GEOTECTONIC AND STRUCTURAL PHENOMENA IN WESTERN BOHEMIA AND THEIR MANIFESTATION IN ELECTRICAL CONDUCTIVITY DATA

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A joint magnetotelluric (MT) experiment was carried out, in Western Bohemia during three field campaigns in 1992 and 1993. Measured sites were aligned along the seismic reflection profile 9HR. Five component, electromagnetic data in the frequency range between 8 kHz and (128 s)$^{-1}$ were recorded with a broadband AMT system GMS 05 while data of lower frequencies down to (10,000 s)$^{-1}$ were recorded by MT systems. Totally 43 AMT– and 14 MT–sites were measured. Recording time per site varied between 1 (AMT) and 14 (MT) days.

Electrical conductivity of rocks can strongly depend on the their content of fluids as well as of conductive minerals. Phase transformations in the C–O–H volatile system together with mineral changes due to free water may produce graphite during tectonic processes. For this reason tectonic features like shear zones and overthrusts may cause high conductivity zones (HCZ) in the Earth's crust. Thus, electrical HCZs can not, only describe crustal physical properties at present, but may also serve as indicators of tectonocs in the past.

A powerful tool in mapping crustal HCZs are geomagnetic deep soundings. Result of these presented as induction arrows al ong profile 9HR (fig. 1). They point to a crustal zone of enhanced conductivity striking about, EW and stretching from about Plzeň northwards. First quantitative results can be derived from a stitched resistivity section (fig. 2). Shallow conductive zones may be caused by sediments. But, also tectonical events, e.g. the Krušné hory fault (km 25) and the Ohře fault (km 34) may be visible in the data. A zone of enhanced conductivity south of Teplá (TEP) is seen in connection with hydrothermal waters, which also feed the spa of Konstantinovy Lázně. Further south (S of BEZ) a HCZ may result from Permian sediments and their basement, consisting of graphitic shists with pyritisation.

2D–modelling of conductive structures is done at present, and will enhance the knowledge on structures as well on the cause of crustal HCZs in Western Bohemia.

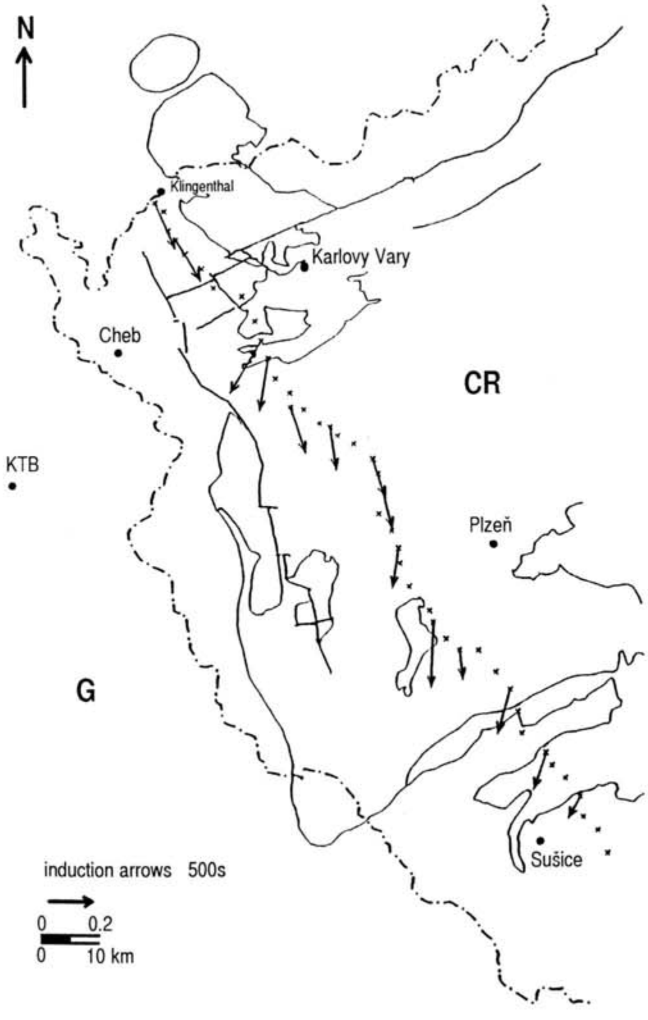

Fig. 1. Map of induction arrows along geotravers 9HR

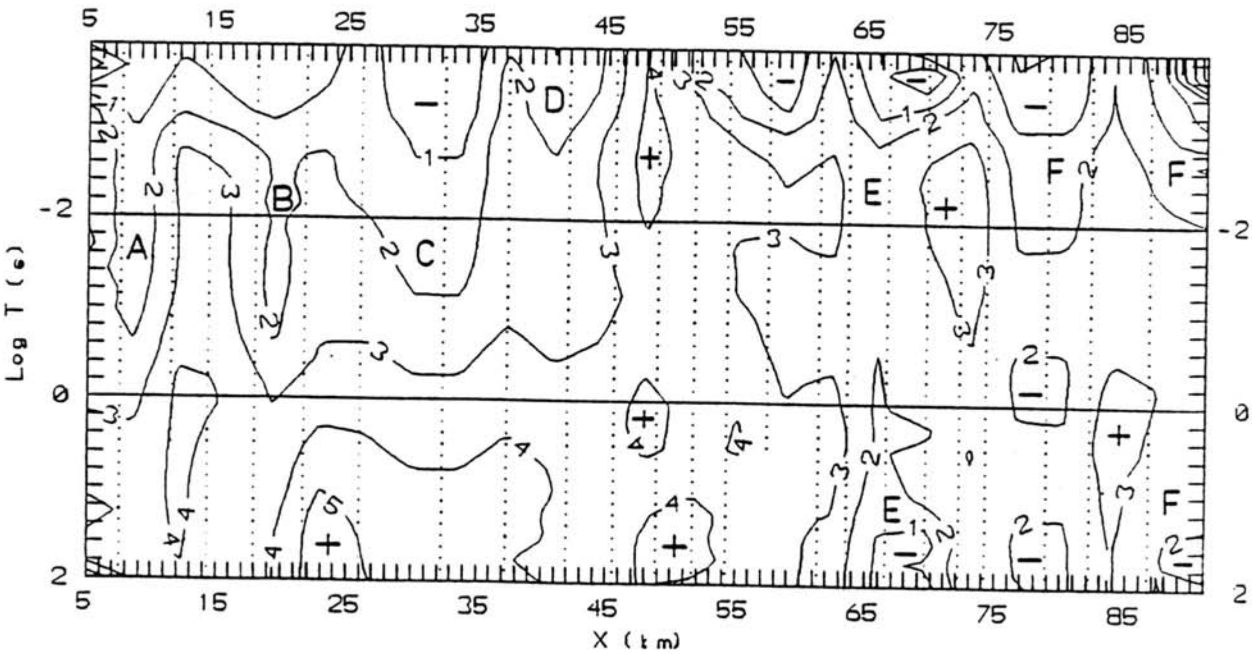

Fig. 2. Pseudosection log Rux (ohmm)

ANALYSIS OF KILOMETRE–SCALE SHEARING IN DEEPLY ERODED OROGENS

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Archean cratons such as the Superior Province of the Canadian Shield are rimmed by Proterozoic orogens exposed at mid–crustal levels. Typical orogens are aggregates of allochthonous masses (suspect terranes, tectonic domains, etc.) that are bounded by prominent shear zones. Centimetre–size features such as rotated porphyroblasts and fibrous veinlets have been used in unravelling the structural history of kilometre–scale shear zones, but the difference in scale poses a problem unless the macro–deformation is perfectly continuous. We employ kilometre–scale structures such as attenuated plutons, tight monoclinic folds and deflection patterns of mineral lineations in attempts at constraining the path of distributed shear at domain boundaries. Some boundary zones host several generations of attenuated granitoid plutons in which the principal–strain axes subtend different angles with the normal to the boundary surface. Using the geometric properties of the strain ellipsoid, one may determine several finite shears (Ψf), together with their sense and direction. Large shear increments (Ψi) may be obtained by combining different Ψf, and this information constrains the shear path at the boundary. By contrast, the monoclinicity of large folds and the deflection pattern of inherited lineations generally pertain to single large increments of boundary shear. The use of folds as shear–sense indicators is fraught with difficulty because the enveloping plane, axial plane and profile section are non–material surfaces that do not qualify as shear planes. Fold–enveloping surfaces or attenuated fold limbs will be nearly parallel to domain boundaries but the sense of boundary–parallel shear may differ from that of limb–parallel shear, even where the obliquity angle is $< 2°$.

The La Ronge/Rottenstone domain boundary, situated in the western Trans–Hudson orogen, northern Saskatchewan (Fig.1) furnishes a practical example of shear–path analysis. The domains were assembled by southward thrusting and associated ductile deformation, which probably resulted in an E–W orogen. The subsequent path of strike shear, including a reversal in shear sense at the Birch Rapids Straight Belt (BRSB, Fig. 1), is constrained by attenuated plutons, large Z folds and the deflection pattern of mineral lineations (see next page).