

Analytical summary of climate change assignment



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Analytical Summary of Climate Change Modeling Methodology Articles

(NAME) (NAME OF SCHOOL) Abstract The present essay includes a synthesis of four research articles discussing climate change related to tropical cyclones through various climate modeling methods. More specifically, the articles examine whether the frequency and intensity of tropical cyclones, with subsequent global impact on climate, atmospheric carbon levels, and human population may be predicted through the current climate modeling methodology employed by the authors, and if so, to what extent.

The consensus of all four articles, despite inter-author differences in methodology and prediction, is that more research is needed in this area, and that the potential impact of changes in frequency and intensity of tropical cyclones is extremely significant in terms of its implications to the global population. Analytical Summary of Climate Change Modeling Methodology Articles

The purpose of the present analytical summary essay is to present a synthesis of three research articles and one review article discussing the changing global weather patterns related to tropical cyclones, and the subsequent global impact of such changes. While each of the articles presents the fact of global climate change related to tropical cyclone patterns, the differences between authors lie primarily in methodology used to make predictions, and based on results which vary based on methodology used, the implied significance of predictions related to changing tropical storm patterns.

The articles concur that a certain amount of climate change occurs as a result of a natural warming process reflective of climate changes occurring over millennia, but that changes occurring as a result of human created global warming processes cannot be predicted solely through climate models looking at natural patterns that occur over time. There is no debate regarding the existence of global climate warming, rather the debate presented by the articles is the mechanisms by which the warming climate will impact tropical cyclones in terms of frequency and intensity, and to what degree.

Donnelly and Woodruff (2007) examine the issue using recorded data of tropical cyclone activity over the past millennia, as well as examining sediment cores from a Caribbean lagoon containing coarse-grained sediment deposits characteristic of hurricane landfalls. The resulting cyclone prediction model presented using the methodology in the Donnelly and Woodruff study posits that they were able to investigate trends over the past 5000 years.

The article purports that warmer Sea Surface Temperatures (SSTs), which have been hypothesized as causal factors in the increasing frequency and intensity of tropical cyclones, cannot explain the cyclone patterns, and in fact appear to be more correlative than causal based on the sediment record. The article looks at the importance of El Niño and the West African Monsoon will be impacted by the warming climate, and subsequently more study is called for in order to predict the impact of the El Niño/West African Monsoon on tropical cyclones. Contrary to this position is the research presented by Elsner et al. (2008), evaluating the trending increases in frequency and intensity of tropical cyclones through their relationship to

warmer SSTs consistently below the cyclone. The methodology utilized by the research article examines SSTs over the 25-year period between 1981-2006 using quantile regression statistical models, and finds that a statistically significant relationship exists between warmer SSTs and the intensity of tropical cyclones, and that this relationship may be explained by the hypothesis that warmer SSTs lead to an increase in available energy which is converted into tropical cyclone winds.

Evaluating the issue of tropical cyclone weather patterns with available kinetic energy hypothesized as a causal factor, the O’Gorman (2010) research article includes a combination of the Elsner et al (2008), and Donnelly and Woodruff (2007) concepts. O’Gorman posits that the available, or potential kinetic energy created by warming temperatures explains the changing tropical storm patterns in terms of increases in frequency and intensity, but that the relationship between warming temperatures and changing weather patterns cannot be simply explained by warmer SSTs.

The methodology used in the O’Gorman article is observation over a period of approximately one decade combined with an analysis of climate models looking specifically at the relationship between temperatures and available kinetic energy. O’ Gorman concludes that there is a direct relationship between temperatures and the trending increase in frequency and intensity of tropical storms, but that the effect is dependent on hemisphere.

For example, more intense storms will occur in the Southern Hemisphere throughout the year, whereas in the Northern Hemisphere, the change in storminess will depend on the season. Knutson et al (2010) presents a

review of the available research related to tropical cyclone behavior trends and predictions based on climate change. Ultimately, the article summarizes well the need for additional research to examine the causal factors and to develop reliable prediction methods.

The article summarizes the current data, supporting the consensus that future projections indicate that climate changes caused by global warming will continue leading to an increase in intensity of tropical cyclones, and a decrease in the frequency of tropical cyclones. From a policy perspective, more reliable prediction models are called for. The Knutson article raises the significant issue within the research that between studies, there is a wide range of variability in the percent increase predicted in terms of intensity of tropical cyclones, as well as the percent decrease predicted in their frequency. To summarize, each of the articles examines whether the frequency and intensity of tropical cyclones may be predicted through the current climate modeling methodology employed by the authors, and if so, to what extent. The consensus of all four articles, despite inter-author differences in methodology and prediction, is that more research is needed in this area, and that the potential impact of changes in frequency and intensity of tropical cyclones is extremely significant in terms of its implications to the global population.

Hypotheses related to causal factors include warmer SSTs (Elsner et al), El Nino and the West African Monsoon's predicted response to climate change (Donnelly and Wodruff), and available kinetic energy (O'Gorman); however, all authors call for additional research and posit that changes will occur, and will have a significant impact on human populations.