地球物理学报 2010 53 (1): 171～176 ISSN: 0001-5733 CN: 11-2074/P

应用地球物理学

直升机航空TEM中心回线线圈姿态校正的理论研究

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收稿日期 2009-3-11 修回日期 2010-1-7 网络版发布日期 2010-1-20 接受日期

摘要 在直升机航空电磁测量时，固定在吊舱内的发射-接收线圈受飞行速度、飞机颠簸、风向等影响，会发生旋转，导致线圈与大地之间的耦合发生变化，给测量的电磁数据带来姿态误差，因此，研究航空线圈姿态校正非常重要.本文在建立吊舱和大地系统双坐标系的基础上，确定了吊舱旋转时，双坐标系之间变量变换的旋转矩阵，推导出层状大地垂直圆线圈姿态变化时航空电磁响应的计算表达式，以及线圈发生摇摆、俯仰旋转时的电磁响应系数，仿真研究了线圈姿态变化对电磁测量的影响，提出了姿态误差的几何校正方法，为航空电磁测量数据的精确处理和解释奠定了理论基础.

关键词 中心回线 航空电磁响应 旋转矩阵 线圈姿态 几何校正

分类号 P631

DOI: 10.3969/j.issn.0001-5733.2010.01.019

Theoretical study of concentric loop coils attitude correction in helicopter-borne TEM

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Received 2009-3-11 Revised 2010-1-7 Online 2010-1-20 Accepted

Abstract During the helicopter time electromagnetic (TEM) survey, transmitting and receiving coils fixed in the bird can be rotated by flight speed, bumpy, wind direction, etc. Meanwhile, the coupling change between coils and earth causes the attitude error to TEM survey data, so it's crucial to study a correction algorithm of the coils attitude. Based on building up the bird and earth bi-coordinate system, we determine the rotation matrix of variable transform in the bi-coordinate system, deduce the calculation expression of airborne TEM response while the vertical circle-coils attitude of layered earth is changing, and obtain the coefficients of TEM response for the rolled and pitched coils. Through simulating the changing coils attitude corresponding to the TEM survey effect, we propose a geometric algorithm for the attitude error correction, which is the foundation for accurate processing and interpretation airborne TEM data.

Key words Concentric loop;Airborne electromagnetic responses;Rotation matrix; Coils attitude; Geometric correction

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