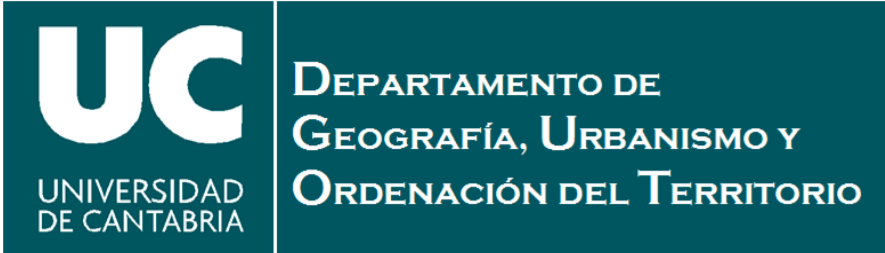


# Reconstructing the history of fires in Northern Spain. Methodological considerations from a multi-proxy approach

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## INTRODUCTION- GOALS

We present some methodological results of a research project aimed at the reconstruction of the history of wildfires that have been occurring in two mountain areas of the northern Iberian Peninsula since the Neolithic (ca. 7000 B.P.) in relation to human activities.

In order to cover the entire history of fires we resort to both environmental (sediment cores from peat bogs) and historical (written and graphic documents) information sources.

Thus, we are combining the results of **SEDIMENTOLOGICAL TECHNIQUES:** analysis of pollen, charcoal, plant

macroremains and isotopes of lead and heavy metals.

**HISTORICAL RESEARCH:** information obtained in historical archives (from the Middle Ages), newspapers and periodicals libraries (from the nineteenth century)

**STATISTICAL ANALYSIS:** databases of climatology and forest fires (from the mid-twentieth century onwards).

Thus, we can cover all ages, take advantage of all available sources and check the accuracy and comparability of the data obtained by different techniques and sources of information in order to answer the following questions:

\* Are data obtained from different sources consistent with each other?

\* What are the strengths and weaknesses of each type of data?

Two different areas have been considered: Eastern Pyrenees and Cantabrian Mountains.



## DATA COLLECTION

**I. Pyrenees:** peat bogs of Bassa Nera (42°38'17"N, 0°55'27"E), Estany de Burg (42°30'14"N, 1°18'16"E) and Clots de Rialba (42°39'53"N, 1°01'14"E).

Historical archives: Arxiu Nacional de Catalunya (Barcelona), Històric Comarcal (Sort- Lleida), Històric General d'Aran (Viella-Lleida) and some municipal archives

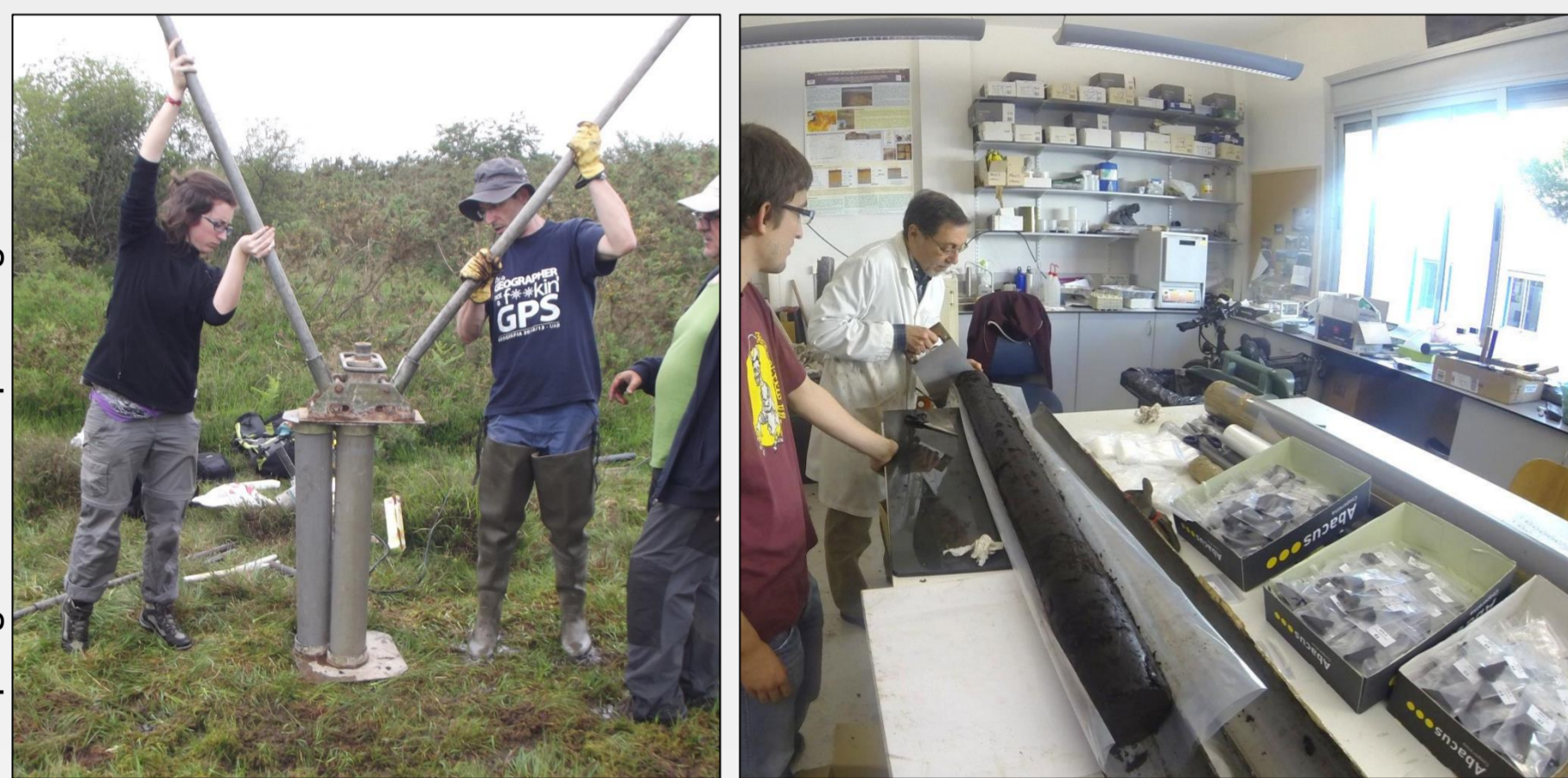
**II. Cantabrian Range:** peat bogs of La Molina (43°15'38"N, 3°58'37"W), Cueto de la Avellanosa (43°06'50"N, 4°21'58"W) and el Sertal (43°12'59"N, 4°26'09"W)

Historical archives: Archivo Histórico de Cantabria (Santander), Histórico Diocesano (Santander), Servicio de Montes (Santander), General de Simancas (Valladolid).

## RESULTS

### I. SEDIMENTARY DEPOSITS

Samples obtained in the peat bogs provide continuous and thorough sequences up to 20ky B.P. (but so far the information previous to the Neolithic period has not been analyzed).



**Anthracology:** estimation of the intensity of fires in which wood is burned and monitoring their evolution over time from charcoal (>150 µm) concentration.

- Chronological/ spatial reliability: up to 25 years/ local.
- Limitations: it does not show the grass or small scrub fires.

**Palynology:** evolution of vegetation- assessment of the impact of fires. Relation to agriculture or livestock.

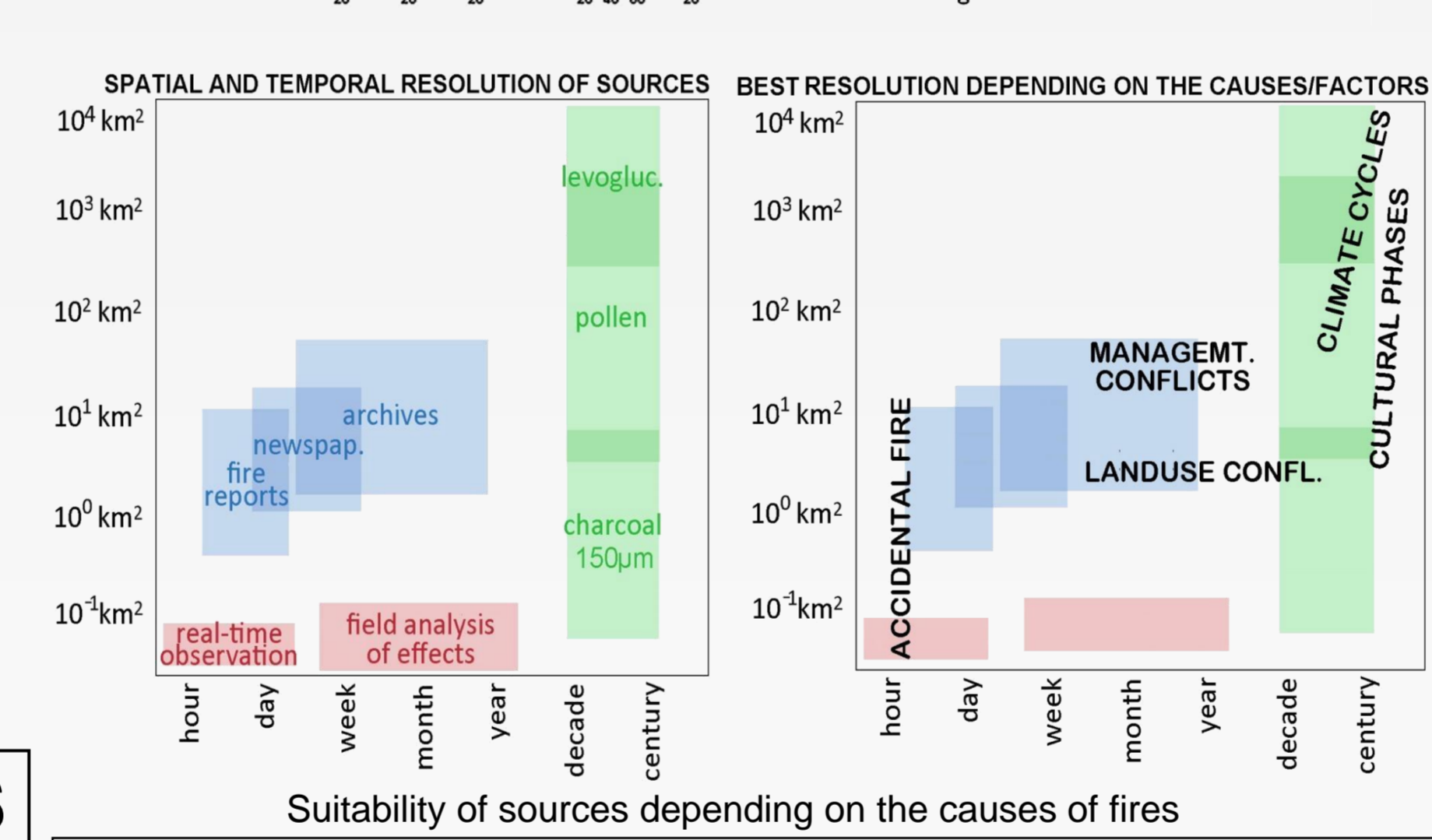
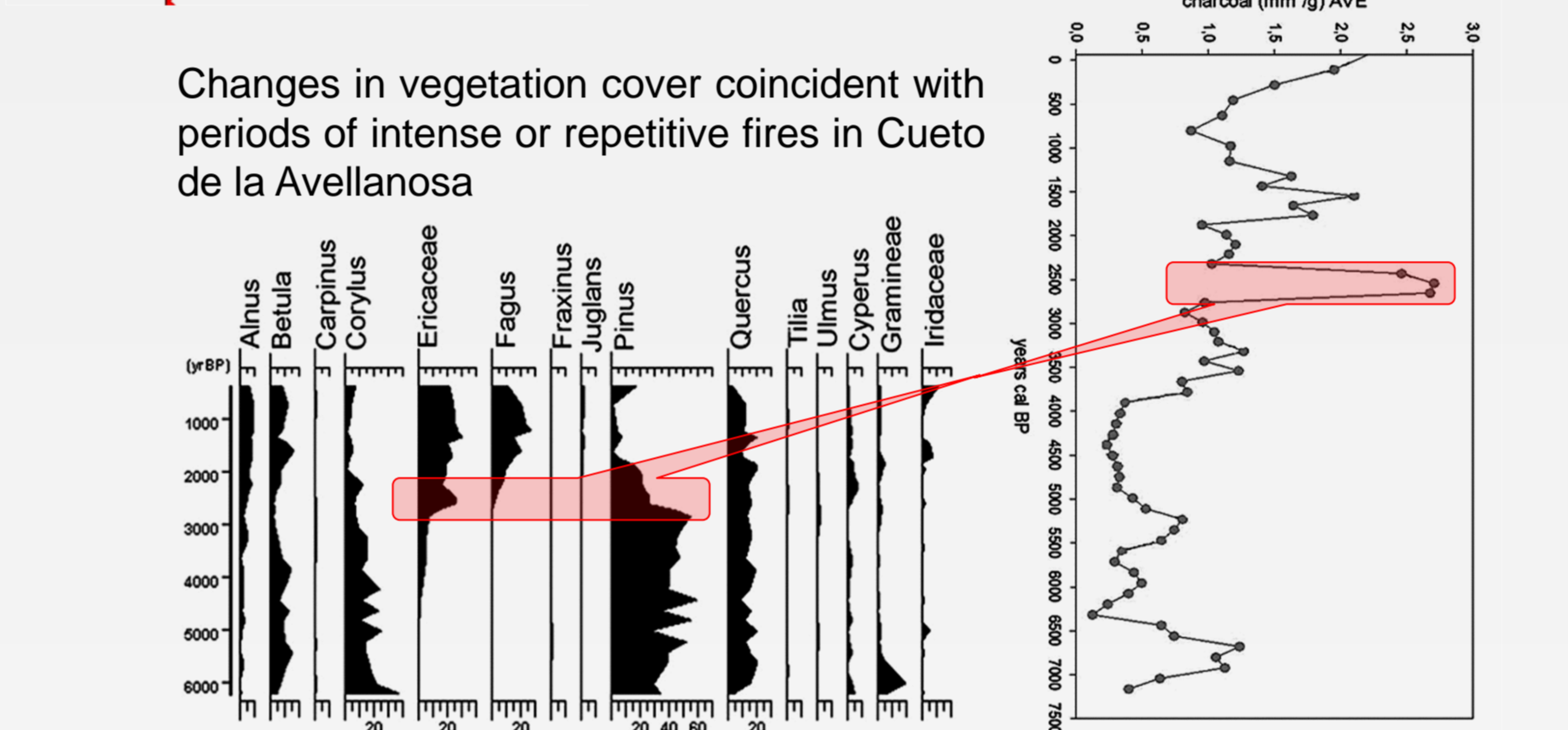
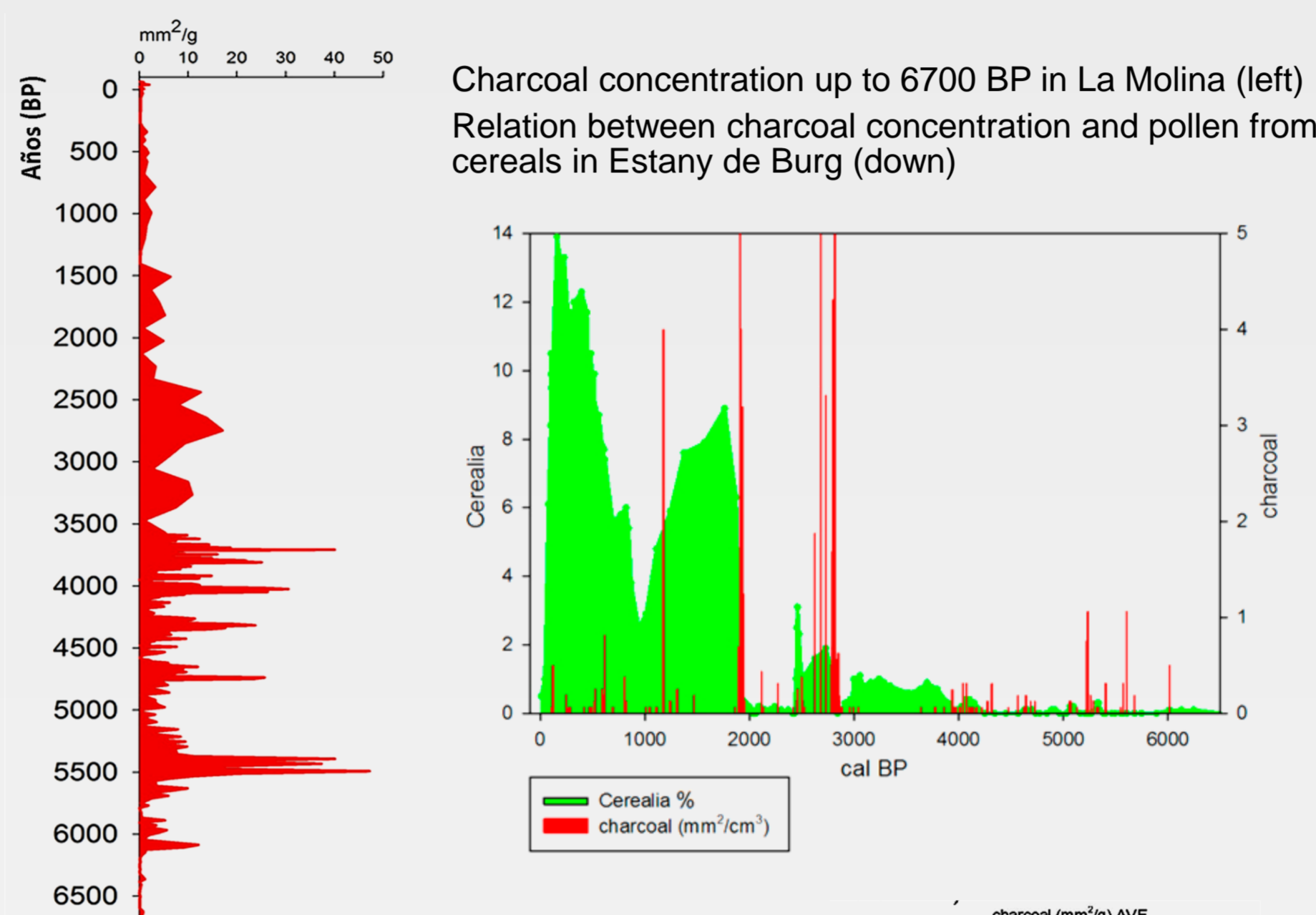
- Chronological/ spatial reliability: up to 25 years/ local to regional.
- Limitations: indirect information through the composition of the vegetation cover and presence of pyrophytes.

**Analysis of lead/metal isotopes:** detection of mining activities (and, through them, information on forest use and demand for fuelwood and charcoal).

- Chronological/spatial reliability: up to 25 years/ uncertain.
- Limitations: indirect information.

**Analysis of levoglucosan** (initial test): Information on the intensity of fires (including scrubland)

- Chronological/ spatial reliability: up to 25 years/ macro regional.
- Limitations: very high dispersibility, insufficient spatial accuracy.



### II. WRITTEN SOURCES/ DIRECT OBSERVATION

Sparsely and discontinuous information between the late Middle Ages and the eighteenth century. From that moment documentary sources are increasingly rich, accurate and easy to use.

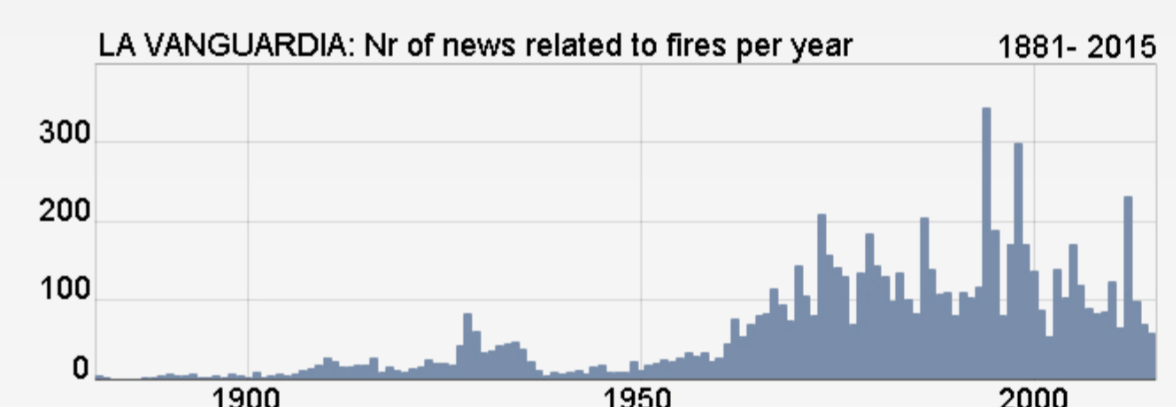


**Historical archives:** knowledge of farming practices in mountain areas. Information on conflicts and lawsuits related to the use of fire. Burning regulations over time.

- Chronological/ spatial reliab.: year/ local (1- 100 km²)
- Limitations: hard understanding of the oldest sources. Indirect, scarce and very subjective information.

**Newspapers- periodical publications:** large fires or exceptional events. Information on damage.

- Chronological/ spatial reliability: one week/ local.
- Limitations: Very little information until the second half of the twentieth century.



**Statistics- fire reports:** comprehensive and good quality info that allows us to characterize the fires of the past fifty years.

- Chronological/ spatial reliability: one day/ Initially, local scale. Currently, cartographic delimitation of burnt areas with a metric accuracy.

**Real-time/ ex post observation:** impact assessment, evolution of fire and extinction.

- Chronological/ spatial reliability: hours to years/ local
- Limitations: partial and mainly qualitative information.

## HISTORY OF FIRES

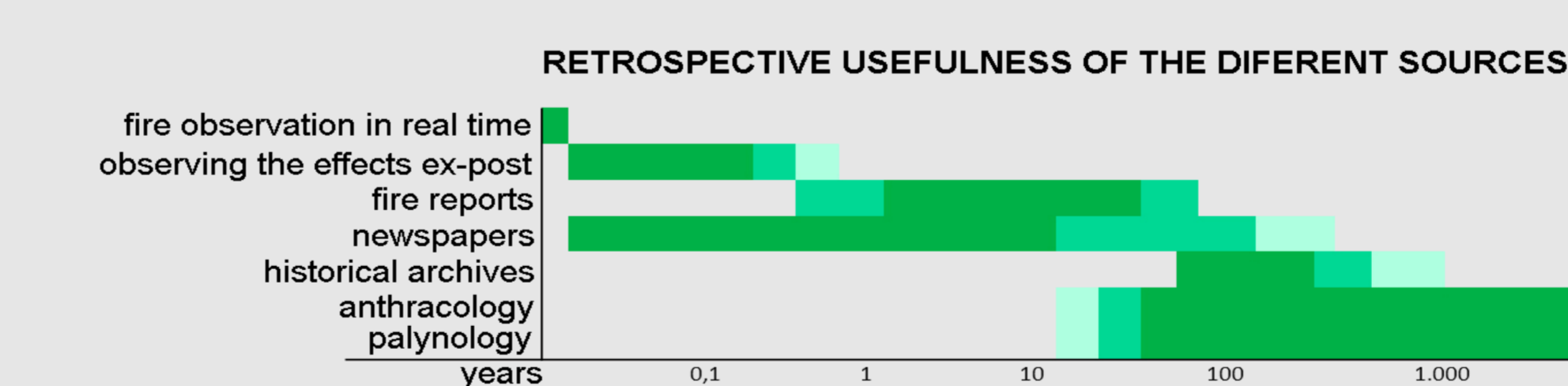
In the Cantabrian range and eastern Pyrenees fires have been continuously used by successive human groups over the last 6300 years as a tool to facilitate plowing or maintaining grasslands and also to exert pressure in times of conflict. Lacking information, we cannot reconstruct the circumstances of these historic fires. However, their emergence occurs at the same time as farming practices and the curves (see graphs) have inflection points that coincide with some of the key moments in history, which seems to demonstrate their human origin.

From the Modern Ages, written sources relate fires with the management of forests and pastures. With few exceptions, burnings are mentioned as a common instrument without negative connotations. Still today, fires are provoked with the purpose of controlling the composition and structure of vegetation cover.

According to palynology, the appearance of fire led to a dramatic transformation of the vegetation cover resulting in a decrease in the proportion of tree pollen and a rapid expansion of pyrophytic taxa such as *Calluna*, *Erica*, gorse or others.



## DISCUSSION ON THE METHODOLOGICAL OBJECTIVES



Contribute to the understanding of...	Data from...						
	REAL-TIME OBSERVATION	OBSERVATION EX-POST	FIRE REPORTS	NEWSPAPERS	HISTORICAL ARCHIVES	ANTHRACOLOGY	PALYNOLOGY
REAL-TIME OBSERVATION	ALWAYS						
OBSERVATION EX-POST	ALWAYS	ALWAYS	sometimes				sometimes
FIRE REPORTS	sometimes	sometimes	ALWAYS				
NEWSPAPERS	sometimes	sometimes	ALWAYS			sometimes	
HISTORICAL ARCHIVES	sometimes	sometimes	sometimes			sometimes	sometimes
ANTHRACOLOGY		sometimes	sometimes	sometimes		ALWAYS	
PALYNOLOGY		ALWAYS		sometimes		ALWAYS	



Understanding of wildfires requires consideration of both natural (type of fuel, weather, etc.) and human factors (cultural aspects, interests, social perception of fires, legal and administrative circumstances, etc.)

The different techniques (specific to earth sciences and social sciences) provide complementary and consistent information. Their combination allows us to link all ages and generates useful synergies in order to develop a holistic approach to the problem.

Data from the most recent sources, which are also the most accurate, help in understanding the older ones, generating feedback mechanisms that are very useful for reconstructing the history of fires in the region under the principle of actualism and in understanding the role that fires have played in the construction of present landscapes.

Please, find more information on posters C5 & C10:

- \* Carracedo, V. et al.: Burning and wildfire in rural culture: the Nansa valley (Cantabria, Northern Spain)
- \* Carracedo, V.: The relevance of studying past fires in understanding present day ones and managing future ones.

And at [http://www.gimena.unican.es/entrada\\_eng.html](http://www.gimena.unican.es/entrada_eng.html)

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