*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 #1

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This paper discusses the important effects of clouds on the relationship between air temperature and satellite LST. It gives a comprehensive analysis on how clouds affect the Tmax-Daytime LST and Tmin-Nighttime LST relations particularly for the LST data from MODIS, based on both AWS and CMA station data. The effects of undetected clouds on MODIS LST accuracies are first explored, and MODIS nighttime LST are found to receive much more negative effects than daytime. Then, the real Tmax-Daytime LST and Tmin-Nighttime LST relations are analyzed using observed LST, and clouds are found to have a much larger influence on Tmax estimation than Tmin. Further, MODIS LST and observed LST are used as proxies for estimating Tair respectively, and the results are compared. The authors conclude that for Tmin estimation, large errors introduced by undetected clouds are key factors, while for Tmax, clouds strongly affect the relationship between Tmax and daytime LST. This study also discusses the clearly larger errors of Tmax than Tmin estimations and the heterogeneity of daytime LST is considered to be the main factor.

I think the authors have generally done good job of explaining their research and on the whole I found the paper reasonably straightforward to read. This paper is certainly worth of publication as it presents new and very useful information to researchers interested in estimating air temperatures from satellite data. However, there are few minor revisions that are required, as detailed below:

We greatly appreciate the reviewer's positive evaluation of our study. We have addressed all the detailed comments in the following.

The abstract can be more concise. Some sentences should be condensed.

Following this comment, some redundant statements in Abstract are deleted or integrated to make it more concise.

The order of references cited in the context appears to be a little mess, e.g. Line 53-55, Line 107-108, Line 177 : : : and many other lines. The authors should check and correct all of them.

All references in the context have been sorted in the order of "Year + Author".

In section 3.1: The way that "Ld is assumed to linearly increase from clear to overcast 185 conditions at a given temperature" may need a reference.

Thanks, the related references of Giesen et al., 2008; Yang et al., 2011; and Østby et al., 2014 have been added.

For section 3.3 "Tair estimation": The discussion about selection of linear regression as estimating method should be intensified.

We thank the reviewer for this valuable comment. 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., 2016). 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 independent variable is chosen as the T_{air} estimating method in this study."

Figure 3 and Figure 4: sub-plots should be plotted with the same scale.

Figures 3 and 4 have been replotted accordingly.

Figure 5: When x > 0.4, the variation of Tmax estimating accuracy is very flat, especially for Xiao Dongkemadi. I think this should be discussed, possibly due to the sample amounts?

Yes, a sentence is added in section 4.3, as "It should be noted that when the "cloudiness condition" exceeds 0.6 ($x > 0.6$), the sample number no longer varies and due to the limited number of samples, the variation of T_{max} and T_{min} estimating accuracy is rather flat."