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GEOLOGICAL TRANSECT ACROSS THE SYLVESTER ALLOCHTHON NORTH OF THE BLUE RIVER, NORTHERN BRITISH COLUMBIA* (104P/12)

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INTRODUCTION

In Cry Lake (104I), McDame (104P) and Jennings River (104O) map areas the Sylvester allochthon is juxtaposed against Paleozoic North American continental margin carbonates and clastics of the Cassiar platform across the basal Sylvester fault as a vast klippe (Gabrielse, 1963, 1970, 1979; Gabrielse and Mansy, 1980; Harms, 1986a). Regionally, the Sylvester assemblage consists of a suite of oceanic lithologies: banded radiolarian chert, siliceous argillite, argillite, carbonate, minor coarse clastics, basalt and pillow basalt, gabbro and diorite, serpentinite and ultramafics. Various units of the Sylvester have been dated and range in age from Middle (?) Devonian to Late Triassic (Mamet and Gabrielse, 1969; Gordey *et al.*, 1982; Harms, 1986a). In contrast, immediately underlying North American units, carbonates of the McDame Group, and black argillite and chert arenite of the Earn Group and equivalent black and grey argillites, range in age up to earliest Mississippian. The basal Sylvester fault which separates these two disparate assemblages is planar, not significantly deformed, and subhorizontal to broadly synformal. Nevertheless, both the Sylvester allochthon and the underlying autochthonous strata are deformed into separate complex structural systems.

Geological mapping during the 1987 field season in the Blue Dome (104P/12) map area, conducted as part of the Midway-Cassiar project of the Canada/British Columbia Mineral Development Agreement (*see* Nelson and Bradford, this volume), broadened documentation of the distinctive internal structural style which characterizes the Sylvester allochthon (Gordey *et al.*, 1982; Harms, 1984, 1985, 1986b; Nelson and Bradford, 1987). For the first time, a complete and detailed transect across the structural strike of the Sylvester allochthon was mapped at a scale of 1:25 000. This report presents a structural cross-section over 20 kilometres long, along that transect (Figure 1-22-1), which elucidates the complex deformation within the allochthon.

STRUCTURAL STYLE OF THE SYLVESTER ALLOCHTHON

The Sylvester allochthon is composed of innumerable, discrete, fault-bounded lithotectonic slices. This is a consistent, very large-scale structural fabric which is a fundamental distinguishing characteristic of the allochthon. Each of the lithotectonic slices which make up the Sylvester assemblage may include only one, or several lithologies. Some lithotectonic units are repeated in several telescoped slices, or can be shown to be one of a suite of lithologically related slices; however, many have no inherent relationship to any of the other Sylvester units. These lithotectonic slices are commonly thin, and pinch out laterally in all directions. Where units of the Sylvester can be dated, older-over-younger relationships are common. The sequence of lithologies seen in the Sylvester is thus a completely tectonic "stratigraphy"; it was developed almost entirely by faulting and varies widely from place to place.

BLUE DOME (104P/12) TRANSECT

Figure 1-22-2 presents a composite structural section, which crosses the Sylvester allochthon approximately perpendicular to its large-scale northwesterly structural grain, just north of the Blue River in 104P/12 map area. A line of section was chosen which best illustrates the structural style of the Sylvester, and so as to cross units which could be accurately projected from one line of section to another. This transect provides for the first time a complete trans-Sylvester cross-section drawn from detailed mapping and it is shown in as much detail as possible. Major suites of lithotectonic slices (Divisions I, II and III) drawn from Nelson and Bradford (this volume) are indicated. However, specific lithotectonic

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units shown on the transect may not be directly correlatable with the more generalized units used in the large-scale compilation map which appears in that report, or integrated with units used by Nelson *et al.* (1987, open file 1:25 000 map, in preparation).

The pervasive, fault-bounded lithotectonic nature of the Sylvester assemblage and its tectonic "stratigraphy" are readily apparent from the cross-section. Most contacts shown are low-angle faults. Even the same or clearly related lithologies are repeated and juxtaposed by faults. Undisrupted original relationships are seen only in the intrusive contacts of Unit IIPv basalt with Unit IIPzPc Mississippian-Permian (?) grey to green and red-banded radiolarian cherts, and in the intrusive contacts of Unit IIIPvs basalt and andesite with Unit IIIPls Permian fusulinid-bearing tuffaceous carbonate. The many faults which bound the remainder of the Sylvester lithotectonic units are recognized by a number of factors. First among these is map scale, along-strike truncation of units. Abrupt juxtaposition of unlike lithologies, with no intervening transitional facies, and of depositionally incompatible lithologies such as silicified metachert (Unit IIc) and *Halobia*-bearing carbonate (Unit IITrls) also indicate

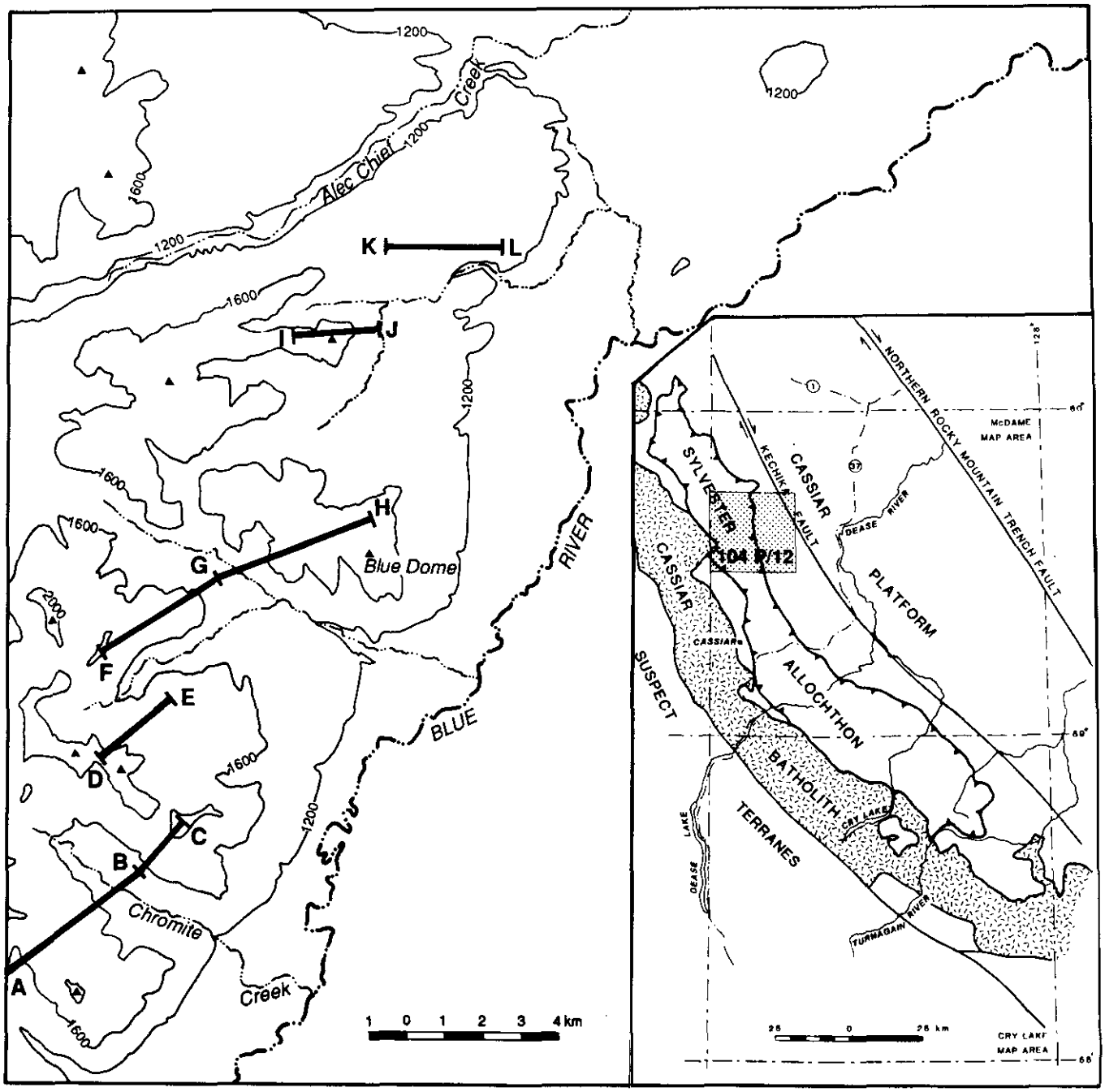

Figure 1-22-1. Location of lines of composite transect through the Sylvester allochthon in 104P/12 map area. Contours in metres. Solid triangles denote prominent peaks.

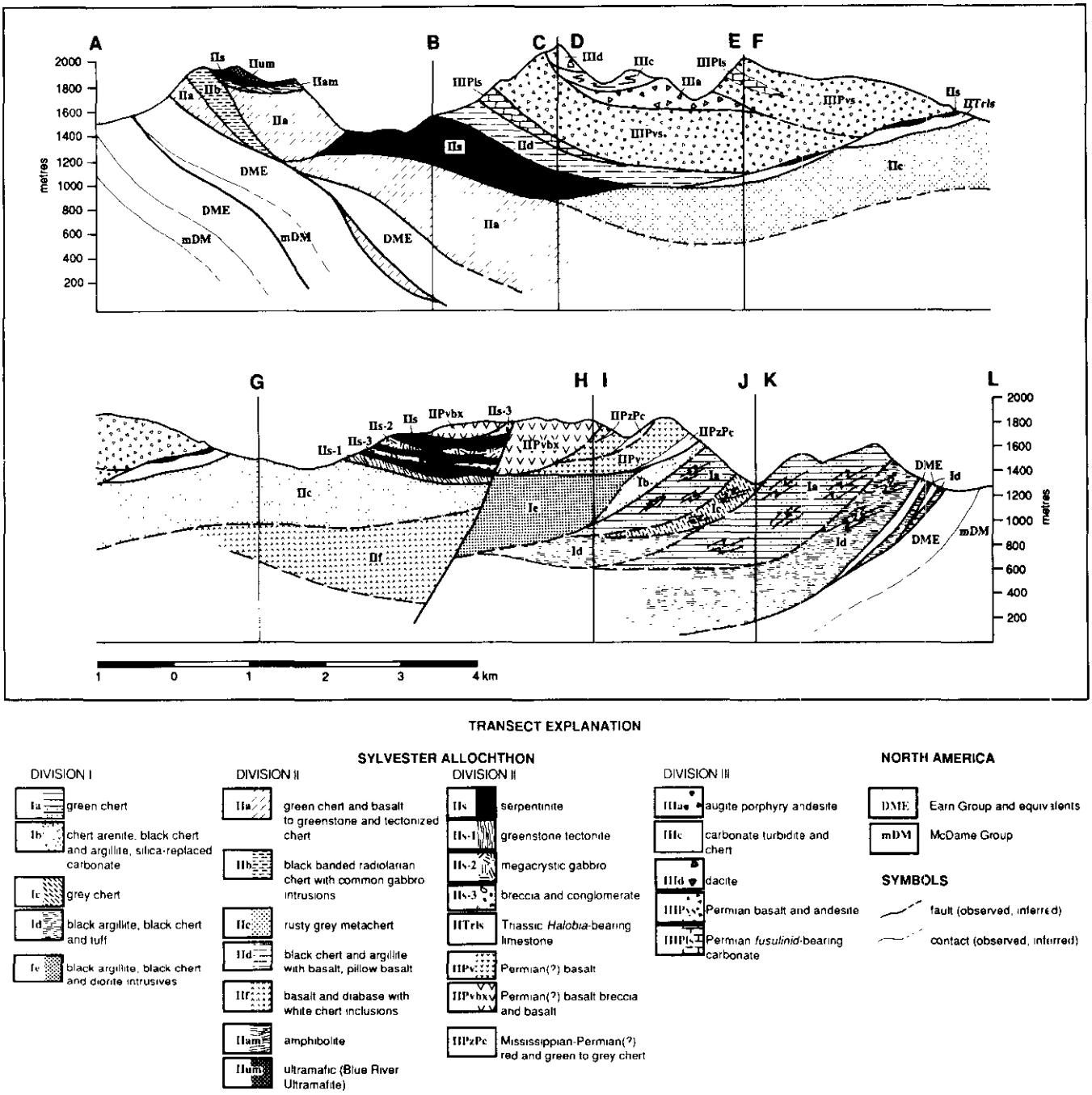

Figure 1-22-2. Composite geologic cross-section through the Sylvester allochthon. 1.6× vertical exaggeration. Line of section located in Figure 1-22-1.

tectonic convergence. Most slice-bounding faults are planar and not significantly deformed. In contrast, units between these faults are commonly deformed. Banded chert (Units Ia, Ic and Ie) and rhythmically bedded carbonate turbidite (Unit IIIc) are isoclinally folded between unfolded parallel contacts. Unit IIam, a strongly foliated and lineated amphibolite, and Unit IIs-1, a foliated siliceous-greenstone tectonite are considerably more penetratively deformed and of higher metamorphic grade than the lithotectonic units around them. This structural disharmony between adjacent units provides further evidence of tectonic emplacement.

Clear demonstration of the geometry and pattern of the juxtaposition of lithotectonic slices across the Sylvester allochthon is an intriguing result of this transect. The tectonic slices of the Sylvester, on a regional scale, are nested together in a "pancake" stack which is interleaved in all directions. Lithotectonic slices are grossly lensoidal; they taper and pinch-out, both along and across strike. East dips to fault surfaces predominate in the western Sylvester and west dips in the east; however, on a regional scale lithotectonic slices are for the most part subhorizontal with overlapping lateral pinch-outs. In such a stacking, a unit may be structurally

highest locally, but no one unit can be said to overlie all others. The internal structural style of the Sylvester allochthon is therefore not strictly imbricate as are imbricate stream pebbles, roof shingles or fish scales. This is fundamentally different in nature from the truly imbricate internal structural style which is commonly attributed to subduction-related accretionary assemblages (Seely *et al.*, 1974; Karig and Sharman, 1975; Sample and Fisher, 1986). Recognition of the nested character of the Sylvester lithotectonic slices provides a more accurate and powerful model for prediction or extrapolation within the allochthon, and suggests that simple subduction zone genetic models may be inadequate to describe the telescoping of upper oceanic crust which is evident in the structural style of the Sylvester allochthon.

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