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Geoscientific Model Development Discussions

Interactive comment on "Validation of the ALARO-0 model within the EURO-CORDEX framework" *by* O. Giot et al.

O. Giot et al.

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We wish to thank the referee for his/her comments and useful suggestions that have now improved the manuscript and have acknowledged his/her efforts in the manuscript.

p 8389, l 10: I'd not speak of "feed-backs" here. Such feedbacks wouldn't be addressed by one-way coupled downstream models.

We agree and have changed "feed-backs" to "interactions" in the text.

p 8389, l 13-19: I'd suggest to mention here that also empirical-statistical downscaling is part of (EURO-)CORDEX.

Agreed, we have added the lines: "The Coordinated Regional Climate Downscal-

ing Experiment (CORDEX; Giorgi et al., 2009) aims to perform both empirical-statistical downscaling and regional climate simulations on different areas across the globe."

p 8389, l 23: "Limited Area Models" instead of "Local Area Models".

Thank you, we have changed this.

p 8390, l 13-14: The term "scale awareness" remains obscure here. The following sentences are somehow related to it, but don't provide a clear picture. Can the authors better specify what is meant here?

The details of the 'scale-awareness' are presented in De Troch et al., 2013 and Gerard et al., 2009. We have changed this part to: "The main feature of 3MT is scale-awareness, i.e. the parameterization itself determines which processes are unresolved at the current resolution, in contrast to traditional parameterizations which are switched on or off or have different tuned parameter values at different resolutions. This allows 3MT to generate consistent results across scales, as shown by De Troch et al. (2013) in an extended downscaling experiment covering the period from 1961 to 1990."

p 8390, l 27-30: Unclear. What's the meaning of "uninterrupted" here?

The runs performed by De Troch et al. were re-initialized daily, i.e. the model fields were reset to the ERA-Interim values every 24 hours, followed by a 36-hour of which the last 24 hours were used for analysis. Another way to look at this, is that a 36-hour weather forecast was performed for every day in the ERA-Interim period, with ERA-Interim as initial and boundary conditions. The setup by De Troch et al. was chosen to capture afternoon summer convection for several model resolutions. By contrast, for the current study, initial conditions were taken only once from ERA-Interim (1st of January 1979) and then the simulation was only forced at the boundaries. To clarify this in the text we have added: "The

model setup differs from the setup used in De Troch et al. (2013), since in the current study simulations are initialized on the 1st of January 1979, after which they are only forced at the boundaries by ERA-Interim. This allows the model and its surface fields in particular to become independent of the initial state."

p 8391, l 7: "The objective of the present work" instead of "The goal of the current text".

Thank you, we have changed this accordingly.

p 8391, l 21: "were analyzed" instead of "are performed" (K14 only analyzed the ensemble results, but didn't carry out all the simulations).

Thank you, we have changed this accordingly.

p 8392, l 8-28: The difference between ALADIN and ALARO-0 is not entirely clear to me. Please better clarify this aspect.

We added some clarifying sentences: "Essentially, ALARO-0 uses the dynamical core of ALADIN, but with different physics routines (e.g. for radiation, microphysics and convection, cloudiness, turbulence), which are designed to tackle the issues that arise when using resolutions of 1-15 km, which is known as the grey-zone for convection."

p 8392, l 8-24: The treatment of SSTs is not clear. According to my understanding of the current text, SSTs are only updated monthly. Is this really true? Furthermore, the authors speak of "interrupted" simulations, while before (page 8390) the present experiments were introduced as "uninterrupted" simulations. There seems to be some mismatch. Concerning the constant monthly fields (roughness length etc.): Are these sharply changed when reaching a new month (which I guess is not the case), or are they interpolated between the centers-of-months?

Yes, indeed, SSTs are updated sharply every month. The reason for this is that ALARO-0 has been developed as a NWP model, for which over the course of a few days it is common practice to keep SSTs constant, especially for a domain of

which only a small area consists of ocean. Therefore, technically changing SSTs during the simulations is not (yet) possible. To grasp at least the seasonal cycle of SSTs, runs were "interrupted", i.e. stopped and restarted with adjusted SSTs and some other climatological fields (mainly fields that are related to the yearly cycle of vegetation such as LAI, surface albedo and roughness lengths). However, all other (prognostic) fields are unchanged. As such, only parameters of the surface scheme and SSTs change instantly at the beginning of the month. We acknowledge this practice is not optimal. Indeed, interpolation between centers-of-months would be a first step in order to avoid introducing sharp changes. This is planned to be implemented in a new version. We however believe that the sharp changes introduced in this way do not lead to major issues or feed-back into climatological fields.

Together with the previous remark about the usage of "uninterrupted", we see that there is an inconsistent usage of the word throughout the manuscript. Therefore we have removed "uninterrupted" from the text and replaced it by 'a single initialization of all fields', as shown above for (p 8390, l 27-30) and also in the conclusion (p 8400, l 11-13): "In this study, for the first time ever the ALARO-0 model was used to perform continuous climate simulations on a European scale for a 32-year period."

p 8393, l 11: Which version of EOBS has been used?

As in K14 version 7 was used. We have added this information in the text.

p 8394, l 1: I'd suggest to rename this Section to "Analysis methods".

Agreed, we have changed this.

p 8394, l 17: "for this purpose" instead of "for this end".

Thank you, this has been corrected accordingly.

p 8397, l 1-6: This results is very interesting (similar for precipitation later on). Do the

authors have any explanation for the large confidence intervals for these scores?

The reason is given in the discussion section: p 8400 l4-5: "This does not hold for some RIAV and most of the TCOIAV scores due to the fact that these exactly assess interannual variability". Additionally, these scores are based on a sample of only 20.

p 8399, l 3: "bias patterns" instead of "bias pattern".

Thank you, this has been corrected accordingly.

p 8399, l 6-7: Could the these low correlations partly be explained by the comparatively large model domain of ALARO-0 (weaker control of boundary forcing)?

Yes, this very possible. We have added this suggestion in the text: "Both spatial and temporal variability are very well reproduced by ALARO-0, while correlations are on the low side compared to other models. The latter could partly be explained by the comparatively larger domain of ALARO-0 which could imply a weaker control of the boundary forcing."

p 8400, l 13: "Within the framework".

Thank you, this has been corrected accordingly.

Figures 2 and 4: The caption of these figures should additionally mention that RMIB-11 is shown.

Indeed, we have added this to the caption.

Figures 3 and 5: These figures need to be enlarged, there's a lot of detail here which is not really accessible. A legend should be introduced (meaning of markers and shadings). I'd also suggest to add a horizontal line above each "DJF" entry to better separate the individual regions from each other.

These figures were produced and submitted as a vector pdf and can therefore be

enlarged without loss of quality. We will request the editor and typesetter to enlarge these figures as much as possible for publication (if possible put them on a separate full page, rotated a quarter turn). We have added a legend horizontal lines, which indeed allows for a better overview. Please see new figures below.

Availability of data: The authors should provide the information, if and where the ALARO-0 simulation results are available. Are they planned to be uploaded to the ESGF archive?

Yes, the uploading to ESGF is planned. We have added this in the last lines of the 'Data and Methods - Setup of the ALARO-0 model' section of the manuscript: "This model data will be uploaded to the Earth System Grid Federation (ESGF, website: esgf.llnl.gov/) data nodes."

Interactive comment on Geosci. Model Dev. Discuss., 8, 8387, 2015.

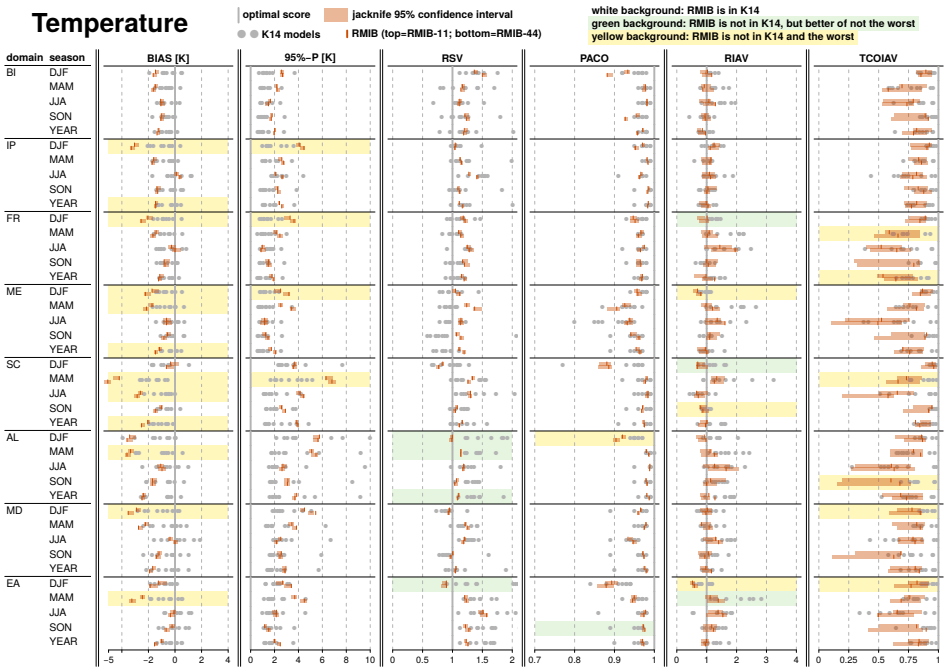

Fig. 1. Scores for near-surface air temperature for all domains (first column), seasons (second column) and metrics.

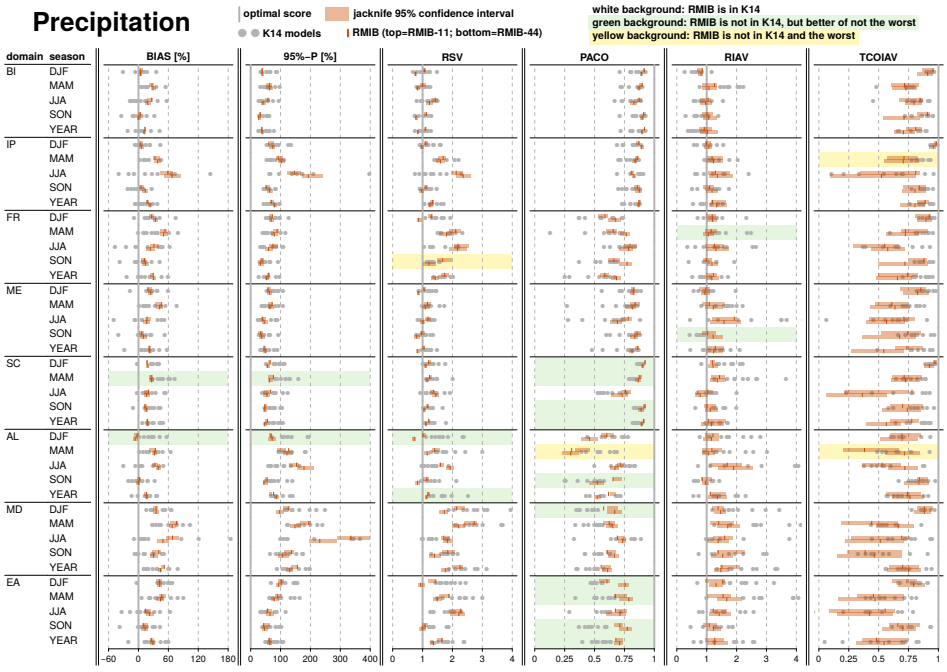

Fig. 2. Scores for precipitation for all domains (first column), seasons (second column) and metrics.