

da ZOM, b) grande heterogeneidade dos comportamentos reológicos (visco-plásticos) das litologias presentes, mármore e metabasaltos, c) pressões de fluidos possivelmente muito elevadas e d) tempo geológico suficientemente lato implicando um "strain rate" baixo.

Idades obtidas pelo método  $^{40}\text{Ar}/^{39}\text{Ar}$  são discutidas para as litologias que envolvem a zona de sutura. As datações realizadas reflectem um evento de arrefecimento generalizado, nesta área, posterior à instalação do COBA e a intrusão do CIB.

Compara-se o COBA com outras sequências ofiolíticas, nomeadamente com o ofiolito de Oman. Elaboram-se hipóteses de modelos geodinâmicos para esta sutura da Cadeia Varisca Ibérica. A obdução para NE do COBA, similar com a polaridade da subdução, que origina a intrusão do CIB, implica uma geometria em floco tectónico, associado a um escape lateral das litologias do SW da ZOM.

### **TECTONO-THERMAL EVOLVING PATH AND METALLOGENETIC POTENTIAL OF THE MANTEIGAS-VILARIÇA-BRAGANÇA NORTHERN DOMAIN (NE PORTUGAL)**

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The Vilariça Fault Zone (VFZ) is one of the major elements of the late-Hercynian strike-slip network in the NW sector of the Iberian Peninsula, which follows a general NNE-SSW trend for about 250 km. The displacement along individual faults is mainly left-lateral; total

displacements as evidenced by cartographic analysis is, actually, the result of the polyphasic and heterogeneous seismic activity along different fault segments, since the end of Hercynian Orogeny until present day. Geological and geomorphological criteria show that a main left-lateral movement with up-thrusting of the eastern block towards WNW is related to the reactivation events of Plio-Quaternary age; an historical seismicity record associated to this tectonic structure demonstrates its present day activity.

Considered as a whole, the fault zone trace has an evident geomorphic expression, is quite straight, and reveals strong continuity. More or less pronounced inflections in strike and branch development at different scales reflect, however, the importance of the geometrical constraints imposed either by the coalescence of en echelon strike-slip fault segments or by structural anisotropies of Westphalian (or earlier) age, on the mechanisms responsible for the VFZ nucleation and propagation. This structural influence, which explains the local and polyphasic development of discontinuous hydrothermal quartz fillings along the fault zone, is particularly evident in the NE domain of the VFZ; the present study focus on the comprehensive characterization of five key fault segments within distinct geo-structural contexts. These fault segments outcrop in (i) Quinta Vale do Meão (Pocinho - SE of Torre de Moncorvo) and Quinta da Terrincha (Horta da Vilariça - NNW of Torre de Moncorvo), (ii) Grijó (SSE of Macedo de Cavaleiros) and Quintela de Lampiças (NE of Macedo de Cavaleiros), and (iii) Rabal-França-Portelo (N of Bragança), and are representative portions of the Southern, Central and Northern sections of the above mentioned fault domain, respectively.

Detailed petrography of rocks that fill and host the mapped fault segments, enable the characterization of the mineralogical and

microstructural modifications developed during the successive deformation events related to the VFZ evolution. The events, coupled and/or followed by the circulation of large volumes of hydrothermal fluids, are part of the main seismic cycles induced by the regional stress field of late-D3 and D4 Hercynian deformation phases. In general, the P-T-t path obtained for the five fault-segments studied are similar to one another, although significant variations on the hydrothermal alteration intensity and typology may be highlighted. Also, strong heterogeneities of the pattern and deformation style correlative of certain evolving steps can be shown to exist. These differences reflect partially the chemical-structural constraints imposed by the host lithologies, but, on the other hand, are ascribable to significant differences of the parameters that control the fluid dynamics coeval of specific displacement increments and/or the stress fields required for their development. In a general perspective, one may conclude the following:

(i) The earlier, sin-D4, seismic events occurred in a semi-ductile regime under average yielding ratios of 10-12 to 10-11s-1, temperatures ranging probably from 300 to 350 °C and global pressures lower than 3 kbars. The estimated average depth for the brittle-ductile transition regimes is  $10 \pm 0.5$  km, assuming fluid pressures near the lithostatic pressure. The available data also support the circulation of aquo-carbonic, reducing and acidic fluids with low salinity during this deformation cycle.

(ii) The seismic events in semi-brittle regime took place at P-T conditions of the order of 1-2 kbars and 250-300 °C. The deformation/alteration pattern correlative of this important cycle suggests that acidic, and reducing aquo-carbonic fluids with low salinity were present.

(iii) The transition to the deformation cycles in brittle regime is

underlined by significant decrease of fluid pressures and gradual increase of deviatoric stress under P-T values near 1-1.5 kbars and 200 °C. Typical fluids comprise aqueous and acidic solutions of low salinity with a low density carbonic phase.

(iv) The fluid pulses pumped to the fault zone during the seismic events that occurred in semi-brittle/brittle transition regime, were responsible for the gold-silver mineralization of the Pingão dos Quintais Concession (Rabal-França-Portelo sector), as well as for the deposition of the sulphides and carbonates within the siliceous

fault-zone filling at Quintela de Lapaças. According to the strong mineralogical, geochemical and microstructural similarities displayed by both sectors, anomalous high gold-silver concentrations are expected in the latter fault segment.

(v) Temperatures below 200 °C and global pressures not above 1 kbar characterize the deformation cycles that occurred in near superficial crustal levels. The mineralogical record of the fluid/rock interaction contemporaneous of this evolving step suggests the percolation of aqueous, oxidizing, and relatively acidic fluids.

(vi) The fracture network exhibited by the quartz fillings of the VFZ in all the mapped sectors was generated during reactivation episodes of probable late-D4 age.

(vii) The fault zone weathering under climatic conditions prevailed at the Late Pliocene-Quaternary transition in Portugal (successive fluctuations from (semi)-arid to humid), enabled the redistribution of the noble metals in the resulting oxidized profile; this geochemical feature should be taken into account in any evaluation of the economic potentialities of the main fault segments belonging to the VFZ NE branch.