# Ph.D. Defense Announcement
# Samuel Childs
# June 12, 2020 at 10:00 a.m.

**Samuel Childs**
**Ph.D. Defense**

Friday, June 12, 2020
10:00 a.m.

Defense
Virtually with Teams information to follow

Post Defense Meeting
Virtuallly

Committee:
Russ Schumacher (Adviser)
Kristen Rasmussen
Steve Rutledge
Dennis Ojima (CSU Natural Resource Ecology Lab)
Julie Demuth (NCAR/UCAR)

Projecting End-of-century Human Exposure to Eastern Colorado Tornadoes and Hailstorms: Meteorological and Societal Perspectives

The Front Range and eastern Plains of Colorado is one of the most active tornado and hailstorm regions in the U.S., with an average of 39 tornado reports and 387 severe (1.0”+) hail reports each year. It is of interest to investigate how the frequency and severity of tornadoes and hailstorms may change in the future and consequently impact those living in eastern Colorado. To gain a more complete understanding of future impacts, both meteorological and societal factors must be taken into account. This doctoral study takes a multidisciplinary approach to project future occurrence of these convective hazards and their associated impacts on society.

After a brief introduction on Colorado severe weather climatology, Part 1 of the defense will examine projected changes in frequency and spatial distribution of tornadoes and hailstorms across the eastern Colorado domain using synthetic reports and pseudo-global warming perspectives. Synthetic tornado and severe hail reports are created and compared between future and historical scenarios, using convective parameter proxies output from high-resolution dynamically-downscaled climate model output. An increase of up to 1 more tornado day and 3 more severe hail days are projected, with maxima in both hazards across northeastern Colorado. A spatial weighting surface of synthetic reports is combined with end-of-century population projections from Shared Socioeconomic Pathways (SSPs) into Monte Carlo models, which simulate how many people will live underneath tornado tracks and hail swaths in the future compared to now. Of note, the model predicts up to a 178% increase in human exposure to hailstorms by the year 2100, but results are very sensitive to the overlap of population and hazard weighting surfaces.

Part 2 will present results from semi-structured interviews with eastern Colorado farmers and ranchers that assessed agricultural perceptions of hailstorm vulnerability and warning messaging. Most farmers and ranchers acknowledged a recent uptick in damaging hail events and considered small hail, either in large volumes or driven by strong winds, to be of more concern for crops than very large hail. The interview sample receives warning messages for severe hail primarily through cell phone applications and self-examining environmental conditions. Affective responses to the threat of a hailstorm include acceptance, anxiety, and dejection. These results will be used to foster relationships between the forecasting and agricultural communities and motivates continued efforts in hail predictability and risk communication to rural areas. Overall, this doctoral study offers a localized perspective of climate change and population impacts on convective hazards, which is of great worth to the local public, meteorologists, urban planners, and other decision-makers.