Petrogenesis and geodynamic setting of the Haines Complex and Shebandowan greenstone belt, Wawa subprovince, Superior Province, Canada

P. Sotiriou[1], A. Polat[1]

[1]Department of Earth and Environmental Sciences, University of Windsor, Windsor, Ontario;

The 2722 Ma Haines Complex occurs in the Neoarchean (2680-2722 Ma) Shebandowan greenstone belt near the boundary between the Wawa subprovince and the metasedimentary Quetico subprovince to the north. The associated Ni-Cu-PGE mineralised Shebandowan greenstone belt consists of komatiitic to trachytic volcanics, dunitic to syenitic intrusions and metasedimentary rocks. Petrographic studies were carried out on the Haines Complex and the adjacent mafic to ultramafic volcanic and intrusive rocks of the Shebandowan greenstone belt. The Haines Complex includes megacrystic anorthosite and leucogabbro as well as gabbro and pyroxenite, all of which have undergone greenschist facies metamorphism. The adjacent basalts, picrites, serpentinites, gabbros and dunites of the Shebandowan greenstone belt also show evidence for having undergone greenschist facies metamorphism. The primary mineralogy (pyroxene, anorthite and olivine) of the rocks of the Haines Complex and Shebandowan greenstone belt has been mostly replaced by actinolite, tremolite, serpentine, chlorite, epidote, zoisite and albite. The rocks of both the Haines Complex and the adjacent Shebandowan greenstone belt display variably negative Nb, Ti and Zr anomalies, pronounced positive Pb anomalies and relatively flat REE patterns. The anorthosites and leucogabbros of the Haines Complex all display pronounced positive Eu anomalies, a characteristic indicative of significant crystallisation of plagioclase. Some of the gabbros of the Haines Complex also exhibit this characteristic. The pyroxenites of the Haines Complex and the basalts and gabbros of the Shebandowan greenstone belt exhibit more fractionated trace element patterns on N-MORB-normalised multi-element diagrams relative to the other studied lithologies. Whole-rock major and trace element data from this study suggest that the Haines Complex and Shebandowan greenstone belt formed in a suprasubduction zone environment. The anorthosites, leucogabbros and gabbros of the Haines Complex appear to be genetically related to the tholeiitic basalts, picrites, gabbros, dunites and serpentinites of the adjacent Shebandowan greenstone belt. The pyroxenites of the Haines Complex appear to be more genetically related to the transitional gabbros and calc-alkaline basalts of the Shebandowan greenstone belt, which may explain the more fractionated nature of these rocks relative to the other studied lithologies. This suggests that the Haines Complex crystallised from both tholeiitic and transitional parental magmas and the Shebandowan greenstone belt crystallised from tholeiitic, transitional and calc-alkaline parental magmas. These preliminary conclusions are yet to be corroborated by Sm-Nd and U-Th-Pb isotopic data and trace element modelling, and the compositions and sources of the parental magma are yet to be determined.