

PETROGENESIS AND TECTONIC IMPLICATIONS OF MAFIC ROCKS IN THE PRECAMBRIAN CORE OF THE BLACK HILLS, SOUTH DAKOTA

Angela Van Boening

Dr. Peter Nabelek, Thesis Supervisor

ABSTRACT

The Precambrian core of the Black Hills of South Dakota records evidence of syncollisional events that occurred in the area during the Proterozoic collision of the Wyoming and Superior provinces. While these syncollisional events are well understood, the geologic setting and tectonic events that occurred prior to the collision are still enigmatic. In this investigation major and trace element ICP-OES and INAA data of four suites of amphibolites were used to define at least two distinct tectonic settings of mafic magmatism within the Black Hills prior to the collision. The 2.48 Ga Blue Draw Metagabbro (BDM) located near Nemo was previously thought to be a rift-related sequence; however, the geochemistry of the BDM shows a distinct calc-alkaline affinity, suggestive of a continental arc setting. The amphibolites in the three other areas of the Black Hills have a tholeiitic affinity. The amphibolites at Minnesota Ridge have a distinctive within-plate geochemical signature; however, they are depleted in Ba and Y and enriched in LREEs, which may indicate a lithospheric, garnet-bearing mantle source associated with the initiation of a spreading center. The remainder of the amphibolites in the Black Hills, located in the Mt. Rushmore and Pactola Dam quadrangles, and near Bear Mountain have MORB to island arc tholeiitic compositions. These characteristics, together with the sedimentary environment in which they occur, suggest a back-arc basin tectonic setting.