An audio-magnetotelluric investigation of the Tongling ore district, China

Cong Zhou[1,2], Jingtian Tang[1], Xianying Wang[3], Xiao Xiao[1]

[1]Central South University, Changsha, 410083, China, Zhoucong_522@163.com
[2] School of Geophysics and Measurement-control Technology, East China University of Technology, Nanchang, 344000, China
[3] College of Earth Science, Graduate University of Chinese Academy of Sciences, Beijing, 100049, China

An audio-magnetotelluric (AMT) investigation for mineral resources has been carried out in the Tongling ore district, China. Twenty-nine AMT lines were designed in the survey area with a grid distribution of 2 km×200 m. The total collected stations were 3115. Fieldwork was carried out during 2011-2013 using Phoenix MTU-5A instruments. Each site was recorded for at least one hour with a synchronous remote reference, and the recording frequency range was 10k~0.35Hz. Using 2D continuous medium inversion programs with topography, we obtained 2D resistivity models within the depth range of 0~3 km.

The results show that the AMT electrical structures provide references, verifications and deeper understandings of the metallogenic models in the Tongling ore district. The tectonic boundaries, deep fold shape and fault strike of the Tongling uplift belt can be revealed by the spatial distribution of high and low resistivity blocks. Under the folded uplift zone, the high resistivity blocks are merged into a magma belt trending north-west-west below the depth of 2 km. The Nanling basin is characterized by low resistivity layers and shows high overall resistivity below the depth of 1500 m; this may indicate the buried basement depth of the Nanling basin. The resistivity of high resistivity areas increases gradually from shallow to deep, and the centers of high resistivity areas basically correspond to the outcrop areas of rock masses. The profiles which pass through the typical ore deposits reflect the ‘five-levels’ dendriform metallogenic model in the Tongling ore district. The emplacement of the intrusion from bottom to top can lead to the formation of metallic ore bodies in contact zones and interlayers with different strata.