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► **To cite this version:**

Thomas Houet, Didier Galop, Florence Mazier, David Sheeren, Jean-François Dejoux. Modelling past and future land cover changes. A multi-scale approach applied in the Pyrénées. AGILE 2012, Apr 2012, Avignon, France. , 2012, Proceedings of the AGILE 2012 International Conference on Geographic Information Science. hal-02749669

**HAL Id: hal-02749669**

**<https://hal.inrae.fr/hal-02749669>**

Submitted on 3 Jun 2020

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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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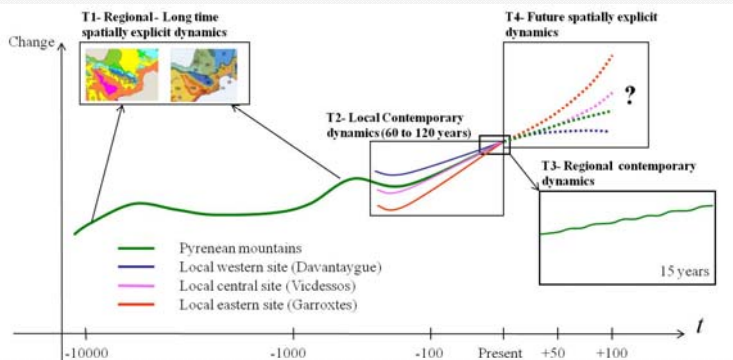
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### CONTEXT AND OBJECTIVES

- 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?

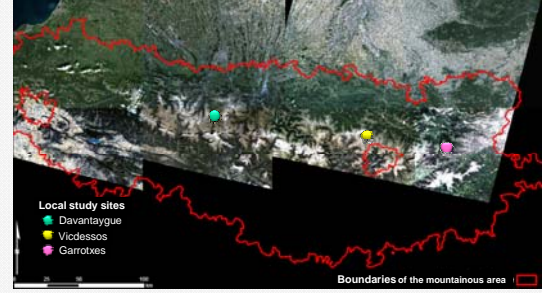
### PROJECT METHODOLOGY



- 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

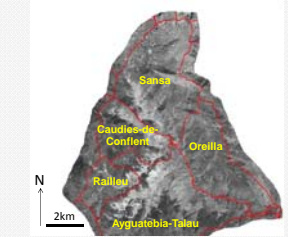
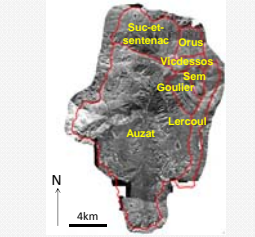
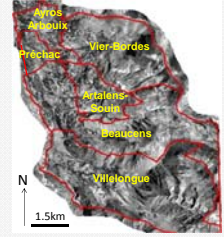
#### The Pyrenees



**Davantaygue**  
 Long Term Ecological Research site  
 76 km<sup>2</sup> - 6 municipalities

**Vicdessos**  
 Human-Environment Observatory  
 244 km<sup>2</sup> - 7 municipalities

**Garrotxes**  
 25 years of observations / studies  
 85km<sup>2</sup> - 5 municipalities



### PRELIMINARY RESULTS

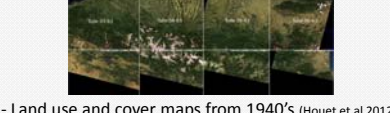
#### LUCC databases

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

- Palaeo database (PALEOPYR and in situ cores)

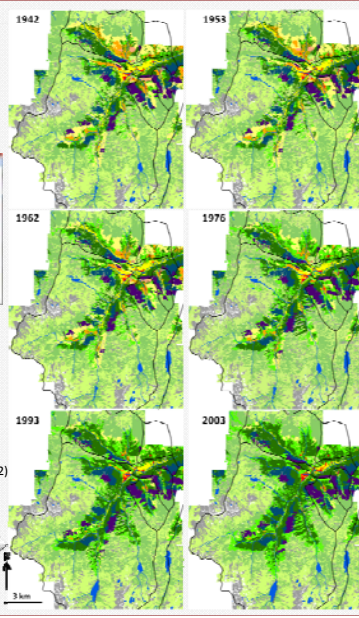


-Satellite imageries pre-treatment and classification (1994, 2002/03, 2009/10) – (Hagolle et al 2008)



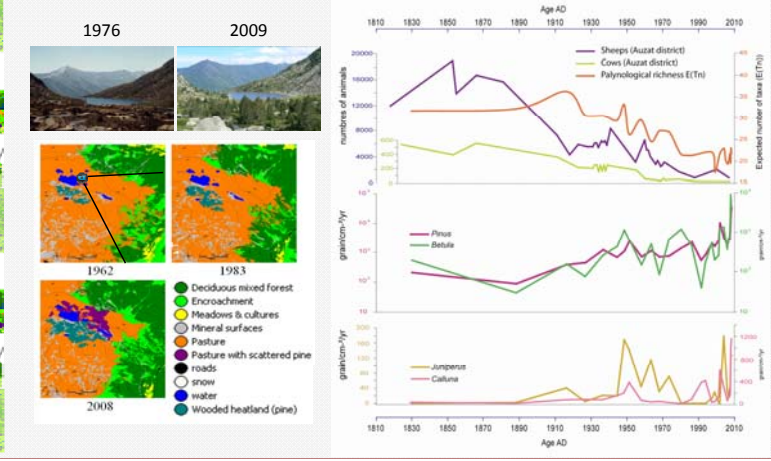
- Land use and cover maps from 1940's (Houet et al 2012)

- Forested areas: Hedgerows, 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)



### CONCLUSION

MODE RESPYR (2011-2015) is a 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

<http://w3.mode-respyr.univ-tlse2.fr>