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Geoscientific Model Development Discussions
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Interactive comment on "Role of atmospheric horizontal resolution in simulating tropical and subtropical South American precipitation in HadGEM3-GC31" *by* Paul-Arthur Monerie et al.

Anonymous Referee #1

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Review: HadGEM3-GC3.1 atmospheric-only simulations are assessed to discuss the impacts of horizontal resolution increasing on the precipitation climatology and precipitation variabilities (in intensity and in the space and time) over South America. Three ensembles of HadGEM3-GC3.1 with horizontal grid spacing of approximately ∼130 (N96), 60 (N216) and 25 km (N512) are compared with reanalysis (NCEP and ERA-Interim) and satellite data (CMORPH) to evaluate the impacts of resolution on precipitation using different metrics (climatology, seasonality, large scale influences of MJO and ENSO, coupling between precipitation and soil moisture, intensity distribution, dry spells, etc.). The results are new and very relevant since are showing that improvements on precipitation occur when the resolution is increased from N96 to N216 for

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Discussion paper

most regions of South America, while over the Andes Mountains the improvements continue until N512. The improvements are associated with better simulation of moisture flux convergence and daily precipitation distribution at fine resolution. In addition, the authors do not found any relevant impacts of resolution on low-frequency variability of precipitation (MJO and ENSO forcings). Overall, this study contributes to understanding the impacts of model resolution on precipitation at spatial and temporal and some limitation of resolution refinements. The manuscript has new contributions to the atmospheric modeling area and it is worthy of publishing after some minor revisions.

Minor comments

In some parts of the text appear “north-east”, “south-east” and in others, respectively, “northeast”, “southeast” to refer to the same geographical regions in Brazil ((Lines: 16, 17, 31, 32, 43, . . ., 504, 508, L514, . . .). Please, to unify how to refer to these regions preferentially using “northeast” and “southeast”

L32, L51, L82 – “de Souza Custodio et al. 2017)” to “Custodio et al. 2017)”

L38 – to remove “over South America”

L57 – In relation to the “South American Monsoon System âĂİ. . .” to refer to Vera et al. (2006). Vera, C., et al. (2006), A unified view of the American monsoon systems, J. Clim., 19, 4977–5000.

L103 – should be “improves the modeled precipitation variability over . . .”

L142-143 – Please, to include the information of what are the horizontal resolutions of GPCC, University Delaware, NCEP-NCAR and ERA-Interim.

L146 – The citation of ERA-Interim in this context is wrong since it is available only from 1979. Please, check.

L194 – I suggest to change “over the equator . . .” to “over tropical latitudes . . .”\

L195 – “eastern Brazil is relatively dry” should be “northeastern Brazil is relatively dry”

since in subtropical eastern of Brazil precipitation is between 4-6 mm/day, which can not be considered dry.

L231- Is hard to interpret Figures 2d-e-f since they do not show any important difference over the continent. This occurs because they are using the same scale of Figures 2-a-b-c. I suggest to the authors to remove Figures 2d-e-f or to change the scale to illustrates what is important in terms of evapotranspiration over continental areas. L346 – change “1, 7 and 8 . . .” to “1, 7 and 8 (Fig. 6a-g-h) . . .”

L386 – change to “moisture flux convergence . . .”

L395 – “over eastern Brazil . . .” should be “over eastern Brazil and southeastern South America “ L416 – I am seeing overestimation in Figure 9e over northeastern Brazil (the box to east 45oW and north 15oS) and not over “eastern Brazil”. Please, verify the affirmation.

L457-459 – Please, check the letters of Figures 10 and 12: a) L457 “Fig. 10c and Fig. 10e” should be “Fig. 10h and Fig. 10j”; b) L458 “Fig. 10e; Fig. 12g” should be “Fig. 10g; Fig 12e”; c) L459 “Fig. 10e; Fig. 12h-j” should be “Fig. 10h-j; Fig. 12e”.

L461 – The correct location are “Peruvian Andes, Paraguay, and northeastern Argentina”

L475 – “function of time (Fig. 13a-d) and distance (Fig. 13e-h). . .” should be “function of distance (Fig. 13a-d) and time (Fig. 13e-h)”

L489 – “precipitation features . . .” should be “simulated precipitation features . . .”

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