WALTER SCOTT, JR.
COLLEGE OF ENGINEERING
COLORADO STATE UNIVERSITY

Hydrology Days
March 27 – 29, 2019

Flood-Producing Storms in a Current and Future Climate Using High-Resolution Convection-Permitting Simulations in the United States

Erin Dougherty, Kristen Rasmussen
Atmospheric Science, Colorado State University

Abstract. Floods are a major hazard across the world and are the second deadliest weather-related disaster in the continental United States (CONUS). Recent well-known floods, such as the Colorado flood of 2013 that led to over $2 million in damage and flooding from Hurricane Harvey (2017) that caused over $125 billion of damage were the result of high rainfall accumulations of 450 mm and 1538 mm, respectively. Recent climate change simulations suggest that the risk of flooding will increase in the future, due to an increased frequency and/or intensity of heavy precipitation. However, the details of how floods and flood-producing storms might change in a future climate have not been explicitly examined. Thus, the goal of this research is to analyze how rainfall characteristics in a large number of flood-producing storms might change in a future climate over the CONUS.

To understand how floods will change in a future climate, a novel hydrometeorological climatology of floods from 2002–2013 over the CONUS was developed to first understand the distribution of flood-producing storms in the current climate using NCEI flood reports, stream-gauge observed floods from Shen et al. (2017), and Stage-IV rainfall data. The top 25% most intense flood-producing storms from this climatology were selected to study in high-resolution (4-km) convection-permitting simulations over the CONUS region (Liu et al. 2016). These simulations were continuous 13-year runs (2000-2013) and included the 1) current climate (CTRL) forced by ERA-Interim reanalysis data and 2) a pseudo-global warming (PGW) simulation forced by ERA-Interim plus a climate delta signal derived from 19 CMIP5 model monthly mean conditions under the RCP 8.5 scenario to determine how today's weather will change under moister and warmer conditions. The CTRL and PGW simulations of high-impact flood-producing storms are examined from a climatological perspective in order to understand how the duration, rainfall accumulation, intensity, and storm structure might change in a future climate.