

GEOMORPHOLOGICAL MAPPING OF GRANITE ZONES IN THE PROVINCE OF GIÀONA (CATALUNYA, SPAIN)

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Since 1978, the unity of Geodynamics of the University of Girona has been publishing a series of detailed geological and geomorphological maps of different municipal terms of the Province of Girona, mainly on the scale of 1:10.000, situated for the major part in the Littoral and Pre-littoral mountain ranges of the Cadena Costera Catalana. These mountain ranges are constituted of materials belonging to the palaeozoic era, basically metamorphous and igneous rocks (plutonic and hypabyssal rocks).

The so far published geomorphological maps are composed of three major elements:

a) Topographical map. It constitutes the infrastructure of the map above which the geomorphological attributes are projected. In order to avoid confusion with other information strata, it is printed in a pale brown colour. The limits of the mapped municipal term and the bounds that define it are printed in black, as they constitute also the exact limits of the published map.

b) Geomorphological information. It derives from the interaction of the morphological data (morphometric, morphographical, morphodynamic, and morphogenetic) obtained from the photointerpretation and the in-the-field campaigns. The use of a large range of colours and screens allows to superimpose easily detail forms above others of major dimensions and, in the same time, to differentiate the forms according to genetic criterion (littoral, fluvial, gravitational, aeolian, among others). Besides, this information stratum includes other aspects as the deposits of the quaternary and different hydrological data (springs, water courses), as well as geological data (fracture, contact between materials, rocks types) and the forms of outstanding anthropical modeling (quarries, mines, beach protection structures).

c) Legend and list of symbols. Logically, the geomorphological information of the map is accompanied with an explicative legend, in which all the symbols, screens and colours are perfectly described. In general, the legend is gathered in four large blocks: topography, human installations, lithology and morphology. The first block describes the elementary list of symbols of the topographical infrastructure (in light brown) and the boundaries of the municipal term (in black). The second one gathers the symbols that represent the anthropical forms (in a black colour). The third block is subdivided into two categories both represented by red screens, the first one representing prequaternary materials and the second one representing quaternary deposits. The fourth block gathers all the morphological symbols put into order according to basically genetic criterion. Thus, the lithological forms appear represented in a green colour, while the littoral and the fluvial forms appear in blue and the plains in black screens.

One particularity of the geomorphological maps so far elaborated is the great number of the proper lithological landforms of the named granite landscapes that they represent. The reason for it lays in the fact that this landforms are very common in the outcrops of plutonic rocks in the Province of Girona (Roqué and Pallí, 1994a; Roqué, Pallí and Capellà, 1994).

Seven geomorphological maps of those elaborated by the Unity of Geodynamics are centred in granite modeling zones: Santa Cristina d'Aro (Pallí, 1985); Conca del Ridaura (Pallí *et al.*, 1985); Palamós (Pallí *et al.*, 1987); Massís de Begur (Pallí and Roqué, 1990); Tossa de Mar (Pallí and Roqué, 1993a); Santa Coloma de Farners (Roqué and Pallí, 1994b); and Sant Feliu de Guíxols (Pallí and Roqué, 1996).

The realization of these maps made it necessary to create a legend which were very appropriate to express in terms of map-drawing the different granite landforms, with the needed details in a map on the scale of 1:10.000.

As it is usual in granite geomorphological specialized works, the landforms have been subdivided into macroforms (or major forms) and microforms (or minor forms) in accordance with their dimensions and the role they play in the configuration of the landscape. The major forms have decametric or higher dimensions and thus constituting the most significant landscape unities on the scale of the map. The minor forms have metric or lower dimensions. They do not have a significant importance in the landscape configuration limiting itself to signal a detail modeling on the macroforms, practically inestimable on the scale of the map.

The major forms (table 1) may be individually localized on a map of the scale of 1:10.000, should they be by real bounds (bomhardts) or by conventional symbols (tors, perched boulders, split boulders). In some cases, it is more useful to map the areas where these landforms appear, specially when they are abundant (area of boulders, area of blocks).

The minor forms (table 2), because of their dimensions, cannot be correctly delimited in a map on the scale of 1:10.000. That is why they should be represented by symbols in order to determine their presence in a specific area. In this case, the symbol coincides with a set of landforms.

We must signal that in some cases it can be interesting to include on the map, by using special symbols, all those landforms which for different reasons can be gathered as geological points of interest as is the case with balancing rocks; *tafoni*, boulders or blocks which look like animals; and mushroom rocks among others. In this way, detailed geomorphological mapping may supply the needed information so that the geological points and zones of interest could be known, visited and if necessary conveniently protected.

Finally, we must signal that the Unity of Geodynamics published a general geomorphical map of the Province as a whole on the scale of 1:200.000 (Pallí and Roqué, 1993b), where the main granite landscape zones are delimited by four basic symbols: area of boulders, bornhardts, area of "promontory" and major weathering depressions.

References

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



macroforms		
name		symbol
bornhardt	simple	
	complex	
	incipient	
"promontory"	area of p.	
	irregular	
	shapped rounded	 
castle-kopje		
boulder	area of b.	
	split	
	"whale-back"	
	perched	
tor		
block	area of b.	 
cave in boulder or block acumulation		 

Table 1. Legend corresponding to granite macroforms.







microforms	
name	symbol
nervations	n 
polygonal cracking	p _c
rock basins	ω
armchair-shaped hollows	∞
<i>tafoni</i> and alveoles	S 
mushroom rocks	
runnels and gutters	 
grooves and flutings	
speleothems	*

Table 2. Legend corresponding to granite microforms.