DAMOCLES

DETAILED REPORT OF CONTRACTOR FOR FIRST PROGRESS MEETING (1 March – 23 October 2000. Zaragoza)

Contractor: **Instituto Tecnológico Geominero de España, (ITGE).**

Responsible Scientist: **Santiago Ríos Aragüés**

Address: **c/ Fernando el Católico 59, 4º C. 50006 Zaragoza. España**

Telephone: **++ 34 976 555 282 / 153**

Fax: **++ 34 976 55 33 58**

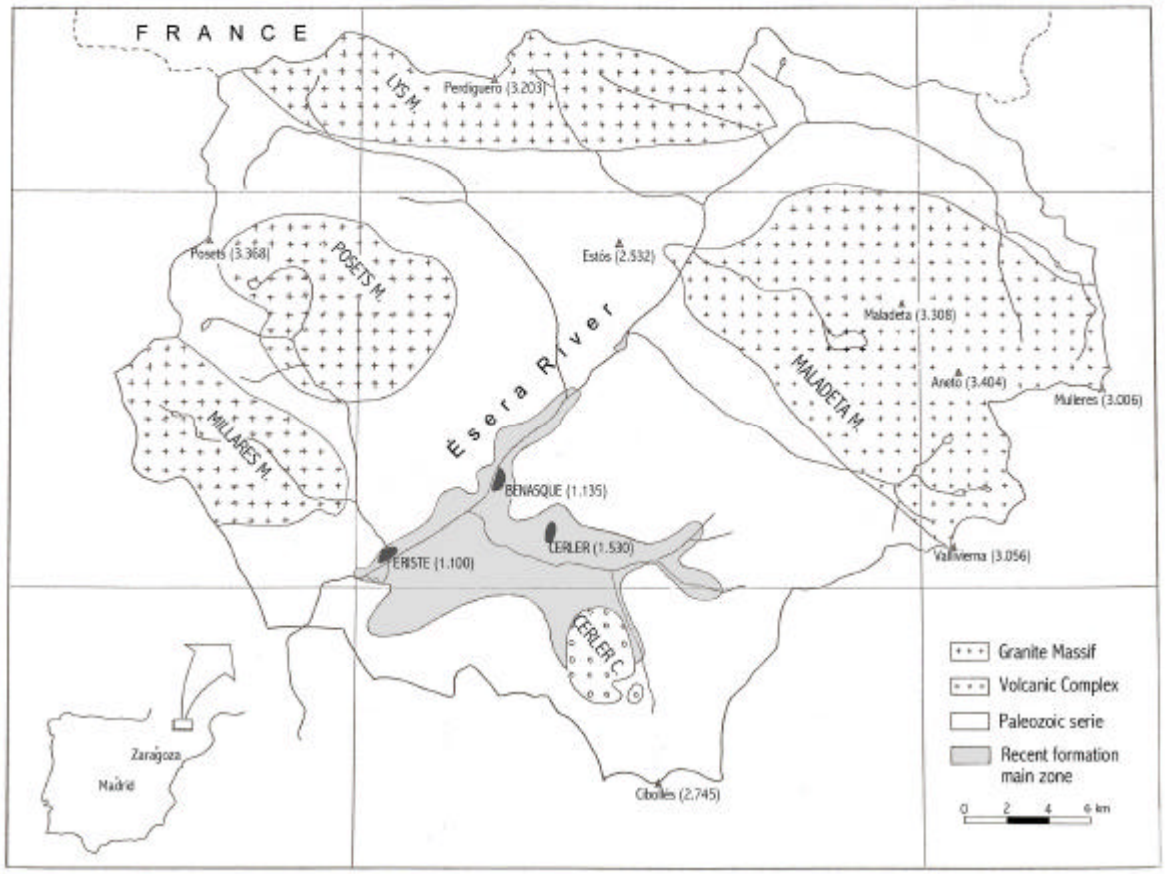
Email: **itgez@arrakis.es**

1.- Summary of work carried out

- Compilation of historical and technical information. Study of geologic and geomorphologic works done on the Central Pyrenees.
- Detail examination and comparison between aerial photographs from scale 1:30.000 (1981) and scale 1:20.000 (1997) flights.
- Field work during May-September: Recognition of the most important slope instabilities phenomena (debris-flows, landslides and rockfalls) in the area as well as the different glacial deposits and morphologies.
- Learning and management of computer tools (Microstation SE, Arcview and Avenue) for digitising, showing and treating the cartographic information that is being obtained .
- Attendance to courses related with slope instabilities and geomorphology in mountain areas.

2.- Main results obtained. ITGE STUDY AREA SUMMARY:

Geographical location: The study area has 290 km^2 and is located in the Spanish Central Pyrenees. It mainly covers the upper Ésera river basin (also called *Benasque Valley*). It is a very rugged area, the highest summit is 3.400 m a.s.l. and the deepest valley is 1.100 m a.s.l. It is 3 hours away (by car) from Zaragoza.



Geographical location and simplified lithologies

Geological context: The area is made up of Palaeozoic materials: shale, limestone and granite. These materials are the basement of the Alpine Cycle Sediments in the Pyrenees. Today, this basement comes to the surface in the Axial Zone, tectonically piled up southwards through Alpine age thrusts.

There are four igneous bodies. All of them intruded during the Carboniferous cutting the upper Palaeozoic materials:

- *Maladeta Granite Massif*, here is where we find the highest Pyrenean summits (Maladeta 3.308 m, Aneto 3.404 m).
- *Posets-Millares Granite Massif*, very similar to the Maladeta one.
- *Lys Granite Massif*.
- *Cerler Volcanic Complex*: small rhyodacite intrusion due to the joints framework.

The shale covers a great extension in the middle of the study area, however the limestone is less spread, commonly within the limestone and in smaller outcrops.

Geomorphology: The relief is controlled mainly by two factors: lithology and processes, fundamentally glacial.

In the northern part, where the granite lithologies are common, shows a very rugged relief. There are not many slopes instability phenomena, however here is where the glacial and periglacial morphologies has more entity.

The south half is made up of less strong and firm materials (shales and shales+limestones), thus the generated relief is softer than before. Here is where we find most of the slope instability phenomena. The standing out morphology consists of:

- Rounded watersheds, wider "U" valleys
- Circular breaks and mass movements (debris flows, landslides, rock falls...)
- Fluvial incision
- In these wider valleys there are active and non-active alluvial fans

The *Benasque Valley* is the best example of glacial valley in the Pyrenees. Nowadays there are a few examples of very reduced active glaciers. During the glacial maximum, the ice covered a length of 36 km, from the *Mulleres cirque* to the *Congosto de Ventamillo* natural barrier.

3.- Summary of activities for the next reporting period

- Since beginnings of October, after the field work, all the information is being digitised and after that, it will be implemented in a GIS.

- Selection of the areas for later and more detail studies.

- Description of the characteristics of the principal debris flows.

4.- References

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- García-Ruiz, J.M., Bordonau, J., Martínez de Pisón, E. & Vilaplana J.M. (1992) - **Mapa Geomorfológico de Benasque. (M.T.N. 180**). Geoforma Ediciones.

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- Ríos, M. – **Estudio del Paleozoico al Norte del Macizo de la Maladeta.** (Proyecto fin carrera ETSIMM

- ITGE (1999) – **Los Sistemas de Información Geográfica en los riesgos naturales y en el medio ambiente.** Luis Laín ed. 227 pp.

- ITGE – **Memoria de la hoja (32 – 09) 180 Benasque.**

- ITGE – **Memoria de la hoja (31 - 08) 147 Liena.**

- ITGE – **Memoria de la hoja (32 – 08) 148 Bossost.**

- ITGE – **Memoria de la hoja (31 – 09) 179 Bielsa.**

5.- Publications

Since March the 1st, the ITGE has not published any paper or report concerning the activities carried out within the DAMOCLES framework.

6.- Keywords

Debris-flows, Landslide, Central Spanish Pyrenees, Benasque.