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PUEBLO VIEJO HIGH-SULFIDATION EPITHERMAL GOLD-SILVER DEPOSIT, DOMINICAN REPUBLIC: A NEW MODEL OF FORMATION BENEATH BARREN LIMESTONE COVER

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Abstract

Field observations in the Pueblo Viejo district, Dominican Republic, show that an extensive advanced argillic lithocap and the contained giant high-sulfidation epithermal gold-silver deposit were emplaced beneath a thick limestone cover. Massive silicification and associated magnetite and hematite, containing the same anomalous multielement suite as the underlying advanced argillic alteration, developed widely in the basal few meters of the limestone. These observations imply that alteration and mineralization cannot be synchronous with the host volcano-sedimentary sequence, of Early Cretaceous age, but must be substantially younger, probably part of a Late Cretaceous to early Tertiary metallogenic epoch that is well documented throughout the Greater Antilles magmatic arc. Hence, there is no genetic relationship between the gold-silver orebodies and either a maar-diatreme system or volcanic dome complex, two proposed models for Pueblo Viejo, nor with the bimodal island-arc tholeiite suite of which both would necessarily be a part.

This reinterpretation offers an explanation for some of the unusual geologic features of the Pueblo Viejo orebodies when compared to other giant high-sulfidation deposits, particularly those in the central Andes. The impermeable limestone appears to have acted as a barrier that inhibited upward fluid flow, ground-water recharge, and heat dissipation, thereby accounting for the unusually high gold and zinc tenors, dominance of quartz-pyrophyllite over vuggy quartz alteration, prograde overprinting of alunite by higher temperature pyrophyllite, and almost exclusively magmatic character of the ore fluid. The limestone probably also played a determinant role in orebody preservation.

Recognition that the Pueblo Viejo deposit and its host lithocap are likely to have been completely concealed by unaltered limestone prior to exhumation, with probably little or no paleosurface expression, underscores the likelihood of other similar blind high-sulfidation deposits in calc-alkaline magmatic arcs elsewhere. The existence of blind high-sulfidation gold ± silver deposits, especially in limestone terranes but also potentially beneath other low-permeability rock units, needs to be considered during exploration.

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