**Geoscientific
Model Development
Discussions**

Interactive comment on "The HadGEM2 family of Met Office Unified Model Climate configurations" *by* The HadGEM2 Development Team: G. M. Martin et al.

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Q: - p. 767, l. 19: "climate prediction" I think "projection" is a better word than "prediction". Prediction is widely used in meteorology and in order to dissociate climate from meteorology I have the impression that using a different word is better. Moreover the authors may have in mind the potential predictability of the climate system at the decadal time scale. This is actually an area of intense research for the last few years. Nevertheless, no clear conclusions have emerged yet concerning any predictability at this time scale. I think that the authors have to define what they were thinking of by using the term "prediction". The same problem appears elsewhere in the manuscript

(p. 768, l. 4; p. 790, l. 2).

A: The reviewer is quite right that we should have used the phrase "climate projection" rather than "climate prediction" here and elsewhere in the paper. This has been changed.

Q: - p. 775, l. 15: I have difficulties to find the comparison between GPCP and CMAP in the Taylor diagram. I think I have missed the symbol, which is not easy to find in my view.

A: CMAP is the reference dataset and thus lies at the "Obs" point on the diagram. The comparison between GPCP and CMAP is therefore the distance between the blue square and the "Obs" point. We will add a note to the caption to clarify this.

Q: - p. 775, l. 20-25: I think it will be valuable to quantify (in the text) the improvements that are found in the Taylor diagram between HadGEM2 family and HadGEM1 for the different variables discussed in the text. For instance the authors can compute the mean distance to the observations in the space of their Taylor diagram and provide this figure in parenthesis for each variables they discuss.

A: This is a good suggestion, although since the Taylor diagram gives information on both the spatial correlations and the r.m.s. errors, the actual distance to the observation point combines both of these factors. It is possible that this distance may not change much even though one of these factors is improved considerably. Thus we consider that including such figures could be misleading.

Q: - p. 777, l. 25: "show overall improvement". This is very difficult to draw such a conclusion when looking at Fig. 4. This seems region dependent (worst in South America for instance) and the colour scale is not very helpful. Please try to be more specific concerning this overall improvement and find a more appropriate colour scale.

A: We assume that the reviewer is referring to Fig. 6. In response to a suggestion made by Referee #2, we have included bias, RMS and correlation values for each

of these plots. We have also adjusted the colour scale, and included comments on the increased bias in some regions, including South America. The revised figure is attached.

Q: - p. 783: Please give a word (and/or reference) concerning the representation of the Atlantic Meridional Overturning Circulation in the model family

A: Discussion of the strength of the AMOC in HadGEM2-ES compared with that in HadGEM1 has now been included in Section 4.2.5. The strength of the Atlantic Meridional Overturning Circulation (AMOC) in HadGEM2-ES in 1990-2000 is 16.0±1.0 Sv (mean and standard deviation of annual mean overturning streamfunction minima at 30°N from a four-member ensemble of historical simulations; Menary et al., 2011), only slightly weaker than observational estimates of the AMOC from 26.5°N of 18.7±2.1 Sv (mean and best estimate of uncertainty over the period 2004-2008; Kanzow et al., 2010). The AMOC strength at 26°N in the pre-industrial control simulation of HadGEM2-ES is 13.3±1.0 Sv (mean and standard deviation of 495 years of annual mean data; Roberts and Palmer, in preparation), which is rather weaker than that in the pre-industrial control simulation of HadGEM1 at the same latitude (16.0±1.0 Sv: mean and standard deviation of 1150 years of annual mean data; Roberts and Palmer, in preparation).

Q: - Table 2: It will be more appropriate to use mSv (103 m3/s) in this table since most of the figures are smaller than 0.1 Sv (which is nice).

A: Done.

Q: - Fig. 6: which time period is used for the comparison?

A: Both model averages are ~20 years: HadGEM2-AO is a present-day control run based on the year 2000 and HadGEM1 is the 1979-1999 period from a historical run (this information is provided in section 4.2). The CRU climatology is 1961-1990, but has the advantage over other surface temperature datasets that it is provided at 0.5 x

0.5 deg resolution.

Q: - Fig. 14: Please provide a colour bar scale.

A: Done. Replacement figure attached.

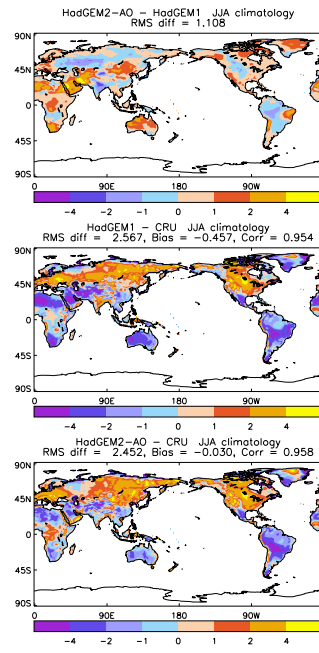Interactive comment on Geosci. Model Dev. Discuss., 4, 765, 2011.

HadGEM2-AO - HadGEM1 JJA climatology
RMS diff = 1.108

HadGEM1 - CRU JJA climatology
RMS diff = 2.567, Bias = -0.457, Corr = 0.954

HadGEM2-AO - CRU JJA climatology
RMS diff = 2.452, Bias = -0.030, Corr = 0.958

Fig. 1. Revised Figure 6

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a U(m s⁻¹), DJF, HadGEM2-CCS
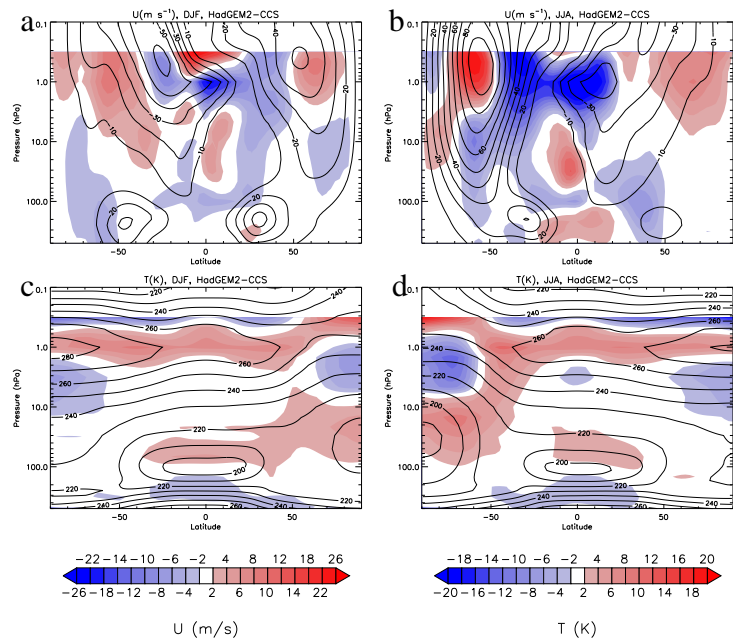b U(m s⁻¹), JJA, HadGEM2-CCS
c T(K), DJF, HadGEM2-CCS
d T(K), JJA, HadGEM2-CCS

U (m/s)
T (K)

Fig. 2. Revised Figure 14

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