PALYNOLOGY OF SUBSURFACE CENOZOIC SEDIMENTS AND PYROCLASTIC ROCKS SOUTHWEST OF VANDERHOOF, BRITISH COLUMBIA*
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INTRODUCTION

The Nechako Plateau of central British Columbia is an area of rolling topography with bedrock outcrops generally confined to some of the river banks and to the upper and steeper slopes of hills. The road from Vanderhoof to the Kenney Dam 75 kilometres to the southwest, for example, is within sight of bedrock outcrops only at Mount Greer, midway along its length and at the Kenney Dam itself (Figure 1-22-1). Exposed bedrock is, moreover, almost exclusively Mesozoic to Eocene plutonic and volcanic rocks. Two notable departures from the dominance of crystalline rocks were revealed by drilling in a vain search for uranium by E. & B. Explorations Ltd. (now owned by Imperial Metals Corporation) in 1978 on its EN and GY claims.

RESULTS

Graphic logs for both drill holes are shown in Figure 1-22-2. In both, the uppermost rocks are Middle Eocene volcanics lying on younger Tertiary sediments. Hole EN-1 bottomed in volcanic rocks which have a potassium-argon date of 42.7 Ma, that is, Middle Eocene (for analytical data on the potassium-argon determinations *see* Rouse and Mathews, 1988).

Sediment samples were collected and processed for palynological recovery at the intervals indicated in Figure 1-22-2. Recovery varied from good to poor. Surprisingly, the palynoassemblages from 17 to about 140 metres in EN-1 correlate with Miocene assemblages reported to the east at Quesnel, in the Fraser Bend Formation, by Rouse and Mathews (1979), and equivalents to the south on Gang Ranch by Mathews and Rouse (1984). The main Miocene palynomorphs are shown on Plate 1-22-1. These have been grouped in three zones in

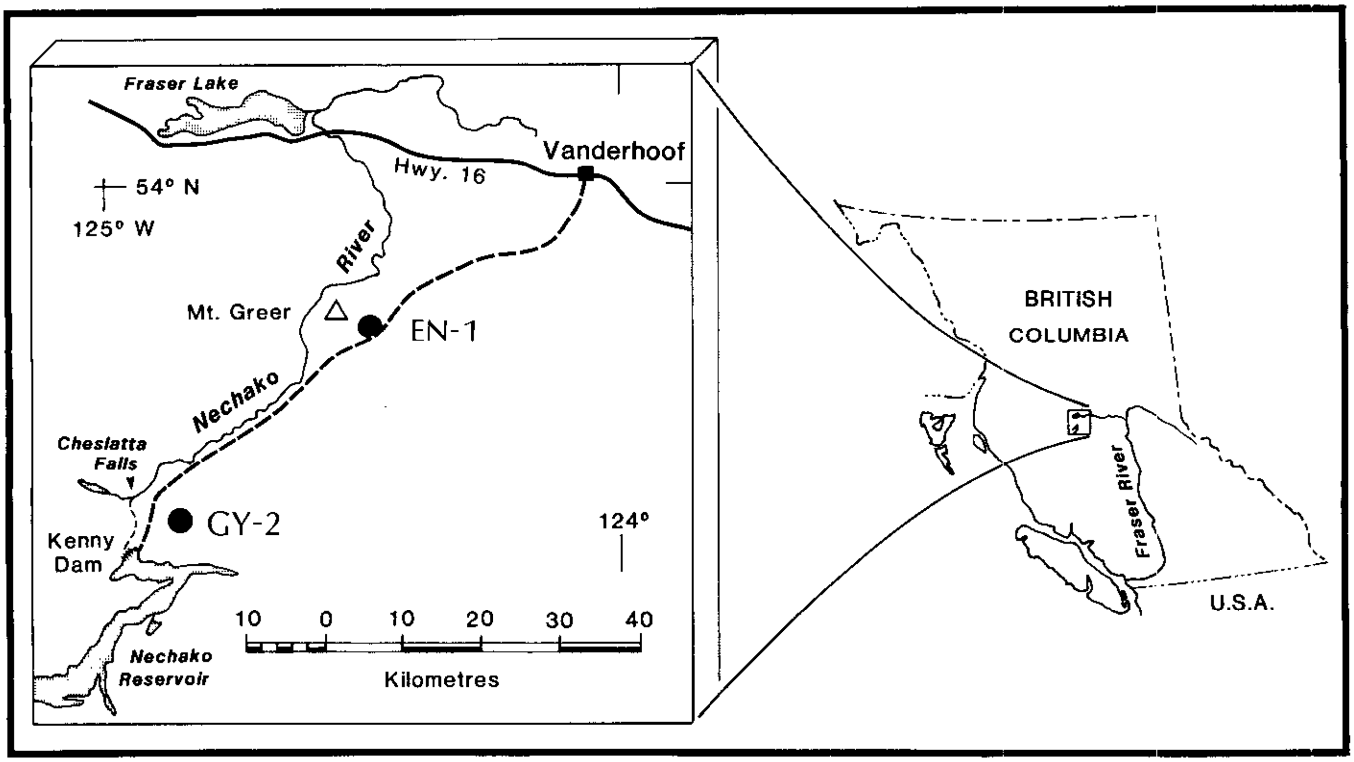

Figure 1-22-1. Location of the study area in central British Columbia, and location of drill holes EN-1 and GY-2 with respect to the main road between Vanderhoof and the Kenney Dam.

* This project is a contribution to the Canada/British Columbia Mineral Development Agreement.
British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork, 1988, Paper 1989-1.

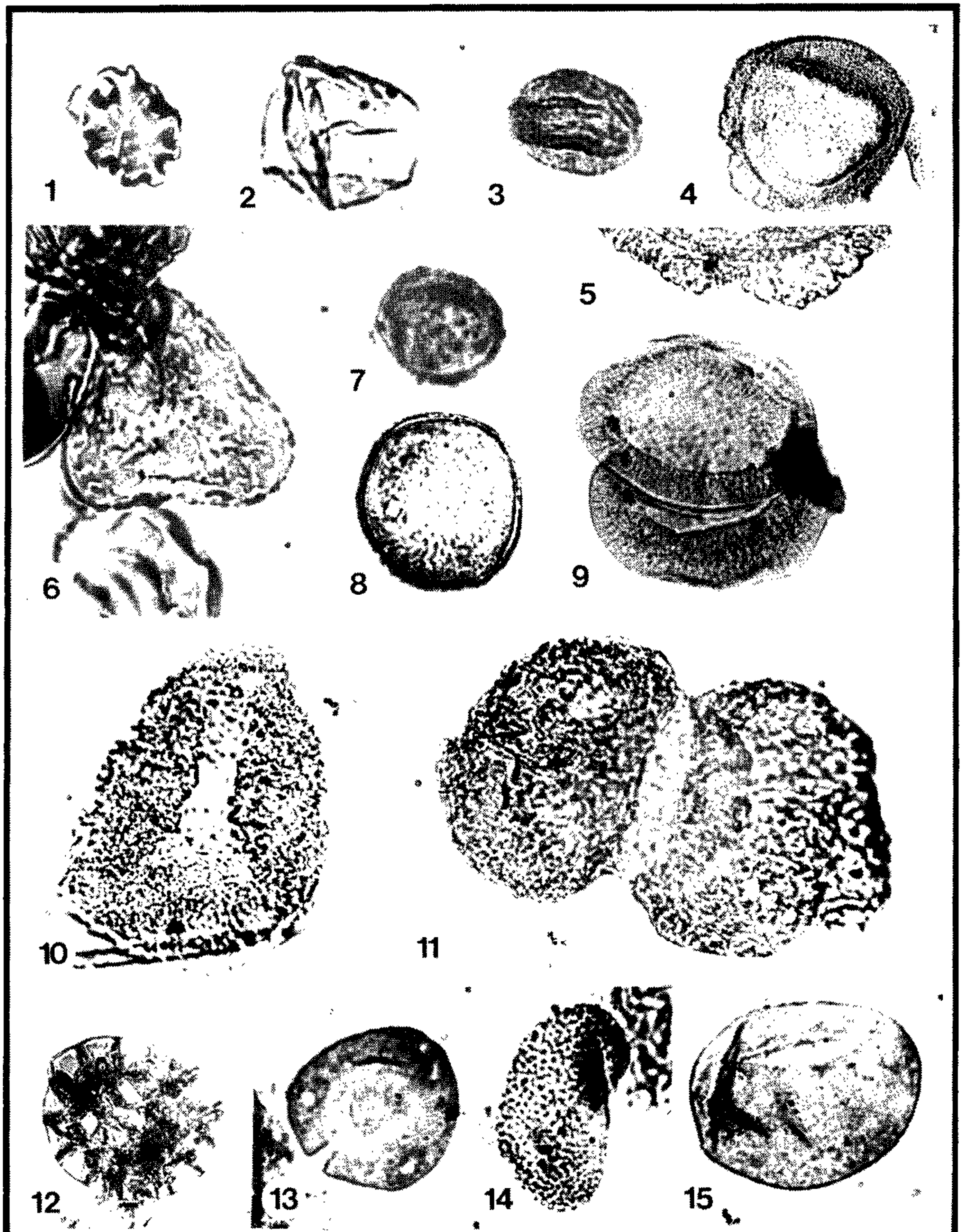

Plate 1-22-1. Photographs of the more diagnostic palynomorphs from the five palynozones in Table 1-22-2. All photographs × 1000 except No. 9 which is × 750 and No. 4 which is × 500.

1 *Desmidiospora*
2 *Juglans periporites*
3 *Quercoidites microhenricii*
4 *Tsuga igniculus*
5 magnification of part of the outer wall of No 4
6 *Lycopodium foveolites*
7 *Metasequoia papillapollenites*
8 *Monulcipollenites confossus*
9 *Cedrus perialata*
10 *Tsuga heterophyllites*
11 *Podocarpus biformis*
12 *Pesavis tagluensis*
13 *Carya veripites*
14 *Arecipites columellus*
15 *Laevigatosporites kloster*

**TABLE 1-22-1
PALYNOZONATION OF THE MIOCENE AND OLIGOCENE SEDIMENTS FROM DRILL HOLES EN-1 (MIOCENE AND OLIGOCENE) AND GY-2 (ALL OLIGOCENE). THE NUMBERS FOLLOWING THE PALYNOMORPH NAMES REFER TO THE SPECIES ILLUSTRATED IN PLATE 1-22-1**

MIOCENE	Zone 1 17-32 m	*Desmidiospora sp.* (1) *Juglans periporites* (2) *Quercoidites microhenricii* (3) *Tsuga igniculus* (4)
	Zone 2 48-63 m	*Lycopodium foveolites* (6)
	Zone 3 68-140 m	*Metasequoia papillapollenites* (7) *Monulcipollenites confossus* (8) *Cedrus perialata* (9)
OLIGOCENE	Zone 4 149-178 m	*Tsuga heterophyllites* (10) *Podocarpus biformis* (11)
	Zone 5 180-283 m	*Pesavis tagluensis* (12) *Carya veripites* (13) *Arecipites columellus* (14) *Laevigatosporites kloster* (15)

**TABLE 1-22-2
XRF MAJOR-ELEMENT ANALYSES OF VOLCANIC ROCKS FROM EN-1 AND GY-2 DRILL CORE**

Depth (m)	SiO_2	Al_2O_3	Fe_2O_3*	FeO*	CaO	MgO	Na_2O	K_2O	TiO_2	P_2O_5
					EN-1					
Surface	59.22	15.02	2.24	6.09	5.48	3.14	4.23	3.33	1.42	0.01
17	54.27	16.09	3.62	6.61	7.78	2.55	4.94	1.47	2.12	0.37
288	52.48	15.27	3.38	6.48	7.03	6.51	4.82	1.60	1.88	0.43
					GY-2					
133	58.06	15.68	2.76	5.88	6.09	2.92	4.79	1.81	1.25	0.31

* Fe_2O_3 and FeO adjusted during normalization according to Irvine and Baragar (1971). Results expressed in weight %, normalized to 100%.

**TABLE 1-22-3
RANDOM REFLECTANCES OF SIX SAMPLES OF VITRINITE FROM DRILL HOLE EN-1**

Depth (m)	% Ro_{ran}
17*	0.26±0.05
22	0.20±0.02
149	0.44±0.07
239	0.47±0.05
249	0.56±0.05
291+	4.26±0.57

* vitrinite squeezed into fractures (faults?) in lava.
+ vitrinite under lavas, evidently baked.

Table 1-22-2, in case future drilling programs may reveal similar zones for correlation.

The palyno-assemblages in EN-1, from about 140 metres to the contact with the basal lavas, correlate with those from the Oligocene Australian Creek Formation reported from the Quesnel region by Rouse and Mathews (1979). The assemblage in GY-2, from the upper volcanics to the bottom of the hole, also correlates with the Australian Creek assemblages. The palynomorphs illustrated in Plate 1-22-1 are some of the more diagnostic of the overall Oligocene assemblage. These have been grouped into two zones in Table 1-22-2.

The contact of the Miocene and Oligocene palyno-assemblages in EN-1 is marked by a sharp lithologic change, from white tuffaceous siltstone in the Miocene to coal in the top of the Oligocene, and brown carbonaceous siltstones and coal seams and stringers in much of the lower sections of the Oligocene.

Volcanic rocks in the core (Figure 1-22-2) include both lava flows and breccias of andesitic to basaltic composition. Major-element analyses of four samples are given in Table 1-22-1. The sedimentary units are for the most part tuffaceous; pale grey to white lapilli and bentonitic alteration are common.

There is also a sharp change in vitrinite reflectance values from the Miocene to Oligocene (Figure 1-22-2; Table 1-22-3). This is probably a result of greater time and depth of burial for the Oligocene sediments.

SIGNIFICANCE

The most significant feature of this study is that Middle Eocene volcanics overlie about 250 metres of younger Tertiary sediments. One explanation is that the Eocene volcanics, which outcrop quite close to both drill holes, were thrust over the Miocene sediments in EN-1, and on Oligocene sediments in GY-2. However, a thrust surface was not recognizable in either hole, nor are the beds markedly disturbed.

A second explanation is that slabs of Middle Eocene rocks from surrounding hills broke off sometime after sediment deposition and slid downwards to form the volcanic caps.

That this development was fairly regional is suggested by the report by Kathryn Andrew (1988) of Middle Eocene strata on top of Miocene sediments in the Capoose Lake area, some 75 kilometres to the southwest of EN-1.

Another significant feature is that middle to late Tertiary basins, some of them deep, appear to be numerous below the mid-Eocene volcanic cover. This setting has high potential for hydrocarbon source beds, and suggests that gravity and seismic exploration are warranted to search for such basinal deposits.

ACKNOWLEDGMENTS

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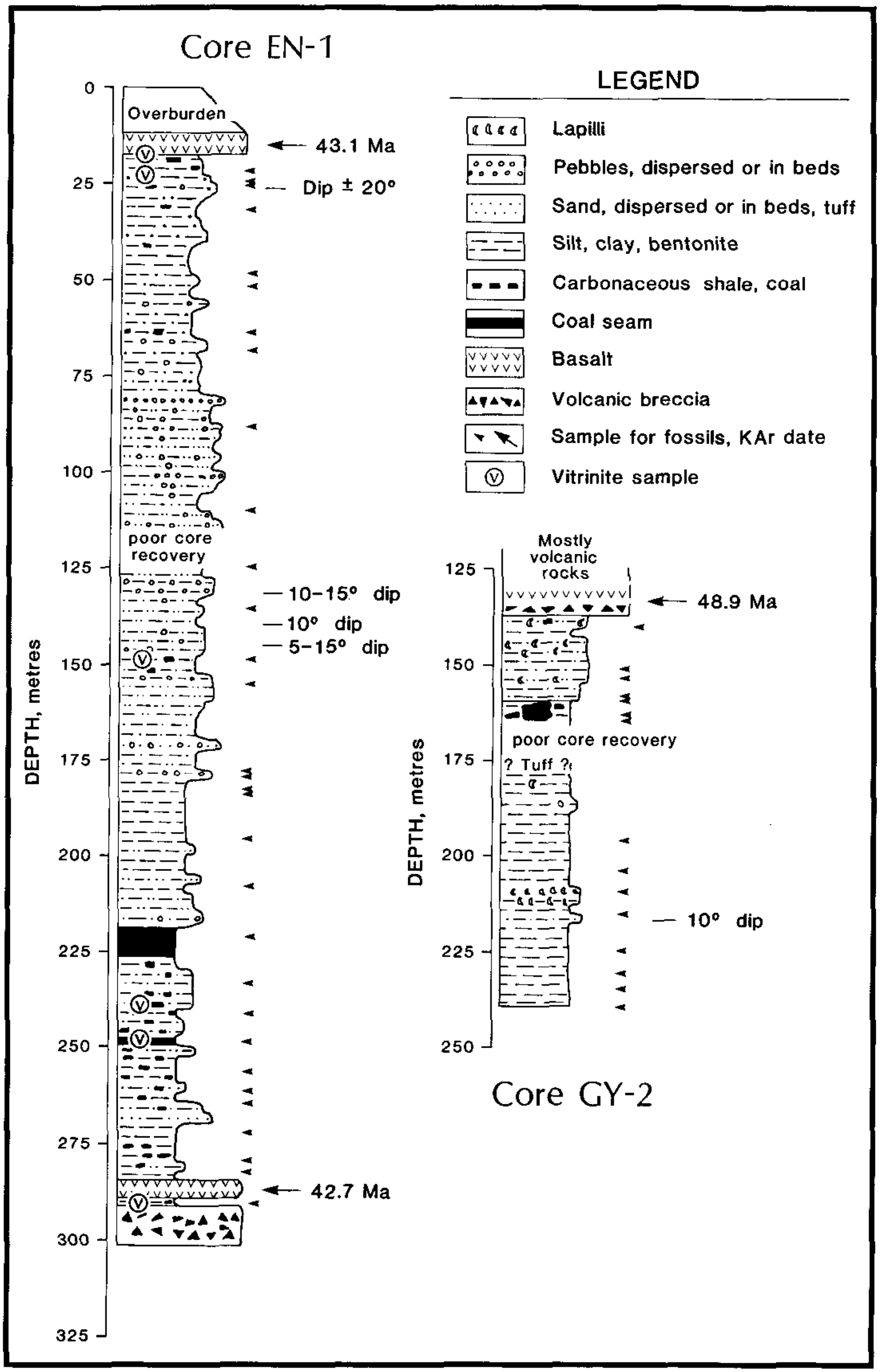

Figure 1-22-2. Graphic logs for drill holes EN-1 and GY-2, showing K-Ar dates, location of samples for palynology and for vitrinite reflectance. Lithology in part from company drill logs, in part by present authors.

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