An estimate of equilibrium climate sensitivity from interannual variability

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Estimates of equilibrium climate sensitivity (the equilibrium warming in response to a doubling of CO_2; hereafter ECS) come mainly from models, paleoclimate data, and the 19th and 20th century historical record. Fewer have attempted to infer ECS from interannual variability. Using observations of interannual climate variations covering the period 2000 to 2017, we estimate the ECS is likely (17-83% confidence interval) 2.4-4.5 K, with a mode and median value of 3.0 and 3.3 K. The main obstacle to further reducing the uncertainty is not observations, but rather our understanding of how to convert the observations of short-term, mainly unforced, climate variability to an estimate of the response of the climate system to long-term forced warming.