

# Monitoring Land Cover Through Big Data: Finding Buried Treasure in Landsat Data

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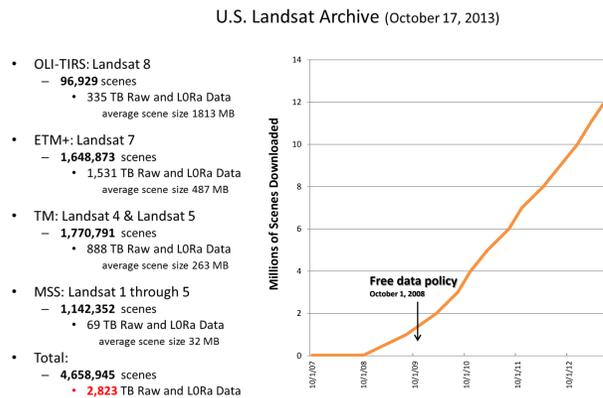
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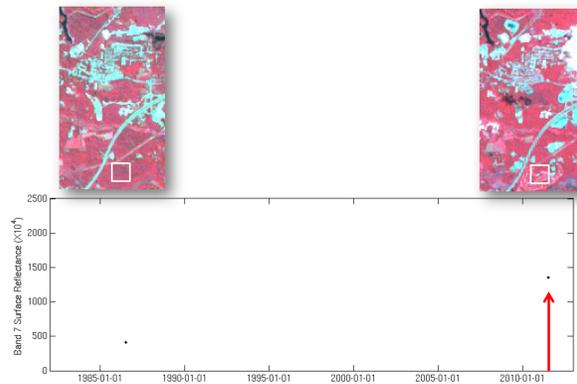
## Introduction

Land cover and alterations of land cover, play a key role in the climate and biogeochemistry of the Earth system. The 40+ years of data in the Landsat archive comprise the most valuable dataset available for understanding land cover change. By using all available Landsat data in the archive, a new algorithm called CCDC (Continuous Change Detection and Classification) is developed. This algorithm is capable of detecting many kinds of land cover change as new images are collected and at the same time providing land cover maps for any given time.

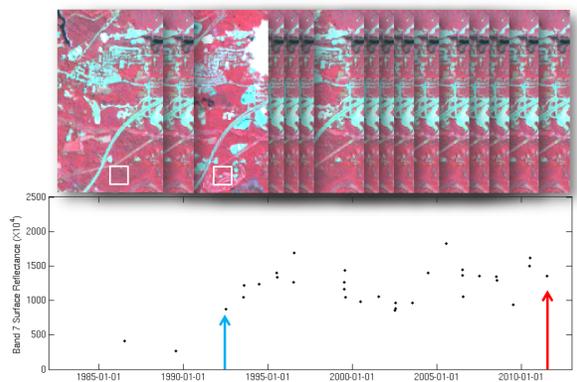
## Big data and free!



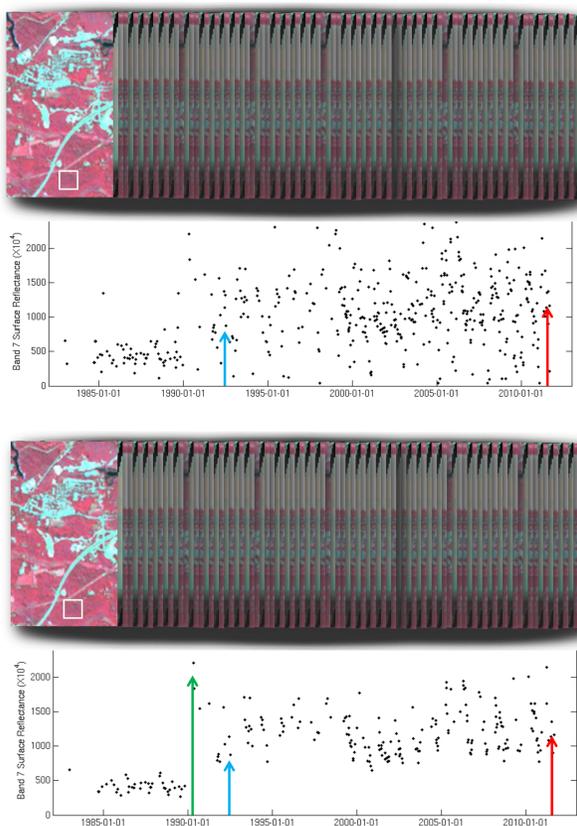
## The dark ages



## Brighter days



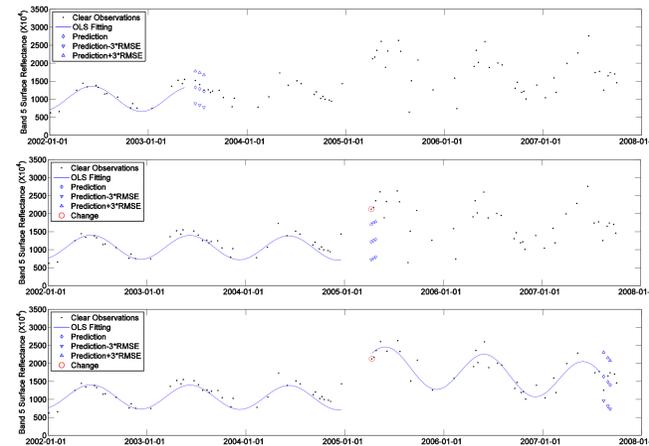
## The new ages



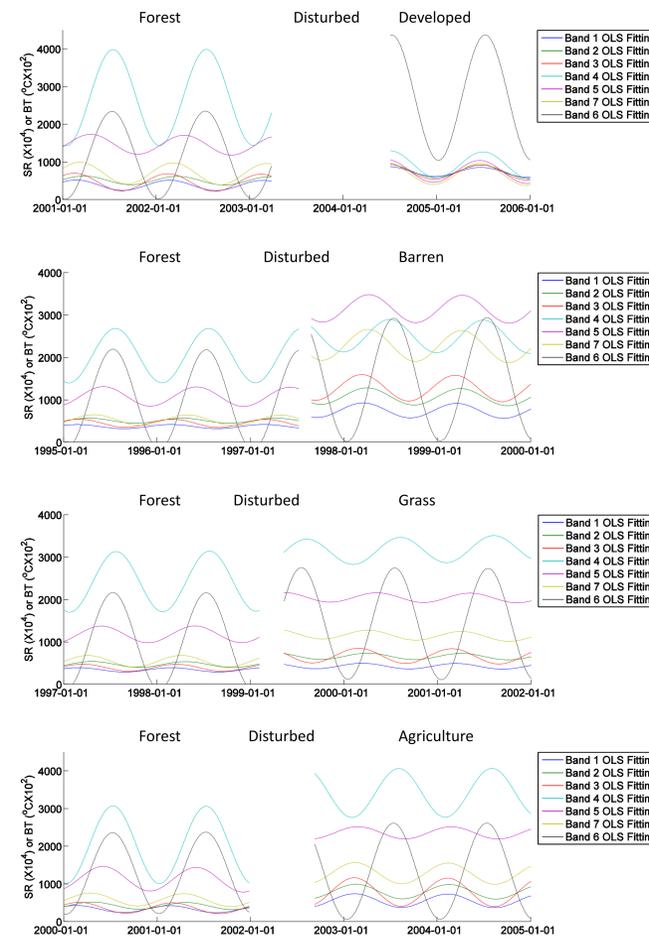
## Continuous change detection

$$\frac{1}{k} \sum_{i=1}^k \frac{|\rho(i, x) - \hat{\rho}(i, x)|}{3 \times \text{RMSE}_i} > 1 \quad (\text{consecutively three times})$$

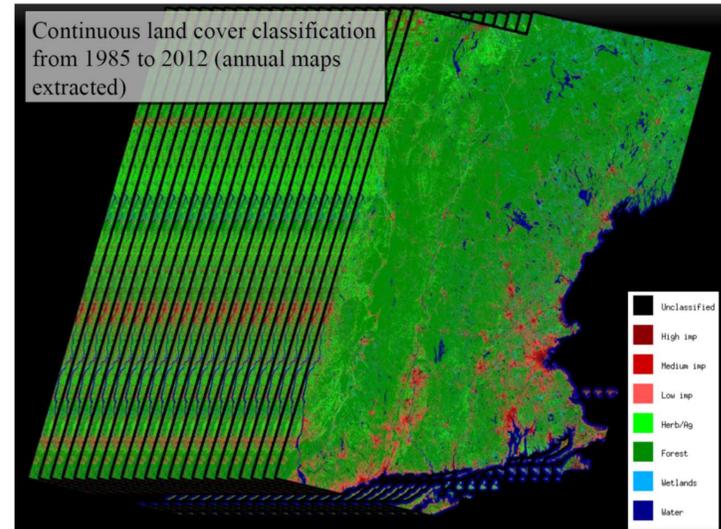
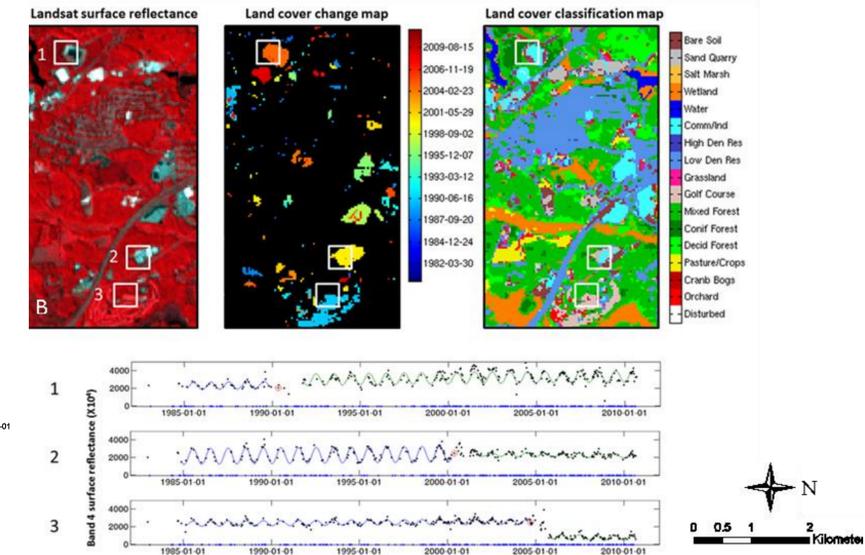
Where,  
 x: Julian date  
 i: The ith Landsat band  
 k: The number of Landsat bands  
 $\rho(i, x)$ : Observed value for the ith Landsat Band at Julian date x  
 $\hat{\rho}(i, x)$ : Predicted value for the ith Landsat Band at Julian date x



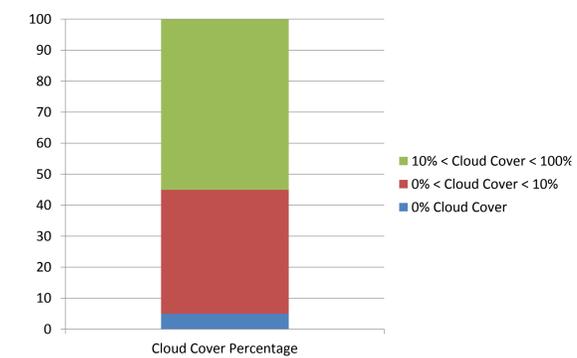
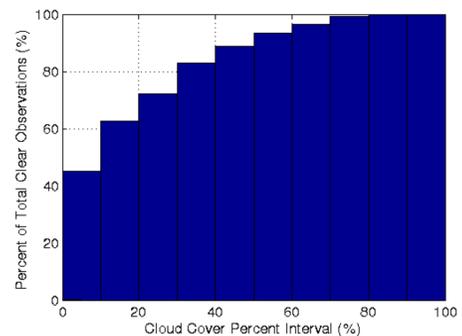
## Continuous classification



## Illustrating the CCDC results



## Buried Landsat treasure



## Conclusions

- By using all available Landsat data, it is possible to monitor land cover change as it occurring and provide land cover maps for any given time.
- Comparing model prediction with satellite observation is better than comparing satellite observation for detecting change.
- Time series models contain rich information.

## Future Research

