

Looking North for future gold resources: exploration and mining within the Nanortalik Gold Belt, South Greenland

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Greenland's economy relies heavily upon fishing, hunting and tourism, but increasing emphasis is being placed upon the development of the country's mineral wealth. Mining has played an important role in the local economy of South Greenland for over a century including Nalunaq gold mine, 2004-2013; the Ivigtut cryolite mine, 1854-1987; the Amitsoq graphite mine, 1915-1924; the Josva copper mine, 1904-1915; and the King Frederik VII copper mine, 1851, and 1912 (e.g. Kolb *et al.*, 2016, 2017; Steenfelt *et al.*, 2016). One of the most densely populated parts of the country, South Greenland is located at a similar latitude (ca. 60°) to Oslo, Helsinki and Whitehorse. The region benefits from a well-developed infrastructure with an international airport (Narsarsuaq), as well as several heliports and harbours. The deep water fjords that bisect the region, generally remain ice-free throughout the winter months. The relatively mild climate would facilitate year-round mining operations.

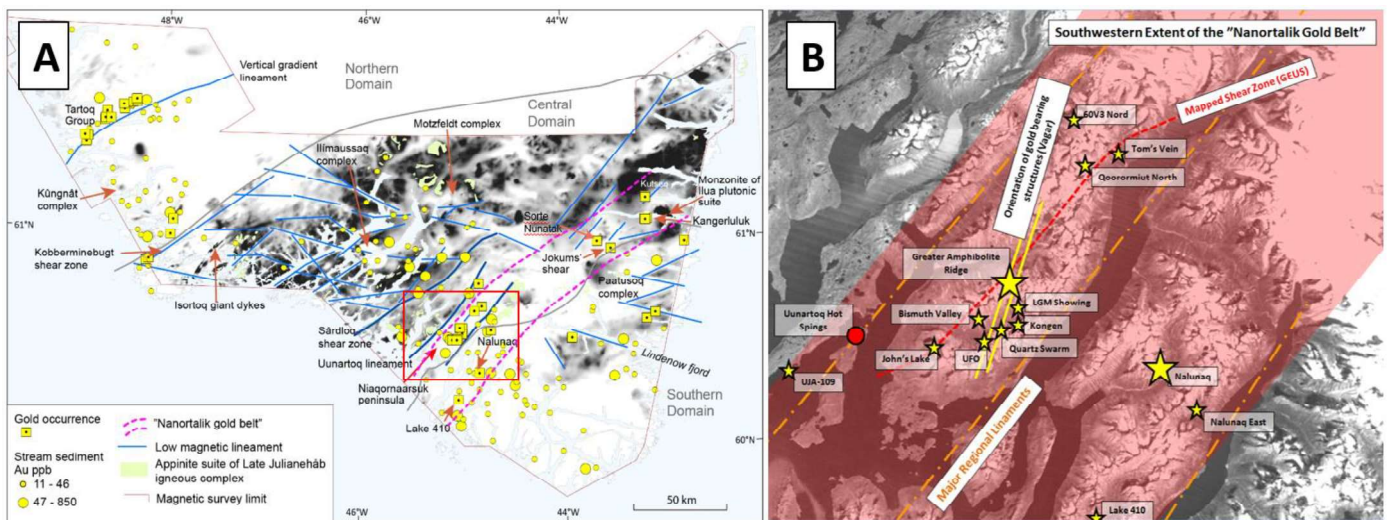


Figure 1: (A) Location of the “Nanortalik Gold Belt” in South Greenland showing all know gold occurrences and stream sediment gold anomalies, adapted from Steenfelt *et al.*, 2016; (B) southwestern extent of the gold belt showing the location of gold occurrences on the Niaqornaarsuk Peninsula, as well as the location of Nalunaq gold mine. Note that the Greater Amphibolite Ridge area hosts the Vein I, Vein II, Femøren, Bella I/II, West Ridge, Crown, Kastrup, Ørestad, Øresund and Christianshavn gold occurrences.

At the current spot price the physical gold market accounts for 170 billion USD annually, with gold receiving more than half of the global mineral exploration expenditure. In this contribution we present recent exploration results from the highly-underexplored Nanortalik Gold Belt (NGB), a >150 km long and 50 km wide corridor of gold occurrences and anomalies with significant future gold resource potential. The NGB hosts Greenland's only commercially exploited gold deposit to date (Nalunaq gold mine; Kolb *et al.*, 2017; Hughes, J.W. *et al.*, this meeting). The alpine terrain of South Greenland offers a spectacularly well

exposed and essentially complete transect through a mid-crustal Palaeoproterozoic continental arc which was accreted along the southern margin of the West Greenland North Atlantic Craton (c.f. Hughes, H.S.R. *et al.*, this meeting) during the Ketilidian Orogeny. The multiphase Julianehåb Igneous Complex represents the plutonic component of the arc and covers more than half of the present exposure of the Ketilidian Orogeny. The NGB is located along the southern margin of Julianehåb Igneous Complex, with the overlying Southern Domain (previously divided into the Psammite and Pelite Zones), which represents a fore-arc basin with interbedded metasediments and metavolcanics (Fig. 1).

Previous explorers had neglected the gold potential of the granitoids of the Julianehåb Igneous Complex, notwithstanding the presence of unexplained gold anomalies. Their focus has been limited, directed by the geological setting of the 1.8 Ga Nalunaq deposit within hydrothermally altered metavolcanics of the Southern Domain. Recent exploration by the authors within granitoids on the Niaqornaarsuk Peninsula (the so-called "Vagar" area) has successfully located >18 individual targets with in-situ gold grades exceeding 10 g/t gold (Schlatter *et al.*, 2015; 2013). Sediment sampling defines several large, highly anomalous gold clusters. The >3 x 4 km Greater Amphibolite Ridge cluster hosts some of the strongest sediment gold anomalies in the whole of Greenland. Here orogenic gold mineralisation occurs as laminated quartz veins carrying up to 2533 g/t gold, hosted within hydrothermally altered granitoids, themselves mineralised up to 14 g/t gold. Channel sampling has returned up to 11 metres @ 80 g/t gold. Exploration within the southeastern extent of the NGB has resulted in a number of gold discoveries within Palaeoproterozoic plutonic and volcanic host rocks, e.g. Jokum's Shear, Sorte Nunatak and Kangerluluk (Schlatter and Hughes, 2014). Correlation of gold with As, Bi and Te is characteristic of the NGB.

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