A Coupled Numerical Investigation of the Cape Fear River Basin during Hurricane Florence (2018)

Dongxiao Yin[1], Z. George Xue[1], Daoyang Bao[1], Arezoo RafieeiNasab[2], Yongjie Huang[3], and Mirce Morales[4]

[1]Louisiana State University
[2]National Center for Atmospheric Research
[3]University of Oklahoma
[4]National Autonomous University of Mexico

March 4, 2021

Abstract

In this study we adapted WRF-Hydro to the Cape Fear River basin (CFRB) to assess its performance during Hurricane Florence (2018). The model was first calibrated with a strategy of mixture of automatic and manual calibration during Florence and then evaluated with an independent hurricane event. With satisfactory NSE values (>0.4) achieved at all gages for hourly simulation, the model demonstrates its potential in simulating the flood response at both basin and sub-basin scale during hurricane events. The model's capability in reproducing rainfall and properly translating it to hydrological response was further evaluated. The analysis suggests that the calibrated WRF-Hydro in combination with a series of WRF simulation using different microphysics schemes can provide reasonable flood simulations. The model reproduced peak streamflow observed at gage stations with acceptable errors in timing and amplitude. Meanwhile, positive(negative) bias in rainfall input is likely to be amplified (reduced) in streamflow forecast when simulated rainfall volume is larger than the "model true". And the timing bias mostly inherited from rainfall simulation and calibration process.

Hosted file

A Coupled Numerical Investigation of the Cape Fear River Basin during Hurricane Florence (2018) _SUB.pdf available at https://authorea.com/users/399452/articles/511987-a-coupled-numerical-investigation-of-the-cape-fear-river-basin-during-hurricane-florence-2018