

SPATIAL AND SEASONAL IMPACT OF MAJOR VOLCANIC ERUPTIONS ON EUROPEAN TEMPERATURE OVER THE LAST CENTURIES

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Volcanic eruptions are an important natural cause of climate variations. The surface temperature response to explosive volcanic eruptions has been extensively studied on a hemispherical and global scale within the reliable instrumental period. A new compilation of 500 year spatio-temporal highly resolved temperature reconstructions recently developed for the European land areas allows to get an extended insight into the impact of major volcanic eruptions on a continental scale. The temperature estimations are based on the combination of early instrumental station series and documentary proxy evidence and revealed to be trustworthy over the last centuries. These surface temperature fields are used to precisely investigate the seasonal climate response to major volcanic eruptions on a regional scale.

We calculated seasonal anomalies of European land temperature following selected major volcanic eruptions over the last centuries. Superposed epoch analysis is performed to identify the mean climate response to large volcanic eruptions.

The composite temperature field for the first and second summer after an eruption reveals significant cooling in most parts of Europe, which can be explained by radiative cooling. The mean winter temperature pattern found in the two years after the eruptions is dominated by a strong warming, in particular in Northern Europe and somewhat cooler conditions over the Mediterranean. The winter warming is associated by a SLP pattern resembling a strong positive NAO mode. The composite precipitation field (independently reconstructed for the same area and period) during winter shows positive precipitation anomalies over the British Isles and Scandinavia and drier conditions over the Eastern Mediterranean. We state that explosive volcanism plays a crucial role of climate forcing on a continental scale over the last centuries.