Generally, this MS utilized multi-source data and a modified surface energy balance model to simulate the temporal and spatial patterns of surface energy fluxes at national scale (China). Compare to the previous related studies, a higher resolution data set of energy fluxes was produced and well validated with ground flux measurement. With such dataset, 10 years variations of radiation and turbulent heat fluxes in China were evaluated. Obviously, this study provided a useful dataset and gave some interesting results on the spatial-temporal patterns of land surface energy balance in China, especially in Tibetan Plateau. However, there are still some explanations and modifications are needed, 1. In Introduction section, if the authors can make a more clearly introduction on the reasons for constructing such a high spatial resolution and long term dataset at national scale? And what are the progresses about this topic in China and world?

RESPONSE: *Thanks for your precious comments and suggestions. As Reviewer #1 has pointed out that 'the global surface energy flux data sets, including reanalysis data, do not have enough spatial and temporal resolution when looking at the national-level fluxes. The surface flux data sets from reanalysis data sets still contain large uncertainty. Therefore, ……it is necessary to produce spatially and temporal higher resolution surface flux data sets.'; We have also discussed this issue (why a high spatial resolution and long term dataset at national scale is necessary):*
On Page 14473, Line11-19 of our ACPD manuscript:
'While ***it is of critical importance to understand the partitioning of water and energy distribution across China's terrestrial surface****, accurate monitoring of their spatial and temporal variation is notoriously difficult (Ma et al., 2011). Several field experiments are being carried out to monitor turbulent fluxes over selected land cover in China by using ground-based eddy covariance devices (Wang et al., 2010;Yu et al., 2006;Ma et al., 2008b;Li et al., 2009).* ***However, these measurements are only representative of small areas around the locations where the measurements are being made. For this reason, establishment of an eddy-covariance flux network cannot provide a complete land-surface heat flux picture for the entire Chinese landmass****. ' and*
On Page 14474,line 8-14 of our ACPD manuscript:
'Zhu et al. (2012) have also reported that summer sensible heat flux derived from eight datasets (including NCEP, ERA, and GLDAS) of China`s Tibetan Plateau region differ from each other in their spatial distribution. In addition, ***all the flux datasets mentioned above are based on model simulations, which have deficiencies for studying changes in water-cycle and land–air interactions in China*** *(Chen et al., 2013;Su et al., 2013;Wang and Zeng, 2012;Ma et al., 2008a)'.*
in the Introduction section.

We have ***reviewed the topic progress in world with these sentences*** *on page 14473, line 20- page 14474 line 6 (ACPD manuscript):* ***'A number of methods can be used to derive land-surface energy fluxes****. Jung et al. (2009), for example, generated global spatial flux fields by using a network up-scaling method. ………………………..When these products were applied at continental scales, the different approaches resulted in large differences (Vinukollu et al., 2011;Jiménez et al., 2011;Mueller et al., 2011). '.*

In the revised manuscript, we have added more discussions *on these issues to let the reader understand our work clearly. All the changes have been shown by the track change in the manuscript word file, which is uploaded as the supplementary file of our response to the reviewer comments.*

2. In model description, although the structure and equations were detail introduced with many references, it is still not clearly that how the model was developed based on those references in this MS.

RESPONSE: *Actually, the most development of the SEBS model by us have been done within our previous paper, Chen et al. JAMC 2013. The further development or improvement in this paper is to upscale the model to an continental coverage area. Actually, we have further developed several methods to help the model to be used in a global scale. Such as the method of how to get global canopy height information for SEBS. This method has been demonstrated in lines 16-30, page 14479 (ACPD manuscript). The second significant contribution of this work is how to make an gap filled land surface fluxes and evapotranspiration. Normally, application of remote sensing dataset is limited by the spatial and temporal gaps in themselves. Here we overcame the setbacks in LST product. To make this point more clearly, we added a new figure to show how reasonable is our process method of monthly LST.*

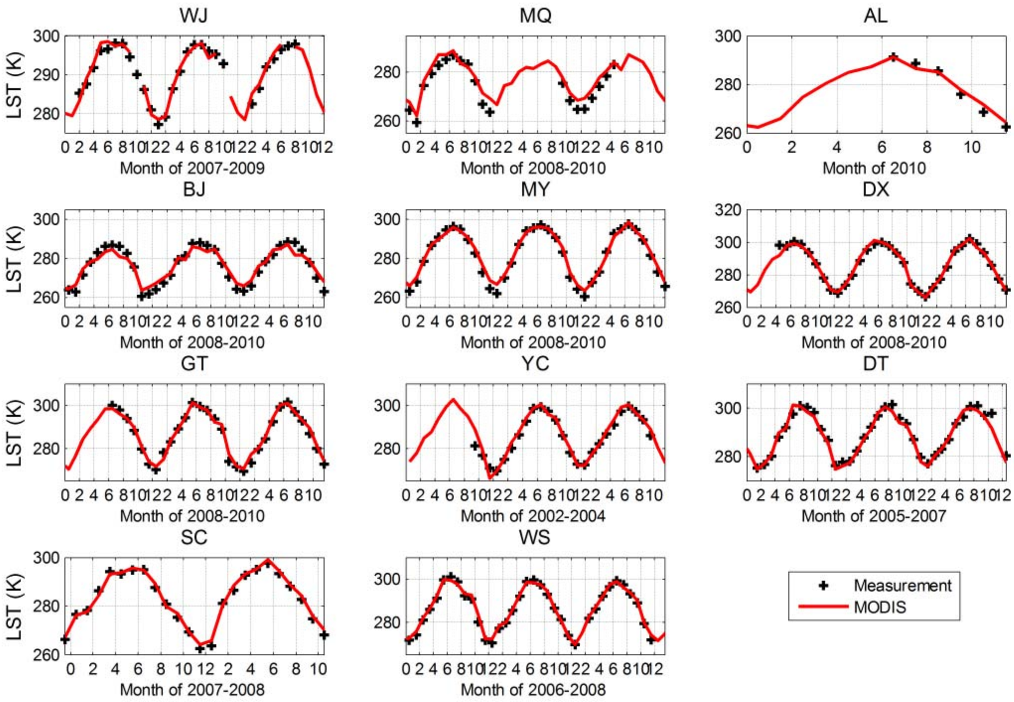


Fig. 3 Time series comparison of monthly averaged LST derived from MOD11C3&MYD11C3 and in-situ measurement.

Thus, Lines 22-30 on page 14482, line1-10 on page 14483 were also revised appropriately. Please check the new manuscript.

3. Only the EC data with more than 70% available in a month was acceptable in flux validation. However, it is popular that the most nighttime EC data usually was questionable and filtered out under weak turbulent condition, which resulted in large gaps in EC data. So 70% available data probably main come from daytime. If it will affect the monthly flux validation, for example, sensible heat flux?

RESPONSE: *We have checked the dataset, the percent of filtered fluxes at nighttime is very low, not higher than 0.1%. So its influence on the monthly averaged flux is negligible. 70% standard is used to kick off the months which have not enough samples due to equipment problems, e.g. EC at Maqu station has sensible heat flux data from 1th to 10th July, 2009, there is no data from 11th to 30th July due to electricity power problem, the valid sensible flux data takes a 30% percentage of that month. Thus the averaged monthly sensible heat flux for this month could not be used due to inadequate samples. That`s why we use this standard to filter this month and similar events at other stations.*

4. If possible, please add a figure to show the validation of LWD, because it was assumed to be important and there still existed room for improvement, although linear fitting slope and correlation coefficient attained 0.9 and 0.98, respectively.

RESPONSE: *If you look at the below evaluation results, it`s clear that the LWD has a certain systematic bias, even the R and fitting slope are very high. The scatter point closely located around the 0.91*x line, not 1:1 line, which makes us believe that the LWD still has some room for improvement. The following figure was added in the new manuscript. Please check the supplementary.*

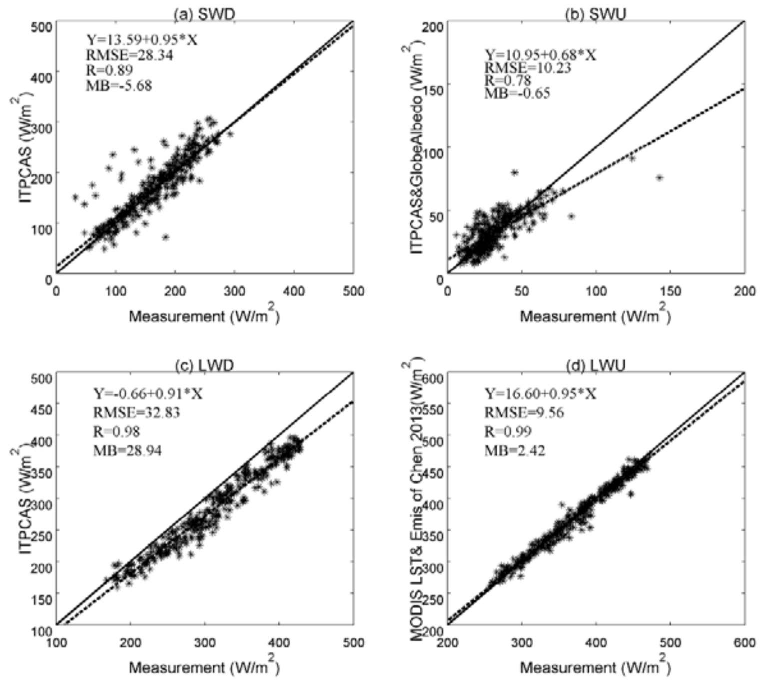


Figure 4 Scatter point for downward shortwave (SWD), upward shortwave (SWU) , downward longwave (LWD), and upward longwave (LWU) radiation against in-situ measurement.

5. Why only the validation from Yucheng and SC flux site were introduced in detail, the results were similar for other 9 sites?

RESPONSE: *The validation results for other 9 sites were uploaded as supplementary of the ACPD paper. Here, we would like to list results for the three sites located in the Western, Eastern and center of Tibetan Plateau, to show part of the evaluation results. Please check for others in the supplementary materials of the discussion paper.*

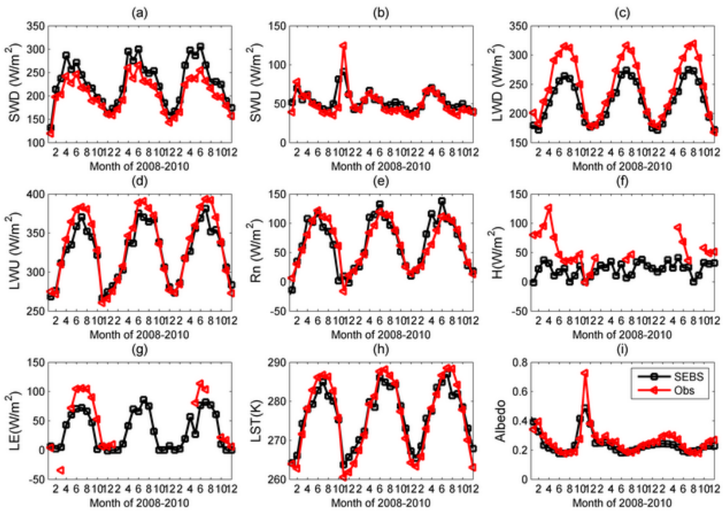


Fig. 1 SEBS input and output variables vs measurement at BJ station in the central Tibetan Plateau

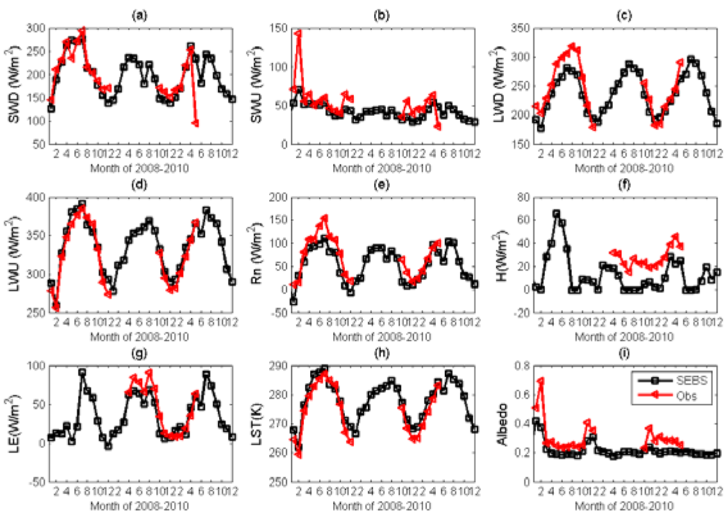


Fig. 2 SEBS input and output variables vs measurement at Maqu station in the eastern Tibetan Plateau

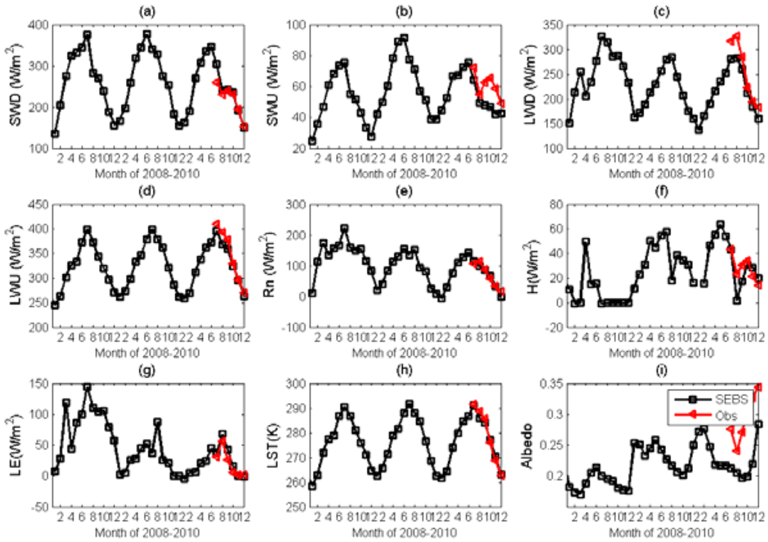


Fig.3 SEBS input and output variables vs measurement at Ali station in the western Tibetan Plateau

The validation results also show that the sensible heat fluxes over high canopy is lower estimated, this is due to that the roughness sublayer over the high canopy is not considered in the model. So we added this sentence in the discussion part, '<u>Additionally, the sensible heat flux over forest is lower estimated by present turbulent flux parameterization method in SEBS which does not take the roughness sublayer over high canopy (Bosveld, 1999) into consideration.</u>'.

6. In trend analysis, it is interesting for the distinct variations in Tibetan Plateau, for example, in Fig 9 and 10. Meanwhile, it is also noticeable that the radiation and turbulent energy fluxes decreased in both northeastern and north China. Related explanations will be helpful for the understanding of the spatial variations of radiation and fluxes in China as a whole picture.

RESPONSE*: Yes, we also agree that the trend analysis is interesting. The problem is that we only have 10-years dataset, which may not be long enough for climate studies. We have reminded the readers in the new manuscript with the sentence in the discussion section '. Besides, the time period of MODIS datasets is not longer than 15 years which has limited application of our dataset in climate analysis.'.*

Meanwhile, the dataset does show some variations in the last 10 years. We have reviewed papers and found some explanations, such as the drying atmosphere over the plateau could be used to explain why SWD on the Tibetan Plateau has increased during last decade, we also address the reason for the LWU rising trend in the Lhasa basin. It`s a pity that we didn`t find any related publications which could be used to explain the variations in radiation and fluxes in northeastern and north China.

7. The organization of discussion is not well, and lots of discussion has already appeared in Introduction and Results section.
RESPONSE*: Thanks for your appreciated comments. We have revised the introduction and discussion section. We have added more detailed discussions about the reasons for constructing such a high spatial resolution and long term dataset for China land area. Please check the new manuscript.*

Technical corrections:
1. In Introduction section, some descriptions about the estimation method and input data were also included in this section, for example, "For this reason we chose a more physically-based method –turbulent flux parameterization – to produce the dataset" on p14475, line 17, and "To derive the surface energy balance terms for the Chinese landmass, we used high resolution reanalysis data,: : :" on p14476, line 16. It will be more appropriate to move such description into the Methods section.
RESPONSE*: Please pay attention to the paragraph 'The simple relationships established cannot give a reasonable approximation for extreme conditions such as bare soil or other types of non-canopy land cover (e.g. lakes, deserts) because land covers behave significantly differently in land-surface energy flux partitioning. Fortunately, turbulent flux transfer parameterization can overcome the shortcomings of statistical methods and produce spatially continuous distributions of land-surface energy fluxes with prepared meteorological forcing data. For this reason we chose a more physically-based method –turbulent flux parameterization – to produce the dataset.. ', here we not only review the advancement in the related area, but also inform the readers why do we use the model. So we do not only talk about the Methods but also the frontier of land surface flux remote sensing retrievals. The two sentences you have selected out may not be enough to set up a new Methods section. The related paragraph was rewritten. We also revised the Introduction section. Please check the new manuscript.*

2. Canopy height is important for the estimation of land surface heat flux. From eq. 8, it was just the linear function of NDVI, and even canopy fraction (fc) from eq. 9. Although the author indicated the reference, if some HC validations at flux sites can be provided?
RESPONSE*: Actually, we have checked the produced canopy height at the 11 flux station by equation 8 and GLAS forest height. We add section 4.1 in the new manuscript to assess the canopy height method. The following content was added in the new version.*
"4.1 Canopy height assessment
We checked the canopy height variations at the 10 flux station produced by equation 8 and GLAS forest height (Figure 3). The derived canopy height for AL is not higher than 0.2 m, which is reasonable for the local land cover. YC, GT, and WS stations located in the North China, represent a typical agricultural land, where crops mature twice per year. The highest canopy height is around 1.5 m, a similar magnitude to the height of maize in summer. The step decrease in canopy height in June at these three stations is due to that wheat/maize is harvested and new seeds are sown during this period. This step variation

in the canopy height also causes similar step changes in sensible and latent heat flux (shown by Fig. 5). Although the land cover near WJ station is crop, it is more surround by forest in a 10 km diameter. The GLAS forest height reflects this ground truth. These canopy height assessments at the observation sites enable us to consider that the developed method in this work is an appropriate one for solving scarcity of canopy height information at a continental area. ”

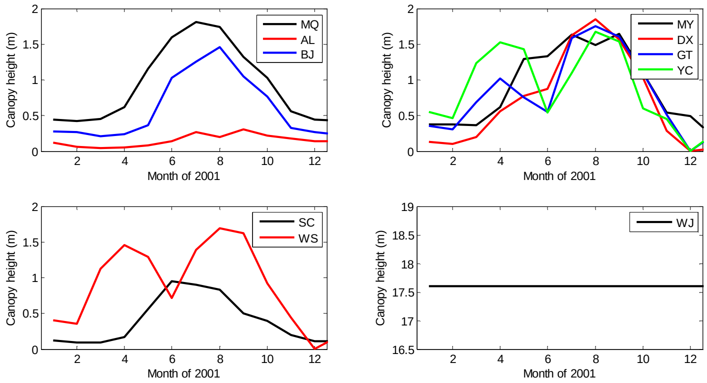
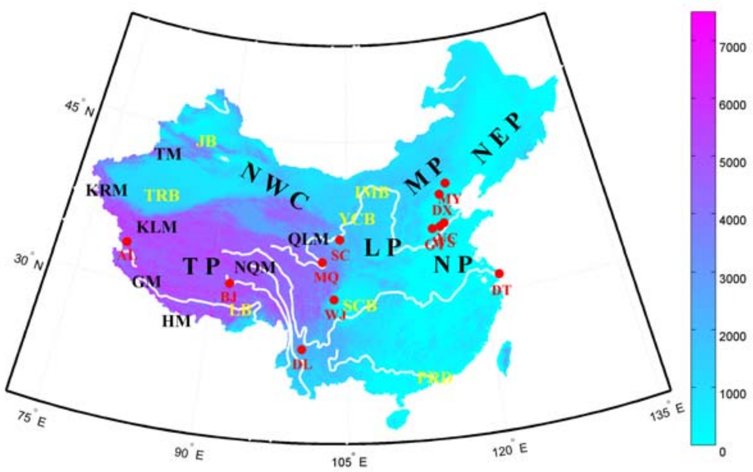


Fig. 3 Monthly variation of canopy height at the 10 flux stations

3. The color and letters in Fig.1 is confusing, please improve it.

***RESPONSE**: Figure 1 was changed to DEM map, please check the new figure:*



4. From Table 3, it seems that no forest flux site was included for model validation.

RESPONSE*: Yes, forest site was not included. However, we have evaluated the model with a forest flux site in Netherlands. It shows that the sensible heat flux over forest cover is lower-estimated by SEBS. We added the discussion to remind the readers about this shortage ‘Additionally, the sensible heat flux over forest is lower estimated by present turbulent flux parameterization method in SEBS which does not take the roughness sublayer over high canopy (Bosveld, 1999) into consideration.’.*

5. As for the sensible heat flux and latent heat flux, different names were used in this MS, for example, Heat flux, Surface fluxes, Heat and water fluxes, Land surface fluxes, Land surface-energy fluxes, Turbulent flux, Turbulent heat fluxes, Turbulent heat, etc., please check and uniform it.

RESPONSE*: A uniform ‘land surface heat fluxes’ was adopted in the new manuscript. Please check it.*

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