

17th International SeaSpace Conference, Mexico City, October 2007

An Overview of MODIS Direct Broadcast Land Processing & Projects at Landgate SRSS

Stefan W. Maier et al & Indonesian Friends

Satellite Remote Sensing Services

Landgate

www.landgate.wa.gov.au



Outline

WASTAC

Overview of NRT Processing system for MODIS

- Atmospheric correction***
- Agriculture & Vegetation***
- Flood Mapping***
- Fire applications***

International Projects

Western Australian Satellite Technology and Applications Consortium

Consortium Members:

Landgate

Curtin University

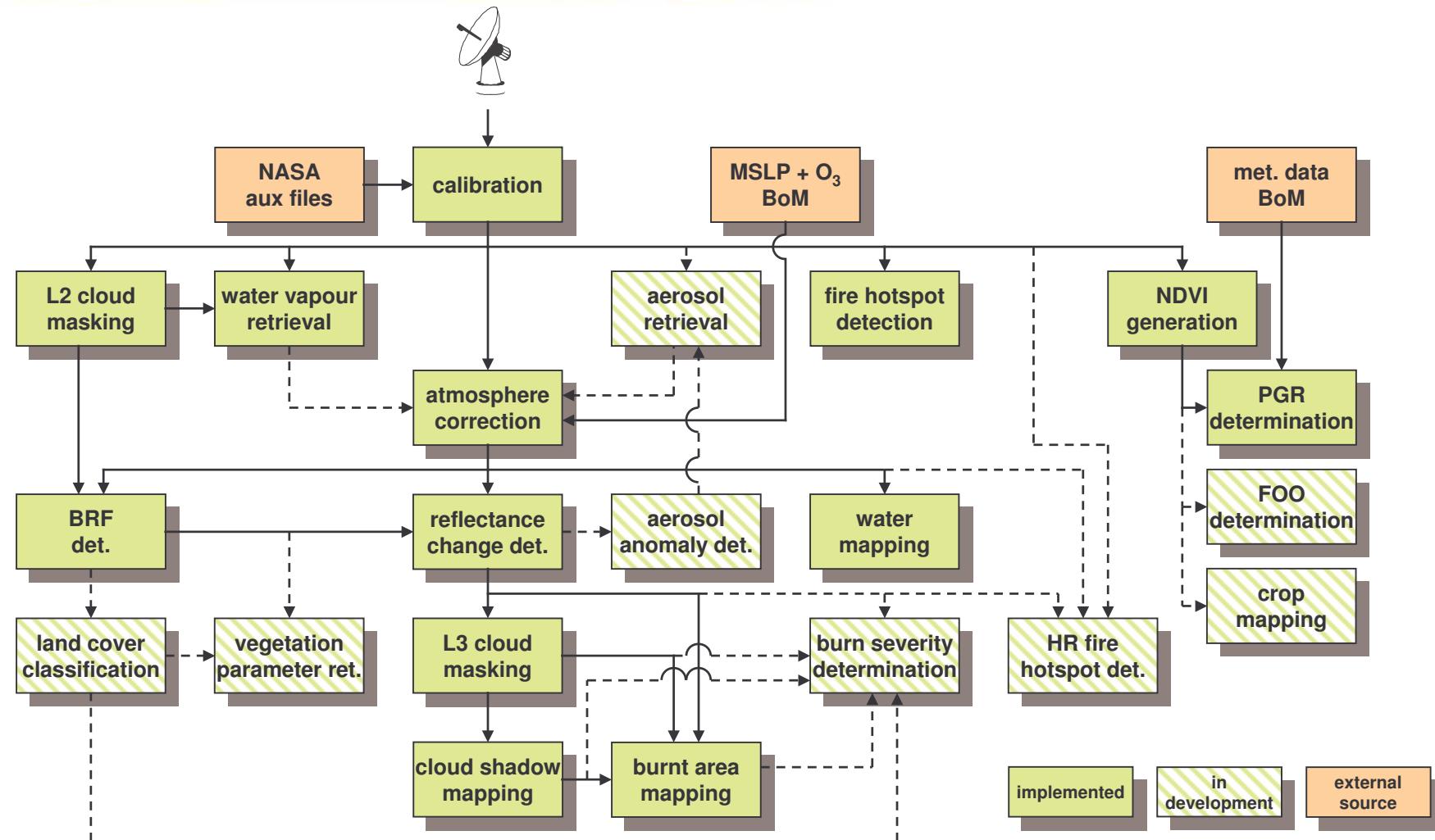
Geoscience Australia

CSIRO

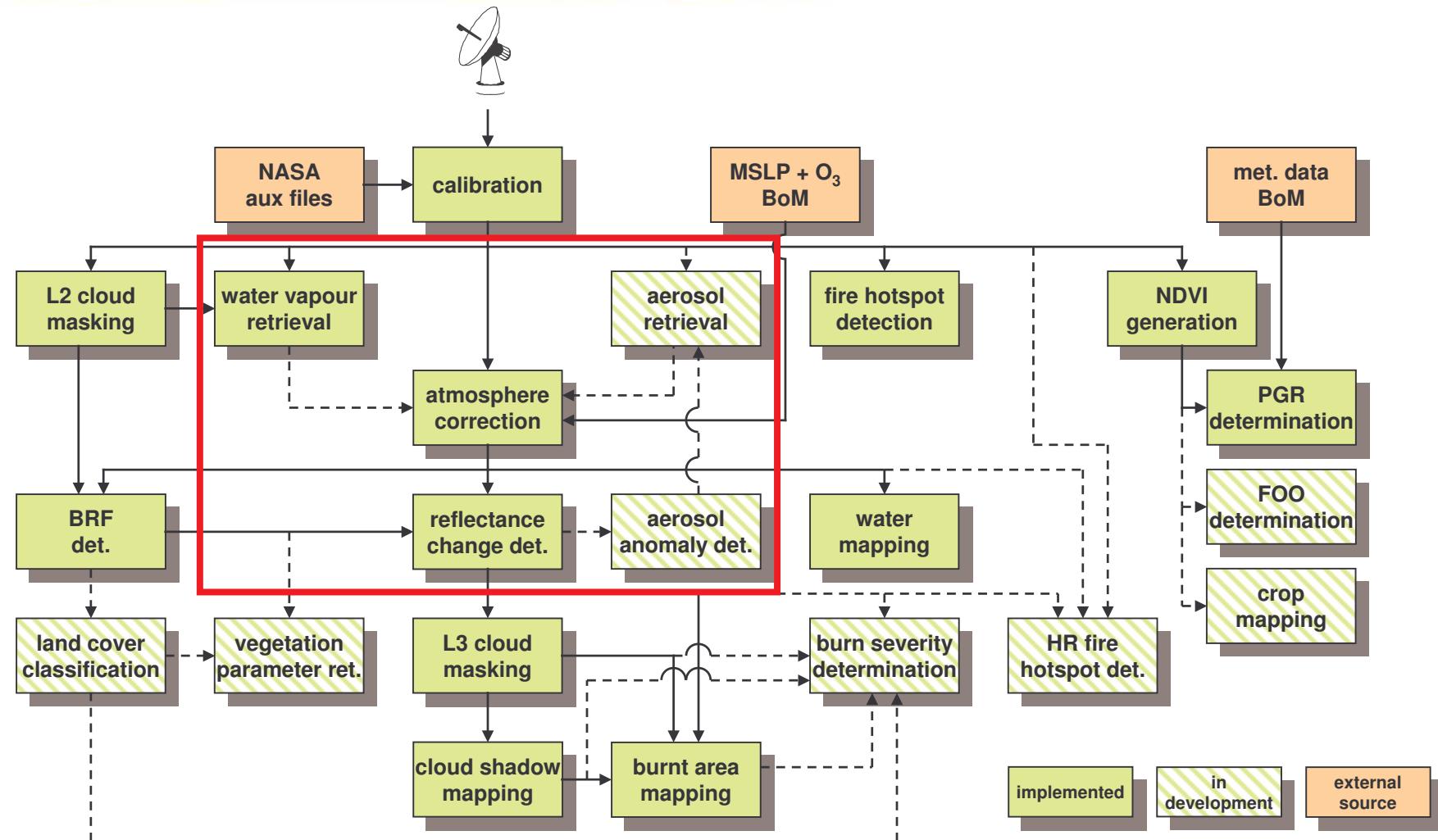
Bureau of Meteorology

Murdoch University

MODIS Land Processing System Overview

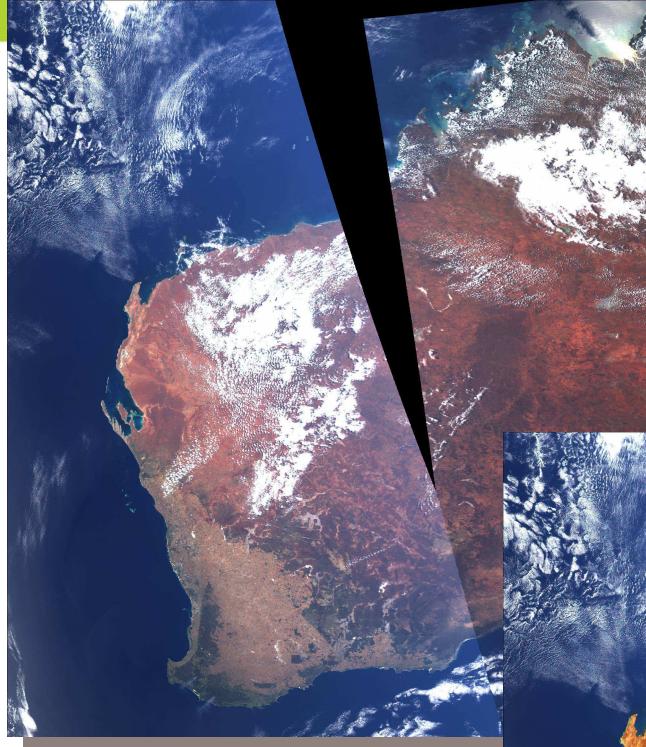


MODIS Land Processing System Overview

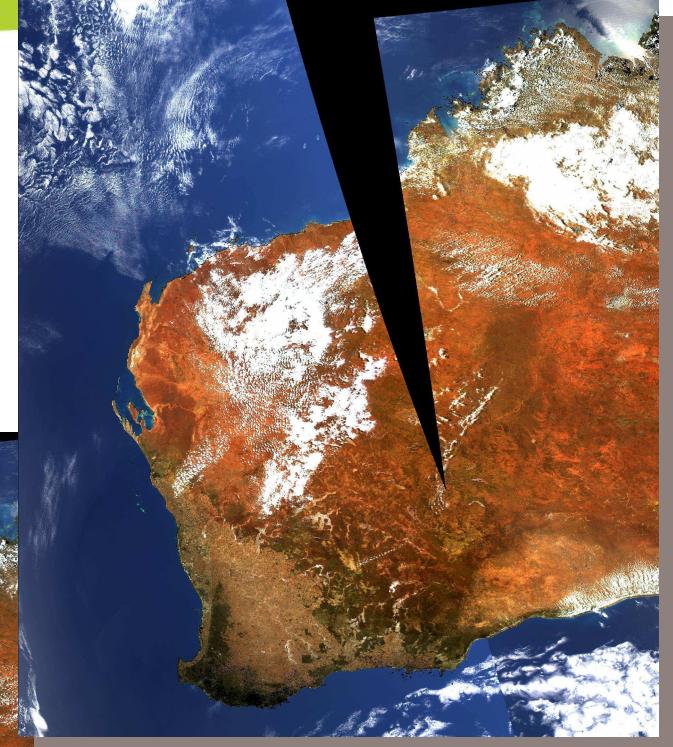


Atmospheric Correction

top-of-atmosphere reflectance



NADIR bottom-of-atmosphere reflectance



Sensor: MODIS/Aqua

Date: 22/11/2003 consecutive orbits at 04:43UTC + 06:20UTC

Bands: 1/4/3

Receiving Station: WASTAC - Perth, Australia

Processing: Satellite Remote Sensing Services, DLI, WA

atmosphere correction using the Simplified Method for Atmospheric Corrections (SMAC)

BRDF correction using Ross-Thick/Li-Sparse kernel driven model
corrections applied to land pixels only

Atmospheric Correction

Operational process based on SMAC

Uses NRT H_2O from MODIS and O_3 from BoM

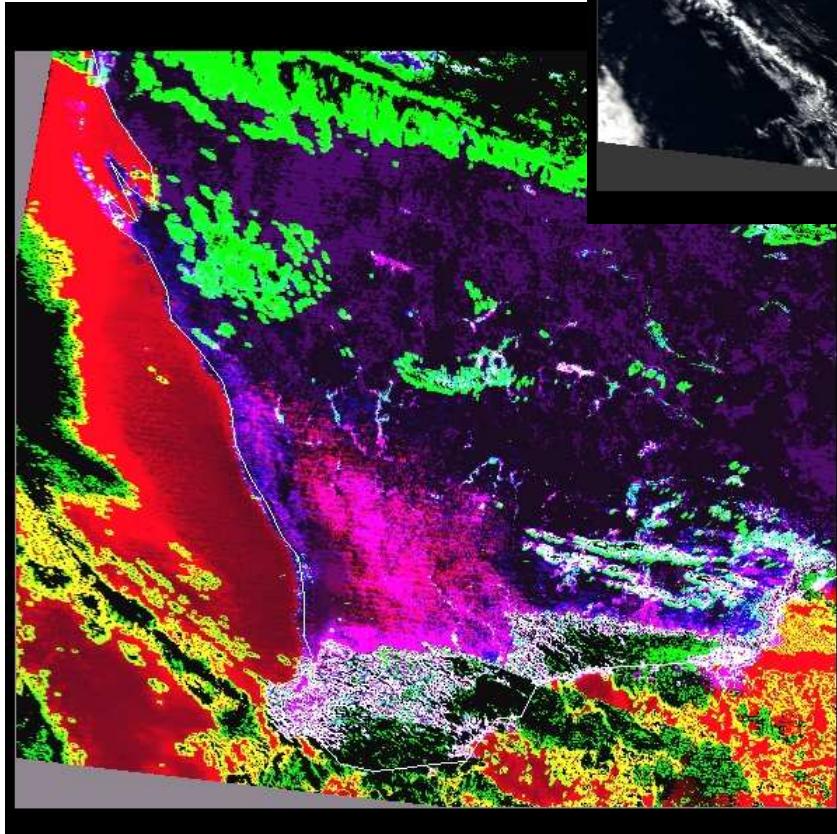
Developing improved AOD retrieval method for Australian continent

Atmospheric Corrected

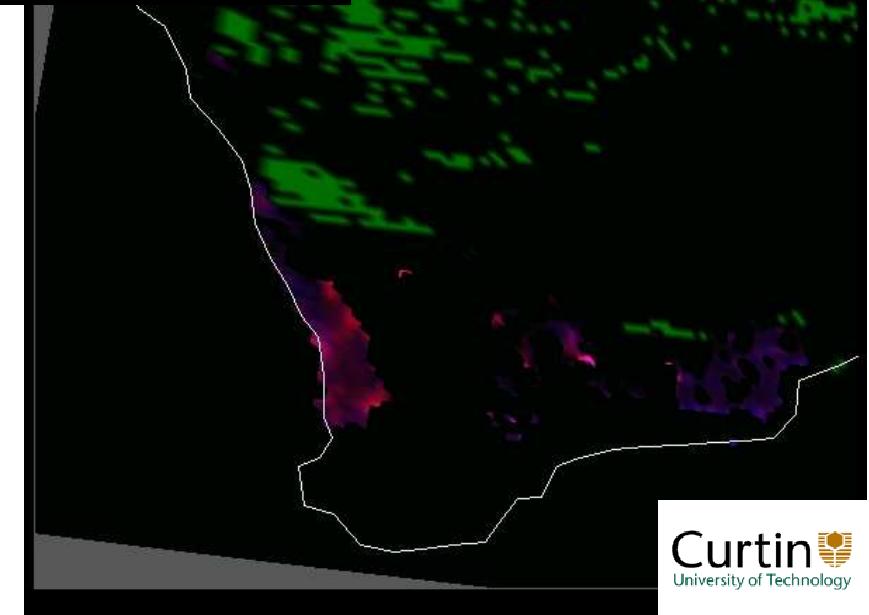
Level 1B
28/02/2004

The Problem:

MOD09

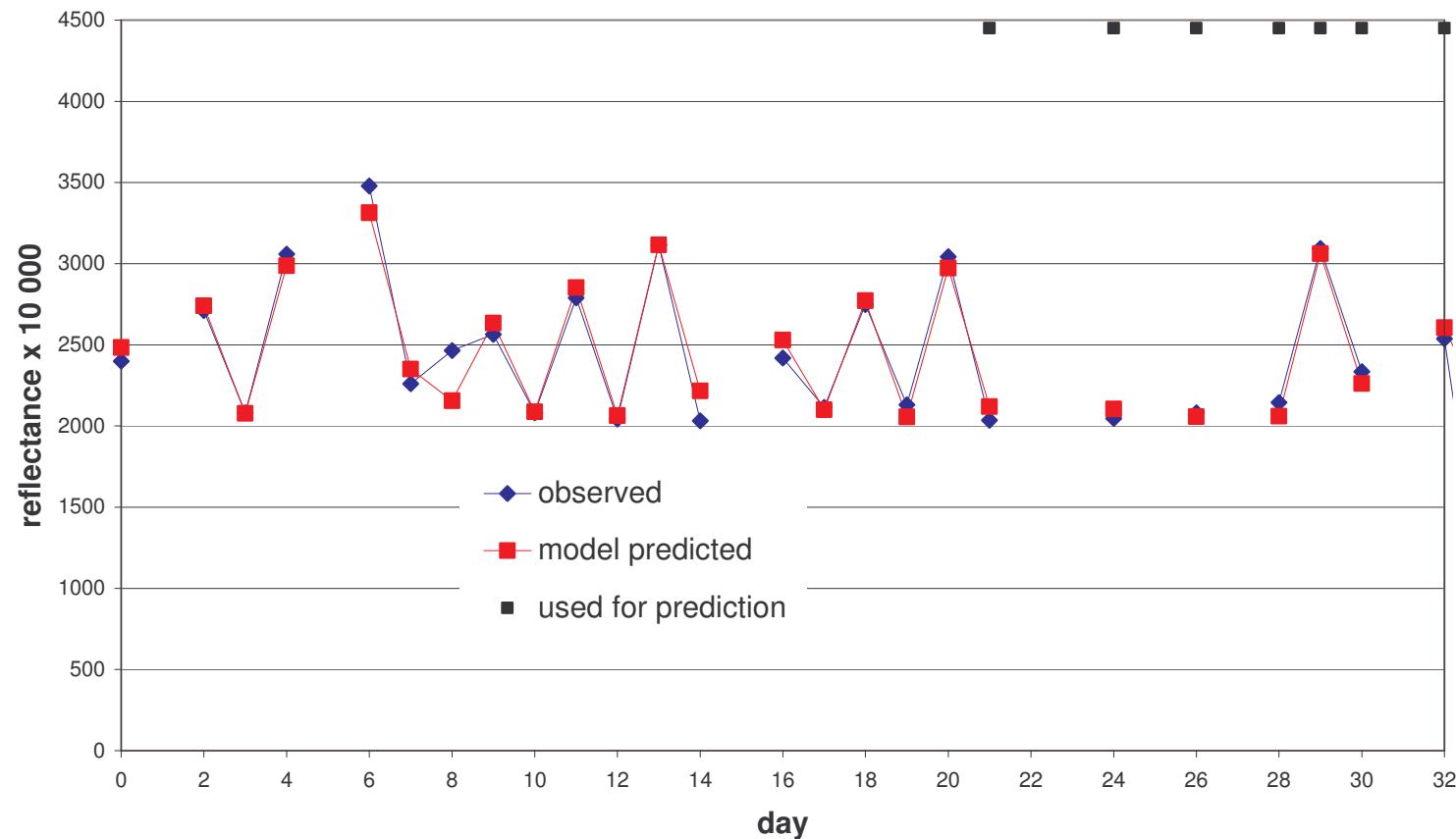


MOD04



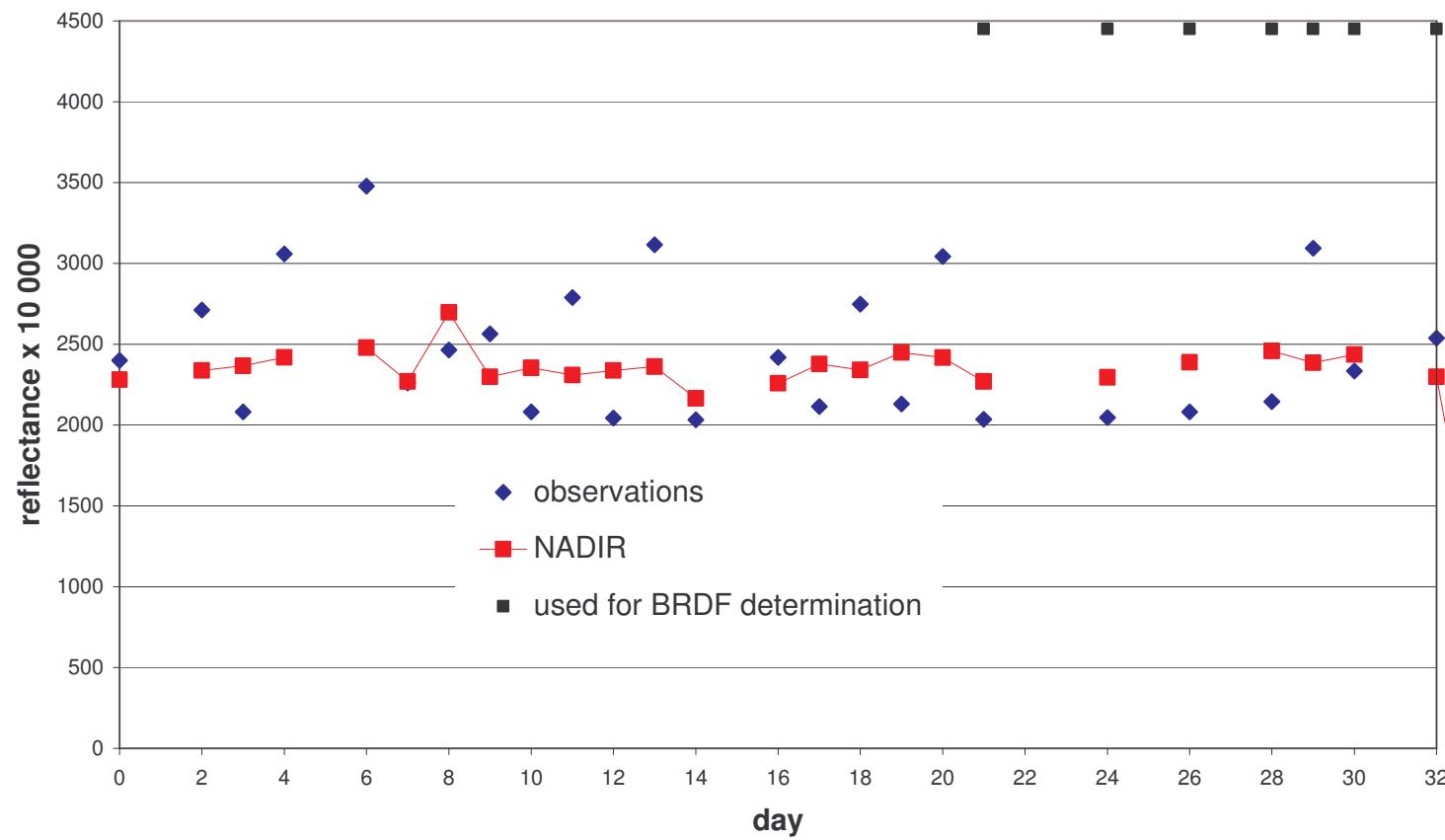
Atmospheric Correction - BRDF

MODIS band 2 (pixel 6671/700, 126.68E/14.75S)

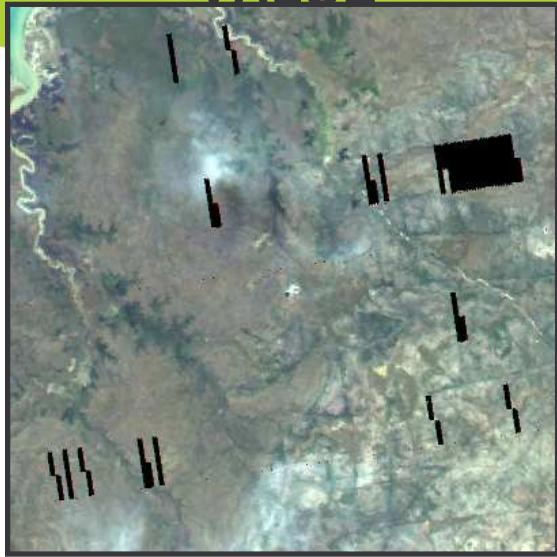


Atmospheric Correction - BRDF

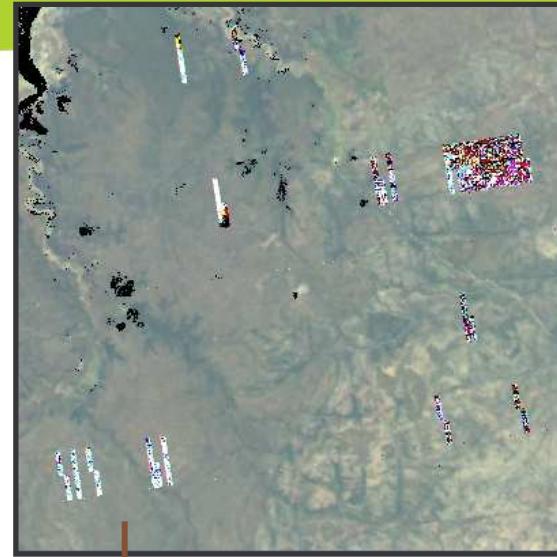
MODIS band 2 (pixel 6671/700, 126.68E/14.75S)



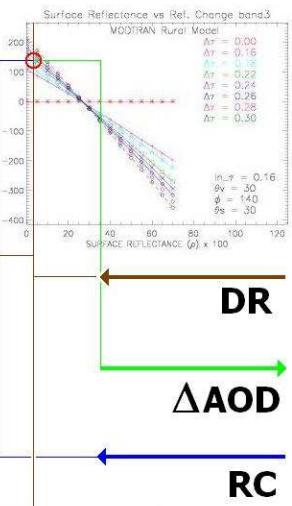
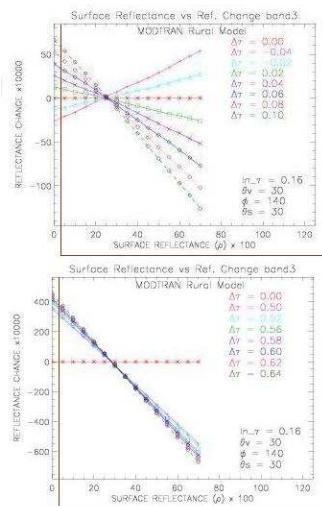
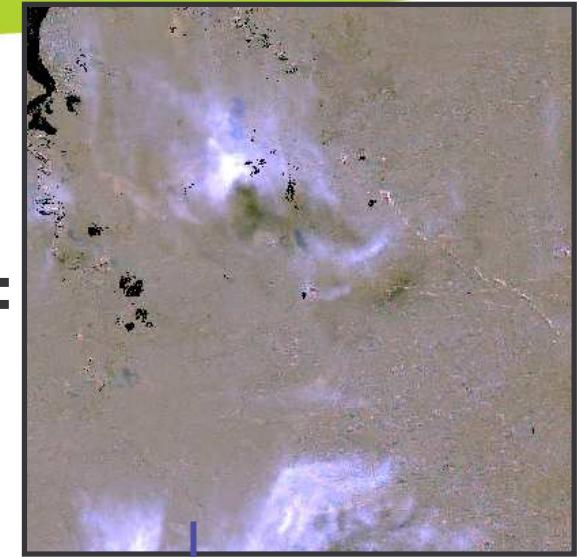
BOA REFLECTANCE WITH FIXED AOD VALUE



BRDF PREDICTED REFLECTANCE

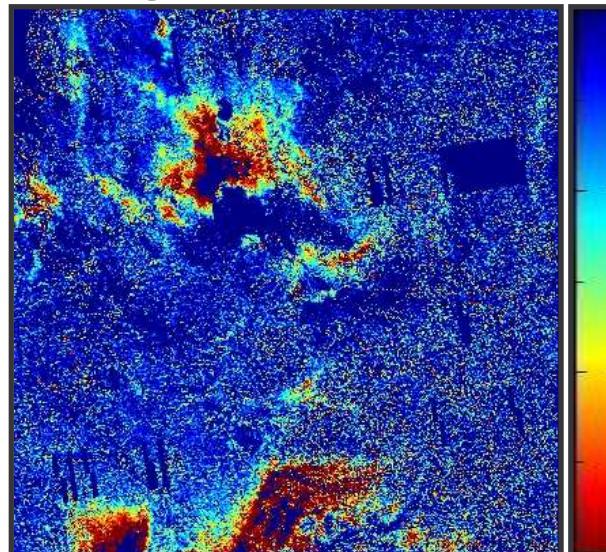


CHANGE IN REFLECTANCE



MODTRAN MODELLED REFLECTANCE
CHANGE FOR CHANGE IN 550 nm AOD

Change in AOD at 550 nm

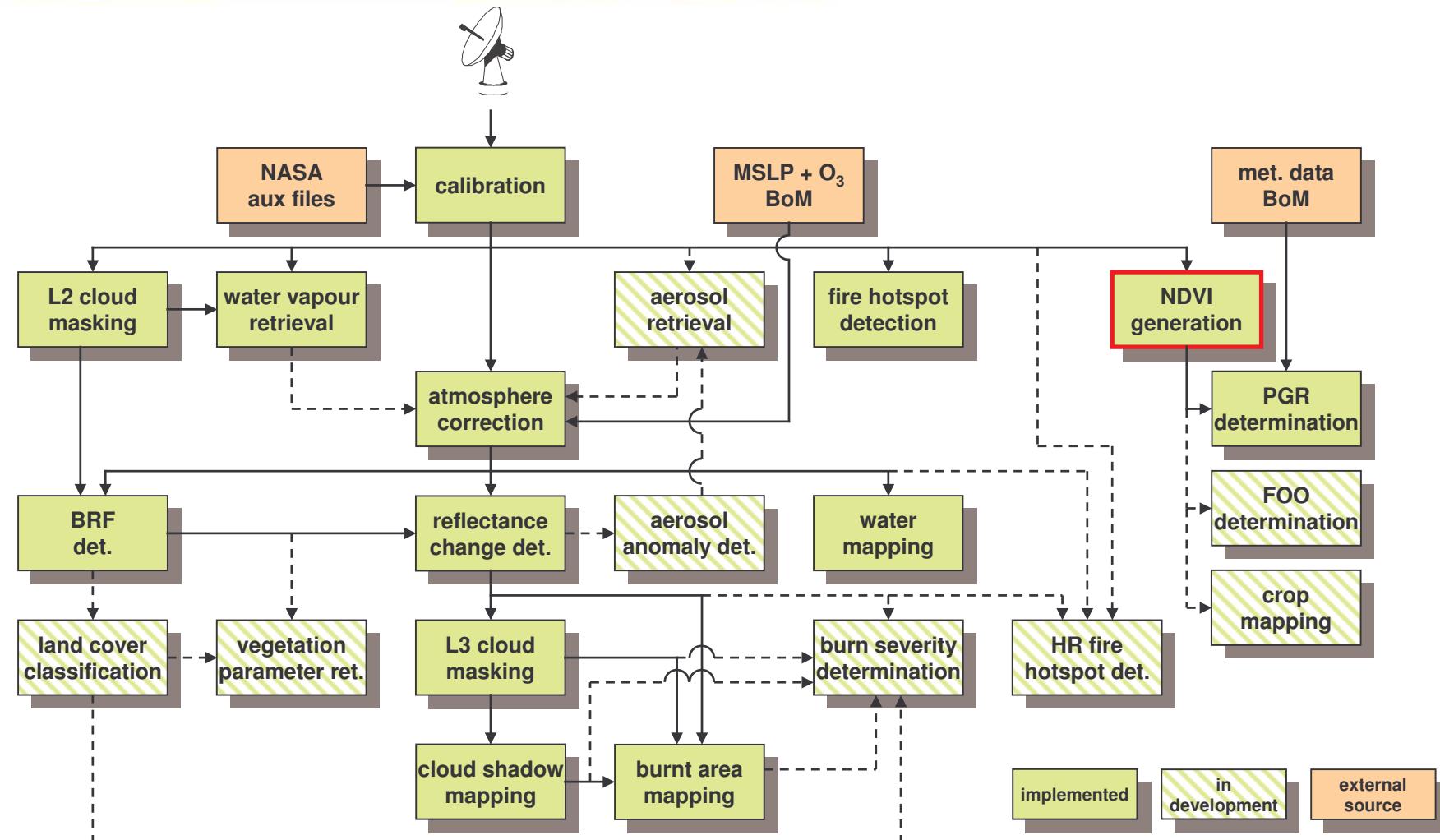


<0.019

0.24

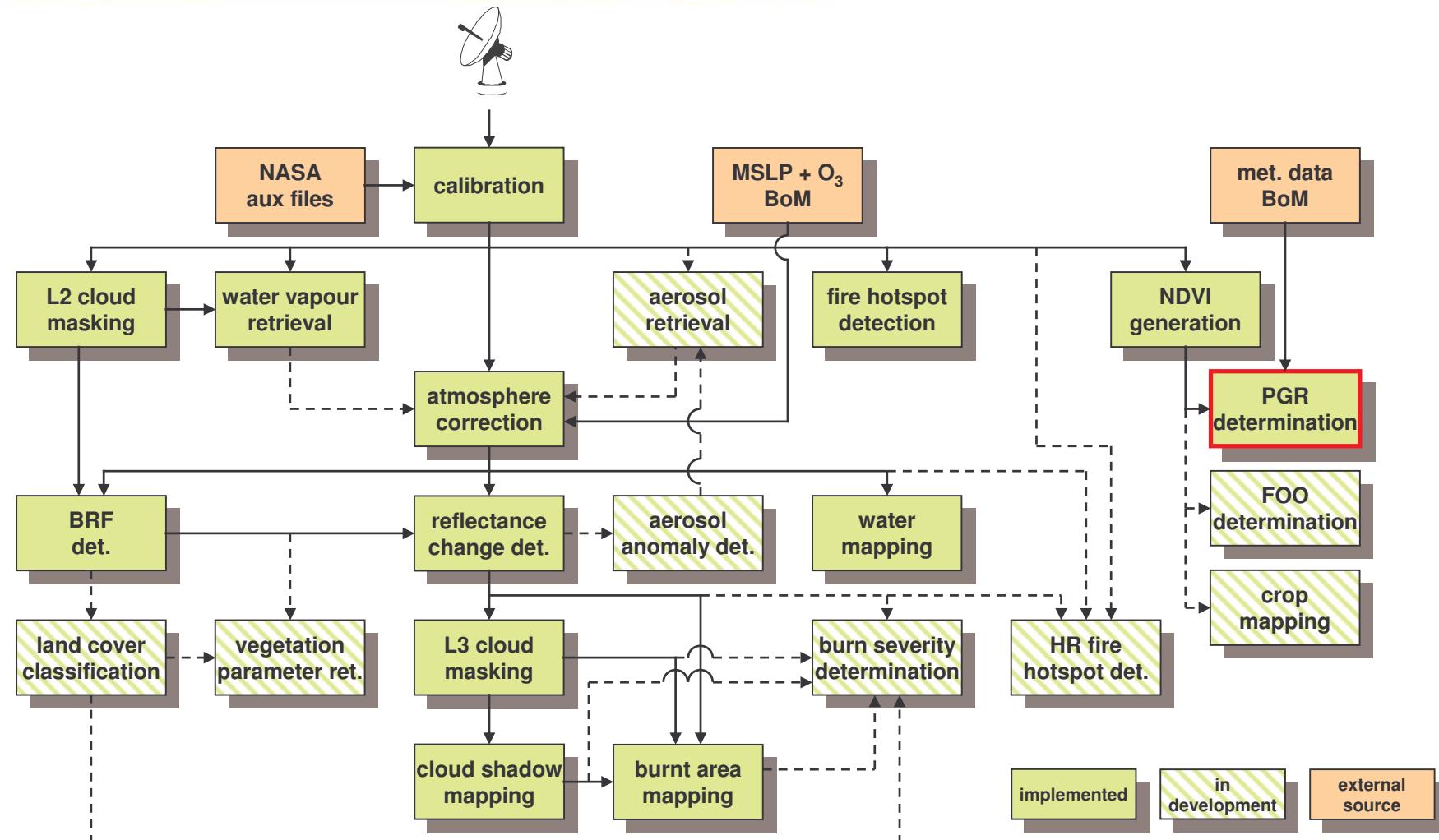
MODIS Land Processing System

Overview



MODIS Land Processing System

Overview



Pasture Growth Rate (PGR)

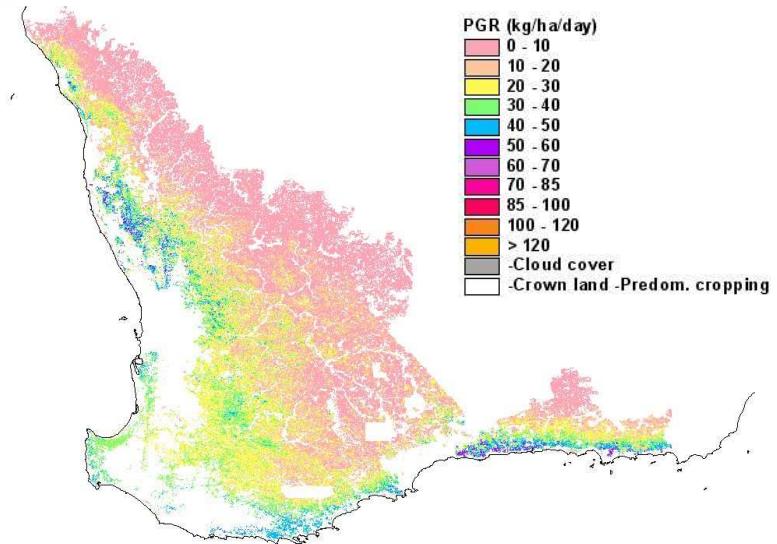
growth model developed by CSIRO

use of NDVI to estimate fAPAR

PAR (BoM) to estimate APAR

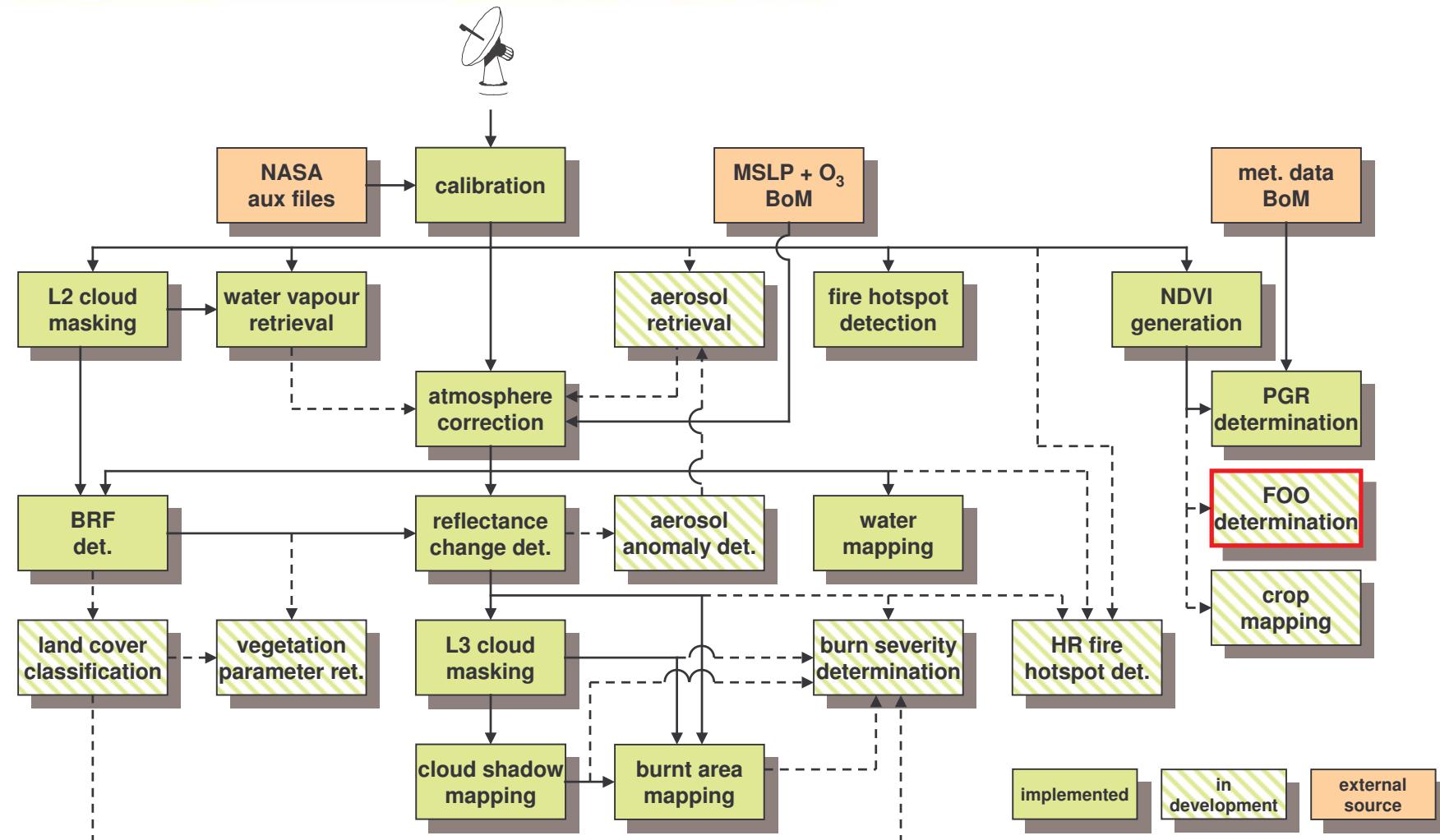
*other meteorological data from BoM (temperature, rainfall)
and soil parameters to estimate LUE to calculate PGR*

delivered to farmers to make stocking rate decisions



MODIS Land Processing System

Overview



Feed on Offer (FOO)

use of NDVI to estimate pasture biomass

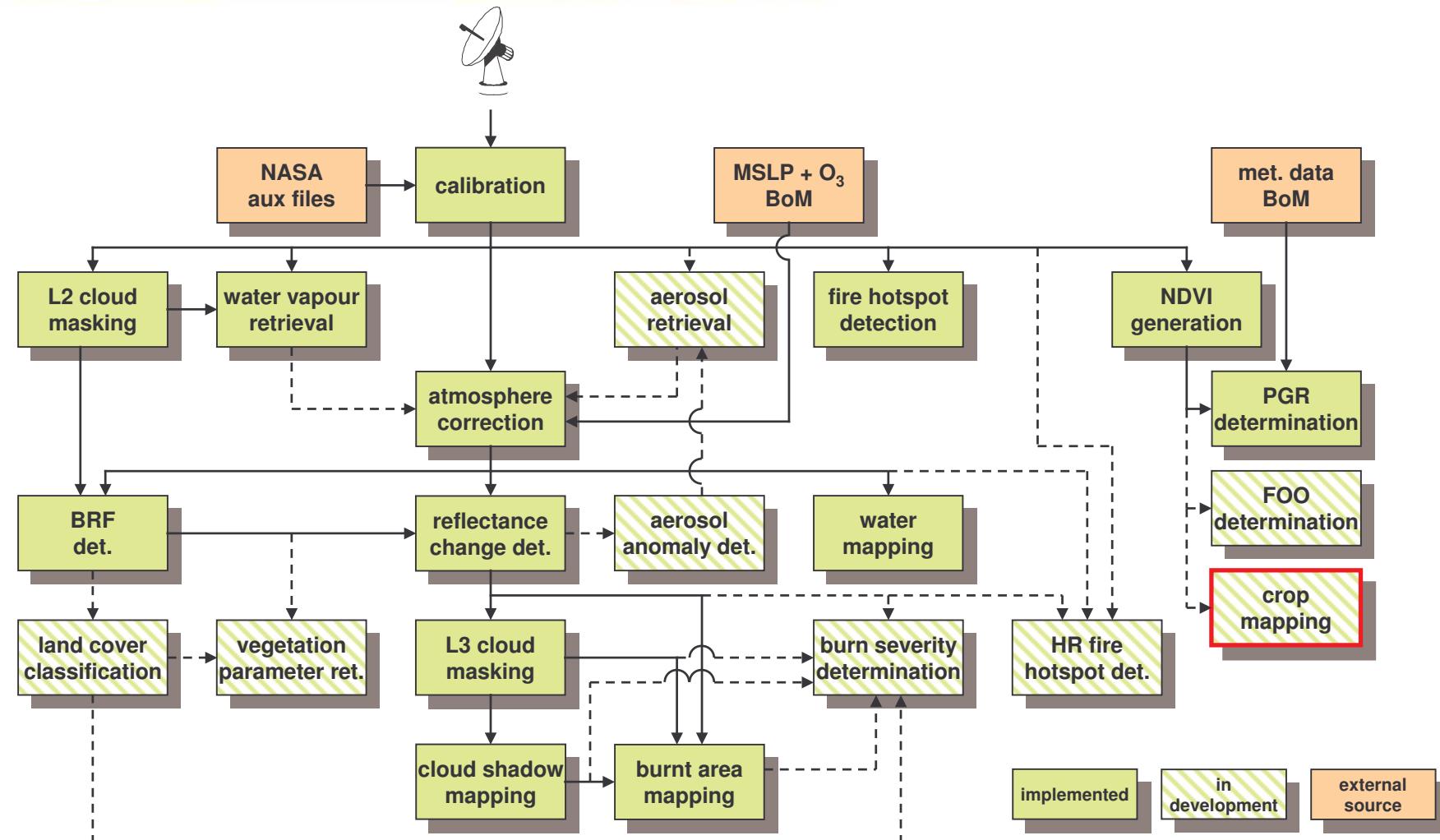
empirical model fitted to field estimates

only useful during growth period

delivered to farmers to make stocking rate decisions

MODIS Land Processing System

Overview

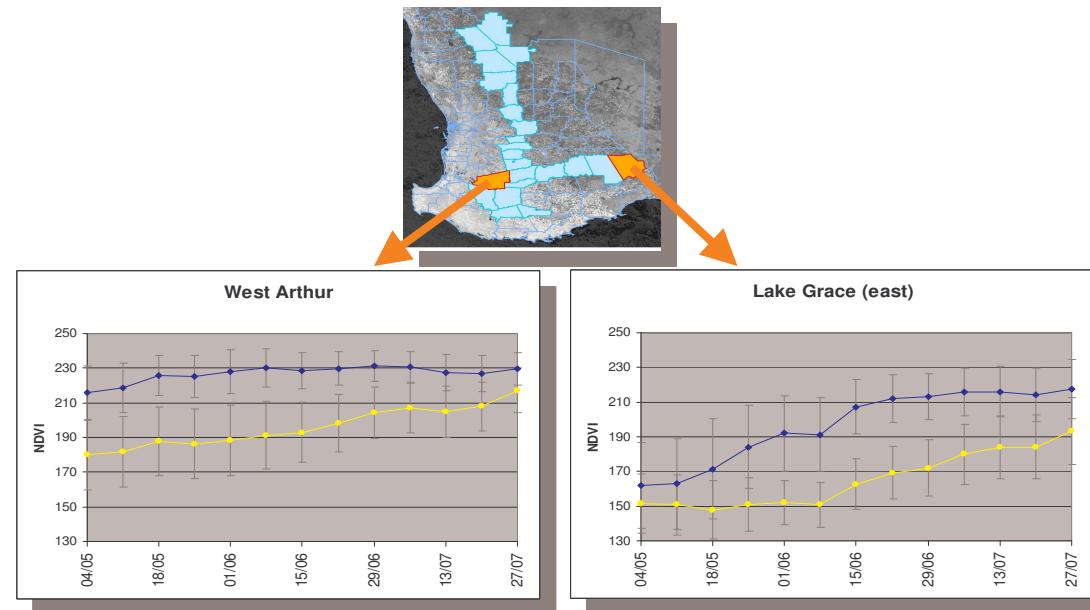


Crop Mapping

map cropped areas

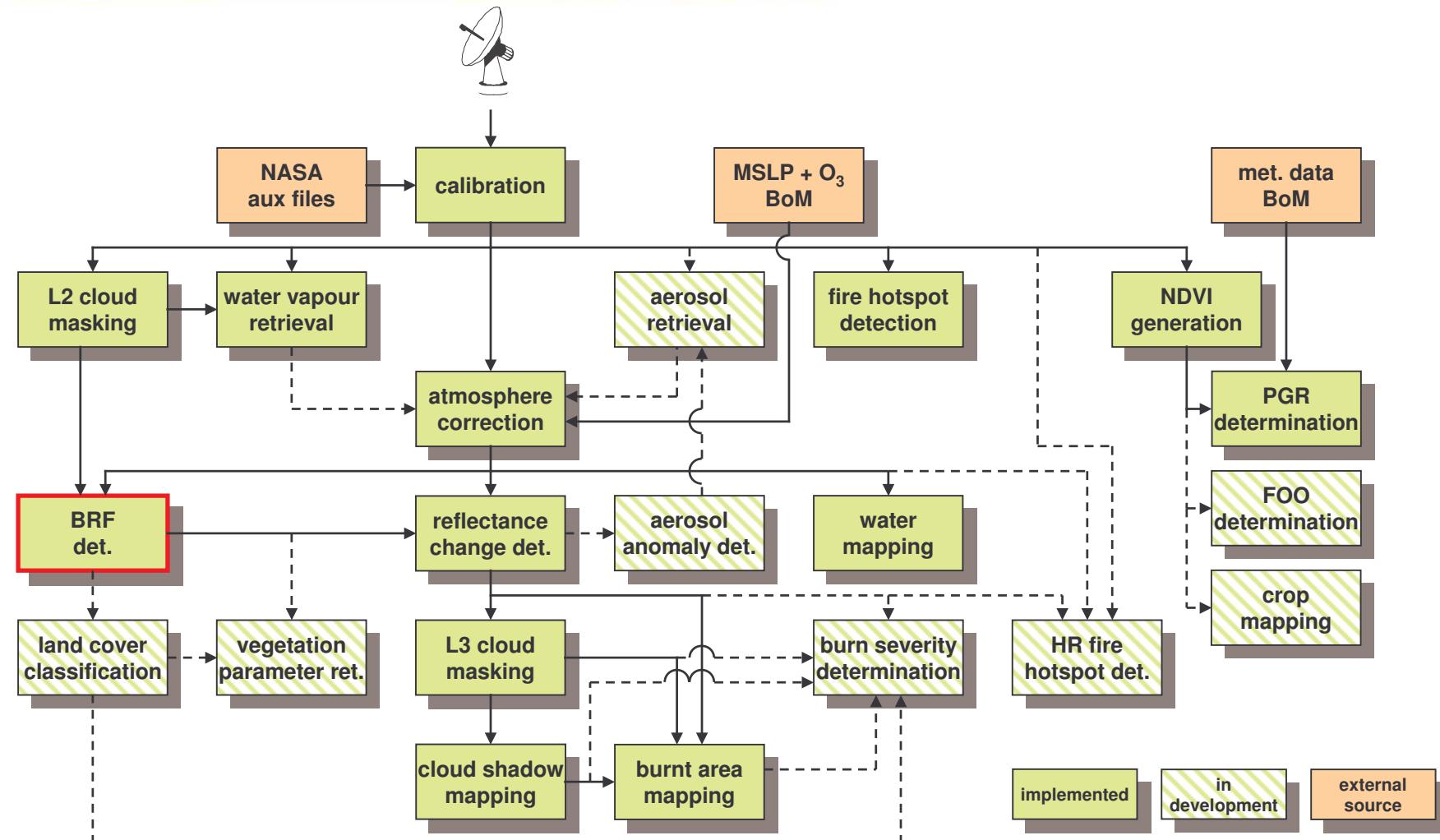
uses different phenology to separate crops from pastures

temporal signatures depend on geographic location



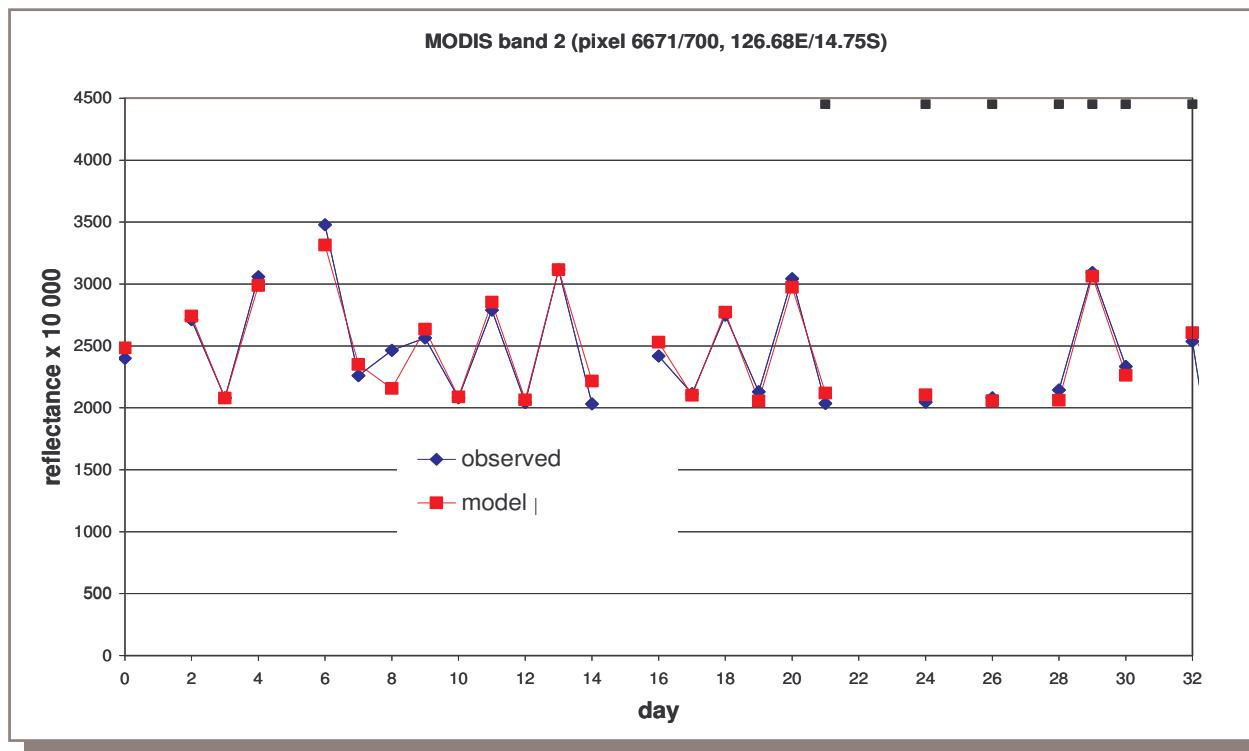
MODIS Land Processing System

Overview



BRF Determination

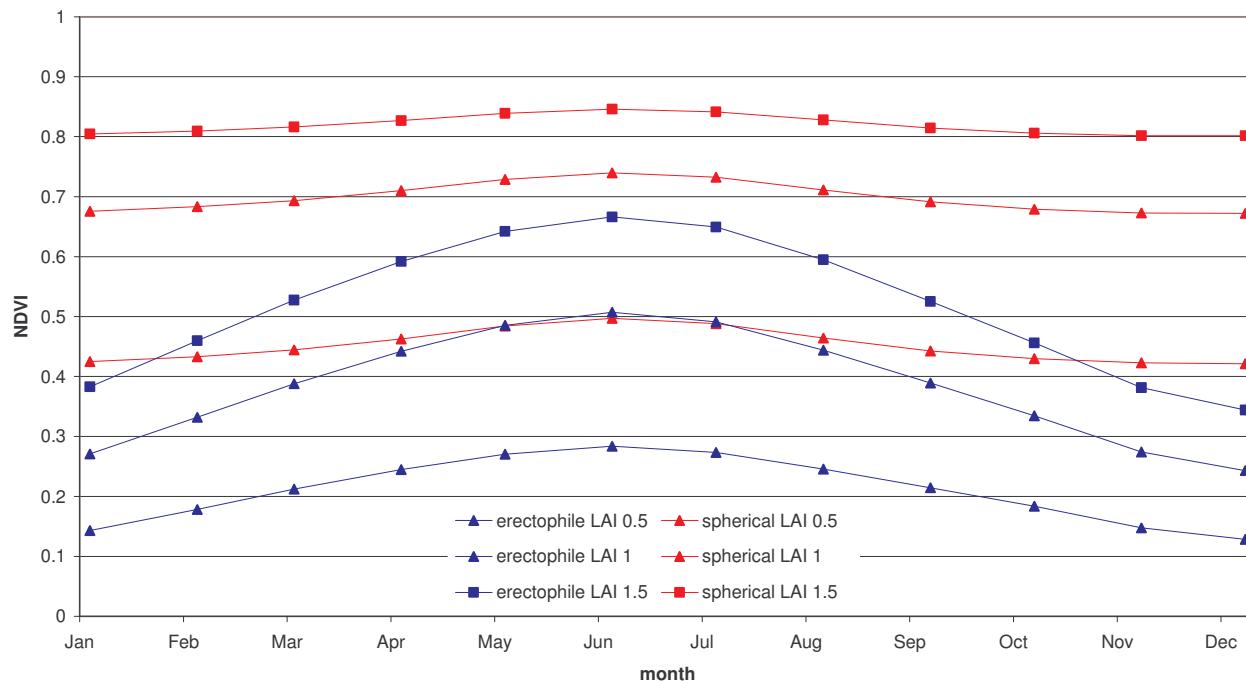
reflectance varies with observation geometry (view zenith, azimuth, solar zenith)



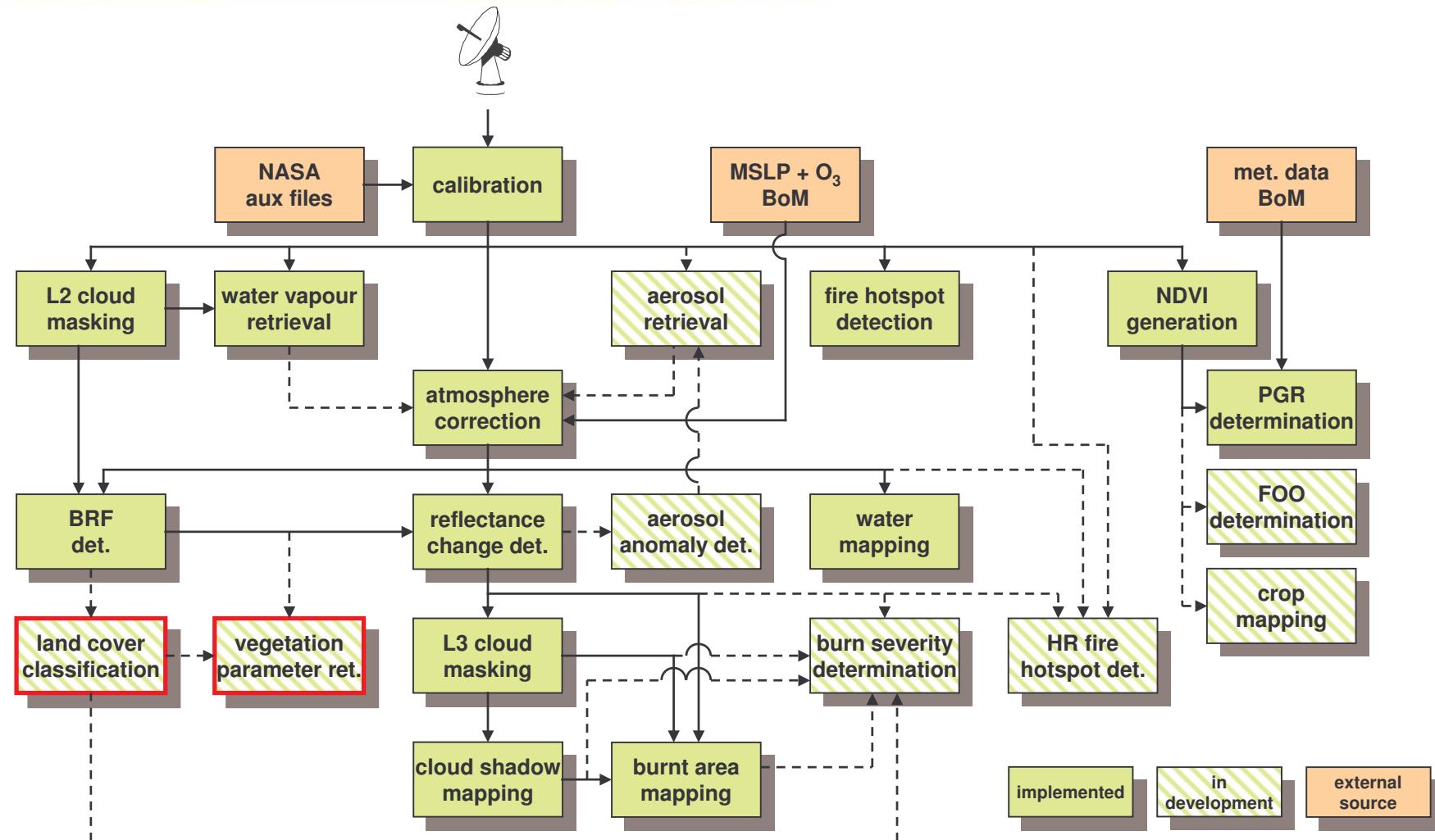
BRF Determination

reflectance varies with observation geometry (view zenith, azimuth, solar zenith) → even NDVI is affected

MODIS BOA-NDVI Simulation using SAIL-SLOPE (32S/116E)

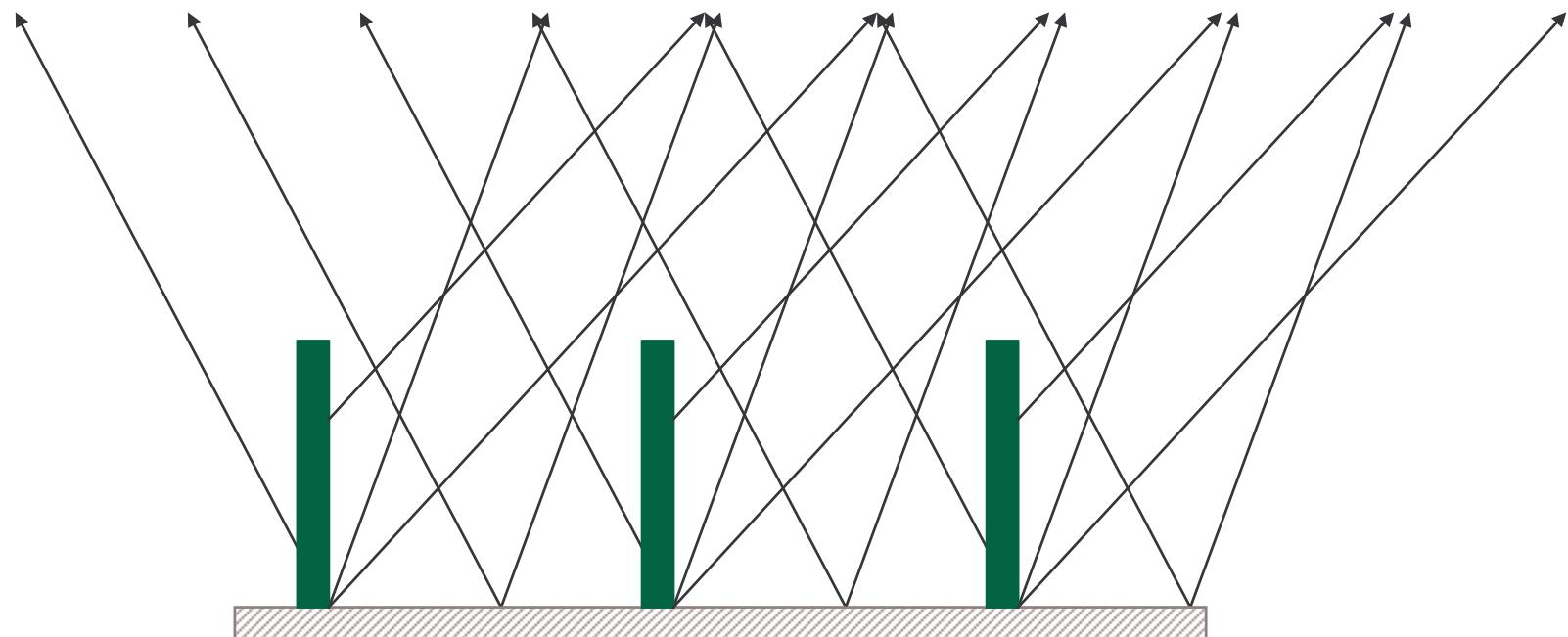


MODIS Land Processing System Overview



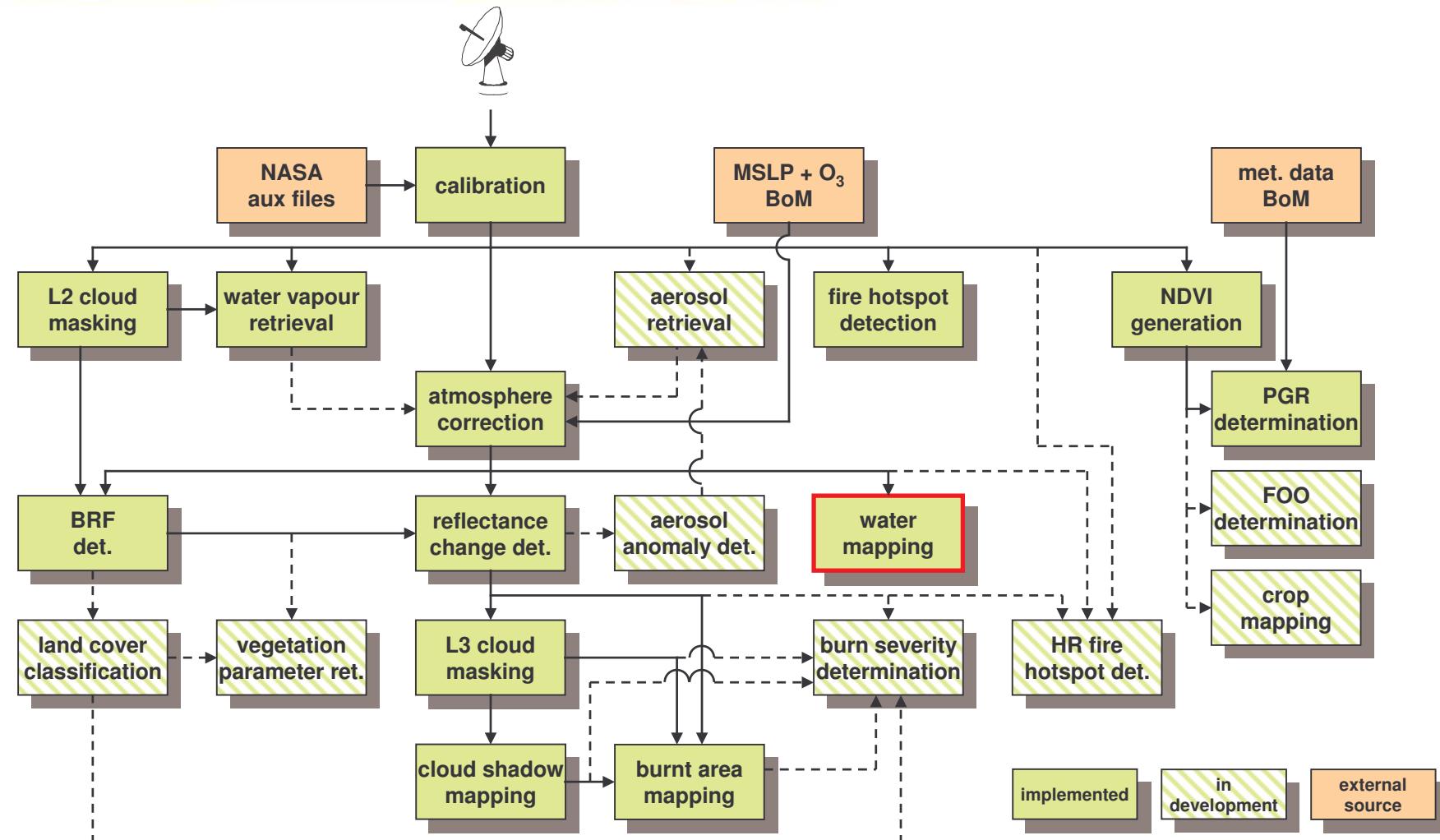
BRF as Information Source

at more oblique viewing angles the background contribution is reduced



MODIS Land Processing System

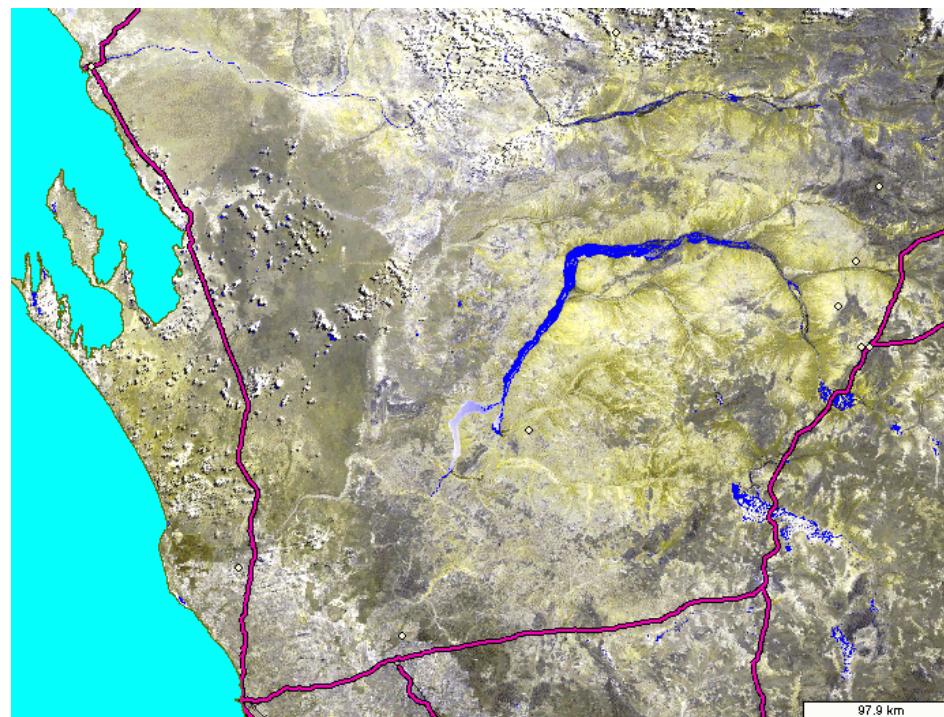
Overview



Water Mapping

*mapping of water inundated areas using every MODIS overpass
flood mapping for emergency management*

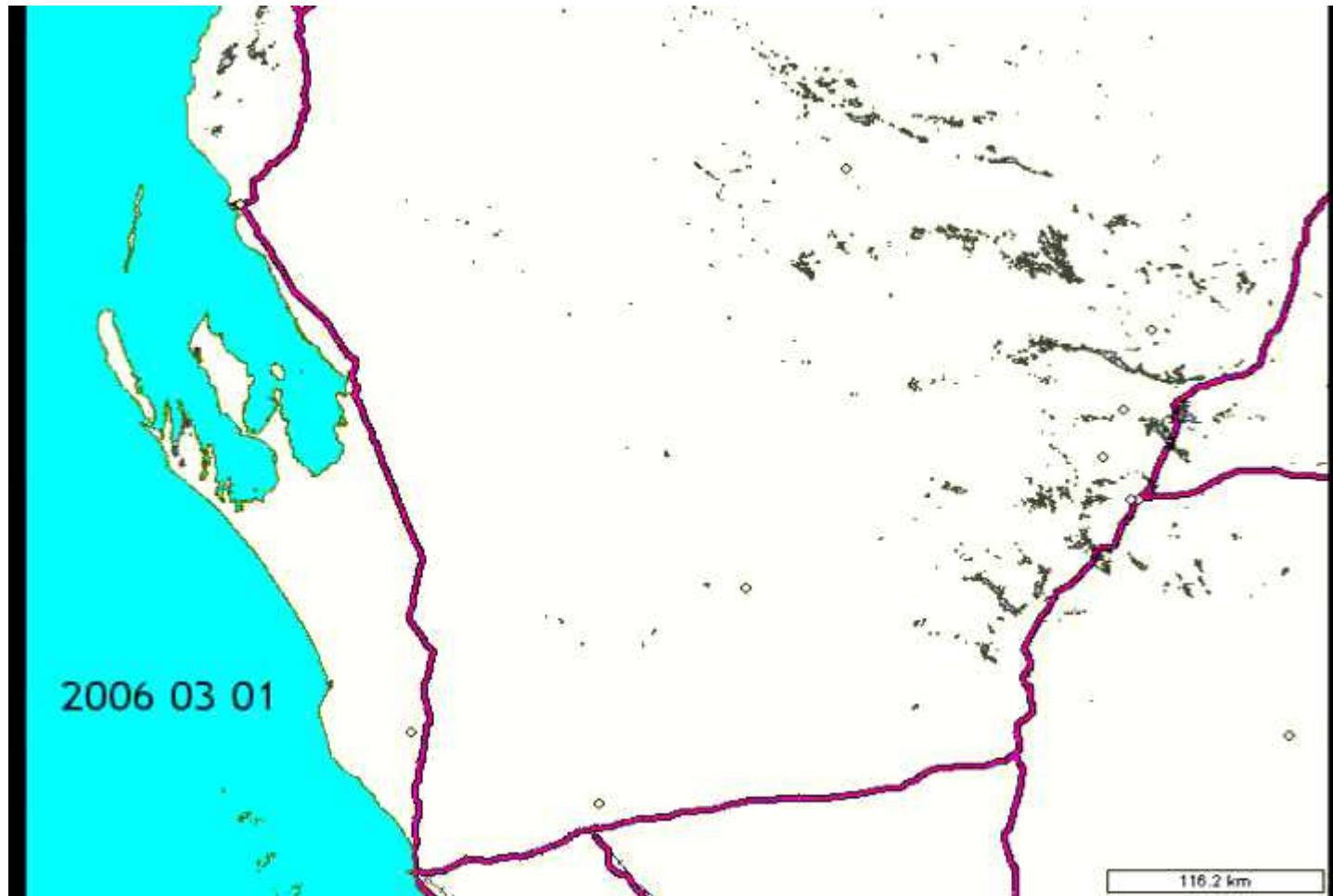
Flooding from
Cyclone Emma
08/03/2006



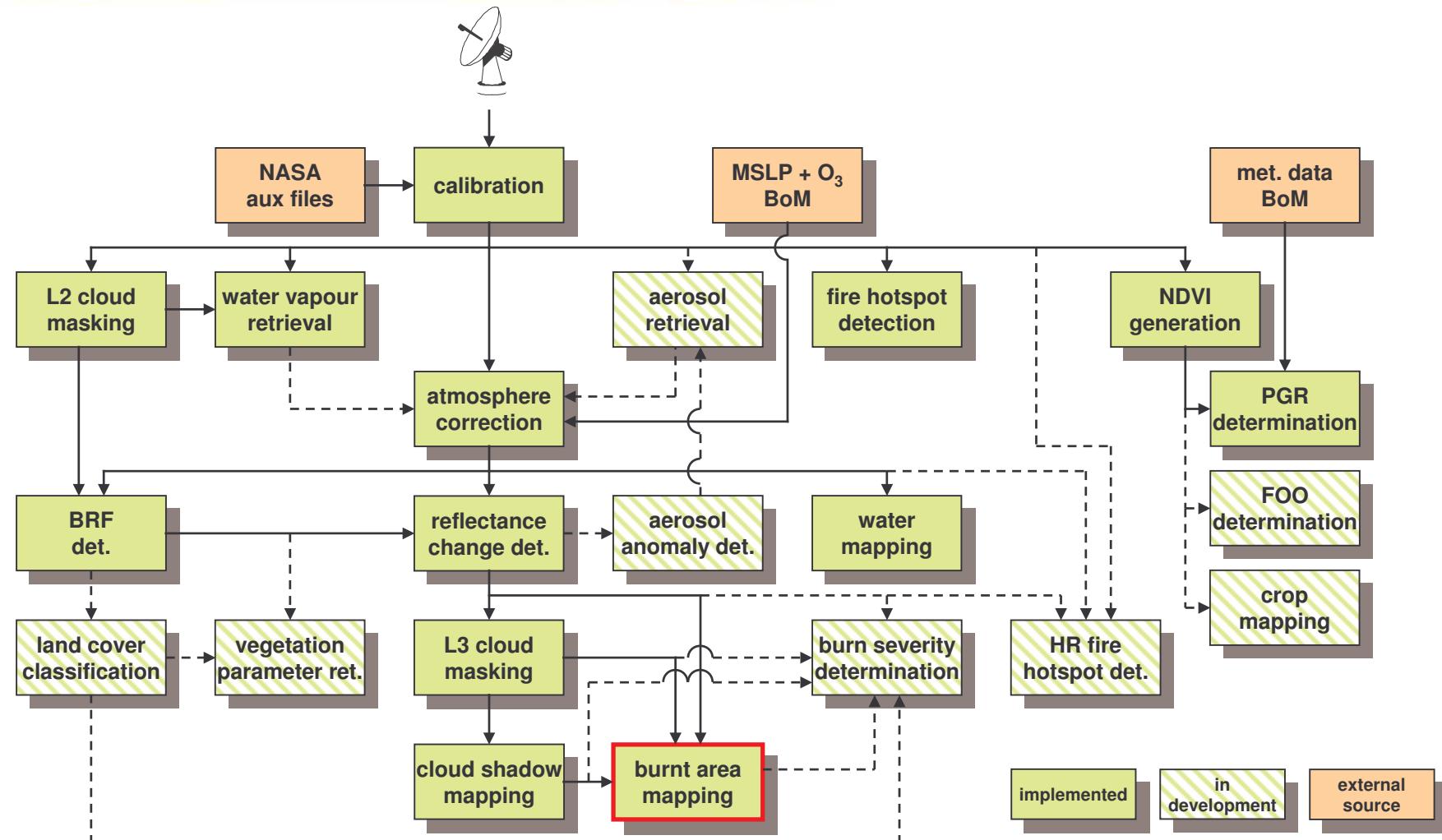
www.landgate.wa.gov.au



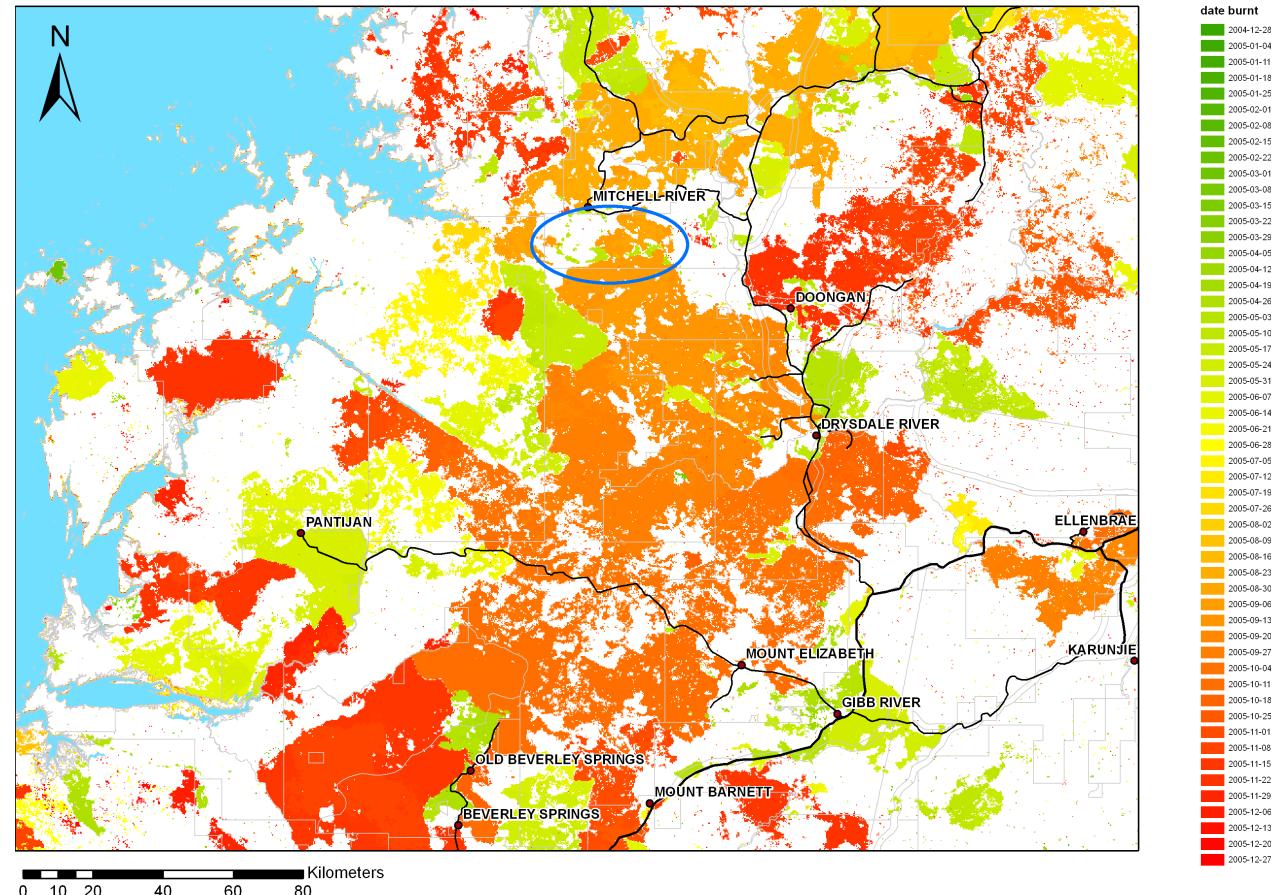
Water Mapping



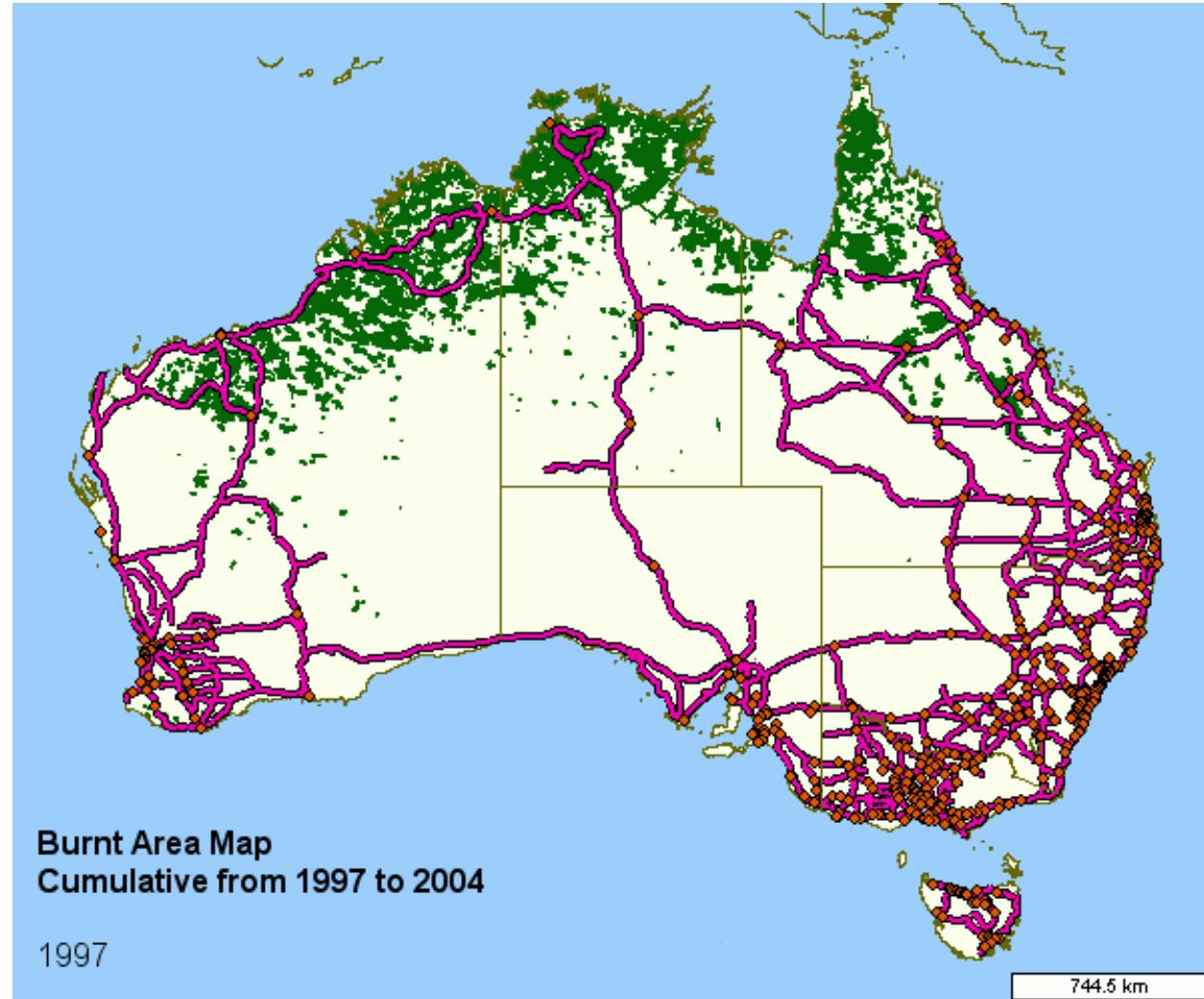
MODIS Land Processing System Overview



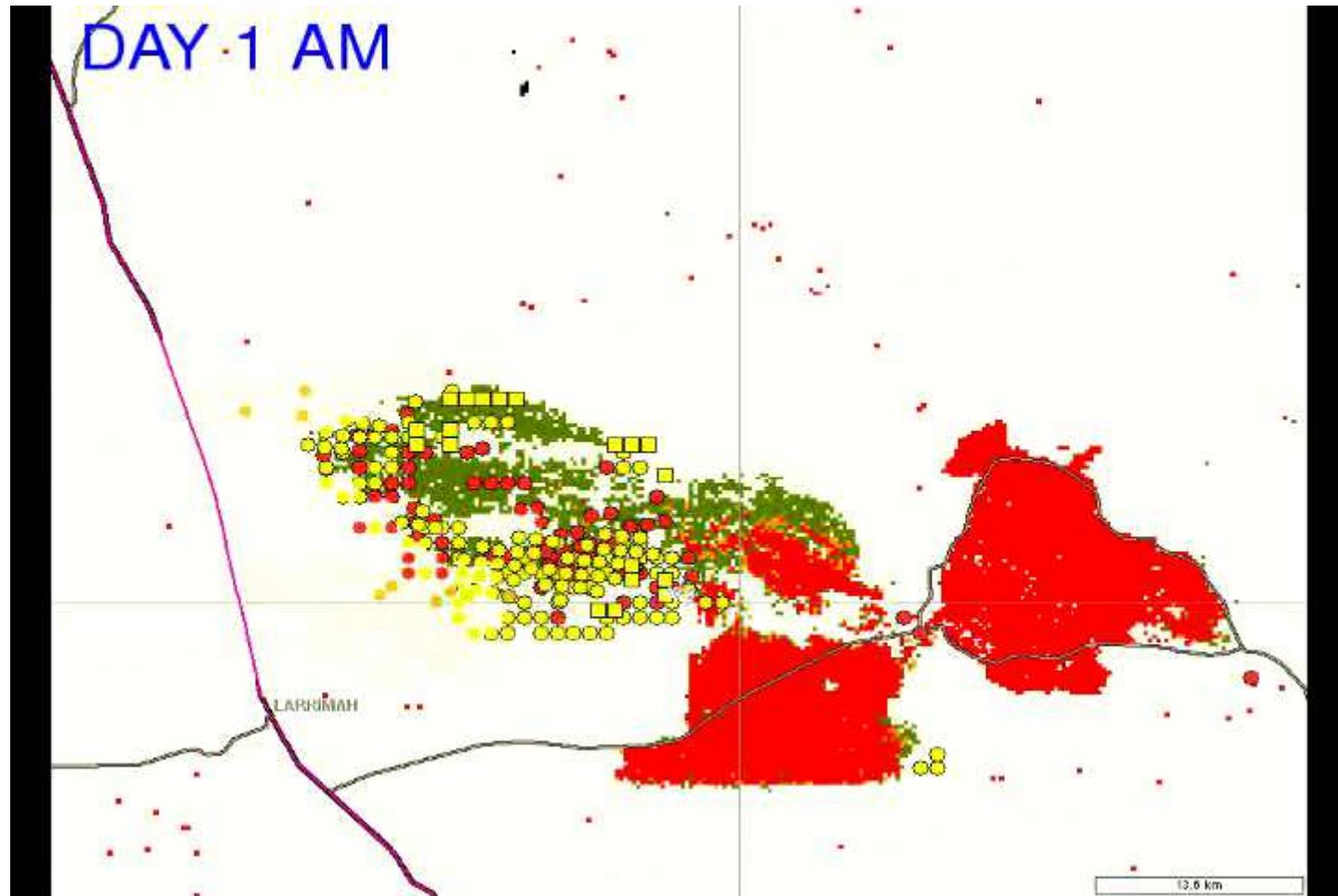
Burnt Area Mapping



Burnt Area Mapping



Integration of Fire Information



International Projects

Vietnam

Knowledge & technology transfer to enable full utilisation of SeaSpace systems for fire applications

Indonesia

AusAid funded project(s) for building capacity for fire and forest management in Indonesian government agencies.

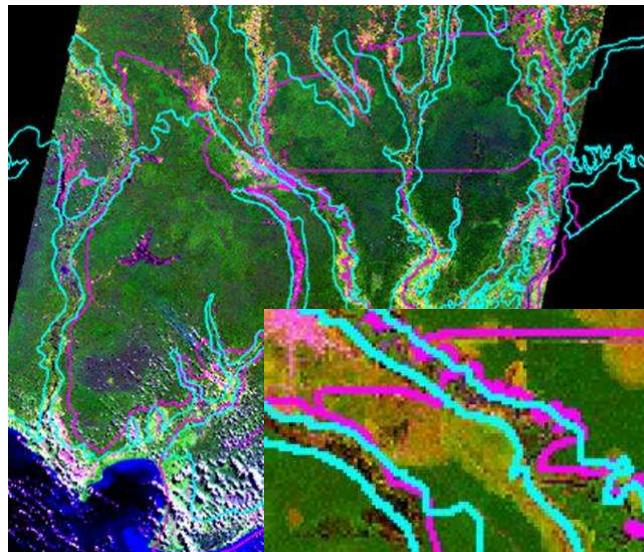
Ongoing fire-based training, system development and dissemination of information between agencies.

Indonesia

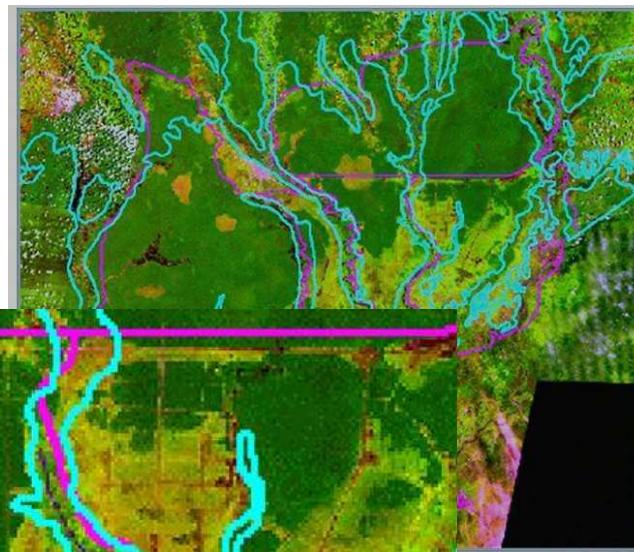


Indonesia - Landcover Change

1991



2002



Feed on Offer (FOO)



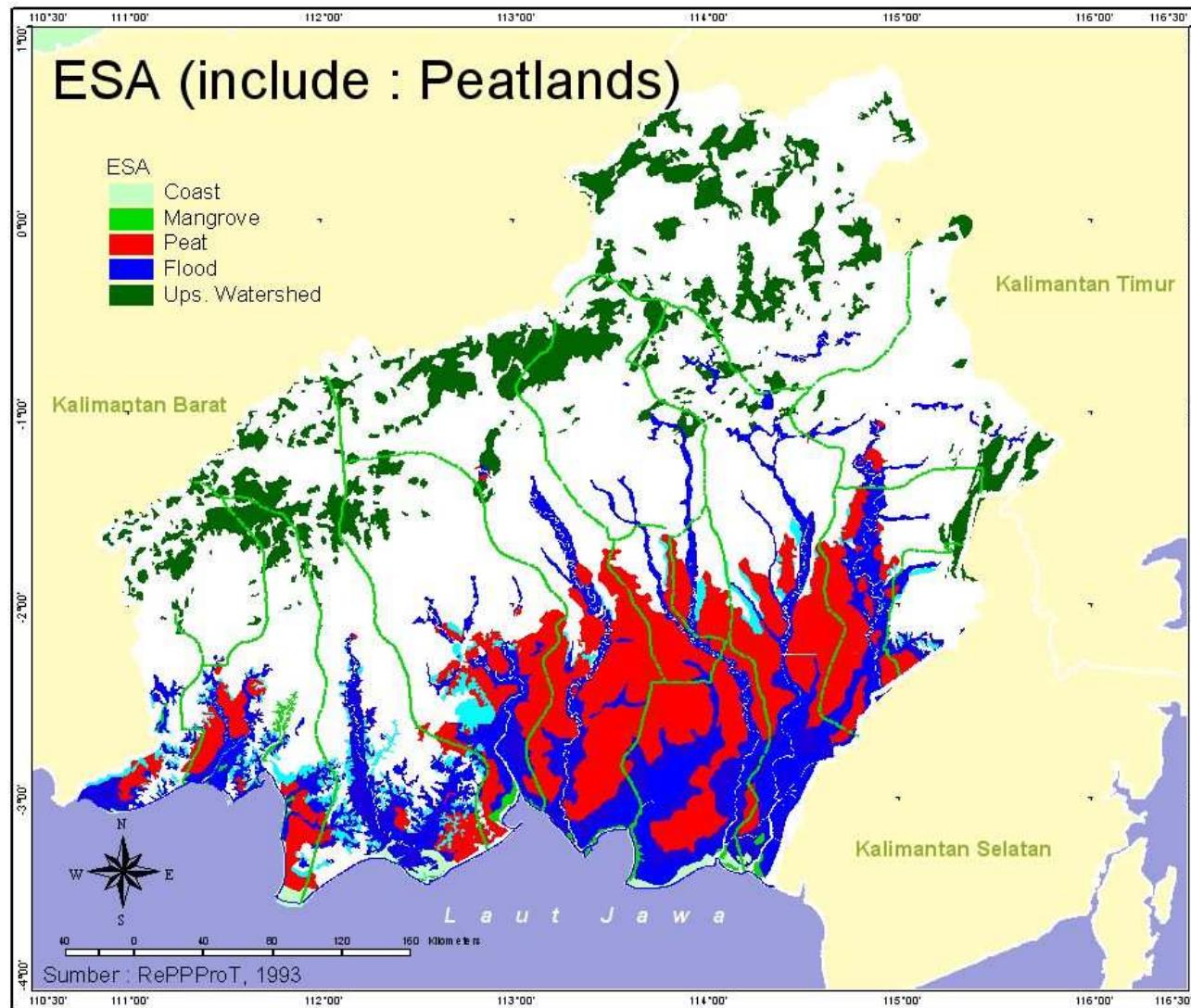
Canals dug into the forest by illegal logging operations

Indonesia - The Peatlands

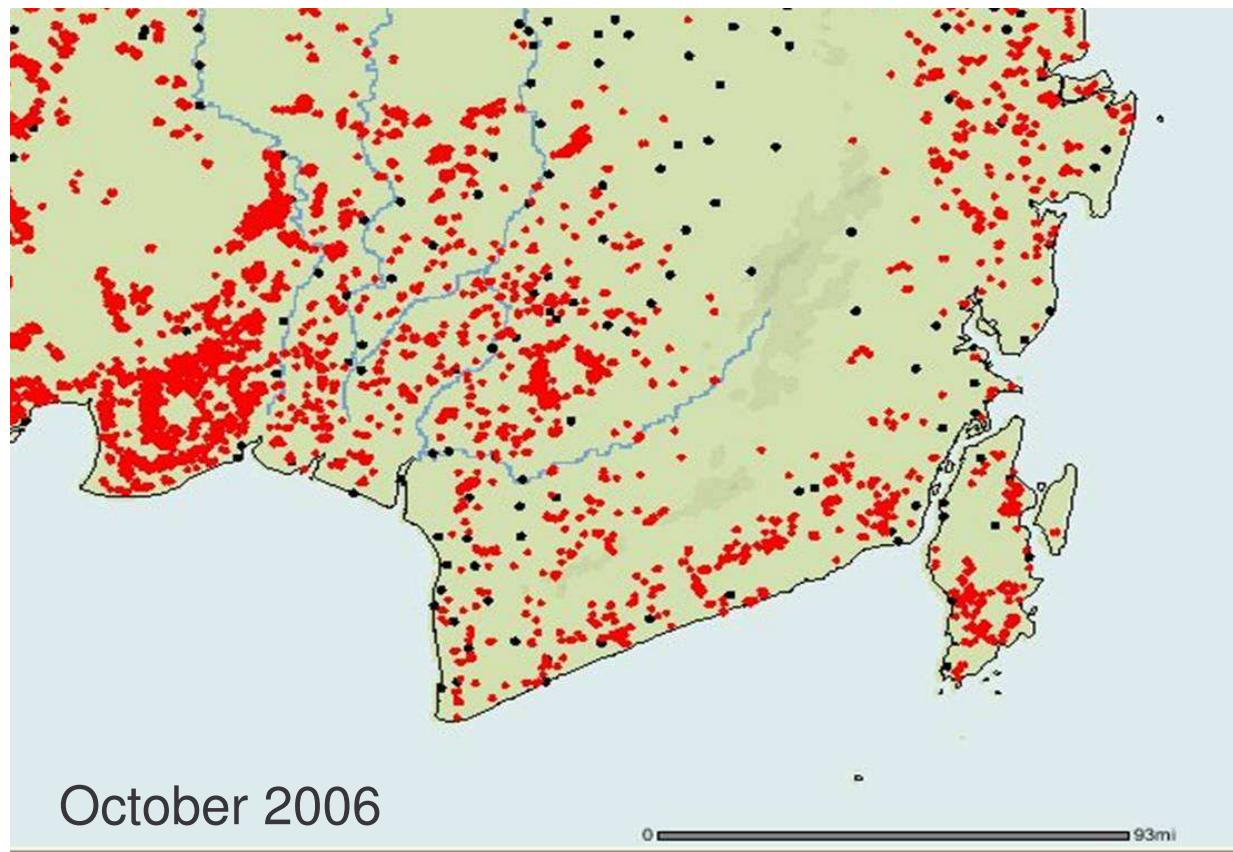


The canals drain the logged areas exposing dry peat

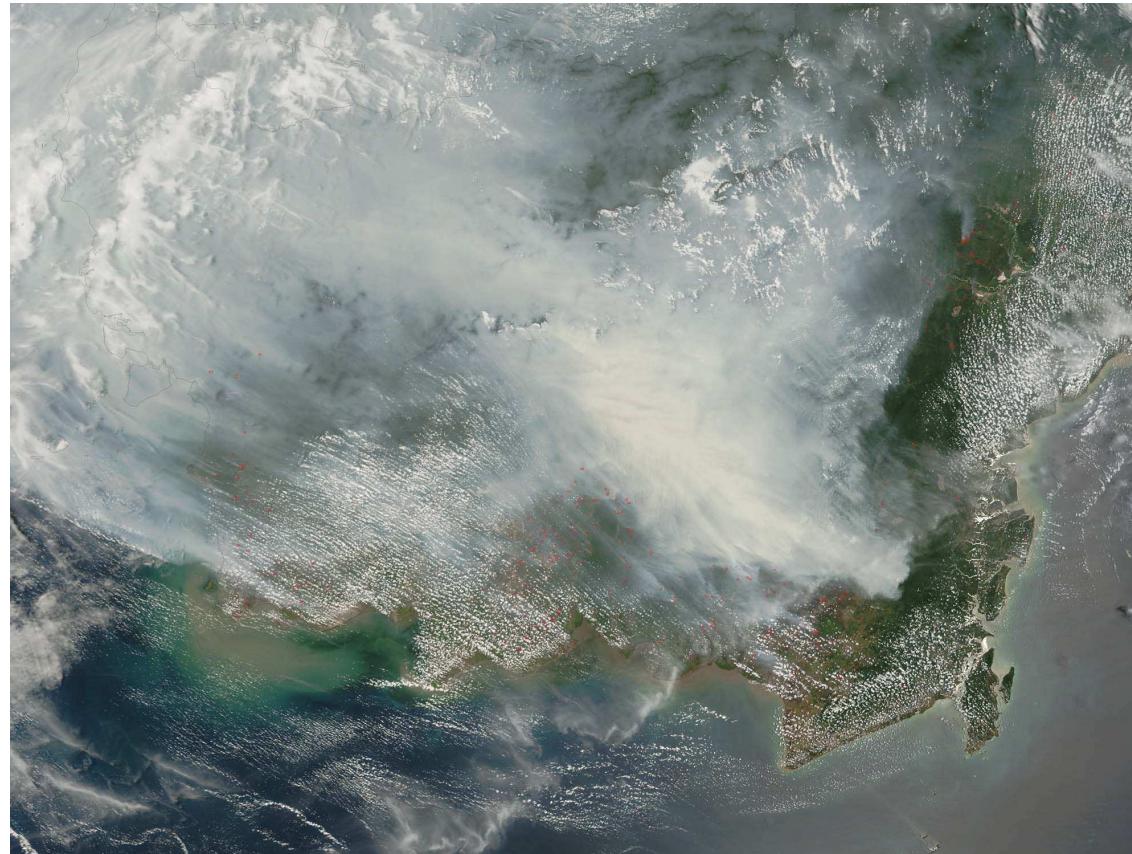
Indonesia - The Peatlands



Indonesia - Fire Hotspots are Serious Events



Indonesia - Fire Hotspots are Serious Events



Indonesia - Johnnie & Zaini



www.landgate.wa.gov.au

Summary

Landgate's remote sensing operations cover data reception through to product development and dissemination.

It balances public good and commercial outcomes and is now attempting to address real world environment and social problems through its international projects based on remote sensing.