Generation of Digital Ellipsoidal Height Model of Japan #2

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1. Introduction

When remote sensing techniques including InSAR are applied to measuring topography, the measured height of earth's surface is not orthometric height but ellipsoidal height. Though 50m-spacing Digital Elevation Model (DEM) of whole Japan islands was provided by GSI in 2000, Digital Ellipsoidal Height Model (DEHM) has not been made. GSIGEO2000, geoidal height model of Japan is released in 2002 and TKY2JGD software (Tobita, 2001, 2002) with 1-km spacing regional transformation parameters from Tokyo Datum to Japanese Geodetic Datum 2000 was completed 2001. The DEM, the geoid model, and the software have enabled us to develop the DEHM of Japan.

2. Specification of DEHM

(1) The grid spacing is 1.5 second and 2.25 second (~50m) in latitude and longitude, respectively.

(2) Coordinate system and reference ellipsoid are Japanese Geodetic Datum 2000 (JGD2000) (=ITRF94) and GRS80 ellipsoid.

(3) One binary file will contain whole DEHM. (Easy to handle and fast to access)

(4) Data size should be small

(5) Data variable type should be defined to represent minus ellipsoidal height and the height of Mt. Everest. (e.g. Signed Short Integer)

(6) Grids are positioned at latitude that is the multiple of 1.5 sec and longitude that is the multiple of 2.25 sec. This is different from 50-m spacing DEM.

(7) DEHM data will be distributed with an interface program in C.

3. A recipe of DEHM

The following calculations will be done at 3,194,880,000 grids in 20N - 45N (latitude) and 122 E - 154 E (longitude). (B, L) represents the latitude and longitude of the grid in [JGD2000 : GRS80].

(1) Refer to the geoid model file at four geoid grids surrounding a (B, L) and compute a represented geoid height by the bilinear-interpolation.

(2) Transform (B, L) to Tokyo Datum, then refer to the DEM file and compute a represented orthometric height by bilinear-interpolation.

(3) Calculate ellipsoidal height adding the geoid height and orthometric height.

4. Current status of developing DEHM

The first version of a binary file of DEHM was computed spending four months CPU time. Developed display program of the file and found some bugs in the data. The computation program of DEHM was debugged. Now preparing for recomputing.

A transparent interface program, which refers to the binary DEHM file, has developed. It is double dehm(double lat, double lon)in C language. Developing a program that will make simulated SAR interferogram based on the DEHM.

Considering dull effect by resampling. Discussing the way of distributing DEHM data.

References

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