WHAT KIND OF
ENVIRONMENTAL TRANSITION
FOR THE MEDITERRANEAN REGION?

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Pharo

ABSTRACTS

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WITH SUPPORT BY : cerege ECCOREV

MONDAY, October 14th

SESSION 1: BIODIVERSITY, ECOSYSTEM SERVICES, ADAPTATION

Chaired by Didier AURELLE *(Mediterranean Institute of Oceanography, Aix-Marseille University, Marseille)* **& Bruno FADY** (*INRA: Institut National de la Recherche Agronomique, Avignon, France*)

Speaker	Title
Didier AURELLE & Bruno FADY	Session introduction
Guillermo GEA-IZQUIERDO *(CIFOR-INIA, Forest Research Centre, Madrid, Spain)*	Vulnerability to global change of Mediterranean forests: towards an interdisciplinary approach in functional ecology
Rutger DE WIT *(MARBEC : Marine Biodiversity, Exploitation and Conservation, Sète, France)*	Mediterranean coastal lagoon ecosystems: ecological restoration and assessment of ecosystem services
Luis-Miguel CHEVIN *(CEFE : Centre of Functional and Evolutive Ecology, Montpellier, France)*	Population responses to randomly fluctuating environments
Abdelhamid KHALDI *(INRGREF, Tunisia)*	Mediterranean forest ecosystems: better value NWFPs for conserving resources
Keynote speaker **FADY B et al.** *(URFM, Institut national de la recherche agronomique, Avignon, France)*	Ecological gradients as an evolutionary opportunity for Mediterranean biodiversity
DISCUSSION	

Short focus **Nathalie BOUTIN** *(IMBE: Mediterranean Institute of Biodiversity and marine & continental Ecology, Aix-en-Provence, France)*	*AMU 2018 PhD prize winner: Environmental and Biodiversity Management:* Territory Management and Environmental Industrial Conflicts: In Search of Biodiversity

Vulnerability to global change of Mediterranean forests: towards an interdisciplinary approach in functional ecology

Guillermo GEA-IZQUIERDO

Global change threatens biodiversity. Different biotic and abiotic stress factors interact in time and space to condition forest dynamics. Some species already express vulnerability to climate change, decline and accelerated mortality. In the Mediterranean Region, vulnerability in forest dynamics can be greatly attributed both to the progressive increase in water stress produced by climate change and negative land-use legacies after centuries of human-related disturbances and management. Thus, it is crucial to better understand phenotypic plasticity of functional traits as well as the mechanisms associated with forest vulnerability to global change. This will enable development of more robust and realistic models both to understand past dynamics and simulate spatio-temporal variability in future forest dynamics under a much

warmer climate and an enriched atmosphere in CO_2. Examples of forest vulnerability in the Mediterranean will be discussed together with functional traits that better express vulnerability, current hypotheses related to forest vulnerability, and gaps in knowledge for sustainable forest management.

Mediterranean coastal lagoon ecosystems: ecological restoration and assessment of ecosystem services

Rutger DE WIT

By the beginning of the 21st century, many of the coastal lagoons along the French Mediterranean coastline occurred in a degraded ecosystem state, mainly because of nutrient overenrichment leading to eutrophication. The Water Framework Directive (E.U.) has initiated their ecological restoration, mainly by improved sanitation in the catchments of the lagoons, which has resulted in oligotrophication. Oligotrophication of eutrophied coastal lagoons is characterized by rapid responses of the phytoplankton and slower regime shifts of the benthic communities, indicating hysteresis compared to the eutrophication process. Non-monetary assessment of ecosystem services showed that stakeholders share a strong consensus concerning the importance of regulating services. In contrast, concerning cultural ecosystem services, different stakeholder profiles can be recognized, particularly naturalist profiles based on a contemplative approach of nature are opposed to a profile that favours consumptive use of nature combined with a sense of local identity.

Population responses to randomly fluctuating environments

Luis-Miguel CHEVIN

Climate change is characterized not only by long- to mid-term trends in the average values of environmental variables, but also by altered patterns of environmental variation on shorter time scales. In particular, most environments include a substantial component of random variation (or noise), the magnitude and predictability of which are modified by global change. In order to predict the fate of natural populations under future environmental conditions, we thus need to improve our fundamental understanding of how populations respond to randomly fluctuating environments. I will present recent and ongoing work on the interplay between phenotypic plasticity, genetic evolution, and population dynamics in noisy environments. Most of this work highlights the importance of temporal autocorrelation, which determines the time scale of environmental predictability in a stochastic environment. I will use these results to advocate for the combined use of theoretical modeling, multi-generational experiments in the lab, and long-term monitoring of wild populations, as a way to reach a more complete picture of population responses to changing environments.

Mediterranean forest ecosystems: better value NWFPs for conserving resources

Abdelhamid KHALDI

The Mediterranean basin is one of the largest biodiversity "hotspots" identified in the world. Its terrestrial ecosystems are marked by a high rate of endemism; half of the flowering plant species found in the Mediterranean region do not naturally exist anywhere else. Mediterranean forest ecosystems have suffered all kinds of aggression throughout history, but they continue to provide invaluable goods and services to societies. The conservation of Mediterranean forest resources cannot be based solely on protective

measures. Enhancing the value of Non-Timber Forest Products (NTFPs) from these resources is a conservation asset. In order to illustrate this concept, we review illustrative examples of the research that we have carried out in order to develop these NTFPs and generate income for the local populations which results in an increased concern for the conservation of forest ecosystems.

Keynote

Mediterranean biodiversity in the swell of global climate change

FADY Bruno, M. Bally, A. Bondeau, F. Carlotti, A. Chenuil, W. Cramer, J-P. Féral, T. Gauquelin, A-C. Monnet, S. Thomas, F. Van Wambeke, D. Aurelle

The Mediterranean Basin is a good example of a socio-ecological system with a high biodiversity long affected by human influence. Although significantly threatened in the 21st century by many global change related processes such as warming, drought, sea-level rise, ocean acidification and diverse extreme events, many of the highly heterogeneous Mediterranean landscapes and seascapes offer substantial opportunities for adaptation when adaptation is understood as a bundle of processes, from individual acclimatization to population level migration and genetic adaptation to management practices. Although the identification of ecosystem collapse tipping points remains a research challenge, we argue that adaptive management of marine and terrestrial habitats should rely on the nature-based solutions offered by ecological and evolutionary processes.

Short focus

Territory Management and Environmental Industrial Conflicts: In Search of Biodiversity

Nathalie BOUTIN

To what extent is biodiversity a real concern in public and private decisions affecting it? This question is approached through two environmental conflicts about projects with significant effects on both marine (Alteo case) and continental (E.On case) biodiversity. It is shown that territorial regulatory tools for conflict mitigation are inadequate, exacerbating disputes and levels of public decision-making. The persistent divergence between stakeholders is explained by their decision-making supported by three visions of Man-Nature relationship: 1) Anthropocenic, 2) Eco-pragmatic, and 3) Promethean. Thus, each conflict requires institutional tools regarding these visions, acting as attitude filters. This reveals how the interplay between vested interests leaves biodiversity in oblivion by lack of its institutionalization. It is observed that the invocation of "myths of nature" plays a positive role in spreading values for a greater concern for biodiversity. To upgrade biodiversity on national and local agendas, a deep reform of its institutional status is recommended. This requires innovation in new tools for local and national management of environmental conflicts where biodiversity is at stake.

SESSION 2: WATER RESOURCES, RISKS AND ADAPTATION

Chaired by Laurence VIDAL (CEREGE, European Center for Research and Teaching in environmental geosciences, Aix-en-Provence) & **Pierre DESCHAMPS** (CEREGE)

Speaker	Title
Laurence VIDAL & **Pierre DESCHAMPS**	Session introduction
Keynote speaker **Khatim KHERRAZ** *(Sahel and Sahara Observatory)*	Comparison of water challenges in Maghreb and Sahel
Julio GONCALVES *(CEREGE: European Research and Training Centre in Environmental Geophysics, Aix-en-Provence, France)*	Revisiting recharge and sustainability of the North-Western Sahara aquifers
Piero LIONELLO *(University of Salento, Lecce, Italy)*	The future climate of the Mediterranean region
Yves TRAMBLAY *(HSM, Hydro Sciences Montpellier, France)*	Hydrological impacts of climate change in North African countries
Valenti RODELLAS *(UAB, Universitat Autònoma de Barcelona, Spain)*	The role of groundwater processes as a conveyor of nutrients to coastal Mediterranean lagoons: fluxes and driving forces
DISCUSSION	

Short focus **Virginie BALDY** *(IMBE: Mediterranean Institute of Biodiversity and marine & continental Ecology, Aix-en-Provence, France)* **François CARLOTTI** *(Mediterranean Institute of Oceanography, Marseille)*	MISTRALS projects (co)financed by OT-Med: MerMex, BioDivMex…

Keynote

Comparison of water challenges in Maghreb and Sahel

Khatim KHERRAZ

Abstract not available

Revisiting recharge and sustainability of the North-Western Sahara aquifers

Julio GONCALVES

Abstract not available

The future climate of the Mediterranean region

Piero LIONELLO

Model simulations show that in the 21st century the temperature in the Mediterranean region will warm 20% more than the global average and precipitation will decrease at a rate around -20mm/K or -4%/K). Warming of the land areas located North of the basin will be largest in summer (locally up to 100% larger than global warming). Changes of frequency of warm nights and cold days will be similar across the Mediterranean region. Almost all nights will be classified as warm nights and there will be no cold day if the global temperature reaches the 4K threshold. Reduction of precipitation will affect all seasons in the southern Mediterranean areas (max reduction in winter at -7 mm/k or -7%/k), and mostly summer in the northern Mediterranean areas (-7mm/K or -9%/K). Climate change will likely further increase the difference in intensity of precipitation and hydrological extremes between the northern and the southern areas. The maximum number of consecutive dry days (CDD) is likely to increase faster in southern than in northern Mediterranean areas.

Hydrological impacts of climate change in North African countries

Yves TRAMBLAY

Countries in North Africa are facing water scarcity and high inter-annual variability of their water resources. Many dams and reservoirs have been built to collect surface water and improve the management of existing water resources. However climate projections for this region indicate a possible future decrease in precipitation together with an increase in temperature that could have strong impacts on water resources. The main results of a recent research project are presented, about the climate change impacts on water resources at the regional and basin scale. In addition, the limitations and uncertainties linked to the different components of the modelling chain required to produce these scenarios are discussed.

The role of groundwater processes as a conveyor of nutrients to coastal Mediterranean lagoons: fluxes and driving forces

Valentí RODELLAS, Thomas Stieglitz, Aladin Andrisoa, Peter Cook and medLOC team

A sound understanding of nutrient inputs to coastal lagoons and their ecological implications is required to sustainably manage lagoonal ecosystems. Groundwater processes, including fresh groundwater discharge and the recirculation of lagoon water through permeable sediments, have long been recognized as an essential pathway for the transfer of dissolved nutrients to coastal lagoons. The physical mechanisms driving groundwater fluxes strongly affect the extent and rate of biogeochemical reactions occurring in permeable sediments, and therefore the composition of discharging fluids. A comprehensive understanding of the

underlying physical processes is thus required in order to fully evaluate the significance of groundwater fluxes and their ecological implications, as well as to understand how changing conditions will affect coastal ecosystems. This talk will be focused on recent works conducted in French Mediterranean lagoons where we quantified the fluxes of nutrients driven by groundwater processes and identified the mechanisms driving these fluxes by using a set of different tracers and modeling approaches.

Short focus

MISTRALS projects (co)financed by OT-Med: MerMex, BioDivMex…

Virginie BALDY, François CARLOTTI
with Aumeeruddy-Thomas Y., Y., Ramet A., Faget D., Pérez T., Fourt M., Perreira S., Aupic-Samain A., Kheir M., Santonja M., Fernandez C., Gauquelin T., Reiter I., Simioni G., Ourcival J.-M., Limousin J.-M., Farnet A.M., Batteau P

The French initiative MISTRALS (Mediterranean Integrated STudies at Regional And Local Scales), is a ten-year research program and aims at a better understanding of the environmental functioning of the Mediterranean basin, in a global change context. BioDivMeX (BioDiversity of the Mediterranean eXperiment) is part of the 6 specific programs of MISTRALS. BioDivMeX addresses questions about the biodiversity of the Mediterranean region, its specificities and its vulnerability to recent changes. We will present the main results of the two BioDivMeX projects co-funded by OT-Med: “French Mediterranean FOREst functioning in changing environments: how will Climate Change Affect the suSTainable provision of biomass and other ecosystem services? (FORECCAST)” and “Spatial and temporal Adaptation of a traditional Mediterranean fishery facing Regional Change: COmbining history and ecoLogy to study past, prEsent and future of sponge harvesting (SACOLEVE)”.

TUESDAY, October 15th

SESSION 3: NATURAL HAZARDS, ASSOCIATED RISKS AND ADAPTATION

Chaired by Lucilla BENEDETTI *(CEREGE, European Center for Research and Teaching in environmental geosciences, Aix-en-Provence)* & **Thomas CURT** *(IRSTEA National Institute of Research in environmental and agricultural Science and Technology)*

Speaker	Title
Lucilla BENEDETTI & **Thomas CURT**	Session introduction
Matteo VACCHI *(Pisa University, Pisa, Italy)*	Holocene sea-levels and isostatic adjustment along the Mediterranean coasts. Where are we now?
Laura PERUZZA *(INOG : National Institute of Oceanography and Applied Geophysics, Sconigo, Italy)*	Earthquakes, memory loss and predictability
Fantina TEDIM *(University of Porto, Portugal)*	Wildfire management adaptation to climate change: the challenges, the needs, and the barriers
Goneri LE GOZANNET *(BRGM : French Geological Survey)*	Sea-level rise in the Mediterranean: examples of impacts for flooding and shoreline changes
Keynote speaker **Freddy VINET** *(Montpellier University)*	The impacts of floods in the Mediterranean basin: drivers, trends and adaptation
DISCUSSION	

Holocene sea-levels and isostatic adjustment along the Mediterranean coasts. Where are we now?

Matteo VACCHI

Glacial and hydro-isostatic adjustment (GIA) constitutes an important driver of past, present and future sea-level variability. For this reason, a major focus of current sea-level research is the continuous improvement of GIA geophysical models to provide more accurate constraints for future sea-level scenarios. The isostatic pattern defined from newly assembled Relative Sea Level databases shows significant disparity with respect to those predicted by present GIA models, notably in the bulk of the basin where sea-level data suggests a general overestimation of the magnitude of the GIA contribution. This implies GIA-related vertical motions represent a key parameter to quantify any possible post-industrial acceleration in RSL rise and to define future scenarios of coastal inundation in the Mediterranean region.

Earthquakes, memory loss and predictability

Laura PERUZZA

Earthquakes pose a persistent threat both to the physical and socio-economic infrastructures of the modern world. In the Mediterranean area, earthquakes are often devastating, even if they are not extremely strong in term of energy release (rarely above magnitude 7). This is due to the high vulnerability and exposure, which jointly with the hazard component enter into the seismic risk assessment. The strategies for seismic risk reduction adopted by the most developed countries are pivoted on the national seismic codes, the reference at the European scale being Eurocode8, released in 1998. After a short state-of-the-art of seismic hazard and risk in Italy and Europe, some controversial aspects of earthquake predictability, and on the widespread loss of memory about natural catastrophes will be tackled.

Wildfire management adaptation to climate change: the challenges, the needs, and the barriers

Fantina TEDIM

Wildfires of unprecedented size and intensity occur regularly around the globe, provoking massive evacuation, fatalities and casualties, and a growing toll of loss and damage. These extreme wildfire events (EWEs) represent a minority among all wildfires, but are a huge challenge for societies, as they exceed the current control capacity even in the best prepared regions of the world. Despite climate change, the occurrence of EWEs and disasters are not an ecological inevitability but a consequence of socio-economic dynamics and unbalanced management strategies and policies. The failure of the current "War on Fire" that is not able to cope with EWEs leads to new ways of thinking wildfire management. In this framework, two main issues are examined: 1) the rationale of the definition of EWE and the novel wildfire classification that combines physical properties of wildfires with the potential consequences on people and assets; and 2) the novel "Shared Wildfire Governance" (SwG) paradigm not only to "live with fire" but to "thrive with fire". SwG represents a tipping point in wildfire management and supports a new generation of policies.

Sea-level rise in the Mediterranean: assessing local impacts for flooding and shoreline changes

Goneri LE GOZANNET

Using contributions from Rémi THIEBLEMONT, Rodrigo PEDREROS, Jeremy ROHMER, Guy Wöppelmann and other colleagues

The Mediterranean region is recognized particularly vulnerable to sea-level rise compared to other regions due to its physical settings (microtidal coasts, low-lying areas) and the high number of human assets (cities, settlements, cultural heritage). However, characterizing sea-level rise and its impacts in the Mediterranean is far from straightforward. Here we review marine and geological processes that prevent from accurate coastal impacts assessments. Despite uncertainties in quantitative assessments of coastal impacts in the Mediterranean, we show that these are expected to be severe, as a drastic change in flooding modes (from overtopping to overflow) is expected over the coming decades in a number of places.

Keynote

The impacts of floods in the Mediterranean basin: drivers, trends and adaptation

Freddy VINET

The impacts of disasters are supposed to rise due to climate change. The presentation examines the human and economical impacts of floods in the Mediterranean basin. The flood related mortality is considered as an indicator to account for the effect of flood disasters. Trends over the forty past years show huge discrepancies between countries especially an opposition between the western and the eastern basin of the Mediterranean Sea. Concerning forthcoming trends, the presentation points out nthe difficulties to link the rising impacts of disasters to climate change as the expected trends in flood hazard still are fuzzy. Both human and natural drivers might regulate the future impacts of disasters. Stakeholders and decision makers have to take in account deep changes in climate change but also in society such as the eldering of population.

SESSION 4: PROSPECTIVE

Chaired by Joël GUIOT (Labex OT-Med) (no abstract)

Speaker	Title
Joël GUIOT	Session introduction
Jeroen VAN DEN BERGH *(Institute of Environmental Science and Technology, Univ. Autònoma de Barcelona, Spain)*	Sustainability transitions from local to global scales
Jean-Paul MOATTI *(president of IRD, Member of the Independent Group of Experts drafting the UN 2019 Global Sustainable Development Report (GSDR))*	Environmental transition and the sustainable development objectives
DISCUSSION	
Peter DE MENOCAL (Paleoclimatology, human-environment interactions) *(Center for Climate and life, Columbia, USA)* **Patrizia ZIVERI** (Marine science) *(Institute of Environmental Science and Technology, Universitat Autònoma de Barcelona, Spain)* **Luc ABBADIE** (Ecology) *(SU-ITE: Sorbonne University Institute of the Environmental Transition)* **Jean SCIARE** (Atmospheric sciences and climate change) *(EMME – CARE: Eastern Mediterranean and Middle East-Climate and Atmosphere Research Centre, Cyprus)* **Jérôme ROSE** (ITEM Institute's leader) *(ITEM : Institute of the Environmental Transition in the Mediterranean (follow-up to OT-Med and Serenade)*	***ROUND TABLE:*** *HOW TO DEAL WITH ENVIRONMENTAL TRANSITION AND SUSTAINABLE DEVELOPMENT IN SCIENTIFIC STRATEGIES?*