LAND COVER AND LAND USE CHANGE IN GHANA FROM 2000 TO 2010: MULTI-TEMPORAL LANDSAT ETM+ IMAGE PROCESSING APPROACHES FOR A CLOUD PRONE STUDY AREA

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ABSTRACT:

A primary objective of our NASA-funded project on rural-urban migration in relation to land cover and land use change (LCLUC) is to identify, map, and quantify LCLUC within four contiguous regions (i.e., states) in southern and central Ghana from 2000 through 2010.We present results of LCLUC analyses for the Greater Accra region. Over 50 Landsat 7 ETM+ surface reflectance images (LEDAPS processing) that are at least 66% cloud-free were used to generate a time series data set. Pixels with cloud, cloud shadow, water, or no data due to scan line corrector problems were masked. The time series approach is critical due to the high percentage of cloud cover that regularly blankets the southern Ghana study area. Multitemporal composite images (such as maximum NDVI and maximum local spatial texture) are the basis for creating c. 2000 and c.2010 LCLU products (urban, agriculture, forest and other natural land cover classes). Composites are created using approximately 25 images with less than 33% cloud cover, for each end of the study period (i.e. c. 2000 and 2010). Products characterizing within-image spectral variability enhance Ghanaian agriculture fields that are present in the imagery but not easily identified from visual or traditional computer-assisted techniques. Built cover maps derived from ERS-2 /ENVISAT radar imagery are also incorporated. A novel pixel-based classification and post-classification trajectory analysis was implemented to estimate the likely date for which LCLUC transitions first began to occur.

The major type of regional LCLUC is agricultural to built, driven by the high amount of migration to Accra. Most of this has occurred in the peri-urban areas outside of Accra. Backscatter and texture information from ERS/Envisat SAR data were useful for detecting small rural settlements. Urban LCLUC within Accra is mostly occurring as building within limited open spaces and densification of residential areas, particularly in slums.

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