

Paper Number: 3034

Application of Bi-dimensional empirical mode decomposition (BEMD) modeling for extracting gravity anomaly indicating the ore-controlling geological architectures and granites in the Gejiu tin-copper polymetallic ore field, Southwestern China

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The exploration and evaluation of mineral deposits that are concealed represent a frontier in exploration for which geophysical methods are particularly well suited [1]. The primary challenge to geophysical interpretation is that a measured anomaly may represent any of a number of overlapped geologic features and usually exhibit nonlinearity and non-stationarity [2]. The Bi-dimensional empirical mode decomposition (BEMD) [3] can be effectively used to decompose gravity data covering the Gejiu tin-copper polymetallic ore field [4], which yielded three two-dimensional intrinsic mode function (BIMFs) and one residue (Res(m, n)) images that depict four layers of geological architectures at different wavelengths within the study area. (a) The high-pass filtered image (BIMF₁) depicts the shallow geological architecture showing that two negative gravity anomalies, bracketed by a positive gravity anomaly conjectured to be associated with contact metasomatic skarn tin-copper mineralization zones, which correspond to the outcropping granites and the buried granites, respectively. (b) One band-pass filtered image (BIMF₂) is conjectured to show the middle - shallow geological architecture where there is a negative gravity anomaly reflecting the distribution of the whole Gejiu granitic complex. (c) The other band-pass filtered image (BIMF₃) shows what we believe to be the middle - lower geological architecture where there is an EW- trending negative gravity anomaly zone showing the existence of an EW- trending granite zone connecting the Gejiu tin-copper polymetallic deposits to the Bozhushan silver-lead-zinc polymetallic deposits [5] at middle-lower depth. (d) The low-pass filtered image (Res(m, n)) is believed to show the lowest geological architecture where there is one pair of NW-trending positive and negative gravity anomaly zones reflecting the existence of the mantle uplift and mantle depression at depth. The tin and copper mineralization in the Gejiu ore field correspond to the transitional zone between the mantle uplift and depression, whereas the Bozhushan silver, lead and zinc deposits are situated within the mantle depression.

References:

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