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FFTGEOID™ - Geoid Determination Software

TECH ID #:018.4

Background

FFTGEOID™ is a suite of Fortran language programs that allows accurate and efficient geoid determination from gridded gravity anomalies. FFTGEOID™ uses spectral techniques and algorithms to achieve the highest computation efficiency while minimizing the requirements on computer memory. The conventional Stokes integral formula is expressed as a two-dimensional convolution. With the use of the Fast Fourier Transform (FFT,) the required computer CPU time is reduced logarithmically. By using the Fast Hartley Transform (FHT,) the computational efficiency can be further improved by one-third while the required computer memory can be reduced by half.

Areas of Application

- General uses of the geoid in Geophysics and Geodesy.
- Levelling by GPS and the geoid: conversion of GPS heights to orthometric heights.
- The geoid as a reference surface for geo-referencing, positioning and navigation.

Competitive Advantages

- FFTGEOID™ has the unique advantage of providing five different computation options using different kernel functions:
 - 1D Fourier Stokes formula with the original spherical Stokes kernel function.
 - 2D Fourier Stokes formula with the approximated spherical kernel function.
 - 2D Fourier Stokes formula with the approximated planar kernel function, with mean data.
 - 2D Fourier Stokes formula with the approximated planar kernel function, with point data.
 - 2D Fourier Stokes formula with the analytically-defined kernel spectrum.
- Based on FFT algorithms, it is extremely fast compared to conventional numerical integration software and is suited for computations involving very large data files. Results are given on the same grid as the input gravity anomalies, so are available for plotting, fast interpolation, and 2D and 3D visualization.

Stage of Development



- FFTGEOID™, coded in Fortran language, is easily portable to any platform and operating system. It is accompanied by a program that, if needed, can interpolate results at points not belonging on the grid. Detailed deviation of the mathematical formulas are also available upon request.
- The program can be stand-alone or accompanied by software that computes the complete geoid undulation. This includes fast routines for the computation (and combination) of the contributions to the geoid of a global geopotential model, terrain reduction, and indirect effects. For GPS users, a routine is also available for fitting the geoid to leveling benchmarks with GPS heights.

Intellectual Property Status

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Publications

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