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A Review of Monsoon Responses to Warm Climates

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Knowledge of how monsoons will respond to external forcings through the twenty-:rst century has been confounded by incomplete theories of tropical climate and insuZcient representation in climate models. This talk will overview recent insights from past warm climates and historical trends that can inform our understanding of monsoon evolution in the context of an emerging energetic framework. A theoretical framework interprets monsoons as an integral part of the global atmospheric overturning circulation, and associated energy, angular momentum, and moisture budgets, rather than regional land-sea breeze circulations. The discussion will include monsoon responses to (1) external forcing in paleoclimate records, (2) external forcing and internal variations in observed records, and (3) anthropogenic forcing in future projections. Lines of evidence from warm climate analogues indicate that while monsoons respond in globally coherent and predictable ways to orbital forcing and interhemispheric thermal gradients, there are differences in response to these forcings and also between land and ocean. Re:ning the energetic framework to incorporate zonal asymmetries will be critical to gain further insights into monsoon evolution at regional scales.