*A detailed, point-by-point response to the review comments is given below. Each review comment is repeated in **Bold** followed a description of our modification of the manuscript.*

Anonymous Referee #2
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In this paper, the authors evaluated the cloud effect on air temperature derived from MODIS land surface temperature based on ground measurements over the Tibetan Plateau. In summary, the authors revealed an interesting result. However, some questions and points need to be further addressed by some revisions before it can be published by ACP

We appreciate the reviewer's pertinent evaluations on our study very much. We have addressed all the detailed comments in the following.

The following is my comments:
(1) Line 86: A reference was missed, such as (Yu et al?).

Thanks. This reference has been added.

(2) Line 144: Did you test the accuracy of LST derived from radiative transfer theory?

Thanks. To reduce ambiguity, a sentence in section 2.1 in the revision is modified as "The LSTs of the Qinghai and Ngari stations were derived based on the Stefan–Boltzmann law and the thermal radiative transfer theory". To be clearer, a sentence is added in this section as, "The calculated LSTs were taken as ground measurements of LST as Wang et al. (2008)."

(3) Please show that the scattered points in the Fig.2 are based on the observed downward long-wave radiation. In addition, it is necessary to the further indicate how did you derive the cloud index in the section 3.1.
A reference is needed in Line 185.

Based on the comment, the caption of Fig.2 has been modified to show that the data points are observed values, as "The distribution of observed downward longwave radiation (DLW) under different air temperatures".

To further indicate, some descriptions are added in section 3.1, as "For example, for an observed downwelling longwave radiation as L_i at the temperature T_i, if the L_{max} and L_{min} are the maximum and minimum L_d under that temperature (T_i) respectively, then the CI is determined as $(L_i - L_{min}) / (L_{max} - L_{min})$."

The reference of Østby et al., 2014 describing the method for estimating cloud index is added.

(4) Section 3.2: My concern about the section is that subvisible cloud can affect the accuracies of MODIS LST, However, some aerosol layers also have a little bit effect, such as, at spring (Huang J., T. Wang, W. Wang, Z. Li, and H. Yan, 2014: Climate effects of dust aerosols over East Asian arid and semiarid regions. Journal of Geophysical Research: Atmospheres, 119, 11398–11416, doi:10.1002/2014JD021796.). How did you consider this issue?

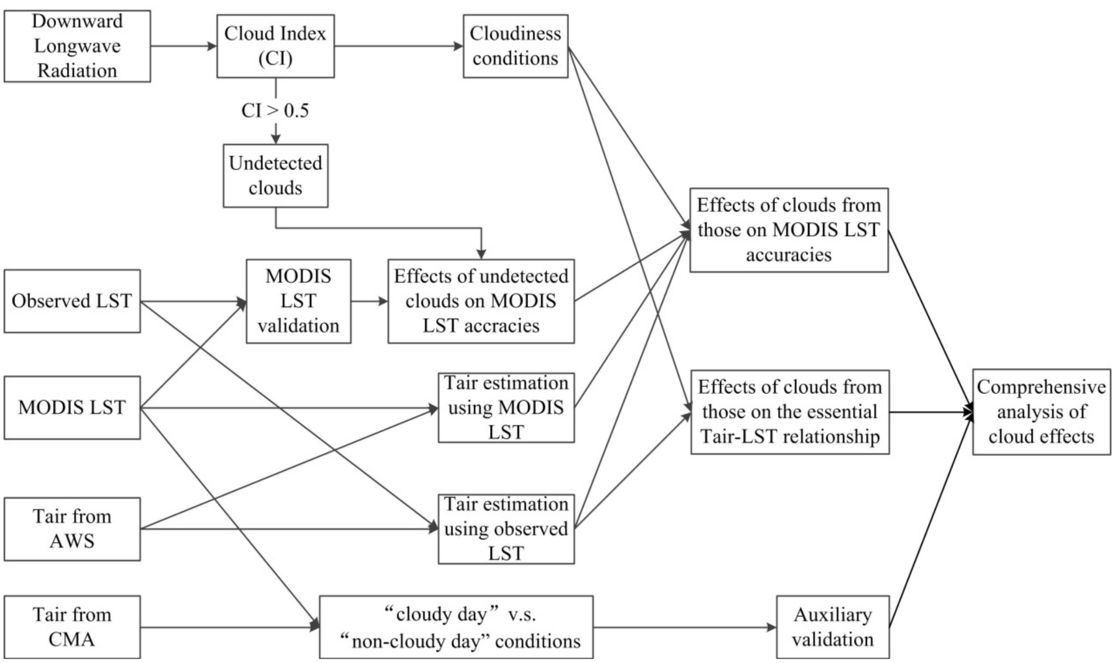
We thank the reviewer for this comment. The effects of aerosol layers should be discussed. Some sentences are added in this section as "It should be noted that the effects of undetected clouds may come from or be mixed with the effects of residual/thin clouds (Platnick et al., 2003), fogs (Østby et al., 2014) and some thick aerosol layers (Huang et al., 2014) existing in the MODIS pixel, which may impose errors on the MODIS LST product to varying degrees. Even though these effects are hard to distinguish in detail, undetected clouds are generally considered to have strong negative effects on the accuracies of MODIS LST (Williamson et al., 2013;Østby et al., 2014;Shamir and Georgakakos, 2014)."

(5) Section3.3: In your method, only LST was used to estimate the air temperature. Did you do some comparison with other methods? My main concern is that larger uncertainty maybe also exists in your method, thus some error evaluations are needed.

We thank the reviewer for this valuable comment. In fact, we compared the performances of six statistical methods for daily air temperature estimation in another work of us recently published (Zhang et al., *in press*). Following this comment, section 3.3 has been rewritten, as "Various statistical methods have been used for T_{air} estimation using MODIS LST, including neural network (Jang et al., 2004), random forests (Xu et al., 2014), M5 model tree (Emamifar et al., 2013) and the simple linear regression (Zhang et al., 2011; Benali et al., 2012; Lin et al., 2012). Comparisons among the performances of six types of statistical models with different levels of complexity for T_{air} estimation indicate that though there truly exist some cases where advanced statistical models clearly outperform the simple linear regression model, the absolute differences of accuracies produced by different models are generally not big, especially for cases using MODIS nighttime LST (Zhang et al., *in press*). Compared with the complex models such as neural network and random forests which introduce uncertainties owing to their much larger number of parameters, the linear regression model has the advantage of being easy to interpret and is most commonly used in previous studies (Zhang et al., 2011; Benali et al., 2012; Lin et al., 2012). In addition, an individual linear fit is built for each AWS or CMA station to make the relationship between T_{air} and LST as locally accurate as possible and thus, variables indicating spatial coordinates (longitudes and latitudes) and land cover (e.g. NDVI) are not used. Therefore, the linear regression model using LST as the single independent variable is chosen as the T_{air} estimating method in this study."

(6) In the section 3, a detailed flow chart is recommended, and can be make the paper more clear.

We thank the reviewer for this valuable comment. A flow chart is added as below:



"Figure 2: The flow chart describing the analysis and validation of cloud effects on air temperature estimation using MODIS LST in this study. "