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Crustal conductors and lithospheric structure in an accretionary Svecofennian orogeny in Fennoscandia

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We have studied conductivity structures within the Svecofennian orogen, a complex accretionary orogen in the Fennoscandian Shield. The accreting units comprise a subducting plate carrying passive margin sequences and two island arc complexes with possible forearc, backarc and accretionary prism sequences. Conductors are interpreted as representing different types of closed basins and thus marking the boundaries between the accreting units.

The data comprise c. 240 magnetotelluric soundings transecting palaeo-basins: Kiiminki, Bothnian, Savo, and Kainuu belts in the central part of the orogen. Older data from 1980's ([3], [9], [10], [17]) have been inverted for the first time. The new inversions of the old and new data ([15]) have revealed several sets of conductors with opposing dips. The conductors associated with a passive margin dip W/SW-wards whereas the conductors affiliated with arcs dip E/SE-ward. The Botnian belt represents a palaeo-accretionary prism within which a large dome structure with a granitic core (Vaasa dome) has developed. The eastern part of the dome is characterized by deep conductors dipping E and below the neighbouring tectonic unit. At the surface, the prism sequences are dipping W-wards at low angles. Sub-horizontal conductors mark the bottom of the granitic core of the dome. A comparison of the conductivity models with airborne electromagnetic ([1], [15]) and seismic reflection data ([2], [5], [13]) and lithological maps ([12]) suggest that the upper to middle crustal conductors are composed of graphite- and/or sulphide-bearing metasedimentary rocks and a lower crustal conductor below the Central Finland Granitoid Complex is probably composed of oxides.

The results of long period electromagnetic soundings (e.g., [3], [14] [16]) indicate that the electrical asthenosphere is either very deep (>250-350 km) or is absent in Fennoscandia and that the electrical asthenosphere is much shallower ([7], [11]) in Central and Southern Europe. An abrupt transition from the thick Precambrian East European Craton to the thinner Phanerozoic Europe coincides with the Trans European Suture Zone. The lithosphere is also thinning towards the Atlantic Ocean (150 km).

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