Department of Atmospheric Sciences Seminar Announcement

Department of Atmospheric Sciences, S.O.E.S.T., University of Hawai'i at Mānoa
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A new general framework for understanding the drivers of regional climate change

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You are invited to our weekly online Atmospheric Sciences Fall 2021 seminars via Zoom meeting.
When: September 1, 2021 at 3:15PM HST

Register in advance for this meeting:
https://hawaii.zoom.us/meeting/register/tJwlcOmtpz8iGtFAfj1LmB2t-J89CV76hI1s

After registering, you will receive a confirmation email containing information about joining the meeting.
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Abstract:

With the Earth warming in response to anthropogenic greenhouse gas forcing, changes in surface temperature and rainfall manifest themselves with characteristic geographical patterns. For instance, land areas warm faster than the oceans and the poles warm faster than the low-latitudes.

In addition, numerical climate models with prescribed anthropogenically-driven changes in greenhouse gas concentrations robustly simulate enhanced warming on the equator compared to the adjacent off-equatorial regions. However, the physical processes driving these equatorial patterns of change are still strongly debated. Improved understanding of these is critical, as small deviations from projected surface temperature change patterns can cause large geographical shifts in projected future rainfall patterns. Moreover, the global impacts felt by internal climate variability – such as the El Niño-Southern Oscillation and the Madden-Julian Oscillation – will depend crucially on the climate mean state change pattern that will emerge in the future.

Recently, we developed a new general framework to better understand the physical drivers of regional climate change patterns. We use linear impulse response theory combined with targeted coupled climate model simulations forced by idealized regional radiative perturbations to delineate the relative contributions of coupled local feedbacks and remote drivers to regional climate change. Within this framework, I will revisit the question of how much different processes contribute to the equatorial warming signal that is robustly projected by the current generation of climate models. I will show that off-equatorial radiative forcing and corresponding coupled circulation/cloud adjustments are responsible for a large fraction of equatorial warming in response to global CO_2 forcing. Similarly, the framework is applied to delineate the physical drivers of polar amplification.