

inclusions on quartz indicate temperatures of formation in the range of 430–230°C from vapor- and CO<sub>2</sub>-rich fluids; U/Pb dating on ferberite indicates an age of 290 Ma. Overall, the SVMS developed from late Devonian to late Permian, with two peaks of activity around 305 and 290 Ma that produced orogenic-type deposits in the SE and RIRGD in SW Sardinia. Metallogenic peaks overlap with post-collisional shearing, uplift and extension and the production of OMP and YMP magmatism. Thus, the differences in metals budgets and types of Au-bearing mineralisation from southern Sardinia were inherited from pre-Variscan crustal sources with distinct geochemical signatures such as Au-Sb-fertile Ordovician continental arc and Silurian black shales, more common in the SE, and an inferred, Mo(-W-Sn)-enriched Precambrian crystalline basement in the SW of the region.

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## **Mississippian gneiss domes and synorogenic basins: Keys to understand the Variscan collisional orogen**

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*gneiss domes, synorogenic basins, Variscan belt*

The relationship of gneiss domes and sedimentary basins is of great interest for understanding an orogen. Gneiss domes (GD) are flat-lying tectono-thermal structures, usually related to the fast thinning of continental crust. They are caused by the high thermal influx that invades the upper crust, related to the rapid exhumation of deeper levels. This phenomenon is responsible for the partial melting of the continental crust and lithospheric mantle, and the resulting magmatism.

As a response to this crustal thinning, extensional shear zones develop in depth in conditions of low pressure (LP) but varying from high (HT) to low temperature (LT). Consequently, topography in the hanging-wall of GD reacts forming horst-graben systems and sedimentary basins.

In the Iberian Massif (IM) (Variscan orogen), Mississippian GD and sedimentary basins are described as synorogenic. They were formed as a response to the gravity-driven collapse of the thickened crust after the Late Devonian continental collision between Laurussia (upper plate) and Gondwana (lower plate) (Alcock et al. 2015).

In the IM, Mississippian sedimentation was locally synchronous with volcanic activity, linked in time and space to the syn-tectonic plutonism and the development of GD (Pereira et al. 2012, 2020). Tectono-metamorphic evolution of this orogenic extensional event, strongly overprinted the earlier tectonic fabrics.

It seems unlikely that these basins were formed in a foreland, backarc, or forearc setting related to the subduction of the Rheic oceanic lithosphere, given that the Laurussia-Gondwana collision occurred earlier. Their tectonic evolution is believed to be controlled by a notable thermal anomaly beneath the orogen, but the tectonic setting remains under discussion. Recently, two models have been proposed (Dias da Silva et al. 2024): Model A) suggests that following the subduction of the Rheic oceanic lithosphere beneath the upper plate (Laurussia) and the ensuing continental collision, the roll-back of the lower plate was responsible for the formation of an orogenic plateau, the lateral flow of partially molten orogenic roots, and peel-back tectonics; in this case, Mississippian synorogenic basins are considered of peel-back type; and Model B) assumes that the ongoing subduction of the Paleotethys oceanic lithosphere (lower plate), following the Devonian continental collision, provides a reasonable explanation for the onset of a magmatic arc in Gondwana (upper plate); As a consequence, Mississippian synorogenic basins are considered of backarc type.

Work supported by FCT I.P./MCTES (PIDDAC, Portugal) by IDL: UIDB/50019/2020 (doi:10.54499/UIDB/50019/2020), UIDP/50019/2020 (10.54499/UIDP/50019/2020), LA/P/0068/2020 (10.54499/LA/P/0068/2020), and DL57/2016/CP1479/CT0030 (10.54499/DL57/2016/CP1479/CT0030); by ICT- UIDP/04683/2020 (10.54499/UIDP/04683/2020) and UIDB/04683/2020 (10.54499/UIDB/04683/2020); and by MCIN/AEI/10.13039/501100011033 and TED2021-130440B-I00 (Spain).

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## **Geological investigations at Einstein Telescope site of Sardinia (Italy): preliminary results**

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*Structural analysis, Variscan basement, Geological modeling*

The Einstein Telescope is a large underground facility designed for gravitational wave detection. One of the candidate sites to host the infrastructure is near the area of the disused Sos Enattos mine (Sardinia). In the framework of the SAR-GRAV and FdS-2021 projects, we performed new geological investigations in the area comprised within the potential vertex (Bitti-Lula-Mamone) limiting the ET triangle, aiming to assess the geological, structural, and hydrogeological conditions. For this purpose, we adopted a multidisciplinary approach involving detailed geological, structural and petrological investigations, and groundwater sampling and analysis (both water chemistry and stable isotopes  $\delta D$ ,  $\delta^{17}O$  and  $\delta^{18}O$ ).

The geological setting of the Sos Enattos area is characterized by metamorphic and magmatic rocks belonging to the Variscan basement. The metamorphic rocks mainly consist of mica-schists, paragneisses and orthogneisses; the magmatic rocks, belonging to the Variscan batholith, are mainly granites and