From estimation of resource to risk assessment and management

Merging of geophysical and economical models

## Anthropogenic and climate change on ocean carbon sequestration

Impact of atmospheric input on the stoichiometry of dissolved organic matter in the surface Mediterranean Sea (started in 2014) *PhD Kahina Djouadi* PI Elvira Pulido-Vilena (MIO, CEREGE) - look at the poster



Remineralization of Organic particles in Presence of Ballast Minerals (ROBIN) *Postdoc Virginie Rioux* PI Christian Tamburini (MIO, CEREGE)

- ✓ Continent - ocean interaction
- ✓ Episodic events (aerosol deposition), acidification, enhanced stratification
- ✓ Consequences on surface and deep sea ecosystems

## Thematic events

✓ Theme day “Fires: hazards, ecosystems vulnerability”:  
June 20, 2014 (11 talks and discussion; about 50  
attendees) IRSTEA, IMBE, CEREGE

*Journée thématique*  
**ECCOREV – PRZI « Environnement » AMU – OT-Med**  
Risque sismique  
10 Octobre 2014  
Europe de l'Arbois, salle de conférence du Forum

ECCOREV, **Axe 1:** Morphogénèse, risques naturels et variabilité climatique  
**Axe transverse:** Risques et Informations  
OT-Med, **Axe 1:** Comprendre et évaluer les changements climatiques et  
les risques naturels en Méditerranée



*Renseignements, personnes à contacter:*  
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aurelie.arnaud@univ-amu.fr  
Eric Chojnacki (IRSN), axe transverse ECCOREV  
eric.chojnacki@irsn.fr

✓ Theme day "Seismic  
risk": October 10, 2014 (7  
talks, round table, about  
50 attendees) CEREGE,  
LIEU, IRSN

✓ Interdisciplinary meeting “PALEOCLIMATE and  
PAST EARTHQUAKES in the MEDITERRANEAN  
during the HOLOCENE” (L. Vidal & L. Benedetti)  
July 8 -9, 2014 (100 attendees and 50  
contributions) CEREGE, IMBE

Interdisciplinary meeting on climate change and seismic hazards during the Holocene in the mediterranean  
JULY 7 and 8, 2014  
CEREGE, Technopôle de l'Arbois, Aix-en-Provence  
Details and inscription : <http://www.otmed.fr/spip.php?article661>  
Contacts : Laurence Vidal (vidal@cerege.fr), Lucilla Benedetti (benedetti@cerege.fr)

## Co-funded workshops

- ✓ Workshop Mermex Zagreb
- ✓ Colloque "International Conference on Forest FireRisk"  
"Anthropogenic Vulnerabilities of Rural-Urban Interfaces (RUI)  
to Forest Fire"
- ✓ 7th HyMex Workshop Hydrological cycle in the  
Mediterranean eXperiment



## Participation to public events

Conferences or debates on climate, seismic risk in "Fête de la Science", « Maison des associations », « Café des Sciences », Alcazar library, help for permanent exposition. Scientific expertise for the realisation of two movies: « Trois cents millions d'années » and « Ainsi la mer » - at Villa Méditerranée.

## Conclusion on previous founded actions

### Key words emerging :

Old society - climate

Modern society - risk

Coastline - insularity

Different time scales

Interaction city vs coast : littoralization...

### Forces

Huge quantities of proposals, increasing interactions between different laboratories of OT-Med consortium and workpackages of OT-Med, seed money for new MRT Ph-D, nursery of ideas, starting block for developing more ambitious proposals

AMidex, ICDP 'Chadrill', EU ITN Marie curie action...

### Weaknesses

Not enough merging with socio economics applications, Thematic dispersion,  
Not enough internal WP1 meetings

## Future plans

### More animation

Some suggestions for thematic day or event to organize

#### «Extreme events in the Mediterranean»

seismic cluster, Messinian crisis, for example Xynthia storms, tsunamis, floods, marine circulation, fires... could be interesting and could help bringing together scientific communities '*sciences exactes/SHS*', marine/continental...

#### « Dangerous connexion: humans and climate »

Role of human and climate in structuring or degrading natural areas

#### «Littoral »

marine/continental...

.../...

## Future plans...

### **Make effort to insert socio economics (association with WP3)**

Some ideas:

- ✓ in analyzing behavioral processes (at the human to society scale) potentially affected by natural hazard
- ✓ in examining how we can achieve the resilience of communities and of the territories facing an hazard in the Mediterranean?
- ✓ in characterizing evolution of societies facing risk, and impact on the economic development of a region

### **Increase data acquisition:**

- ✓ from Earth to Sea, at small temporal and spatial scale, for implementing continent to ocean regional climate modelling

**Better comparison** between short (present) to mid (historic) and long term (paleo) analysis of hazards