

Second review for Keen and Blockley

## **Investigating future changes in the volume budget of the Arctic sea ice in a coupled climate model**

Submitted to *The Cryosphere*

I thank the authors for answering my questions clearly and taking into account my comments. The manuscript has a clearer purpose and an improved structure compared to the last version. I also appreciate that the results are underlined more quantitatively than before in the text.

Besides the comments below, the science behind the manuscript is clear enough. However, I suggest that the authors use more conjunctions to improve the readability of this very technical and descriptive study.

Still, overall, the manuscript is nearly ready for publication and I only recommend minor revisions.

### **Thematic comments**

#1 P9L12: I would agree that increased CO<sub>2</sub> has an influence on incoming longwave radiation, but I do not know how it has an impact on incoming shortwave. Could the authors clarify?

#2 P9L16 : I suggest replacing “non-shortwave” by longwave. Notz and Stroeve (2016) show that the highest effect comes from the incoming longwave radiation.

#3 P9L16-19: The reasoning of this part is not clear: There is not much change in downward longwave, there is an increase in the outgoing longwave, but the net change is an increase in net downward longwave. There is one explanation missing to make this couple of sentences logically linked.

#4 P11 L5-10: Is there a reason why RCP4.5 is not really mentioned?

### **Style**

#5 In contrast to a flowing story, the manuscript reads mostly as a succession of figure/process descriptions. I suggest to work on clear transitions and on highlighting logical links and contrasts.

#6 Several times, the HadGEM2-ES is described as a CMIP5/AR5 model. I suggest stating it just once in the beginning.

#7 Especially in the conclusion/discussion, “for HadGEM2-ES” is repeated many times. I think it is clear that results stated there are for HadGEM2-ES unless specified otherwise. I suggest going through this part again and remove some of these mentions.

### **Technical comments**

P8 L1 : it begins (s is missing)

P9 L30: I suggest starting the sentence with “however” to make clear that there is a contrast here.

Figure 6: I suggest writing the corresponding represented period as a title for each subplot.