

ATS/CIRA Colloquium

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**3 p.m. Thursday,
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by Christine Chiu**

**Anthropogenic forcing and response yield observed
positive trend in Earth's energy imbalance**

The observed trend in Earth's energy imbalance (TEEI), a measure of the acceleration of heat uptake by the planet, is a fundamental indicator of perturbations to climate. Satellite observations (2001–2020) reveal a significant positive globally-averaged TEEI, but the contributing drivers have yet to be understood. Using climate model simulations, we show that it is exceptionally unlikely (<1% probability) that this trend can be explained by internal variability. Instead, TEEI is achieved only upon accounting for the increase in anthropogenic radiative forcing and the associated climate response. TEEI is driven by a large decrease in reflected solar radiation and a small increase in emitted infrared radiation. This is because recent changes in forcing and feedbacks are additive in the solar spectrum, while being nearly offset by each other in the infrared. We conclude that the satellite record provides clear evidence of a human-influenced climate system.

Colloquia page: atmos.colostate.edu/colloquia