Table 2 *Estimation of organic compounds.*

Reductant	Applied Voltage (V)	Taken (mg)	Found (mg)	% Error
Ascorbic acid	1 0	9 89	9.85	− 0.4
		20 48	20 51	+ 0 2
		35 23	35.24	+ 0.03
Thiourea	1 0	7 60	7 65	+ 0.7
		20.20	20.08	− 0.6
		31 82	32.00	+ 0.6
Oxine	1.0	7.30	7.36	+ 0.8
		22.02	22.20	+ 0 8
Semicarbazide hydrochloride	1 0	11.15	11 22	+ 0.6
		30.56	30.32	− 0.8
Thiosemi carbazide	1.0	12.88	12.96	+ 0.6
hydrochloride		35 62	35.39	− 0.7

Table 3 *Estimation of amino acids*

Amino Acids	Applied Voltage (V)	Taken (mg)	Found (mg)	% Error
Glycine	0.6	7.50	7.54	+ 0.5
		16 82	16.74	− 0.5
		31.24	31.04	− 0 6
Alanine	0.6	8.92	8.90	− 0.2
		17.50	17.57	+ 0.4
		38.71	38.90	+ 0.5
Valine	0.6	11.75	11.67	− 0.7
		28.50	28.65	+ 0.5
Hippuric acid	0 6	8.96	8.90	− 0.7
		19.80	19.89	+ 0.5
Methionine	1.0	14.92	15.00	+ 0.5
		30.20	30.00	− 0.7
Phenylalanine	1.0	16.52	16.41	− 0.7
		33.80	34.00	+ 0.6
Lysine	1.0	7.40	7.45	+ 0.7
		28.85	28.70	− 0.5
Tryptophan	1.0	10.21	10.28	+ 0.7
		30 68	30.46	− 0.7
Cystine	1.0	12.70	12.60	− 0.8
		33.65	33.85	+ 0.6

potentiometry[13]. It was found that the same stoichiometry holds good in dead stop tritrimetry at the same experimental conditions.

8 May 1984; Revised 3 September 1984

1. Belcher, R., El-Khiami, I. and Stephen, W. I., *Talanta*, 1965, **12**, 775.
2. Bishop, E. and Jennings, V. J., *Talanta*, 1961, **8**, 34.
3. Koupparis, M. A. and Hadjiioannov, T. P., *Talanta*, 1978, **25**, 477.
4. Nair, V. R. and Nair, C. G. R., *Anal. Chim. Acta*, 1971, **57**, 429.
5. Singh, B., Sahota, S. S. and Singh, R. P., *J. Indian Chem. Soc.*, 1960, **37**, 392.
6. Mahadevappa, D. S. and Swamy, R., *Indian J. Chem.*, 1976, **14B**, 463.
7. Matsuda, T., *Bull. Chem. Soc. Japan*, 1978, **51**, 639.
8. Matsuda, T., *Talanta*, 1979, **26**, 326.
9. Kikuo Terada, Hiromi Honnami and Toshiyasu kiba, *Bull. Chem. Soc. Japan*, 1977 **50**, 132.
10. Vogel, A. I., '*A text-book of Quantitative Inorganic Analysis*', ELBS, 3rd Edn, 1968, p. 392.
11. Radhakrishnamurti, P. S. and Prasada Rao, M. D., *Indian J. Chem.*, 1979, **17A**, 60.
12. Matsuda, T., *Bull. Chem. Soc. Japan*, 1977, **50**, 1934.
13. Gowda, N. M. M. and Mahadevappa, D. S., *J. Indian Chem. Soc.*, 1978, **55**, 665.

GEOLOGIC MAPPING OF THE KOYNA REGION IN THE DECCAN TRAPS BY THE MAGNETOTELLURIC METHOD

R. P. SINGH, B. B. BHATTACHARYA* and D. RANKIN

Institute of Earth and Planetary Physics, Department of Physics, University of Alberta, Edmonton, Alta. T6G 2J1 Canada.

** Department of Applied Geophysics, Indian School of Mines, Dhanbad 826 004, India.*

ABOUT 200,000 square miles of the western peninsula of India are covered with Deccan Traps. The Koyna region (figure 1) has become of intense interest because of the devastating earthquake[1] of 10 December 1967. The earthquake is directly attributed to the loading effect due to the Koyna dam either by load failure or lubrication along some pre-existing fault. The earthquake locus is placed at a depth of 30 km. Some minor precursory tremors[1] were located at a depth of about 4 kms. The area is non seismic but unfortunately it is also aseismic. Other geophysical methods have failed to yield information either on the thickness of the traps or the thickness of the Mesozoic sediments which overlie the basement. Boreholes to depths of 2500 m exist in the surrounding areas of the Deccan Traps but in the Koyna region no such deep boreholes have been drilled due to the excessive thickness of the hard basaltic rocks and consequently the data on these

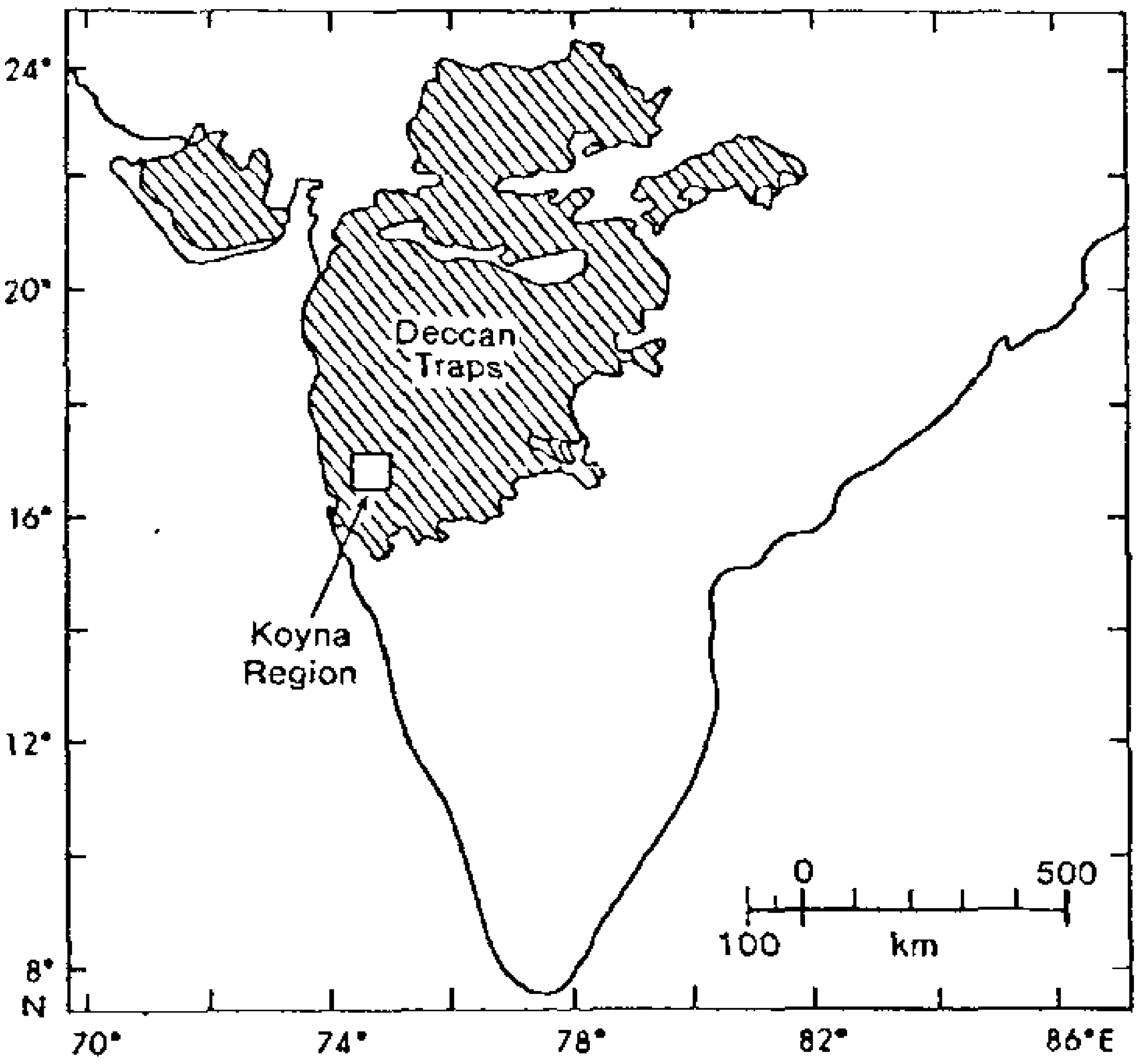

Figure 1. Deccan Traps covered area of western peninsular India.

thicknesses are unknown. This has hampered the exploration for oil and gas in the area. Recently Sarma *et al*[2] have indicated the feasibility of using the magnetotelluric method for this area. Here we present some one-dimensional layered earth model studies. These can yield valuable information about resistivities and depths for a two or three-dimensional earth. The results of this study indicate a very good possibility of mapping this region using the magnetotelluric method.

Based on the geophysical studies[3-6], in this area, four layer models have been designed with values which span the parameters proposed in those studies and which could reasonably be expected to exist. In all cases the surface layer (weathered trap) is taken to be 20 m thick with a resistivity of 20 Ohm-meters. The second layer corresponds to the basaltic lavas of the Deccan Traps. These will have various thicknesses from 0.5 to 5 km with resistivities varying from 20 to 200 Ohm-meters, a 20 Ohm-meter case corresponding to a three layer model. The next layer corresponds to

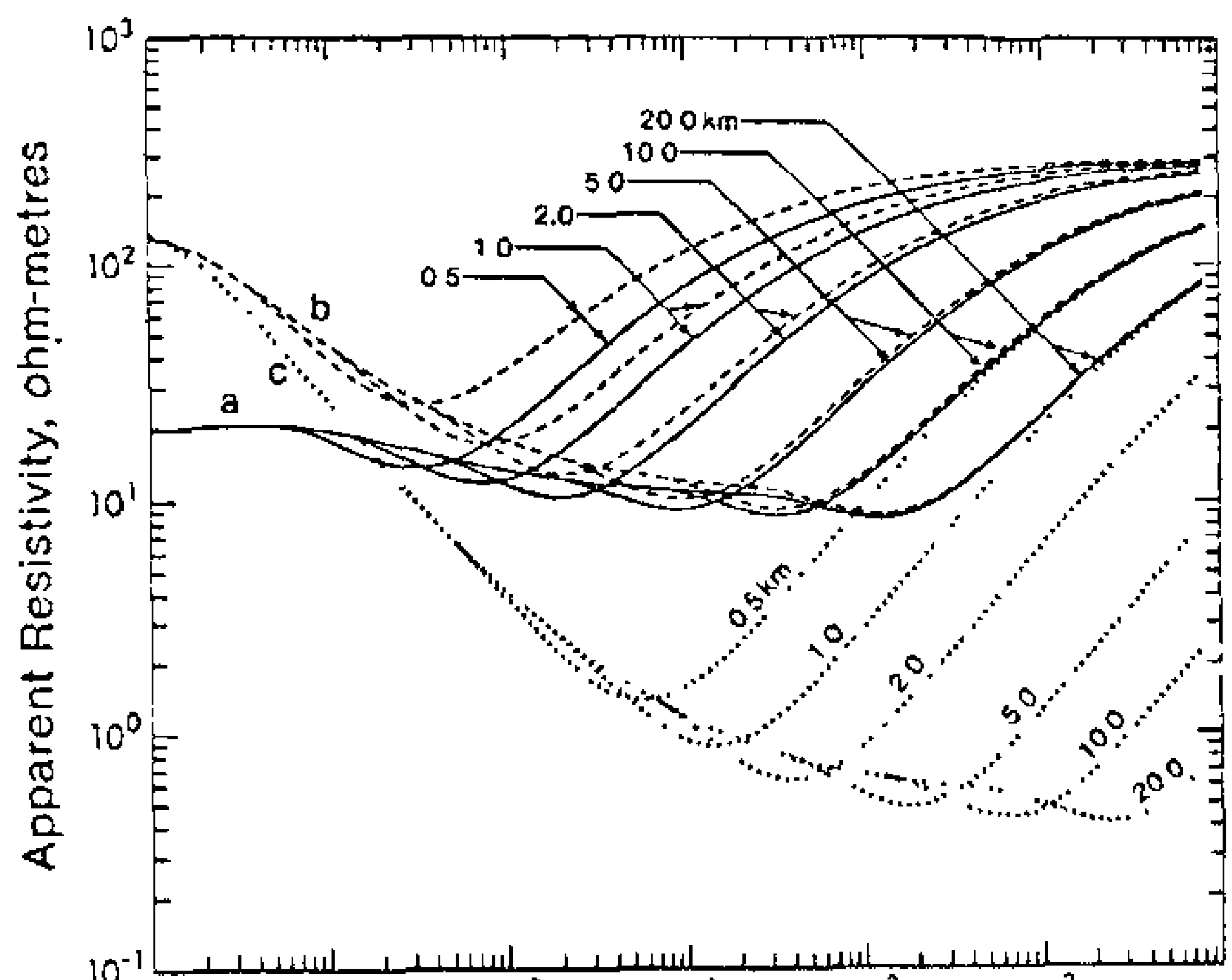

Figure 2. Variation of apparent resistivity with period for the models with the following parameters:

Layer	Group (a)		Group (b)		Group (c)	
	Resistivity (Ω-m)	Thickness (km)	Resistivity (Ω-m)	Thickness (km)	Resistivity (Ω-m)	Thickness (km)
1	20	0.02	20	0.02	20	0.02
2	20	0.5	200	0.5	200	0.5
3	10	0.5, 1, 2, 5, 10, 20	10	0.5, 1, 2, 5, 10, 20	0.5	0.5, 1, 2, 5, 10, 20
4	300		300		300	

the Mesozoic sediments with a thickness from 0.5 to 20 km and resistivities from 0.5 to 20 Ohm-meters. The substratum has a resistivity of 300 Ohm-meters except in figure 4, where one set of curves corresponds to a substratum with a 30 Ohm-meter resistivity.

The effects of variations in the thickness of the Mesozoic sediments are shown in figure 2, where apparent resistivity is plotted versus period on a log-log scale. The parameters are given in tabular form in the figure captions. Curves (a) are the curves for three layer models (from an electrical point of view) when the resistivity of the Trap is the same as the weathered surface materials. Group (b) and group (a) differ only in the resistivity of the Traps Curves (c) differ from curve (b) only in the very low resistivity of the Mesozoic layer. We note that curves (b) and (c) are incomplete at the short period end, *i.e.* the apparent resistivity curves do not show the furthest right zero crossing at the value equal to the true value of surface resistivity.

Figure 3 shows the effect of varying the resistivity of the Mesozoic sediments for a 5 km thickness. Curves (a) and (b) differ only in the thickness of the Trap. Curves (b) and (c) differ only in the resistivity of the Trap. The relative effects of varying the thickness of the Trap are shown in curves (a) of figure 4 with a 300 Ohm-meter substratum resistivity.

The results discussed in the preceding paragraphs clearly show that the Mesozoic sedimentary layers underneath the varying parameters of traps are detectable with the magnetotelluric method which are otherwise quite difficult to map by the other commonly used geophysical methods.

The problem mentioned by Sarma *et al*[2] regarding the instability of magnetotelluric results has been solved by the techniques recently described by Rankin and Pascal[8]. They have shown from actual field measurements that stable results can be obtained and that the one-dimensional inversion of data using the Rankin-Pascal[9] inversion yields consistent results.

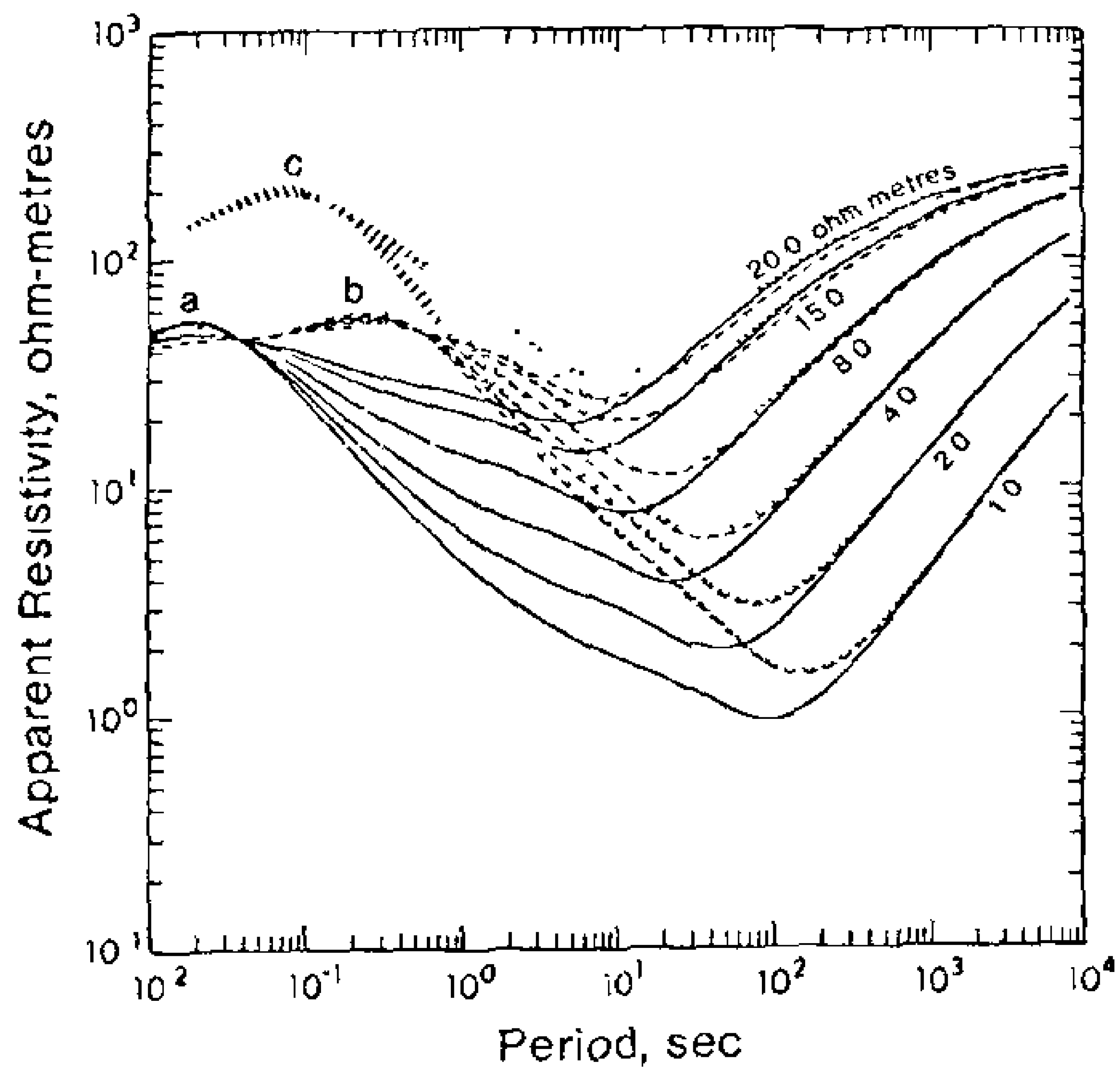

Figure 3. Variation of apparent resistivity with period for the models with the following parameters:

Layer	Group (a)		Group (b)		Group (c)	
	Resistivity (Ω-m)	Thickness (km)	Resistivity (Ω-m)	Thickness (km)	Resistivity (Ω-m)	Thickness (km)
1	20	0.02	20	0.02	20	0.02
2	50	0.5	50	2.0	200	2.0
3	1,2,4,8, 15,20	5.0	1,2,4,8, 15,20	5.0	1,2,4,8, 15,20	5.0
4	300		300		300	

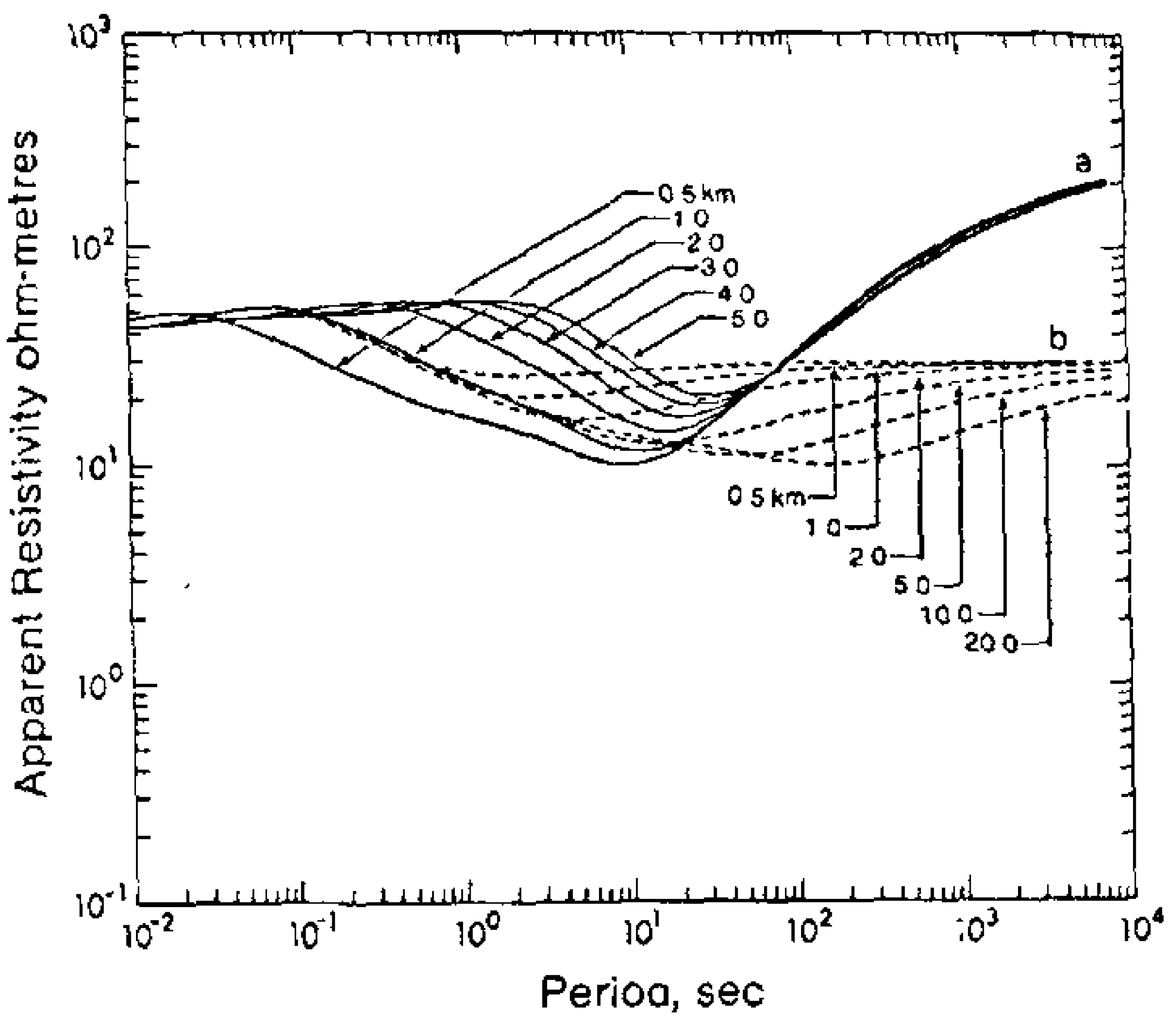

Figure 4. Variation of apparent resistivity with period for the models with the following parameters:

	Group (a)		Group (b)	
Layer	Resistivity (Ω-m)	Thickness (km)	Resistivity (Ω-m)	Thickness (km)
1	20	0.02	20	0.02
2	50	0.5, 1, 2, 3, 4, 5	50	1.0
3	10	5.0	10	0.5, 1.0, 2.0, 5.0, 10.0, 20.0
4	300		30	

We are grateful to the Natural Sciences and Engineering Research Council of Canada for financial support for this work.

18 April 1984; Revised 2 August 1984

1. Narain, H. and Gupta, H. K., *Nature (London)*, 1968, **217**, 1138.
2. Sarma, S. V. S., Kumar, R., Harinarayana, T. and Sanker Narayan, P. V., *Geophysical Res. Bull.*, 1982, **20**, 243.
3. Bhaskara Rao, V., Murty, B. V. S. and Satyanarayana, A. V. S., *Tectonophysics*, 1969, **7**, 265.
4. Brahmam, N. K., *Geophysical Res. Bull.*, 1975, **13**, 89.
5. Kaila, K. L., Reddy, P. R., Krishna, V. G., Chowdhury, K. R., Tewari, H. C., Murty, P. R. K. and Tripathi, K. M., *Geophysical Res. Bull.*, 1979, **17**, 273.
6. Kailasam, L. N., Reddi, A. G. B., Rao, M. V. J., Sathyamurthy, K. and Murty, B. S. R., *Curr. Sci.*, 1976, **45**, 9.
7. Goubau, W. M., Gamble, T. D. and Clarke, J., *Geophysics*, 1978, **43**, 1153.
8. Rankin, D. and Pascal, F., *Geophysics* (submitted) 1984.
9. Rankin, D. and Pascal, F., *Geophysics*, 1983, **48**, 736.

PRECAMBRIAN FOLDED UNCONFORMITY IN RAJASTHAN

S. SINHA-ROY
Geological Survey of India, A-4 Vijaipath, Jaipur 302 004, India.

A GROUP of low to medium grade metamorphic rocks occurs in SE Rajasthan in an arcuate belt between the Vindhyan rocks on the east and the Banded Gneissic Complex on the west. The dominant rock component of this group was considered to be equivalent to the Aravalli sequence[1] and was also correlated with the Gwalior sequence[2]. These rocks are overlain in the Jahazpur sub-belt in the north-central part of the above belt by a dominant carbonate and orthoquartzite sequence which was correlated[1] with the Raialo sequence, and hence considered post-Aravalli. In the revised stratigraphy of Rajasthan (GSI[3]) the Gwalior type rock sequence has been designated as the Hindoli Group and the overlying sequence, the Jahazpur Group, both being contended as pre-Aravalli. Thus a controversy exists on the positions of these rock sequences in Rajasthan stratigraphy.

The Hindoli and the Jahazpur rocks have contrasting lithologies. The former, containing metabasics, metagraywacke and metapelites, is a turbidite sequence, while the latter is principally a metamorphosed dolomite-orthoquartzite sequence with local conglomerate and banded iron formation. Although a profound unconformity between the Raialo and the older formations has been mentioned by Heron[4] from elsewhere, the stratigraphic and structural relations between the Jahazpur Group (= Raialo of Heron[4]) and the Hindoli Group have not yet been worked out. The author describes here an unconformable relation between these rock groups,