

Surface Climate Responses to Explosive Volcanic Eruptions Seen in Long European Temperature Records and Mid-to-High Latitude Tree-Ring Density Around the Northern Hemisphere

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The surface temperature response to explosive volcanic eruptions has been widely studied for the period of reliable global and hemispheric records since 1861. Studies have looked at the effects on large-scale averages and the spatial and seasonal pattern of the response. Prior to 1861 the effects have only been considered in detail for specific large eruptions such as Tambora and Laki. Tree-ring density records from around the NH clearly demonstrate effects prior to 1861 but the dates and locations of some volcanic events are not exactly known for some presumed events. Recent improvements in the quality of instrumental data from Europe now mean that gridded temperature data can be derived back to 1750 from a network based on 40 long-term records. This study will report on assessments of the volcanic influence over Europe for the period from 1750 until 1860. Instrumental records have the advantage of looking at effects in all seasons of the year using the monthly resolution of the temperature data. This study will also report on longer tree-ring density records from the mid-to-high latitudes of the NH, where information can be derived back to the 15th century. For both data sources, volcanic influences will be assessed in large-scale average data and through spatial patterns of response after presumed major volcanic events. The number of probable volcanic events in the 17th century suggest that volcanism is an important source of low-frequency climate forcing as well as more well understood high-frequency source.