Reply to the review of the Anonymous Referee #3:

The Authors are grateful to the editor and would like to thank the Referee #3 very much for his important comments that helped us to improve the original manuscript. We have responded to all comments. Details of our responses to each comment are shown below: -

NO.	**Referee's Comments**	**Authors Responses**
1	The authors should express the difference between this software and software of Jin et al (2012) in detail.	As shown in the introduction section (L 50-54), in this study we introduce a mathematical model estimating satellites & receiver DCBs for a GPS network based on Spherical Harmonic Function like M_DCB software. But, the DCB and ionosphere coefficients can be estimated from GPS dual-frequency observations by the Weighted Least Squares (WLS) method. Weights were produced from the satellites elevation angle. Also we can estimate DCB for any type of receiver (codeless tracking, Cross Correlation, and Non-Cross Correlation types) the other software of Jin et al (2012) calculate DCB for codeless tracking receiver type only
2	The model of spherical harmonic function is key to calculate the DCBs. However, the order of spherical harmonic function is very important. How many is the order in this paper? The authors should express clearly in the article.	Fourth order was used as it is recommended for our small areas, and it is mentioned to the used order in the revised paper.
3	What is the time required to calculate the DCBs of multi stations? For example, 20 stations and 30 stations.	It depends on number of observation from each station of the network and cut off elevation angle. For our solved networks, it takes about 20-30 min, I think it might need about 60-90 min for 20-30 station.
4	In the section of experiment, it is important to select more stations for comparative analysis.	In the current paper we used a pre-solved networks which had been published by Jin et al. 2012 and others. To evaluate our results. So, we are restricted with the number of stations used by the other papers. But the code is applicable to any number of stations.

Reply to the review of the Anonymous Referee #4:

The Authors are grateful to the editor and would like to thank the Referee #4 very much for his important comments that helped us to improve the original manuscript. We have responded to all comments. Details of our responses to each comment are shown below: -

NO.	**Referee's Comments**	**Authors Responses**
1	The authors have compared DCBs estimated by different methods, such as MSDCBE, M_DCG, and ZDDCBE, and provided by CODE, IGS, and JPL. The difference between them are shown, but the reasons why the difference is large (or small) is not discussed based on the difference of the adopted methods.	As mentioned in the abstract, these differences between MSDCBE and M_DCB come from the added weight function and the processing weighted least square method. In addition, differences between MSDCBE and ZDDCBE come from using network and single station for MSDCBE and ZDDCBE, respectively.
2	ll. 16, 17: In Abstract, the authors describe "The second factor concerned with estimating DCBs using single GPS Station Precise Point Positioning (PPP) or using GPS network." However, the results are not shown in this manuscript.	ZDDCBE code used single station to estimate DCB, which we mean by PPP. Compared results of single and multi-stations (ZDDCBE and MSDCBE) shown in the paper. This statement edited in the revised paper.
3	l. 131, "By substituting eq (10) and eq (11) into eq (9) we get": Equation (8) is also needed.	considered
4	l. 147: Explain how constants of 0.05 and 0.02 are determined.	Reference added in the revised paper. For more details please see (Ray and Griffiths, 2008)
5	l. 150: Explain how constants of 5 and 2 cm are determined.	
6	l. 150: "c" is used as speed of light. Use another expression.	considered
7	DCBs estimated in this study are compared with those obtained from CODE or IGS. The authors consider that smaller difference from DCBs estimated by CODE and/or IGS is better. In this paper, the authors show that MSDCBE with a weighting function depending on the satellite elevation angle is better than M_DCB without weighting function. Is MSDCBE same as M_DCB except only usage of weighting function? The authors concluded that the estimated DCBs are affected an improved by using weighting function according to the satellite elevation angle. To obtain this conclusion, MSDCBE must be same as M_DCB except only usage of weighting function.	As shown in the introduction section (L 50-54), in this study we introduce a mathematical model estimating satellites & receiver DCBs for a GPS network based on Spherical Harmonic Function like M_DCB software. But, the DCB and ionosphere coefficients can be estimated from GPS dual-frequency observations by the Weighted Least Squares (WLS) method. Weights were produced from the satellites elevation angle. Also our software capable of calculating DCB for any type of receiver (codeless tracking, Cross Correlation, and Non-Cross Correlation types) the other software of Jin et al (2012) calculate DCB for codeless tracking receiver type only

8	The authors describe "improved" in conclusion, but the correct value of DCBs are unknown. The estimated results becomes close to the those from IGS and CODE by using a weighting function, but it is impossible to conclude "improved".	considered
9	The authors need to compare the method of MSDCBE with that used by IGS and CODE, and discuss the difference among the methods. Especially, the authors need to mention whether the methods adopted by IGS and CODE use a weighting function or not. If they use the same weighting function, the results shown in this manuscript is meaningless.	CODE using the same spherical harmonic function but with different order (15), JPL uses the triangular mesh model to describe the ionosphere while estimating DCB and TEC coefficients, and the IGS values are from the combination of several GNSS analysis centers.
10	l. 213: What is the difference of ZDDCBE compared to other methods?	ZDDCBE code used single station to estimate DCB.