Slave2Bear project: A magnetotelluric transect from the Slave craton to the Bear Province across the Wopmay Orogen

talk

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A magnetotelluric (MT) project was initiated in July, 2004, as a contribution to C.S. Lord's Western Slave Study. The first phase (July, 2004) comprised float-plane deployed MT instrumentation at a total of 21 locations along an approx. 300-km-long WNW-ESE profile from the south-central Slave craton to the Bear Province crossing the Wopmay Orogen. Broadband MT (BBMT) data were recorded, over two night intervals, at all sites yielding regional-scale information about the resistivity structure of the crust and uppermost mantle. At six sites spaced equally along the profile an attempt was made to try to record long period MT (LMT) data using equipment installed for the whole month of July. However, ambient curious wildlife, especially at one site, resulted in recovery of useable data at only five of them. To date processing is almost complete of the BBMT data, but some minor problems due to strange equipment function still need to be resolved. Nevertheless, from these BBMT data we are able to derive a preliminary regional-scale two-dimensional (2-D) model of the crust and uppermost mantle. The features in this model that we consider robust, in that they are unlikely to change after completion of processing and modelling, are the following:

1) The upper mantle at depths of 80-140 km beneath the eastern part of the profile under the Slave craton does exhibit reduced resistivities (approx. 1000 ohm.metres), but is almost two orders of magnitude less conducting then the anomalous region observed beneath Lac de Gras and named the Central Slave Mantle Conductor by Jones et al. (2001, 2003). Thus we conclude that the CSMC does not extend into the western Slave.

2) There is significant upper crustal conductivity observed at sites in the middle of the profile. This anomaly is within the conjectured boundaries of the Slave craton, and not within the Wopmay Orogen.

3) The bulk of the crust within the Wopmay Orogen is anomalously resistive, compared to Paleoproterozoic orogens worldwide. The lowermost crust displays reduced resistivities of 1000s ohm.metres.

4) Other than these features, the mantle lithosphere is highly resistive, with resistivities of tens of thousands of ohm.metres, consistent with Ol-Opx-Cpx mineral assemblages without any interconnected conducting phase.