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Hindcasting Global Temperature by Evolutionary Computation

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Abstract

Interpretation of changes of global temperature is important for our understanding of the climate system and for our confidence in projections for the future. Massive efforts have been devoted to improve the accuracy of reproducing the global temperature by the available climate models, but the hindcasts are still inaccurate. Notwithstanding the need to further advance climate models, one may consider data-driven approaches, providing practically useful results in a simpler and faster way. Without assuming any prior knowledge about physics and without imposing a model structure that encapsulates the existing knowledge about the underlying processes, we hindcast global temperature by automatically identified evolutionary computation models. We use 60 years of records of global temperature and climate drivers, with training and testing periods being 1950-1999 and 2000-2009, respectively. This paper demonstrates that the global temperature observed in the past is mimicked with reasonably good accuracy. Evolutionary computation holds promise for modeling the global climate system, which looks hopelessly complex in classical perspective.

Key words: global temperature, climate drivers, climate change attribution, evolutionary computation, genetic programming.

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