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On the climate impacts from the volcanic and solar forcings

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The observed and the modelled estimations show that the main forcings on the atmosphere are of volcanic and solar origins, which act however in an opposite way. The former can be very strong and decrease at short time scales, whereas, the latter increase with time scale. On the contrary, the observed fluctuations in temperatures increase at long scales (e.g. centennial and millennial), and the solar forcings do increase with scale. The common practice is to reduce forcings to radiative equivalents assuming that their combination is linear. In order to clarify the validity of the linearity assumption and determine its range of validity, we systematically compare the statistical properties of solar only, volcanic only and combined solar and volcanic forcings over the range of time scales from one to 1000 years. Additionally, we attempt to investigate plausible reasons for the discrepancies observed between the measured and modeled anomalies of tropospheric temperatures in the tropics. For this purpose, we analyse tropospheric temperature anomalies for both the measured and modeled time series. The results obtained show that the measured temperature fluctuations reveal white noise behavior, while the modeled ones exhibit long-range power law correlations. We suggest that the persistent signal, should be removed from the modeled values in order to achieve better agreement with observations.

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