Progress Report JPTM Wildfire WG toward Step3

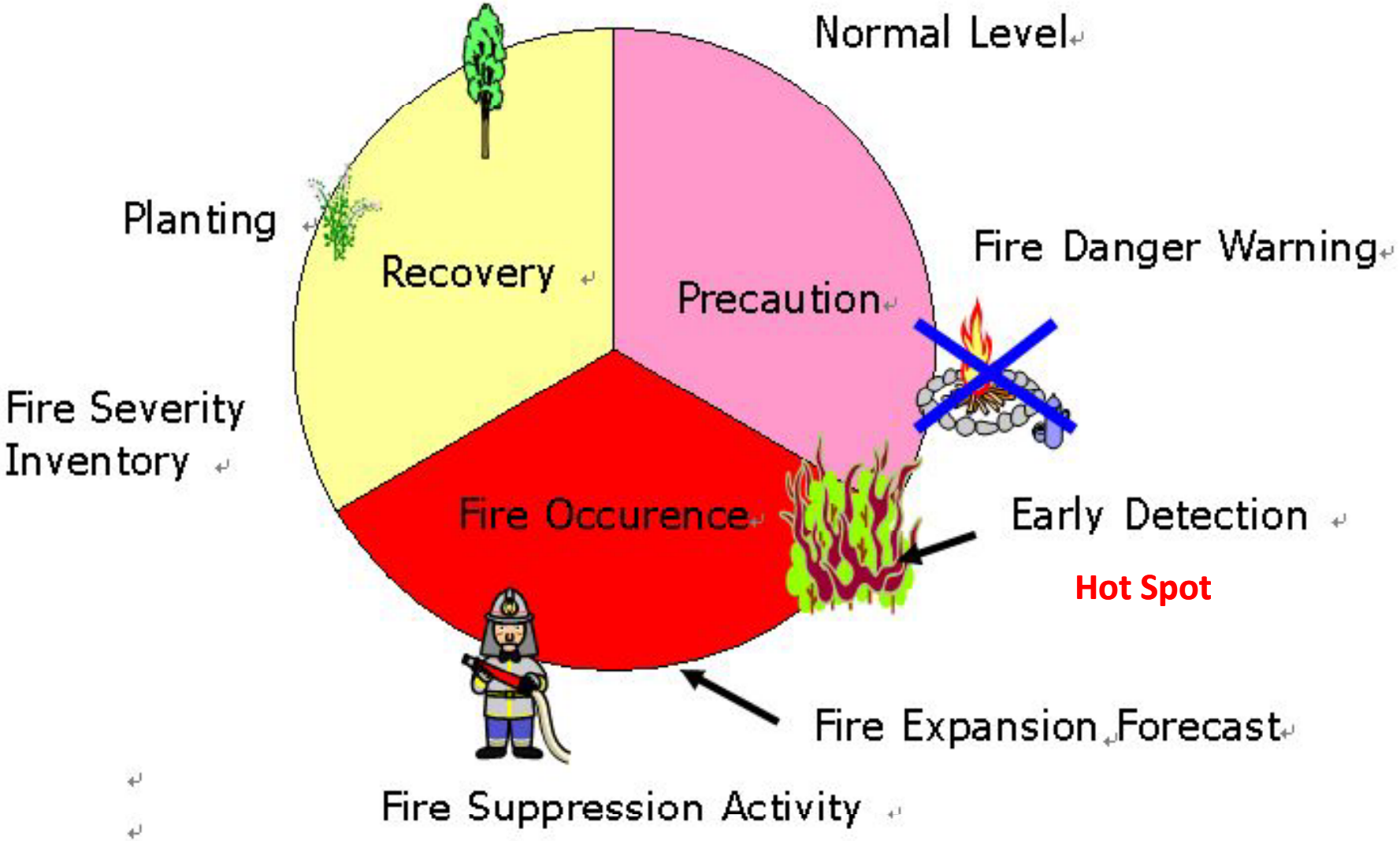
Recent Wildfire Situation in Asia and Pacific Region

Masami FUKUDA （Fukuyama City Univ.)

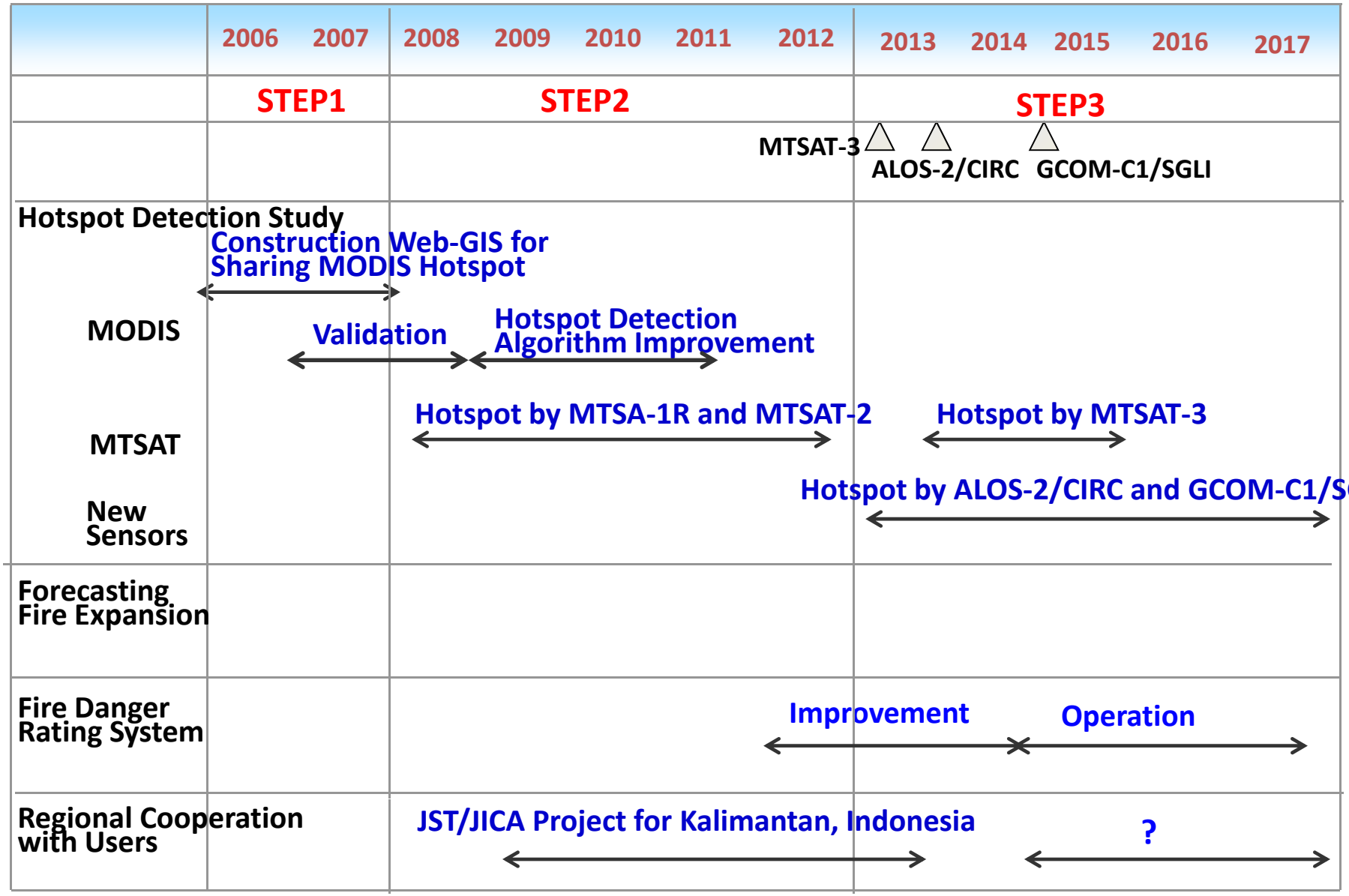
m-fukuda@fcu.ac.jp

Sentinel Asia JPTM Meeting
Bangkok 2013 Nov.27

Basic Concept of Wild Fire Control Initiative



Sentinel Asia Wildfire WG Milestone



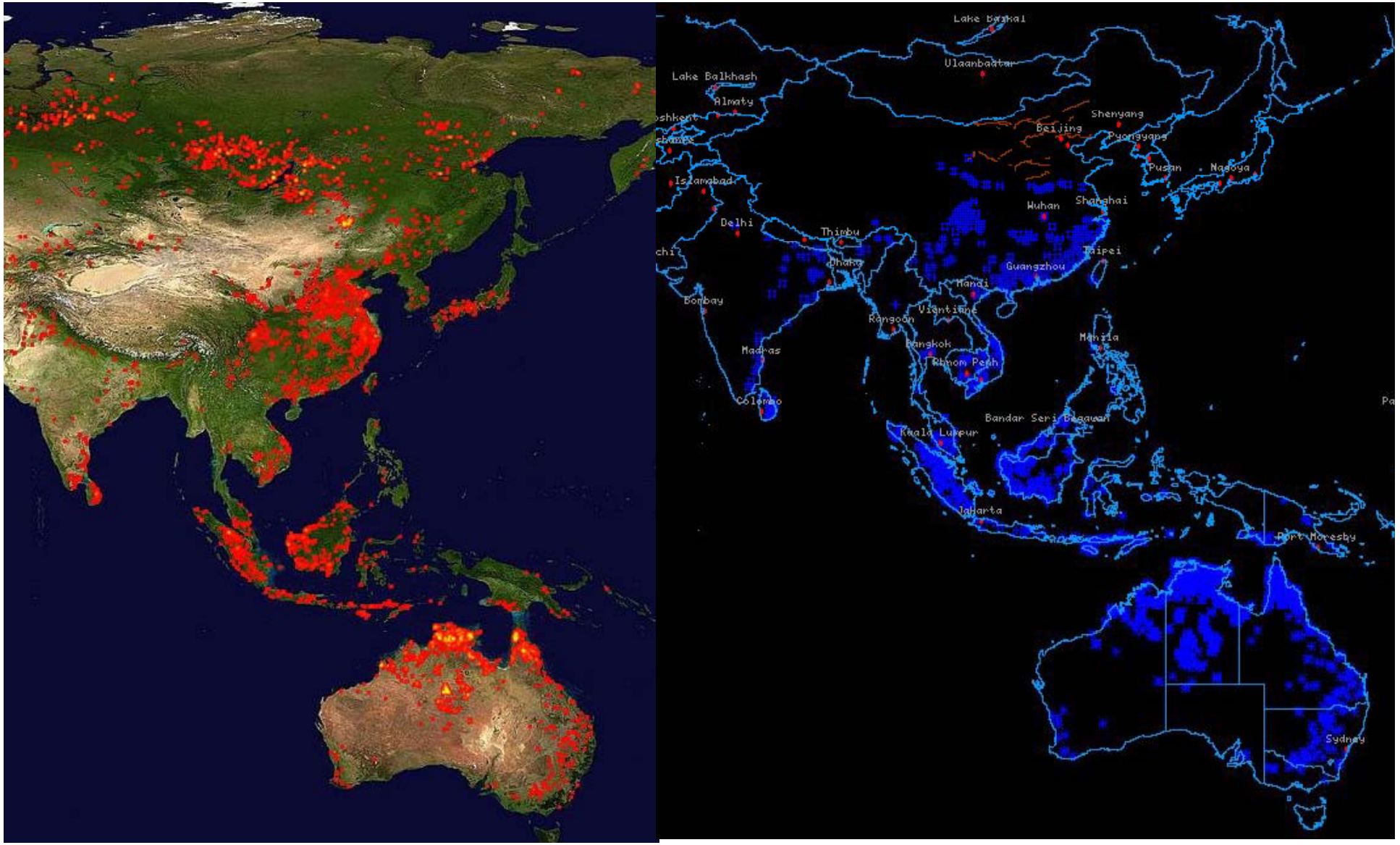
Results of STEP1 and STEP2 (2006-2012)

- **Construction of Web-GIS for sharing MODIS Hotspot (MOD14)**
  AIT, Univ of Tokyo, CSIRO, CRISP and LAPAN are providing Hotspot Information

- **Validation of MODIS Hotspot (MOD14)**
  Campaign using Ground Truth Data and Satellite Imagery in Kalimantan, Indonesia, Thailand, and Mongolia

- **Study of Hotspot Detection Algorithm to improve MOD14**
  7 kinds of Algorithm under study: Hokkaido Univ, CRISP, Soul National Univ and JAXA, as sub-working group activity

- **Early Fire Control in cooperation with Users**
  JST /JICA Project: Wild Fire and Carbon Management in Peat-forest in Indonesia



NASA MODIS RAPID RESPONSE SYSTEM SENTINAL ASIA

2011/06/20---2011/06/29

Assignment from last JPTM

Improvement of Fire Danger Rating Index

MMD LAPAN

Original Algorithm was developed by Canadian Forest Service

Many empirical equations and parameters derived from boreal forest experiments

FFMC

Dry phase

- k_0 = 0.424*(1-(100-H)/100)^1.7)+0.0694*(W^0.5)*(1-((100-H)/100)^8)
- k = k_0*0.581*exp(0.0365*T)
- E_d=0.942*(H^0.679) + 11*exp((H-100)*100
- + 0.18*(21.1*T)*(1-exp(-0.115*H))
- E_w=0.648*(H^0.753) + 10*(exp(10*(H-100))
- + 0.18*(21.1-T)*(1-exp(-0.115*H))
- m=E_d + (13-E_d)*(10^(-k))
- FFMC=59.5*(250-m)/(147.2+m)

Wet phase (when precipitation ≧0.5mm)

- Δm = r*(42.5*(exp(-100/(251-m_0)))*(1-exp(-6.93/r)))

where H : relative humidity (%), W : wind speed (km/h)

T : temperature (^{0}C), m_0 : previous value of “m”

r : precipitation (mm/day)

Direct information obtained from satellite data ➡ FDRI

ALOS 1 Palsar

New Algorithm by Dr.Watanabe JAXA

Alternative data obtained by satellite indirectly manner

JASMES

JAXA Satellite Monitoring for Environmental Studies

http://kuroshio.eorc.jaxa.jp/JASMES/monthly/global/index_j.html

"WST (Water Stress Trend)" is index to understand the droughty state of ground. Using the characteristic of specific heat of water, WST is calculated from the temperature change during daytime and nighttime.

On this site, WST product calculated from brightness temperature data of Terra/MODIS

and Aqua/MODIS is provided.

The degree of dryness is strong when WST value approaches 1.

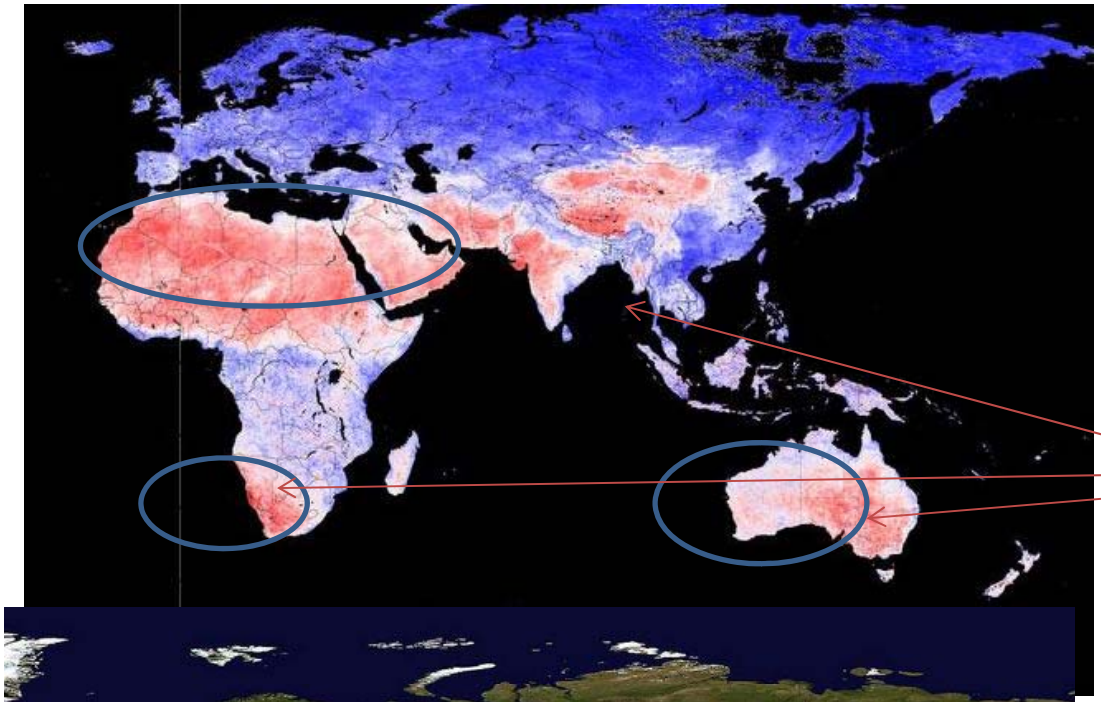
On the other hand, the degree of dryness is weak when WST value is 0.

Larger Soil Moisture Value

Larger Heat Capacity

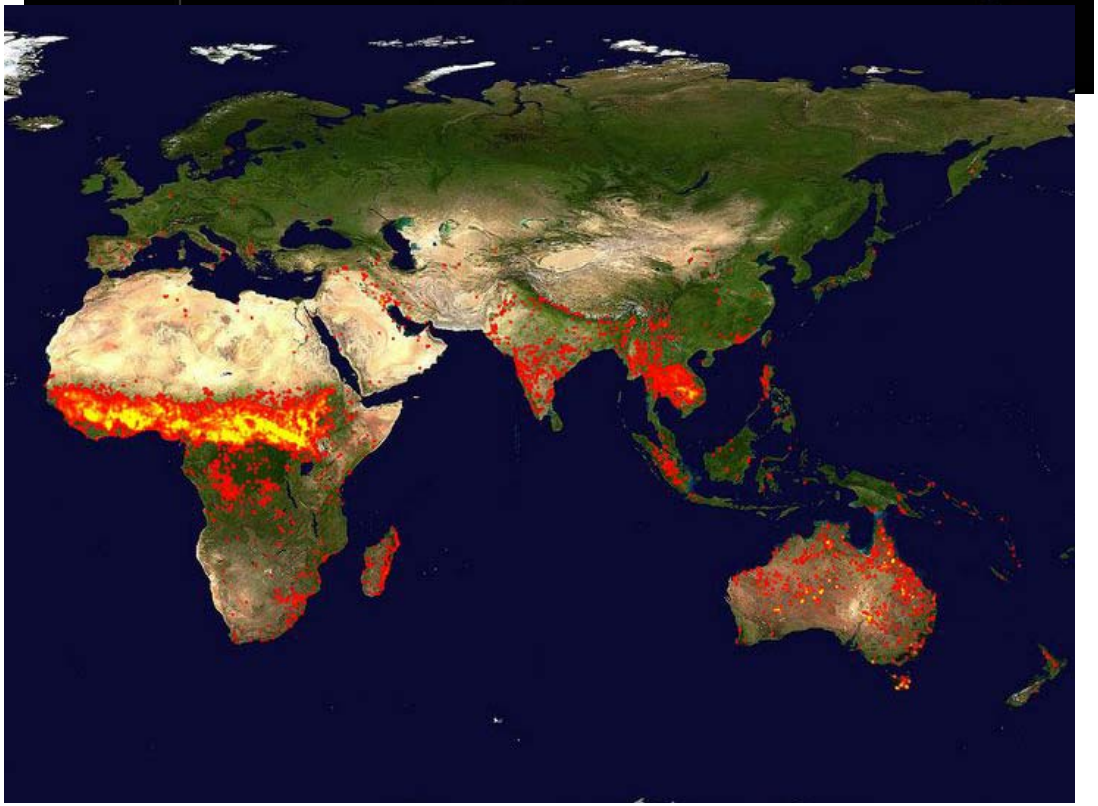
Smaller Heat Increase Value

Smaller Brightness Temperature Difference of MODIS between Date time and night time

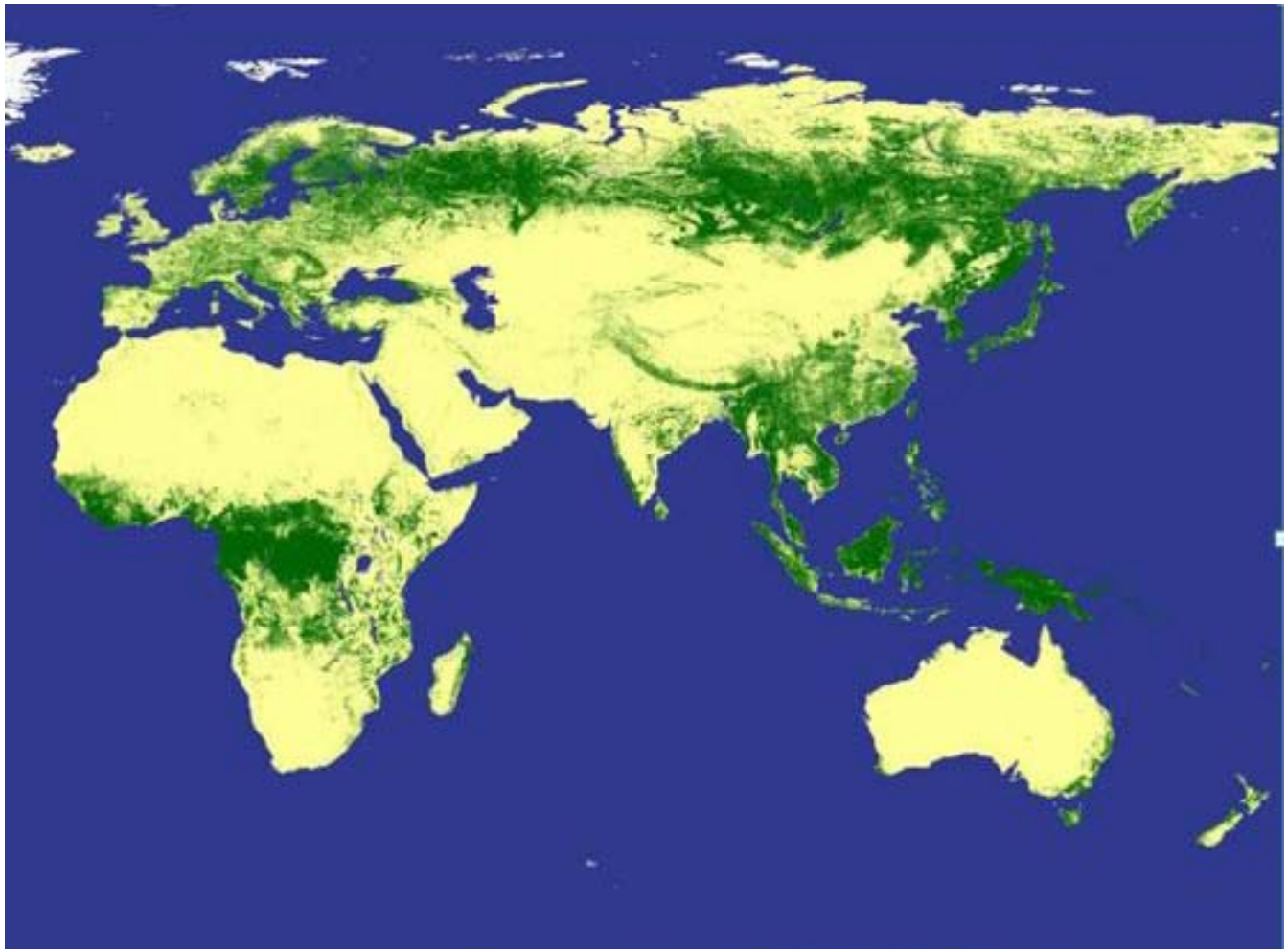


2013 Jan 1-15 Water Stress

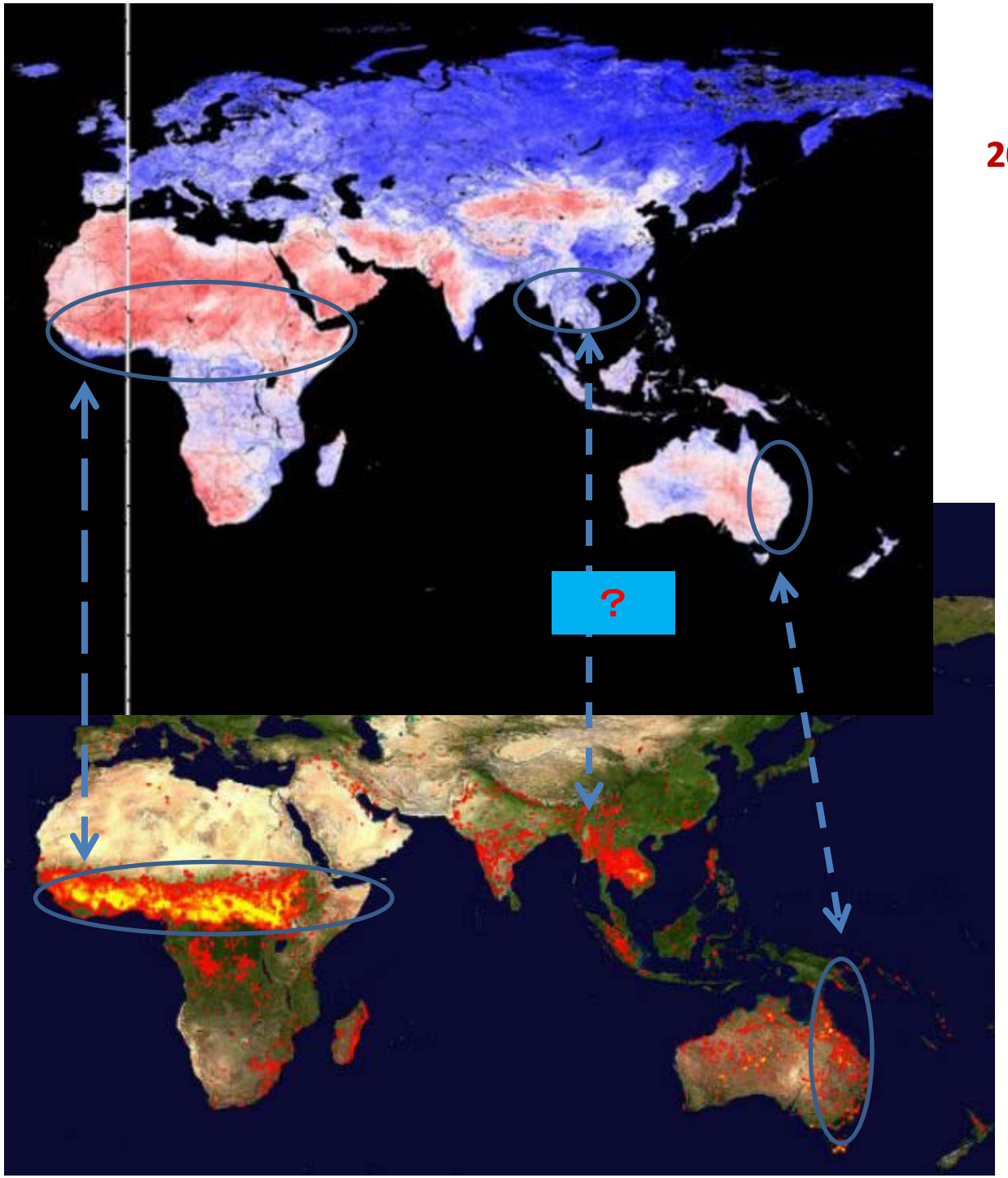
Desert



2013 Jan 1-10 Hotspot

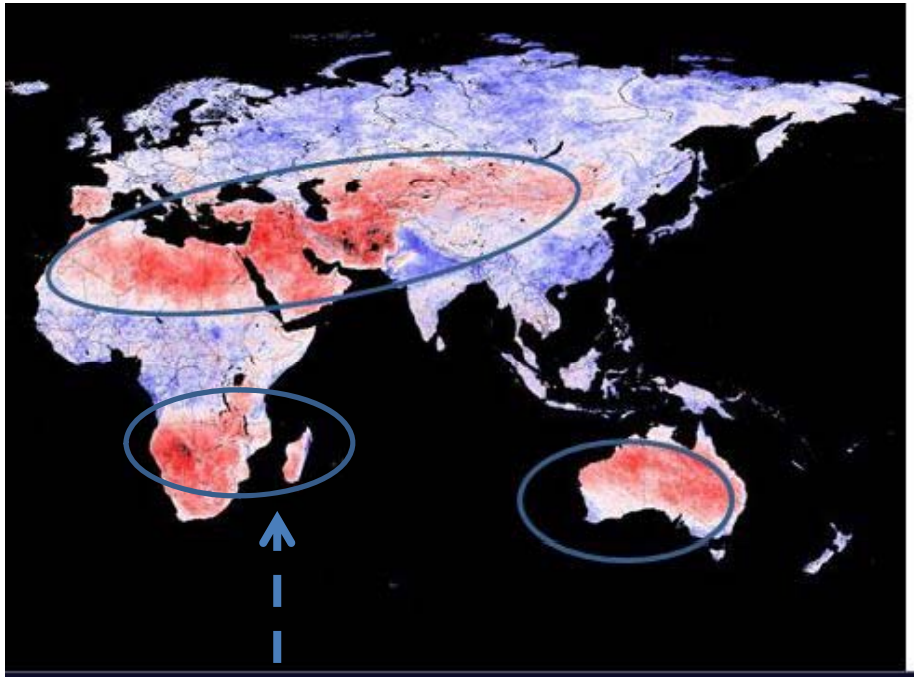


World Vegetated Area Map by ALOS PALSAR
JAXA 2010
Resolution 10m　　Biomass ≧100t/ha

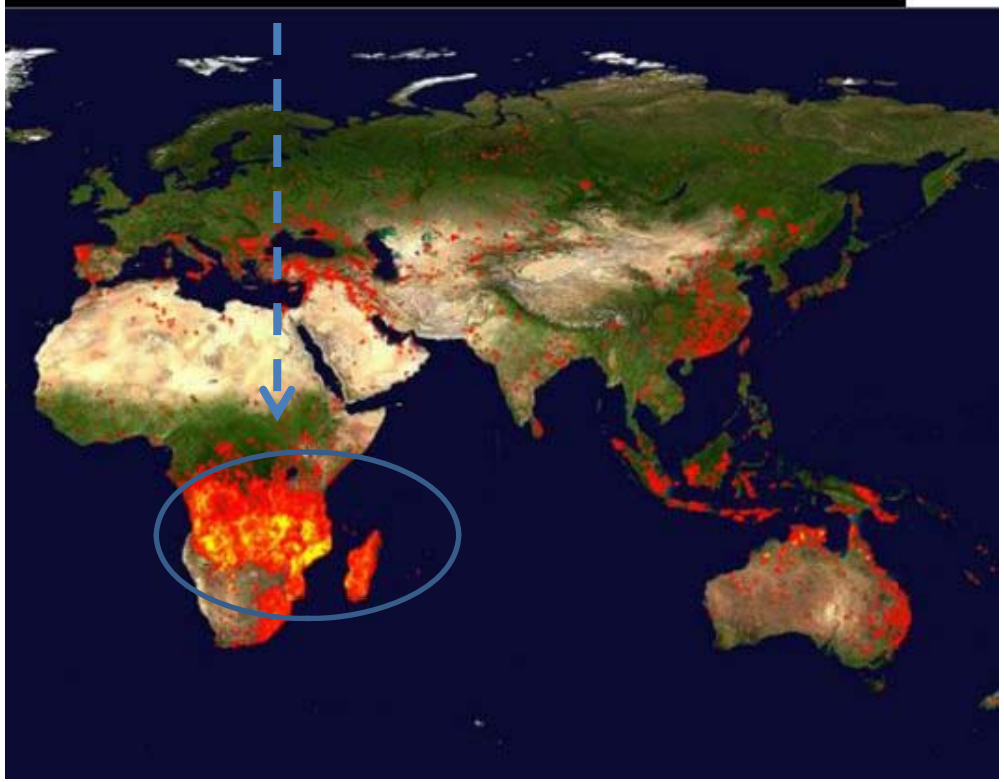


2013 Jan.01-14

2013 Jan01-09



2013 Sept 1-15 Water Stress



2013 Sept 07-18 Hotspot
MPDIS System

Historical Trend of Wildfire Occurrence

Hotspot Distribution

from Jan.1 2000 until Sept.17 2013

Every 10 days MODIS RAPID

RESONSE System NASA

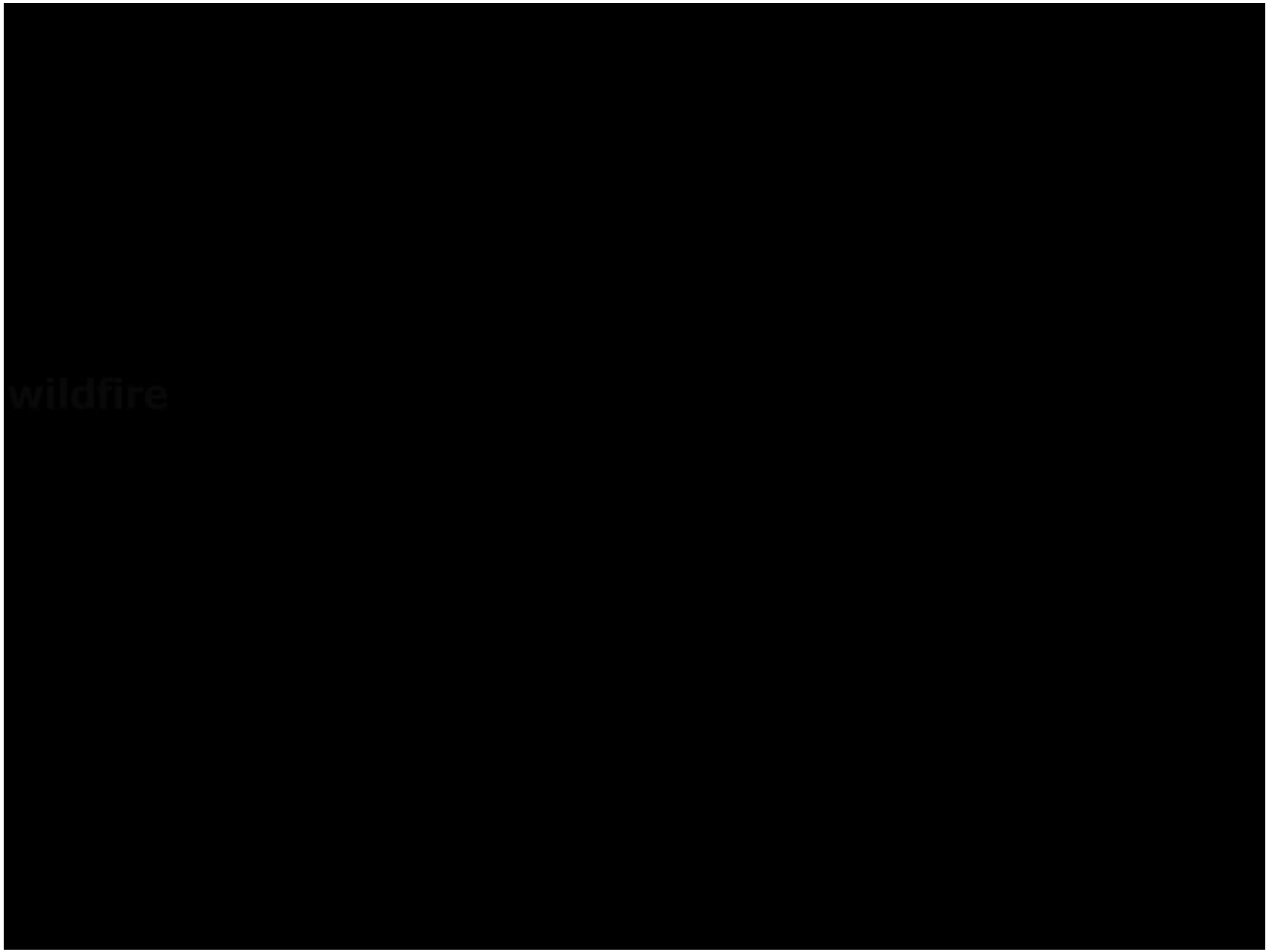
Water Stress Trend

from Jan.1 2000 until Sept.17 2013

Every 2 weeks JASMES JAXA


wildfire


Water Stress All

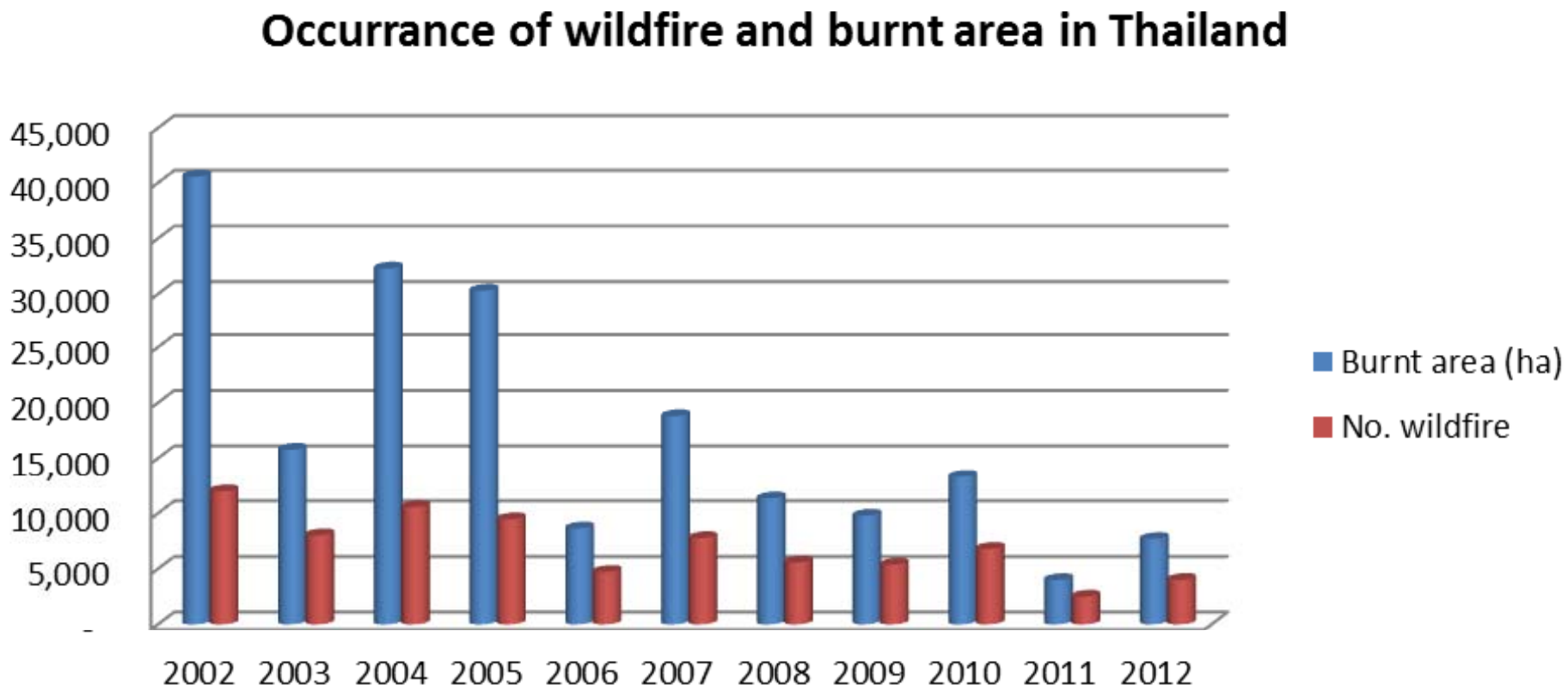

wildfire

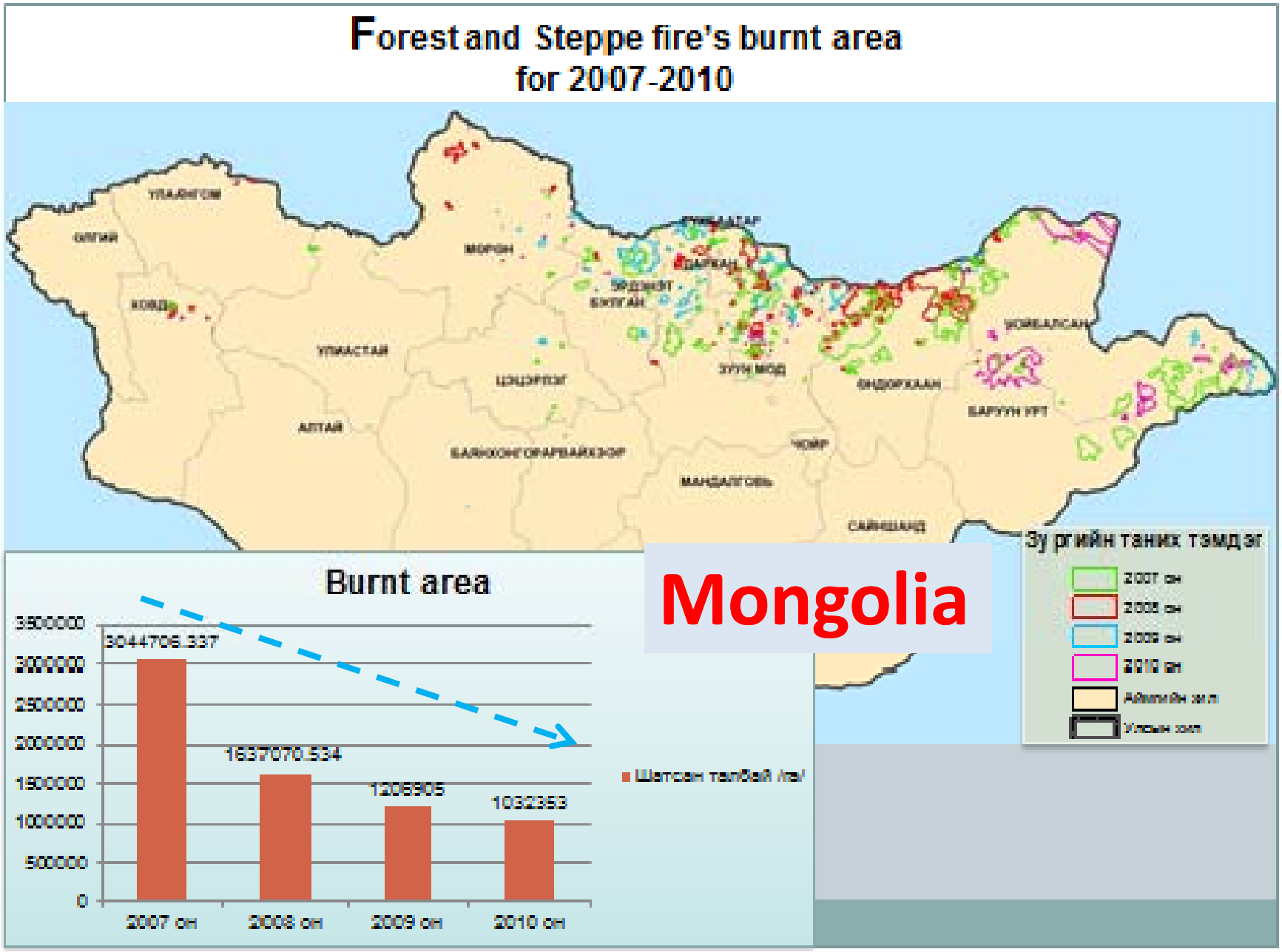

Water Stress All

Annual Report on Wild fire Occurrence from

Thailand,India, Hongkong, Indonesia

Generally Wildfire Occurrence tends to decrease except Australia


Occurrance of wildfire and burnt area in Thailand
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Burnt area (ha)
No. wildfire


Forest and Steppe fire's burnt area
for 2007-2010
Mongolia
Burnt area
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
3044706.337
1637070.534
1206905
1032363
2007 он
2008 он
2009 он
2010 он
Шатсан талбай /га/
Зүргийн таних тэмдэг
2007 он
2008 он
2009 он
2010 он
Аймгийн зэл
Улсын хил

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Environmental Information Center

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Forest and steppe fire detected from satellite image

Thu, 2013/10/31 - 15:48 — Nandin-Erdene

Satellite name:

Aqua

Image date:

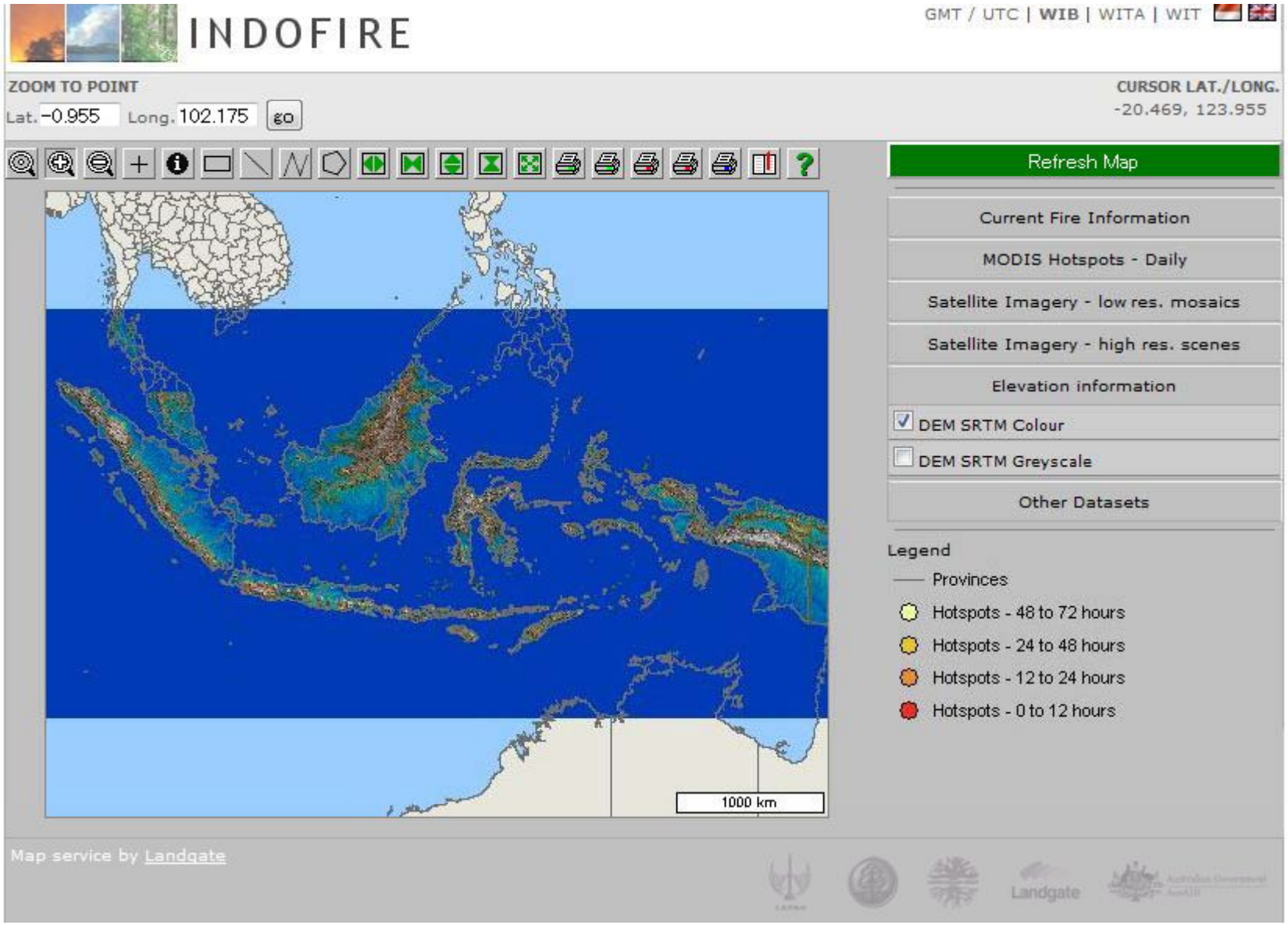
2013/10/30 - 13:20

LANGUAGES

Image date:

2013/10/19 - 11:55

LAPAN Fire Web Site



CSIRO CLIMATE RESPONSE

New apps for critical bushfire assessment

November 7, 2013

The NSW Rural Fire Service is using new android apps developed by the CSIRO to conduct a critical assessment of the recent bushfires that have devastated communities in the state, and plan for future climate adaptation scenarios. The two android tablet apps are being used for the first time in the Blue Mountains towns of Winmalee, Lithgow and Mount Victoria. The towns are among those severely affected by the recent bushfires.

Improved technology for post-bushfire surveillance is crucial, as bushfires are likely to increase in frequency. Australia has just had its warmest 12-month period on record, and NSW has just had its warmest period from January to September.

Bushfires have long been a key part of Australia's environment and are influenced by many factors – including warmer and drier conditions, extreme heat, strong winds and low humidity, housing design and materials, and fuel loads and management.

The new technology development is led by Justin Leonard, the research leader for bushfire urban design at the CSIRO's Climate Adaptation Flagship.

"Climate change projections are suggesting that we're going to see an increase in the frequency of fire weather events that drive fires like this through the landscape, so we're expecting a significant increase in the number of

About the researcher

Justin Leonard is investigating the design of buildings on bushfire prone areas to improve their survival prospects during extreme bushfire events, and providing understanding of infrastructure loss, relative


BBC

New Japanese satellites for wildfire

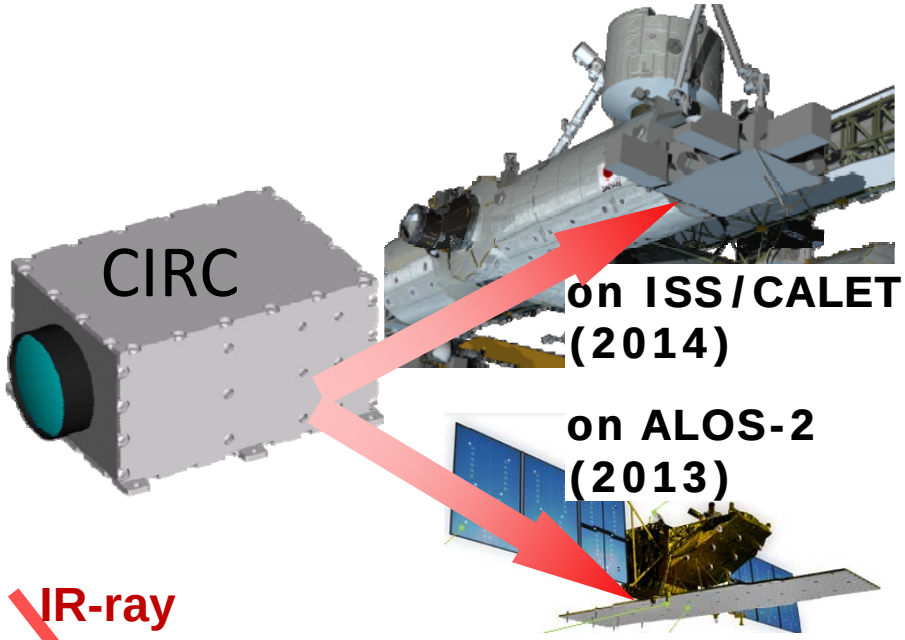
	Launch year	Sensor	Satellite	4-1.6μ	11μm	Swath	Interval
Mid res.	Operational (1998)	MODIS	Terra	1km	1km	2330km	0.5d
	Operational (2002)	MODIS	Aqua	1km	1km	2330km	0.5d
	Operational (2010)	VIIRS	NPP	750m	750m	3000km	0.5d
High res (Interval 0.7day)	Operational (1999)	ETM+	LANDSAT 7	---	60m	185km	16d
	Operational (1998)	**ASTER**	**Terra**	**---**	**90m**	**60km**	**48d**
	Operational (2013)	OLI/TIRS	LANDSAT 8	30m	100m	185km	16d
	2014	**CIRC**	**ALOS 2**	**---**	**200m**	**130km**	**7d**
	2014	**BOL**	**UNIFORM1**	**---**	**150m**	**100km**	**7d**
	2014-	**CIRC**	**JEM/CALET**	**---**	**120m**	**70km**	**7d**
	2015-	**BOL**	**UNIFORM2**	**---**	**150m**	**100km**	**7d**
	2016-	**SGLI**	**GCOM-C1**	**250m**	**250m**	**1150km**	**1.5d**
	2015-	**BOL**	**UNIFORM3**	**---**	**150m**	**100km**	**7d**

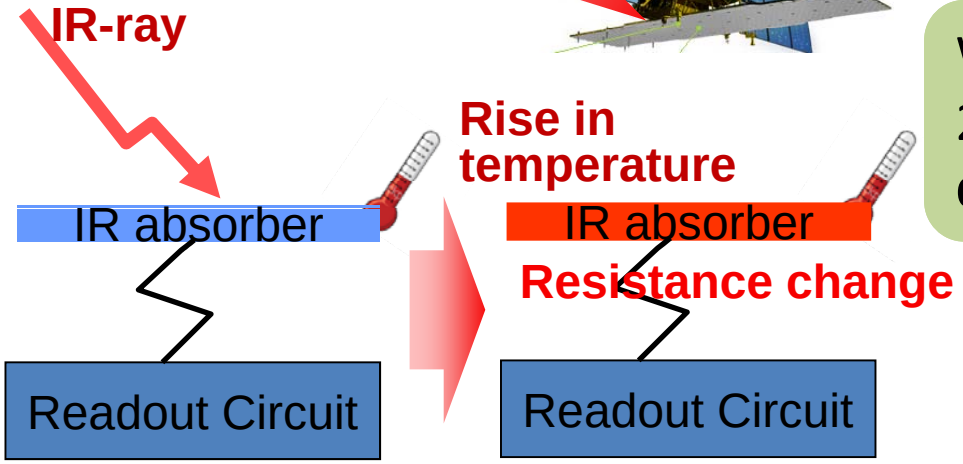
Image available once a 3 days with determined launch schedule

Image available Everyday when all planned satellites launched

At
Wildfire will be observed once a two to three days.
3 high resolution IR sensors among 5 are Japanese.

CIRC (Compact InfraRed Camera)
JAXA (2013,14) (on ALOS-2 & JEM)





CIRC(Microbolometer) is low cost IR sensor with large format (640x480)
-- No cooling, Small and Light --

Onboard on several satellites; including ISS and ALOS-2.

Wildfire observed frequently with 120-200m resolution Thermal IR conjunctively with GCOM-C1/SGLI.

Specification		
	Size	10cm x 18cm x 20cm
	Mass	< 3kg
	Pixel	640 x 480
	Resolution	200m on ALOS-2 120-200m on ISS
	Power	<20W

UNIFORM satellite fire monitoring

Alaska Fire Service

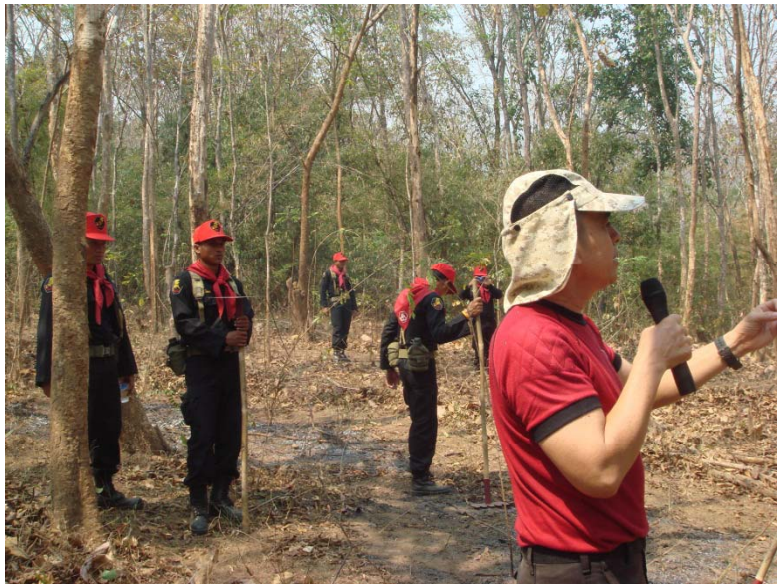
- Focused on wild fire monitoring
  - Thermal InfraRed sensor 11µm / 150m GSD
  - 100km swath

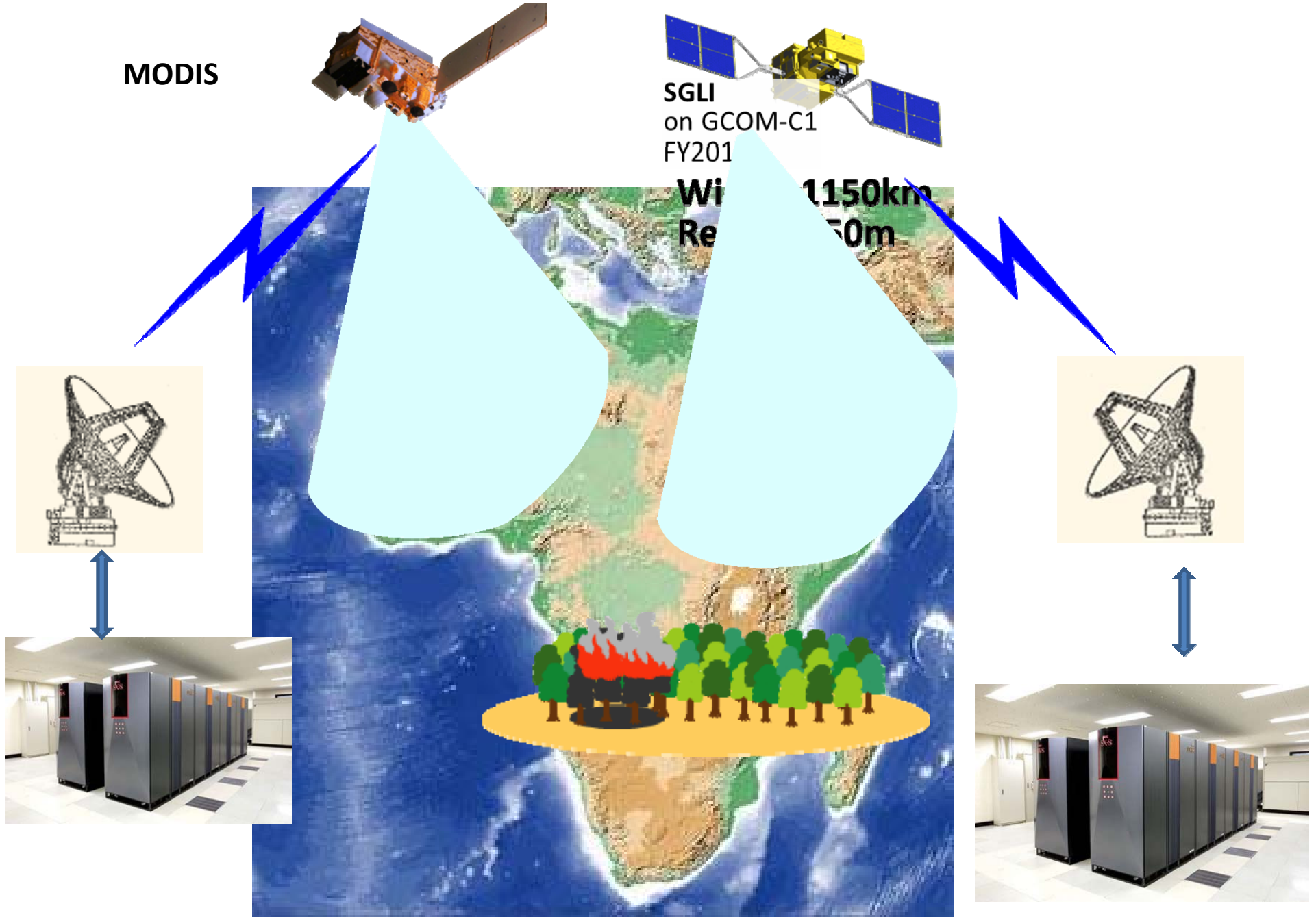
Wildfire Control in Southern African Region

From Sentinel Asia to Sentinel Africa

New Program supported by JICA

Special Seminars for African Countries were held in Chiang Mai March 2012 and Bangkok Sept. 2012 assisted by AIT




MODIS
SGLI
on GCOM-C1
FY201
Wi
1150km
Re
50m

Thank you for your attention