



European Hydroclimate Response to Volcanic Eruptions over the Past Nine Centuries

Yujuan Gao and Chaochao Gao

Department of Environmental Science, Zhejiang University, China (gaocc@zju.edu.cn)

The climatic aftermath of the 1815 Tambora eruption in Europe suggests large volcanic eruptions can introduce environmental and societal consequences in this region. Here, we analyze the European summer hydrological response to 31 tropical and 44 Northern Hemisphere mid-to-high latitude eruptions over the past nine centuries, using a newly published reconstruction of global volcanism and a proxy record of droughts (Old World Drought Atlas) coupled with a superposed epoch analysis. Our results show a significant wetting response (at the 95% confidence level) for year 0 and year 1 after tropical eruptions. Spatially, wetting occurs in northeast and southern Europe, while a drying response develops in central and northwest Europe. Both the wetting and drying responses increase with the eruption magnitude. Large high latitude eruptions tend to cause a drying response. Correcting for the effects of El Nino does not noticeably change the response patterns. Our results verify previous modeling studies from a longer term proxy perspective, and indicate that future stratospheric aerosol perturbations are likely to further separate modern and 20th central hydroclimate conditions in Europe during the boreal summers. Complex regional variability exists, and regions such as the Balkan Peninsula may experience intensified wetting. The results may therefore illuminate potential effects of stratospheric geoengineering in Europe.