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Tectonic Map of Arctic Canada (TeMAC): accurately tracking 4 billion years of crustal history

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As part of a seven-country project (Canada, USA, Norway, Denmark, Sweden, Finland, and Russia as lead) to produce a new Tectonic Map of the Arctic (TeMAr), the Geological Survey of Canada (GSC) has published a new Tectonic Map of Arctic Canada (TeMAC) that presents a complete tectonic synopsis of all onshore and offshore bedrock areas north of latitude 60°N at a scale of 1:4 000 000. Data sources that contributed to TeMAC include regional, territorial, national, and international compilations, simplified from original spatial data at scales ranging from 1:100,000 to 1:5,000,000. Standardization of map-unit attributes, including map colours for sedimentary strata, was facilitated by the Gradstein et al. [1] International Chronostratigraphic Chart (2014 version), which draws on the absolute scale for the Precambrian and the relative time scale for Ediacaran and younger rocks.

One hundred and two tectonic domains of Precambrian and Phanerozoic age are recognized in Arctic Canada. These include 5 cratons, 37 basins, 2 platforms, 3 shelves, 2 plains, 1 ridge, 3 oceanic domains, 7 cover sequences, 15 accreted terranes, 16 magmatic suites and 11 compressional orogens. The tectonic domains are organized based on age and domain type with the resulting tectonic architecture of Arctic Canada, from the oldest Archean cratons (Hearne, North Atlantic, Rae, Slave, Superior) to the youngest Neogene basins (Arctic coastal plain, Continental shelf), captured on the map and reflected in the underlying database structure.

In addition to being organized into tectonic domains, map units are also coded in terms of the dominant lithotectonic environment of formation. Lithotectonic variation is expressed by 24 associations, which include seven sedimentary associations based on gross depositional setting, eight extrusive, six intrusive, and two metamorphic associations, plus an ophiolitic association.

The colour design of the map for onshore Phanerozoic tectonic domains follows as closely as possible that of the International Chronostratigraphic Chart, with new colour shades added for broader age divisions or to distinguish contrasting tectonic domains of similar age. Colours are further modified to convey isopach information for Cambrian to Neogene basins, with saturation increasing with thickness. For Precambrian onshore tectonic domains, a more nuanced colour scheme than available on the chronostratigraphic chart was selected in order to adequately portray the rich Canadian rock record. Offshore tectonic units are designated by labels and contact boundaries and are coloured much in the same way as the onshore units. A distinct colour scheme for oceanic crust present in the Canada basin (Cretaceous) and in the Labrador Sea and Baffin Bay (Paleogene) is based on age range and magnetic chrons.

Pencil stripe patterns are utilized to indicate the extent of orogenic overprinting (mostly right-slanted stripes) with the colour of the stripes keyed to individual orogens as indicated in the map legend. If a

tectonic domain is overprinted by two orogenic events, a paired set of right-slanted stripes is shown and in cases of three orogenic overprints, a triad of right-slanted colour stripes is shown.

Immediate applications of TeMAC include 1) providing a new tectonic compilation and database context for Arctic Canada; 2) encouraging frontier mineral and energy exploration; and 3) providing general support for the geological framework developed for the delineation of the outer limits of Canada's Arctic continental shelf.

[1] Gradstein FM et al. (2012) *The Geologic Time Scale*: Elsevier, 1176 p.