Venezia, K., Jaume, S., “Predicted Ground Motions and Observed Damage in Charleston from 1886 Earthquake.”

Karissa Venezia Research Statement:

In 1886, a roughly 7.0 magnitude earthquake devastated the Charleston Peninsula. Fire insurance agents did a wonderful job documenting the existing building damage, but Charleston has undergone tremendous growth and change since then. The effect of this is that, although we know a relatively large amount about the damage caused by the 1886 earthquake, we have little understanding of what damage would be caused if such an earthquake occurred today. The primary objective of this work is to determine how building damage resulting from the 1886 earthquake is related to earthquake ground motions. We intend to use historical maps of Charleston and the building damage documented in 1886 in conjunction with modern estimates of ground motion from large magnitude earthquakes, modeled using the 1886 epicenter, to better define exactly how ground shaking impacted buildings in Charleston. We hope to find clear relationships between the degree of damage, the type of building, and strength and frequency of ground shaking. Such relationships could then be extended to those parts of Charleston built after the 1886 and used to predict damage in future earthquake events. We will focus on the southeastern portion of the Charleston Peninsula, since it has complete coverage in both the earthquake damage reports from 1886 and the Sanborn maps from 1884. At the beginning of the research period (6/2/2021), we will start from the southernmost section and work northwards completing as many sections as time allows before the research period concludes on
(8/11/2021). By examining the 1886 insurance report and the corresponding portion of the Sanborn map, an accurate determination of the location of the buildings in the report will be established. Each individual building entry will then be assigned a damage state. Once each section of the Sanborn map is finished, each building will be assigned a predicted ground motion value based off a ground motion map produced in 2020 by Cramer et al. This research will allow me to work with both historical and modern data that ties together my two majors, Geology and History, which many assume are unrelated. I will also gain exposure to the fields of earthquake engineering and seismology. I will learn the basics of ArcGIS, which ties my two majors to my Geoinformatics minor. Since I plan on working for the DOD and focusing on GIS, this will allow me to have real world experience is the field of hazard mapping. If I am able to work for the Army Engineer Corps or other divisions of the military, I could assess the necessary precautions needed for future building. Learning how to interpret and analyzing historical maps and documents of Charleston as well as gaining experience in GIS will boost my ability to do hazard mapping. Even if I am unable to secure a job with the DOD, my intended focus in the field of Geology would be this type of hazard mapping, analyzing past geological disasters and learning how to improve for the future. Many or most of the opportunities likely to come for newly graduating geologists will involve applied science, and this makes research experience based on real-world data extremely important. Getting real-world research experience is maybe even more important this year because, with the continued impact of COVID-19, we still can't know if traditional in-person field experience will start again before my graduation. I see my proposed research as a way to work around that impediment as much as safely possible.