Response to the comments (SC2)

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Thank you very much for your valuable comments and suggestions.
Our responses to your comments are as follows:

Regarding comments of RC2, please note that in my comment SC1, I suggest that "the histogram of differences (d) in each layer ... may help".
In fact, P (|d|>2*sigma) = 0.95 is true if the differences are zero-mean Gaussian coherently with authors' lines 32-33: "Assume that m1 = m2 is true and that uncertainty follows normal distribution.". If the differences are zero mean, but non-Gaussian, for example, zero mean Student's t with 3 degrees of freedom, then the constant 2 is wrong and the corresponding Student's t percentile should be used.
So if, after subtracting the mean of d, the distribution of d at a certain pressure level is not approximately Gaussian, then the constant 2 is not the appropriate one.
Which would be the correct constant depends on the distribution of d. So my general consideration does not give the final answer but may help in understanding a step more on this issue.

- Thank you for your very useful comment. We followed your suggestion in SC1 to create the histogram of temperature differences to confirm the distribution. Please see the following Figure R1 (this figure is also attached to our reply to your comments in SC1), which shows the histogram of temperature differences for 70-50hPa pressure layer. The mean of the temperature differences at daytime was about -0.4 K in 70-50hPa pressure layer. The temperature differences are considered to be normally distributed with a non-zero mean. Thus, the large temperature difference of 70-50hPa pressure layer for the daytime observations may have occurred due to systematic effects.

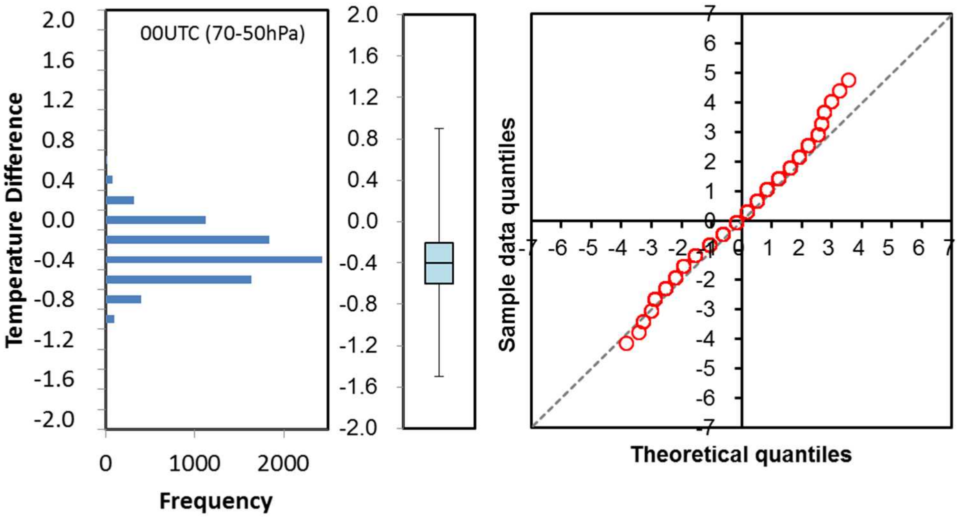

Figure R1: Distribution of the temperature differences at pressures between 70 hPa and 50 hPa for daytime. Left:histogram, center:box plot, and Right:Quantile-Quantile plot.