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Reconstructing the East Asian monsoon response to major volcanic eruptions: A test of model skill with instrumental and paleoclimate data

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[James A Bradbury, University of Massachusetts - Amherst](#)

Abstract

Global and regional-scale climatic changes caused by volcanic eruptions are difficult to discern conclusively based on limited 20th century climate records. Analyses of paleoclimate records and global climate model (GCM) simulations indicate that a significantly increased volcanic signal occurs in East Asia in response to historical eruptions, many of which were much larger than those experienced in the 20th century. Records of historical floods vs. drought in eastern China suggest that major eruptions over the past millennium typically led to a relatively wet north and a dry south. The GCM simulates a 10% reduction in the strength of tropical Hadley circulation and significantly decreased precipitation throughout the tropics under Tambora-like volcanic forcing conditions. The volcanic-induced weakening of the West Pacific sub-tropical high apparently contributes to a decrease in modeled precipitation throughout northeastern China. Meanwhile a general decrease in tropical precipitation resulting from reduced incoming solar radiation and lower evaporation is hypothesized to have caused observed (and modeled) decreases in summertime precipitation in southeastern China. ^

Subject Area

Physics, Atmospheric Science

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