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Volcanic effect on the tropical sea surface temperature in a millennium coupled model simulation

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This study examines the response of El Niño-Southern Oscillation (ENSO) to volcanic event using a millennium simulation of coupled general circulation model forced by both natural (solar forcing and volcanic forcing) and anthoropogenic (CO_2 and CH_4) forcing in the period of 1000-1999 AD (ERIK simulation). It is found that the SST anomalies in the next winter of volcanic eruptions are characterized by positive SST anomalies in the eastern tropical Pacific (i.e., El Nino), in addition, their amplitude is proportional with the magnitude of volcanic forcing. Our further analysis suggests that there exists a threshold magnitude of volcanic eruptions to lead El Nino-like state in the tropical Pacific in which the change of effective solar forcing should be above 15W/m^2 $\sim$20 W/m^2. In other words, such amount of radiative forcing is able to change the mean state of tropical Pacific. We estimate the concentration of greenhouse gases such as CO_2 based on its radiative forcing efficiency..