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The Hajjar regional transpressive shear zone (Guemassa Massif, Morocco): Consequences on the deformation of the base-metal massive sulfide ore

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The genesis of the base-metal massive sulfide deposits hosted within the Moroccan Hercynian Jebilet and Guemassa Massifs is still under debate. No consensus currently exists between the two models that have been proposed to explain the deposits, i.e., (1) syngenetic volcanogenic massive sulfide mineralization, and (2) synmetamorphic tectonic fluid-assisted epigenetic mineralization. Conversely, researchers agree that all Hercynian massive sulfide deposits in Morocco are deformed, even though 3D structural mapping at the deposit scale is still lacking. Therefore, while avoiding the use of a model-driven approach, the main aim of this contribution is to establish a first-order structural pattern and the controls of the Hajjar base metal deposit. We used a classical structural geology toolbox in surface and subsurface mining work to image finite strain at different levels. Our data demonstrate that: i) the Hajjar area is affected by a single foliation plane (not two) which

developed during a single tectonic event encompassing a HT metamorphism. This syn-metamorphic deformation is not restricted to the Hajjar area, as it is widespread at the western Meseta scale, and it occurred during Late Carboniferous times; ii) the Hajjar ore deposit is hosted within a regional transpressive right-lateral NE-trending shear zone in which syn- to post-metamorphic ductile to brittle shear planes are responsible for significant inflexion (or virgation) of the foliation yielding an anastomosing pattern within the Hajjar shear zone. Again, this feature is not an exception, as various Late Carboniferous-Permian regional scale wrenching shear zones are recognized throughout the Hercynian Meseta orogenic segment. Finally, we present several lines of evidence emphasizing the role of deformation in terms of mechanical and fluid-assisted ore concentrations.

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