Gravity field due to a homogeneous oblate spheroid: Simple solution form and numerical calculations

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A b s t r a c t : The subject of the presentation is a simple derivation of the interior and exterior gravitational potential and corresponding gravity field components due to oblate spheroid using the fundamental solution of the Laplace equation in oblate spheroidal coordinates. Application of the method of separation of variables provides an expression for the potential in terms of oblate spheroidal harmonics of the degree $n = 0,2$. Such solution is more concise and suitable for the numerical calculations in comparison with infinite series in spherical harmonics. The derived relations for the interior and exterior of the spheroid are presented in visual form as well. They reveal some interesting properties of the gravity field of this fundamental geophysical body useful for the applied gravimetry.

Key words: ellipsoid gravity field, oblate ellipsoidal coordinates, oblate ellipsoidal harmonics

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