1   *Supplementary material*

3   **Objective Evaluation of Earth System Models: PCMDI Metrics Package**

4   **(PMP) version 3**

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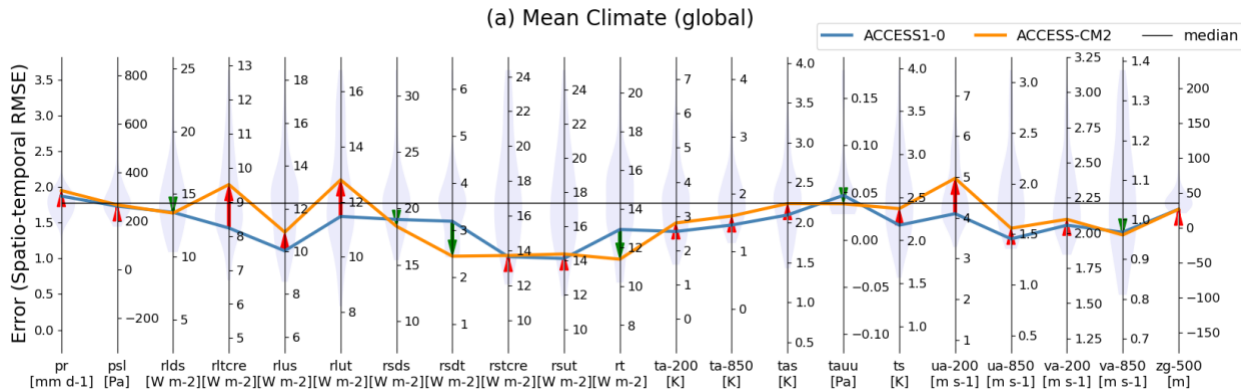
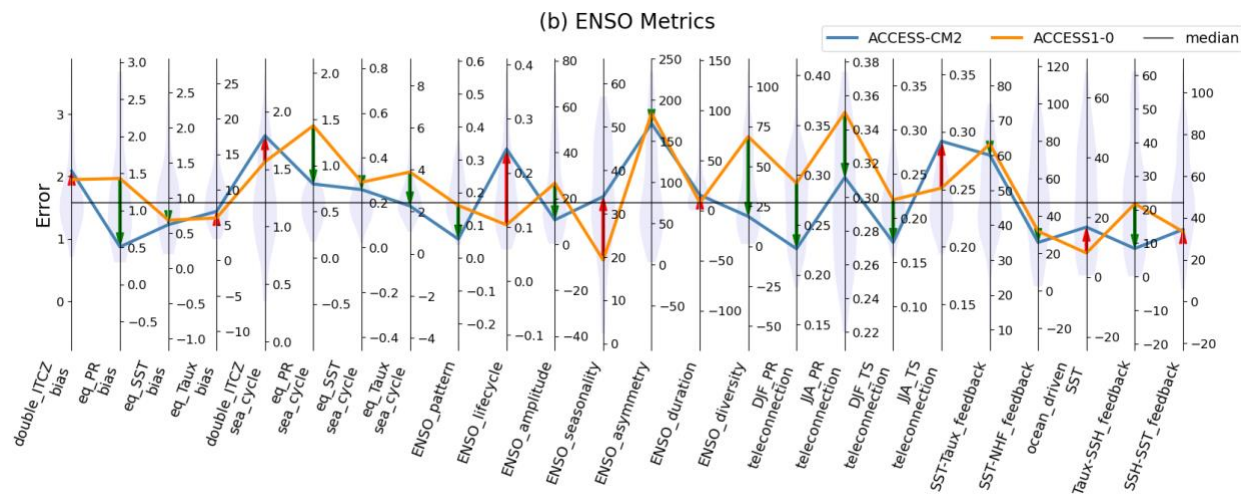
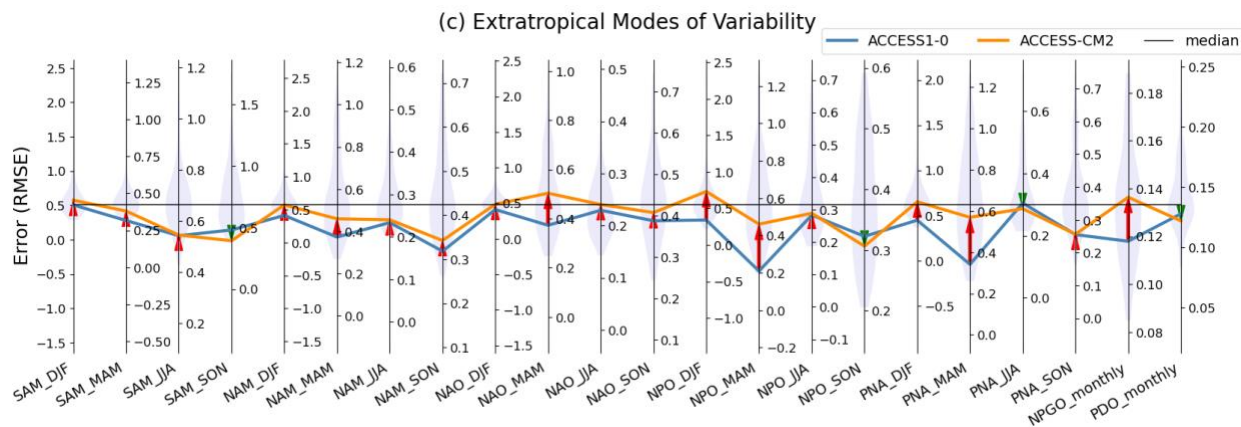
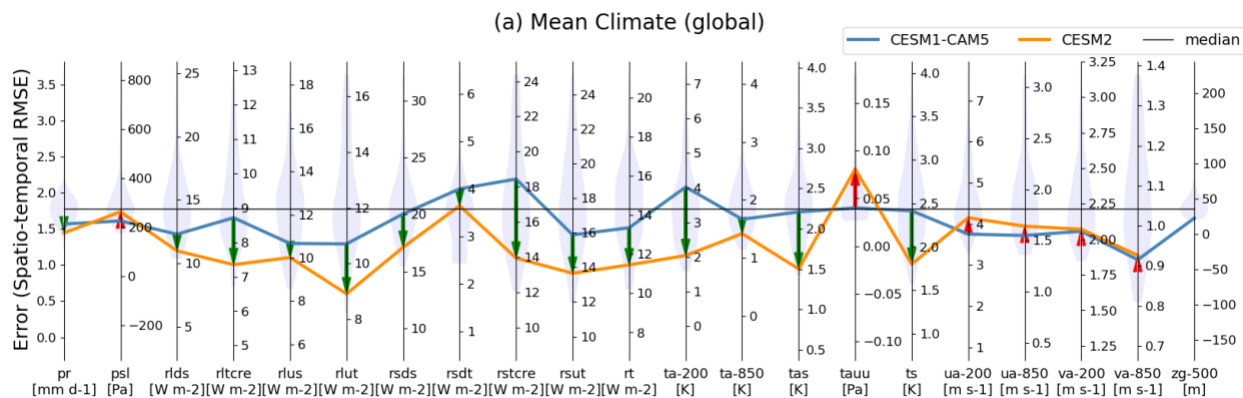


Figure S1. Parallel Coordinate Plot contrasting performance of two different versions of the ACCESS model (i.e., ACCESS-1-0 from CMIP5 and ACCESS-CM2 from CMIP6) in their Historical experiment for errors from (a) mean climate, (b) ENSO, and (c) extratropical modes of variability. Improvement (degradation) in the later version of the model is highlighted as a downward green (upward red) arrow between lines. Middle of each vertical axis is set to the median of the group of benchmarking models (i.e., CMIP5 and CMIP6), with the axis range stretched to maximum distance to either minimum or maximum from the median for visual consistency. The inter-model distributions of model performance are shown as shaded violin plots along each vertical axis.

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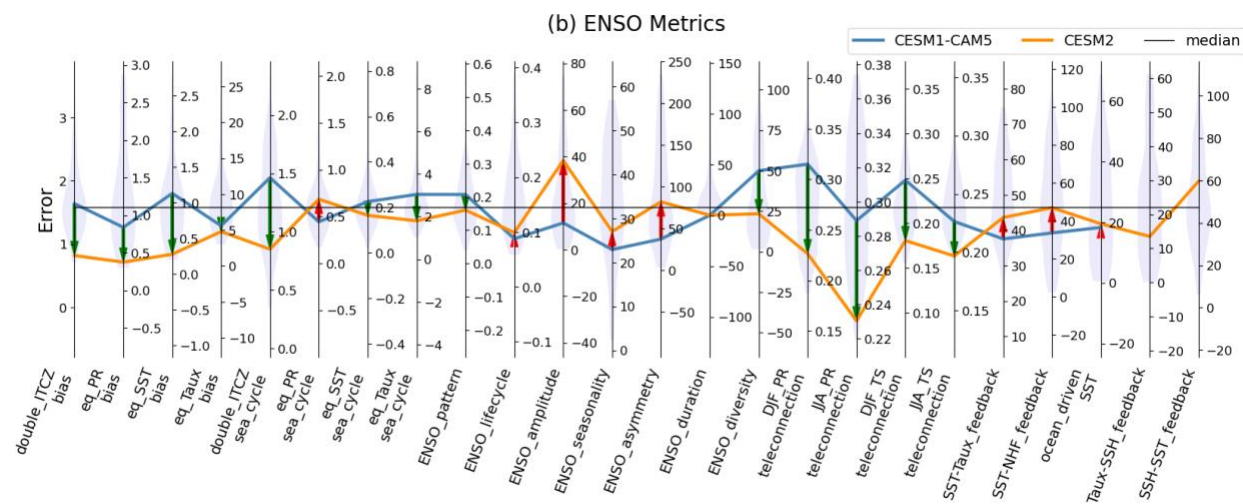
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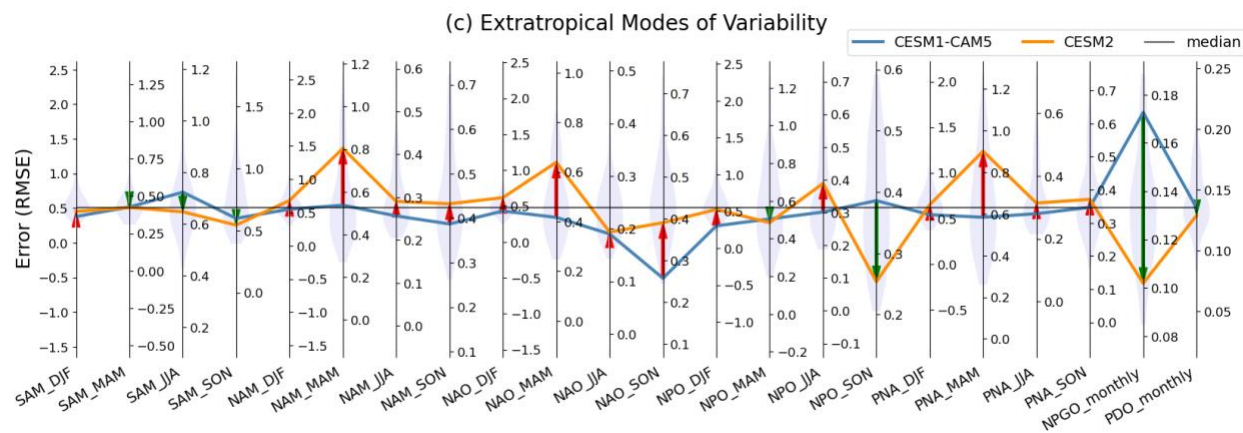
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48 **Figure S2.** Same as Figure S1, but for CESM models (i.e., CESM1-CAM5 from CMIP5 and

49 CESM2 from CMIP6)

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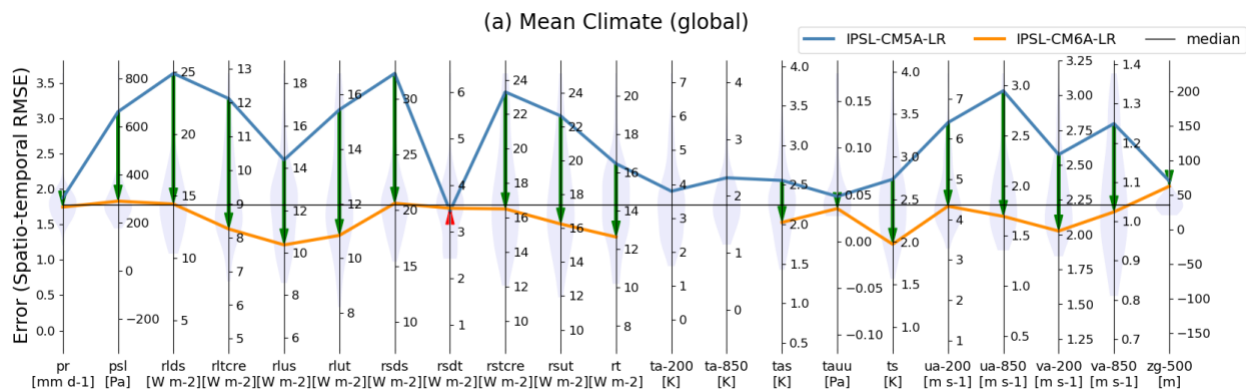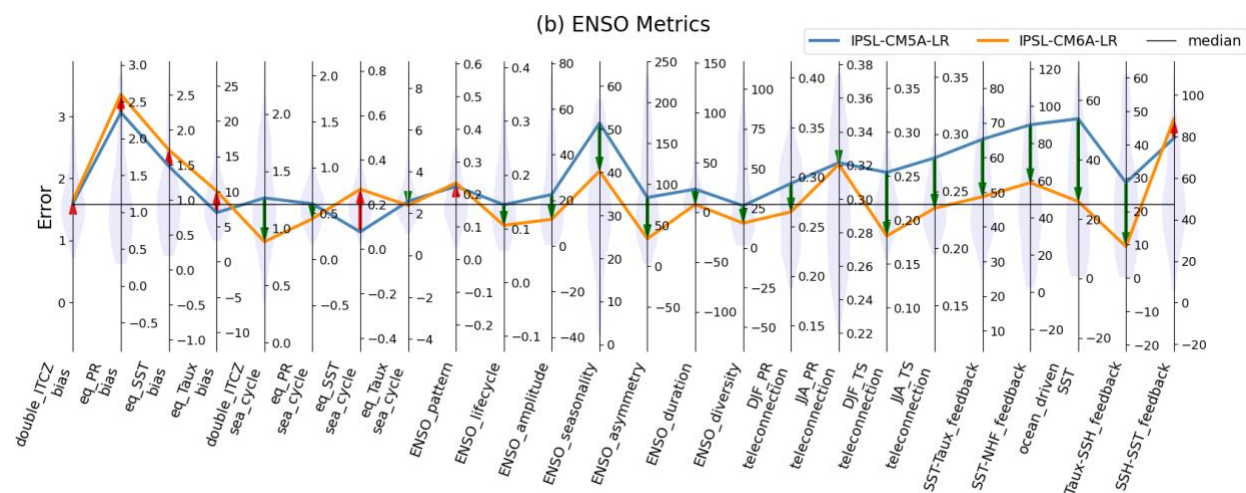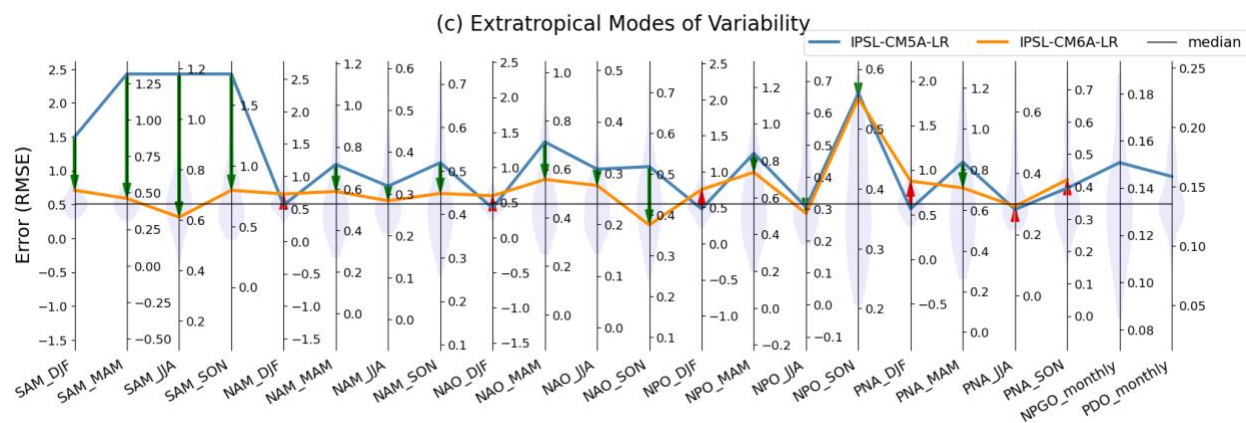
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54   **Figure S3.** Same as Figure S1, but for IPSL models (i.e., IPSL-CM5A-LR from CMIP5 and
55   IPSL-CM6A-LR from CMIP6)