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## A new ensemble-based consistency test for the Community Earth System Model (pyCECT v1.0)

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**Abstract.** Climate simulation codes, such as the Community Earth System Model (CESM), are especially complex and continually evolving. Their ongoing state of development requires frequent software verification in the form of quality assurance to both preserve the quality of the code and instill model confidence. To formalize and simplify this previously subjective and computationally expensive aspect of the verification process, we have developed a new tool for evaluating climate consistency. Because an ensemble of simulations allows us to gauge the natural variability of the model's climate, our new tool uses an ensemble approach for consistency testing. In particular, an ensemble of CESM climate runs is created, from which we obtain a statistical distribution that can be used to determine whether a new climate run is statistically distinguishable from the original ensemble. The CESM ensemble consistency test, referred to as CESM-ECT, is objective in nature and accessible to CESM developers and users. The tool has proven its utility in detecting errors in software and hardware environments and providing rapid feedback to model developers.

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