Geophysical Research Abstracts
Vol. 21, EGU2019-2222, 2019
EGU General Assembly 2019
© Author(s) 2018. CC Attribution 4.0 license.

# Hydroclimate responses over global monsoon regions following volcanic eruptions at different latitudes

Meng Zuo (1,2), Tianjun Zhou (1,2), Wenmin Man (1,3)

(1) LASG, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China (zuomeng@lasg.iap.ac.cn), (2) University of Chinese Academy of Sciences, Beijing, China, (3) Jiangsu Collaborative Innovation Center for Climate Change, Nanjing, China

Understanding the influence of volcanic eruptions on the hydroclimate over global monsoon regions is of great scientific and social importance. However, the link between the latitude of volcanic eruptions and related hydroclimate changes over global monsoon regions in the last millennium remains inconclusive. Here we show divergent hydroclimate responses after different volcanic eruptions based on large sets of reconstructions, observations and climate model simulation. Both the proxy and observations show that northern hemispheric (southern hemispheric) (NH (SH)) monsoon precipitation is weakened by northern (southern) and tropical eruptions, but is enhanced by the southern (northern) eruptions. Similar relationship is found in coupled model simulations driven by volcanic forcing. The model evidence indicates that the dynamic processes related to changes in atmospheric circulation play a dominant role in precipitation responses. The dry conditions over NH (SH) and global monsoon regions following northern (southern) and tropical eruptions are induced through weakened monsoon circulation. The wet conditions over NH (SH) monsoon regions after southern (northern) eruptions are caused by the enhanced cross equator flow. We extend our model simulation analysis from mean state precipitation to extreme precipitation and find that the response of the extreme precipitation is consistent with that of the mean precipitation, but more sensitive over monsoon regions. The response of surface runoff and net primary production is stronger than that of precipitation over some sub-monsoon regions. Our results imply that it is imperative to consider the potential volcanic eruptions at different hemispheres in the design of near-term decadal climate prediction experiments.