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An Automatic and Multivariate Statistical Algorithm to Extract Common Pulse-Like Forcing Factors in Climatic Multivariate Time Series

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To understand the full range of natural climate variability, it is important to attribute past climate variations to particular forcing factors. In this talk, our main focus is to introduce an automatic procedure to estimate the impact of strong but short-lived perturbations from large explosive volcanic eruptions on climate. An extraction algorithm that handles multivariate time series with a common but unknown forcing is presented. This statistical procedure is based on a multivariate multi-state space model and it can provide an accurate estimator of the timing and duration of the climate response to an eruption from a set of different climatic time series. It not only allows for a more objective estimation of its associated peak amplitude and the subsequent time evolution of the signal, but at the same time it provides a measure of confidence through the posterior probability for each cooling event. This flexibility, robustness and limitations of our approach are also discussed by applying our method to simulated and real multivariate vectors.