Abstract

Stratospheric aerosols from large tropical explosive volcanic eruptions backscatter shortwave radiation and reduce the global mean surface temperature. Observations suggest that they also favour an El Niño within 2 years following the eruption. Modelling studies have, however, so far reached no consensus on either the sign or physical mechanism of El Niño response to volcanism. Here we show that an El Niño tends to peak during the year following large eruptions in simulations of the Fifth Coupled Model Intercomparison Project (CMIP5). Targeted climate model simulations further emphasize that Pinatubo-like eruptions tend to shorten La Niñas, lengthen El Niños and induce anomalous warming when occurring during neutral states. Volcanically induced cooling in tropical Africa weakens the West African monsoon, and the resulting atmospheric Kelvin wave drives equatorial westerly wind anomalies over the western Pacific. This wind anomaly is further amplified by air–sea interactions in the Pacific, favouring an El Niño-like response.

摘要

來自熱帶大量的火山噴發，平流層的氣交會散射短波輻射，並減少全球的平均表面溫度，觀察發現，噴發後的兩年期間，這些氣膠會造成聖嬰現象；然而在模式研究中，並未在聖嬰現象和火山運動間得到相應的特徵和物理運動機制。

在此篇研究,我們可以看到在(CMIP5)氣候模式模擬中強調,Pinatubo-like 的火山爆發使得反聖嬰現象縮短，聖嬰現象延長，甚至在自然情況下導致異常高溫。在非洲熱帶地區的火山運動，造成的氣溫下降減弱了西非的季風，並讓大氣的 Kelvin wave 驅使太平洋西側的赤道西風異常。這種風的異常現象在在影響了太平洋的海氣交互作用，並促成類似聖嬰的現象。