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Spaceborne observations enable benchmarking of land–atmosphere moisture feedback strength in ESMs

Analysis of remotely sensed data suggests coupled ESMs overestimate feedback strength.

The Science

Researchers from the University of California Irvine and the National Center for Atmospheric Research developed a novel method for measuring the strength of the land–atmosphere moisture feedback using global satellite observations. These feedbacks are initiated when the land surface moisture state influences atmospheric conditions by limiting the partitioning of incoming energy between the latent and sensible heat fluxes. These atmospheric conditions then go on to influence the land surface in the full feedback loop. It is important for models to correctly represent the strength of this feedback loop in order to correctly predict climate extremes and project long-term climate change.

The Impact

The current metrics, derived using a suite of remote sensing platforms of both terrestrial water storage and atmospheric conditions, enable coupled models to be benchmarked relative to observations.

Summary

Results indicate that ESMs may be overestimating the strength of the feedback loop relative to observationally derived metrics. While these results are limited by the relatively short time series of satellite data, the metrics described in this study will become increasingly useful as the length of the satellite record increases. However, even with the current limitations, these metrics may be used to evaluate further development of ESMs, particularly representations of land surface processes and planetary boundary layer development.

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Publications

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