(provisional) are suggested to be taken in account as regional geochemical thresholds for this study area: 1700-2000 ppm of F; 250-270 ppm of Li; 580-750 ppm of Rb; 20 ppm of Sn; 2-4 ppm of W; and values of 15-30, 40-80 and 1-10 for the Rb/Sr, K/Rb ad Mg/Li, respectively.

The application of multivariate mathematical techniques of data treatment (factor analysis) led to the discrimination of two principal factors: one petrogenetic, characterised by the Ba-Sr-Zr-Y association, and the other metallogenetic, defined by the F-Rb-Li-Sn group. It appears from these data that F should be an important element as a carrier for W and Sn.

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SATIR M.* - *Stable isotope investigations of polymetamorphic rocks from the Western Tauern Window (Austria)*

Petrological, geochemical and geochronological studies in the Western Tauern Window have distinguished two mineral parageneses. Hercynian and Alpine. Hercynian metamorphism involved anatexis (280 Ma) and plutonism (250 Ma). The Alpine event (between 40-15 Ma) involved progressive metamorphism with greenschist facies in the north and amphibolite facies in the south.

Oxygen isotope fractionation between minerals of the Hercynian paragenesis gives a maximum temperature of 620°C for the Hercynian metamorphism. Alpine minerals give temperatures increasing from 450°C to 560°C from the northern edge southward into the central Tauern Window.

The Hercynian micas give, with one exception, Alpine Rb/Sr and K/Ar ages, although they preserve high oxygen isotope temperatures consistent with the high-grade Hercynian metamorphism. The Alpine minerals give Alpine Rb/Sr and K/Ar ages and lower oxygen isotope temperatures. These relations indicate mobility of radiogenic Sr and Ar from the interlayer sites of the Hercynian micas during Alpine metamorphism whereas the Si = O and Al = O bonds in the tetrahedral and octahedral layers were not disturbed.

The hydrogen isotope composition of Hercynian (brown) biotite is preserved through Alpine metamorphism in a relatively H_2O-poor closed system. The coexisting Alpine biotite (green) has lighter δD values than the Hercynian biotite. During recrystallisation of brown biotite to form green biotite, the lighter δD isotopes were incorporated in the latter.

The O- and H-isotope compositions of both Hercynian and Alpine parageneses show that the Alpine metamorphism did not introduce significant amounts of fluid. By contrast, the O-, H-, and Sr-isotope data of Hercynian minerals suggest a wide-spread homogenisation caused by open-system behaviour during the Hercynian metamorphism.

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SERRA P.R.* - *The Alforja breccia body (NE Spain) and its origin by explosive phenomena in an epiplutonic magma chamber*

In the Southern Catalonian Coastal Ranges intrusive complex (whose principal characteristics are summarized by SERRA & ENRIQUE in a companion abstract), breccia bodies related to igneous processes and having varied morphologies, structures, degrees of complexity and modes of occurrence, are sparsly distributed. To start with the study of these formations I have chosen the Alforja breccia body because it meets several favourable conditions: a) its exposition is very good in a road cut in which has an observable width of around 100 m; b) the Alforja massif, in which breccia occurs, is at present the best known intrusive unit of the complex, and c) the igneous origin of the breccia is easily demonstrated since pebbles are embedded in an igneous matrix.

The breccia body is located inside a tonalitic unit that is the dominant lithology in the Alforja massif. Structurally this formation is composed of puzzling network of irregularly shaped and connected pebble masses that isolate between them big blocks compositionally identical to the tonalitic host. In the road-cut, the breccia is seen limited at both sides by two dykes, few metres thick, that are in direct contact with the unbrecciated tonalite. Field relationship outside the road-cut indicate that the two dykes are not two, but only an arcuate one that encircles the breccia.

From inside outwards, subtle gradational changes took place that give the breccia a zoned structure. Essentially these changes affect the size, shape and lithology of the clasts, and the morphology of the pebble masses.

Pebble masses are commonly thick throughout the breccia, but in the outer zone there are also more delicate, thin, dyke-like, anastomosed pebble masses.

Clast sizes can vary from millimetric to metric; the commonest ones have dimension between 5 and 15 cm.

Clast shape varies from very angular to well rounded; it depends on lithology and on location inside the breccia body. Roundnees is better developed in the inner zone.

Granulometric classification is in general poor and clasts of all sizes are mixed.

Clasts composing pebble masses can be tonalitic, leucogranitic, porphyritic and sedimentary. These latters are extremely rare. The commonest lithologies are those tonalitic and leucogranitic. The former ones are petrographically identical to the host tonalite. Porphyritic pebbles are markedly concentrated in the interior. Leucogranitic ones are sligthly enriched in the outer zone, while tonalitic clasts follow a reverse trend. In general, the most angular pebbles are leucogranitic and the best rounded ones are porphyritic.

An igneous matrix occupies interstitial spaces between pebbles. It is composed of a fine-grained, phaneritic and equigranular rock of granitic to granodioritic composition. It shows no important signs of deformation except undulating extinction in some quartz grains and an incipient mortar texture in some grain boundaries. Crystal pulled away from clasts are almost securely present in the matrix.

Some inter-pebble spaces are not occupied by igneous matrix, but by iron oxides and/or epidote, and hydrothermal alteration is always present in the surrounding rock.

About the genesis of the breccia, an origin by explosive phenomena in an epiplutonic magma chamber is consistent with the high crustal level reached by the magmas (see SERRA & ENRIQUE companion abstract) and can also account for many observed features of the breccia.

Sudden release of energy as a consequence of volatile exsolution from magma in a low pressure subvolcanic reservoir can cause the fracture failure of its roof allowing gas to escape. If the internal overpressure is sufficiently high, streaming gas carrying solid particles can form a fluidized system capable of abrasively erode the fracture walls. This would result in an enlargement of the total void volume and the formation of rounded pebbles. If rising magma flows follow the gas surge then a cleaning of the channels from previously formed fragmentary material is to be expected. As this is not in accord with the observed relationships, it must be accepted that gas was not followed by ascending magma. To explain the igneous nature of the pebble masses' matrix, let us hypothesize that the present day exposition level is close to the top of the magma chamber from which gas was released. As void volume has been enlarged by the fluidized system, gas-suspended solids will collapse when pressure falls donw. Rocks at the base of the column will, in this way, enter into the underlying magma chamber and will force the injection of the liquid into the inter-pebble spaces at the same time that clasts will be more closely packed. Such a collapse injection can also account for the arcuate dyke that embraces the breccia provided that both the dyke-forming rock and these composing the pebble masses' matrix come from the same source. If this is the case then the non-porphyritic texture of the matrix as opposed to the porphyritic one of the dykes can be explained by a filter effetc exerted by the pebble packing over phenocryst suspended in the liquid of the underlying reservoir. A closure of the chamber after collapse can have prevented magma from more volatile lossing and can have maintained the required conditions for the crystallization of rocks with phaneritic equigranular textures as those observed in the matrix of the pebble masses.

Inter-pebbles spaces occupied not by igneous matrix but by oxides and other minerals are regarded as gas bubbles equivalent to miarolitic cavities.

In such a scenario, the interconnected network of pebble masses is regarded as an anastomosed system of enlarged fractures that was subsequently filled by collapsed fragmentary material and then was embedded in magma. The big tonalitic blocks isolated by pebble masses are believed to represent inter-fracture remnants of the failed roof. Tonalitic lithologies present as pebbles also derive from the fragmented roof. Leucogranitic and porphyritic clasts are believed to be fragemts of dyke rocks intruded and crystallized in the host tonalite prior to the explosive event. Some pebbles have been foud that are composed of two lithologies (e.g. tonalite and leucogranite) showing sharp contact relationships between them.

The zoned structure of the breccia appears to be due to a non-homogeneous release of energy throughout the body. The observed relationships indicate that the energy release was more intense in the inner than in the outer zone.

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SERRA P.R.*, ENRIQUE P.* - *The subvolcanic nature of the late-Hercynian calc-alkaline plutonics from Southern Catalonian Coastal Ranges (NE. Spain)*

Intrusives from Southern Catalonian Coastal Ranges from an I-type series that compositionally expands from diorite to biotitic leucogranites. They occur both as voluminous, irregularly shaped plutonic bodies ans as dykes of identical composition. Their wall-rocks are composed of an anchimetamorphic Palaeozoic sedimentary sequence that ranges in age from Silurian to Middle Carbonoferous. All these formations are covered by Triassic sediments.

Evidence supports the epizonal character of the intrusives; in addition, many features strongly suggest that the complex is subvolcanic, that is to say that magmas were emplaced in a very low-pressure environment and were able to eventually reach the surface. Unfortunately, erosion has removed any related volcanic cover.

Contacts between intrusives and their host-rocks are sharp and cross-cut the structures generated in these latter by the main Hercynian tectonic pulses. This sharpness together with the angularity of the contact surfaces, indicate a brittle behaviour of the host during magma emplacement. Intrusions are surrounded by contact metamorphic aureoles that reach — at least locally — the pyroxene hornfelds facies.

Plutonic masses are composed of several distinct bodies that record a multiple intrusion history. Preferentially they crop out in relatively depressed areas in which their enclosing rocks can be seen lying above them, with flat, nearly horizontal contact surfaces. This tendency is believed to be indicative that today's exposition level is close to the top of a much bigger batholith that outcrops only in its most apical parts.

A well developed dykes swarm is present and is especially impressive in the l'Argentera-Riudecanyes area: just above of the plutonics, NE.-SW. trending composite dykes of varied compositions and recording a multiple emplacement history, intrude into the sedimentary host-rocks occupying more than 50% of the surface and, in many cases, confining the Palaeozoic sediments to thin septas between dykes. Well formed chilled margins and fairly cystalline interiors characterize the porphyritic texture of these dykes. Their inner parts have just the phenocrystic content needed to maintain phenocryst in contact; the interstices are occupied by finer-grained material or, sometimes, by granophyric quartz-feldspar intergrowths. It is intersting to note, at