NATURE OF EARLY DEFORMATION IN THE SOUTHWESTERN PART OF THE MICHIPICOTEN GREENSTONE BELT, ONTARIO; George E. McGill and Catherine H. Shrady, Department of Geology and Geography, University of Massachusetts, Amherst, MA 01003.

The Michipicoten Greenstone Belt extends for about 150 km ENE from the northeastern angle of Lake Superior. The eastern limit of the belt is the high-grade Kapuskasing zone, a deep crustal thrust separating the originally continuous Michipicoten and Abitibi belts (1). In common with many other Archean greenstone belts, the Michipicoten Greenstone Belt is characterized by generally steep dips and a crudely synformal structure (2). Recent mapping by the Ontario Geological Survey (3) provides excellent regional control at a scale of 4" = 1 mile, based on lake-shore geology plus traverses at one-fourth mile spacing. Our primary objectives are to determine the structural sequence in detail, estimate the relative roles of vertical and horizontal displacements and strains, and infer the tectonic environment(s) of deformation. Both detailed field mapping and various strain-analysis procedures will be needed. This abstract reports results of field work only.

We are mapping a portion of the southwestern part of the Michipicoten Greenstone Belt at a scale of 1" = 400'. The area chosen is structurally complex, but because most of it lies within a large fume kill, outcrops are abundant and easily found, permitting the determination of meso-scale structural relationships normally obscured by the sparse outcrop in the bush. Structural analysis in this area also is greatly facilitated by a thick sequence of sedimentary rocks containing excellent indicators of stratigraphic tops. Because our work is still in progress, all conclusions must be considered tentative. Furthermore, detailed studies must inevitably begin in small areas, and the area under study is very small relative to the size of the belt. Additional field work will be required to determine if the geometry and kinematics of the southwestern part are typical of the entire belt.

The rocks of the Michipicoten belt are divided into map units based on gross lithology: intermediate-mafic volcanics, intermediate-felsic volcanics, clastic metasediments, and chemical metasediments (2,3). The volcanic rocks have been further divided into three mafic to felsic "cycles", in part based on field relationships, in part on radiometric ages (4-6). This stratigraphy cannot be extended very far from the iron ranges near Wawa where it was defined because of rapid facies changes and pervasive faulting.

Our mapping in Chabanel Township, northeast of Wawa, indicates that the sedimentary rocks of the fume kill can be divided into mappable lithological "packages", but that the contacts between these packages are generally faults. The direction of stratigraphic tops reverses across some of these faults. At map scale, the faults bounding the stratigraphic packages commonly are roughly parallel to bedding, but this is not everywhere the case. At outcrop scale, the fault surfaces generally do not follow bedding in those few places where exposures permit determination of this relationship.

There are numerous steep faults in the area, most trending either NNW or NE (2,3). Movement on these faults is relatively young; some offset the abundant diabase dikes in the area, all offset mappable contacts within the sedimentary and volcanic sequences, and none is deformed by the folding that affects pre-diabase rocks. In addition, there is some young movement along bedding; unequivocal in those places where diabase dikes are offset, somewhat uncertain elsewhere. However, almost all of the faulting separating sedimentary packages is older than dike intrusion and late faulting.

We have tentatively divided the structural sequence prior to late faulting and diabase intrusion into four phases, based mostly on relationships among cleavages. Phase 0 is local soft-sediment deformation, characterized by disrupted bedding, rootless minor folds, and possibly fracture cleavages. Phase 1 includes a cleavage that is approximately parallel to bedding, with extensive flattening of large clasts within this cleavage. We believe that the areally extensive overturning of the section is associated with this phase. Phase 2 is characterized by a penetrative cleavage of moderate dip. Although this cleavage strikes generally northwest throughout much of the area mapped, it appears to be affected by younger warping or folding, so this orientation very likely is local. In fact, for a significant part of our area we have not yet been able to distinguish this cleavage from phase 1 cleavage. Phase 3 is a regionally inhomogeneous deformation characterized by a NE striking cleavage that ranges from penetrative to non-existent, and local NE-plunging folds with a variety of geometries and with amplitudes ranging from mm to dm. It is probable that additional work will result in the subdivision of this phase.

The faults bounding the stratigraphic packages within the sedimentary sequence either relate to phase 1 or fall between phase 1 and phase 2; thus they are relatively early structures. In many places, these faults are associated with local fracture cleavages or with stretched clasts. The attitude of the rocks when these faults developed is not at present known. However, analogy with Phanerozoic deformed belts suggests that early faults closely related to bedding, cleavages, and flattening are most likely thrusts that began to form when the rocks had low dip angles. Geometrically, foreland basins and subducting trenches both are feasible as tectonic environments, but the rock assemblage would favor the latter. Deformation by dominantly vertical transport seems less likely. Elevating this inference from speculation to convincing hypothesis will require more field work as well as detailed strain analysis at critical locations.

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