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

Roberto Bilbao¹, Panos Athanasiadis², Leon Hermanson³, Juliette Mignot⁴, Reinel Sospedra-Alfonso⁵, Didier Swingedouw⁶, Xian Wu⁷, and Pablo Ortega¹

¹Barcelona Supercomputing Center (BSC), Barcelona, Spain

²Centro Euro-Mediterraneo sui Cambiamenti Climatici, Bologna, Italy

³Met Office Hadley Centre, Exeter, Devon EX1 3PB, UK

⁴Laboratoire d'Océanographie et du Climat: Expérimentation et Approches Numériques (LOCEAN/IPSL), Paris, France

⁵Canadian Centre for Climate Modelling and Analysis, Environment and Climate Change Canada, Victoria, British Columbia, Canada

⁶Environnements et Paléoenvironnements Océaniques et Continentaux, Université de Bordeaux/CNRS, Bordeaux, France

⁷National Center for Atmospheric Research, Boulder, Colorado, 80307, USA

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 six CMIP6 decadal prediction systems (CanESM5, CESM1, EC-Earth3, HadGEM3, IPSL-CM6A and CMCC-CM2-SR5). 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.