

## Hurricane Frederic: Facilitator of Climate Change

**John C. Breckenridge**, Department of Earth Sciences, University of South Alabama, Mobile, AL 36688. [jcb605@jaguar1.usouthal.edu](mailto:jcb605@jaguar1.usouthal.edu). Hurricane Climate Changer

In 1979 Hurricane Frederic tore through Mobile knocking down numerous trees along with everything else in its wake. It has been hypothesized that this particular storm was so devastating that it actually changed the climate of Mobile. Using data collected from the National Weather Service I attempted to compare and contrast reports from separate stations in Mobile using records dating before Hurricane Frederic to many years after the storm. This should give a clear idea on whether or not this storm did change the climate and if small-scale climate change is a possible outcome of a major weather event.

Keywords: climate change, Hurricane Frederic, deforestation.

### **Introduction:**

In the beginning of the latter half of the past century Mobile was a lush and vibrant city full of trees growing in abundance helping to promote the romanticized vision of the rural south with its huge pines and down-home country feel. The climate was similar to today with the weather being blistering hot and incredibly muggy. Most of the nation would have found this climate unbearable, but the resilient citizens of Mobile took pride in their ability withstand the heat and humidity of their beloved city. Tropical weather was just a normal part of life – everyone knew that storms would assault our shores and push inward barraging the city with wind and rain. However, no one expected the devastation that would occur in the late 1970s that changed the rustic, tree rich persona of the city.

Late on September 12, 1979 Hurricane Frederic struck Mobile and decimated its population of trees (South Alabama 2011). Hurricane Frederic tore down 165,100,000 board feet of hardwood and 398,040,000 board feet of pine in Mobile County alone. Each board foot is equal to 144 cubic inches (USACOE). Jack Petit argues that this has led to

an overall change in climate in Mobile. Petit also claims that flash flooding now occurs more often with more sporadic rainfall and a greater total of rainfall in the summer (Petit 1995). Edward A. G. Schuur's research shows that trees can affect climate change. His research contradicts Petit, showing that precipitation can lessen with a reduction of productivity of trees (Schuur 2003). Along with deforestation, rising sea levels can affect climate as well as land use (Michner et al 1997, Dale 1997). A loss of trees would reduce the amount of cooling of the air, which would allow for more convection, causing storms. It also changes the surface's albedo, along with concrete not allowing water to drain into soil causing mass runoff. Thus a loss of trees can most definitely change a climate, especially when that loss is coupled with urbanization.

**Research Question:**

Has the climate of Mobile changed since Hurricane Frederic? If so, what factors have helped to contribute to the change of the climate and could Hurricane Frederic be a driving force and reason for this change.

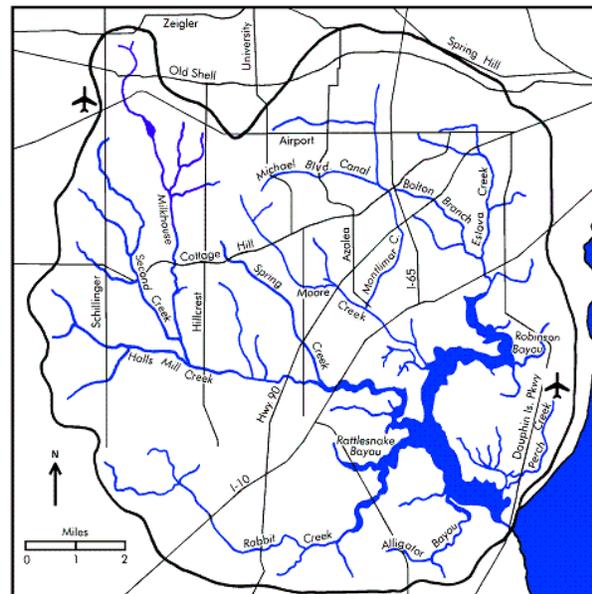


Figure 1: Map of Dog River Watershed. Source: USA

**Methods:**

I attempted to look up climate data for Mobile using local climatological data from the National Weather Service as well as national climatological data. I attempted to look up data from within 20 years previous of Hurricane Frederic to 20 years after for

multiple sites. The sites used were Bates Field and Brookley Field (Fig 1.). With these two sites located in West and East mobile respectively, I should have a good basis for comparison. I then attempted to compare the climates of each location before and after Hurricane Frederic. This should allow me to effectively determine whether the climate of Mobile was changed because of Hurricane Frederic.

### **Results:**

Hurricane Frederic might have altered the climate of Mobile. The results are indefinite because records were unable to be obtained for the Brookley location. Thus, a comparison of the two stations was unable to be observed. However, there are differences in the data for Bates Field.

Climate records from 1964 to 1995 were used to determine if temperatures and precipitation have varied since Hurricane Frederic. Figures 1 and 2 show that average Pre-Hurricane Frederic monthly temperatures and Post-Hurricane Frederic monthly temperatures are very similar. The trends show data shows that pre-hurricane temperatures are slightly higher but that post-hurricane temperatures are on the rise.

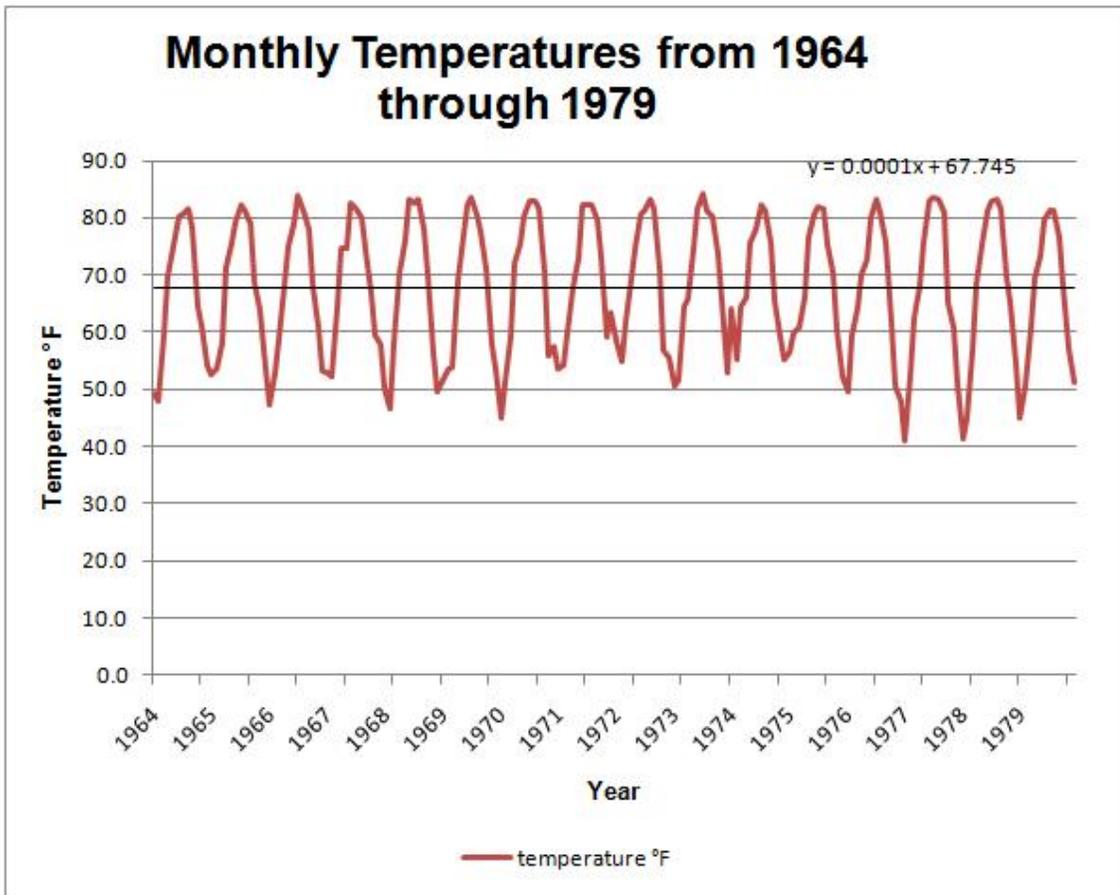


Figure 2: Monthly Temperature for Bates Field from 1964 through 1979. Data Source: NOAA

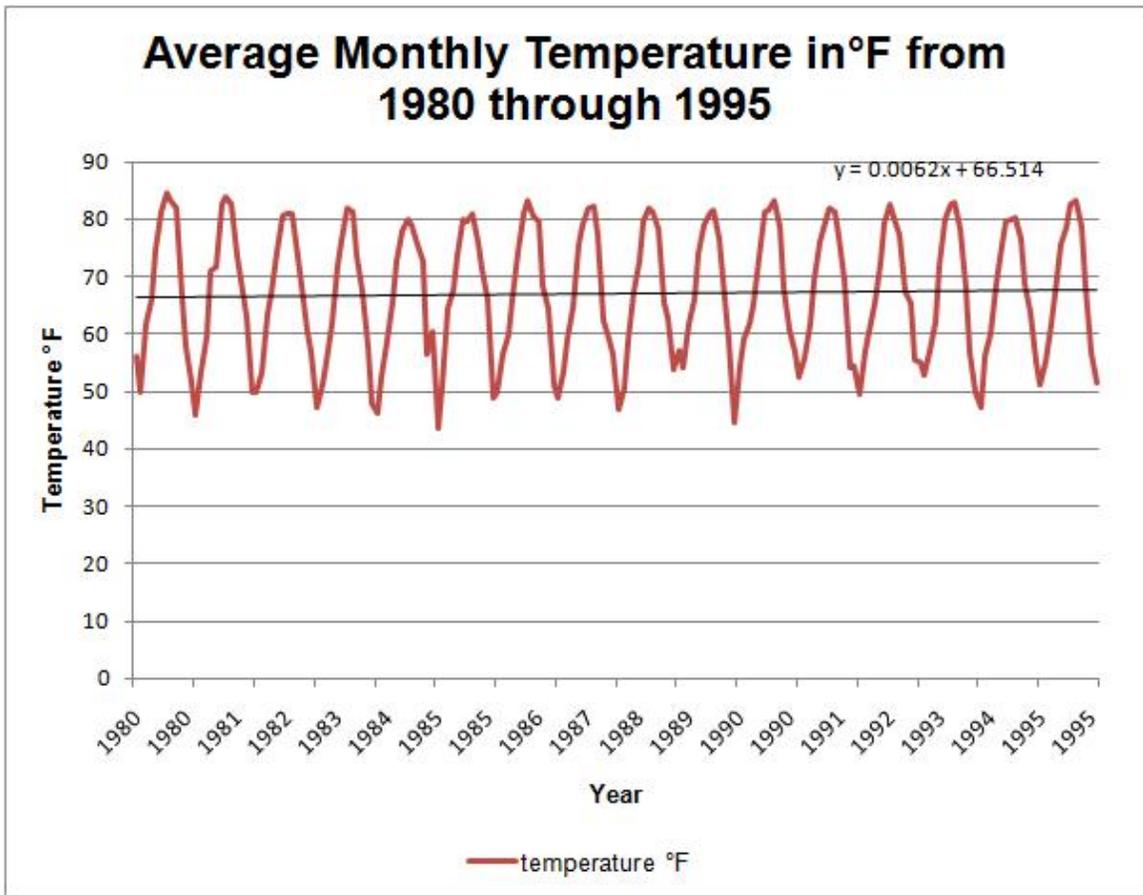


Figure 3: Monthly Temperatures for Bates Field from 1980 through 1995. Data Source: NOAA

Precipitation records show that more rain is now falling in West Mobile since Hurricane Frederic struck the area. As Petit claims, Bates Field shows a greater amount of rain in late spring/early summer in the post-hurricane timeline (Fig 3.) In fact, the post-hurricane period experienced about 5 more inches of rain on average than that of the pre-hurricane period.

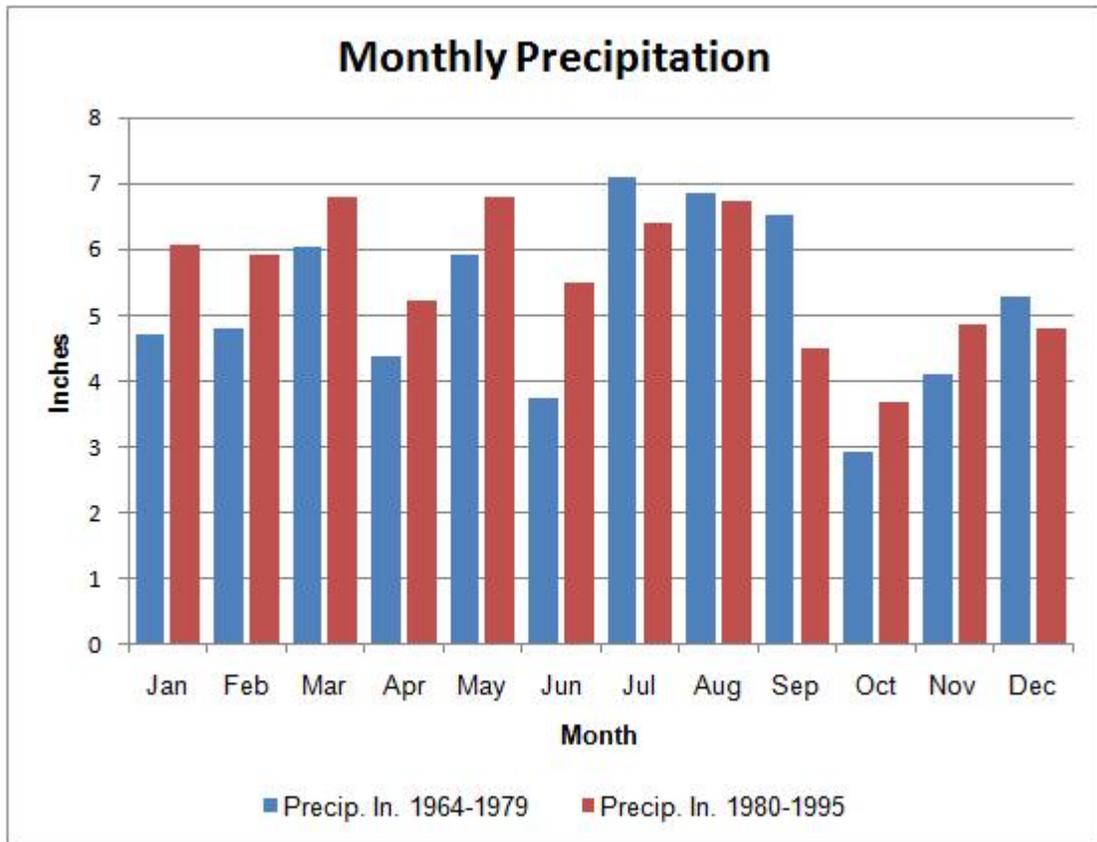


Figure 4: Monthly Precipitation at Bates Field. Data Source: NOAA

Unfortunately, records for Brookley Field stopped being a National Weather Service Center in 1965 (Fig. 5) (Sercc 2011). This was 14 years before Hurricane Frederic. Though an airport remains in use, data for this station is hard to come by.

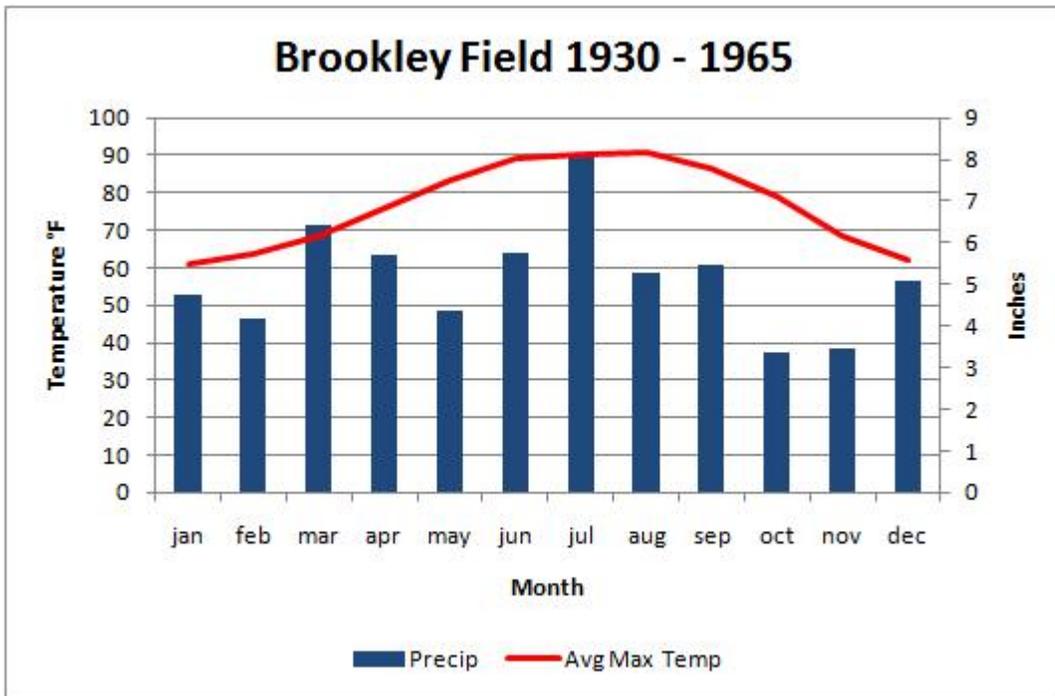


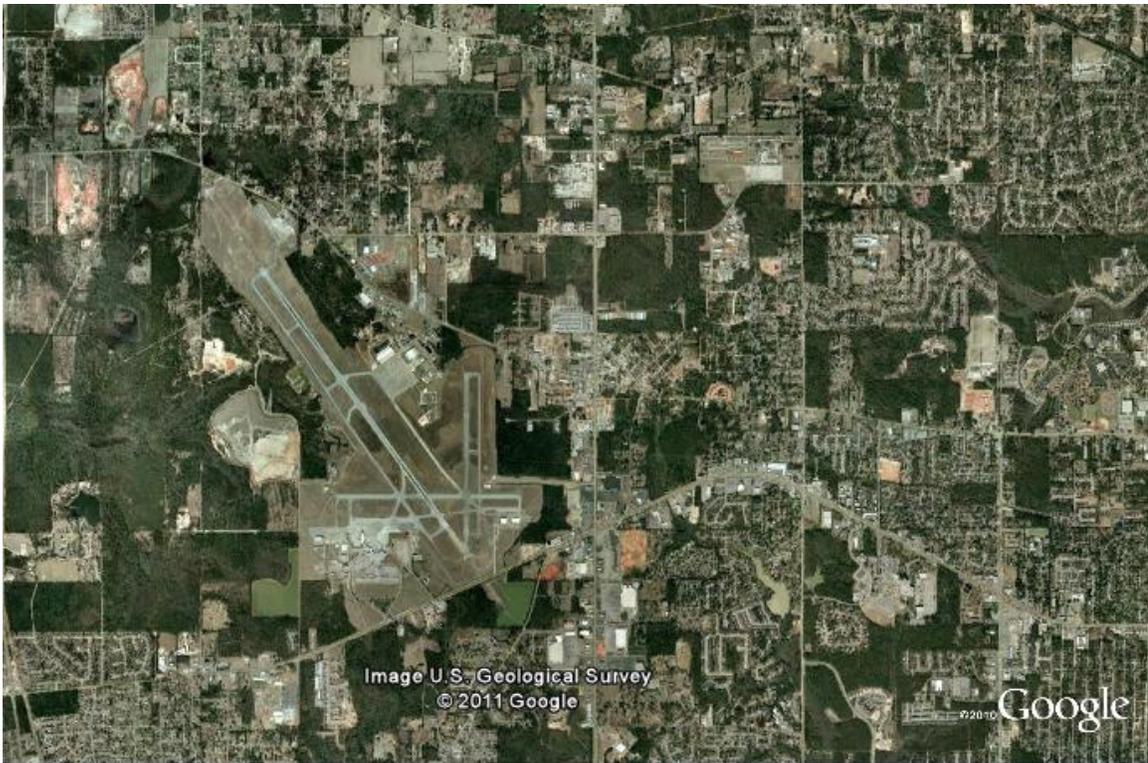
Figure 5: Climograph for Brookley Field From 1930 - 1965. Data Source: SERCC

### Discussion and Conclusion:

Due to the lack of comparison one cannot confirm a change in Mobile's climate. However from 1980 to 1995 West Mobile did see an increase in rain in the late spring season/early summer season just as Petit claims. The increase in rainfall might likely be in some part due to Hurricane Frederic. Other factors could include the expansion/urbanization of Mobile helping to create an urban hot spot, which would trigger summer thundershowers. Mobile County has experienced a population increase since 1960. In 1960 the population was just under 365,000 and grew to almost 477,000 in 1990 (Census Scope). This increase can be seen on aerial photos and would certainly help create an urban hot spot (Fig. 6) (Fig. 7).



**Figure 6: Aerial Photo of Bates Field in 1960. Data Source: UA**



**Figure 7: Aerial photo of Bates Field 2011. Source: Google Earth**

Though no comparison can be made between intercity locations for the time period directly preceding Frederic and directly proceeding Frederic, one can claim that Mobile has seen an increase in rain since Hurricane Frederic.

## References Cited:

- "Bates Field 1960." *Alabama Maps*. Web. 09 May 2011.  
<[http://alabamamaps.ua.edu/aerials/Counties/Mobile/Mobile\\_Bates\\_Field\\_1960.html](http://alabamamaps.ua.edu/aerials/Counties/Mobile/Mobile_Bates_Field_1960.html)>.
- "CensusScope -- Population Growth." *CensusScope: Census Data, Charts, Maps, and Rankings*. Web. 09 May 2011.  
<[http://www.censuscope.org/us/m5160/print\\_chart\\_popl.html](http://www.censuscope.org/us/m5160/print_chart_popl.html)>.
- Dale, Virginia H. "The Relationship Between Land-Use Change and Climate Change." *Ecological Applications* 7.3 (1997): 753-69. Print.
- "Dog River Watershed: Black and White Map." *University of South Alabama Homepage*. Web. 30 Apr. 2011.  
<<http://www.usouthal.edu/geography/fearn/480page/MapBW.html>>.
- Google Maps*. Web. 09 May 2011. <<http://maps.google.com/maps?hl=en>>.
- "Hurricane Frederic." *University of South Alabama Homepage*. Web. 23 Apr. 2011.  
<<http://www.southalabama.edu/meteorology/hurricanefrederic.html>>.
- Michener, William K., Elizabeth R. Blood, Keith L. Bildstein, Mark M. Brinson, and Leonard R. Gardner. "Climate Change, Hurricanes and Tropical Storms, and Rising Sea Level in Coastal Wetlands." *Ecological Applications* 7.3 (1997): 770-801. Print.
- "MOBILE, ALABAMA Period of Record Monthly Climate Summary." *Homepage / Welcome - Southeast Regional Climate Center*. Web. 22 Apr. 2011.  
<<http://www.sercc.com/cgi-bin/sercc/cliRECTM.pl?al5483>>.
- NOAA. "Mobile Alabama." *Local Climatological Data 1993.Annual* (1994). Print.
- NOAA. "Mobile Alabama." *Local Climatological Data 2009.Annual* (2010). Print.
- Petit, Jack. "Gone With the Breeze: Tree-loss and Potential Climate Change in Mobile, Alabama." *Design & the Environment* V.II (1995). Print.
- Schuur, Edward A. G. "Productivity and Global Climate Revisited: The Sensitivity of Tropical Forest Growth to Precipitation." *Ecology* 83.5 (2003): 1165-170. Print.
- United States Army Corp. of Engineers. *Hurricane Frederic Post Disaster Report*. Rep. United States Army of Engineers, 1981. Print.