Reply to the comments of reviewer #3 on paper CLIDY-D-09-00146 "*Scale-decomposed atmospheric water budget over North America as simulated by the Canadian Regional Climate Model for current and future climates*" submitted by Raphael Bresson and René Laprise.

This paper presents a scale analysis of the atmospheric water budget in North America as simulated by a regional climate model (RCM) driven by a global climate model (GCM). The paper follows rather closely the method developed in a previous work by Bielli and Laprise (2006). From the technical point of view, I do not have any major comments. The method is well established, the analysis is straightforward and the conclusions, although not particularly surprising, are solid. From the editorial point of view, however, I found the paper too lengthy and descriptive, and to be honest, a bit tedious to read. In my specific comments I offer some suggestions to make it more agile, which the authors may want to consider. My recommendation is for publication after revision to address the comments below.

We thank this reviewer for his encouraging and constructive comments. In the revised version, the paper has been shortened by 5 pages and the number of figures reduced to 15. In particular the section on current climate has been cut down by 4 pages.

We also tried to make the text more agile and pleasant to read. For example the explanations of figures have been limited to the minimum necessary in the text and concentrated in legends. We also focused on more important results, both in the current climate section, in order to be more synthetic, and in the future climate section, by carrying out statistical local significance tests for climate-change projections (see section 2) and displaying and discussing only significant values.

Specific comments

1) *I wonder whether the extensive description of the present day simulation is entirely needed. It seems to me the basic model behavior is rather similar to that discussed by Bielli and Laprise (2006), so is it really necessary to go through it in detail again? I would suggest to look at the option of presenting a brief summary of the conclusions of Bielli et al. (2006) and discussing in some depth where substantial differences compared to that work are found. In particular, it would be important to clearly identify where (or if?) the use of GCM vs. Analyzed boundary conditions is affecting (deteriorating?) the model behavior. This would substantially reduce section 3 and make it perhaps less descriptive and more agile to read.*

Section 3 has been shortened for the analysis of current climate for both the winter and summer seasons. The interannual variability is not dealt with anymore and the discussion has been reduced to the most important remarks. The summary and conclusion section and the abstract have also been reworded in consequence.

The number of figure has also been reduced, from 4 to 3 for each season. Some panels have been withdrawn (for each season: 4 panels concerning the interannual variability, as well as 5 panels showing the intraseasonnal variances of total water budget variables).

However we believe that the results for the current climate are worth being described again, since the configuration of the simulation used here is significantly different from the configuration of the simulation used by Bielli and Laprise (2007). We also believe that examining the results for the current climate helps the reader to better

understand the future climate results. Therefore we kept figures displaying scale-decomposition results for the current climate.

The purpose of the paper was not to investigate specifically the differences between our results and those obtained by Bielli and Laprise in a different experimental configuration. In the revised paper, we emphasise the fact that the driving data are different (NCEP-NCAR for them and CGCM3 for us). The CRCM version is also different. In particular, our version includes an up-to-date surface scheme, whereas their version used a simple bucket model. The domain size is also different.

2) *It would be useful to have a short section summarizing the main biases in the GCM simulation and how these are reflected in the RCM results.*

The main purpose of the paper was not to investigate the biases of CGCM3, something that the authors of the model at CCCma are currently working on. Rather the purpose was to investigate the performance of the CRCM when driven by CGCM3 rather than reanalyses, as was the case in Bielli and Laprise. We believe that doing an analysis of the CGCM3 biases would lead us to far from our main topic, which is the contribution of scales to the water budget climatology and to its evolution accompanying a warmer climate. Moreover the good agreement between our results and those of Bielli and Laprise (2007) also shows the good agreement between the CGCM3 and NCEP/NCAR reanalyses. A discussion on the CGCM projected climate with respect to the other models of the IPCC can be found in the 4th assessment report of the IPCC.

3) *In line with the previous comments, section 4 could also be a bit streamlined.*
For example, instead of going through a systematic description of each term, the authors could focus a bit more on the "added value" issue, which in my opinion is the most interesting aspect of this work.

As section 3, section 4 has been reduced. For each season, 1 figure has been removed. The statistical local significance tests that have been performed for climate-change projections helped us focusing on most important results. After a necessary description of the changes in the climatology of the atmospheric water budget, all the scale-decomposition results focus on the comparison of the small- and large-scale contributions to these changes.