

Structural geology of the Timiskaming and Cadillac groups along the Malartic segment of the Larder Lake–Cadillac deformation zone and implications for gold mineralization, Abitibi greenstone belt, northwestern Québec

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INTRODUCTION

The Malartic segment is a NW-trending section of the overall E-trending Larder Lake–Cadillac deformation zone (LLCDZ; Figure 1a). This study documents three deformation events which affect the supracrustal rocks found adjacent to this segment of the LLCDZ. These supracrustal rocks include turbidites with local iron formations and conglomerates of the Cadillac Group and polymictic conglomerates, sandstones and argillites of the Timiskaming Group (Figure 1b).

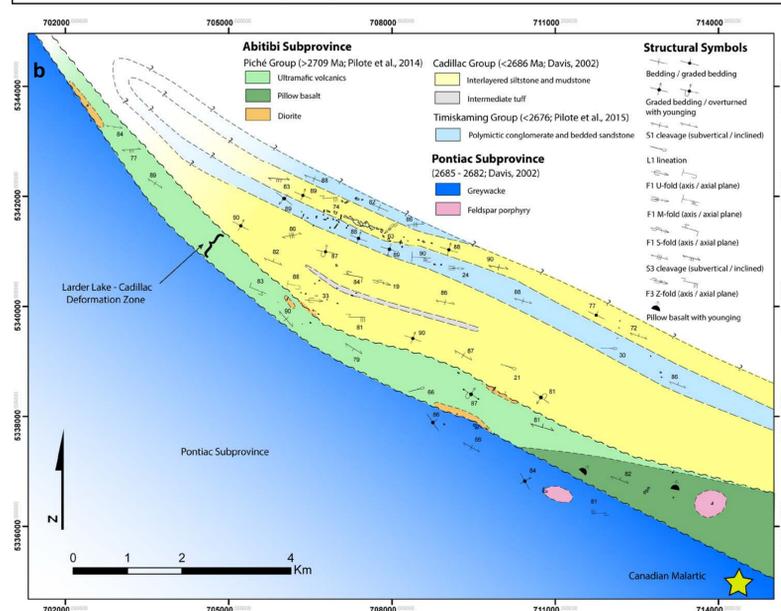
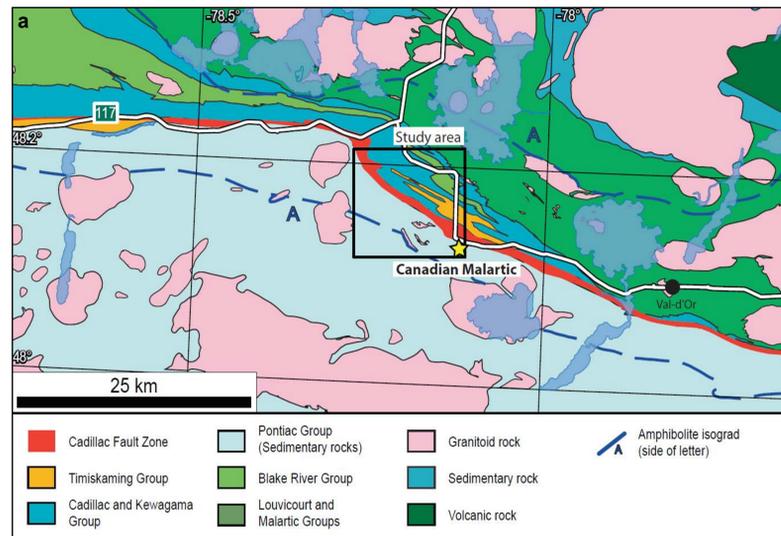


Figure 1: a) Regional geological map of the LLCDZ in the Malartic area. The area of focus for this study is outlined by the black box. Modified after Bedeaux et al. (2017). b) Simplified geological map of the study area. Modified after SIGÉOM interactive map (2017).

STRUCTURAL INTERPRETATIONS

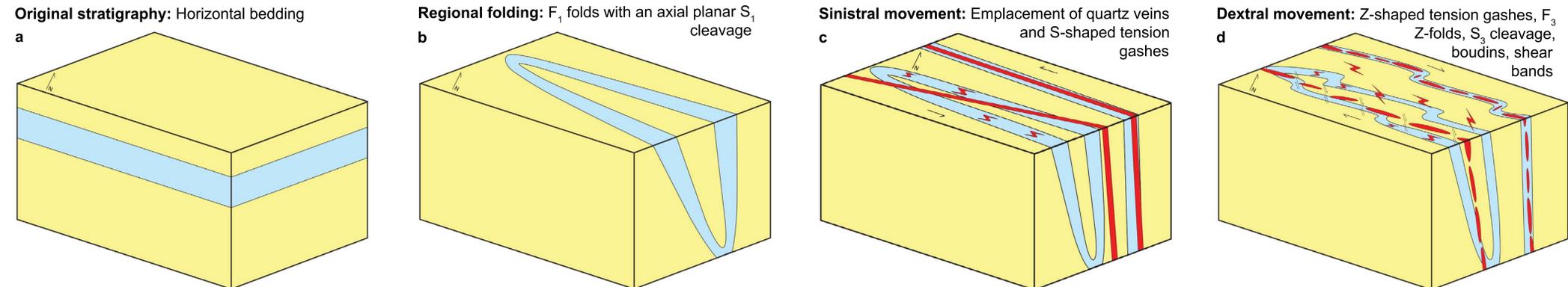


Figure 2: Schematic diagrams depicting the effects of the regional deformation history from a - d. a) Original horizontal stratigraphy prior to deformation. Sediments were likely deposited in an extensional basin. b) NE-SW shortening caused regional isoclinal F_1 folds and an axial planar S_1 cleavage. c) Sinistral bedding-parallel shearing and compression emplaced continuous extensional quartz veins and sigmoidal S-shaped tension gashes. d) Late dextral shearing emplaced Z-shaped tension gashes and overprinted previous structures with F_3 Z-folds, an axial planar S_3 cleavage, boudinage and shear bands. Yellow lithology = turbidite; blue lithology = conglomerate; red features = quartz veins.

Regional folding: F_1 folds with an axial planar S_1 cleavage

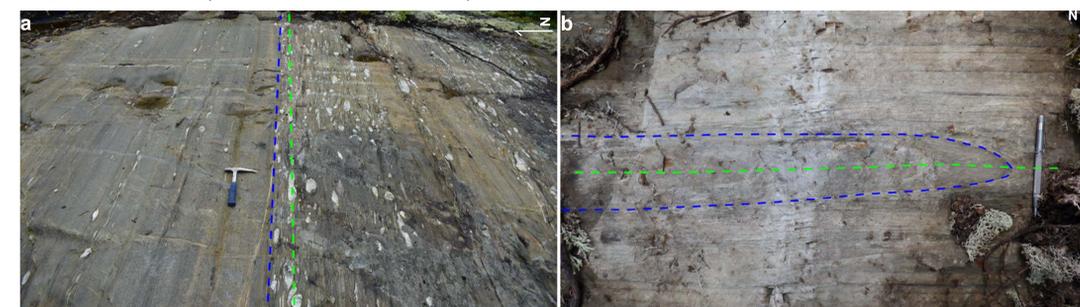


Figure 3: a) Polymictic conglomerate and bedded sandstone of the Timiskaming Group with bedding parallel S_1 cleavage defined by the conglomerate clasts. b) Isoclinal F_1 fold with an axial planar S_1 cleavage.

Dextral movement: Overprinting with F_3 folds, S_3 cleavage, boudins, shear bands and Z-shaped tension gashes

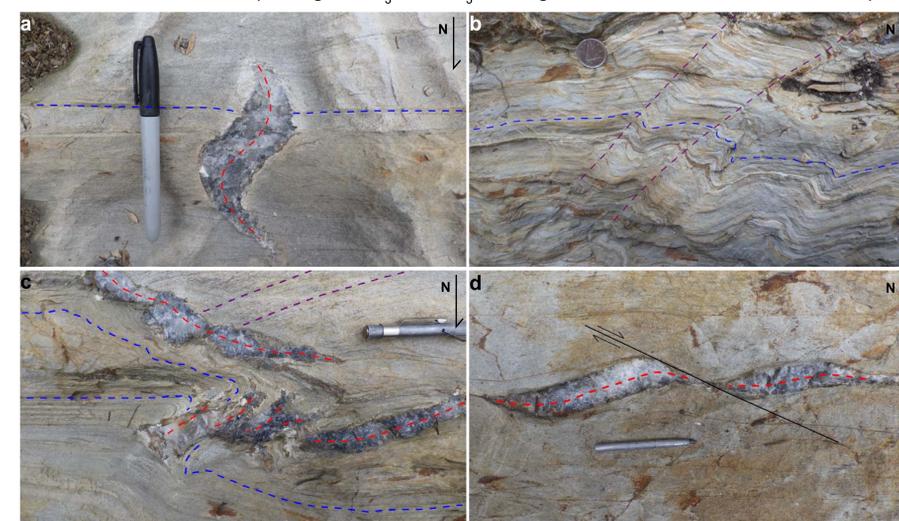


Figure 5: a) Sigmoidal Z-shaped quartz tension gash. b) F_3 Z-folds with an axial planar S_3 cleavage. c) Z-folded flanking structures on to quartz veins with an axial planar S_3 cleavage. d) Boudinaged quartz veins along a dextral shear band.

Sinistral movement: Emplacement of extensional quartz veins and S-shaped tension gashes

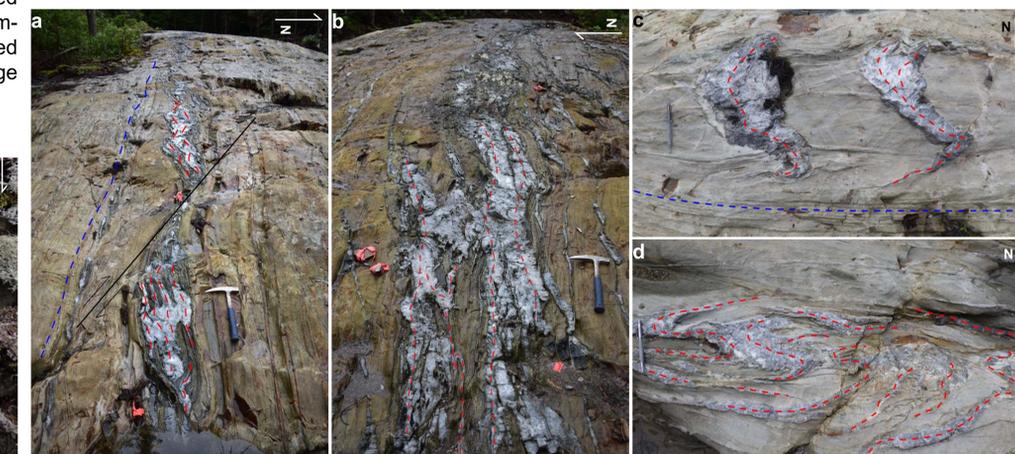


Figure 4: a) S-folded and boudinaged extensional quartz veins. b) Deformed extensional quartz veins. c) S-folded quartz tension gashes. d) S-folded en échelon quartz veins.

CONCLUSION

Three deformation events affected the supracrustal rocks in the Malartic segment of the LLCDZ. The first deformation event caused regional folding, where isoclinal F_1 folds plunge moderately to the ESE with an axial planar S_1 cleavage. During the second deformation event, extensional quartz veins and S-shaped tension gashes were emplaced as a result of sinistral transpression. The NW-SE-trending quartz veins are oriented anticlockwise and subparallel to the NW-trending bedding. Finally, during the third deformation event, Z-shaped tension gashes were emplaced and previous structures were overprinted by F_3 Z-folds, an axial planar S_3 cleavage, boudinage and shear bands caused by late dextral shearing.

Gold mineralization is hosted within the quartz veins and their associated alteration halos. The alteration assemblage is characterized by chlorite-sericite-biotite-arsenopyrite. Previous assays returned values of 1.7-41 g/t Au (Midland Exploration, 2016). Mineralization at Canadian Malartic (~10 km SE of the study area) is associated with veins that were emplaced along major E-W and NW-SE-trending D_2 faults and shear zones subparallel to the S_2 cleavage (e.g., De Souza et al., 2015; Perrouty et al., 2017). Hence, it is interpreted that the mineralizing fluid within the study area could represent a similar fluid to that of Canadian Malartic.

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