Introduction

It has been long acknowledged that the assembly and stabilization of the Late Paleoproterozoic supercontinent Rodinia was accompanied by extensive orogenies between 1.05 and 0.95 Ga (e.g., Hoffman, 1988). These orogenies were not only responsible for the formation of major mountain belts in the Rodinia supercontinent but also placed significant constraints on the development of the Proterozoic orogenies during which the supercontinent was assembled. In the northwest Wyoming province of the Western United States, the Laramide orogeny resulted in the deformation and metamorphism of Precambrian basement rocks over a large area, creating a strong geologic record of the Proterozoic orogenies (e.g., Alcock and Muller, 2012).

Methods

SEM analysis

Figure 1b. SEM images of mineral bearing decimetric to cm-scale quartzofeldspathic gneiss from the Elk Gulch area. (a) Backscattered electron image shows biotite separated from quartz by a fracture. The biotite is crossed by a large inclusion of quartz (Q). The biotite is also intersected by a vein that contains small inclusions of quartz and feldspar. (b) Secondary electron image of the same field of view as (a). The biotite is outlined by the backscattered electron image. The inclusion in the biotite is also outlined by the backscattered image. The vein contains small inclusions of quartz and feldspar. The biotite is crossed by a fracture that contains small inclusions of quartz and feldspar. (c) Secondary electron image of the same field of view as (a). The biotite is outlined by the backscattered electron image. The inclusion in the biotite is also outlined by the backscattered image. The vein contains small inclusions of quartz and feldspar. The biotite is crossed by a fracture that contains small inclusions of quartz and feldspar.

SEM analysis

Figure 1c. SEM images of mineral bearing decimetric to cm-scale quartzofeldspathic gneiss from the Elk Gulch area. (a) Backscattered electron image shows biotite separated from quartz by a fracture. The biotite is crossed by a large inclusion of quartz (Q). The biotite is also intersected by a vein that contains small inclusions of quartz and feldspar. (b) Secondary electron image of the same field of view as (a). The biotite is outlined by the backscattered electron image. The inclusion in the biotite is also outlined by the backscattered image. The vein contains small inclusions of quartz and feldspar. The biotite is crossed by a fracture that contains small inclusions of quartz and feldspar. (c) Secondary electron image of the same field of view as (a). The biotite is outlined by the backscattered electron image. The inclusion in the biotite is also outlined by the backscattered image. The vein contains small inclusions of quartz and feldspar. The biotite is crossed by a fracture that contains small inclusions of quartz and feldspar.

SEM analysis

Figure 1d. SEM images of mineral bearing decimetric to cm-scale quartzofeldspathic gneiss from the Elk Gulch area. (a) Backscattered electron image shows biotite separated from quartz by a fracture. The biotite is crossed by a large inclusion of quartz (Q). The biotite is also intersected by a vein that contains small inclusions of quartz and feldspar. (b) Secondary electron image of the same field of view as (a). The biotite is outlined by the backscattered electron image. The inclusion in the biotite is also outlined by the backscattered image. The vein contains small inclusions of quartz and feldspar. The biotite is crossed by a fracture that contains small inclusions of quartz and feldspar. (c) Secondary electron image of the same field of view as (a). The biotite is outlined by the backscattered electron image. The inclusion in the biotite is also outlined by the backscattered image. The vein contains small inclusions of quartz and feldspar. The biotite is crossed by a fracture that contains small inclusions of quartz and feldspar.

Conclusion

The results of this study provide new insights into the tectonic evolution of the Precambrian basement in the Ruby Range, southwestern Montana. The Geological Survey of Canada: Precambrian Research, v. 55, no. 1.

Acknowledgements

This research is supported by the Tobacco Root Geological Society Jack Harrison Scholarship, the University of Montana Department of Geosciences graduate assistantship, and the University of Montana Undergraduate Research Council. Thanks to Andreas Johanns and Alex Clark from the University of California, Santa Barbara, for help with SEM analysis.