Geophysical Research Abstracts
Vol. 18, EGU2016-8617, 2016
EGU General Assembly 2016

Study of Regional Volcanic Impact on the Middle East and North Africa using high-resolution global and regional models

Sergey Osipov, Mohammad Dogar, and Georgiy Stenchikov

King Abdullah University of Science and Technology, Division of Physical Sciences and Engineering, Thuwal, 23955-6900, Saudi Arabia (sergey.osipov@kaust.edu.sa)

High-latitude winter warming after strong equatorial volcanic eruptions caused by circulation changes associated with the anomalously positive phase of Arctic Oscillation is a subject of active research during recent decade. But severe winter cooling in the Middle East observed after the Mt. Pinatubo eruption of 1991, although recognized, was not thoroughly investigated. These severe regional climate perturbations in the Middle East cannot be explained by solely radiative volcanic cooling, which suggests that a contribution of forced circulation changes could be important and significant.

To better understand the mechanisms of the Middle East climate response and evaluate the contributions of dynamic and radiative effects we conducted a comparative study using Geophysical Fluid Dynamics Laboratory global High Resolution Atmospheric Model (HiRAM) with the effectively "regional-model-resolution" of 25-km and the regional Weather Research and Forecasting (WRF) model focusing on the eruption of Mount Pinatubo on June 15, 1991 followed by a pronounced positive phase of the Arctic Oscillation. The WRF model has been configured over the Middle East and North Africa (MENA) region. The WRF code has been modified to interactively account for the radiative effect of volcanic aerosols.

Both HiRAM and WRF capture the main features of the MENA climate response and show that in winter the dynamic effects in the Middle East prevail the direct radiative cooling from volcanic aerosols.