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# The role of aerosol forcing in recent Pacific multi-decadal variability

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## Abstract

The role of anthropogenic aerosols in contributing to multi-decadal variability in the Pacific remains a topic of ongoing investigation. Climate models differ widely in their representation of aerosol processes and resulting forcing, as well as in their representation of Pacific multi-decadal variability. Such model diversity renders a robust quantification of the role aerosol forcing for Pacific variability difficult. However, understanding what drives multidecadal variability in the Pacific is imperative for improving near-term climate projections and therefore merits further investigation. Here, we show how aerosol forcing interacts with other external forcings and internal climate variability to generate simulated multi-decadal Pacific variability since the 1980s in models partaking in the Sixth Phase of the Coupled Model Intercomparison Project (CMIP6). A large ensemble of climate model simulations with HadGEM3-GC3.1, where anthropogenic aerosol emissions are scaled by a range of factors, is further used to identify the mechanisms driving the response to aerosol forcing in HadGEM3. Our results show a forced response in Pacific surface air temperatures to anthropogenic aerosols in the period 1981-2012 in HadGEM3, associated with a Rossby Wave train across the North Pacific and a weakening of the Aleutian Low. We discuss these results in the context of understanding recent real-world Pacific variability and the role of the Pacific in explaining observed and simulated temperature trends since the 1980s.

**Keywords:** Pacific, decadal variability, anthropogenic aerosols, CMIP6

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