Updates on GEORICE project

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Earth Observation Technologies for Crop Monitoring: A GEOGLAM Workshop to Promote Collaborations among JECAM and Asia-RiCE 2018
17-20 September 2018 – Taichung City (Taiwan)

Context of the project

Rice is the most critical staple food for more than half of humanity,with 90% in Asia)

- Among EO data, SAR data have been proved efficient for rice monitoring since late 80's , but applications have been hampered by lack of systematic and cost effective data
- Sentinel-1 represents unpreceding opportunity for operational rice monitoring applications
- R&D Demonstrator projects were urgently needed with the launch of Sentinel-1 in April 2014
- The project was conducted within Asia-Rice, on improved use of EO data for rice monitoring
- Initial phase: 2015-2017

The GEORICE Project

innovators

georice

esa

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GEORICE

Towards Global Earth Observation of Rice

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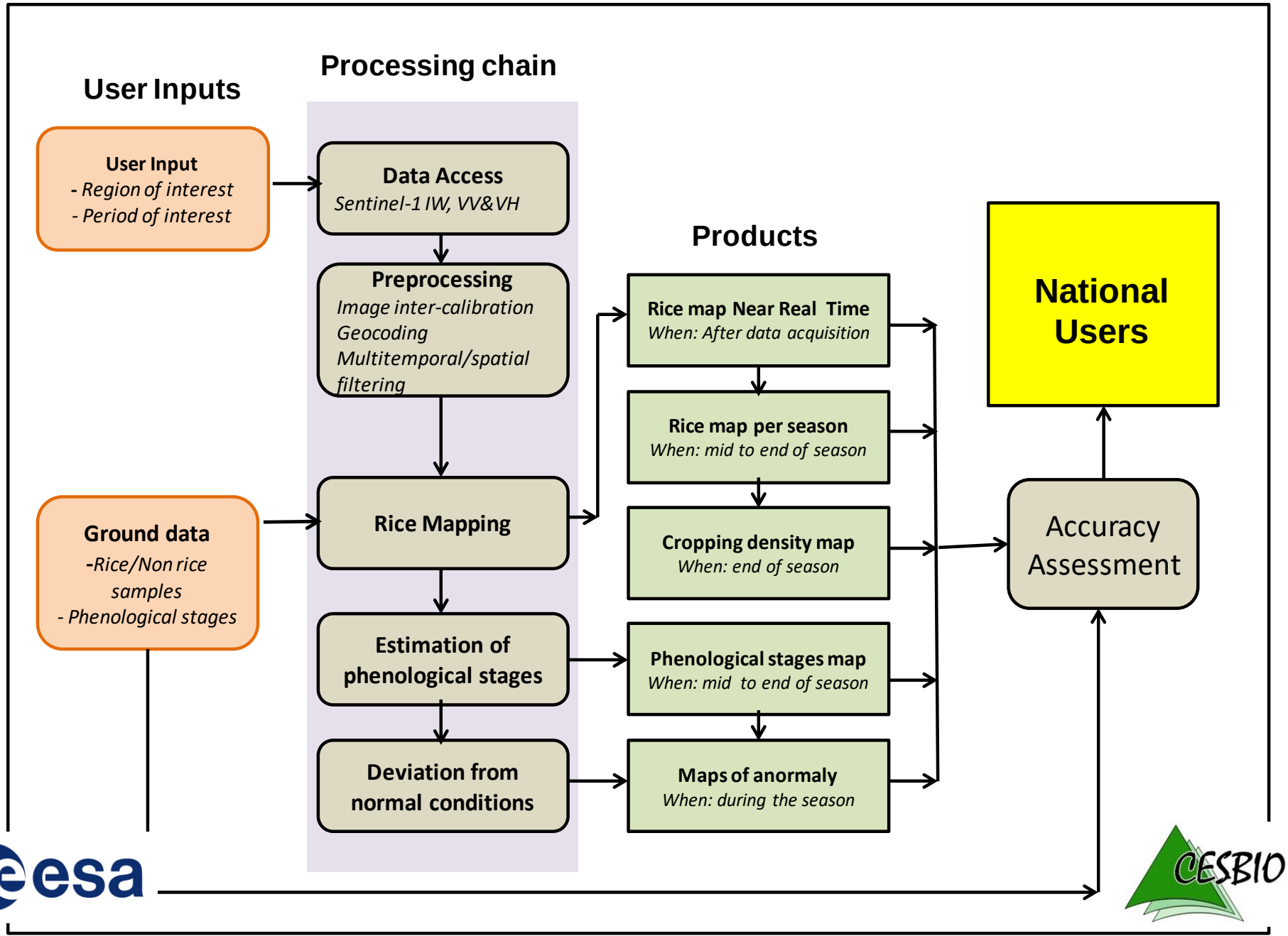
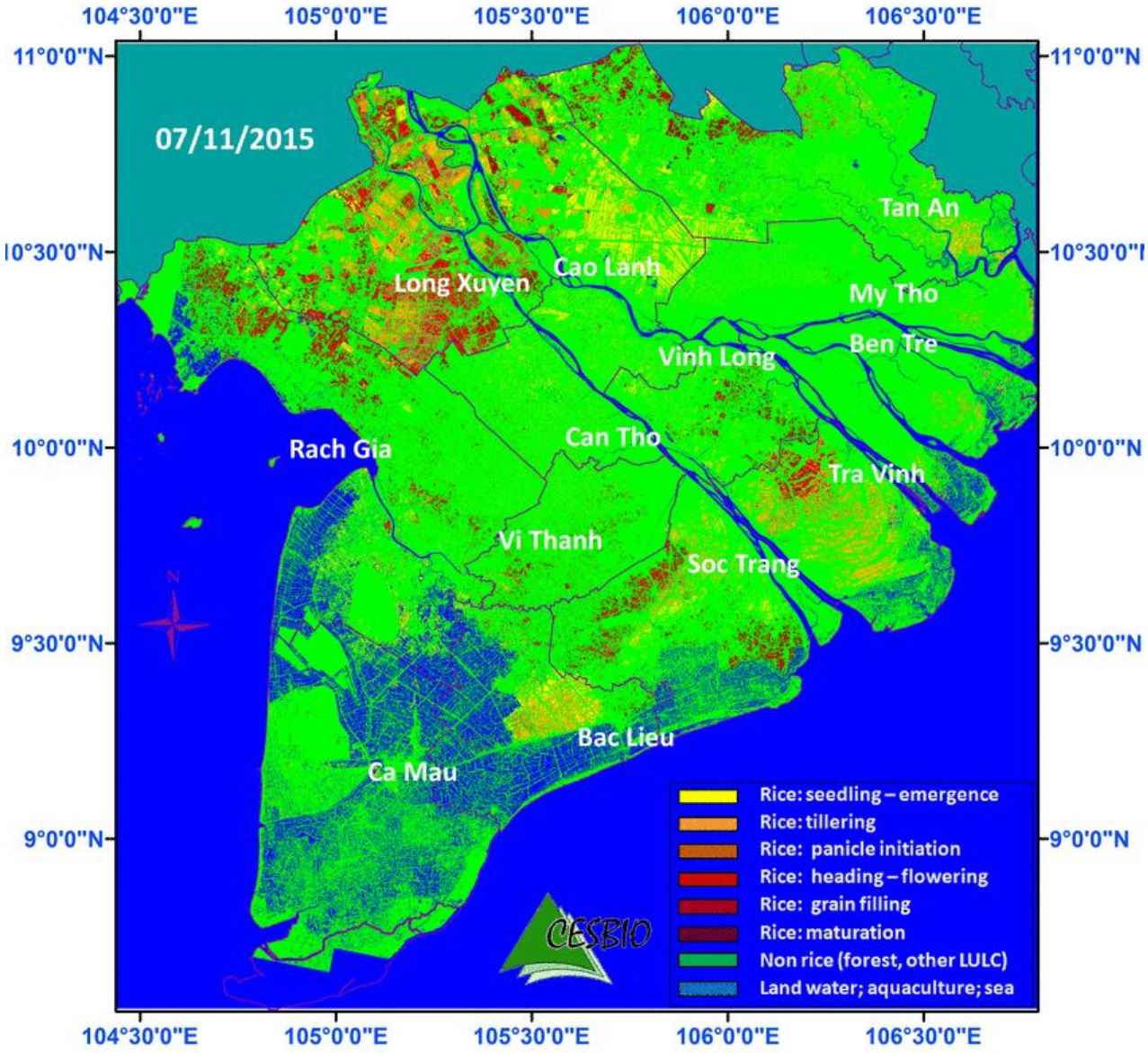
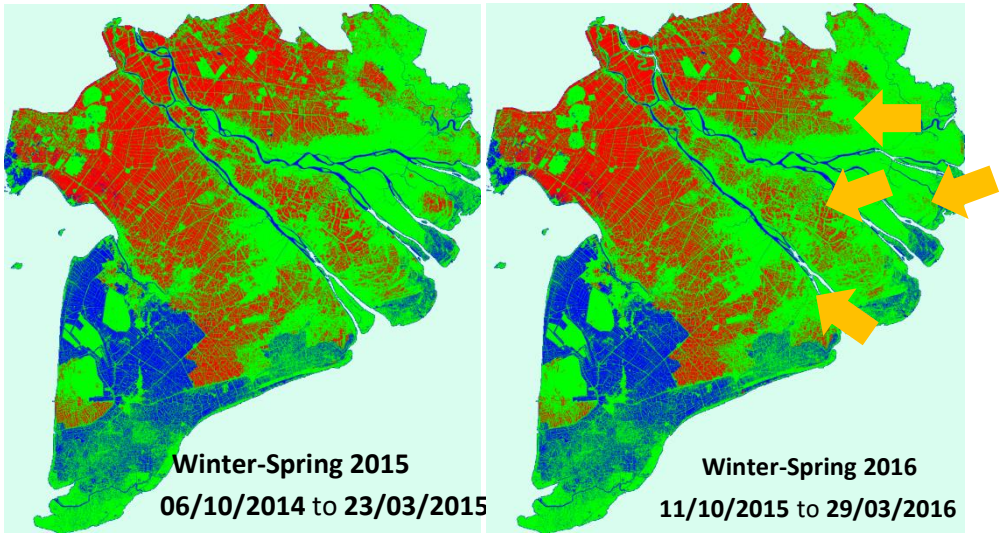
GEORICE Scheme



S1 used to monitor rice growth stage



S1 produces Rice Maps and Statistics

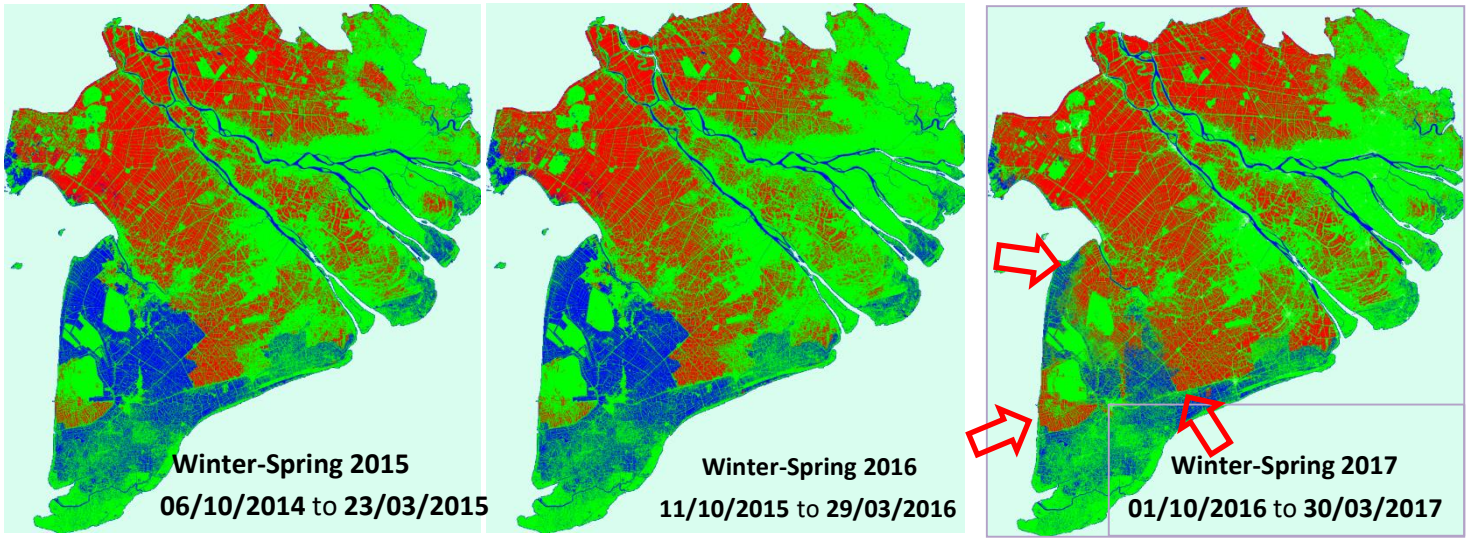


➢ **Decrease of Winter-Spring rice area in 2016 compared to 2015** (decrease of **276,000 ha** or 16.7% ; i.e. 1.39M ha vs 1.67M ha) caused by **shortage of water** and **saline water intrusion (El Niño effect)** .

***Official report by Vietnam MARD 2017**:*

*The severe drought and salinity intrusion strongly affected 11 of the 13 provinces in the MRD. Rice areas affected by drought and salinity intrusion rapidly increased from 139,000 ha in mid March 2016 to **224,552 ha** by mid April 2016.*

S1 produces Rice Maps and Statistics

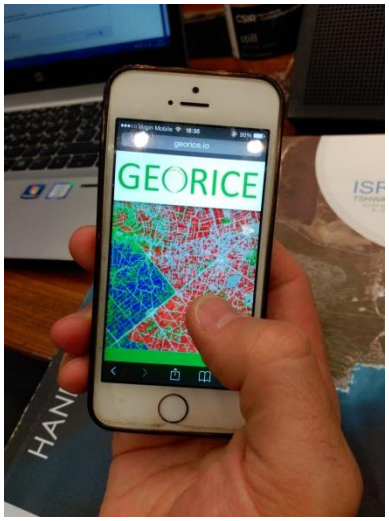


- **Increase of Winter-Spring rice area in 2017 compared to 2016, 2015**

(More fields planted with rice and conversion of aquaculture. Among causes: shortage of rice production in 2016 and increase of rice price in 2016)

GEORICE implementation

Users Community



Sentinel-1 images

Collect

Tech4Earth

Application Store	GEORICE application
Services	Service Platform: geospatial handling, data management
Big Data Architecture for Data Processing	Processing engines for analysis in near real time
Data Lake (External data, Satellite data, User data)	Data Hub, to collect, ingest and archive data

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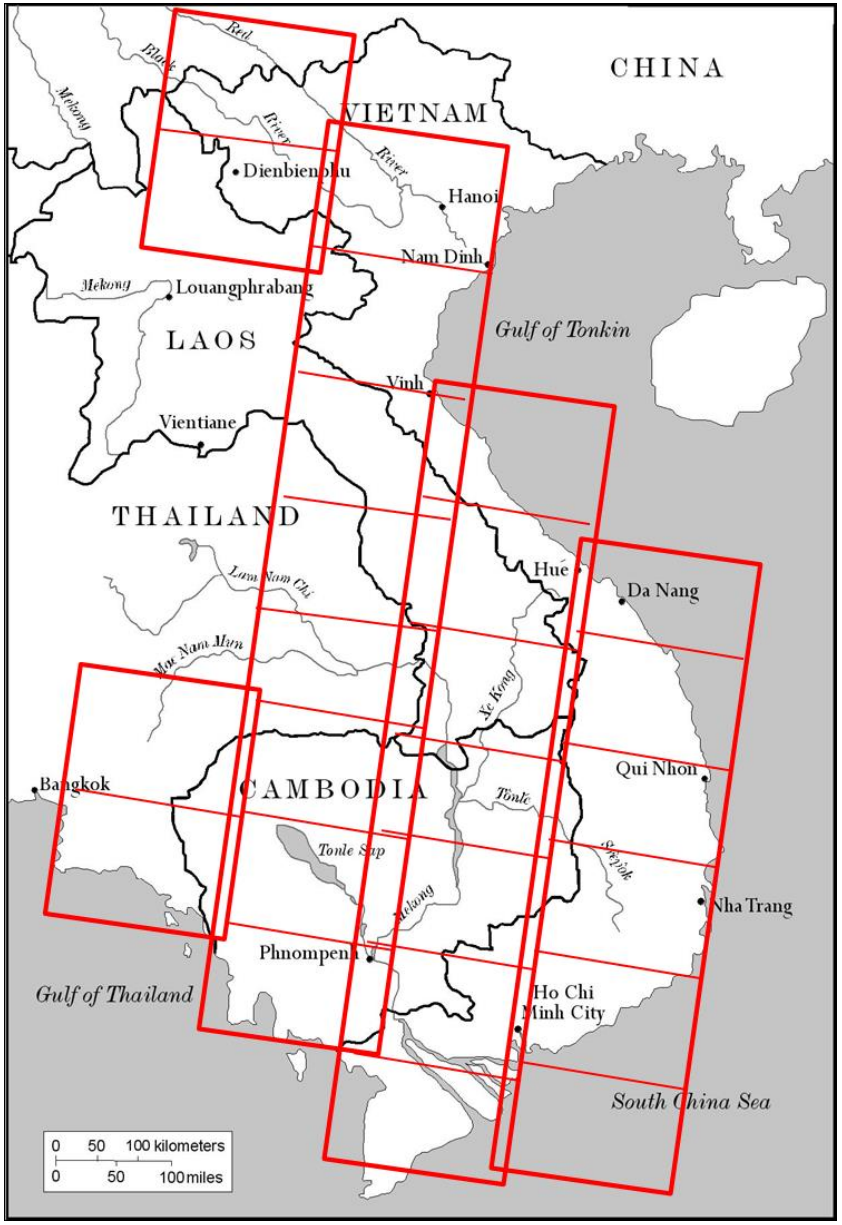
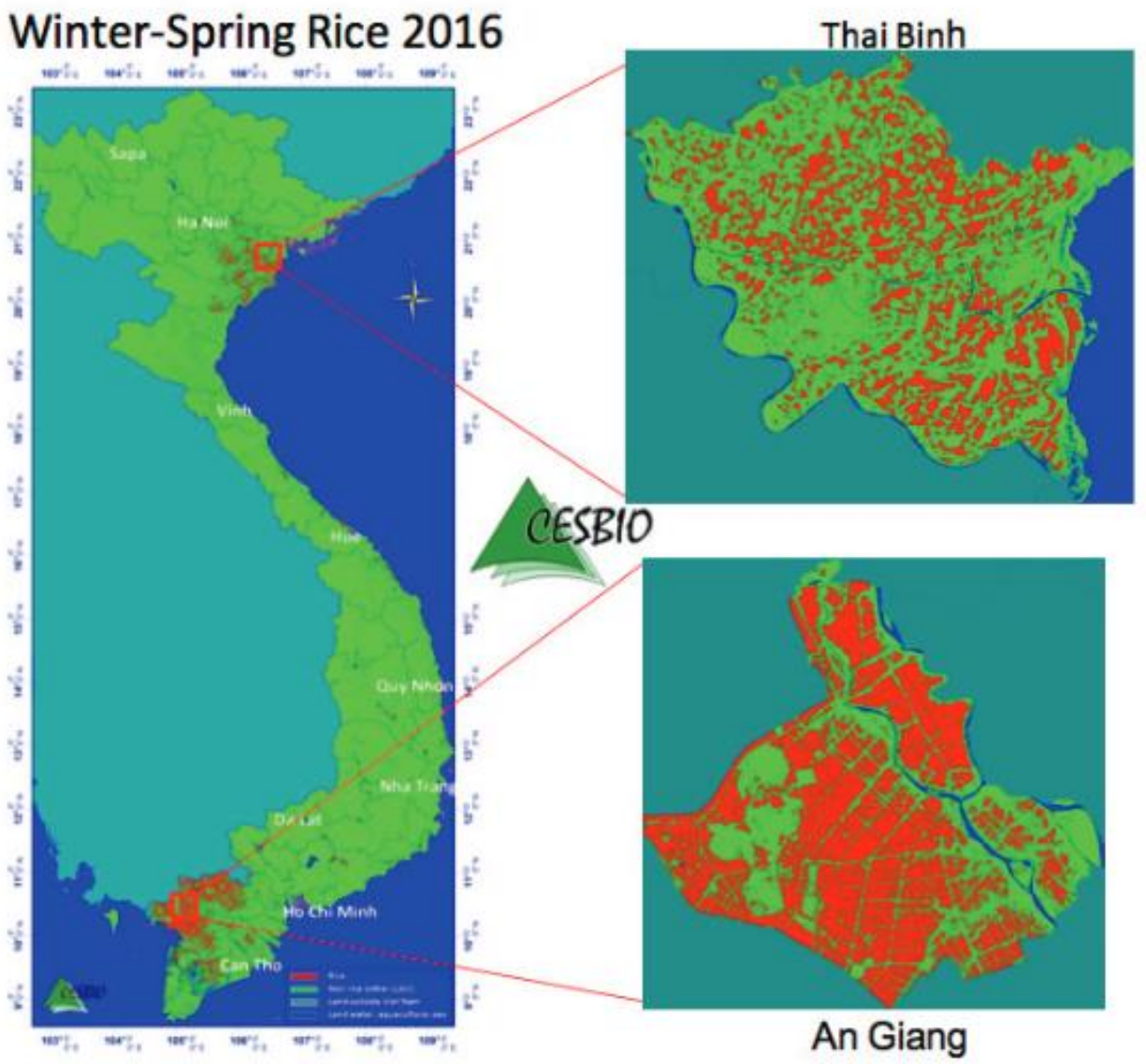
Mapping at country scale

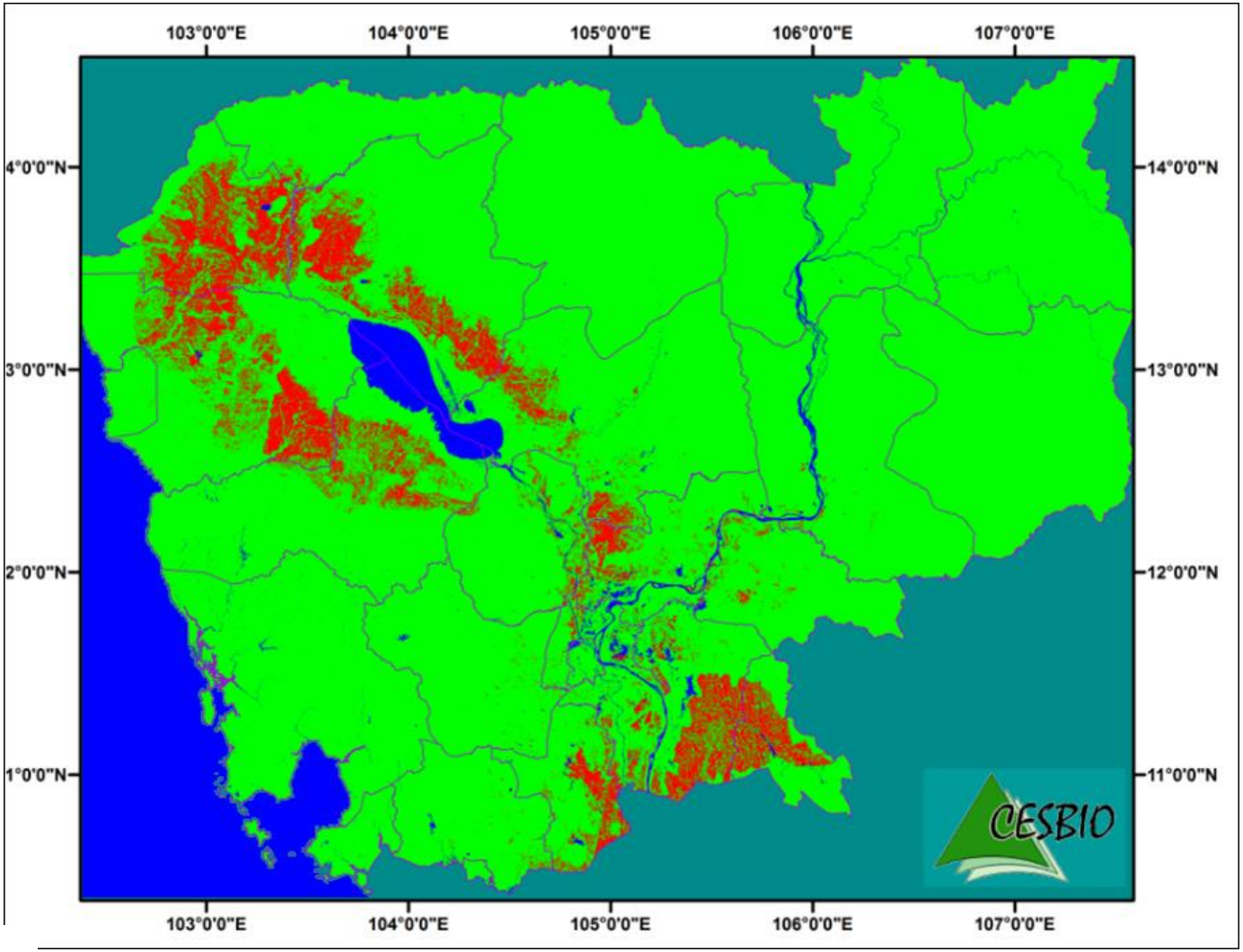


Test of wall-to-wall national mapping using S1

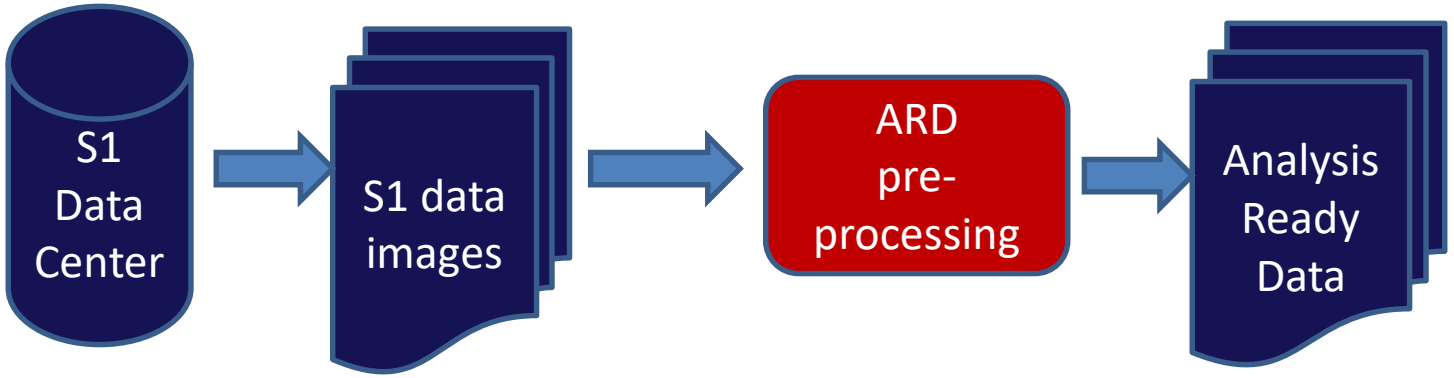


Mapping at country scale

Winter-Spring rice in Cambodia 2016



Building Analysis Ready Data (ARD) for Sentinel-1 on Datacube – Application on Rice monitoring



S1 images ready to use in Datacube

https://peps.cnes.fr

Ground projected image (GRD) .SAFE format

Python script

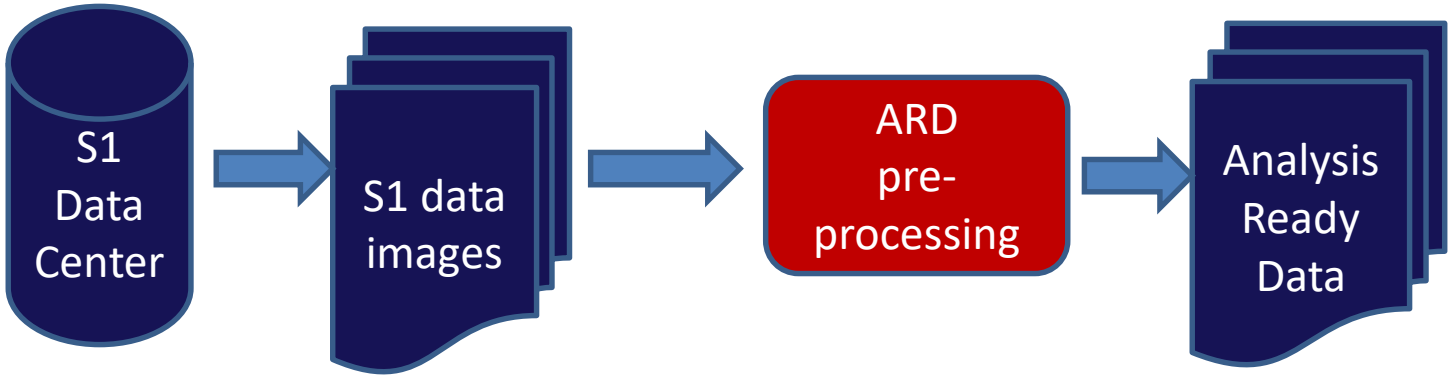
S1toARD.py

https://scihub.copernicus.eu

Metadata for Datacube

S1 images metadata for Datacube ingestion (.yaml file)

Building Analysis Ready Data (ARD) for Sentinel-1 on VN Datacube



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Ground projected image (GRD) .SAFE format

Python script

S1toARD.py

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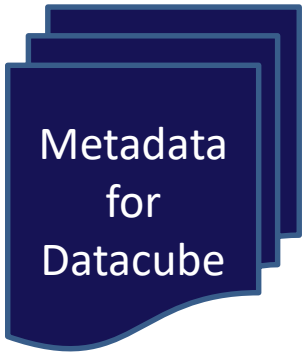
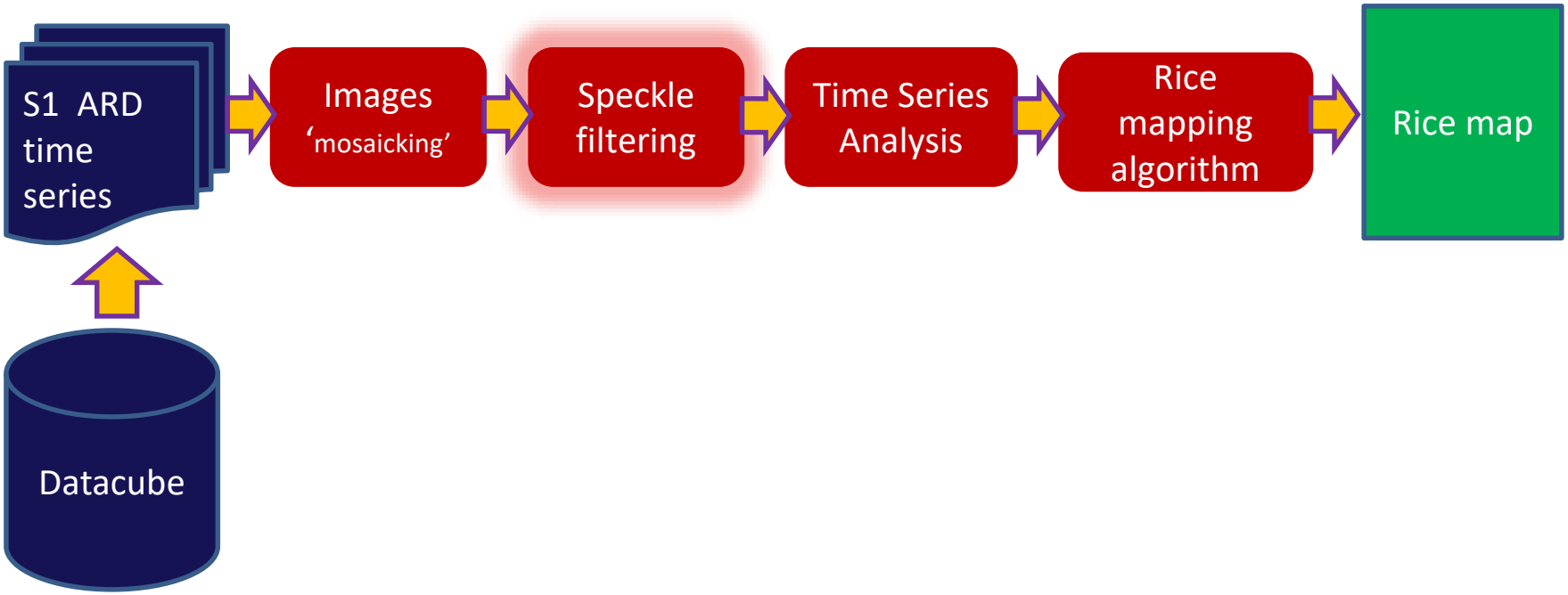


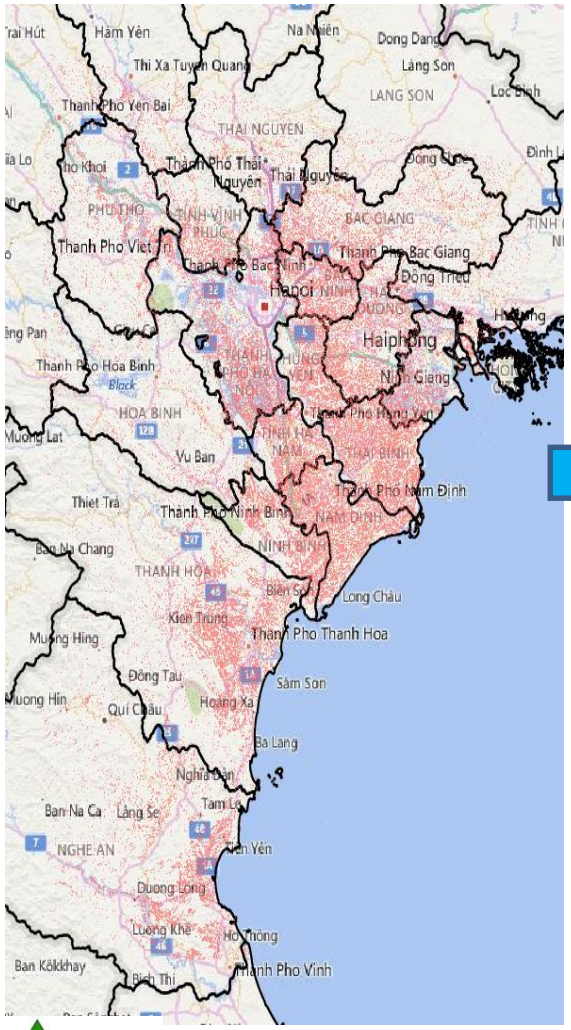
S1 images metadata for Datacube ingestion (.yaml file)

Rice mapping with Datacube

To generate a rice map using Sentinel-1 time series

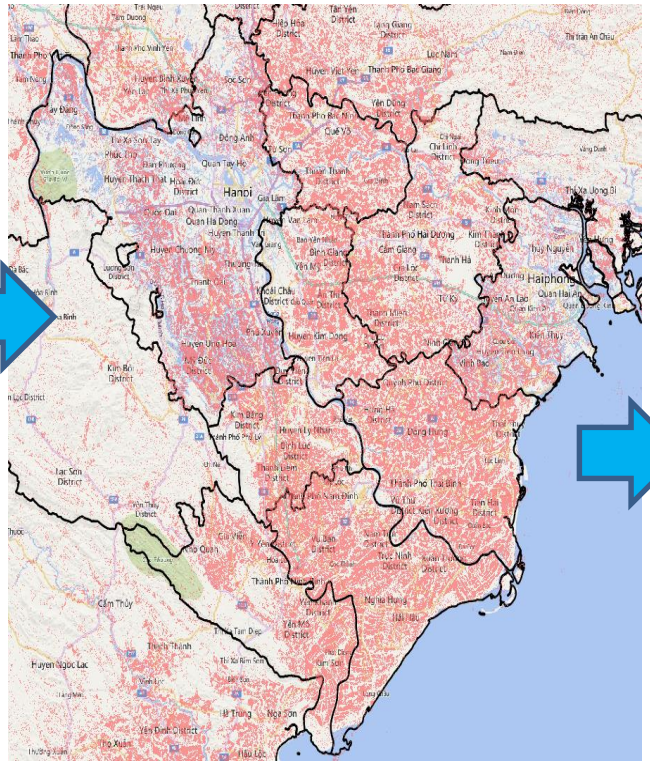


Demonstration of Rice mapping using VN Datacube

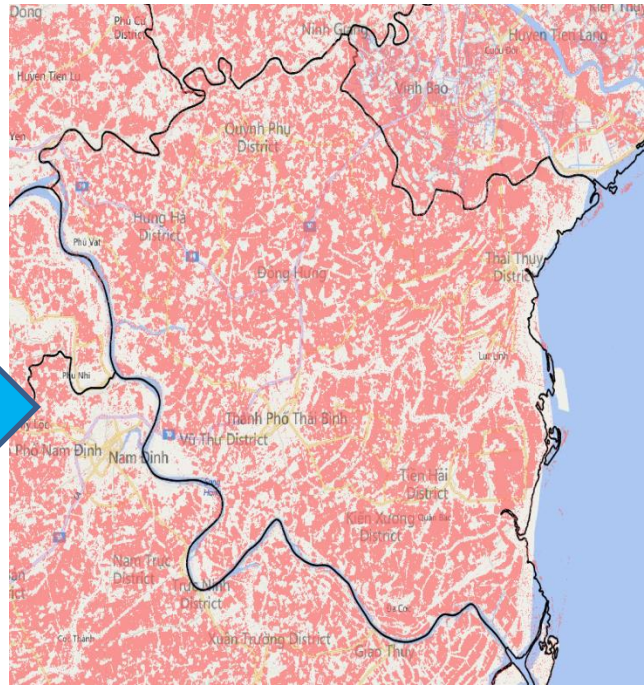


Northern Vietnam

Red River Delta



Thai Binh Province



Winter-Spring 2017 rice map generated from S1 data using VN DataCube

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GEORICE extension

- **GEORICE:** proof-of-concept in the Mekong Delta of Vietnam: 41000 km^2

  1. Rice/Non rice maps:

  - Near-real time after S1 acquisition
  - map per rice season (3 seasons per year)
  - annual synthesis (cropping intensity)

  2. Anomaly maps: interannual variation

  3. Phenological stage maps

- **GEORICE-Extension:** demonstration of larger scale deployment (October 2018- March 2020)

  Extension to 1/3/4/5 full countries of South-East Asia

  1. **Seasonal Rice/Non rice maps** for (2018/2019)
  2. **Rice growth status** for selected regions

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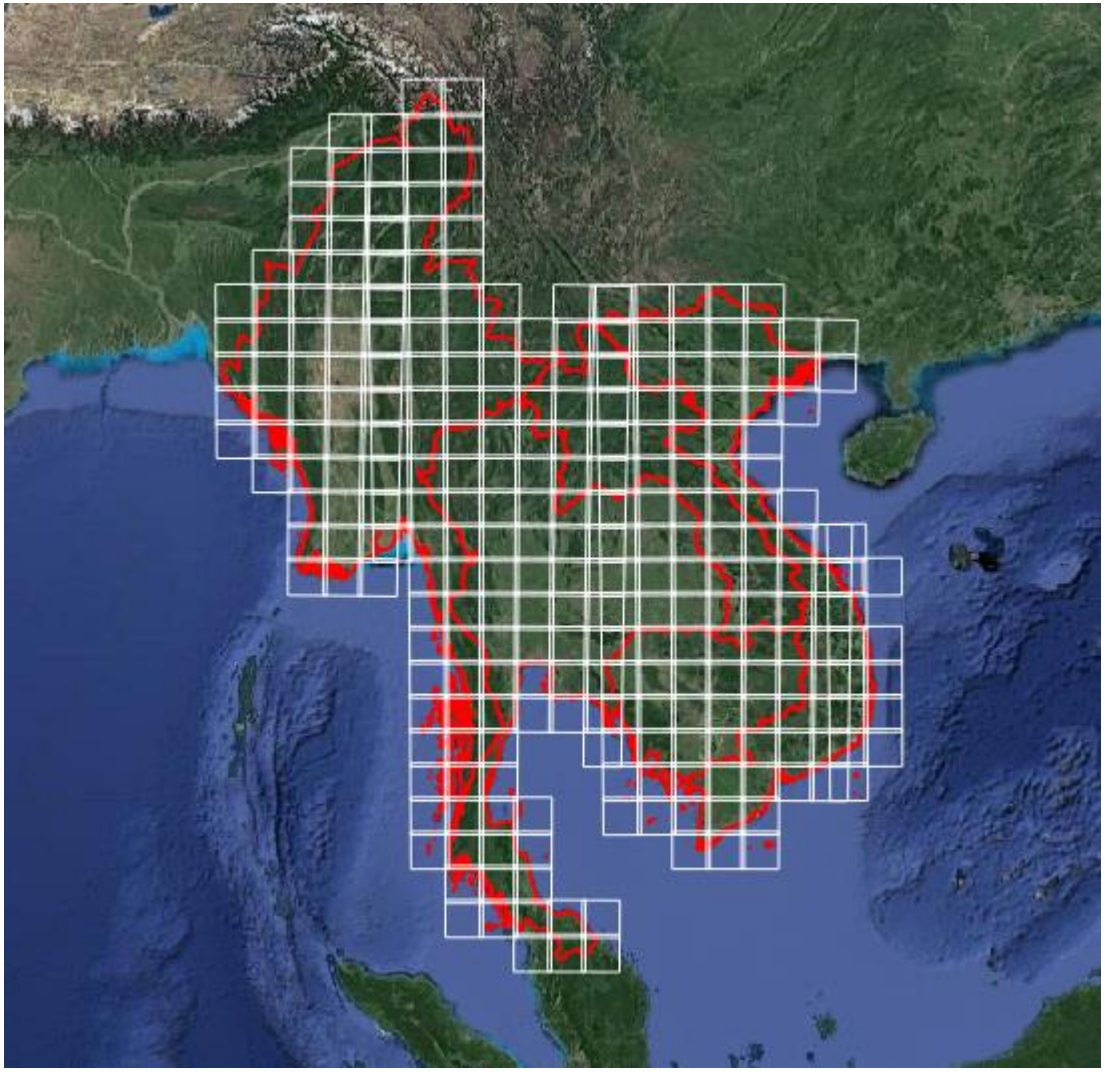
Challenging work to deal with a huge amount of data

Vietnam + Lao PDR + Cambodia + Thailand + Myanmar



1 940 000 km²
297 tiles

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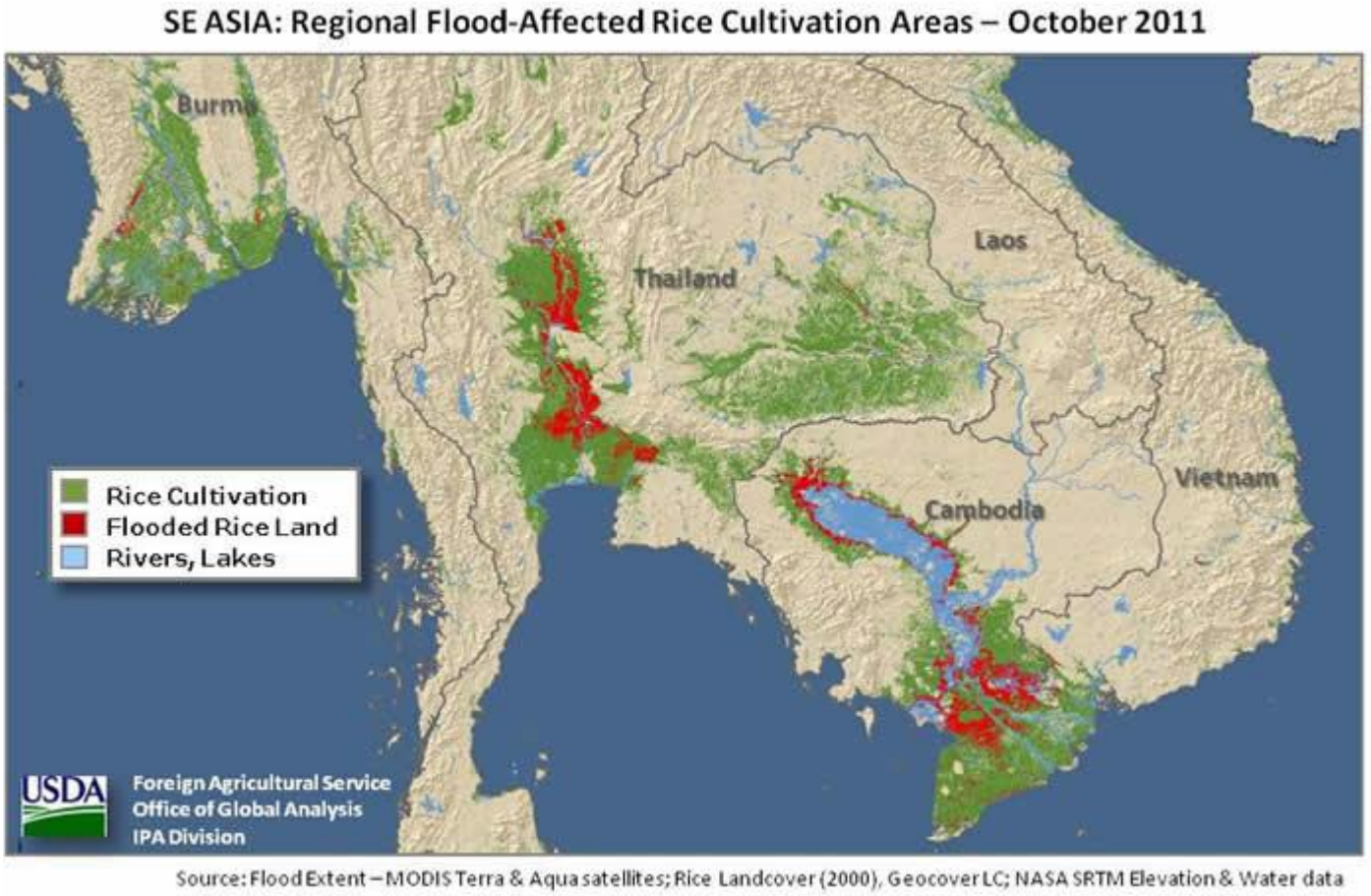
Challenging work to deal with a large diversity of rice ecosystems



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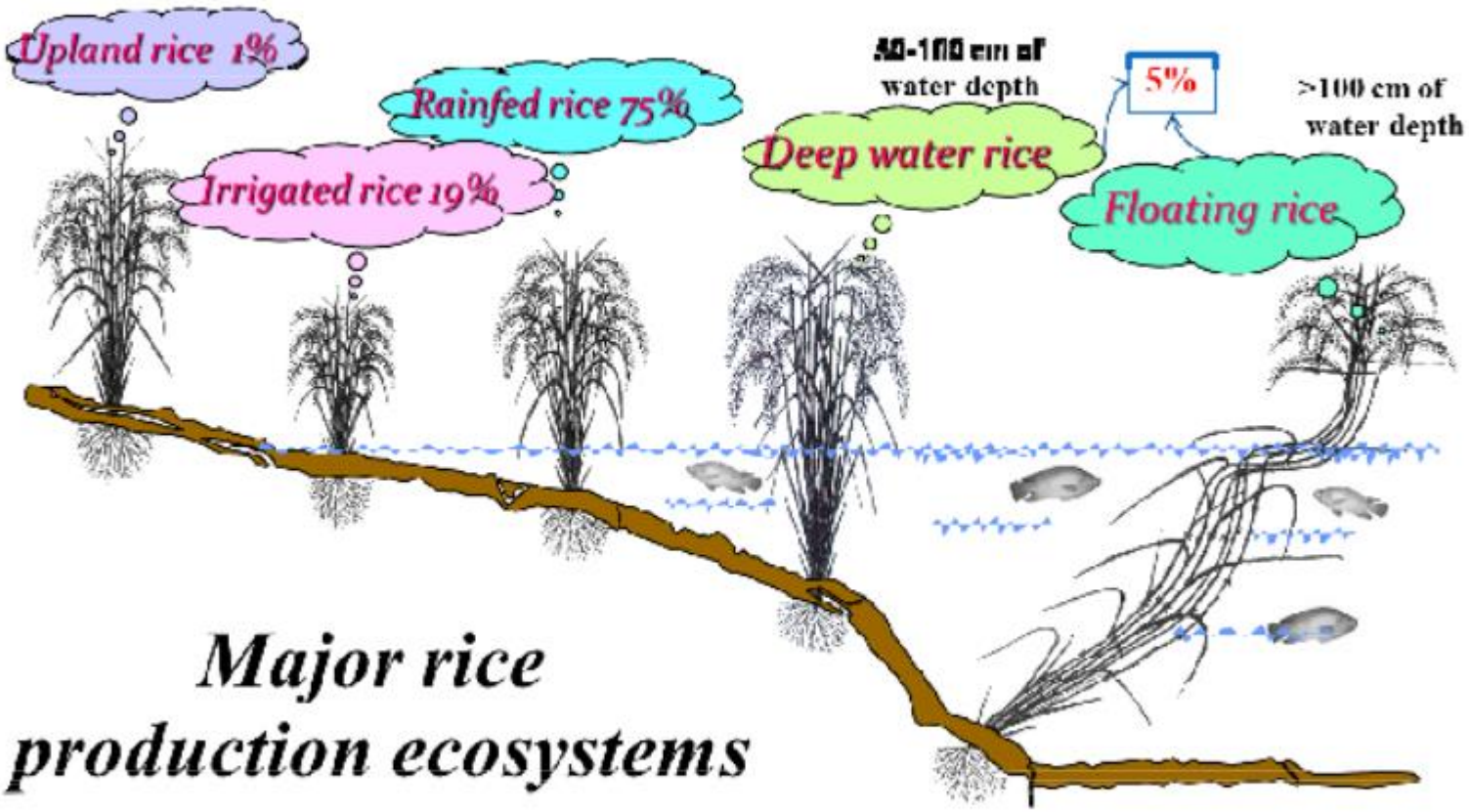
Challenging work to deal with a large diversity of rice ecosystems

Thailand Rice production system



Boondit Varinruk
Rice Department
MOOC, Thailand

Collaboration foreseen

- Collaboration with JAXA for projects with countries of SE Asia
- Collaboration with Asia-Rice teams for EO data methodology, ground data collection standard, standards for method validation
- Collaboration with teams from Vietnam, Cambodia, LaoPDR, Thailand, Myanmar for
  - Knowledge on rice ecosystems (user requirements, cultivation practices..)
  - Participating on results assessment
- Collaboration on data handling/processing (e.g. Data Cube)
  - CSIRO, JAXA, CNES, VNSC
- Scientific collaboration for products exploitation
  - Methane emissions: JAXA/University of Tokyo
  - DNDC: AGS (US)
  - ORYZA: IRRI

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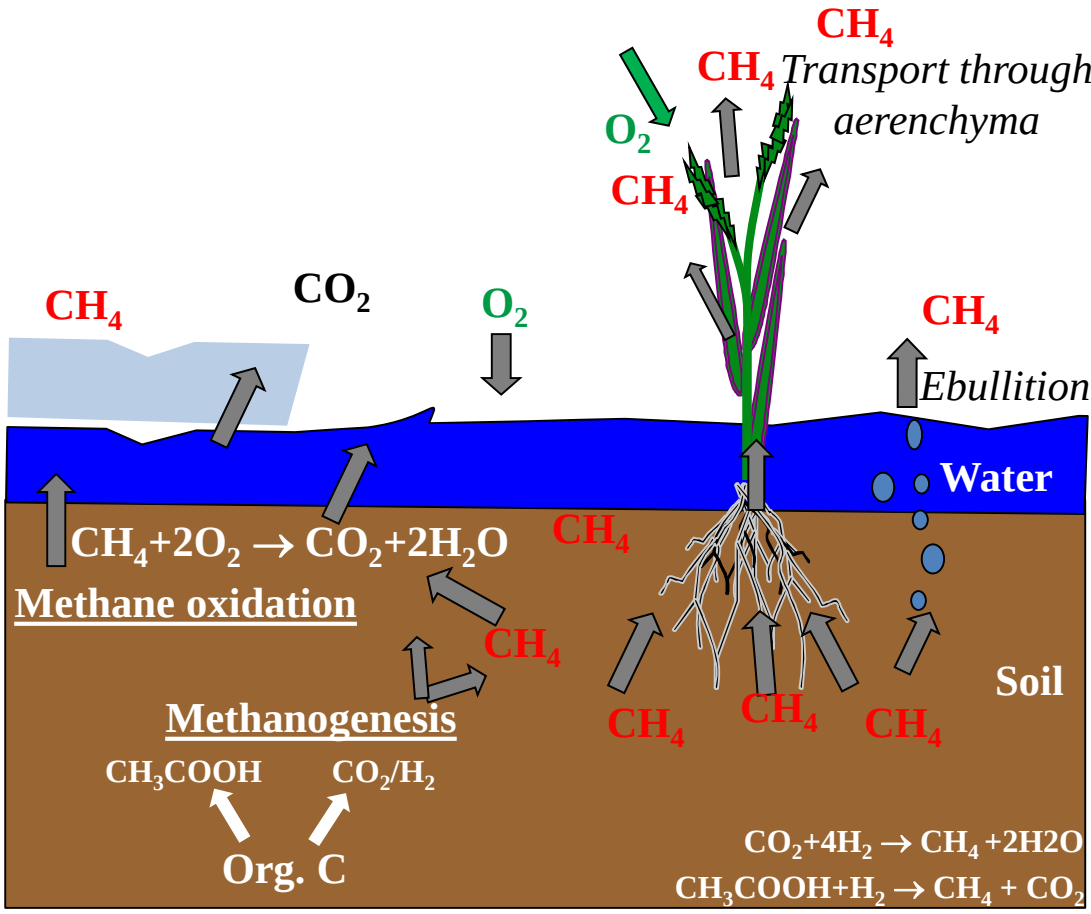
Collaboration on methane emissions

Anaerobic decomposition of organic material in flooded rice fields produces methane (CH4).

The flux depends upon several factors including

- climate,
- Soil characteristics
- **Rice characteristics** ,
- Agricultural practices, particularly **water regime, post harvest management…**



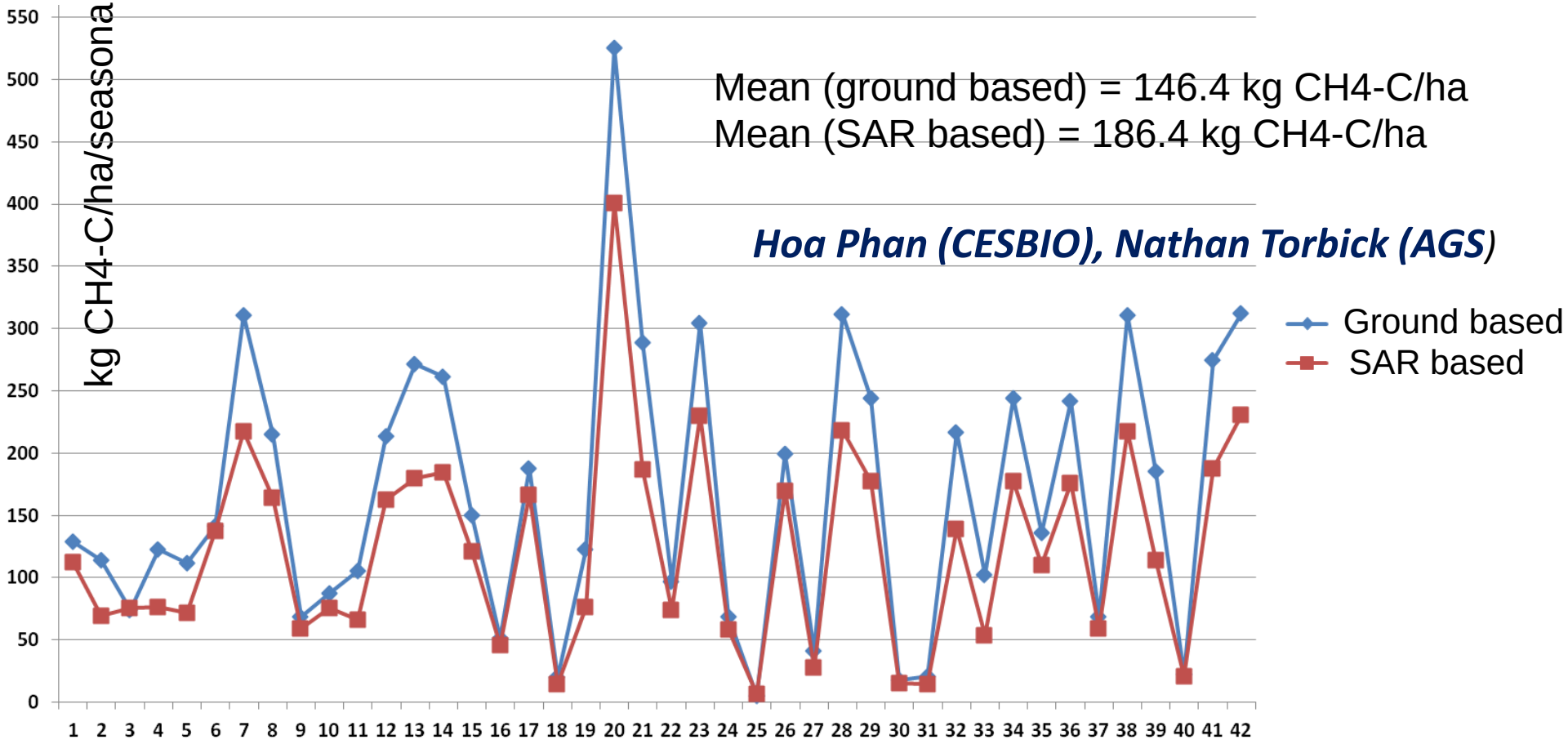
Collaboration

JAXA/University Tokyo (H. Arai) : *Cantho site*

AGS (Nathan Torbick, William Salas): *Thai Binh site*

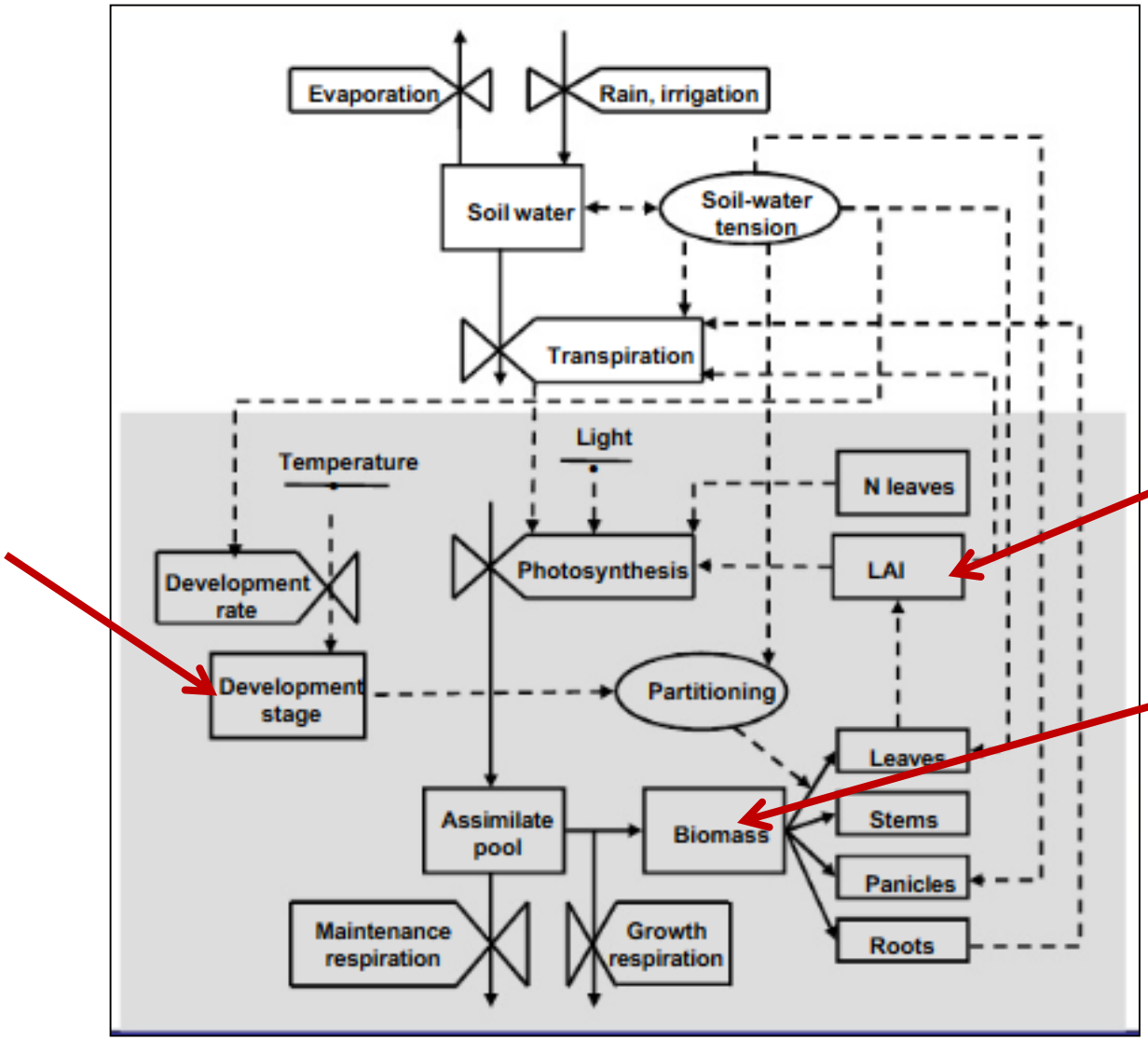
Estimation of seasonal CH4 emissions for 42 fields in Thai Binh

Comparison of simulations based on parameters collected by ground survey and detected using Sentinel-1(**Season rice maps**, **cropping density** (SoS and harvest), **Growth stage**, **Inundation period**)



Running OZYZA rice production model integrating Sentinel-1 data

Collaboration IRRI (Tri Deri Setiyono & Alice Laborte)



From Remote Sensing

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The way forward

1. GEORICE will be in Research and Development phase
2. The objective will be toward the transition from Research to Operations for Rice monitoring at national scale

   ---Capacity building----

3. Meeting Asia-Rice and GEOGLAM priorities:

   to respond to Policy drivers, coordination with CEOS, SDG…

谢谢

Thank you

Site scoping in Phu Yen (Centre Vietnam), 11/8/18