Geologic unit name: Disko Bugt

Geologic unit map code: PR_AE-GLMD

Unit Hierarchy:

Disko Bugt

Status: In current use

Geological period(s): Proterozoic - Eoarchaean

Full description: The area from Disko Bugt and northwards on the Greenlandic west coast is underlain by Archean rocks that are correlated with the Rae Craton in Canada (Connelly et al., 2006; St-Onge et al.,2009). The Rae Craton of western Greenland consists of Meso- to Neoarchean orthogneiss and supracrustal complexes (see also review in Kolb et al. 2016). Dioritic orthogneiss and augen gneiss are dated at 3030+8/-5 Ma and 2947±23 Ma (U-Pb zircon), respectively.The age data are interpreted as Mesoarchean emplacement ages (Connelly et al., 2006). A felsic schist was dated at 2847 ± 4 Ma (Connelly et al., 2006). The orthogneiss consists of tonalite, trondhjemite, granodiorite, monzogranite and diorite with local leucosomes (Garde and Steenfelt, 1999). Zircons from three orthogneiss samples were dated by SHRIMP U-Pb indicating intrusion ages of ca. 2800 Ma (Nutman and Kalsbeek, 1999). An undeformed monzogranite yields 2758±2Ma as emplacement age largely postdating metamorphism and deformation (Nutman and Kalsbeek, 1999). Orthogneiss in the Rodebay area is dated at ca. 2835–2785 Ma by U-Pb zircon ages, suggesting Meso- to Neoarchean emplacement, whereas zircon rims yield ca. 2800–2760 Ma formetamorphism largely contemporaneous with granite emplacement (Connelly et al., 2006).
In the Disko-Nuussuaq area, Meso- to Neoarchean orthogneiss is intercalated with greenstone belts (Garde and Steenfelt, 1999; Connelly et al., 2006). Three greenstone belts, namely Saqqaq, Itilliarsuk and Arveprinsen-Eqi greenstone belts, are distinguished (Garde and Steenfelt, 1999). The Arveprinsen-Eqi greenstone belt forms a complex regional-scale fold structure consisting of 3–4 km thick metasedimentary and metavolcanic rocks at upper greenschist to lower amphibolite facies grades. The rocks are greenstone with local pillow structures, quartz- and feldspar-phyric metavolcanic rock, metagabbro, BIF, phyllite and metadolerite (Garde and Steenfelt, 1999). The metagabbro forms a tholeiitic to komatiitic sill complex in the greenstone belt (Marshall and Schønwandt, 1999). Both the metagabbro and the quartz and feldspar porphyry have a volcanic arc geochemical signature (Marshall and Schønwandt, 1999; Stendal et al., 1999). The contact between orthogneiss and the Arveprinsen-Eqi and Itilliarsuk greenstone belts is intrusive, suggesting that at least these belts are Mesoarchean (Garde and Steenfelt, 1999). The Saqqaq greenstone belt forms a N 500 m thick NW-trending anticlinal structure and consists of biotite-garnet schist, amphibolite and minor ultramafic rocks (Garde et al., 1999). The Itilliarsuk greenstone belt is approx. 2.5 km thick and consists of quartz-biotite schist, staurolite-muscovite schist, metaconglomerate, amphibolite, metagabbro, BIF and calcsilicate rocks (Garde and Steenfelt, 1999; Rasmussen and Pedersen, 1999; Haugaard et al., 2013).
The Archaean basement together with Palaeoproterozoic cover rocks are variably affected by the

Palaeoproterozoic Nagssugtoqidian orogeny lasting from c. 2000 to 1750 Ma (van Gool et al. 2002). The orogen comprises dykes intruded during initial rifting, volcanic rocks formed during subduction, bodies of mantle peridotite emplaced tectonically during collision, and post-collisional granites and pegmatites.
The ~2500–3600 mthick Anap Nunâ Group is situated in the northeastern Disko Bugt area and based on similar lithology correlated with the Karrat Group in the north Garde and Steenfelt, 1999). It is weakly metamorphosed and consists of b30 m thick sandstone unconformably overlying Archean rocks at the base and in turn overlain by 50 m thick carbonate and N2000 m thick sandstone and siltstone, suggesting a shallowmarine to coastal setting progressing into a deeper basin where turbidite sequences were deposited (Garde and Steenfelt, 1999). Detrital zircons yield age groups between 3000 and 2700 Ma, and 2100 and 1900 Ma similar to the Karrat Group, confirming stratigraphic correlation (Connelly et al., 2006).
The Nuussuaq Basin covers the Disko-Svartenhuk Halvø area of West Greenland. The basin is bound to the east by a system of faults, but Cretaceous-Paleogene sedimentary rocks may have extended further to the east (Chalmers et al., 1999; Pedersen et al., 2007). Approx. 6–8 km thick sedimentary units were deposited starting with Albian fluvial-lacustrine sandstone, mudstone and coal (Pedersen et al., 2007; Dam et al., 2009). The facies in the south developed into a deltaic system with sandstone and coal towards the Campanian. In the north, marine mudstone and turbidite were deposited in the deeper parts of the basin (Dam et al., 2009). Intense block faulting until the Danian divided the basin into marine turbidite-conglomerate and fluvial sandstonemudstone sandstone-mudstone facies of largely variable thickness and distribution. Marine mudstones and lacustrine-fluvial mudstone and sandstone of upper Danian–lower Selandian are subsequently interlayered with volcanoclastic rocks marking the transition to the extensive Paleocene volcanism (Pedersen et al., 2007; Dam et al., 2009; Kolb et al. 2016).
The ca. 60 Ma volcanic rocks cover an area of ~22,000 km2 on Disko, Hareø, Ubekendt Ejland, Nuussuaq and Svartenhuk Halvø, and extend off-shore from 68°N to 73°N covering an area of more than 100,000 km2 (Storey et al., 1998; Chalmers et al., 1999; Larsen and Pedersen, 2009). The extensive Paleocene volcanism is attributed to the impingement of the proto-Icelandic mantle plume head at the base of the lithosphere (White and McKenzie, 1989; Saunders et al., 1997). The bulk of the West Greenland volcanic rocks are of the same age as the oldest rocks of the NAIP in East Greenland, but it is unlikely that they are connected underneath the Inland Ice sheet because both units thin inland (Brooks, 2011).
The Paleocene volcanic rocks in the Nuussuaq Basin on Disko and Nuussuaq comprise the Vaigat Formation (c. 62–61Ma) and the Maligat Formation (c. 60 Ma). The Vaigat Formation in this area is 0–1600 m thick and is dominated by olivine-rich picrites. The formation was deposited during three volcanic episodes and is divided into 10 formally defined members and about 20 informal units. The first episode gave rise to the Anaanaa Member. The second episode gave rise to the Naujanguit Member. The third episode gave rise to the Ordlingassoq Member and the minor alkaline Manitdlat Member. Contemporaneous sedimentsdeposited during the first two episodes are the marine Eqalulik Formation, and during the third episode the nonmarine Atanikerluk Formation (Pedersen et al. 2017).

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