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The Structural Setting of Navachab Gold Mine and Satellite Orebodies: Insights for Exploration

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The Navachab Gold Deposit, central Namibia, is situated in amphibolite-facies, marble-schist-dominated metasediments of the Neoproterozoic Damara Sequence in the Pan-African Damara Belt. The deposit is hosted by continental-shelf-type metasediments, primarily biotite-schists, marbles, and calcsilicates. Gold mineralization is hosted by two main sets of auriferous quartz veins that are developed on the subvertical northwestern limb of the regional-scale anticline, the Karibib dome (KD). The orientation, relative timing and progressive deformation of quartz veins indicate that veining occurred during folding-and-fold amplification of the KD. This deformation forms part of the main phase of northwest-directed collisional tectonics in the Damara belt at ~530-510 Ma. The two main vein sets include bedding-parallel, shallowly plunging ore lenses/shoots at the base of a prominent marble unit, and a laterally extensive package of shallowly dipping quartz veins that truncate host rocks at high angles. The bedding-parallel lenses represent dilational jogs that opened during flexural flow along bedding-parallel slip planes during the amplification of the KD. The KD is an asymmetric anticline with a steep limb dipping 75^{o}NW, with siliciclastic and carbonate rock formations of contrasting rheology. Flexural flow and associated bedding-parallel fluid infiltration was concentrated proximal to the contact between marbles and the underlying siliciclastic formations. This contact represented a pronounced rheological contrast, which increased slip rates during fold amplification. The shallowly dipping, sheeted-quartz veins were emplaced during the fold lock-up of the KD. Quartz veining occurred when the KD's northwestern limb rotated subvertically, with the halting of bedding-parallel flexural slip. Extensional fracturing for veining was facilitated by the short-lived supralithostatic fluid pressures. The high-amplitude fluid pressure associated with extensional fracturing likely triggered gold precipitation in the shallow-dipping veins. Crosscutting relationships between the two main vein systems indicate that the two vein sets represent separate entities and succeeded each other rather than forming an interconnected fracture mesh.