at 1 h periods decrease in length from about 1.0 at the coast to 0.2, 130 km inland. Little evidence was found for near surface conductors, such as might be associated with currently active volcanoes.

If the transfer functions are plotted as a function of distance from the coast, using the 2000 m bathymetry contour (rather than the trench) as origin, the decay is found to be indistinguishable from that found at 'young tectonic' continental margins, such as those in California (Schmucker 1970), the east (Bennett & Lilley 1974) and south coast of Australia (White & Polatajko 1978). A similar normal coast effect was observed by Aldrich (1972) for the southern portion of the Peru–Chile trench in Chile.

From the west Java and Chile results it would appear that neither the expected temperature contrasts, nor the presence of a more resistive upper slab, are by themselves necessarily sufficient to modify the normal coast effect.

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Conductive structures under the Canadian Cordillera

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Three major structures of high electrical conductance have been mapped and investigated by means of large arrays of three-component recording magnetometers. The first array was deployed during 1980 and covered an area of 500 000 km^2 at a station spacing of about 150 km, with correspondingly low resolution. This array served to locate anomalies in the magnetovariation fields, two of which were mapped and studied by means of arrays with stations 50 km apart, each covering about 50 000 km^2, during 1981. These are denoted the 1981A and 1981B arrays.

The 'discovery' array of 1980 gave preliminary maps of three structures, all detected previously with linear arrays of magnetometers. A large regional conductive layer, in the upper mantle and lower crust, covers much of the Cordillera of Canada south-west of the Rocky Mountains tectonic province, where it attenuates the vertical component of magnetovariation fields. Figure 1 illustrates this attenuation at a period of 25 min. This conductive layer is called the Canadian Cordilleran Regional (CCR) conductor. Its conductance is of the order of 10^4 S.

The CCR conductor is bounded along its north-eastern edge by the pre-Mesozoic craton of North America. Near that edge the conductor thickens and produces large local anomalies in all three components of the fields, in the Rocky Mountain Trench near latitude 53°N. Two stations of the 1980 array detected this anomaly, but could not define its shape; it appears near the centre of the northern-most line of stations in Fig. 2.

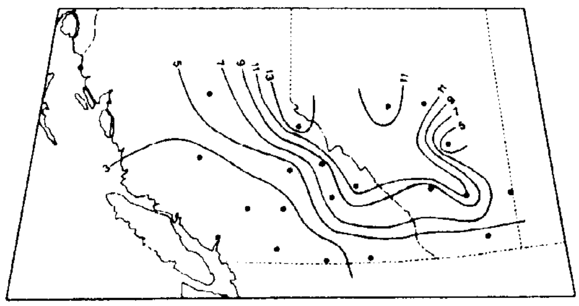

Fig 1 Fourier transform amplitude at period 25 min of the vertical component, *Z*, of a magnetovariation event recorded by the 1980 array (Gough *et al.* 1982).

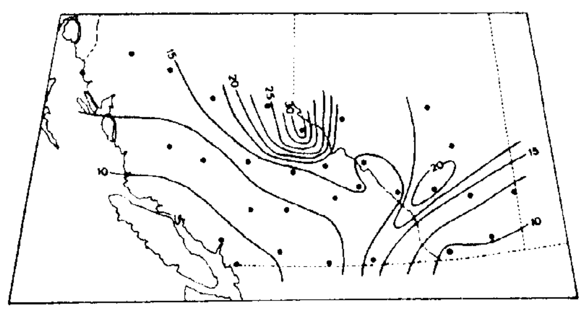

Fig 2 Fourier transform amplitude at period 15.5 min of the north–south horizontal component, *X*, of a magnetovariation event recorded by the 1980 array (Gough *et al.* 1982).

The 1981A array was centred on this anomaly. It revealed the presence of very large induced currents flowing under the Rocky Mountain Trench and even more under the Main Ranges of the Rockies. Figure 3 shows the Northern Rocky Mountains (NR) conductor as located by the technique of artificial event analysis, applied to transfer functions from horizontal to vertical components estimated from adequate samples of variation events. The location of the NR conductor was unexpected: by general consent the Rocky Mountain tectonic belt is part of the Precambrian craton of North America, and was expected to be resistive. It appears that the edge of the craton has been invaded by a very good conductor. The CCR conductor is correlated in position with a well developed low-velocity layer for S waves in the upper mantle, with a thin lithosphere and high heat flow. It probably represents a layer of upper mantle containing a molten fraction. If the Northern Rockies structure at the edge of the CCR is similarly composed, or consists of saline water associated with melt lower down, then recent uplift of the Rockies would find a ready explanation. The obvious test is to measure the heat flux, but this is very difficult in a mountain range full of water with considerable vertical components of velocity.

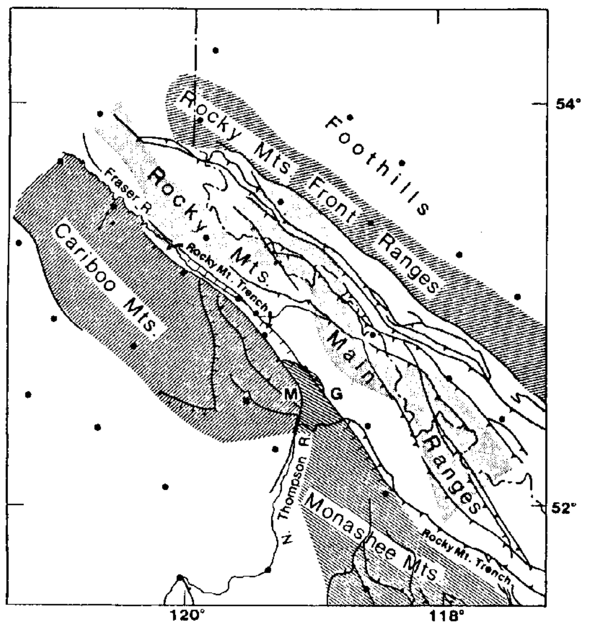

Fig 3 Stippling shows the location of the Northern Rockies conductive ridge along the north-eastern edge of the Canadian Cordilleran Regional conductor. The CCR conductor is not shown, but fills half of the map south-west of the NR conductor (Bingham *et al.* 1985).

Conductive ridges resembling the NR conductor are known to underlie the Southern Rockies of Colorado and the Wasatch Front Mountains of Utah, as thickenings of the general conductive upper mantle beneath the Basin and Range and Colorado Plateaux tectonic provinces of the western United States. In the Canadian Cordillera as in the Basin and Range province, a variety of geophysical evidence strongly indicates the presence of partial melt as the cause of the conductive layer.

The third major conductive structure produces an elongated magnetovariation anomaly striking north-east to south-west across southern Alberta and the south-eastern corner of British Columbia. Figure 2 shows the anomaly in the amplitude of the north–south horizontal component of an event recorded by the 1980 array. This anomaly has been studied by means of the 1981B array, whose much more detailed maps show that the earlier array gave a fairly good account of the position of this structure. It continues the dominant strike of structures in the Precambrian basement beneath the sedimentary basin of Alberta, across strike of the Rocky Mountains. Over part of its length it coincides with a lower crustal rift valley identified by Kanasewich in 1968, from the earliest deep crustal seismic reflection study extended by means of gravity and magnetic anomalies. However the conductor and the rift as traced by Kanasewich diverge near Calgary, and their association is debatable. The identity of the Southern Alberta–British Columbia (SABC) conductor is unknown. A thermal origin seems unlikely, since any tectonic association would be of Precambrian date. It could consist of an accumulation of conductive minerals. It must have a very large conductance, as it responds strongly to inducing fields with periods as long as 90 min. Even without knowing what the conductive structure is, it has tectonic importance in pinning the Purcell Anticlinorium of south-eastern British Columbia to the Precambrian craton and so locating the boundary between the old craton and the terrains added to the continent in Mesozoic times.

Numerical modelling calculations are in progress on both the NR and the SABC conductive structures.

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