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Decadal monsoon-ENSO relationships re-examined

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The strength of the El Niño-Southern Oscillation (ENSO)-Indian summer monsoon rainfall (ISMR) relationship shows considerable decadal fluctuations, which have been previously linked statistically to low-frequency climatic processes, such as shifts in ENSO's center of action or the Atlantic Multidecadal Oscillation. However, random variability can also cause similar variations in the relationship between climate processes. Here we propose a statistical test to determine whether the observed time-evolving correlations between ENSO and IMSR are different from those expected from a simple stochastic null hypothesis model. The analysis focuses on the time-evolution of moving correlations, their expected variance and probabilities for rapid transitions. The results indicate that the time-evolution of the observed running correlation between these climate modes is indistinguishable from a white noise perturbation process. This challenges previous deterministic interpretations. Our results are further corroborated by the analysis of climate model simulations conducted as part of the Coupled Model Intercomparison Project Phase 5 (CMIP5) and by an ensemble of Last Millennium experiments conducted with the Community Earth System Model.