

## ***Interactive comment on “Surface deformation detected by the space-observed small baseline SAR interferometry over permafrost environment in Tibet Plateau, China” by F. Chen and H. Lin***

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Thanks for your careful review and pertinent comments. They are indeed helpful to improve the manuscript of this paper.

Responses to major weaknesses: 1) I agree with your criticisms regarding to the permafrost focus issue, and thus the surface deformation related to permafrost or active layer will absolutely emphasized in the revision by the way of detailed description as well as further discussion. The contradiction between permafrost and slope processes is confused by the expression. Actually, in mountainous region, the slope process is dominated, vice versa; the active layer evolution is prevailing. 2) The geomorphologi-

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cal processes are dominated in slope regions considering the unconsolidated mantle condition caused by the weathering. The atmospheric artifacts and topographic phase error have been well estimated and mitigated during the SBAS procedures. In shadow or layover regions, it is impossible to extract PS or coherent points, and thus those regions can be easily masked out. 3) We never made such an assertion as the review stated. Instead, we described that the water level variation may be measured by InSAR or SBAS when the horizontal water surface and cliff lake shores allow a double bounce reflection of the transmitted radar signal back to the satellite (in this study, only a small section of the lake holds this assumption). Of course, further studies are crucially required (as we described and discussed), such as the validation using ICESat.

Responses to major comments: 4) The recommended citations will be included in the revision. 5) Regarding to the Qinghai-Tibet Railway, the section will be rewritten for avoiding plagiarism suspicion. 6) The validation using leveling has been described in Chen et al., 2012. The reference citation will be applied instead of repeated clarification. 7) 'The annual rates' has been replaced by 'mean linear rates' as the review suggested. 8) The correlation of normal baselines is indeed a problem for InSAR data processing, particularly for the topographic error mitigation. That why the SBAS is introduced because of its two advantages: firstly, the topographic phase can be estimated by the SBAS algorithm; secondly, the interferogram formation with small baseline strategy mitigates topographic phase errors. 9) The spelling or writing mistakes have been corrected under the reviews comments. 10) By citing Chen et al., 2012, the table has been removed. 11) The Fig. 4 is a good demonstration example for slope process. Apart from some exceptions, the direction of surface movements is under a reasonable assumption: the parallel movement is determined by the shallow-seated landslides in the middle section of slopes. Regarding to other portions, landslides are rare; instead, surface motions are determined by the frost heave at the top section and by the alluvial accumulation at the foot of slopes, respectively. Fig.5 has been deleted. The coverage of Fig. a and b are consistent. The 'incidence angle' has been replaced with 'looking angle'. Throughout of the whole manuscript, the SB-InSAR has changed into SBAS.

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