Inventory, Modeling and Climate Impacts of Greenhouse Gas emissions (GHG's) and Aerosols; Remote Sensing Applications and Integrated Technologies

Meeting Objectives

Krishna Vadrevu and Chris Justice

University of Maryland College Park
USA

VNU UNIVERSITY OF ENGINEERING AND TECHNOLOGY

UNIVERSITY OF MARYLAND

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global change SysTem for Analysis, Research & Training

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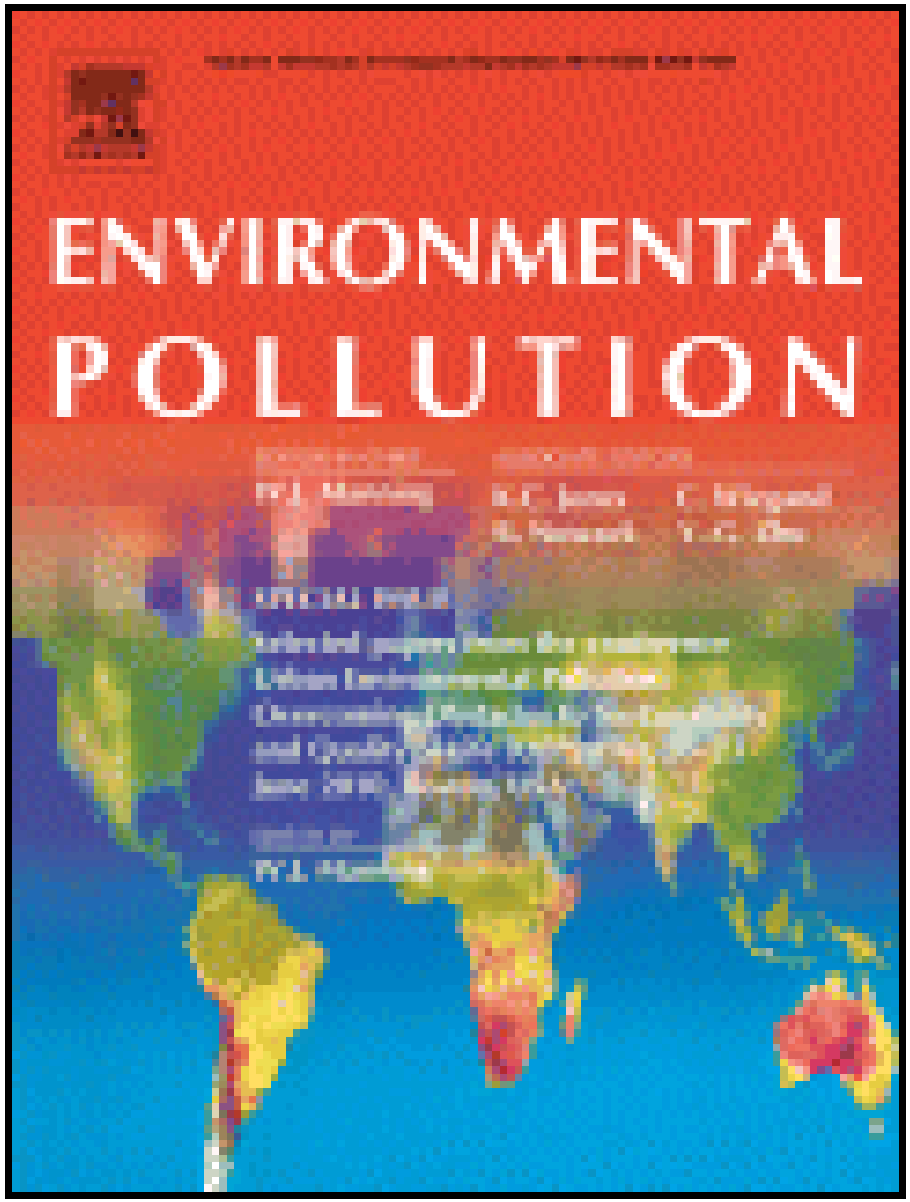
GHG and Remote Sensing Meeting, June, 2013
Tsukuba, Japan

90 participants from 12 different countries in Asia

Previous Meeting Outputs



Journal Impact Factor: 3.73
5-year impact: 4.09

Selected papers are being published after peer review;

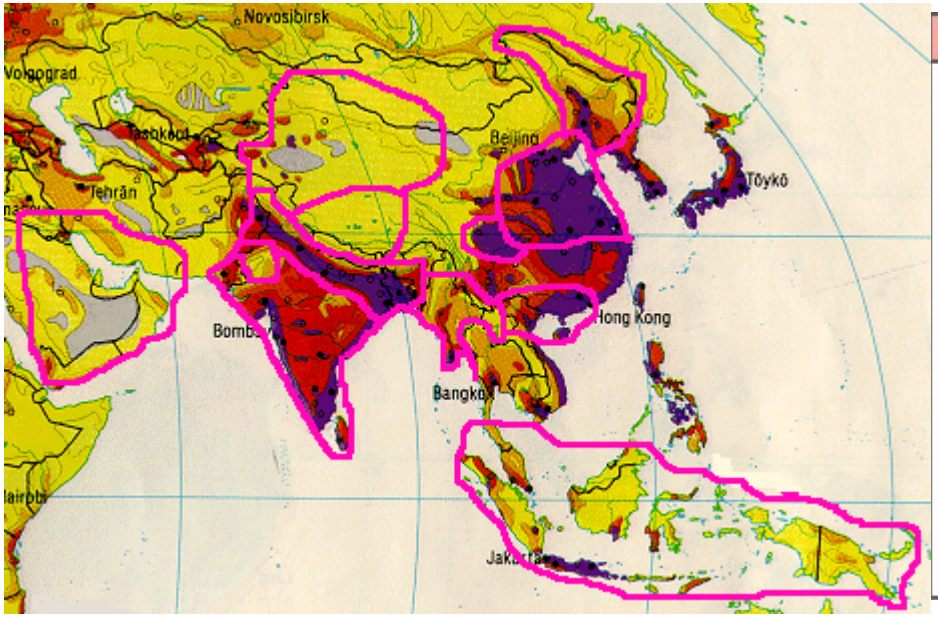
Timeline:

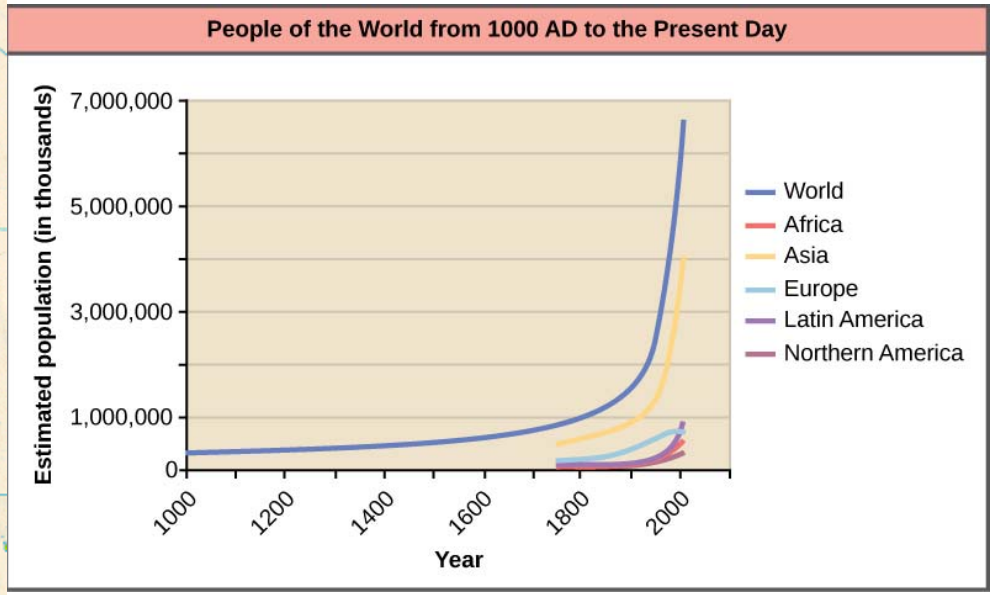
Publishing: July, 2014

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.

Population and Pollution





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

- CO_2 emissions are responsible for 55-60% of anthropogenic radiative forcing.
- SLCP's include black carbon, tropospheric ozone, methane, and hydrofluorocarbons (HFCs). These pollutants have atmospheric lifetimes of only days to a decade and a half.
- CO_2 mitigation must be combined with fast and aggressive reductions of the pollutants causing the other 40-45% of forcing which are short-lived climate pollutants (SLCP's).
- Six of the world's most polluted cities are in Asia and region generates a third of the world's CO_2 emissions.

Japanese in India warned of air pollution

Posted by weekly on February 28, 2013 in GREEN | 0 Comment

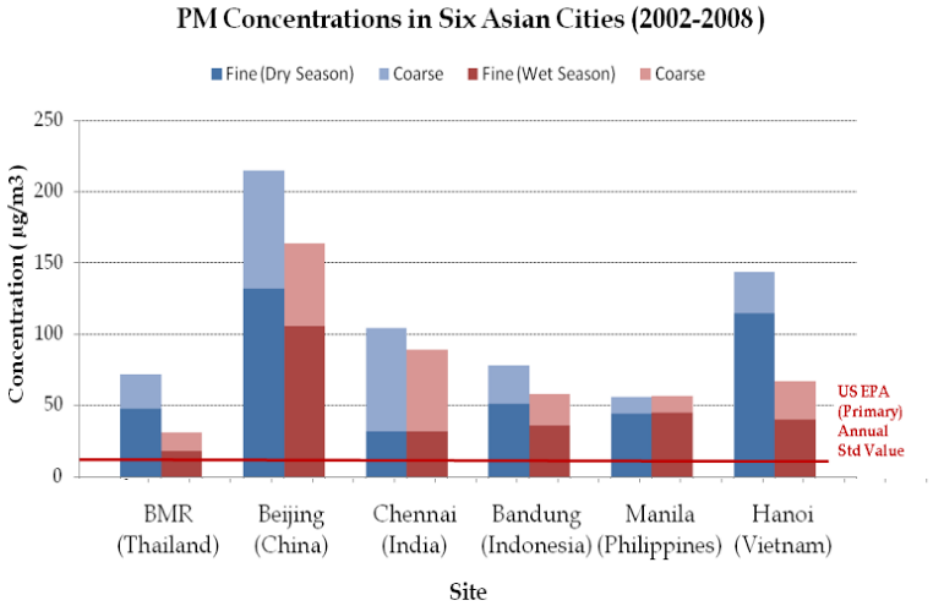
Air pollution in India.(Photo: chilfriend news)

Pollutant limits exceed WHO standards

PM2.5 - 10 micrograms/meter cube (annual mean)
- 25 micrograms/meter cube (daily mean)

PM10 – 20 micrograms/meter cube (annual mean)
- 50 micrograms/meter cube (daily mean)

PM Levels & Temporal Variation



Cruz et al., 2010

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

Pollution and Health Impacts

Lung cancer rates in some cities of China have increased 400 percent in some areas due to the ever-growing pollution problem (Zhang et al., 2014).

Indians have 30% weaker Lungs than Europeans. Study conducted 10,000 healthy, non-smoking individuals in Jaipur, Pune, Hyderabad, Kolkata and Kashmir (Salvi et al., 2014).

The main reason for worsening lung health of India is air pollution. "The number of motor vehicles, a major contributor to air pollution, in India has gone up from 37.2 million in 1997 to 100 million in 2012" (Salvi et al., 2014).

In addition...

- 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 immediate reaction but later forgotten;
- Effective long term solutions are needed.


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

Fires, Riau province, Indonesia, June 18, 2013

Haze in Singapore, and Malaysia, June 20, 2013

Key points

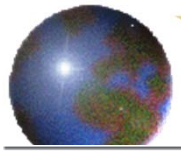
- Emission sectors/sources are well known (urban, industries, biomass burning, livestock, etc.), however emissions in general are poorly quantified;

- Not an easy task – requires operational monitoring;

- No one system can provide the necessary data.

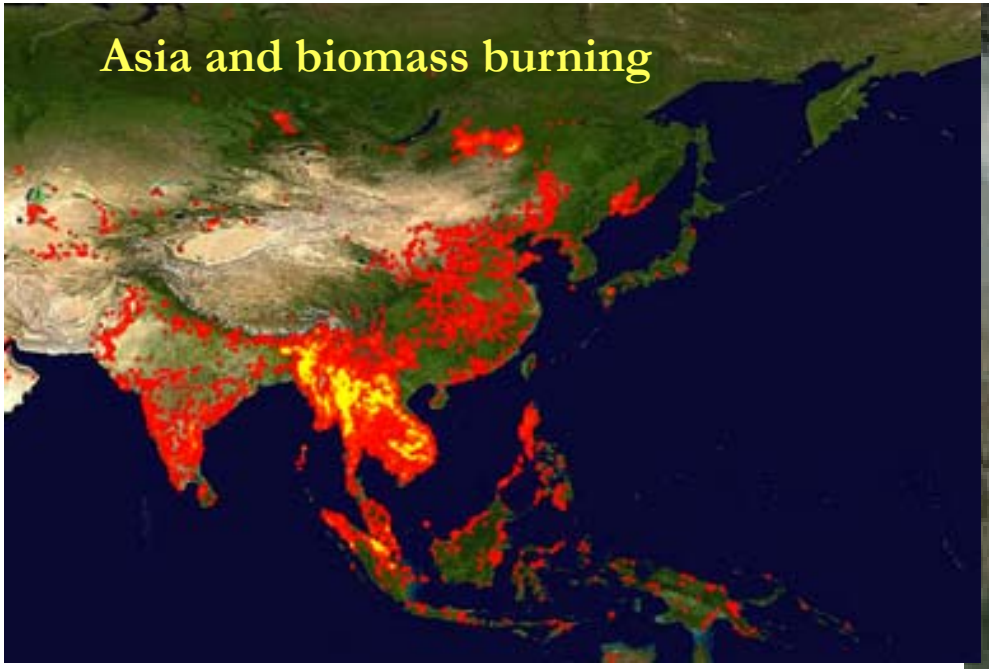
Key points

- 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



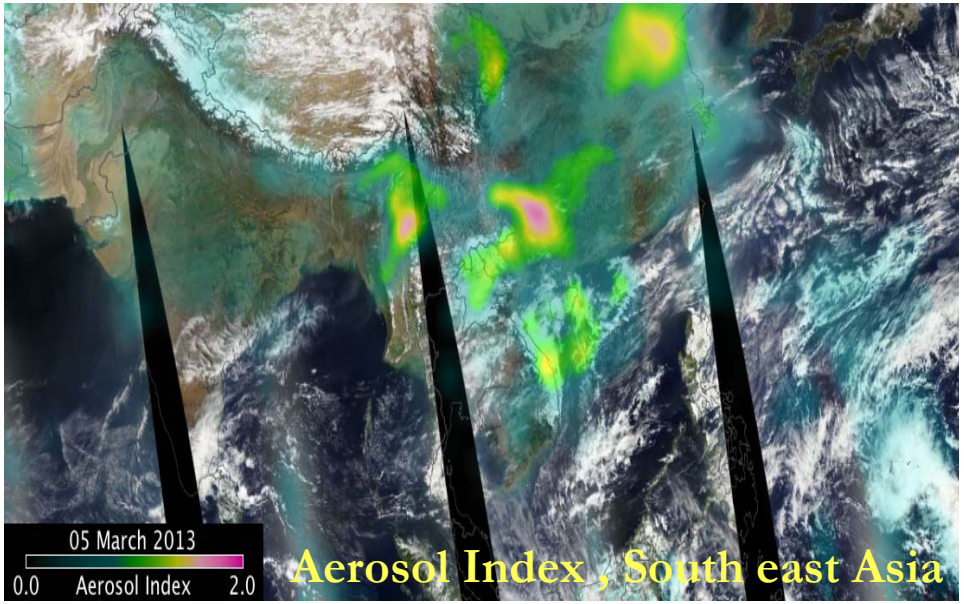
Satellite Data for Air Pollution Studies

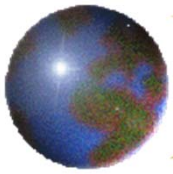
Variable	Sensor (Satellites)	Nominal spatial res	Spatial coverage	Data period[a]	References[b]
PH	MISR (Terra)	1.1 × 1.1 km	Global	2000–present	Kahn et al. (2007, 2008); Val Martin et al. (2010)
PVP	CALIOP (Calipso)	N/A	Global (curtains)	2006–present	Winker et al. (2007, 2009)
AI	OMI (Aura)	13 × 24 km	Global	2004–present	Torres et al. (2010)
	TOMS (Nimbus-7, Meteor-3, Earth Probe)	50 × 50 km	Global	1978–present	Hsu et al. (1996, 1999)
AOD	MODIS (Terra and Aqua)	10 × 10 km	Global	2000–present	Remer et al. (2005, 2008), Levy et al. (2010).
	MISR (Terra)	18 × 18 km	Global	2000–present	Kahn et al. (2009, 2010)
	OMI (Aura)	13 × 24 km	Global	2004–present	Torres et al. (2010)
	POLDER (ADEOS1, ADEOS2, PARASOL)	19 × 19 km	Global (Ocean only)	1996–2010	Tanré et al. (2011)
	SEAWiFS (SeaStar)	4 × 4 km	Global	1997 - 2010	
	AVHRR (NOAA)	8 × 8 km	Global (Ocean only)	1988–present	Ignatov et al. (2004); Mishchenko et al. (1999)
	SEVIRI (MSG)	3 × 3 km	Africa, Europe		Popp et al. (2007)
	IMG (GOES)	4 × 4 km	N/S America		Zhang et al. (2001)
	CALIOP (Calipso)	5 × 5 km	Global (curtains)	2006–present	Winker et al. (2007, 2009)
CO_2	AIRS (Aqua)	90 x 90 km	Global	2002–present	Chahine et al. (2008)
	SCIAMACHY (Envisat)	30 x 120 km	Global	2003–present	Buchwitz et al. (2005a,b, 2006)
CO	MOPITT (Terra)	22 km × 22 km	Global	2000–present	Edwards et al. (2004)
	AIRS (Aqua)	50 × 50 km	Global	2002–present	McMillan et al. (2005)
	TES (Aura)	5 × 8 km	Global	2004–present	Lopez et al. (2008)
	SCIAMACHY (Envisat)	30 × 120 km	Global	2003–present	Buchwitz et al. (2005a,b, 2006)
CH_4	MOPITT (Terra)	22 km × 22 km	Global	2000–present	Edwards et al. (2004)
	AIRS (Aqua)	50 × 50 km	Global	2002–present	Xiong et al. (2008)
	TES (Aura)	5 × 8 km	Global	2004–present	
	SCIAMACHY (Envisat)	30 × 120 km	Global	2003–present	Buchwitz et al. (2005a,b, 2006)
NO_x	GOME (ERS-2)	40 km × 40 km	Global	1995–present	Martin et al. (2003, 2004)
	SCIAMACHY (Envisat)	30 × 120 km	Global	2003–present	van der A et al. (2008)
HCHO	OMI (Aura)	13 × 24 km	Global	2004–present	Millet et al. (2008)
	GOME (ERS-2)	40 km × 40 km	Global	1995–present	Martin et al. (2004)
	SCIAMACHY (Envisat)	30 × 60 km	Global	2003–present	Dufour et al. (2009)
O_3	OMI (Aura)	13 × 24 km	Global	2004–present	McPeters et al. (2008)
	TOMS (Nimbus-7, Meteor-3, Earth Probe)	50 × 50 km	Global	1978–present	Bhartia (2007)
	SCIAMACHY (Envisat)	30 × 120 km	Global	2002–present	Brinksma et al. (2006)
	TES (Aura)	5 × 8 km	Global	2004–present	Bowman et al. (2002)
	GOME (ERS-2)	40 km × 40 km	Global	1995–present	Liu et al. (2006)


Asia and biomass burning


Northeast India and Myanmar Haze


Riau Province, Indonesia


05 March 2013
0.0
Aerosol Index
2.0
Aerosol Index , South east Asia



How effective are the atmospheric remote sensing satellites in capturing Air pollution events?

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

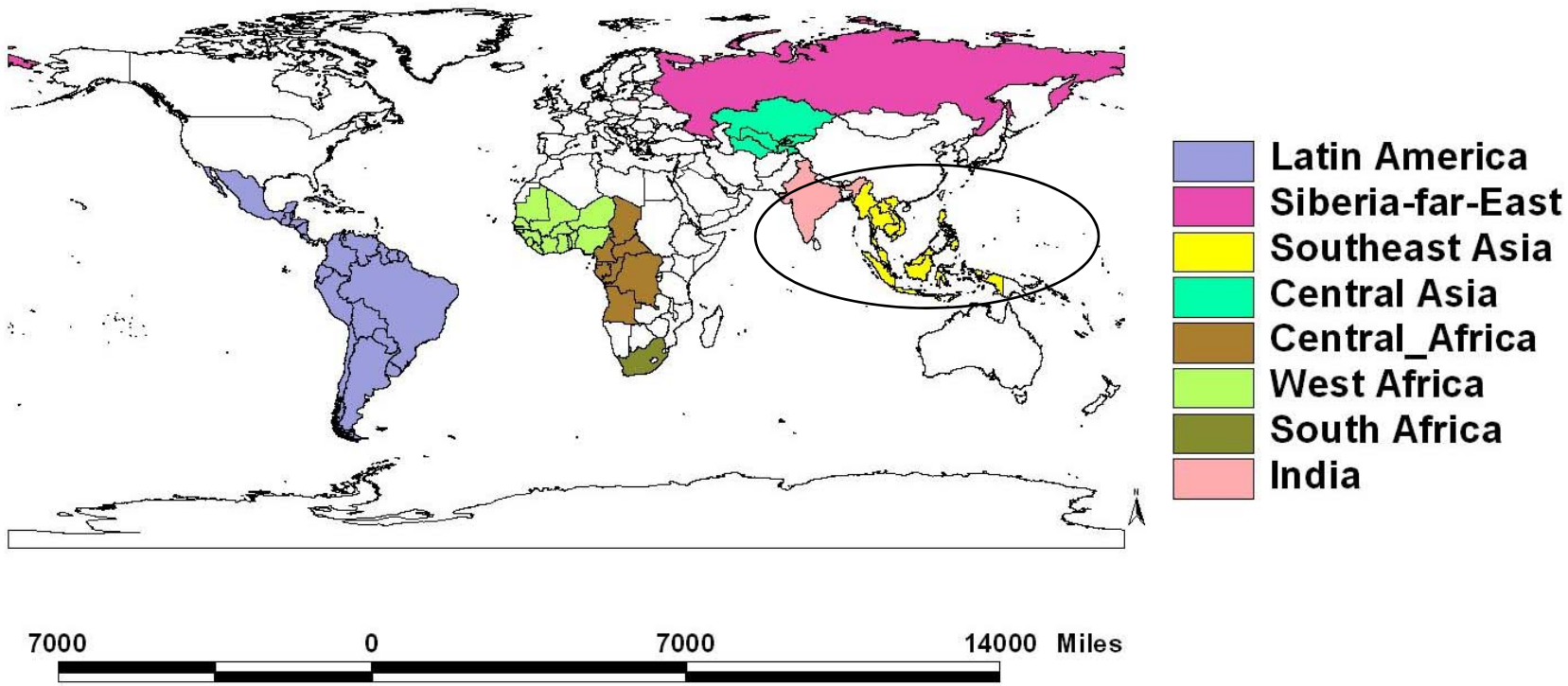
Global Observation of Forest and Land Cover Dynamics

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

GOFC-GOLD Overview

GTOS

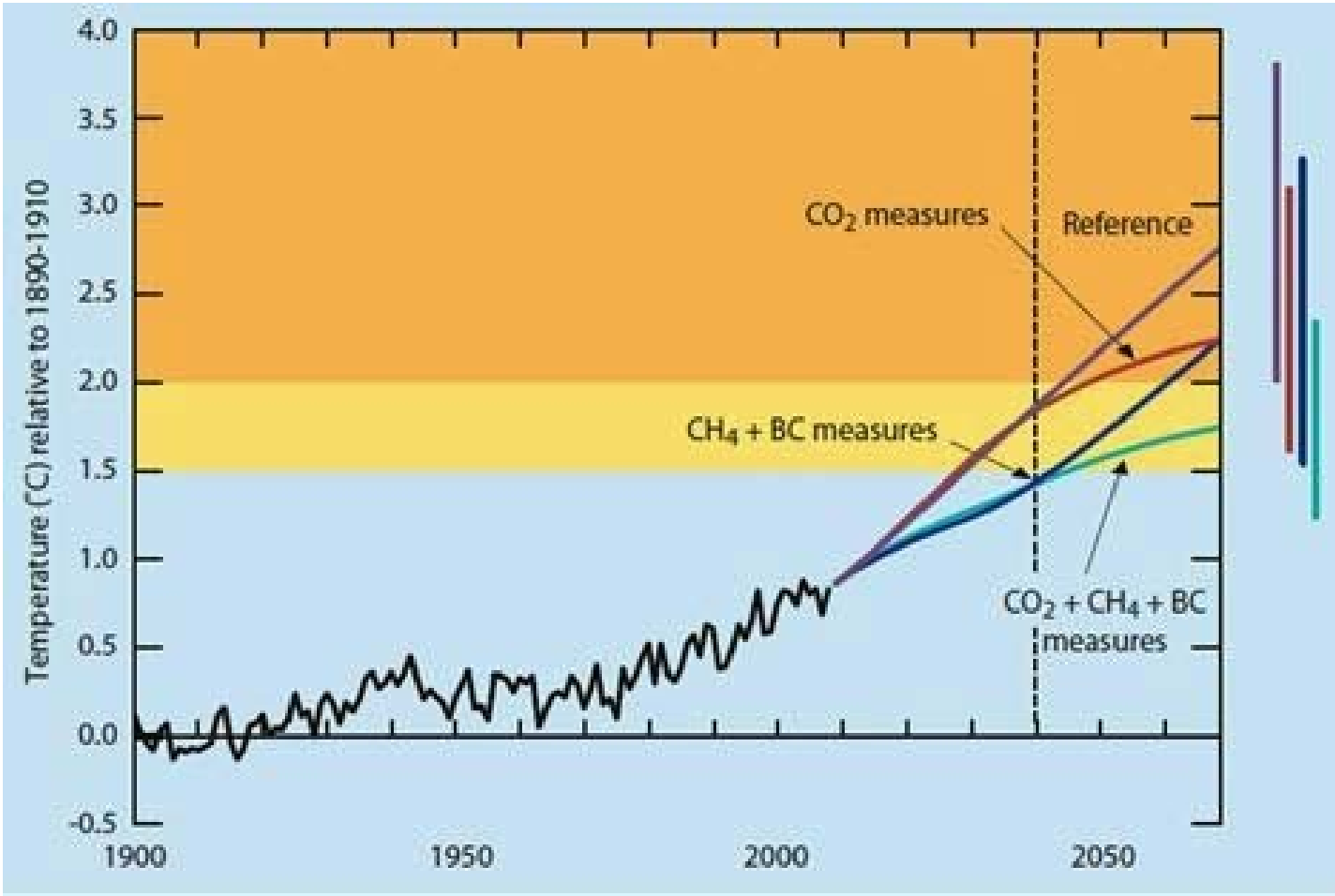
Regional Networks and Coordinators



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.

IPCC 5th Assessment Report



SLCP's can help in cutting the current rate of climate change in half by 2050

SLCP Reductions Seem Feasible

Cutting SLCP might prevent more than 2.4 million air-pollution related deaths a year, and avoiding around 35 million tonnes of crop losses annually.

Technologies for SLCP reductions are readily available without adversely impacting people's quality of life. They include efforts to improve energy efficiency through:

-vehicle efficiency standards;
-new building codes for improved efficiency;
-increasing renewable energy;

The economic viability of clean energy from wind and solar sources are becoming increasingly obvious.

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 land remote sensing, biomass burning pollutants, aerosols and other 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 and Anthropogenic emission inventories in Asia**

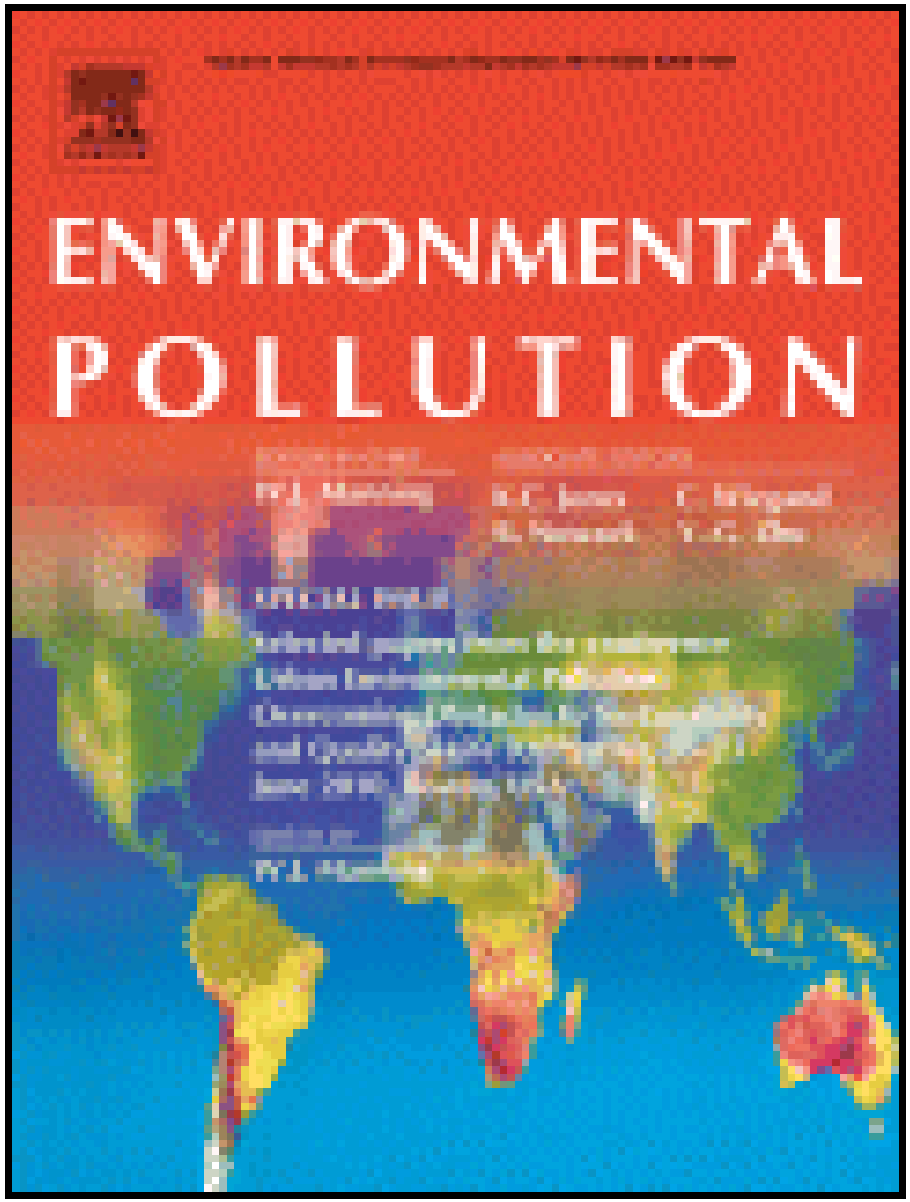
Day-2

- **Session II. Earth Observations and Remote Sensing Applications**
- **Session III. Biomass burning emissions**

Day-3

- **Session IV. Aerosols and Air Quality**
- **Session V. Air Pollution Modeling, Impacts and Scenarios**
- **Session VI. South East Asia Regional Information Network**

Previous Meeting Outputs



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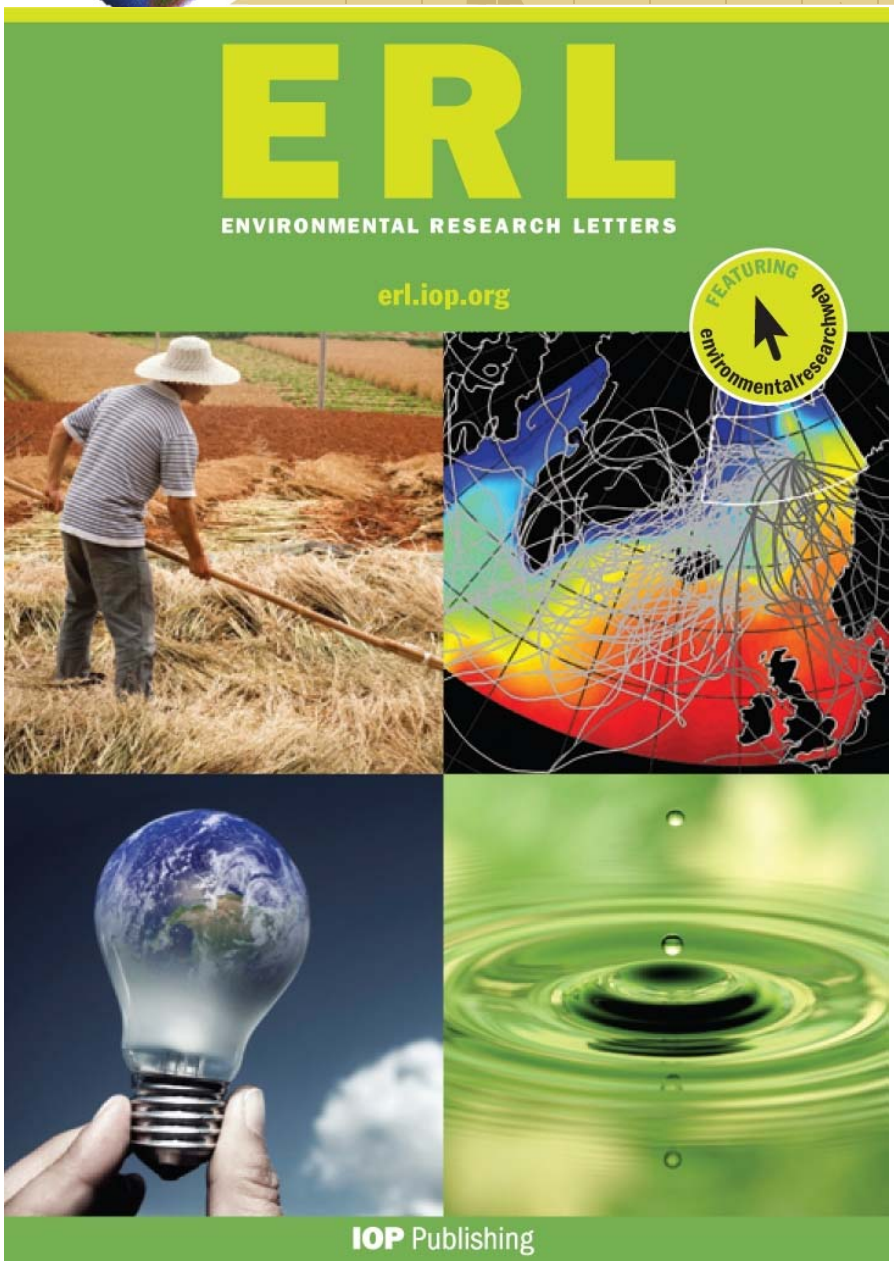

Journal Impact Factor: 3.8

All are invited to submit articles – no restrictions;

-Each article will undergo a regular peer review process of the journal.

Timeline:

Manuscript submissions: July 15-October-15th (2014)

Welcome to Hanoi