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Bias Correction for Decadal Predictions

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In a scenario of increasing external forcing, it is generally understood that as the lead time of prediction increases, the component of predictive skill attributable to the initial state decreases, just as the component of predictive skill attributable to external forcing increases. In the context of current climate and its forcing, it is estimated that initial state-related skill decreases quite rapidly and becomes smaller than external forcing-related skill at a lead time of about ten years. As such, there is considerable interest in initialized decadal predictions.

Initialized decadal prediction efforts, however, are hamstrung by model bias. That is, in a number of state-of-the-art climate models, model bias is large in comparison to interannual climate variability—the size of the signal to be predicted. As such, for current, state-of-the-art initialized decadal predictions to be useful, bias-correction in a post-processing fashion is essential.

A striking feature of initialized decadal predictions is model drift, a component of the evolution of such predictions that, sometimes rapidly, moves the system from its initialized state, a state that is close to observations, to a model's own preferred state, and with the model's own preferred state being typically best characterized by the uninitialized projections. After discussing existing methods of bias correction, we present a new method that exploits the dynamical nature of drift of initialized predictions and helps enhance the preditive skill of such simulations