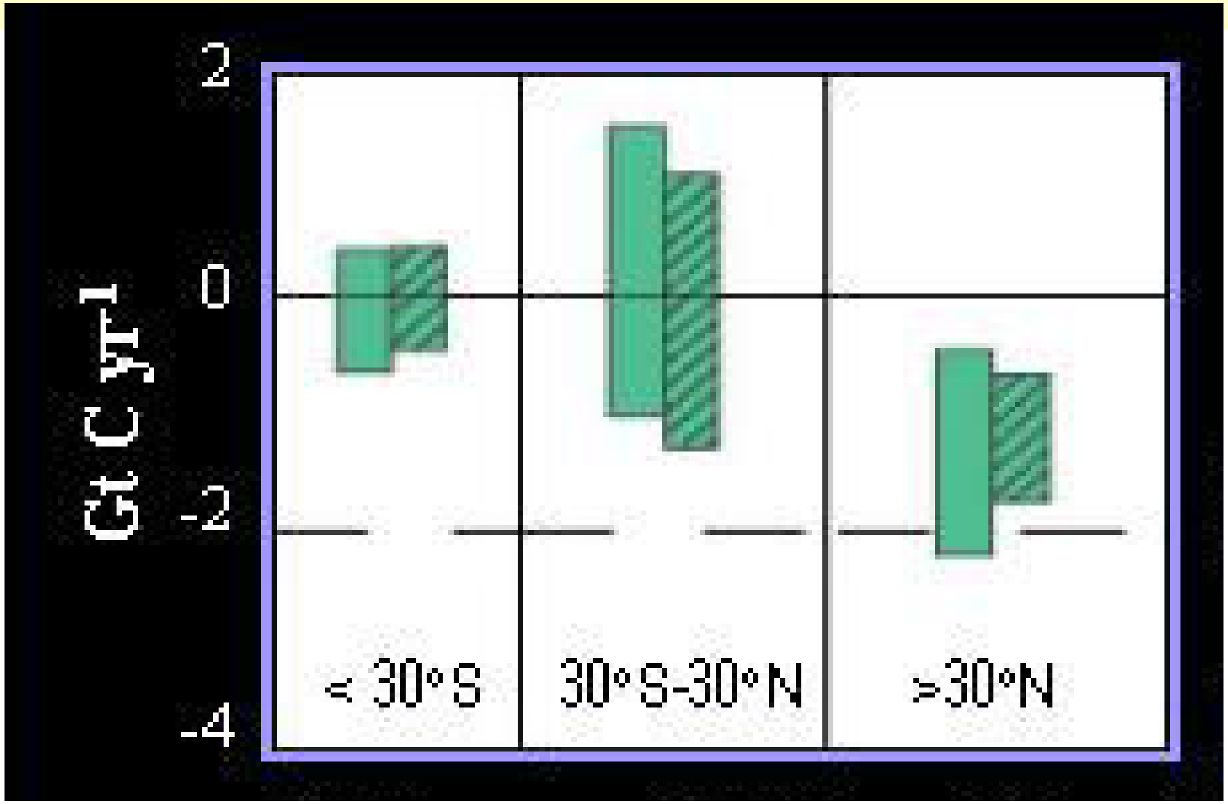
Identifying Forest Change with PALSAR

Latitudinal distribution of land carbon sources and sinks



Land carbon sinks (<0) and sources (>0) for the 1980s (plain bars) and for 1990-1996 (hatched bars) (Heimann et al., 2001)

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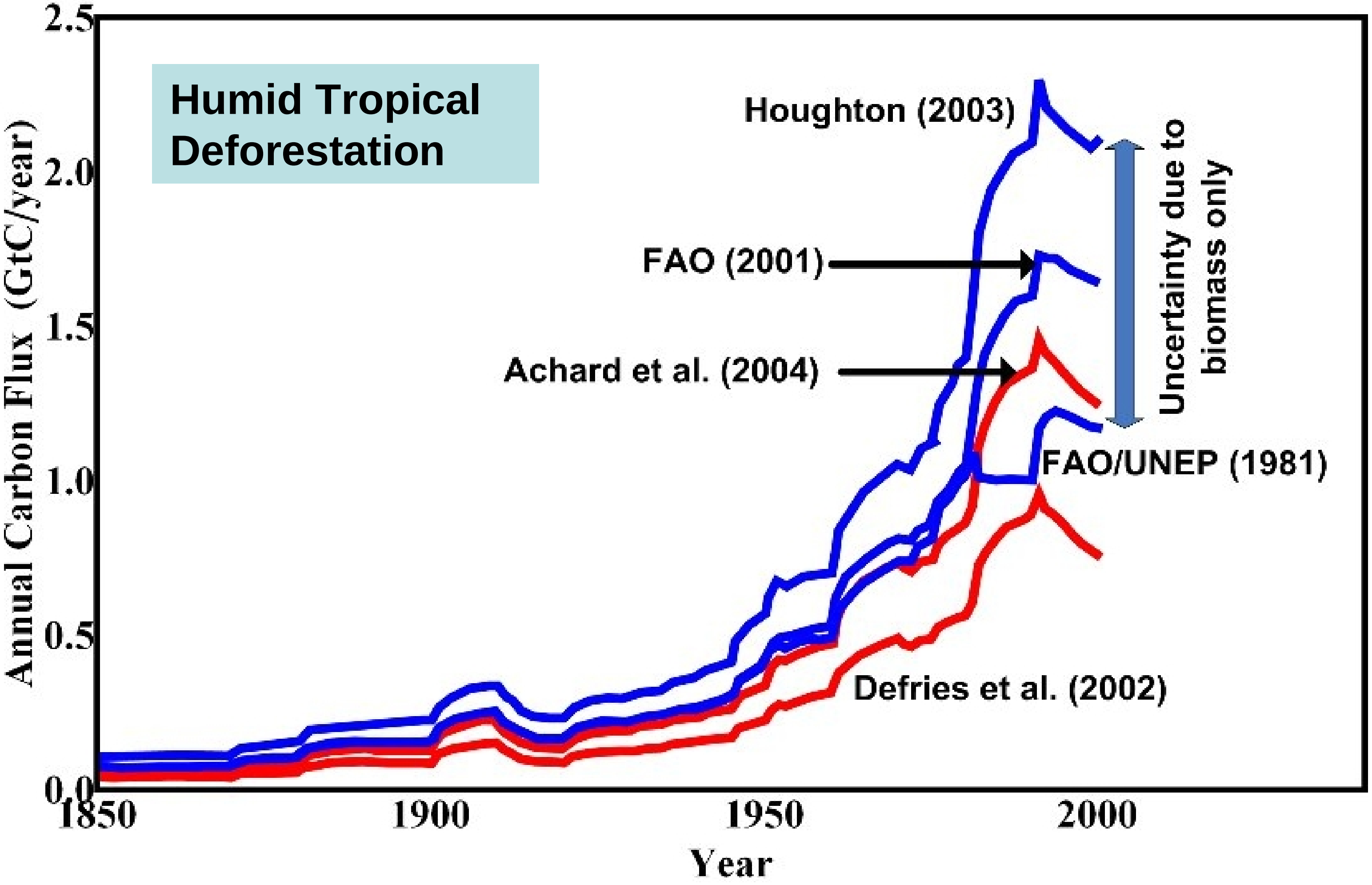
Uncertainty in tropical carbon emissions



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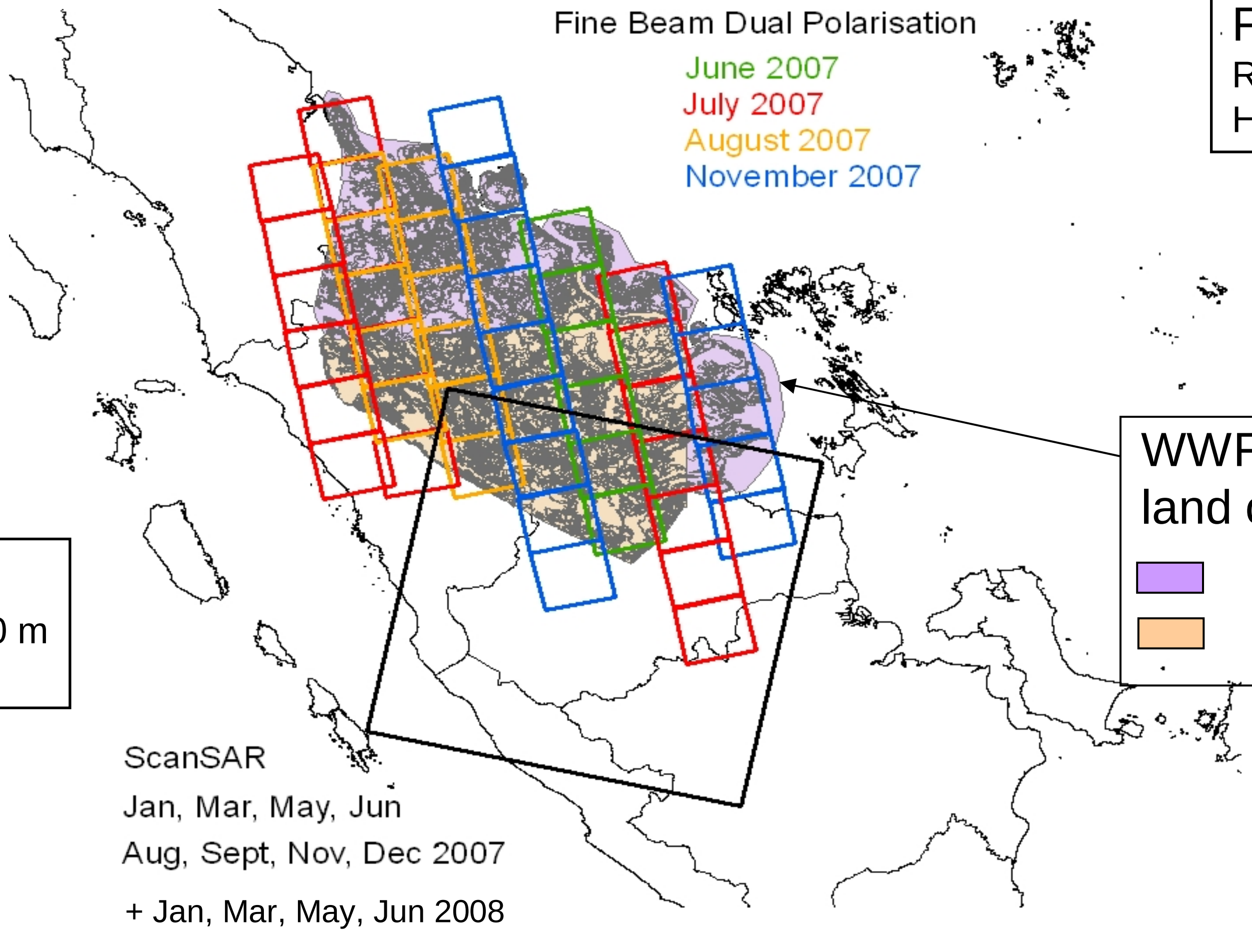
Objectives

- Global objectives:
  - Improve estimates of tropical carbon flux
  - Contribute to REDD methodology
- Local objective: Produce methodology for semi-automatic detection of natural forest loss using ALOS 46-day ScanSAR and bi-annual FBD/FBS data.

Current focus area: Riau, Sumatra

FBD:
Resolution: 12.5 m
HH/HV



WWF Riau
land cover DB 2007
North
South

ScanSAR:
Resolution: 100 m
HH only

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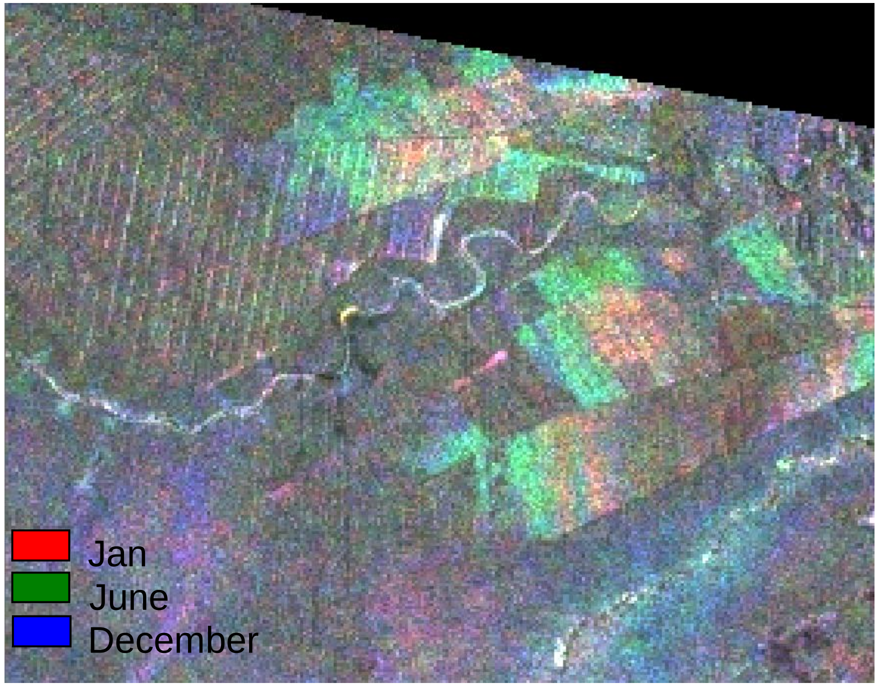
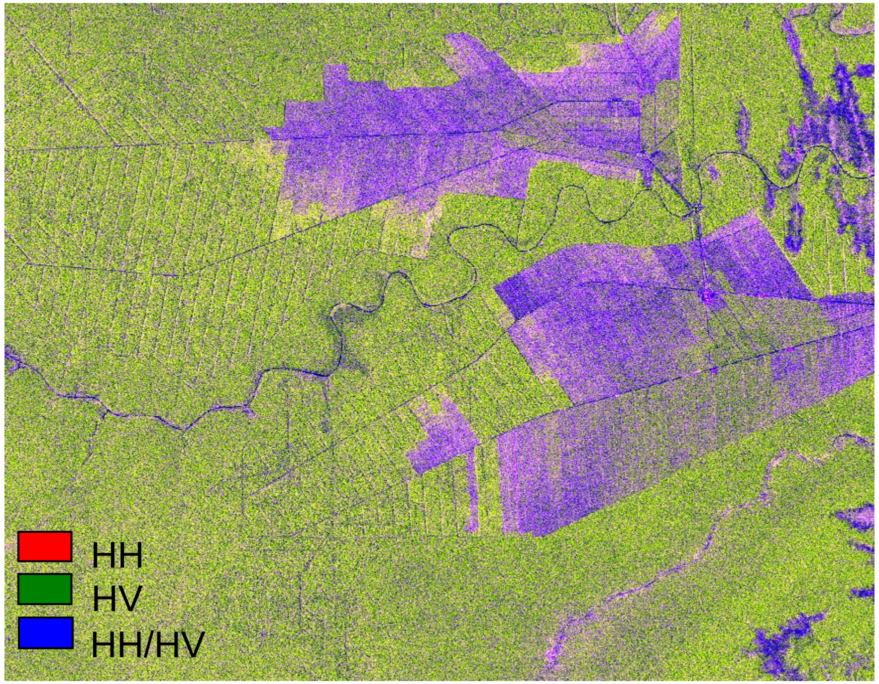
Temporal ScanSAR & FBD

Temporal ScanSAR compares well with FBD



Temporal
ScanSAR



FBD

10 km

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Composite ScanSAR image of Kampar region

Jan 2007

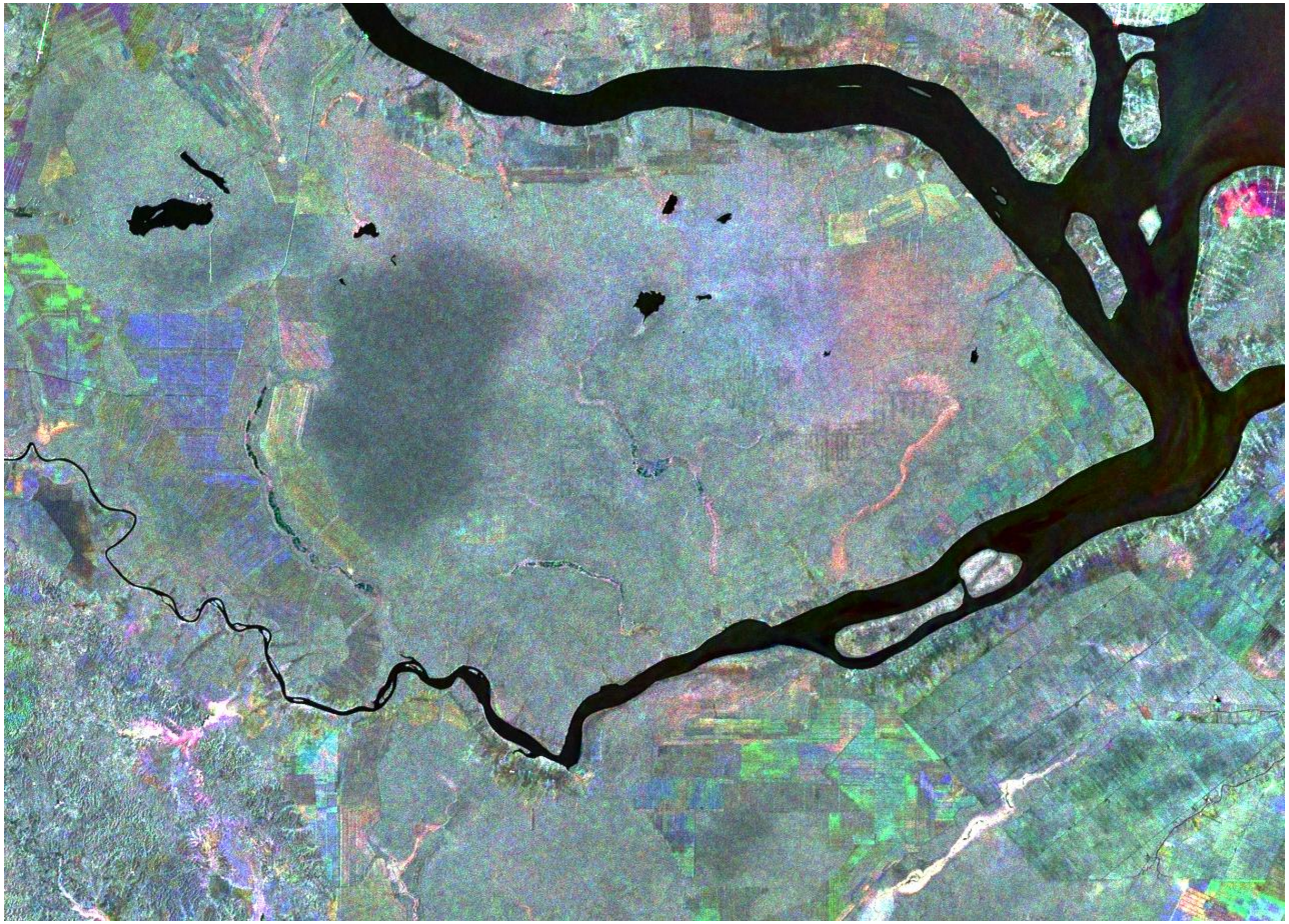
Sept 2007

June 2008

Each HH image has been de-noised by multi-channel filtering.

Pixel size:
100 X 100 m

Image size:
128 X 91.8 Km



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Coverage ~ 136,000 km^2

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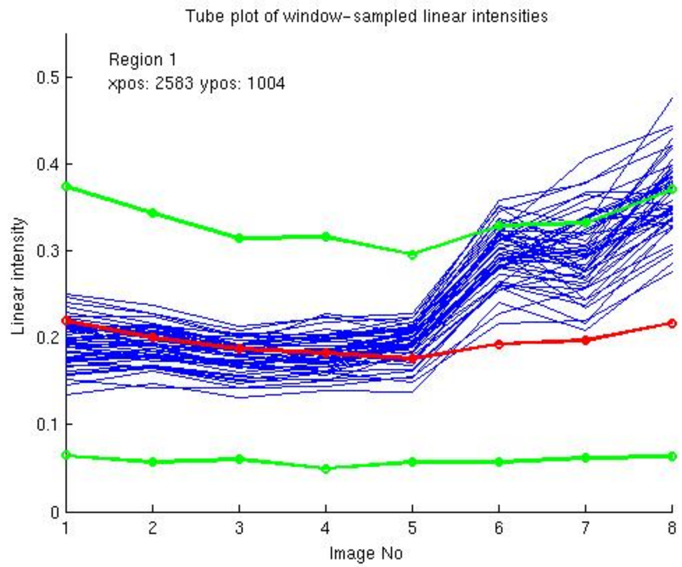
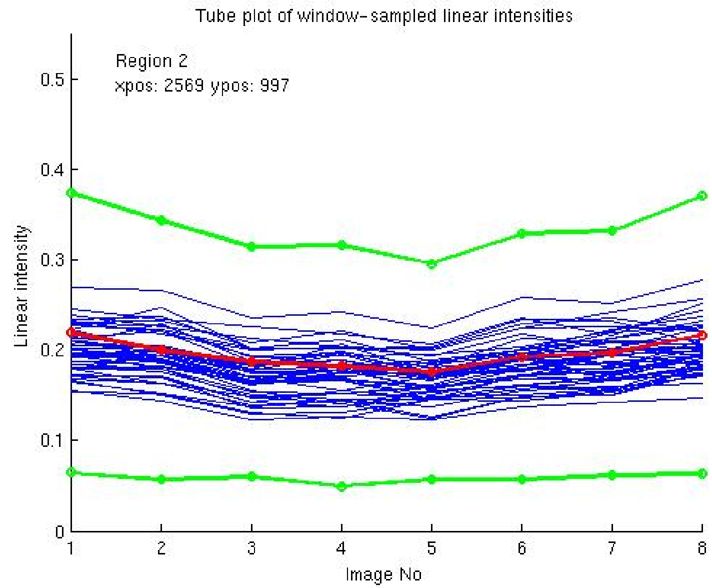
Temporal intensity plots



Suspect region



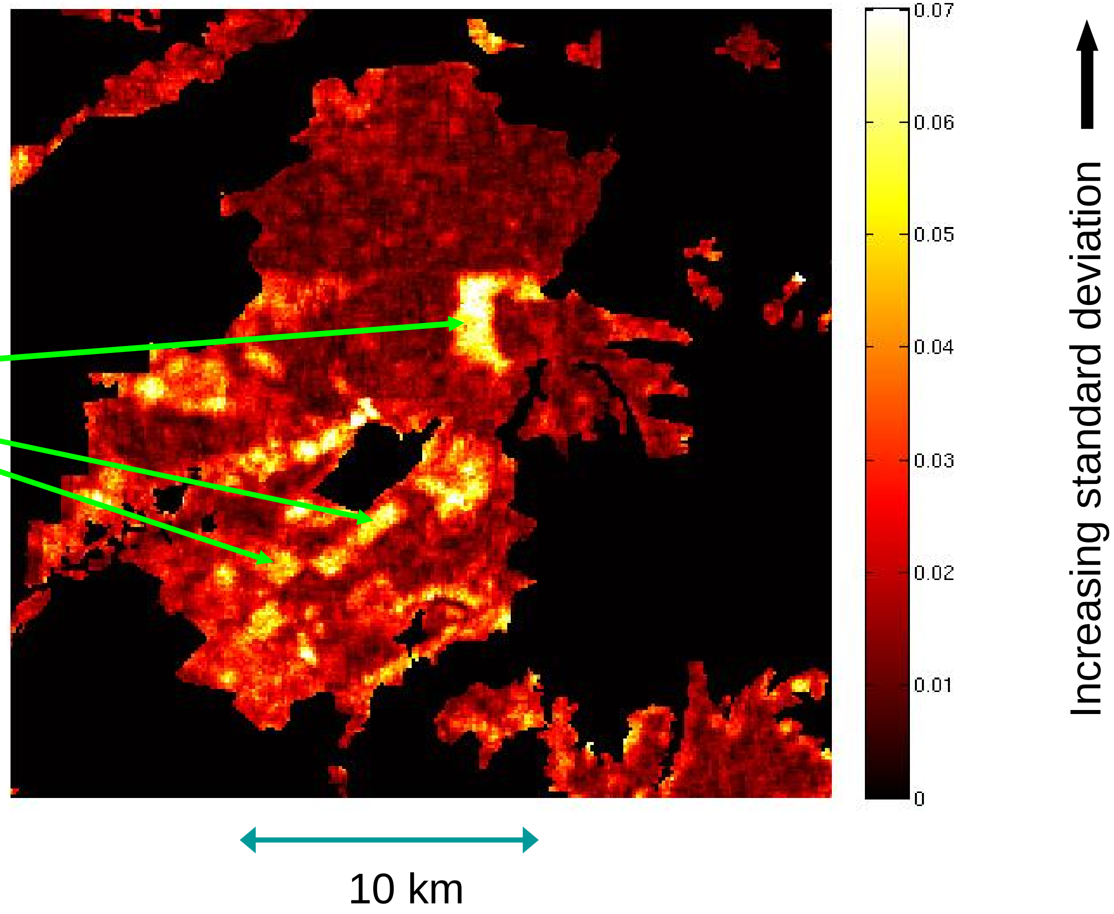
Adjacent forest region

The region on the left shows a distinctive step profile.
Red line shows the forest mean intensity
Green lines show range of the forest intensity (1 standard deviation)

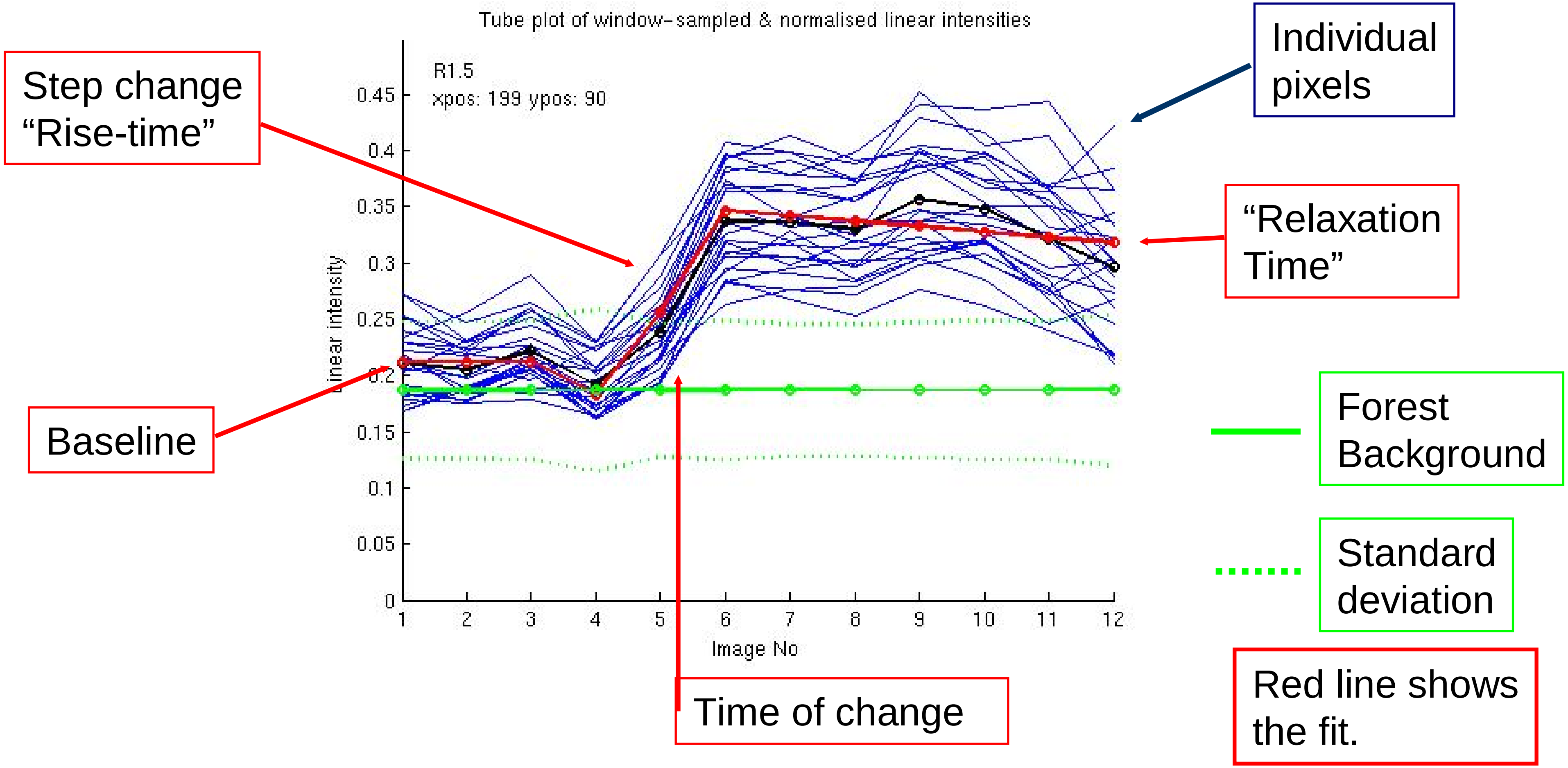
Areas of change

All coloured regions are shown as forest in the 2007 WWF database

These regions have anomalously high intensity deviations and regular shapes.



Bilinear fit + baseline



Scheme for identifying date of change

Acquire time series

Co-register

MCF to De-speckle

Normalise intensities to forest reference

Variability map to create mask of high deviations

Bi-linear fit applied within mask step size > threshold

Scoring function to filter out known false positive regions

Linearise

Display map

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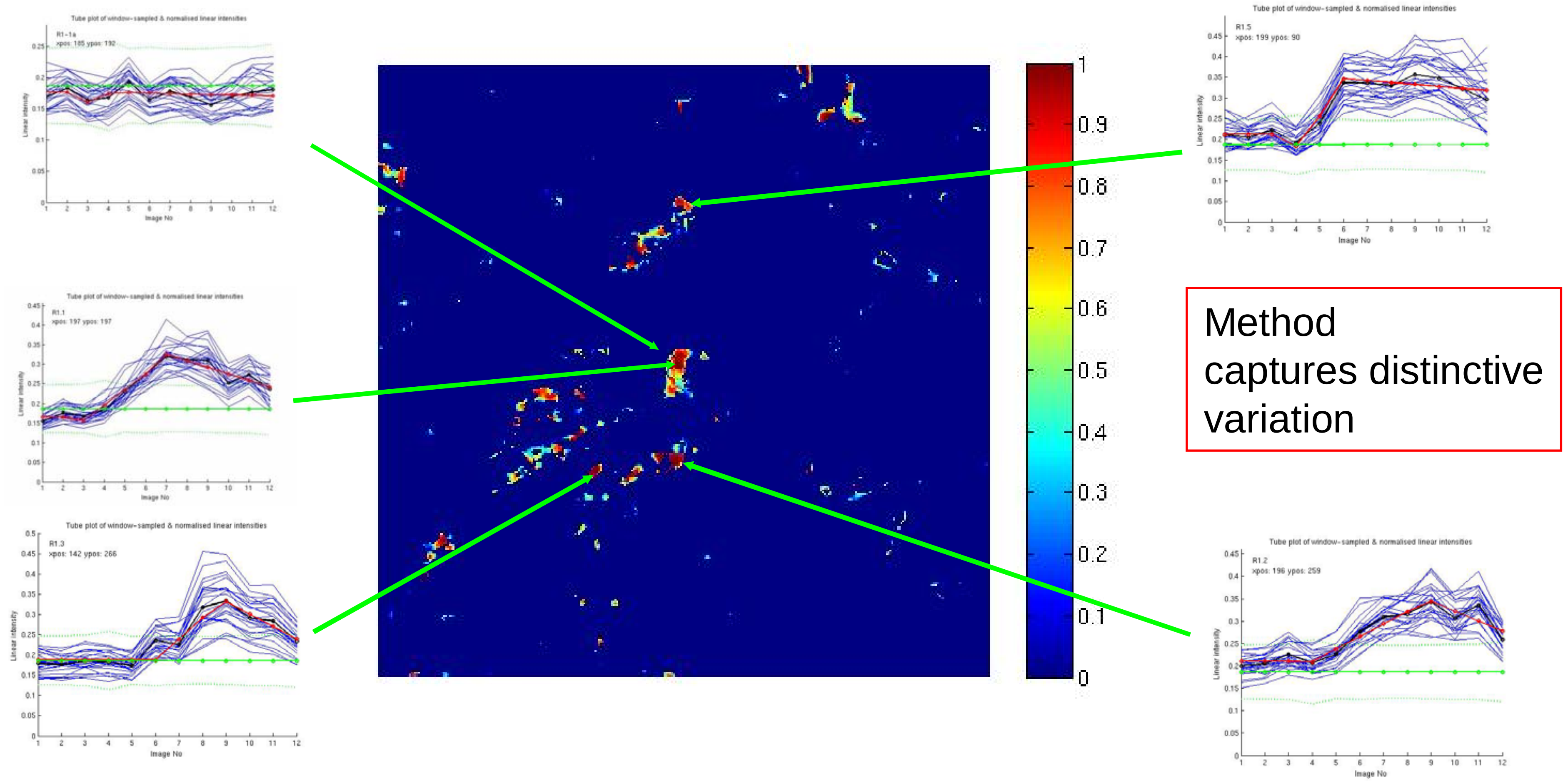
Resulting detection map



Method captures distinctive variation

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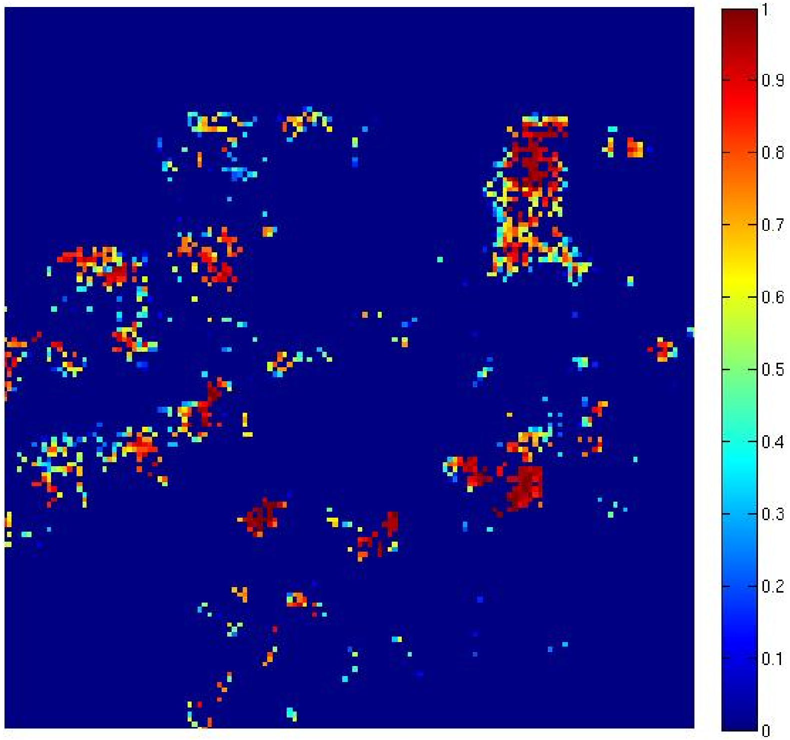
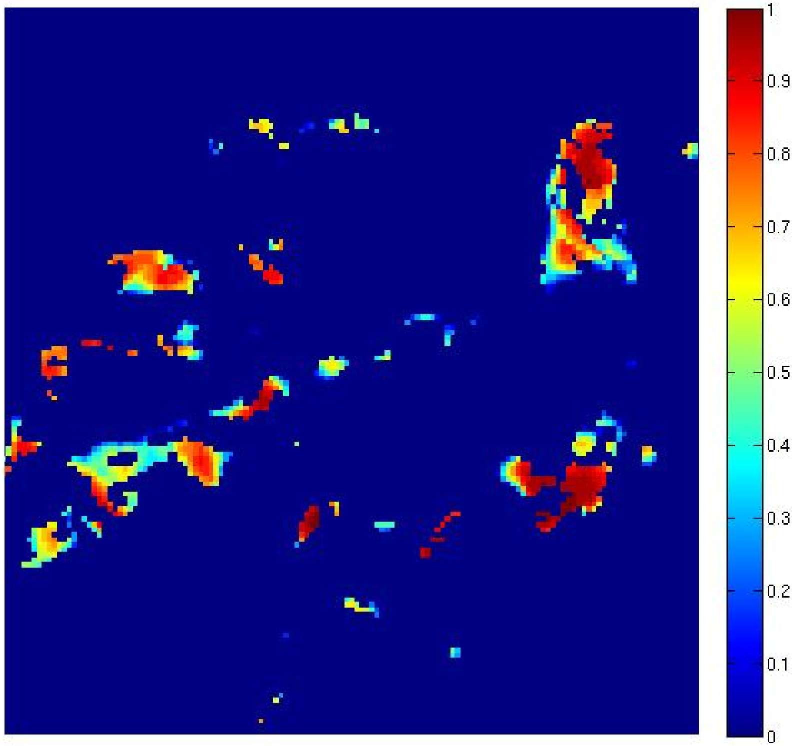
Effect of window size

Single pixels



5x5 Window



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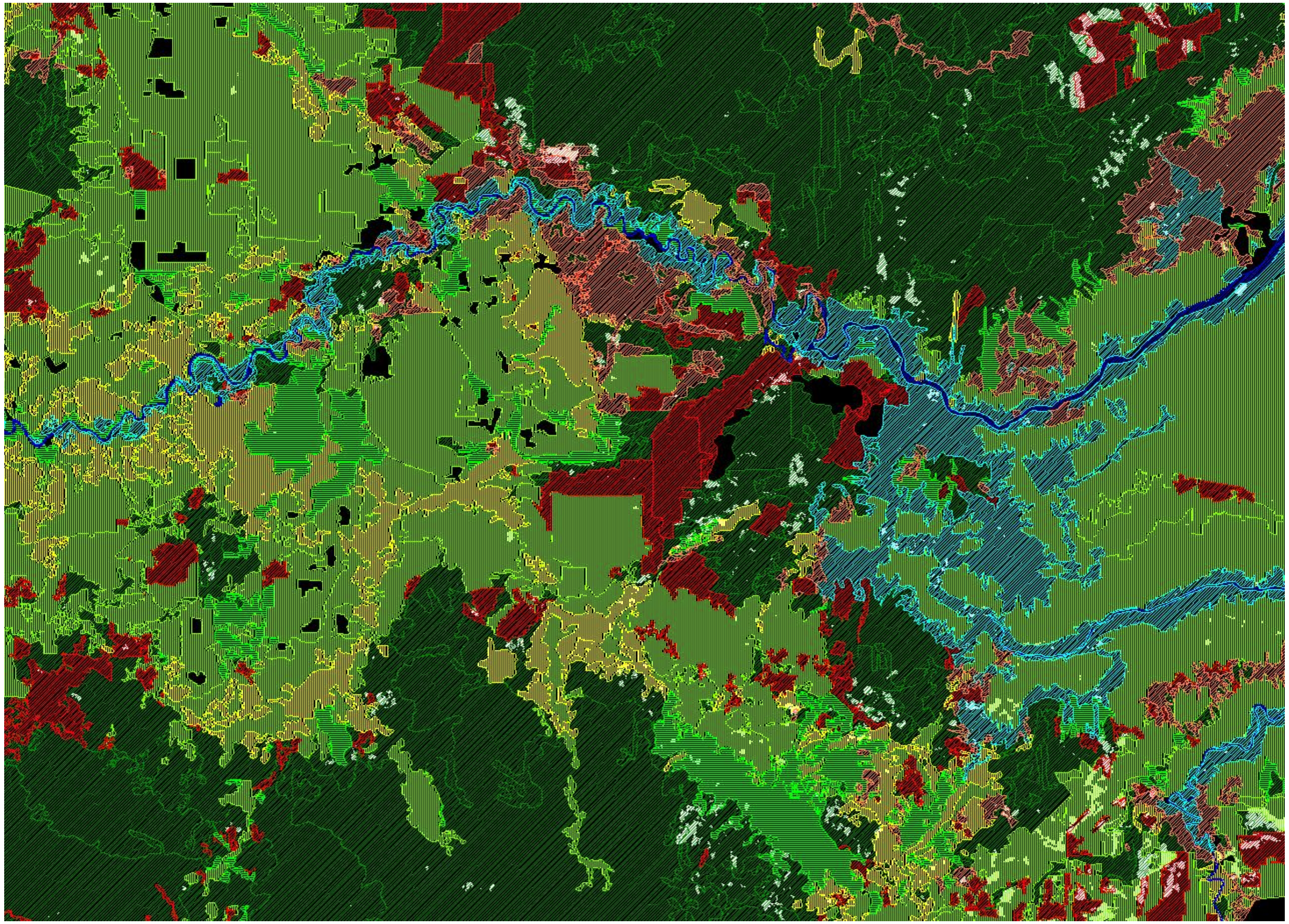
Detections and landcover

Detections
Primary Forest
Plantation
Agri-Garden
Paddy Fields
Cleared
Regrowth
Shrub,Grass,Fern
Other



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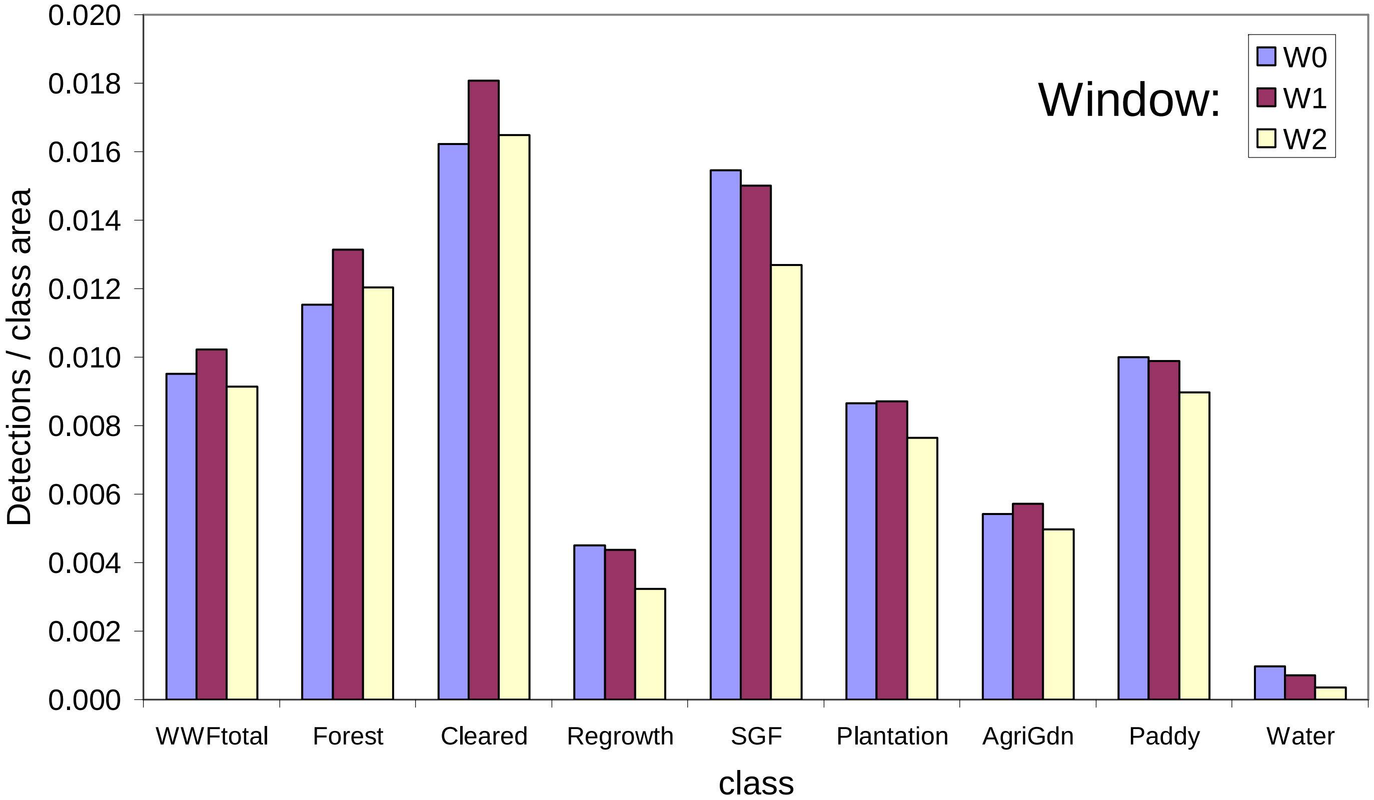
Detections/class area

Current scheme will need forest map

Groundtruth will lead to scoring function improvements

Parameter	Pixels
W0	1
W1	9
W2	25



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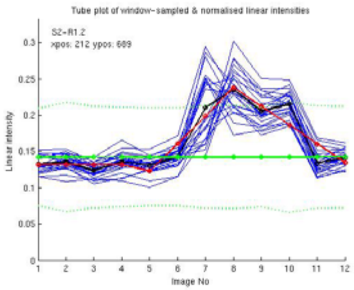
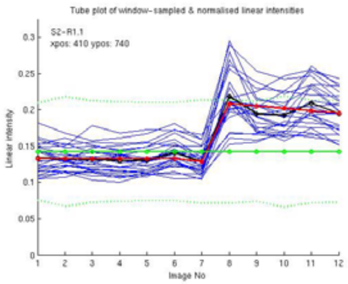
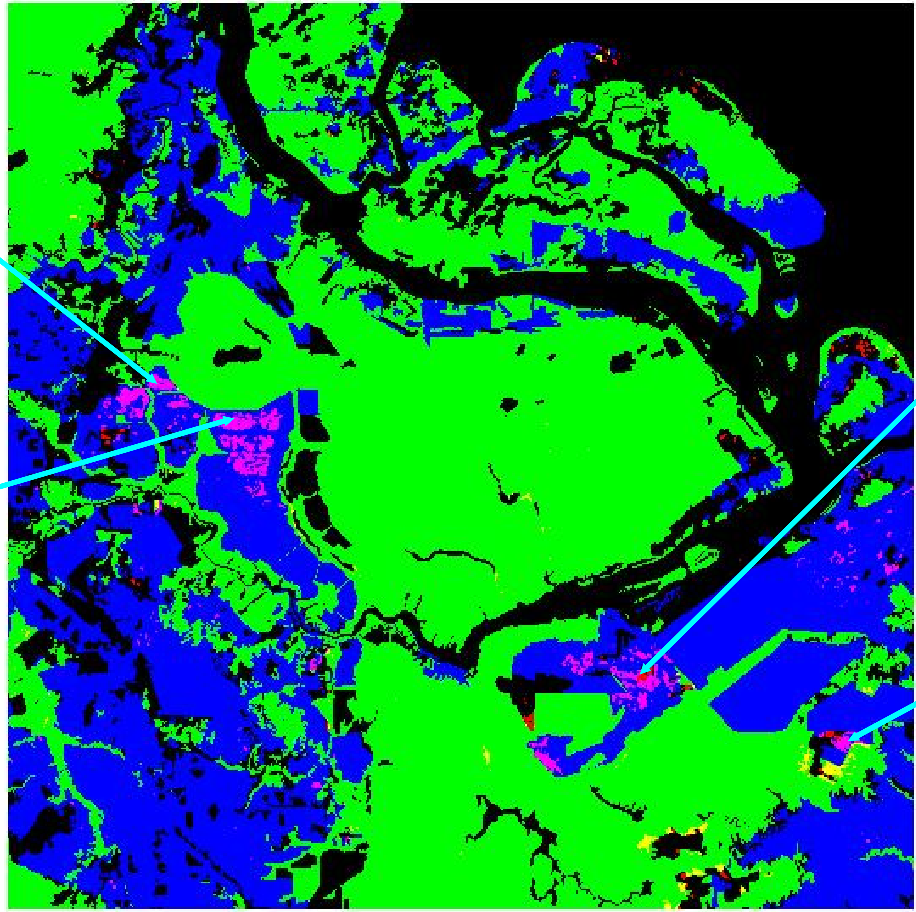
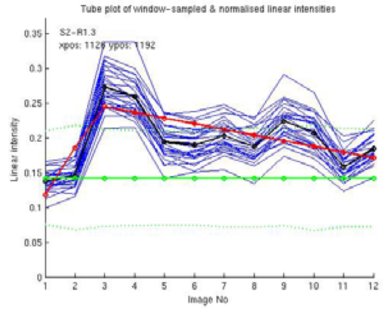
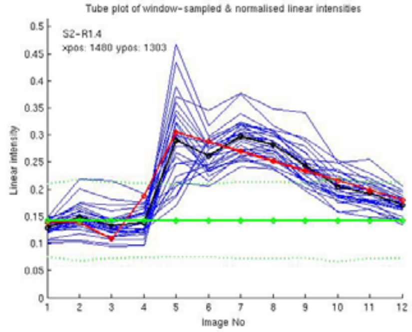
Kampar region











Landcover

- Forest
- Plantation+ Cleared

Detections

- Class not shown
- In primary forest
- In Plantation/cleared

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Summary

- Anomalous temporal deviations can be used to locate “areas of interest” over large areas imaged by ScanSAR.
- Deforestation is associated with a distinctive signature intensity variation but may be confused with plantation management activity – hence may require prior mapping of forest areas
- Current issues: validation, data availability, general application