

# Detection of Volcanic Eruptions and Time-Series-Breaks of any Specified Form using Indicator Saturation

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## Abstract

We present a methodology to detect structural breaks of any specified form at any point in a time series using an indicator saturation approach. Based on recent developments in model selection and estimation using more variables than observations, we saturate a regression model with a full set of specified break functions. By selecting over all possible break functions using a general-to-specific algorithm we obtain unbiased estimates of the break date and magnitude. Monte Carlo simulations confirm the approximate size and power of the approach. We demonstrate the methodology by detecting volcanic eruptions in a time series of Northern Hemisphere mean temperature derived from combined last millennium and historical simulations of the National Center for Atmospheric Research Community Climate System Model version 4, as part of the Coupled and Paleoclimate Model Intercomparison Projects Phases 5 and 3.

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