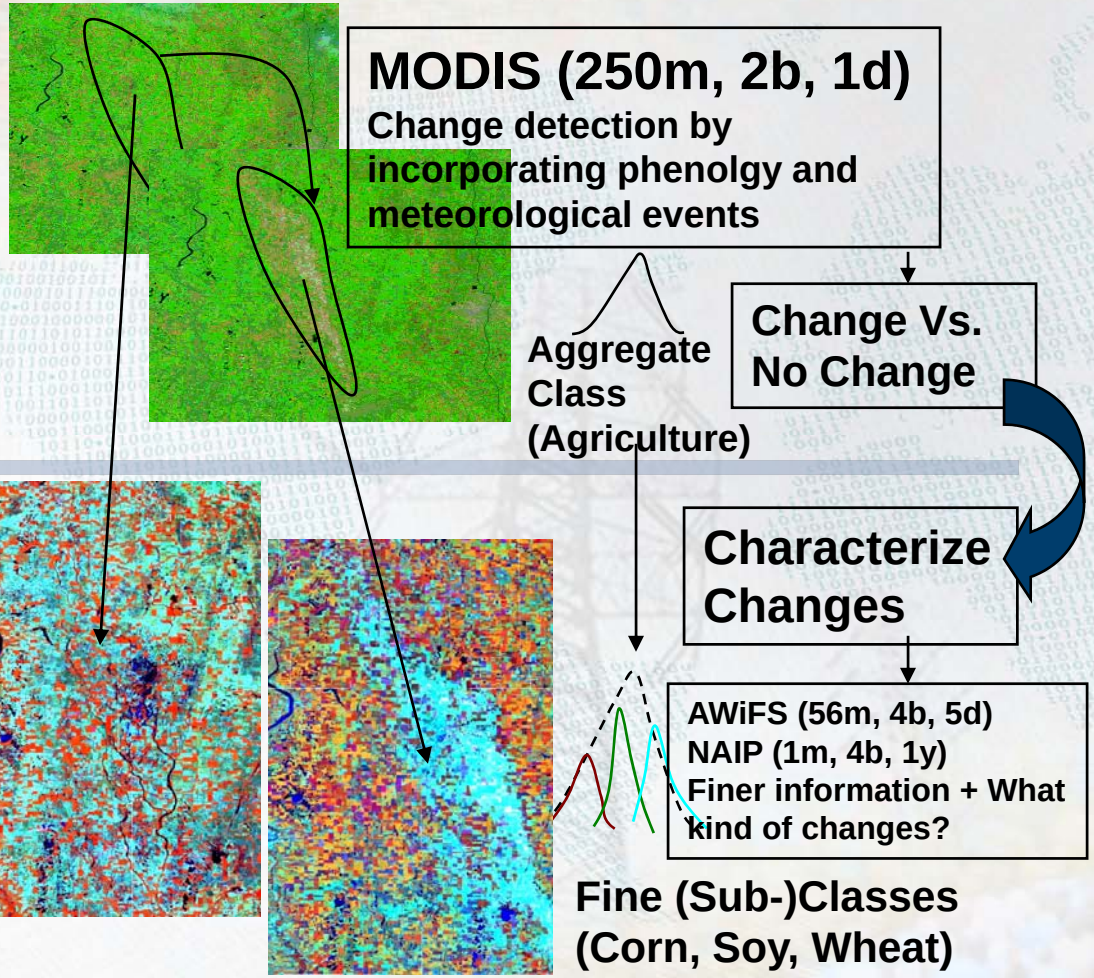
Monitoring Biomass at Regional and Global Scales

A Spatiotemporal Data Mining (STDM) Framework

Geographic Information Science and Technology



Overall Architecture

Problem Statement:

Monitoring biomass at regional and global scales is a highly complex task and requires integration of phenological properties and metrological observations to reduce false positives. Biomass monitoring is required for timely dissemination of fine-resolution information about the spatial distribution and state of the crops.

Technical Approach:

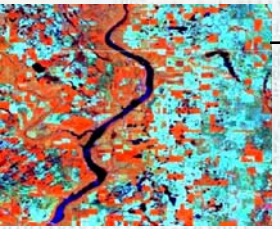
ORNL is designing and developing a spatiotemporal data mining framework for continuous monitoring of biomass and to characterize changes. This framework allows integration of multi-resolution (spectral, spatial, and temporal) images and geospatial databases to reduce false positives.

Benefit:

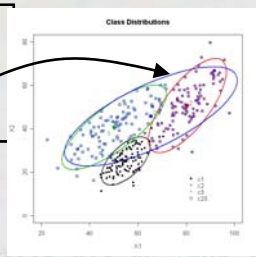
Provides timely information about dynamic changes in biomass at regional and global scales.

Oak Ridge National Laboratory

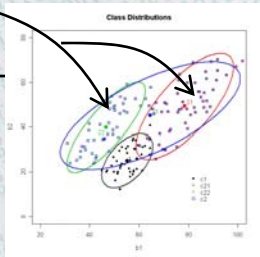
Coarse-to-fine Resolution Information



Coarse Classes (MODIS)
Each class is Gaussian

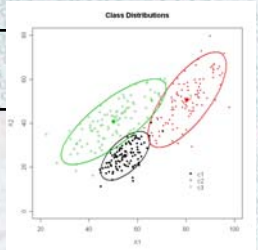


Sub-Classes (AWiFS)
Each class is MoG



Model Selection (BIC,AIC)
How many components?
Parameter Estimation

Semi-supervised Learning



Characterize Changes

Problem Statement:

Land cover classification at regional and global scales poses several research challenges: insufficient ground-truth, overlapping and hierarchical classes, computational complexities. Consistent and accurate land cover classification is highly desirable for characterizing changes.

Technical Approach:

ORNL is developing several machine learning approaches that allows rapid land cover classification even in situations where ground-truth data is sparse and classes are highly overlapping by exploiting multi-resolution and multisource data.

Benefit:

The framework scales to regional and global scales, and reduces mapping cycles and costs. Can be easily adoptable to new spatiotemporal settings without complete retraining of the classification model.

Paper:
Ranga Raju Vatsavai, Shashi Shekhar, Budhendra L. Bhaduri: **A Learning Scheme for Recognizing Sub-classes from Model Trained on Aggregate Classes.** *Structural, Syntactic, and Statistical Pattern Recognition, Joint IAPR International Workshop (SSPR & SPR).* Springer, LNCS Vol. 5342. Dec.2008.