

# **Southern Hemisphere climate effects of large tropical volcanic eruptions**

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This study aims to give an overview on Southern Hemisphere (SH) climate effects of tropical volcanic eruptions. Major volcanic eruptions which directly inject high SO<sub>2</sub> amounts into the tropical stratosphere have a significant impact on the global climate. Volcanic sulfate aerosol in the stratosphere is transported by the large scale meridional overturning circulation in the stratosphere, called the Brewer-Dobson circulation (BDC). Due to the different strengths of the BDC in the Northern Hemisphere and SH, and to its seasonality, we find different climate effects between the two hemispheres. To address the role of the seasonality, and eruption strength, we perform a set of model simulations with stratospheric SO<sub>2</sub> injections of different magnitudes varying between weak and very strong eruptions during January and July season. We particularly address the effects from the stratosphere down to the surface, showing the dominant atmospheric modes during the Southern winter: the Southern Annular Mode (SAM). We explore the mechanisms for such a SAM volcano response, highlighting atmospheric and oceanic circulation changes and possible implications for ice core proxies.