



High electrical conductivity of the mantle wedge below the central Andean subduction zone, as inferred from magnetotelluric soundings

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Previous deep electromagnetic sounding experiments revealed a strong electrical conductivity anomaly in the deeper crust of the Bolivian Altiplano plateau, which was interpreted by vast amounts of partial, probably acidic, melts. This conductor severely attenuates the electromagnetic fields and hinders their penetration into deeper levels, i.e. the upper mantle. Thus the detection of a conductor associated with the mantle wedge was virtually impossible, although there are hints that such a structure might exist. New long-period magnetotelluric measurements, carried out on the central Altiplano along a profile from the Western to the Eastern Cordillera south of La Paz, showed that the crustal conductor does not exist throughout the entire plateau and that it must be regarded as a regional feature confined to the southern Altiplano.

Instead, an upper mantle conductive feature was detected below the central Altiplano at depths of around 80-100 km. Derived resistivities from 2-D inversion are in the range of 1 Ohm.m, which requires at least 3-4% of interconnected mafic melt, perhaps in conjunction with deep mantle fluids rising from the subducted slab. This value is higher than seismic tomography studies commonly imply for the asthenospheric wedge and may reflect a constant fluid influx from the downgoing plate. Another interesting aspect of the model is that the wedge lies well beyond, i.e., eastwards from the actual volcanic arc. The profile has recently been completed over the Western Cordillera into Chile, where a conductive feature appears in the middle crust at the very western margin of the volcanic arc. A connection (e.g., a feeder dyke or crustal melt deposits) between the mantle anomaly and the volcanoes is unlikely to exist, at least not of a size which is detectable by magnetotelluric soundings. It may be speculated that we observe the initiation of a future eastward migration of the volcanic chain.