

Interactive comment on “Diurnal temperature range over Europe between 1950 and 2005” by K. Makowski et al.

K. Makowski et al.

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We thank the reviewer for the helpful comments. We copied the remarks from the PDF and compiled them to the list below, A: indicates the beginning of our answer or comment respectively.

P7052 L2 "It has been widely accepted that" - document this. It is not a question of belief but what the data have shown A: References in the abstract are not common but we supported the statement in the introduction section by the references of Karl et al. 1984, Karl et al. 1993, Kukla and Karl 1993.

P7052 L8 "...covering the area from Iceland to Algeria and from Turkey to Russia..." - But none of these are Europe (at least most of Turkey and Russia) A: We rephrased the sentence as follows: "...we selected approximately 200 stations, covering the area

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bordered by Iceland, Algeria, Turkey and Russia for the period 1950 to 2005."

P7052 L11 "...show a statistical significant increase since" - insert "of DTR" A: We inserted "of DTR"

P7052 L14 "The long-term change in DTR is governed by both surface shortwave and longwave radiation" - There are also other terms in the surface energy balance. A: We are aware of that. That is why we wrote "governed" instead of e.g. caused or determined, which we hope the reviewers can agree with.

P7052 L25 "In more detail for the 1950s and 1960s" - What does this mean? "...a characteristic phase of roughly no increase" - What is this? A: We do not completely follow the reviewer's comment concerning this point. We are just describing qualitatively the annual mean temperature series in some introductory sentences. "In more detail for the 1950s and 1960s a characteristic phase of roughly no increase or even decrease is apparent while since the late 1970s an accelerated increase in the mean temperature was observed"

P7053 L1 "The slow and later on enhanced increase of the mean temperature" - Very awkward language - rewrite A: We rephrased the sentence as follows: "The pattern of a slow followed by a rapid increase in the mean temperature is especially evident during the summer months..."

P7053 L10 "...the incoming flux has significantly decreased in nearly all and subsequently" - all what A: We rephrased the sentence as follows: "Measurements of shortwave radiation at the surface, from stations around the globe, have shown that the incoming flux has significantly decreased and subsequently increased at many of the investigated stations..."

P7055 L9 "...data is available only since 1966" - are A: We inserted "are"

P7055 L14 "...likewise the states of the FRY" - What is FRY? A: Please see same page, line 8

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P7055 L17 "...according to the boarder line" - border A: We replaced "boarder" by "border"

P7056 L21 "Additional to the minimum DTR" - In addition A: We replaced "additional" by "In addition"

P7057 L16 "Circumjacent countries, as Portugal, FYR, FCZS" - Is this the same as FRY previously? Again, what does it mean? A: During the preparation of the manuscript we used different abbreviations for the former Republic of Yugoslavia; we did not read carefully enough though the text and made them congruent. We are sorry for the confusion and thank the reviewer for the hint.

P7059 L2 "...from Global Dimming to Brightening" - why use CAPS? A: We removed the CAPS. However, we used CAPS in the first place because we regard "Global Dimming" and "Global Brightening" as well established and especially coined expressions, comparable to a proper noun.

P7060, chapter 4.1 Plot time series of emissions together with DTR, or show scatter diagrams of emissions and DTR - just words like this without showing the data are insufficient. A: We plotted the time series of DTR, SO₂ emissions and sunshine duration (where available) in the new figures 5 and 6. Also we rewrote parts of the section 4.1 which refers to the biggest emitters according to the reviewer's suggestions.

P7062 L3 "...due to the method how" - used to determine how A: We rephrased this sentence while rewriting the section 4.1 .

P7062 L1516 "Summarizing we would like to point out that, for the area of the biggest emitters, if still there are few exceptions," - very awkwardly written A: We rewrote the whole section completely, following the reviewer's suggestions.

P7063 L7 - 11 "Similar to Finland, other countries in Northern Europe, such as Sweden, Norway, Iceland, Latvia, Lithonia and Denmark contribute no more than 10A: We included the citation: (Klein and Benedictow 2006) to support the statement we have

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made.

P7065 L22 "Reading example Table " - What does this mean? A: We changed the title to: "Illustrative example how to read Table 1"

P7067 L1 "time series of FYU" - What is this? A: Again we apologize for the confusion it is meant to be "FRY" and means: "former Republic of Yugoslavia"

P7080, figure 1 The labels "SW heating" and "LW release" are wrong. It is the net radiation that forces the temperature change. There is LW release always. It is not SW "heating" unless this is the only heat source. Furthermore, the shape of the diurnal cycle is wrong. It should have the correct shape and times of day should be noted. A: We are aware of that fact that it is not only the SW or LW radiation causing the temperature change, it is actually all components of the energy balance including amongst net radiation also, latent heat flux etc. . We also agree that LW release happens continuously throughout the day (for that reason we have drawn upward point arrows through all the day in 1b where they denote anthropogenic influence on LW release by greenhouse gases). However, we aim to illustrate the dominant components influencing the temperature change. According to the reviewer's helpful comment we subsequently included: "...cycle under a) weak anthropogenic radiative influence, dominant radiative processes are denoted by arrows." Regarding the comment on the shape of the diurnal cycle we also agree that is not entirely correct, first of all it is only a sketch and from the energetic point of view it is not important how long it takes to heat or cool the atmosphere. The second issue that forced us to draw this graph as it is, was the fact that most aspects that we were trying to illustrate happen mostly during the heating period of the day so we needed more space to draw them, otherwise we would have had to increase the size of the overall figure. Increasing the size of each of the three illustrations would have made it impossible to place them next to each other horizontally. This would have finally made it impossible to see the changes in the mean temperature from panel a) to c) that easily. We still agree that it might be misleading readers who are not active in that research area. To cope with that problem we included the time

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as suggested by the reviewer and in addition we indicated the duration of the different phases of the day to point towards the disproportionality of the graph.

In (b), why is dimming indicated as downward? If it is a cooling, the arrow should be the opposite direction. Doing like this is very confusing. A: As the reviewer noted, the dimming is a cooling effect that is why the arrows are pointing downward in contrast to the upward pointing greenhouse warming. They are pointing downward "intensively" in b) and due to the weakening of the dimming/cooling (also referred to as brightening) less intensively in c).

You should actually plot the diurnal cycles of SW and LW and their changes. A: We did not follow this suggestion because the temperature cycle is something rather simple which everybody senses every day and can easily imagine. That's why it is illustrative and important to show only the temperature and not in addition the more abstract LW and SW cycles.

P7081, figure 2k What is FCZS? A: It is defined on P7055 L15, but we agree that it should again be defined in the figure captions so we included: "FCZS - former Czechoslovakia" as well as: "FRY - Former Republic of Yugoslavia"

P7081 L2 "scaled to 3 degrees" - give units A: We added "Celsius"

P7082, figure 2o What is FYU A: Once more we have to apologize for the confusion it is meant to be "FRY" and means: "former Republic of Yugoslavia"

P7083, figure 3 Why so few stations for England, Italy, and Turkey? A: For Turkey not many sites meet the needs of length. For the UK it is the quality which lacked, for some reasons many sites have very obvious deficiencies in the latest five years so we had to sort them out. For Italy it was both, length and quality issues that forced us to reduce the number of sites which we could use from the ECAD dataset.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 7051, 2008.

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