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The sensitivity of EC-Earth3 decadal predictions to the choice of volcanic forcing dataset: insights for the next major eruption

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Volcano name	Eruption year	Eruption month	Eruption day	Latitude (degree north)	Mass of SO_2 (kt of SO_2)	Hemispheric asymmetry of aerosol spread (NH/SH)
Agung	1963	3	17	-8	10440	0.19
El_Chichon	1982	3	29	17.2	7000	1.5
Pinatubo	1991	6	15	15	18000	-1

Table S1: List of eruption parameters (Toohey et al., 2016) used to create the EVA forcing.

Volcano name	Eruption year	Eruption month	Eruption day	Latitude (degree north)	Longitude (Degree east)	Mass of SO_2 (kt of SO_2)	Tropopause altitude at volcano location (km a.s.l.)	Altitude of SO_2 emission (km a.s.l.)
Agung	1963	3	17	-8.34	115.58	9400	16.56	20
Agung	1963	5	16	-8.34	115.58	4600	16.56	18
El_Chichon	1982	3	29	17.36	-93.228	750	16.25	17
El_Chichon	1982	4	3	17.36	-93.228	340	16.25	17
El_Chichon	1982	4	4	17.36	-93.228	7000	16.25	28
Pinatubo	1991	6	13	15.13	120.35	140	16.51	19
Pinatubo	1991	6	14	15.13	120.35	54	16.51	25
Pinatubo	1991	6	15	15.13	120.35	18000	16.51	25
Hudson	1991	8	9	-45.9	-72.97	700	96.76	12
Hudson	1991	8	12	-45.9	-72.97	600	96.76	16
Hudson	1991	8	15	-45.9	-72.97	2700	96.76	18

Table S2: List of eruption parameters (Carn et al., 2016) used to create the EVA_H forcing.

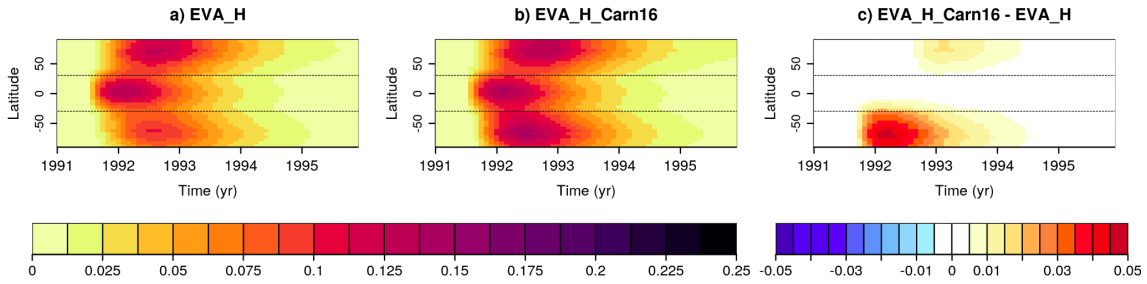

Figure S1*: Stratospheric aerosol optical depth at 530 nm as a function of time and latitude for the eruption of Mount Pinatubo in 1991 for (a) EVA_H, (b) EVA_H_Carn16 and their difference.*

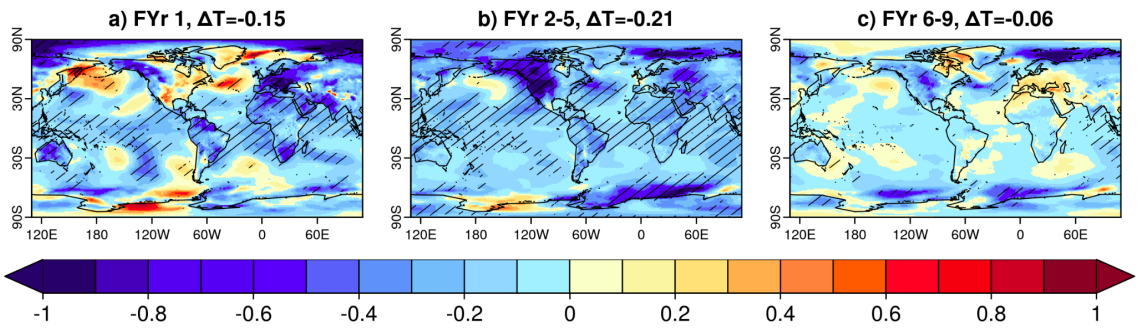

Figure S2: Ensemble mean surface air temperature (°C) response (volc - no volc) following the eruption of Pinatubo (June-May) in DCPP-EVA_H-Hud for (a) forecast year 1, (b) forecast years 2-5 and (c) forecast years 6-9. Hatching indicates statistically significant anomalies according to a bootstrap with resampling with 1000 iterations. The titles include the global mean surface temperature response.

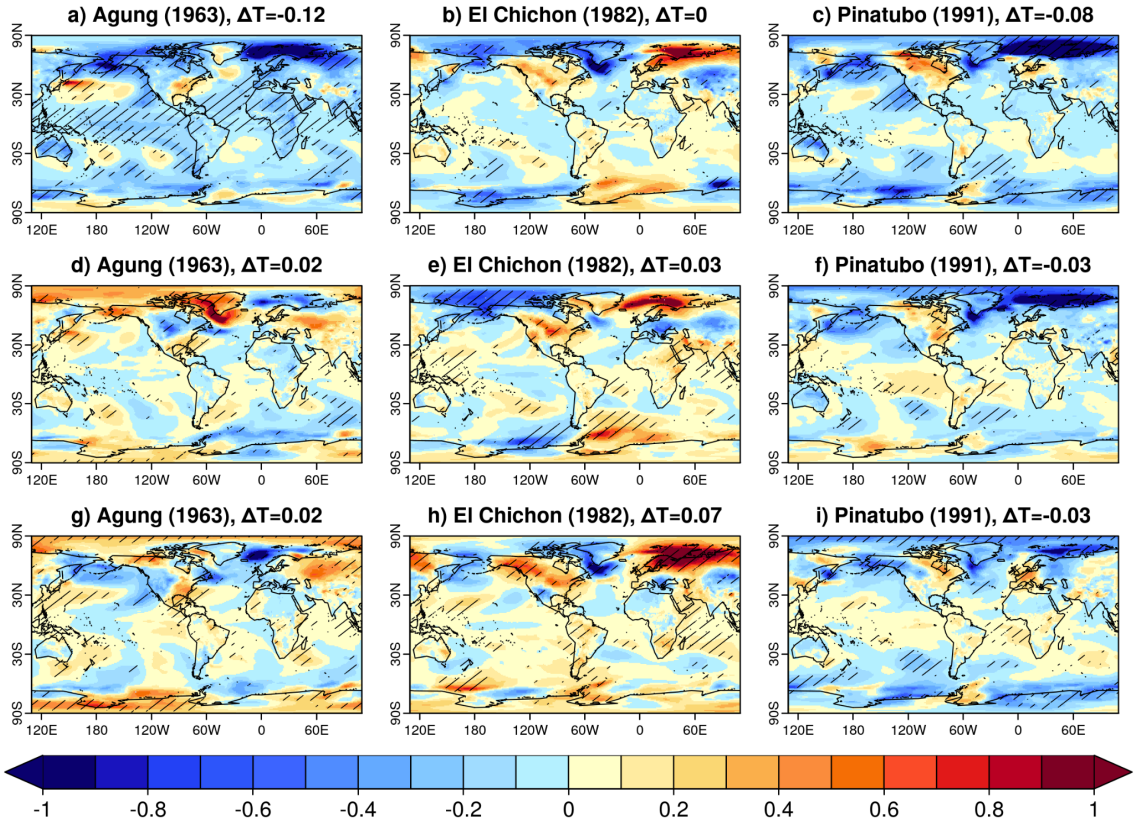

Figure S3: Ensemble mean surface air temperature (°C) response (volc - no volc) for years 6-9 following the eruptions (June-May) in DCPP (CMIP6), DCPP-EVA and DCPP-EVA_H. Hatching indicates statistically significant anomalies according to a bootstrap with resampling with 1000 iterations. The titles include the global mean surface temperature response.

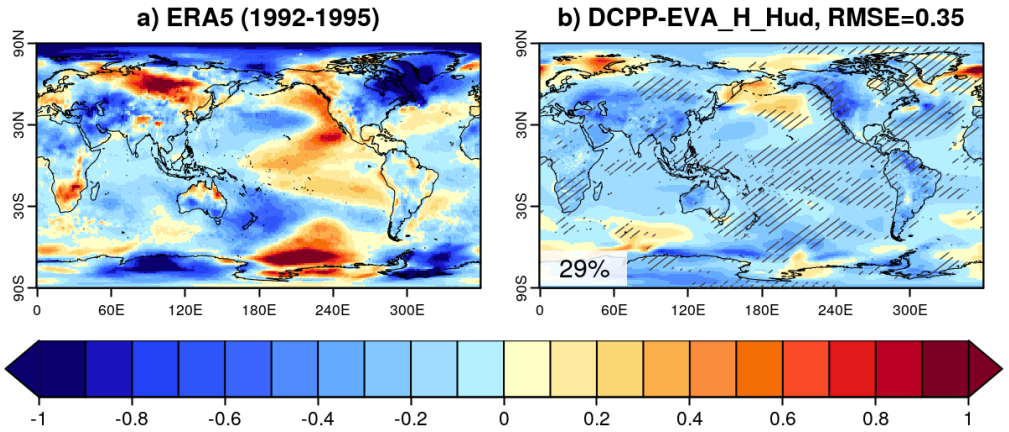

Figure S4: Surface air temperature anomalies (ºC) for forecast years 2-5 following the eruptions (years are defined from Jan-Dec) in ERA5 and for the predicted ensemble mean initialised in 1990 for the DCPP-EVA_H-Hud hindcasts. The anomalies have been computed with respect to the period 1971-2015 (see methods). Stippling indicates where the observations fall outside of the 90% range of the ensemble and the percentage at the bottom left corner of each map indicates the percentage of global area outside this range.