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Debriefing paper: Andrew Grundstein
Assessing Climate Change in the Contiguous United States Using a Modified Thornthwaite
Climate Classification Scheme

In his paper, Grundstein uses a modified version of the Thornthwaite Classification Scheme to look for changes of patterns of climate change in the contiguous US. This paper's purpose statement is: "The objective of this study is to examine how variations in moisture and thermal conditions interact together to affect climate" (401). This statement is poor for a few reasons. The verb "examine" is not a strong verb and does not indicate any sort of methodology. Also it is written very broadly and does not clearly indicate scope or clarity of the research. The paper is divided into four sections: introduction, methodology, results and discussion, and summary and conclusion. This is less than the standard six section structure of other articles. Grundstein discusses some previous research and studies that use the Koppen climate classification system and focus on one region, and emphasizes the importance of his study and what makes it original. His main point of departure from similar works is the use of Thornthwaite's classification scheme and the scale at which he conducts his research. He favors the Thornthwaite system because it incorporates inputs and outputs of water, which the Koppen system does not account for. Thornthwaite's system also uses even class intervals making interpretation easier. There were several research questions that Grundstein was trying to answer. The overarching question was how changes in precipitation and temperature affect climate. Within that were how the area of different climate types change over time, and how the climate types change spatially.

The author uses quantitative precipitation and temperature data obtained from the Climate Division Dataset, which makes the data high quality secondary data. This dataset was chosen because it provides continuous records for long periods of time. Data from three thirty year periods were used (1910-1939, 1940-1969, 1970-1999). The author does acknowledge some of the criticisms of the dataset, mainly that mountainous climate divisions would affect the larger climate region by showing that this is indeed not true. As was mentioned in class, however, he does not acknowledge at all the issue of rainshadows and how this would affect the data. The data from the Climate Division Dataset is used to calculate monthly potential evapotranspiration (PE) based on a method devised by Thornthwaite and Mather. There is no explanation about this method, or why it is best to use, or why it is valid in any way. A moisture index and seasonality index were derived from the PE calculation, with very little convincing explanation for their computation.

When examining variability in areal coverage, each year's climate areas were calculated and put into percentages of the total area of the US. This was then put into time-series graphs and analyzed for changes in area over time using Spearman rank correlation because the pattern was not linear. Next, to study spatial variations, he computes thirty year climate averages for each climate division and assigns climate types to each climate division. An ordinary least squares regression is used for each time series to determine trends and changes in climate regions spatially. Charts and maps are then used to convey the results.

As for my opinion on how convincing the article was, it is safe to say that I was not entirely convinced. I think the reason I was not extremely thrilled about this article was because I am familiar with the Koppen system and not at all with the Thornthwaite system or any of Thornthwaite's work. That being said, I wish the author had done a better job of explaining how PE was calculated, rather than refer to where he got the method from. I think Grundstein should explain how this method compares to other ways of calculating PE and how close it may be to other ways. As with the issue I had with PE, I had similar issues with the moisture index and seasonality index. I think he could have done a better job of explaining why the methods of calculation are valid and meaningful. Another thing that bothered me was the redundancy throughout the paper, the main objective and "road map" of the article are clearly stated twice. That space should have been used to better explain his methodology, rather than repeat himself. Overall, I found the article to be interesting but the way it was presented was not exceptionally clear for me.

We touched on many of these gripes, and more, in class and further dissected the methodology and data. It was the consensus that he should have explained more about the various details because the article is in the *Professional Geographer* and thus has a large, broad audience. There are not enough specific explanations for readers that are unfamiliar with the techniques and ideas that are used. It appears that the author was mainly focused on the techniques and messing around with the data to see what he could find rather than being focused on the context of the research. Furthermore, he asks the reader to make leaps in methodology by not being thorough in his explanations. Like I stated above, the class was unimpressed with the purpose statement, and even found items addressed in the summary that should have been in the introduction. Another point mentioned in class was how he uses different methods for analysis, specifically Spearman rank and least squares regression. His justification for the use of least squares is weak and relies on other peoples' research to choose this method. He would have been better off sticking to one method of analysis, Spearman rank correlation, in order to analyze changes in climate area and spatiality. It was also noted that there should be more sections to the paper and that "may" is used a lot because he is scared of making leaps beyond their data. Overall, the discussion and class mentioned various aspects of the author's methodology, data, and general structure noting any strengths and weaknesses. Doing this sort of discussion is beneficial in this stage in our graduate degree because it allows us to see what other authors have done and how they have done it, so we can better understand the way in which we wish to write in order for our research to be strong and effective.

Grundstein, A. 2008. Assessing Climate Change in the Contiguous United States Using a Modified Thornthwaite Climate Classification Scheme. *The Professional Geographer* 60(3): 398-412.