

On implementation of VMF1 and GMF mapping functions in Bernese GPS software Ver. 5.0

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Boehm et al. (2006) proposed newly improved mapping function, VMF1. They calculated the mapping function by raytracing method in the numerical weather model of European Centre for Medium-Range Weather Forecasts. The continued fraction form is used for the hydrostatic and wet mapping function. The coefficients of this form, a, b, and c are estimated, and coefficients, b and c were determined constant values except coefficient c for hydrostatic mapping function, which was dependent on the latitude of the site. The coefficients, a, of hydrostatic and wet mapping function are site and time dependent parameters, which are given as grid data with every 2.0 and 2.5 degrees in latitude and longitude. These grid values are opened these values for every 6 hours on their Web Site. Boehm et al. (2006) proposed GMF mapping function whose coefficients, a, b, and c based on VMF1 were expanded by using Legendre Function. Fortran subroutines of VMF1 and GMF are also opened on the Web site.

These mapping functions are not included on Bernese GPS Software Ver. 5.0(Bernese Ver. 5.0). I tried to implement these two mapping function. The subroutines gmfl_deriv.f and vmf1_ht.f are called in the subroutine TRPMAP of Bernese Ver. 5.0 which is a mapping function part. The height correction, which is proposed by Niell (1996) is included into the subroutine gmfl_deriv.f, and derivative of the mapping function is introduced into vmf1_ft.f program. The coefficients, a, of VMF1 at GPS sites should be interpolated by using linear bi-interpolation by a program interp_a.f, which is not included in Bernese Ver. 5.0. In Bernese Ver. 5.0 a file of coefficient, a, at a GPS site open and the coefficient is read from the file and then they is interpolated at epoch of GPS data because given coefficient a values are at 0, 6, 12, 18hours.

These mapping functions are adapted for GPS network which is constituted with GPS sites operated by Kagoshima University (5 sites) and GEONET (60 sites) in the period from August 1, 2005 to August 7, 2005. Repeatabilities of the result using VMF1 are 2.9mm in NS component, 3.6mm in EW, 10.5mm in UD, respectively. Repeatabilities in NS and UD component using VMF1 are not better than those by Niell mapping function (NMF), which are 2.7mm in EW, 8.9mm in UD component. We are trying to find the reason why repeatabilities using VMF1 are better than those using NMF.