
Impact of volcanic eruptions in CMIP6 decadal prediction systems: a multi-model analysis.

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Abstract

In recent decades three major volcanic eruptions of different intensity have occurred: Mount Agung (1963), El Chichón (1982) and Mount Pinatubo (1991), with reported climate impacts on seasonal-to-decadal timescales and providing a high prediction potential. The Decadal Climate Prediction Project component C (DCPP-C) includes a protocol to investigate the impact of such volcanic eruptions on decadal prediction, which consists in performing initialised sets of predictions just before the three historical volcanic eruptions, but in which the volcanic aerosol forcing is excluded. The impact of the volcanic eruptions is therefore determined by comparing these new forecasts with those included in the corresponding retrospective prediction experiment DCPP-A, which include historical volcanic aerosol forcing. Here we present the results from four CMIP6 decadal prediction systems (CanESM5, CESM1, EC-Earth3 and HadGEM3). The global mean temperature cooling is comparable among models and consistent with previous studies. The surface temperature response pattern in the first years is similar across all the models and for the individual volcanic eruptions. At later forecast times (years 6-9), differences among the models and eruptions emerge. Preliminary results show that the volcanic eruptions impact the atmospheric and oceanic dynamics, as shown in previous studies, although some differences across models emerge, specifically on the ocean overturning and gyre circulation changes.

Keywords: Decadal Climate Prediction, Volcanic Eruptions, DCPP

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