Components of the Paleoproterozoic Hottah Terrane in Wopmay Orogen of Northwest Laurentia

Luke Ootes*
Northwest Territories Geoscience Office, Yellowknife, NT
luke_ootes@gov.nt.ca

and

William J. Davis
Geological Survey of Canada, Ottawa, ON

and

Valerie A. Jackson
Northwest Territories Geoscience Office, Yellowknife, NT

and

Wouter Bleeker
Geological Survey of Canada, Ottawa, ON

Introduction

The Hottah Terrane figures prominently in models of the Paleoproterozoic evolution of the western margin of the Archean Slave craton. Hottah Terrane has been interpreted as an exotic lithospheric block, composed of a composite crust (ca. 2200-2400 Ma) and younger volcanic arc (ca. 2000-1900 Ma) that collided with the Archean Slave craton at ca. 1885 Ma. Alternatively, Hottah Terrane has been interpreted as a rifted segment of the Slave craton. Most of the Hottah bedrock is covered by the Phanerozoic Western Canada Sedimentary Basin and the Paleo-Mesoproterozoic Coppermine Homocline. Thus, the character and extent of the terrane is poorly known and is derived from evolved radiogenic isotopic signatures in younger volcano-plutonic rocks, interpretations of the Slave-Northern Cordillera geophysical transect, and aerially restricted bedrock outcrops south of Great Bear Lake from which a small number of U-Pb zircon ages have been obtained. Understanding the components and the evolution of the Hottah Terrane is essential to the evaluation of the diamond potential of the younger cover regions (e.g., is there an Archean component to Hottah Terrane?) and to the assessment of its role in the formation of iron oxide copper-gold deposits and other styles of mineralization distributed throughout the younger 1875-1855 Ma Great Bear magmatic zone.

There are at least four localities south of Great Bear Lake (spread over ~100 km) that preserve unconformities where quartz arenite or feldspathic arenite rests on Hottah basement. Previous age-dating indicates these sedimentary rocks are older than the ca. 1885 Ma Hottah-Slave collision and they are heavily intruded by younger Great Bear magmatic zone granitoids. Ongoing U-Pb detrital zircon dating and Lu-Hf zircon data from these sedimentary rocks and U-Pb zircon dating of Hottah Terrane rocks will provide further details on the crustal components of the Hottah Terrane and contribute to the interpretation of the components covered by the Phanerozoic sedimentary rocks.

At Beaverlodge Lake, a well-exposed section of quartz arenite and mudstone rests directly on intrusive porphyry and intermediate volcanic rocks of Hottah Terrane. Our new SHRIMP II U-Pb detrital zircon results from the quartz arenite yields the following $^{207}Pb/^{206}Pb$ age components (n=# of grains analyzed): 1.92 Ga (n=12), 1.98 Ga (n=32), 2.07 Ga (n=10), 2.07 to 2.31 Ga (n=5), 2.31 Ga (n=4), and 2.57 Ga (n=4). The youngest grain identified in the sample yields a weighted mean age of 1903 ± 13 Ma (n=6; multiple analyses of the same grain). We interpret

the results to indicate and confirm that the Hottah arc component formed between ca. 2.0-1.9 Ga, but further distinguish the more cryptic 2.07, 2.31, and 2.57 Ga crustal components of Hottah Terrane. Our results indicate for the first time that there is at least a Neoarchean constituent to Hottah, although it remains unknown if this was exotic with regards to the Slave craton or rifted from it. Significantly, the identification of an Archean component requires further consideration in the evaluation of the Hottah Terrane, particularly in light of active diamond exploration in the region.