

Observed multi-variable signals of late 20th and early 21st century volcanic activity

Objective

- To improve scientific understanding of volcanic effects on climate during the late 20th and early 21st centuries

Research

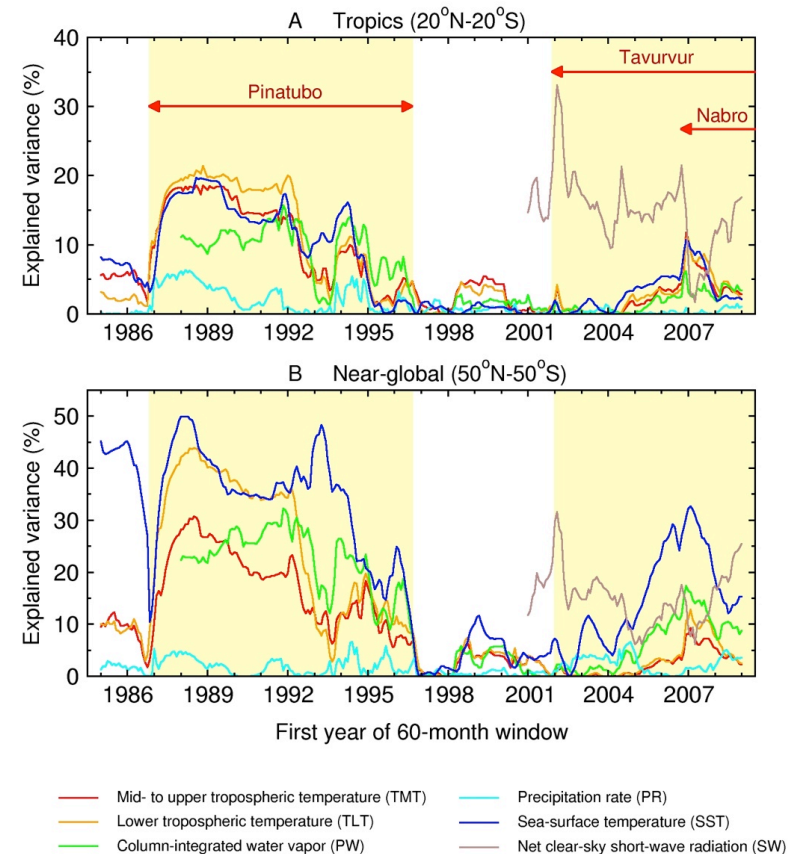
- To determine whether multi-variable signals of recent volcanic activity are identifiable in satellite observations
- To estimate the percentage of the temporal variance of observational temperature, moisture, and radiation data explained by volcanically-caused changes in stratospheric aerosol optical depth (SAOD)

Impact

- Signals of late 20th and early 21st century volcanic activity are statistically discernible in spatial averages of tropical and near-global SST, tropospheric temperature, net clear-sky short-wave radiation, and atmospheric water vapor
- Signals of late 20th and early 21st century volcanic eruptions are also detectable in near-global averages of rainfall
- During the post 2005 period, up to 30% of the temporal variance of near-global SST is explained by SAOD
- The largest post-Pinatubo cooling signals are preferentially distributed in the final third of the recent “warming hiatus” period, and must therefore contribute to the hiatus

Reference: B. D. Santer, S. Solomon, C. Bonfils, M. D. Zelinka, J. F. Painter, F. Beltran, J. C. Fyfe, G. Johannesson, C. Mears, D. A. Ridley, J.-P. Vernier, and F.J. Wentz (2015): Observed multi-variable signals of late 20th and early 21st century volcanic activity. *Geophysical Research Letters* (in press).

Temporal Variance Explained by Stratospheric Aerosol Optical Depth



Percentage of the temporal variance of observed temperature, moisture, and radiation data explained by observed changes in stratospheric aerosol optical depth (SAOD). Results are for data spatially averaged over the tropics (panel A), and over a near-global domain (panel B). The two yellow boxes indicate 60-month analysis periods influenced by the effects of Pinatubo (left box) and by the more recent “moderate” eruptions of Soufrière Hills, Tavurvur, and Nabro (right box). For further details of the statistical analysis, refer to Fig. 4 in Santer *et al.* (2015).