The medial zone of Wopmay orogen, District of Mackenzie

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Abstract

The "Wopmay fault zone", which bisects Wopmay orogen, contains a spectrum of rock types, formed and deformed at different times, and juxtaposed along faults, intrusive contacts and unconformities; however, the structure is dominated by northerly-striking folds formed about 1.84 Ga. Therefore, we propose to rename the zone the medial zone of Wopmay orogen, No exposures of Slave craton are known west of the zone nor is it likely that Slave craton exists in the subsurface. A large klippe of Hottah terrane occurs east of the medial zone, where it occupies a substantial portion of the internal zone of Wopmay orogen. Major unresolved questions include the extent of Hottah terrane within the internal zone, the nature of the Hottah-Akaitcho contact, and the origin of cross-folding of the medial zone.

Résumé

La « zone de failles de Wopmay » qui découpe en deux parties égales l'orogène de Wopmay, contient divers types de roches, formées et déformées à différentes époques et juxtaposées le long de failles, de contacts intrusifs et de discordances; cependant, la structure est surtout caractérisée par des plis à direction nord datant de 1,84 Ga environ. Par conséquent, une redésignation de cette zone par zone médiane de l'orogène de Wopmay est proposée. Il n'existe aucun affleurement connu du craton des Esclaves à l'ouest de la zone, lequel ne serait pas non plus présent dans le sous-sol. Une grande klippe du terrane de Hottah se trouve à l'est de la zone médiane où elle occupe une partie importante de la zone interne de l'orogène de Wopmay. Parmi les principales questions non résolues, mentionnons l'étendue du terrane de Hottah au sein de la zone interne, la nature du contact Hottah-Akaitcho et l'origine du plissement transversal de la zone médiane.

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INTRODUCTION

During the summer of 1989 six weeks were spent in the field mapping rocks in the Calder River (86F) map area. The map area includes: (1) Archean gneisses and granitoid rocks of the Slave province; (2) rocks of Hottah terrane, interpreted as an exotic terrane that collided with the western margin of the Slave craton during the Calderian orogeny (Hildebrand et. al., 1983); (3) rocks of Akaitcho Group, interpreted as a rift succession deposited on the western margin of the Slave craton prior to the Calderian orogeny (Easton, 1980; Hoffman and Bowring, 1984); (4) plutons of the syn-collisional Hepburn batholith (Lalonde, 1986); and (5) rocks of the Great Bear batholith, a post-collisional magmatic arc (Hildebrand et. al., 1986). Previous investigations within the Calder River area are listed in Hildebrand et al. (1987). The major aims of the project are to unravel the geological evolution of the central Great Bear magmatic zone; the ''Wopmay fault zone'' and the western part of the internal zone of Wopmay orogen. The purpose of this report is to summarize some of the geological results of the summer's field work, with particular emphasis on the ''Wopmay fault zone''; report preliminary geochronological results; and to explore some of their implications for Wopmay orogen.

WOPMAY FAULT ZONE

Background

The major linear that bisects Wopmay orogen, and separates the Great Bear magmatic zone from the internal zone, has long been considered to be a major fault termed the Wopmay River fault (Fraser et. al., 1972; Hoffman, 1973; McGlynn, 1975). Work done in the north during the 1970s led to the idea that the fault was a normal or oblique-slip fault active during Great Bear magmatism, but overstepped during later sedimentation (Hoffman et al., 1976; Hoffman and McGlynn, 1977). Easton (1981) coined the term Wopmay fault zone to refer to a zone of northerly-striking mylonites and faults of unknown age. He considered the westernmost fault of the zone as the boundary between the Great Bear and internal zones and coined the name, Grant subgroup, for a package of volcanic and sedimentary rocks of different metamorphic grades that occurs within the fault zone. St-Onge et al. (1982; 1983; 1984) also considered the internal zone-Great Bear boundary to be a fault and argued that the mylonitic rocks of the zone, and northwesterly-oriented folds in the Hepburn metamorphic-plutonic zone, were formed by dextral transpression during the Calderian orogeny. Subsequent normal faulting juxtaposed various blocks during uplift and erosion of the internal zone. Hoffman (1984b) argued that the Wopmay fault zone marked the western limit of non-stretched Archean crust and that as such it behaved as a buttress during subsequent orogenic events.

During the course of the present study Hildebrand and Bowring (1988) demonstrated that within the Calder River map area the boundary between the Great Bear and internal zone is an unconformity, similar to relations in the north (Hoffman and McGlynn, 1977). Locally, small displacement west-side-down normal faults appear to have been active during the early stages of Great Bear magmatism as evidenced by sedimentary facies and sequences within the Dumas Group (Hildebrand and Bowring, 1988). They also found that the northwesterly-striking folds within the Great Bear magmatic zone were progressively rotated into a northerly direction along the eastern margin of the zone. Furthermore, they argued that northwest-striking folds within the internal zone also rotated progressively into a northerly direction as one went westward and were generated by the same deformational episode as the Great Bear folds. This created a northerly-striking corridor dominated by tight, gently-plunging to horizontal, northerly-striking folds within a broad zone of northwesterly-oriented folds (see figures in Hildebrand and Bowring, 1988). The age of folding is about 1843 Ma as determined by U-Pb dating of zircons separated from folded volcanic rocks dated at 1844 ± 4 Ma and a granitic pluton, dated at 1843 ± 5 Ma, which clearly postdates the folding (Bowring, 1984).

Redefinition and new name

Because there has been so much confusion within the literature as to what constitutes the Wopmay River fault or the ''Wopmay fault zone'', and because we now recognize that the zone is dominated by northerly-striking folds, not faults, it is proposed here to rename the corridor the *medial zone of Wopmay orogen*. The zone, which bisects the orogen, is located near the boundary between the Great Bear magmatic zone and the internal zone where northwesterly-striking folds of the internides and the Great Bear magmatic zone strike northerly. To the west, rocks of the medial zone are intruded by the youngest plutons of the Great Bear magmatic zone and to the east by plutons of the Bishop intrusive suite. In such areas the boundary of the medial zone is an intrusive contact and easily defined: elsewhere, it is gradational. Although the medial zone contains a wide spectrum of rock types, formed and deformed at different times and juxtaposed along faults, intrusive contacts and unconformities of different ages, when taken together they define a corridor of northerly-striking folds formed during a regional deformational episode that occurred about 1.843 Ga. Redefining the zone in this manner will allow future workers the freedom necessary to designate units, structures and events within the zone.

Geology and geochronology

Figure 1 is a mapped transect across the medial zone at the Wopmay River. It serves as an example of the geological map units of the medial zone and the complexity of their relations to one another. The units are described from east to west.

a.) The most easterly unit of the medial zone is a complex assemblage of orthogneisses, in part mylonitic (Fig. 2). Tonalitic, monzodioritic, and granitic layers dominate, although boudinaged mafic dykes and gneisses of possible volcanic parentage are common. The contact with rocks to the west is a fault that is concordant with fabric both above and below. Kinematic indicators suggest eastward top-over-bottom movement.

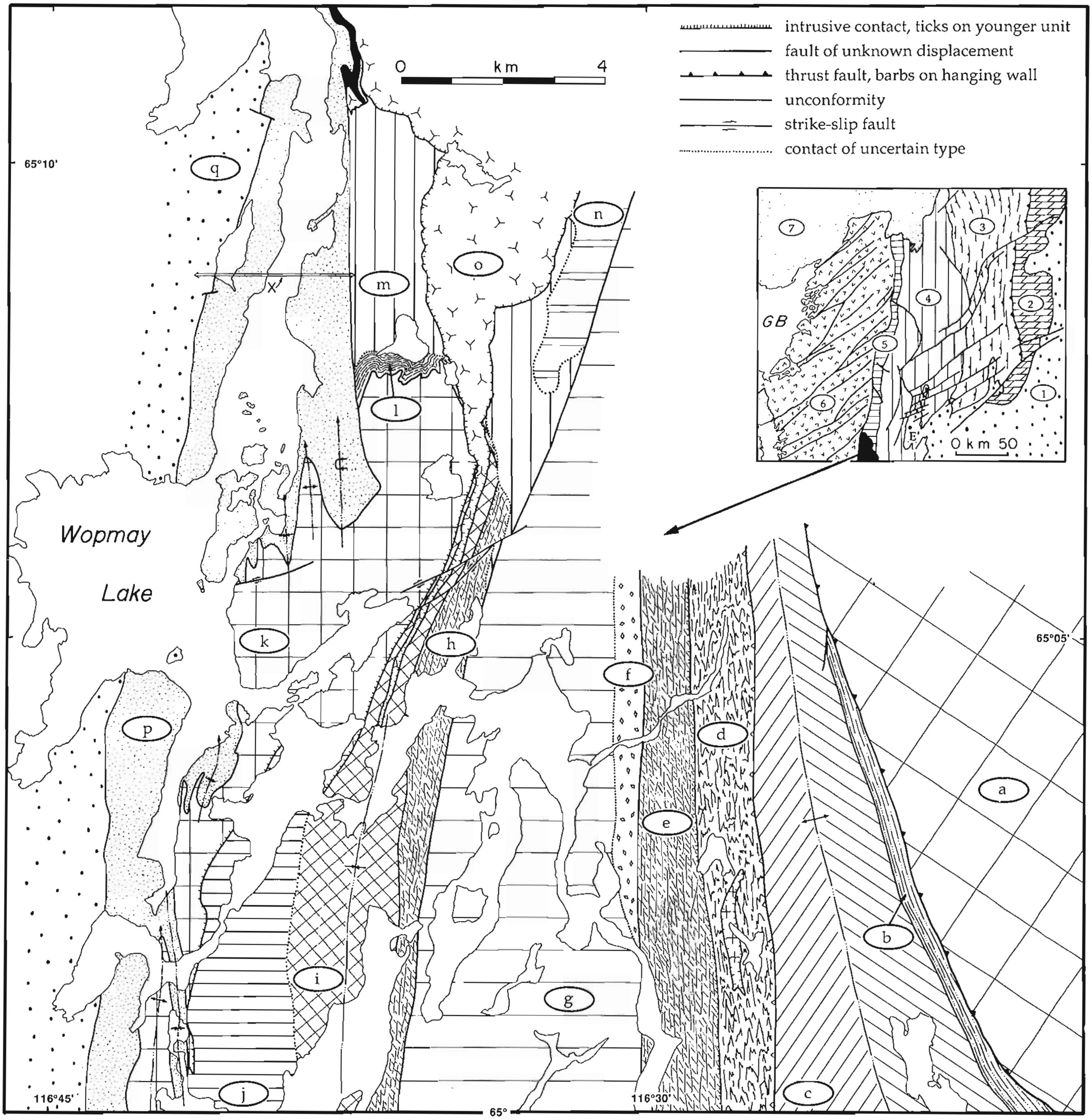

Figure 1. Geological sketch map showing distribution of lithological units within the medial zone at Wopmay Lake. Inset map shows location of main figure and major subdivisions of Wopmay orogen. 1 = Archean Slave craton; 2 = autochthonous strata of Wopmay orogen; 3 = Asiak thrust-fold belt (external zone); 4 = internal zone; 5 = medial zone; 6 = Great Bear magmatic zone; 7 = early Proterozoic and Paleozoic cover; E = Exmouth massif; GB = Great Bear Lake. a = Hottah orthogneiss; b = metasedimentary rocks; c = Archean mylonitic gneiss; d = migmatitic paragneiss; e = protomylonitic granite; f = muscovite-andalusite-garnet schist; g = low-grade sedimentary rocks, basalt and gabbro; h = protomylonitic granite; i = granitic and supracrustal gneisses; j = tonalitic and granitic gneiss; k = biotite granite, mylonite; l = siltstone, sandstone, carbonate; m = biotite-garnet-sillimanite gneiss; n = pillow basalt and gabbro; o = cpx-hornblende-biotite monzogranite; p = Dumas Group; q = foliated biotite granite; solid black areas = post-Dumas gabbro; X = line of section in Figure 12. The unconformity between rocks of the Dumas Group and unit o is exposed just east of the gabbro in the northern part of the figure.

A sample of unit a, an intimately-interlayered quartz monzodioritic and monzogranitic mylonitic gneiss (HWA-87Zr-21), was collected at 64° 59′ N, 116° 17′ W for U-Pb zircon geochronology. Preliminary results for four fractions are shown in Figure 3 and listed in Table 1. Two populations of zircon are present: light-brown, euhedral zircons and yellowish, subrounded zircons. Two fractions of light-brown euhedral zircons yield $^{207}Pb/^{206}Pb$ ages of 2.010 and 2.019 Ga and define a chord with an upper intercept of about 2.040 Ga. We interpret this as a preliminary estimate of the age of the quartz monzodioritic portion of the rock. Two fractions of subrounded yellow grains yield slightly younger $^{207}Pb/^{206}Pb$ ages of 1.991 and 1.995 Ga, which we infer were derived from the granitic material.

Based on these ages, gneisses of unit a are considered to be part of Hottah terrane, which has ages ranging from 1.914-2.278 Ga (Bowring, 1984). Based on the sense of movement and the fact that the Hottah rocks lie structurally above rocks of Slave craton, the fault is interpreted to be an eastward-vergent thrust fault. If correct, then rocks of unit a form a klippe in the internal zone. Reconnaissance done during the summer indicates that the western contact of the klippe may continue for over 100 km to the north. The eastern contact of the klippe remains unmapped and its relationship to rocks of the Akaitcho Group is unknown.

b.) Metasedimentary rocks dominate this unit, which sits unconformably upon unit c and is structurally overlain by unit a. The succession contains quartzites, garnet amphibolite and thinly-layered biotite-quartz-feldspar-garnet rocks. Rocks of this succession are folded about axial planes that dip easterly at 50°-70°, the same inclination as both the upper contact and the gneissic layering in the rocks of Hottah terrane. Additionally, the folds have an asymmetry compatible with an eastward vergence of the overlying thrust fault.

c.) This unit comprises annealed mylonitic gneisses derived mostly from plutonic rocks. The gneisses are lithologically heterogeneous at outcrop scale (Fig. 4) and comprise dominantly granitic, tonalitic, and amphibolitic layers. They are folded to form an anticline with steeply-dipping limbs (>50°) and a gentle northward plunge (0°-35°). To the southeast, the fold limbs shallow and the axial trace strikes northwest. Mineral lineations are gently-plunging and coaxial with the fold axis.

Figure 2. Typical mylonitic gneisses of unit a, which is interpreted on the basis of geochronology to be part of Hottah terrane. Note the disrupted granitic veins which yield a younger age than the surrounding quartz monzodioritic layers. GSC 205000-C.

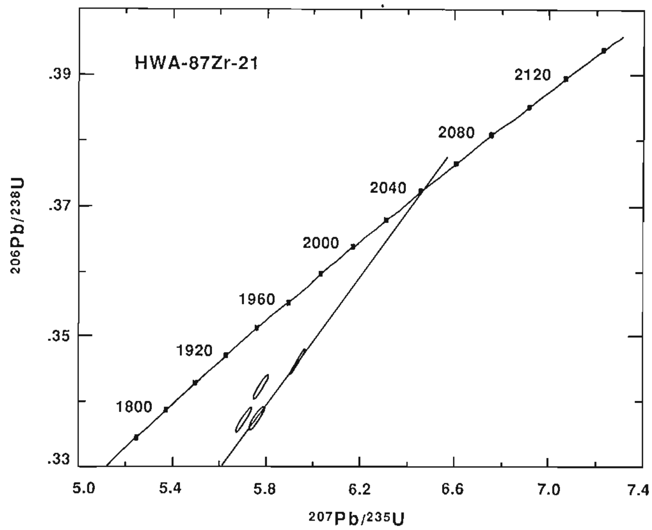

Figure 3. Concordia diagram showing U-Pb isotopic data for sample collected from unit a (HWA-87Zr-21).

Table 1. Isotopic data

Zircon fractions			Concentrations		Measured	Atomic ratios corrected for blank and common Pb				Age (Ga)
No.	Properties	Weight (mg)	U (ppm.)	Pb (ppm.)	$^{206}Pb/^{204}Pb$	$^{208}Pb/^{206}Pb$	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{207}Pb/^{206}Pb$	$^{207}Pb/^{206}Pb$
					HWA-87Zr-21					
1	nm1	0.6905	701	258	5556	0.11502	0.34223	5.77548	0.12240	1.991
2	m2,eu,tan	0.2630	630	241	6141	0.14973	0.34621	5.93513	0.12433	2.019
3	m3,eu,tan	0.5045	566	210	4461	0.14168	0.33737	5.75521	0.12372	2.010
4	m4,yel,sbr	0.1867	724	260	11082	0.11171	0.33725	5.70342	0.12265	1.995
					HWA-89Zr-8					
5	nm2,B	0.8575	120	67	2067	0.09755	0.48730	13.5093	0.20106	2.834
6	nm2,eu	0.6661	242	132	3041	0.09205	0.48328	13.3213	0.19992	2.826
7	d-3	0.1260	253	138	15691	0.09454	0.48802	13.4892	0.20047	2.830
8	nm4	0.6434	146	77	1846	0.09028	0.46148	12.4908	0.19631	2.796

nm=nonmagnetic; m=magnetic; d=diamagnetic; number following refers to degrees of tilt on the Franz Isodynamic Separator; eu=euhedral; yel=yellow; sbr=subrounded

A sample of mylonitic syenogranite from unit c (HWA-89Zr-8) was collected at 64° 57′ N, 116° 18′ W for U-Pb zircon geochronology. Four fractions of light-brown euhedral zircons were analyzed and the results yield a discordant array (Fig. 5). $^{207}Pb/^{206}Pb$ ages of three fractions cluster together around 2.83 Ga and the other fraction has a $^{207}Pb/^{206}Pb$ age of about 2.8 Ga (Table 1). The upper intercept of a line regressed through the points is 2.925 ± 0.017 Ga.

d.) West of the Archean gneisses is a northerly-striking belt of recessively-weathering migmatitic paragneisses (Fig. 6) with a 70°-85° westward dipping fabric defined by cleavage and detached fold limbs. Their age is undetermined. They are intruded by variably-deformed, white-weathering, biotite granites, also of unknown age, that contain inclusions of granitic ultramylonite. The contact with the Archean gneisses is poorly-exposed but appears to be a concordant mylonite zone, 1-2 m thick. The granites, which are common within the paragneisses, are completely absent in rocks east of the contact. The occurrence of a mylonitic zone and the lack of the distinctive biotite granites in the Archean gneisses suggests that the contact is a fault.

Figure 4. Unit c showing heterogeneous character of the gneisses. Pen in top centre for scale. GSC 205000-A.

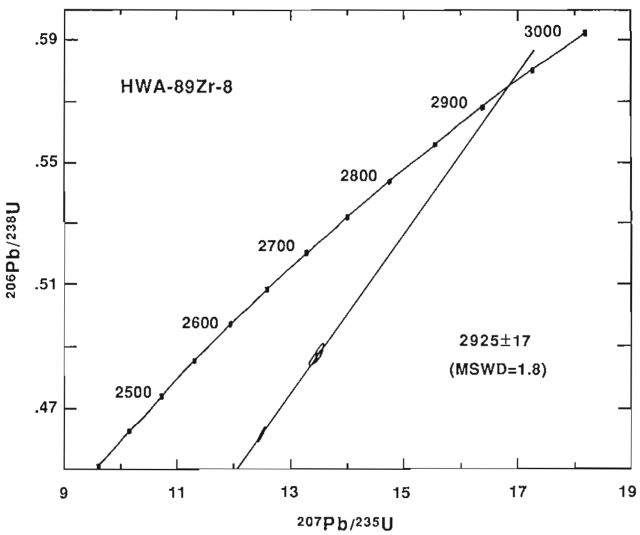

Figure 5. Concordia diagram showing U-Pb isotopic data for sample collected from unit c (HWA-89Zr-8).

e.) This unit is dominated by white-weathering, protomylonitic biotite granite (Fig. 7). Potassium feldspar phenocrysts range up to 10 cm across and sit in a medium- to coarse-grained groundmass of feldspars, quartz, and biotite. S-C fabrics are well-developed and there is typically a gently-plunging (0°-35°) mineral lineation. The granite contains enclaves, some to 8m, of sillimanite-garnet-biotite schist with local centimetre-thick layers of garnet. The porphyritic granite is intruded by variably-deformed medium-grained biotite granites similar to those intruding unit d paragneisses and, in many places, the contact between the granite of unit e and the paragneisses is obscured by the younger granites. Where the contact was observed the porphyritic granite contains abundant xenoliths of paragneiss.

f.) Juxtaposed against the porphyritic granite by a fault of unknown displacement is a westward-dipping belt of metapelites and psammites. Cleavage dips 75°-80° to the west; bedding typically dips 50°-60° to the west. Mineral lineations plunge less than 10° north or south. The age of the rocks is undetermined but they are part of a group of metasedimentary rocks, ranging continuously in metamorphic grade from muscovite-andalusite-garnet (Fig. 8) to above the production of granitic melts and muscovite breakdown, found within the medial zone for a strike length of

Figure 6. Typical appearance of sheared migmatitic paragneisses of unit d. Note the well-developed shear-bands in lower right. GSC 205000-J.

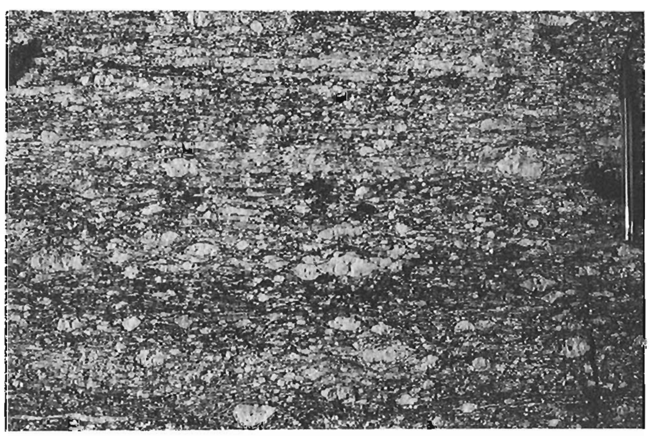

Figure 7. Protomylonitic granite characteristic of unit e. GSC 205000-V.

at least 100 km (Easton, 1981; St-Onge et. al., 1982; 1983; 1984). They are typically in contact with chlorite-grade sedimentary rocks, basalts and gabbros of unit g along a fault or unconformity. Easton (1981) included both the higher-grade rocks and the chlorite-grade rocks in the Grant subgroup. Here we prefer to avoid the term Grant subgroup because we are not certain that the low- and high-grade rocks are parts of the same stratigraphic package.

g.) West of unit f is a low-grade assemblage of rocks which Easton (1981) also included in the Grant sub-group. It is dominated by gabbroic sills that intrude a chlorite grade succession of quartz arenites, semipelites, dolomite-argillite rhythmites, cryptalgal dolomite, minor spherulitic rhyolite, and pillow basalts. The lowest part of the succession comprises siliciclastic sedimentary rocks, overlain by rhythmites (Fig. 9) and capped by cryptalgal dolomite. The upper part of the section is composed of pillow basalts but the contact between the basalts and sedimentary rocks was not observed due to the intrusion of numerous gabbroic sills. A rhyolite within the basalts yielded a U-Pb age of about 1.9 Ga (Bowring, 1984). The contact between units g and f was not exposed. The contact with units to the west was not observed by the authors but Easton (1981) found a 2-3 m-wide belt of ultramylonite.

Figure 8. Close-up of muscovite-garnet-andalusite schist (unit f) showing well-developed andalusite porphyroblasts. GSC 205000.

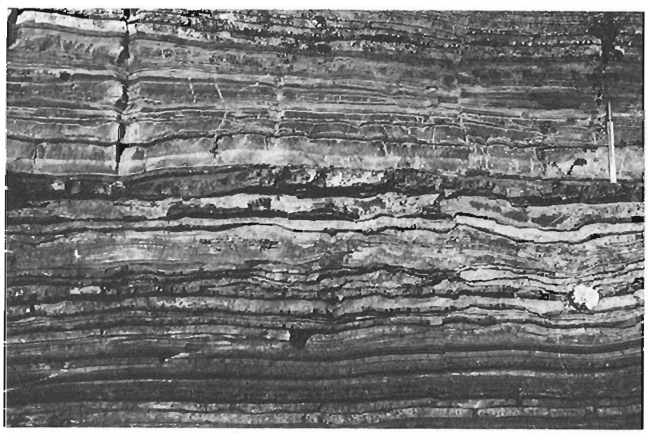

Figure 9. Carbonate-argillite rhythmites of unit g. Note the lack of penetrative fabric. Compare with Figure 11. GSC 205000-B.

h.) This unit is similar to unit e in that it is a white weathering, potassium feldspar porphyritic, biotite granite with a well developed s-c fabric and a sub-horizontal mineral lineation. It contains numerous enclaves of amphibolite and metasedimentary rocks, especially along its western margin where it intrudes a package of gneisses of supracrustal origin. Its age is undetermined but it appears to be basement to a low-grade sedimentary package discussed below (unit l).

i.) This unit is a heterogeneous assemblage of gneisses derived from sedimentary and volcanic protoliths. Common lithologies include quartzite, semipelite, garnet-plagioclase-biotite rocks considered to be meta-andesites, and a variety of siliceous lavas or hypabyssal porphyries. Granitoid intrusions cut the supracrustal rocks and, with a few exceptions, were deformed with them. The foliation defines a shallow northward-plunging synform with limbs that dip mostly between 60°-85°. Mineral lineations are also gently plunging. This unit, along with units h, j, and l, forms part of the basement upon which undated sedimentary rocks of unit l were deposited.

j.) Undated tonalitic and granitic gneiss containing boudinaged mafic dykes (Fig. 10) constitutes the bulk of this map unit. The unit has a well-developed gently-plunging mineral lineation and a steep, westward-dipping foliation. Its contact with unit i is possibly a fault. It is intruded on its western flank by granite of unit k.

k.) This map unit comprises variably-strained, pink weathering, biotite granite. It is mostly an l-s tectonite but in places there is no visible planar fabric, only a lineation. In some areas the rock is mylonitic. The granite is unconformably overlain by rocks of the Dumas Group and adjacent to the contact a well-developed weathered zone up to 10 m thick is developed. Numerous siliceous and intermediate composition porphyritic dykes, most varieties of which also cut the overlying Dumas Group, intrude the granite.

l.) This unit is a succession of low-grade sedimentary rocks, similar in lithology and metamorphic grade to unit g, that lies unconformably upon deformed granite of unit k but is itself unconformably overlain by rocks of the Dumas

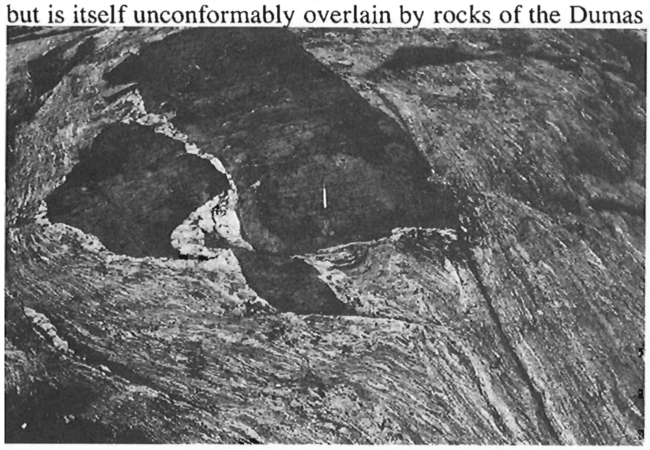

Figure 10. Typical appearance of unit j. Pen in lower part of large boundin for scale. GSC 205000-T.

Group (unit p). The lower 10-20 m are dominated by quartz arenite, arkose and siltstone, with minor intercalated beds of volcaniclastic sandstone. The siliciclastic sequence is overlain by several metres of finely-interbedded carbonate and argillite, which passes upward into 5-10 m of more massive, brown-weathering, cryptalgal dolomite. The section is structurally overlain by gneisses of unit m.

m.) This map unit comprises biotite-garnet-sillimanite gneisses of sedimentary origin. Layering is typically 1-3 cm thick and contorted (Fig. 11). Its contact with the low-grade sedimentary rocks of unit l occurs within a valley and is not exposed. However, it appears to structurally overlie that unit. The dramatic jump in metamorphic grade and the juxtaposition of high-over-low grade rocks suggests that the contact may be a thrust fault.

n.) This unit is mostly pillow basalt and gabbro metamorphosed under greenschist facies conditions except within a few metres of a large pluton (unit o) where it is metamorphosed to amphibolite. It is similar to the upper mafic part of unit g in that it comprises pillow basalts, gabbroic intrusions, and small amounts of rhyolite. Its relationship to the biotite-garnet-sillimanite gneisses (unit m) is unclear as the contact was not exposed. The top of the unit was not found.

o.) This unit, included as a member of the Bishop intrusive suite by Lalonde (1986), is a clinopyroxene-hornblende-biotite quartz monzonite-monzogranite pluton that intrudes units i, k, l, m, and n. Locally, there is a well-developed clinopyroxene-biotite-hornblende dioritic border phase. In general, the main body of rock is coarsely porphyritic with potassium feldspar phenocrysts to 4 cm. Biotite defines a foliation, especially adjacent to the intrusive contacts. The pluton is unconformably overlain by rocks of the Dumas Group (unit p) and is therefore older than 1:75 Ga.

p.) Rocks of this unit are part of the Dumas Group, which is the oldest group of rocks in the eastern Great Bear magmatic zone (Hildebrand et. al., 1986). In this area the group comprises laminated siltstone and sandstone, dolomite, siliceous ash-flow tuff, basaltic lavas, pebbly sandstone and conglomerate. U-Pb zircon geochronology indicates that an ash-flow tuff within the sequence was emplaced at 1.875 Ga (Hildebrand et. al., 1987). The supracrustal rocks are intruded by a variety of intermediate and siliceous porphyritic dykes. Rocks of the group unconformably overlie units j, k, l, m, n, o, and q. Similar rocks outcrop all along the eastern boundary of the Great Bear magmatic zone and, within most of the Calder River map area, occupy the core of an overturned syncline with an axis that plunges 0°-5° to either the north or south (Hildebrand and Bowring, 1988). At Wopmay Lake fold axes and mineral lineations plunge 35° to the north and deeper structural levels are seen. The plunge was utilized to construct the cross-section shown as Figure 12.

q.) This unit lies unconformably beneath the Dumas Group on the western side of an overturned syncline down the entire length of the Calder River map area (Hildebrand et. al., 1987; Hildebrand and Bowring, 1988). It comprises coarsely-porphyritic biotite granite dated at 1890±5 Ma (Hildebrand and Bowring, 1988). The rock is characterized by 2-6 cm potassium feldspar phenocrysts, anhedral quartz phenocrysts to 1 cm, and subhedral-euhedral plagioclase to 5 mm, in a matrix of quartz, feldspars, and biotite. Biotite defines a well-developed, steep (>75), westerly-dipping foliation, especially near the unconformity.

Figure 11. Typical contorted layering in biotite-garnet-sillimanite gneisses of unit m. Contrast the deformational style with Figure 9. GSC 205000-U.

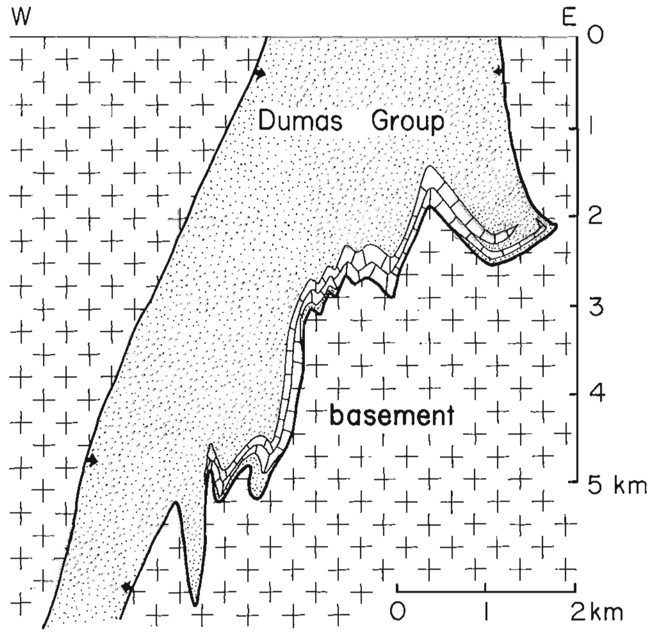

Figure 12. Down-plunge projection through the Dumas Group and its basement at Wopmay Lake showing style of folding. The overall structure is an overturned syncline with infolded rocks of the Dumas Group flanked by older rocks on both limbs. Basement on the west is unit q; on the east, units j, k, l, m, n, and o. Arrows indicate younging directions in Dumas Group. Note the overturned unconformities at the surface on both limbs of the syncline. Carbonate pattern = dolomite in lower Dumas Group. In places the dolomite sits directly on basement. The rheological difference between the basement and the carbonate could be responsible for the short wave length folds. Location is indicated in Figure 1.

CROSS FOLDING

For most of the length of the Calder River map area folds in the medial zone have horizontal, or very gently-plunging, axes. However, in the Wopmay Lake area most fold axes and mineral lineations plunge northward at about 35°. The northward plunge of linear elements in the area suggests that there is a deformational event which refolded the folds of the medial zone. As this region is directly west of a major westerly-striking cross-fold (Redrock culmination) that exposes Exmouth massif within the internal zone (Fig. 1 and see Hoffman et. al., 1988), it may be a continuation of that fold. However, Redrock culmination has been interpreted to be one of many east-northeast-trending folds (Tree River folds) that formed shortly after the Calderian orogeny but prior to magmatism of the Great Bear magmatic zone (St-Onge et. al., 1984; King, 1986; Hoffman et. al., 1988). The cross-folding that refolds rocks of the medial zone cannot predate rocks of the Great Bear magmatic zone as the folding involves those rocks. Conceivably, there were two distinct periods of cross-folding, but if the cross-folds in rocks of the medial zone were generated by the same event as that which generated Redrock culmination then there are two possibilities: (1) the Tree River folds postdate Great Bear magmatism; or (2) the Redrock culmination is not a Tree River fold. Additional work in the medial zone to the south should clarify this problem.

LINEATION WITHIN THE INTERNAL ZONE

The occurrence of the pervasive north-south oriented lineation that affects all rocks of the medial zone, including the Dumas Group, may have implications regarding interpretation of similar north-south mineral lineations of unknown origin within the western internal zone. Hoffman et al. (1988) suggested that the north-south oriented mineral lineations within the internal zone developed during the Calderian orogeny by strain partitioning. That is, the collision between Hottah terrane and Slave craton was oblique such that it had a strong strike-slip component (King, 1986). Whereas the kinematics of such a model are identical to those suggested by the event that generated the northwesterly and northerly-striking folds of the Great Bear magmatic zone, the medial zone, and the internal zone, it may be that some of the lineations within the internal zone were generated during the late folding event and not the Calderian orogeny. This is testable because lineations of Calderian age within the internides should be folded by the northwest-striking folds rather than coaxial with them.

DISCUSSION

Recent work by Bowring and Grotzinger (1989) and Bowring and Podosek (1989) suggests that in northern Wopmay orogen most of the Akaitcho Group is exotic with respect to Coronation margin and Slave craton. Additionally, they argued that magmas of the Akaitcho Group did not interact with Slave Craton but rather with Hottah terrane. The discovery last summer of a klippe of Hottah terrane within the internal zone, and the isotopic similarities of the Akaitcho Group to Hottah terrane, raise the question of whether or not rocks of the Akaitcho Group constitute a cover sequence on Hottah terrane. At present the eastward extent of the klippe and its contact with the Akaitcho Group remain unmapped so this question is not answerable; however, tectonic models proposed for Wopmay orogen hinge on its resolution.

SUMMARY OF THE MEDIAL ZONE

A summary of the major characteristics of the medial zone and their significance is listed below.

1. The fundamental structure of the medial zone is a group of shallowly-plunging, north-striking folds. Northwesterly-striking folds in both the Great Bear and internal zones tighten and trend progressively more northerly as the medial zone is approached until they strike northerly to define the zone (see Hildebrand and Bowring, 1988). Thus, the overall form of the fold system indicates that it formed as the result of dextral transpression. The age of folding is about 1.843 Ga as determined by U-Pb dates on zircons separated from granitic plutons and volcanic rocks in the Great Bear magmatic zone.

2. Most rocks within the medial zone, except for a few competent lithologies such as basalt and gabbro, have a well-developed mineral lineation that is coaxial with the folds. This suggests that the lineation formed contemporaneously with folding.

3. Numerous lithologies of various ages are exposed within the medial zone. They are separated by faults of unknown displacement, unconformities, thrust faults and contacts of unresolved type.

4. The contact between the Great Bear magmatic zone and the internides is nearly everywhere an unconformity, but minor west-side-down normal faults were active during sedimentation of the Dumas Group. Within the northern half of the orogen it is this unconformity, now rotated near vertical by folds of the medial zone, that forms the dominant photolinear, visible even from space (see McGlynn, 1981).

5. At first approximation the line forms a domain boundary between northeasterly-striking, right-lateral transcurrent faults to the west and northwesterly-striking, left-lateral faults to the east (Hoffman, 1984a; Hildebrand and Bowring, 1988). Within the medial zone many of the right-lateral faults of the Great Bear zone appear to turn northward until they parallel bedding and cleavage in sedimentary rocks of the Dumas Group where they disappear. Northwesterly-striking left-lateral faults of the internal zone transect the medial zone.

6. There are no known exposures of Archean rocks west of the medial zone. Neodymium and lead isotopic data from igneous rocks of the Great Bear zone indicate that the magmas did not interact with Archean crust (Bowring and Podosek, 1989; Housh et. al., 1989). Thus, even in the subsurface there may be no Archean crust west of the medial zone.

7. Rocks of Hottah terrane occur east of the medial zone where they form a klippe that forms part of a package of rocks thrust eastward over the Slave craton and its cover.

The klippe comprises a sizable portion of the internal zone, but the eastward extent of the klippe, and the nature of its contact with the Akaitcho Group, are unknown.

8. In the Wopmay Lake area north-striking folds of the medial zone are refolded by easterly-striking cross-folds. The relationship of the cross-folds to the Redrock culmination and the Tree River folds is unknown at present.

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ANALYTICAL PROCEDURES

Zircons were separated using standard techniques, dissolved in Teflon micro-bombs spiked with a mixed ^{208}Pb-^{235}U tracer solution, and analyzed in single-collector mode using a VG-354 mass spectrometer. Radiogenic ^{206}Pb and ^{207}Pb were calculated by correcting measured ratios with measured blank Pb and the model Pb of Stacey and Kramers (1975) corresponding to the age of the zircons for the original non-radiogenic component. During the course of analyses blanks were < 10 pg ^{206}Pb and < 15 pg total U. Uncertainties on the $^{207}Pb/^{206}Pb$ and U-Pb determinations, estimated from the long-term reproducibility of standards and samples, are $\pm 0.1\,\%$ for $^{207}Pb/^{206}Pb$ and $^{208}Pb/^{206}Pb$ at the 2σ level and $\pm 0.4\,\%$ for $^{235}U/^{207}Pb$ and $^{206}Pb/^{238}U$.