

Remote Sensing of Fires in Australia and First Results of Using MTSAT-1R for Fire Detection in Australia and South-East Asia

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Department of Land Information
Government of Western Australia
Perth



Satellite Remote Sensing Services SRSS

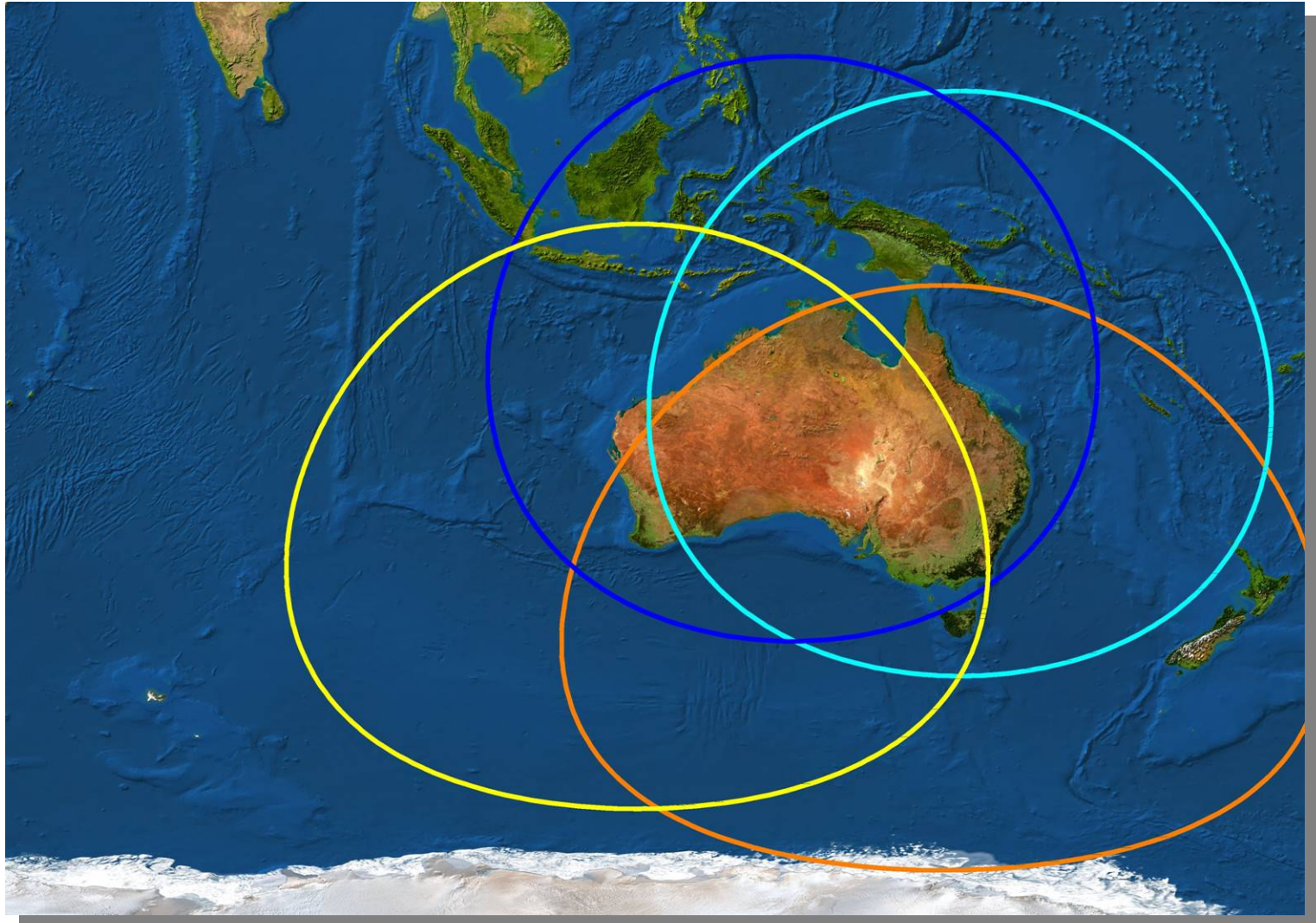
- 26 staff
- operational agency
- application / client driven
- provides RS services for WA government agencies and other customers around Australia
- operates (through WASTAC consortium) two satellite receiving stations in Perth (L-band, X/L-band) for more than 15 years
- gets data from 5 other receiving stations (L- or X-band) around Australia
- runs the FireWatch programme for Australia (firewatch.dli.wa.gov.au)



Satellite Remote Sensing at SRSS for Fire Management

- fire hotspots AVHRR and MODIS (automatic)
- fire hotspots AVHRR (manual)
- burnt area mapping AVHRR (manual, since 1997)
- burnt area mapping MODIS (automatic 250m)
- NDVI, curing index (fuel load estimate, planning of prescribed burning, fire danger rating)
- data delivery through a variety of interfaces

Coverage L-Band Groundstations

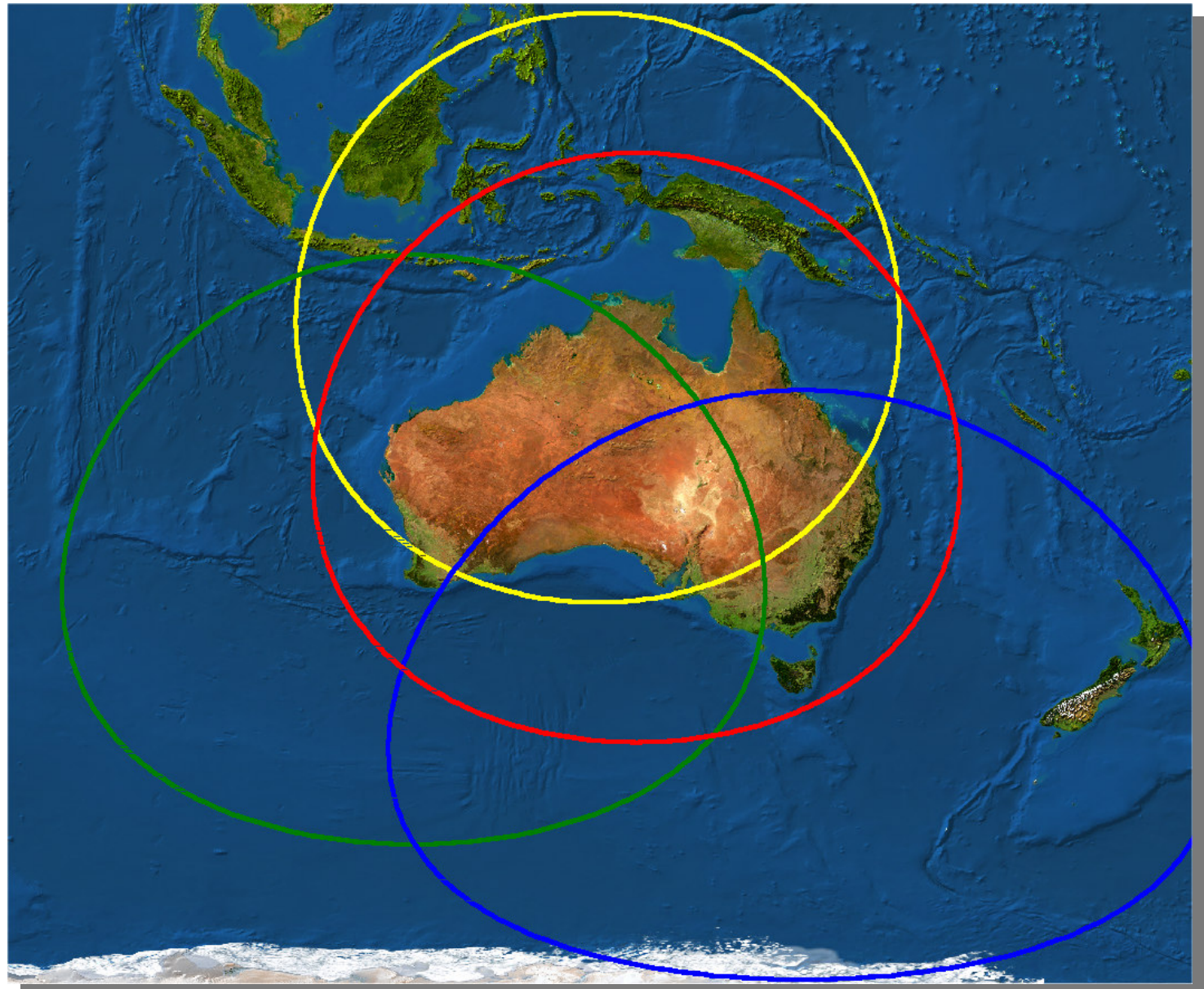


■ Perth ■ Melbourne ■ Townsville ■ Darwin

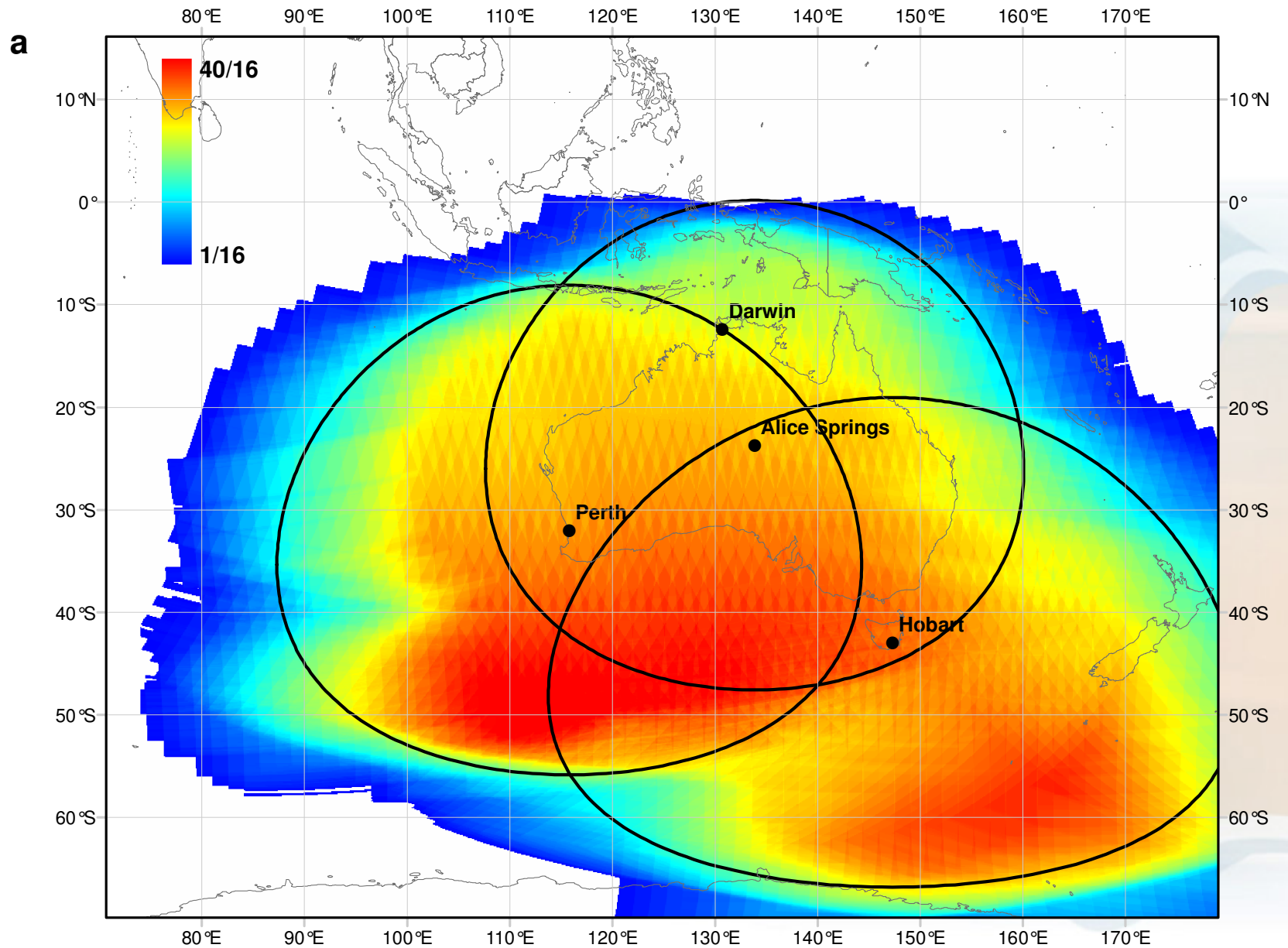


Coverage X-Band Groundstations

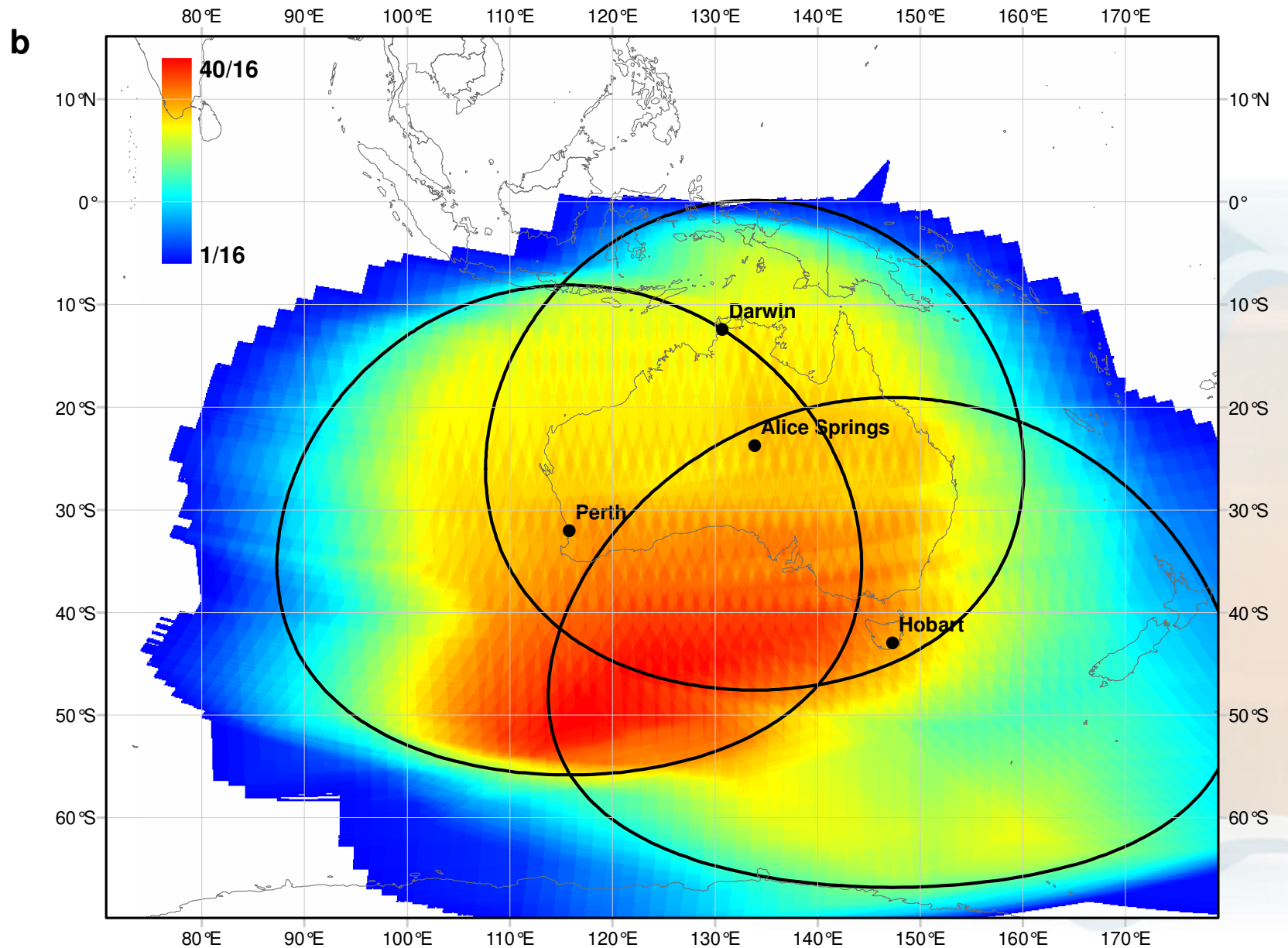
- Perth
- Alice Springs
- Hobart
- Darwin (June 07)



Observation Frequency MODIS (Day-Time)



Observation Frequency MODIS (Night-Time)



Delivery System

interactive web mapping pages

WMS

KML

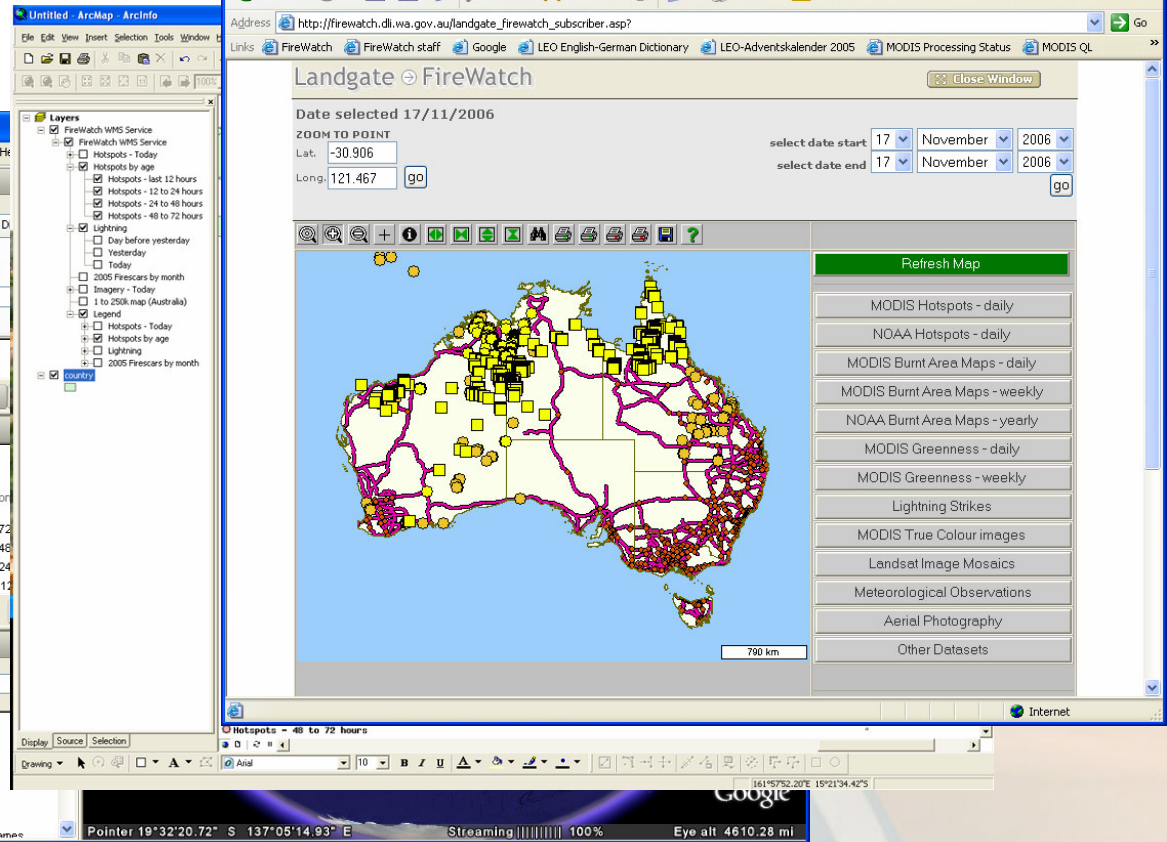
email

FAX

ftp



maier@l
Connecte
220 sun
Name (s
331 Gue
Passwor
230 Gue
ftp> ls
200 POR
150 ASC
total 1
lrwxrwx
dr-xr-x
dr-xr-x
drwxr-x
drwxr-x
226 ASC
ftp> cd
250 CWD
ftp> ls
200 POR
150 ASC
total 2
drwxrwx
drwxrwx
drwxrwx
drwxrwx-x 2 101 10 1536 Feb 15 2005 dpif
drwxrwx-x 7 0 1 1024 May 5 2006 incoming
drwxrwx-x 29 0 11 1024 Apr 12 2006 outgoing
226 ASCII Transfer complete.
ftp>

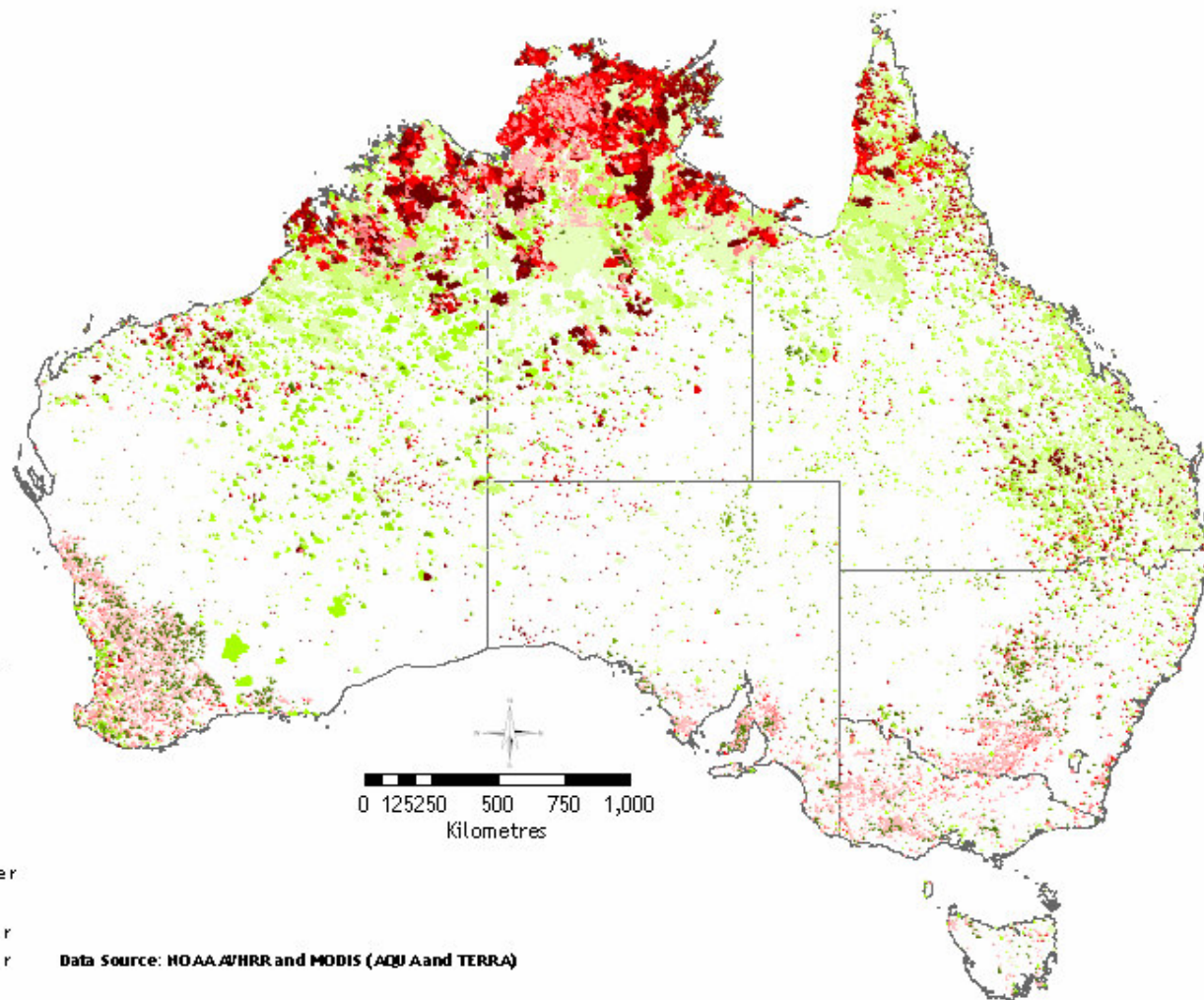


AUSTRALIA FIRE HOTSPOTS 2004

Legend

Month

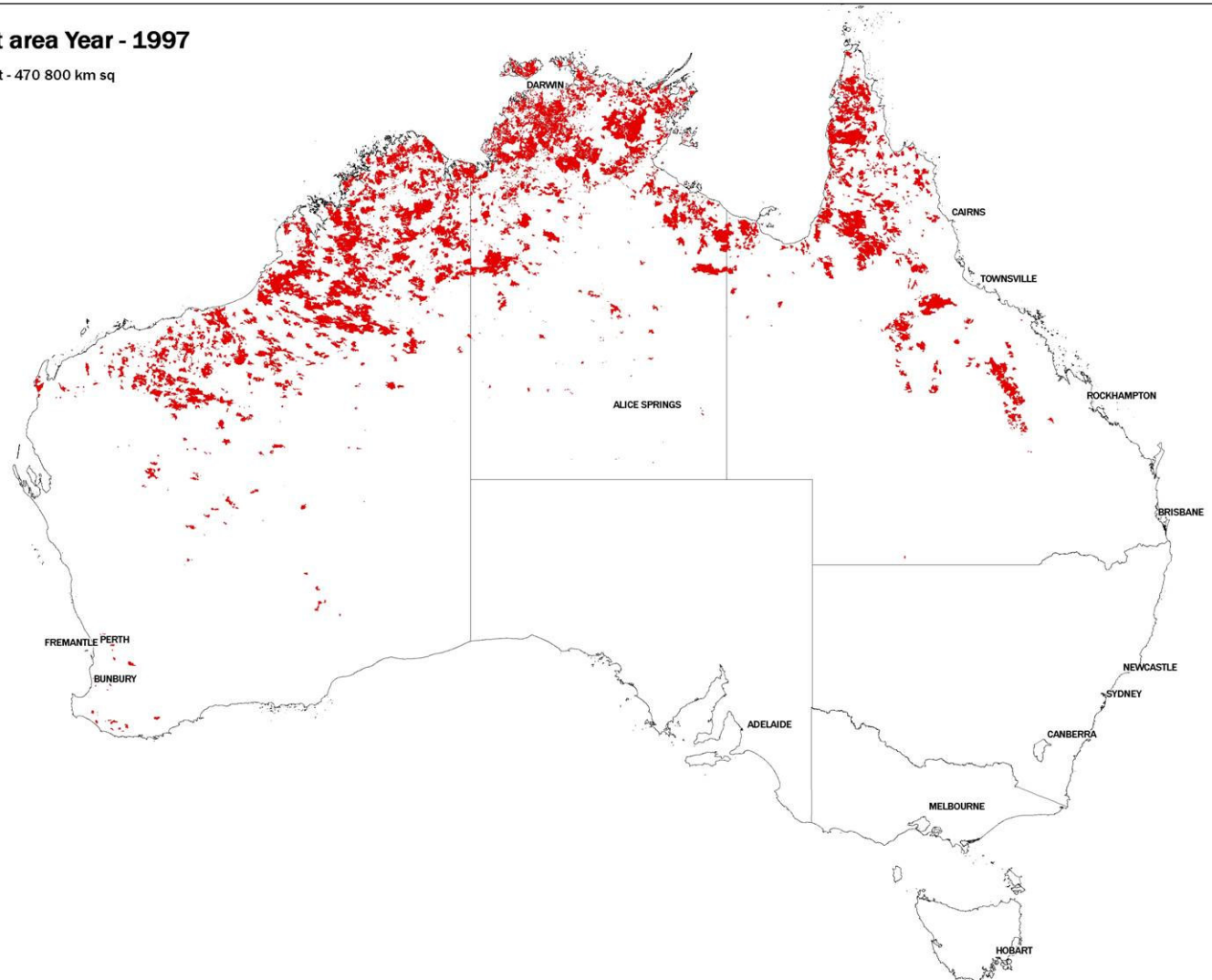
- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December



Burnt Area Mapping

Fire burnt area Year - 1997

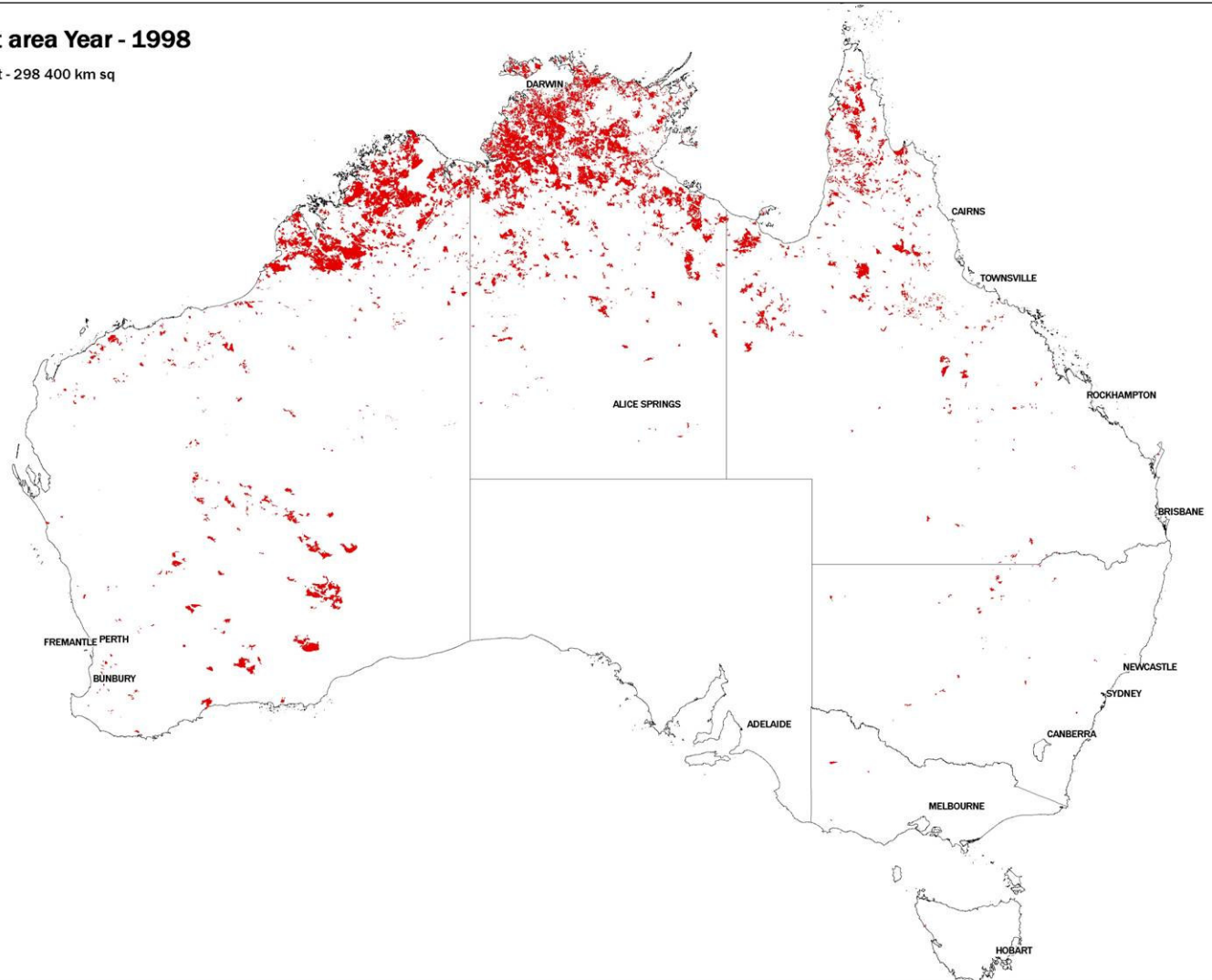
Total Area Burnt - 470 800 km sq



Burnt Area Mapping

Fire burnt area Year - 1998

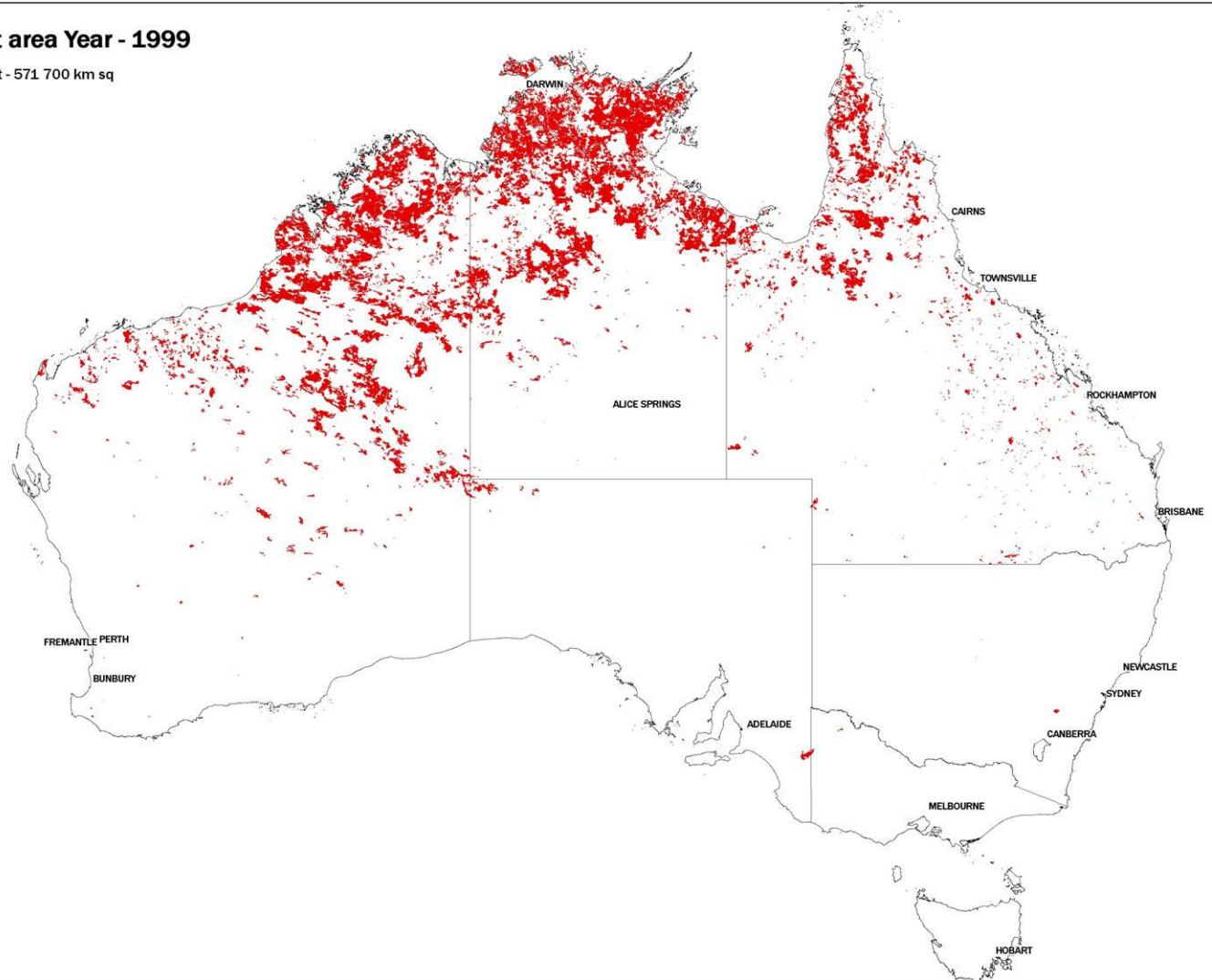
Total Area Burnt - 298 400 km sq



Burnt Area Mapping

Fire burnt area Year - 1999

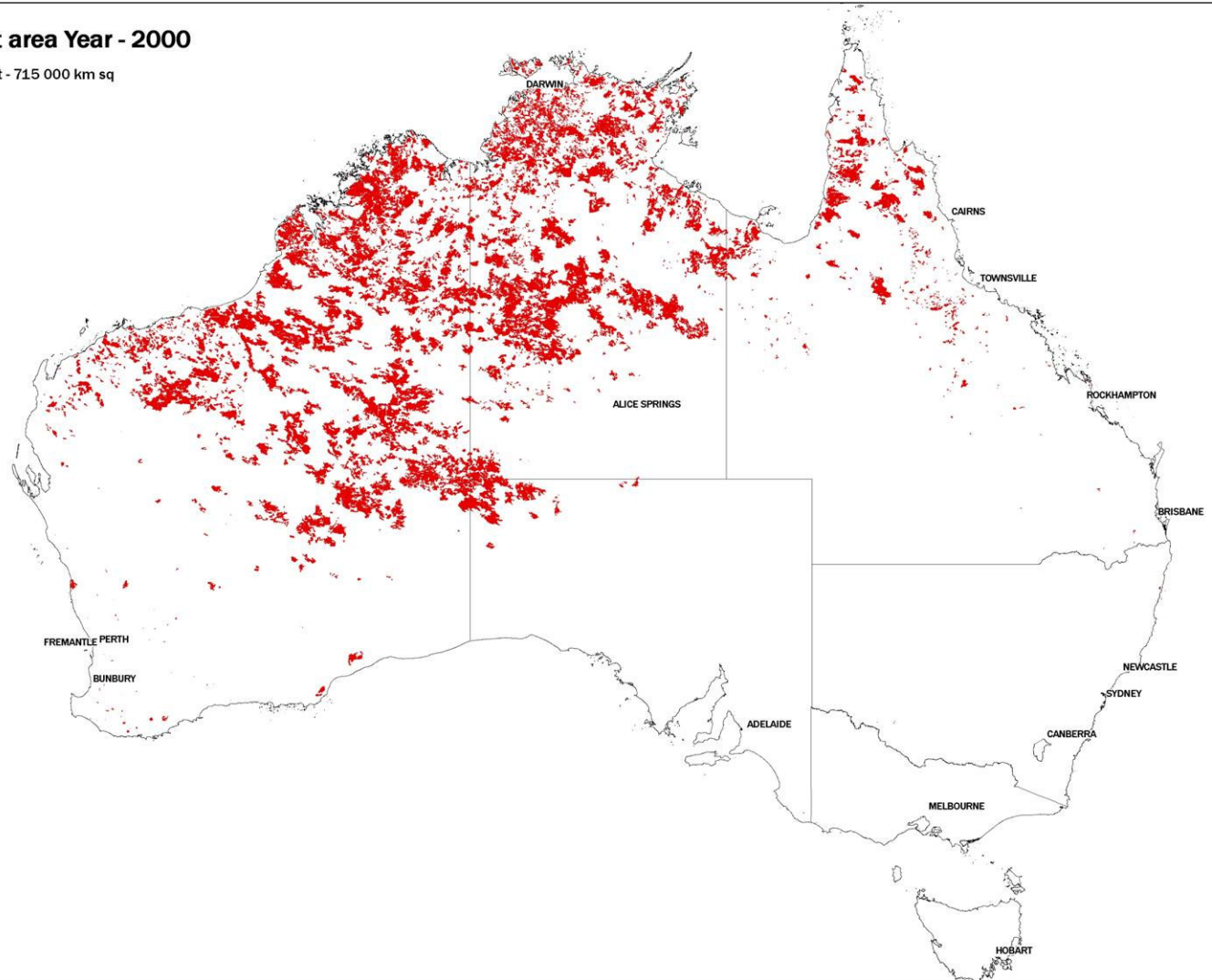
Total Area Burnt - 571 700 km sq



Burnt Area Mapping

Fire burnt area Year - 2000

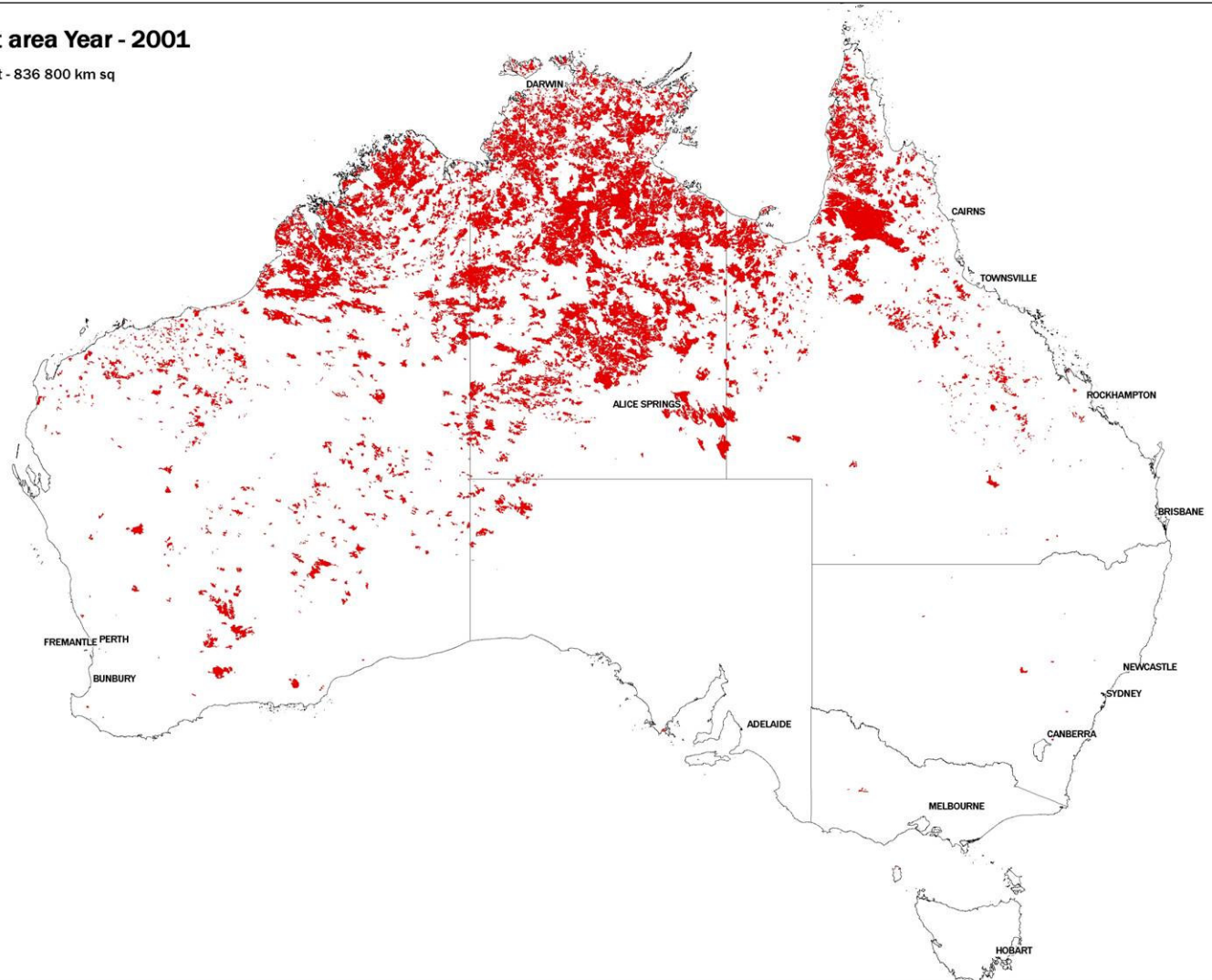
Total Area Burnt - 715 000 km sq



Burnt Area Mapping

Fire burnt area Year - 2001

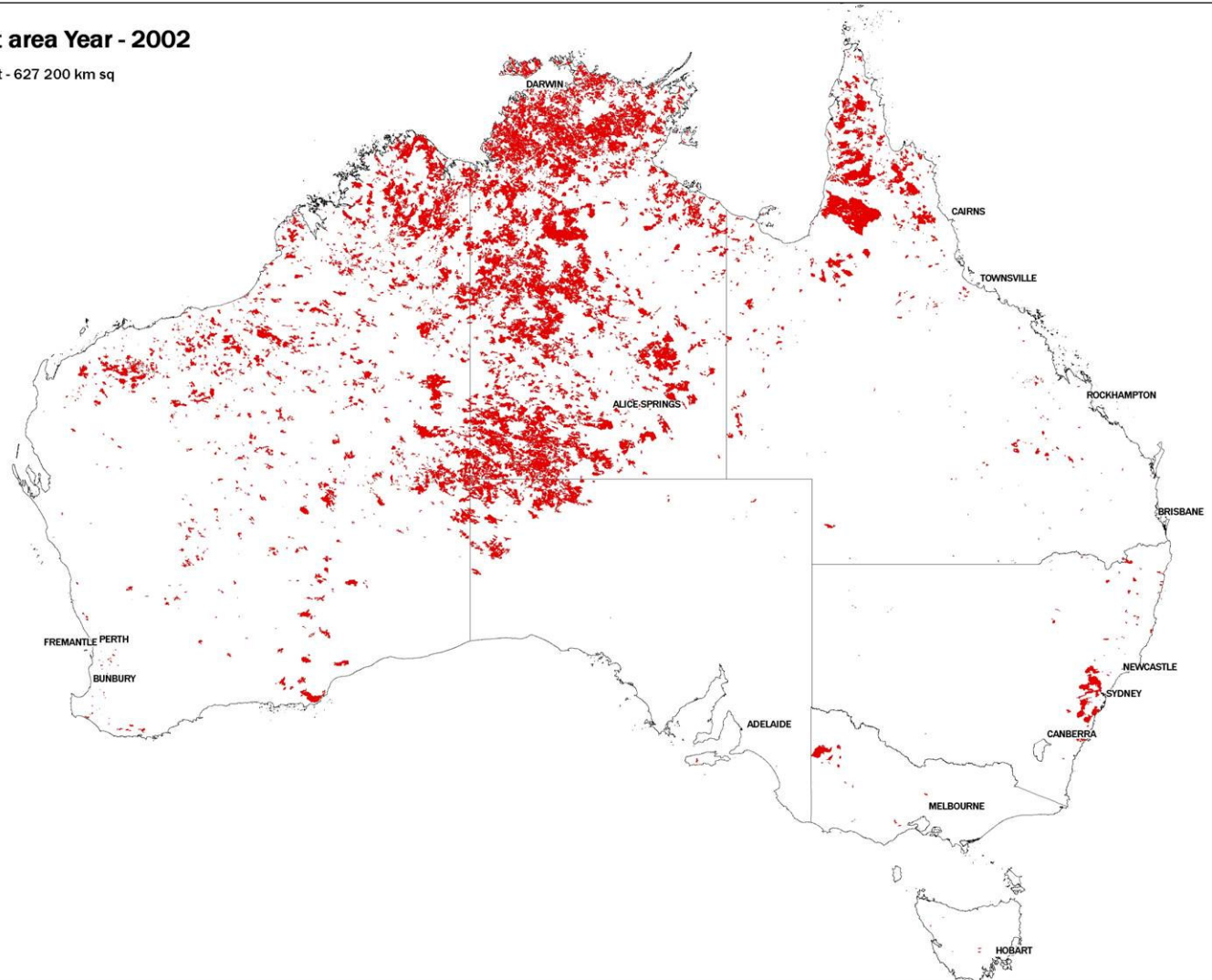
Total Area Burnt - 836 800 km sq



Burnt Area Mapping

Fire burnt area Year - 2002

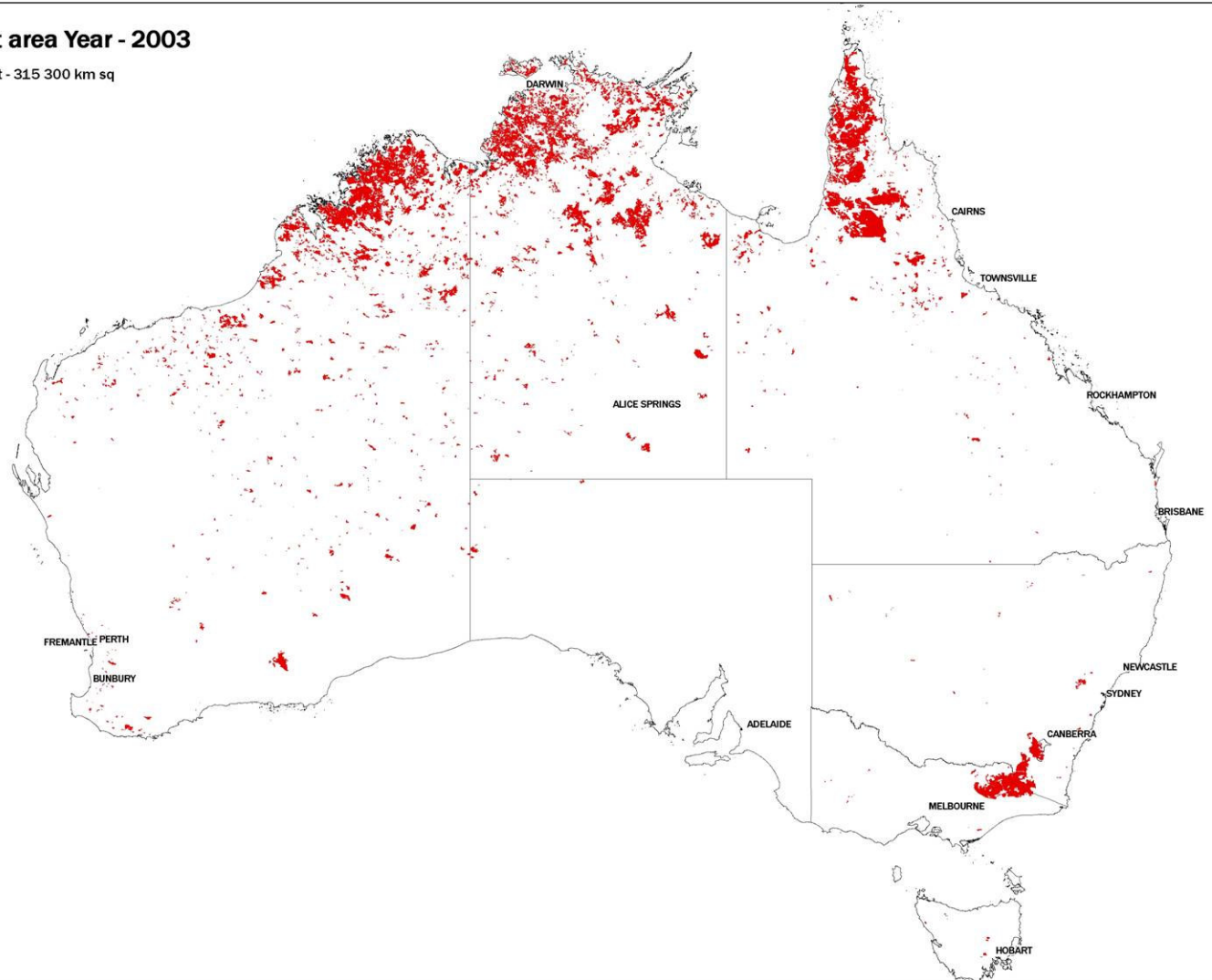
Total Area Burnt - 627 200 km sq



Burnt Area Mapping

Fire burnt area Year - 2003

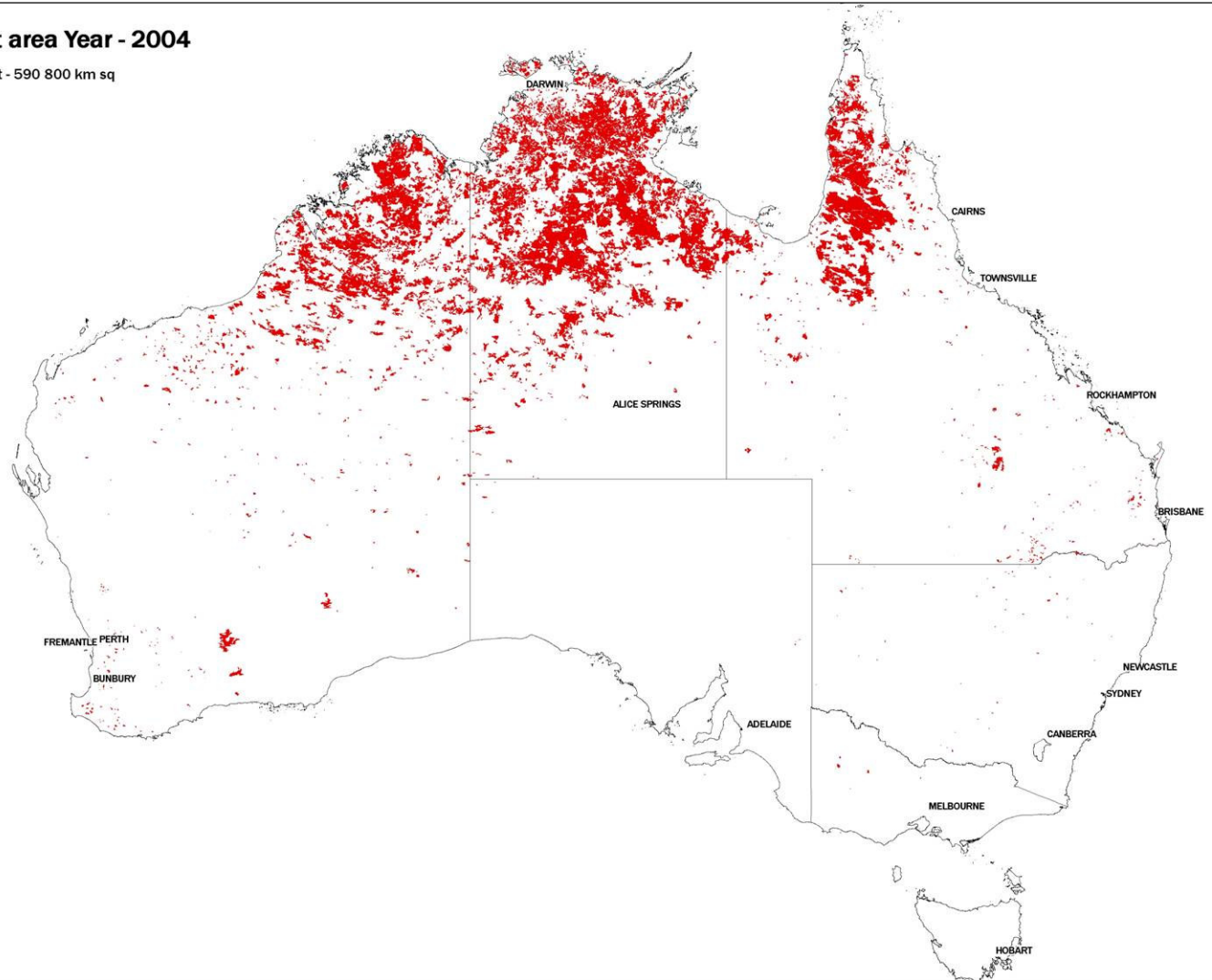
Total Area Burnt - 315 300 km sq



Burnt Area Mapping

Fire burnt area Year - 2004

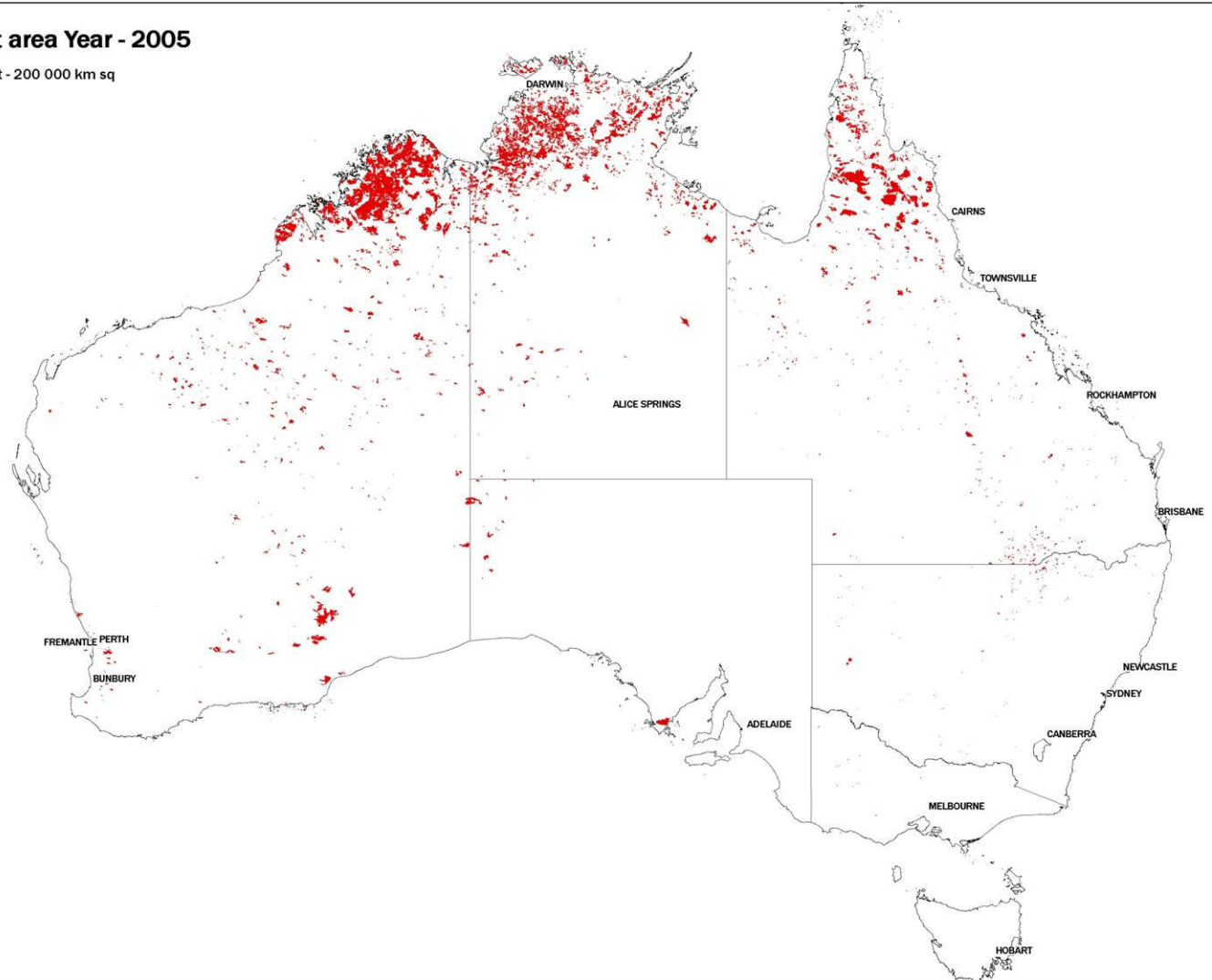
Total Area Burnt - 590 800 km sq



Burnt Area Mapping

Fire burnt area Year - 2005

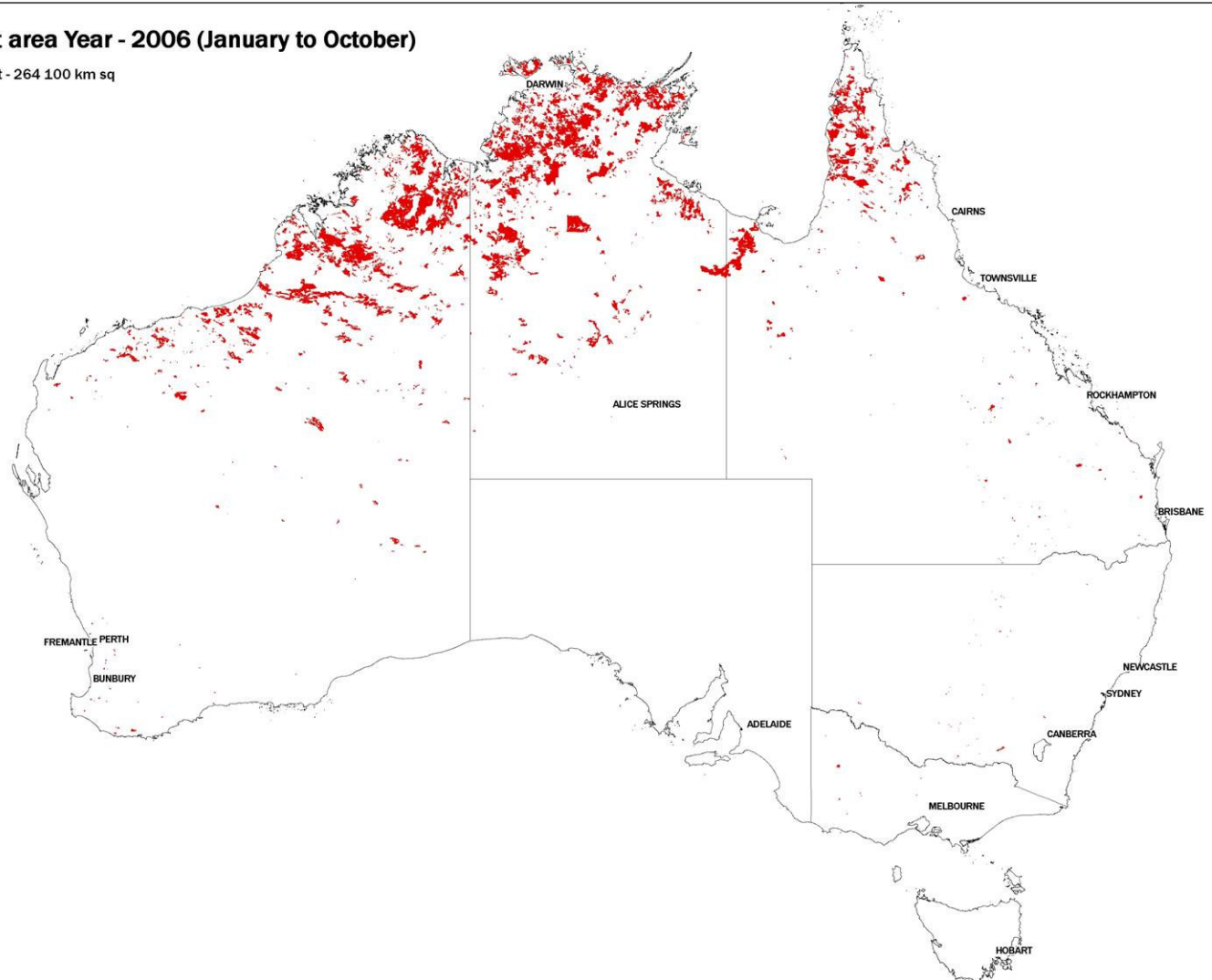
Total Area Burnt - 200 000 km sq



Burnt Area Mapping

Fire burnt area Year - 2006 (January to October)

Total Area Burnt - 264 100 km sq

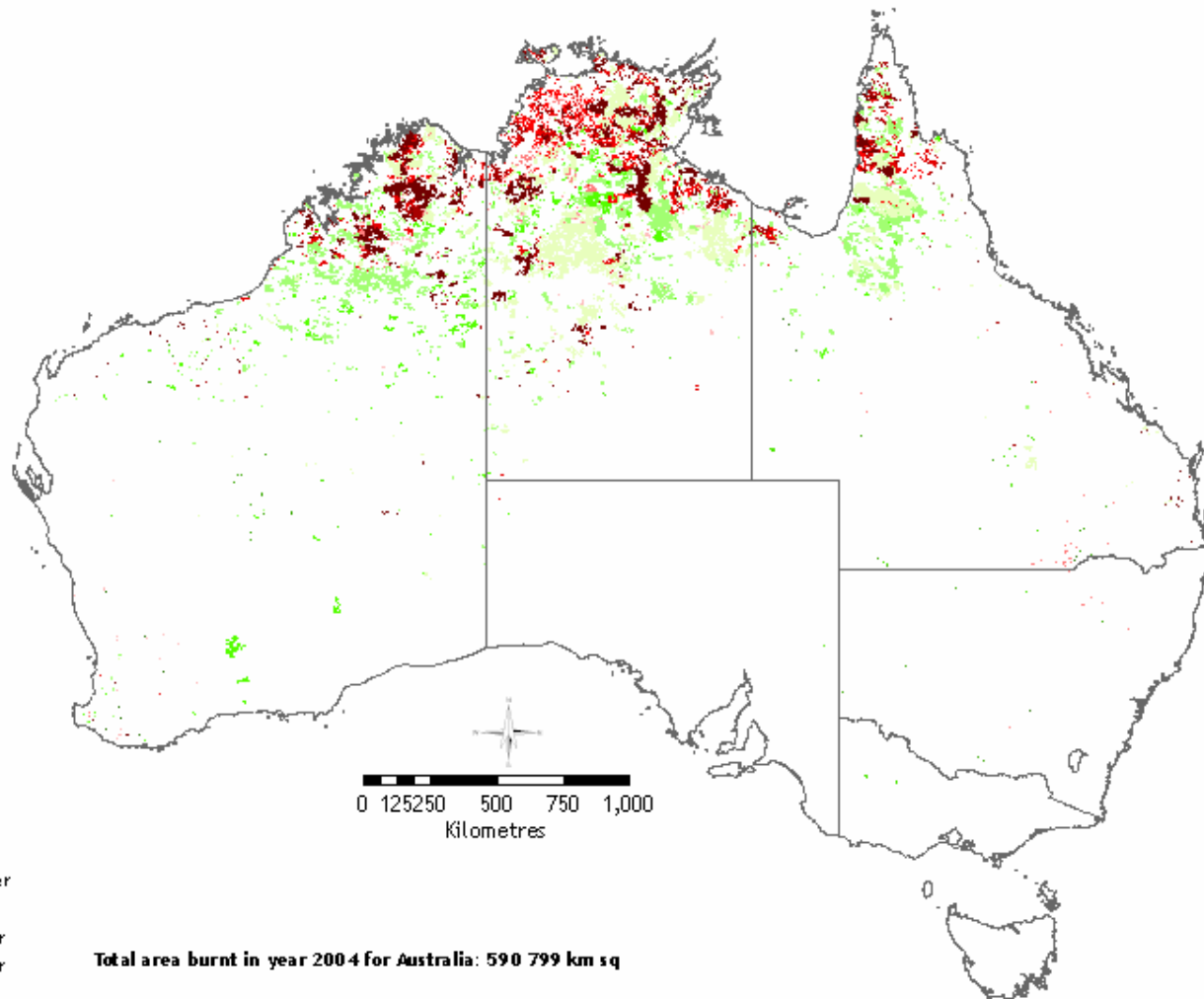


AUSTRALIA FIRE BURNT AREAS 2004

Legend

Month

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

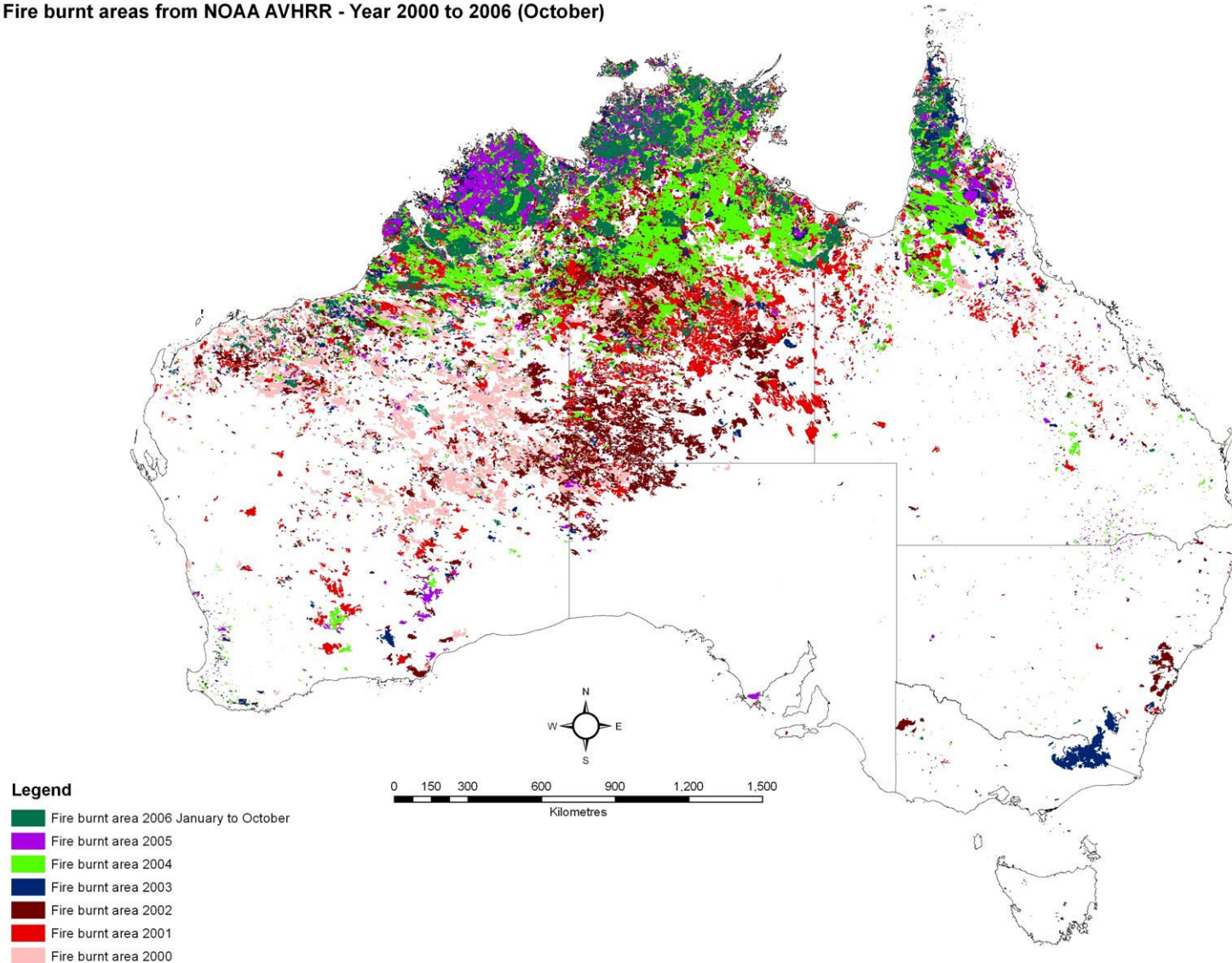


Total area burnt in year 2004 for Australia: 590 799 km sq

Burnt Area Mapping

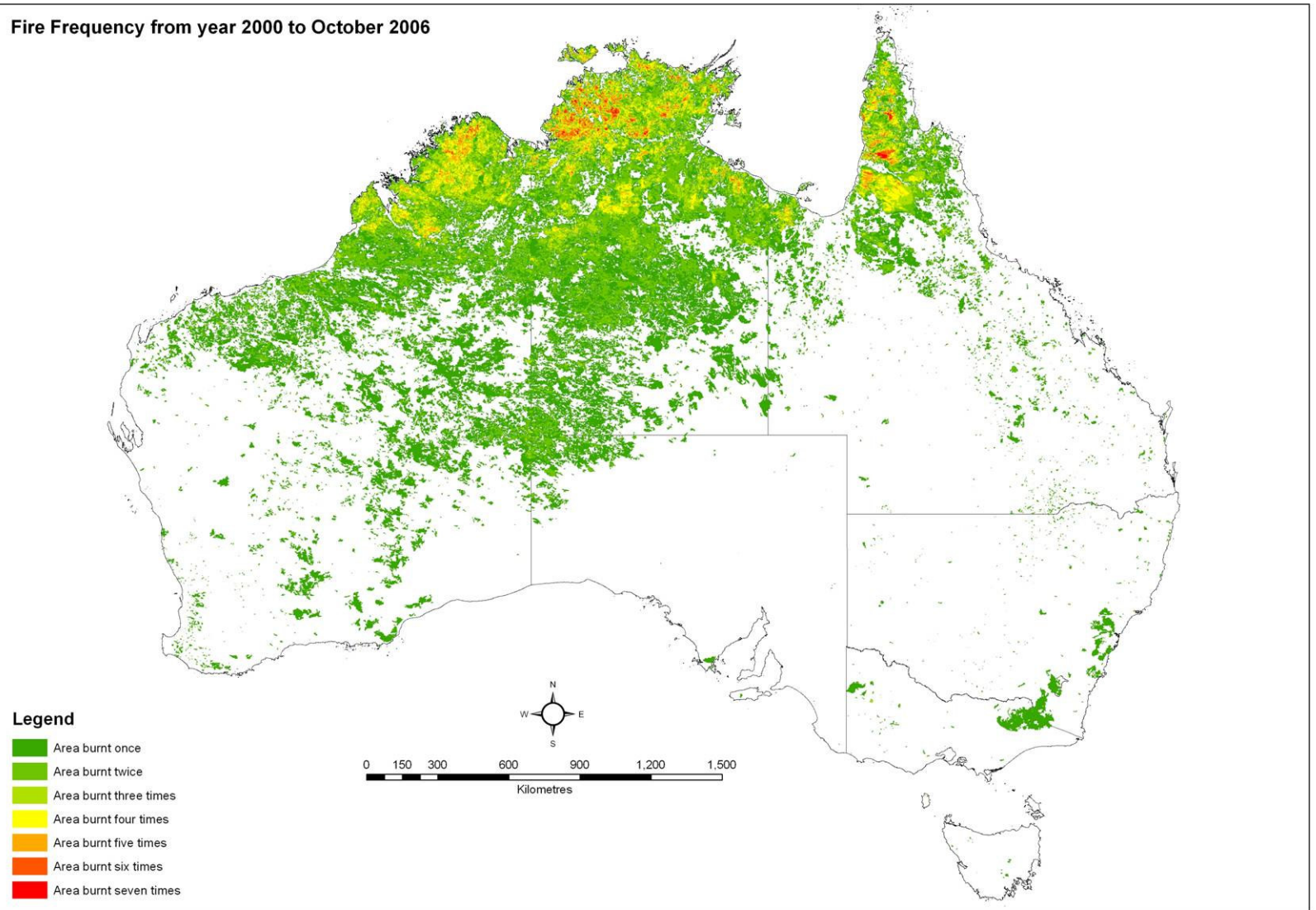
200 000-
850 000km²
every year

Fire burnt areas from NOAA AVHRR - Year 2000 to 2006 (October)



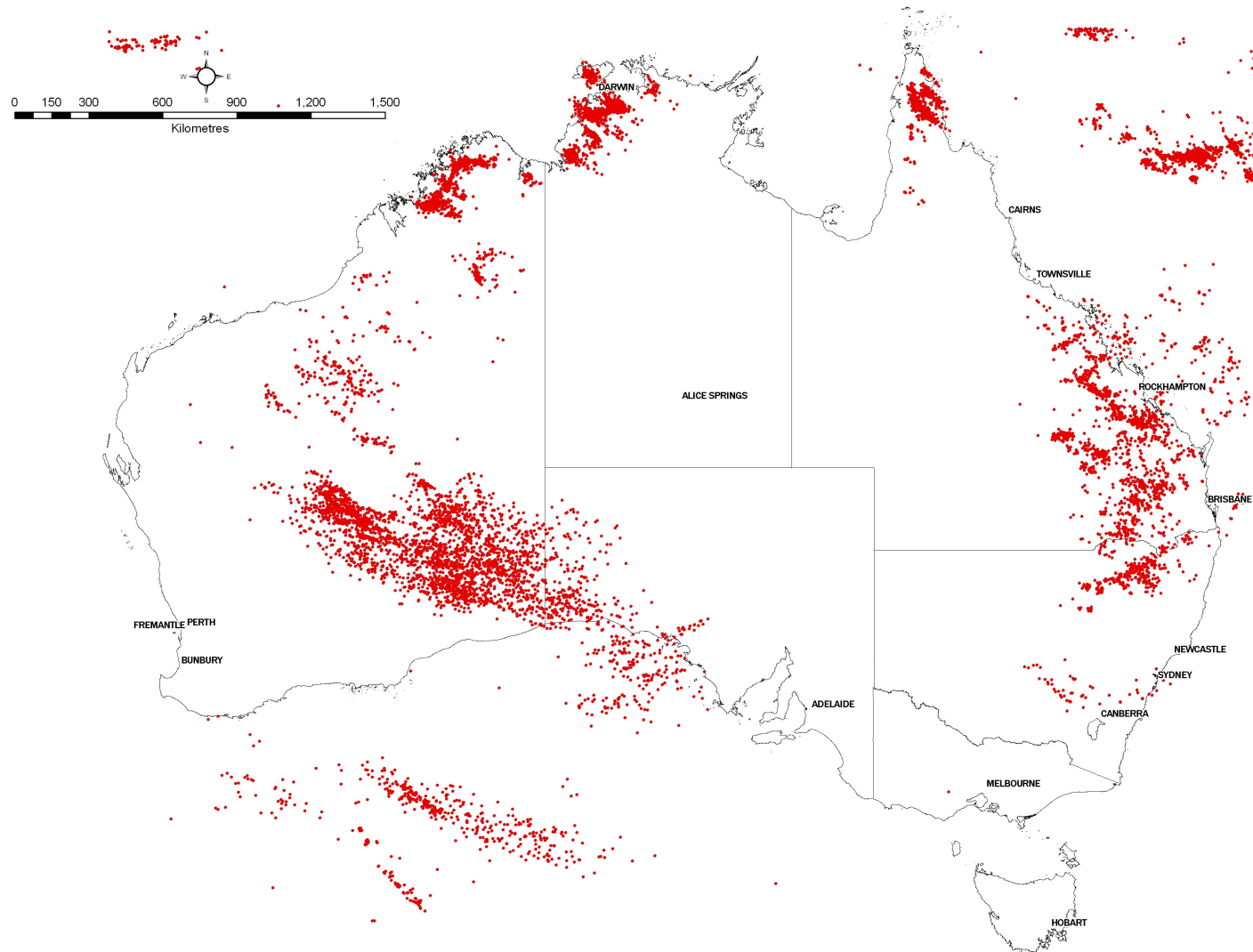
Fire Frequency

Fire Frequency from year 2000 to October 2006



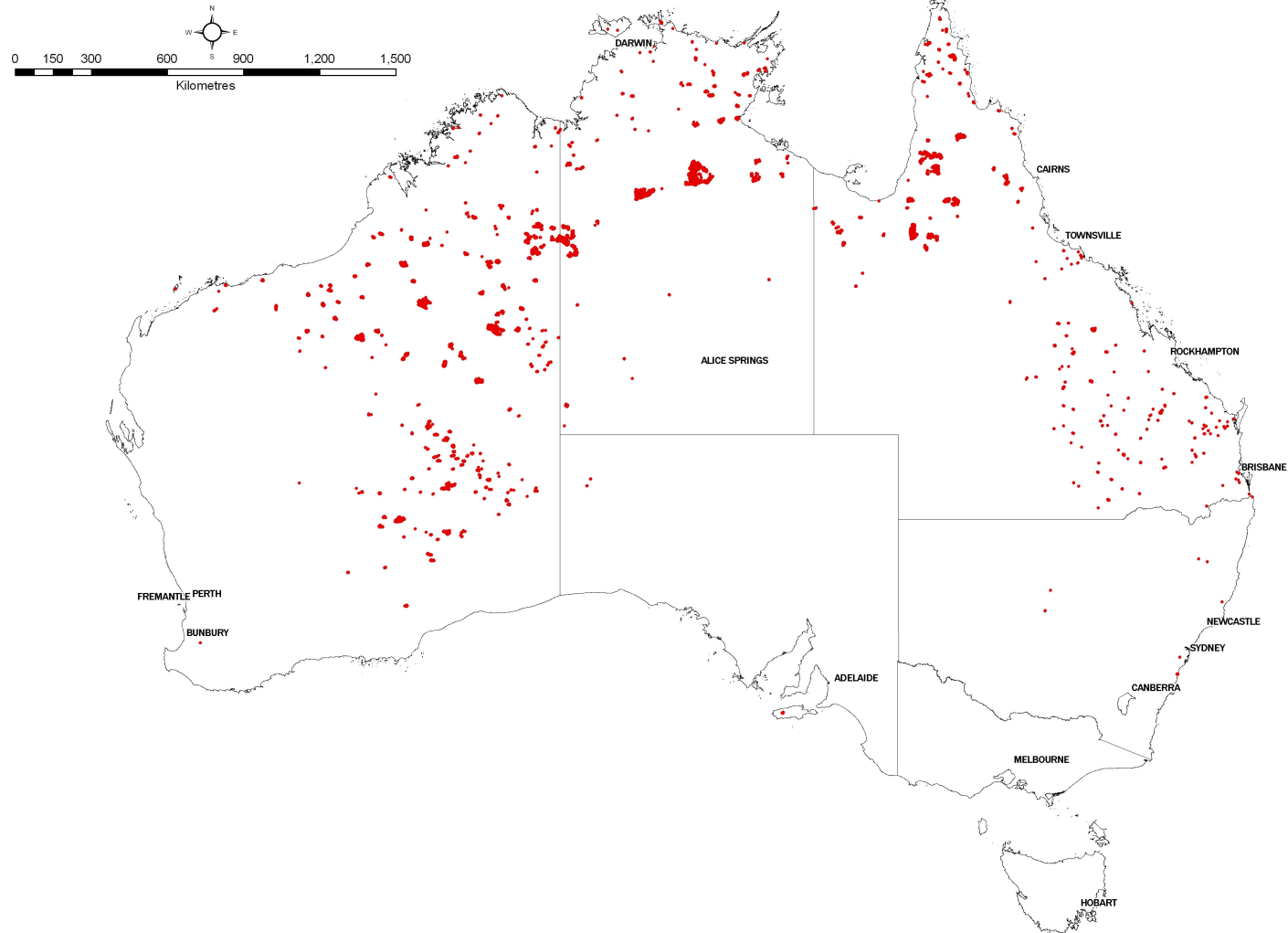
Fire Hotspots and Lightning

Lightning data on the 9th and 10th November 2006

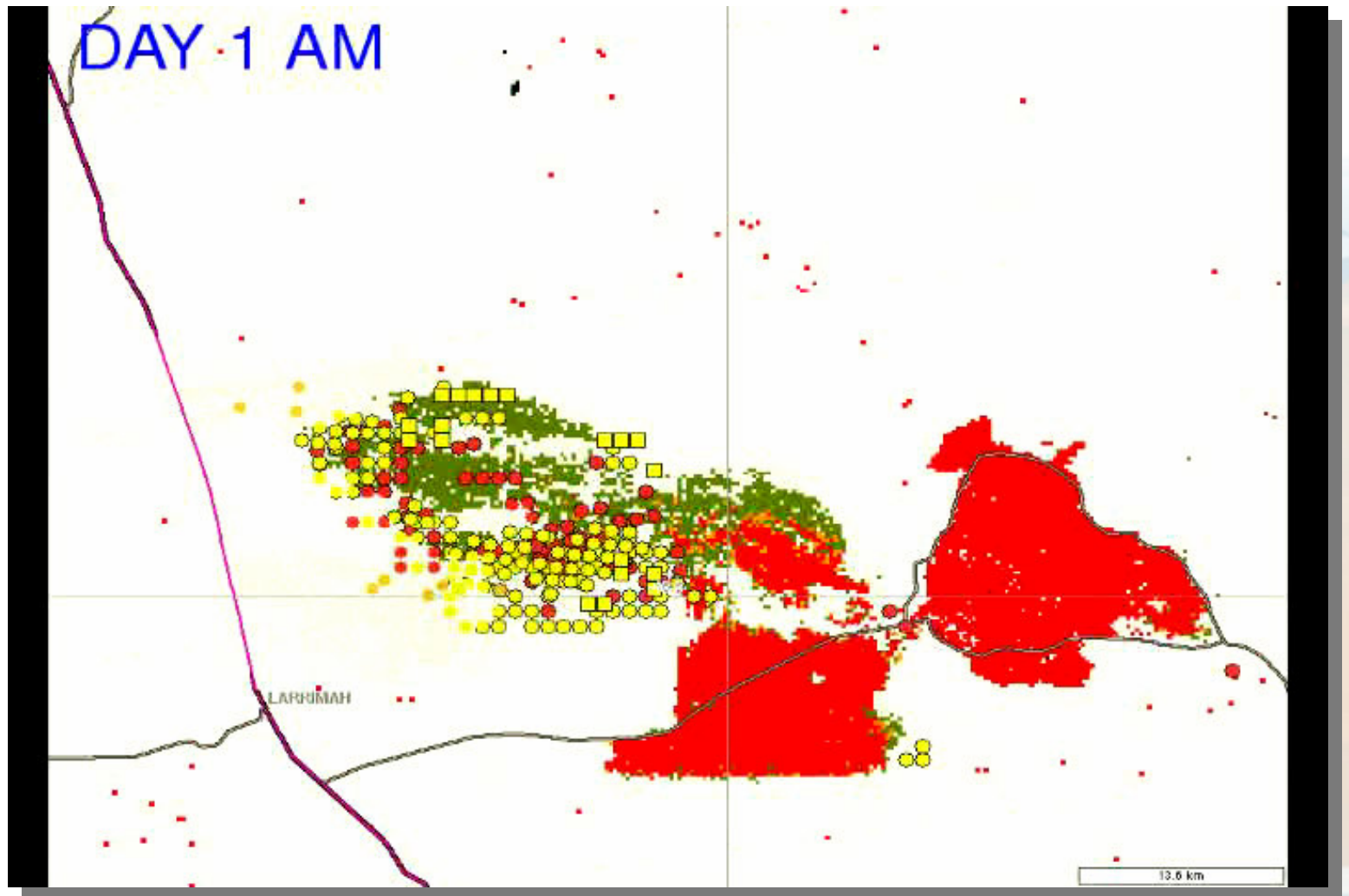
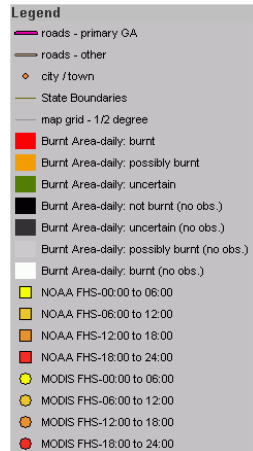


Fire Hotspots and Lightning

Fire hotspots (MODIS - Aqua and Terra and NOAA AVHRR satellites) on the 10th and 11th November 2006



Near Real-Time Burnt Area + Fire Hotspots





The Kimberley Fire Season 2005

Daily Fire Hotspots from AVHRR and MODIS
Accumulated Daily Burnt Area Maps from MODIS

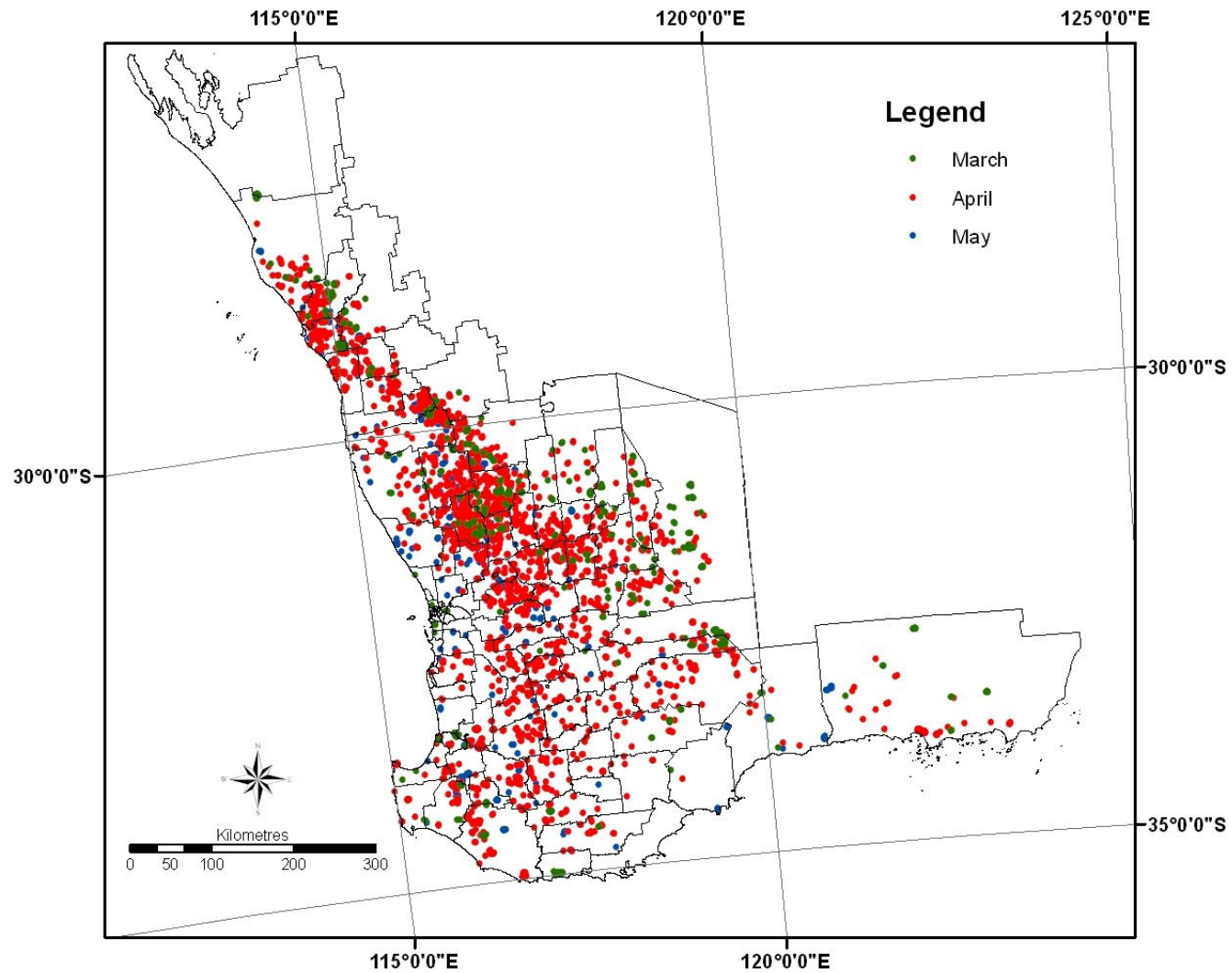
This work has been supported by the Natural Disaster Mitigation Programme
of the Australian Government Department of Transport and Regional Services

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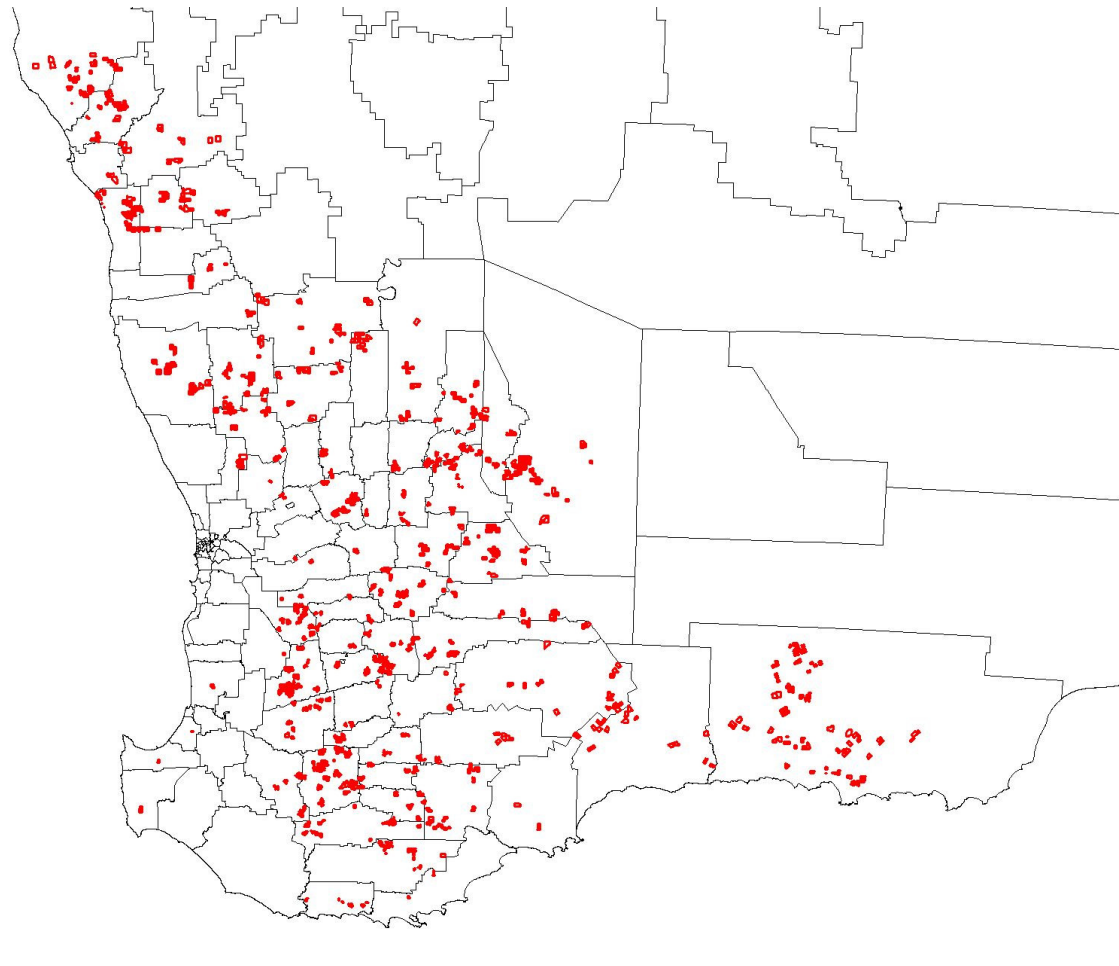
FIREFWATCH

<http://firewatch.dli.wa.gov.au>

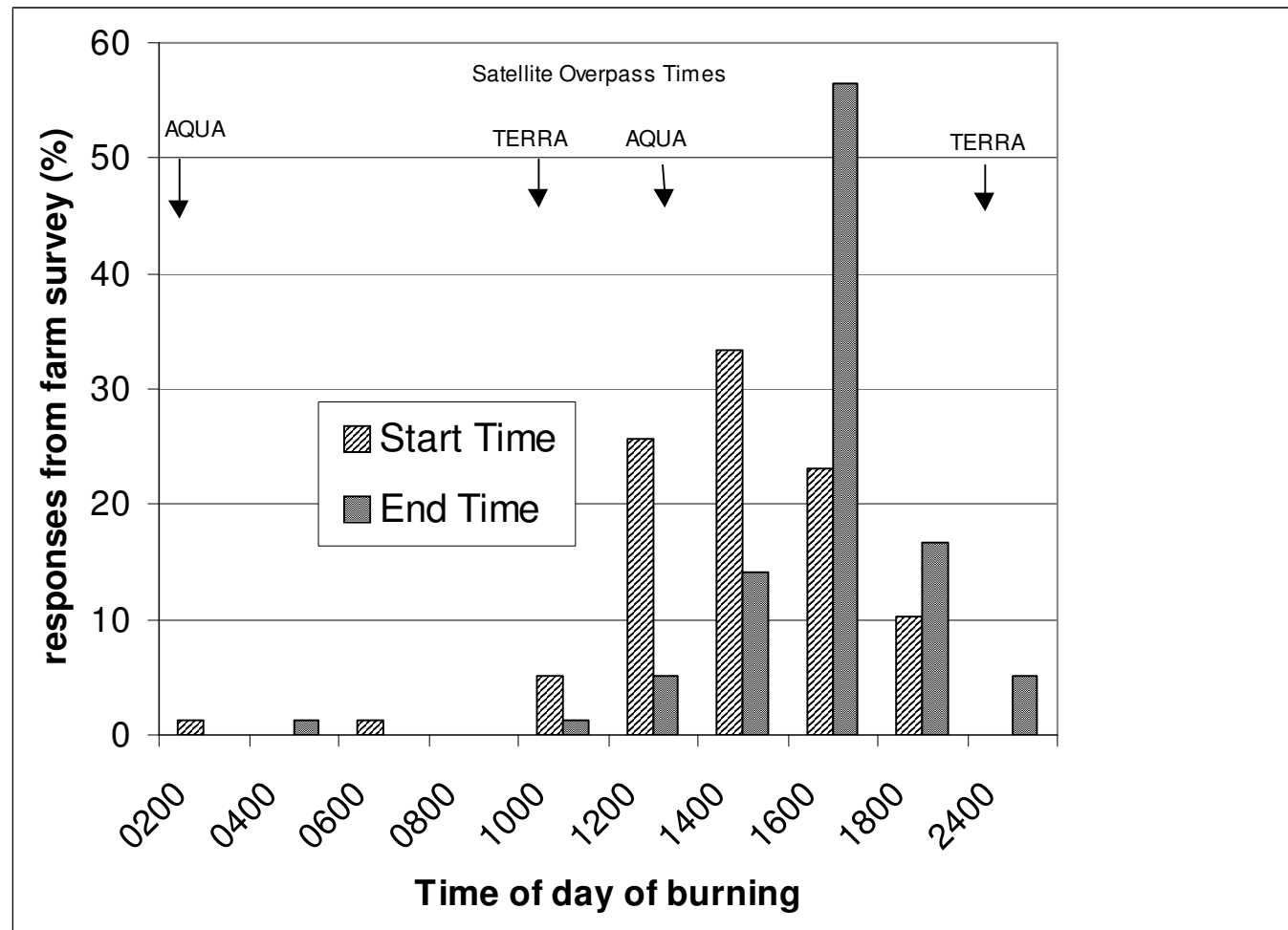
Stubble Burning (FHS Detected)



Stubble Burning (Farm Survey)



Stubble Burning (Farm Survey)



- 13% of reported fires have been detected



Geo-Location Accuracy FHS

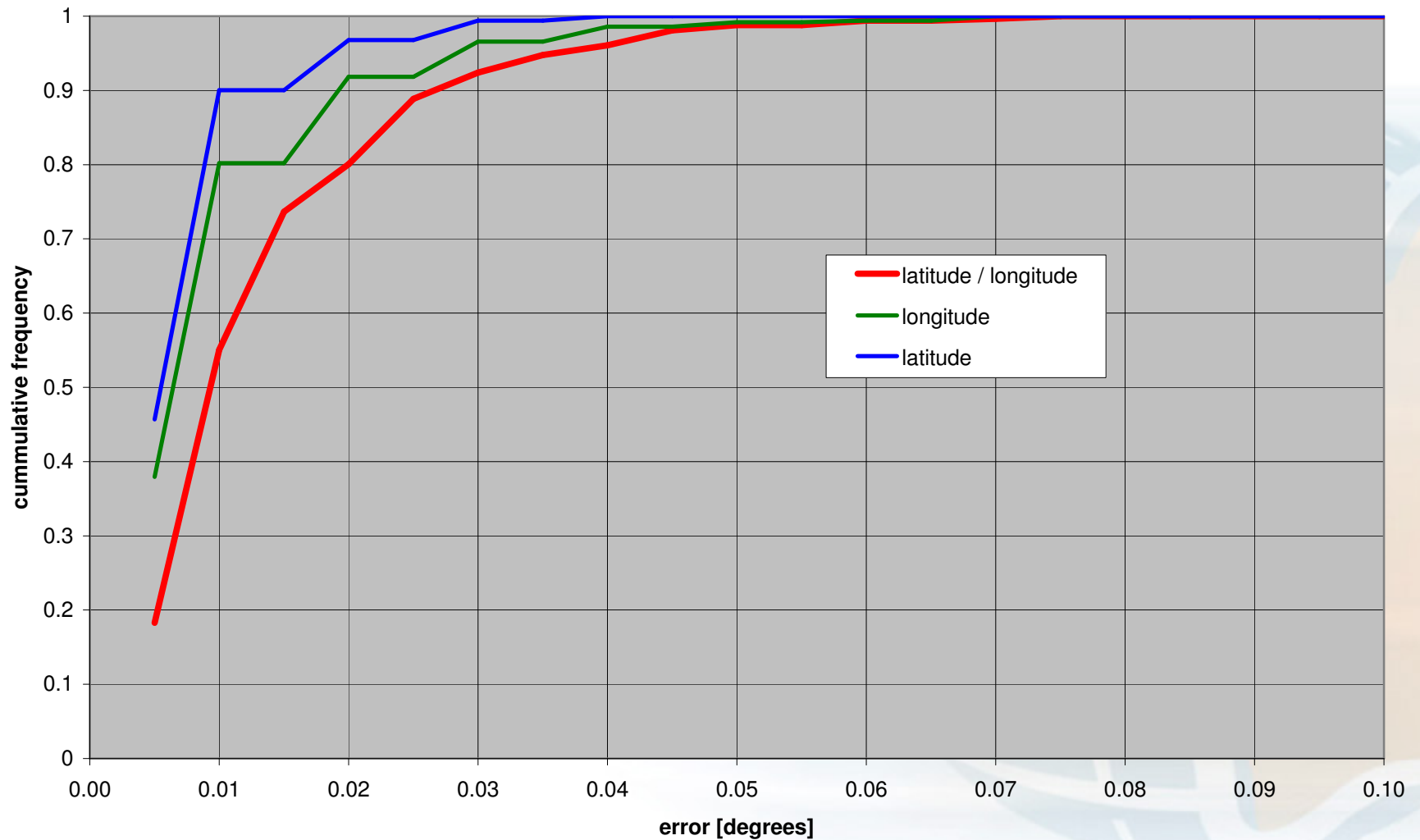
→ Kalgoorlie Nickel Smelter



Geo-Location Accuracy FHS

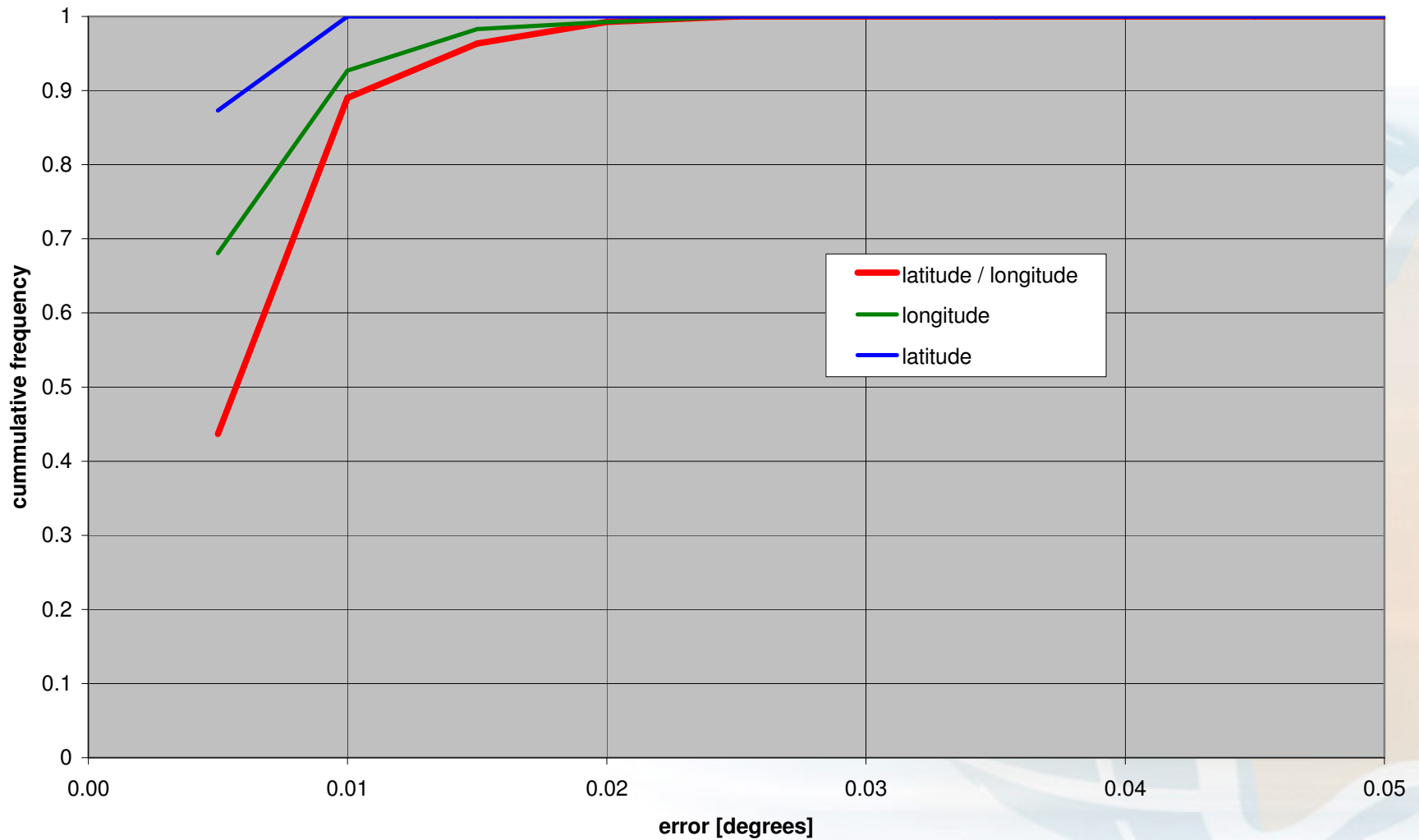
FHS geolocation error AVHRR (night)

06/2005 - 05/2006 definitive FHS Kalgoorlie smelter (No. of FHS 823)



Geo-Location Accuracy FHS

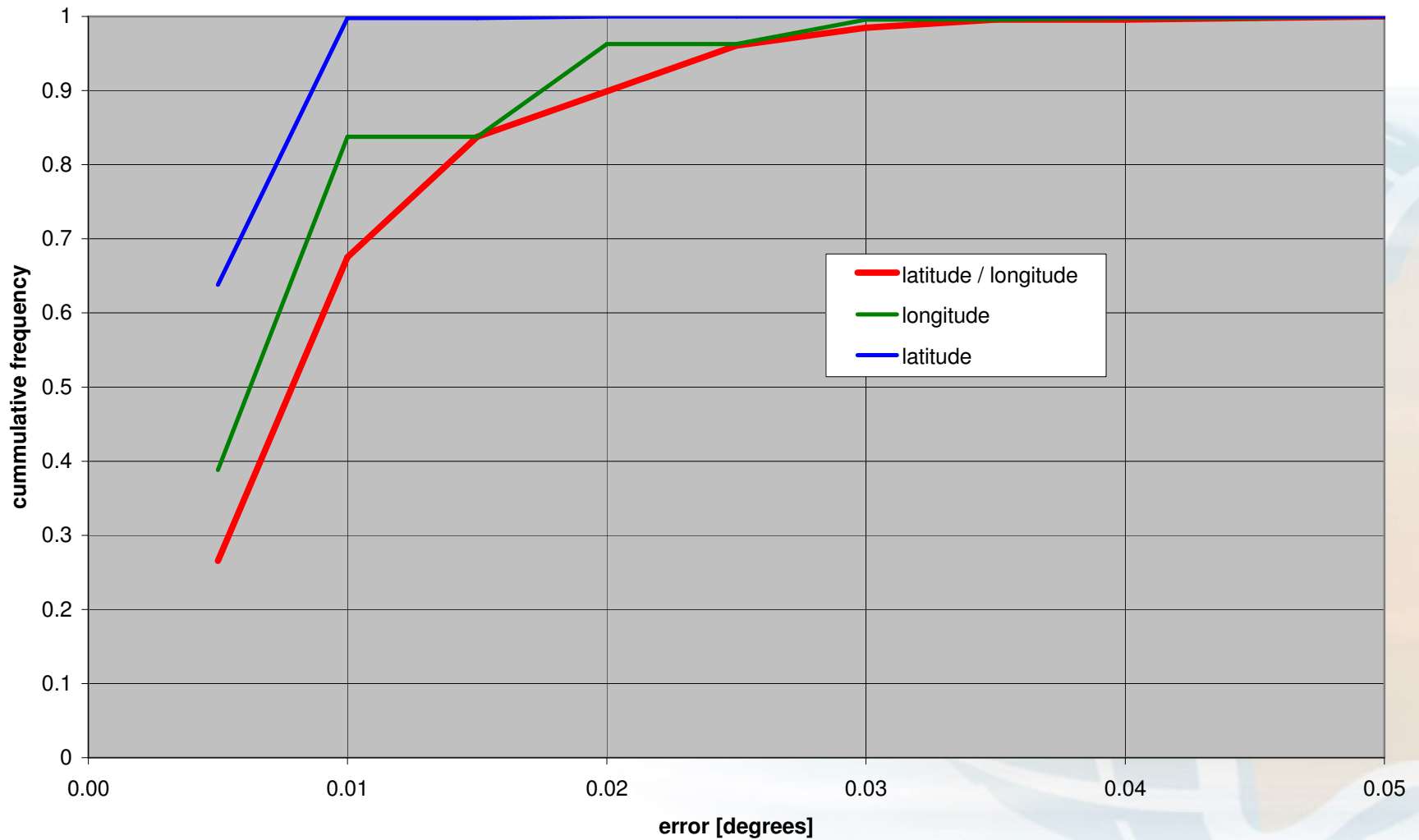
FHS geolocation error MODIS MOD14 (day & night)
01/2005 - 12/2005 Terra & Aqua FHS Kalgoorlie smelter (No. of FHS 410)



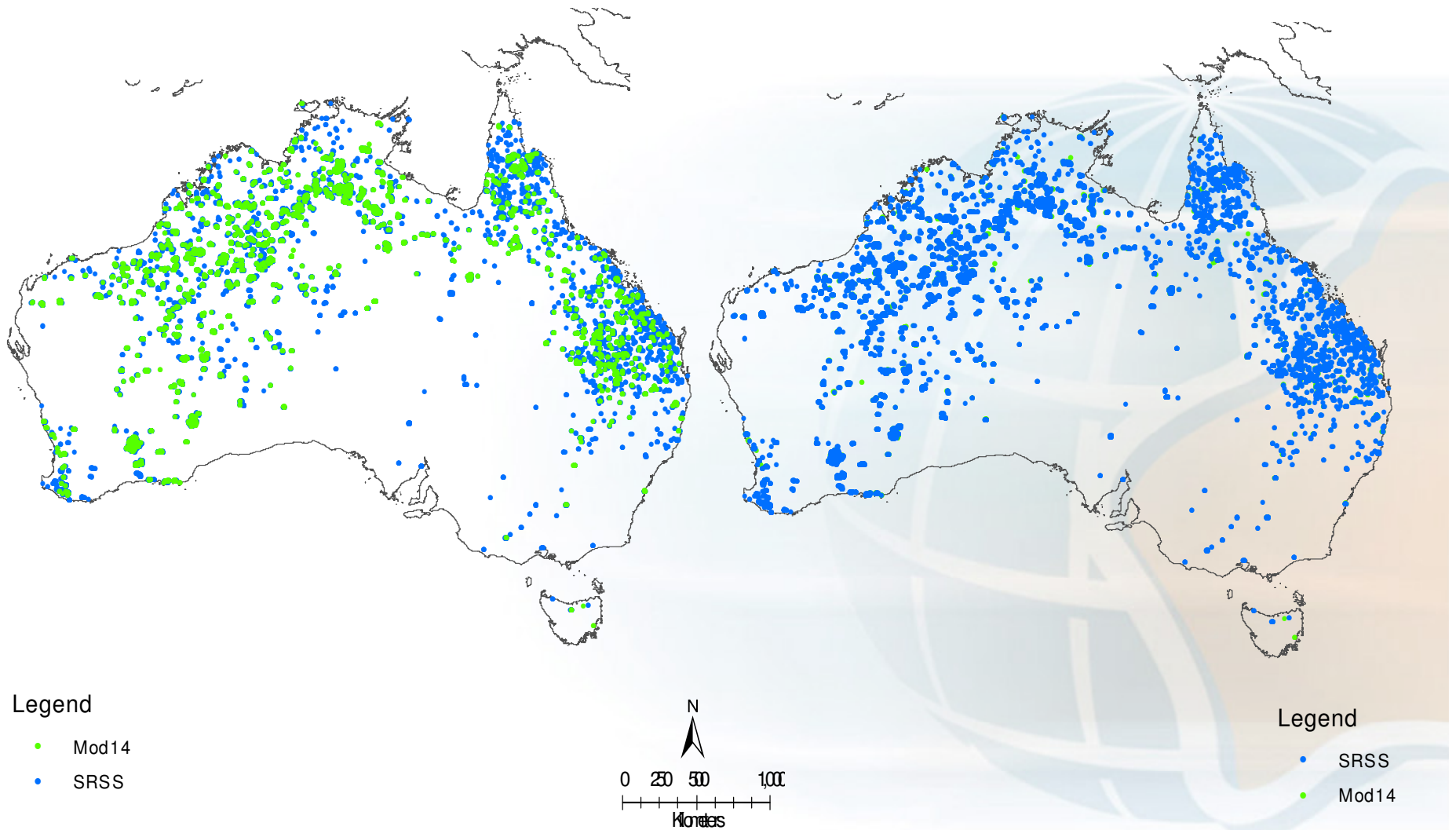
Geo-Location Accuracy FHS

FHS geolocation error MODIS SRSS algorithm (night)

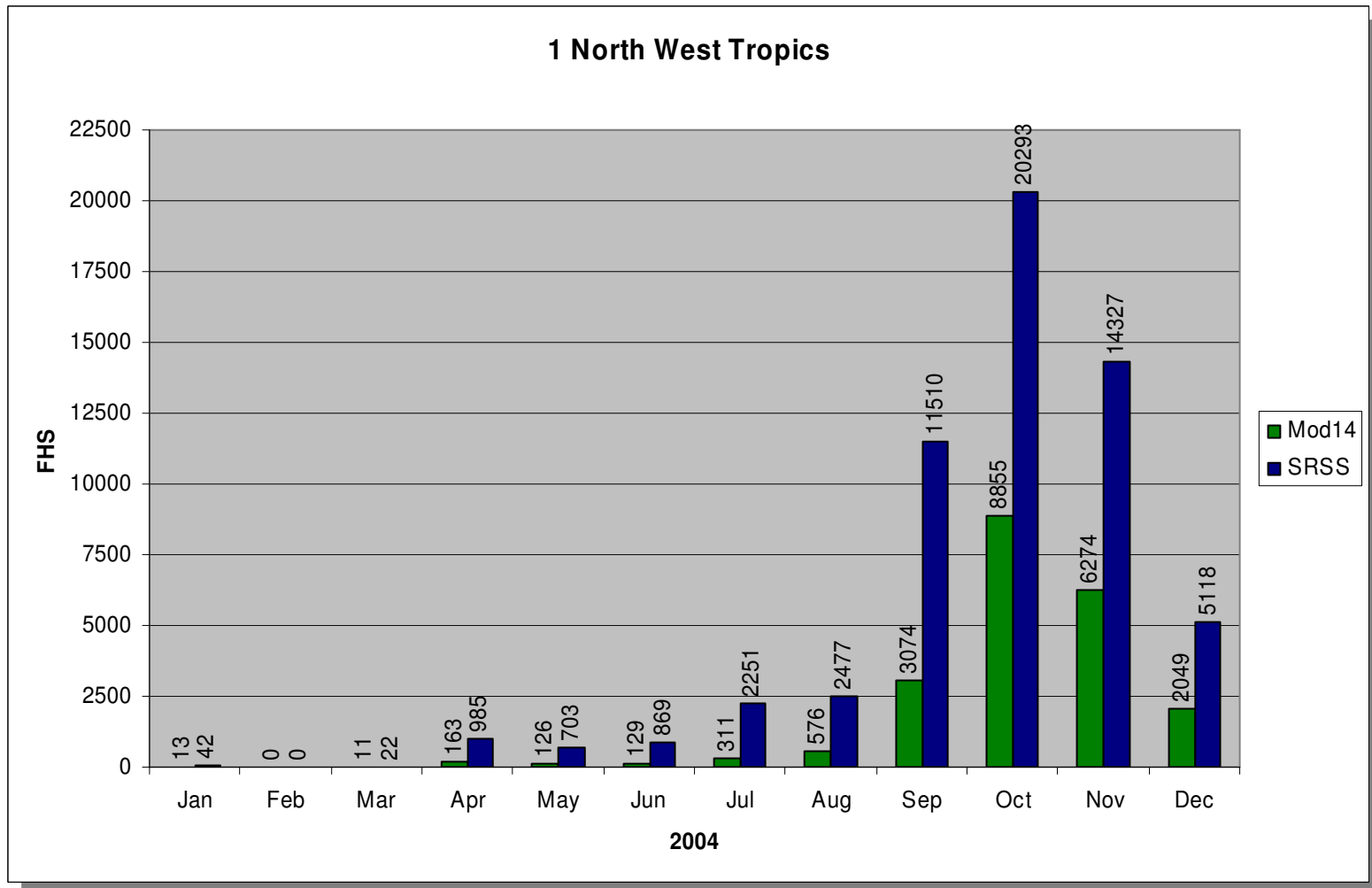
03/2005, 09/2005 - 12/2005 Terra & Aqua FHS Kalgoorlie smelter (No. of FHS 456)



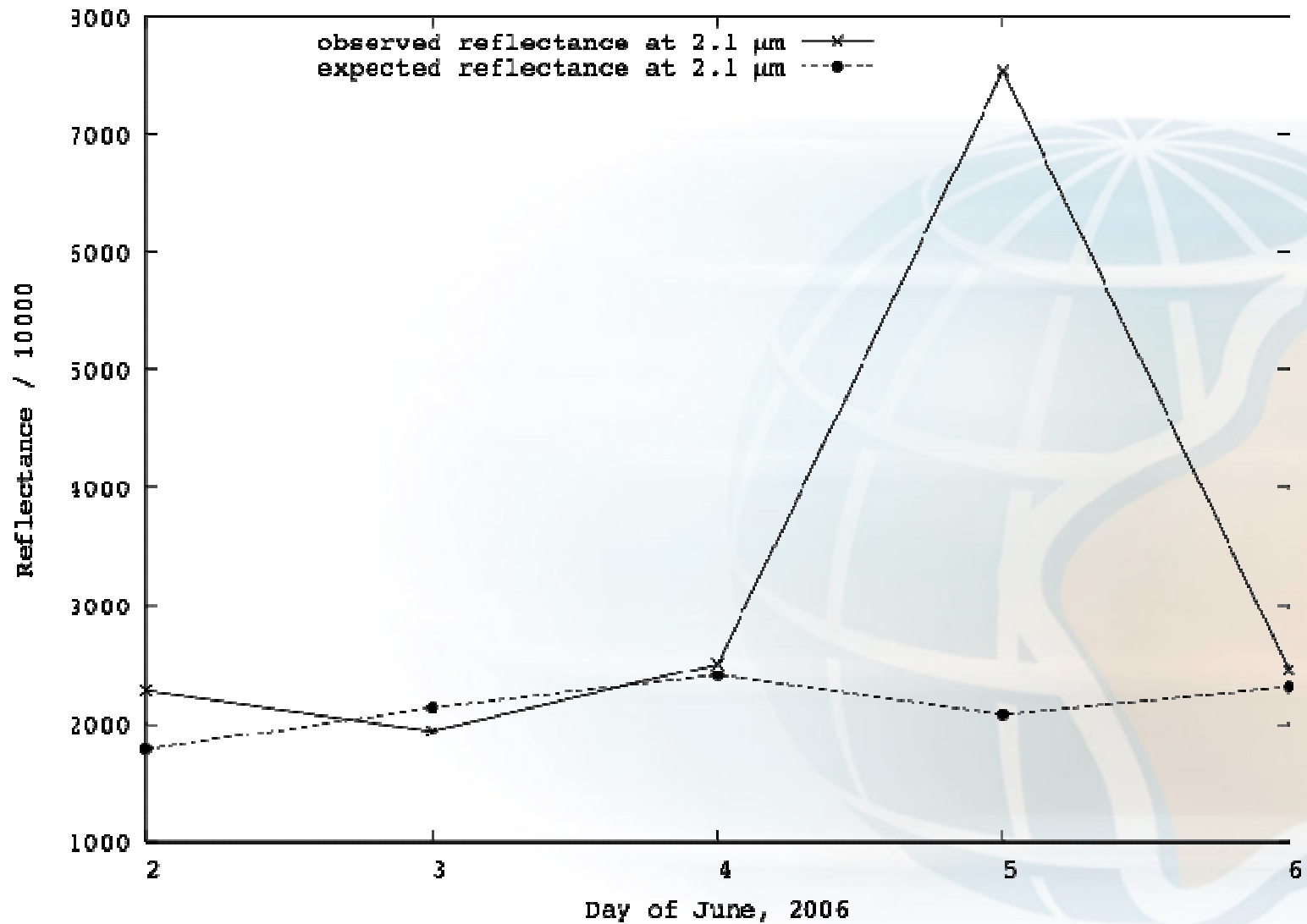
Comparison Global / Local FHS Algorithm



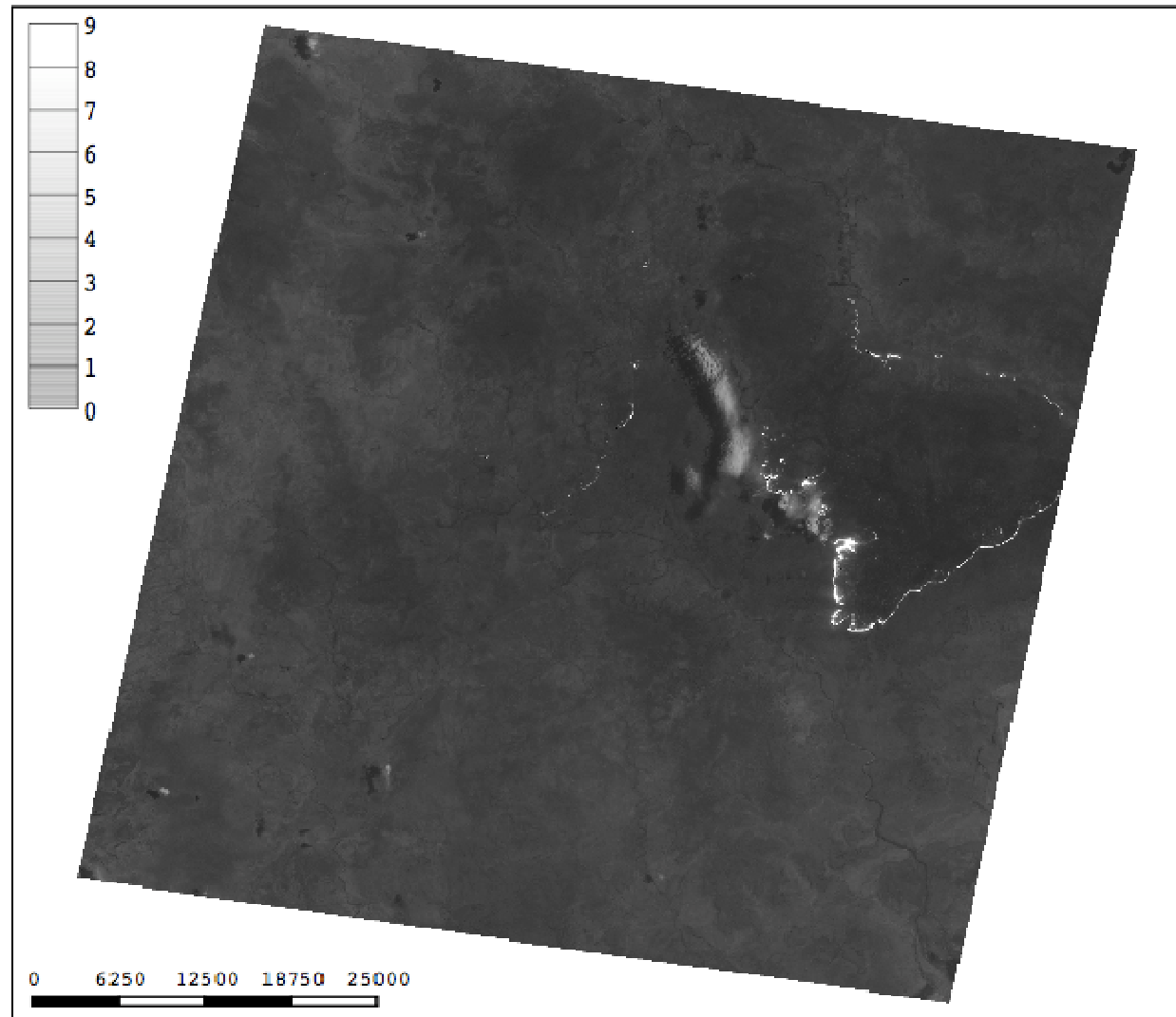
Comparison Global / Local FHS Algorithm 2/2



FHS Detection using Reflective Bands of MODIS



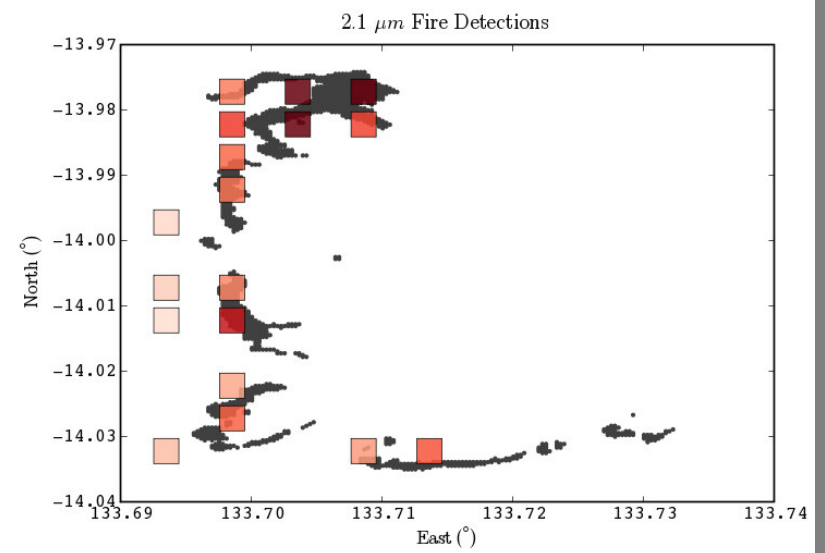
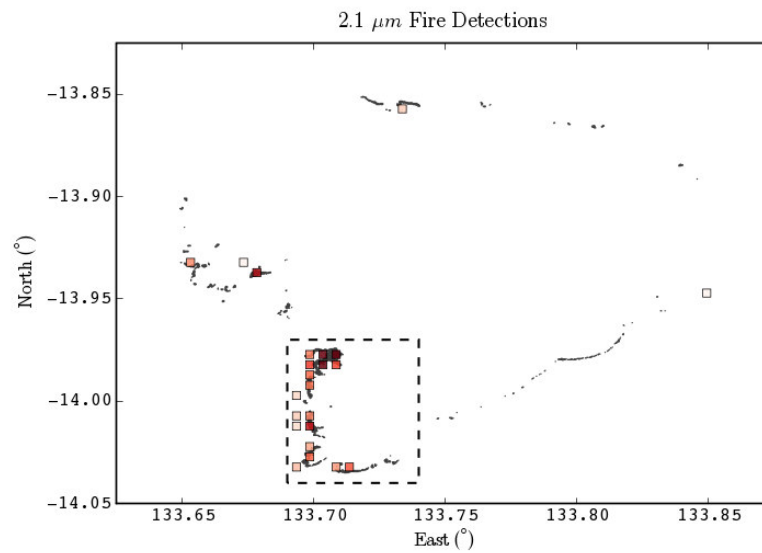
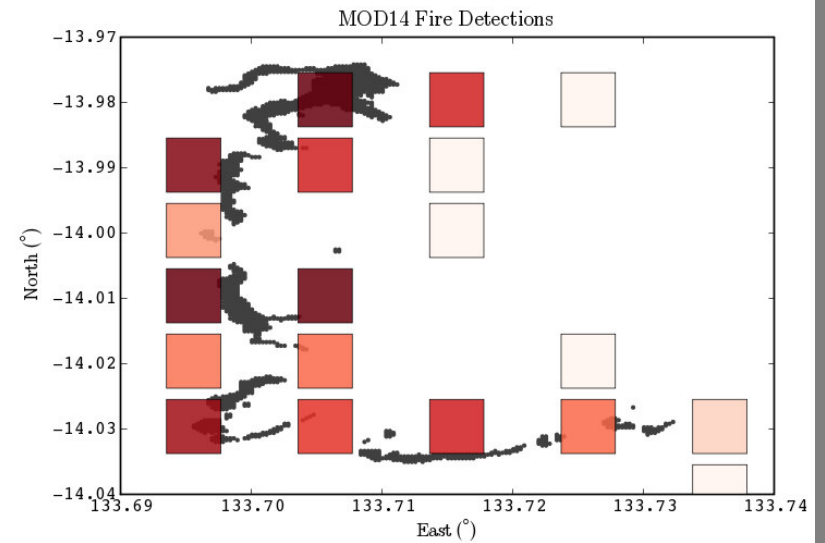
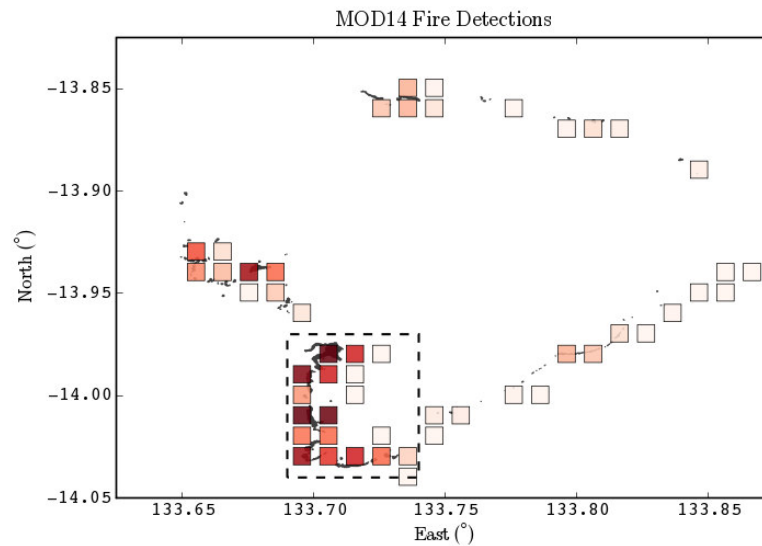
FHS Detection using Reflective Bands of MODIS (ASTER Reference)



SCALE: 1 : 550000

REGION: 133:09:45.865008E 13:37:24.45438S
133:55:59.453058E
14:17:11.137934S

FHS Detection using Reflective Bands of MODIS

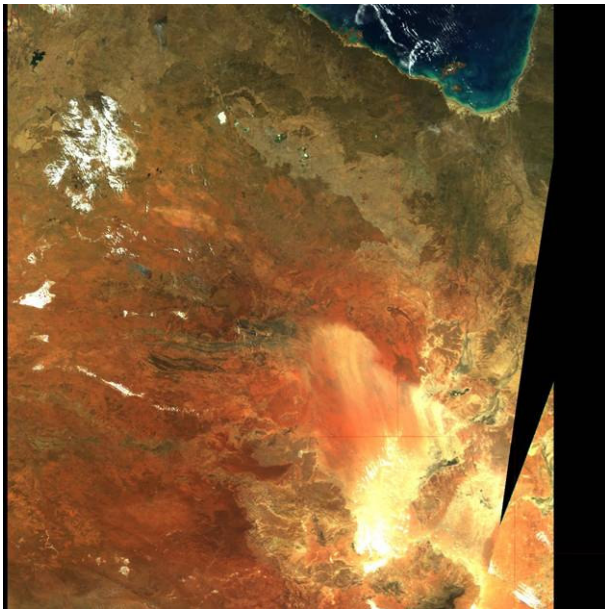


Aerosol Anomaly (Dust Storm in Simpson Desert)

True-Colour Reflectance Image

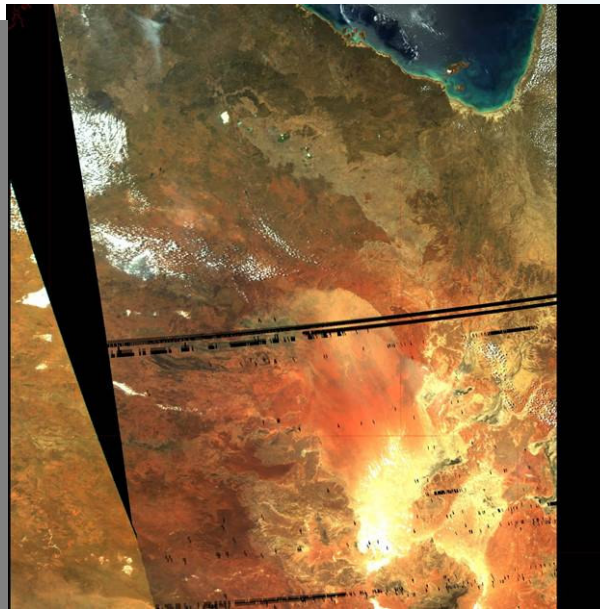
MODIS / Terra (AM)

24/09/2006



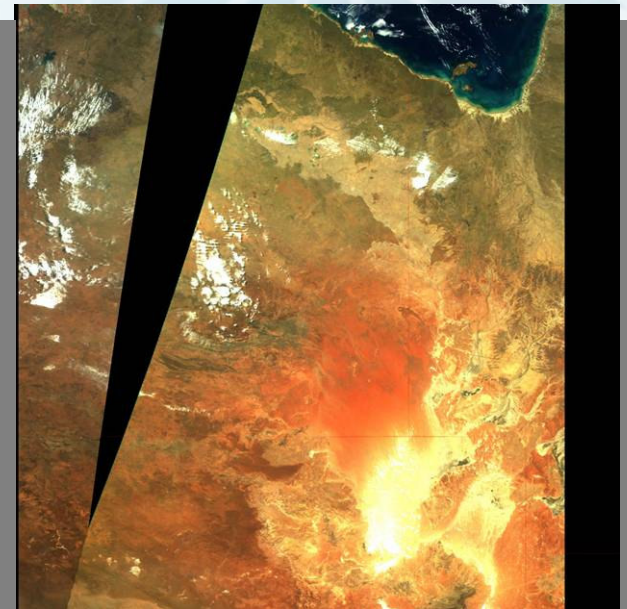
MODIS / Aqua (PM)

24/09/2006



MODIS / Terra (AM)

25/09/2006



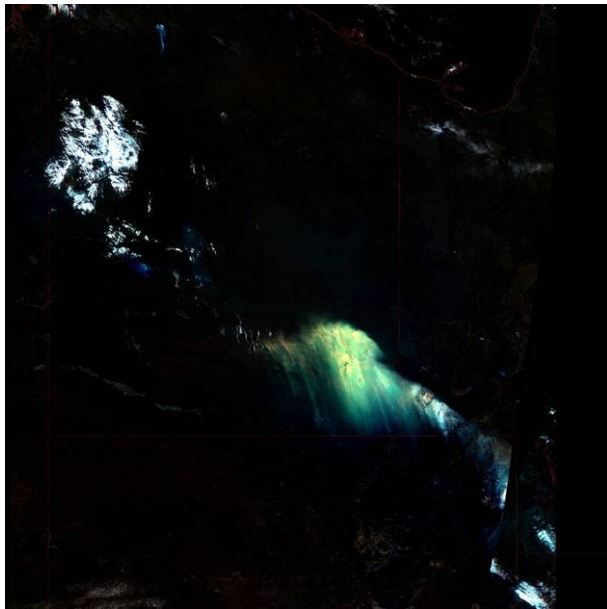
0 500 1000km

Aerosol Anomaly (Dust Storm in Simpson Desert)

True-Colour Reflectance Change Image

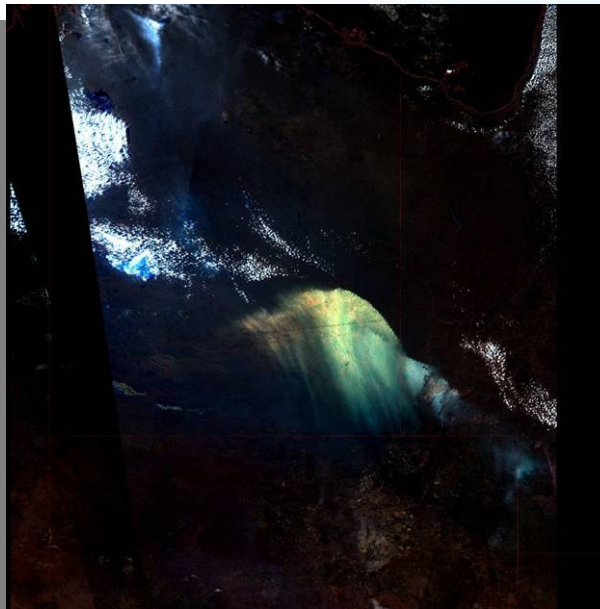
MODIS / Terra (AM)

24/09/2006



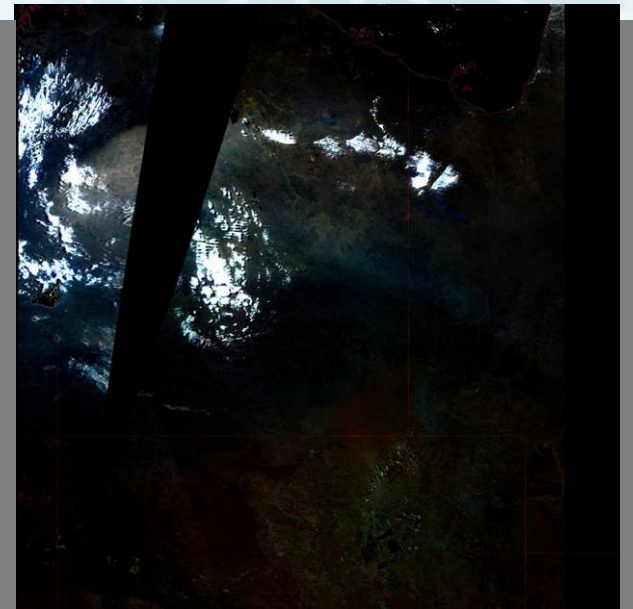
MODIS / Aqua (PM)

24/09/2006



MODIS / Terra (AM)

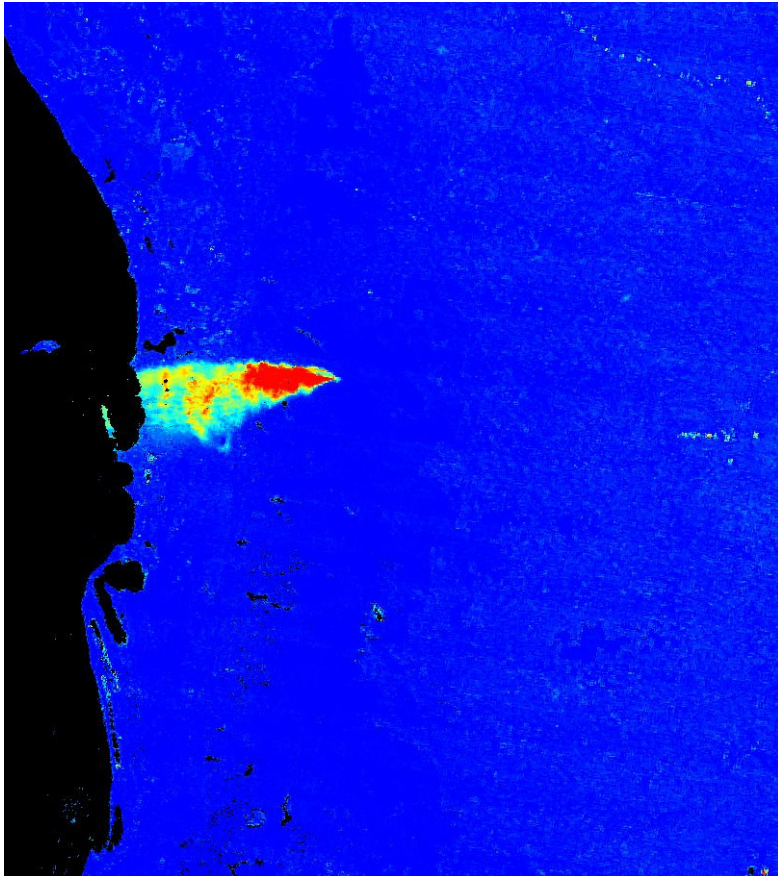
25/09/2006



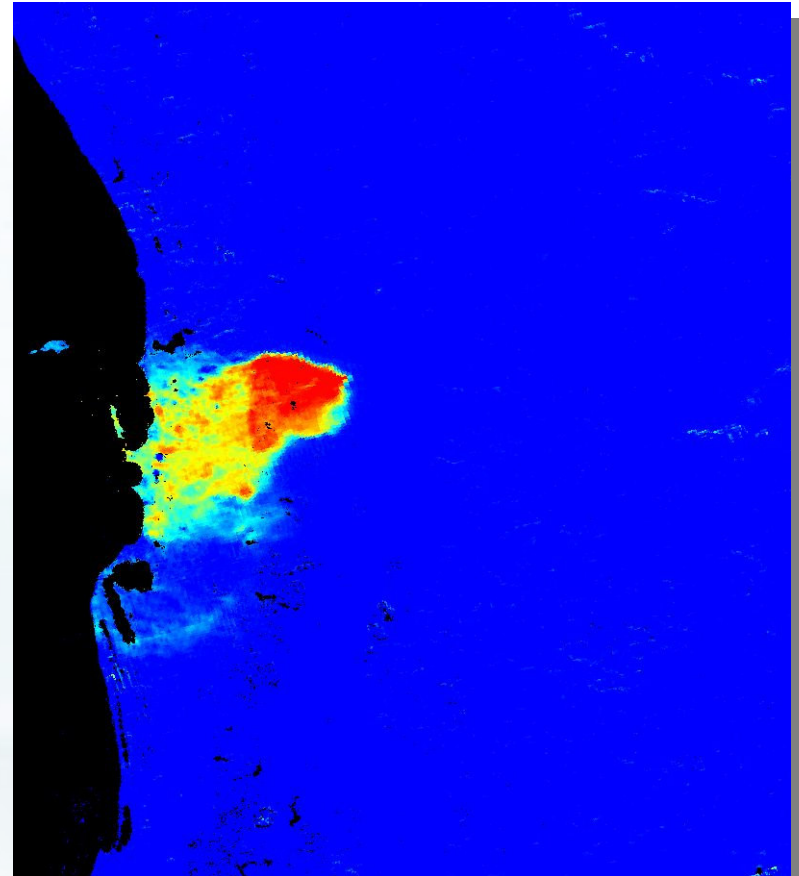
0 500 1000km

Aerosol Anomaly (Smoke from Perth Hills Fire)

low aerosol high



2005/01/16 02:21UTC



2005/01/16 06:35UTC



International Activities at SRSS

- training project Indonesia (Dept of Forestry, Dept of Environment) – AusAID funded
- training project Vietnam (Dept of Forestry) - preparation
- Sentinel Asia (JAXA → establish disaster risk management system within APRSAF Asia-Pacific Regional Space Agency Forum, validation of FHS in Kalimantan)



Other Activities in Australia

... Conoco-Phillips and the NT Government signed up for carbon trading in September.

Each year for the next seventeen years, Conoco-Phillips will pay a million dollars to employ Arnhem land people and support their fire management.

It's a carbon trade that will buy the company millions of tonnes of greenhouse savings – and even though that's only a few percent of their total emissions, it could be a trailblazer.

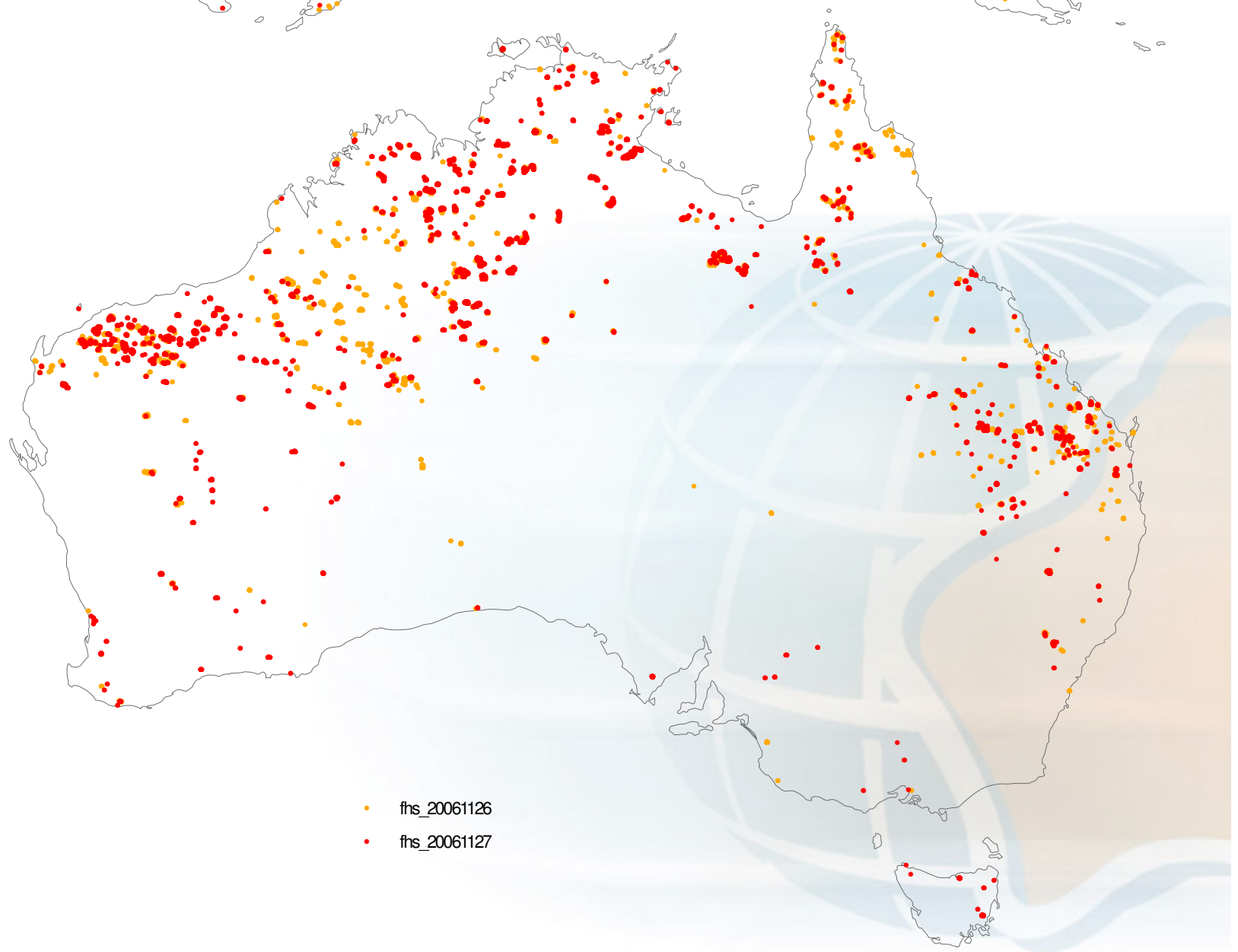


First Results Using MTSAT-1R

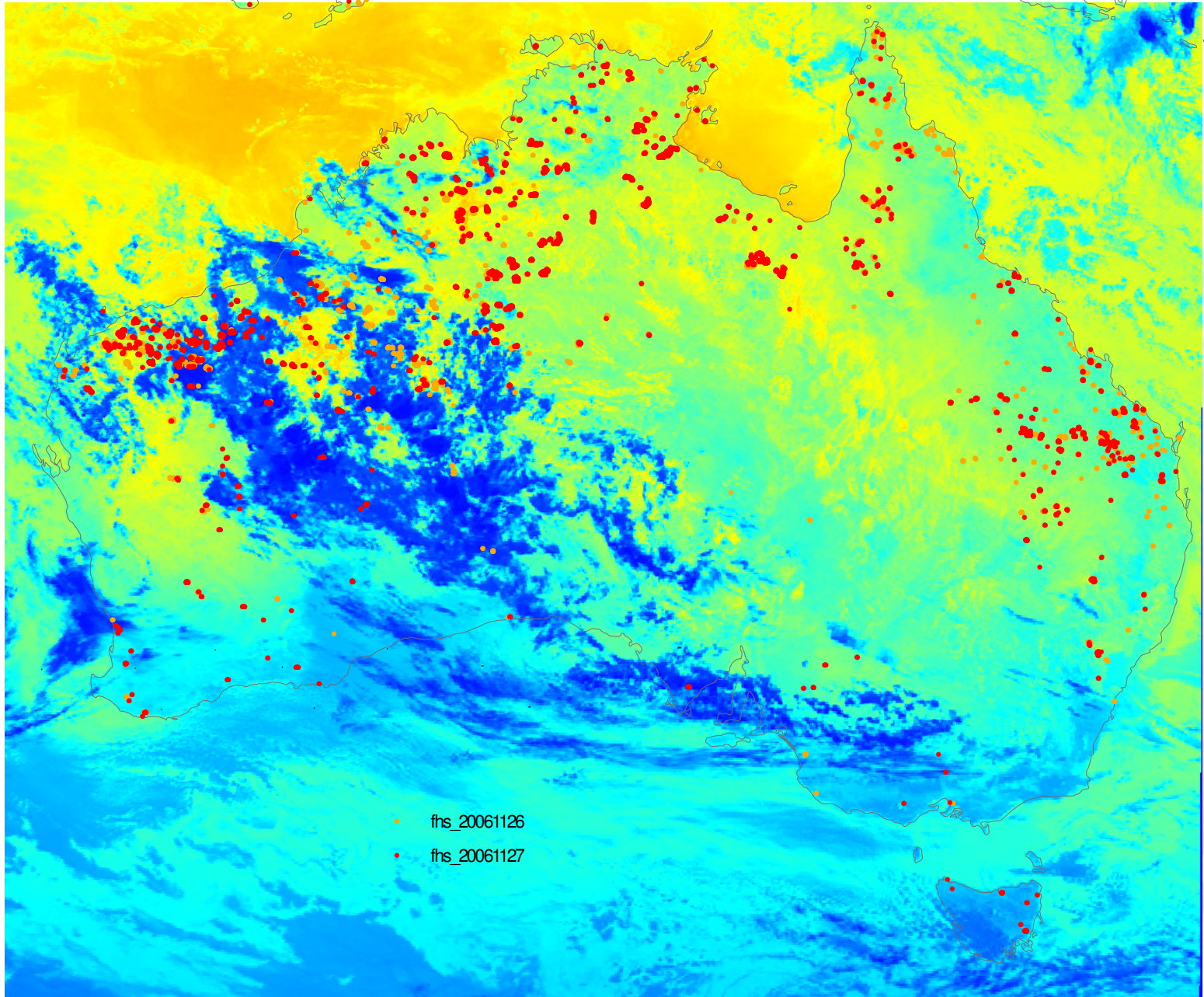
- geo-location day-time by coast line matching (AVHRR master)
- geo-location night-time by using day-time information parameters
- low saturation level → limited use during day-time
- potential of using VIS for burnt area / flood mapping
- smoke as indicator of wind direction
- FY-2C data available (currently setting up the geo-location process)



FHS from MODIS and AVHRR (2006/11/26 - 2006/11/27)



MTSAT-1R (2006/11/26 - 2006/11/27)



END