Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-624-AC1, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impact of humidity biases on light precipitation occurrence: observations versus simulations" *by* Sophie Bastin et al.

Sophie Bastin et al.

sophie.bastin@latmos.ipsl.fr

Received and published: 14 December 2018

A. Referee #1 comments and authors' response on "Impact of humidity biases on light precipitation occurrence: observations versus simulations" J.J. Gómez-Navarro (Referee) jjgomeznavarro@um.es Received and published: 18 July 2018

1 Abstract This study evaluates the performance of a number of regional climate models to reproduce humidity and precipitation. The emphasis of the article lies on the evaluation of Integrated Water Vapor (IWV), as well as its relation with temperature and finally with precipitation. It is found that models tend to overestimate the lower values of IWV, which is closely related to the "drizzling effect", i.e. too often too low

Printer-friendly version

Discussion paper

precipitation.

2 General comments I find this an interesting piece of work. The authors have made an effort to collect and put in comparable terms an heterogeneous set of data, from models to different observed variables at different locations and with different temporal availability. The use of an ensemble of simulations is a particularly good choice, as it provides robustness in the findings. I also like the fact that the authors do not just compare models with observations in plain terms, but they describe a simple two-layer atmosphere model that allows them to modelise the relationship between IWV and relative humidity with temperature, which allows them to gain insight on the sources of model biases. The text is well written and is easy to read, and the conclusions follow from the analysis carried out. Therefore I have only found very minor issues that the authors might want to consider.

»We thank the referee for the positive comments and we took in consideration all the minor issues listed in section 3.

3 Specific comments & Technical corrections 1. Pag. 6, line 23: has been → have been -> done 2. Pag. 7, line 1: consists in → consists of -> done 3. Pag. 7, line 34: Due to the existence of gaps in the observational dataset, which reduces... -> done 4. Pag. 10, line 18: valeurs → values? -> done 5. Pag. 11, line 20: I'd suggest that s, in Qs(T) to be called subscript, not exponent. An exponent is something else -> done 6. Pag 10, line 28: Why do we have that Qs(TFT)$\approx\alpha$Qs(TBL)? It is not obvious to me.

»The August-Roche-Magnus formula (approximation of Clausius-Clapeyron law) allows to express qsat (specific humidity at saturation) in function of Ta (air temperature (in °C)) :

es = 6.1094*exp((17.625*Ta)./(243.04+Ta)); qsat = 0.622*(es./(Pa-es));

Fig.AC1toRC1 plots qsat = f(Ta) and it shows that for low T, qsat is less than 2 g/kg, and it increases exponentially at high T. But in our 2-layers model, we consider the averaged

temperature of the boundary layer, not the surface temperature, so it is not so high, and we consider that T is around 280-290K, so qsat is between 6 and 12 g/kg ; and for the free troposphere, the temperature is less than 260K and qsat is less than 2 g/kg. The ratio between Qs(TBL) and Qs(TFT) is then close to $1/\alpha$. In the text, we added some indications on these values and we mentionned the August-Magnus-Roche formula.

7. Pag. 12, line 8: What is Tb1 and Tb2? »Tb1 is the temperature after which RH starts to decrease, while Tb2 is the temperature after which IWV starts to decrease. We clarified that in the text in this way :

'RH starts to decrease significantly at T$\sim$13°C (hereafter called Tb1), while IWV curve deflects at T$\sim$16°C (hereafter called Tb2)'

We also added vertical lines on Fig. 5b to indicate Tb1 and Tb2.

8. Pag. 12, line 33: What is SD? »SD is for standard deviation. We replaced SD by the full name.

9. Figure 5: Should the right panel in the first row be labelled d? Further, that panel has particularly low resolution and generally lower presentation quality than, let's say, Figure 4

» the right panel of the first row is now labeled b, and the two plots under it are now c and d. References to these subplots have been modified in the text accordingly. We also improved the quality of this figure and added vertical lines for Tb1 and Tb2 on subplot b. The colors for IWV have also been inverted to have hot colors for dry areas and cold colors for humid ones, as suggested by reviewer 2.

10. Figure 6: The same applies here. The first panel has bad quality and different aesthetics. I'd advice to follow the style followed to produce Fig. 4

»We tried to improve the esthetics of the figure as much as we could.

11. Figure 7: the lines surrounding the panels are partly hidden by them and produce

an ugly effect that should be avoided in the final version of the manuscript

» Figure 7 now appears correctly in the PDF file.

12. Figure 9: The panels could be larger to take better advantage of the available space. Unlike in the other two, the third column has no right and top axis. The labels in the first row overlap with the axes. The low resolution issue applies here as well. There is no legend.

» We added a legend and right and top axis in the third column. Labels are also better located and resolution has been improved.

The marked-up manuscript including all the changes has been uploaded as *.pdf supplement

Please also note the supplement to this comment:
https://www.atmos-chem-phys-discuss.net/acp-2018-624/acp-2018-624-AC1-supplement.pdf

---

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-624, 2018.

Printer-friendly version

Discussion paper

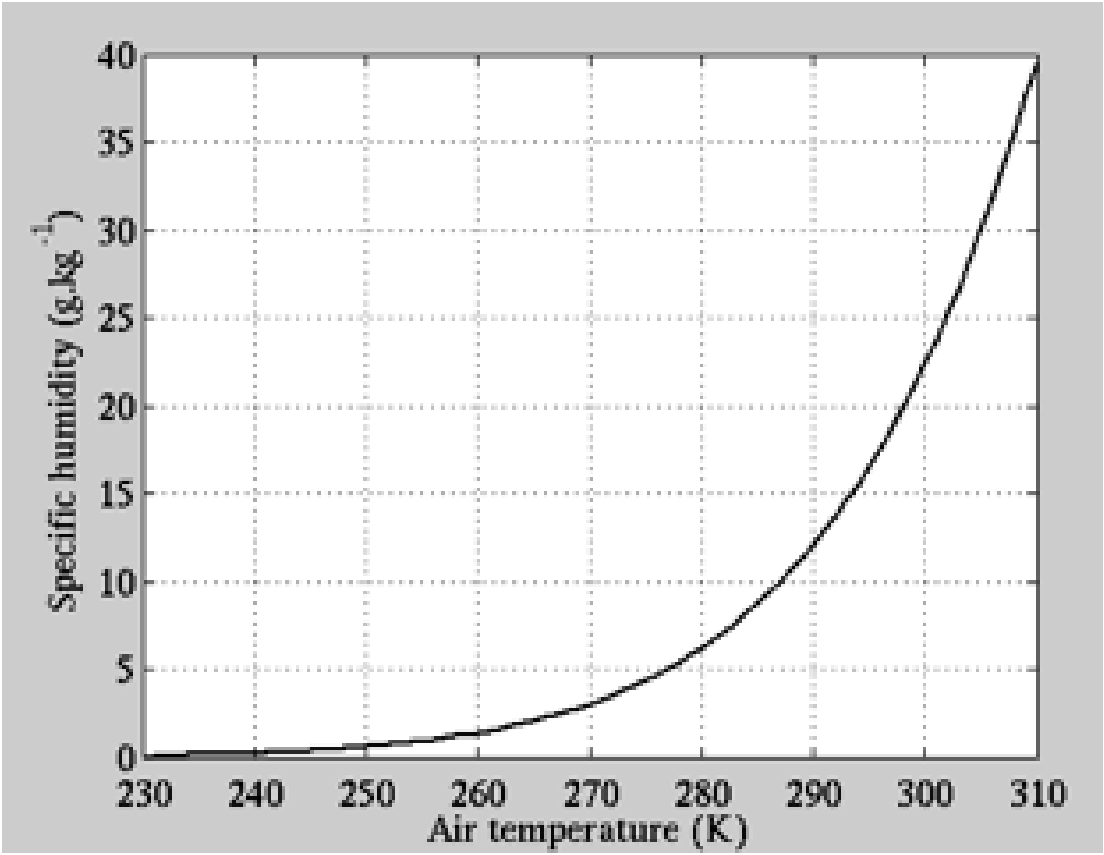

Fig. 1. Fig.AC1toRC1:Specific humidity at saturation in function of temperature following August-Magnus-Roche approximation of Clausius-Clapeyron law.

Printer-friendly version

Discussion paper