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Northern Hemisphere wintertime continental warming following the Mount Pinatubo eruption: forced response or just natural variability?

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It is widely believed that the anomalous wintertime warming of the Northern Hemisphere continents observed following the 1991 eruption of Mt Pinatubo was actually caused by the presence the stratospheric sulfate aerosols of volcanic origin. Moreover, many studies have reported that state-of-the-art climate model simulations of that eruption are unable to reproduce this result. Here, we reconcile models and observations by analyzing large ensembles of integrations with several, different, CMIP-class coupled climate models. We show that each model is able to capture, in many ensemble members, the observed wintertime continental warming following the eruption. We also show that the forced response, given by the ensemble mean for each model, is not statistically significant; in fact, it is minuscule compared to the large internal variability. We also examine a popularly invoked mechanism involving the strengthening of the stratospheric polar vortex, and find it to be non-operative. Having reconciled models and observations, we conclude that the wintertime continental warming that occurred following the 1991 Mt Pinatubo eruption was most likely a simple manifestation of internal atmospheric variability, and was completely unrelated to the eruption itself.