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Climate of the Past Discussions

Interactive comment on "Temperature trends at the Mauna Loa Observatory, Hawaii" *by* B. D. Malamud et al.

Anonymous Referee #2

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General comments

The study analyzes long-term trends of the hourly temperatures and the DTR at the Mauna Loa observatory. This location best represents an open area with no anthropogenic influence. The nocturnal warming and the decrease of the DTR found in Mauna Loa strengthens some previous studies arguing that regional and global warming are not a reflection of urban heat island (UHI, e.g., Parker 2006, 2010). Thus, the study can contribute to the scientific discussion on global warming and deserves publication, subjected to a major revision based on the following comments.

Specific comments

Measurements of CO_2 concentrations at Mauna Loa observatory have been widely

taken as representative of global average values (IPCC, 2007). However, temperature trends widely differ among regions. While there is a global warming, there are large variations in its rate among various parts of the world and in some regions there is even cooling. Moreover, trends can be different and even opposite between the seasons and the annual temperature trend does not reflect this complexity. The authors should stress the difference between global and regional temperature trends, unlike CO_2 concentrations, and present the regional temperature trends for the study region including the differences between the seasons.

Different causes can explain the slight cooling trend in the maximum temperature against the nocturnal (and average) warming, and thus the decrease in the DTR. The authors should discuss potential causes for the trends found, such as changes in wind velocity, cloud cover and variations in the occurrences and intensity of the regional synoptic systems. It is recommended, if possible, to analyze long-term trends of these factors and correlate them with the temperature and DTR trends.

Table 1 presents temperature trends for different locations and study periods. The discussion on the results presented in this table should be extended beyond the explanations suggested by the authors (the continental location or anthropogenic effects) and consider also potential regional and local causes, as specified above.

In order to present the complicated connections between the long-term trends of the temperature (minimum, maximum and DTR) and the CO_2 concentrations, consider adding a graph of their variations along the study period and the problematic in deriavting the correlation between them.

Suggestion for additional references:

Easterling et al. (1997) Maximum and Minimum Temperature Trends for the Globe. *Science*, 277 (5324): 364-367. DOI: 10.1126/science.277.5324.364

Leathers Leathers D.J., Palecki M.A., Robinson D.A. and Dewey K.F. (1998) Climatol-

ogy of the daily temperature range annual cycle in the United States. *Clim Res*, 9: 197-211.

Parker D.E. (2010) Urban heat island effects on estimates of observed climate change. *WIREs Clim Change,* 1: 123-133. wires.wiley.com/climatechange

Parker D.E. (2006) A demonstration that large-scale warming is not urban. *J Clim*, 19: 2882–2895. DOI:10.1175/JCLI3730.1.

Scheitlin K.N. and Dixon P.G. (2010) Diurnal Temperature Range Variability due to Land Cover and Airmass Types in the Southeast. *J Appl Meteor*, 49(5): 879-888. DOI: 10.1175/2009JAMC2322.1

Technical corrections

1. Add the geographic location of Mauna Loa, i.e., 19˚28'N 155˚36'W
2. Page 2, line 20: Change CO2 to CO_2
3. Page 6, line 4: the difference between the maximum and minimum annual trends is +0.054˚C y^{-1} and not -0.054˚C y^{-1}. Delete the minus before the value.
4. Page 6, line 8: since the separate trends for each 15-year period are not presented in Fig. 3b, change the sentence: "... we divided the annual DTR data in Fig. 3b into..." to: "... we divided the annual DTR data (presented in Fig. 3b) into...."
5. Page 8, lines 9-11: since the study indicates strong nocturnal warming in Mauna Loa, located on relatively low latitudes (the border of the tropics), consider deleting the last sentence "Relatively strong nocturnal warming can qualitatively explain 'why' global warming appears to be concentrated in the high-latitude Arctic (IPCC, 2007)" or refer also to lower latitudes.

6. Page 13, line 8 (caption of Fig. 2): the mean rate of warming.... is +0.021˚C y^{-1} and not -0.021˚C y^{-1}. Delete the minus before the value.

Interactive comment on Clim. Past Discuss., 6, 1685, 2010.