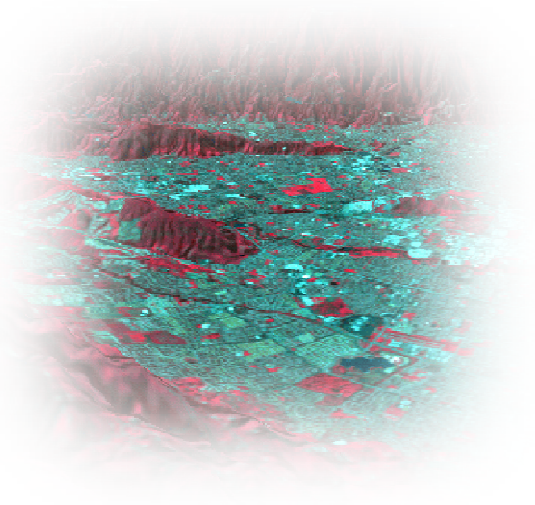
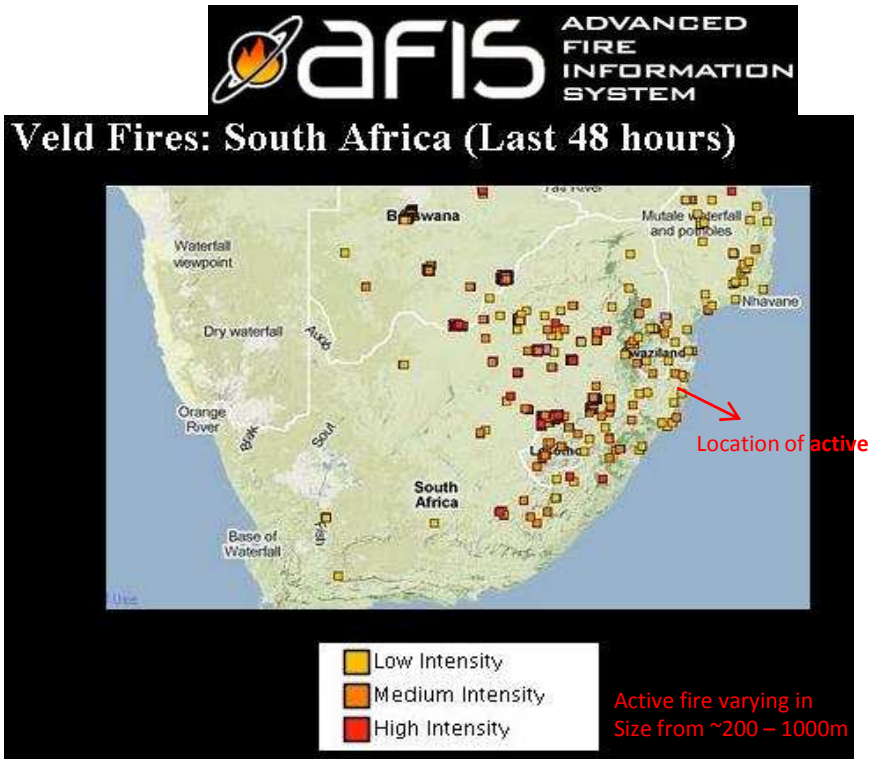
APPLICATIONS OF REMOTE SENSING

From a change detection perspective



ADVANCED FIRE INFORMATION SYSTEM

E.g.

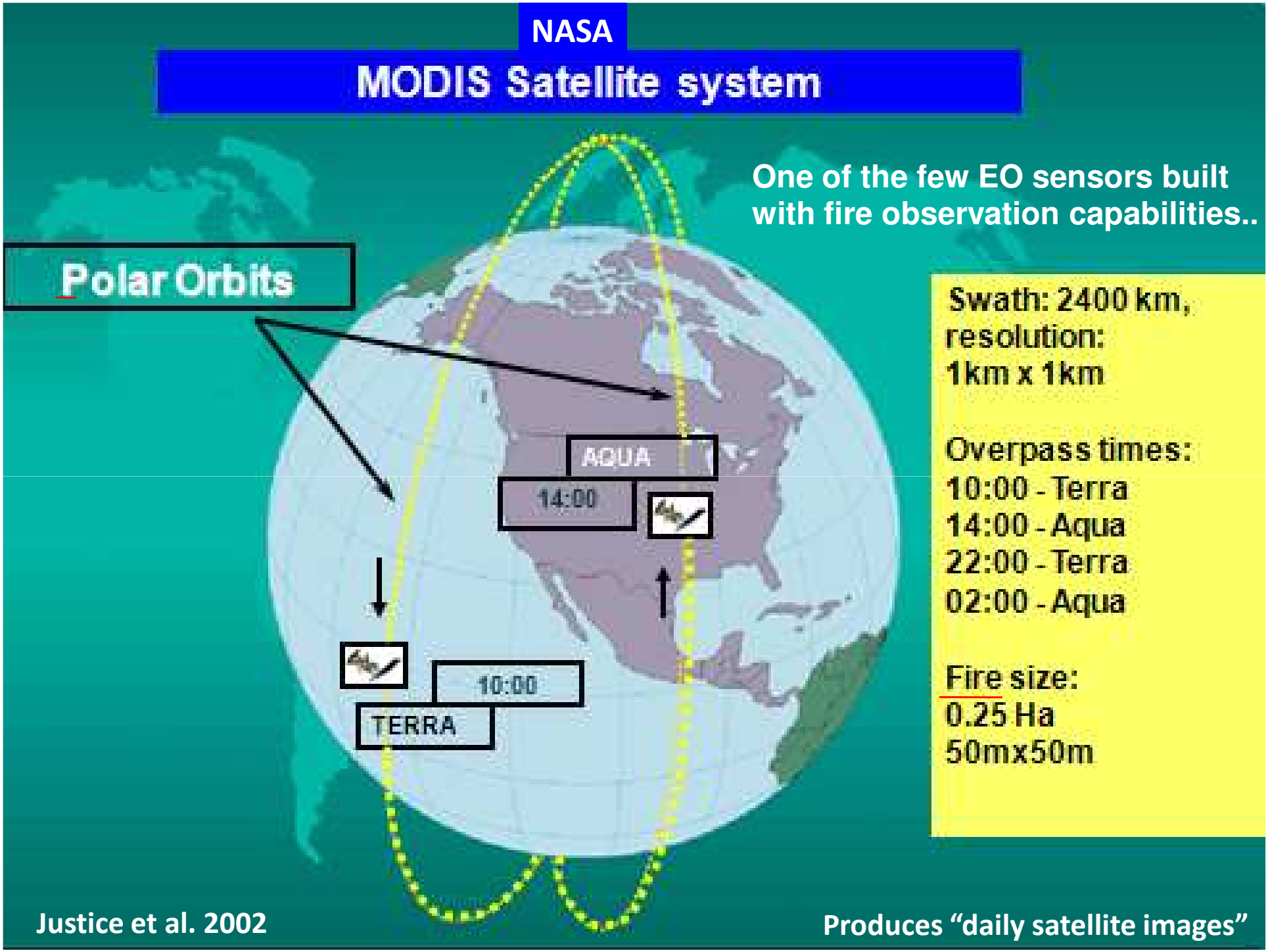


Early warnings

http://afis.meraka.org.za/

NASA

MODIS Satellite system



One of the few EO sensors built with fire observation capabilities..

Swath: 2400 km,
resolution:
1km x 1km

Overpass times:
10:00 - Terra
14:00 - Aqua
22:00 - Terra
02:00 - Aqua

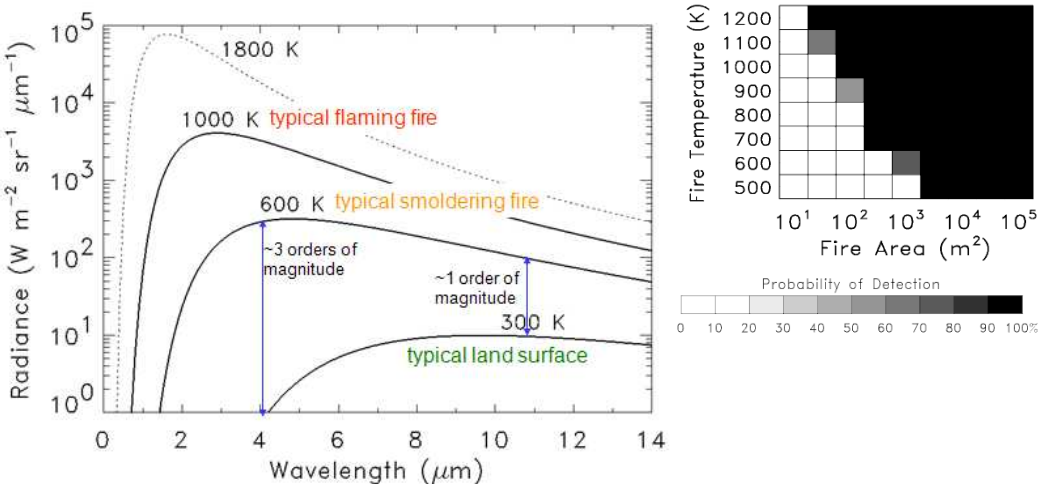
Fire size:
0.25 Ha
50mx50m

Justice et al. 2002

Produces “daily satellite images”

Algorithm - detect active fires as those pixels with very high brightness temperature values taking advantage of differential increase of radiance with temperature at 4μm and 11μm

Giglio et al. 2010



- Valuable method

for extensive monitoring of biomass burning activity

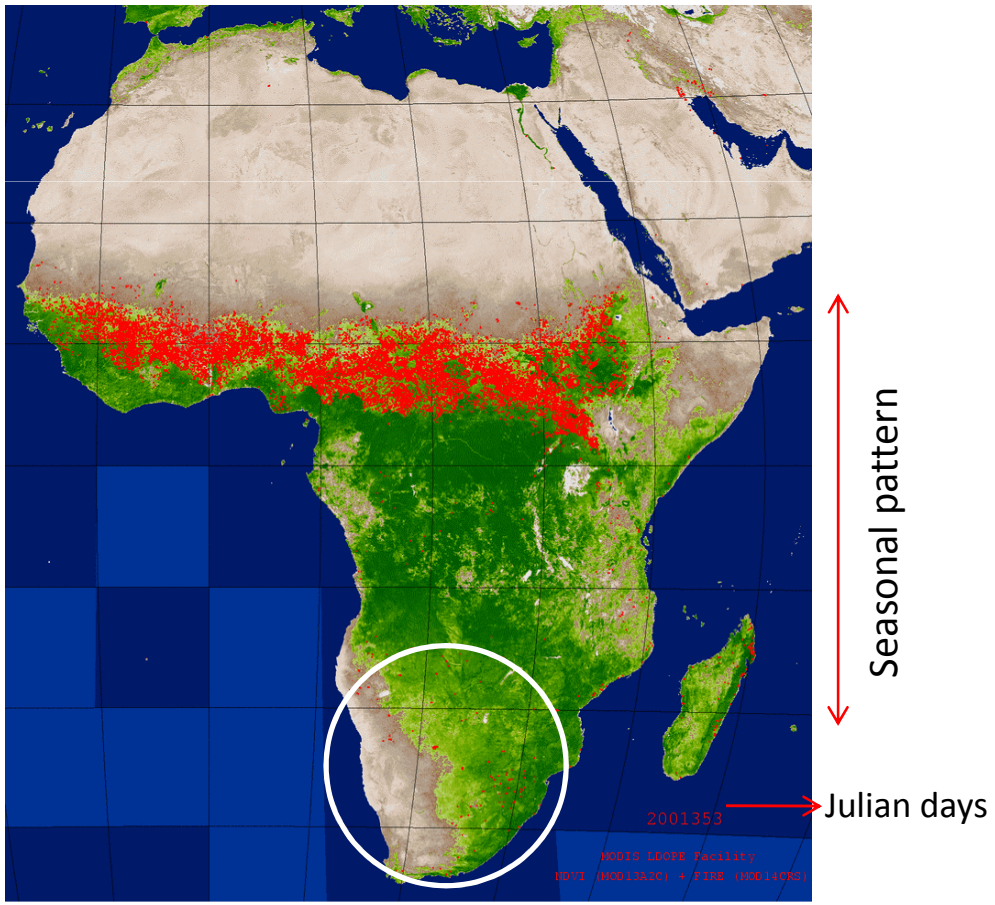
ACTIVE FIRES

2001 animation

MODIS 1km active fire detections at time of satellite overpass

superimposed on MODIS 16 day NDVI

(Provided by Prof David Roy, State Dakota University)

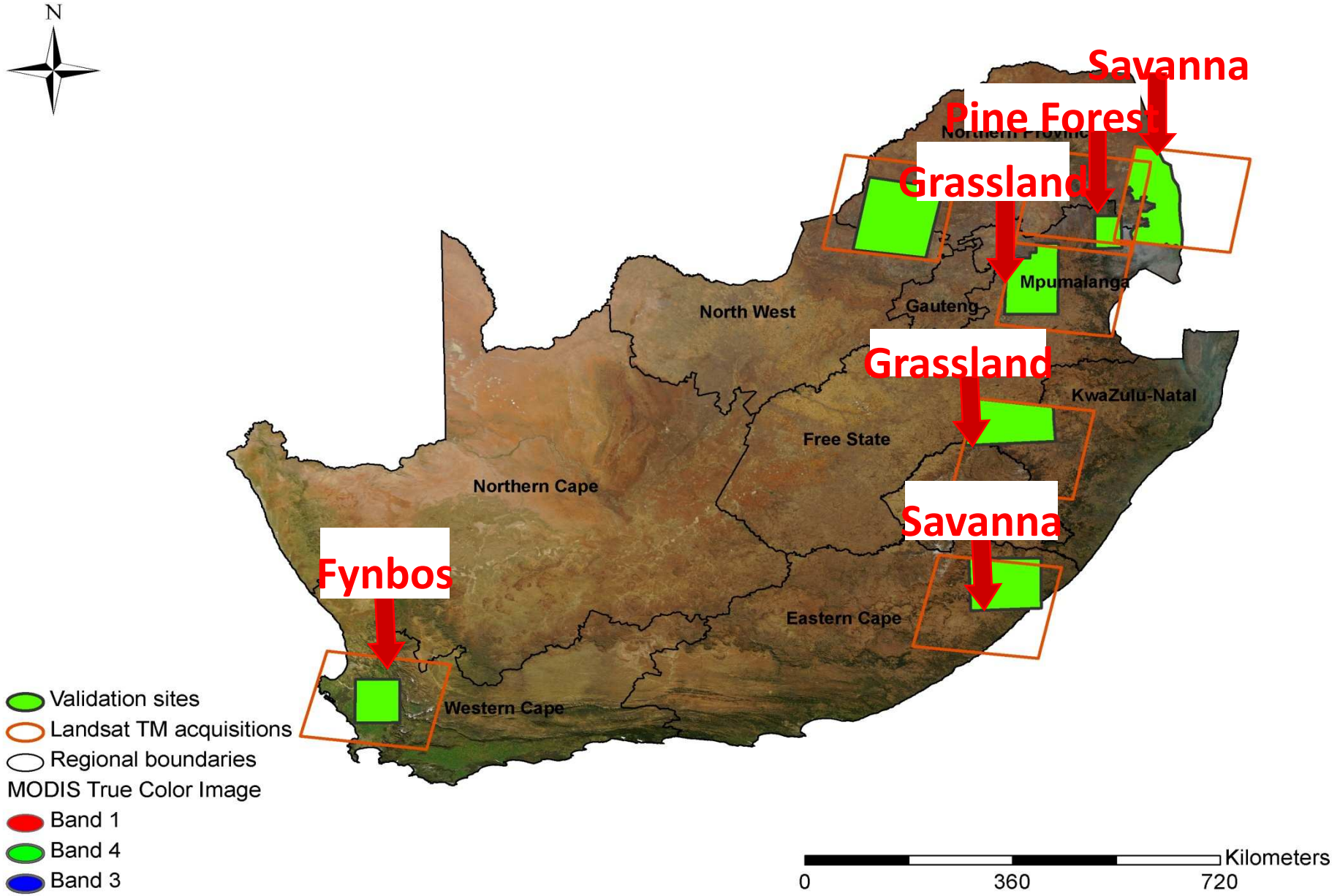


Global Satellite *Burned-Area* Detection Algorithm

Animation: 5 Months of burning, Okavango Delta, Botswana, 2002. Produced using multitemporal rolling BRDF-based change detection approach, 16 day temporal period
Roy *et al.* 2009

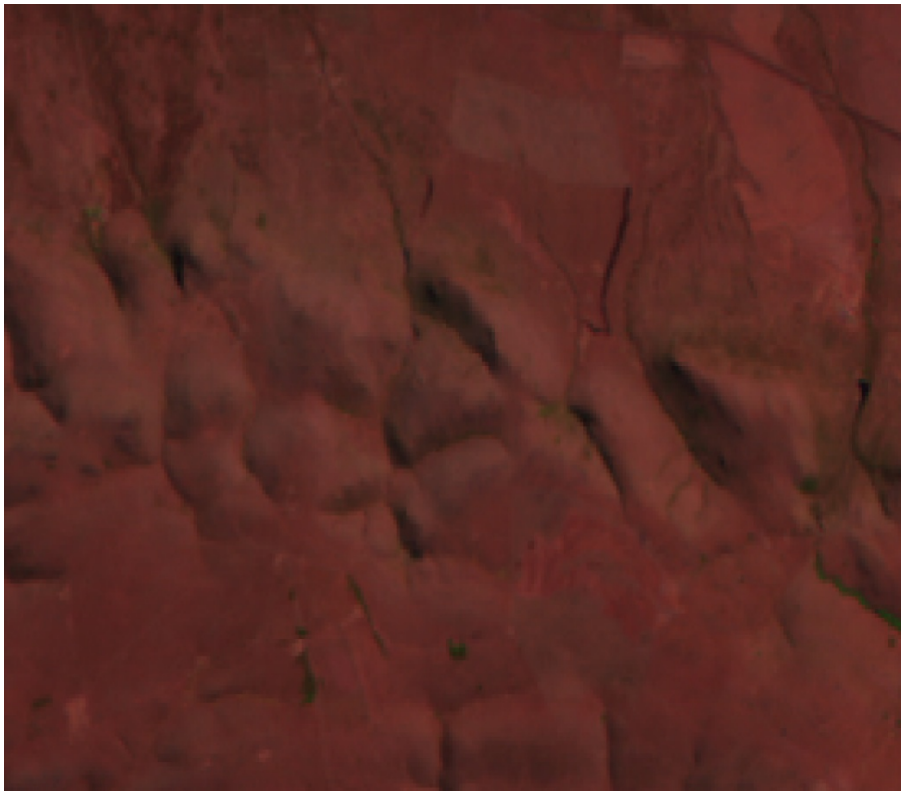
(Prof. David Roy)

Study period & region



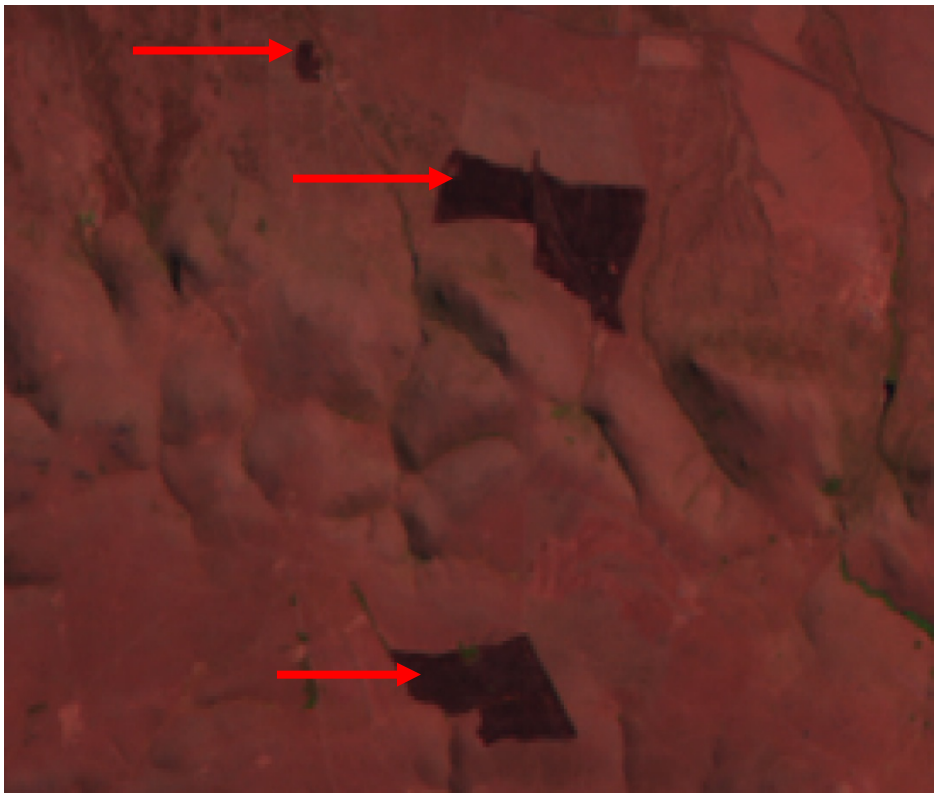
Burned-Area Satellite Validation Protocol

Date 1: 18 August 2007



Landsat TM: RGB – 5,4,3

Date 2: 03 September 2007



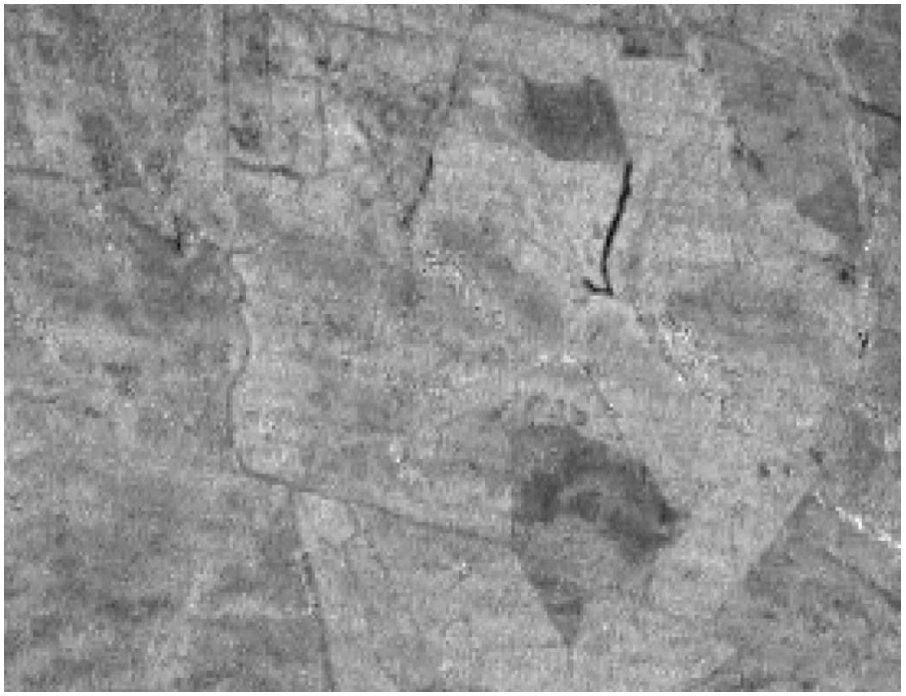
Landsat TM: RGB – 5,4,3

Images display shorter (16-day) time interval
Burned areas on second image are reliably identified

Burned-Area Satellite Validation Protocol..

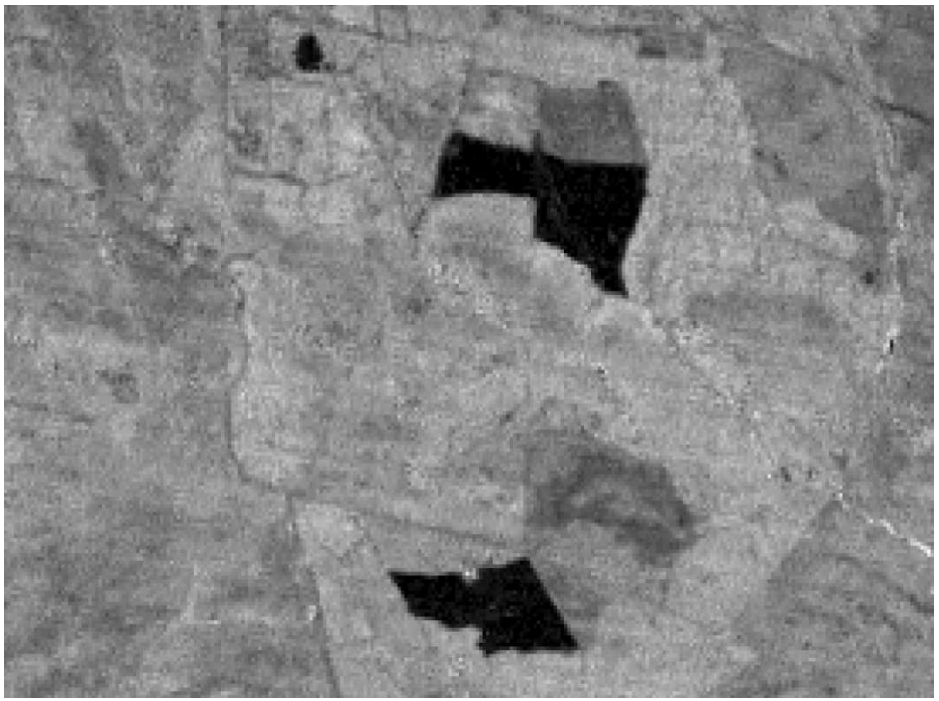
Date 1: 18 August 2007

Burn-sensitive VI_{date1}



Date 2: 03 September 2007

Burn-sensitive VI_{date2}



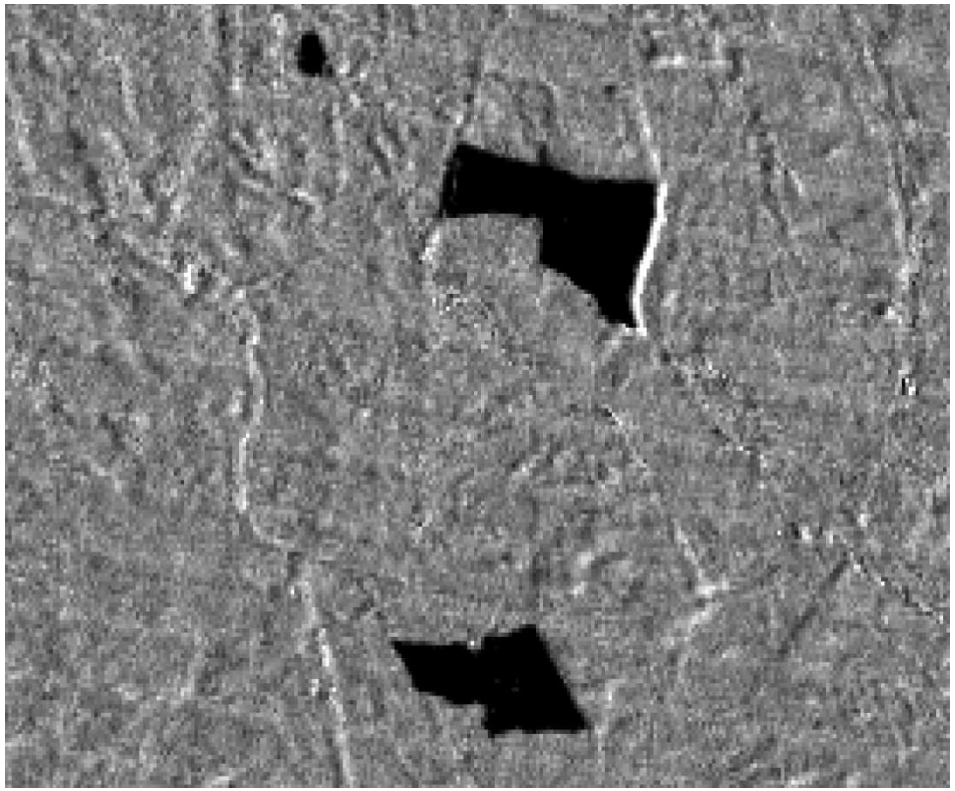
$$VI_i = \frac{b_{5,i} - b_{7,i}}{b_{5,i} + b_{7,i}}$$

Roy and Landmann, (2005)

Burned-Area Satellite Validation Protocol..

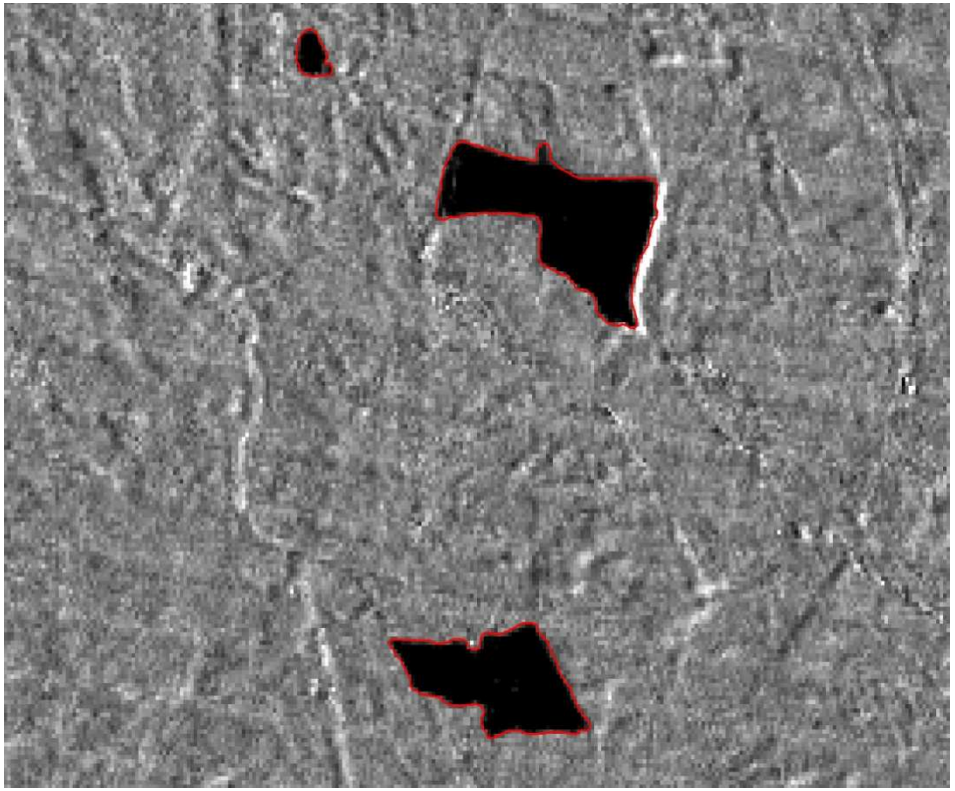
Temporal difference of the spectral indices

$(VI_{date2} - VI_{date1})$

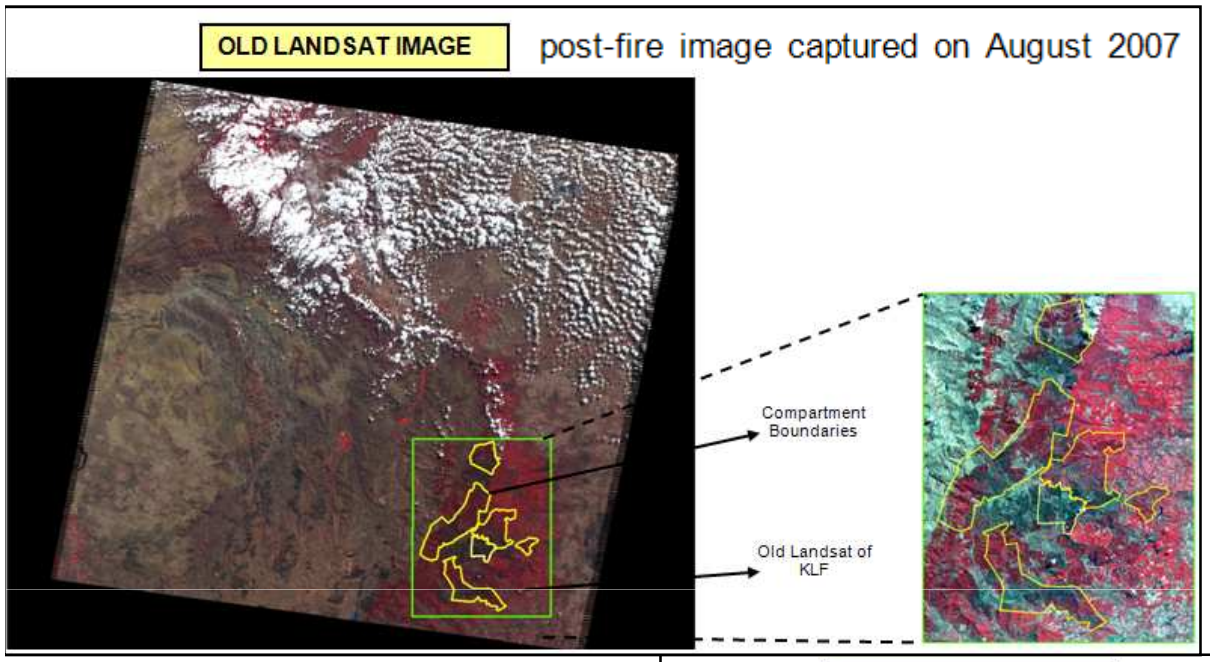


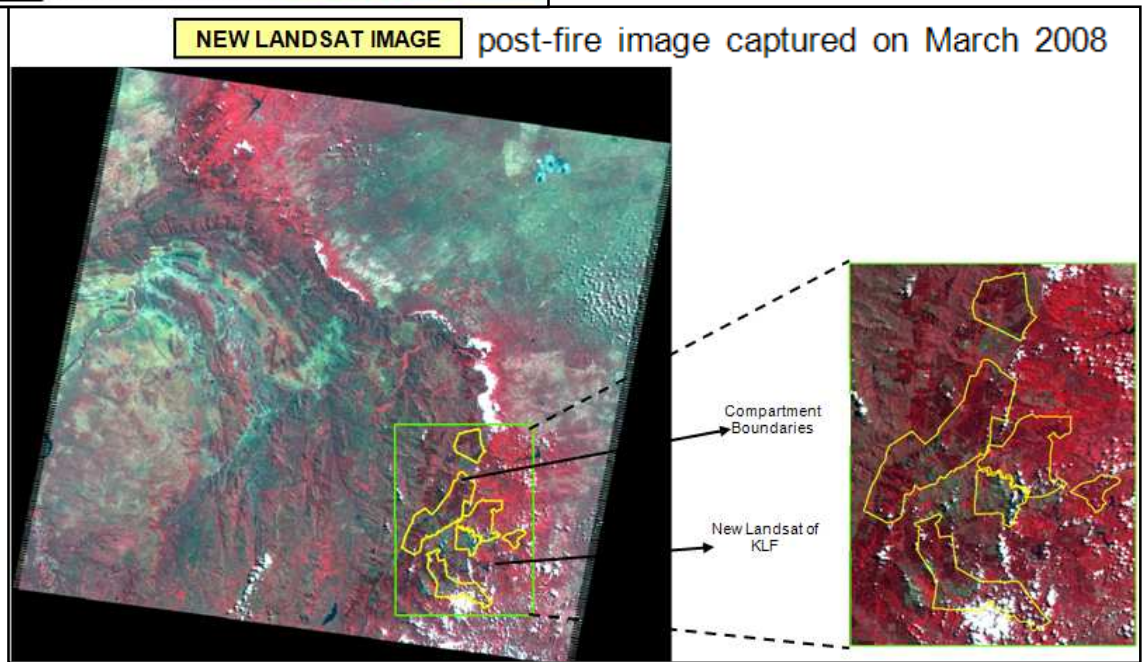
Visual Interpretation & on-screen digitizing

(Landsat TM validation reference data)



CHANGE DETECTION OF POST-FIRE EFFECTS

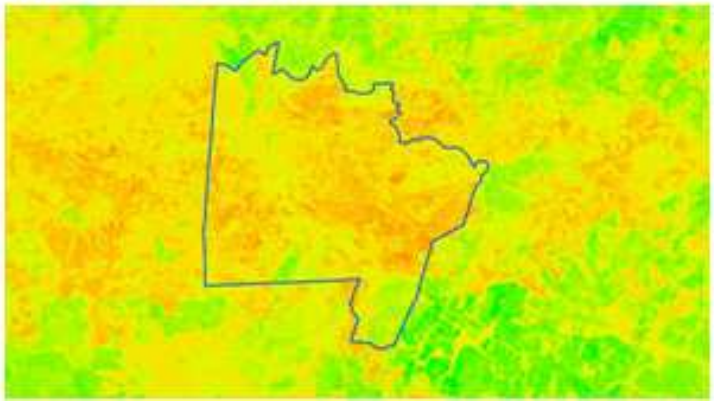


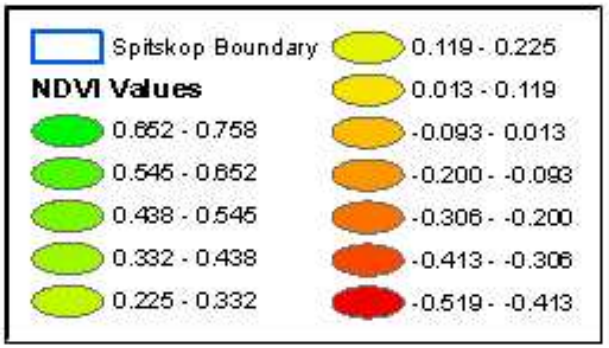


Characterizing Changes on the Landsat images using NDVI

A1: Old Landsat TM

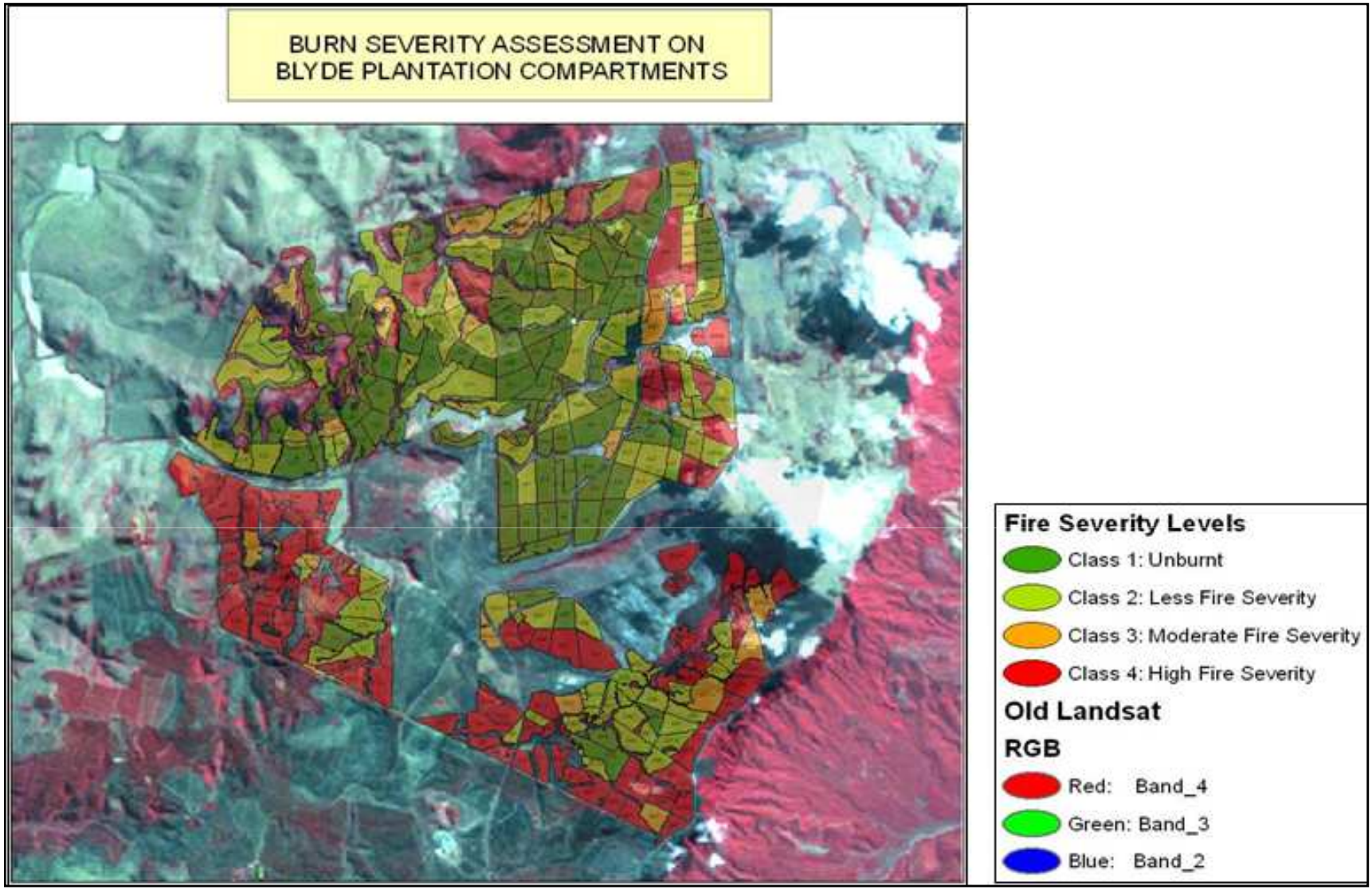
A2: Old NDVI





$$NDVI = \frac{(NIR - Red)}{(NIR + Red)}$$

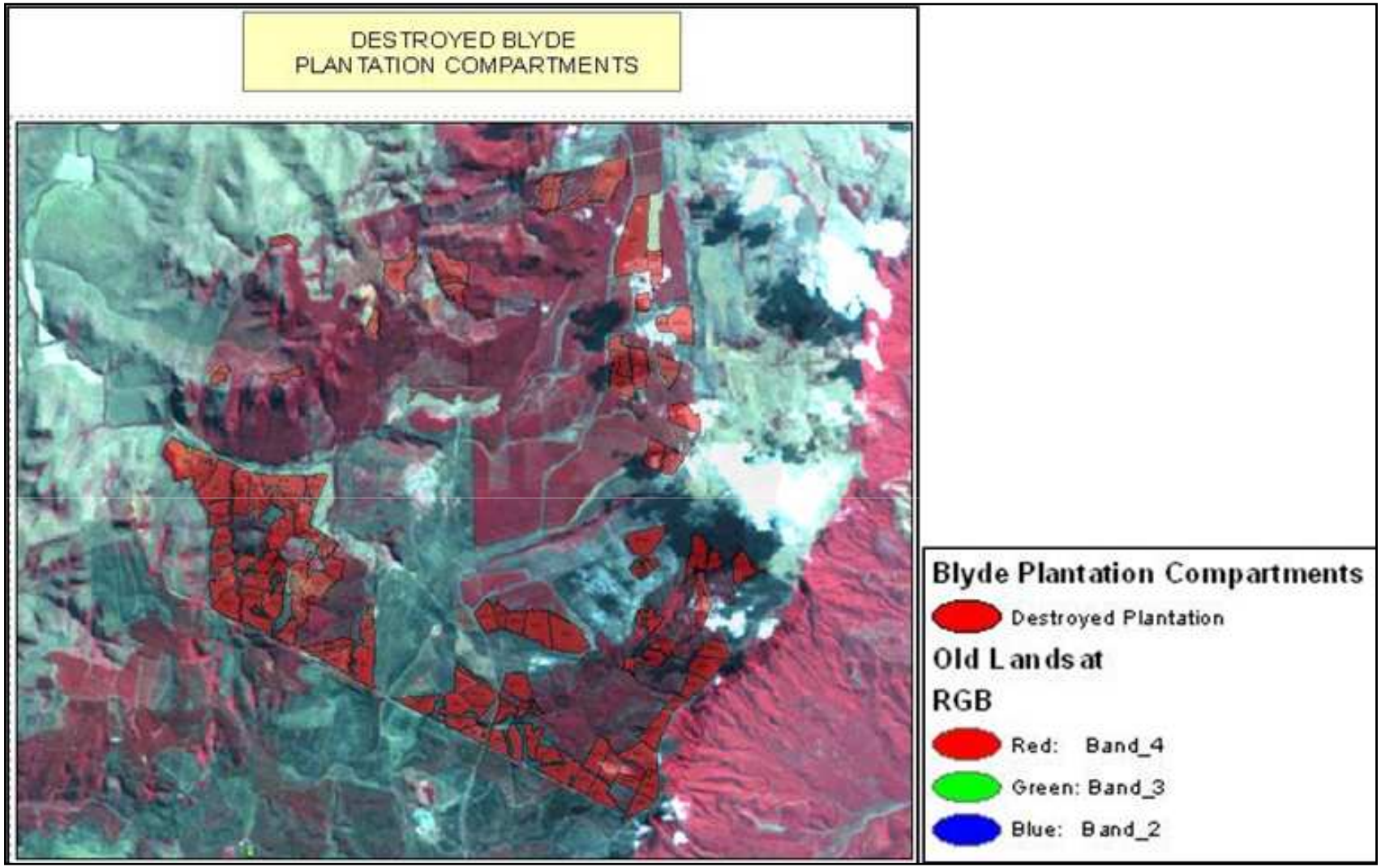
Rouse et al. (1974)



Grouping of 20 classes into 4 fire-severity classes

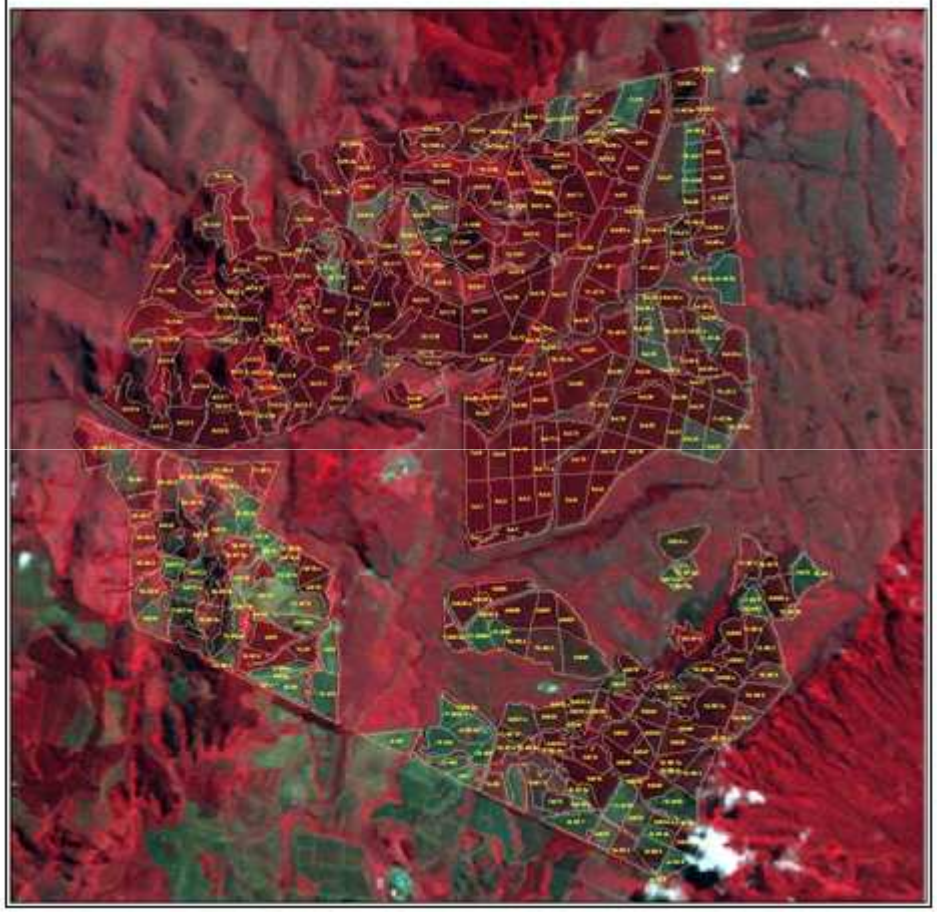
Class	Newly grouped class	Description
1	10 – 20	High severity
2	9	Moderate
3	7 – 8	Less severity
4	1 – 6	Unburnt

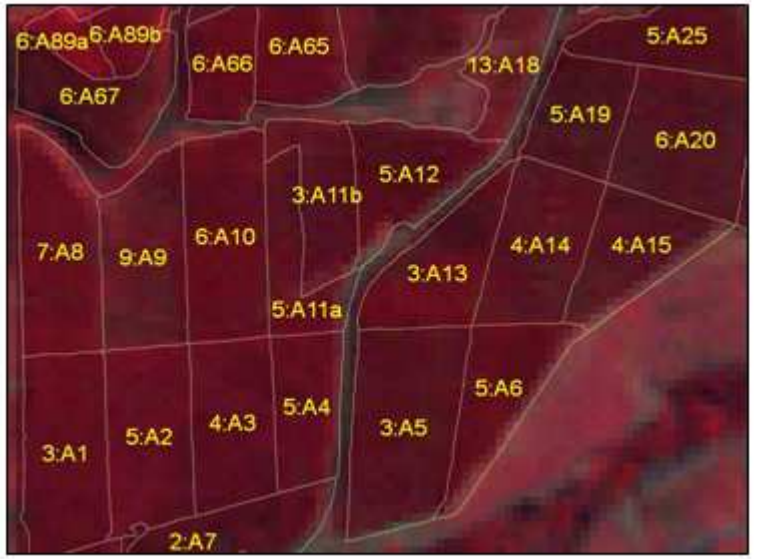
Field measurements used to guide grouping of NDVI classes



High severely burnt Blyde plantation compartments to be clear-felled

BLYDE POST-FIRE VEGETATION RECOVERY





Blyde Plantation Compartments

14:B23 = % Recovery:Compartment Number

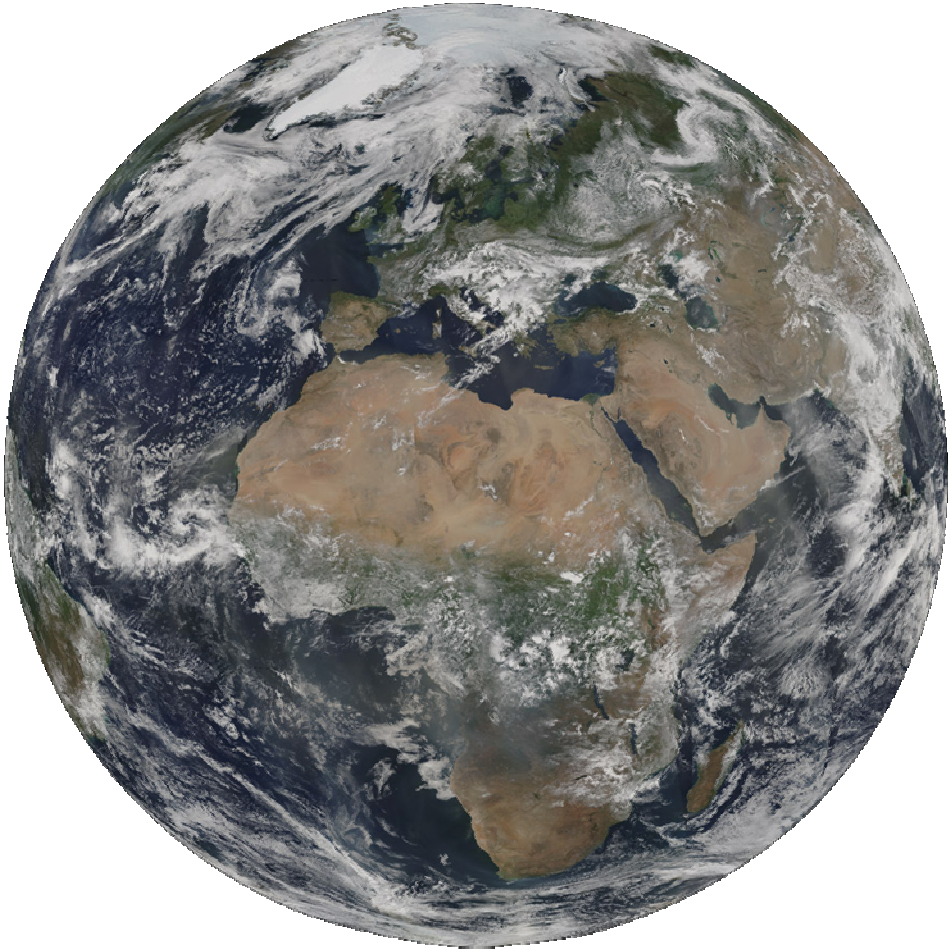
New Landsat

RGB

Red: Band_4

Green: Band_3

Blue: Band_2



THANK YOU ALL