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## Resolving the differences in the simulated and reconstructed climate response to volcanism over the last millennium

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Explosive volcanism imposes impulse-like radiative forcing on the climate system, providing a natural experiment to study the climate response to perturbation. Previous studies have identified disagreements between paleoclimate reconstructions and climate model simulations (GCMs) with respect to the magnitude and recovery from volcanic cooling, questioning the fidelity of GCMs, reconstructions, or both. Using the paleoenvironmental data assimilation framework of the Last Millennium Reanalysis, this study investigates the causes of the disagreements, using both real and simulated data. We demonstrate that the disagreement may be resolved by assimilating tree-ring density records only, by targeting growing-season temperature instead of annual temperature, and by performing the comparison at proxy locales. Our work suggests that discrepancies between paleoclimate models and data can be largely resolved by accounting for these features of tree-ring proxy networks.