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Robust relationships in past and future simulation: atmospheric circulation and hydrological cycle over the tropics

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The CMIP5 (paleo, modern, and idealized warm) simulations and both modern and paleo environmental data show several features of large-scale temperature responses (e.g. land-ocean contrast, high-latitude amplification, and seasonality change), and these responses are proportional, generally linear across simulations of both warm and cold climate states that are induced by changes in atmospheric CO_2 concentration. On the other hand, projecting the response of precipitation to climate changes faces a host of challenges. In this study, we mainly investigate the robust relationship about seasonal atmospheric circulation and hydrological cycle, which is associated with the large-scale temperature responses, over the tropics between past and idealized warm simulations with CMIP5 models. Finally, we investigate the role of cloud-radiative effects in paleo-climatic changes through experiments in which clouds are made transparent to radiation using the IPSL model. The impact of cloud-radiative effects on circulation and precipitation changes in mid-Holocene and last glacial maximum experiments will be discussed.