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The gravimetric boundary value problem in spheroidal approximation

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In this presentation the linear gravimetric boundary value problem is discussed in spheroidal approximation. The input to the problem is gravity disturbances, using the known Earth's topography as boundary and corresponds to an oblique derivative problem. From the physical viewpoint, it has many advantages and can serve as the basis in establishing a world vertical datum. Adopting the spheroidal approximation in this boundary value problem, an integral equation results which can be solved analytically using successive approximations. However, the mathematical model becomes simpler and can be solved more easily by applying certain permissible approximations: neglecting the Earth's topography, a spheroidal normal derivative (Neumann) problem is obtained. Under the spherical approximation, the result is a normal derivative problem plus suitable corrections. In this case, neglecting the Earth's topography, the solution corresponds to the well-known spherical Hotine integral. Finally, the relative errors in the above approximations and derivations are quantitatively estimated.