Land Atmospheric Interactions in Southeast Asia – Instrumentation, Emissions Data and Research Activities

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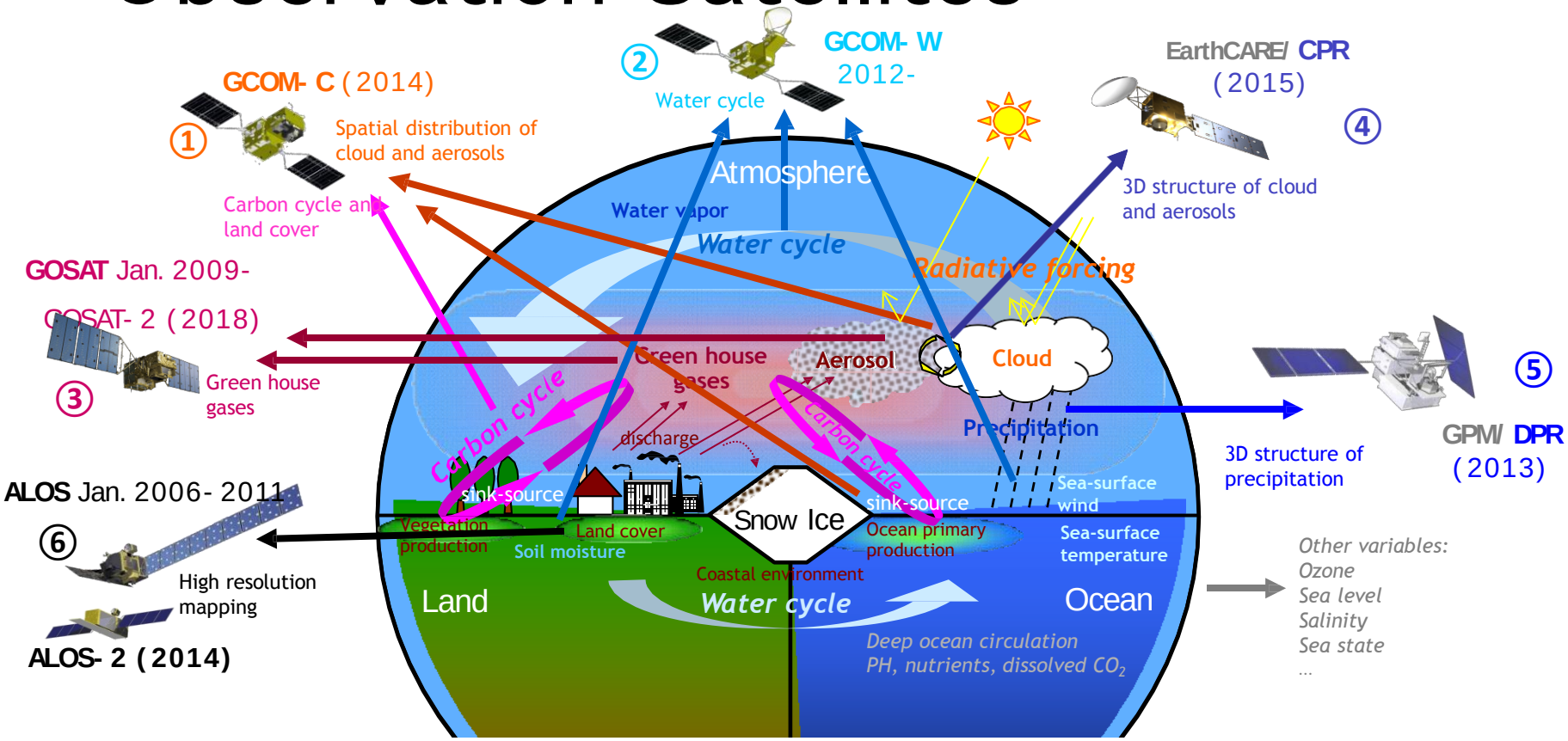
Asian Brown Cloud – AERONET – SKYNET – Measuring Stations

Monitoring stations for atmospheric aerosols by ABC, AERONET, and SKYNET in Asia.

SKYNET is an observation network to understand **aerosol -cloud-radiation interaction** in the atmosphere. The main instruments consist of a sky radiometer and radiation instruments such as a pyranometer and pyrgeometer as a basic site, and a super site has more instruments extended for analyzing **atmospheric parameters** of aerosol , cloud and radiation.

http://atmos.cr.chiba-u.ac.jp/skynet_index.html

JAXA Earth Environment Observation Satellites



① GCOM- C: Long- term observation of the horizontal distribution of aerosol, cloud, and ecosystem CO_2 absorption and discharge

② GCOM- W: Long- term observation of water- cycle such as the snow/ ice coverage, water vapor, and SST

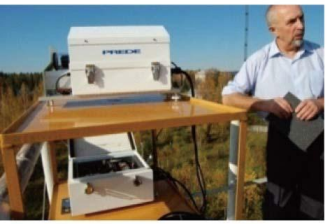
③ GOSAT: Observation of distribution and flux of the atmospheric greenhouse gases, CO_2 and CH_4

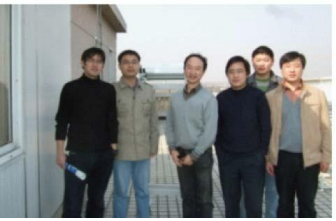
④ EarthCARE/ CPR: Observation of vertical structure of clouds and aerosols

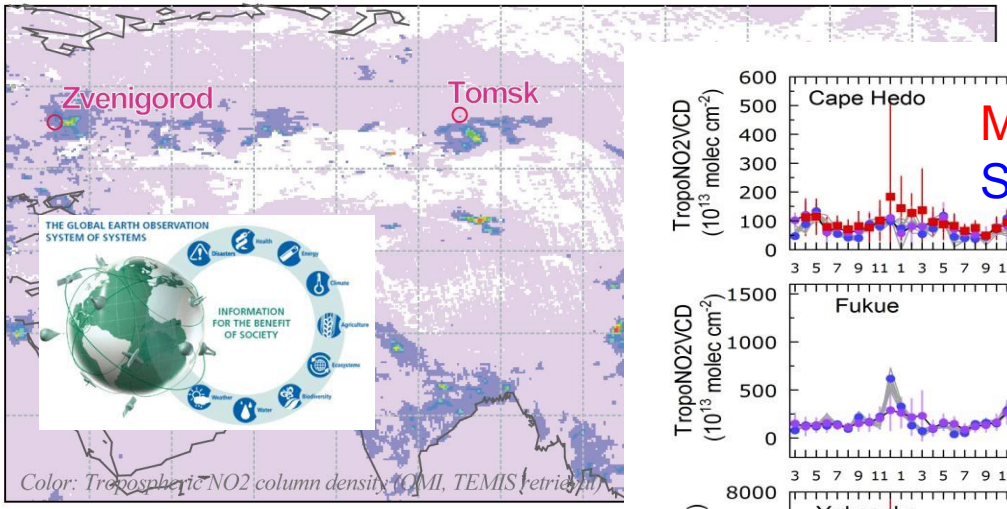
⑤ GPM/ DPR: Accurate and frequent observation of precipitation with active and passive sensors

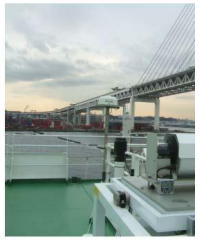
⑥ ALOS, - 2 Fine resolution mapping by SAR instruments

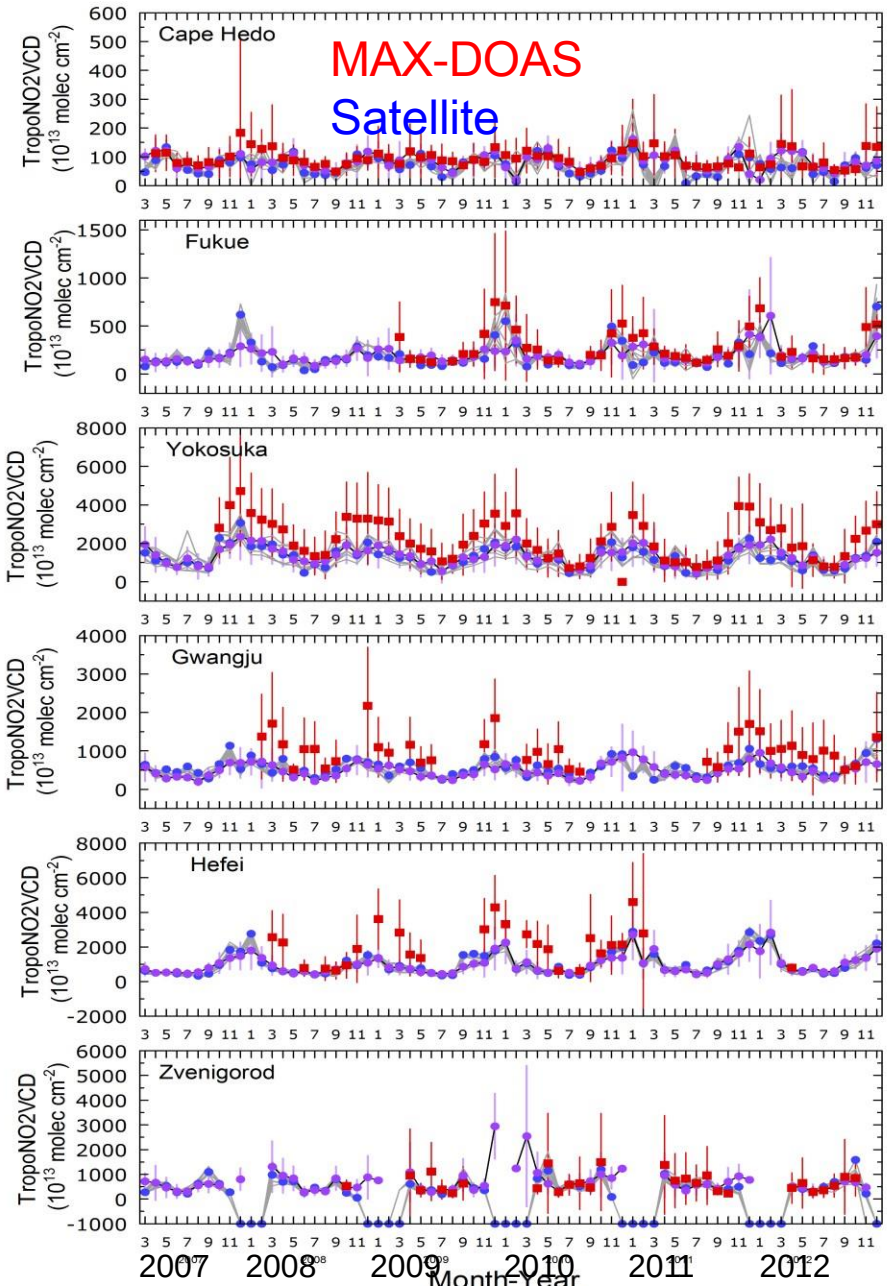
MAX-DOAS network over Asia and Russia









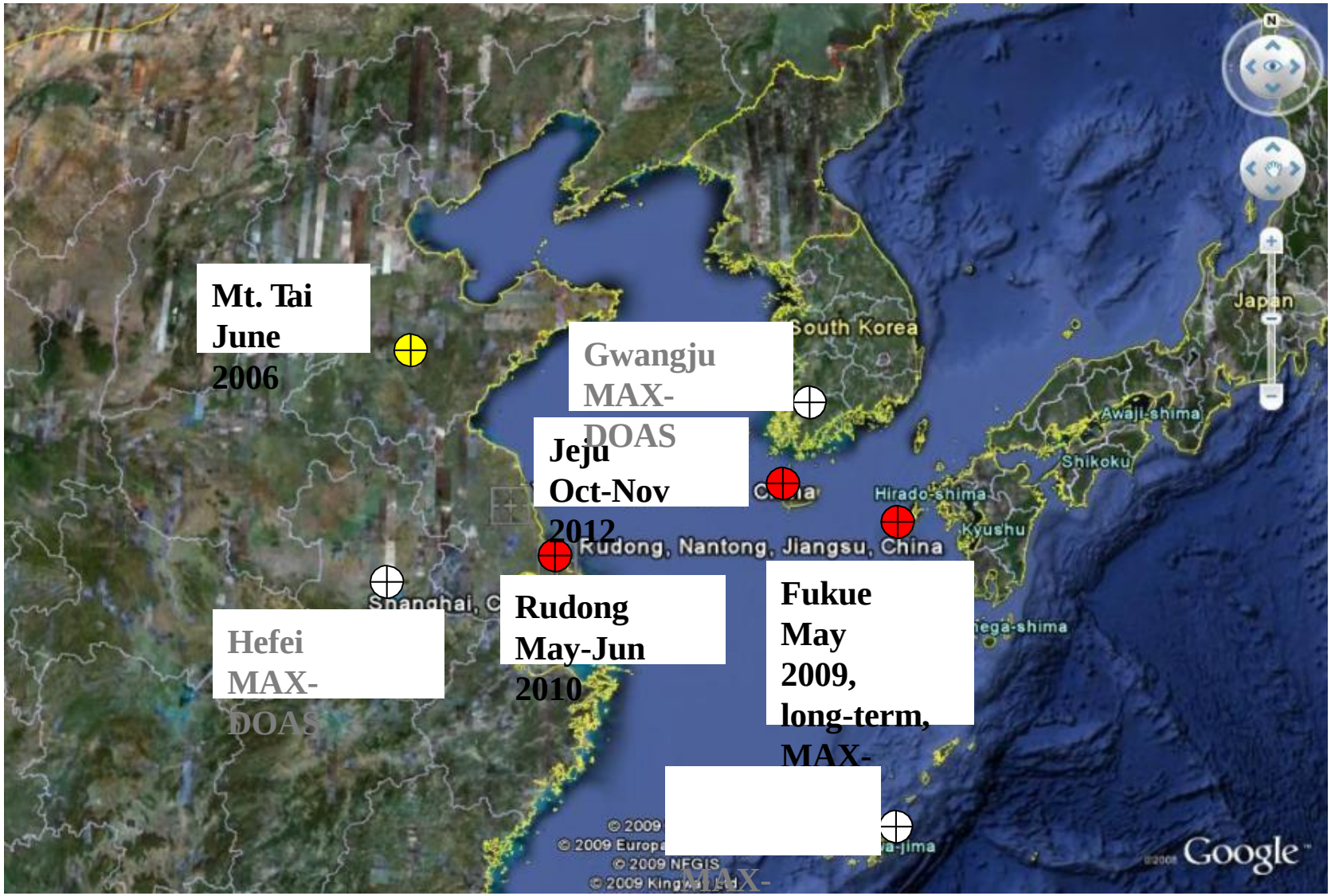


- Wanted: partners for obs in SE/S Asia!
- Climatology of NO2 and aerosols
- Validation of satellite & model

http://ebcrpa.jamstec.go.jp/maxdoashp/

JAMSTEC - Representatives

MAX-DOES Network over Asia – China, Korea, Japan (as of now)

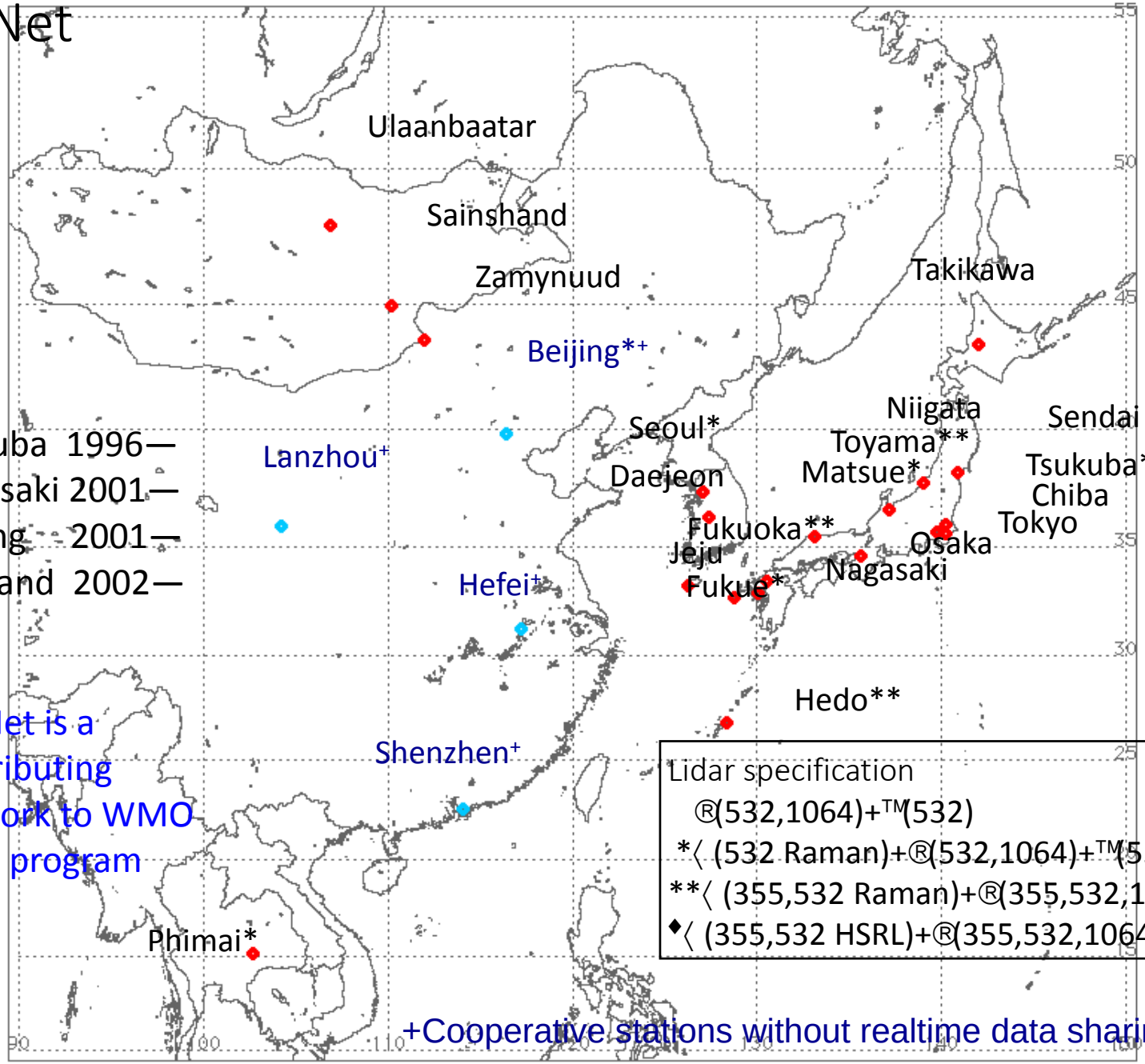


Continuous observation of aerosols in East Asia using a ground-based lidar network (AD-NET)

Asian Dust (AD-Net) is an evolving advanced multi-parameter lidar network

Contact: Dr. Nobuo Sugimoto
National Institute for Environmental Studies, Japan

AD-Net



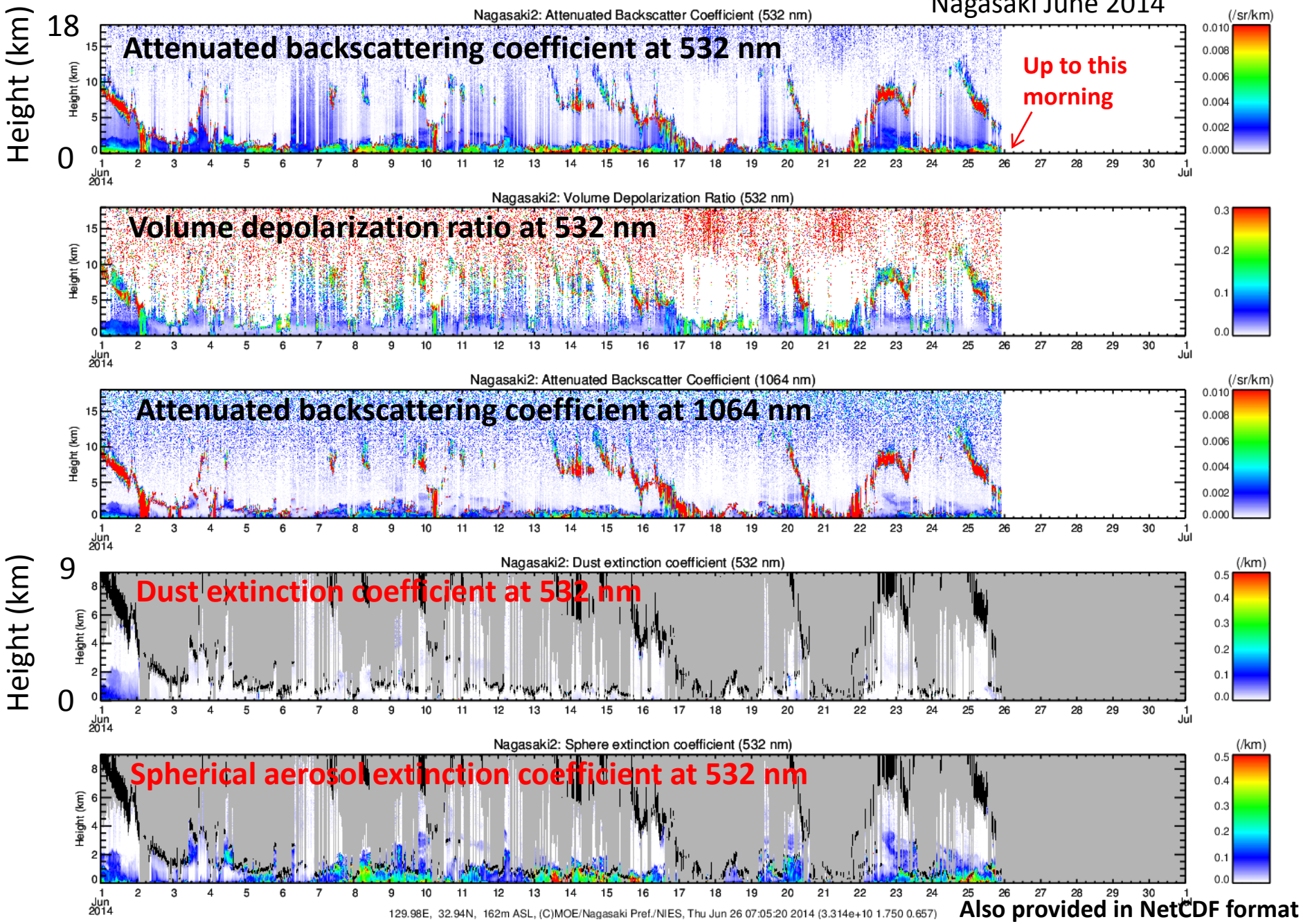
Tsukuba 1996—
Nagasaki 2001—
Beijing 2001—
Thailand 2002—
…

AD-Net is a contributing network to WMO GAW program

Lidar specification
®(532,1064)+™(532)
*〈 (532 Raman)+®(532,1064)+™(532)
**〈 (355,532 Raman)+®(355,532,1064)+™(355,532)
◆〈 (355,532 HSRL)+®(355,532,1064)+™(532,1064)

+Cooperative stations without realtime data sharing

Standard near realtime AD-Net data products (updated every hour)



Also provided in NetCDF format

LIDAR Instrument useful for measuring:

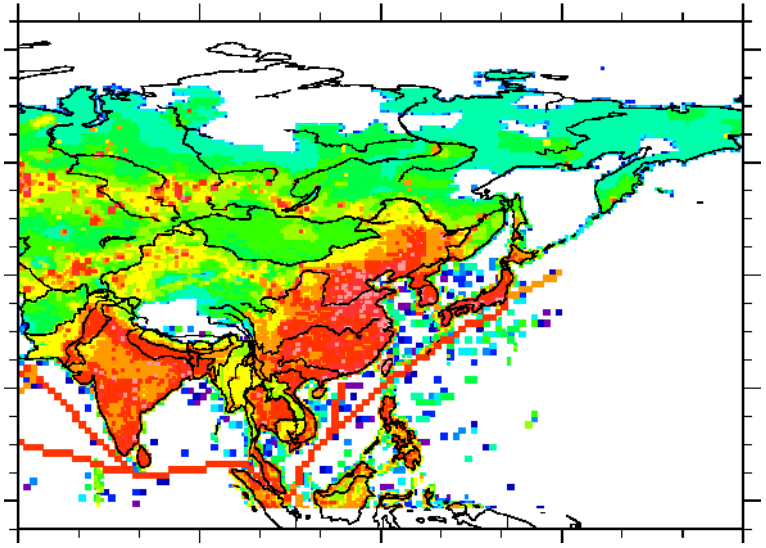
non-spherical (dust) aerosols
weak-absorption fine (sulfate, etc.)
weak-absorption coarse (sea salt)
strong-absorption fine (black carbon)

α: extinction,
β: backscattering,
δ: depolarization

Source: Picture taken by Sugimoto, NIES, Japan

Regional Emissions Inventory on Asia (REAS version 3.2)

NIES, Japan – Toshimasa Ohara (NIES)



Kurokawa et al., ACP, 2013, 2014

Item	Description
Target Areas	E, SE, S, and Central Asia Asian part of Russia
Target Years	2000-2008 (- 2015)
Spatial Resolution	0.25 x 0.25 degree
Temporal Resolution	Monthly
Japan	JEI-DB/OPRF*
Korea and Taiwan	Officially estimated data

	SO_2	NO_x	CO	PM_{10}	$PM_{2.5}$	BC	OC	NMV	NH_3	CH_4	N_2O	CO_2
Fossil Fuel Biofuel	●	●	●	●	●	●	●	●	●	●	●	●
Industrial Process	●		●	●	●	●	●	●	●		●	●
Fertilizer use		●							●	●	●	
Livestock									●	●	●	
Others								●	●	●	●	

On-Going Campaigns

The 7-SEAS http://7-seas.gsfc.nasa.gov/

Investigates the impacts of aerosols on *weather and the total SE Asian environment*

-Aerosol lifecycle and air quality

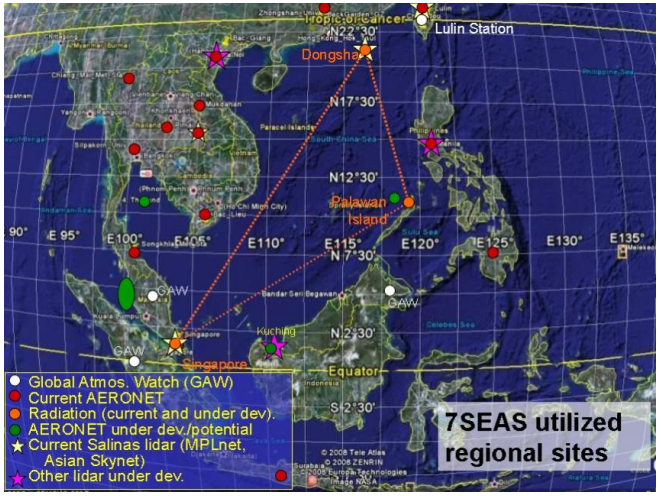
-Tropical meteorology

-Radiation and heat balance

-Clouds and precipitation

-Land processes and fire

-Biomass burning



Contact George Lin (nhlin@ncu.edu) National Central University, Taiwan for more details; new campaign from 2017-2019

On-Going Campaigns

KORUS-AQ -- An International Cooperative Air Quality Field Study in Korea

- Data Archive: KORUS-AQ
- KORUS-AQ Data @ ASDC

File Sharing:
Telecons, Meetings, Presentations, etc.

Research Intentions:
Collaboration, Analysis, Ideas, etc.

- Flight Summaries

- KORUS-AQ Data Management
- ICARTT Data Format Document

Relevant Data / Links

- Forecast Products . . .
- Satellite Observations . . .
- Real-time Surface Observations . . .
- PANDORA Data

Data Upload Tools

- Steps for submitting data to the Archive

Recent Activities

- **KORUS-AQ Science Team Meeting,15-16 October 2015**
  NASA Langley Research Center

KORUS-AQ offers the opportunity to further advance NASA goals and those of its international partners related to air quality through a targeted field study focused on the South Korean peninsula and surrounding waters. The study would integrate observations from aircraft, ground sites, and satellites with air quality models to understand the factors controlling air quality across urban, rural, and coastal interfaces.

KORUS-AQ serves as a model for international collaboration as Korean and U.S. scientists would cooperate on all aspects of air quality research. This would build relationships and strengthen future collaboration critical to the success of the constellation of geostationary air quality satellites to be launched by NASA, KARI, and ESA later this decade » more

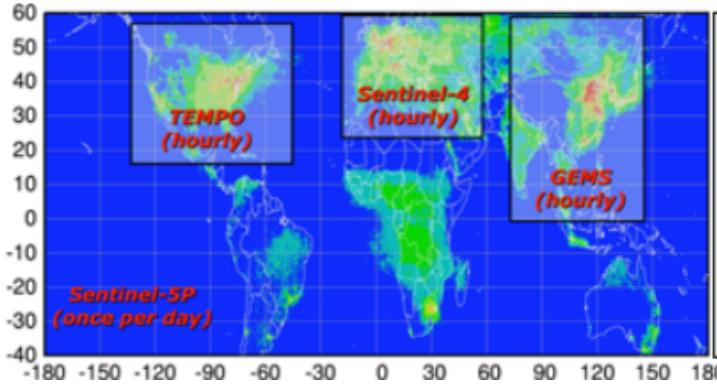
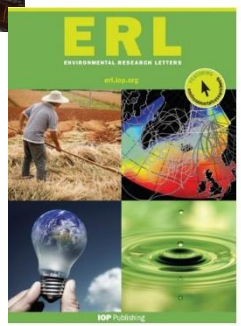


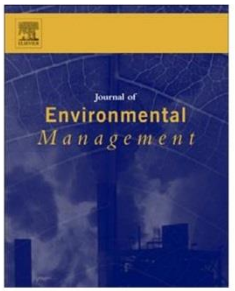
Figure 1. Global air quality satellite constellation showing expected fields of view for hourly geostationary observations from satellites positioned over North America (NASA-TEMPO), Europe (ESA-Sentinel-4), and Asia (KARI-GEMS). These observations will be supplemented by daily global views from TROPOMI onboard ESA's LEO satellite, Sentinel-5P. The background image is the global distribution of NO_2 as seen from space

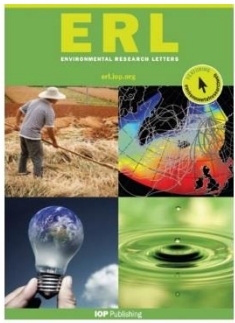
SARI Meetings

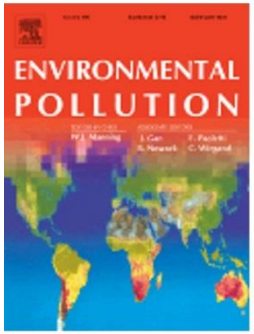
SARI is strengthening its activities through facilitating international collaborations, capacity building and publications.

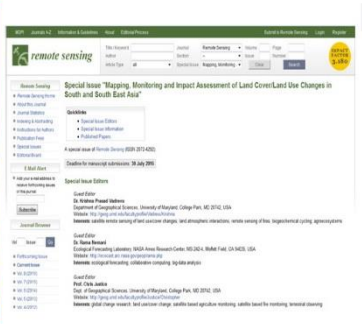
SARI Publications











SARI On-going collaborations

CESBIO

GOFC-GOLD
GLOBAL OBSERVATION OF FOREST AND LAND COVER DYNAMICS

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

START
global change SysTem for Analysis, Research & Training

Deltares

VNSC
Lift-off your Dream

JAXA

adpc

SEI STOCKHOLM ENVIRONMENT INSTITUTE

GEOGLAM
Global Agricultural Monitoring

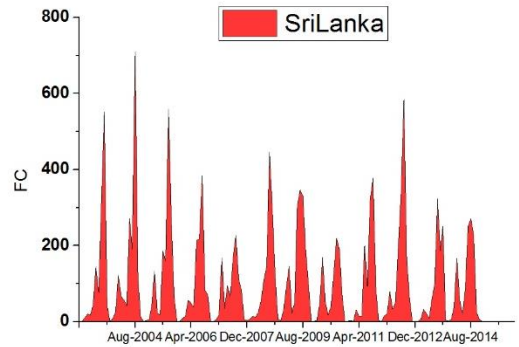
Land Use and Emissions Meeting in Ho Chi Minh City, Vietnam (October 17-29, 2016)

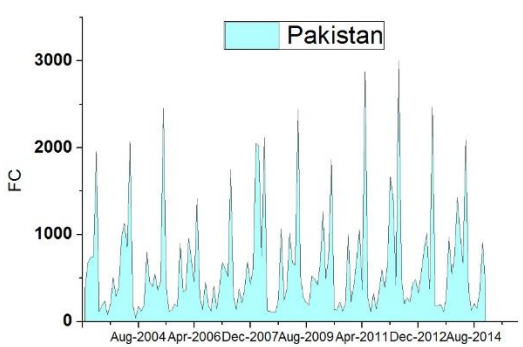
150 attendees from different countries; Presentations to be uploaded soon to the SARI website

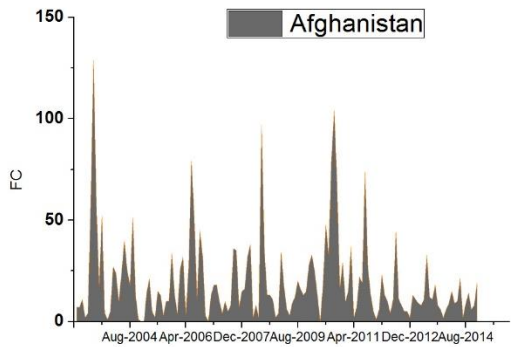
My Own Research Findings

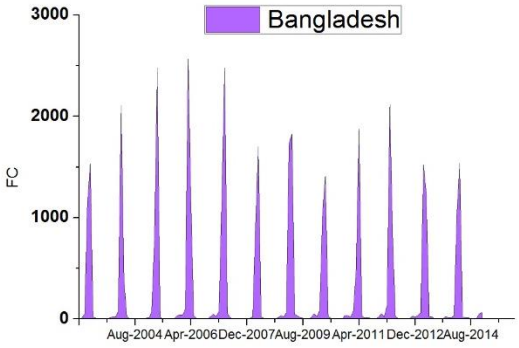
- **Fire Trends and Albedo Variations in South/Southeast Asia**

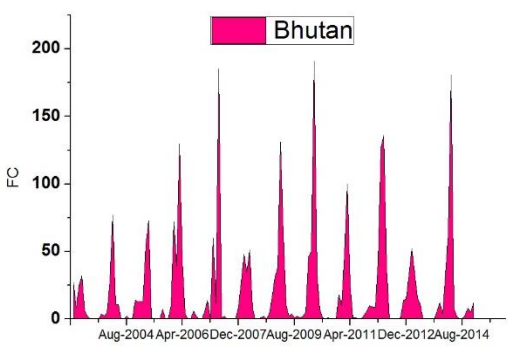
Fire-Trends (2003-2014) in South Asia

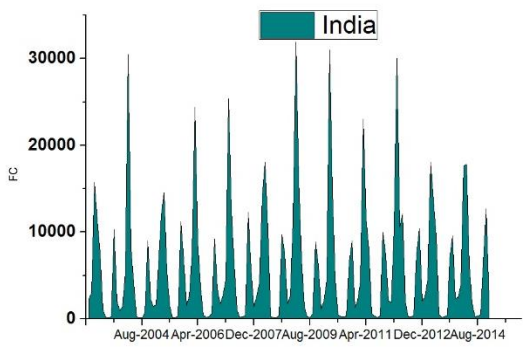


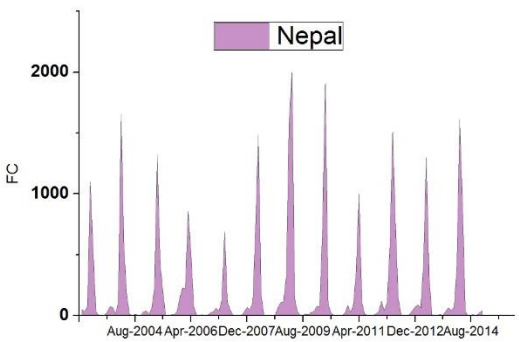






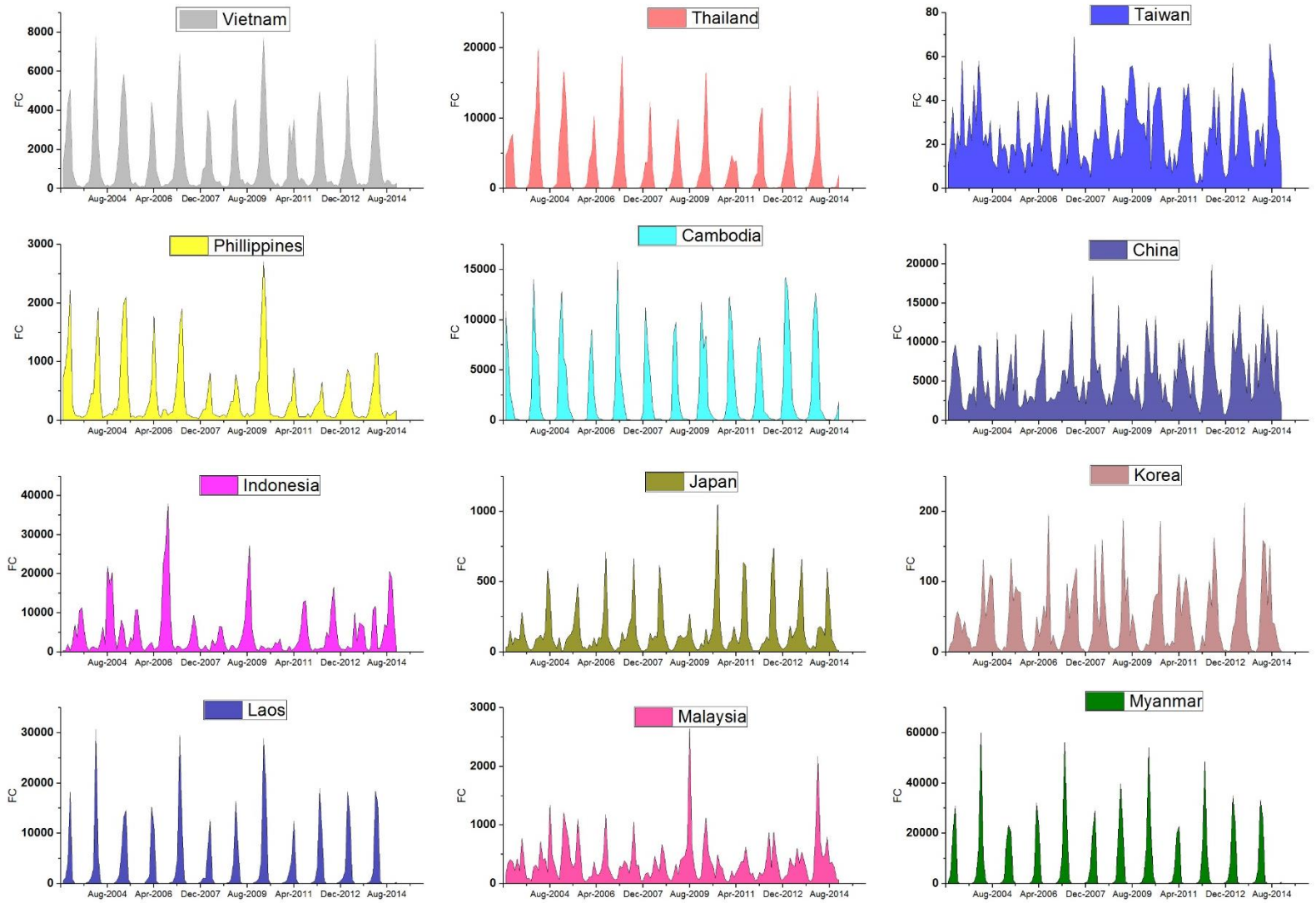






Vadrevu et al. 2016. ERL (In press)

Fire-Trends (2003-2014) in Southeast Asia



Vadrevu et al. 2016. ERL (In press)

Mann Kendall Seasonal Trend Test for Fires(2003-2014)

MK – test is a non-parametric robust test for detection of trends in a time series.

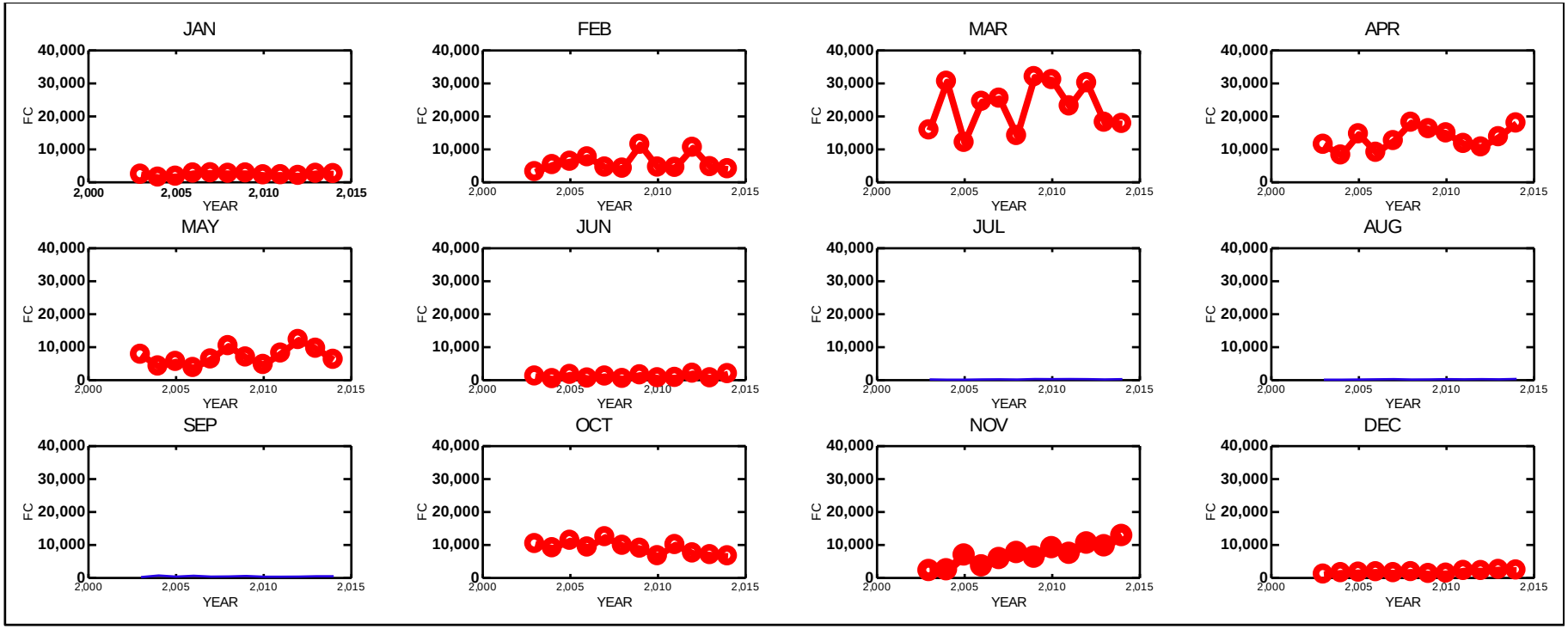
MK – test used to see whether Y values (Fire counts) increased or decreased with Time (2003-2014 monthly data).

*** p-value <0.0001
** p-value <0.01
* p <0.05

Country	Slope estimate	Significance (p-value)	Trend
Afghanistan	-0.167	NS	Decreasing
Bangladesh	0.25	**	Increasing
Bhutan	0	**	No trend
Brunei	0	NS	No trend
Cambodia	10.472	***	Increasing
China	239.22	***	Increasing
Hong Kong	0	NS	No trend
India	28.625	***	Increasing
Indonesia	-4.862	NS	Decreasing
Japan	1.333	NS	Increasing
Laos	0	NS	No trend
Malaysia	-0.1	NS	Decreasing
Myanmar	-0.171	NS	Decreasing
Nepal	0.143	NS	Increasing
North Korea	0	NS	No trend
Pakistan	9.444	***	Increasing
Phillippines	-2.633	**	Decreasing
South Korea	0.402	NS	Increasing
SriLanka	-0.111	NS	Decreasing
Taiwan	0.279	NS	Increasing
Thailand	-1	NS	Decreasing
Timore Leste	-0.4	**	Decreasing
Vietnam	8.652	**	Increasing

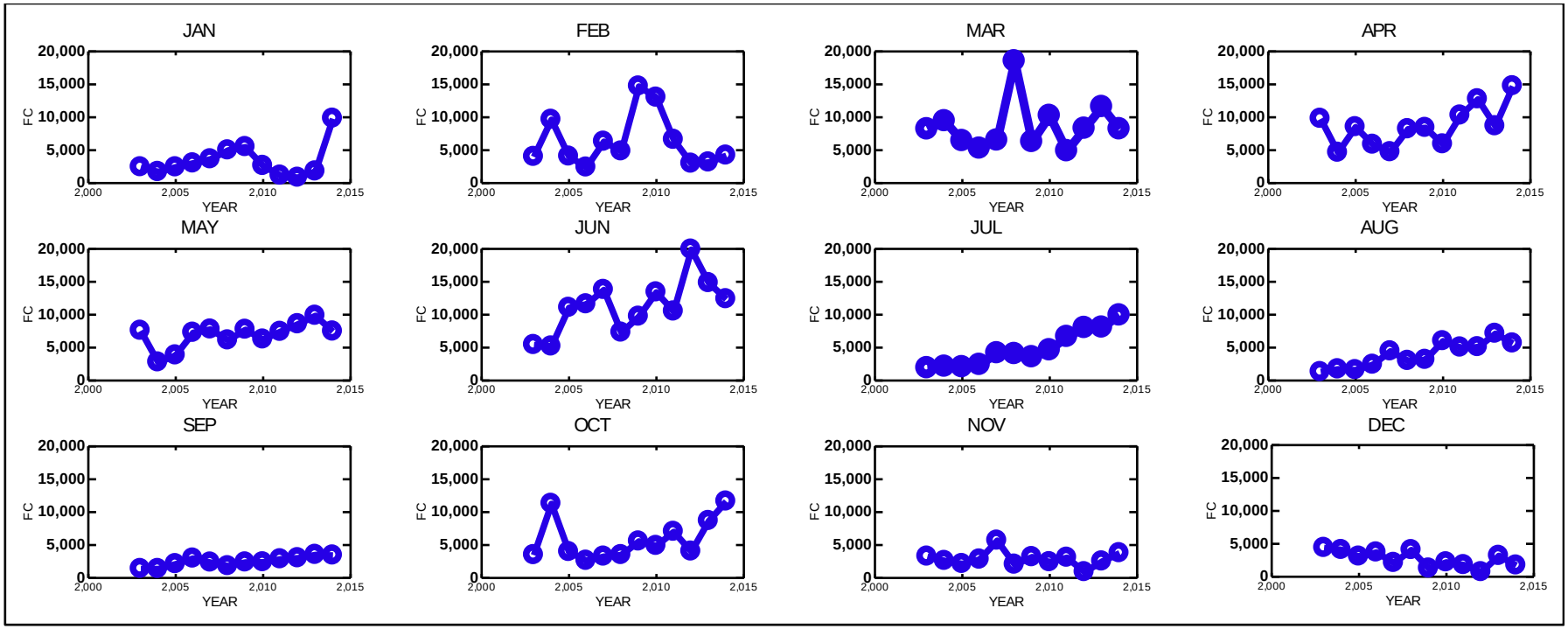
Vadrevu et al. 2016. ERL (In press)

Mann Kendall Seasonal Trend Test



India - significant increase in November fires corresponding to Agricultural residue burning

Mann Kendall Seasonal Trend Test



China - significant increase of Fires in several months – reasons yet to be explored

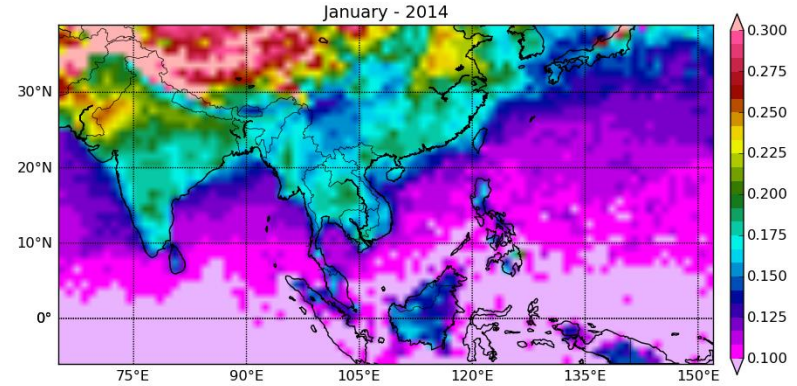
Fire Impacts on Albedo in South/Southeast Asia

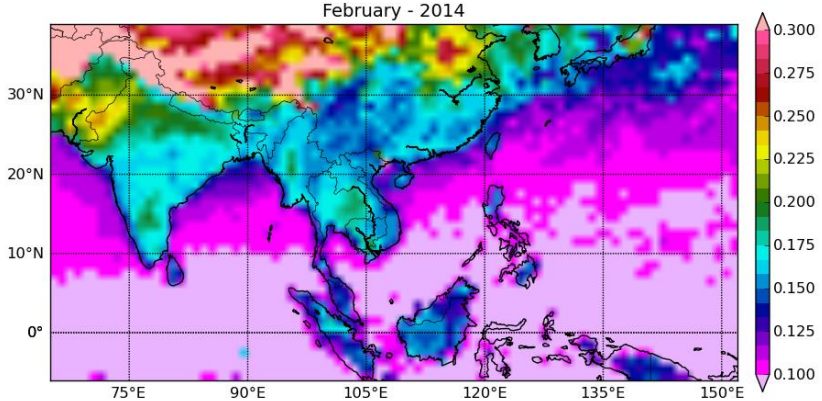
-How does fire impacts Albedo in different ecosystems of South/Southeast Asia? Does Albedo increase or decrease after fire?

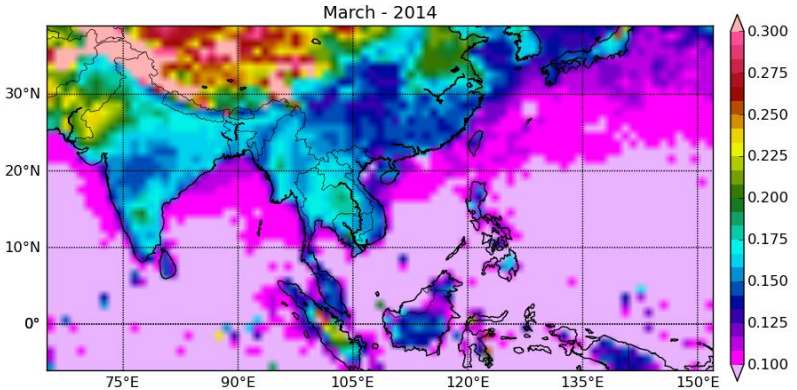
-How much change in Albedo occurs before and after fire?

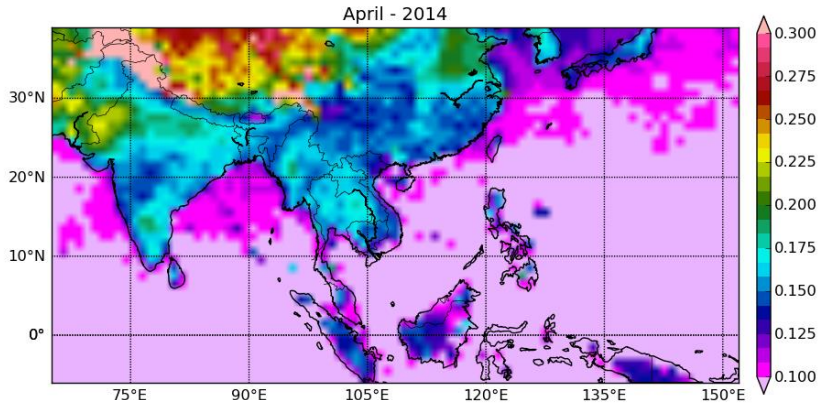
South Asia – Albedo Changes

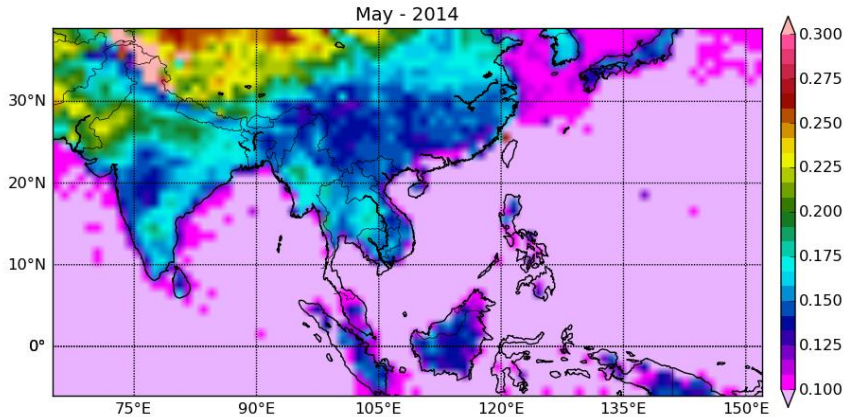
Clear Sky Albedo – CERES SYN1-Deg-TERRA-AQUA-MODIS_Ed3A





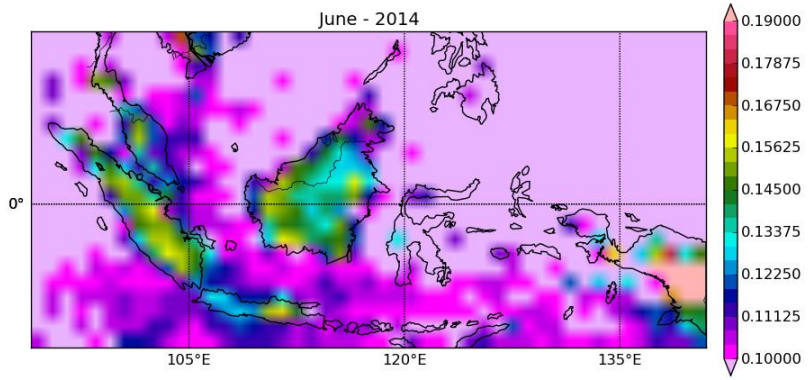


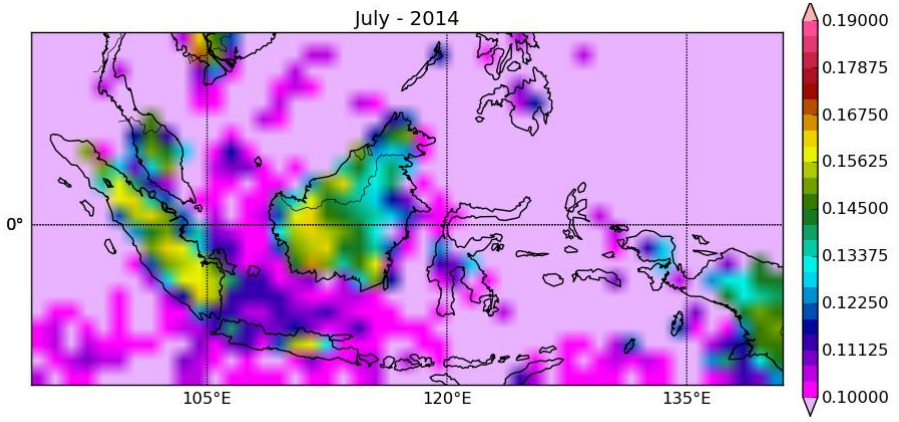


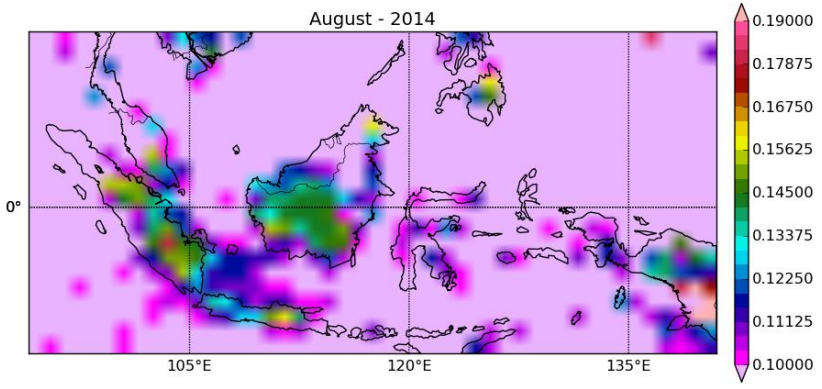


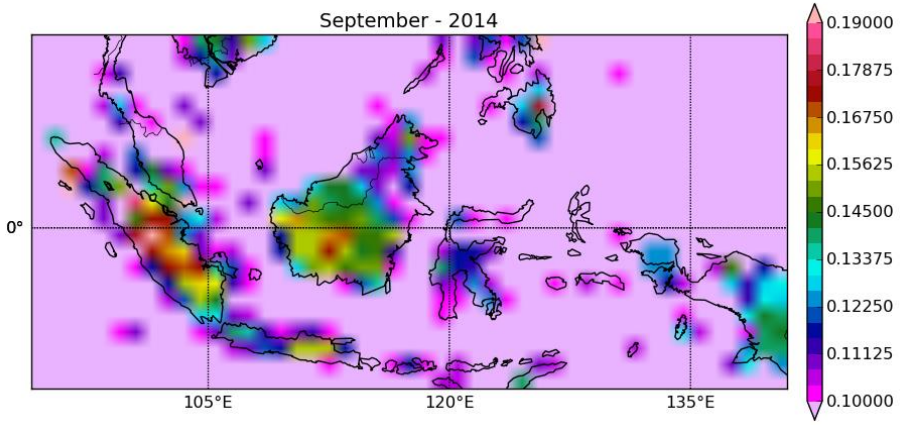
Notice change in color from Green to Blue suggesting decrease in Albedo!

Southeast Asia – Albedo Changes
Clear Sky Albedo – CERES SYN1-Deg-TERRA-AQUA-MODIS_Ed3A





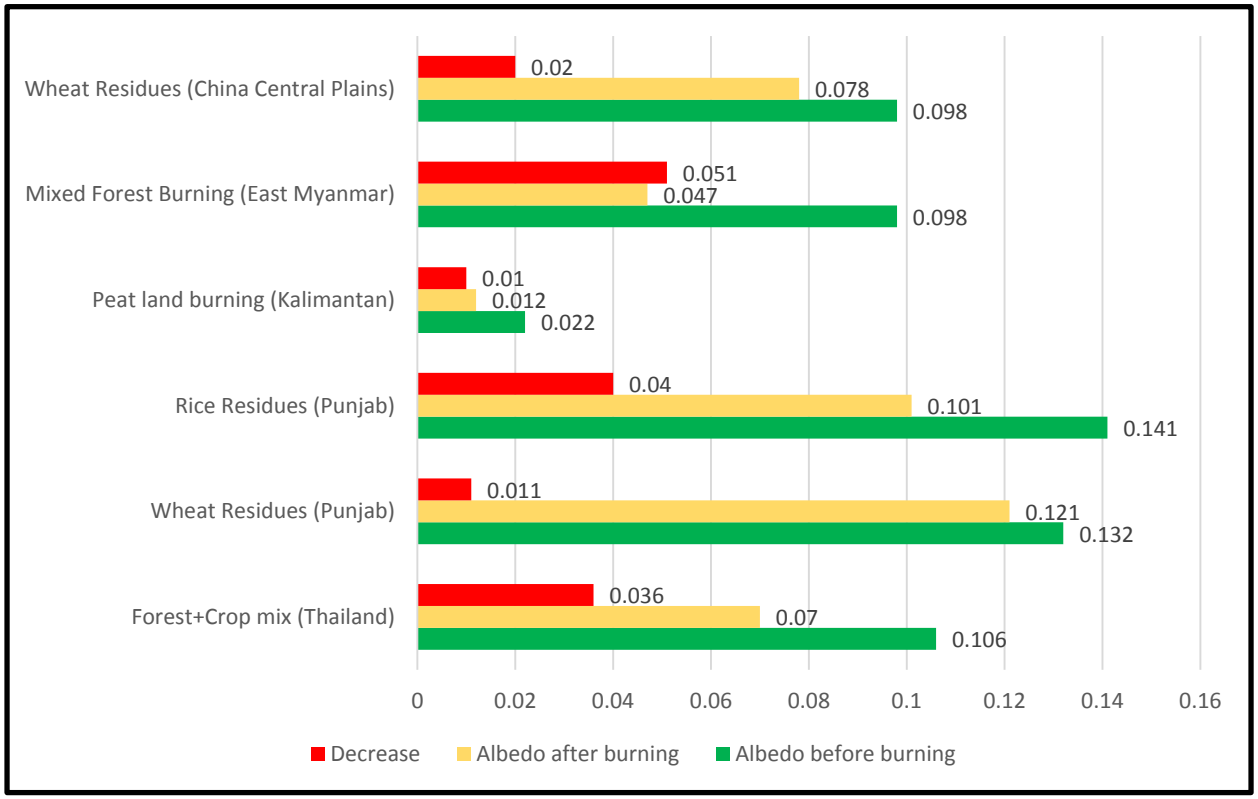


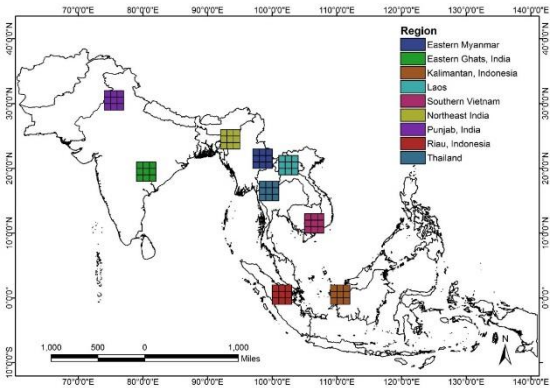


Notice change in color from Yellow to Green from June-August. Transition not clear during September

Indonesia dominated by Peat-land fires !

Decrease in Albedo after Fire in different ecosystems





All ecosystems showed decrease in Albedo following fire. Mixed forests had a relatively larger decrease compared to others.

SARI
South/Southeast Asia Research Initiative

Home | Core Team | Participants | Projects | Partners | Meetings | Resources | News | Contact

Welcome to SARI

The goal of SARI is to develop an innovative regional research, education, and capacity building program involving state-of-the-art remote sensing, natural sciences, engineering and social sciences to enrich Land Cover/Land Use Change (LCLUC) science in South Asia. Our objectives are twofold. First, we aim to advance LCLUC science in the region. Second, we endeavor to strengthen existing and build new collaborations between US and South Asia researchers in the areas of LCLUC research. To address LCLUC science, SARI will utilize a systems approach to problem-solving that examines both biophysical and socioeconomic aspects of land systems, including the interactions between land use and climate and the interrelationships among policy, governance, and land use. A central component of this initiative will be the use of geospatial data from both remotely sensed and in situ sources and models. To strengthen the theoretical underpinnings of LCLUC science in the South Asian region, SARI will facilitate:

a) new partnerships with space agencies, universities and non-government organizations;
b) novel and regionally-appropriate methodologies and algorithms for LCLUC products;
c) data sharing mechanisms;
d) leadership training;
e) international workshops to identify regional priorities, discuss and share scientific findings;
f) capacity building programs; and
g) international student/researcher exchanges, including among LCLUC scientists in the region.

SARI will serve as a facilitator and catalyst for LCLUC research in South Asia. The outputs will be beneficial to the U.S., South Asia and international researchers and will serve as a model for interdisciplinary research that links LCLUC science with NASA assets.

SARI website
www.sari.umd.edu