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K&C Extension Proposal

Richard Lucas, Institute of Geography and Earth Sciences

PRIFYSGOL ABERYSTWYTH UNIVERSITY

North Australian Forests: Project objectives

- To revise, enhance and apply algorithms for retrieving forest structure and biomass for the wide range of forest types occurring across northern Australia

- To generate, for the years 2007-2011, maps of change in the biomass and structure of intact and regenerating forests (growth stage) using JERS-1 SAR and ALOS PALSAR mosaics
  - ↓ Better understand the longer term impacts of natural and indirectly induced (e.g., climate) anthropogenic change.

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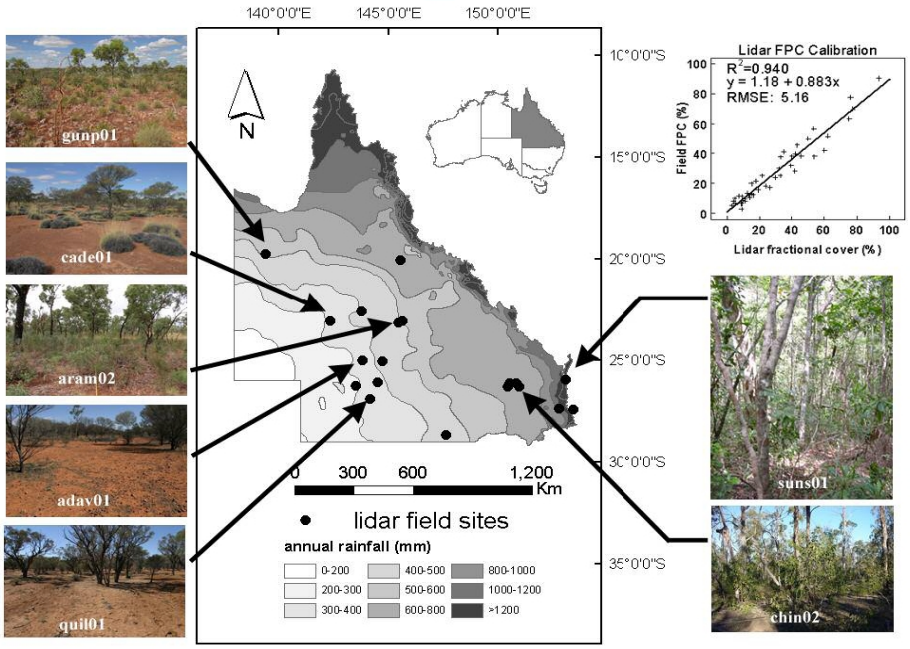
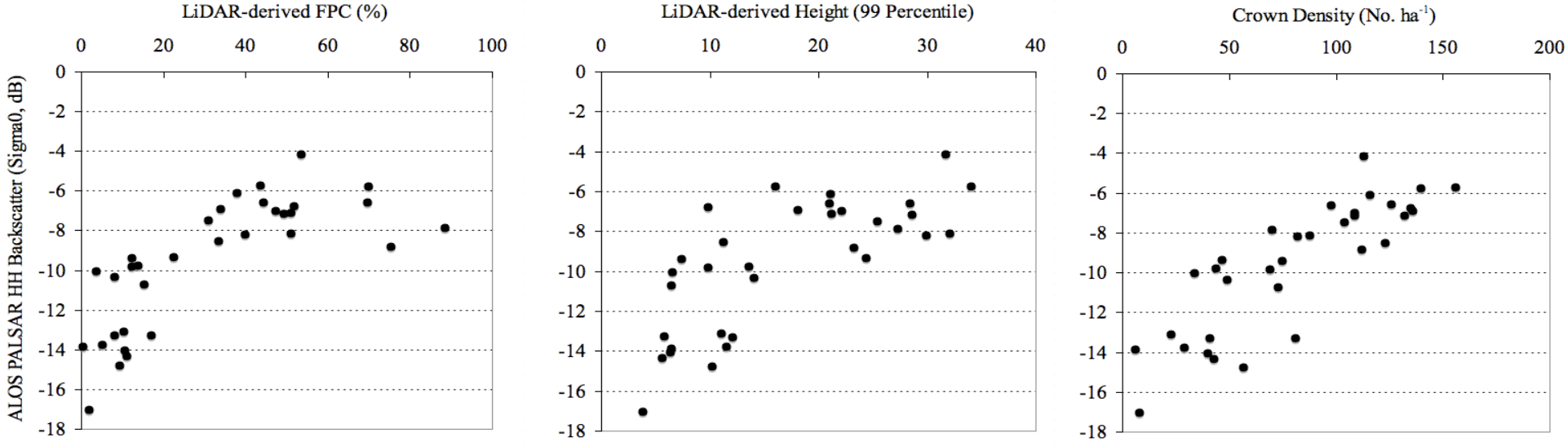
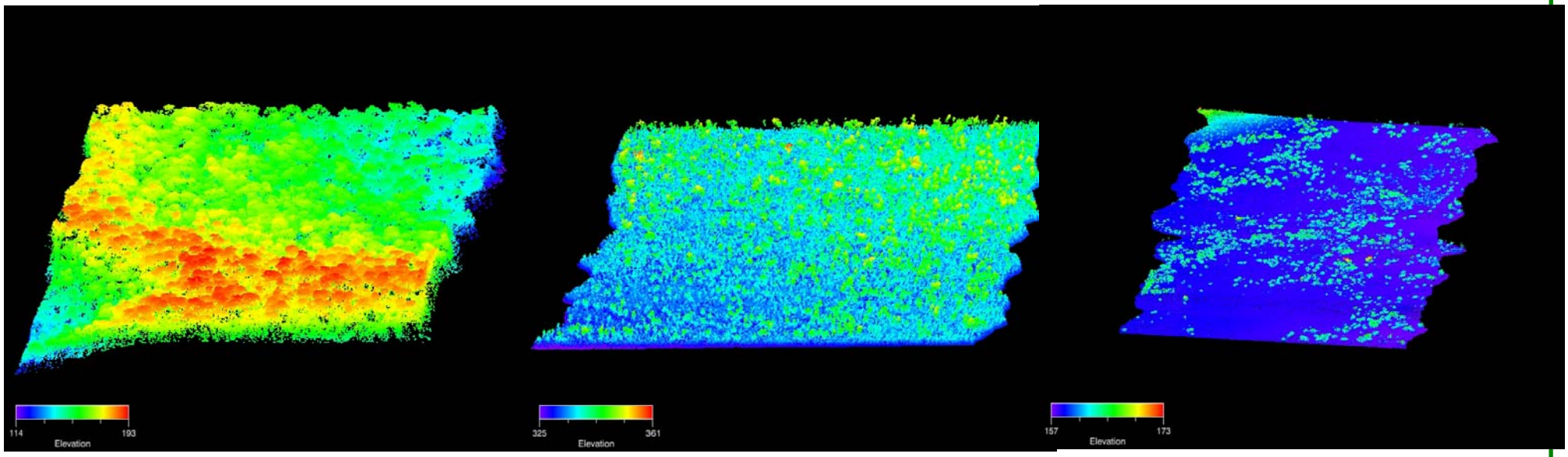




Full waveform LiDAR acquisitions (Nov, 2008)



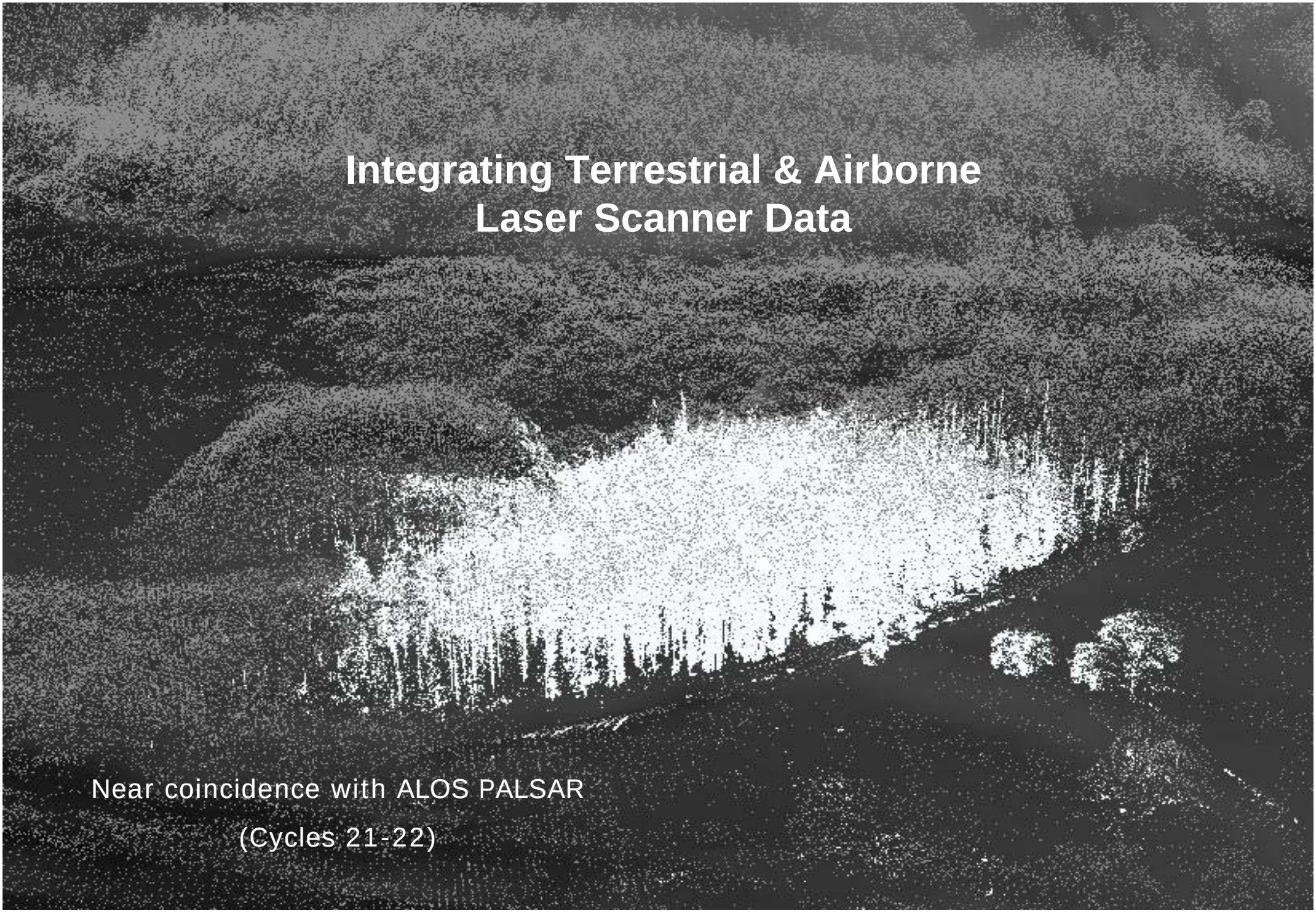
Closed Tropical Rainforest

Open Eucalyptus woodland

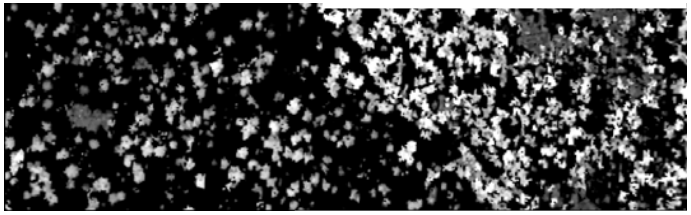
Low woodland

- Range of products
  - Forest height
  - Canopy volume
  - Biomass

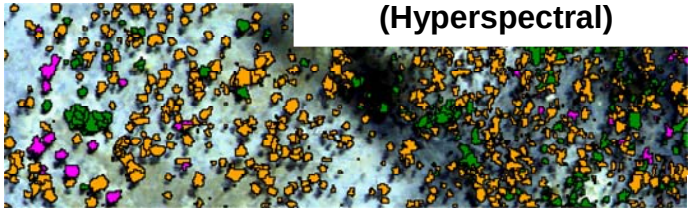
Validation using TLS


Integrating Terrestrial & Airborne
Laser Scanner Data
Near coincidence with ALOS PALSAR
(Cycles 21-22)

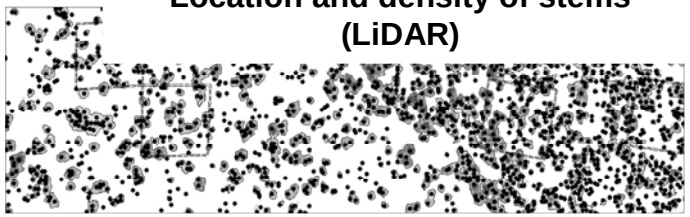
Tree height (LiDAR)



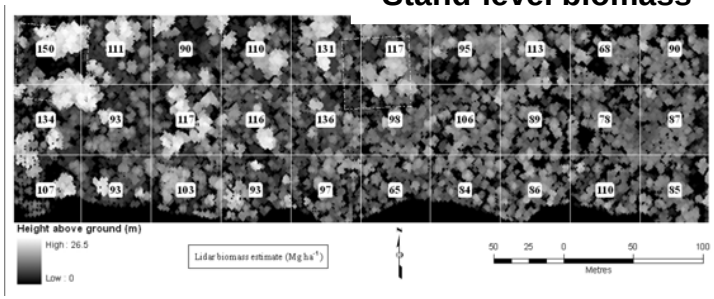
Species (Hyperspectral)

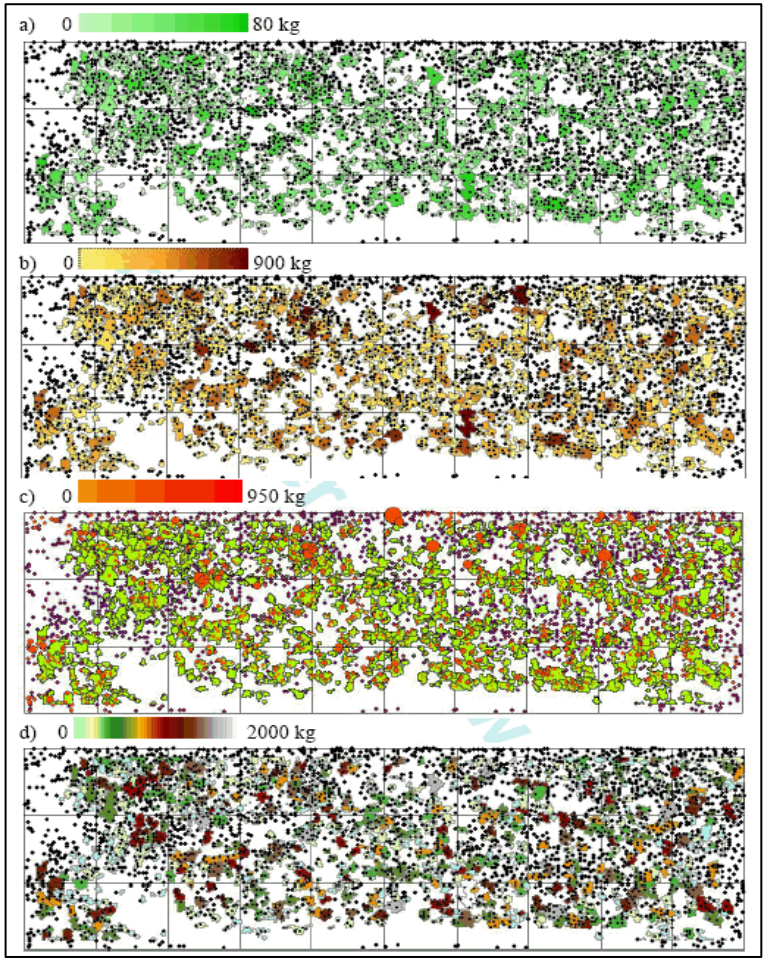


Location and density of stems (LiDAR)



Stand-level biomass





Leaf

Branch

Trunk

Total

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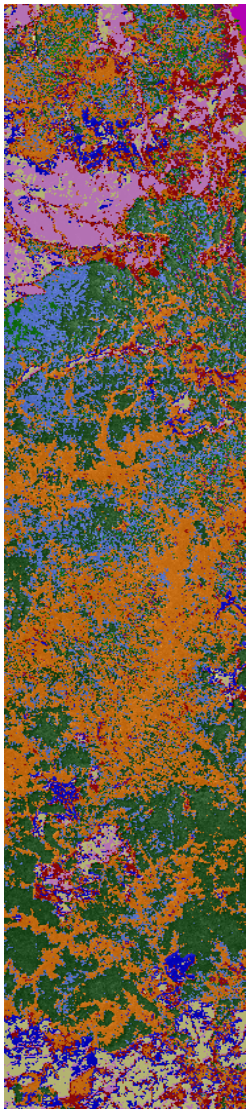
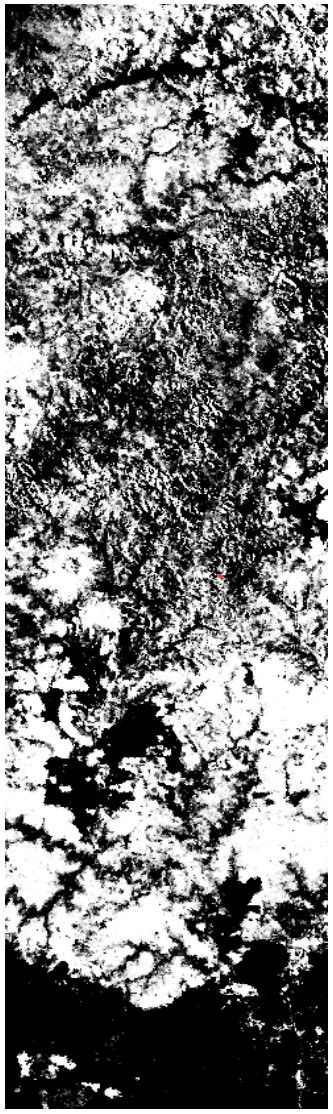
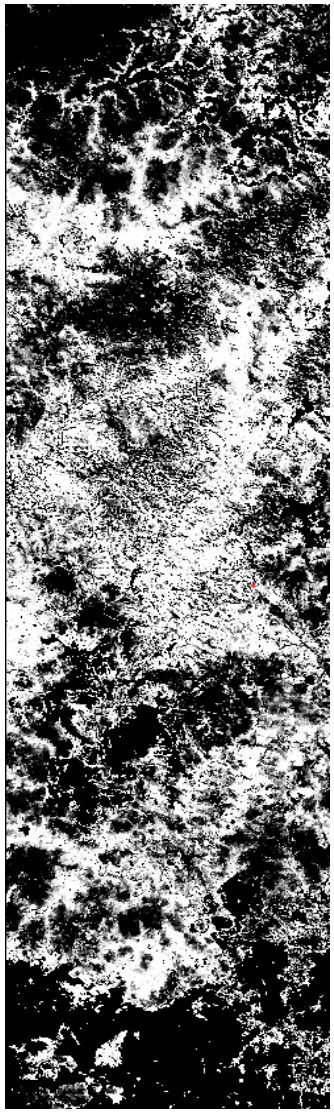
Classification of forest structural types



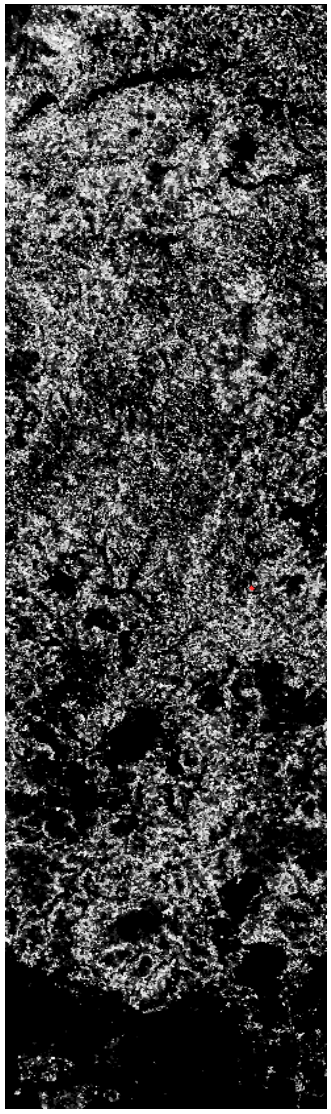
Classified Strip Data



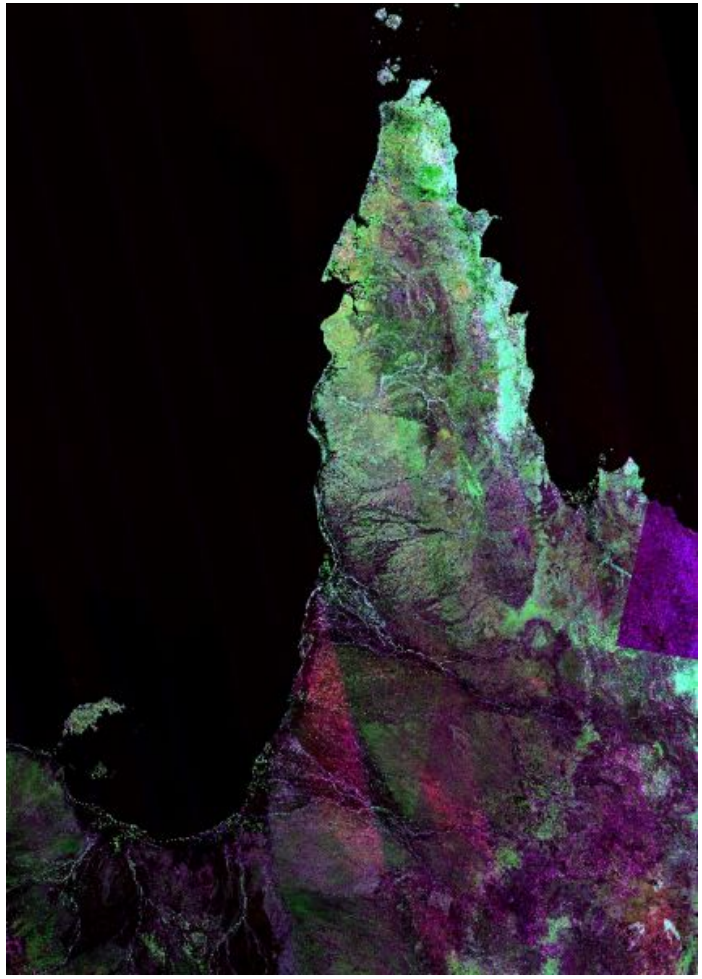
Excurrent (Pines)

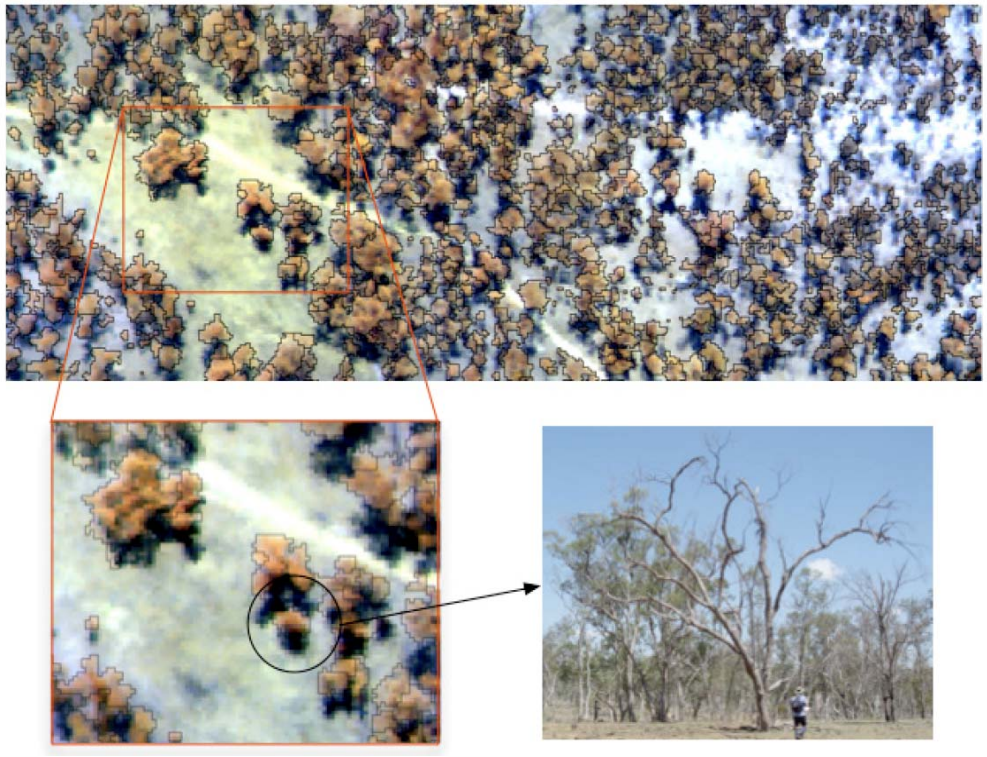


Decurrent (Eucalyptus)



Excurrent/ Decurrent



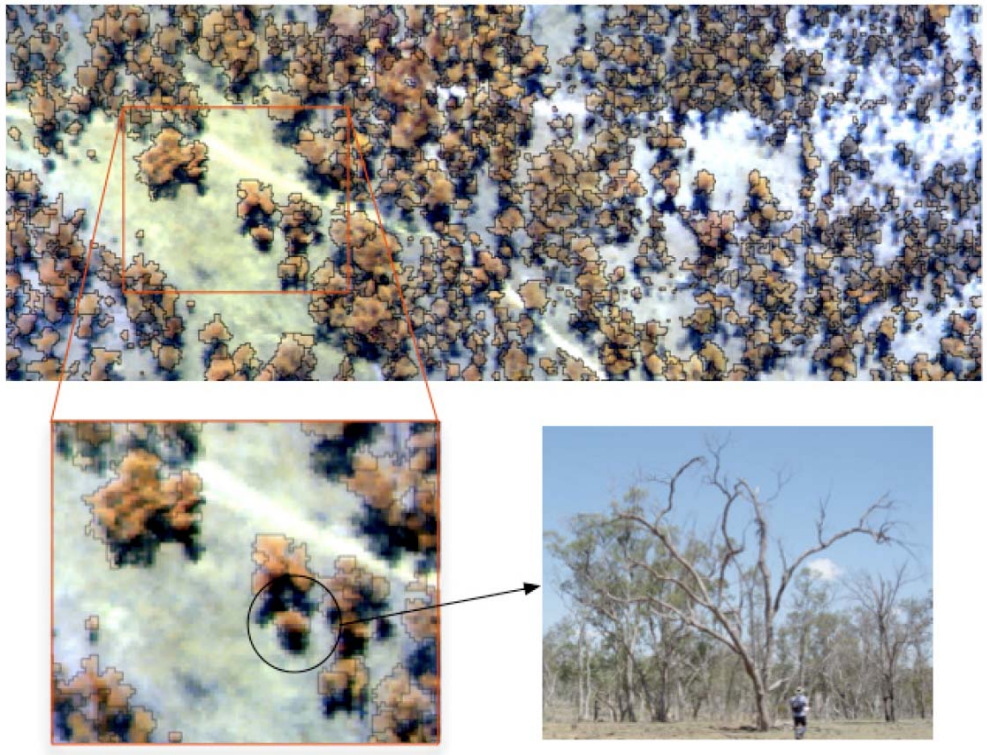


2000 2006

Drought impacts,
Injune, Queensland

Detection of Environmental Change

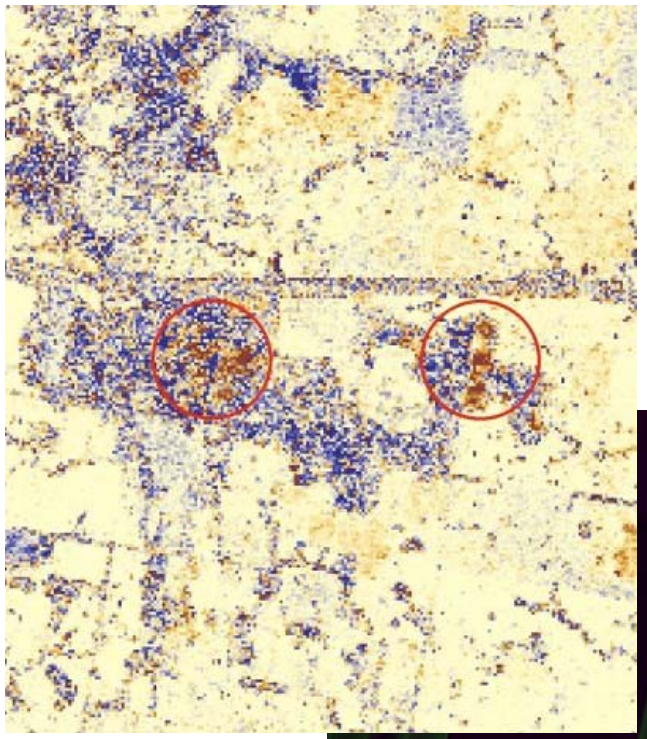
- **Time-series comparison of LiDAR/optical data/products**
  - 2000 (Injune)
  - 2004/5
  - 2008/9
- **Time-series comparisons**
  - JERS-1 SAR
  - ALOS PALSAR (2007 onwards)
  - Landsat-derived FPC
- **Detection of:**
  - Woody thickening
  - Forest degradation

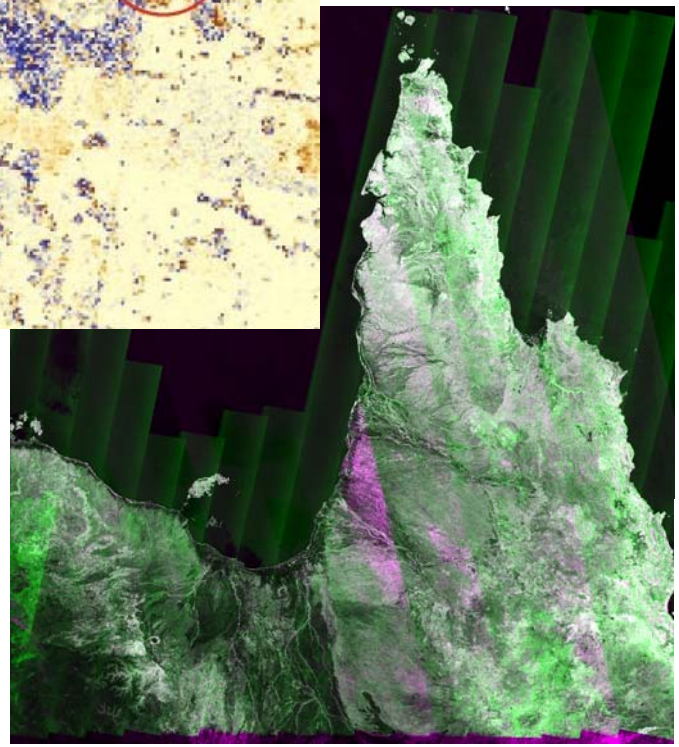


2000

2006

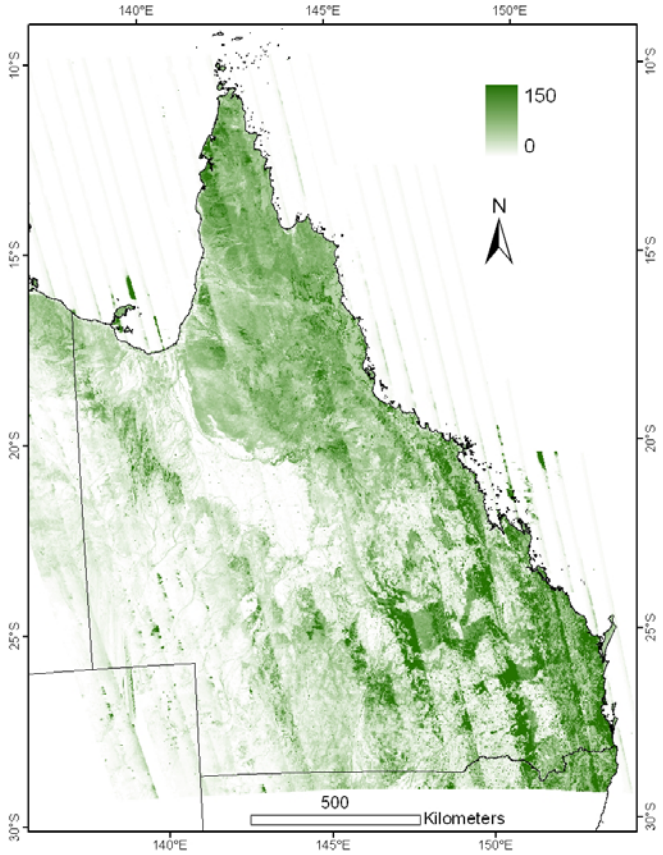
Drought impacts,
Injune, Queensland

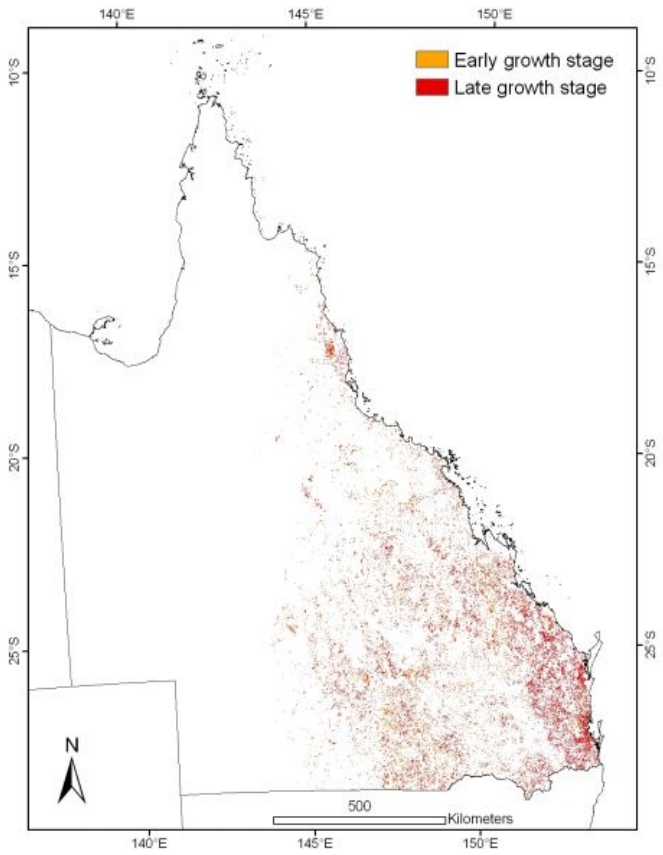


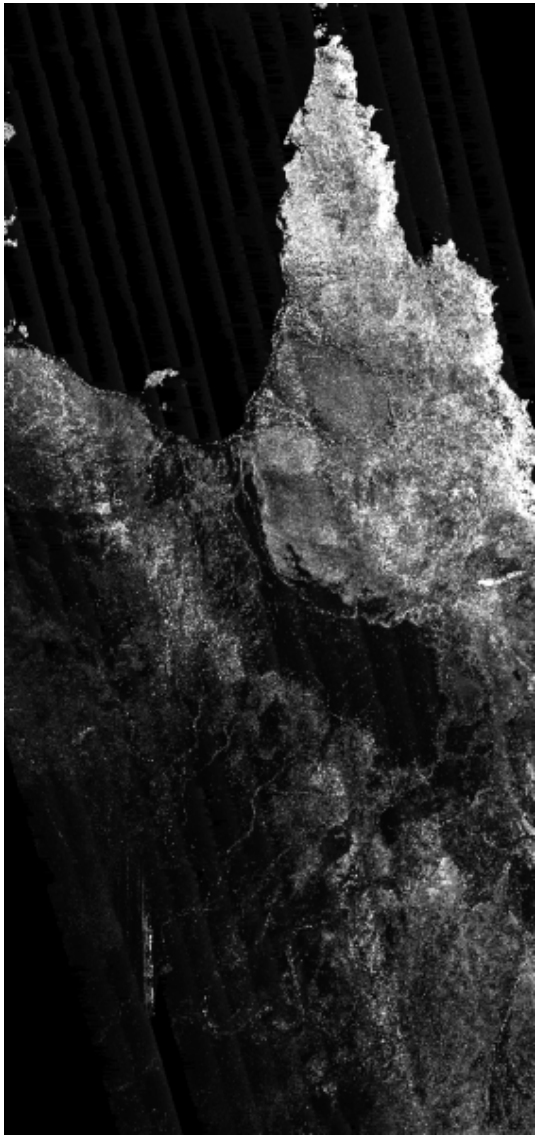


Detection of Environmental Change

Deliverables: Biomass/biomass change (annual and decadal) and growth stage for northern Australia (Qld, NT and WA)







Data Requirements

- Strip data/mosaics for 2009-2010
  - ↓Northern Australia
- Extend to New South Wales
  - ↓Using existing algorithms (biomass only)
  - ↓Possibility to apply to Australian mosaics
- JERS-1 SAR mosaic
  - ↓Australia?

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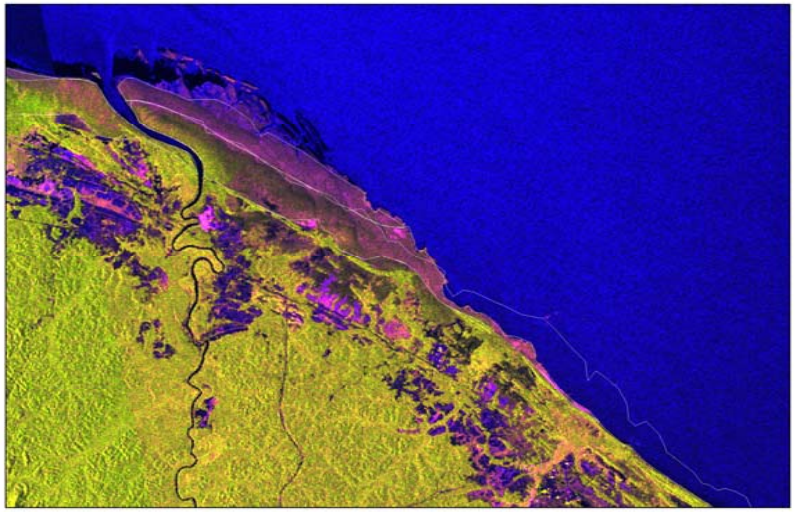

Global Mangrove Watch
(in conjunction with the
UNEP World
Conservation Monitoring
Centre)

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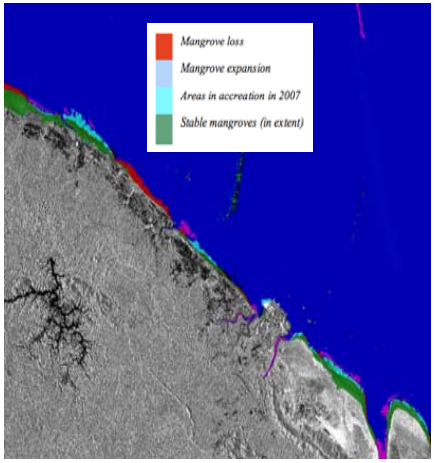
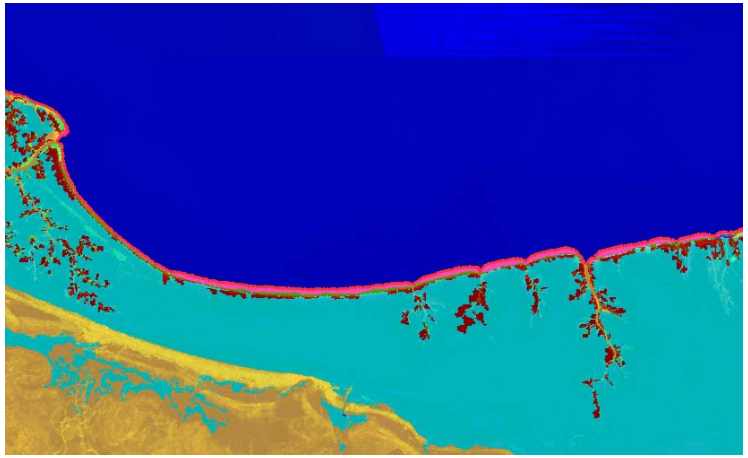
‘Natural’ change accretion and erosion

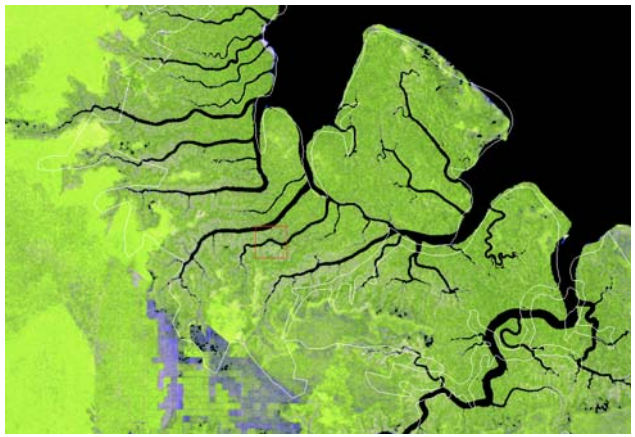
Climate-change induced?

Anthropogenic





Discrepancies in existing maps of mangroves



- **Error in classification**
- **Deforestation since estabishment of baseline**

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Project Objectives

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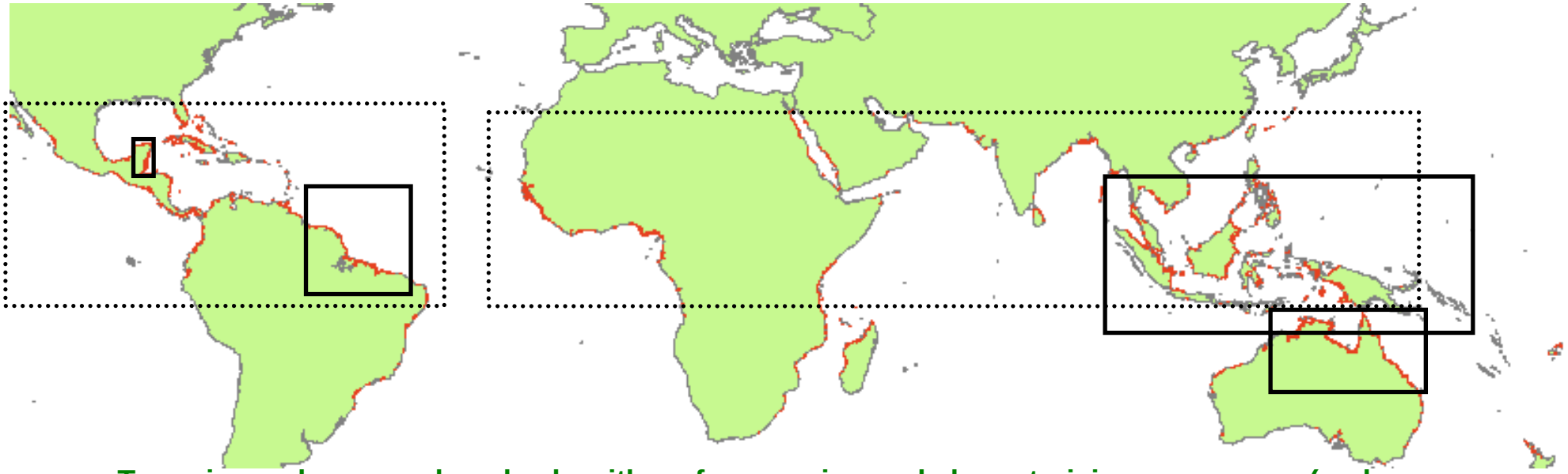
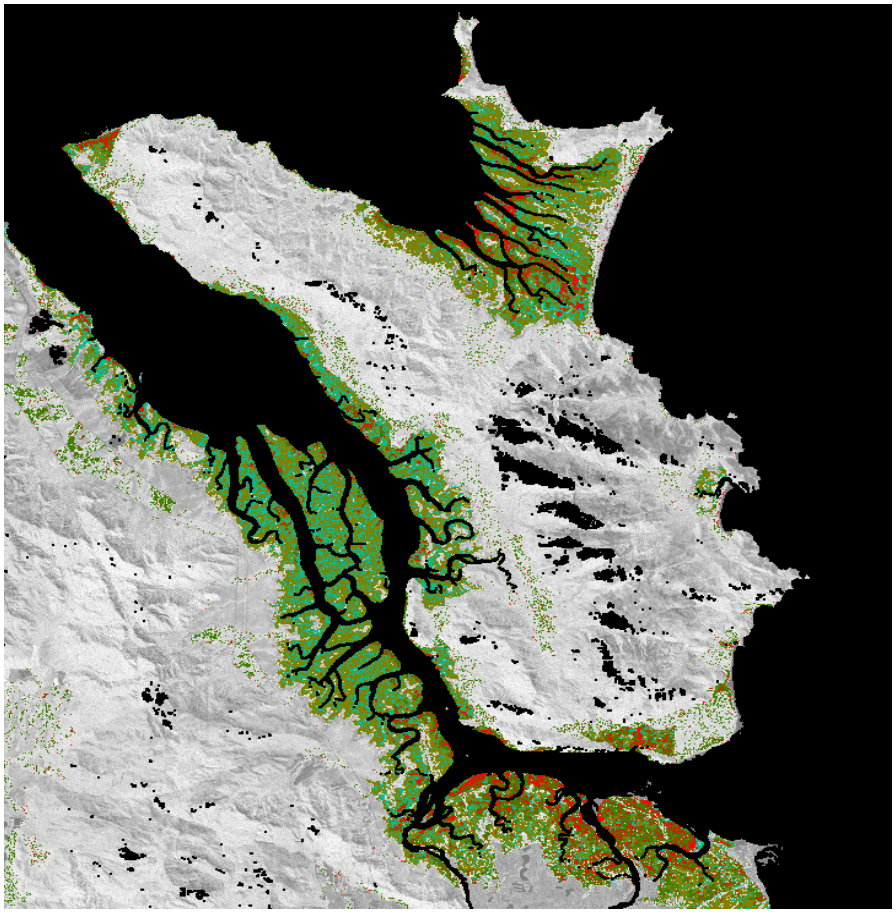
World Conservation Monitoring Centre
Global Mangrove Map



- **To revise, enhance and apply algorithms for mapping and characterising mangroves (and proximal wetlands) in the existing study regions**
  - **Australia, Amazon coast, Belize, Insular SE Asia**
- **To generate maps of change in mangroves across the tropics with possible extension to the sub-tropics (in selected regions)**
- **To demonstrate a global mangrove monitoring “hot spot detection” system based on multi-temporal ALOS PALSAR data**
  - **Integration within existing or estabishment of new monitoring systems**
  - **Knowledge transfer component (to WCMC)**

a) To revise, enhance and apply algorithms for characterising, mapping and detecting change in mangroves (and proximal wetlands) in the existing study areas



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Comparison of mangrove distributions, SE Asia

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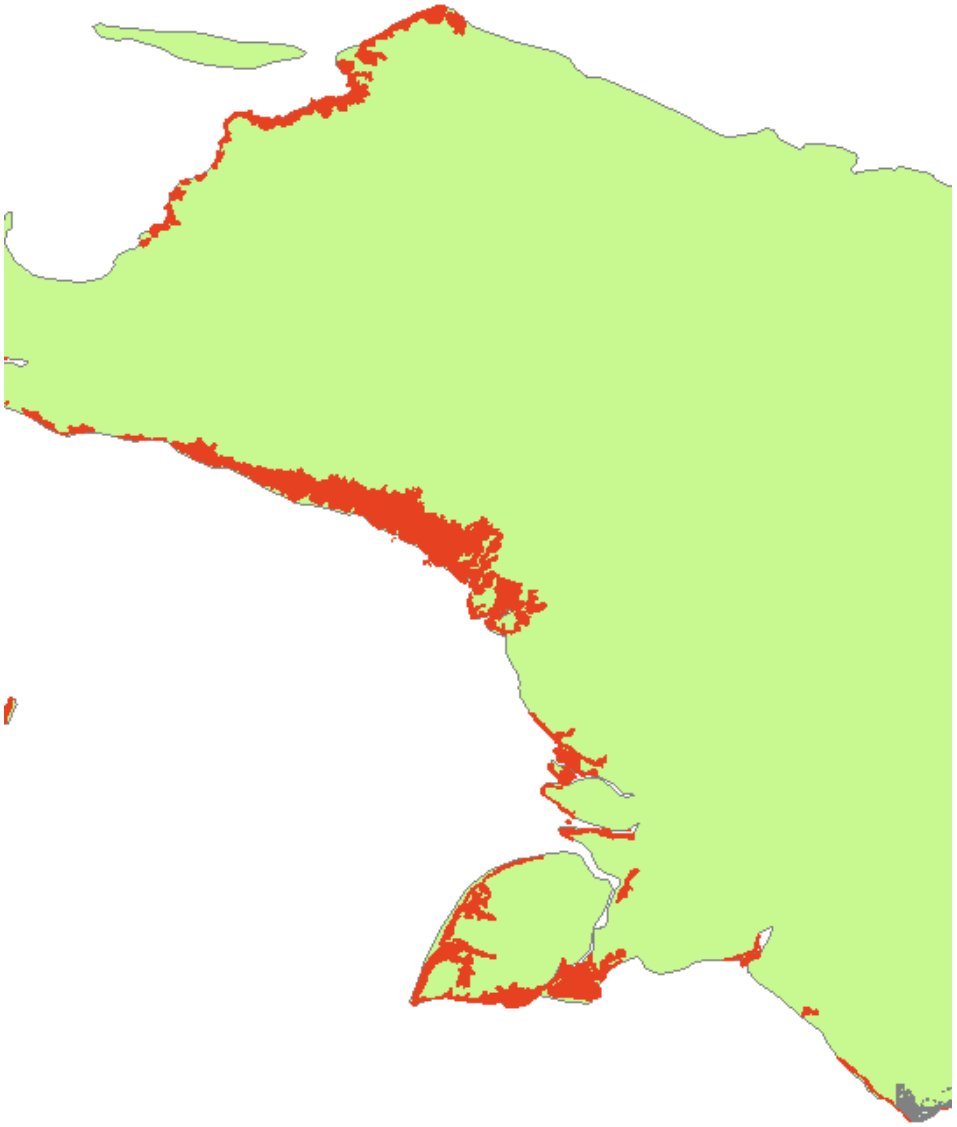
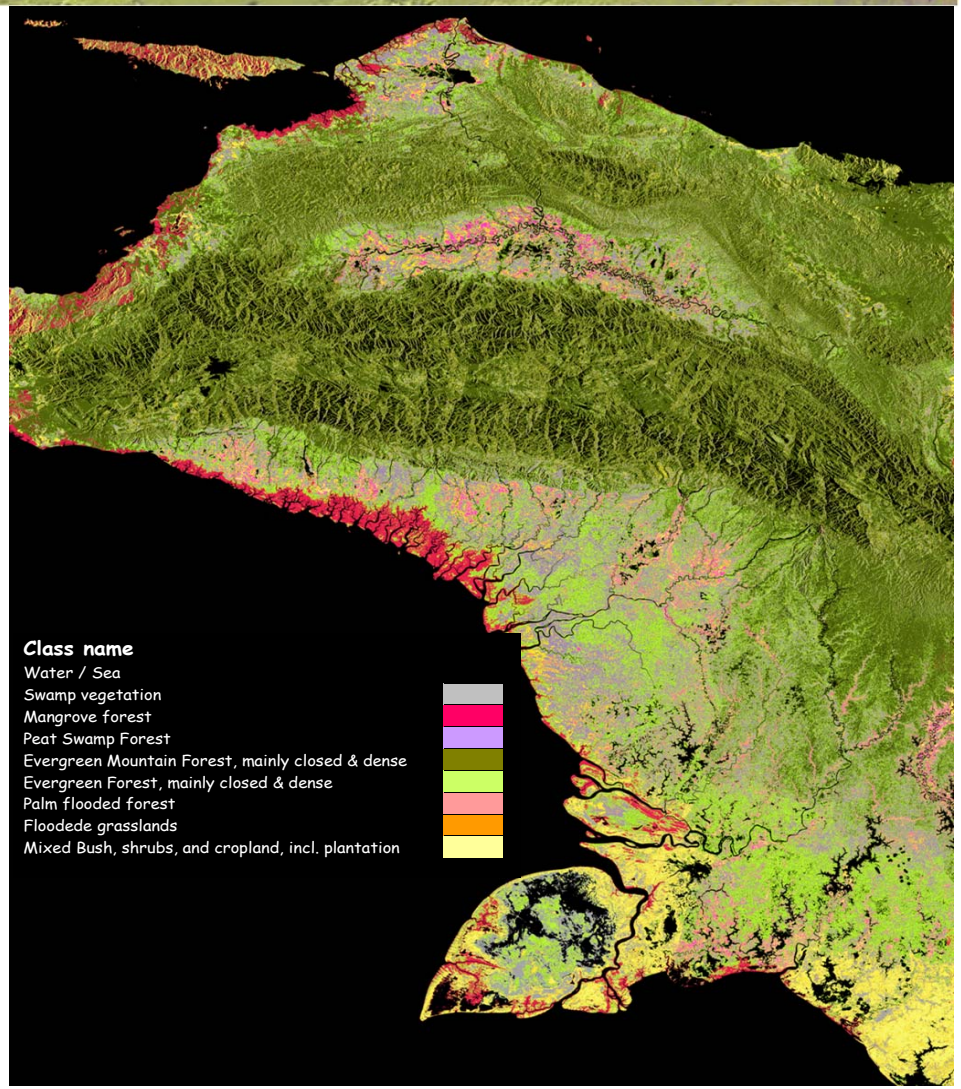


World Conservation Monitoring Centre



SAR Vision Classification

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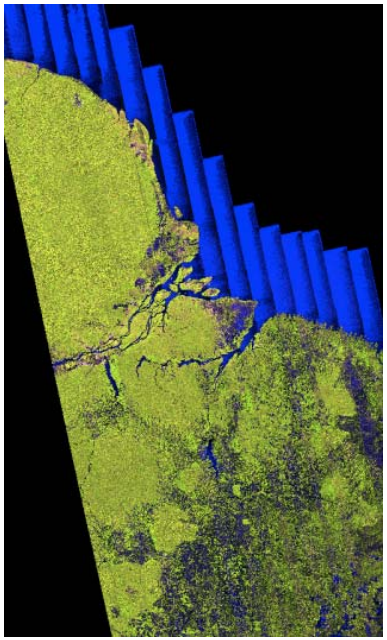
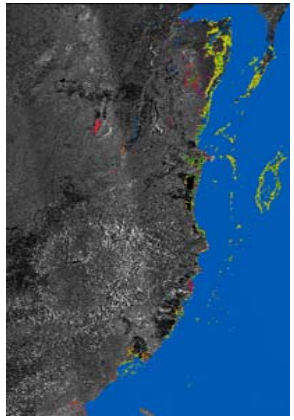
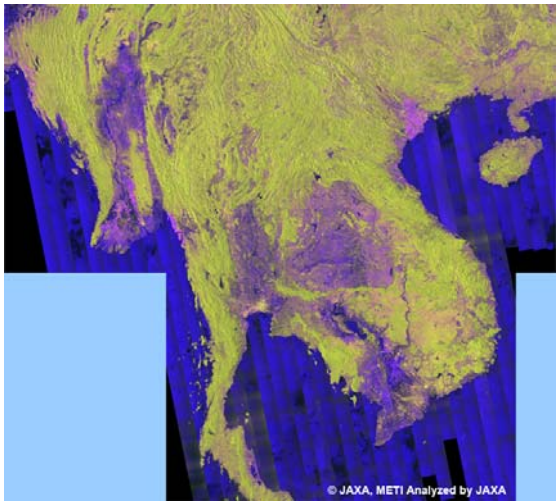
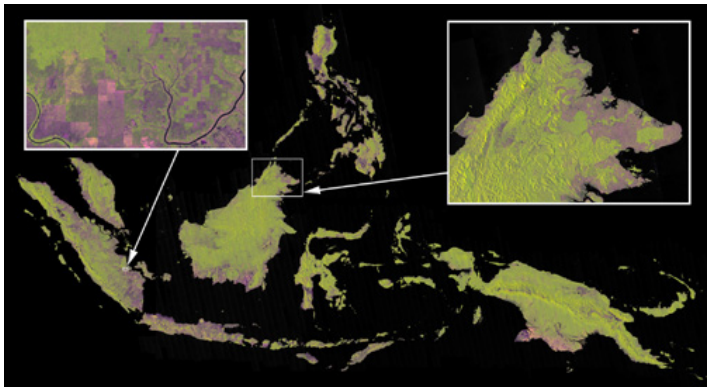




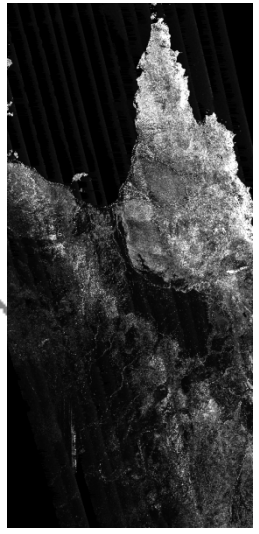




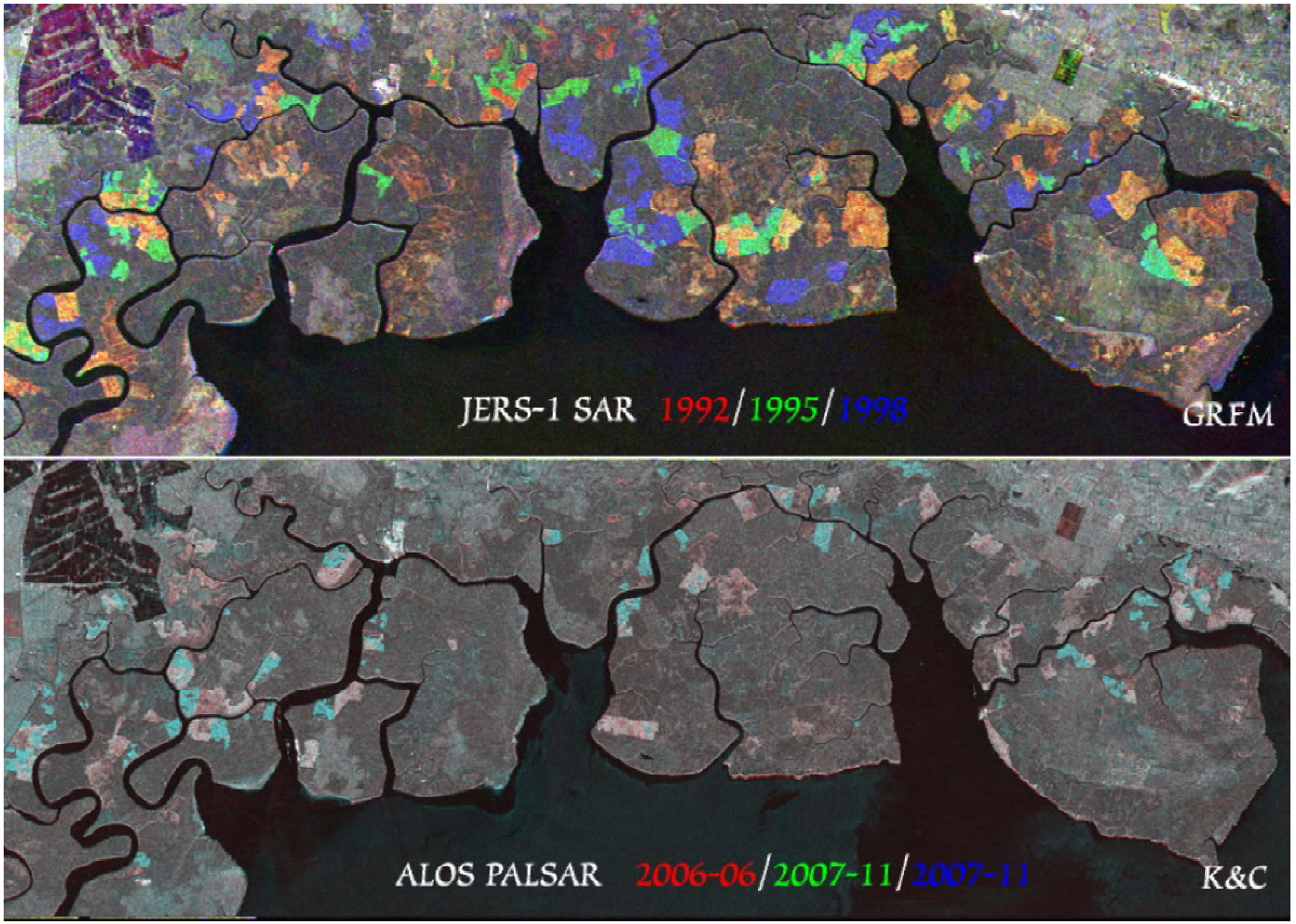
b) Generate maps of change in mangroves across the tropics with possible extension to the sub-tropics (in selected regions)

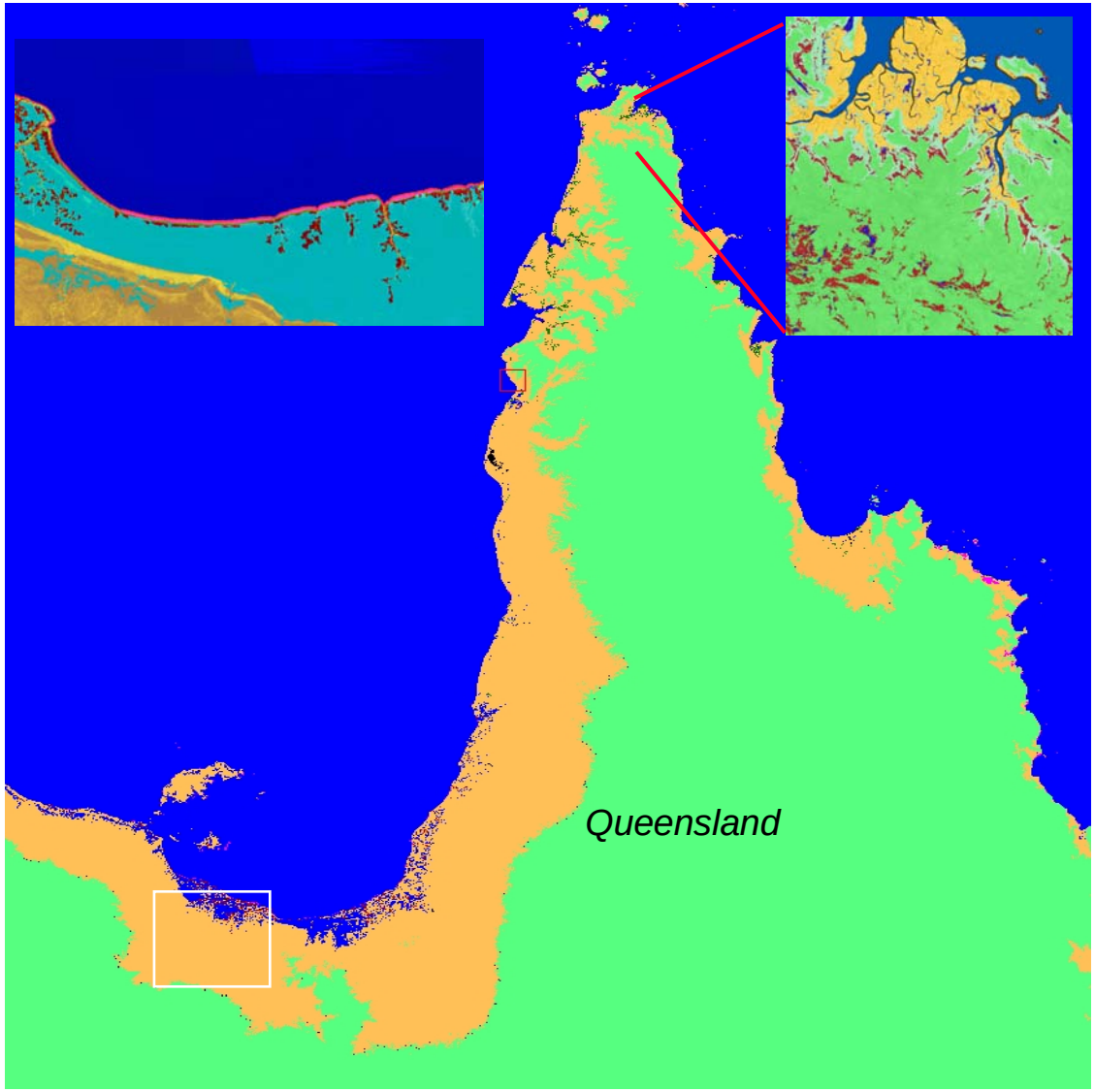
Utilise mosaics as and when produced (for 2007)

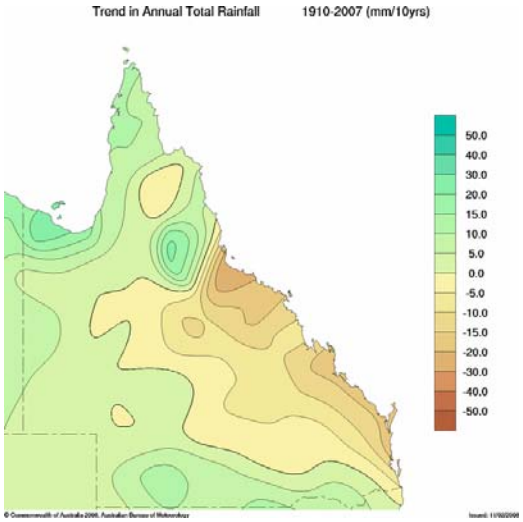
Revised current baselines to JERS-1 mosaic



c) To demonstrate a global mangrove monitoring “hot spot detection” system based on multi-temporal ALOS PALSAR data (for adoption by agencies)







d) To map broad changes in wetland extent across northern Australia

ScanSAR mosaics of wetland dynamics, northern Australia (2007 onwards)

Refined classification of wetlands

Links with climate information to better understand reasons for change in mangroves

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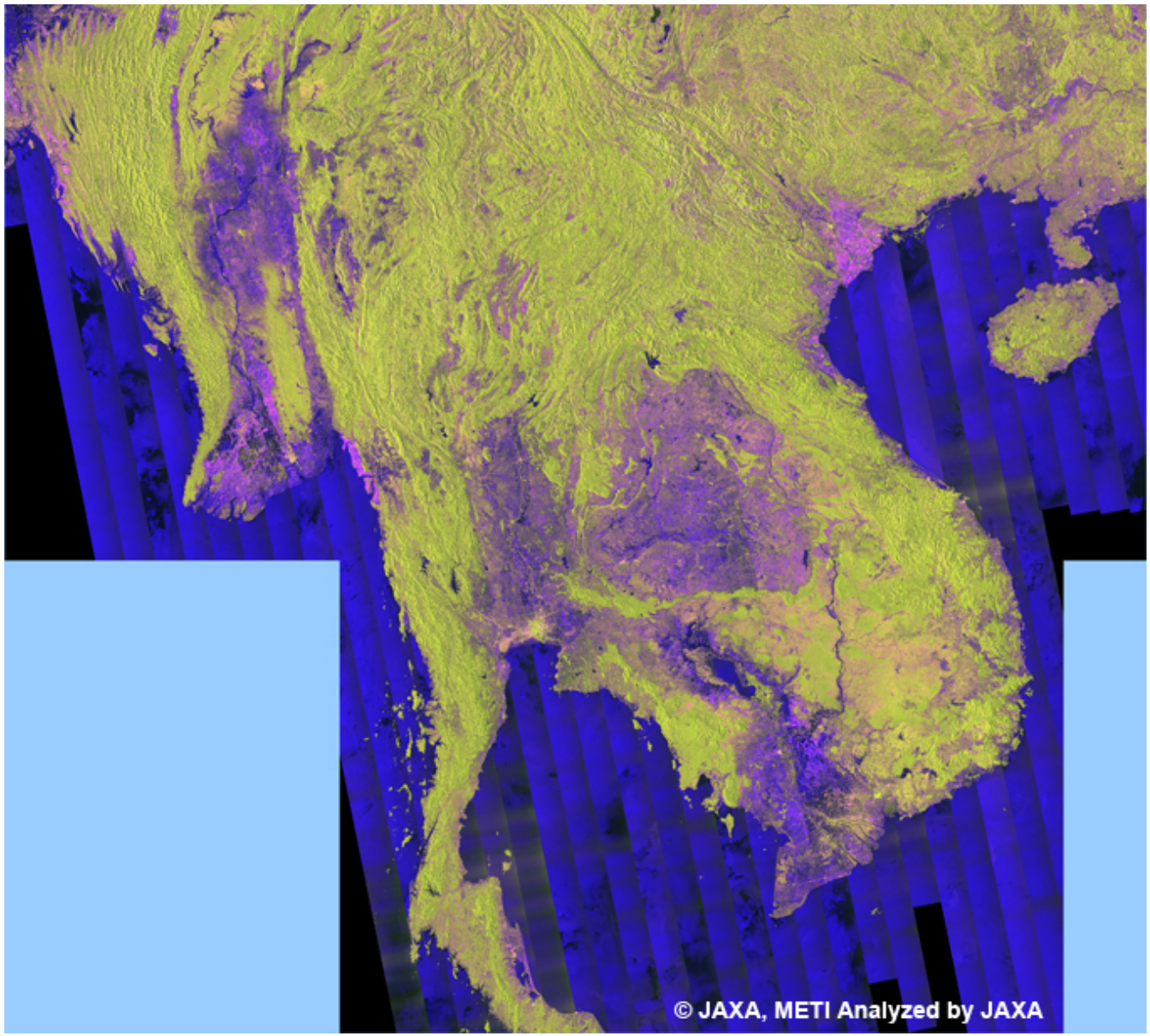
- Australia
  - Queensland/NT/WA
- South America
  - Brazil
  - French Guiana
- Central America
  - Belize
- Southeast Asia
  - Borneo
  - Papua
  - Sumatra*

- Australia
- South America
  - Colombia
  - Surinam
  - Guyana
- Central America
- Southeast Asia
  - New Guinea
  - Remaining mainland and islands
- Africa
  - Gabon

- Australasia
- South America
- Central America
- Southeast Asia
- Africa

- Mapping dependent on mosaic generation
- Technology transfer process through WCMC



Data Requirements

- Regional mosaics (FBD)
  - All tropical regions
  - Some subtropical regions
- Time-series of mosaics
  - Selected regions
- Revised global baseline for 2007
- Capacity to detect change globally and routinely

Thank you

Richard Lucas, Institute of Geography and Earth Sciences

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