The fingerprint of volcanic forcing on the ENSO–Indian monsoon coupling

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Abstract

Although a nonstationary link between the two nonlinear phenomena might restrict seasonal predictability, ENSO and the Indian monsoon's interaction is essential to seasonal summer monsoon rainfall forecasts over the Indian subcontinent. LVEs cause significant radiative impacts in the stratosphere, which affect ENSO. However, the influence on ENSO-IM coupling is uncertain. We use paleoclimate reconstructions, large-ensemble targeted climate sensitivity experiments, and sophisticated analytic tools to examine how LVEs impact the nonlinear behaviour of the ENSO and IM dynamical systems. Our findings demonstrate that LVEs boost ENSO and IM phase synchronization substantially by increasing the ENSO's angular frequency. Consequently, we gained a new perspective on the mechanism behind the LVE-induced increase of ENSO-IM coupling, which provides an essential contribution to improving seasonal monsoon predictions.

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