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THE PALEOZOIC EVOLUTION OF THE BELLEDONNE, GRANDES ROUSSES AND OISANS MASSIFS (WESTERN ALPS): FROM SUBDUCTION TO COLLISION

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The Belledonne, Grandes Rousses and Oisans massifs in the Western Alps, belong to the Alpine External Crystalline Massifs (ECM). Their Paleozoic basement is constituted by metapelitic, volcanic, plutonic and detritic rocks unconformably covered by Mesozoic sediments and weakly reworked by successive Alpine metamorphic and tectonic episodes.

The two main questions about these three massifs concern their mutual correlation in term of tectono-metamorphic evolution and lithological content, and their relationships with the other ECMs and with the European Paleozoic orogen.

For a better understanding of the signification of these massifs in the framework of the Hercynian belt, it is necessary to update the knowledge of the regional geology, as many new data come from recent 1/50,000 scale mapping program and related studies.

For the massifs of Belledonne, Grandes Rousses and Oisans, a summary of the geological data available in the literature and in the 1/50.000 geological maps has been realized. The cartographic synthesis, drawn with a GIS, allows to define some geological systems displaying a common origin and evolution, as suggested by their lithology, age, structural and metamorphic record. The new definition of geological systems and the synthesis of available data allow to propose an overall geodynamic evolution from Early Paleozoic to Permian time. Three major periods are distinguished:

1. during Lower Paleozoic magmatic rocks of oceanic origin testify a period of oceanisation (Chamrousses ophiolitic complex) and the development of an active margin (eclogitic relics in metabasalts);
2. From Middle Devonian to early Carboniferous, the magmatic activity recorded a contrasted evolution in different domains of the Belledonne and Grandes Rousses massifs. In SW Belledonne bimodal volcanics testifies an extensional regime on continental crust, interpreted as a back arc basin. In NE Belledonne and Grandes Rousses the emplacement of mantle-derive granites in a transpressive regime is accompanied with nappe stacking towards the NW. The temporal succession and the regional distribution of extension, plutonism and nappe stacking suggest the transition from a subduction to a collisional setting (from 370 to 330 Ma);
3. during Late Carboniferous (330-295 Ma) two crustal scale N-S trending normal faults split the collision zone in three blocks, corresponding to different crustal levels. The western and central blocks corresponds to shallow crustal levels, with brittle extensive and transtensive tectonics associated with the development of Westphalian and Stephanian basins. In contrast, in the easternmost block, a pervasive ductile extensional tectonics caused the exumation of deep crustal levels, with generation of HT-LP granulites and partial melting of the thinned crust.

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