

## ***Interactive comment on “An evaluation of current capabilities of modelling low-frequency climate variability” by Heikki Järvinen et al.***

### **Anonymous Referee #2**

Received and published: 1 August 2016

This study aims to evaluate 12 CMIP5 models' performance in simulating climate variability using the RMSSA method. The authors examined the models' biases in reproducing the observed variance at different periods and in reproducing the observed spatial pattern of ENSO. The results appear to be interesting. The reviewer has several major concerns that need to be addressed.

1. Fig. 1 shows that the greatest variance is explained by decadal-multidecadal variabilities (after detrending). However, the decadal-multidecadal variabilities are not examined in this paper, including their spatial patterns and potential mechanisms as well as model biases.

2. Table 2: Some of the periods identified by the RMSSA are very close to each other (for example, 2.2, 2.3, and 2.5; 3.5 and 3.6). It is unclear whether those identified peri-

C1

ods truly represent significantly different physical modes or they could merely represent the artifacts of the RMSSA method.

3. Figs. 1 and 3: In addition to ENSO, it will be useful to display the spatial patterns of other significant periods and examine the models' performance in simulating them.

4. Specific comments: a) Last paragraph of Page 1: Atmosphere's memory is too short to explain the signal with a period of 1.7 years. b) First paragraph of Page 2: Ocean dynamics responsible for the decadal-multidecadal variabilities needs to be discussed. c) Page 5, Line 19-20: Components 15-17 of ERA-20C appears to capture the decadal variability of ENSO. d) page 7, Line 16-25: Replace "a warm pool" and "a cold pool" by "a warm anomaly" and "a cold anomaly".

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Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-61, 2016.

C2