



## Extreme precipitation events related to volcanic eruptions

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The best time period for achieving a better understanding of extreme precipitation events is the present day. This is because both instrumental records and satellite records are available for verification. While the influence of 'major' volcanic eruptions on short-term cooling of the Earth is relatively well known, the impact on precipitation variability is poorly understood. In the present study, the role of volcanic eruptions in causing extreme precipitation variability in the East Asian Monsoon region of southern China based on the Hong Kong Station during 1884 to 2010 is examined. The main conclusions drawn are:

(1) At least some extreme precipitation events over the past 127 years have been caused by volcanic eruptions. Examples include the worst drought year since record began in 1963 and the second wettest year since record began in 1982.

(2) The lack of statistical relationship in extreme precipitation variability may be explained at least partially by the random occurrence of volcanic eruptions.

(3) Out of 13 'major' volcanic eruptions with Volcanic Explosivity Index (VEI) of 5 and above, 9 have resulted in drought years.

(4) The spread of the ash clouds from long distances exceeding 10,000 km have a role in the second wettest year since record began and in causing a 1-in-1100 year rainstorm.

(5) Both the impact of humans and the impact of volcanic eruptions on the natural hydrological cycle are grossly underestimated as a cause of climatic forcing.

(6) Reasons for severely dry and wet years include –

(a) Regional tropospheric wind shift from predominantly offshore to onshore and vice-versa.

(b) Transfer of water vapour from the troposphere into the stratosphere.

(c) Reduction in solar radiation caused by the release of tephra, gases and water vapour into the atmosphere.

(d) Interference of the 'normal' atmospheric circulation pattern by the eruption cloud.

(e) Condensation nuclei provided by the eruption cloud.

Examples of modern volcanic eruptions will be used to illustrate their role in extreme regional precipitation variability at the annual, monthly and event level.