Proterozoic Mafic Dikes in Southwestern Montana

Geochronologic Data

**Sm-Nd Age for ca. 1450 Ma Group A/C Dikes**

**U-Pb and Ar/Ar Dates for ca. 780 Ma Group B Dikes**

**Proposed Rodinia Plate Reconstructions**

**NW-SE Extension During ca. 1450 Ma Mesoproterozoic Development of the Belt Basin**

**Areal Extent of the 780 Ma Gunbarrel Mafic Event**

**Paleomagnetic Data from Mafic Dikes in the Southern Tobacco Root Mtns, MT**

**Geochronologic Evidence for Meso- and Neoproterozoic Mafic Magmatism Along the Western Margin of the Wyoming Craton**

**Conclusions**

**References**

**Abstract**

Igneous rocks from southwestern Montana are characterized by the presence of Precambrian mafic dikes that have been dated by U-Pb zircon and Ar/Ar dating. Two discrete mafic magmatic episodes are recognized, one characterized by U-Pb dates that are consistent with a 1450 Ma age for the Wyoming craton and the other characterized by Ar/Ar dates that range from ca. 780 Ma. The two mafic magmatic events have been related to distinct tectonic events in the southern Rocky Mountain Front province of the Wyoming craton. The ca. 1450 Ma mafic dikes are west-directed and intrude the Mesoproterozoic Belt Supergroup and are interpreted to represent the emplacement of a major event of mafic magmatism that occurred during the Mesoproterozoic. The ca. 780 Ma mafic dikes are east-directed and are interpreted to represent the emplacement of a major event of mafic magmatism that occurred during the Neoproterozoic.

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Group B Magnetization

Geochronologic data from mafic dikes in the southern Tobacco Root Mountains of southwestern Montana provide evidence for two distinct episodes of subparallel Proterozoic mafic magmatism separated by about 700 m.y. Precisely dated mafic dikes in southwestern Montana include three geochronologic groups (termed groups A, B, and C) with apparent Rb-Sr ages of 1459 Ma (group A) and 1120-1150 Ma (group B and C). Sm-Nd dating of geochronologic group A/C dikes yields a mineral isochron age of 1567 ± 49 Ma that is interpreted to represent the emplacement age of the dikes. This age is similar to published U-Pb dates from mafic sills that intrude the nearby Mesoproterozoic Belt Supergroup and that cut the Laramide basement-cored uplifts of the Arkose Mountains. We suggest that the mafic magmatism recorded by the mafic dikes probably corresponds with widespread extension that accompanied the development of the Mesoproterozoic Belt Supergroup. U-Pb dating of baddelyte from the group B dikes provides evidence for a younger magmatic event with an age of 782 ± 4.9 Ma (95% confidence; ± 7.1 Ma incorporating uranium decay constant errors). This date is similar to dates from Neoproterozoic mafic dikes and sills exposed elsewhere in uplifts of the Rocky Mountain Front and that intrude sills of the Belt Supergroup. Ar/Ar dating from hornblende in the group B dikes is interpreted to represent the emplacement age of the dikes. This age is similar to dates from Mesoproterozoic Maclaren dikes which intruded the nearby Mesoproterozoic Belt Supergroup and that cut the Laramide basement-cored uplifts of the Arkose Mountains. The ca. 780 Ma age for these dikes is similar to dates from NW-trending dikes elsewhere in Montana and Wyoming and may be related to a major episode of mafic magmatism along the western margin of the Wyoming craton. Geochronologic data from this study provides evidence for two discrete mafic magmatic events that have affected the western margin of the Wyoming craton. The two mafic magmatic events have been related to distinct tectonic events in the southern Rocky Mountain Front province of the Wyoming craton. The ca. 1450 Ma mafic dikes are west-directed and intrude the Mesoproterozoic Belt Supergroup and are interpreted to represent the emplacement of a major event of mafic magmatism that occurred during the Mesoproterozoic. The ca. 780 Ma mafic dikes are east-directed and are interpreted to represent the emplacement of a major event of mafic magmatism that occurred during the Neoproterozoic.

**Paleomagnetic Data from Mafic Dikes in the Southern Tobacco Root Mtns, MT**

**Group A/C Dual-polarity Magnetization**

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Geochronologic data from mafic dikes in the southern Tobacco Root Mountains of southwestern Montana provide evidence for two discrete mafic magmatic episodes characterized by the presence of Precambrian mafic dikes that have been dated by U-Pb zircon and Ar/Ar dating. Two discrete mafic magmatic episodes are recognized, one characterized by U-Pb dates that are consistent with a 1450 Ma age for the Wyoming craton and the other characterized by Ar/Ar dates that range from ca. 780 Ma. The two mafic magmatic events have been related to distinct tectonic events in the southern Rocky Mountain Front province of the Wyoming craton. The ca. 1450 Ma mafic dikes are west-directed and intrude the Mesoproterozoic Belt Supergroup and are interpreted to represent the emplacement of a major event of mafic magmatism that occurred during the Mesoproterozoic. The ca. 780 Ma mafic dikes are east-directed and are interpreted to represent the emplacement of a major event of mafic magmatism that occurred during the Neoproterozoic.

**References**