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Cloud statistics over agricultural and mixed forest areas in Lower Mississippi River Valley

Valentine Anantharaj[2], Udaysankar Nair[2], Denise Berendes[2], Salvi Asefi[2], and Jonathan Fairman[2]

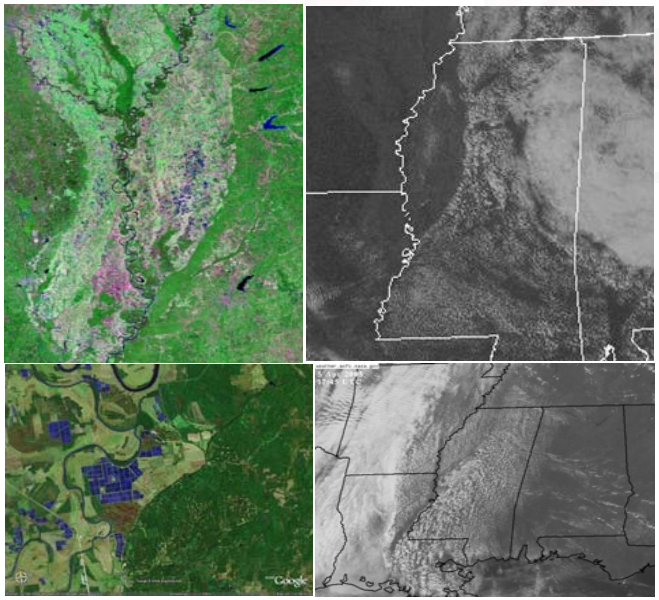
[1]GeoResources Institute, Mississippi State University, MS;

[2]Department of Atmospheric Sciences, University of Alabama, Huntsville, AL

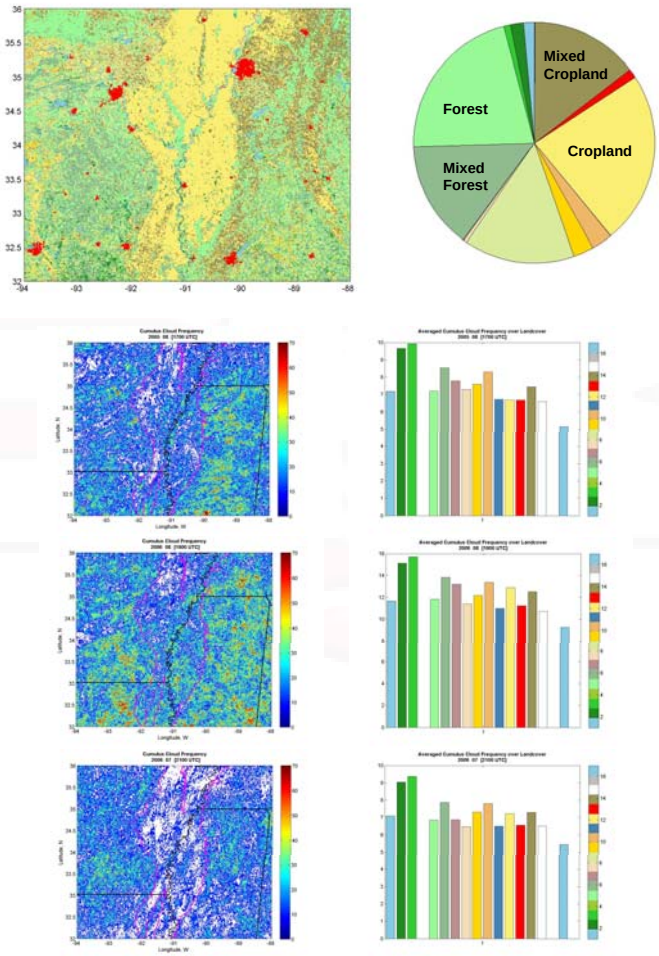
Overview

During the past 150 years, the Mississippi Alluvial Valley (MAV) across the alluvial flood plains in Tennessee, Arkansas, Mississippi and Louisiana, along the Mississippi River, have been gradually **converted to agricultural and other anthropogenic use, especially during the years 1880 to 1960**. This region, also known as the ***Delta***, is characterized by a distinct land use and land cover pattern. This is evident in satellite imagery, both visible and near infrared on clear days, especially during the spring season due to different land surface temperatures. The MAV with the rich alluvial soil and available supply of water is an area of intense agriculture practice as well as aquaculture. The MAV is **surrounded by wooded and mixed forest areas to the east and west**. This landscape heterogeneity can result in different patterns of cloudiness as well as surface temperatures. In this study, we have analyzed the satellite cloud cover from the daytime visible imagery obtained from the GOES-12 satellite, and then attempt to **relate these temperature trends to land use changes, especially agriculture**. In general, **there is decreased instances of cumulus cloud cover with-in the agricultural MAV, when compared to the adjacent forested areas to the east and west have cooled.** Effects of sea-breeze are also evident in the southern extent of the study

Satellite imagery show the heterogeneous landscape in the *Mississippi Delta* and their effects on land surface temperatures and cloud patterns.



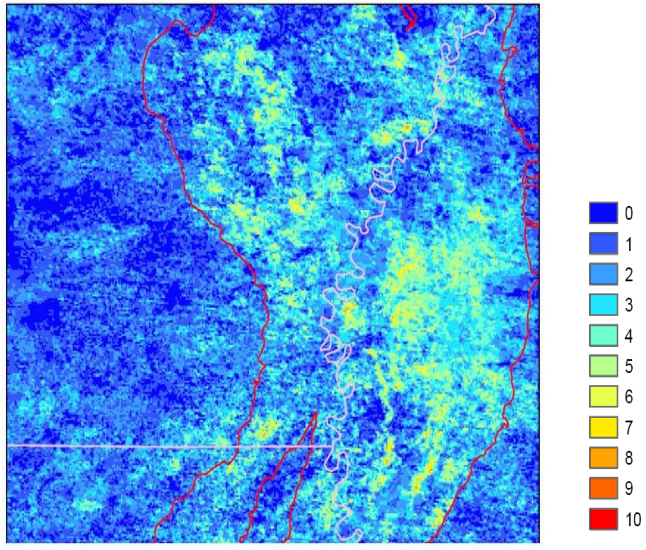
IGBP Landuse and Land Cover of the study area and their distribution



Cloud Statistics

Data from the visible channel of the **GOES-12** satellite have been used to derive the occurrence of cumulus clouds during the months of March – September for the years **2004-2006** at times 1400, 1500, 1600, 1700, 1800, 2000, 2100 and 2200 UTC. The detection of cumulus clouds is based on ***Structural thresholding*** (Nair et al., 1999), an automated algorithm which ***uses the spatial structure of the cloud elements***. We used the results of the cloud classification to compute the **frequency of occurrence of cumulus clouds** for every month at a given time. We then aggregated and averaged the computed frequencies of occurrence for a given land cover, based on the **IGBP Land Use and Land Cover** (LULC) maps, derived from historical MODIS data. In general, (a) in most instances, there is **increased cumulus cloudiness over forested areas than across agricultural lands** in the LMAV; and (b) there are **less cumulus clouds over the urban areas** in our domain. There have been no systematic instances of more cumulus clouds in agricultural lands than forests. However, in a single case, when we used the **Interactive Visualizer and Image Classifier for Satellites (IVICS)** software (Berendes et al., 2008) to classify cumulus clouds MODIS, the **results were different** (see below), and showed **more cumulus clouds over agricultural lands**. This could be attributed to the differences in the fidelity of the cloud detection and classification algorithms. We intend to **reanalyze the GOES-12 data using IVICS**.

The IVICS analysis MODIS data for March 2005 shows more cumulus clouds with the MAV at the time of the satellite overpass



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