*Starting from your proposed list of articles, you will begin to construct an annotated bibliography. In research, it’s often useful to write a short summary of your own about the articles that you read. That way you don’t have to return to the article entirely to make sense of what you know. This is a living document that gets added to and refined as you read more literature.*

*For this week, read and summarize 2 of the 4 relevant journal articles. While working through each paper think about the following questions to guide your summary of each: What does the paper say about your phenomenon? How are the theoretical models constructed? What assumptions and approximations are being made? What are the predictions and implications? What more do you need to know to understand this article? For this first summary, I expect you to write 2-3 paragraphs per article that you summarize. You may include equations and figures, but they do not count towards the total number of paragraphs.*

Petrov, N. I., & Petrova, G. N. (1999). *Physical mechanisms for the development of lightning discharges between a thundercloud and the ionosphere*. Technical Physics, 44(4), 472-475.

Petrov and Petrova write in their article a short, descriptive context of the effects of altitude and pressure on the formation of lightning in storms. Through several figures and equations, the phenomena is described using intensity, pressure, electric field, and charge, with correlations between them and several references to support the values or concepts they did not personally conceive. Overall, their paper successfully points out the strong correlation between amplitude of cloud structure and air pressure to the formation of lightning, plus the type or vague expected trajectory of lightning produced.

This paper provides a flourishing start to describing the phenomena of lightning, electrically. Petrov and Petrova describe an approximation of the cloud being an electric dipole charge distribution to model the cloud ‘predominantly positively charged’ at the top and negatively at the bottom. As well, among many other elements that contribute to the formation of lightning, there is described a ‘cellular type structure’ of clouds, where parts of the clouds can be denser with excess charge, increasing the likeliness of lightning formation. Added with several threshold values for possible lightning formation, this article presents a foundation for the intent of describing, fully, the occurrence of lightning.

Dwyer, J. R. (2003). *A fundamental limit on electric fields in air.* Geophysical Research Letters, 30(20).

With a strong focus on the nuclear and radiative aspects of storms, Dwyer presents a paper on the effect of ‘feedback’ on the Electric Field threshold for the production of lightning. Excluding atmospheric pressure and the Earth’s own field, it is described that certain feedbacks can induce the breakdown of Electric Fields in air, causing somewhat of an ‘electron avalanche’ that sparks lightning. In the end, the goal of the paper is to present a new fundamental upper limit on how strong the Electric Field can be due to these conditions.

In relation to my research, I wish to incorporate the assumptions made in this paper; ignoring the Earth’s magnetic field, plus *starting* with a uniform electric field before an intruding event causing the actual event process. With the additional information on possible causes of lightning – besides the known limit of Electric Field being reached – this adds another level to storm creation. It pulls electricity and magnetism and collides it with the nuclear sciences, which is still explainable and far more interesting than before. It also provides some numerical values to ‘stable’ or ‘unstable’ Electric Fields, much needed for a more conceptually driven research paper.