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NATMAP
CARTNAT
Canada's National Cartography Mapping Program
Le Programme national de cartographie géoscientifique du Canada

GEOLOGICAL SURVEY OF CANADA / COMMISSION GÉOLOGIQUE DU CANADA

DESCRIPTIVE NOTES

INTRODUCTION

This 1:250 000 compilation map is one of a series assembled as part of the Western Superior NATMAP project. The map is based on digital data from various sources, including published and unpublished maps, and reports. It covers all areas with existing microbedrock and surficial geology mapping. Some areas, for example, are glaciated but coded to identify units and provide information on their age, tectonic affinity and assemblage name. Colour is used on the map to show age groups, with the oldest rocks (Archean) in shades of pink, Paleoproterozoic in shades of blue, Mesoproterozoic in shades of green, Neoproterozoic in shades of brown, and Phanerozoic in shades of grey. Lower case letters in the symbols identify assemblages and uppercase letters identify chronostratigraphic units. Where lower case letters are used, the assemblage name is the same as the chronostratigraphic unit. Symbols are composed of a maximum of three letters. Additional information on lithologic character, structural geomorphic characteristics, and other geological attributes is shown by a symbol that is superimposed on the colour and letter symbol. Symbols for igneous rocks, sedimentary rocks, and metamorphic rocks, differentiate types and geochemical characteristics, following the approach outlined in Stott et al. (1991). Symbols for rocks of the Archean Superior Province include information on tectonic affinity, if supported and assemblage, if recognized, and lithologic character, such as gneiss, metasediments, and metavolcanics. Symbols for Paleoproterozoic rocks include information on tectonic affinity, if known, and lithologic character.

Lithostratigraphic units are used to define the stratigraphic framework for Paleoproterozoic rocks in the map area and in Western Tectonic Zone (Lithoprobe Southern Province) and Superior Province of the Canadian Shield, and depositional ages of many different rock types from relatively modern samples. Consequently, the ages assigned to units are based on a wide variety of data, including U-Pb zircon, monazite, and titanite ages, Sm-Nd whole rock crystallizing isochrons (where there is a high level of confidence about the ages), and biostratigraphy. Ages assigned to units are based on the best available information and are subject to change as more data are acquired. As well as indicating the continuous week, the width of the age range also serves to identify units and areas where more data are required. Ages of units are shown on the map as a range of colours, with the oldest rocks in shades of pink and the youngest in shades of brown.

The map shows tectonic domains and Proterozoic orogens of the western Superior Supracrustal Belt, which are underlain by a series of east-southeast trending plutonic belts including the Sachigo, Lake, Fort Ware, Ellard, Stull Lake, Oxford Lake, and Berens River belts. The Superior Province in the map area is dominated by Neoarchean plutonic rocks, which are cross-cutting, multiple, generally east-trending, Paleoproterozoic orogens (Lake, Ellard, Stull Lake, Oxford Lake, and Berens River belts) (Stott et al. 1991; Corkery et al. 1999). A Neoarchean rift in the geology of the area in the latter belts was begun with the intent to characterize the Paleoproterozoic orogens and to determine the extent to which they may be controlled by the pre-existing Neoarchean rift. Work during 1997 and 1998 (Stone et al. 1998; Stone et al. 1999) has made apparent that the Paleoproterozoic belts, which have been mapped as a single belt in the past, are in fact a series of belts with different ages and different geochemical signatures (Corkery et al. 1999; Henkel et al. 1999; Henkel et al. 2000; Henkel et al. 2001; Henkel and Stone 2002; Henkel 2003). The results from Table 3 and Figure 3 show that the Ellard Lake belt is 1.9 Ga, the Stull Lake belt is 1.8 Ga, and the Oxford Lake belt is Neoarchean to Paleoproterozoic (Neoarchean–Paleoproterozoic magmatism spans 50 Ma in some parts of the Superior Supracrustal Belt). Lake Manitoba (Neoarchean magmatism 2.9 to 2.6 Ga) is known widely and includes predominantly Neoarchean plutonic rocks (Corkery et al. 1999). Neoarchean plutonic rocks are also known in the Berens River and Ellard belts, and plutonic rocks from Ellard and Oxford Lake belts are composed of Neoarchean and Paleoproterozoic magmatic events.

There is widespread evidence from SHRIMP (Sensitive High Resolution Ion Micro Probe) U-Pb zircon ages and Nd isotopic data (see Table 1 and U. Kissyadlo, Stone et al. 2002) for magmatism during the Mesoarchean and Neoarchean in the Superior Province in the map area. Mesoarchean magmatism is known in the Berens River and Lake Manitoba belts (Henkel and Stone 2002). The basement to the Ellard Lake belt may represent magmatism of the North Caribou Arch (Corkery et al. 1999). Neoarchean magmatism is known in the Lake Manitoba, Ellard, Stull Lake, and Oxford Lake belts. Neoarchean magmatism is also recognized at the northern margin of the Superior Province in the Sachigo Lake belt (Henkel et al. 2001). Neoarchean magmatism is also known in the Superior Province with Mesoarchean inherited zircon samples (in Table 1) but no record is found of early Mesoarchean magmatism.

Island Lake Terrane

SACHIGO LAKE ORIGINATING BELT

The Island Lake terrane is bounded south and northeastern by 100 km, attaining a width of 70 km in the southeast corner of the map area. It is composed of mainly late Mesoarchean basaltic flows, subordinate komatiitic and rhyolitic flows, and minor sedimentary rocks. The rocks are intruded by Neoarchean granitoid plutons. The rocks belonging to the Island Lake terrane are characterized by upper-amphibolite grade metamorphism. The rocks belonging to the Island Lake terrane are characterized by upper-amphibolite grade metamorphism.

Pierce assemblage (J-0800 Ma)

Volcanic arenites of the Pierce assemblage are strongly foliated and super a compositional spectrum from basaltic komatiites to rhyolites and includes siliceous high-magnesium basalt. Most rocks show trace element characteristics of high-Mg tholeiites (Table 2). The rocks are cut by a suite of mafic to felsic intrusions. The mafic and ultramafic bodies range from sills and dikes. The dyke of Gibbins Lake gneiss is a quartz-rich diorite with a distinctive trace element signature. The Pierce assemblage is intruded by the Red Cross Lake pluton (2719 Ma) and by the Island Lake pluton (2700 Ma).