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Hiatuses in global warming: the role of volcanic eruptions and Pacific decadal variability

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The latest generation of climate model simulations is used to investigate hiatuses in global warming. Large tropical volcanic eruptions are found to cause decade long hiatus periods consistently across the models. These eruptions not only cool the globe to cause hiatus decades, but are also found to influence modes of Indo-Pacific variability. Specifically we find an increased probability of an initial positive Indian Ocean Dipole / El Niño-like response followed by a La Niña-like cooling in the third Southern Hemisphere summer after the eruption, which may increase the persistence of the post-volcanic global cooling anomaly. We further demonstrate that most non-volcanic hiatuses across CMIP5 models are associated with enhanced cooling in the equatorial eastern Pacific, linked to a transition to the negative phase of the Interdecadal Pacific Oscillation. Finally, two future scenarios are investigated to determine the likelihood of hiatus periods occurring under different rates of greenhouse gas emissions. Under high rates of greenhouse gas emissions there is little chance of a hiatus decade occurring beyond 2030, even in the event of a large volcanic eruption.