



Inter-Model Warming Projection Spread: Inherited Traits from Control Climate Diversity

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Since Chaney's report, the range of global warming projections in response to a doubling of CO₂—from 1.5 °C to 4.5 °C or greater—remains largely unscathed by the onslaught of new scientific insights. Conventional thinking regards inter-model differences in climate feedbacks as the sole cause of the warming projection spread (WPS). Our findings shed new light on this issue indicating that climate feedbacks inherit diversity from the model control climate, besides the models' intrinsic climate feedback diversity that is independent of the control climate state. Regulated by the control climate ice coverage, models with greater (lesser) ice coverage generally possess a colder (warmer) and drier (moister) climate, exhibit a stronger (weaker) ice-albedo feedback, and experience greater (weaker) warming. The water vapor feedback also inherits diversity from the control climate but in an opposite way: a colder (warmer) climate generally possesses a weaker (stronger) water vapor feedback, yielding a weaker (stronger) warming. These inherited traits influence the warming response in opposing manners, resulting in a weaker correlation between the WPS and control climate diversity. Our study indicates that a better understanding of the diversity amongst climate model mean states may help to narrow down the range of global warming projections.