TECTONIC SETTINGS AND TEMPORAL EVOLUTION OF OROGENIC GOLD DEPOSITS

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Orogenic gold deposits have formed over more than 3 b.y. of Earth's history, episodically during the Archean to Paleoproterozoic, and continuously throughout the Phanerozoic. This class of gold deposit is associated with deformed and metamorphosed mid-crustal blocks, near major crustal structures. The temporal distribution of the most important gold deposits, excluding the still controversial Witwatersrand ores, indicates most vein formation at about 3.1 Ga, 2.7-2.5 Ga, 2.1-1.7 Ga, and 0.6-0.0 Ga. Age patterns for Precambrian gold deposits are remarkably similar to those of episodic growth of juvenile continental crust, both reflecting discrete periods of mantle overturning and extreme heating at the base of the lithosphere. Patterns subsequent to 1.7 Ga reflect the decreasing influence of such plume activity on plate tectonics and the increasing impact of modern-style plate tectonics on crustal evolution and ore deposition. Late Mesoproterozoic growth of Rodinia initiated, for the first time, a fragmental style of crustal growth defined by thin orogenic belts rather than as broader blocks of new crust with well-cratonized interiors. Such Cordilleran- and Turkic-styles of continental growth certainly would have been favorable for deposition of orogenic gold, but these older, narrower orogens were totally reworked during post-Rodinian outboard terrane collisions. Therefore, unlike older Precambrian lodes preserved in cratonic blocks, almost all significant gold concentrations from the Mesoproterozoic and Neoproterozoic would have been eroded. Beginning with the ca. 600 Ma East African orogen, preserved gold systems are recognized to have evolved continuously during collisions along the Gondwana, Paleo-Tethyan, and Circum-Pacific continental margins.