**Using NASA Earth Observations (EOS) to evaluate**
**Relationship between Land Cover Use and Tornadogenesis in Alabama**
**NASA Marshall Space Flight Center**
**Earthzine/DEVELOP Virtual Poster Session, Fall 2011**
**Video Transcript**
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**Scene 1: Title Page, Music – Sample music from windows media Scene 2(Voice over by Steve)** The April 27th tornado outbreak in 2011 affected much of the southeast leaving catastrophic destruction in its wake, especially across the state of Alabama.

**Scene 2 Pictures of tornado affected areas in Alabama**
**Picture 1- April 27th, 2011: Tornado towards Gainsville, AL**
**Picture 2- GIS out of Aril 27th tornado Tracks in Alabama**
**Picture 3- Tornado looking North along US-231 near James Cooley Blvd, Arab, AL (Courtesy Dr. Kevin Knupps)**
**Post tornado destruction site in Concord, Al (Courtesy Steve Padgett)**
**Script:** On average, 22 tornadoes occur in Alabama every year, resulting in approximately 7 deaths and more than hundred injuries. The April 27th tornado outbreak resulted in 239 deaths in Alabama alone and more than 1 billion dollars in total damage costs.

**Scene 3- Video of tornado on Highway (Courtesy Dr. Kevin Knupps)**
**Picture of landscapes- (Courtesy Steve Padgett)**
**Pictures of study abstracts**
**Script:** Several factors play a role in tornado occurrence including sufficient climatic conditions such as Wind, Air pressure, Temperature, gravity Waves and Raindrop Size. Some studies have suggested that surface characteristics such as elevations, agricultural fields, forests, soil moisture and topography may also have an impact on the tornado formation and determine the path for the tornadoes. However studies supporting this hypothesis are minimum and further research is warranted.

**Scene 4- Picture of the Team in front of NSSCT MFSC BLDG. Voice over: Steve Script:** Based on previous literature and consultation with scientists in the field, the DEVELOP team at Marshal Space Flight Center proposed to explore whether data from Earth observing systems can be used to assess any correlation between tornadogenesis and surface characteristics such as land cover use and topography. Our study falls within the scope of the **Applied Sciences National Application in the area of Natural** Disaster.

**Scene 5 - Introduce team members- Pictures of each member with captions in the Nsstc lab**

For the fall semester, we have in our team Claire Herdy, undergraduate in Earth Systems Science at UAH, Tiffany Keeton, graduate student at UAH in atmoshperic sciences, Meghan Tipre (Tip-rhe), a graduate student in Public Health at University of Alabama at Birmingham and I am Steve Padgett-Vasquez the Center lead for DEVELOP at Marshall Space Flight Center.

**Scene 6- PPT OF MAP SHOWING FOUR COUNTIES WITH CAPTIONS FOR THEIR NAMES Voice over by Steve - PPT displaying each aim one after another Script:** The objectives of our projects are:
1. Use NASA Earth Observing System data from ASTER satellite images to determine the type of land cover –land use for the for North and Central Alabama region within the last 10 years.
2. Investigate the relationship between land cover types and frequency of tornado occurrence in North and Central Alabama.

**Scene 7- TIFFANY VOICE OVER- PPT OF SATELLITE IMAGES USED FOR THE ANALYSIS, Animated video of remote sensing satellites (courtesy- http://glory.gsfc.nasa.gov/a-train.html) Script:** We obtained ASTER_LIB.3 data from usgs for this study. ASTER which is Advanced Spaceborne Thermal Emission and Reflection Radiometer is an imaging instrument flying on Terra, a satellite launched in December 1999 as part of NASA's Earth Observing System. ASTER is a cooperative effort between NASA, Japan's Ministry of Economy, Trade and Industry and Japan's Earth Remote Sensing Data Analysis Center.

**Scene 8- Tiffany voice over- Images of LP DAAC website**
**PPT of Data Acquisition** The Data Pool is publicly available portion of the LP DAAC online holdings. Data Pool provides a direct way to access files with all holdings available at no cost to the user. ASTER level-1B data have had system radiometric corrections and geometric coefficients applied and are reprojected to a given map projection.

We obtained ASTER images between 2005 and 2011. Images were obtained between the months of march and june to coincide with tornado season in the SouthEast. Data on tornados was obtained from **National Oceanic and Atmospheric Administration.**

**Scene 9- Image of Claire working on ENVIR and ARC GIS.**
**Image of Interface of ENVIR**
**PPT of Methodlogy, Areas of Interest**
**Claire Voice over Script:** Data was analyzed using ENVI and ARC GIS. Images were analyzed using unsupervised k-means and maximum Likelihood Supervised classifications. For supervised classifications, regions of interest most relevant to our study were found to be: baresoil/shrub, agriculture, forest and developed. **Script:** Using ENVI’s ROI tool these areas were manually picked out of the original false color image. Any water contained

in the image was masked out to keep the classes of interest clear. These ROIs were used in a supervised maximum likelihood classification followed by a 3 kernal median filter to clean up the entire image. Band math was applied adding the filtered classified image to the masked collar of the false color to keep the classes separate. This image was then uploaded into ArcGIS for further analysis.

**Scene 10- Images of Satellite images classified**
**Claire Voice over**
**Discussion of results for supervised classification**
**Script:** For the Maximum Likelihood Supervised Classification in a cross section of the following Alabama counties: Jackson, Limestone, Madison, Marshall and Morgan, the majority of tornado #1 hit forested areas. The majority of tornados #2 and #3 hit developed/baresoil. The majority of tornado #4 hit forest with the other tornado ranges falling outside the scope of this ASTER scene. The relationship between landcover and the entire tornado length will be determined from additional ASTER data already acquired.

**Scene 11 – Tiffany voice over**
**Discussion of results for unsupervised classification**
**PPT of Satellite images classified**
**Script:** K-means Unsupervised Classification is a cross section for the following Alabama counties: Madison, Jackson, DeKalb, Etowah, Marshall, Cullman, Winston, Lawrence, Marion, Fayette, Pickens, and Lamar. The majority of Landcover type tornadoes most affected was forest. Over half the counties had forest Jackson, Marshall, Madison, DeKalb, Blount, Cullman, Lamar, Fayette, Pickens. The remaining tornadoes in the counties hit bare soil or water.

**Scene 12- PPT slides for limitations and future directions**
**Slides for acknowledgements**
**MEGHAN VOICE OVER Script:** The overall goal of the study was to evaluate whether Earth observing Systems data was useful is assessing relationship between land cover use and tornado occurrence. However, the main limitation of our study was inability to adjust for climatic factors. Thus we can state with limited certainty whether land cover types play a role in torndaogenesis. We would however like to further expand our research to assess benefits of of EOS in post-tornado recovery analysis. We are very grateful to our science advisor Dr. Jeff Luvall for his guidance. We would also like to give special thanks to Dr. Tim Coleman at University of Alabama in Huntsville, Dr. Andrew Molthon at Short Term Prediction Research and Transition Center in Huntsville,Rob Griffin, Tod Murphy and Dr Kevin Knupps at UAH Earth Systems Science center for their time and support. Our potential partners for this project are Alabama Emergency Management Agency (Alabama EMA), Short Term Prediction Research and Transition

Center(SPoRT)and City of Huntsville Geographic Information Systems Department.

**Scene 13- Credits**