PHYSICAL GEODESY

3-0-2-0-11

Introduction: Need to study gravity, Historical review, Research areas, Applications, Open questions. Potential theory: Some vector calculus, Attraction and potential, Potential of a solid body, Laplace equation – exterior potential field, Poisson Equation – Interior potential field, Spherical harmonics, Boundary-value problems. Gravity field of the Earth: Gravitation, Gravity, Attraction of a point mass, Attraction of a rigid body, Gravity and shape of the earth, Level surfaces and plumb lines, Natural coordinates. Normal gravity: Superposition principle, Ellipsoid as an approximation of the Earth, The level ellipsoid, Series expansion of the normal gravity field. Gravimetry: Functionals of the gravity field, Terrestrial gravimetry – absolute and relative, Airborne gravimetry, Spaceborne gravimetry, Gradiometry, Torsion balance, Gravity networks. Gravity field modelling: Linear model of physical geodesy, Disturbing potential and gravity, Anomalous potential and gravity, Gravity reductions. Geoid modelling: The Stokes integral, Koch's formula, Vening-Meinesz formula, Molodensky's approach, Practical aspects. Statistics of the gravity field: The power spectrum, Kaula's rule of thumb, Covariance functions. Height systems: Height measurements, Physical and geometric heights and their relationship, Height systems around the world, Geoid as a vertical reference frame. Temporal variations of the gravity field: Geophysical effects on gravity, Loading theory, Tides, Hydrological loading, Atmospheric loading, Ocean loading, Ice-mass loading, Glacial Isostatic Adjustment.