Earth System
Dynamics

Discussions

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Interactive comment on "Seasonal prediction skill of East Asian summer monsoon in CMIP5-Models" *by* Bo Huang et al.

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Received and published: 17 July 2017

We thank reviewer 1 very much for her/his helpful comments. We took her/his remarks into account and improved the manuscript accordingly.

Minor comments:

1. Comment: There are more than 20 models in CMIP5, they are different from each other, the author should clarify the rationality of the six model used in the study.

Response: You are right. There are more than 20 models contributing to the CMIP5 project. Our manuscript discusses the prediction skill of EASM on seasonal time-scale. Therefore, a yearly initialisation is required. Only the six models have been initialised with a yearly time-frequency. There is a detailed description of the models in section

2.1, line86-96. More information about the six models can be found in Table 1 and 2.

2. Comment: The structures of this paper need to be organized substantially. The authors should pay more attention on the analysis of the performance of EASM with different model instead of introducing the previous results in the main body.

Response: We changed the structure of this paper. The summary (section 6) comes now after the discussion (section 5).

CMIP5 models have been wildly used to investigate the monsoon change in East Asia. In our paper, we solely focus on the seasonal predictability of the EASM aspect. A comprehensive evaluation of the performance of the CMIP5 models exceeds the scope of this paper. Some analysis can be found in Sperber et al. (2013).

Previous study shows that the prediction of the climate on seasonal time-scale is the initial value problem (Meehl et al., 2009). Given suitable initial condition, coupled models have potential to predict the climate. Furthermore, CMIP5 models illustrate significant improvement in simulating the EASM (Sperber et al., 2013). Meanwhile, the models show the ability to predict the SST indicator (i.e., El Niño-Southern Oscillation-ENSO index) up to 15 months in advance (Choi et al., 2016; Meehl et al., 2014; Meehl and Teng, 2012). This extended prediction skill of the ENSO suggests that the EASM can be predicted on a seasonal time-scale if the dynamic link between the ENSO and monsoon circulations is well represented in these models. Analysing the six suitable CMIP5 models, we find that the GFDL-CM2p1 and the MIROC5 add prediction skill in simulating the EASM index with initialisation, the BCC-CSM1-1, the CanCM4, and the MPI-ESM-LR change the skill insignificantly, and the HadCM3 indicates a decreased skill score.

Our paper pursues following structure: why do these models show different reactions? To answer this question, the different response of the models to the initialisation has been evaluated. An EOF method has been employed to analyse the principle components of the models simulated EASM. The result show that the GFDL-CM2p1 and

MIROC5 have better performance to simulate the first EOF leading mode. Wang et al. (2015) found that in EASMs the first EOF leading mode is the ENSO developing mode. We checked the ENSO-EASM coupled mode in the six models investigated, and found that only the GFDL-CM2p1 and MIROC5 simulate this ENSO-EASM coupled mode. This answers the question about the different responses to the initialisation in the models.

3. Comment: The conclusion of this study is vague and needs to the summarized deeply. Besides, Line 327-328 should be moved Section 1 or section4.

Response: The summary and the discussion have been reorganized. The summary now follows the discussion.

The sentence in Line 327-328 (now 292-294) is basis of the first part of our discussion, which was found by Wang et al. (2015). To keep the flow of argumentation tight we think it is appropriate at this place.

The main fining of this manuscript is that the GFDL-CM2p1 and MIROC5 exhibit better prediction skill of the EASM due to their ability in capturing the EASM-ENSO coupled mode.

Specific comments:

1. Comment: The conclusion of EASM-ENSO coupled mode should be put in the abstract.

Response: The EASM-ENSO coupled mode is defined by Wang et al. (2008). The different depiction of EASM-ENSO in the CMIP5 models can explain the different response to the initialisation in the models (Abstract, line 21-24). We added a sentence to the abstract to clarify why the simulation of this mode is important (line 24-25).

2. Comment: Line 162-164, the authors should give the sample size in calculating ACC.

Response: In section 2.1, we describe the datasets which are used in our study. The temporal coverage of these data is satellite era (1979 to 2005). Therefore, the sample sizes are 26.

3. Comment: Apart from the analysis of each figure, the authors should also give a brief summary of each figure. For instance, after Line 187, what is the key findings of Figure 1 and 2.

Response: Line 166-167 shows the finding of figure 1.

We added two sentences to clarify the summary of figure 2, line 187-190.

We also show the summary for each figure in Section 6.

The logic and structure of our paper can be found in response of minor comment 2.

Please also note the supplement to this comment:
https://www.earth-syst-dynam-discuss.net/esd-2017-51/esd-2017-51-AC1-supplement.pdf

Interactive comment on Earth Syst. Dynam. Discuss., https://doi.org/10.5194/esd-2017-51, 2017.