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SYNSEDIMENTARY DEFORMATION AND THRUSTING ON THE EASTERN MARGIN OF THE BARBERTON GREENSTONE BELT, SWAZILAND, Lamb, S.H., Research School of Earth Sciences, Victoria University of Wellington, Private Bag, Wellington, New Zealand.

Mapping on the eastern margin of the 3.6-3.3 Ga Barberton Greenstone Belt, NW Swaziland, has revealed a tectonic complex which is more than 5 km thick (Lamb, 1984a). The area consists of fault bound units made up of three lithological associations. Some of these have been affected by four phases of deformation (D1-D4). Fold structures (F1-F4), foliations (S1-S4), and lineations are associated with the deformation.

The oldest rocks consist of metaigneous rocks (talcose schists, serpentinite, and quartz-chlorite-sericite schists) interleaved with silicified fine grained sediments (cherts). These make up the Onverwacht Group, though deformed (D1) and intruded by meta-ultramafic rocks. Onverwacht Group cherts locally pass conformably into a circa 1.8 km thick sequence of siltstones, shales, BIF, with sandstone and conglomerate layers, forming the Diepgezet Group. The lower part of the Diepgezet Group is interpreted as submarine fan deposits, and can be correlated with sequences in South Africa referred to as both the Moodies and Fig Tree Groups (Lamb and Paris, in prep). The Diepgezet Group is overlain unconformably, with angular discordances of up to 90 degrees, by at least 1.8 km of coarse clastics (Malalotsha Group). These are interpreted as fluvial and marginal marine deposits. In certain localities the Diepgezet Group passes up conformably into the Malalotsha Group through a sequence of coarse sediments which have been left undifferentiated (Mal/Diep Group). Parts of the Malalotsha Group can be correlated with the Moodies Group.

Three pronounced angular unconformities occur within the basal 1000m of the Malalothsha Group. Malalotsha Group sediments are both folded by, as well as unconformably overlying, D2 fold structures which deform the Diepgezet and Onverwacht Groups. Folded fault zones (D1) juxtaposing the Diepgezet and Onverwacht Groups are also unconformably overlain by the Malalotsha Group. Faults associated with the F2 folding (flexural slip faults) offset Malalotsha Group sediments, but are also unconformably overlain by younger Malalotsha Group sandstones and conglomerates. In sequences where the Malalotsha Group is transitional with the Diepgezet Group, a progressive change is observed in the clast content of the sandstones. Chert grain dominated sandstones within the Diepgezet Group pass up into sandstones made up mainly of single crystal quartz grains. Clasts representing all the underlying stratigraphy, as well as parts of the gneissic terrain (potassium poor granitoids) are found in Malalotsha Group conglomerates. Palaeocurrents within the basal Malalotsha Group indicate polymodal sediment transport directions. This, combined with evidence for rapid sediment thickness changes and facies variation, suggest that these sequences were deposited in tectonically controlled (and actively deforming) basins. However the overall tectonic setting is not clear, though the sediments were clearly deposited in a compressional regime.

The sedimentary sequences described above are now found within thrust sheets up to a kilometre thick. These are bounded by thrust faults, subparallel to bedding, which juxtapose different parts of the stratigraphy. One of these thrusts emplaces part of the Onverwacht Group on top of the Malalotsha Group, with a displacement of more than 10 km. The Onverwacht Group here contains a low angle foliation (S2) subparallel to the bounding fault. The thrust faults are considered to be a later expression of the D2 deformation, which is seen as syn-sedimentary deformation structures within the thrust sheets. The D2 deformation caused shortening in northerly and westerly directions.

The thrust sheets and their internal structures have been refolded by tight kilometre scale north trending folds, which plunge south at 20-40 degrees (F3). The folds contain a pronounced axial planar cleavage defined in places by a muscovite schistosity. The cleavage is most intense near and within marginal granitoids which were probably intruded c. 3.0 Ga (part of the Mpuluzi batholith, Barton 1981). Earlier fold structures have been tightened up, intensifying an axial planar cleavage fabric in F2 folds (S2/S3). The contact with intrusive granitoids on the western margin of the study area (Steynsdorp pluton, which may be c. 3.4 Ga, Barton 1981) contains a pronounced foliation which cuts across intrusive contacts. This is interpreted as an S3 foliation which contains an intersection and/or stretching lineation plunging at 20-40 degrees NE. The apparent domal pattern of foliations in the marginal parts of the Steynsdorp pluton is interpreted as both the result of F3 folding of an earlier foliation (S2) and also the imprint of an S3 foliation. Elongation lineations in sediments within the greenstone belt may be a result of subvertical extension during the D3 shortening (e.g. Jackson and Robertson, 1983).

The above structures have been refolded by heterogeneous southeast trending folds (F4) with the local development of an L4 crenulation lineation.

It has been suggested (Lamb, 1984a,b) that the high level syn-sedimentary D2 deformation and subsequent development of a thrust complex was related to coeval deformation and metamorphism (Jackson, 1984) in the Ancient Gneiss Complex of southern Swaziland. D2 in the study area predates the c. 3.0 Ga Mpuluzi batholith. It is not clear what the relation was between D2 and an early D1 deformation, which occurred during the evolution of the Onverwacht Group rocks (de Wit, 1982; pers. com.). It is likely to be close as a continuous depositional sequence is preserved between the Onverwacht and Malalotsha Groups. The correlation of clastic sequences in the southern part of the greenstone belt with those in the study area, indicates that the D2 deformation was diachronous with variable structural trends. The presence and position of unconformities show that NW-SE shortening (D2b) and the deposition of the Malalotsha Group in the study area post-dates the deposition of the Moodies Group and N-S shortening (D2a) observed in the southwestern part of the greenstone belt (de Wit et al., 1983). It is however not clear to what extent the D2b shortening has reworked and translated structures which formed in D2a. Subsequent D3 deformation (coeval with the intrusion of the Mpuluzi batholith, c.f. Jackson and Robertson, 1983) has had a considerable effect on structures in the study area, continuing the shortening (E-W) on the eastern margin of the greenstone belt.

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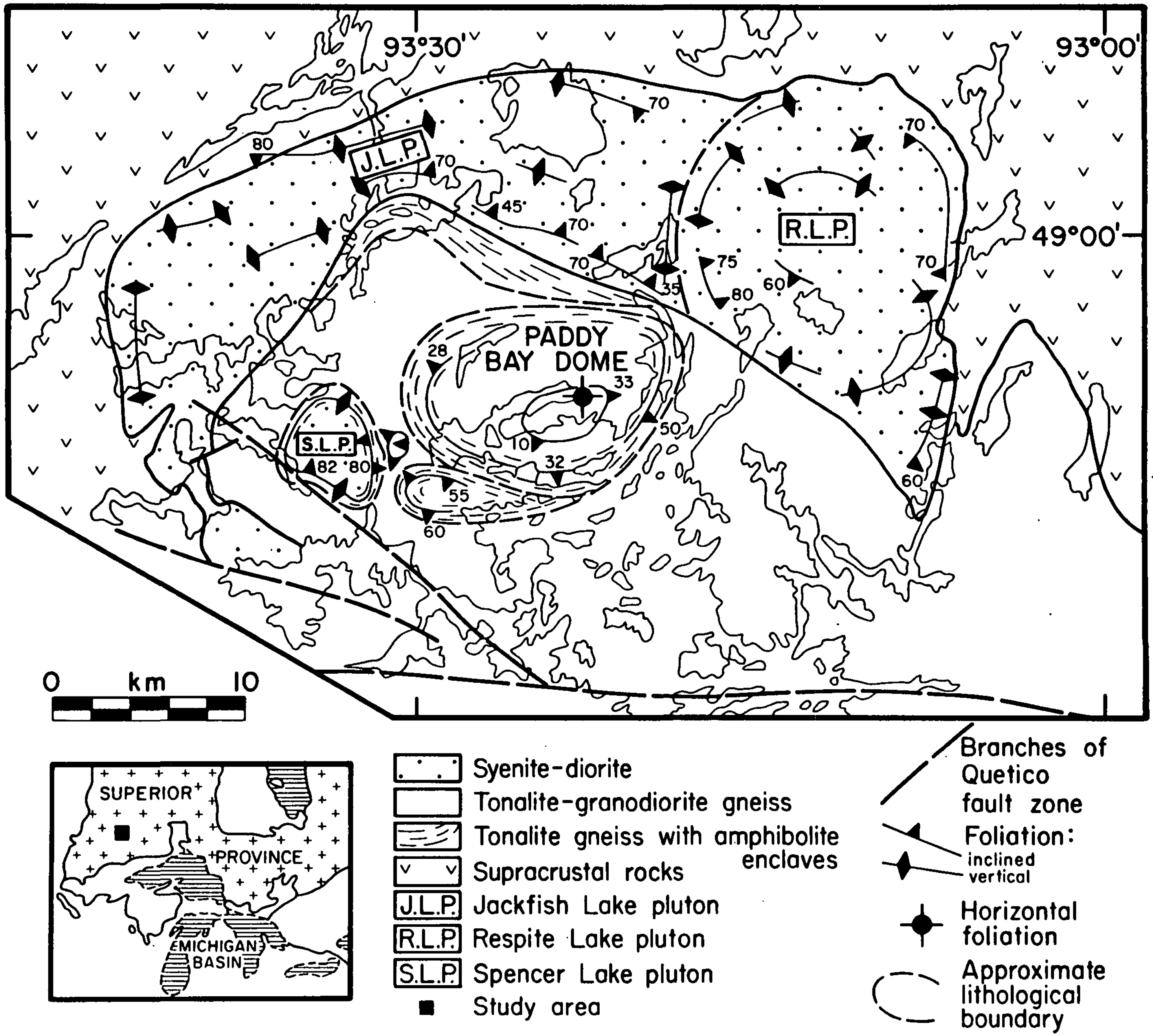
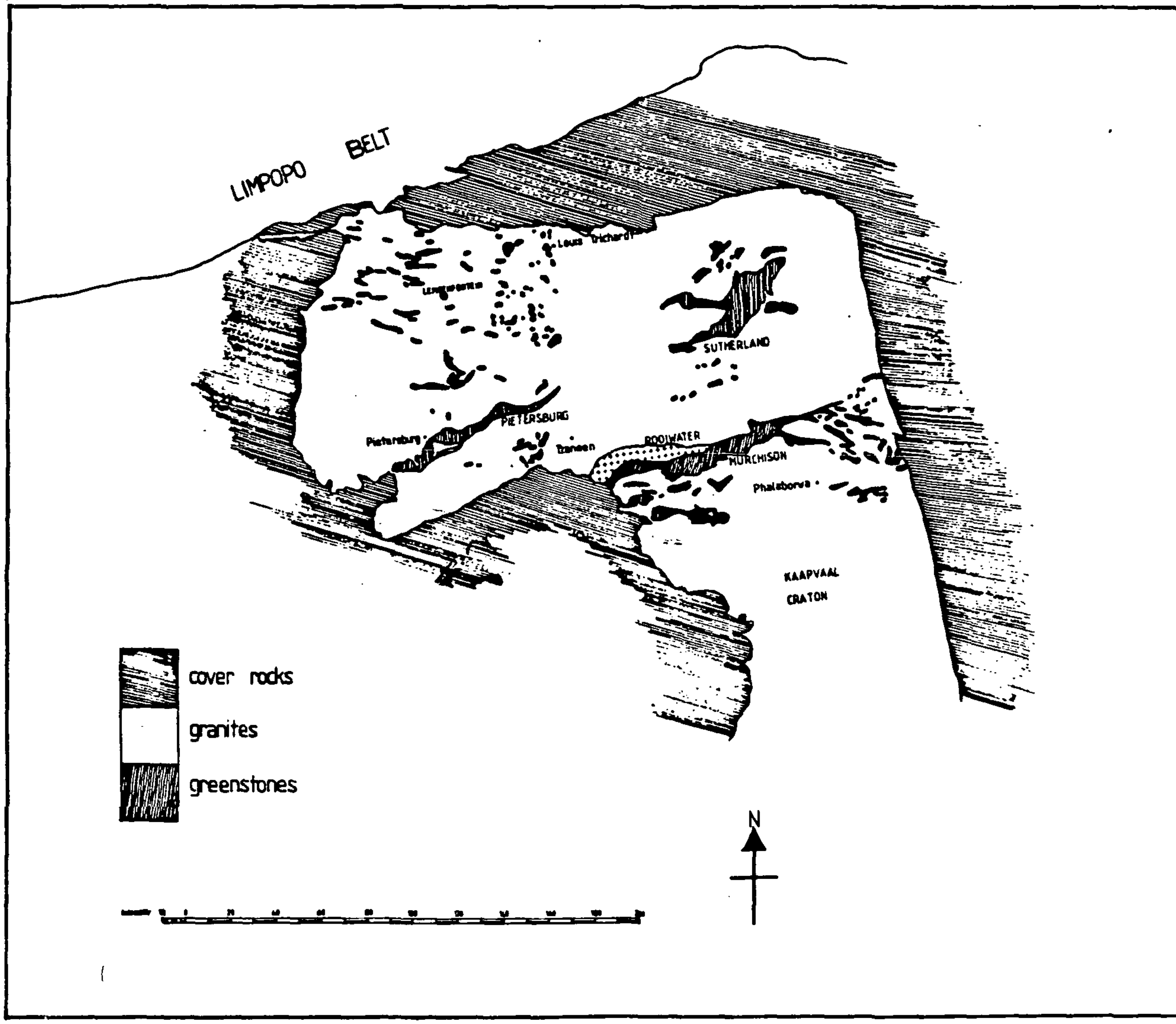

93°30'
93°00'
49°00'
J.L.P.
R.L.P.
S.L.P.
PADDY BAY DOME
0 km 10
SUPERIOR PROVINCE
MICHIGAN BASIN
Syenite-diorite
Tonalite-granodiorite gneiss
Tonalite gneiss with amphibolite enclaves
Supracrustal rocks
J.L.P. Jackfish Lake pluton
R.L.P. Respite Lake pluton
S.L.P. Spencer Lake pluton
Study area
Branches of Quetico fault zone
Foliation: inclined vertical
Horizontal foliation
Approximate lithological boundary


LIMPOPO BELT
SUTHERLAND
PIETERSBURG
ROOIWATER
MURCHISON
KAAPVAAL
CRATON
cover rocks
granites
greenstones
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