Future of Decadal Predictions

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Abstract

Decadal climate variability (DCV) has impacted society for centuries, perhaps millennia. There are well-documented episodes of droughts, floods, and tropical storms lasting one or more decades in many parts of the world. It was believed for many centuries that solar and lunar cycles at decadal timescales (~10-20 years) influence the Earth's climate. This belief led to the development of conceptual and statistical models for decadal climate prediction, using sunspot numbers and lunar orbital phases as predictors. Such efforts, however, failed due to lack of understanding, and inadequate concepts and models. The DCV field has undergone a revival in the last 15-20 years, due to more and better climate observations,especially over and in the oceans; better understanding of possible physics and availability of a hierarchy of ocean-atmosphere models leading to the realization that the climate system can generate DCV on its own; and an obvious societal need for decadal climate predictions. In spite of the advances, mechanisms of observed and modeled phenomena are not well understood, but recent breakthroughs in understanding solar influences are promising. While it remains extremely important to understand and predict DCV and its impacts on society, the future course of this field remains unpredictable!