

Interactive comment on “Multi-quadric collocation model of horizontal crustal movement” by G. Chen et al.

Dr. Gan (Referee)

wjgan@gps.gov.cn

Received and published: 7 April 2016

Interpolation is often used when we investigate and analysis crustal movement based on the observed velocities of scattered GPS stations, for the purpose of estimating the velocity values of some unmeasured points, getting a gridded velocity field to better demonstrate crustal movement and further calculate a gridded strain rate field, and so on. Although there have been quite a lot of interpolation methods, such as the classical Kriging spatial interpolation, spline in tension, nearest-neighbor interpolation, cubic spline interpolation etc, being widely used for the above mentioned purpose, which of the methods is the most suitable remains unclear. In fact, an interpolation method is optimal for this application (or region) is not optimal for the another. In this regard, I think this paper, which presented a new method on the basis of collocation and multi-

C2049

quadric equation interpolation, and established a horizontal velocity field model for the Chinese Mainland by using a set of observed velocity data of 1070 GPS stations, is of important reference value. Some questions and suggestions: 1. Crustal movement is composed of two parts: rigid rotation, which could be well described by Euler Vector, and local deformation, which is mainly corresponding to local tectonic movement. The local crustal deformation is not stochastic, but obey some physical models. For example, the deformation around an active fault could be well described by the Okada's half-space elastic dislocation model. In this paper, the local deformation is assumed or simplified as the stochastic signals. How does this assumption affect your method or solution? 2. The most important part of this paper is a new interpolation method. How do you convince us that your new method is better than the existing classical ones for the purpose of establishing a horizontal crustal movement model of Chinese Mainland? I suppose you need to do some comparisons and discussions. One strategy to judge which of the methods furnishes the most reliable interpolation to the observed velocity is to predict the velocity at "each" of the 1070 stations using the different methods based on the observed velocities at the other 1069 stations to get the misfit between the observed velocity and the predicted one. 3. According to the topic of this paper, It would be better to produce and present a gridded velocity map of Chinese Mainland based on your interpolation method and the observed velocities of the scattered GPS stations. 3. The English expression of this article need to have substantial improvement, as the meaning of some sentences is difficult to understand.

Some corrections: P.3360 +L.15 : the precision in the north and east directions was 1.25 and 0.80mm/yr, respectively.[the precision in the north and east components was 1.25 and 0.80mm/yr, respectively.] P.3360 +L.23 : from measured points has been the focus of much research at home and abroad, and it has produced a lot of research literature [from measured points has been the focus of a lot of researches all over the world] P.3362 +L.22 : where n and u are the station quantity and estimated parameter numbers[where n and u are the station number and estimated parameter number, respectively.] P.3363 +L.5: where U_e denotes the easterly component of the ground

C2050

station's horizontal velocity in a topocentric coordinate system, and U_n represents the northerly component. [where U_e and U_n denotes the east and north components of the horizontal velocity of ground stations, respectively, in a topocentric coordinate system] P.3364 +L.13: different physical applications spend a lot of energy in determining the covariance [different physical applications take a lot of effort in determining the covariance] P.3366 +L.18: inverted double curved surface, positive three surface, and inverted three surface. [inverted double curved surface, positive thrice curved surface, and inverted thrice curved surface.] P.3367 +L.22: the Crustal Movement Observation Network Engineering [the Crustal Movement Observation Network project] P.3368 +L.2: (29 consecutive observation stations and 56 irregular observation basis points) [(29 continuous observation stations and 56 campaign-mode observation stations)] P.3368 +L.20: We use inverted and positive, double curved, two, and three surfaces to obtain [We use inverted and positive, double curved, twice (?) and thrice curved surfaces to obtain] P.3369 there are a lot of "three surfaces" which should be thrice curved surface, I suppose!

Interactive comment on Solid Earth Discuss., 7, 3359, 2015.