Electrical properties of the lithosphere in the western desert, Egypt, using magnetotelluric sounding

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We present electrical resistivity models of the crust and upper mantle estimated from 2D inversions of broadband magnetotellurics (MT) data acquired from two profiles in the western desert of Egypt, which can contribute to the understanding of the structural setup of this region. The first profile data are collected from 14 stations along a 250 km profile, in EW direction profile runs along latitude ~25.5°N from Kharga oasis to Dakhla oasis. The second profile comprises 19 stations measured along a 130 km profile in NS direction centered at longitude 28°E and crossing the Farafra. The acquisition for both profiles continued for 1 to 3 days at each station, which allowed for the calculation of impedances for periods from 0.01 sec up to 4096 sec at some sites. The wide frequency band corresponds to a maximal skin depths of up to 150 km that can provide penetration to the top of the asthenosphere. The inversion models display high-conductivity sediments cover at the near surface (<1-2 km), which can be associated with the Nubian aquifer. Along the EW-profile from Kaharge to Dhakla, the crustal basement is overly highly resistive and homogeneous und underlain by a more conductive lithospheric mantle below depths of 30-40 km. Along the N-S profile across Farafra, only the southern portion exhibits a highly resistive crust, whereas beneath Farafra northwards, moderate crustal conductivities are encountered. A comparison has been made between the resultant resistivity models with the 1° tessellated updated crust and lithospheric model of the Earth (LITHO1.0) which was developed by Pasyanos, 2014 on the basis of seismic velocity data. The obtained results show a remarkable consistency between the resistivity models and the calculated crustal boundaries. Especially at the Kharga-Dakhla profile a clear matching can be noticed at the upper and lower boundaries of a characteristic anomaly with the Moho and LAB boundaries respectively.