

Interactive
Comment

Interactive comment on “Orientation dependent glacial changes at the Tibetan Plateau derived from 2003–2009 ICESat laser altimetry” by V. H. Phan et al.

Anonymous Referee #1

Received and published: 9 June 2014

Title: Orientation dependent glacial changes at the Tibetan Plateau derived from 2003 - 2009 ICESat laser altimetry

General comments:

In this study, the terrain slope and roughness are considered while comparing the elevation differences between ICESat and SRTM DEM. The glacial elevation changes are estimated for 15 different scenarios. Some methods and conclusions from this study are useful for examining the glacial elevation changes across the Tibetan Plateau. This study needs to improve combining the comments below and comments from Discussion online.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



1. What is the TP boundary used in this study (Figure 5)? Some important regions, especially in the Himalayas, is not included.
2. The authors need explain clearly how they convert the datum from ICESat and STRM consistently.
3. The co-registration between ICESat and STRM DEM is conducted before comparing between them? [Nuth and Kääb, 2011]
4. The GLIMS glacier outlines have spatial displacement. If you overlap GLIMS glacier outlines with Landsat images, it is obvious. This is important for this study. This offset could result in large error for estimating of glacier elevation changes.
5. The elevation differences derived from ICESat data in winter (February-March) and autumn (October-November) should be separated to examine their trends.
6. Also add comparison with field measurements of mass balance from [Yao et al., 2012] in regions A-H

In addition, some important comments from Andreas Kääb available at <http://www.the-cryosphere-discuss.net/8/2425/2014/tcd-8-2425-2014-discussion.html> also need response and incorporate in revisions.

Specific comments:

P1, L5, change "Tibetan Plateau" to "Tibetan Plateau (TP)" and use TP thereafter

P1, L1, Title: "...on the Tibetan Plateau derived from ICESat laser altimetry (2003-2009)"

P2, L5-6, The TP and surroundings, same with study area of this study, contain glacier area of ~100,000 km² [Gardner et al., 2013; Yao et al., 2012].

P2,L7, except for Karakoram region [Gardelle et al., 2012]

P2, L31, "footprint diameter of 70 m", add an important reference from [Zwally et al.,

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

2002] here

P3, L21, "on the whole Tibetan Plateau" to "across the TP"

P3, L25-26, "water level" to " water level, volume and area" [Song et al., 2013; Zhang et al., 2013; Zhang et al., 2014]

P4, L6, "at" to "on"

P4, L19-20, "~5 m in horizontal and ~10 cm in vertical for slopes below 1 degree" add peer reviewed paper here

Table 1 could be removed.

Table 5, "Phan et al" to "this study", and "Neckel et al" to "Neckel et al, 2014"

Figure 2 could be removed.

Figure 3 caption "An example showing that. . ."

References

Gardelle, J., E. Berthier, and Y. Arnaud (2012), Slight mass gain of Karakoram glaciers in the early twenty-first century, *Nature Geosci*, 322-325, doi:10.1038/ngeo1450.

Gardner, A. S., et al. (2013), A Reconciled Estimate of Glacier Contributions to Sea Level Rise: 2003 to 2009, *Science*, 340(6134), 852-857, doi:10.1126/science.1234532.

Nuth, C., and A. Kääb (2011), Co-registration and bias corrections of satellite elevation data sets for quantifying glacier thickness change, *The Cryosphere*, 5(1), 271-290, doi:10.5194/tc-5-271-2011.

Song, C., B. Huang, and L. Ke (2013), Modeling and analysis of lake water storage changes on the Tibetan Plateau using multi-mission satellite data, *Remote Sens. Environ.*, 135, 25-35, doi:10.1016/j.rse.2013.03.013.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



Yao, T., et al. (2012), Different glacier status with atmospheric circulations in Tibetan Plateau and surroundings, *Nature Clim. Change*, 2(9), 663-667, doi:10.1038/nclimate1580.

Zhang, G., T. Yao, H. Xie, S. Kang, and Y. Lei (2013), Increased mass over the Tibetan Plateau: From lakes or glaciers?, *Geophys. Res. Lett.*, 40(10), 2125-2130, doi:10.1002/grl.50462.

Zhang, G., T. Yao, H. Xie, K. Zhang, and F. Zhu (2014), Lakes' state and abundance across the Tibetan Plateau, *Chin. Sci. Bull.*, In press, doi:10.1007/s11434-014-0258-x.

Zwally, H. J., et al. (2002), ICESat's laser measurements of polar ice, atmosphere, ocean, and land, *J. Geodyn.*, 34(3-4), 405-445, doi:10.1016/S0264-3707(02)00042-X.

Interactive comment on The Cryosphere Discuss., 8, 2425, 2014.

TCD

8, C873–C876, 2014

[Interactive
Comment](#)

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

