

MAPPING AND MONITORING RICE ECOSYSTEMS TO DRIVE DECISION SUPPORT TOOLS

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Applied · Geosolutions

**INTERNATIONAL LAND COVER / LAND USE CHANGES REGIONAL
SCIENCE TEAM MEETING IN SOUTH / SOUTHEAST ASIA
JANUARY 2016 YANGON, MYANMAR**



Background

Synergistic projects

1. NASA SBIR (NNX14CS01C): Rice Decision Support System (RiceDSS): Support global food security programs, disaster management, and commodity markets with fused rice info from EO, weather, and crop models



2. NASA LCLUC: Mapping LCLUC and sensor fusion in South Asia



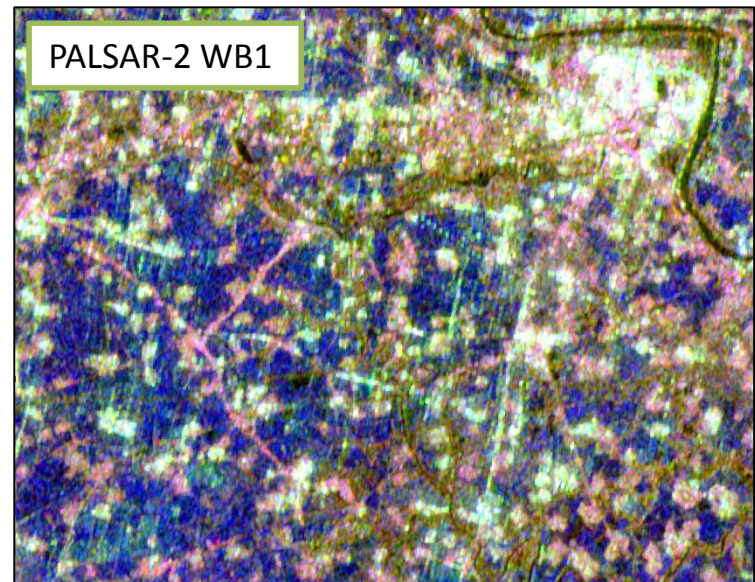
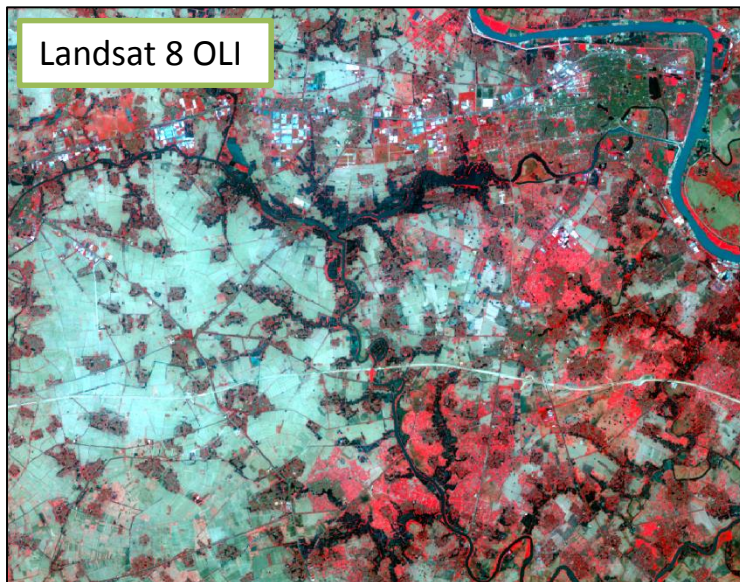
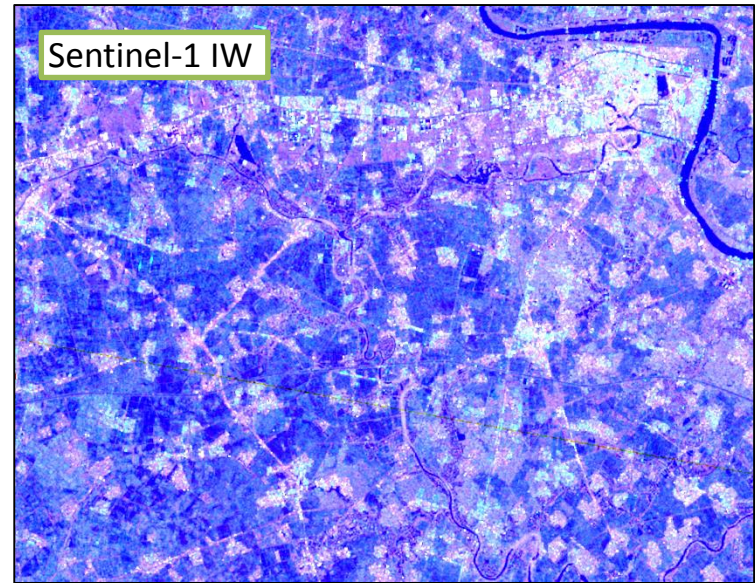
3. USAID: Developing GHG Monitoring, Reporting, and Verification (MRV) and landscape accounting tools



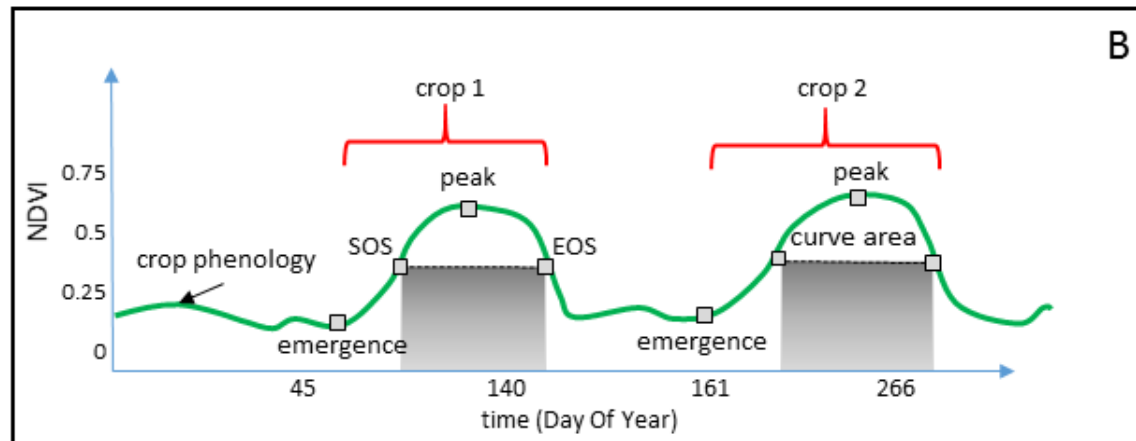
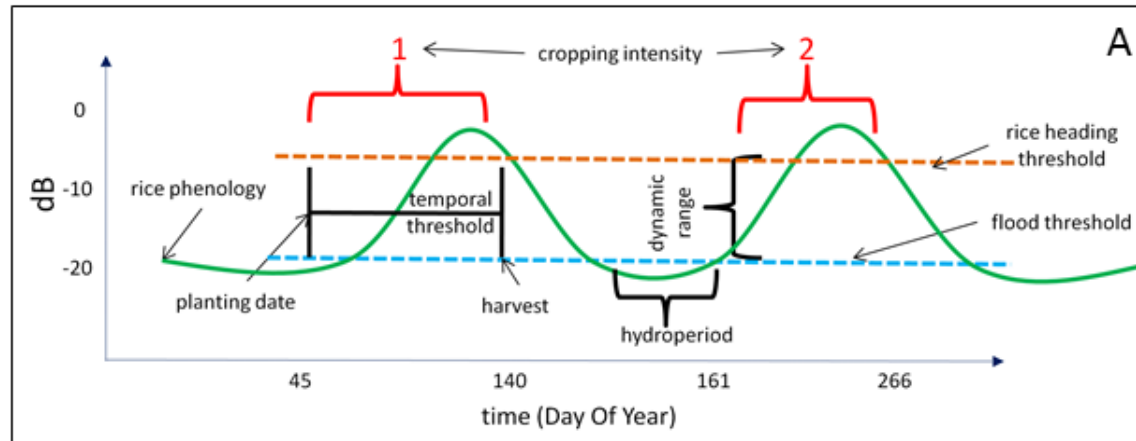
Presentation Outline

- A. Multiscale rice mapping with snapshot examples in S. Asia and USA
- B. Modeling rice greenhouse gas (GHG) application in Red River Delta (RRD), Vietnam

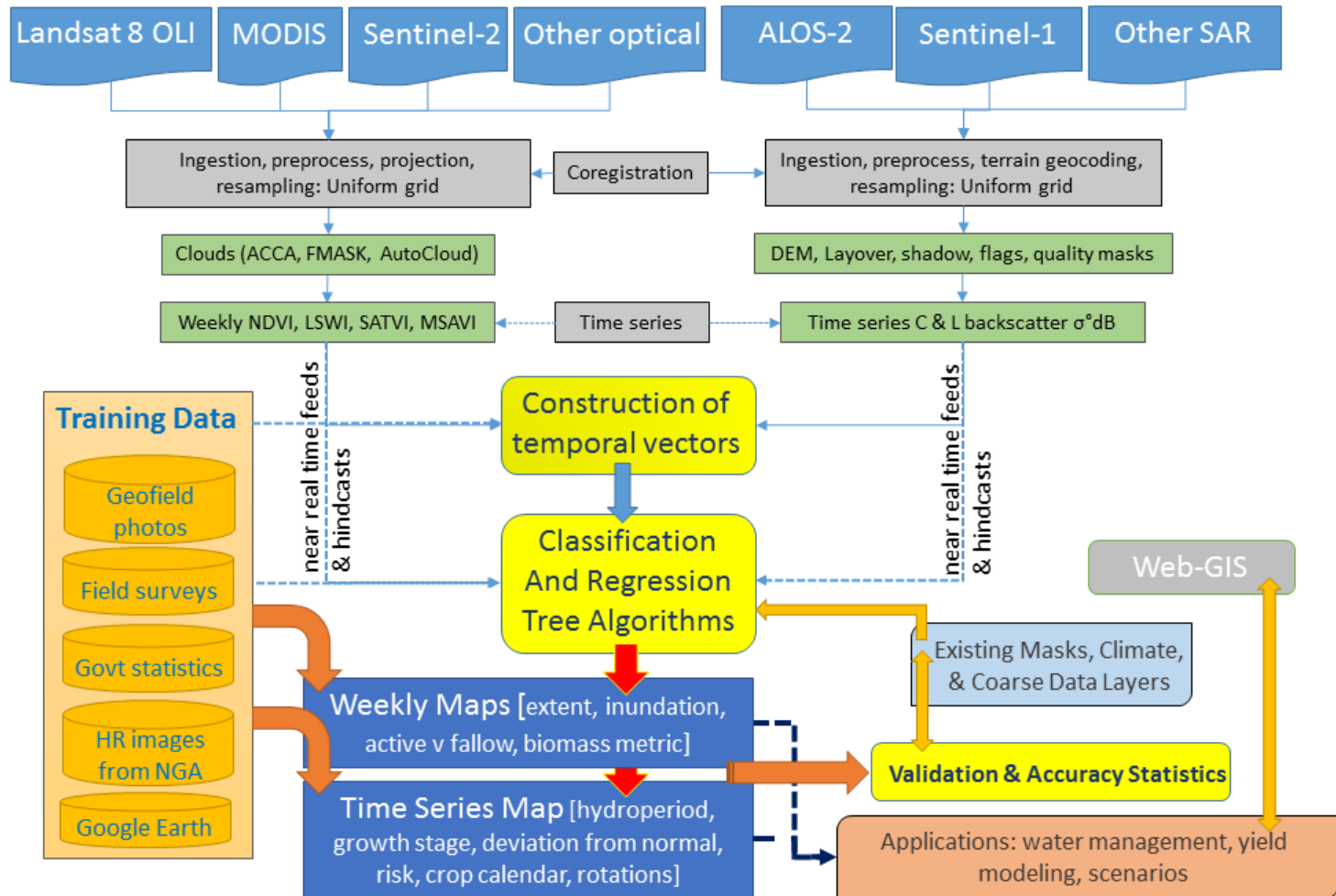
Red River Delta Multiscale Imagery



Multi-temporal remote sensing key for rice monitoring



Multi-scale Earth Observation integration work flow



Collecting field training data for cal val, Ground Truth, surveys

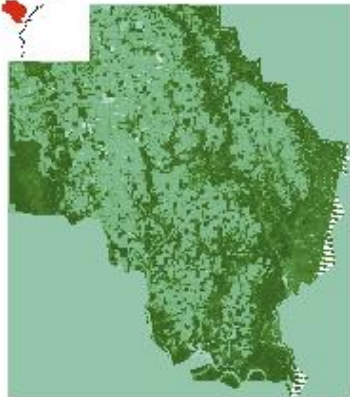
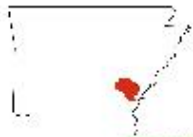


<http://www.eomf.ou.edu/photos/>

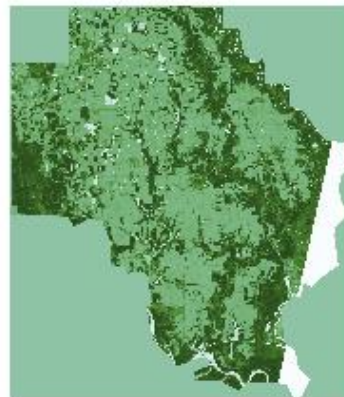
Mobile Apps for Geofield photos; U. Oklahoma, Xiangming Xiao



Time series Landsat NDVI (greenness and biomass vigor)



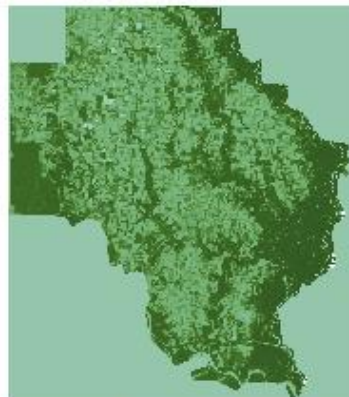
DOY 107



DOY 113



DOY 139



DOY 155

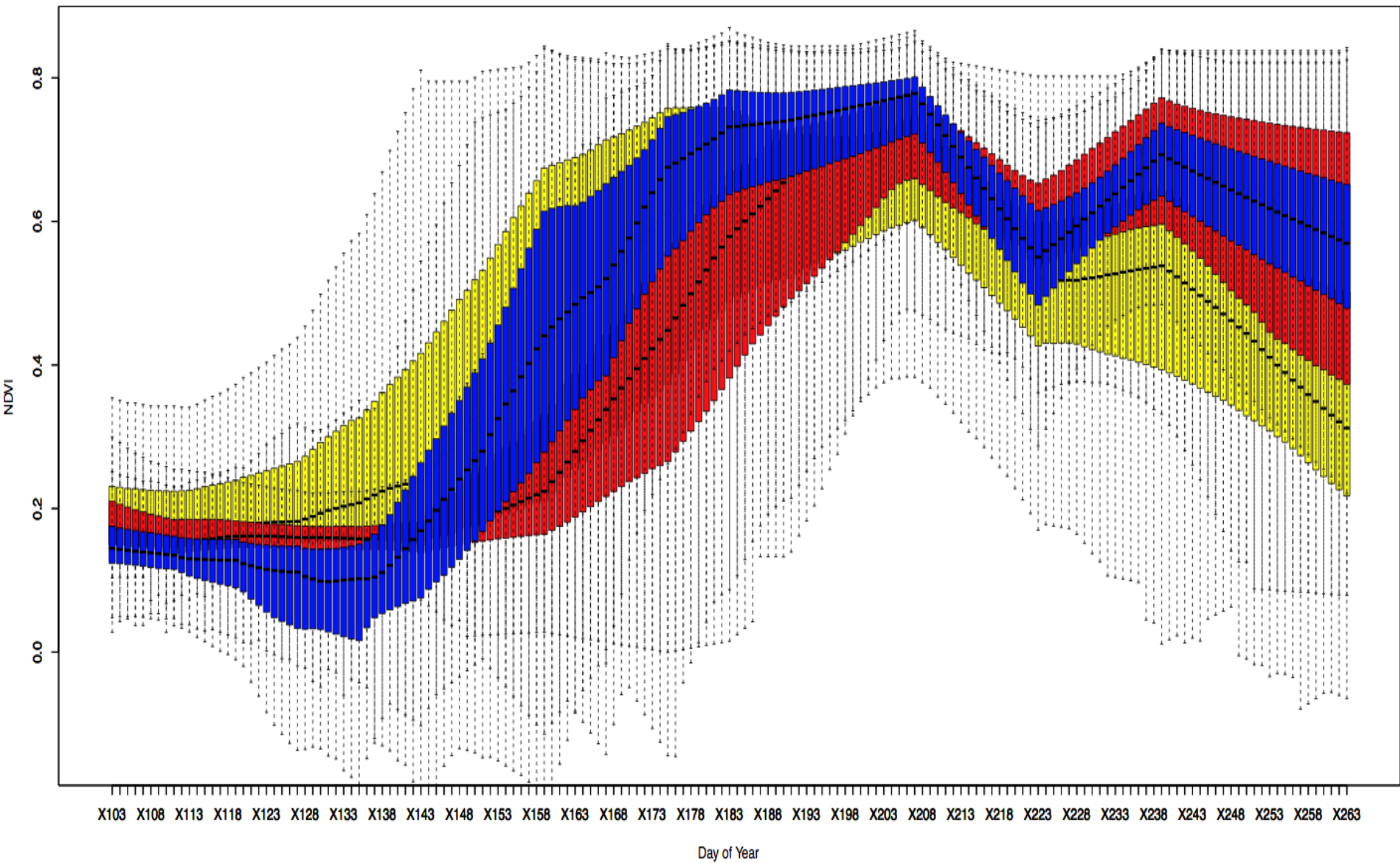


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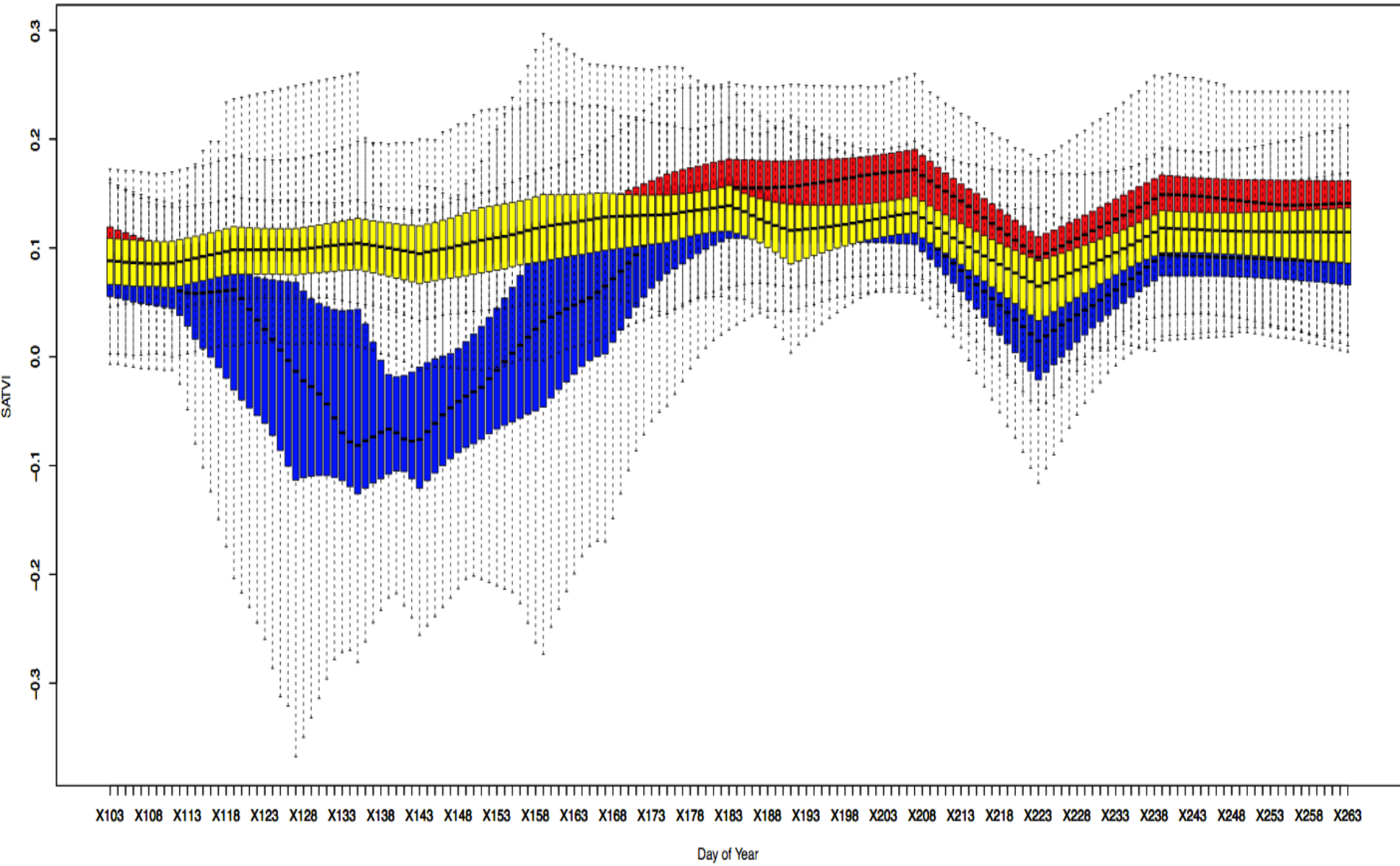


DOY 225

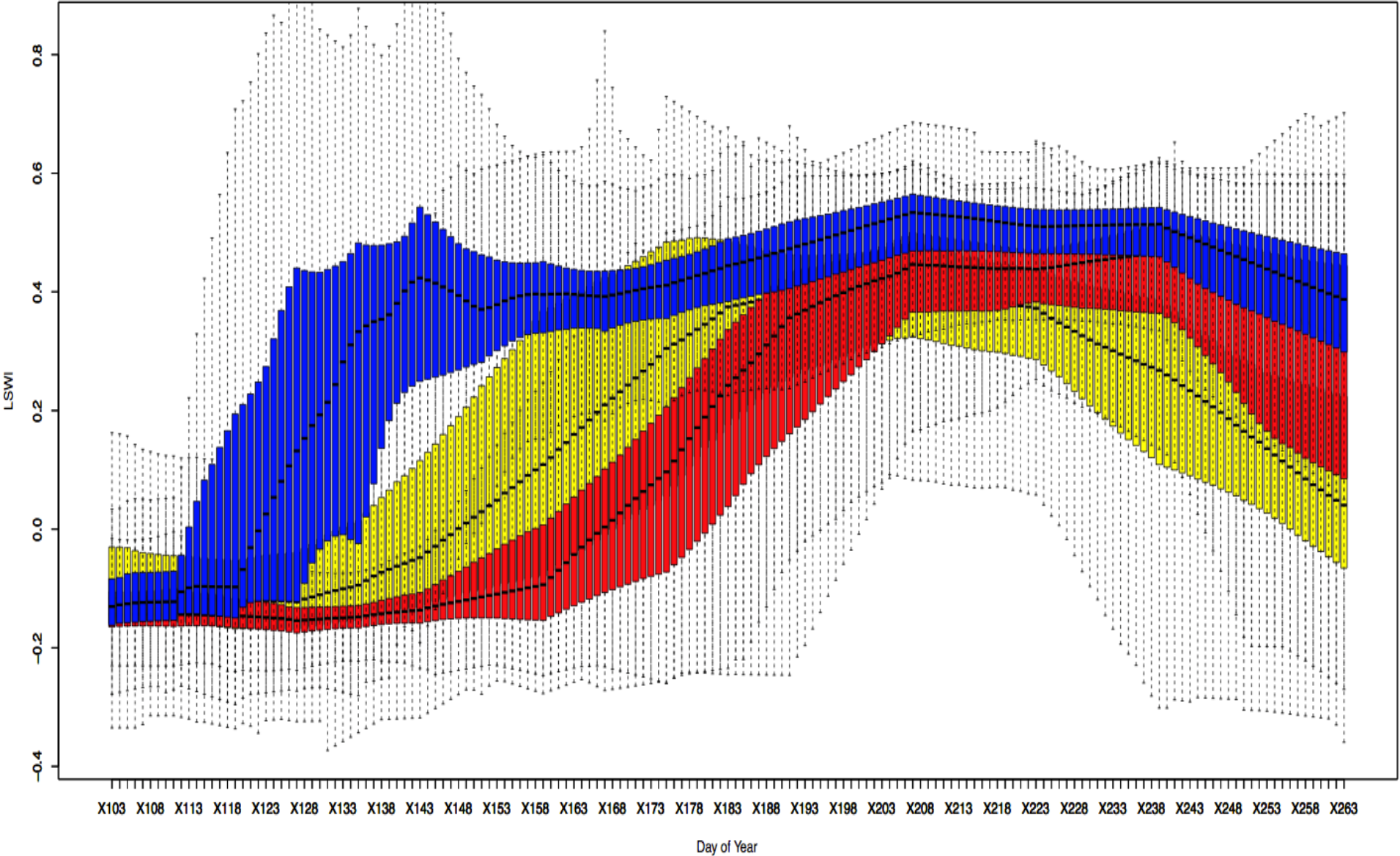
DOY vs. NDVI for Corn, Cotton and Rice in Sacramento, 2009



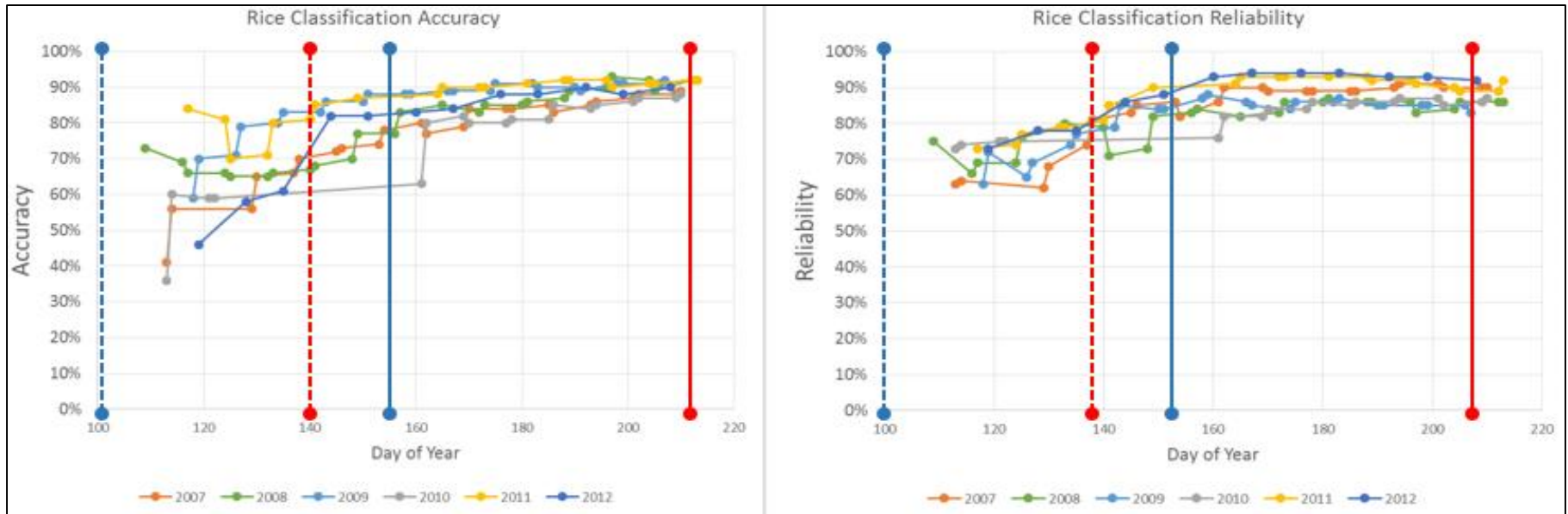
DOY vs. SATVI for Corn, Cotton and Rice in Sacramento, 2009



DOY vs. LSWI for Corn, Cotton and Rice in Sacramento, 2009

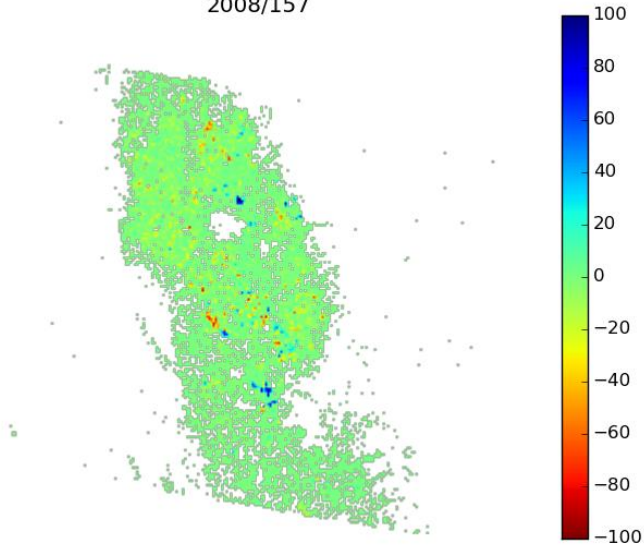


Near real time comparisons against NASS

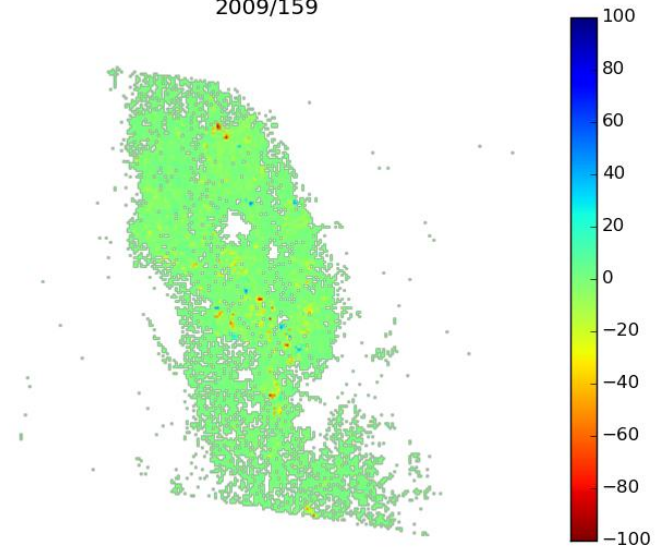


Annual Producer Accuracy (left) and User Accuracy / Reliability (right) of real-time rice extent mapping routine using Landsat imagery from 2007-2012 compared against NASS CDL for California.

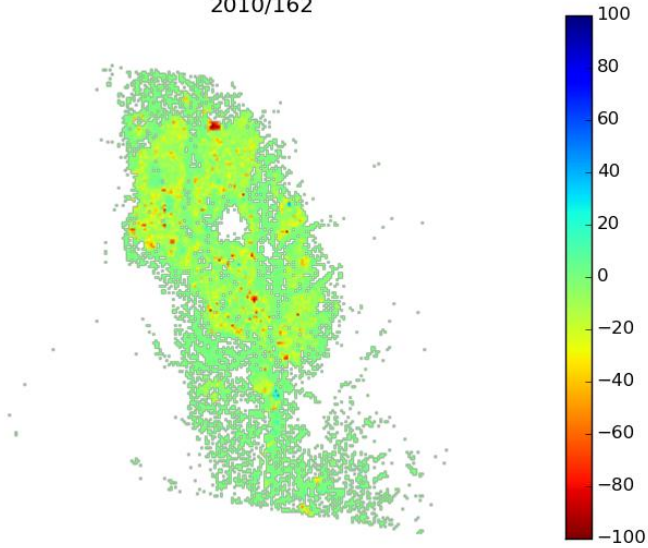
Difference between CDL and tclass pixel % Rice,
2008/157



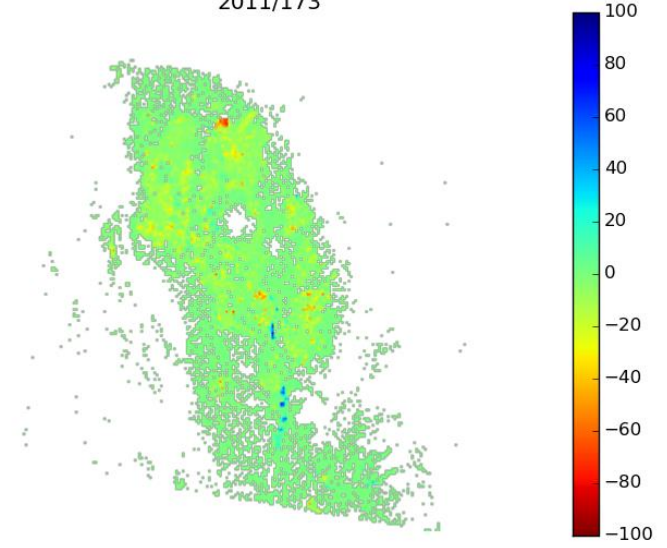
Difference between CDL and tclass pixel % Rice,
2009/159

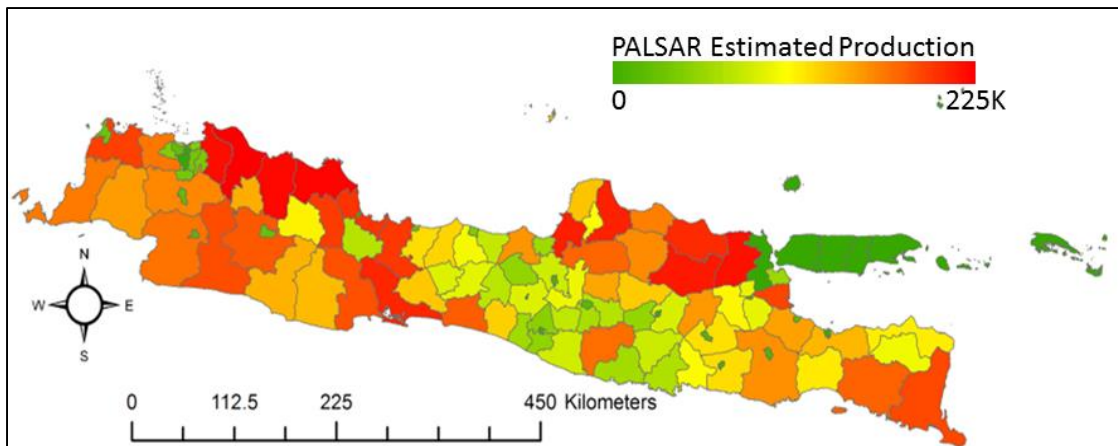
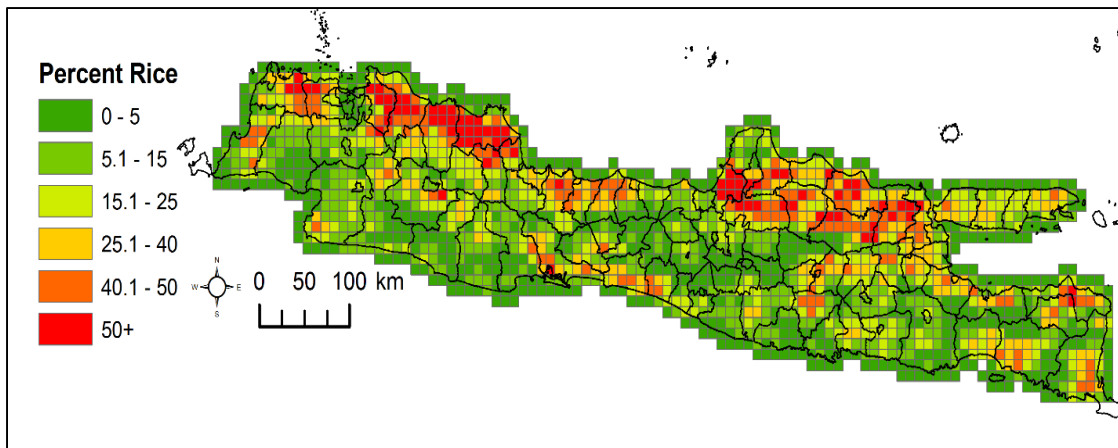
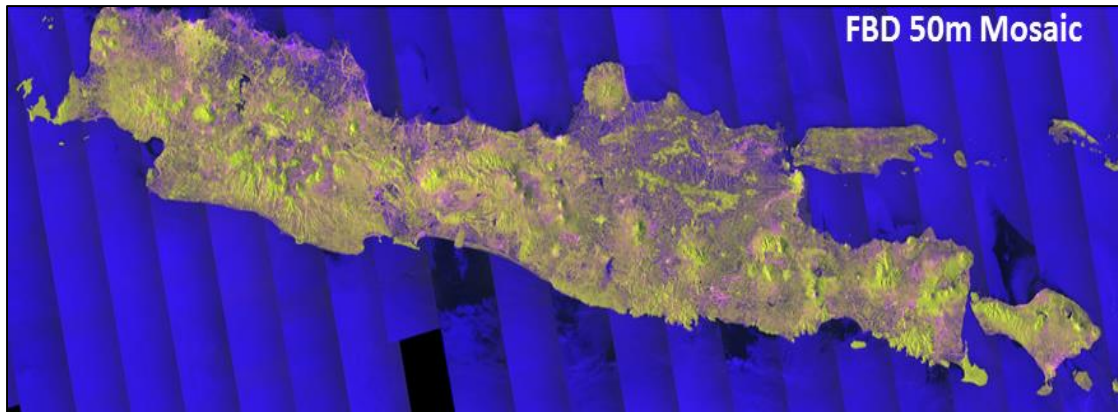


Difference between CDL and tclass pixel % Rice,
2010/162



Difference between CDL and tclass pixel % Rice,
2011/173





The DNDC Model [gramp.org.uk]

Background

- **DNDC** stands for **DeNitrification-DeComposition**
- DNDC is a soil biogeochemical model that has been used for quantifying GHG emissions from agricultural
- DNDC is a process (as know as mechanistic) model that simulates the biogeochemical processes to drive C and N cycling in agricultural soils.
- Long history of peer-reviewed publications (well over 200 publications).



Use for Rice Emissions Modeling

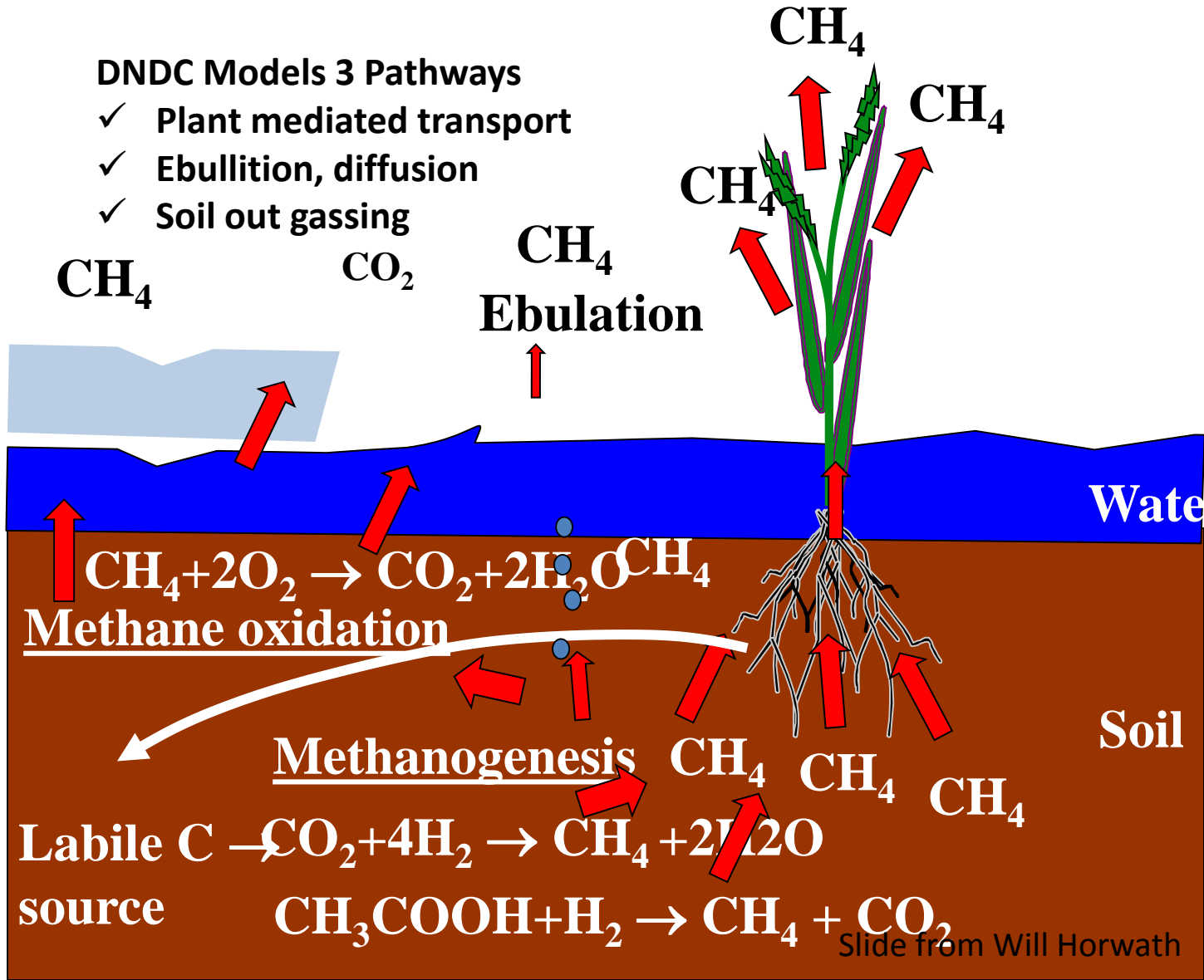
1. What is the rice GHG footprint in RRD?

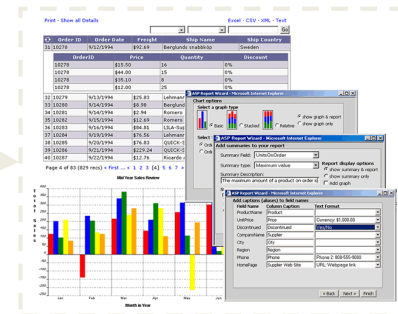
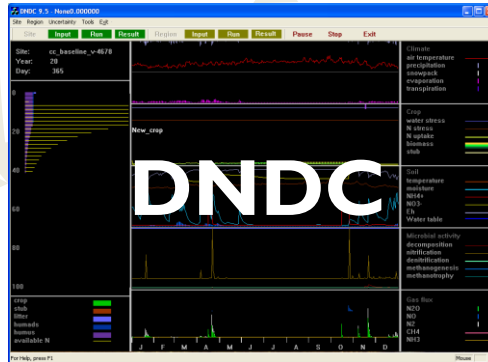
2. How can multiscale RS improve parameterization and spatiotemporal drivers?

- DNDC can simultaneously simulate anaerobic (flooded) and aerobic (non-flooded) conditions in soils.
- DNDC can model both Methane and Nitrous Oxide emissions: critical for rice agro-ecosystems.
- DNDC has been extensively validated for rice globally.

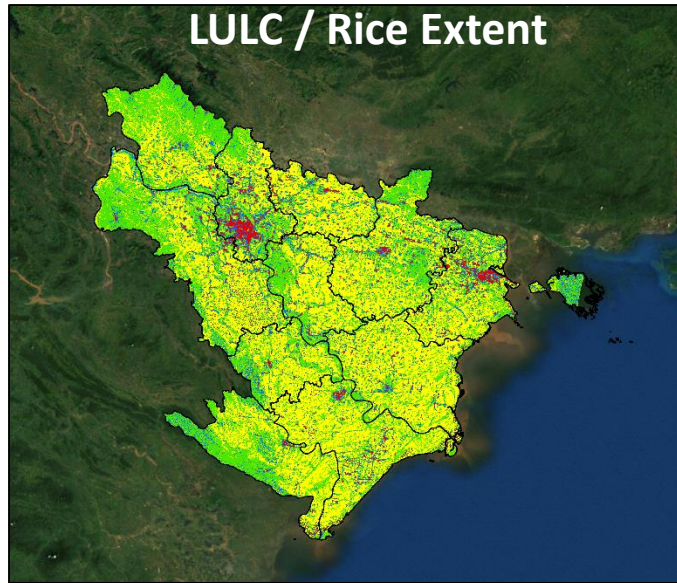
Rice: CH₄ production and emission

(REDOX < -100 to -200 mv)

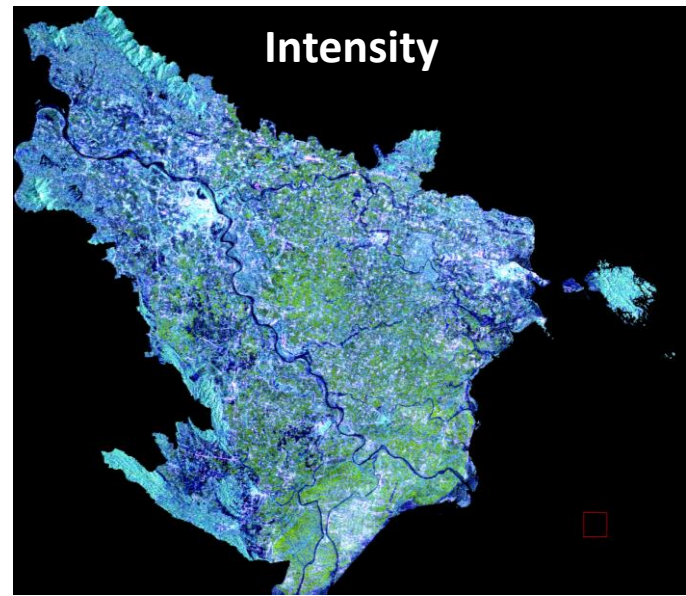
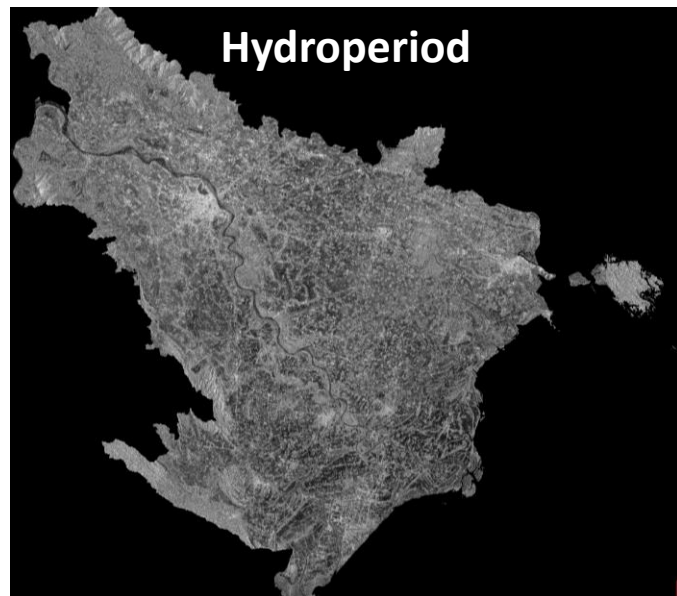
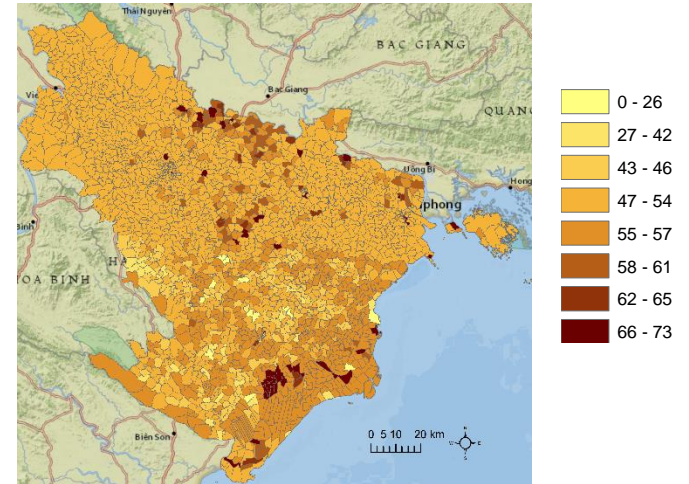




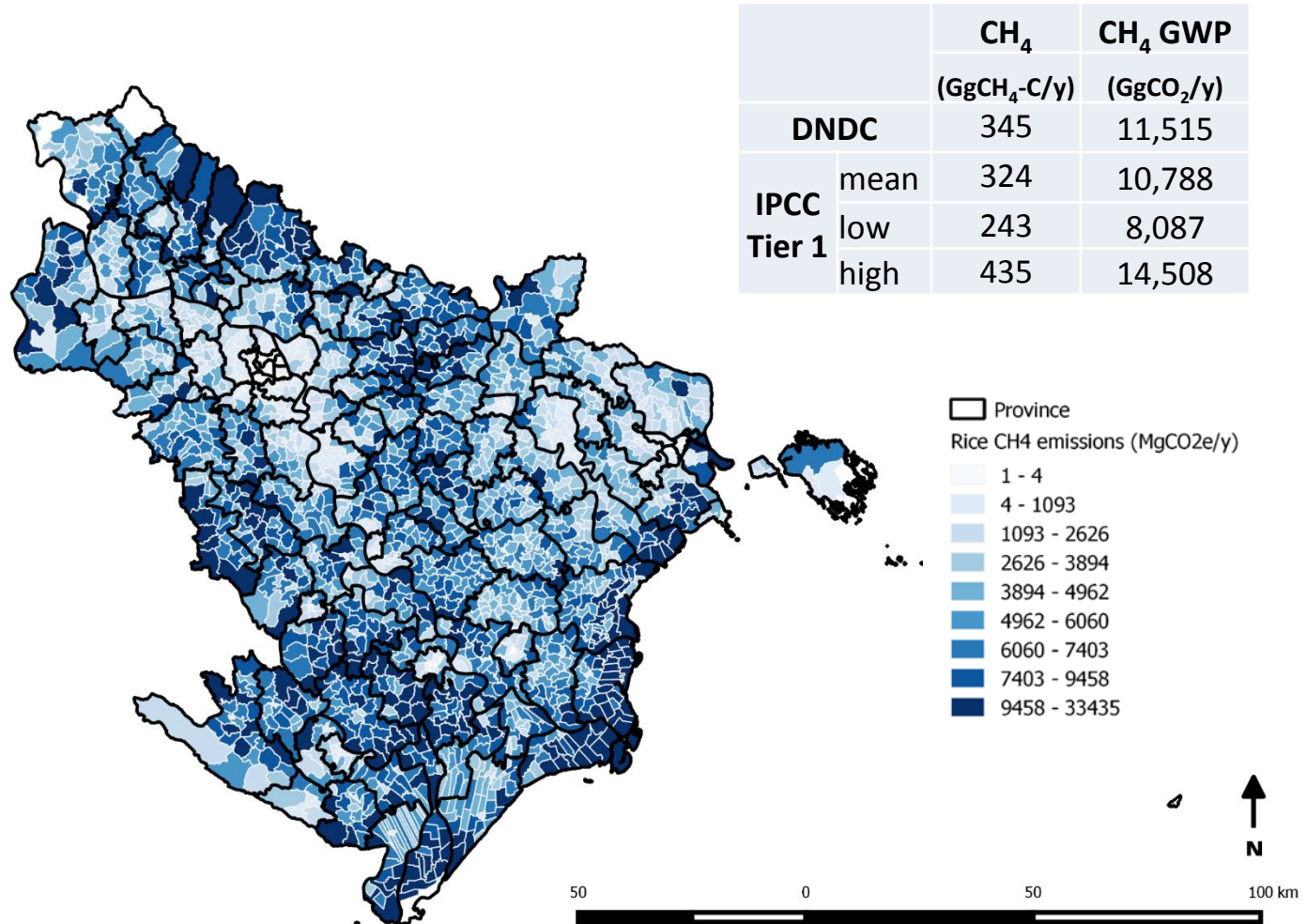
Driving DNDC with Earth Observations for GHG Assessment



Crop calendar (1st crop planting DOY)



RRD 2015 Rice CH₄ Emissions



Summary

- PALSAR-2, Sentinel-1, Landsat 8 fusion high LULC accuracy
 - Multitemporal required for mapping rice attributes
 - Suite of parameters: extent, hydroperiod, intensity, calendar
- RRD GHG footprint characterized and uncertainty reduced with EO compared to IPCC Tier 1 approach
- Tuning & evaluating forecasts for select hot spots this upcoming year
- Open source tools, tech transfer, Decision Support Tools
 - Transition research to operational domain
 - github.com/Applied-GeoSolutions
 - Web-mapping, mobile, cloud,...

Please let me know if you are
interested in applications &
coordination

ntorbick@ags.io

Thanks to our hosts, NASA SBIR,
NASA LCLUC program.

Questions?

