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SUBSURFACE COAL RANK PROFILES EWIN PASS TO BARE MOUNTAIN ELK VALLEY COALFIELD SOUTHEASTERN BRITISH COLUMBIA (82G/15, 82J/2)

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INTRODUCTION

During detailed lithological logging of selected drill cores from the south half of the Elk Valley Coalfield in 1985 (Grieve and Elkins, 1986) approximately 80 coal samples were collected for petrographic rank ($\bar{R}_o$ max) determinations. The goal was to calculate down-hole rank gradients, in order to discover if variations in gradients correspond with observed regional rank variations.

There was no intent to attempt correlation of coal seams with petrographic data, as regional rank variations make this impossible. Analysis of lithological data collected during this project is continuing, however, with the purpose of effecting further correlations.

METHODS OF STUDY

Small grab samples of coal were collected from very thin seams and coal bands, as almost all coal had been removed from core boxes for analysis by the coal companies. The depth of each sample was recorded.

Petrographic rank was determined by the $\bar{R}_o$ max method (mean maximum reflectance in oil). Fifty grains per sample were read and the results averaged. Coals are classified into ASTM rank categories as follows: high volatile bituminous, $\bar{R}_o$ max <1.12 per cent; medium volatile bituminous, 1.12 per cent $<\bar{R}_o$ max <1.51 per cent.

STRATIGRAPHIC SETTING

All coal samples collected were from the Mist Mountain Formation of the Jurassic-Cretaceous Kootenay Group. In the study area the formation has an average thickness of 500 to 600 metres, and consists of a nonmarine, interbedded sequence of siltstone, sandstone, mudstone, shale, coal and conglomerate. To date two coal-bearing horizons have been correlated throughout the study area (Grieve and Elkins, 1986). The basal coal zone, which occupies the basal 20 metres of the Mist Mountain Formation, consistently includes a thin coal seam directly in contact with the underlying Morrissey Formation. The Imperial coal seam occupies a position roughly 150 metres stratigraphically above the base of the Mist Mountain Formation.

RESULTS

Drill hole locations are shown in Figure 5-2-1, while $\bar{R}_o$ max versus depth plots for the drill holes are shown in Figures 5-2-2 to 5-2-8.

EP-102: $\bar{R}_o$ max values from Ewin Pass drill hole EP-102 range from 1.12 to 1.30 per cent (Figure 5-2-2). The highest value (sample 9) represents a horizon roughly 40 metres stratigraphically above the base of the Mist Mountain Formation. Sample 6, from the floor of the Imperial seam, has a value of 1.19 per cent, while sample 5, from the roof, has a value of 1.24 per cent.

EP-105: $\bar{R}_o$ max values from Ewin Pass drill hole EP-105 range from 0.95 to 1.26 per cent (Figure 5-2-3). Sample 14, with the highest value, represents a nearly identical horizon to sample 2 from EP-102, which has a value of 1.18 per cent. Likewise, a value of 1.18 per cent in EP-105 (sample 15) can be compared with 1.12 per cent, the lowest value in EP-102 (sample 1). The lowest value in EP-105 (sample 10) represents a horizon within approximately 40 metres of the top of the Mist Mountain Formation.

MBE-101: $\bar{R}_o$ max values from Mount Banner drill hole MBE-101 range from 1.34 to 1.42 per cent (Figure 5-2-4). The highest value, from sample 81, represents a horizon roughly 80 metres above the base of the Mist Mountain Formation. Sample 79, with a value of 1.39 per cent, is believed to represent a nearly identical horizon to samples 14 (1.26 per cent) and 2 (1.18 per cent) from holes EP-105 and 102, respectively.

EV-150 and 151: Values from closely spaced Ewin Creek drill holes EV-150 and 151 range from 1.11 to 1.46 per cent (Figures 5-2-5 and 5-2-6). Samples 28 and 29 from EV-151 (values of 1.46 and 1.40 per cent respectively) and sample 37 from EV-150 (1.43 per cent) are from the basal coal zone. A thrust fault in EV-150 (Figure 5-2-5) has produced an apparent thickness duplication of 80 metres between the basal coal zone and the Imperial seam. Corresponding samples from near the floor of the Imperial seam have values of 1.24 per cent and 1.38 per cent (sample 30 from EV-150 and sample 24 from EV-151, respectively). The latter value contrasts with that from sample 23 (1.20 per cent) from the roof of the Imperial seam in the same hole.

BM81-1 and 2: Values from the closely spaced Bare Mountain drill holes, BM81-1 and 2, range from 1.05 to 1.50 per cent (Figures 5-2-7 and 5-2-8). A thrust fault in BM81-2 (Figure 5-2-8) has produced an apparent thickness duplication of 127 metres, including duplication of the basal portion of the Mist Mountain Formation. Corresponding values from the basal coal zone intersected in BM81-2 are 1.50 per cent (sample 59, lower plate) and 1.42 per cent (sample 54, upper plate). The corresponding value from BM81-1 is 1.47 per cent (sample 77). Sample 46, from the floor of the Imperial seam in BM81-2, has a value of 1.38 per cent. Samples 60 to 65 from BM81-1, with a range of 1.05 to 1.15 per cent, represent the uppermost portion of the Mist Mountain Formation.

DISCUSSION

Results indicate that coals in this portion of the Elk Valley Coalfield are predominantly medium volatile bituminous in rank, with some high volatile coals in the upper portion of the Mist Mountain Formation, most notably at Ewin Pass. Based on the limited comparisons possible, rank values for a given stratigraphic horizon are lowest at Ewin pass, a result which is corroborated by field sampling (Grieve and Fraser, 1985). All other areas represented by these drill holes have similar rank values, a result not corroborated by field sampling, which suggests that Mount Banner

British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork, 1986, Paper 1987-1.

samples are anomalously high. Nonetheless, the trend of decreasing volatiles from south to north in samples 2, 14 and 79 from the same stratigraphic horizon in holes EP-102, EP-105 and MBE-101 (1.18, 1.26 and 1.39 per cent) is quite striking.

The two drill holes with significant fault repetition allow preliminary consideration of the timing of coalification with respect to thrust faulting. In the case of BM81-2, the fact that the samples from the lower plate have higher reflectance values than corresponding samples from the upper plate, and that there is no obvious major offset of the profile by the fault, suggests that a significant amount of post-faulting coalification occurred. In the case of EV-150, it appears there may be a slight offset of the profile by the fault, although the data are sparse. A valid comparison can be made between sample 32 below the fault and samples 30 and 31 above it; the upper plate samples have higher reflectances. Comparison of the Imperial seam values between EV-150 and EV-151 is not valid as the thrust fault in EV-150 has a component of dip in the direction of EV-151.

Any further comparison between drill holes, and calculation of down-hole reflectance gradients, has been frustrated by the amount of data scatter in all the profiles. This scatter was not expected, and its causes are not yet known. Contributing factors may be:

- analytical variability;
- sample variability (whether a sample is from a discrete coal seamlet or a coal band within another rock type);
- variability of the heat flow characteristics of different rock types;
- natural, small-scale variations in reflectance overshadowing the average down-hole variation;
- variability of the bireflectance indicatrix.

With regard to the last factor, almost all samples analysed are biaxial, meaning that $\bar{R}_o$ max is not a unique value of an individual vitrinite grain (Kilby, 1986).

Further work will be applied to the interpretation of the petrographic data presented here, including an attempt to determine to what extent the above factors influence reflectance profiles, and to calculate meaningful average gradients.

ACKNOWLEDGMENTS

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Grieve, D.A. and Fraser, J.M. (1985): Geology of the Elk Valley Coalfield, Southern Half (Kilmarnock Creek to Alexander Creek), *B.C. Ministry of Energy, Mines and Petroleum Resources*, Preliminary Map 60, Sheets 5 to 9.

Kilby, W.E. (1986): Biaxial Reflecting Coals in the Peace River Coalfield, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Geological Fieldwork, 1985, Paper 1986-1, pages 126-137.

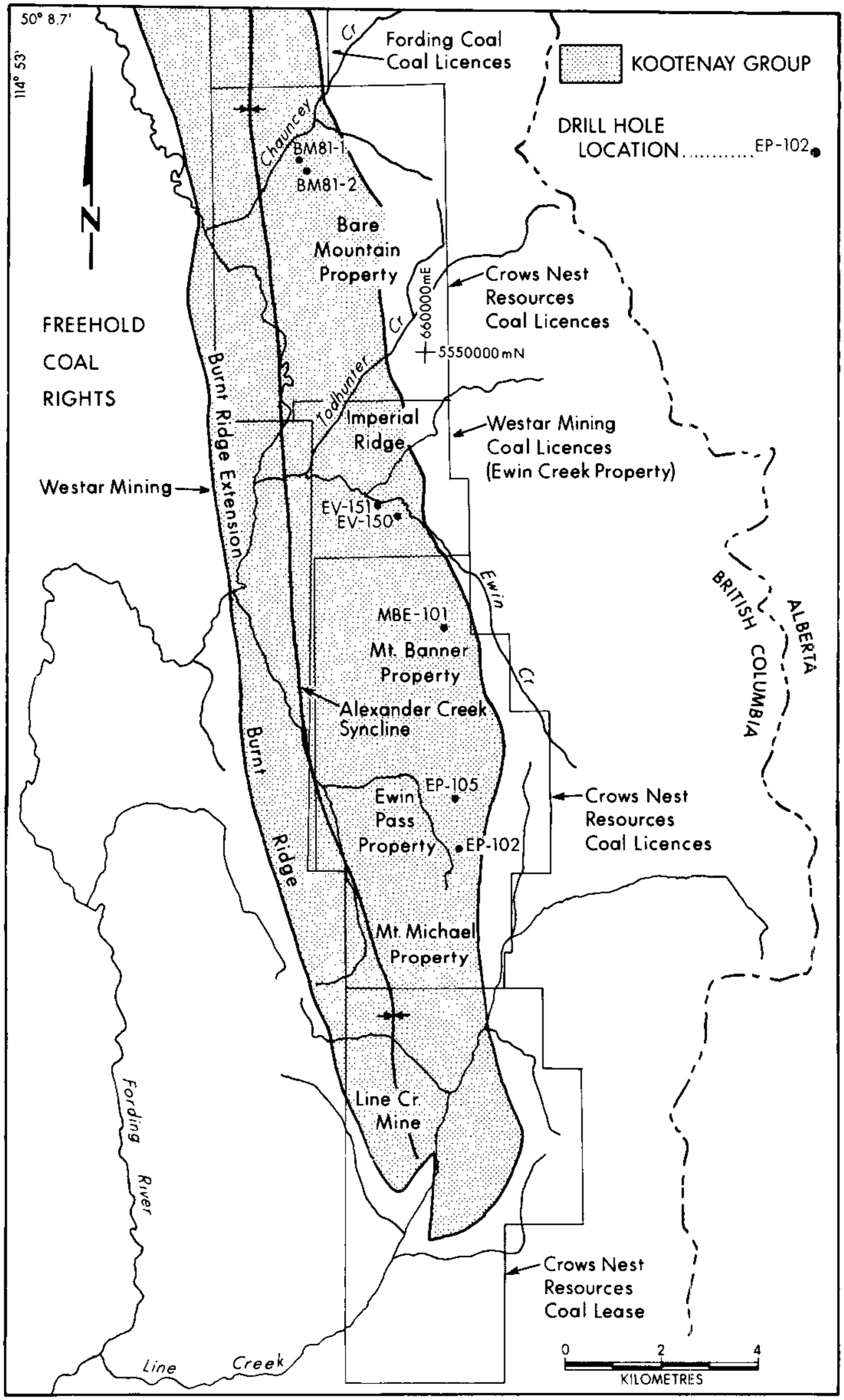

Figure 5-2-1. Drill hole and property location map for a portion of the Elk Valley Coalfield.

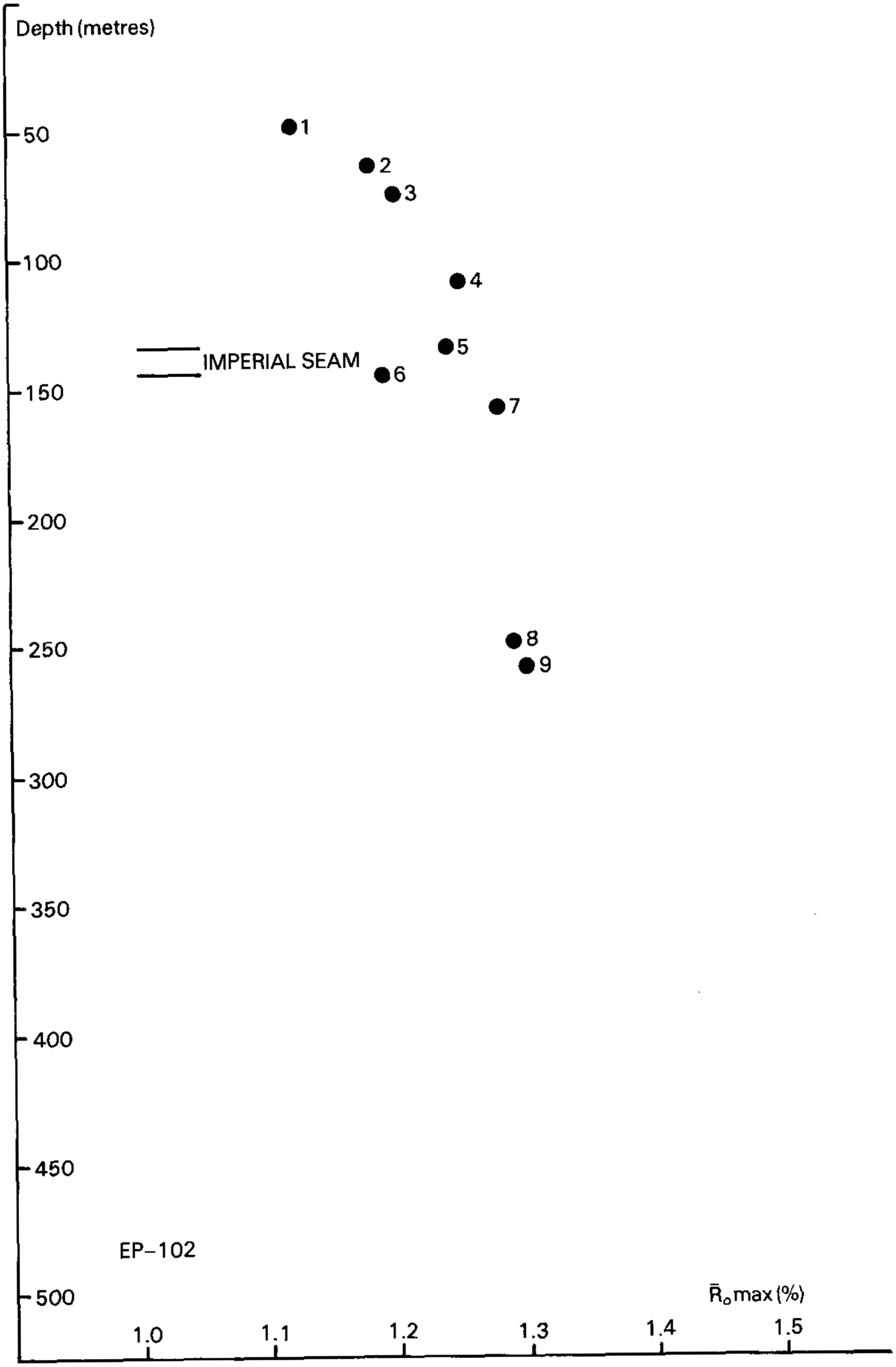

Figure 5-2-2. Reflectance-depth profile of drill hole EP-102.

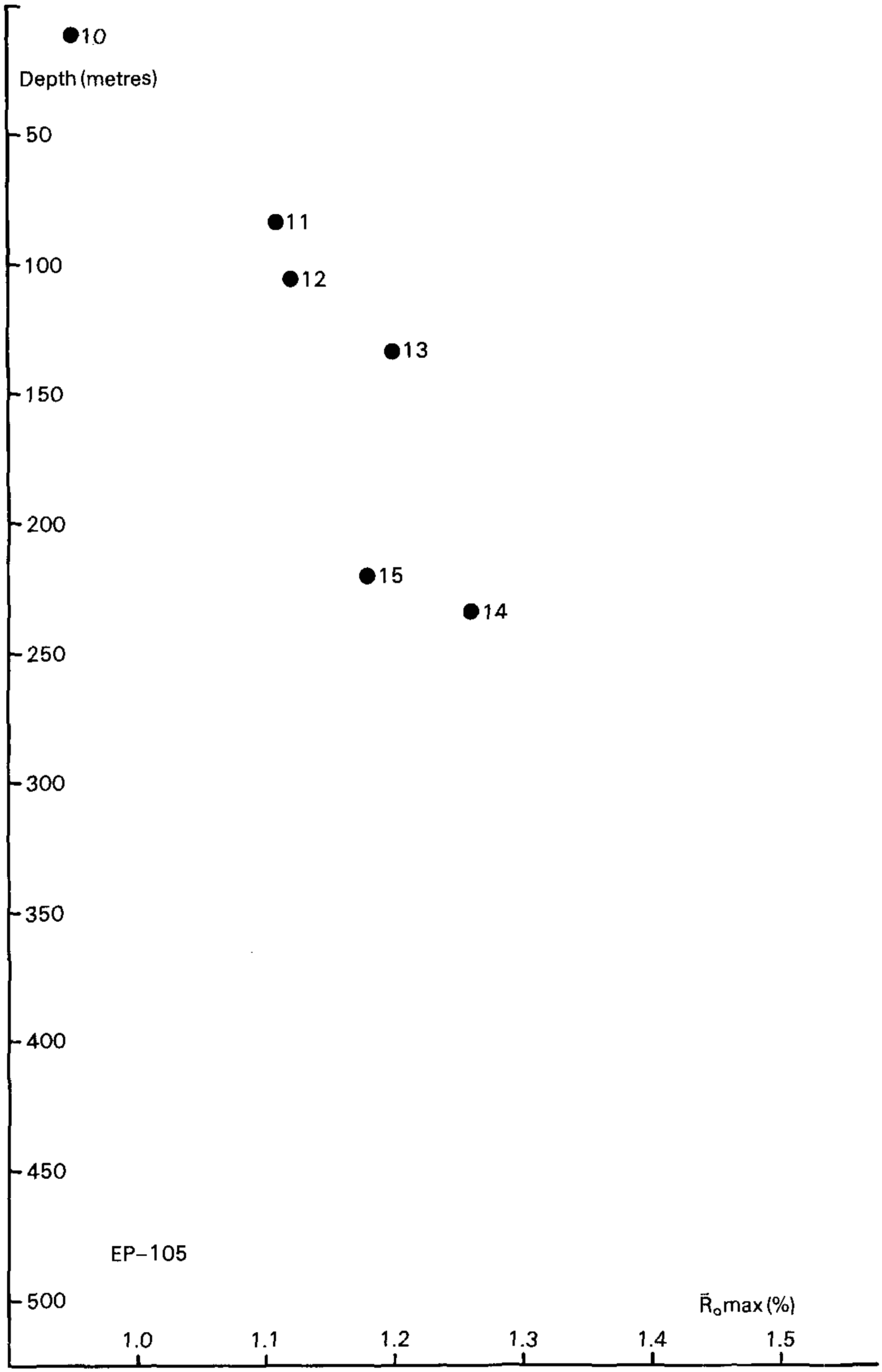

Figure 5-2-3. Reflectance-depth profile of drill hole EP-105.

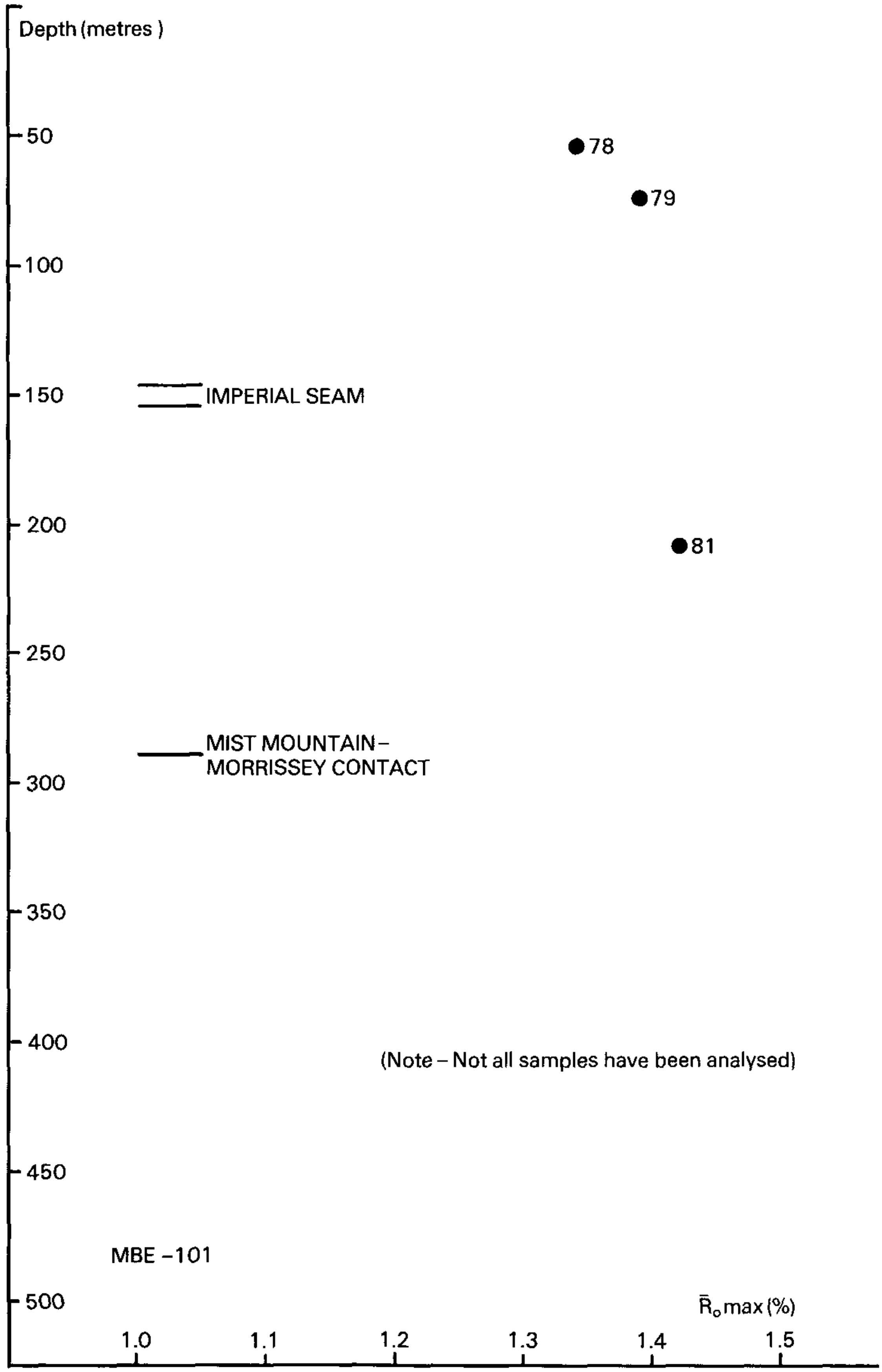

Figure 5-2-4. Reflectance-depth profile of drill hole MBE-101.

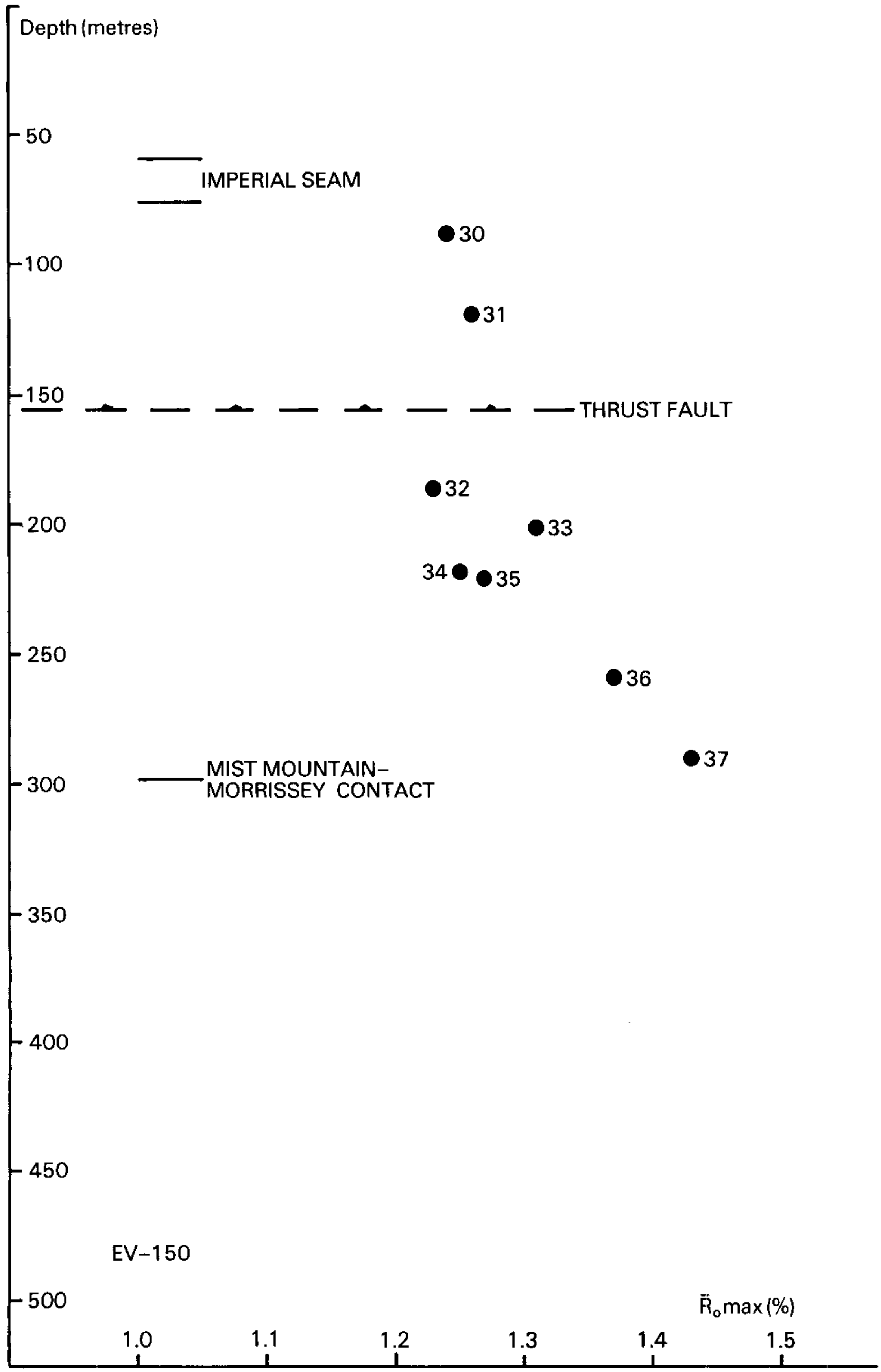

Figure 5-2-5. Reflectance-depth profile of drill hole EV-150.

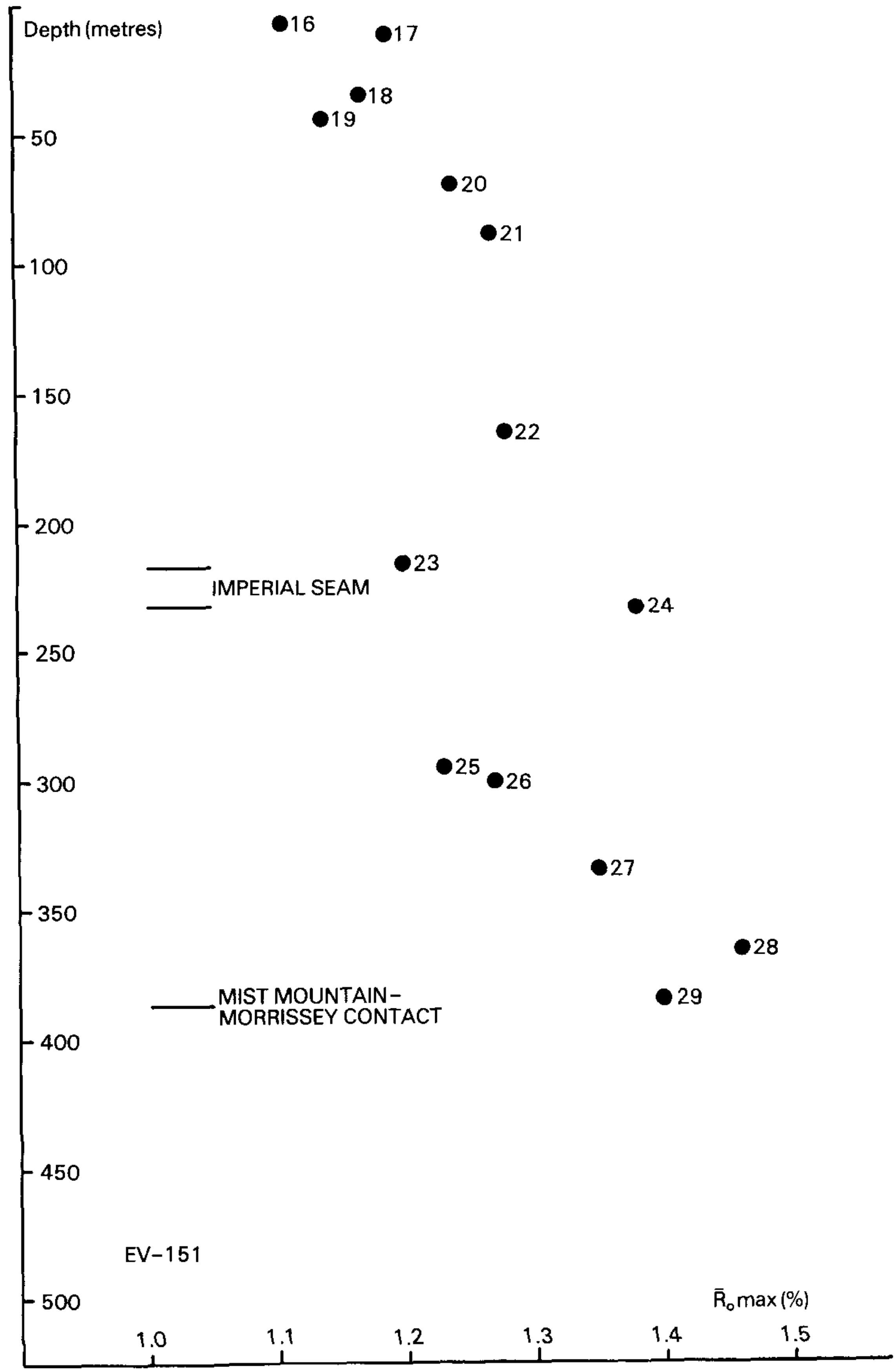

Figure 5-2-6. Reflectance-depth profile of drill hole EV-151.

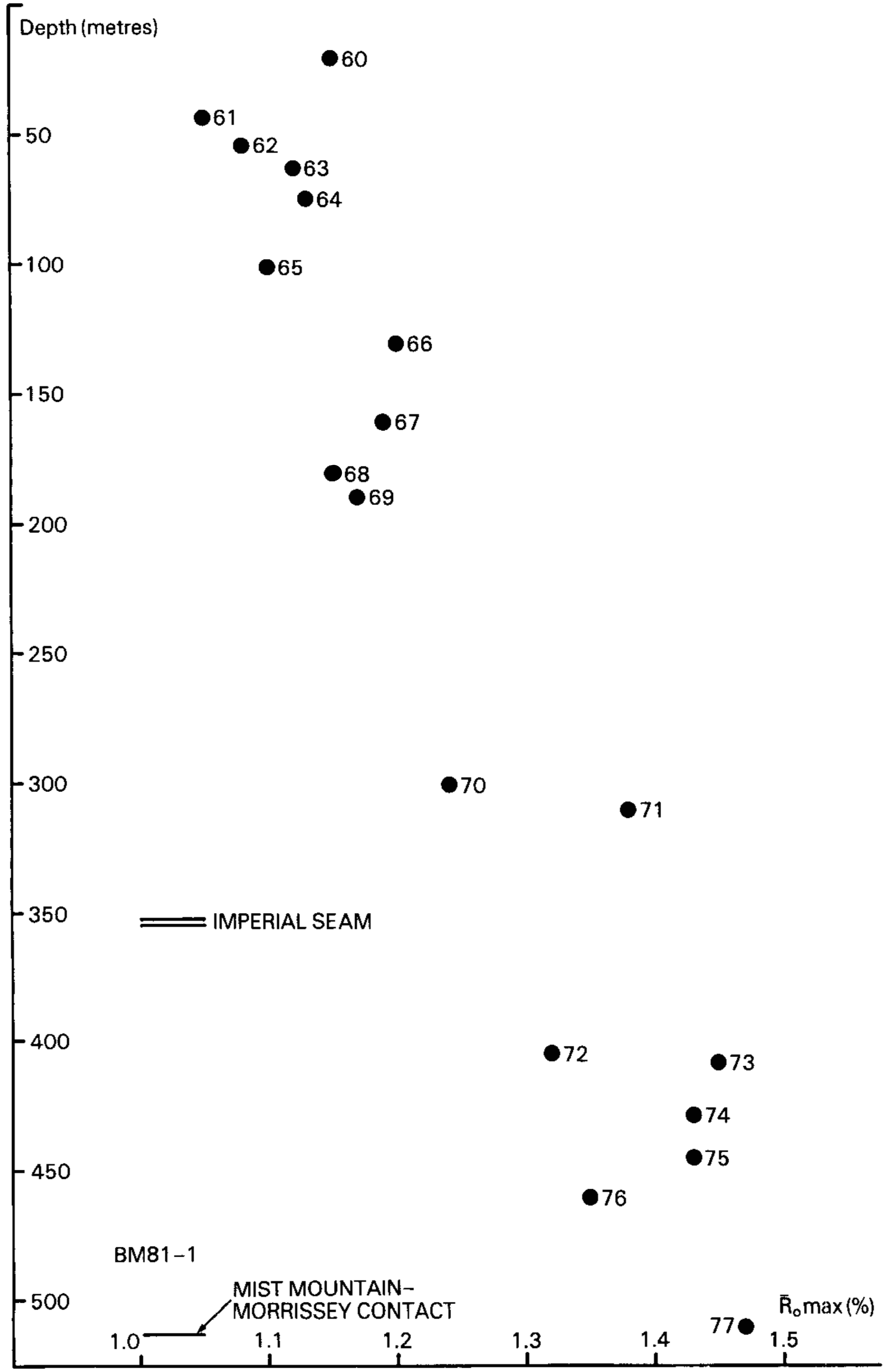

Figure 5-2-7. Reflectance-depth profile of drill hole BM81-1.

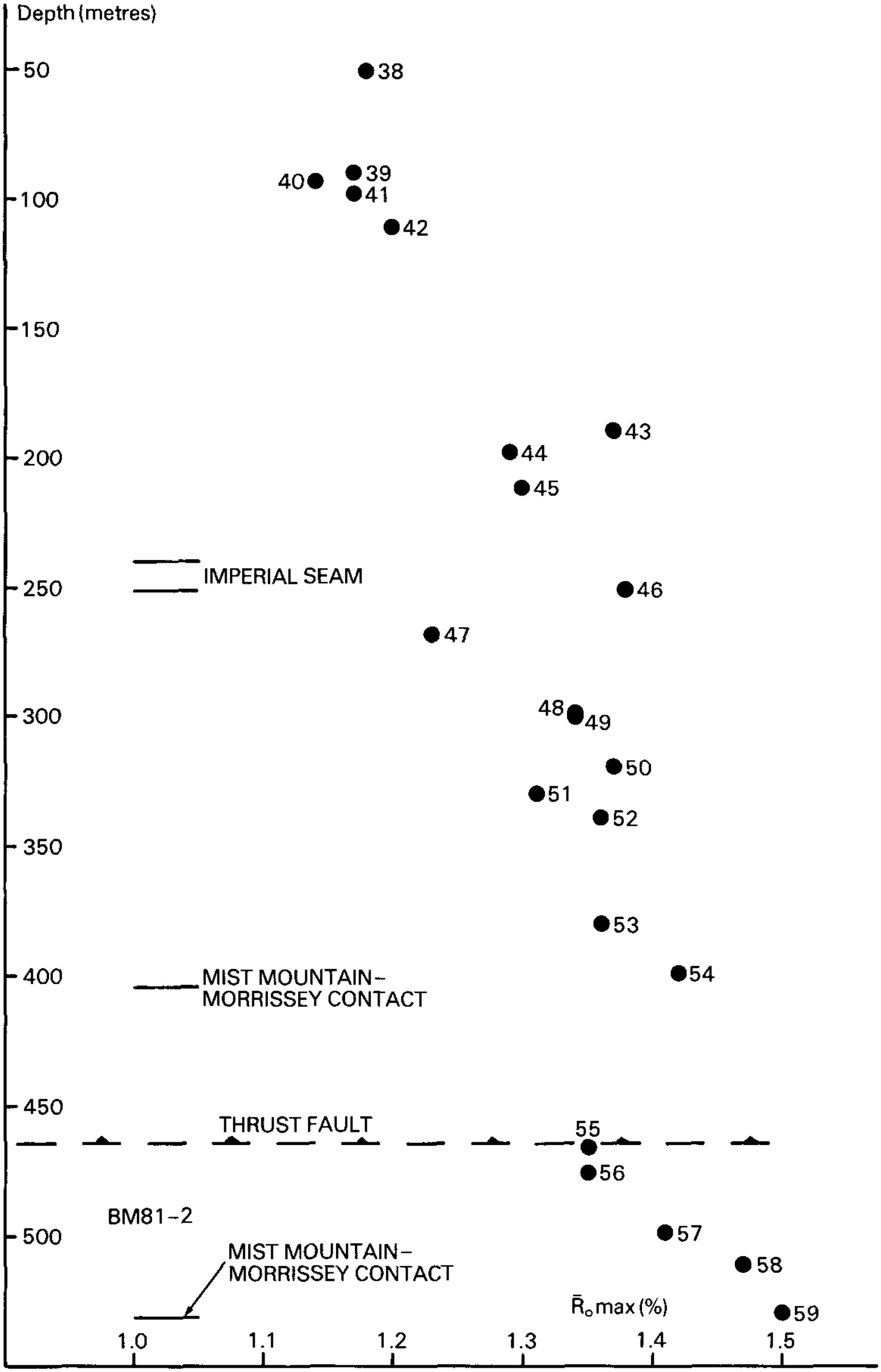

Figure 5-2-8. Reflectance-depth profile of drill hole BM81-2.