

Krakatau: Problems with the 'Reference Eruption'

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Detailed treatment of stratospheric aerosol has been included in simulations of the last 130 years using a fully coupled Atmosphere-Ocean General Circulation Model (NCAR-CSM~1.4). Overall, the modeled climate impact of all important eruptions is quite consistent with observation data. The one exception is the famous Krakatau eruption in August 1883. The simulations repeatedly generate a large global cooling event, which is in strong contrast to the latest observational records where no clear climate signal can be isolated. Unfortunately for paleo-climate studies, the well-documented 1883 event of Krakatau is widely used as a reference against which other explosive eruptions (or their forcing) are compared or scaled to. The historic record contains a number of other Krakatau-sized events which left a much clearer climatic signal, suggesting that the missing Krakatau impact is not solely due to self-limiting processes but possibly influenced by other factors. We present a number of sensitivity experiments that explore possible departures of this eruption from the standard volcanic sulfate approach. At the same time, we carefully evaluate the observational record to resolve possible erroneous contributions from uncertainty in the early observational record. We highlight remaining issues that need to be investigated. Finally, the question is raised if there might have been other large eruptions in the past with no correspondingly large climate impact, and ask if these events might have some common characteristics.