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瞬变电磁法三分量测量方法研究

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摘要: 在不考虑本征电流之间互感的情况下, 研究用本征电流代替涡流计算地表瞬变电磁场的模拟计算方法, 计算均匀半空间中定源装置下薄板导体在不同倾角时的X, Y和Z 3个分量的响应特征, 并与1条已知地质剖面的实测结果进行对比分析。研究表明: 除板状体直立外, 薄板导体X分量的过零点基本上是板状体的中心在地面的投影位置; 当板状体水平或直立时, Y分量曲线是对称的, Z分量曲线是反对称的; 当板状体倾斜时, Z分量和Y分量曲线都不对称, 在倾斜方向曲线平缓, 响应范围大, 在反方向曲线陡立, 响应范围小, 因此, 用X分量可以确定异常的中心, 用Z和Y分量可以定性判断板状体的倾向; 实测结果与计算结果一致, 说明综合分析X, Y和Z方向3个分量的方法比单分量分析的方法更有助于对异常体的解释。

关键字: 瞬变电磁法; 三分量; 本征电流; 薄板导体

Three-component measurement in transient electromagnetic method

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Abstract: Without considering the mutual inductance between eigencurrent and eddy current, the eigencurrent which was instead of eddy current was used to calculate the fixed-loop X, Y and Z component transient responses over a thin plate conductor in homogeneous half-space with various plate dip angles. The results show that except for a vertical target the cross-over of X-component is approximately the projection position of the plate's center. For a horizontal plate, both Y and Z-component plots are symmetrical. For a vertical target Y-component is symmetrical and Z-component is anti-symmetrical. While for an inclined plate, neither component is symmetrical, it is broad and gentle in the inclination direction but narrow and steep in the other direction. So target location and orientation can be defined qualitatively by three-component measurement. The observed results are coincident with the calculated ones, which proves that the method of unitarily analyzing three-component is better than that for the interpretation of conductor body.

Key words: transient electromagnetic method; three-component; eigencurrent; thin plate conductor

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