

## **Emergent Constraints on Regional Cloud Feedbacks**

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Low-cloud based emergent constraints have the potential to substantially reduce uncertainty in Earth's Equilibrium Climate sensitivity, but recent work has shown that previously-developed constraints fail in the latest generation of climate models, suggesting that new approaches are needed. Here, we investigate the potential of emergent constraints to reduce uncertainty in regional cloud feedbacks, rather than in the global-mean cloud feedback. Strong relationships are found between the monthly/interannual variability of tropical clouds and the tropical net cloud feedback. When combined with observations, these relationships substantially narrow the uncertainty in the tropical cloud feedback, and show that the tropical cloud feedback is likely  $> 0$ . Promising relationships are also found in the  $90^{\circ}\text{S}$ - $60^{\circ}\text{S}$  and  $30^{\circ}\text{S}$ - $60^{\circ}\text{N}$  regions, though these relationships are not robust across model generations and we have not identified the associated physical mechanisms.