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Relantionships between gold mineralization and granite - Discussion with the support of a pluridisciplinary study of the Passa Tres gold deposit (South Brazil)

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The Passa Três Granite, located at East of the Paraná State is elongated following a NNE-SSW direction. This sienogranite is emplaced within metapelites of the meso to neoproterozoic Açungui Group, between the Morro Agudo and Lancinha transcurrent faults, comprising the N040°E trending Lancinha Transcurrent Fault System. Gold mineralization within the Passa Três Granite is constituted by huge quartz veins with sulfides, variable quantities of fluorite and carbonates, forming orebodies with different internal textures, including massive, banded, sheared and brecciated. Structural data indicate the existence of two major fault systems, one N-S and the other E-W, with dips of 15-45°W and 20-75°S, respectively. Both NS and EW systems are interpreted to be contemporaneous and conjugate. Normal motions are everywhere suspected and main mineralized veins are located at opening sites at these fault systems, such as pull-aparts. The structural model suggests that the normal motion can be initiated by shearing along a "guide" level, in which sulfides and clay minerals are concentrated. This configuration can be observed at several scales, such as field, hand samples and thin section. Mineralized veins mainly contain, in addition to the quartz of the gangue, sulphides (pyrite, chalcopyrite, galena, molybdenite), fluorite, chlorite, muscovite, sericite, and carbonate. The presence of sericite, kaolinite and chlorite indicate the occurrence of, at least, propylitic and phyllic-type alterations, both in core of the granite and best-expressed at the rim of quartz-rich orebodies. Gold occurs as native grains in core of the quartz veins, within fractures that affect pyrite and frequently exhibiting normal motions consistent with the one observed at larger scale and systematically associated with chalcopyrite and galena. Quartz veins are sometimes bordered by aplitic dike. Additionally, some of the veins can exhibit a very thin margin of adularia minerals that seems to represent the early stage of vein formation. These observations favor the link between late-magmatic fluids and veins formation. In order to constrain this assumption, a campaign of absolute dating has been undertaken. Zircons from granite and aplite for the magmatic feature and adularia, muscovite, sericite and molybdenite grains for the hydrothermal ones were selected and will be dated by, respectively U-Pb, Ar-Ar and Re-Os methods. Preliminary field results may suggest that gold-quartz veins may formed during the magmatic-hydrothermal transition and that mineralizing fluids possibly represent the late stages of magmatic fluid. Their mode of formation looks to be consistent with an extensional setting. With the help of all these new data, a discussion will be initiated about the genetic model of granite-hosted gold deposits and particularly on this specific case represented by the Passa Três deposit in which huge quartz veins, and no stockwork, are only formed inside the granite and not in surrounding rocks.