

**MODELLING PAST AND FUTURE LAND USE AND
COVER CHANGES A MULTI-SCALE APPROACH
APPLIED IN THE PYRENEES – THE MODE
RESPYR PROJECT CONTEXT AND OBJECTIVES**

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MODELLING PAST AND FUTURE LAND USE AND COVER CHANGES

A MULTI-SCALE APPROACH APPLIED IN THE PYRENEES – THE MODE RESPYR PROJECT



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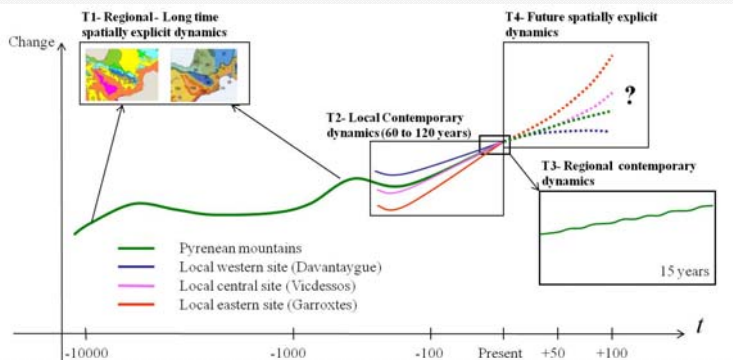
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CONTEXT AND OBJECTIVES

- Context**
- Land cover changes have significant impacts on local and regional climate and on others environmental issues.
 - Understanding past LUCC is essential to reduce uncertainties related to current changes, identify driving forces of LUCC and better anticipate future changes
 - Under climate change assumptions, Pyrenees mountains will face dramatic effects of climate change and show high environmental stakes (water / snow resources, biomass, biodiversity...)
- Scientific & Methodological issues**
- Providing knowledge on past and future land use and cover changes with heterogeneous datasets
 - Simulating local / regional land use and cover changes using spatially explicit models
 - Simulating past / futures land use and cover changes based on scenarios
 - What is the role of spatial approaches in prospective research?
 - What spatial and temporal resolutions are required for short / long term projections?

PROJECT METHODOLOGY



- Task 1:** Regional LUCC over last 12 000 years using palaeo-environmental data and models
- Task 2:** Local LUCC over last 60-120 years using historical maps / aerial photographs
- Task 3:** Regional LUCC over last 15-20 years using high resolution satellite imageries
- Integration of knowledge → Participatory approach → Building scenarios → Use / Development of models
- Task 4:** Modelling past / future LUCC based on scenarios and dynamic/spatially explicit models

STUDY SITES

The Pyrenees

Local study sites
 Davantaygue
 Vicdessos
 Garrotxes

Boundaries of the mountainous area

Davantaygue
 Long Term Ecological Research site
 76 km² - 6 municipalities

Vicdessos
 Human-Environment Observatory
 244 km² - 7 municipalities

Garrotxes
 25 years of observations / studies
 85km² - 5 municipalities

PRELIMINARY RESULTS

LUCC databases

Constitution of LUCC databases based on a reliable land use and cover typology

- Palaeo database (PALEOPYR and in situ cores)
- Satellite imageries pre-treatment and classification (1994, 2002/03, 2009/10) – (Hagolle et al 2008)
- Land use and cover maps from 1940's (Houet et al 2012)

1942 1953 1962 1976 1993 2003

3 km

- Forested areas: Podagroses, Conifer forest, Broad-leaf forest, Mixed forest, Broadleaved areas (by forest)
- Anthropogenic areas: Built-up areas, Roads, Others (blair, car park...)
- Water bodies
- Agro-pastoralism areas: Crops and meadows in Valley bottom, Crops and meadows in intermediate areas, Serous fields, Pasture and pastures, Summer grazing areas, Rocks grazing area, Grazing area with trees
- Altitude areas: Snow, Mineral surfaces

Local LUCC over the last Century

→ Comparison of local LUCC (cf. Sheeren et al 2012 - Poster AGILE'2012)

→ Combining palaeo and GIS data for understanding LUCC

Linking grazing activities and land use and cover changes (Galop et al. 2011)

1976 2009

1962 1983 2008

Age AD

numbers of animals

Expected number of taxa (ETN)

Sheeps (Auzat district)
 Cows (Auzat district)
 Palynological richness (ETN)

grain/cm²/yr

Pinus
 Betula

grain/cm²/yr

Juniperus
 Calluna

Age AD

- Deciduous mixed forest
- Encroachment
- Meadows & cultures
- Mineral surfaces
- Pasture
- Pasture with scattered pine
- roads
- snow
- water
- Wooded heathland (pine)

CONCLUSION

MODE RESPYR (2011-2015) is an ongoing project integrating heterogeneous spatially explicit LUCC data and coupling various disciplines.

→ LUCC databases are nearly finalized and multi-scaled analyses have started as well as model comparison and exploration.

→ Local landscape changes are mostly attributed to human land use changes rather than global warming and have to be compared with regional trends

→ Participatory and scenarios approaches will be performed for modelling future and past local and regional land use and cover changes

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WEBSITE

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