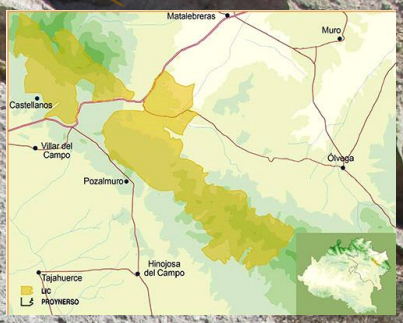
Geología práctica en la provincia de Soria *2016-17*

*Mayo 2017*

# Geología de la Sierra del Madero




# …y las históricas Canteras molineras de Trébago

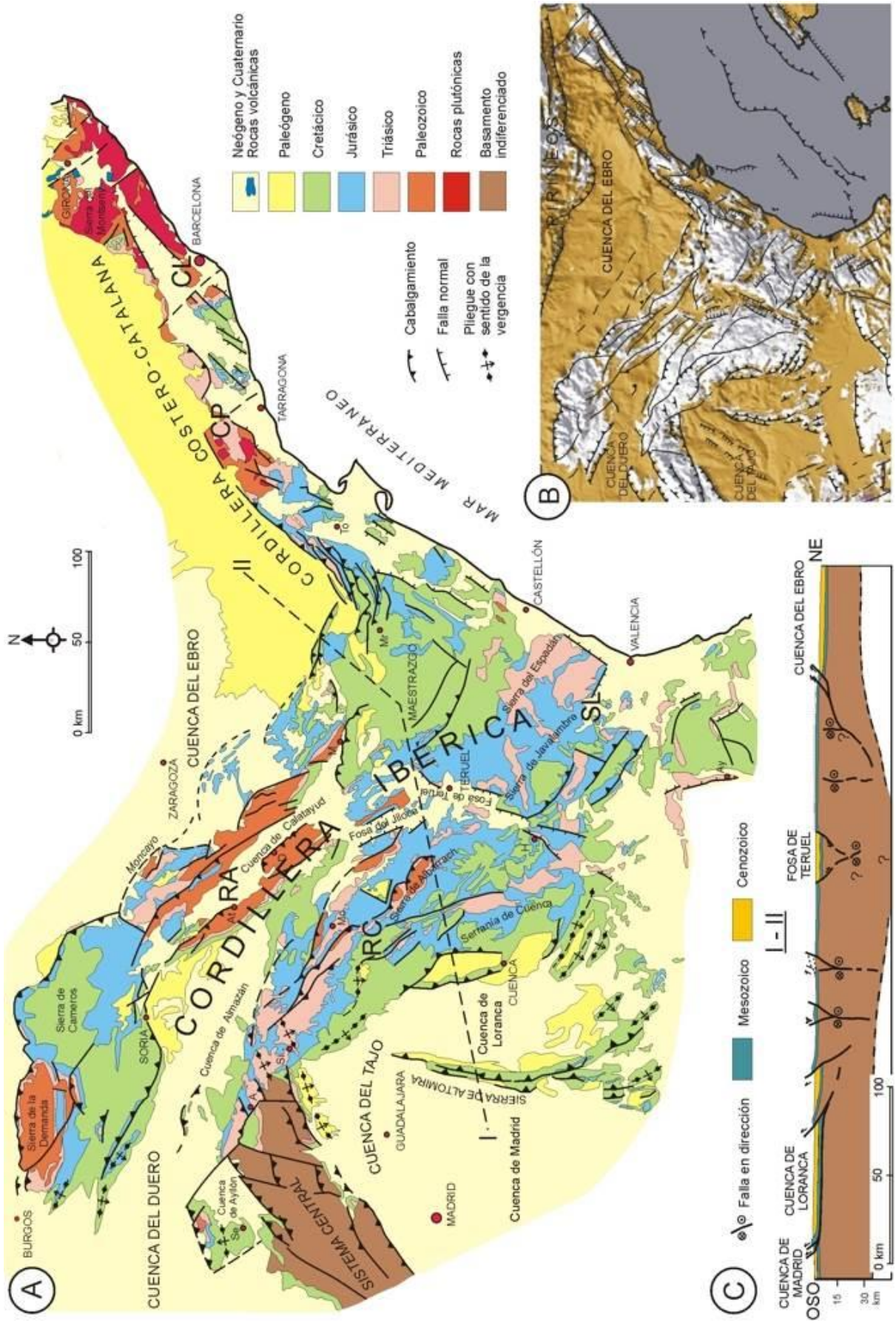
## Las canteras de piedras molineras en el Sistema Ibérico y la tradición en Trébago

"... la necesidad comercial superó, por mucho, a los inconvenientes. Un ejemplo es el transporte de una piedra de molino que medía dos varas (aproximadamente 167 cm) por Santiago García en 1766 entre Trébago en la Sierra del Madero y Mendavia (Navarra). El primer obstáculo consistía en cruzar las montañas ibéricas con desniveles superiores a 1000 m. Su yunta de bueyes tenía que atravesar el territorio de La Rioja para llegar a la orilla derecha del río Ebro. Desde el borde de la región de La Rioja en límite con Navarra, el cantero tuvo que hacer un último esfuerzo para cargar bueyes, carreta y piedra de molino en un ferry en Arrúbal y cruzar el río con el mayor caudal en España antes de llegar, unas pocas millas más adelante, al molino de Mendavia.

" ... Asumimos que Santiago García recordaría los detalles de esta extraordinaria aventura una y otra vez mientras regresaba a Trébago. La vuelta fue más llevadera que la transacción comercial de una piedra de calidad que valía nada menos que el precio de 704 reales pagados por las autoridades de Mendavia; gran suma en aquel momento ... "

| Municipality | Valley | Production centre | Rock | Millstone Atlas |
|---|---|---|---|---|
| Calderuela | Almuerzo | La Hoya | Conglomerate | 284 |
| Canos | Almuerzo | La Cuerda | Conglomerate | 304 |
| Canos | Almuerzo | La Cuerda | Conglomerate | 306 |
| Canrredondo | Carcaña | Cuerda Larga | Conglomerate | 431 |
| Canrredondo | Carcaña | El Carrascal | Conglomerate | 259 |
| Cortos | Almuerzo | El Monte | Conglomerate | 297 |
| Cortos | Almuerzo | La Soledad | Conglomerate | 295 |
| El Espino | Madero | Las Peñas | Conglomerate | 254 |
| Fuentelárbol | C. Villa y Tierra | Pueblo | Limestone | 196 |
| Fuentelárbol | C. Villa y Tierra | Las Canteras | Limestone | 207 |
| Matalebreras | Madero | Pizarrales | Conglomerate | 534 |
| Muro de Ágreda | Madero | Cumbres | Conglomerate | 310 |
| Muro de Ágreda | Madero | Monte Oncillos | Conglomerate | 312 |
| Muro de Ágreda | Madero | Cº de Ágreda | Conglomerate | 313 |
| San Felices | Madero | Los Molares | Conglomerate | 248 |
| Trébago | Madero | Cerro Balcones | Conglomerate | 260 |
| Trébago | Madero | Peña el Mirón | Conglomerate | 253 |
| Valdelagua | Madero | El Sardón | Conglomerate | 321 |
| Valdegeña | Madero | Las Matas | Conglomerate | 294 |
| Villar de Campo | Madero | Castellanos | Conglomerate | 257 |
| Villar de Campo | Madero | Los Molares | Conglomerate | 255 |
| Vinuesa | C. Pinares | Las Majadillas | Conglomerate | 460 |
| Vinuesa | C. Pinares | La Muedra | Conglomerate | 462 |
| Vilviestre Nabos | Carcaña | El Rebollo | Conglomerate | 448 |

# El contexto geológico de la Sierra del Madero

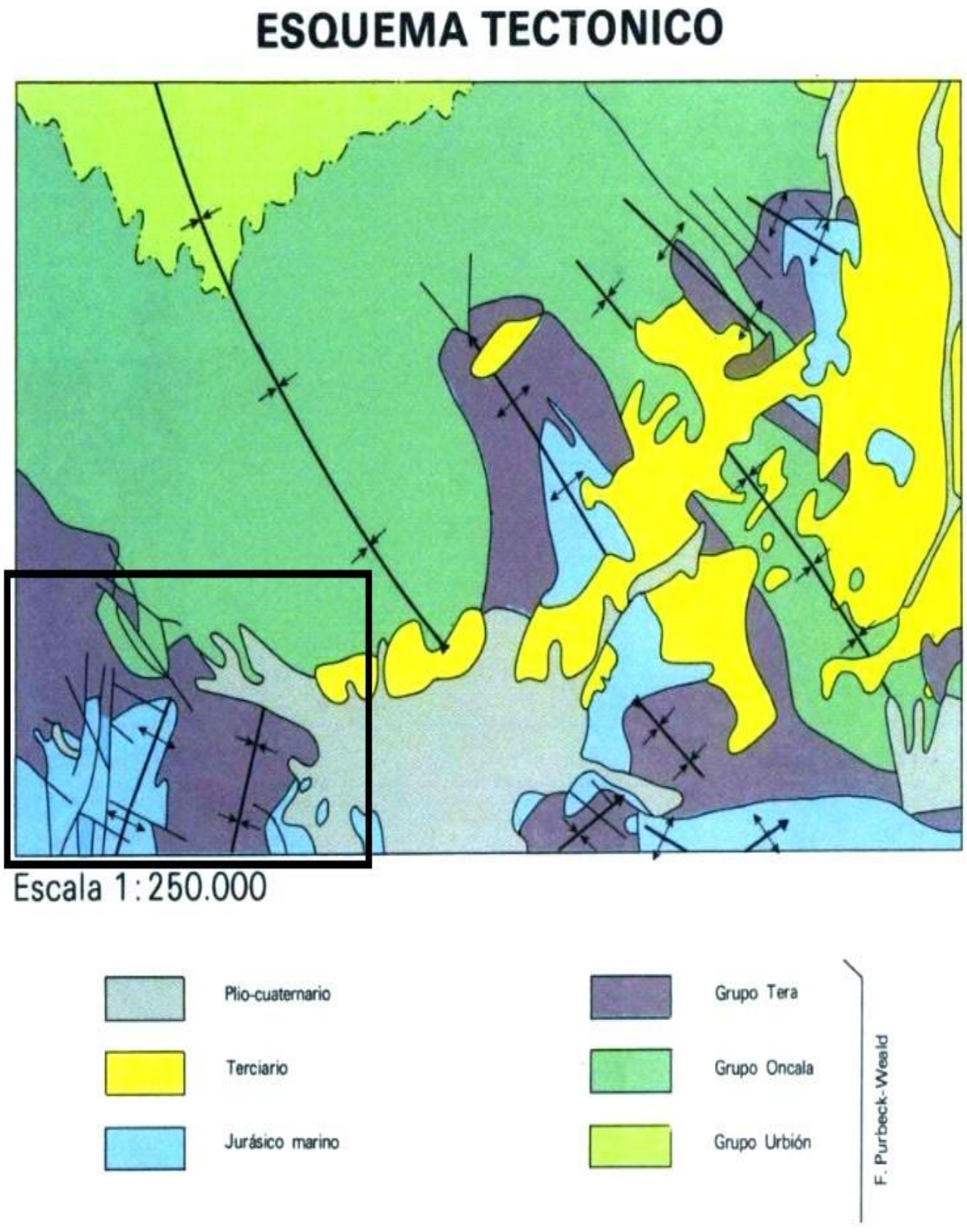


# El enorme "tiempo geológico"

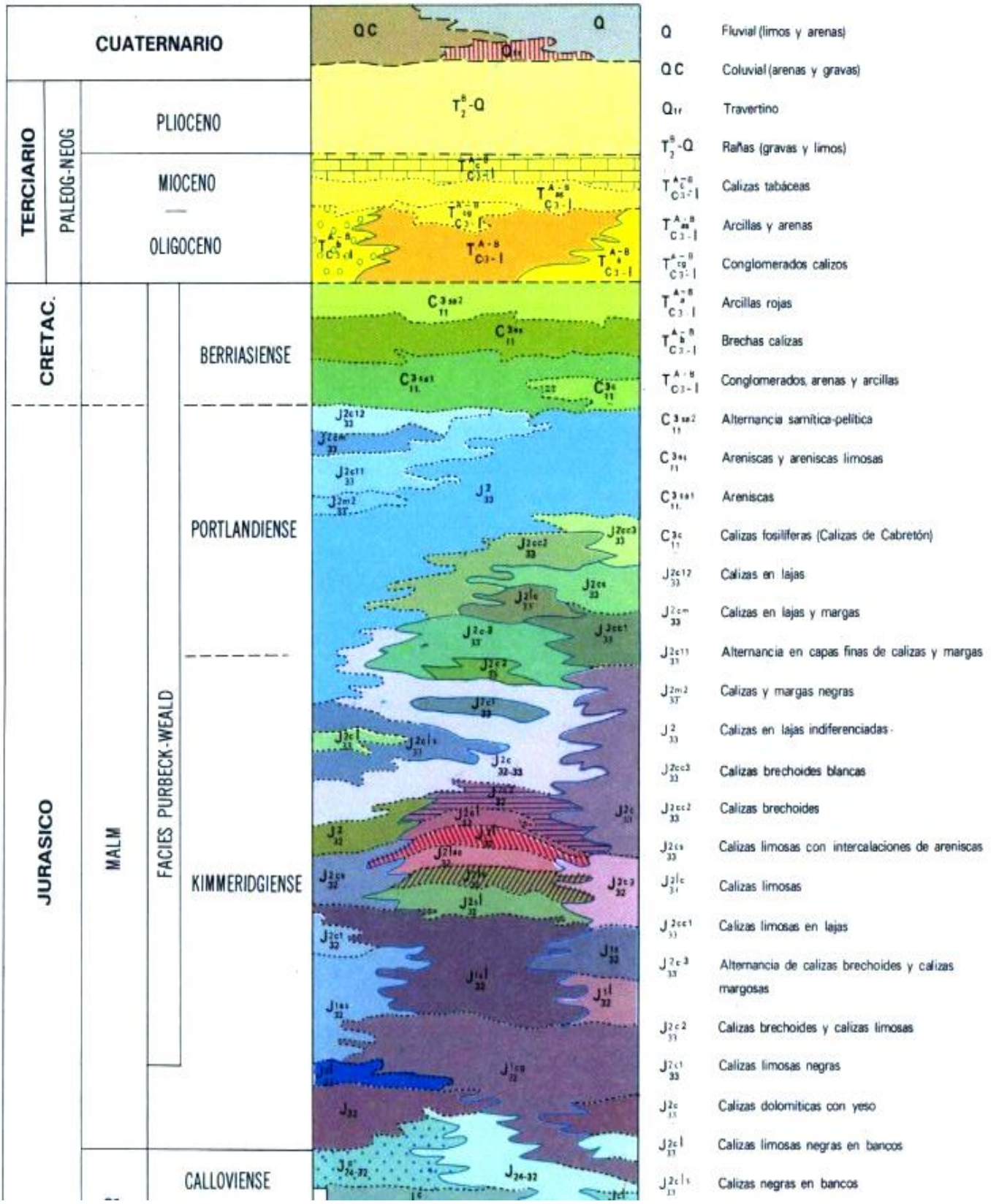
| Era | Periodo | Época | | Edad | Millones de años |
|---|---|---|---|---|---|
| CENOZOICO | CUATERNARIO | Holoceno | | | 0,011 |
| | | Pleistoceno | | Ioniense<br>Calabriense | 1,8 |
| | NEÓGENO | Plioceno | Superior | Gelasiense<br>Piacenziense | |
| | | | Inferior | Zancleiense | 5,3 |
| | | Mioceno | Superior | Messiniense<br>Tortoniense | |
| | | | Medio | Serravalliense<br>Langhiense | |
| | | | Inferior | Burdigaliense<br>Aquitaniense | 23 |
| | PALEÓGENO | Oligoceno | Superior | Chattiense | |
| | | | Inferior | Rupeliense | 33,9 |
| | | Eoceno | Superior | Priaboniense | |
| | | | Medio | Bartoniense<br>Luteciense | |
| | | | Inferior | Ypresiense | 55,8 |
| | | Paleoceno | Superior | Thanetiense<br>Selandiense | |
| | | | Inferior | Daniense | 65,5 |
| MESOZOICO | CRETÁCICO | | Senoniense | Maastrichtiense<br>Campaniense<br>Santoniense<br>Coniaciense | |
| | | Superior | | Turoniense<br>Cenomaniense | 99,6 |
| | | Inferior | | Albiense<br>Aptiense<br>Barremiense | |
| | | | Neocomiense | Hauteriviense<br>Valanginiense<br>Berriasiense | 145,5 |
| | JURÁSICO | Superior (Malm) | | Tithoniense<br>Kimmeridgiense<br>Oxfordiense | 161,2 |
| | | Medio (Dooger) | | Calloviense<br>Bathoniense<br>Bajociense<br>Aaleniense | 175,6 |
| | | Inferior (Lías) | | Toarciense<br>Pliensbachiense | |
| | | | | Sinemuriense<br>Hettangiense | 199,6 |
| | TRIÁSICO | Superior | Keuper | Rhaetiense<br>Noriense | 228 |
| | | Medio | Muschelkalk | Ladiniense<br>Anisiense | 245 |
| | | Inferior | Buntsandstein | Olenekiense<br>Induiense | 251 |
| PALEOZOICO | PERMICO | | | | |
| | CARBONÍFERO | | | | |
| | DEVÓNICO | | | | |
| | SILÚRICO | | | | |
| | ORDOVÍCICO | | | | |
| | CÁMBRICO | | | | 542 |
| PRECÁMBRICO | | | | | |

# Geología de la Sierra del Madero

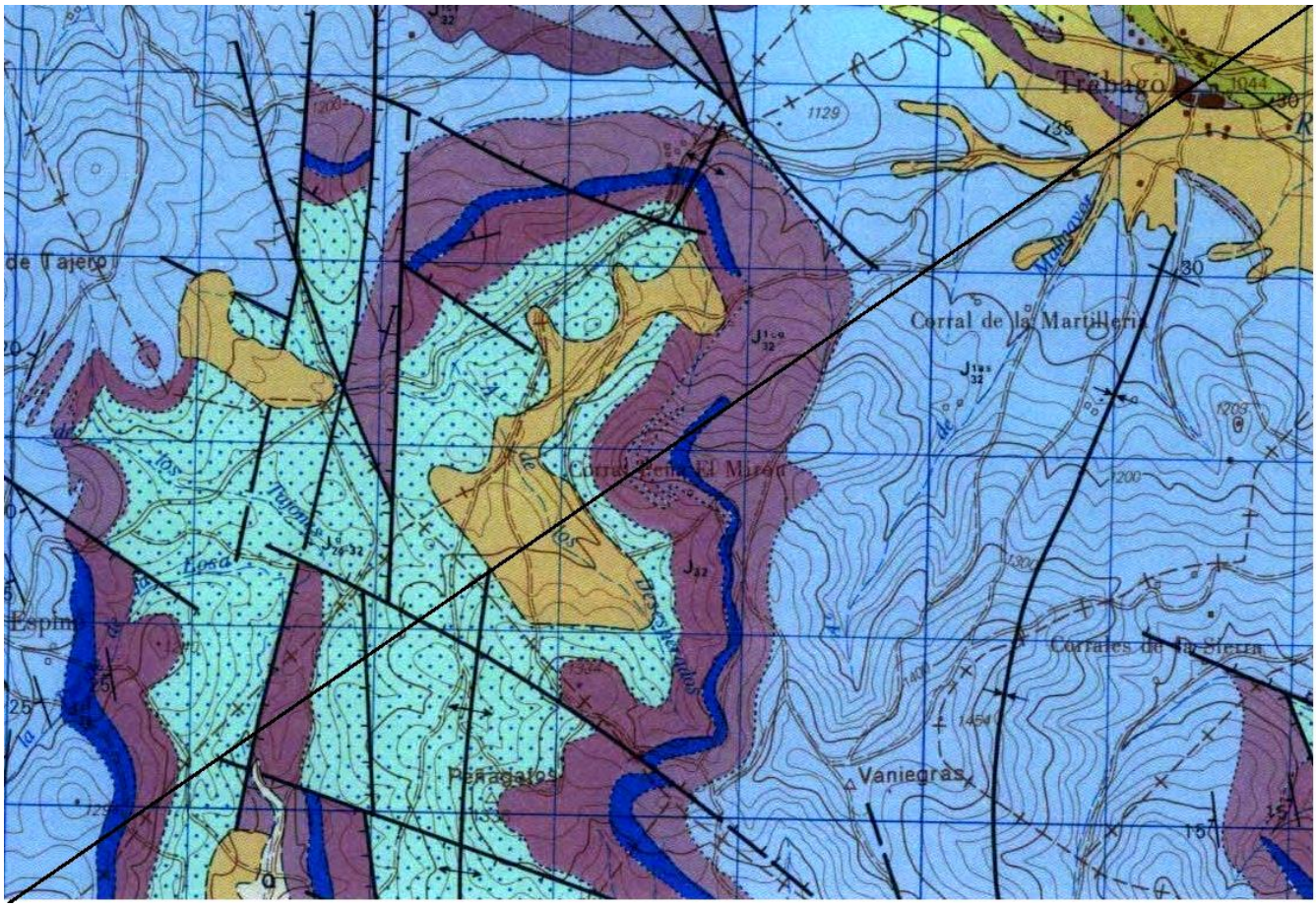
## Esquema geológico de la hoja 319 - Ágreda del MAGNA 1:50.000



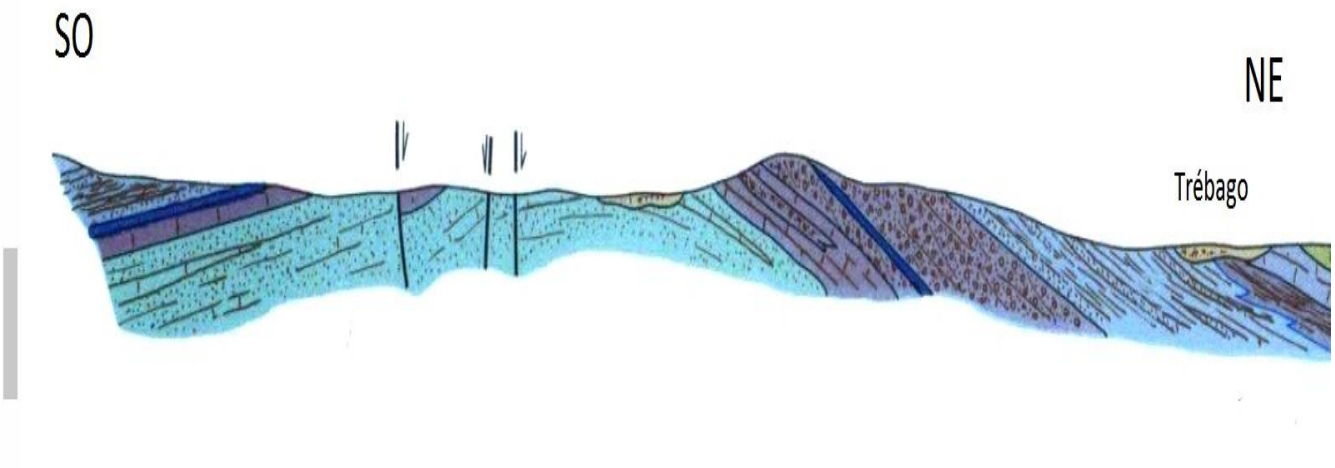
# Columna estratigráfica para la hoja de 319 - Ágreda



# Detalle de la Sierra del Madero tomado del Mapa Geológico Nacional, hoja 319 - Ágreda




# Corte geológico SO - NE marcado sobre el mapa



SERIE DE LA SIERRA DEL MADERO


$J_{32}^{2c1}$

$J_{32}^{1as}$

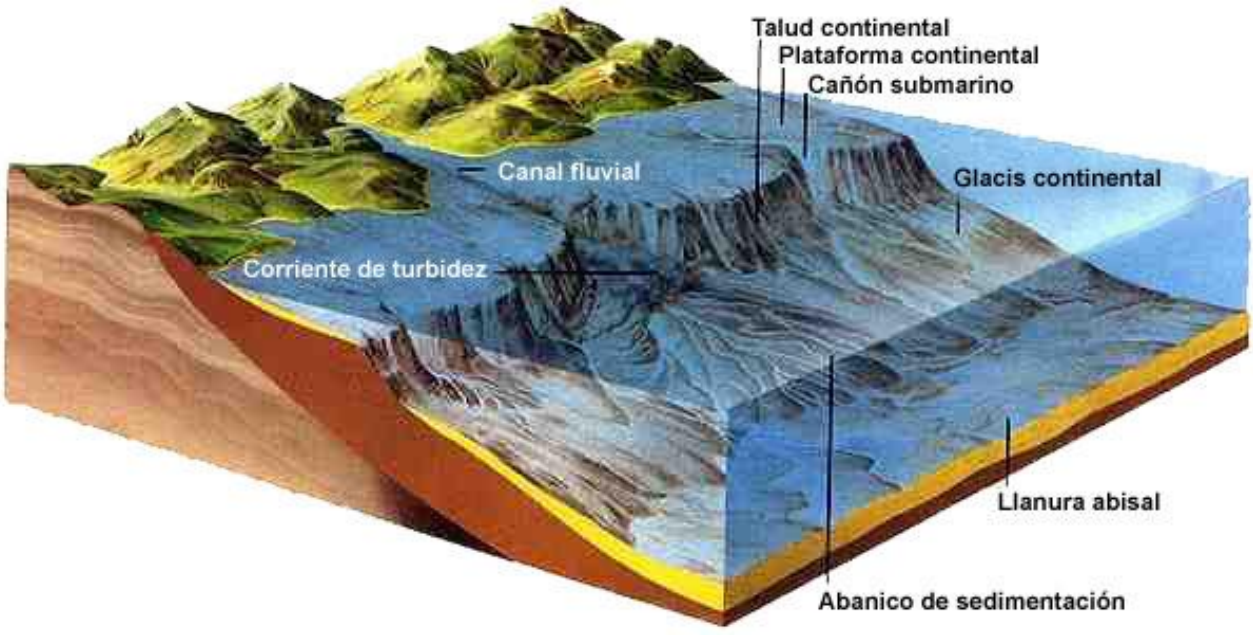
$J_{32}^{1cg}$

$J_{32}^{Cl}$

$J_{32}$

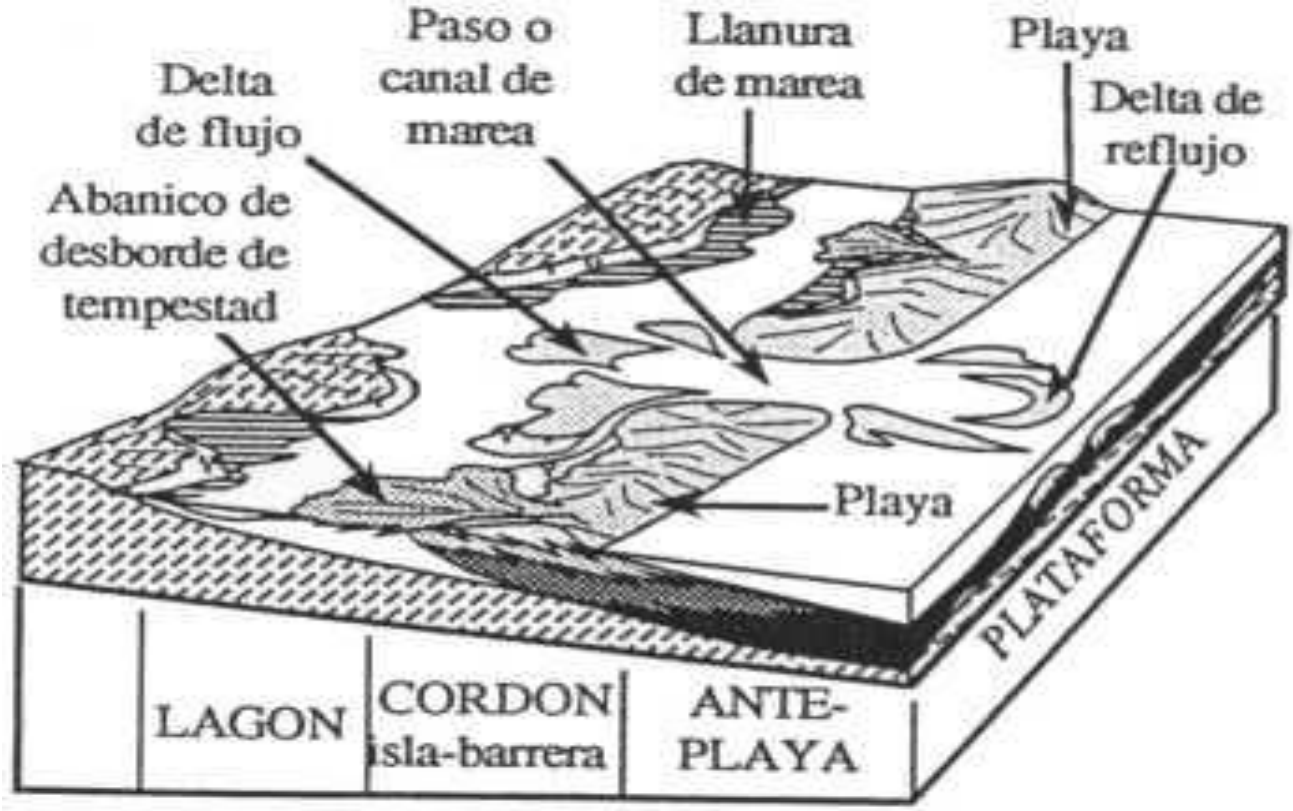
$J_{24-32}^{g}$

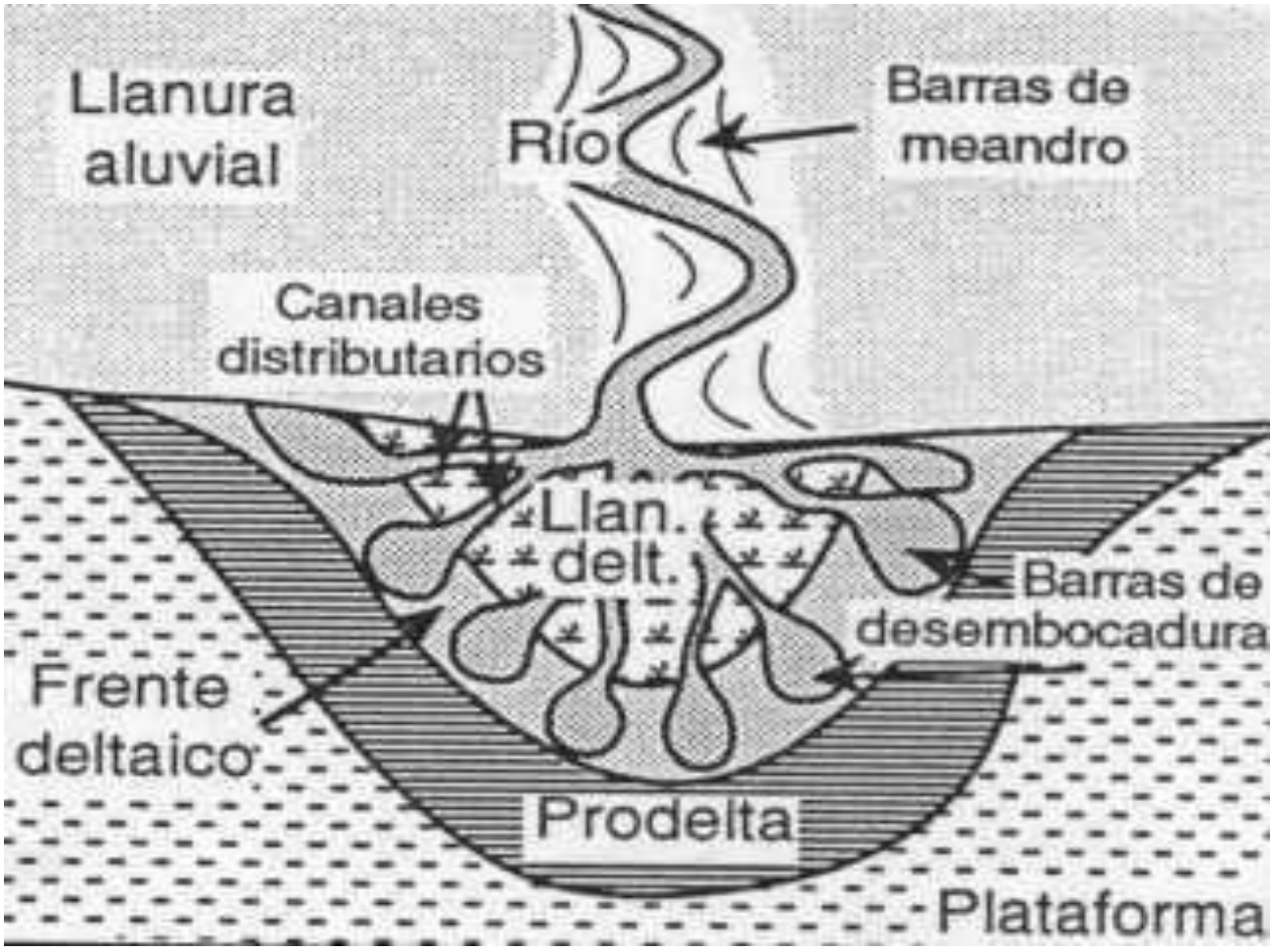
# La paleogeografía del Jurásico y la idea acerca de la plataforma continental

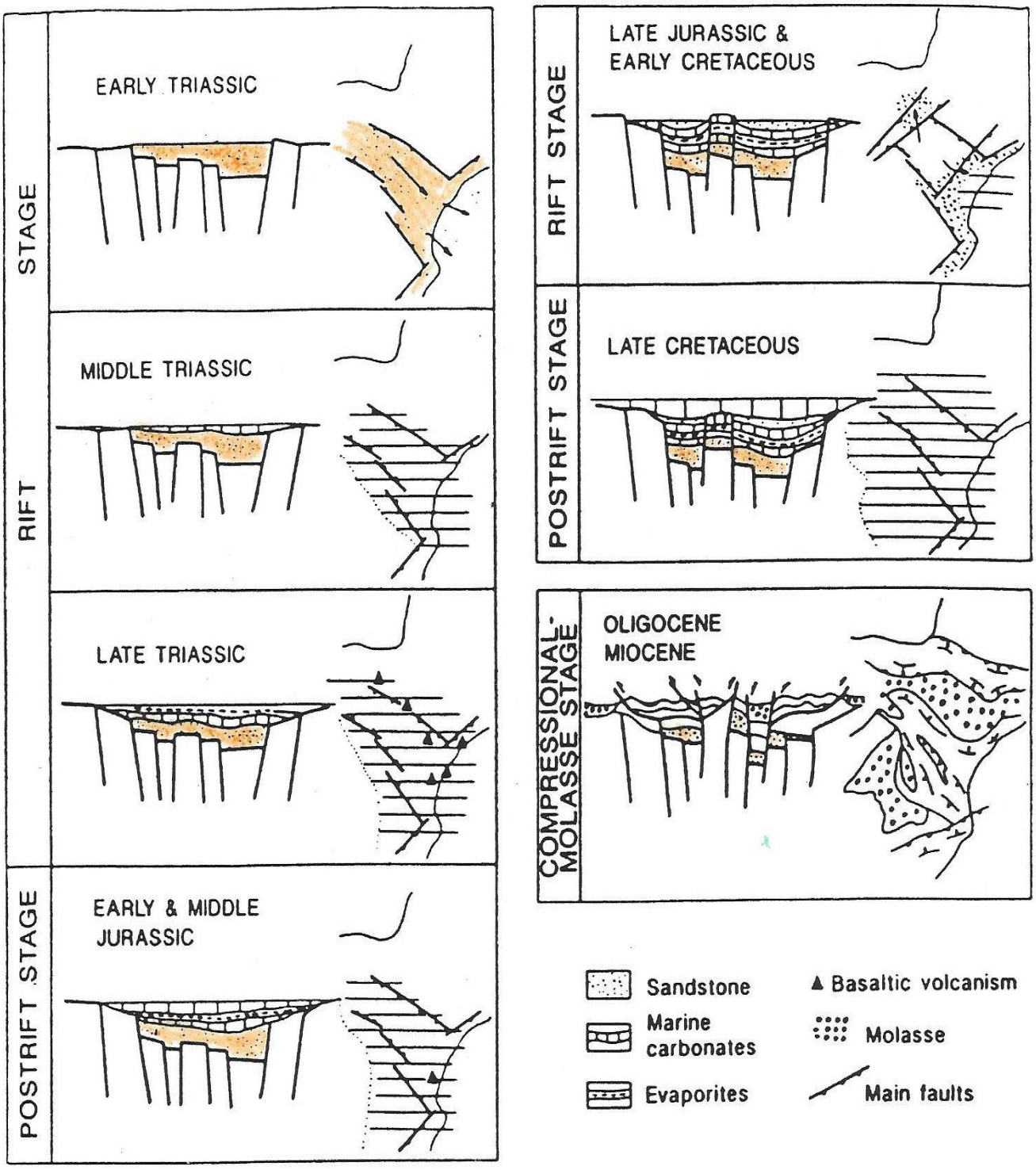
# La situación en el Kimmeridgiense (Malm)

# Ambientes sedimentarios durante el Jurásico marino y Jurásico continental



# La historia tectónica del Sistema Ibérico




Esquema de la evolución del Sistema Ibérico durante el Mesozoico y Orogenia Alpina.

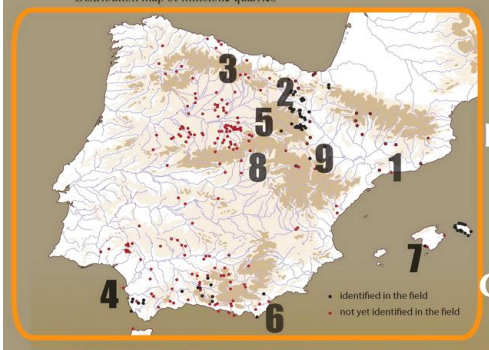
# Anexos

Timothy Anderson
Pilar Pascual Mayoral
Pedro García Ruíz
Joaquín Sanchez Navarro
Amelia Rodríguez Rodríguez
Natalia Alonso Martínez

# Quern and Millstone Quarries in Spain in a glimpse

**"Molares"**, the Spanish place-name often associated with millstone quarries, is the term borrowed to designate a group of researchers focused on the subject of quern and millstone quar ries. Over the last few years several hundred sites have been identified, especially through the study of old texts. Those confirmed in the field (130) are for the most part those located near the residence of the different researchers (i.e. La Rioja and Castilla y León, Menorca, Andalusia and Gran Canaria) reflecting an imbalance in the state of research. We hope that in the future a research project will help us correct this imbalance.

Distribution map of millstone quarries




## Montjuic 1

Archives indicate the extraction of millstones from the Monjuic mountain near Barcelona as early as the 13th c. The height of the production, probably the most significant in the Iberian Peninsula, dates to the 17th c. with exports throughout Spain and even to France and Italy. It is probable that the site was destroyed during construction related to the Barcelona Olympics of 1992.

## Robres del Catilllo 2


This is a vast quarry district discovered by P. Pascual and P. Garcia in the Province of La Rioja. They estimate that the district produced hundreds of millstones in modern times.

## Brañosera 3

The millstone quarry of Brañosera, in the Province of Palencia, is for the moment the only millstone quarry in Spain with photographic evidence. Notice that the stone cutters put on their best attire for the portrait.

## El Berrueco 4


In the 19th c. this quarry in the Province of Cádiz produced the best cereal mill-stones in the region. The quarry employed 23 workers and produced yearly 64 millstones for wind and watermills and 480 stones for animal-powered mills. Today we can only see a vast crater in the middle of the mountain.

## Fuenteárbol 5


This site, located by P. Pascual and P. Ruiz in the Province of Soria, is unique and peculiar. According to tradition, newlyweds could exploit a parcel of the quarry under the condition that the first millstone extracted be placed in an alignment of millstones. This alignment, recalling prehistoric megalithic features, can still be seen in the outskirts of the town.

## Cerro de los Limones 6


This quern quarry in the Province of Almería, dates to Antiquity. It exploited a lava outcrop perched on the top of a hill. This site joins the rank of other lava exploitations known throughout the Mediterranean and beyond. It was recently discovered by T. Anderson and the Dimension Stone Team of the Norwegian Geological Survey and presented in ASMOSIA IX.

## Punta de Sa Dent 7


J. Sanchez has identified over 30 coastal quern quarries dating from the Arab occupation (9th to 13th c.) on island of Menorca. This spectacular site, also probably dating to the Arab occupation, is one of his recent incursions into the neighboring island of Mallorca.

## El Berrueco 8


El Berrueco is located to the north of Madrid. Like the derivatives of the latin "mola", this place-name (possibly of Celtic origin) is often related to stone work. Granite was exploited on a large scale in the region. The town even has a museum dedicated to the history of stone work.

## Trévago 9


The millstone quarry district of Trévago, explored by P. Pascual and P. Garcia, is found in the Province of Soria. A text dating to 1760 mentions the millstone cutter Manuel Ruiz. This reference might correspond to the end of this industry in the region.

## Gran Canaria 10


The pre-colonial lava quern quarries of the Island of Gran Canaria are spectacular. The native extracted rotary querns with stone tools. Iron tools were only introduced in the 15 th c. with the arrival of the Spanish. They are currently being studied by a team led by A. Rodriguez.

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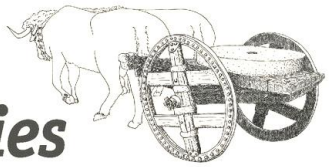
Poster presented at the Bread for the People Colloquium
British School of Archaeology, Rome, Nov. 4-8, 2009

# An approach to millstone making based on the quarries of Trévago *Soria, Spain*



The first written references to the quarries of Trévago are in the Cadastre of the Marquis of Ensenada (1750) and in a file in the Municipal Archives of the town of Mendavia (June, 1766). This second document cites the arrival in Mendavia of the millstone maker Santiago García del Río with a lower stone brought from the quarries of Trévago, 100 km away.

*Poster presented at the colloquium "Seen through a millstone"*
*Bergen, Norway*
*Oct. 19-21, 2011*

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## *Introduction*


The quarries of Trévago are part of an important exploitation located in the Sierra del Madero. The presence of rotary quern roughouts and the industrial quantity of large roughouts suggest millstone production since Roman times until the middle of the 18th century.

## *Geology*

The most important quarries of Trévago are located at the Peña del Mirón, an outcrop of detritic quartzitic conglomerate of Cretaceous Early Albian age.

## *Quarry before the archaeological intervention*

## *Archaeological intervention*

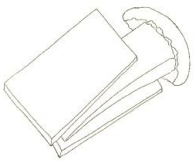
The archaeological work in 2010 brought to light the extraction techniques. These were adapted in function of the characteristics of the rock.

## *Extraction techniques*

The quarryman pried out with levers angular shaped blocks delimited by natural vertical fissures.

When the natural fissures are not present, the quarryman cut long "V" shaped trenches that were fitted with iron wedges.

When a vertical cut was necessary to extract a block, the trench followed an axe formaing an angle that is superior to 90°.



Naturally detached rounded blocks located at the foot of the quarry were also worked. Some of these show signs of wedge holes to yield rough cylinders.

Iron wedges were indispensable to split the rock. They were placed in the holes placed at regular intervals of about 15 cm. Rectangular shaped iron feathers or shims were placed between the wedge and the rock.

## *Millstone fashioning*

Once the rough block was extracted, the millstone maker began the process of fashioning the millstone. Several examples of this work can be consulted in the following website: **www.canterasdepiedrademolino.com.es**


Trévago
USTED ESTÁ AQUÍ
Valdelagua del Cerro
Cerro Montero
Cerro de la Cámara
Fuentesecilla
Valdecubero
Martimuñas
Los Estepares
Cerro de los Calvos
El Canto Hincado
La Dehesa
Cerro Tajero
Monte de Sardón
La Cañadilla
Peña del Horno
El Revedado
Los Tres Obispos
Las Peñas
Dehesa Vieja
El Castillejo
Hoya de la Be
Fuente Zapatero
Cerro Santiago
Vega Somera
El Ayasadero
Alto de los Cerros
Los Ribazos
Cerrillo Colorado
Vega Bajera
Los Almendros
Castilruí
El Altillo
Fuentestrún
El Ulagarejo
Cerrado del Capón
Carramagaña
Los Palomares
La Sendilla
Las Hazas
Hoya de Noceros
La Serna
La Fuente
Riajuelo
Las Huertas
Carramonte
Los Borracailes
Majada Honda
La Mata
Las Ribas
Fuente San Pedro
El Vallejo
Monter
La Tarayuela
Corral de las Ánimas
La Cuesta
La Alberca
La Cañadilla
Peñas de Castejón
Las Rozas
La Umbría de la Alberca
Dehesa Boyal
Las Cañadas
Piedras de Castejón
Los Castillejos
Las Vicentas
Los Berzales
Los Baldíos
Los Baldíos de la Tejera
Alto de Pizarrera
Cuesta del Roble
Fuente de la Casa
Cañaverata
Las Perdices
. El Boñigo
Barranco de la Cañada
Barranco de la Dehesa
Mata Muñarro
La Dehesa
Erta. de la Virgen del Río Manzano
El Calaverón
El Frontal
El Respaldar
Sendero interpretativo de las Canteras Molineras
Los Curuñuelos
Peña del Tío Sartén
Peña el Mirón
Corrales de la Peña del Mirón
Laderas de Valmayor
Barranco del Espesar
Barranco de Valmayor
Ladera del Porrilla
Rozal del Cabrero
Corral del Alto
Corrales de la Sierra
Alto de la Dehesilla 1275m.
La Mesa
Las Colmenas
Peñalaza
Los Horcajos
Alto de la Sierra
Alto de la Tiesa 1455m.
La Solana
Alto la Modorra
Portelrubio
Boquete de Castellanos
Peñagatos
Hoyo de la Peña
La Tejera
La Sierra
Prado Caballero
Mina y Convento Templario
Sierra del Madero
El Collado
Las Matas
Valdegarcía
PRCSO-114
PRCSO-116
PRCSO-116
PR SO-115
GR-86
GR-86

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