

SEG 2024 Conference: Sustainable Mineral Exploration and Development

Structural Evolution of the Magino Gold Mine, Wawa Subprovince, Ontario: An Overprinted Archean Intrusion-Related Deposit

Ian Campos^{1, 3}, Bruno Lafrance¹, Ross Sherlock¹, Stefan Kruse²

1. Mineral Exploration Research Centre (MERC), Harquail School of Earth Sciences, Laurentian University, Sudbury, ON, Canada, 2. Terrane Geoscience Inc., Halifax, NS, Canada, 3. Agnico Eagle Mines Limited, Montreal, QC, Canada

The Magino gold deposit, located within the Michipicoten greenstone belt of the Wawa subprovince (Ontario, Canada), is a past-producing underground mine that has recently begun production as an open-pit gold mine with total resources of 5.4 Moz of Au. Gold is primarily hosted within the ca. 2724 Ma Webb Lake stock (WLS), a steeply dipping, tabular multiphase tonalitic intrusion oriented parallel to the strong regional S_2 foliation along the Goudreau Lake deformation zone. The Magino deposit underwent two gold mineralization events (Au_1 , Au_2) and three episodes of ductile deformation (D_2 , D_3 , D_4). The main gold event (Au_1) is expressed by pervasive biotite-phengite-quartz-pyrite alteration of the stock and the emplacement of auriferous sugary quartz veins. The veins have a molybdenite Re-Os age of 2731 ± 6.9 Ma, which overlaps within error with the age of the WLS. Quartz-feldspar porphyry dikes, cogenetic with the WLS, cut the veins, both of which are transposed, stretched, and folded parallel to the S_2 foliation within high strain corridors in the WLS, supporting a pre- D_2 timing for the Au_1 event. These high-strain corridors formed by strain localization along Au_1 hydrothermally altered zones during D_2 N-S shortening. The Au_2 event is associated with structurally controlled syn- D_2 , N-trending quartz-tourmaline-carbonate veins with albite-paragonite-ankerite-pyrite alteration selvages. The D_3 event resulted in dextral reactivation of the high-strain corridors. D_4 vertical loading produced a subhorizontal crenulation cleavage, which is overprinted by chloritoid porphyroblasts that grew during late upper greenschist-facies peak metamorphism. The Magino deposit represents a paragenetically complex Archean intrusion-related gold system, which was structurally modified and overprinted by a second gold mineralization event.