



## **The influence of the meridional gradients in incoming solar radiation and water vapor on Earth's climate**

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The meridional gradients in incoming solar radiation and in atmospheric water vapor play fundamental roles in determining Earth's climate, but their relative contributions to the pole-to-equator temperature difference and other climate-relevant aspects is currently unknown. Therefore, we use a gray-radiation general circulation model to investigate how Earth's climate is affected by eliminating these gradients, while keeping the total insolation and long-wave optical depth constant. Experiments are conducted in which each of the gradients is eliminated separately, and in which both are eliminated simultaneously. We focus on how the model's global-mean temperature and meridional energy transport are affected by these changes, while presenting simple arguments to explain the results. We also investigate how the two gradients affect the model's response to global warming-like perturbations, including their impacts on the polar amplification of warming. This approach allows us to better understand Earth's present and future climate, as well as the climate of other Earth-like planets.