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Magnetic Curvatures of a Tesseroid in Spherical and Cartesian Integral Kernels

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Abstract: Recently, the Gravitational Curvatures (GC) of a tesseroid have been introduced in the context of gravity field modelling, and the GC functionals are the components of the third-order derivatives of the gravitational potential. Analogous to the concept of GC in gravity field, the Magnetic Curvatures (MC) of a tesseroid can be utilized in magnetic field modelling, and studied together with other magnetic functionals (e.g., magnetic potential, magnetic vector and magnetic gradient tensor). Likewise, the MC functionals are the components of the third-order derivatives of the magnetic potential, and physically mean the rate of the change of the magnetic gradient tensor. In this contribution, the MC formulas of a tesseroid in spherical and Cartesian integral kernels are derived with 3D and 2D forms. Numerical closed-loop tests confirm the correctness of the MC expressions. Comparisons among the MC formulas of a tesseroid in spherical and Cartesian integral kernels with 3D and 2D forms are included as well. This study is supported by Chinese Scholarship Council (No. 201806270174), NSFCs (Grant Nos. 41631072, 41721003, 41429401, 41574007, 41774020), DAAD Thematic Network Project (Grant No. 57173947) and NASG Special Project Public Interest (Grant No. 201512001).

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