Inventory, Modeling and Climate Impacts of Greenhouse Gas emissions (GHG's) and Aerosols in the Asian Region

Meeting Objectives

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START
global change SysTem for Analysis, Research & Training

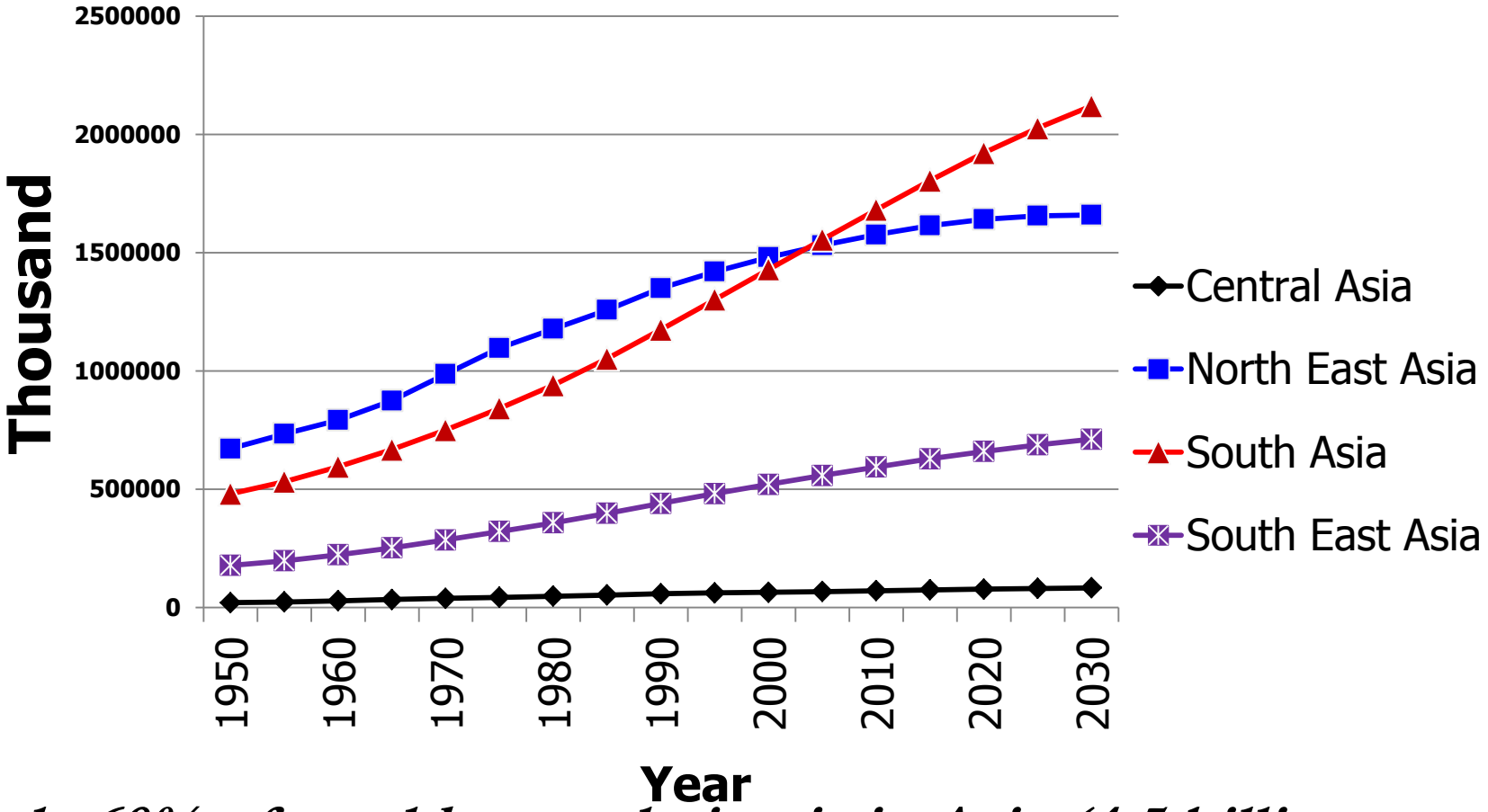
GOFC-GOLD
GLOBAL OBSERVATION FOR FOREST AND LAND COVER DYNAMICS

NASA

Background to the Meeting

- Greenhouse gas (GHG) emissions and short lived climate pollutants (SLCP) from the Asian region have been increasing due to rapid population growth, increasing industrial activities and land use practices.

Asian countries–hotspots of population and growth



Nearly 60% of worlds population is in Asia (4.5 billion people)

Nearly 2/3rd of world population growth is in Asia

Nearly 50 million people are being added every year

Background to the Meeting

- Increasing public awareness and concern in Asia concerning Air Quality and Human Health issues

November, 2010

Studies find effects of air pollution on rate of death, illness

- **~0.5% increase per 10 μg/m3 of PM10.**

- ***With high levels of air pollution in Asian cities (>100 μg/m3), this could mean a substantial public health impact***

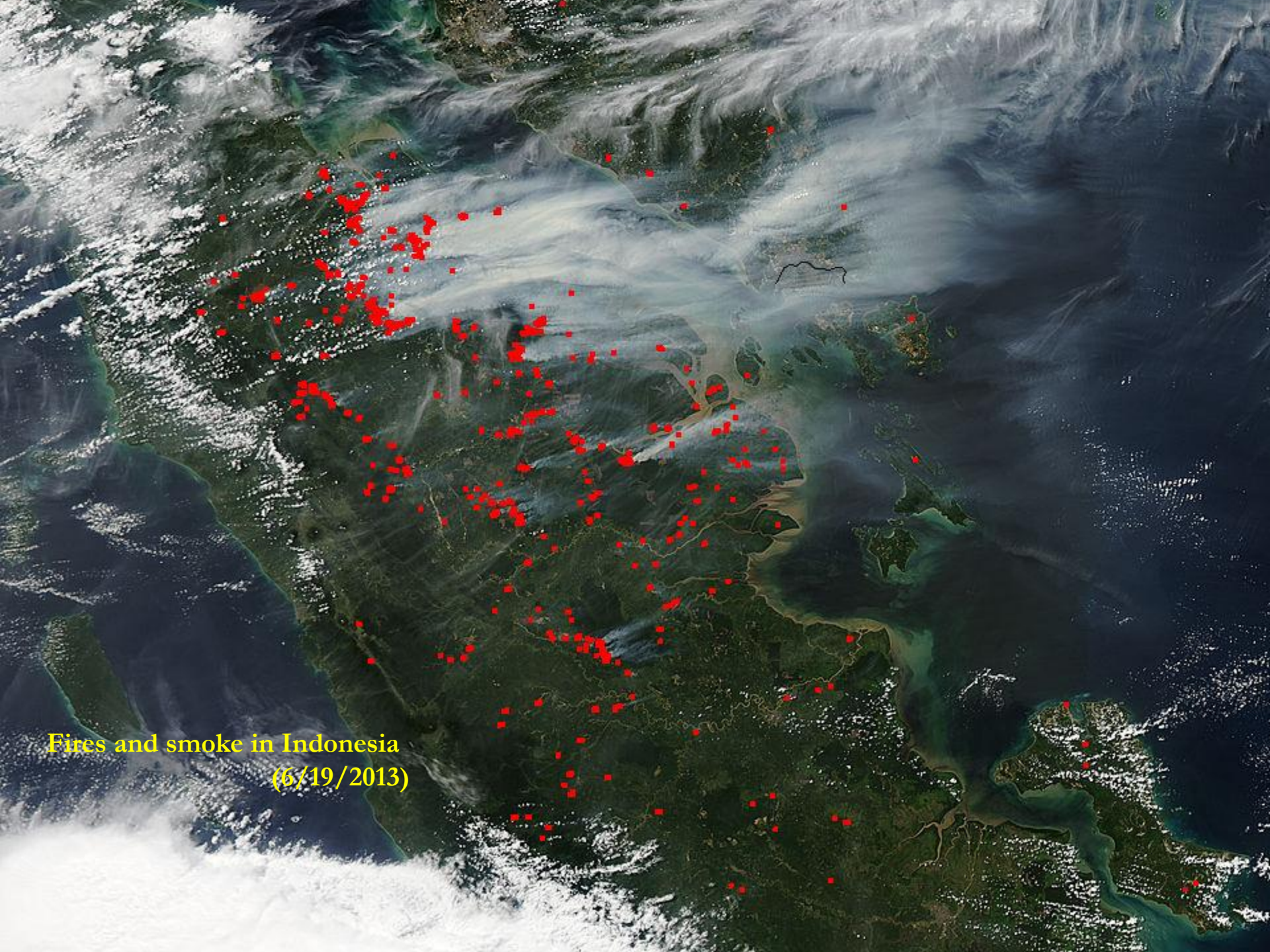
China Env., Problems; Pollution

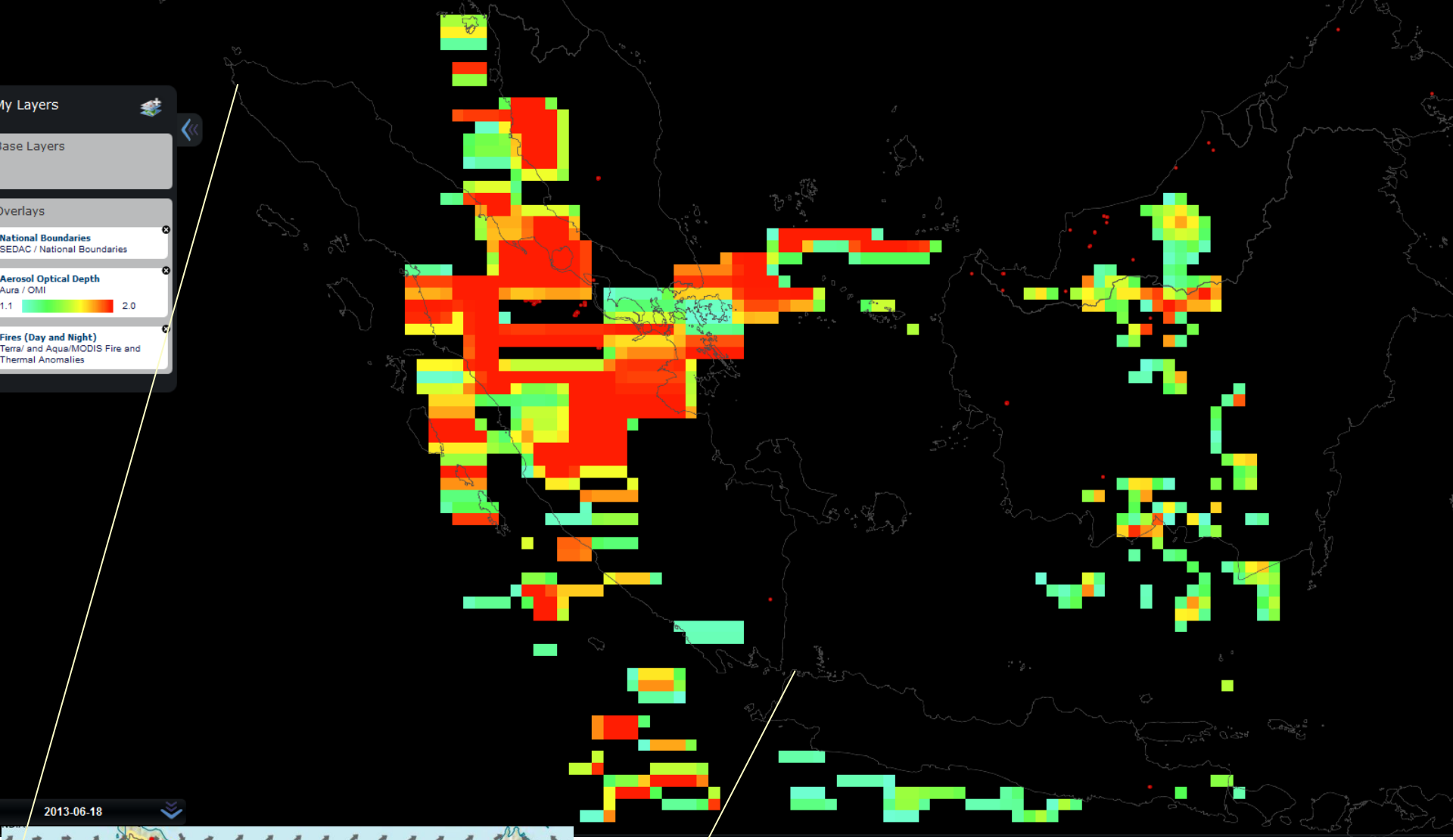
Background to the Meeting

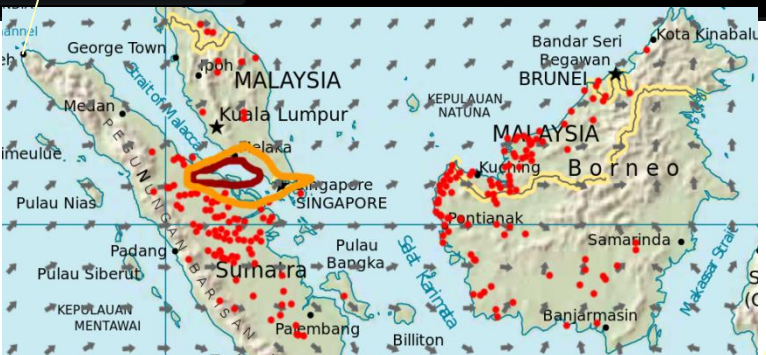
- Repeated trans-boundary pollution events have raised policy questions and debate as to sustainable solutions
- Monitoring systems available but not well understood resulting in mixed reception to their findings
- Crisis management leads to a knee-jerk response
- Effective long term solutions are elusive
- The meeting is timely in this context with the current haze event in Southeast Asia

Fires, Riau province, Indonesia, June 18, 2013

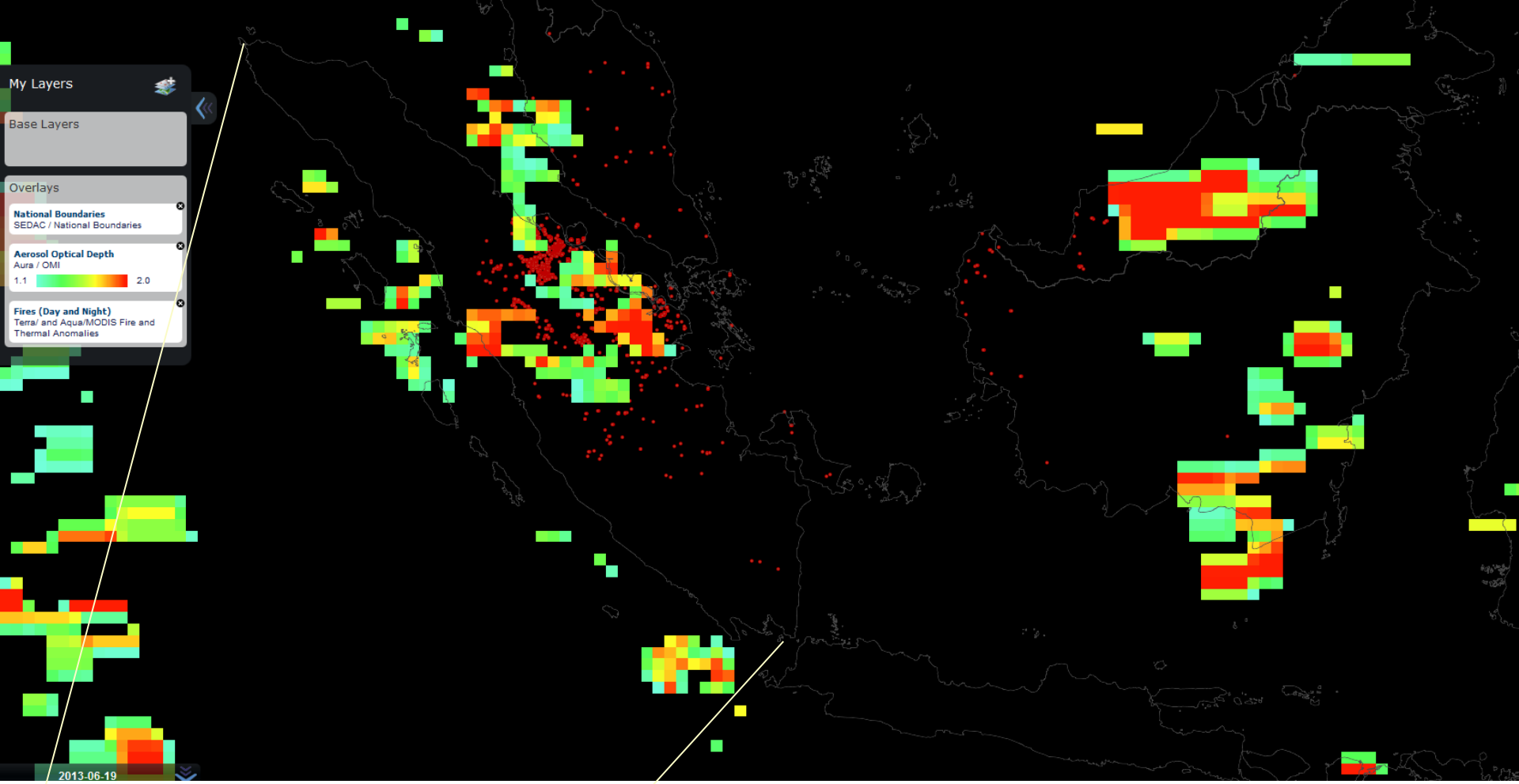
Haze in Singapore, June 20, 2013


Fires and smoke in Indonesia
(6/19/2013)





Aerosol optical depth – OMI (2013-06-18)



Aerosol optical depth–OMI (2013-06-19)

Background to the Meeting

- Nations have annual requirements for GHG inventory and reporting (IPCC)
- Quantification of GHG's and SLCP from different sources in Asia and understanding their climate impacts is an important task requiring integration of both *top-down* (satellite remote sensing) and *bottom-up* (ground based) approaches including modeling.
- Monitoring methods need to be robust, uncertainty quantified and results verifiable

Sources of Emissions

- Sources are varied but well identified and include a combination of natural and anthropogenic sources and interactions
- Emissions in general are poorly quantified
- Not an easy task – requires operational monitoring
- No one system can provide the necessary data

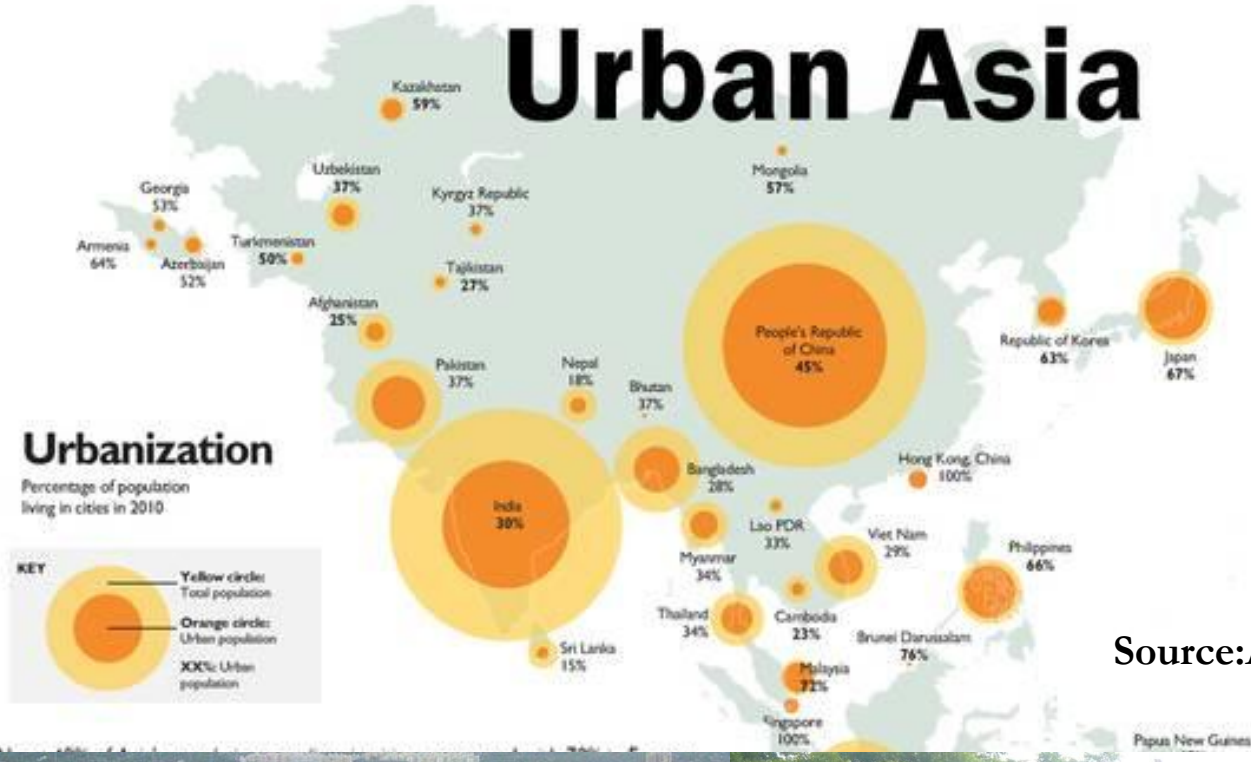

Industries


15-18% OF
GLOBAL GHG
EMISSIONS
ARE PRODUCED
BY LAND-USE
CHANGE AND
DEFORESTATION


Fossil Fuels


Livestock

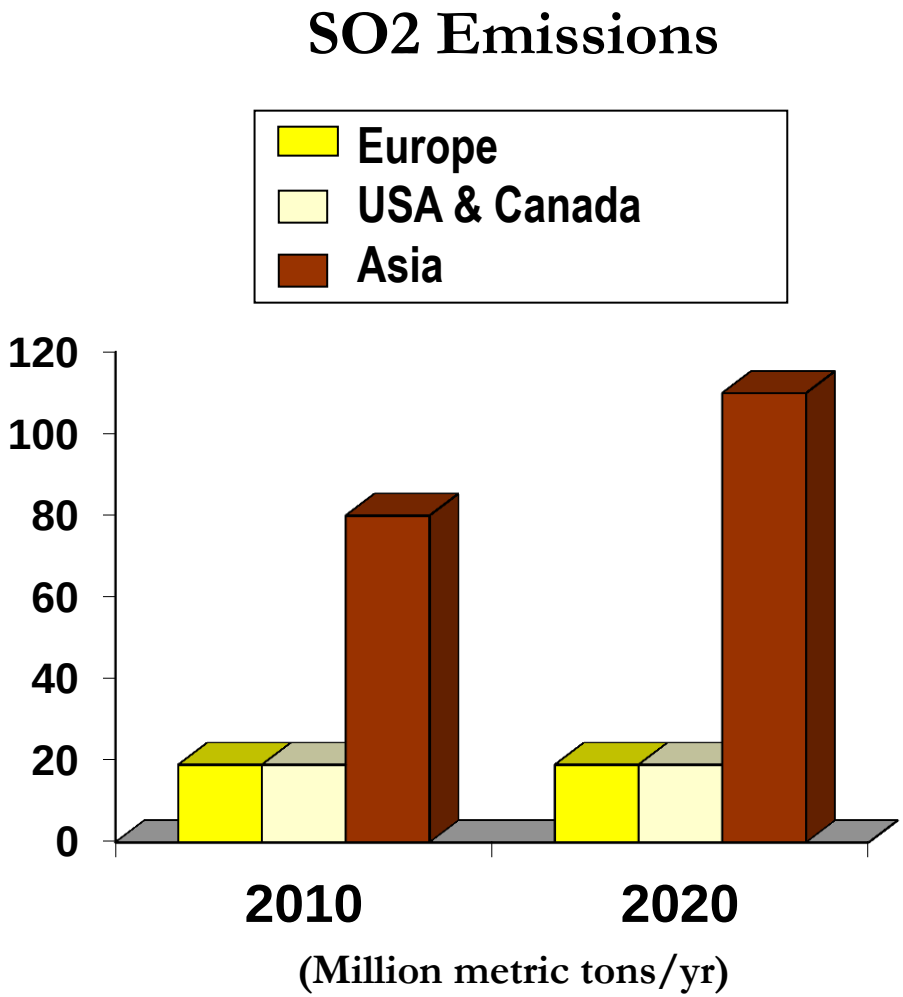

Waste



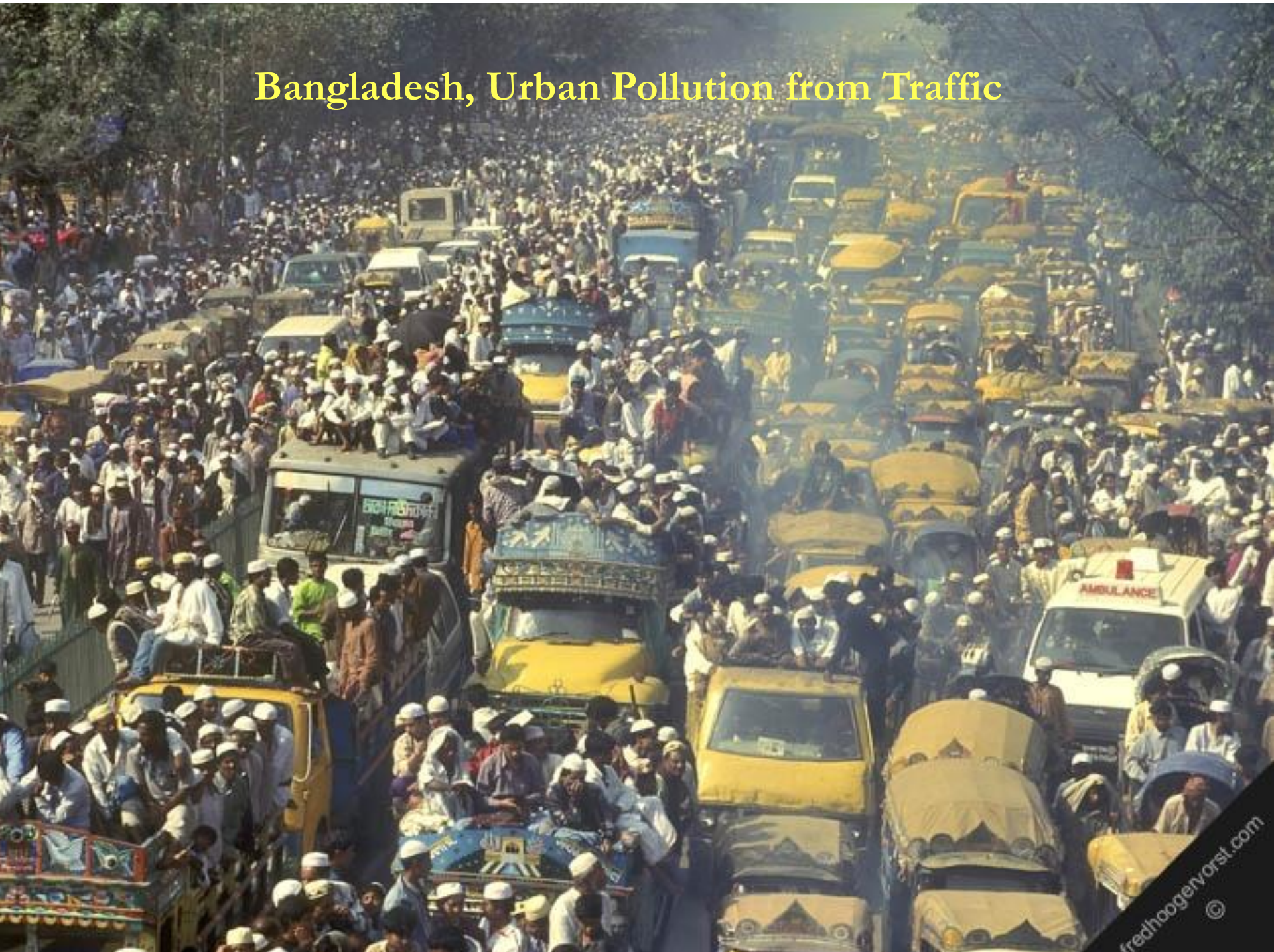
About 40% of Asia's population lives in cities; projected to increase >60% by 2030.

Source:ADB

Mobile Sources-Major pollutant emitors



SEI, 2012


Bangladesh, Urban Pollution from Traffic
AMBULANCE
fredhoogervorst.com
©

Smog enshrouds India Gate, New Delhi

India

Fog disrupts six domestic flights in Delhi

CNN-IBN | *Updated Nov 26, 2010 at 11:39am IST*

New Delhi: Heavy fog in Delhi disrupted air services and at least six domestic flights had to be delayed.

Three international flights: Ethopian airlines (Adisada to Delhi), Kingfisher (London Heathrow to Delhi) Brook Airlines (Bhutan to Delhi) were also delayed due to poor visibility,

"Flights from Bangalore, Mangalore, Jaipur and Pune to Delhi were delayed due to poor visibility. Some flights were even asked to land at other airports," an official at the Indira Gandhi Airport said.

Top News

Uttarakhand: Challenges await rescue teams as Met predicts more rains

Uttarakhand floods Over 550 dead;

Beijing, China

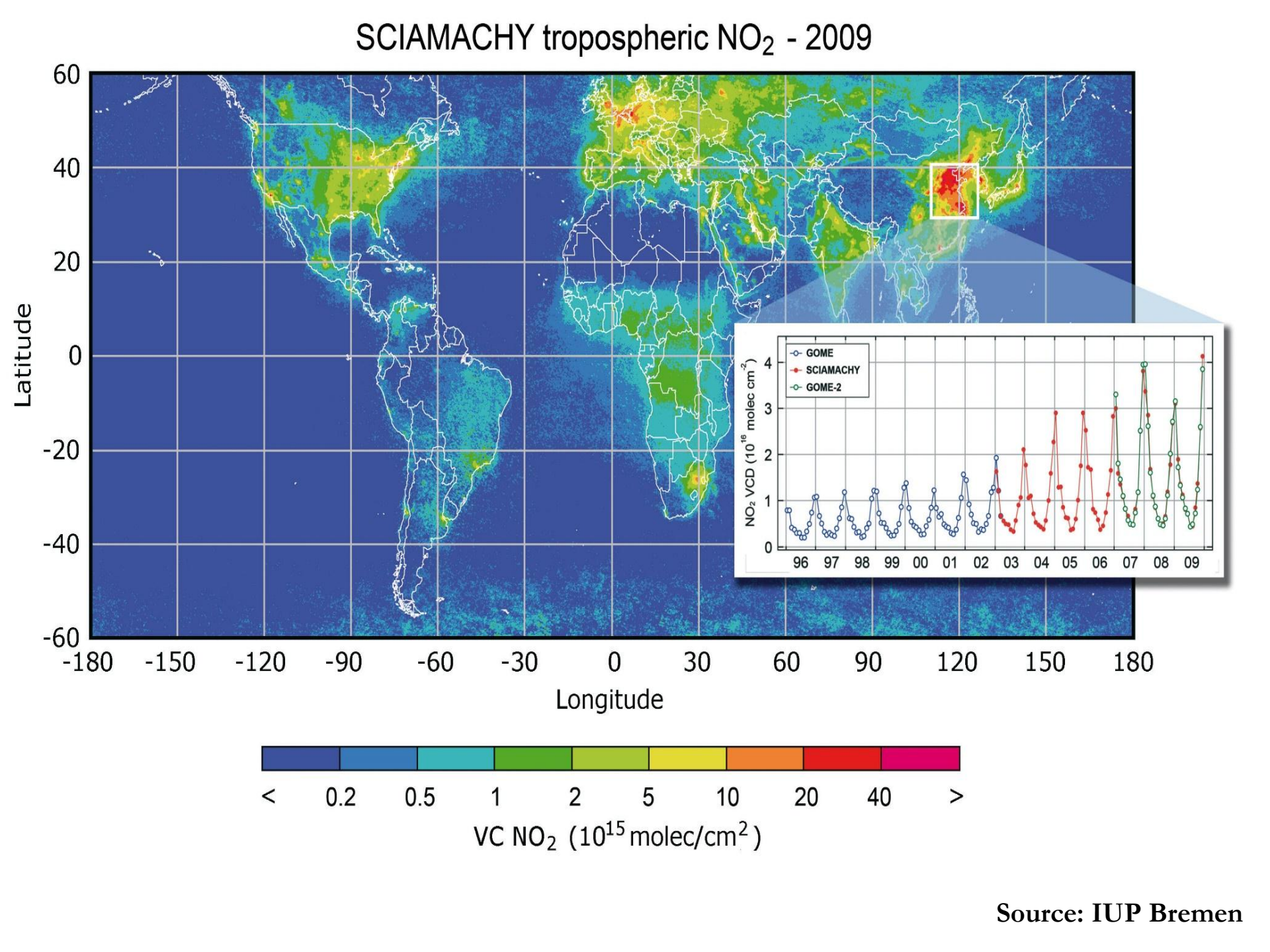
Mirror.co.uk

Quantifying Emissions

- Various measurement systems are in place
  - Satellite measurement of sources (e.g. Fire)
  - Satellite measurements of land cover/use change
  - Satellite measurements of products (e.g. Aerosols and Trace Gases)
  - Airborne measurement systems
  - Ground based measurement of Aerosols and Trace gases
- But few of the these are truly operational
- Relatively little integration and coordination of these systems

Top Down: Satellite Remote Sensing of Air Quality

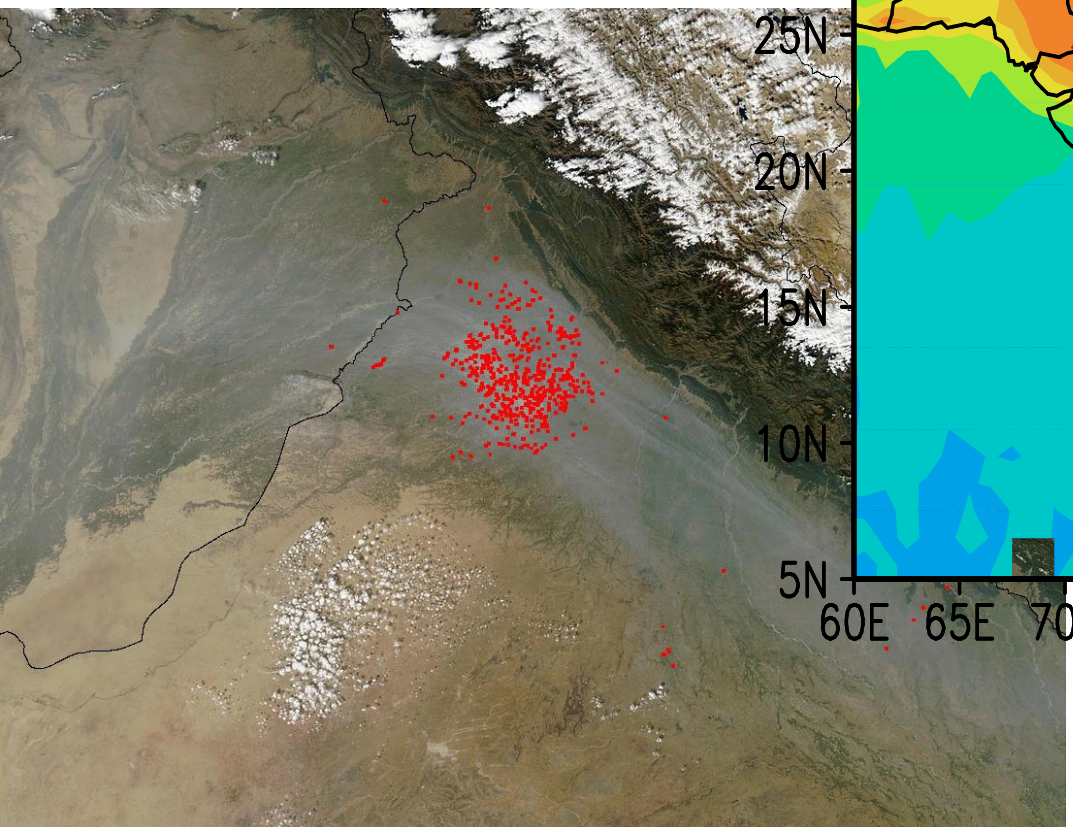
Instrument	Platform	Meas. Period	Typical nadir Res. (km)	Equator crossing time[b]	Global coverage (days)[c]	Spectral range (μm)	NO_2	HCHO	SO_2	CO	O_3	AOD
GOME	ERS-2	1995-2003	320 x 40	10:30d	3	0.23 – 0.79	1	1	1		0.5-1.5	
MOPITT	Terra	2000-	22 x 22	10:30d	3.5	4.7				0.5-2		
MISR	Terra	2000-	18 x 18[e]	10:30d	7	4[d] λ						1
MODIS	Terra Aqua	2000- 2002-	10 x 10[e]	10:30d 1:30a	2	36[d] λ 0.41-14.2						1
AIRS	Aqua	2002-	14 x 14	1:30a	1	3.7-16			1	0.5-1.5		
SCIAMACHY	ENVISAT	2002-	60 x 30	10:00d	6	0.23-2.3	1	1	1	1	0.5-1.5	
OMI	Aura	2004-	24 x 13	1:45a	1	0.27-0.50	1	1	1		0.5-1.5	1
TES	Aura	2004-	8 x 5	1:45a	n/a	3.3-15.4				0.5-1.5	1-2	
PARASOL	PARASOL	2004-	18 x 16	1:30a	1	9[d] λ , 0.44-1.0						1
CALIOP	CALIPSO	2006-	40 x 40	1:30a	n/a	0.53, 1.06						>30
GOME-2	MetOp	2006-	80 x 40	9:30d	1	0.24-0.79	1	1	1		0.5-1.5	
IASI	MetOp	2006-	12 x 12	9:30d	0.5	3.6-15.5				0.5-1.5	1-2	

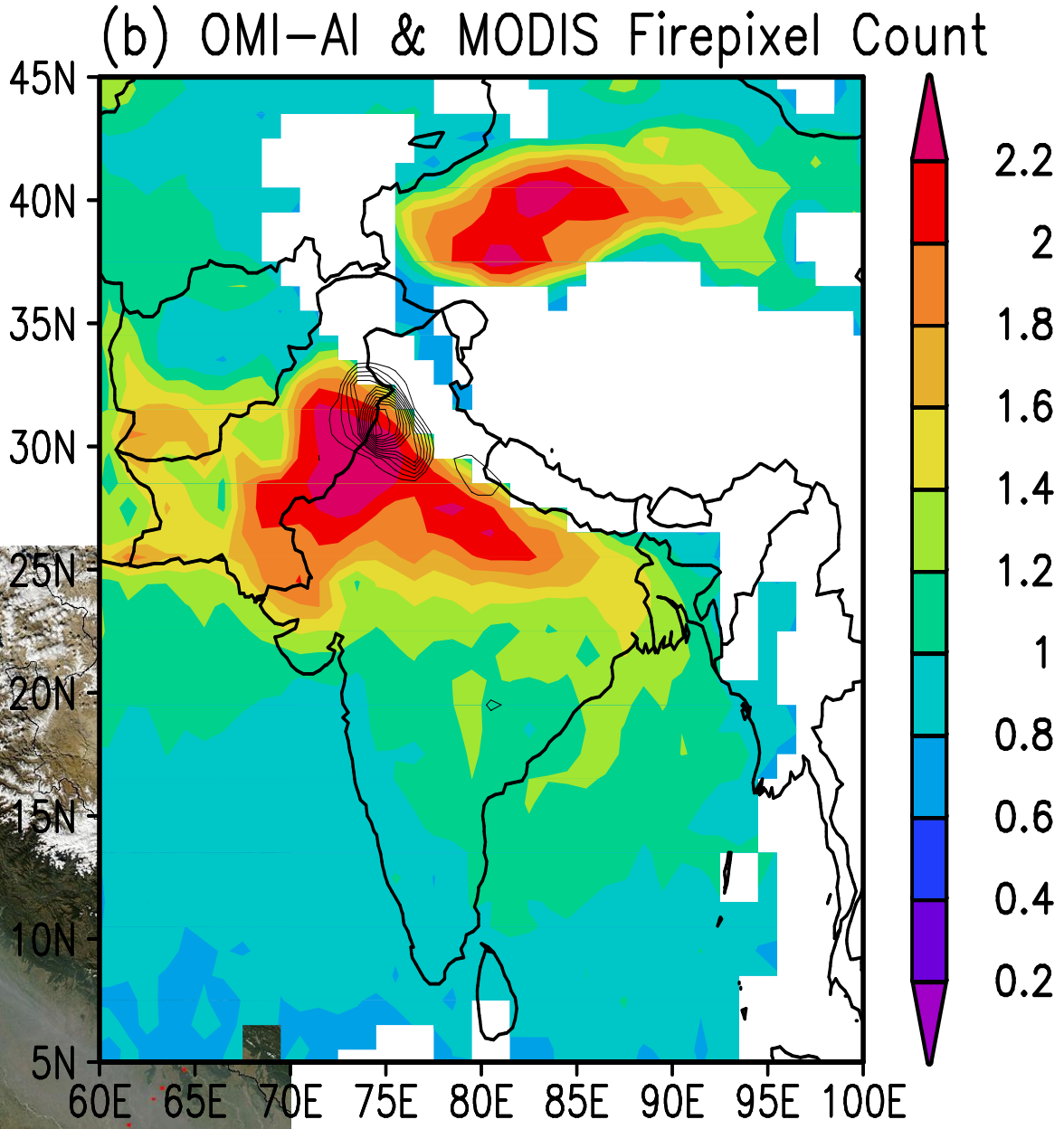


Source: IUP Bremen

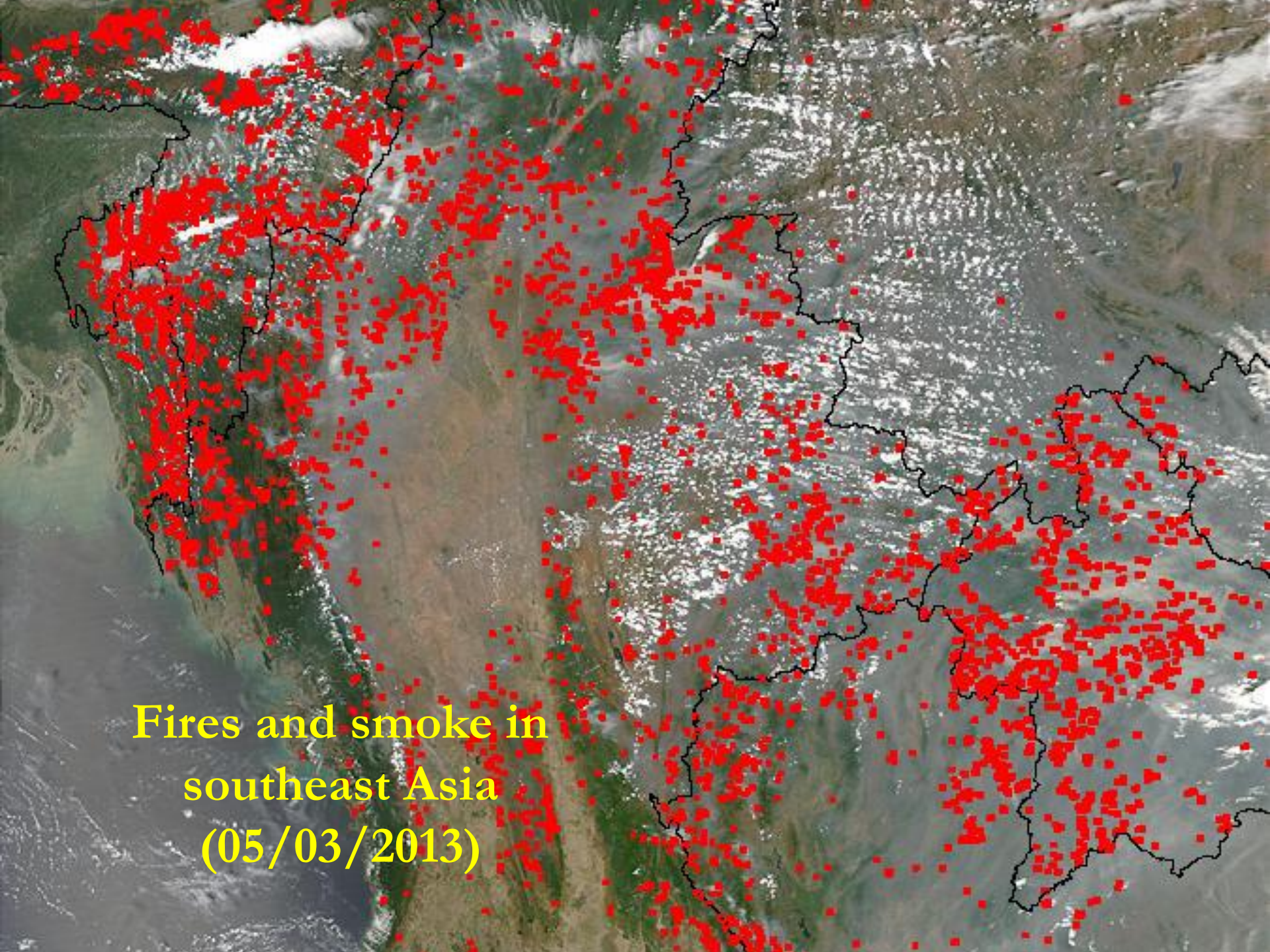

Fires and smoke in Punjab, India
10/29/2002

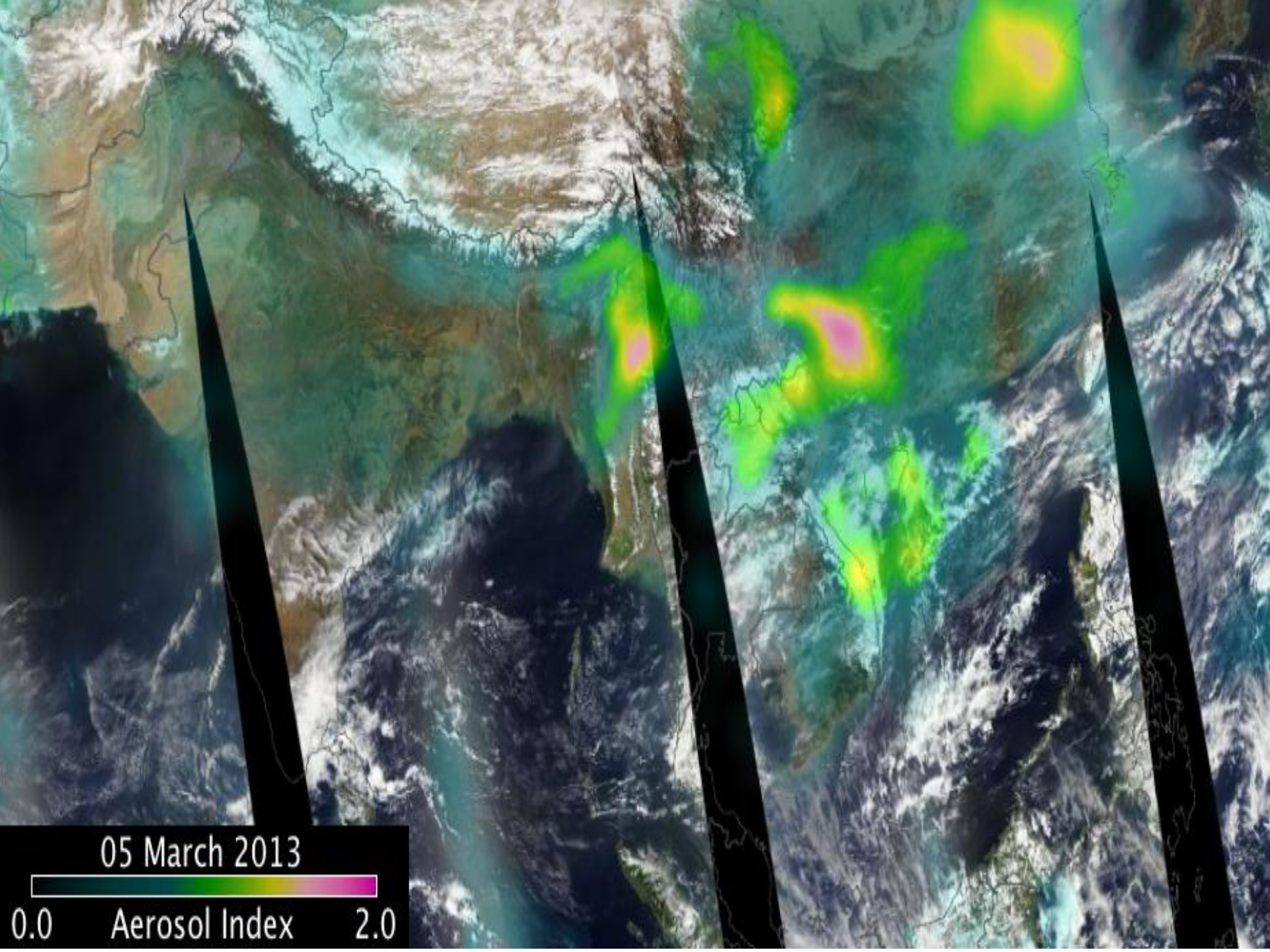
Fires and smoke in Punjab, India 10/29/2002)





Land Use Practices Plays an Important Role


Fires and smoke in
southeast Asia
(05/03/2013)


05 March 2013
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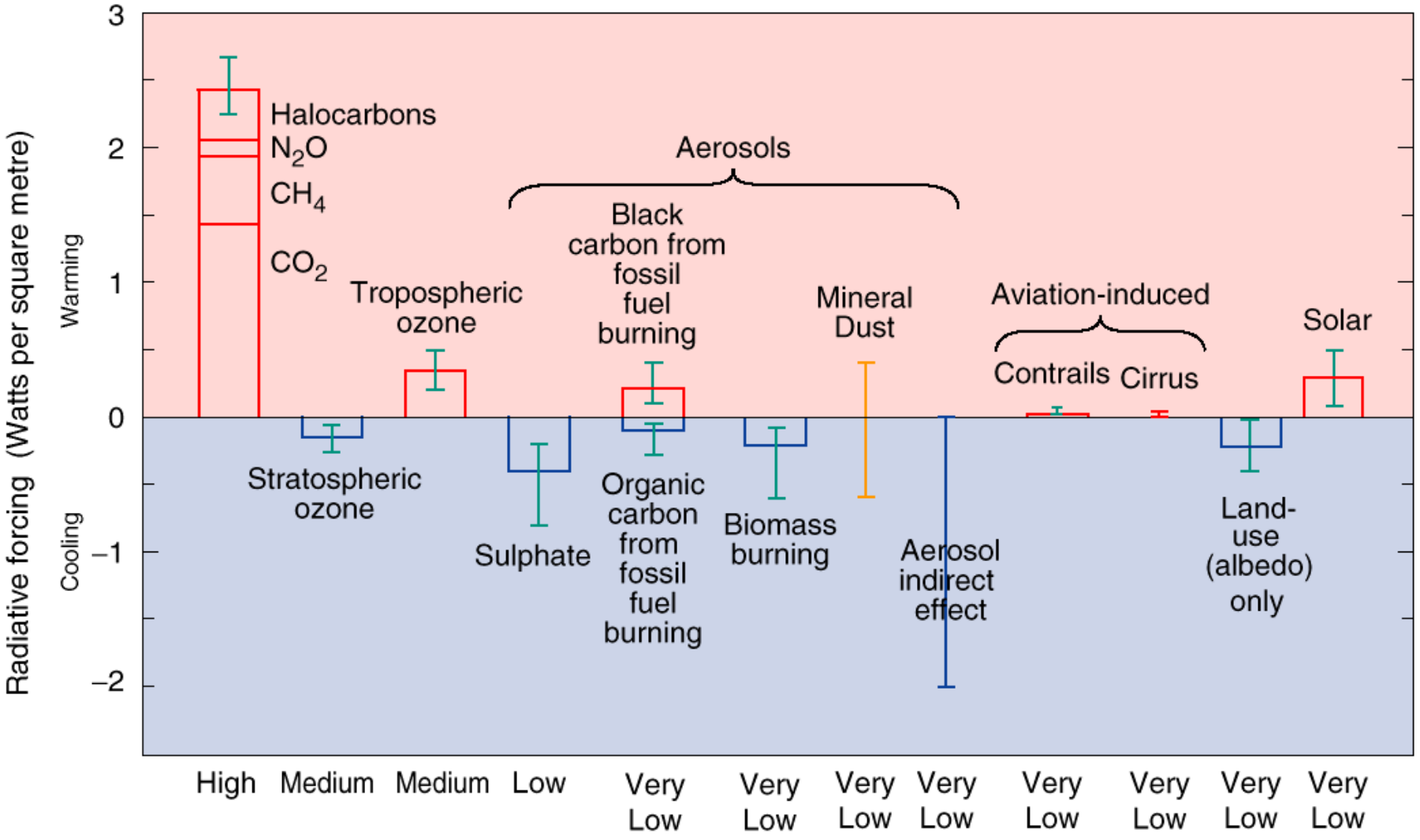
Aerosol Index
2.0

IPCC: Radiative Forcing by Pollutants



Regional Context

- Biomass burning, and greenhouse gas emissions are regional issues
- Regional solutions are needed to address transboundary issues
- In countries many of the sources are similar
- Regionally relevant and applicable measurement systems are needed
- We see benefit in regional cooperation amongst scientists – mechanisms for exchanging experience and ideas are needed

GOFC-GOLD

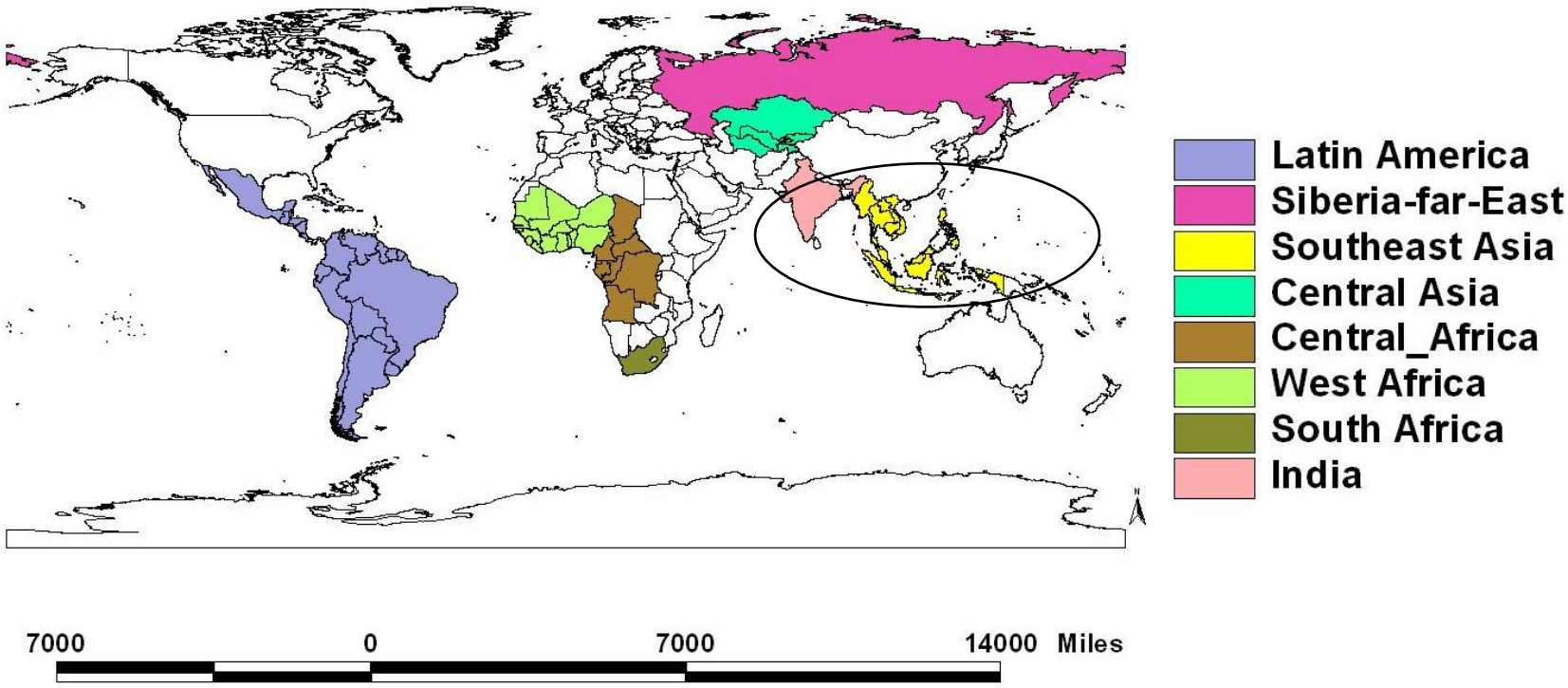
Global Observation of Forest and Land Cover Dynamics

Providing the International Coordination needed for Global Observation of Forest and Land Cover Dynamics

GOFC-GOLD Overview

GTOS

Regional Networks and Coordinators



The principal role of GOFC/GOLD is to act as a coordinating mechanism for national and regional activities. To achieve its goals GOFC/GOLD has developed a number of regional networks across the world.

Regional networks cater the regional users needs and foster lateral transfer of technology and methods within and between regions relating to Land and Fire activities.

Meeting Objectives

- Review GHG and SLCP emission estimates and methodologies from different sources in the Asian region;
- Understand the impact of GHG's and aerosols on regional to local climate;
- Explore the potential of satellite remote sensing datasets for quantifying biomass burning pollutants, aerosols and pollution episodes;
- Review inverse modeling approaches for characterizing emissions;
- Strengthen the GOFC SEARRIN activities in the region

Organized in Six Sessions

Day-1

- **Session I. Regional campaigns/studies in Asia**
- **Session II. Anthropogenic emission inventories in Asia**

Day-2

- **Session III. Earth Observation Programs in Land Cover/Land Use/Air Pollution/GHG emissions and Coordination Activities**
- **Session IV. Biomass burning emissions**

Day-3

- **Session V. Aerosols, Climate Change and Air Quality**
- **Session VI. Regional coordination: SEARRIN Network**

Thanks to Meeting Sponsors

NIES JAPAN

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GLOBAL OBSERVATION FOR FOREST AND LAND COVER DYNAMICS

START
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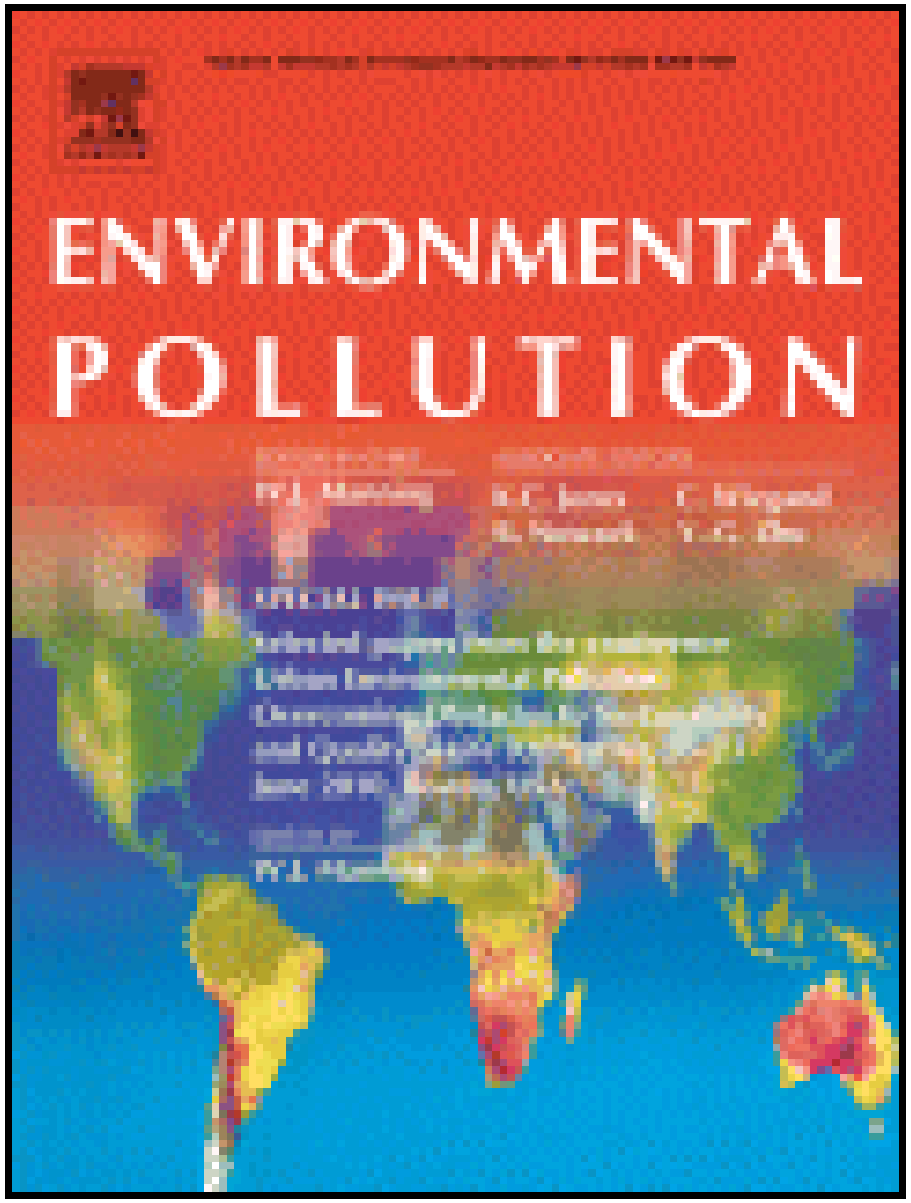
Meeting Outputs



Journal Impact Factor: 3.73
5-year impact: 4.09

Selected papers will be published after peer review;

Timeline:

Manuscript submissions: Deadline: December (2013)

Peer review: Jan-Mar 2014

Publishing: April, 2014