DEFORMATIONAL SEQUENCE OF A PORTION OF THE MICHIPICOTEN GREENSTONE BELT, CHABANEL TOWNSHIP, ONTARIO; Catherine H. Shrady and George E. McGill, Dept. of Geology and Geography, University of Massachusetts, Amherst, MA 01003

Detailed mapping at a scale of one inch = 400 feet is being carried out within a fume kill, having excellent exposure, located in the southwestern portion of the Michipicoten Greenstone Belt near Wawa, Ontario. A simplified geological map of the area described here is presented in a companion abstract (Fig. 1 in 1).

The rocks are metasediments and metavolcanics of lower greenschist facies. U-Pb geochronology indicates that they are at least 2698 ± 11 Ma old (2). The "lithologic packages" (1) strike northeast to northwest, but the dominant strike is approximately east-west. Sedimentary structures and graded bedding are well preserved, aiding in the structural interpretation of this multiply deformed area.

Deformation in this area is tentatively divided into six phases (0-5). Phase 0 is soft sediment deformation. Folds of this type are generally small (amplitudes ranging from several millimeters to tens of centimeters); however, some early larger scale (up to 10 meters in amplitude) tight to isoclinal folds with no or a very poorly developed axial plane cleavage may be slump folds.

Included within Phase 1 of deformation is the regional overturning resulting in rocks that dip north and young to the south in the northern part of our area and extending well to the north (1,3,4), and rocks that dip south and young north in the southern part of our area and farther south (1,3a). To what extent the regional steep dips are attributable to this phase of deformation or to later refolding is, at present, not known. Also included within Phase 1 are an approximately bedding parallel cleavage, and pebbles within conglomeratic units flattened parallel to this cleavage. It is thought that these latter two features are associated and likely relate to the regional overturning.

Cut by and therefore pre-dating Phase 2 cleavage, but of uncertain temporal relationship to the structures included within Phase 1, are areally significant faults that separate lithologic packages. These faults regionally follow but locally truncate bedding. In places, they are associated with an apparently old fracture cleavage.

Phase 2 is characterized by a penetrative northwest to north striking cleavage of moderate dip. Phase 2 cleavage crenulates Phase 1 cleavage where both are clearly present; however, in much of the area, these two cleavages cannot be separated. Related examples of mesoscopic folds are rare, and associated structures of regional significance have not been recognized.

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Phase 3 cleavage is penetrative where well developed and crenulates both Phase 1 and Phase 2 cleavages. Within the area mapped, Phase 3 cleavage strikes northeast with generally steep northwest or southeast dips; dip direction and angle commonly change within individual outcrops. Dips as low as 30° are locally present in the northwest part of the area. It is not clear whether variation in dip indicates the existence of two distinct northeast striking cleavages or whether it is due to later minor folding about sub-horizontal axial surfaces. Phase 3 cleavage is axial planar to folds that are open to tight, range in scale from several millimeters to tens of meters in amplitude, and refold earlier folds. At one locality, Phase 3 cleavage and associated folds appear related to late movement on a fault that approximately parallels bedding. It is not yet clear if this fault is entirely young, or whether it is a reactivated older structure.

Steeply dipping northeast and north-northwest trending faults constitute Phase 4. However, some movement on these faults post-dates diabase dikes (Phase 5) that trend north-northwest and northeast. Locally developed fracture cleavages appear to be associated with diabase dike emplacement, but because the dikes commonly follow trends of older faults, some or all of these fracture cleavages may be related to the faults rather than to the dikes.

In summary: we have tentatively identified at least six phases of deformation within a relatively small area of the Michipicoten Greenstone Belt. These include the following structural features in approximate order of occurrence: 0) soft-sediment structures; 1) regionally overturned rocks, flattened pebbles, bedding parallel cleavage, and early, approximately bedding parallel faults; 2) northwest to north striking cleavage; 3) northeast striking cleavage and associated folds, and at least some late movement on approximately bedding parallel faults; 4) north-northwest and northeast trending faults; and 5) diabase dikes and associated fracture cleavages. Minor displacement of the diabase dikes occurs on faults that appear to be reactivated older structures.

References

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