Multi-Temporal Wild Fire Monitoring in Lao PDR using MODIS Data

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June 2014

www.geoinfo.ait.ac.th

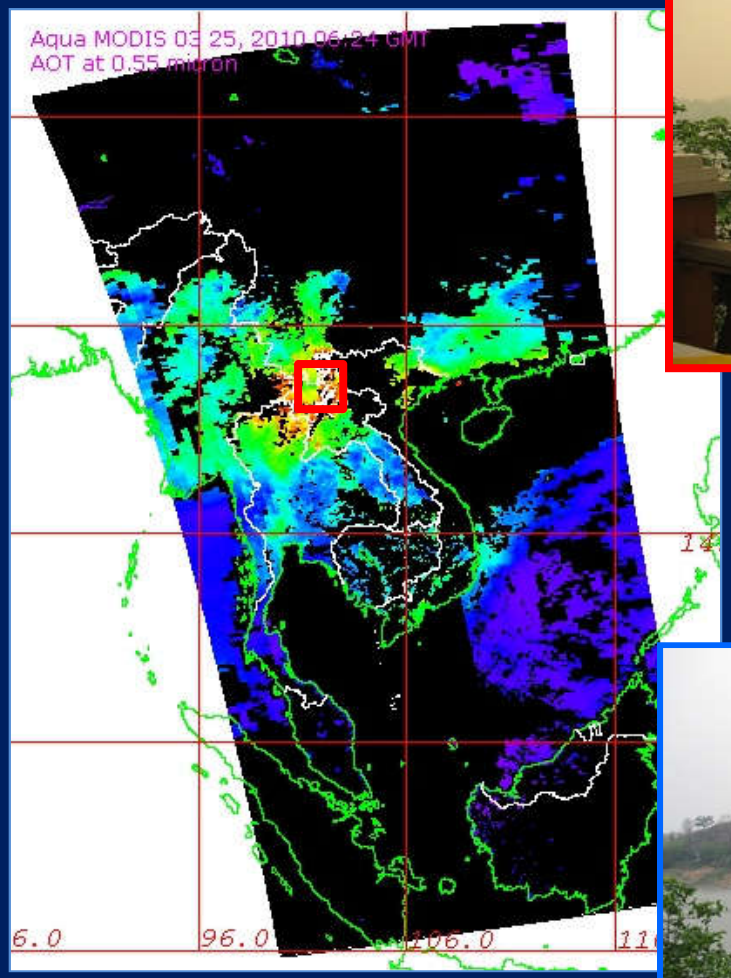
Active Fire, Smoke, Haze and Burned Area in Bane Chok, Chomphet district, Luang Prabang Province, Lao PDR (March 24, 2010 07:08 GMT)

Active fire, Smoke and burned area in Bane Chok, Chomphet district Luang Prabang province, Laos on March 24, 2010 07:08 GMT (Photo: Geoinformatics Center, AIT)

Active Fire, Smoke, Haze and Burned Area in Luang Prabang Province, Lao PDR (March 24, 2010)

Monitoring active fires, smokes and haze using MODIS products

MODIS Fire Product (MOD14)



MODIS Aerosol Optical Thickness (MOD04)

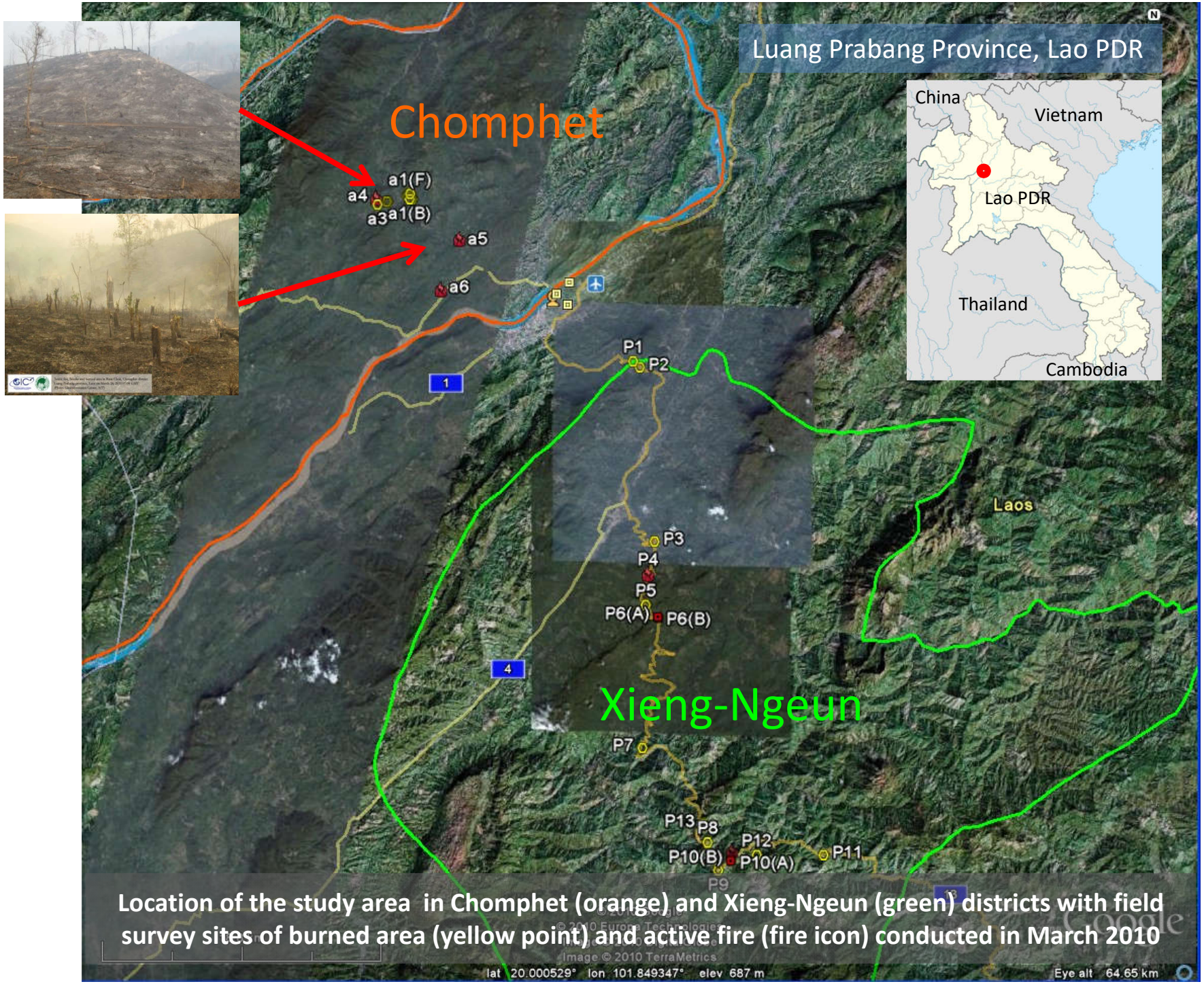
Luang Prabang, Lao PDR

March 25, 2010

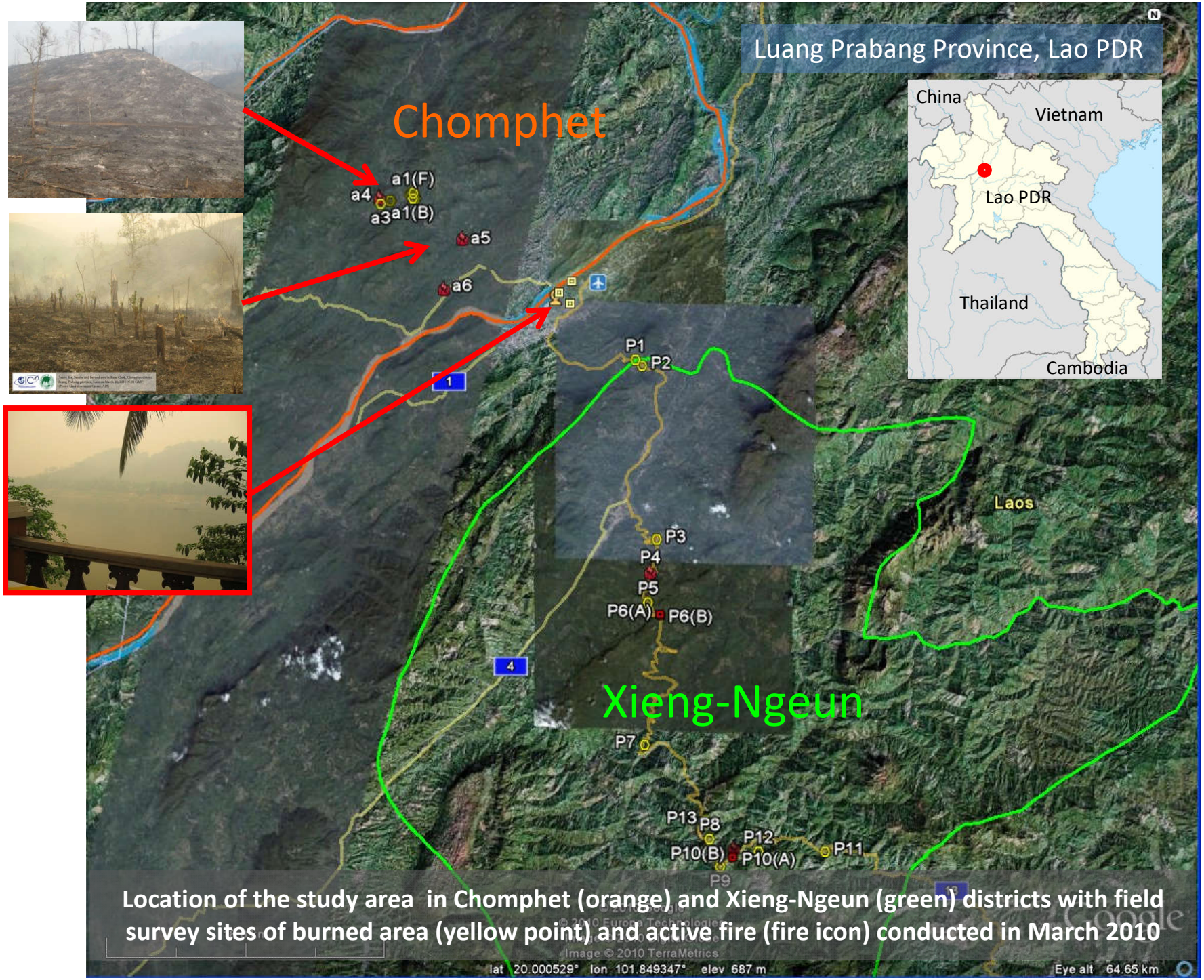
After raining

March 26, 2010

Aqua MODIS March 25, 2010 06:24 GMT



Location of the study area in Chomphet (orange) and Xieng-Ngeun (green) districts with field survey sites of burned area (yellow point) and active fire (fire icon) conducted in March 2010



Location of the study area in Chomphet (orange) and Xieng-Ngeun (green) districts with field survey sites of burned area (yellow point) and active fire (fire icon) conducted in March 2010

Background of the Study

Shifting cultivation is the big problem in Lao PDR which links with poverty eradication. Therefore, the study on **The forest fire** and **slash-burn** using remote sensing and GIS technology will bring great benefit for Ministry of Agriculture and Forestry (MAF) and also for the Government of Lao PDR.

Problems

1. Can't indentify the fire location in the uplands of the Northern part of Lao PDR
2. Difficult for decision making for development programs in the area.
3. Lao PDR is one of the top countries, which have huge amount of active fire locations in yearly dry season.

Objectives

1. To apply MODIS data to carry out active fire distribution analysis in Lao PDR in monthly, provincial and district levels.
   Study period: **2007 - 2010**
2. To study the fire distribution pattern in relation with crop production area
3. To detect frequently-burn area location

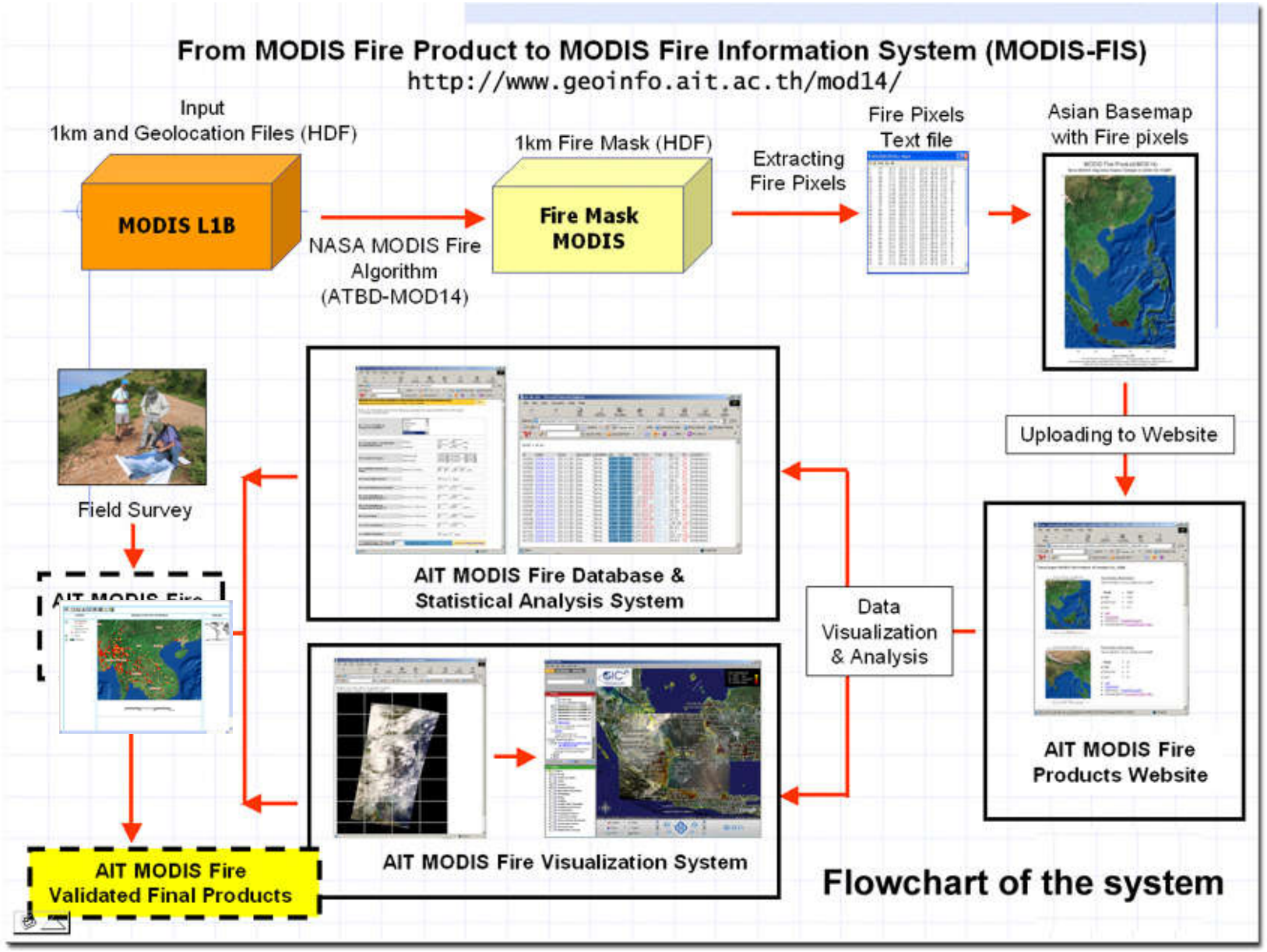
Visit of H.E. Minister of the Ministry of Agriculture and Forestry (MAF) of Lao PDR to Geoinformatics Center, AIT, Mar 02,. 2009

Contents

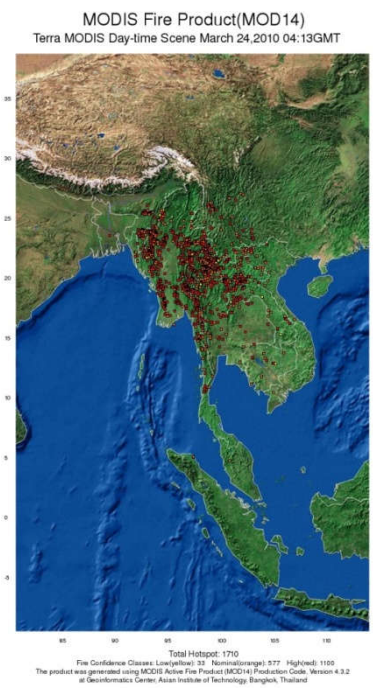
~ 1~
Brief about MODIS Wildfire Monitoring System

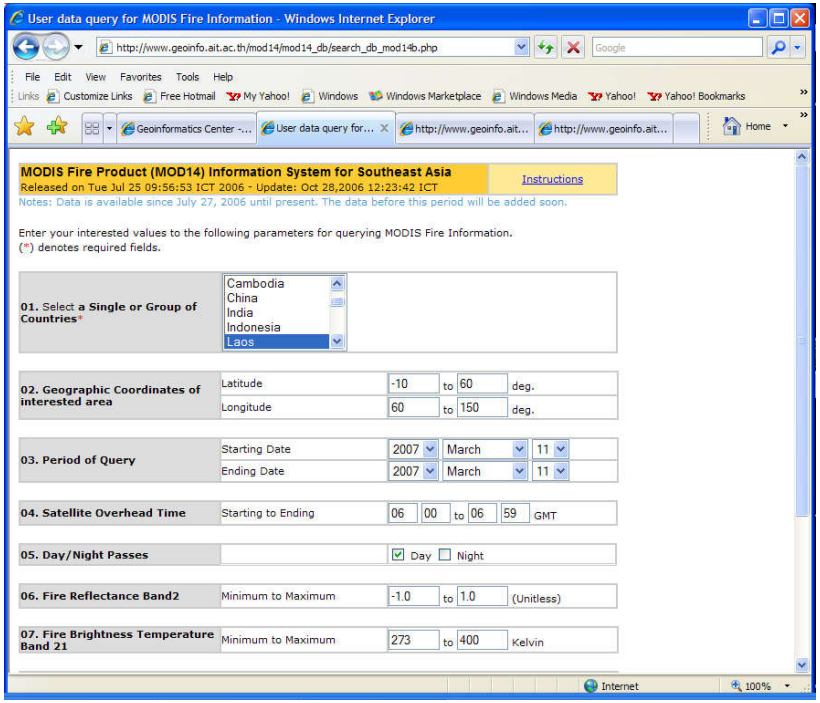
From Regional to National Level

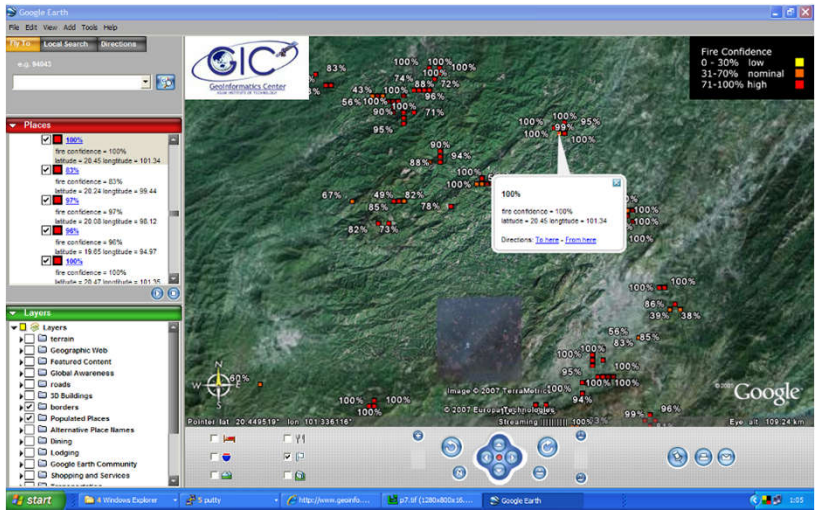
Flowchart of the MODIS Fire Information System (Regional Level)



MODIS Fire Information System (Regional Level)

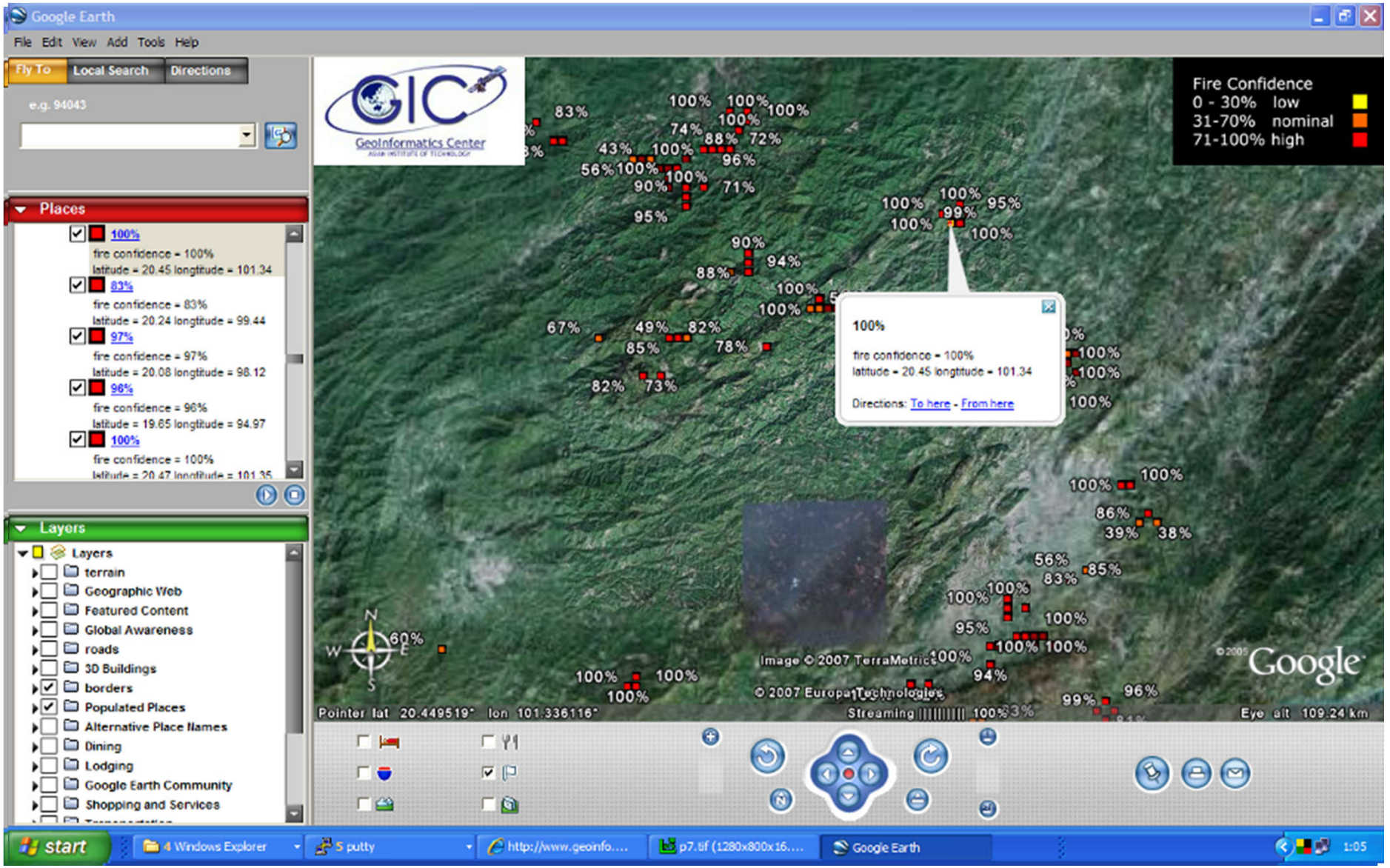






Visualization of Active fire using Google Earth and MODIS True Color 250m

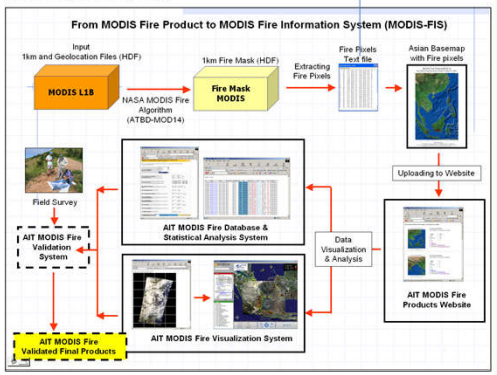
Visualization of Active fire
using Google Earth and MODIS True Color 250m



Flowchart of the MODIS Fire Information System (National Level) - Lao PDR

System for Monitoring in Regional Level

[Objective 1]
1. DEMONSTRATION



Existing MODIS Fire Information System

[Objective 2]
2. DEVELOPMENT

Spatial Data Processing System

Geographical location of fire pixels

Country filtering = Laos

Admin. filtering = {District , Province}

Land use filtering = {landuse type}

Find the closest village to the given fire pixel

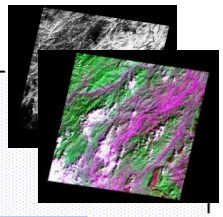
Database

Web Server (WEBGIS)

Extended System for Laos

System for Monitoring in Country Level

ASTER, Landsat



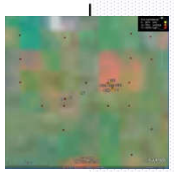
[Objective 3]
3. APPLICATIONS

High Resolution Satellite Images

Secondary data (Burn area records)

Estimation of Burn Area

Geographical Location of fire pixels with administration location



MODIS RGB 721

Burning Area Estimation

Burn Area Mapping

Burn Area Estimation
(using fire geographical location from MODIS and High-Resolution Sat. images)

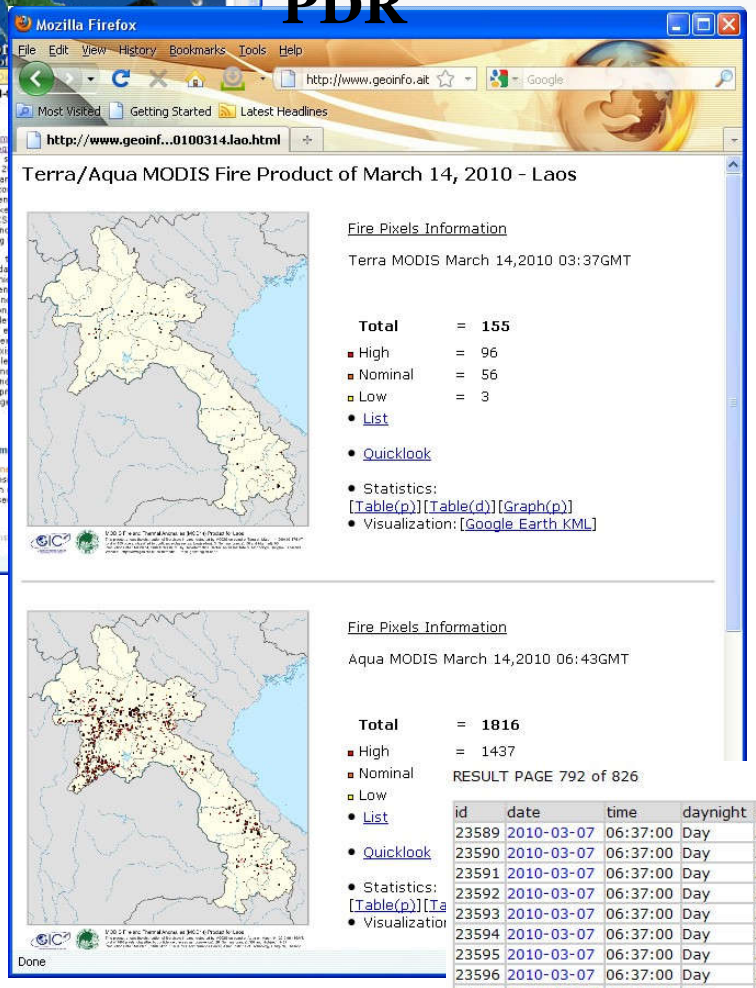
Developed & opened to public

Under development

Terra ASTER specifications

Instrument	VNIR	SWIR	TIR
Bands	1-3	4-9	10-14
Spatial Resolution	15m	30m	90m
Swath Width	60km	60km	60km
Cross Track Pointing	± 318km (± 24 deg)	± 116km (± 8.55 deg)	± 116km (± 8.55 deg)
Quantisation (bits)	8	8	12

MODIS Fire Monitoring System for Lao PDR



MODIS Fire Product (MOD14) Information System for Laos

Released on Tue Jul 25 09:56:53 ICT 2006 - Update: Tue Jan 1 16:33:37 ICT 2008 — Instructions

Notes: Data is available since July 27, 2006 until present. The data before this period will be added soon.

Enter your interested values to the following parameters for querying MODIS Fire Information.
(*) denotes required fields.

01. Select a Single or Group of Provinces *	Attapu, Bokeo, Bolikhamxai, Champasak, Houaphan	
02. Period of Query	Starting Date	2006 January 01
	Ending Date	2010 January 01
03. Satellite Overhead Time	Starting to Ending	02 00 to 20 59 GMT
04. Day/Night Passes		Day Night
05. Fire Reflectance Band2	Minimum to Maximum	-1.0 to 1.0 (Unitless)
06. Fire Brightness Temperature Band 21	Minimum to Maximum	273 to 400 Kelvin
07. Fire Brightness Temperature Band 31	Minimum to Maximum	273 to 400 Kelvin
08. Fire Power	Minimum to Maximum	0 to 400 Watt/m²
09. Fire Confidence	Minimum to Maximum	0 to 100 %
10. MODIS Platform		Terra Aqua

Submit Query | Reset | Display 20 records per page | Contact System Developer

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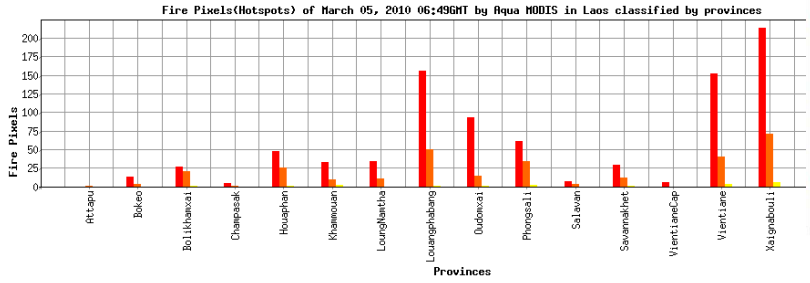
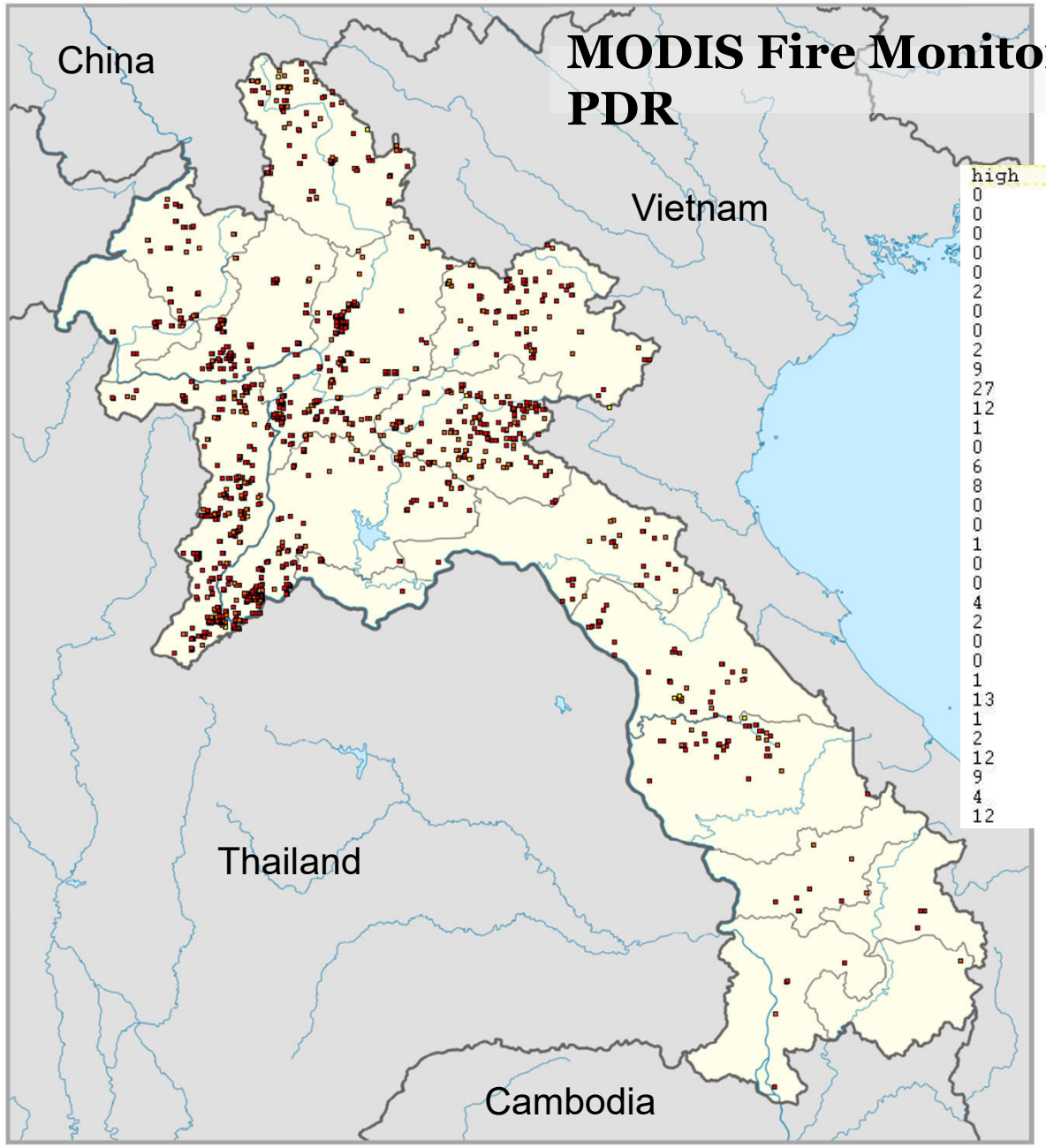
id	date	time	daynight	satellite	lat	lon	ref2	T21	T31	Fp	Fc	district	province	country
23589	2010-03-07	06:37:00	Day	Aqua	20.24	104.28	0.27	327.34	299.05	25.38	89	Xamnua	Houaphan	Laos
23590	2010-03-07	06:37:00	Day	Aqua	20.18	103.81	0.27	356.11	303.24	77.4	100	Houamuang	Houaphan	Laos
23591	2010-03-07	06:37:00	Day	Aqua	20.19	103.81	0.27	345.81	301.1	54.2	100	Houamuang	Houaphan	Laos
23592	2010-03-07	06:37:00	Day	Aqua	20.19	103.8	0.27	365.02	305.19	102.14	100	Houamuang	Houaphan	Laos
23593	2010-03-07	06:37:00	Day	Aqua	20.19	103.79	0.29	350.17	305.34	64.01	100	Houamuang	Houaphan	Laos
23594	2010-03-07	06:37:00	Day	Aqua	20.15	103.46	0.25	316.36	303.33	10.57	71	Viengthong	Bolikhamxai	Laos
23595	2010-03-07	06:37:00	Day	Aqua	20.03	102.58	0.24	320.18	301.68	14.68	80	Pakxeng	Louangphabang	Laos
23596	2010-03-07	06:37:00	Day	Aqua	19.87	101.48	0.23	319.36	305.05	13.5	79	Houn	Oudomxai	Laos
23597	2010-03-07	06:37:00	Day	Aqua	19.76	100.73	0.21	314.01	302.67	5.16	27	Xianghon	Xaignabouli	Laos
23598	2010-03-07	06:37:00	Day	Aqua	20.27	104.34	0.24	313.8	296.69	11.16	66	Viengxai	Houaphan	Laos
23599	2010-03-07	06:37:00	Day	Aqua	20.22	103.92	0.26	312.2	300.49	7.21	52	Houamuang	Houaphan	Laos
23600	2010-03-07	06:37:00	Day	Aqua	20.22	103.91	0.27	310.77	299.52	6.27	33	Houamuang	Houaphan	Laos
23601	2010-03-07	06:37:00	Day	Aqua	20.07	102.86	0.26	334.89	300.75	36.42	96	Pakxeng	Louangphabang	Laos
23602	2010-03-07	06:37:00	Day	Aqua	20.07	102.85	0.26	332.08	300.91	32.24	94	Pakxeng	Louangphabang	Laos
23603	2010-03-07	06:37:00	Day	Aqua	19.77	100.73	0.18	322.01	303.85	14.23	83	Xianghon	Xaignabouli	Laos
23604	2010-03-07	06:37:00	Day	Aqua	20.04	102.53	0.2	328.69	300.78	25.43	90	Pakxeng	Louangphabang	Laos
23605	2010-03-07	06:37:00	Day	Aqua	20.04	102.52	0.21	377.61	304.13	145.67	100	Pakxeng	Louangphabang	Laos
23606	2010-03-07	06:37:00	Day	Aqua	20.03	102.45	0.2	316.09	304.11	7.29	72	Pakxeng	Louangphabang	Laos
23607	2010-03-07	06:37:00	Day	Aqua	19.93	101.74	0.19	326.63	305.22	19.81	88	Chomphet	Louangphabang	Laos
23608	2010-03-07	06:37:00	Day	Aqua	19.92	101.73	0.2	322.09	304.31	13.56	83	Chomphet	Louangphabang	Laos



MODIS Fire Monitoring System for Lao PDR



high	nom	low	dist	prov
0	1	0	Sanxai	Attapu
0	0	0	Samakhixai	Attapu
0	0	0	Xaisettha	Attapu
0	0	0	Phouvong	Attapu
0	0	0	Sanamxai	Attapu
2	0	0	Houayxay	Bokeo
0	0	0	Meung	Bokeo
0	0	0	Tonpheung	Bokeo
2	0	0	Paktha	Bokeo
9	3	0	Pha-Oudom	Bokeo
27	20	1	Bolikhamxai	Bolikhamxai
12	14	1	Viengthong	Bolikhamxai
1	0	0	Thaphabat	Bolikhamxai
0	0	0	Pakxan	Bolikhamxai
6	1	0	Pakkading	Bolikhamxai
8	5	0	Khamkheut	Bolikhamxai
0	0	0	Xanasomboun	Champasak
0	0	0	BachiengCh	Champasak
1	0	0	Pakxong	Champasak
0	0	0	Phonethong	Champasak
0	0	0	Pakxe	Champasak
4	1	0	Champasak	Champasak
2	1	0	Pathoumphone	Champasak
0	0	0	Soukhouma	Champasak
0	0	0	Mounlapamok	Champasak
1	0	0	Khong	Champasak
13	4	0	Et	Houaphan
1	3	0	Xiengkho	Houaphan
2	0	0	Sopbao	Houaphan
12	14	1	Viengthong	Bolikhamxai
9	10	0	Xamnua	Houaphan
4	1	0	Viengxai	Houaphan
12	3	0	Houamuang	Houaphan

GeoInformatics Center

MODIS Fire and Thermal Anomalies (MOD14) Product for Laos

This product shows the distribution of fire pixels in Laos, detected by MODIS on board of Aqua on March 05, 2010 06:49GMT; total of 1372 pixels, classified to confidence classes as: Low(yellow): 20, Nominal(orange): 358 and High(red): 994
Production Date : March 07, 2010 18:53:02 ICT by Geoinformatics Center, Asian Institute of Technology, Bangkok, Thailand.
Website: http://www.geoinfo.ait.ac.th/modis/ E-mail: geoinfo@ait.ac.th

MODIS Fire Monitoring System for Lao PDR

MODIS Fire Product (MOD14) Information System for Laos
Released on Tue Jul 25 09:56:53 ICT 2006 - Update: Tue Jan 1 16:33:37 ICT 2008 Instruction
Notes: Data is available since July 27, 2006 until present. The data before this period will be added soon.

Enter your interested values to the following parameters for querying MODIS Fire Information.
(*) denotes required fields.

01. Select a Single or Group of Provinces *: Attapu, Bokeo, Bolikhamxai, Champasak, Houaphan

02. Period of Query: Starting Date 200(, Ending Date 201(

03. Satellite Overhead Time: Starting to Ending 02

04. Day/Night Passes

05. Fire Reflectance Band2: Minimum to Maximum -1.0

06. Fire Brightness Temperature Band 21: Minimum to Maximum 273

07. Fire Brightness Temperature Band 31: Minimum to Maximum 273

08. Fire Power: Minimum to Maximum 0

09. Fire Confidence: Minimum to Maximum 0

10. MODIS Platform

Submit Query | Reset | Display 20 records per page

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id	date	time	daynight	satellite	lat	lon	ref2	T21	T31	Fp	Fc	district	province	country
23589	2010-03-07	06:37:00	Day	Aqua	20.24	104.28	0.27	327.34	299.05	25.38	89	Xamnua	Houaphan	Laos
23590	2010-03-07	06:37:00	Day	Aqua	20.18	103.81	0.27	356.11	303.24	77.4	100	Houamuang	Houaphan	Laos
23591	2010-03-07	06:37:00	Day	Aqua	20.19	103.81	0.27	345.81	301.1	54.2	100	Houamuang	Houaphan	Laos
23592	2010-03-07	06:37:00	Day	Aqua	20.19	103.8	0.27	365.02	305.19	102.14	100	Houamuang	Houaphan	Laos
23593	2010-03-07	06:37:00	Day	Aqua	20.19	103.79	0.29	350.17	305.34	64.01	100	Houamuang	Houaphan	Laos
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23601	2010-03-07	06:37:00	Day	Aqua	20.07	102.86	0.26	334.89	300.75	36.42	96	Pakxeng	Louangphabang	Laos
23602	2010-03-07	06:37:00	Day	Aqua	20.07	102.85	0.26	332.08	300.91	32.24	94	Pakxeng	Louangphabang	Laos
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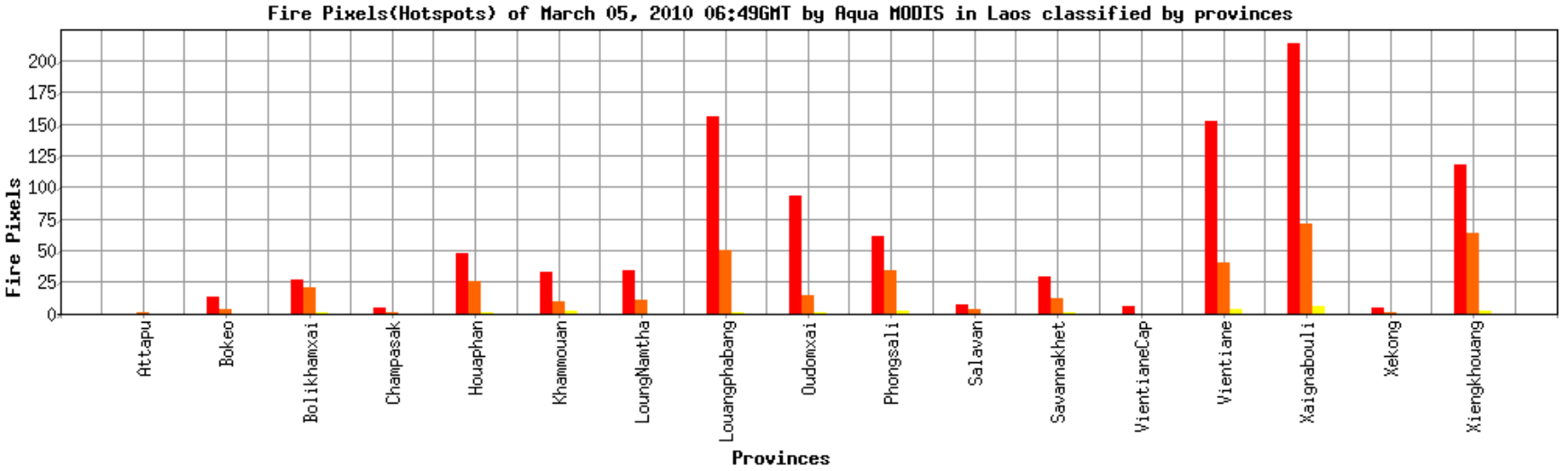
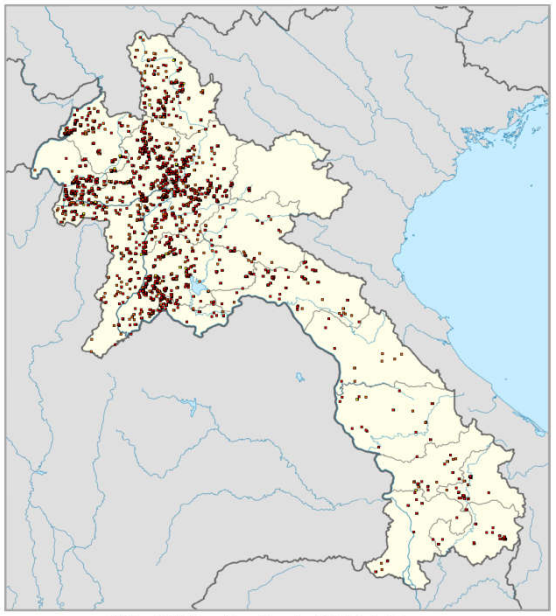
23604	2010-03-07	06:37:00	Day	Aqua	20.04	102.53	0.2	328.69	300.78	25.43	90	Pakxeng	Louangphabang	Laos
23605	2010-03-07	06:37:00	Day	Aqua	20.04	102.52	0.21	377.61	304.13	145.67	100	Pakxeng	Louangphabang	Laos
23606	2010-03-07	06:37:00	Day	Aqua	20.03	102.45	0.2	316.09	304.11	7.29	72	Pakxeng	Louangphabang	Laos
23607	2010-03-07	06:37:00	Day	Aqua	19.93	101.74	0.19	326.63	305.22	19.81	88	Chomphet	Louangphabang	Laos
23608	2010-03-07	06:37:00	Day	Aqua	19.92	101.73	0.2	322.09	304.31	13.56	83	Chomphet	Louangphabang	Laos



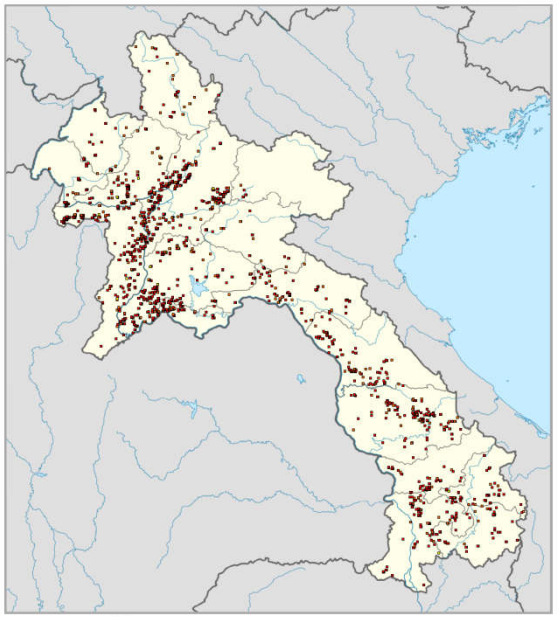
~ 2 ~
Multi-temporal Monitoring of Active fire Distribution in Lao PDR

Regional and National Levels



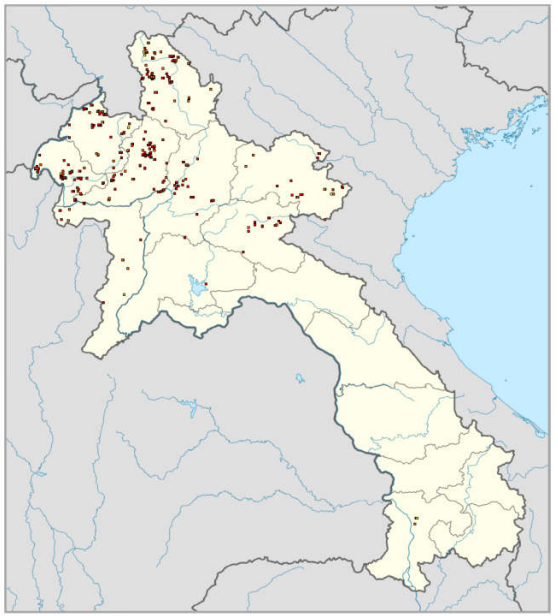
MODIS Fire and Thermal Anomalies (MOD14) Product for Laos

This product shows the distribution of fire pixels in Laos, detected by MODIS on board of Aqua on March 25, 2010 06:24GMT: total of 2365 pixels, classified to confidence classes as: Low(yellow): 41, Nominal(orange): 468 and High(red): 1882 Production Date : March 26, 2010 03:25:44 ICT by Geoinformatics Center, Asian Institute of Technology, Bangkok, Thailand. Website: http://www.geoinfo.ait.ac.th/modis/ E-mail: geoinfo@ait.ac.th



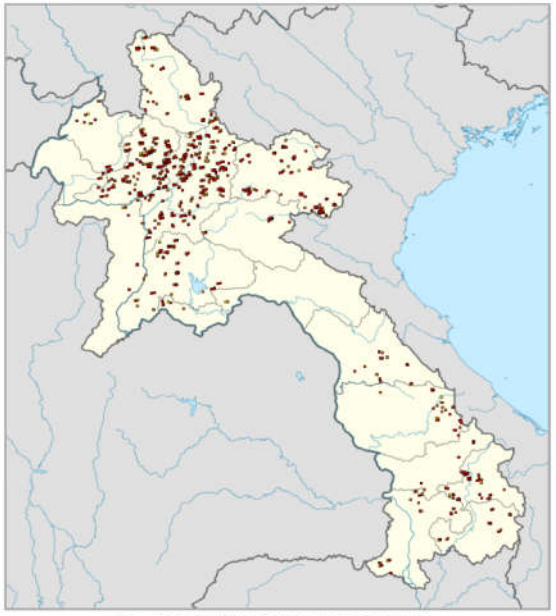
MODIS Fire and Thermal Anomalies (MOD14) Product for Laos

This product shows the distribution of fire pixels in Laos, detected by MODIS on board of Aqua on March 16, 2010 06:31GMT: total of 1717 pixels, classified to confidence classes as: Low(yellow): 18, Nominal(orange): 332 and High(red): 1367 Production Date : March 17, 2010 03:38:59 ICT by Geoinformatics Center, Asian Institute of Technology, Bangkok, Thailand. Website: http://www.geoinfo.ait.ac.th/modis/ E-mail: geoinfo@ait.ac.th



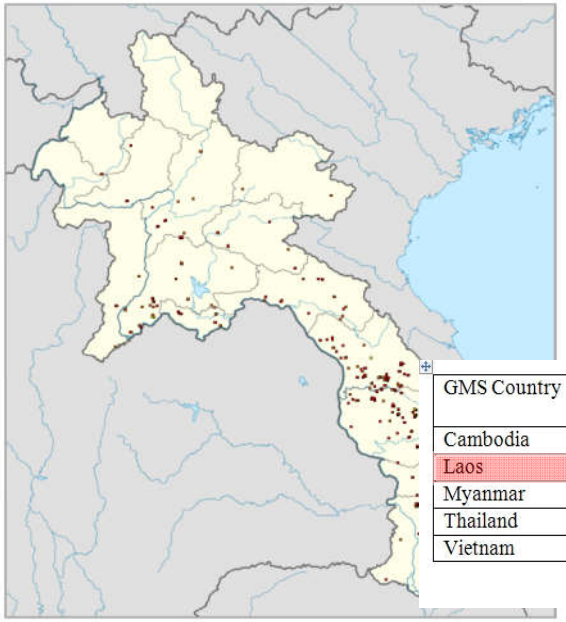
MODIS Fire and Thermal Anomalies (MOD14) Product for Laos

This product shows the distribution of fire pixels in Laos, detected by MODIS on board of Aqua on April 07, 2008 06:52GMT: total of 341 pixels, classified to confidence classes as: Low(yellow): 1, Nominal(orange): 86 and High(red): 245 Production Date : March 18, 2010 15:04:04 ICT by Geoinformatics Center, Asian Institute of Technology, Bangkok, Thailand. Website: http://www.geoinfo.ait.ac.th/modis/ E-mail: geoinfo@ait.ac.th



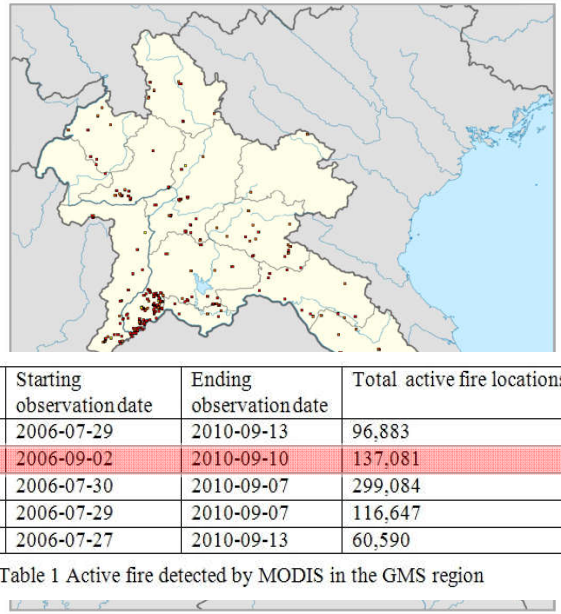
MODIS Fire and Thermal Anomalies (MOD14) Product for Laos

This product shows the distribution of fire pixels in Laos, detected by MODIS on board of Aqua on March 30, 2007 05:52GMT: total of 970 pixels, classified to confidence classes as: Low(yellow): 27, Nominal(orange): 267 and High(red): 676 Production Date : April 06, 2010 12:39:20 ICT by Geoinformatics Center, Asian Institute of Technology, Bangkok, Thailand. Website: http://www.geoinfo.ait.ac.th/modis/ E-mail: geoinfo@ait.ac.th



MODIS Fire and Thermal Anomalies (MOD14) Product for Laos

This product shows the distribution of fire pixels in Laos, detected by MODIS on board of Aqua on March 12, 2008 06:16GMT: total of 575 pixels, classified to confidence classes as: Low(yellow): 0, Nominal(orange): 125 and High(red): 240 Production Date : March 19, 2010 21:33:50 ICT by Geoinformatics Center, Asian Institute of Technology, Bangkok, Thailand. Website: http://www.geoinfo.ait.ac.th/modis/ E-mail: geoinfo@ait.ac.th

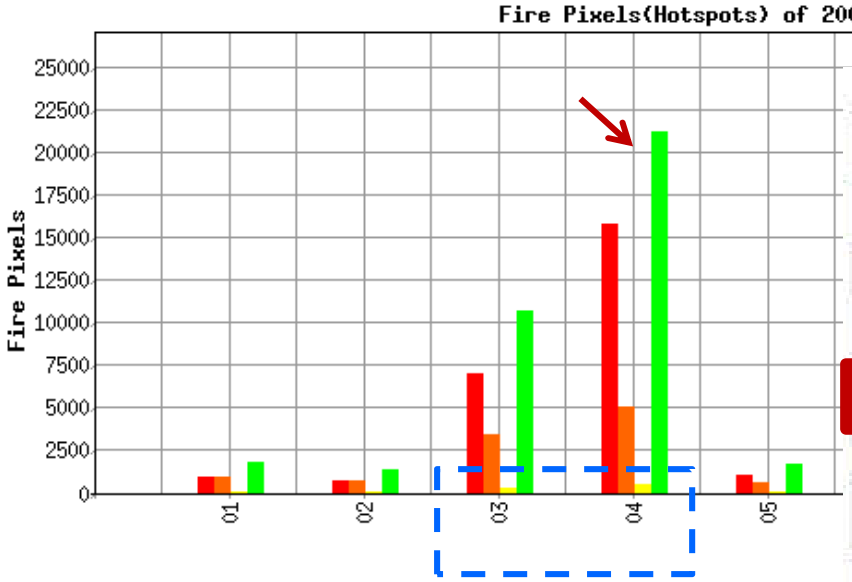


MODIS Fire and Thermal Anomalies (MOD14) Product for Laos

This product shows the distribution of fire pixels in Laos, detected by MODIS on board of Aqua on March 15, 2008 06:46GMT: total of 424 pixels, classified to confidence classes as: Low(yellow): 6, Nominal(orange): 116 and High(red): 302 Production Date : March 19, 2010 23:56:01 ICT by Geoinformatics Center, Asian Institute of Technology, Bangkok, Thailand. Website: http://www.geoinfo.ait.ac.th/modis/ E-mail: geoinfo@ait.ac.th

GMS Country	Starting observation date	Ending observation date	Total active fire locations
Cambodia	2006-07-29	2010-09-13	96,883
Laos	2006-09-02	2010-09-10	137,081
Myanmar	2006-07-30	2010-09-07	299,084
Thailand	2006-07-29	2010-09-07	116,647
Vietnam	2006-07-27	2010-09-13	60,590

Table 1 Active fire detected by MODIS in the GMS region



2008

high	nom	low	total	month
886	868	62	1816	1
664	662	58	1384	2
6984	3440	286	10710	3
15736	5022	466	21224	4
1022	544	70	1636	5
2	14	0	16	6
0	6	0	6	7
0	2	0	2	8
4	0	0	4	9
0	6	4	10	10
22	20	2	44	11
56	108	2	166	12

Monthly Active Fire Distribution in Lao PDR (2007-2010)

March & April - highest

2007

high	nom	low	total	month
624	616	35	1275	1
2692	2046	169	4907	2
19357	6739	563	26659	3
7768	2979	346	11093	4
420	162	16	598	5
11	17	3	31	6
0	3	1	4	7
0	0	0	0	8
0	1	0	1	9
6	9	0	15	10
20	43	6	69	11
106	131	11	248	12

2008

high	nom	low	total	month
886	868	62	1816	1
664	662	58	1384	2
6984	3440	286	10710	3
15736	5022	466	21224	4
1022	544	70	1636	5
2	14	0	16	6
0	6	0	6	7
0	2	0	2	8
4	0	0	4	9
0	6	4	10	10
22	20	2	44	11
56	108	2	166	12

2009

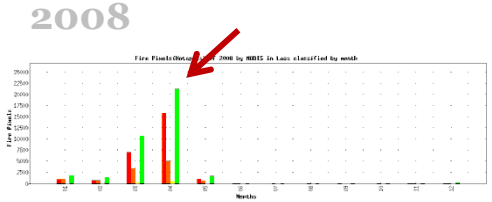
high	nom	low	total	month
301	320	26	647	1
1793	1255	109	3157	2
10500	4138	343	14981	3
2460	1032	91	3583	4
138	127	20	285	5
4	6	0	10	6
788	66	68	922	7
0	4	0	4	8
0	3	1	4	9
1	14	1	16	10
83	67	9	159	11
137	197	16	350	12

2010

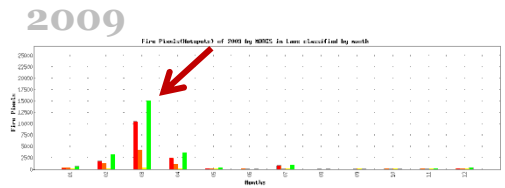
high	nom	low	total	month
425	364	32	821	1
1685	1191	76	2952	2
17613	6541	584	24738	3
11288	4161	436	15885	4
49	46	2	97	5
10	21	2	33	6
12	20	2	34	7
0	1	0	1	8
0	5	3	8	9
0	0	0	0	10
0	0	0	0	11
0	0	0	0	12

2007

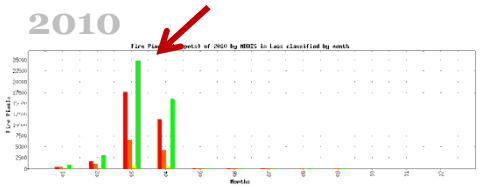
2008

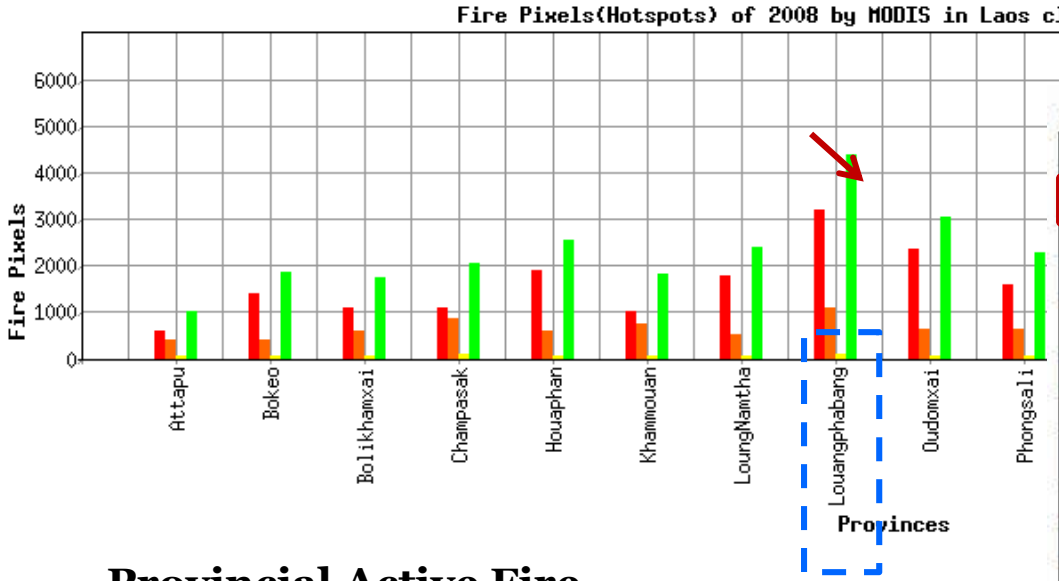


2009



2010





2008

High	nom	Low	Total	Provinces
3176	1106	88	4370	Louangphabang
2512	1050	110	3672	Vientiane
2368	640	46	3054	Oudomxai
2126	816	66	3008	Xaignabouli
1756	918	100	2774	Savannakhet
1896	584	48	2528	Houaphan
1788	526	68	2382	LoungNamtha
1604	632	58	2294	Phongsali
1102	872	84	2058	Champasak
1414	392	44	1850	Bokeo
1010	762	44	1816	Khammouan
1092	584	46	1722	Bolikhamxai
972	430	24	1426	Salavan
860	442	48	1350	Xiengkhouang
694	324	24	1042	Xekong
574	416	42	1032	Attapu
432	198	10	640	VientianeCap

Provincial Active Fire Distribution in Lao PDR (2007-2010)

Louangphabang - highest

2007

High	nom	Low	Total	Provinces
4479	1507	115	6101	Louangphabang
3730	1829	247	5806	Xaignabouli
3012	1278	135	4425	Vientiane
3198	909	58	4165	Oudomxai
2585	1193	108	3886	Phongsali
2229	799	69	3097	Houaphan
1878	961	81	2920	Bolikhamxai
1966	565	65	2596	LoungNamtha
1726	784	61	2571	Xiengkhouang
1654	465	38	2157	Bokeo
1184	644	48	1876	Savannakhet
784	569	32	1385	Champasak
623	411	20	1054	Khammouan
656	226	23	905	VientianeCap
539	232	18	789	Salavan
340	227	17	584	Attapu
421	147	15	583	Xekong

2008

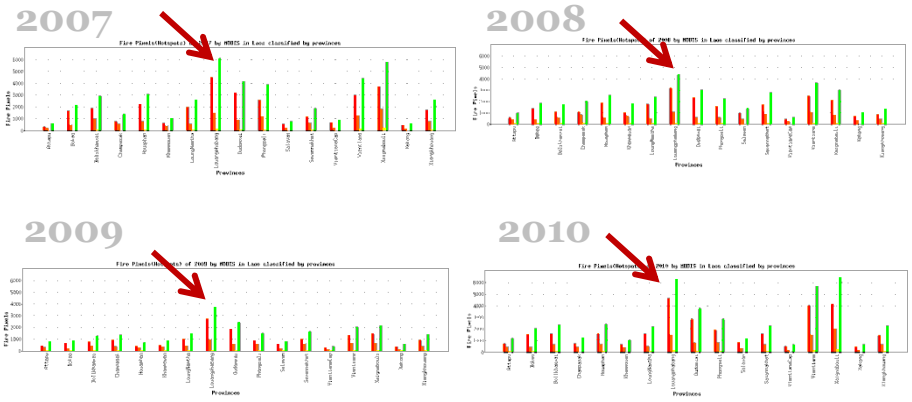
High	nom	Low	Total	Provinces
3176	1106	88	4370	Louangphabang
2512	1050	110	3672	Vientiane
2368	640	46	3054	Oudomxai
2126	816	66	3008	Xaignabouli
1756	918	100	2774	Savannakhet
1896	584	48	2528	Houaphan
1788	526	68	2382	LoungNamtha
1604	632	58	2294	Phongsali
1102	872	84	2058	Champasak
1414	392	44	1850	Bokeo
1010	762	44	1816	Khammouan
1092	584	46	1722	Bolikhamxai
972	430	24	1426	Salavan
860	442	48	1350	Xiengkhouang
694	324	24	1042	Xekong
574	416	42	1032	Attapu
432	198	10	640	VientianeCap

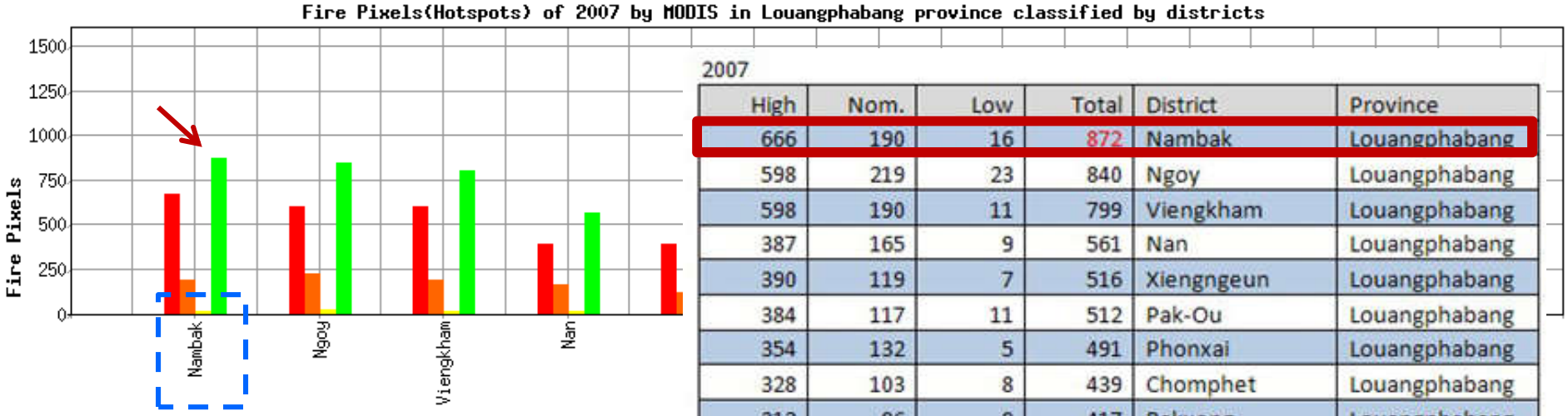
2009

High	nom	Low	Total	Provinces
2730	941	73	3744	Louangphabang
1842	536	48	2426	Oudomxai
1475	638	52	2165	Xaignabouli
1338	623	67	2028	Vientiane
1028	574	44	1646	Savannakhet
893	577	36	1506	Phongsali
1025	435	28	1488	LoungNamtha
941	411	37	1389	Xiengkhouang
925	391	49	1365	Champasak
790	443	33	1266	Bolikhamxai
664	228	18	910	Bokeo
491	377	26	894	Khammouan
597	212	29	838	Salavan
424	318	66	808	Attapu
392	277	30	699	Houaphan
369	125	43	537	Xekong
281	123	5	409	VientianeCap

2010

High	nom	Low	Total	Provinces
4141	2024	263	6428	Xaignabouli
4656	1472	141	6269	Louangphabang
4014	1485	133	5632	Vientiane
2847	836	72	3755	Oudomxai
1936	846	78	2860	Phongsali
1642	719	58	2419	Houaphan
1600	717	65	2382	Bolikhamxai
1591	684	42	2317	Savannakhet
1486	719	58	2263	Xiengkhouang
1594	551	49	2194	LoungNamtha
1567	421	40	2028	Bokeo
761	437	35	1233	Champasak
730	429	40	1199	Attapu
850	303	17	1170	Salavan
657	373	20	1050	Khammouan
491	182	15	688	Xekong
519	152	11	682	VientianeCap





2007

High	Nom.	Low	Total	District	Province
666	190	16	872	Nambak	Louangphabang
598	219	23	840	Ngoy	Louangphabang
598	190	11	799	Viengkham	Louangphabang
387	165	9	561	Nan	Louangphabang
390	119	7	516	Xiengngeun	Louangphabang
384	117	11	512	Pak-Ou	Louangphabang
354	132	5	491	Phonxai	Louangphabang
328	103	8	439	Chomphet	Louangphabang
312	96	9	417	Pakxeng	Louangphabang
230	95	11	336	Phoukhoune	Louangphabang
232	81	5	318	Louangphabang	Louangphabang

Active Fire Distribution in by district in Louangphabang province (2007-2010)

Nambak - highest

2007

High	Nom.	Low	Total	District	Province
666	190	16	872	Nambak	Louangphabang
598	219	23	840	Ngoy	Louangphabang
598	190	11	799	Viengkham	Louangphabang
387	165	9	561	Nan	Louangphabang
390	119	7	516	Xiengngeun	Louangphabang
384	117	11	512	Pak-Ou	Louangphabang
354	132	5	491	Phonxai	Louangphabang
328	103	8	439	Chomphet	Louangphabang
312	96	9	417	Pakxeng	Louangphabang
230	95	11	336	Phoukhoune	Louangphabang
232	81	5	318	Louangphabang	Louangphabang

2008

High	Nom.	Low	Total	District	Province
442	132	12	586	Nambak	Louangphabang
338	134	10	482	Ngoy	Louangphabang
340	110	4	454	Chomphet	Louangphabang
304	122	8	434	Pak-Ou	Louangphabang
286	122	6	414	Viengkham	Louangphabang
300	72	16	388	Phonxai	Louangphabang
288	82	4	374	Nan	Louangphabang
268	96	4	368	Pakxeng	Louangphabang
262	86	8	356	Xiengngeun	Louangphabang
202	82	14	298	Louangphabang	Louangphabang
146	68	2	216	Phoukhoune	Louangphabang

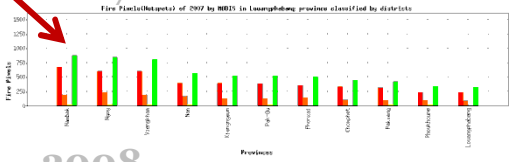
2009

High	Nom.	Low	Total	District	Province
408	121	13	542	Phonxai	Louangphabang
354	104	9	467	Xiengngeun	Louangphabang
342	110	7	459	Nambak	Louangphabang
256	97	5	358	Ngoy	Louangphabang
241	80	9	330	Pak-Ou	Louangphabang
220	71	6	297	Viengkham	Louangphabang
218	73	4	295	Chomphet	Louangphabang
192	78	8	278	Phoukhoune	Louangphabang
186	63	3	252	Louangphabang	Louangphabang
176	64	3	243	Pakxeng	Louangphabang
137	80	6	223	Nan	Louangphabang

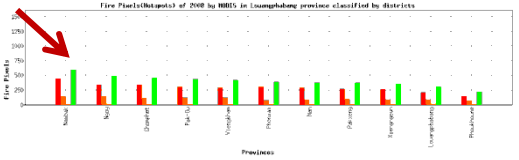
2010

High	Nom.	Low	Total	District	Province
957	533	93	1583	Phiang	Xaignabouli
763	403	58	1224	Paklai	Xaignabouli
604	281	24	909	Xaignabouli	Xaignabouli
407	156	12	575	Kenthao	Xaignabouli
381	137	19	537	Xianghon	Xaignabouli
300	159	11	470	Hongsa	Xaignabouli
193	135	26	354	Thongmixay	Xaignabouli
240	79	7	326	Ngeun	Xaignabouli
200	79	7	286	Khop	Xaignabouli
96	62	6	164	Boten	Xaignabouli

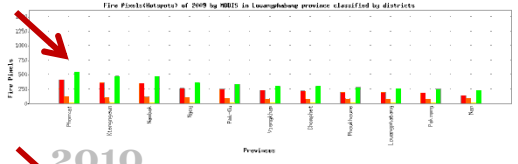
2007



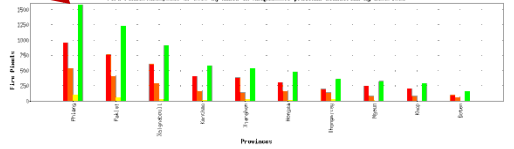
2008

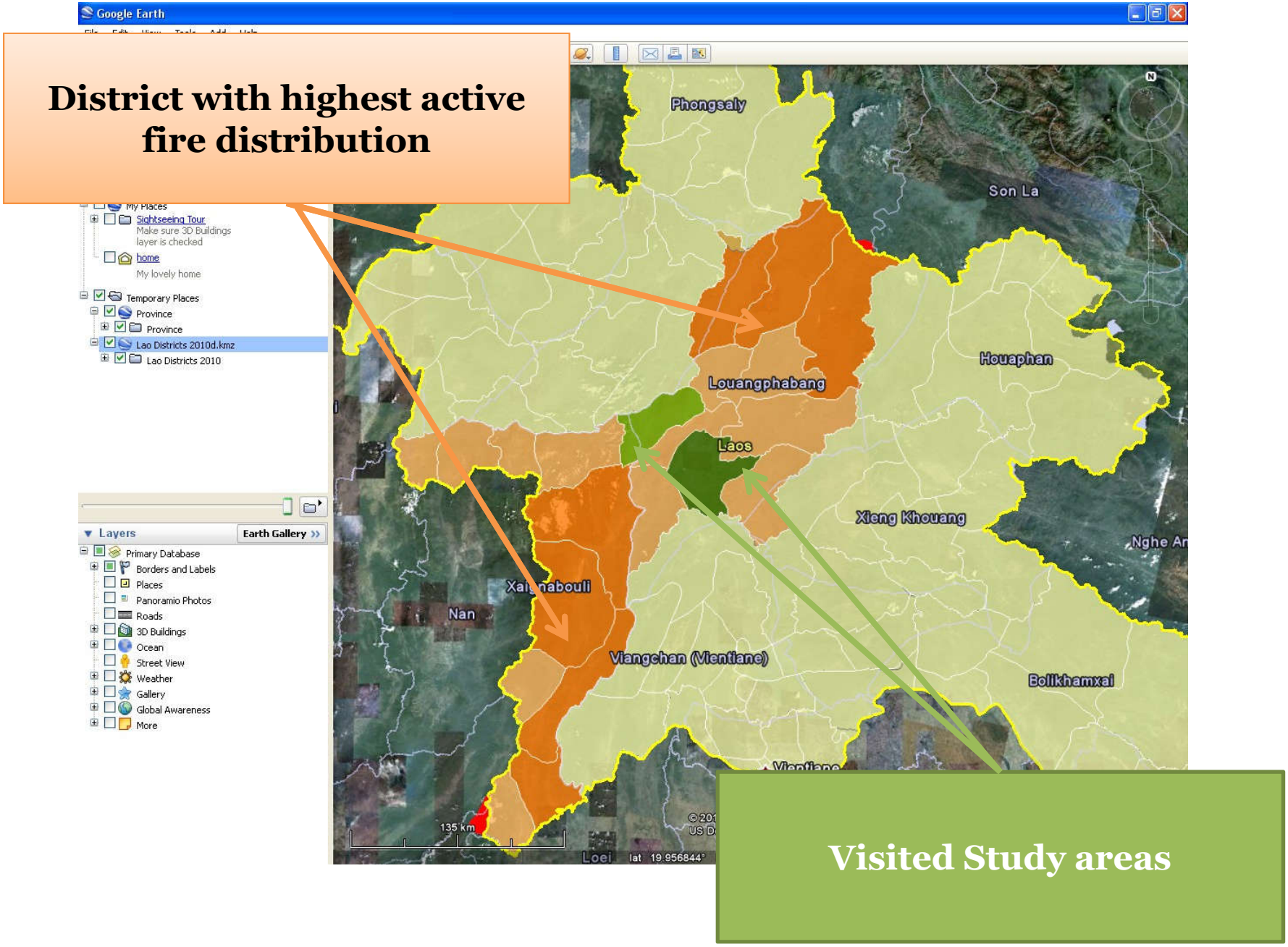


2009

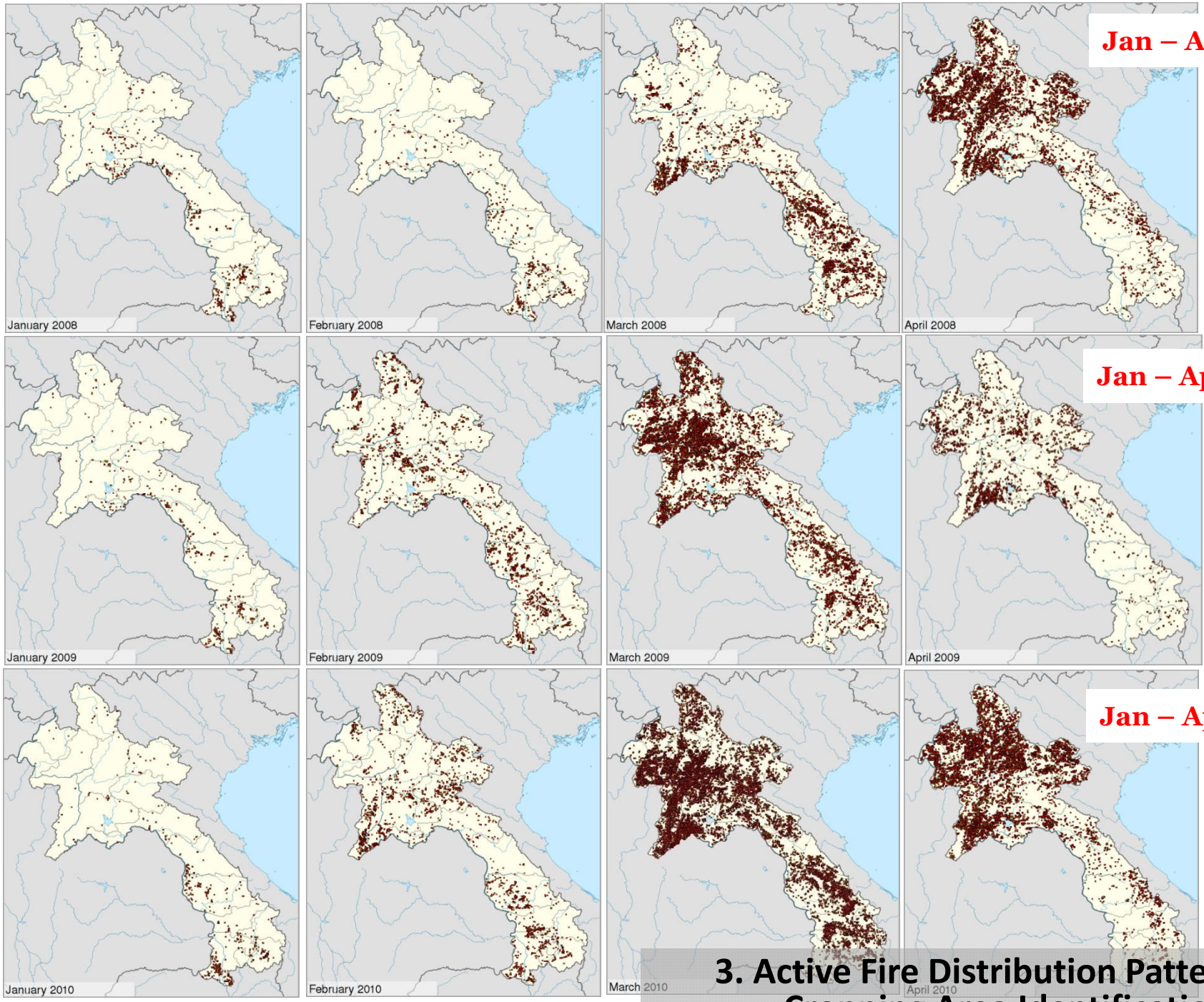


2010



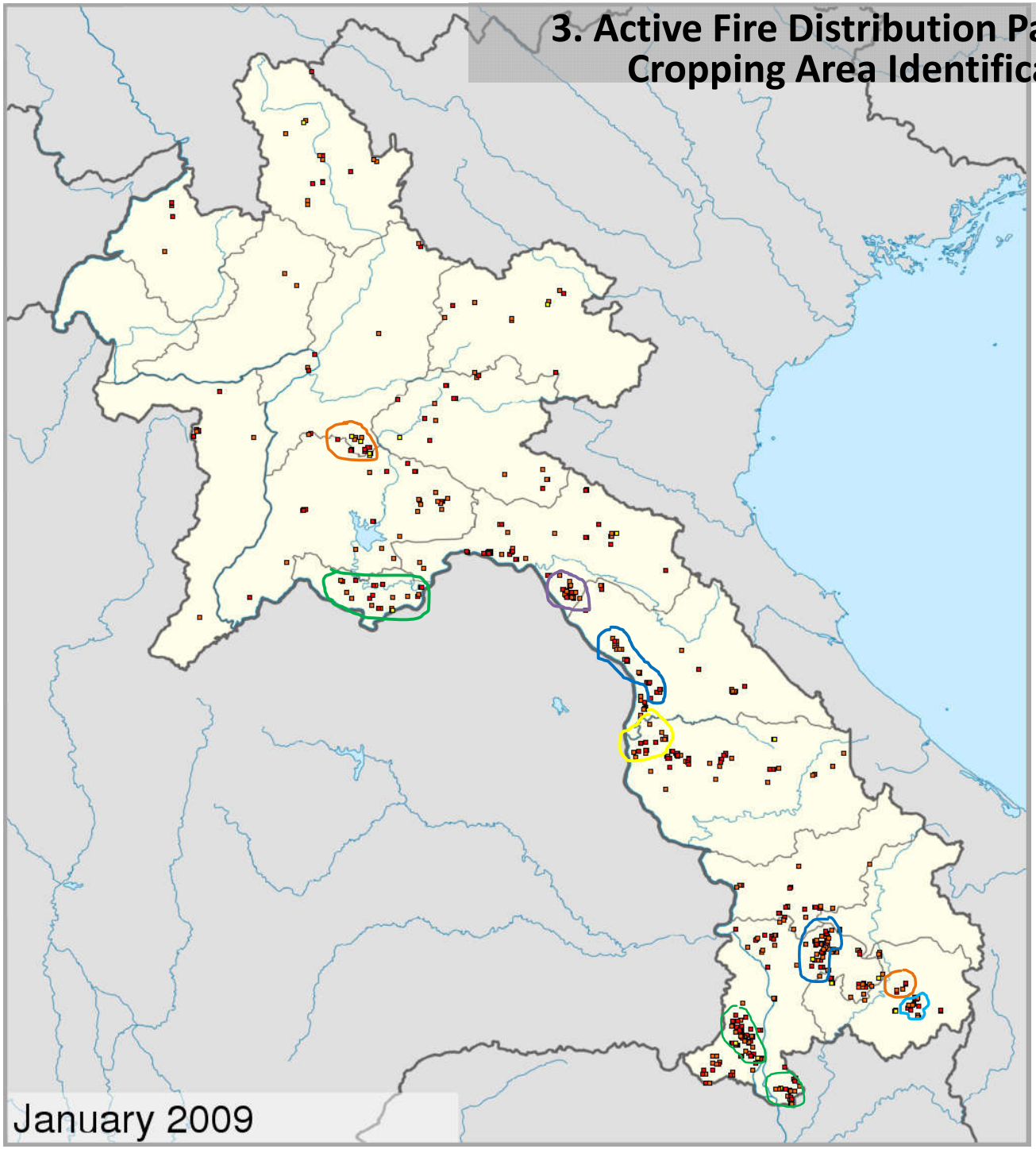

District with highest active fire distribution
Google Earth
Phongsaly
Son La
Houaphan
Louangphabang
Laos
Xieng Khouang
Nghe An
Nan
Viangchan (Vientiane)
Bolikhamxai
Vientiane
135 km
Loei
lat 19.956844°
Sightseeing Tour
Make sure 3D Buildings layer is checked
home
My lovely home
Temporary Places
Province
Province
Lao Districts 2010d.kmz
Lao Districts 2010
Layers
Earth Gallery
Primary Database
Borders and Labels
Places
Panoramio Photos
Roads
3D Buildings
Ocean
Street View
Weather
Gallery
Global Awareness
More
Visited Study areas

~ 3 ~
Active Fire Distribution Pattern and cropping area identification

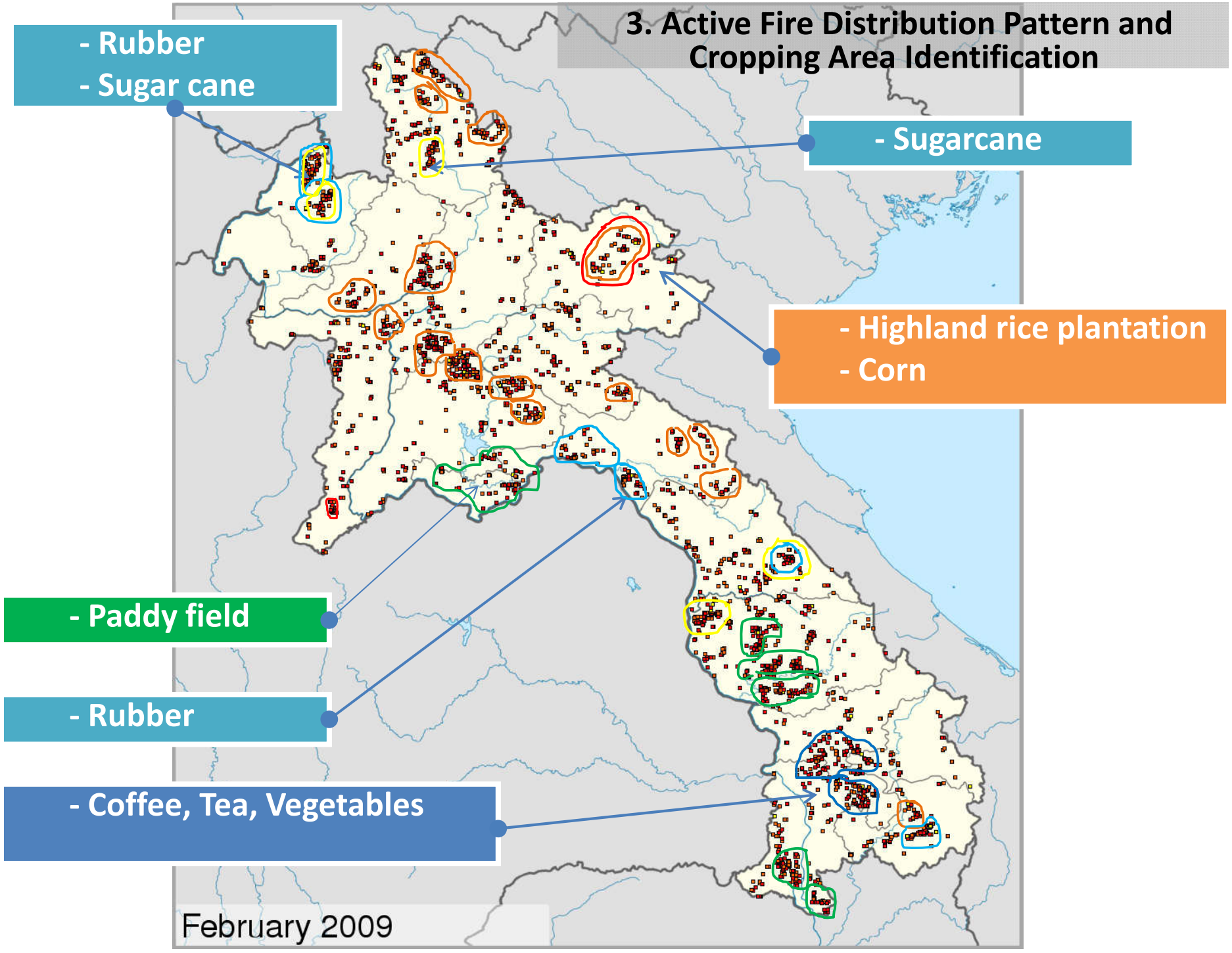


3. Active Fire Distribution Pattern and Cropping Area Identification

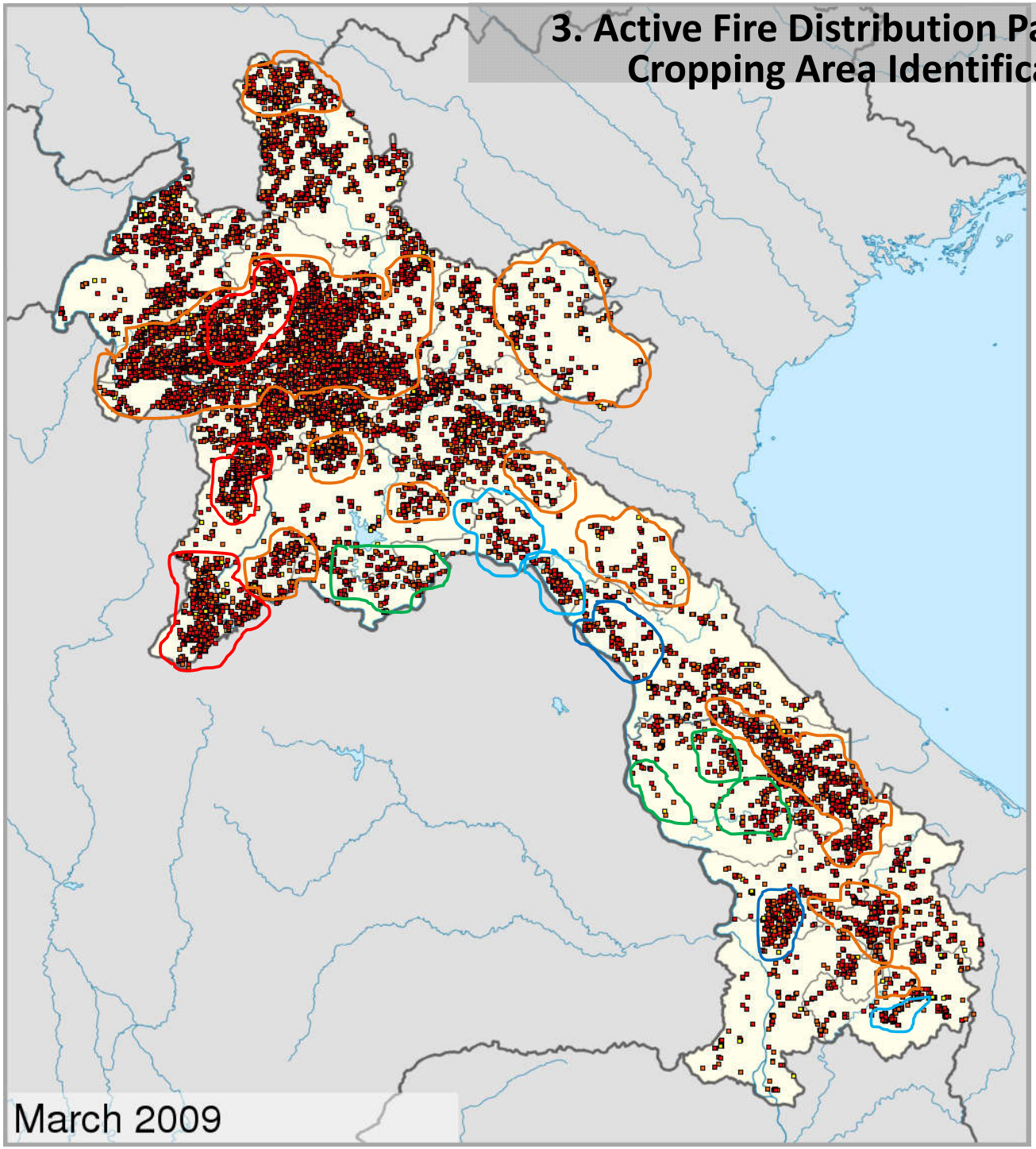
3. Active Fire Distribution Pattern and Cropping Area Identification



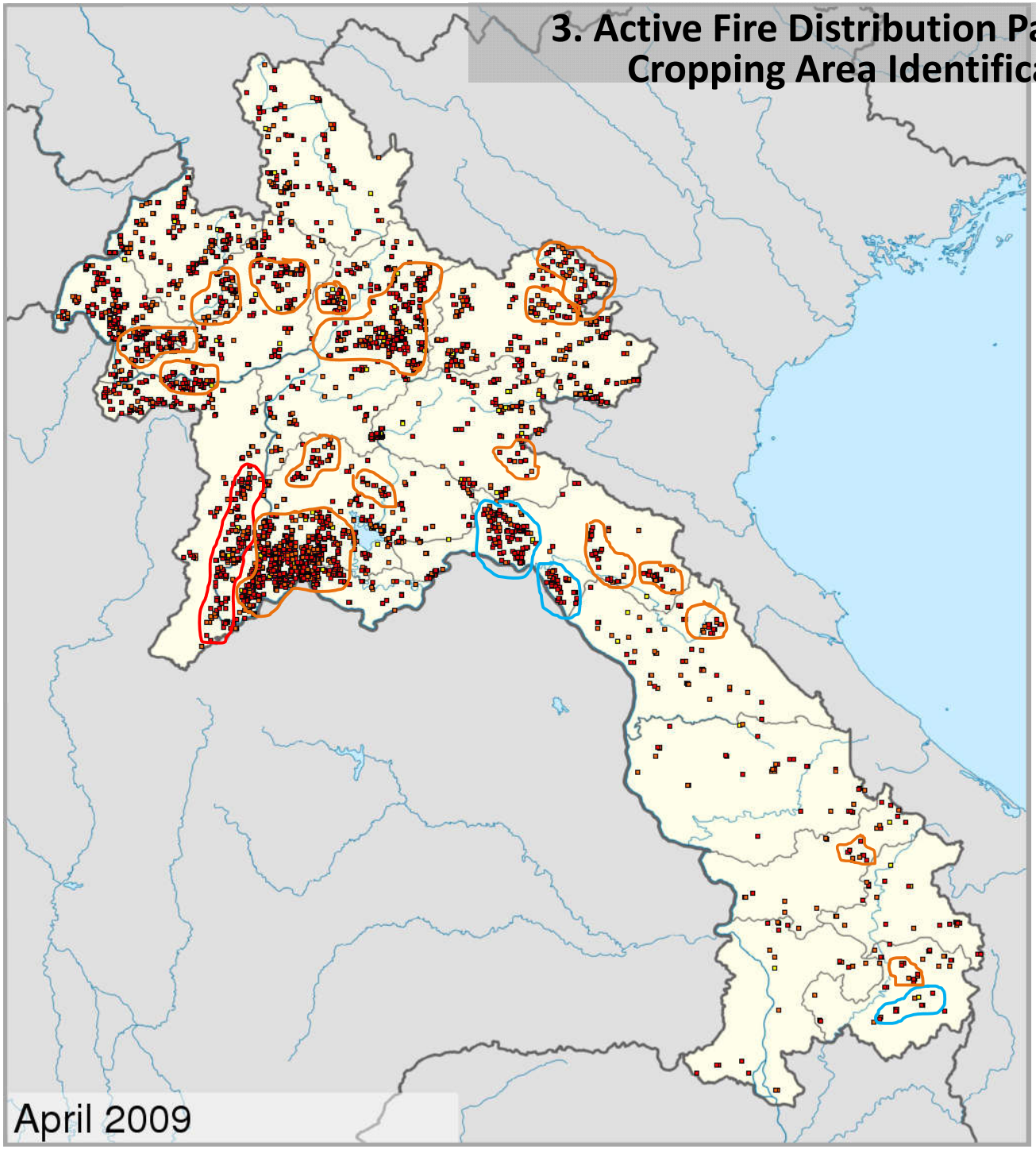
3. Active Fire Distribution Pattern and Cropping Area Identification



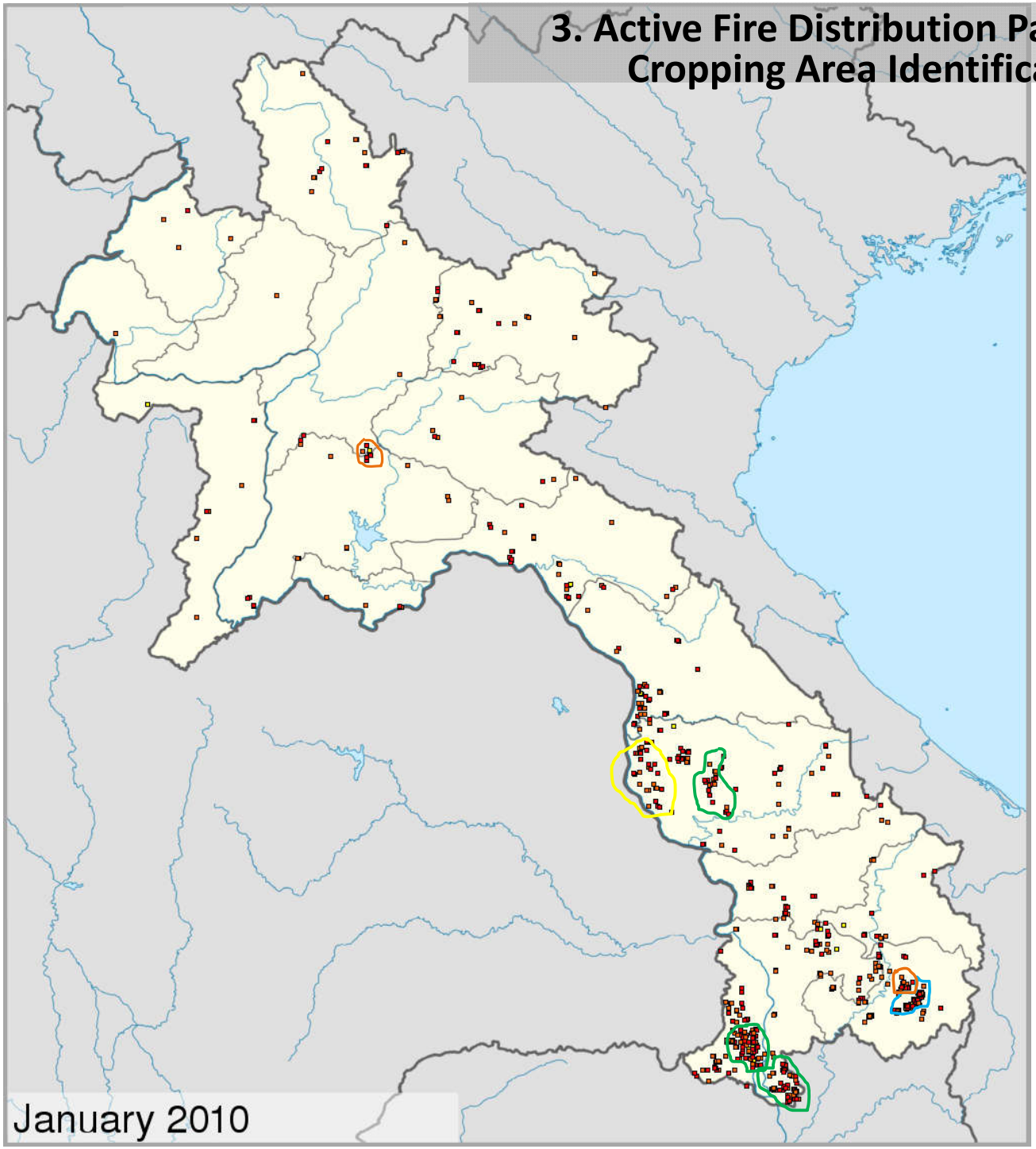
3. Active Fire Distribution Pattern and Cropping Area Identification



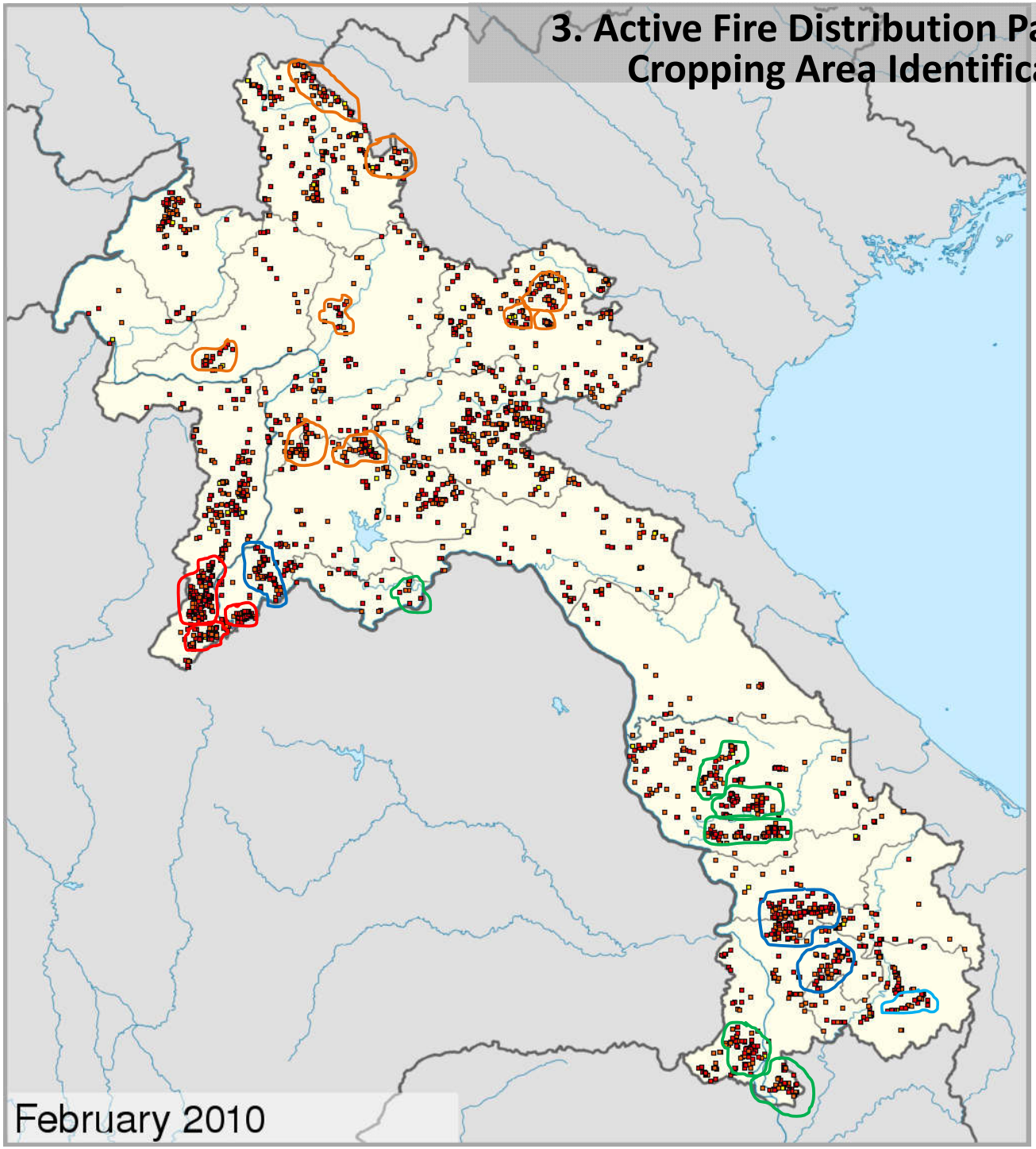
3. Active Fire Distribution Pattern and Cropping Area Identification



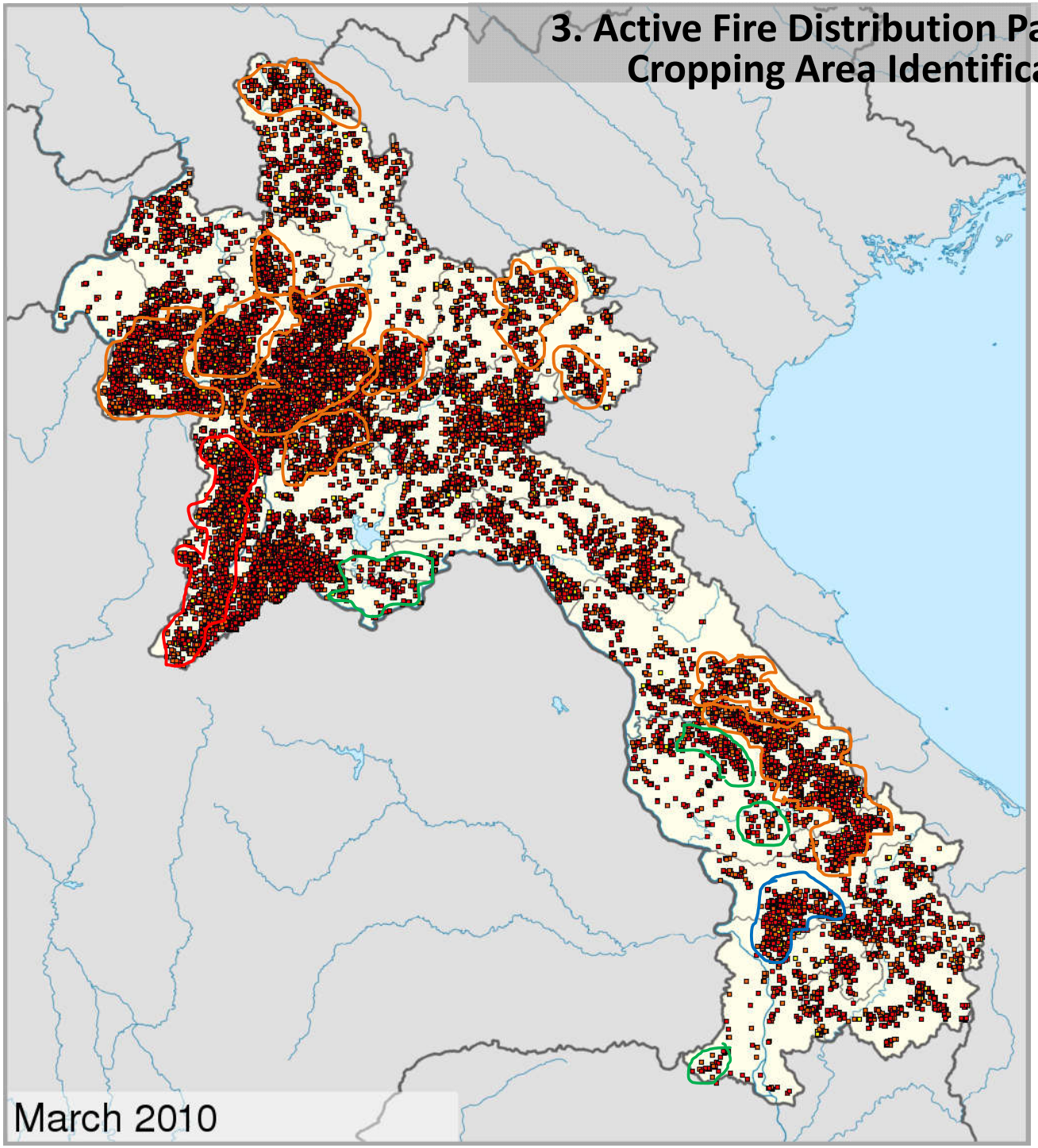
3. Active Fire Distribution Pattern and Cropping Area Identification

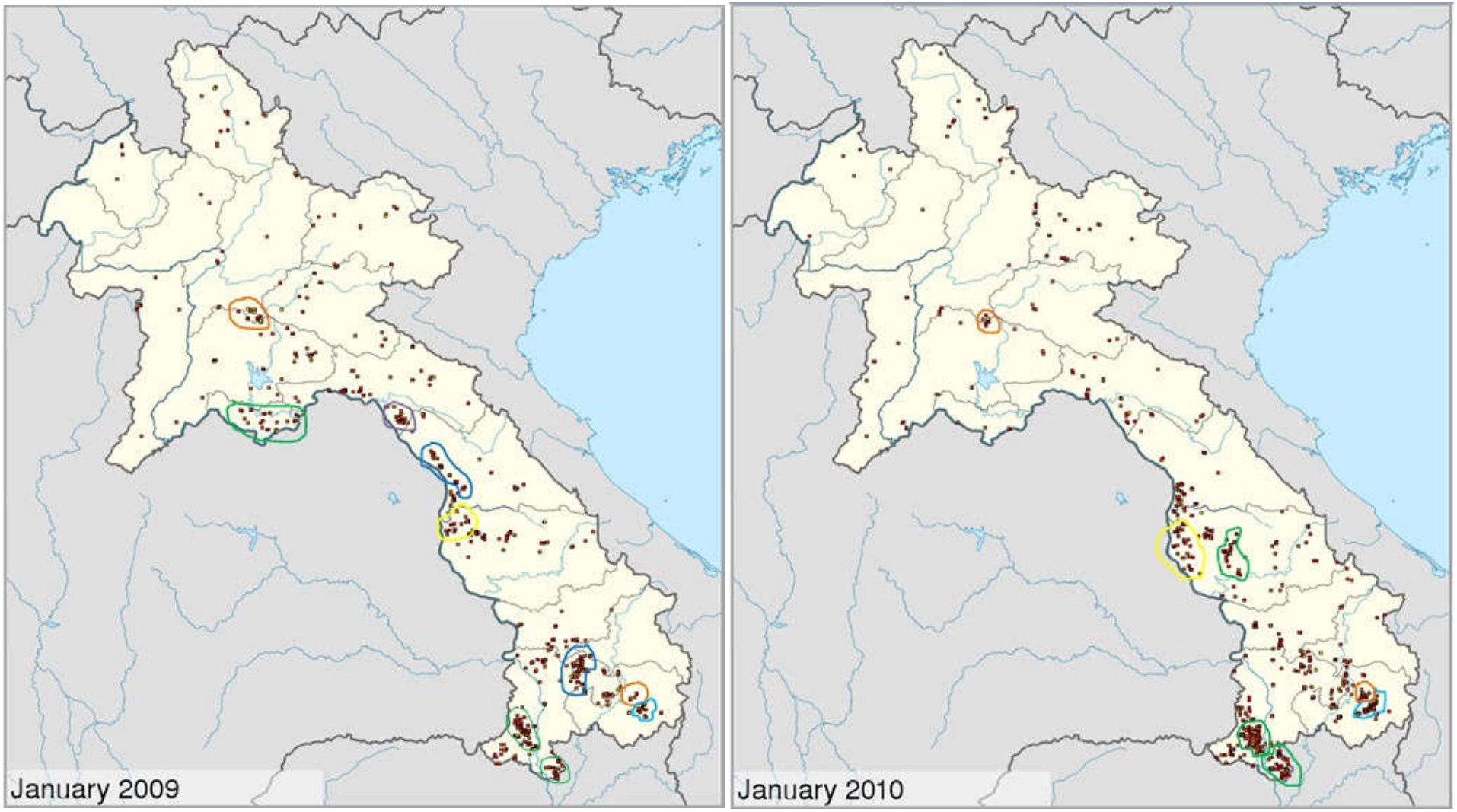


3. Active Fire Distribution Pattern and Cropping Area Identification

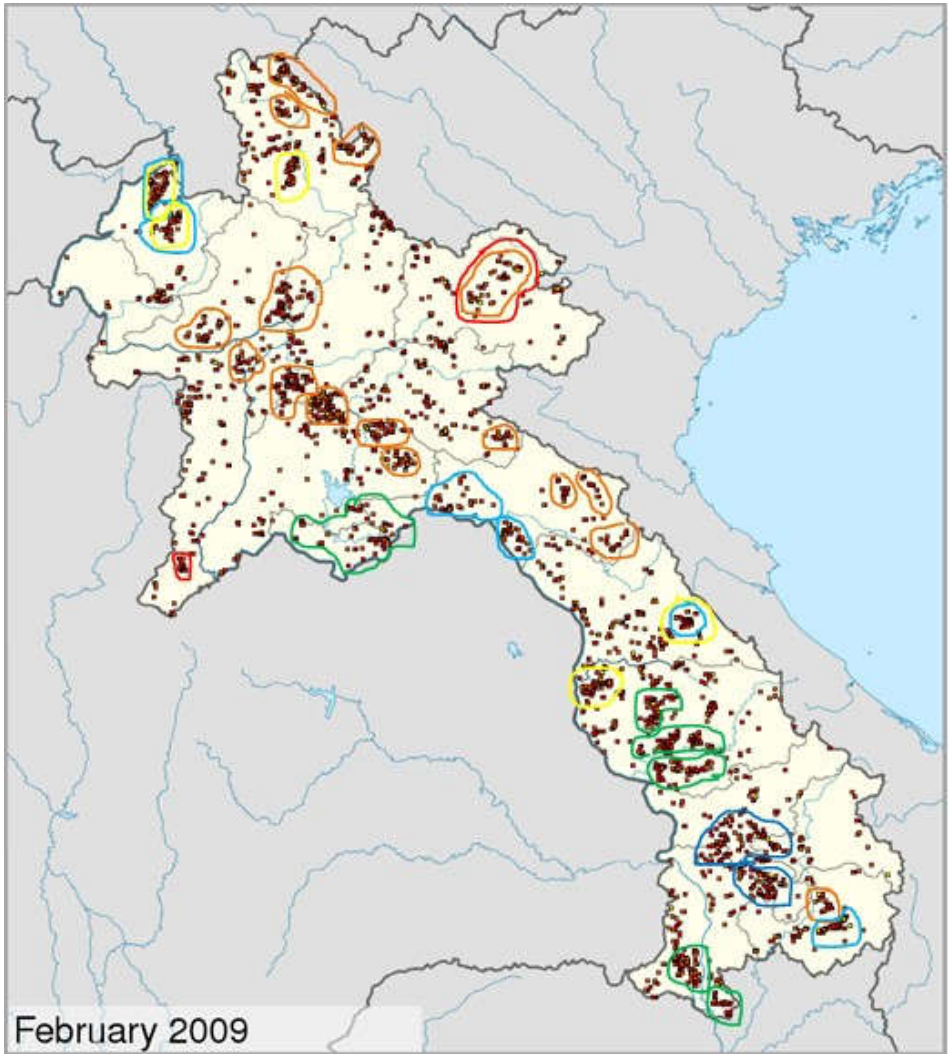


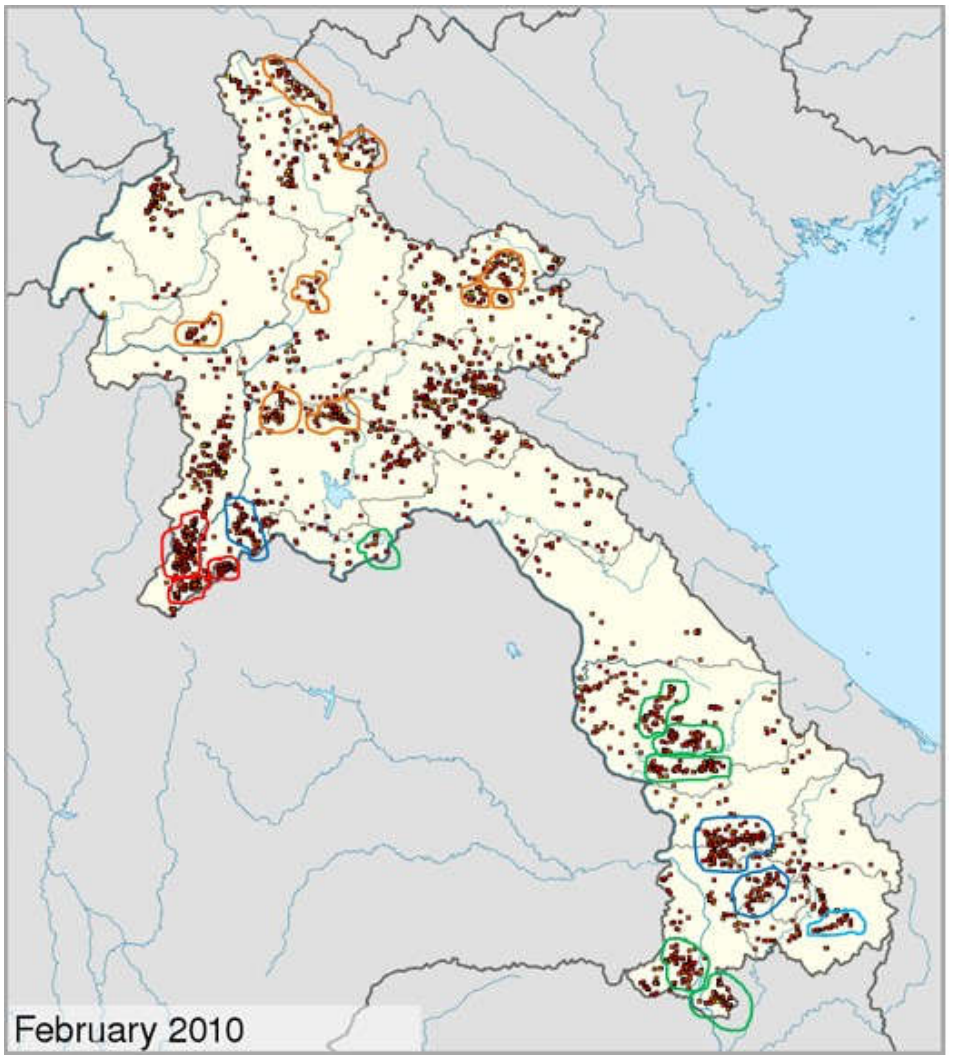
3. Active Fire Distribution Pattern and Cropping Area Identification



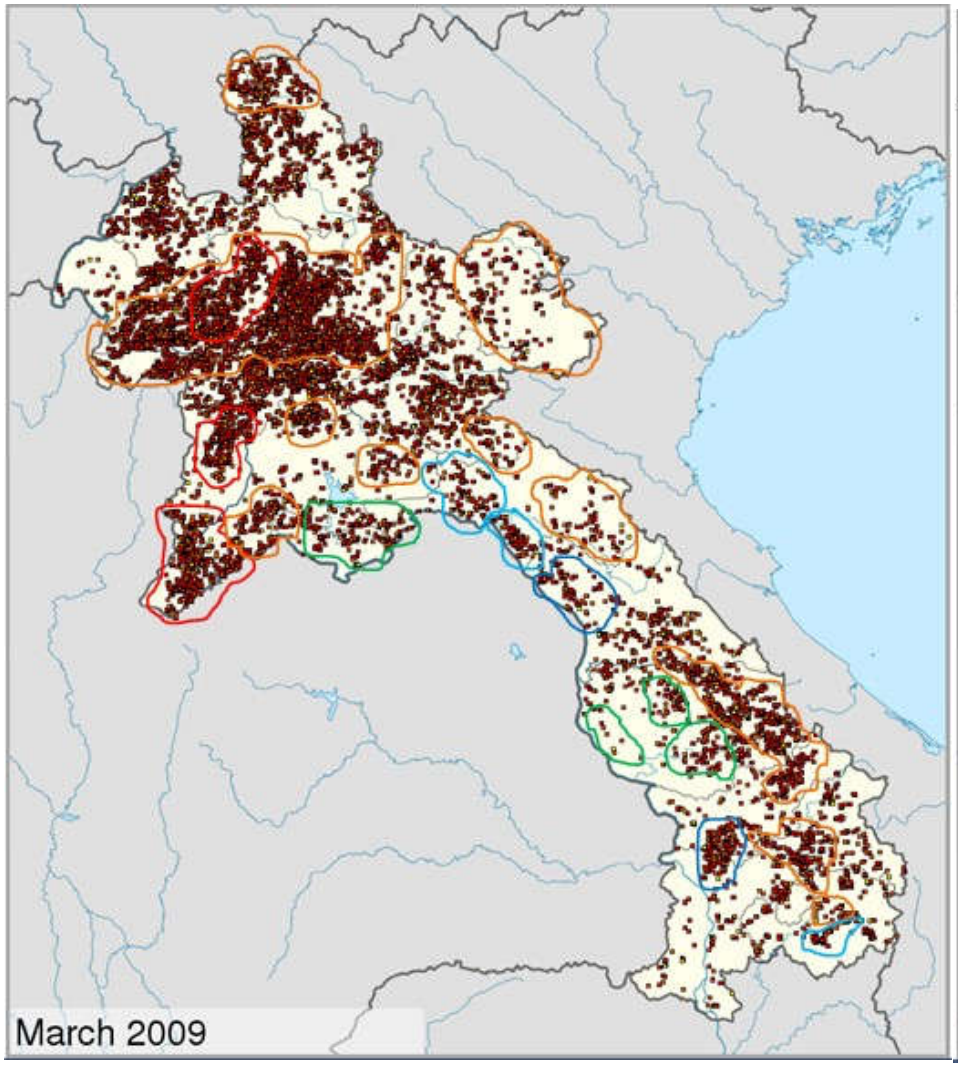


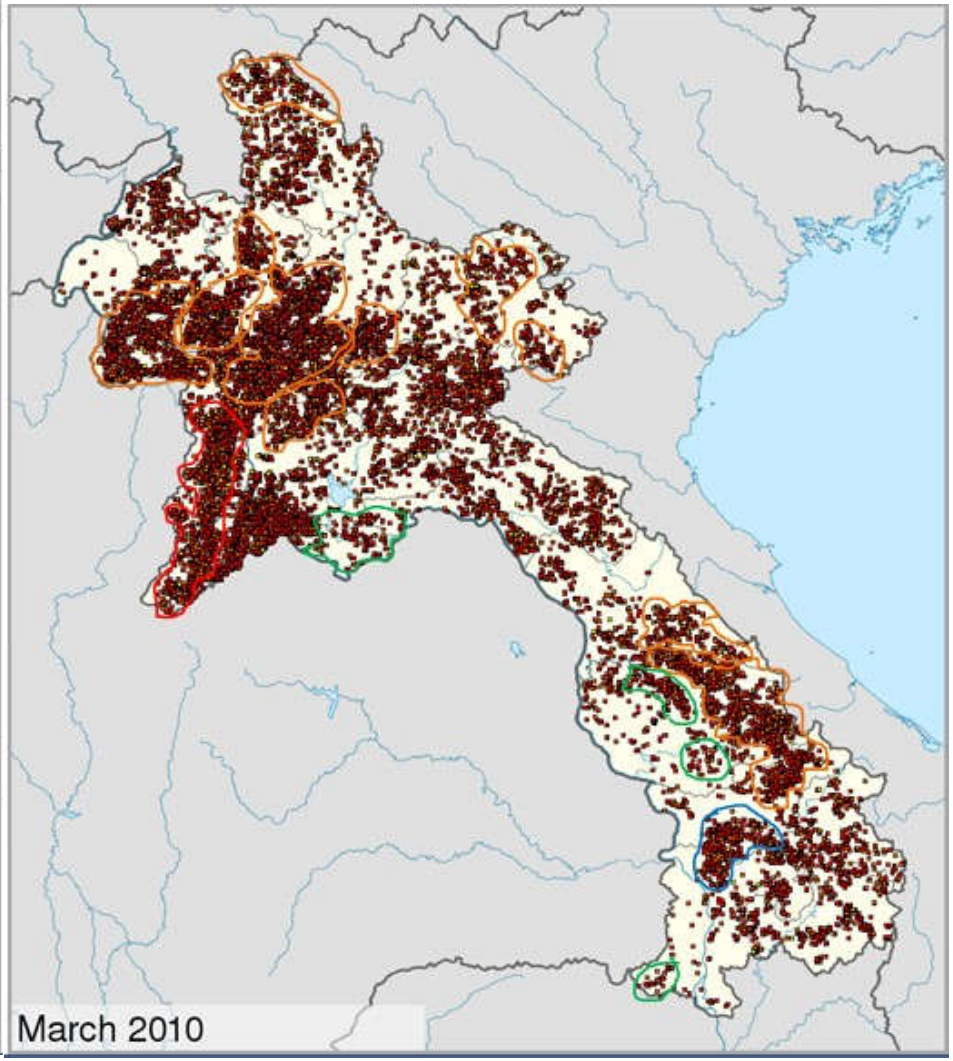
3. Active Fire Distribution Pattern and Cropping Area Identification





3. Active Fire Distribution Pattern and Cropping Area Identification





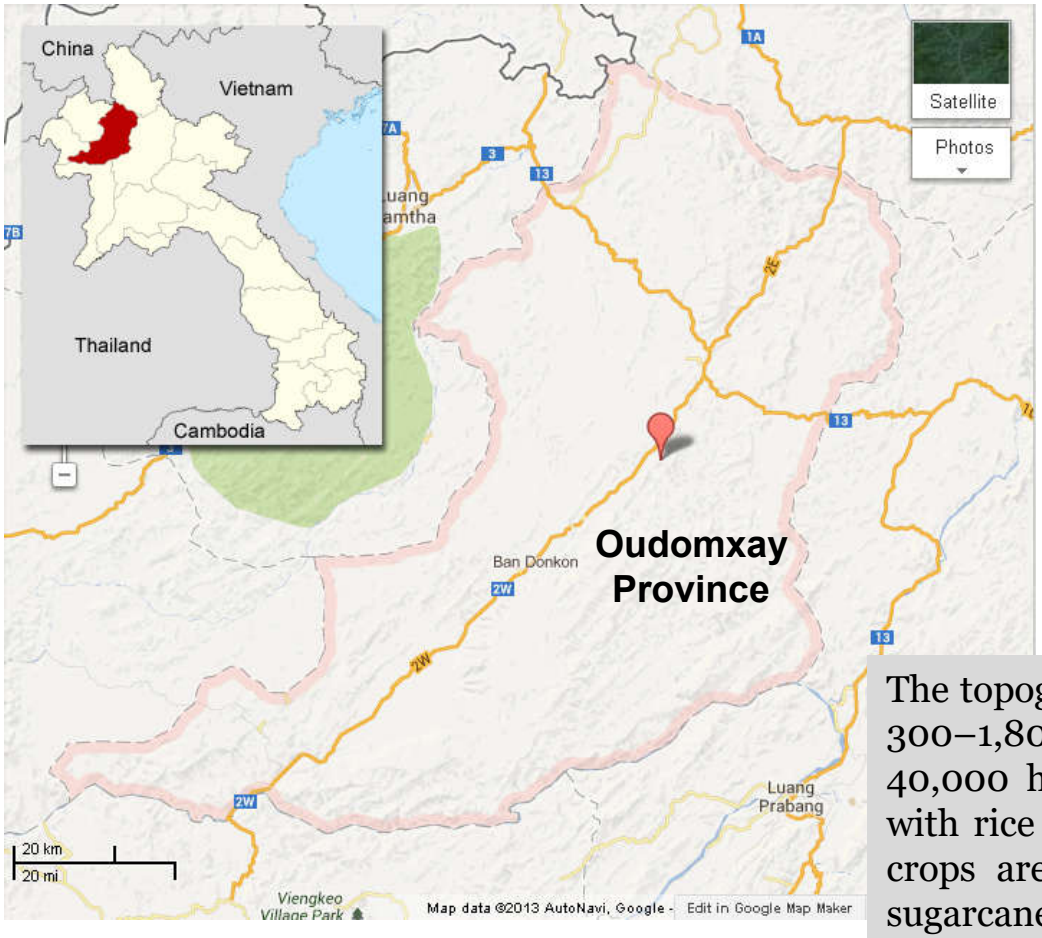
3. Active Fire Distribution Pattern and Cropping Area Identification

~ 4 ~
Detection of Frequently Burn Locations

A Case Study in
Oudomxay Province, Lao PDR

Study on the Detection of Frequently-burn locations in Oudomxay Prov., Lao PDR

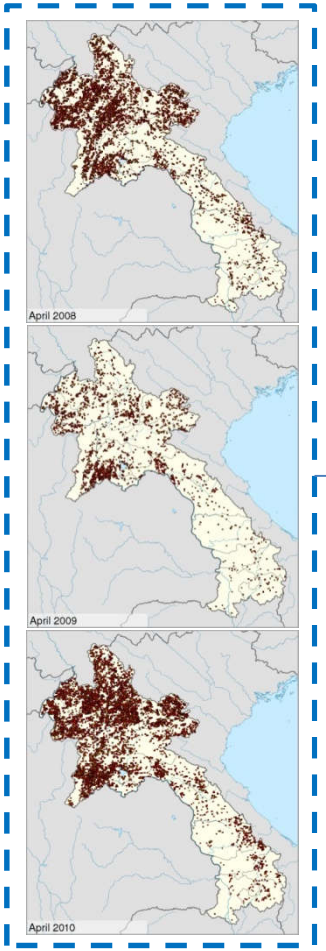
Oudomxay



The topography of Oudomxay is mountainous, between 300–1,800 metres above sea level. Approximately 40,000 hectares of land are cultivated in Oudomxay, with rice being the main crop. Besides rice, important crops are corn, soybeans, fruits, vegetables, cassava, sugarcane, tobacco, cotton wool, tea and peanuts. In 2004, approximately 10,000 tons of sugarcane and 45,000 tons of corn were produced

Data used and Methodology

Multi-Temporal Data



START

1. MODIS Active Fire Product (MOD14) of Laos (2007-2009)

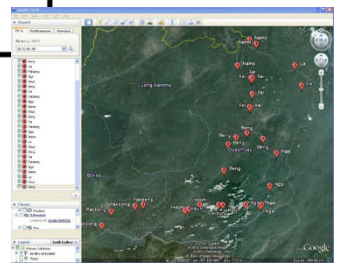
2. Data **filtering** for Oudomxay

3. Selection of active fire locations with same geographic coordinates

4. **Grouping** data from (3) by districts

5. **Overlaying** data from (4) To Google Earth

6. Map of frequently-burn locations by district within 2007-2009



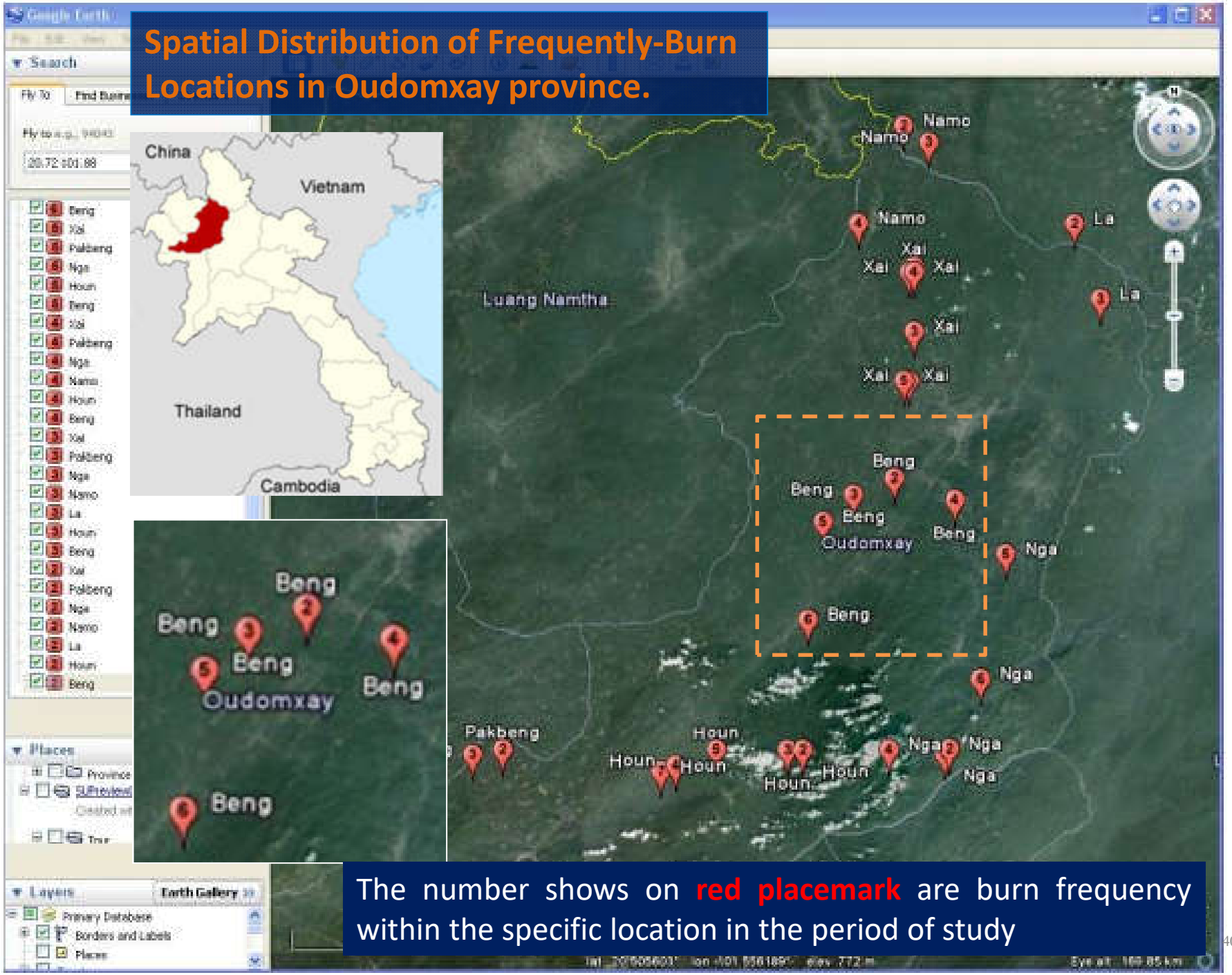
END

List of districts in Oudomxay province with burning frequency of **5, 6 & 7 times** within the study period

ID	Date	GMT time	Lat	Lon	fire conf. (%)	District	Province	Country
01	17/3/2007	6:23:00	20.28	101.68	95	Beng	Oudomxai	Laos
02	28/3/2007	6:04:00	20.28	101.68	100	Beng	Oudomxai	Laos
03	29/3/2007	6:47:00	20.28	101.68	100	Beng	Oudomxai	Laos
04	09/4/2008	6:40:00	20.28	101.68	100	Beng	Oudomxai	Laos
05	06/3/2009	6:27:00	20.28	101.68	96	Beng	Oudomxai	Laos
06	13/3/2009	6:33:00	20.28	101.68	89	Beng	Oudomxai	Laos

ID	Date	GMT time	Lat	Lon	fire conf. (%)	District	Province	Country
01	08/3/2007	6:29:00	20	101.39	73	Houn	Oudomxai	Laos
02	11/3/2007	6:59:00	20	101.39	82	Houn	Oudomxai	Laos
03	11/3/2007	6:59:00	20	101.39	98	Houn	Oudomxai	Laos
04	15/3/2007	6:35:00	20	101.39	93	Houn	Oudomxai	Laos
05	23/3/2008	5:58:00	20	101.39	100	Houn	Oudomxai	Laos
06	11/3/2009	6:45:00	20	101.39	100	Houn	Oudomxai	Laos
07	11/3/2009	6:45:00	20	101.39	99	Houn	Oudomxai	Laos

ID	Date	GMT time	Lat	Lon	fire conf. (%)	District	Province	Country
01	10/3/2007	6:17:00	20.72	101.88	79	Xai	Oudomxai	Laos
02	13/3/2007	6:47:00	20.72	101.88	81	Xai	Oudomxai	Laos
03	29/3/2007	6:47:00	20.72	101.88	96	Xai	Oudomxai	Laos
04	31/3/2007	6:35:00	20.72	101.88	100	Xai	Oudomxai	Laos
05	09/4/2008	6:40:00	20.72	101.88	100	Xai	Oudomxai	Laos
06	20/3/2009	6:39:00	20.72	101.88	91	Xai	Oudomxai	Laos
07	22/3/2009	6:27:00	20.72	101.88	89	Xai	Oudomxai	Laos


Spatial Distribution of Frequently-Burn Locations in Oudomxay province.
China
Vietnam
Thailand
Cambodia
Luang Namtha
Namo
La
Xai
Beng
Oudomxay
Nga
Pakbeng
Houn
The number shows on red placemark are burn frequency within the specific location in the period of study

List of districts in Oudomxay province with burning frequency of **2 times** within the study period

ID	Date	GMT time	Lat	Lon	fire conf. (%)	District	Province	Country
01	28/3/2007	6:04:00	20.54	101.85	100	Beng	Oudomxai	Laos
02	23/3/2009	7:10:00	20.54	101.85	79	Beng	Oudomxai	Laos
01	31/3/2007	18:49:00	20.04	101.67	74	Houn	Oudomxai	Laos
02	01/4/2007	4:13:00	20.04	101.67	98	Houn	Oudomxai	Laos
01	29/3/2007	6:47:00	21.01	102.21	100	La	Oudomxai	Laos
02	22/4/2008	6:10:00	21.01	102.21	88	La	Oudomxai	Laos
01	31/3/2007	6:35:00	21.19	101.87	86	Namo	Oudomxai	Laos
02	04/4/2007	15:35:00	21.19	101.87	100	Namo	Oudomxai	Laos
01	28/3/2007	6:04:00	20.04	101.96	92	Nga	Oudomxai	Laos
02	09/4/2008	6:40:00	20.04	101.96	86	Nga	Oudomxai	Laos
01	09/3/2009	6:58:00	20.04	101.08	71	Pakbeng	Oudomxai	Laos
02	22/3/2009	6:27:00	20.04	101.08	80	Pakbeng	Oudomxai	Laos
01	31/3/2007	6:35:00	20.93	101.89	100	Xai	Oudomxai	Laos
02	31/3/2007	6:35:00	20.93	101.89	100	Xai	Oudomxai	Laos

List of districts in Oudomxay province with burning frequency of **3 times** within the study period

ID	Date	GMT time	Lat	Lon	fire conf. (%)	District	Province	Country
01	29/3/2007	6:47:00	20.51	101.77	87	Beng	Oudomxai	Laos
02	09/4/2008	6:40:00	20.51	101.77	100	Beng	Oudomxai	Laos
03	10/3/2009	6:03:00	20.51	101.77	100	Beng	Oudomxai	Laos
01	31/3/2007	6:35:00	20.04	101.64	94	Houn	Oudomxai	Laos
02	09/3/2009	6:58:00	20.04	101.64	100	Houn	Oudomxai	Laos
03	13/3/2009	6:33:00	20.04	101.64	98	Houn	Oudomxai	Laos
01	09/4/2008	6:40:00	20.87	102.26	100	La	Oudomxai	Laos
02	09/4/2008	6:40:00	20.87	102.26	100	La	Oudomxai	Laos
03	11/4/2008	6:28:00	20.87	102.26	100	La	Oudomxai	Laos
01	03/4/2007	4:01:00	21.16	101.92	87	Namo	Oudomxai	Laos
02	23/3/2009	4:02:00	21.16	101.92	83	Namo	Oudomxai	Laos
03	24/3/2009	6:15:00	21.16	101.92	100	Namo	Oudomxai	Laos
01	01/4/2007	4:13:00	20.03	101.95	98	Nga	Oudomxai	Laos
02	11/4/2008	6:28:00	20.03	101.95	90	Nga	Oudomxai	Laos
03	17/3/2009	6:09:00	20.03	101.95	100	Nga	Oudomxai	Laos
01	29/3/2007	6:47:00	20.03	101.02	100	Pakbeng	Oudomxai	Laos
02	31/3/2007	6:35:00	20.03	101.02	75	Pakbeng	Oudomxai	Laos
03	03/4/2007	7:05:00	20.03	101.02	88	Pakbeng	Oudomxai	Laos
01	31/3/2007	6:35:00	20.81	101.89	100	Xai	Oudomxai	Laos
02	03/4/2007	7:05:00	20.81	101.89	98	Xai	Oudomxai	Laos
03	09/4/2008	6:40:00	20.81	101.89	100	Xai	Oudomxai	Laos

List of districts in Oudomxay province with burning frequency of **4 times** within the study period

ID	Date	GMT time	Lat	Lon	fire conf. (%)	District	Province	Country
01	26/3/2007	6:17:00	20.5	101.97	100	Beng	Oudomxai	Laos
02	31/3/2007	6:35:00	20.5	101.97	100	Beng	Oudomxai	Laos
03	08/4/2008	5:58:00	20.5	101.97	100	Beng	Oudomxai	Laos
04	21/4/2009	6:39:00	20.5	101.97	100	Beng	Oudomxai	Laos
01	11/3/2007	6:59:00	20.01	101.42	100	Houn	Oudomxai	Laos
02	23/3/2008	5:58:00	20.01	101.42	85	Houn	Oudomxai	Laos
03	10/3/2009	6:03:00	20.01	101.42	100	Houn	Oudomxai	Laos
04	13/3/2009	6:33:00	20.01	101.42	100	Houn	Oudomxai	Laos
01	31/3/2007	6:35:00	21.01	101.78	100	Namo	Oudomxai	Laos
02	05/4/2007	6:53:00	21.01	101.78	96	Namo	Oudomxai	Laos
03	25/4/2007	6:29:00	21.01	101.78	94	Namo	Oudomxai	Laos
04	21/4/2009	6:39:00	21.01	101.78	100	Namo	Oudomxai	Laos
01	11/4/2008	6:28:00	20.04	101.84	100	Nga	Oudomxai	Laos
02	08/3/2009	6:15:00	20.04	101.84	94	Nga	Oudomxai	Laos
03	05/4/2009	6:39:00	20.04	101.84	88	Nga	Oudomxai	Laos
04	16/4/2009	6:21:00	20.04	101.84	97	Nga	Oudomxai	Laos
01	02/4/2007	6:23:00	19.89	100.77	78	Pakbeng	Oudomxai	Laos
02	03/4/2007	7:05:00	19.89	100.77	100	Pakbeng	Oudomxai	Laos
03	09/4/2008	6:40:00	19.89	100.77	80	Pakbeng	Oudomxai	Laos
04	31/3/2009	6:21:00	19.89	100.77	96	Pakbeng	Oudomxai	Laos
01	17/3/2007	6:23:00	20.92	101.89	79	Xai	Oudomxai	Laos
02	31/3/2007	6:35:00	20.92	101.89	100	Xai	Oudomxai	Laos
03	22/3/2009	6:27:00	20.92	101.89	72	Xai	Oudomxai	Laos
04	22/3/2009	6:27:00	20.92	101.89	93	Xai	Oudomxai	Laos

List of districts in Oudomxay province with burning frequency of **5 times** within the study period

ID	Date	GMT time	Lat	Lon	fire conf. (%)	District	Province	Country
01	29/3/2007	6:47:00	20.46	101.71	83	Beng	Oudomxai	Laos
02	29/3/2007	6:47:00	20.46	101.71	86	Beng	Oudomxai	Laos
03	09/4/2008	6:40:00	20.46	101.71	99	Beng	Oudomxai	Laos
04	20/3/2009	6:39:00	20.46	101.71	90	Beng	Oudomxai	Laos
05	22/3/2009	6:27:00	20.46	101.71	100	Beng	Oudomxai	Laos
01	08/3/2007	6:29:00	20.04	101.5	76	Houn	Oudomxai	Laos
02	13/3/2007	6:47:00	20.04	101.5	75	Houn	Oudomxai	Laos
03	22/3/2008	6:52:00	20.04	101.5	100	Houn	Oudomxai	Laos
04	22/3/2008	6:52:00	20.04	101.5	100	Houn	Oudomxai	Laos
05	22/3/2009	6:27:00	20.04	101.5	72	Houn	Oudomxai	Laos
01	13/3/2007	6:47:00	20.4	102.07	100	Nga	Oudomxai	Laos
02	27/3/2007	6:59:00	20.4	102.07	95	Nga	Oudomxai	Laos
03	29/3/2007	6:47:00	20.4	102.07	89	Nga	Oudomxai	Laos
04	31/3/2007	6:35:00	20.4	102.07	100	Nga	Oudomxai	Laos
05	13/3/2009	6:33:00	20.4	102.07	71	Nga	Oudomxai	Laos
01	31/3/2007	6:35:00	19.99	100.84	80	Pakbeng	Oudomxai	Laos
02	02/4/2007	6:23:00	19.99	100.84	100	Pakbeng	Oudomxai	Laos
03	03/4/2007	4:01:00	19.99	100.84	82	Pakbeng	Oudomxai	Laos
04	08/4/2008	5:58:00	19.99	100.84	95	Pakbeng	Oudomxai	Laos
05	09/4/2008	6:40:00	19.99	100.84	86	Pakbeng	Oudomxai	Laos
01	31/3/2007	6:35:00	20.72	101.87	99	Xai	Oudomxai	Laos
02	03/4/2007	4:01:00	20.72	101.87	96	Xai	Oudomxai	Laos
03	20/3/2009	6:39:00	20.72	101.87	100	Xai	Oudomxai	Laos
04	20/3/2009	6:39:00	20.72	101.87	86	Xai	Oudomxai	Laos
05	21/4/2009	6:39:00	20.72	101.87	86	Xai	Oudomxai	Laos

List of districts in Oudomxay province with burning frequency of **6 & 7 times** within the study period

ID	Date	GMT time	Lat	Lon	fire conf. (%)	District	Province	Country
01	17/3/2007	6:23:00	20.28	101.68	95	Beng	Oudomxai	Laos
02	28/3/2007	6:04:00	20.28	101.68	100	Beng	Oudomxai	Laos
03	29/3/2007	6:47:00	20.28	101.68	100	Beng	Oudomxai	Laos
04	09/4/2008	6:40:00	20.28	101.68	100	Beng	Oudomxai	Laos
05	06/3/2009	6:27:00	20.28	101.68	96	Beng	Oudomxai	Laos
06	13/3/2009	6:33:00	20.28	101.68	89	Beng	Oudomxai	Laos
01	29/3/2007	6:47:00	20.17	102.02	98	Nga	Oudomxai	Laos
02	02/4/2007	6:23:00	20.17	102.02	100	Nga	Oudomxai	Laos
03	05/4/2007	6:53:00	20.17	102.02	100	Nga	Oudomxai	Laos
04	09/4/2008	6:40:00	20.17	102.02	99	Nga	Oudomxai	Laos
05	06/3/2009	6:27:00	20.17	102.02	100	Nga	Oudomxai	Laos
06	11/3/2009	6:45:00	20.17	102.02	87	Nga	Oudomxai	Laos
01	17/3/2007	6:23:00	20.92	101.88	94	Xai	Oudomxai	Laos
02	31/3/2007	6:35:00	20.92	101.88	100	Xai	Oudomxai	Laos
03	31/3/2007	6:35:00	20.92	101.88	100	Xai	Oudomxai	Laos
04	20/4/2008	6:22:00	20.92	101.88	100	Xai	Oudomxai	Laos
05	22/3/2009	6:27:00	20.92	101.88	71	Xai	Oudomxai	Laos
06	22/3/2009	6:27:00	20.92	101.88	85	Xai	Oudomxai	Laos
01	08/3/2007	6:29:00	20	101.39	73	Houn	Oudomxai	Laos
02	11/3/2007	6:59:00	20	101.39	82	Houn	Oudomxai	Laos
03	11/3/2007	6:59:00	20	101.39	98	Houn	Oudomxai	Laos
04	15/3/2007	6:35:00	20	101.39	93	Houn	Oudomxai	Laos
05	23/3/2008	5:58:00	20	101.39	100	Houn	Oudomxai	Laos
06	11/3/2009	6:45:00	20	101.39	100	Houn	Oudomxai	Laos
07	11/3/2009	6:45:00	20	101.39	99	Houn	Oudomxai	Laos
01	10/3/2007	6:17:00	20.72	101.88	79	Xai	Oudomxai	Laos
02	13/3/2007	6:47:00	20.72	101.88	81	Xai	Oudomxai	Laos
03	29/3/2007	6:47:00	20.72	101.88	96	Xai	Oudomxai	Laos
04	31/3/2007	6:35:00	20.72	101.88	100	Xai	Oudomxai	Laos
05	09/4/2008	6:40:00	20.72	101.88	100	Xai	Oudomxai	Laos
06	20/3/2009	6:39:00	20.72	101.88	91	Xai	Oudomxai	Laos
07	22/3/2009	6:27:00	20.72	101.88	89	Xai	Oudomxai	Laos

Conclusions

1. MODIS has high potential for multi-temporal disaster and environmental monitoring in regional scale, therefore it has been used to monitor the wildfire phenomenon in Lao PDR for various aspects as listed in the content.
2. With the collaboration between MAF, Lao PDR and AIT, the fire monitoring will be upgraded to new level of technical collaboration, and will be useful system to facilitate the fire information to MAF to understand the fire distribution in the country and implementation action on the ground.
3. The monitoring system for Lao PDR has been running since 2009, in order to make the capability of the system to be more efficient, the system was off during rainy season for maintenance and upgrading in term of software and hardware.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Indochinese peninsula as seen from Space by Terra MODIS
Terra MODIS April 11, 2010 04:01 GMT
Geoinformatics Center, Asian Institute of Technology
www.geoinfo.ait.ac.th/modis
Terra/Aqua MODIS Website
Asian Institute of Technology
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Moderate Resolution Imaging Spectroradiometer (MODIS)
MODIS (or Moderate Resolution Imaging Spectroradiometer) is a key instrument aboard the Terra (EOS AM) and Aqua (EOS PM) satellites which are for global environmental change study and research. Read more about MODIS Program in Geoinformatics Center, Asian Institute of Technology. This website is related to MODIS data processing, products, research and applications for environmental and disaster monitoring in regional/global scale. All questions related to MODIS are encouraged to send to vivarad@ait.ac.th
MODIS Images of the Day - January 01, 2011
Southeast Asia as Seen from Space
Visitor locations
Visitors since March 20, 2010
Visitors since April 02, 2010
Visitors
Visitors since March 20, 2010
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The EOS Flagship
TERRA AT TEN
"Terra at Ten" highlights the stunning images and unique insights into our planet the mission has provided over the past decade.
TERRA
Terra is a multi-national, multi-disciplinary mission involving partnerships with the
STATUS UPDATE
August 17 - 23, 2007
(Last Updated 24 August 2007)
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+ Cool Science
+ Webcasts
SEARCH
- HOME
+ SCIENCE + DATA
+ ABOUT AQUA
+ NEWSROOM
+ REFERENCE
Aqua
Project Science
Aqua, Latin for water, is a NASA Earth Science satellite mission named for the large amount of information that the mission will be collecting about the Earth's water cycle, including evaporation from the oceans, water vapor in the atmosphere, clouds, precipitation, soil moisture, sea ice, land ice, and snow cover on the land and ice. Additional variables also being measured by Aqua include radiative energy fluxes, aerosols, vegetation cover on the land, phytoplankton and dissolved organic matter in the oceans, and air, land, and water temperatures.
The Aqua mission is a part of the NASA-centered international Earth Observing System (EOS). Aqua was formerly named EOS PM, signifying its afternoon equatorial crossing time. A timeline of Aqua on-orbit progress through the initial 120 day check-out period can be found here.
Aqua was launched on May 4, 2002, and has six Earth-observing instruments on board, collecting a variety of global data sets. Aqua was the first member launched of a group of satellites termed the Afternoon Constellation, or sometimes the A-Train. The second member to be launched was Aura, in July 2004, the third member was PARASOL, in December 2004, and the fourth and fifth members are CloudSat and CALIPSO, in May 2006. PARASOL exited the A-Train orbit in December 2009. Expected upcoming missions are Glory, a NASA mission due to be launched in 2010, and GCOM-W1, a JAXA mission due to be launched in 2011. After these two missions join, the A-Train will be led by GCOM-W1, followed by Aqua, then CloudSat, CALIPSO, Glory, and, in the rear, Aura.
AQUA IMAGE HIGHLIGHT
August 12, 2010
AIRS map of carbon monoxide
+ Read More
ANNOUNCEMENTS
The IEEE Transactions on Geoscience and Remote Sensing "Special Issue on the EOS Aqua Mission" is available (February 2003, Volume 41, Number 2). Science team members and affiliates may request a copy by sending an email to Steve Graham (steve.graham@nasa.gov).
Aqua EarthSky Podcasts
The entire series of Aqua radio shows and podcasts being done in collaboration with EarthSky have now aired on the Earth & Sky radio show and are available as podcasts on the EarthSky website, at the following links:
1. Podcast 1, highlighting Aqua Project Scientist Claire Parkinson.
2. Podcast 2, highlighting AIRS Science Team Leader Mous Chahine.
MODIS Fi
Active Fire and Thermal Anomalies
Introduction
Overview of the MODIS Fire Information System for Laos
1. MODIS Fire Product Generation System
47