

Dear Anonymous Referee #2,

Thank you for your constructive comments concerning our manuscript entitled “Detecting seasonal and long-term vertical deformation in the North China Plain using GRACE and GPS”. Those comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significance to our researches. We will revise the manuscript according to your comments and here replied each comment bellow. The original comments are in plain text and the replies in italics.

**Anonymous Referee #2 (Received and published: 13 December 2016)**

**General Comments:**

This manuscript investigated the seasonal displacements of surface loadings in the NCP area using GRACE and GPS. The consistency between GPS and GRACE was quantitatively evaluated by removing GRACE-derived seasonal displacement from GPS observed detrended height time series. The rate of GRACE-derived TWS loss in the NCP was estimated and the land subsidence in the central and eastern of NCP was discussed. Generally the topic of manuscript is interesting and the writing is clear. However, in my opinion there are several important issues need to be addressed before publication.

**Major points:**

1. Recently lots of publications regarded on the estimation of TWS variation in the NCP, such as Huang et al. (2015), Feng et al. (2013), Moiwo et al. (2013), Tang et al. (2013) (listed in the manuscript) and some other references (e.g. Su et al., 2011). These studies should be included in the discussion to compare the depletion in TWS in the NCP.

*>Linsong Wang et al.: Thank you very much for the good comments that you mentioned previous studies should be included in the discussion. We are going to compare the depletion in TWS or GWS between our results and previous studied results (i.e., add a table including mass loss trend from our results and previous studied in the revised manuscript) in the NCP (e.g., the reported TWS loss from Zhong et al.(2009), Su et al.(2011), Moiwo et al.(2009), and the reported GWS loss from Huang et al.(2015), Feng et al.(2013), Tang et al.(2013)). Besides, according to the good comments of the Referee #1, we are also going to compare the depletion in GWS between monthly*

*GWS variations estimated from GRACE minus GLDAS/Noah model and monthly groundwater level changes observed by monitoring wells during 2002-2012.*

2. Results and discussion should be presented separately, since some result sections (e.g. section 3) include discussion parts (e.g. lines 308-326, lines 356-359). I would suggest moving the relevant parts to section 5 for discussion.

*>Linsong Wang et al.: Thanks for your good suggestion. We will move the discussion parts in section 3 (e.g. lines 308-326, lines 356-359) to section 5 for discussing the cause of the difference between our results and previous studies.*

3. There are some grammatical errors in the paper, meanwhile some sentences are not well written (e.g., lines 301-302, lines 335-338, lines 422-424, line 448). Please check it carefully throughout the manuscript.

*>Linsong Wang et al.: Thank you again. We will rewrite your mentioned some sentences and continue to polish the manuscript.*

#### **Specific Comments:**

1. Page 1, line 15: please remove “We employ” from the sentence.

*>Linsong Wang et al.: Thank you. We will remove “We employ” from the sentence in the revised manuscript.*

2. Page 1, lines 17 and 19: please give the full name of “NCP” and “WRMS”, since it first appeared in the paper.

*>Linsong Wang et al.: Thank you. We will give the full name of “NCP” and “WRMS” where they first appear in the paper.*

3. Line 367: should be “equations (2) and (3)”.

*>Linsong Wang et al.: Thank you for reminding our negligence.*

4. Line 369: » “was presented: : :”

*>Linsong Wang et al.: Thank you. “were presented” will be changed to “was presented” in the revised manuscript.*

5. Line 388: » “under- or overestimation: : :”

*>Linsong Wang et al.: Thank you. “under or overestimation” will be revised to “under- or overestimation” in the revised manuscript.*

6. Line 449: » “before and after removing: : :”

>Linsong Wang et al.: Thank you. “before and after remove” will be changed to “before and after removing” in the revised manuscript.

7. Line 488: “two periods” » “two sub-periods”

>Linsong Wang et al.: Thank you. “two periods” will be changed to “two sub-periods” in the revised manuscript.

References:

Su, X. L., J. S. Ping, and Q. X. Ye (2011), Terrestrial water variations in the North China Plain revealed by the GRACE mission, *Sci. China Earth Sci.*, 54 (12), 1965–1970, doi:10.1007/s11430-011-4280-4.

>Linsong Wang et al.: Thank you for providing the reference of previous studies.

Merry Christmas and Happy New Year!

Best regards,

Linsong Wang et al.

25 December 2016