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Interactive comment on "Towards European-Scale Convection-Resolving Climate Simulations" *by* David Leutwyler et al.

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Received and published: 5 July 2016

In the article "Towards European-Scale Convection-Resolving Climate Simulations present an adapted version of the COSMO-CLM model" Leutwyleret al. present a new version of the COSMO-CLM model that allows weather and climate simulations on GPUs. They impressively demonstrate the computational efficiency of this approach and the feasibility of the model to simulate processes from the mesoscale to the synoptic-scale by analyzing a strong, large-scale forced winter storm and weakly forced summertime convective storms. The article is well write well suited for publication in GMD. I have only minor comments that are listed below.

L9: I suggest to replace demonstrate with e.g., present. L9: continental-scale L12: There are several places in the manuscript where commas are missing (here after

"Furthermore,...". Please revise the document accordingly. Here are the locations where I found missing commas but there might be more. L61, 76, 122, 142, 200, 270, 301, 408, 460 L126: You already introduce the acronym COSMO in L109. L149: I would suggest to make Figure 2 to Figure 1 since you mention it first in the text. L274-384: I suggest to shorten this section. For me, the basic message here is that the 12 km simulation performs very similar to the 2 km simulation in this kind of storm but the 2 km simulation is able to add some small-scale processes/details that are not present in the 12 km run. I think this can be communicated more concisely. As you mention at the end of this section, a real comparison and evaluation of the two models is not feasible and therefore the detailed description of the differences between the two models can be shortened. L307: What do you mean with observational reference here? If you refer to ERA-Interim I would change observational to reanalysis. L308: Should be ERA-Interim L330: I cannot see that the band is much narrower in the 2 km model in Fig. 6. Also in the bottom panel I would argue that the 12 and 2 km simulation are remarkably similar and not that the differences are even more pronounced as you state in L303. L340-1: In my printout it is very hard to see the difference between 20 mm/h and 50 mm/h. I have similar issues with Fig. 7, 10, and 11. Changing the color map might help to visualize the differences. L350: "..., does not exhibit much similarity." I would change this to ", are different." L387: I suggest to write "An over-prediction..." L389: Please add which version of E-OBS you used. L397: You could add e.g., the pattern correlation coefficient here to quantify what you mean with well captured. L398: Change observations to observed precipitation L399: You could add Prein and Gobiet 2016 here who compared E-Obs precipitation with high-resolution observations in large areas of your simulation domain. L407: Replace: "is already at its peak around noon" with e.g., "has a precipitation peak at noon". In addition, you state that the convection is still building up in the 2 km model but you do not investigate convection here but only investigate precipitation. L439: ...in the 900 hPa... L556: I would suggest to add that you are talking about AMIP style GCMs here. L576-7: add – between the number and the km as you did in L581:

All Figures: I would suggest adding panel names to your figures (e.g., a,b,c...). It is sometimes hard to know which panel you are referring to in the text. Figure 1: Add Southern to UK Figure 2: right column – Would it be possible to have the contour labels more similar to the other maps. There are only very few labels in these maps. Figure 6: The embedded convection that you are talking about in the text is hard to see in my printouts. A way to visualize this more easily could be to show the vertical velocity (e.g., at 700 hPa) instead of the cloud field. However, I leave it up to you if you want to make this additional effort. Figure 9 right panel: Shouldn't this be mm/d? Figure 10: I guess you mean Figure 12 instead of Figure 7 here? Looking at this snapshots it seems like that the largest differences are found over the Iberian Peninsula and Eastern Europe. The cloud field in these regions look very different in the 2 km simulation. Figure 11: These maps are too small. You might want to split them in two figures or move the maps from the right two columns beneath the left columns.

Best regards, Andreas Prein

Literature: Prein, A. F. and Gobiet, A. (2016), Impacts of uncertainties in European gridded precipitation observations on regional climate analysis. Int. J. Climatol.. doi:10.1002/joc.4706

Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-119, 2016.