The 30 m global land cover products from China: datasets and methodology

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April 18, 2013 – GEO GLC Task Session
Wageningen, Netherlands

Evolution of large area mapping in China with satellite remote sensing

China scale mapping

- IOG led (Wu Chuanjun)
    - Land use based on MSS 1980s
- IRSA led by Liu Jiyuan
- SMA Yongwei Sheng
- Activities in 2000s
    - BNU Yaozhong Pan (AVHRR)
    - IRSA/IOG Liu JY/Zhang ZX Land use 2000, 2005, 2010 (Landsat)
    - IRSA Bingfang Wu (SPOT Vegetation, HJ-1)

Mainly general purp. Manual int

Large area mapping from 2007

- IRSA wetland mapping 78-10
    - Landsat MSS, TM; CBERS
- IRSA/Tsinghua urban mapping
    - Landsat TM 90, 00, 10
- Tsinghua 30 m global LC 2010, later 2000, 1990
- Tsinghua 250 m global LC 2001, 2010, later annual
- Tsinghua 30 m global Crop C.
- Tsinghua 30 m China LC
- NJU/IRSA/Tsinghua 500 m 8 day global water
- NGC 30 m global water 00-10

Strategies

- Produce the best maps for China efficiently
- Develop environmental datasets for China in support of scientific applications – health, food security, climate change, biodiversity
- From land cover to land use
- Focus research on hard to map areas – Russia, Africa and India
- Intensify international collaboration networks for validation, scientific application and policy assessment

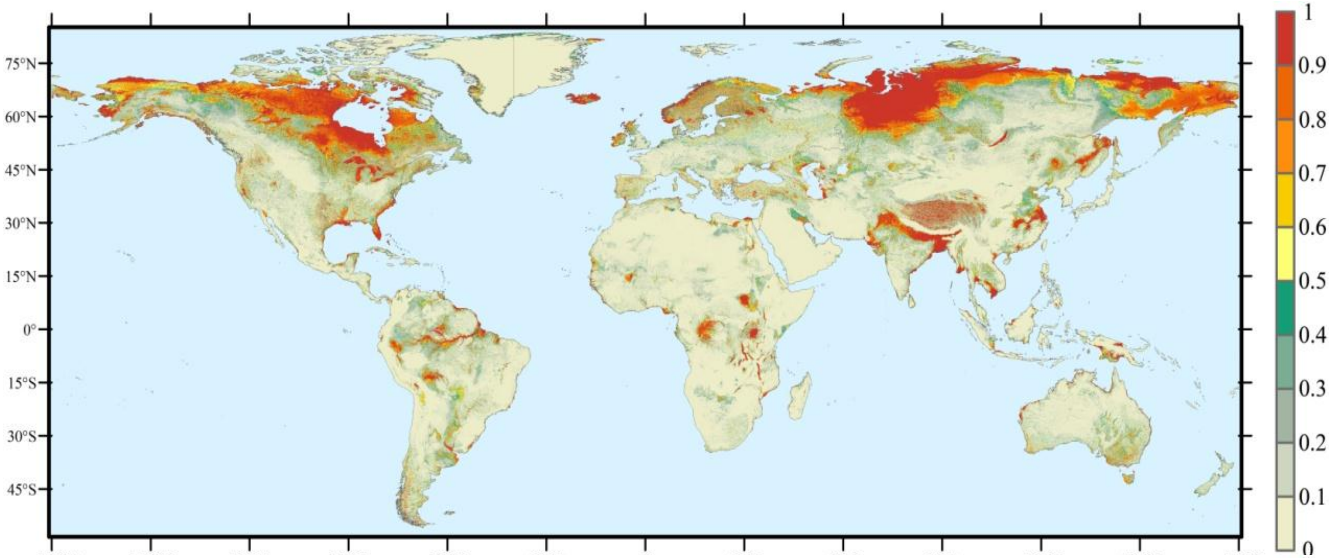
From avian influenza H5N1 research to China's wetland maps – based on optical data only

2000 – Landsat TM
1990 – Landsat TM
1978 – Landsat MSS
2008 – CBERS
2010 – In progress (to be completed this month)
2010 – global In progress (to be completed in 2013)

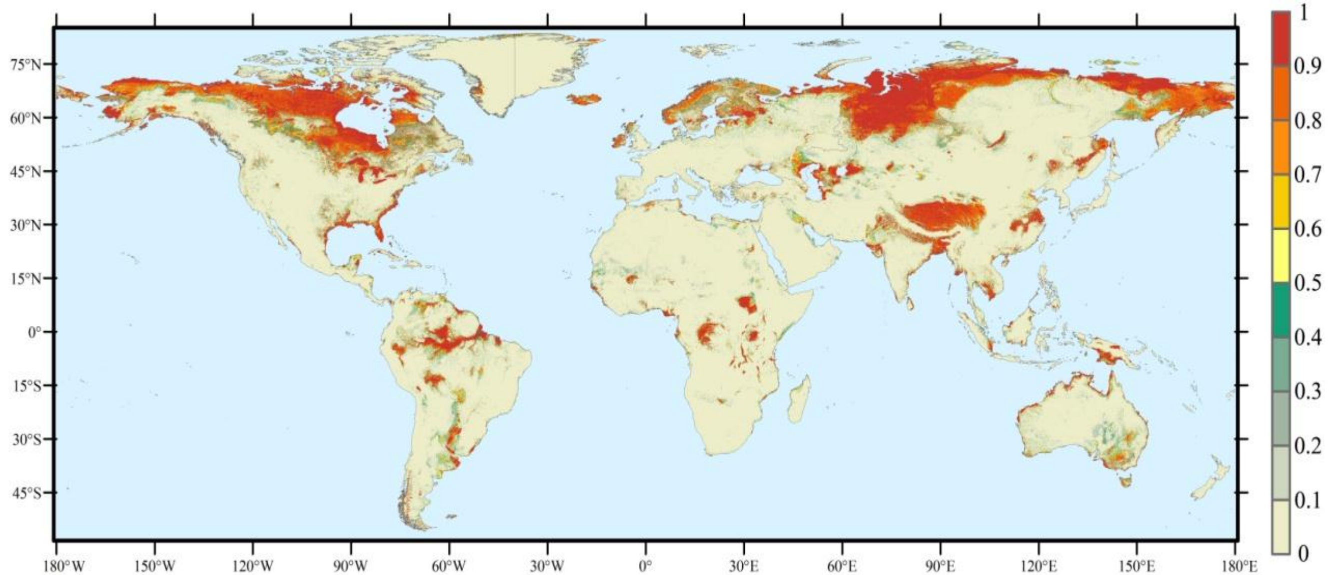
For references:

Niu, Gong, Cheng et al., 2009, Science in China: Series D
Gong, Niu, Cheng et al., 2010, Science China, Earth Science
Niu, et al., 2012, Chinese Science Bulletin

From 1 km global potential wetland mapping to 30 m wetland mapping


75°N
60°N
45°N
30°N
15°N
0°
15°S
30°S
45°S
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

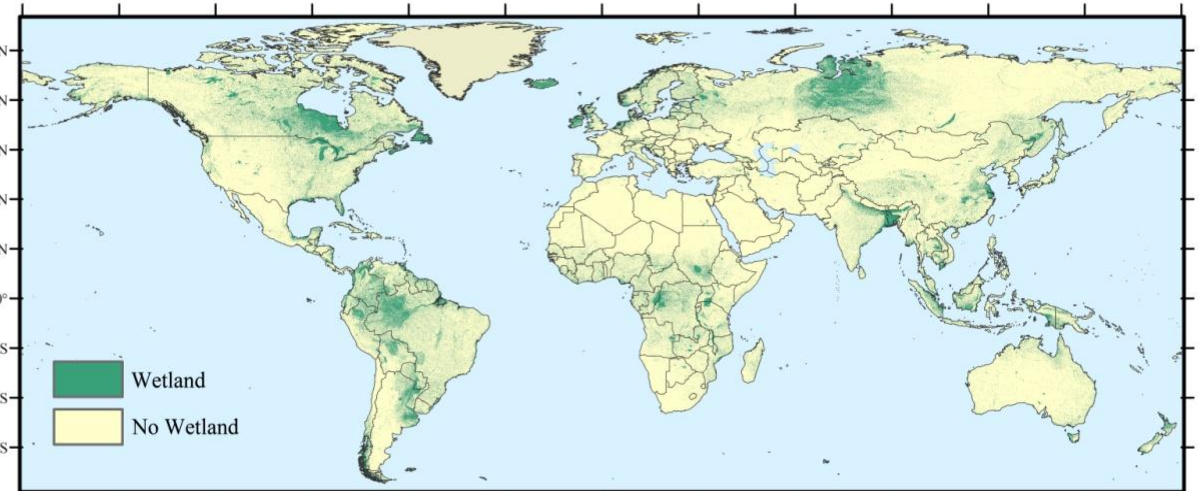
Natural Suitability Predicted by BRT


75°N
60°N
45°N
30°N
15°N
0°
15°S
30°S
45°S
180°W
150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
180°E
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

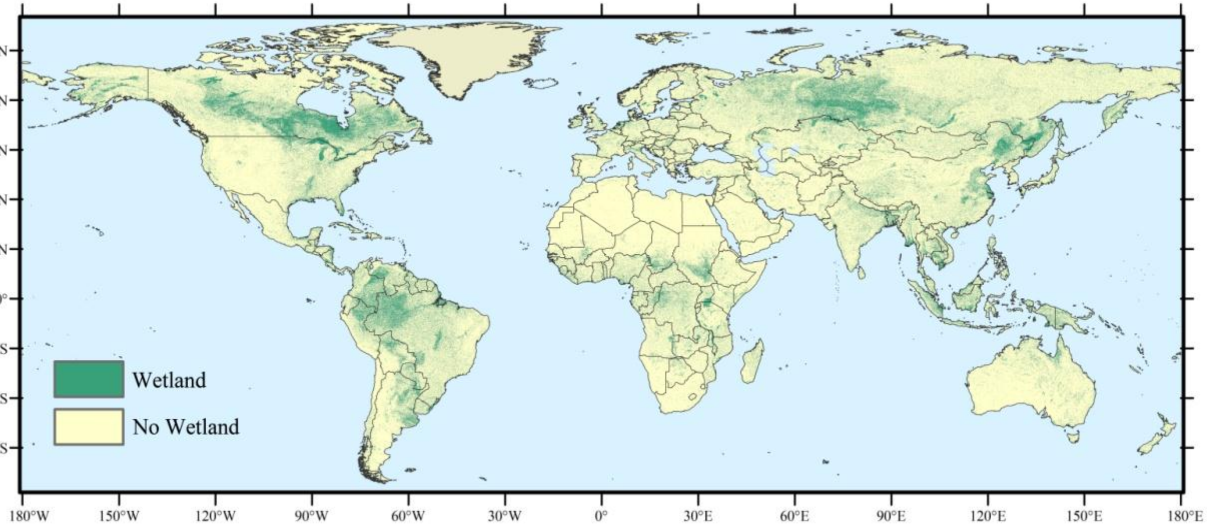
Modified by Human Converted areas

Zhu P et al, In prep

From 1 km global potential wetland mapping to 30 m wetland mapping


75°N
60°N
45°N
30°N
15°N
0°
15°S
30°S
45°S
Wetland
No Wetland

Modelled
Local
Water
Balance
methods


75°N
60°N
45°N
30°N
15°N
0°
15°S
30°S
45°S
Wetland
No Wetland
180°W
150°W
120°W
90°W
60°W
30°W
0°
30°E
60°E
90°E
120°E
150°E
180°E

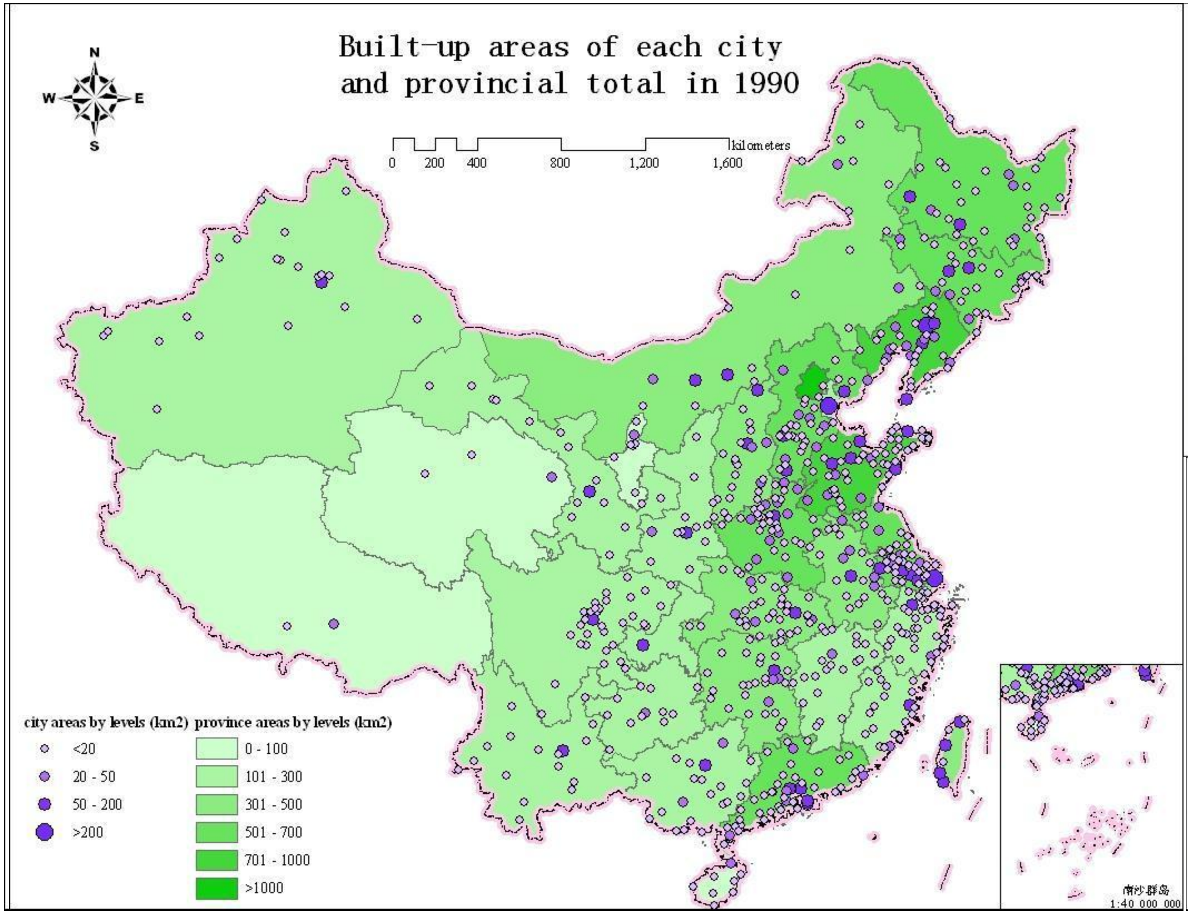
Interpolated
Modelled
Groundwater
Table
Method

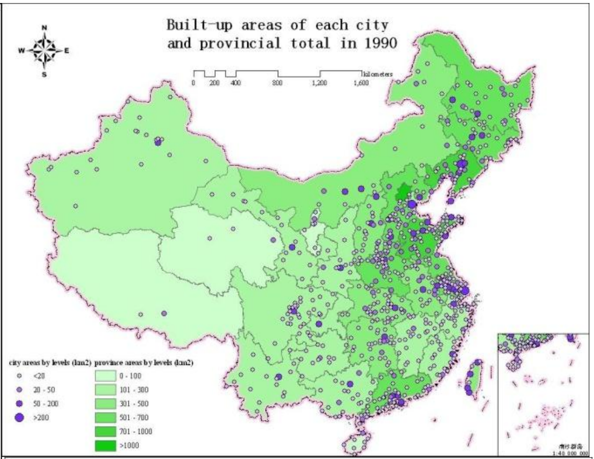
Fan et al, 2013

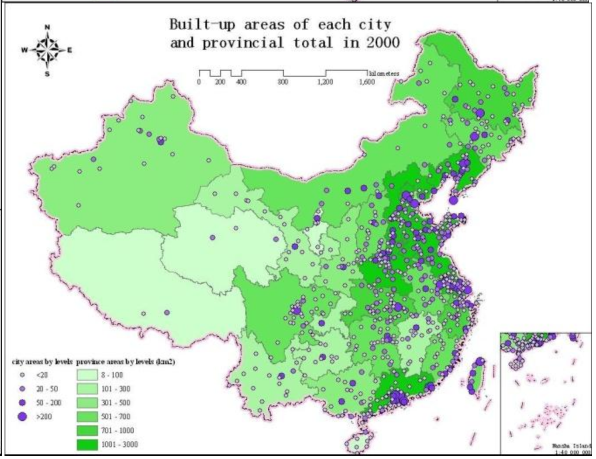
From health research to China’s urban expansion maps

1990 – Landsat TM
2000 – Landsat TM
2010 – Landsat TM/ETM+
In progress all settlements that can be mapped in these three years (to be completed in May, 2013)

For references:
Wang, Li, Ying, et al., 2012. Chinese Science Bulletin
Gong et al., 2012. Lancet,


Built-up areas of each city
and provincial total in 1990
N
W
E
S
0
200
400
800
1,200
1,600
kilometers
city areas by levels (km2)
<20
20 - 50
50 - 200
>200
province areas by levels (km2)
0 - 100
101 - 300
301 - 500
501 - 700
701 - 1000
>1000
南沙群岛
1:40 000 000

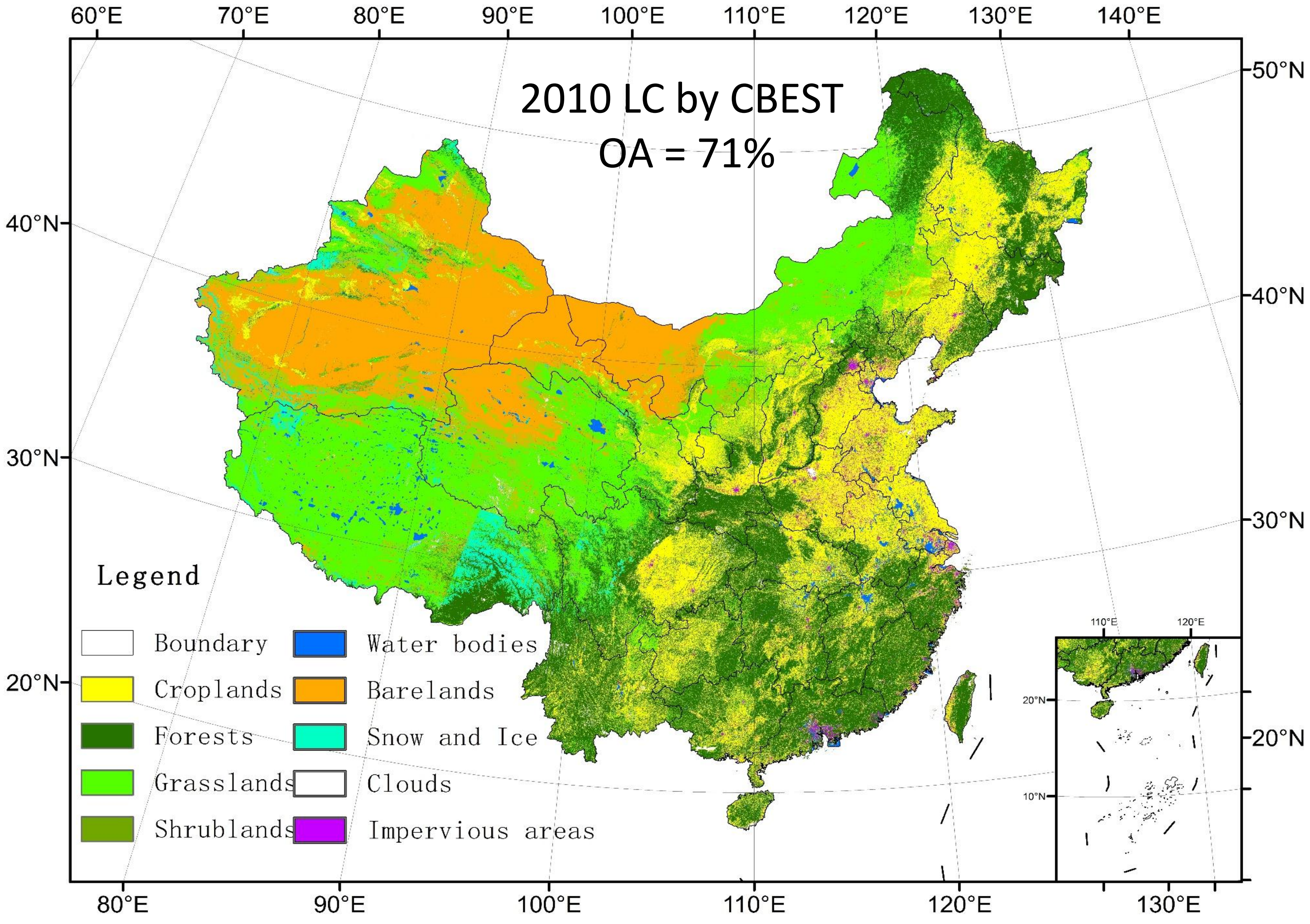

Built-up areas of each city
and provincial total in 1990
N
W
E
S
0
200
400
800
1,200
1,600
kilometers
city areas by levels (km2)
<20
20 - 50
50 - 200
>200
province areas by levels (km2)
0 - 100
101 - 300
301 - 500
501 - 700
701 - 1000
>1000
南沙群岛
1:40 000 000


Built-up areas of each city
and provincial total in 2000
N
W
E
S
0
200
400
800
1,200
1,600
kilometers
city areas by levels
<20
20 - 50
50 - 200
>200
province areas by levels (km2)
8 - 100
101 - 300
301 - 500
501 - 700
701 - 1000
1001 - 3000
Nansha Island
1:40 000 000

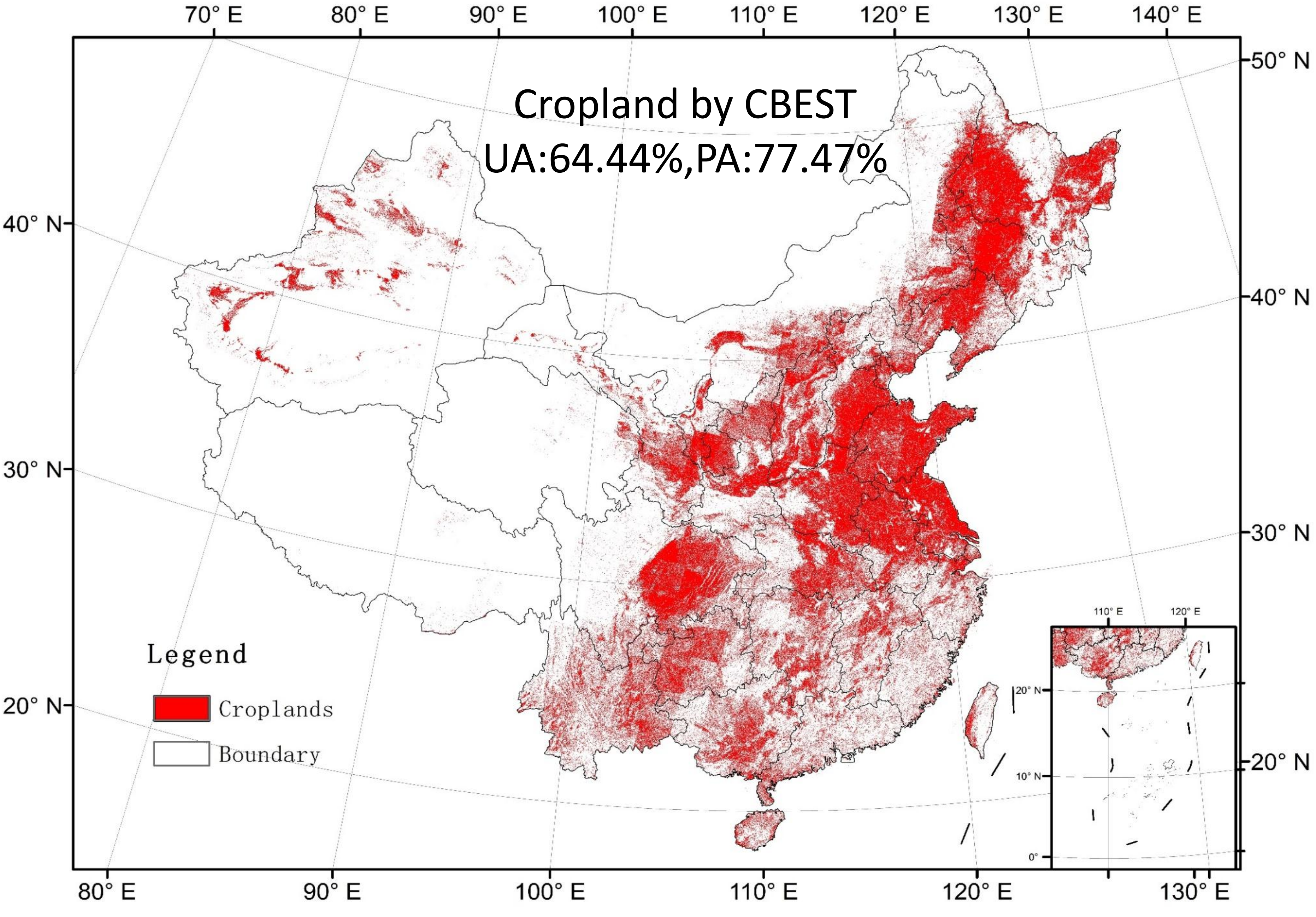
Intensive test of algorithms for China’s land cover mapping

- Faster algorithms
- More features
- Individual class extraction – forest, water, etc.

# 2010 LC by CBEST
OA = 71%


60°E
70°E
80°E
90°E
100°E
110°E
120°E
130°E
140°E
50°N
40°N
30°N
20°N
80°E
90°E
100°E
110°E
120°E
130°E
110°E
120°E
20°N
10°N
Legend
Boundary
Croplands
Forests
Grasslands
Shrublands
Water bodies
Barelands
Snow and Ice
Clouds
Impervious areas

Hu LY et al., in preparation

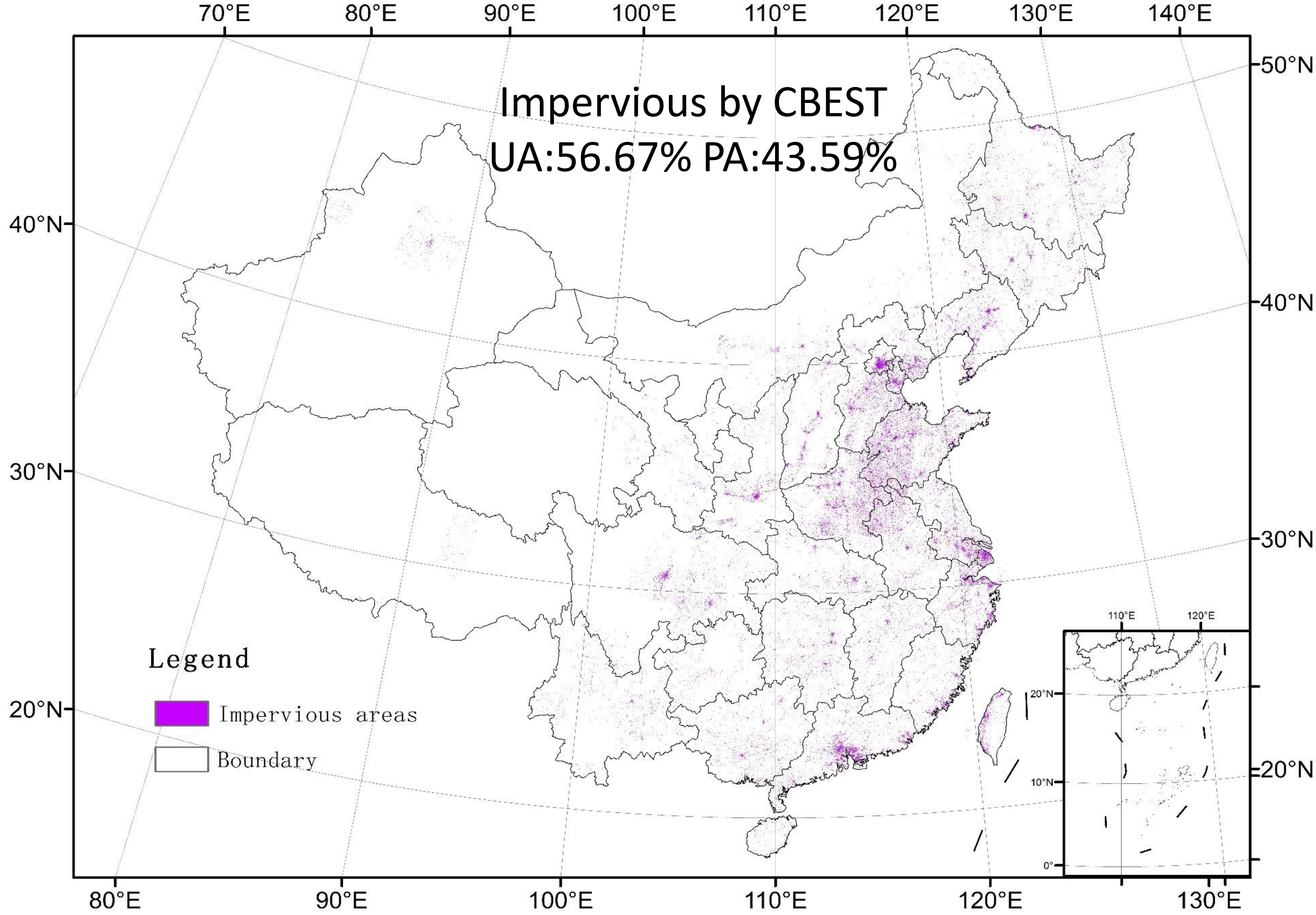


Cropland by CBEST

UA:64.44%,PA:77.47%

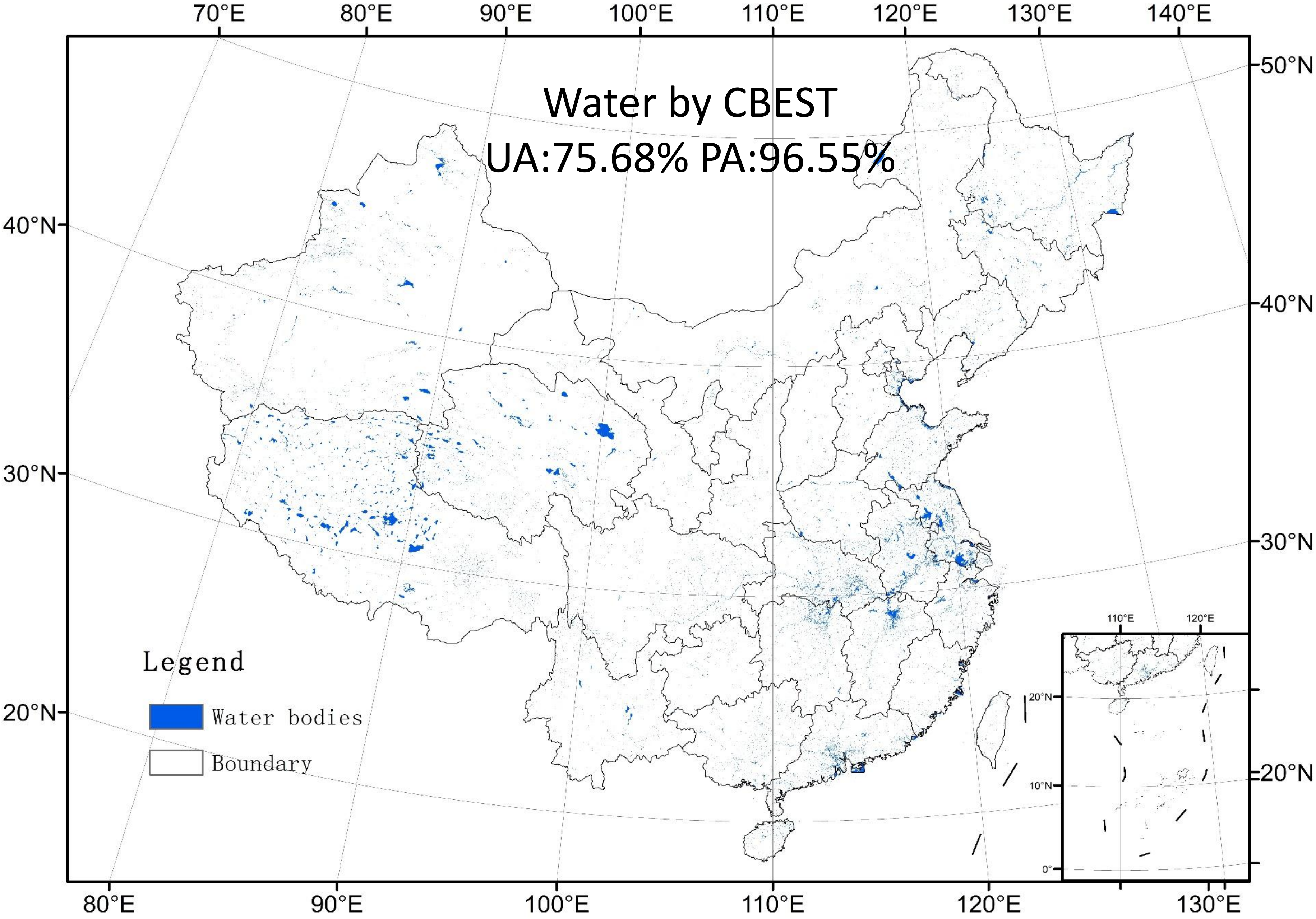
Legend
Croplands
Boundary
70° E
80° E
90° E
100° E
110° E
120° E
130° E
140° E
50° N
40° N
30° N
20° N
10° N
0°

Impervious by CBEST
UA:56.67% PA:43.59%

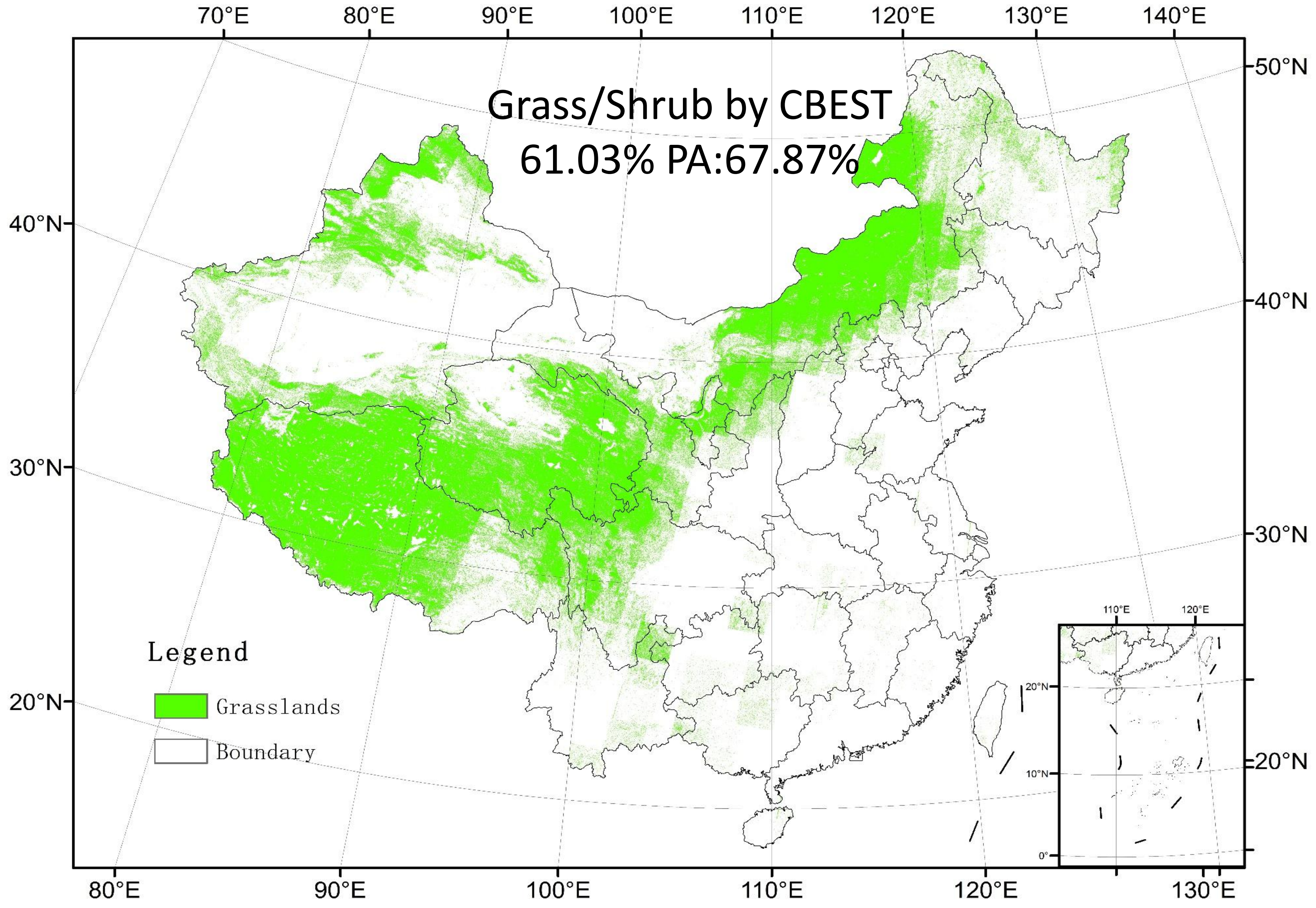

70°E
80°E
90°E
100°E
110°E
120°E
130°E
140°E
50°N
40°N
30°N
20°N
80°E
90°E
100°E
110°E
120°E
130°E
Legend
Impervious areas
Boundary
110°E
120°E
20°N
10°N
0°

Water by CBEST

UA:75.68% PA:96.55%

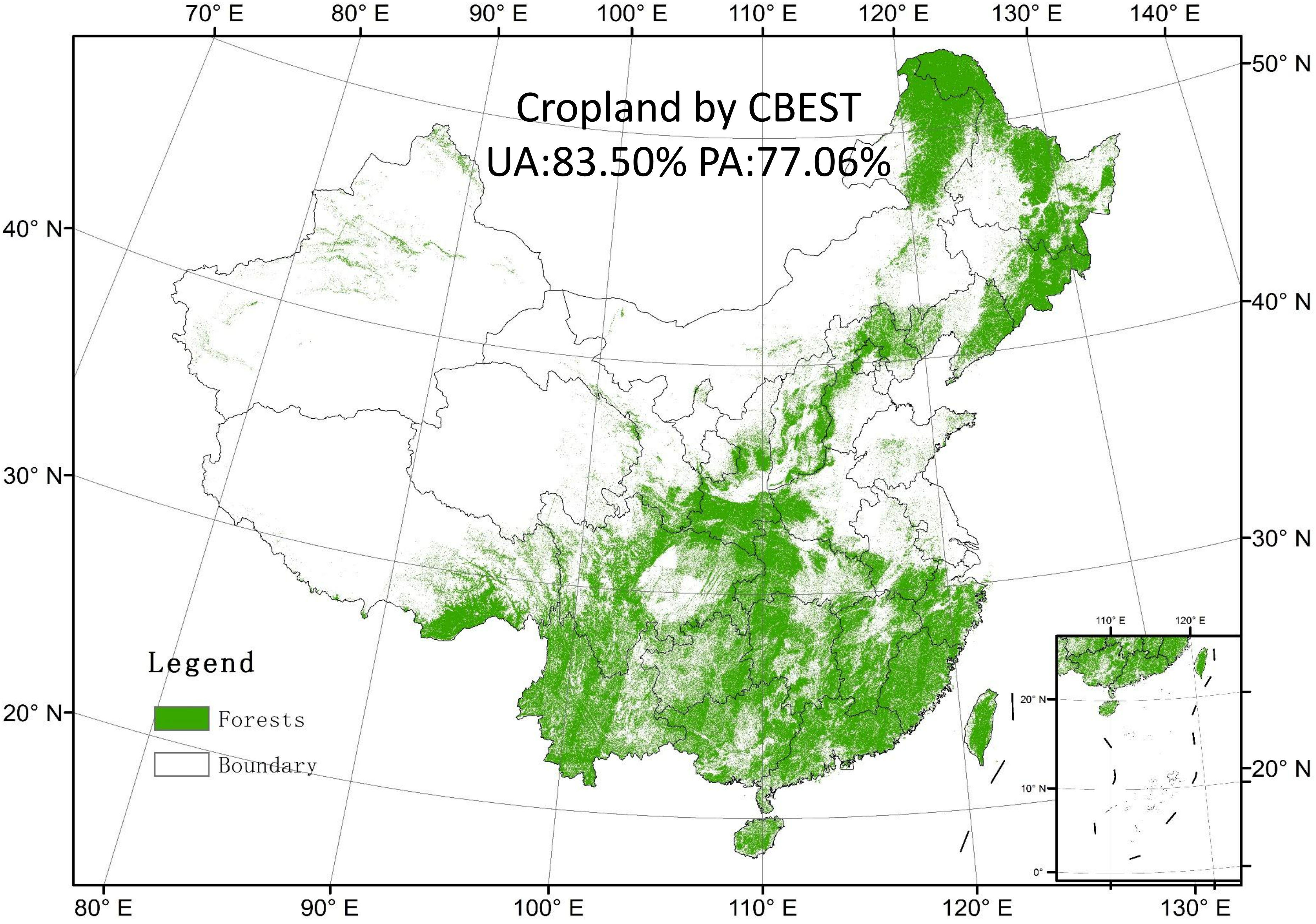

70°E
80°E
90°E
100°E
110°E
120°E
130°E
140°E
50°N
40°N
30°N
20°N
Legend
Water bodies
Boundary
0°
10°N

Grass/Shrub by CBEST
61.03% PA:67.87%


70°E
80°E
90°E
100°E
110°E
120°E
130°E
140°E
50°N
40°N
30°N
20°N
80°E
90°E
100°E
110°E
120°E
130°E
Legend
Grasslands
Boundary
110°E
120°E
20°N
10°N
0°

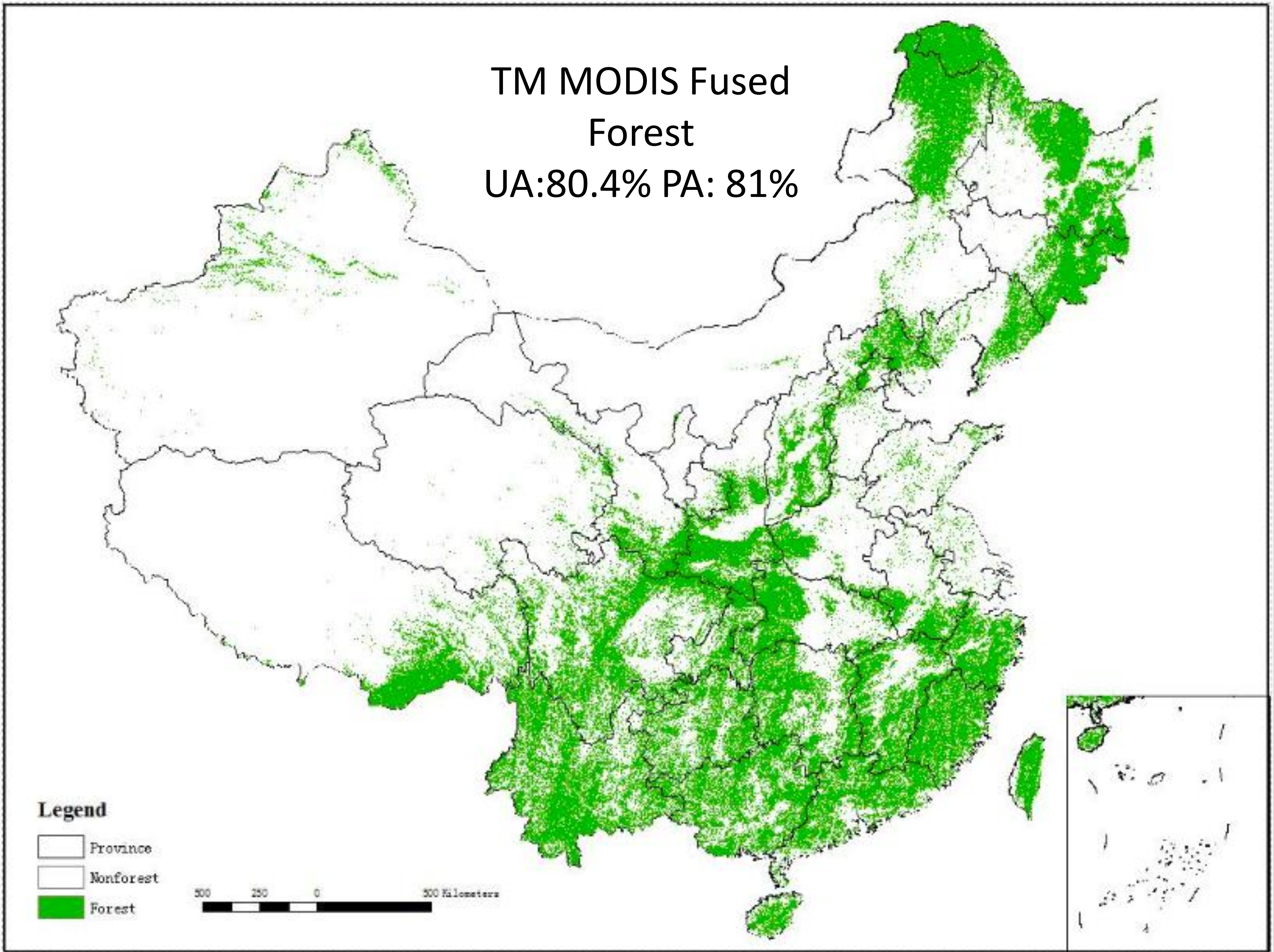
Cropland by CBEST

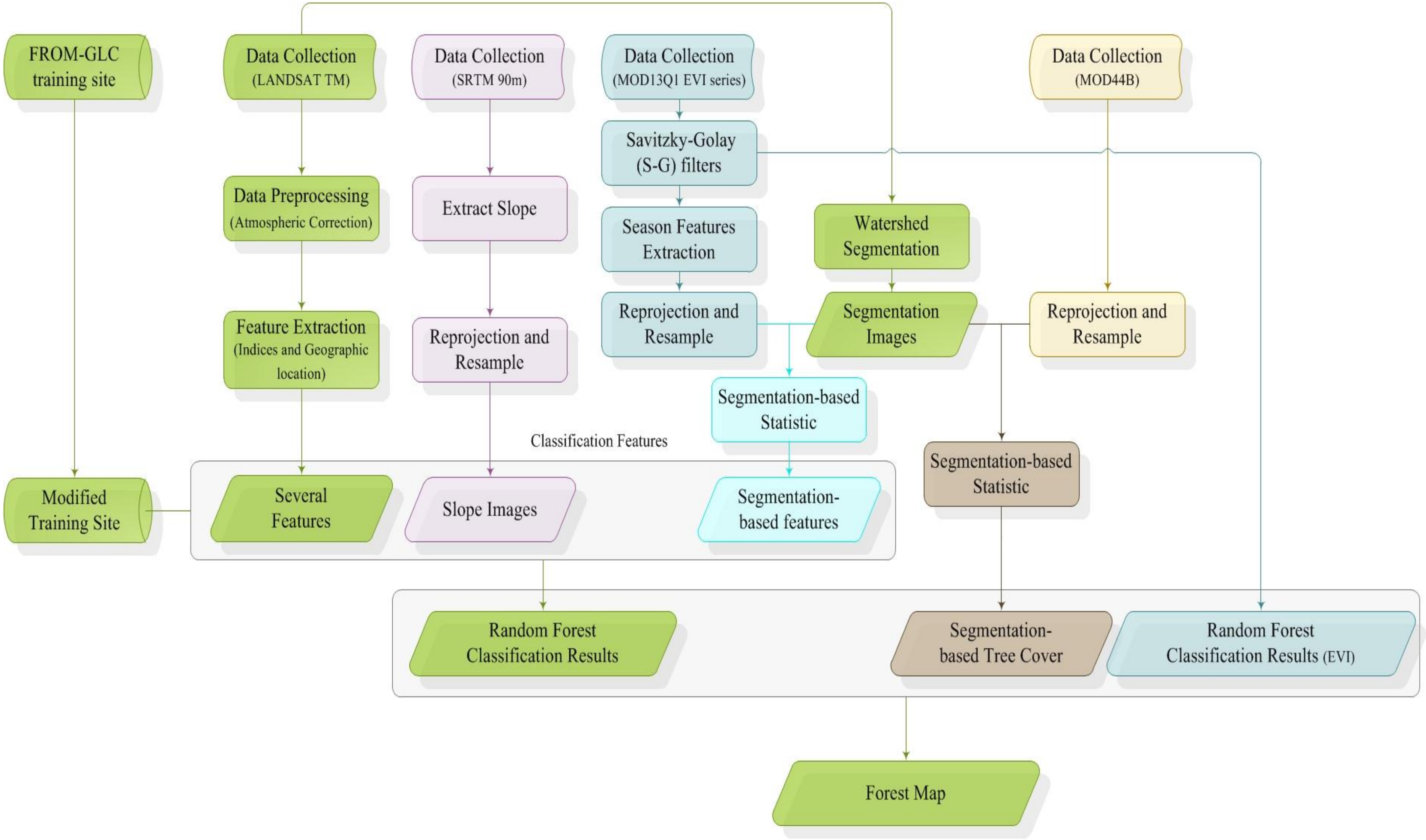
UA:83.50% PA:77.06%


70° E
80° E
90° E
100° E
110° E
120° E
130° E
140° E
50° N
40° N
30° N
20° N
Legend
Forests
Boundary
110° E
120° E
20° N
10° N
0°

TM MODIS Fused Forest

UA:80.4% PA: 81%


Legend
Province
Nonforest
🟩 Forest
500
250
0
500 Kilometers



FROM-GLC training site

Data Collection (LANDSAT TM)

Data Collection (SRTM 90m)

Data Collection (MOD13Q1 EVI series)

Data Collection (MOD44B)

Savitzky-Golay (S-G) filters

Data Preprocessing (Atmospheric Correction)

Extract Slope

Season Features Extraction

Watershed Segmentation

Feature Extraction (Indices and Geographic location)

Reprojection and Resample

Reprojection and Resample

Segmentation Images

Reprojection and Resample

Segmentation-based Statistic

Classification Features

Segmentation-based Statistic

Modified Training Site

Several Features

Slope Images

Segmentation-based features

Random Forest Classification Results

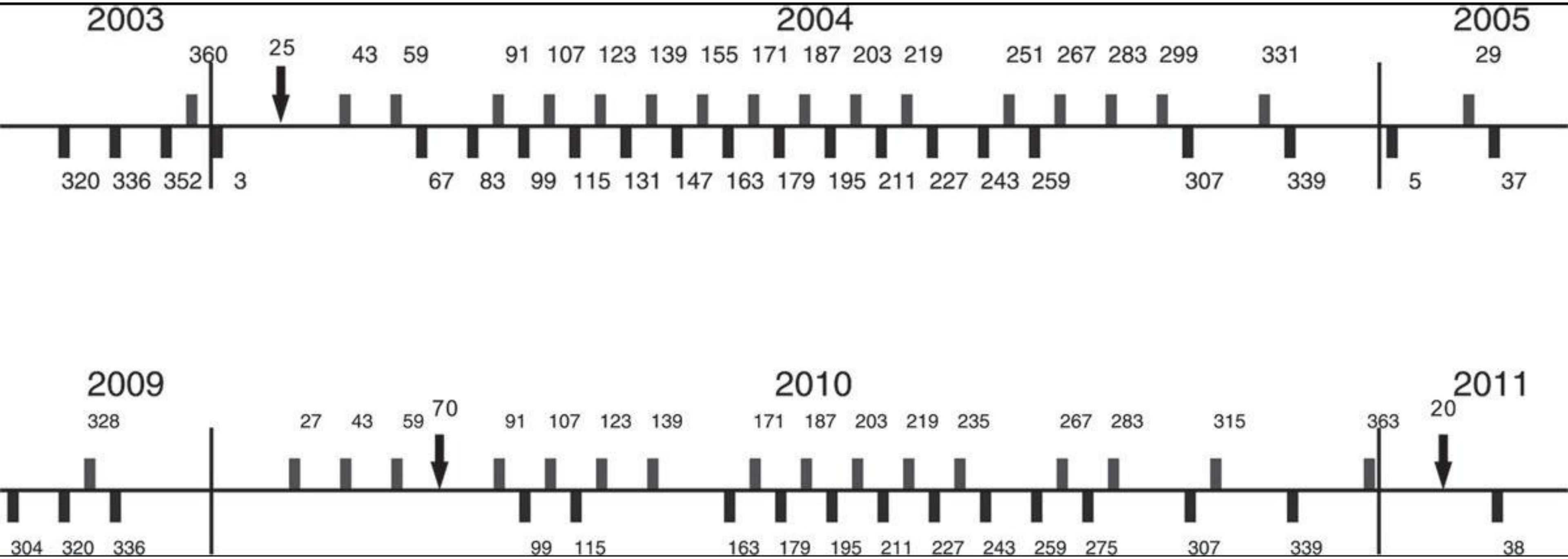
Segmentation-based Tree Cover

Random Forest Classification Results (EVI)

Forest Map

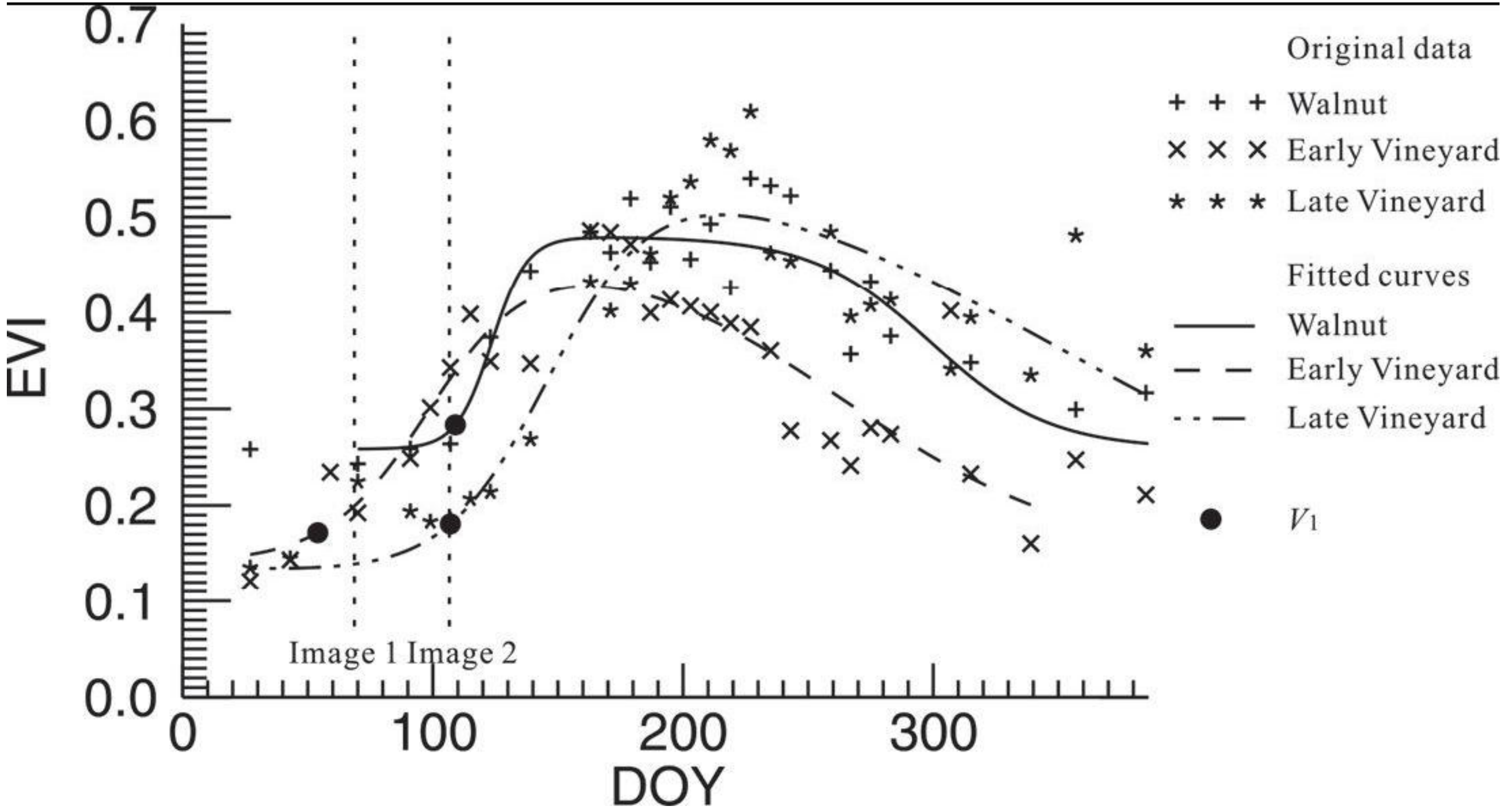
Li CC et al., in preparation

Crop types in Central Valley California from Phenological analysis of Landsat TM images

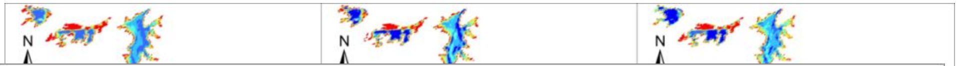

2003
2004
2005
360 25 43 59 91 107 123 139 155 171 187 203 219 251 267 283 299 331 29
320 336 352 3 67 83 99 115 131 147 163 179 195 211 227 243 259 307 339 5 37
2009
2010
2011
328 27 43 59 70 91 107 123 139 171 187 203 219 235 267 283 315 363 20
304 320 336 99 115 163 179 195 211 227 243 259 275 307 339 38

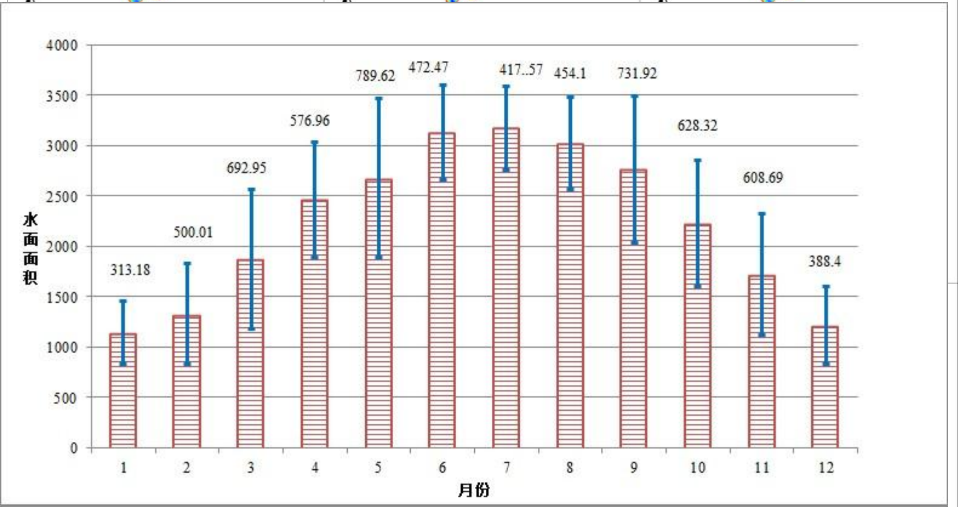
Zhong, Biging, Gong, 2012, PE&RS

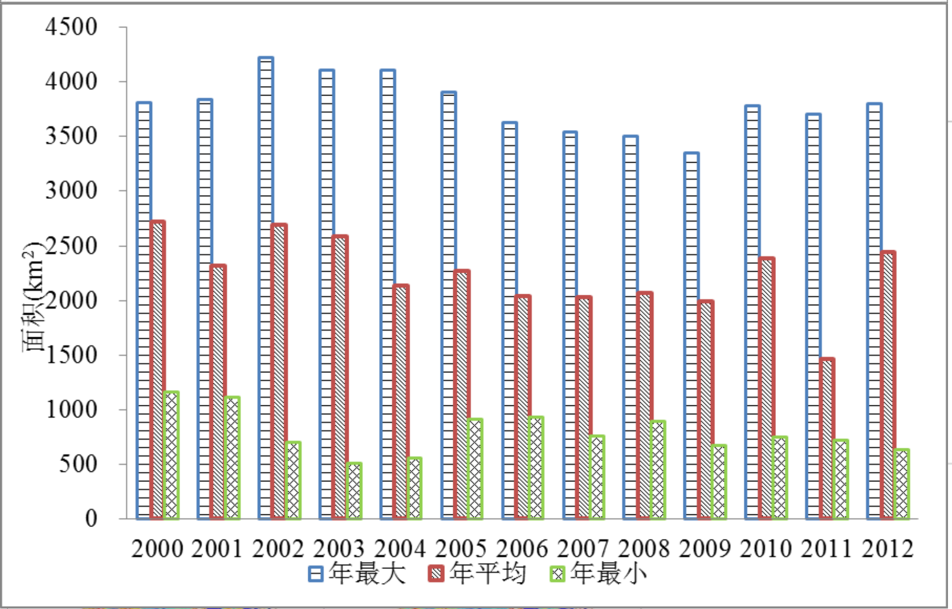
Mapping crop types in Central Valley California

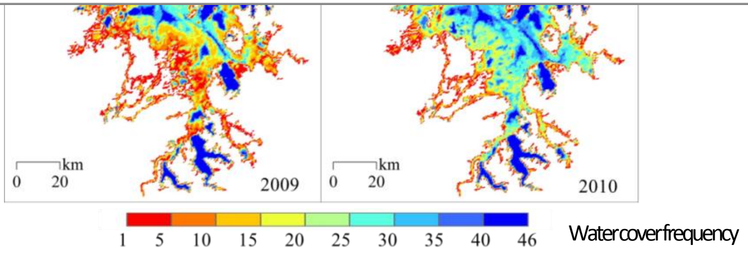


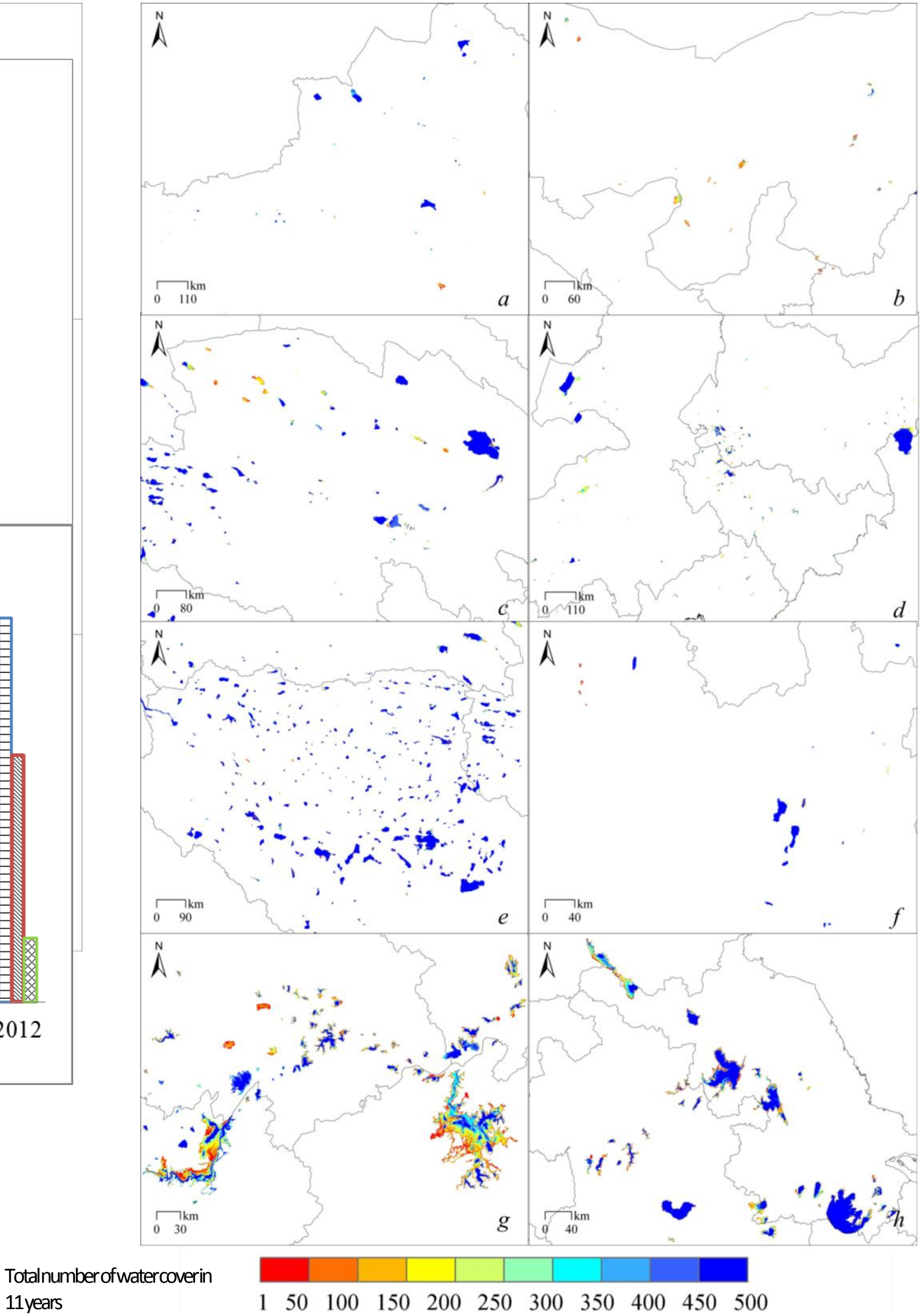
Zhong, Biging, Gong, 2012, PE&RS

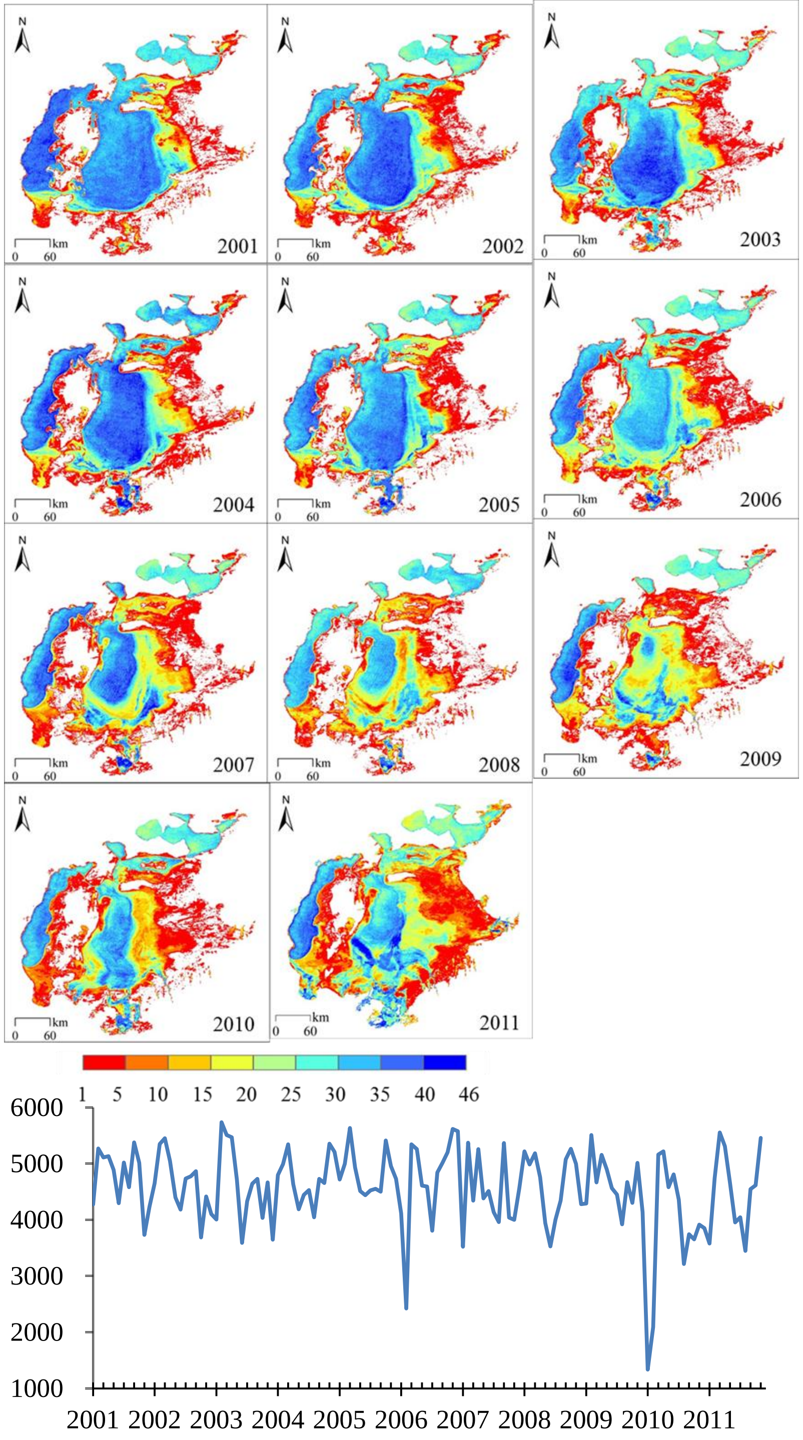

N
N
N

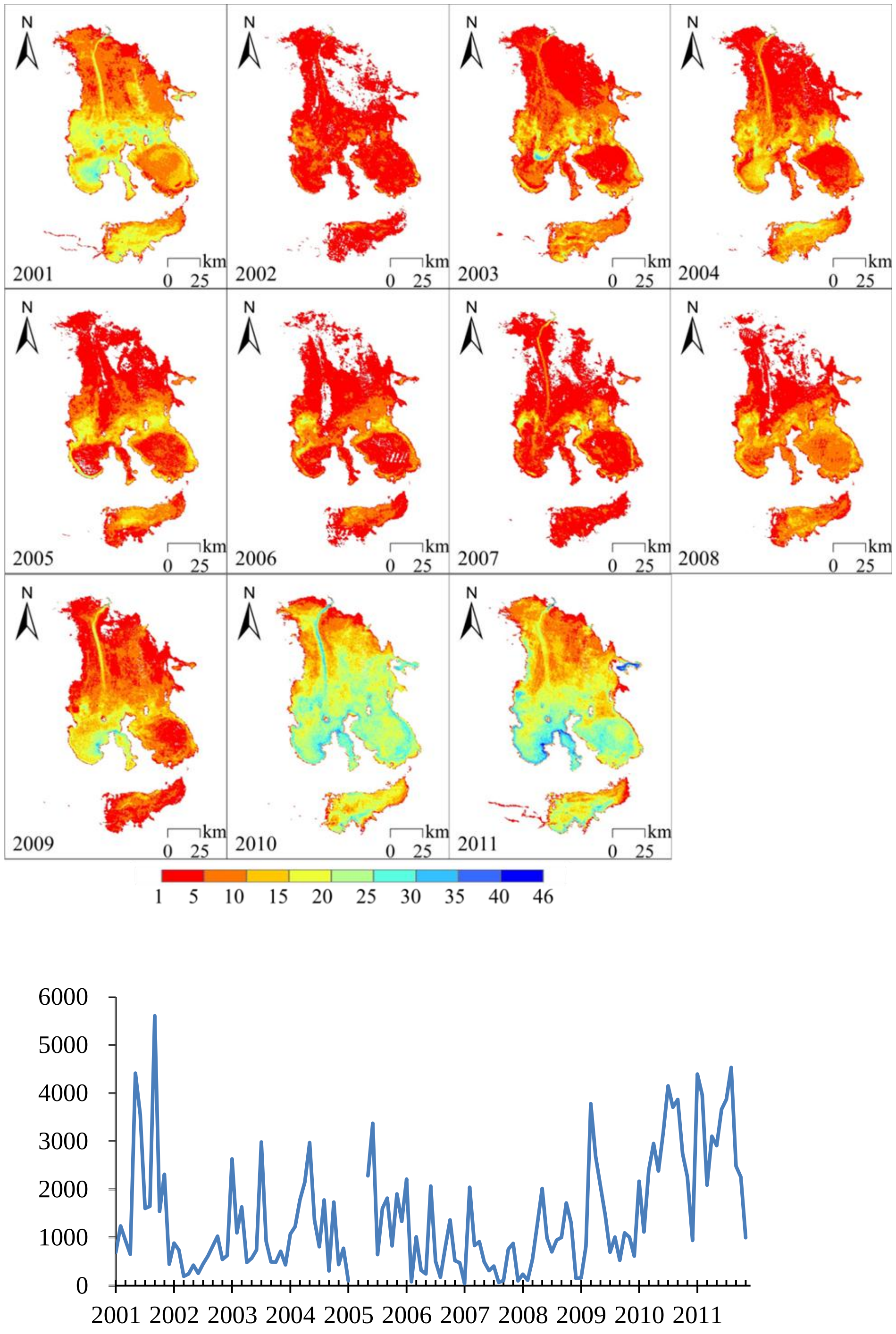

4000
3500
3000
2500
2000
1500
1000
500
0
水面面积
313.18
500.01
692.95
576.96
789.62
472.47
417..57
454.1
731.92
628.32
608.69
388.4
1
2
3
4
5
6
7
8
9
10
11
12
月份


4500
4000
3500
3000
2500
2000
1500
1000
500
0
面积(km²)
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
年最大
年平均
年最小


km
0 20
2009
km
0 20
2010
1 5 10 15 20 25 30 35 40 46
Water cover frequency


N
km
0 110
a
N
km
0 60
b
N
km
0 80
c
N
km
0 110
d
N
km
0 90
e
N
km
0 40
f
N
km
0 30
g
N
km
0 40
h
Total number of water cover in 11 years
1 50 100 150 200 250 300 350 400 450 500


N
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
km
0 60
1 5 10 15 20 25 30 35 40 46
6000
5000
4000
3000
2000
1000
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011


N
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
km
0 25
1 5 10 15 20 25 30 35 40 46
6000
5000
4000
3000
2000
1000
0
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011

Three existing 30m land cover map products

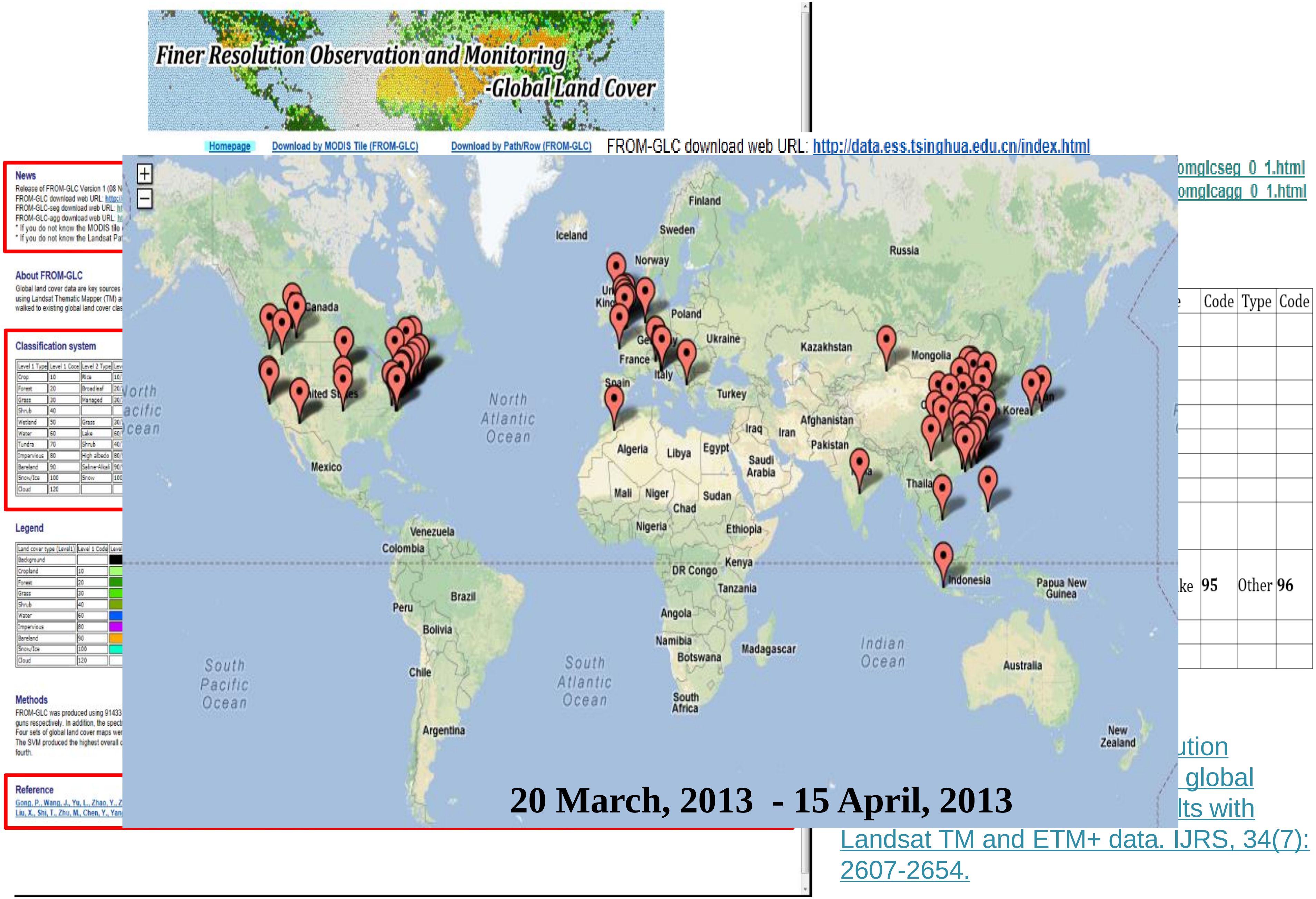
FROM-GLC – only used Landsat TM or ETM+ data

FROM-GLC-SEG used Landsat, 250m MODIS 16 day time series and other bioclimatic data products

FROM-GLC-AGG aggregates previous two products, NOAA night light impervious surface area
and Boston/Wisconsin urban land products

FROM-GLC-MetaPrediciton in progress
(scheduled to complete in June 2013)

All three products downloadable from
data.ess.tsinghua.edu.cn



Finer Resolution Observation and Monitoring -Global Land Cover

Homepage Download by MODIS Tile (FROM-GLC) Download by Path/Row (FROM-GLC) FROM-GLC download web URL: http://data.ess.tsinghua.edu.cn/index.html

News

Release of FROM-GLC Version 1 (08 N
FROM-GLC download web URL: http://
FROM-GLC-seg download web URL: ht
FROM-GLC-agg download web URL: ht
* If you do not know the MODIS tile
* If you do not know the Landsat Pat

About FROM-GLC

Global land cover data are key sources
using Landsat Thematic Mapper (TM) ar
walked to existing global land cover clas

Classification system

Level 1 Type	Level 1 Code	Level 2 Type	Lev
Crop	10	Rice	10/
Forest	20	Broadleaf	20/
Grass	30	Managed	30/
Shrub	40		
Wetland	50	Grass	30/
Water	60	Lake	60/
Tundra	70	Shrub	40/
Impervious	80	High albedo	80/
Bareland	90	Saline-Alkali	90/
Snow/Ice	100	Snow	100
Cloud	120		

Legend

Land cover type (Level1)	Level 1 Code	Level
Background		■
Cropland	10	🟩
Forest	20	🟩
Grass	30	🟩
Shrub	40	🟩
Water	60	🟦
Impervious	80	🟪
Bareland	90	🟧
Snow/Ice	100	🟦
Cloud	120	

Methods

FROM-GLC was produced using 91433
guns respectively. In addition, the spect
Four sets of global land cover maps wer
The SVM produced the highest overall c
fourth.

Reference

Gong, P., Wang, J., Yu, L., Zhao, Y., Z
Liu, X., Shi, T., Zhu, M., Chen, Y., Yan

omglcseg_0_1.html
omglcagg_0_1.html

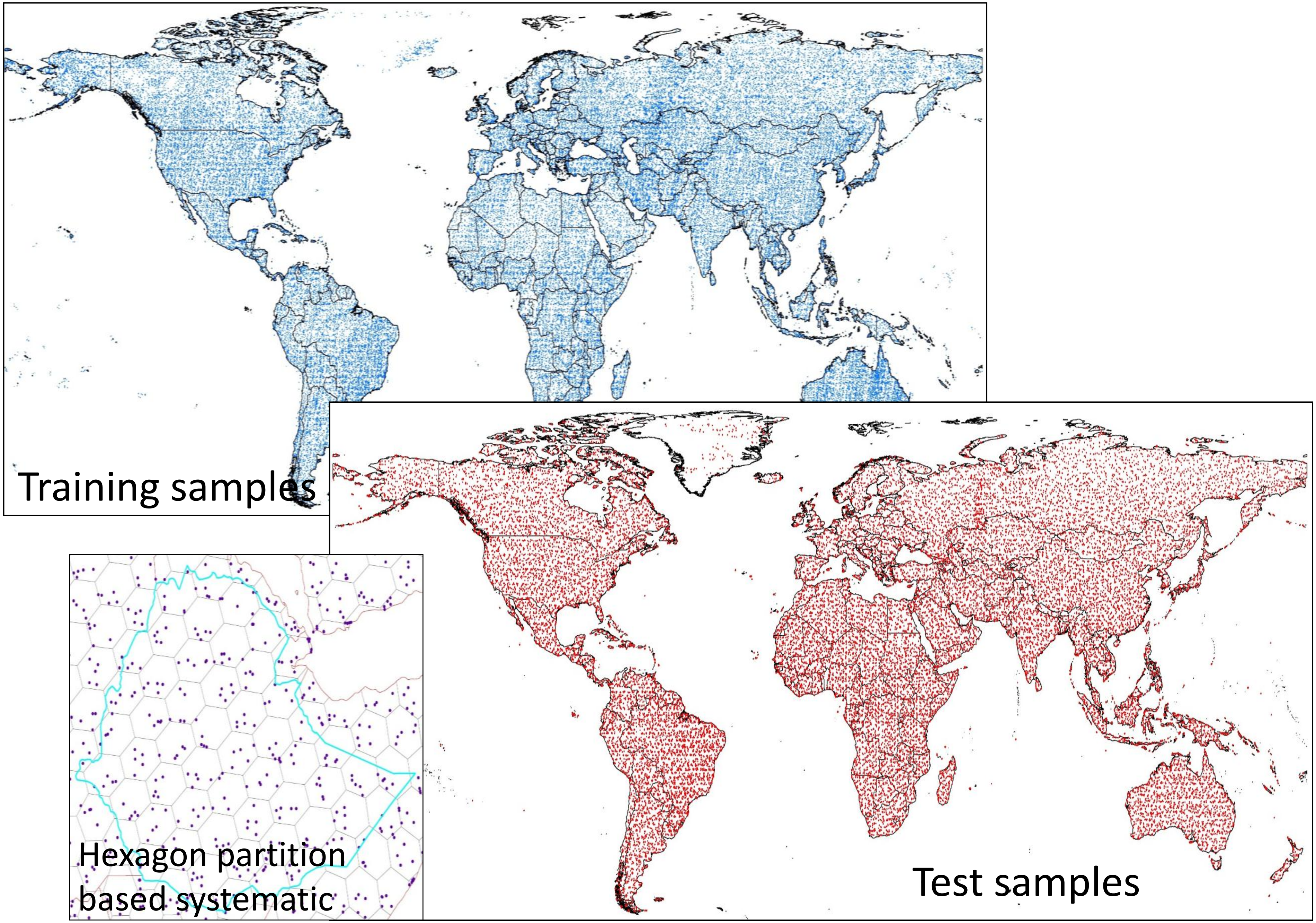
e	Code	Type	Code
ke	95	Other	96

ution
global
lts with
Landsat TM and ETM+ data. IJRS, 34(7): 2607-2654.

+
−
Finland
Iceland
Sweden
Norway
Russia
United Kingdom
Poland
Canada
Germany
Ukraine
France
Kazakhstan
Mongolia
Italy
Spain
Turkey
Korea
Japan
North Pacific Ocean
United States
North Atlantic Ocean
Iraq
Iran
Afghanistan
China
Algeria
Libya
Egypt
Pakistan
Saudi Arabia
India
Mexico
Thailand
Mali
Niger
Sudan
Chad
Nigeria
Ethiopia
Venezuela
Colombia
Kenya
DR Congo
Indonesia
Tanzania
Papua New Guinea
Brazil
Peru
Angola
Bolivia
Namibia
Madagascar
Indian Ocean
Botswana
South Pacific Ocean
South Atlantic Ocean
Chile
Australia
South Africa
Argentina
New Zealand

20 March, 2013 - 15 April, 2013

http://data.ess.tsinghua.edu.cn/

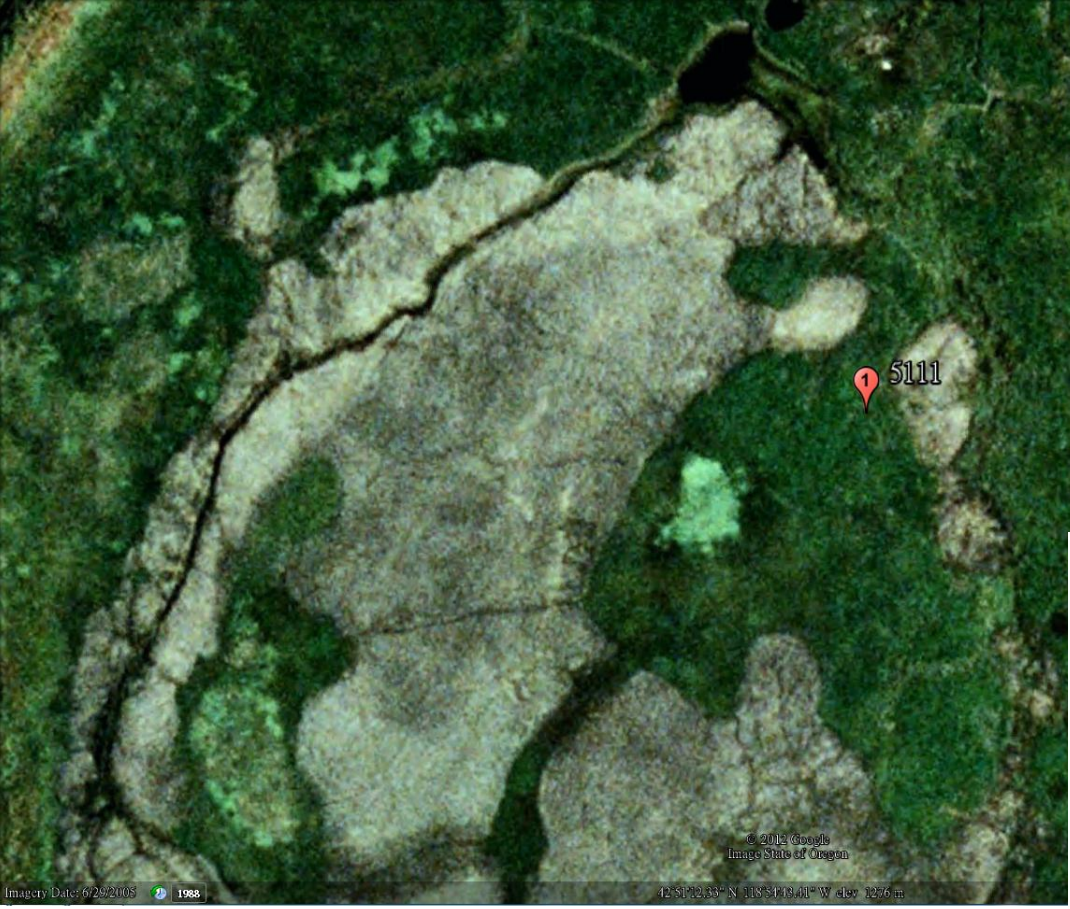


Training samples

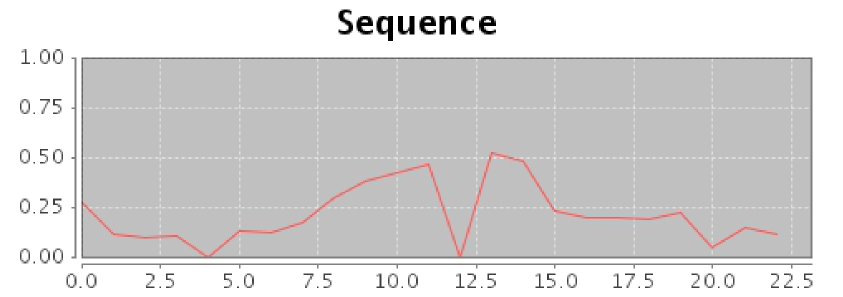
Test samples

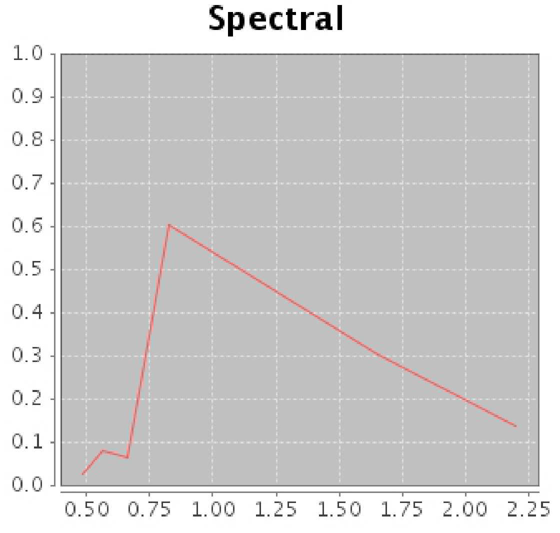
Hexagon partition based systematic unaligned sampling

Gong et al., 2013. IJRS


1
5111
© 2012 Google
Image State of Oregon
Imagery Date: 6/29/2005
1988
42°51'12.33" N 118°54'43.41" W elev 1276 m

imgName: l5043030_03020100807_rad_ref_trc -118.90947, 42.852928 -- classVal: **40**





Initial sample summary

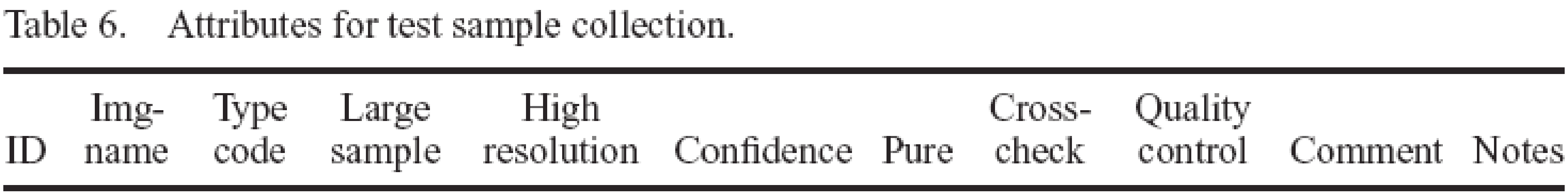


Table 6. Attributes for test sample collection.

ID	Img-name	Type code	Large sample	High resolution	Confidence	Pure	Cross-check	Quality control	Comment	Notes

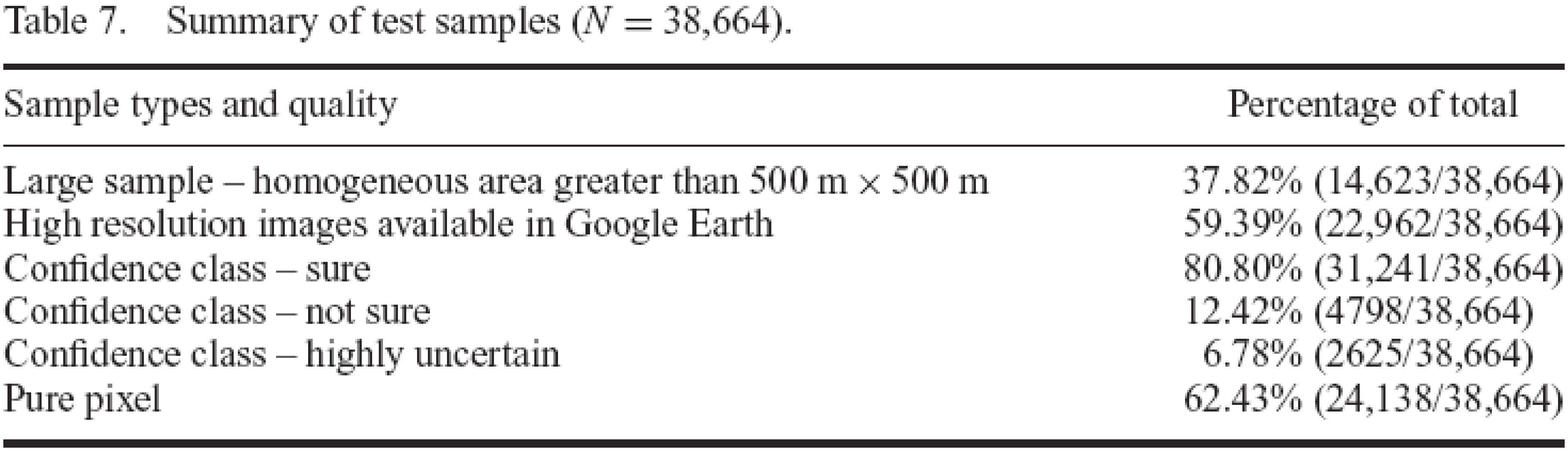
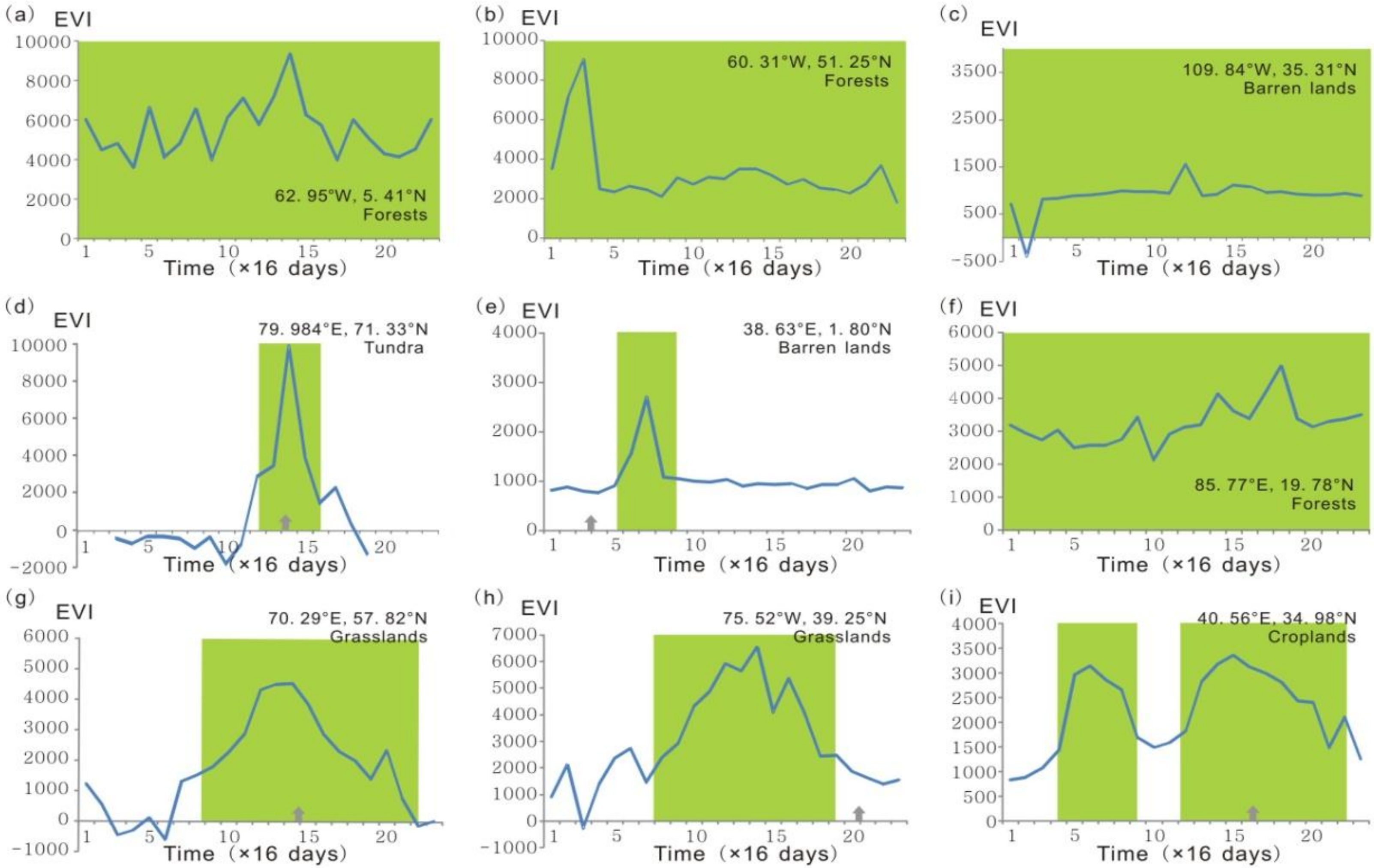


Table 7. Summary of test samples ($N = 38{,}664$).

Sample types and quality	Percentage of total
Large sample – homogeneous area greater than 500 m × 500 m	37.82% (14,623/38,664)
High resolution images available in Google Earth	59.39% (22,962/38,664)
Confidence class – sure	80.80% (31,241/38,664)
Confidence class – not sure	12.42% (4798/38,664)
Confidence class – highly uncertain	6.78% (2625/38,664)
Pure pixel	62.43% (24,138/38,664)

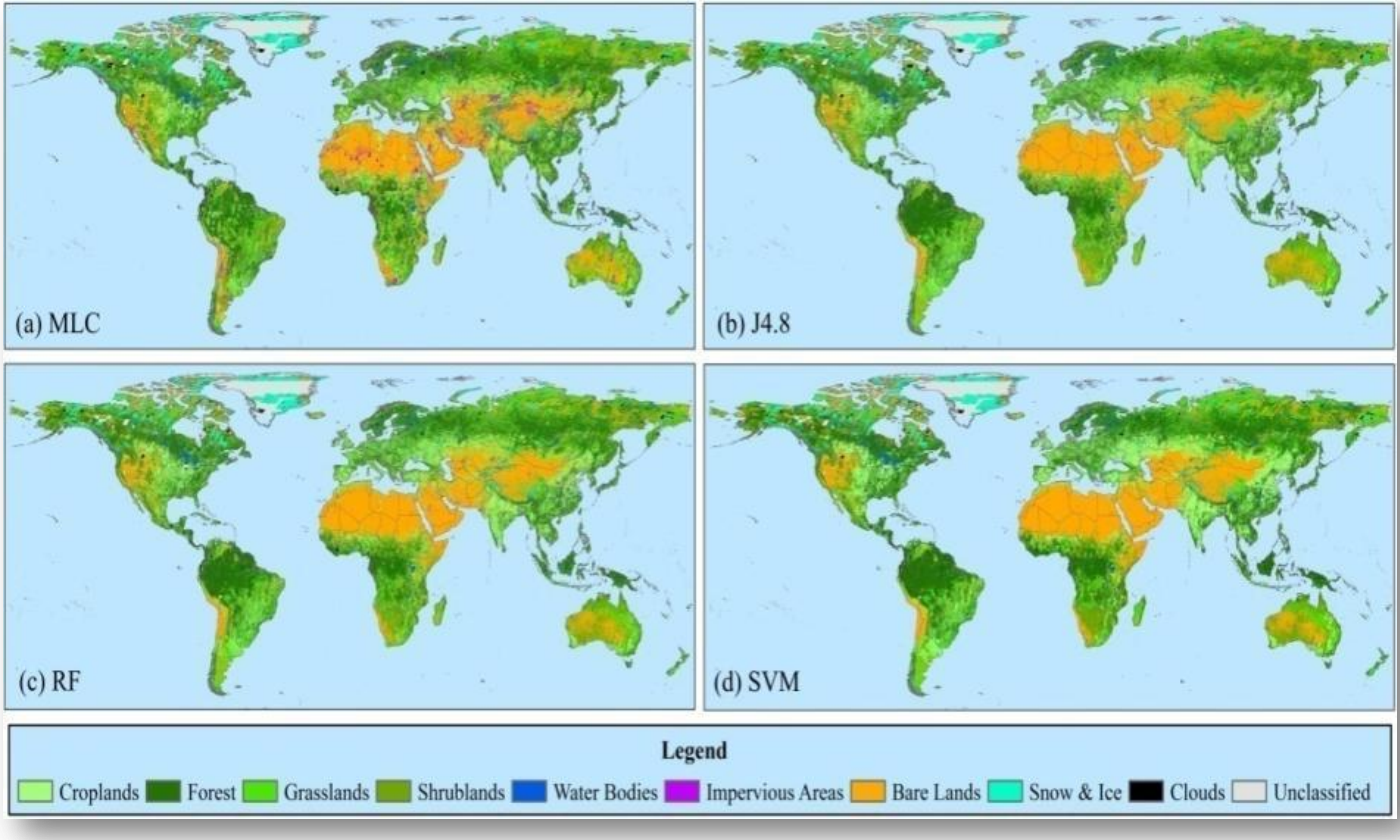
Gong P et al., 2013, IJRS

Example of phenology characterization

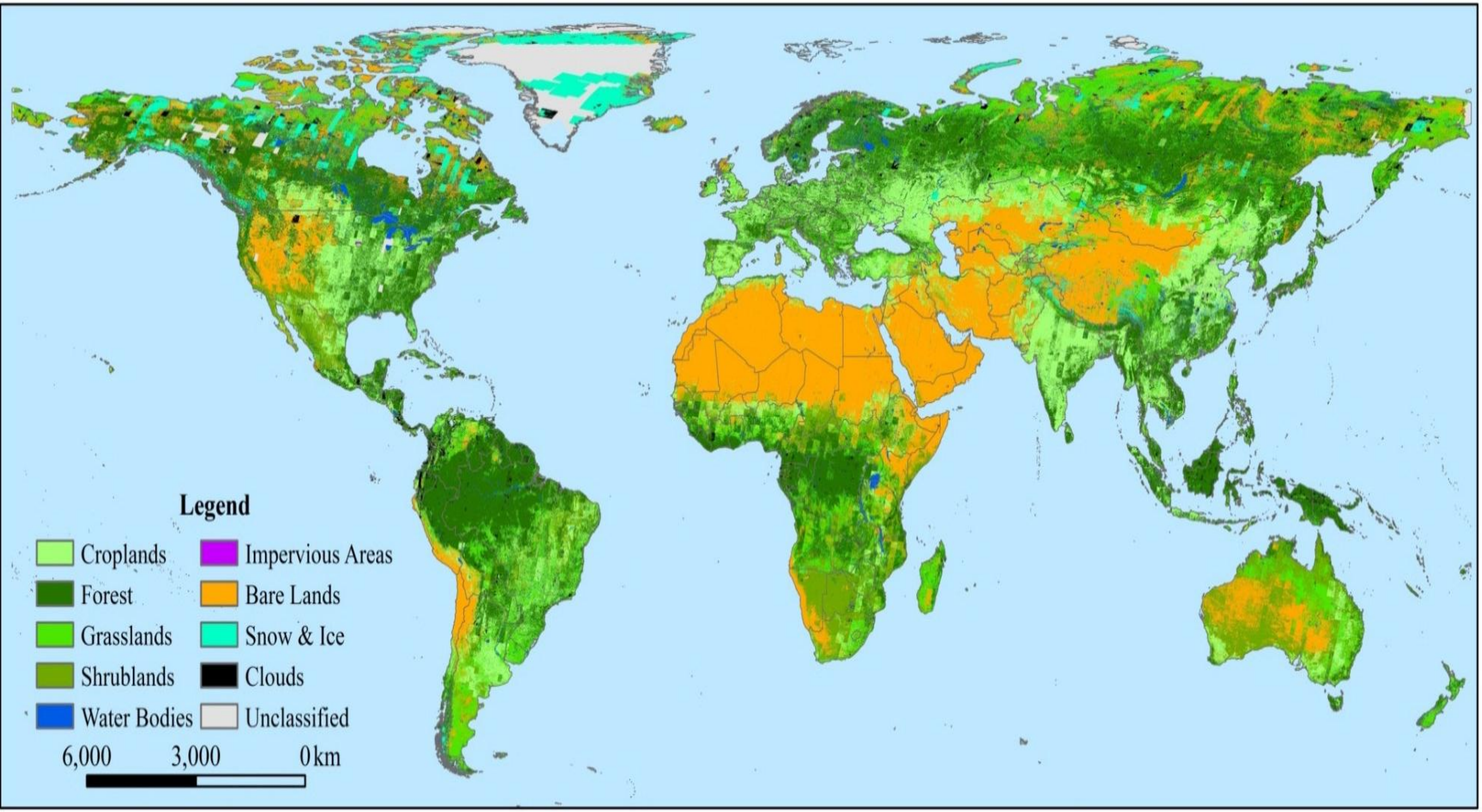


Challenges – samples are time dependent, sustaining this database requires long-term commitment

30 m resolution global land cover mapping


(a) MLC
(b) J4.8
(c) RF
(d) SVM
Legend
Croplands
Forest
Grasslands
Shrublands
Water Bodies
Impervious Areas
Bare Lands
Snow & Ice
Clouds
Unclassified

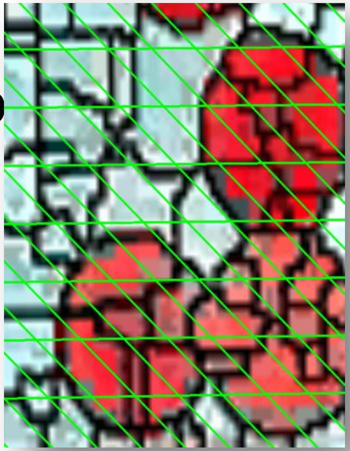
FROM-GLC (Accuracy: 63.72%)

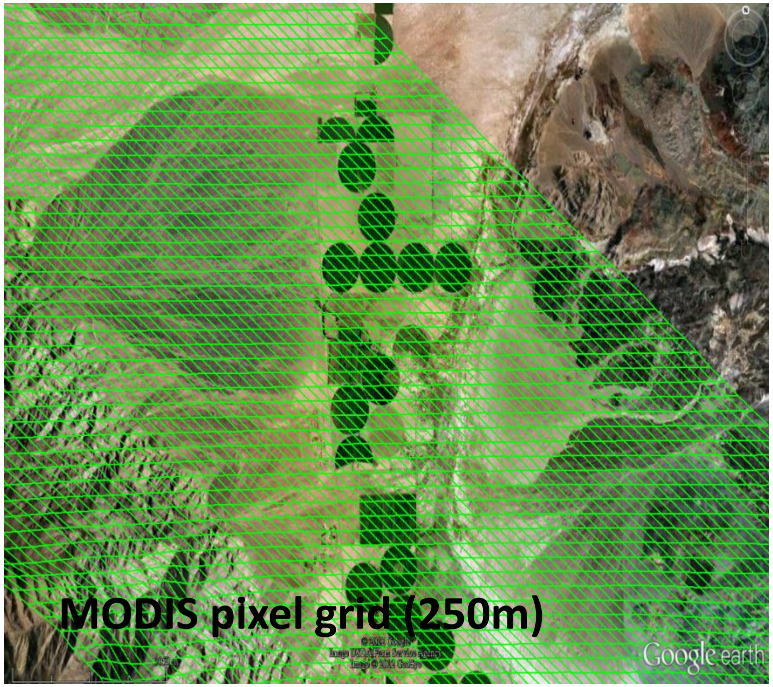

Legend
Croplands
Forest
Grasslands
Shrublands
Water Bodies
Impervious Areas
Bare Lands
Snow & Ice
Clouds
Unclassified
6,000
3,000
0 km

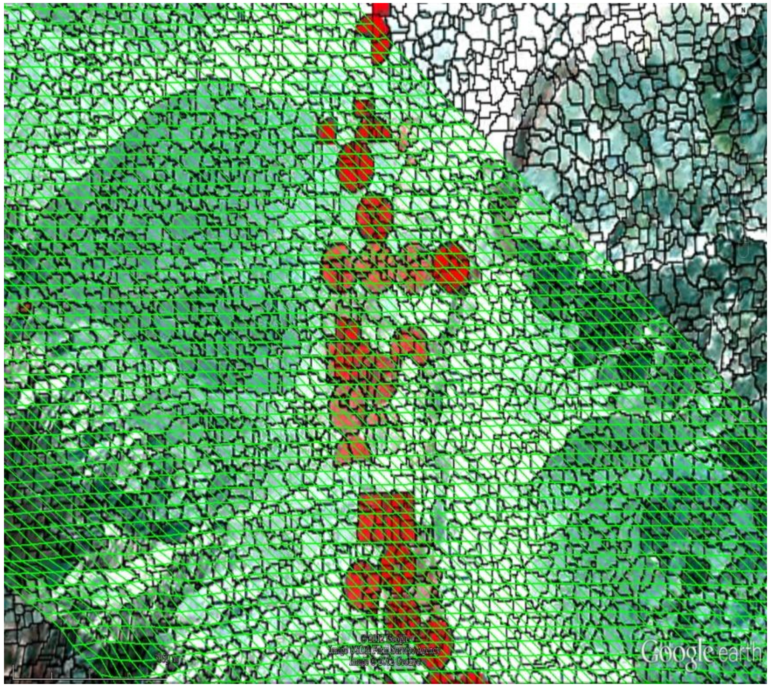
Gong et al., 2013. IJRS

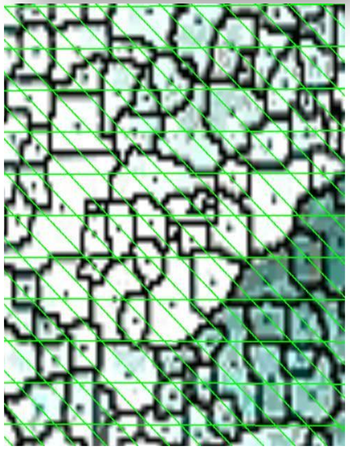
FROM-GLC-SEG, a segmentation-based multi-resolution integration

- Spatial down-scaling
  - TM/ETM 30m -> MODIS EVI 250m, Bio/DEM/Soil-Water1km
  - Homogeneous polygon (watershed segmentation)
- Extracting MODIS EVI (and other features) values b the center of segment polygon

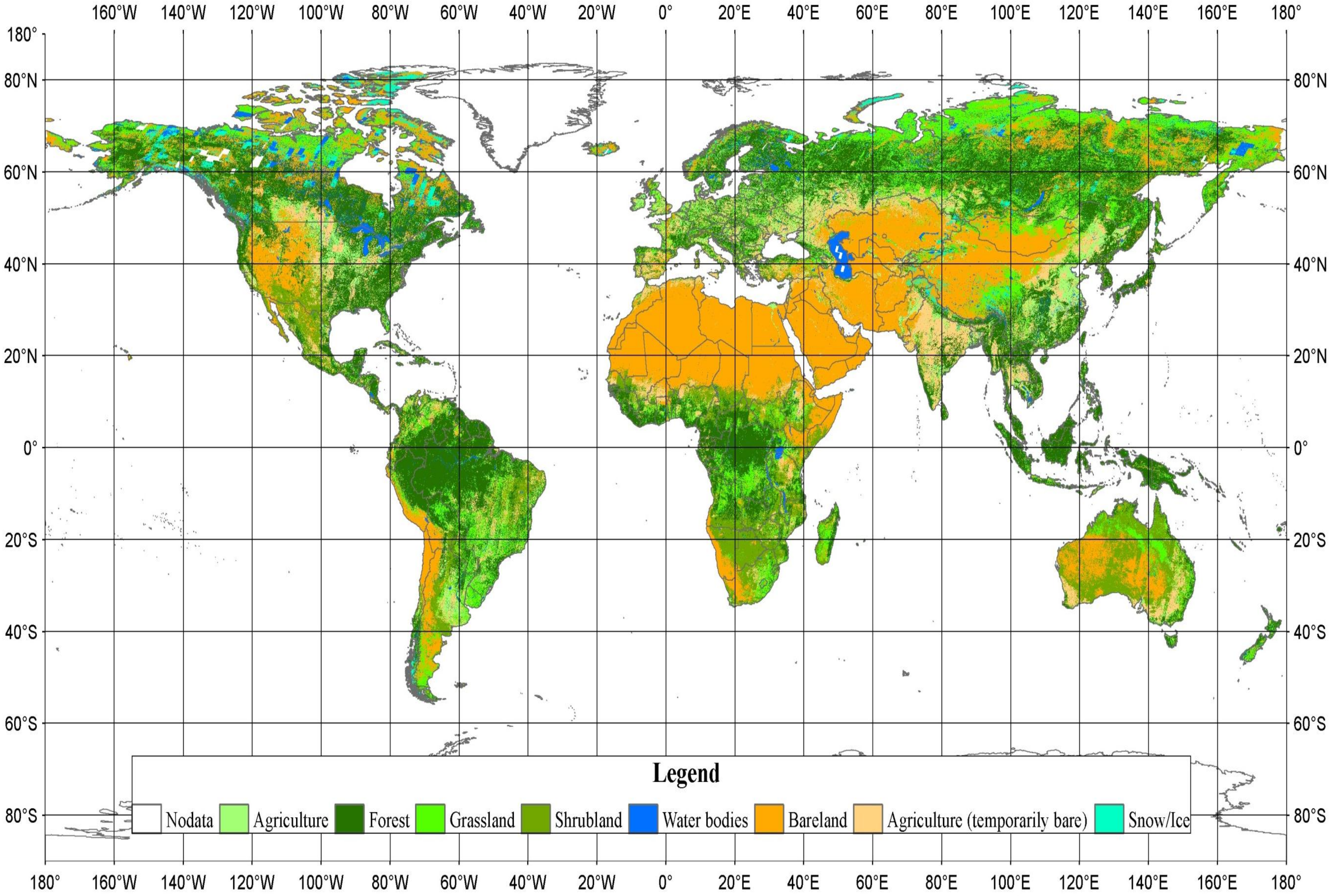



MODIS pixel grid (250m)
Google earth


Google earth

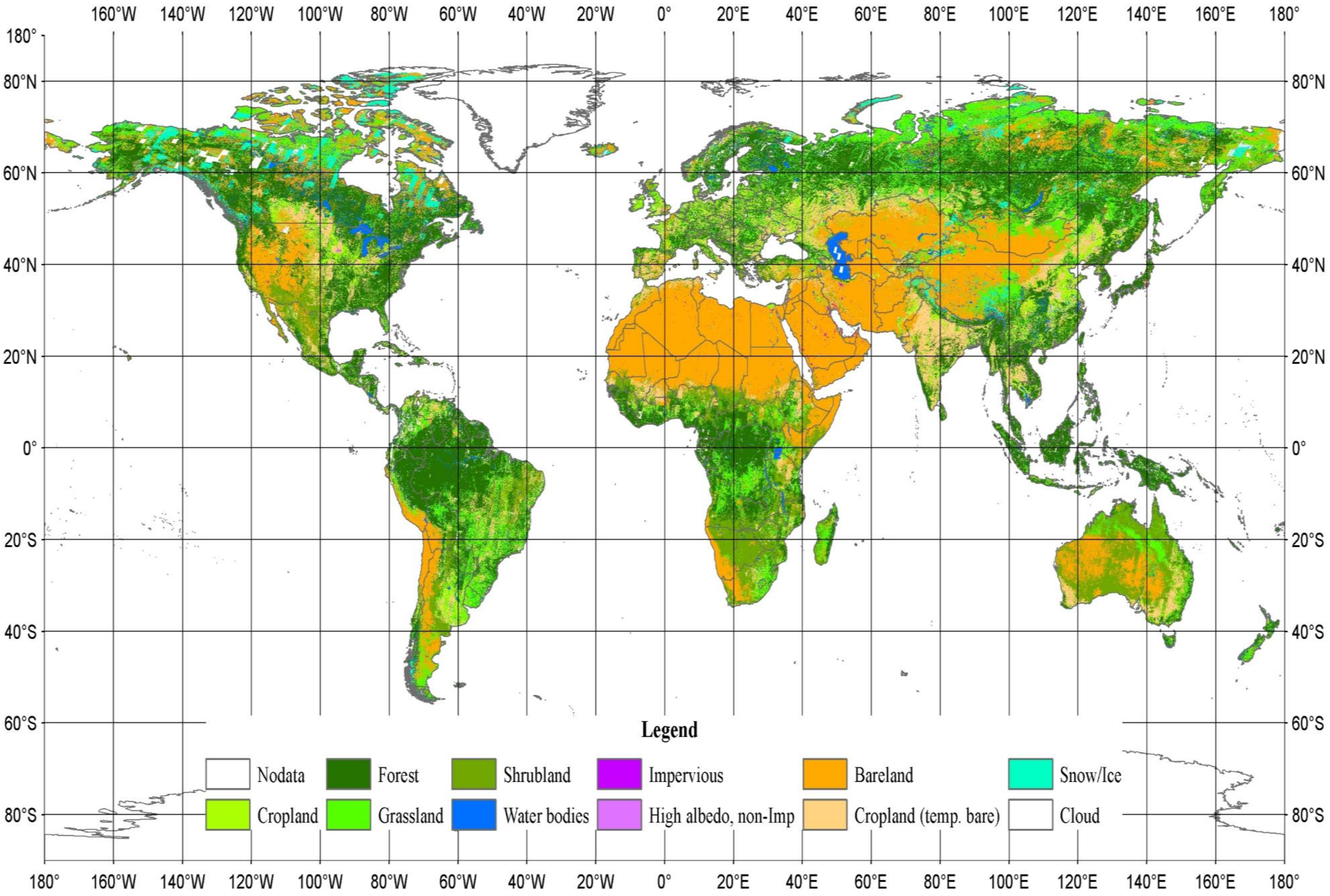


Yu et al., in press, IJRS


Legend
Nodata
Agriculture
Forest
Grassland
Shrubland
Water bodies
Bareland
Agriculture (temporarily bare)
Snow/Ice
180°
160°W
140°W
120°W
100°W
80°W
60°W
40°W
20°W
0°
20°E
40°E
60°E
80°E
100°E
120°E
140°E
160°E
80°N
60°N
40°N
20°N
20°S
40°S
60°S
80°S

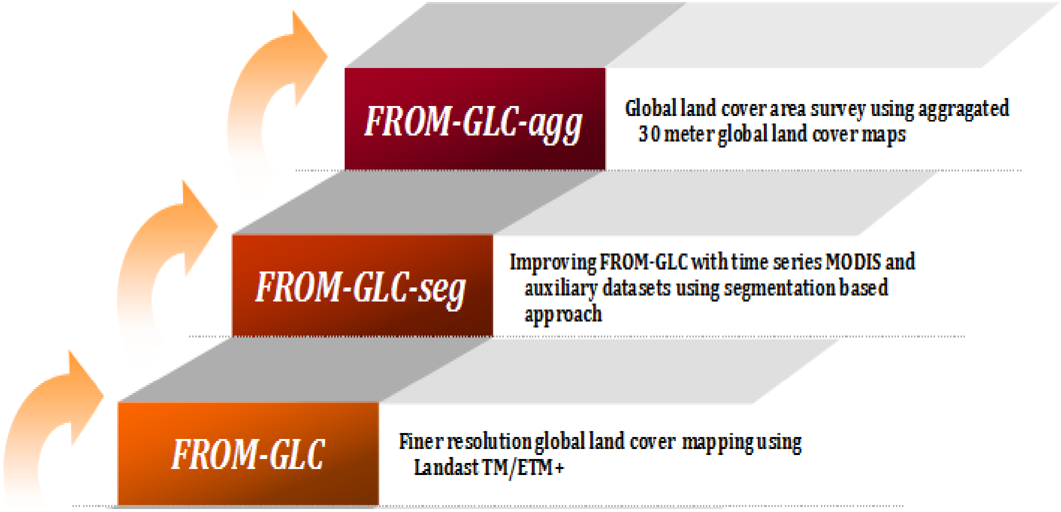
FROM-GLC-SEG (Accuracy: 64.63%)

Yu et al., in press, IJRS


160°W
140°W
120°W
100°W
80°W
60°W
40°W
20°W
0°
20°E
40°E
60°E
80°E
100°E
120°E
140°E
160°E
180°
180°
80°N
60°N
40°N
20°N
0°
20°S
40°S
60°S
80°S
Legend
Nodata
Forest
Shrubland
Impervious
Bareland
Snow/Ice
Cropland
Grassland
Water bodies
High albedo, non-Imp
Cropland (temp. bare)
Cloud

FROM-GLC-AGG (Accuracy: 66.00%) Yu et al., submitted

Three global land cover products



FROM-GLC-agg

Global land cover area survey using aggragated 30 meter global land cover maps

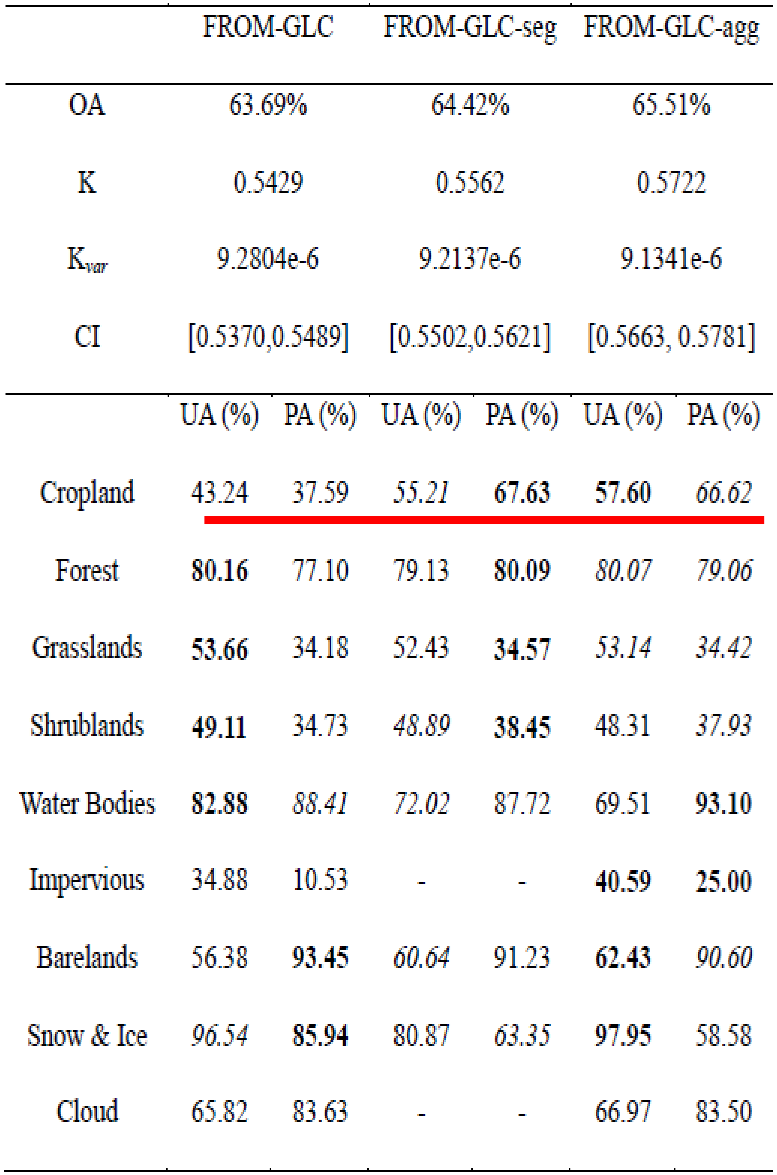
FROM-GLC-seg

Improving FROM-GLC with time series MODIS and auxiliary datasets using segmentation based approach

FROM-GLC

Finer resolution global land cover mapping using Landsat TM/ETM+

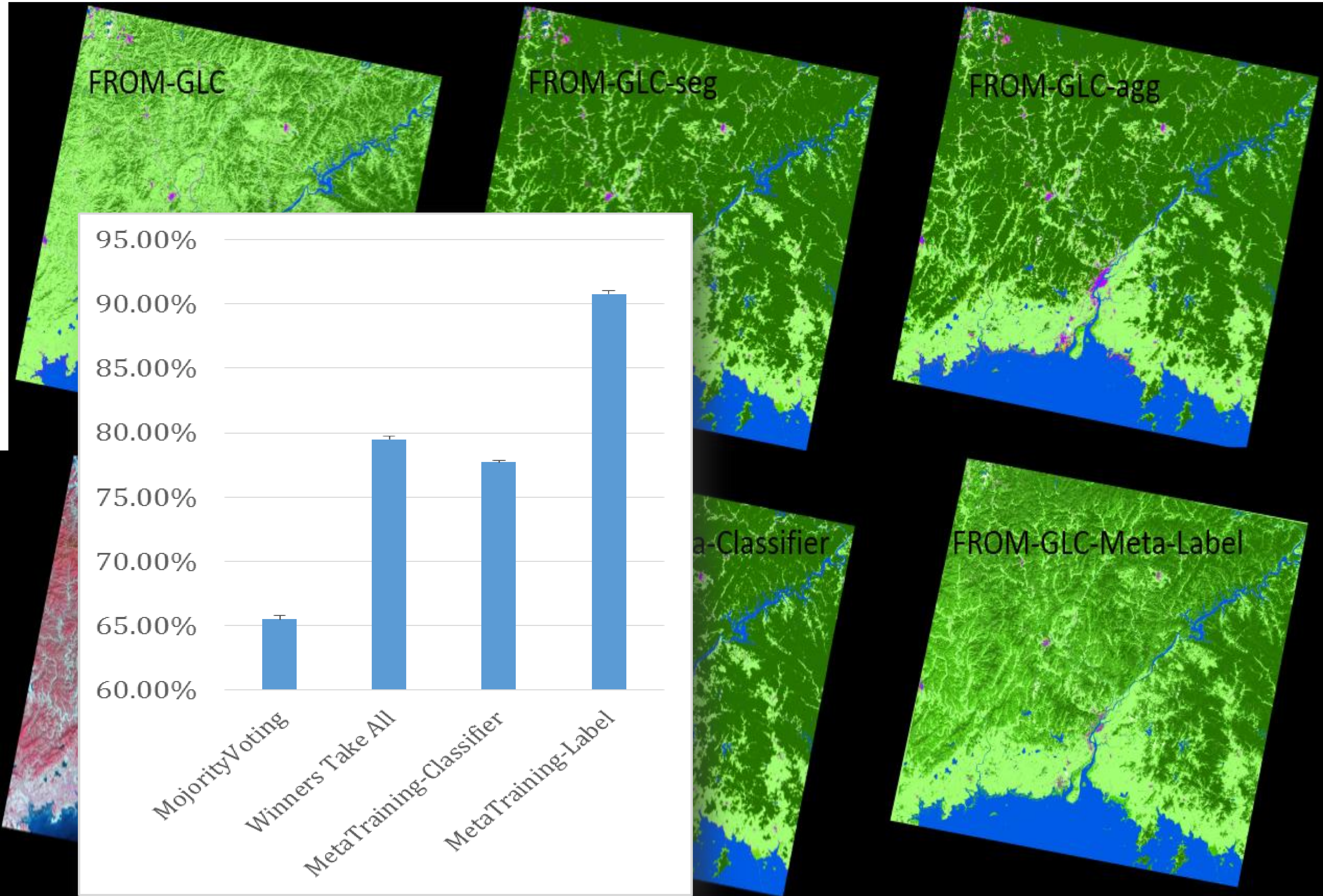
- FROM-GLC
  - Landsat TM/ETM+
- FROM-GLC-seg
  - Landsat TM/ETM+, Landsat TM/ETM+, MODIS EVI, Bioclimatic variables, DEM…
  - Segmentation based
- FROM-GLC-agg
  - Aggregation of FROM-GLC, FROM-GLC-seg, and two 1km global impervious products (Elvidge et al., 2007), Schneider et al., 2009, 2010)



	FROM-GLC		FROM-GLC-seg		FROM-GLC-agg	
OA	63.69%		64.42%		65.51%	
K	0.5429		0.5562		0.5722	
K_{var}	9.2804e-6		9.2137e-6		9.1341e-6	
CI	[0.5370,0.5489]		[0.5502,0.5621]		[0.5663, 0.5781]	
	UA (%)	PA (%)	UA (%)	PA (%)	UA (%)	PA (%)
Cropland	43.24	37.59	*55.21*	**67.63**	**57.60**	*66.62*
Forest	**80.16**	77.10	79.13	**80.09**	*80.07*	*79.06*
Grasslands	**53.66**	34.18	52.43	**34.57**	*53.14*	*34.42*
Shrublands	**49.11**	34.73	*48.89*	**38.45**	48.31	*37.93*
Water Bodies	**82.88**	*88.41*	*72.02*	87.72	69.51	**93.10**
Impervious	34.88	10.53	-	-	**40.59**	**25.00**
Barelands	56.38	**93.45**	*60.64*	91.23	**62.43**	*90.60*
Snow & Ice	*96.54*	**85.94**	80.87	*63.35*	**97.95**	58.58
Cloud	65.82	83.63	-	-	66.97	83.50

Meta-prediction results

Clinton, Yu et al, in prep

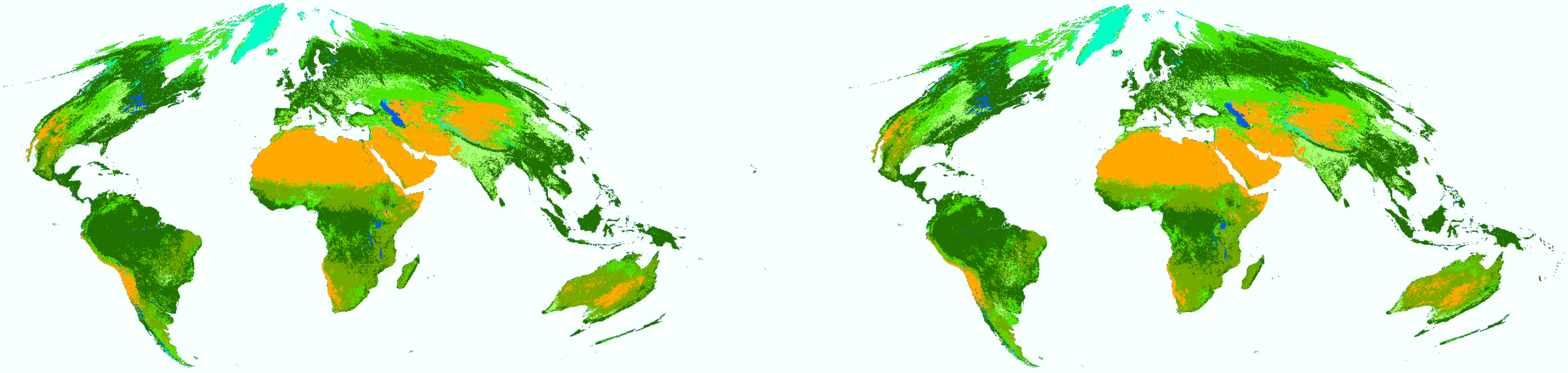


250 m global land cover change maps

250 m global land cover using Random Forest classifier
- overall accuracy = 77%
by cross-validation

250 m global land cover 2001, 2010 using spatial-temporal contextual classification

With 3 yr MODIS time series data
Method – Liu, Kelly and Gong, 2006, RSE
Liu, Song, Townshend, Gong, 2008, RSE



2000 – 2001 - 2002

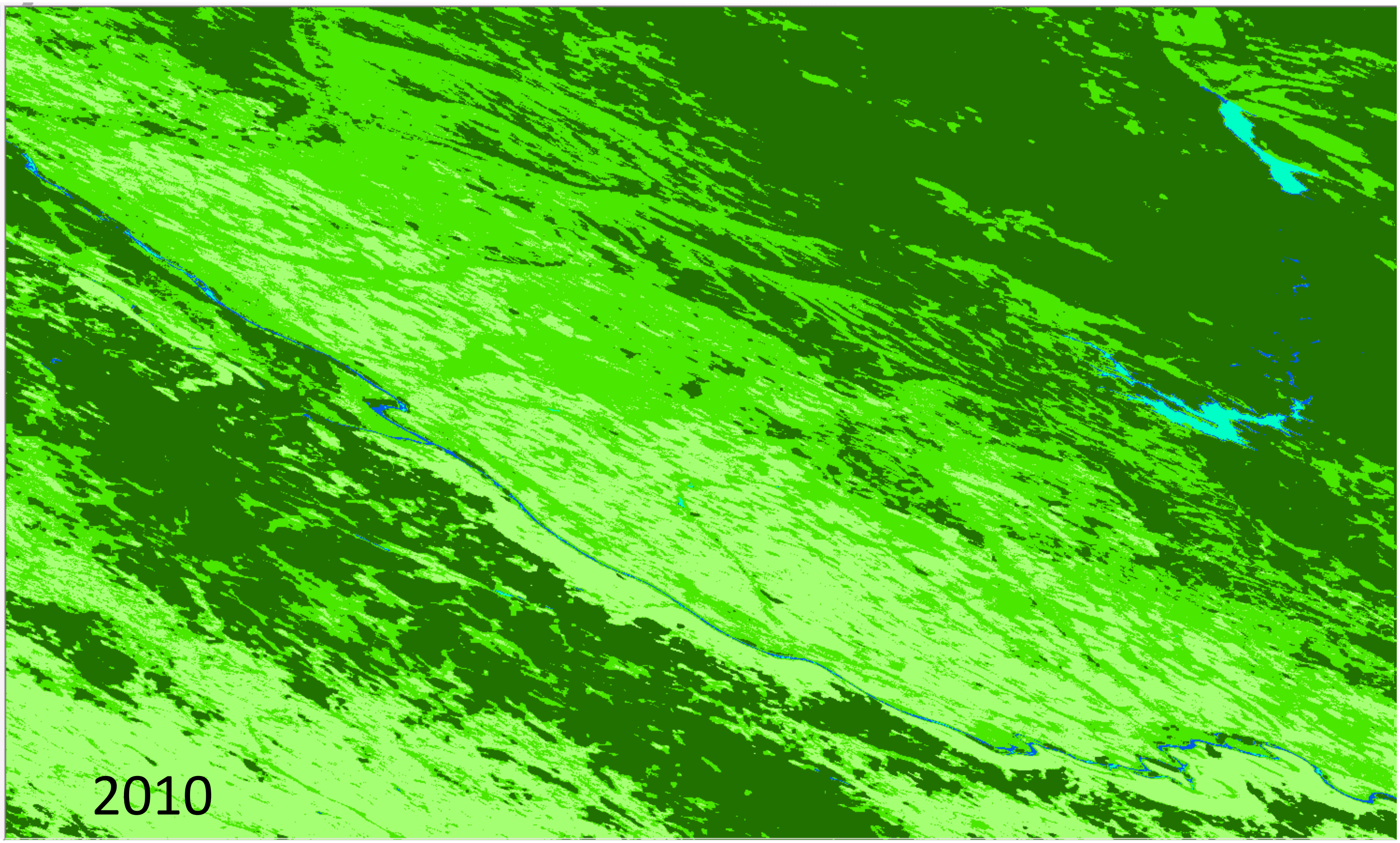
2009 – 2010 - 2011

Legend

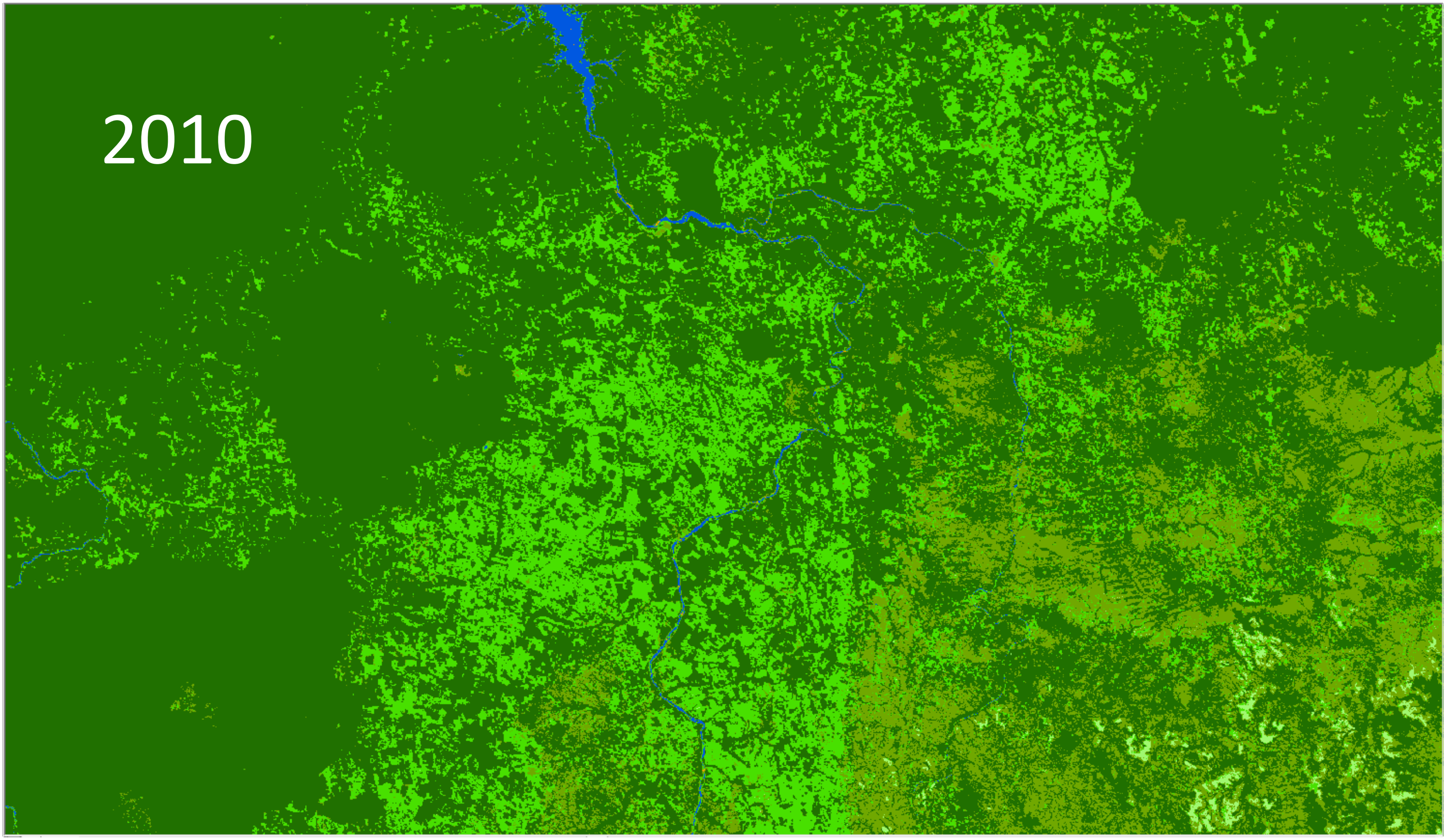
- 🟦 Water
- 🟩 Cropland/Pasture
- 🟩 Forest
- 🟩 Grassland
- 🟩 Shrubland
- 🟧 Barren
- 🟦 Snow/Ice

Wang et al., in prep

Russian and China border (2001,2010)
(127.7E, 50.5N)

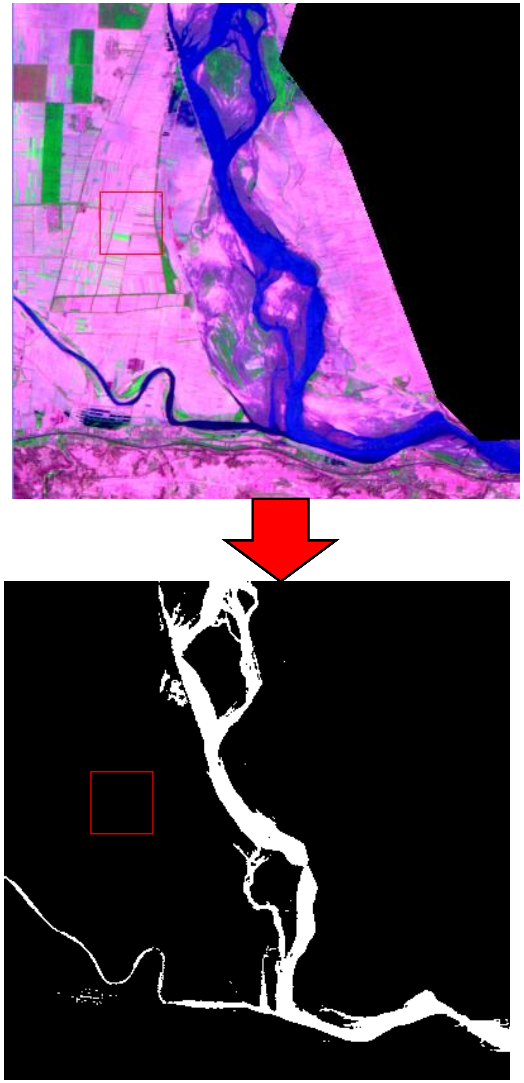


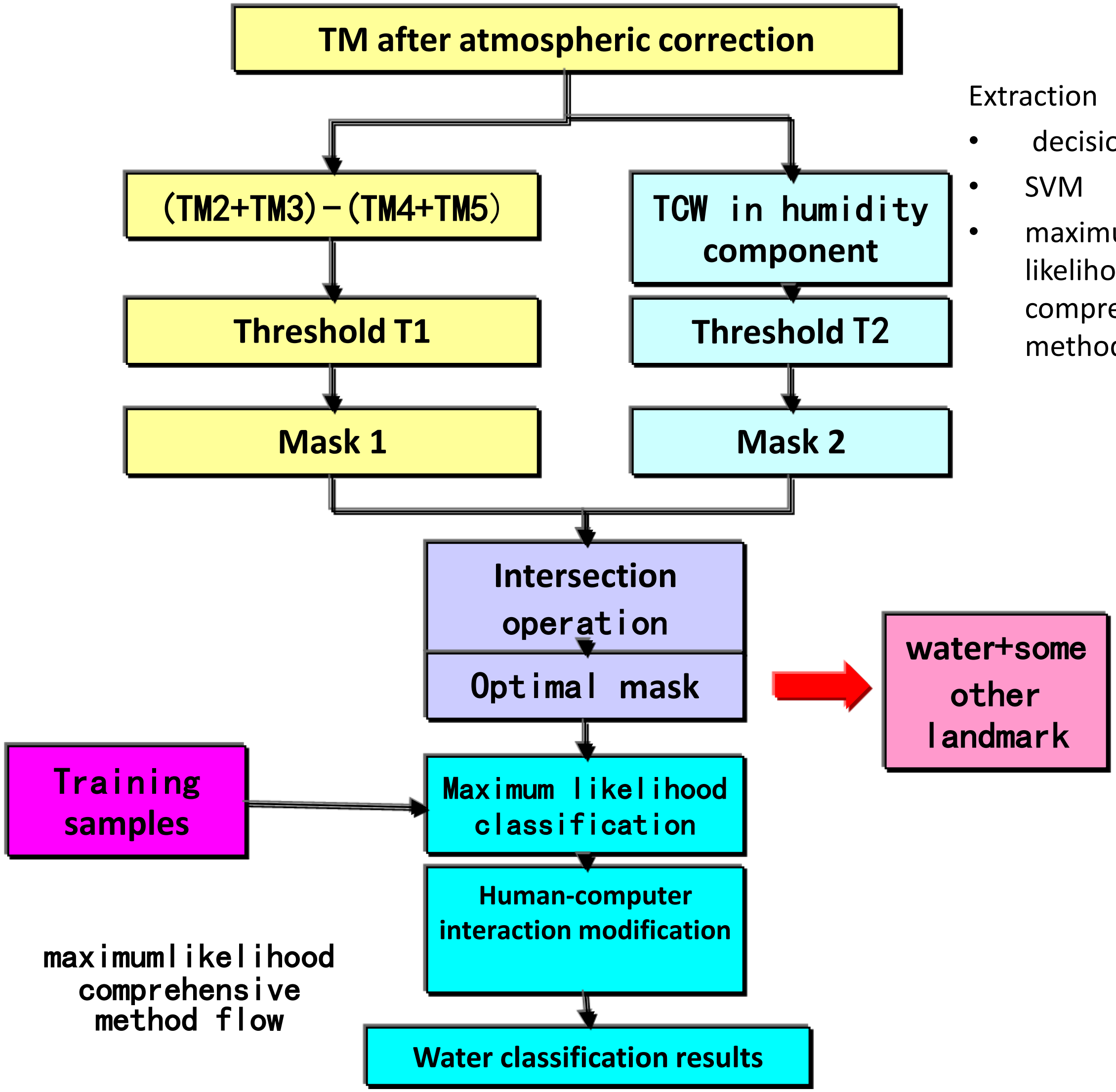
Amazon Basin (2001,2010)
(49.7W, 5.9S)



30 m global water masks, 2000, 2010

Extraction of Open Water





TM after atmospheric correction

(TM2+TM3)－(TM4+TM5)

Threshold T1

Mask 1

TCW in humidity component

Threshold T2

Mask 2

Intersection operation

Optimal mask

water+some other landmark

Training samples

Maximum likelihood classification

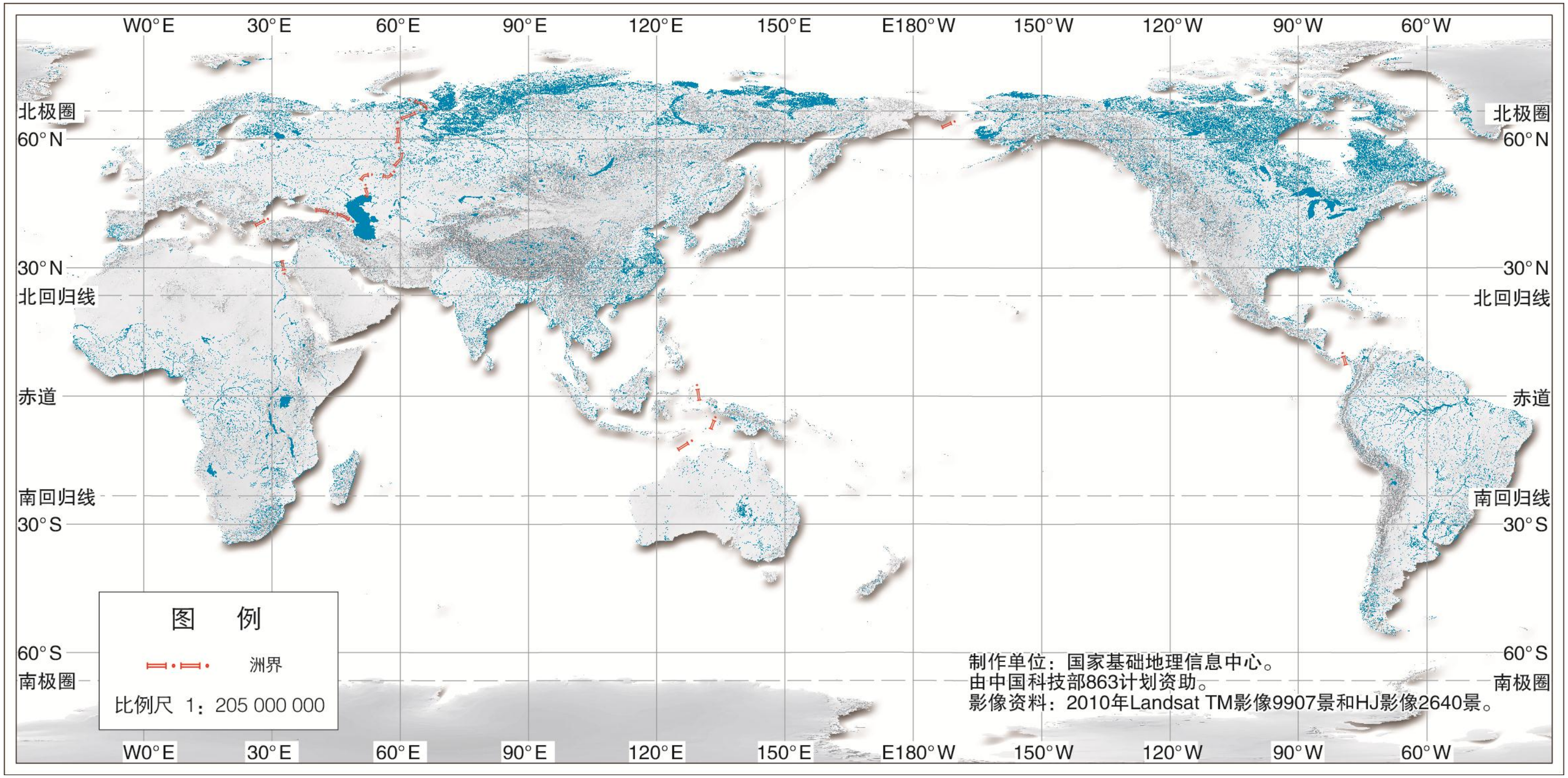
Human-computer interaction modification

Water classification results

maximumlikelihood comprehensive method flow

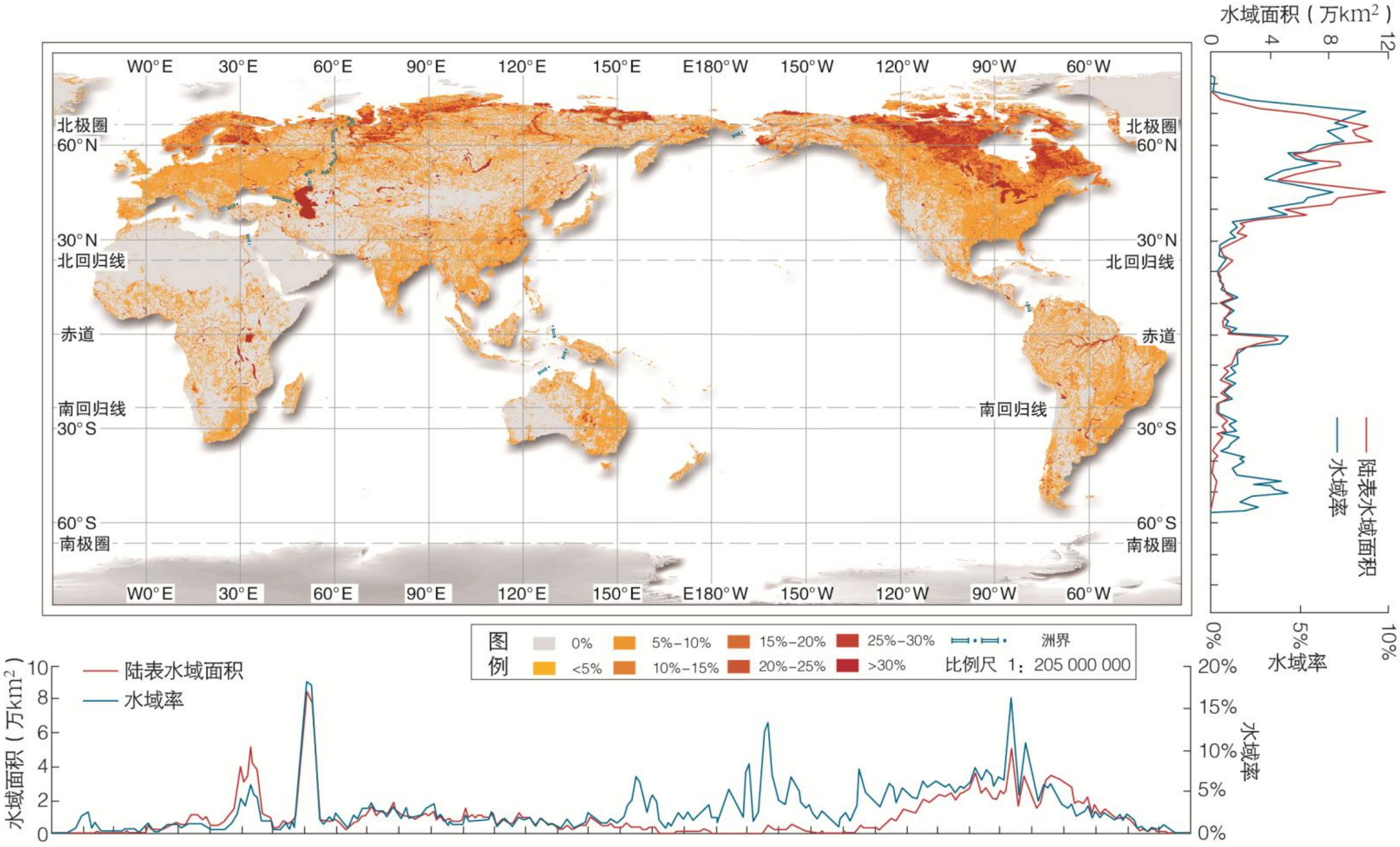
Extraction

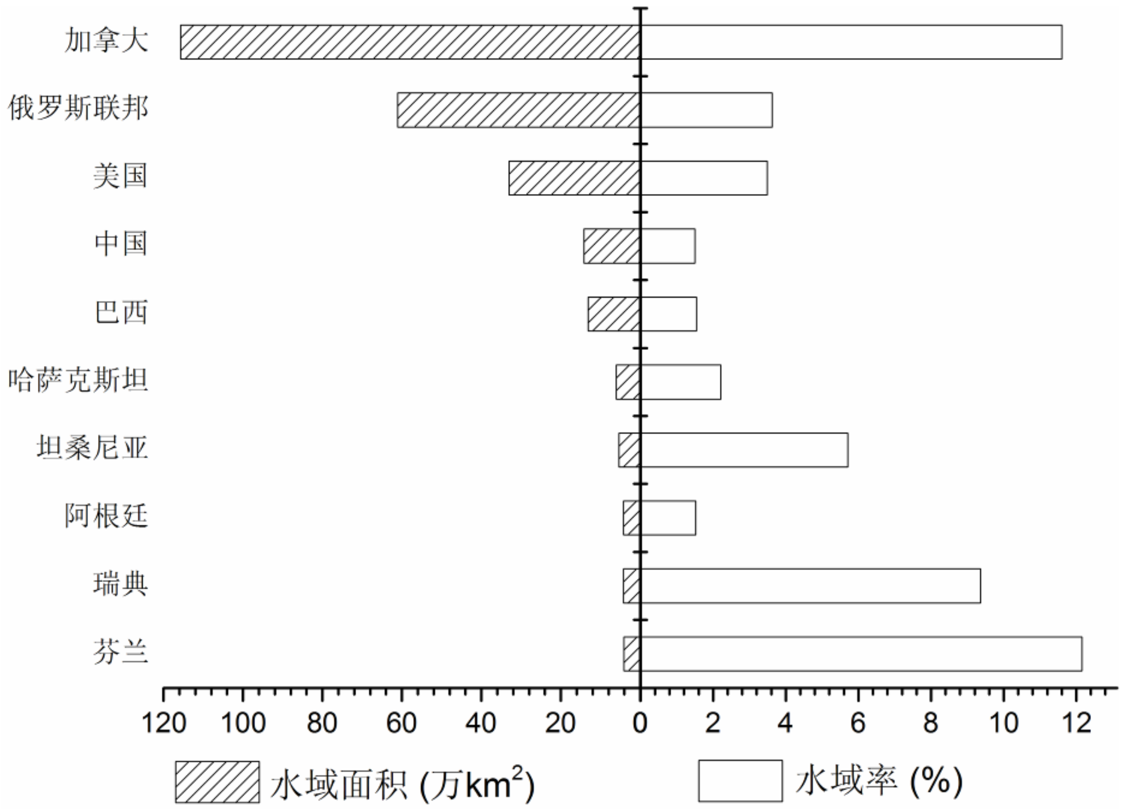
- decision tree
- SVM
- maximum likelihood comprehensive method


W0° E
30° E
60° E
90° E
120° E
150° E
E180° W
150° W
120° W
90° W
60° W
北极圈
60° N
30° N
北回归线
赤道
南回归线
30° S
60° S
南极圈
图　例
洲界

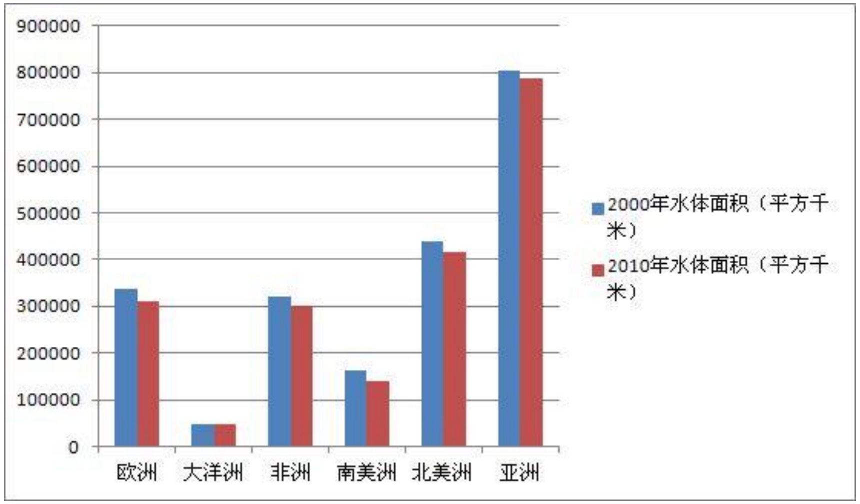
比例尺 1：205 000 000

制作单位：国家基础地理信息中心。
由中国科技部863计划资助。
影像资料：2010年Landsat TM影像9907景和HJ影像2640景。


W0° E
30° E
60° E
90° E
120° E
150° E
E180° W
150° W
120° W
90° W
60° W
北极圈
60° N
30° N
北回归线
赤道
南回归线
30° S
60° S
南极圈
水域面积（万km²）
0
4
8
12
0%
5%
10%
水域率
陆表水域面积
水域率
图例
0%
<5%
5%–10%
10%–15%
15%–20%
20%–25%
25%–30%
>30%
洲界
比例尺 1：205 000 000
水域面积（万km²）
10
8
6
4
2
0
20%
15%
10%
5%
0%
水域率


加拿大
俄罗斯联邦
美国
中国
巴西
哈萨克斯坦
坦桑尼亚
阿根廷
瑞典
芬兰
120
100
80
60
40
20
0
2
4
6
8
10
12
水域面积 (万km²)
水域率 (%)

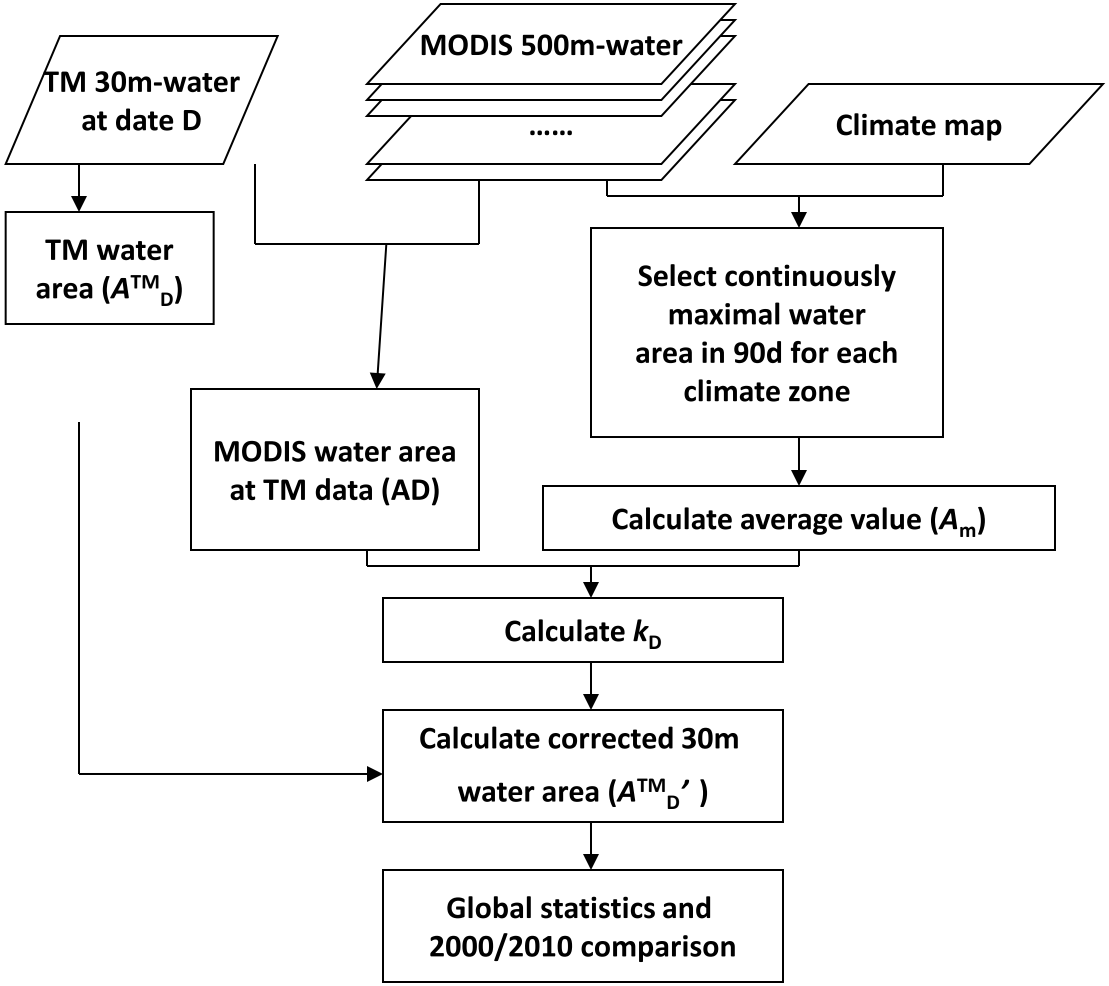
Global Land Surface Water (2000-2010)



Continents name	2000 water area(10^4**km**^{2})	2010 water srea(10^4**km**^{2})
Europe	31.56	31.59
Oceania	4.61	4.82
Africa	27.23	27.19
South America	26.57	26.78
North America	153.05	153.02
Asia	124.55	124.28
Globe	367.56	367.67

- 2000 367.56 **10^4km^2**，
- 2010 367.67 **10^4km^2**

Statistical Correction


TM 30m-water at date D
MODIS 500m-water
……
Climate map
TM water area (A^{TM}_D)
Select continuously maximal water area in 90d for each climate zone
MODIS water area at TM data (AD)
Calculate average value (A_m)
Calculate k_D
Calculate corrected 30m water area ($A^{TM}_D{}'$)
Global statistics and 2000/2010 comparison

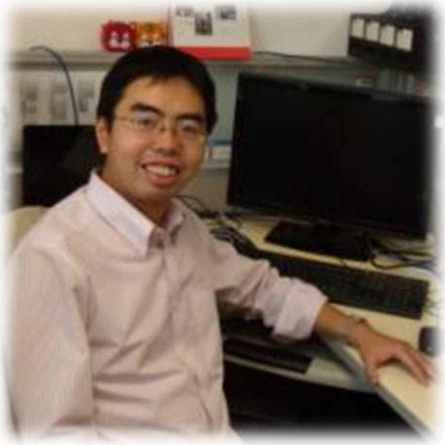
- **At TM date (D), the correction coefficient (k_D) can be calculated as:**

  $$k_D = A_m / A_D$$

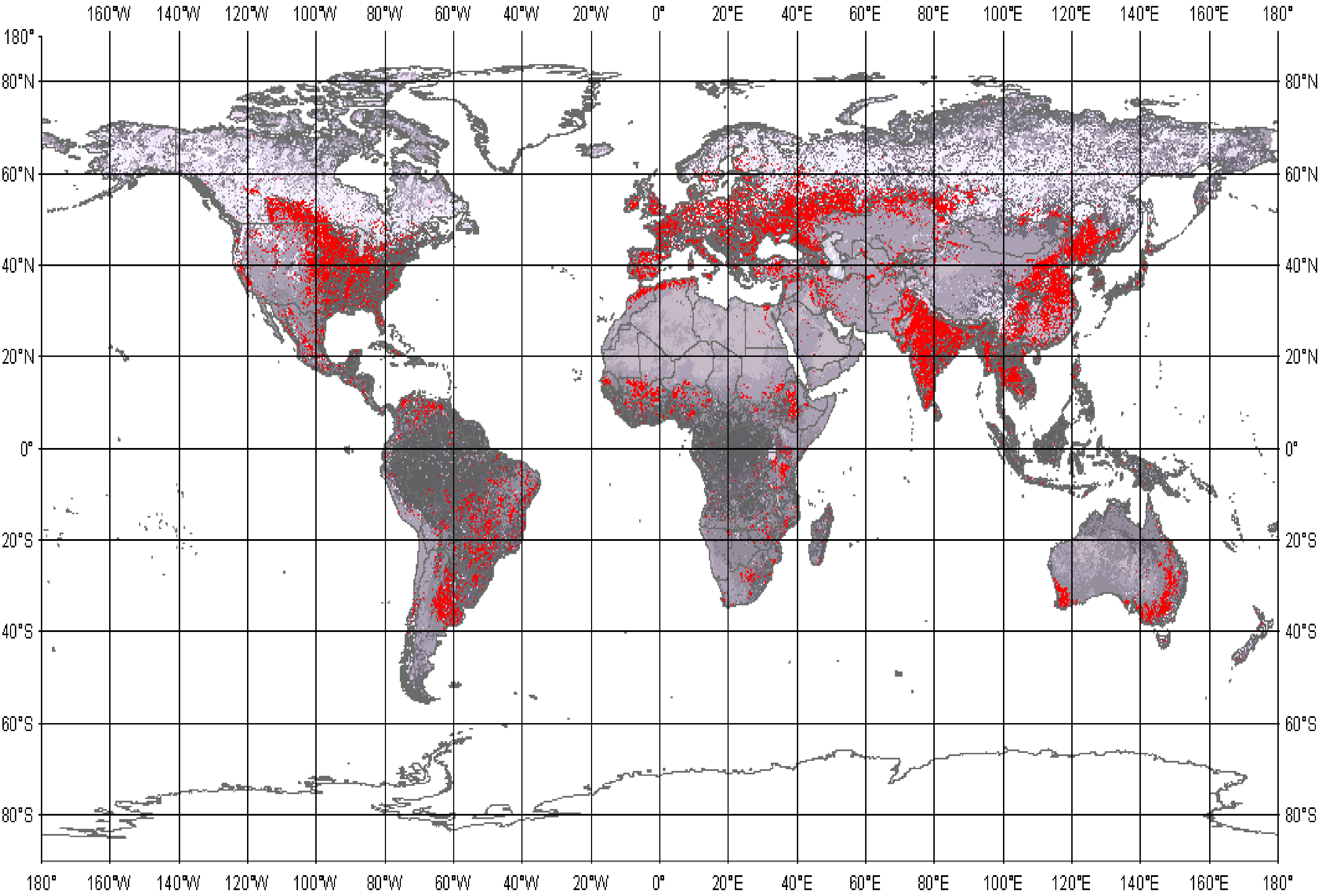
- **The corrected 30m water area ($A^{TM}_D{}'$) for each TM scene is calculated as:**

  $$A^{TM}_D{}' = A^{TM}_D * k_D$$

- **Finally, we can carry out the global regional statistics and 2000/2010 comparison using the corrected 30m-water data.**

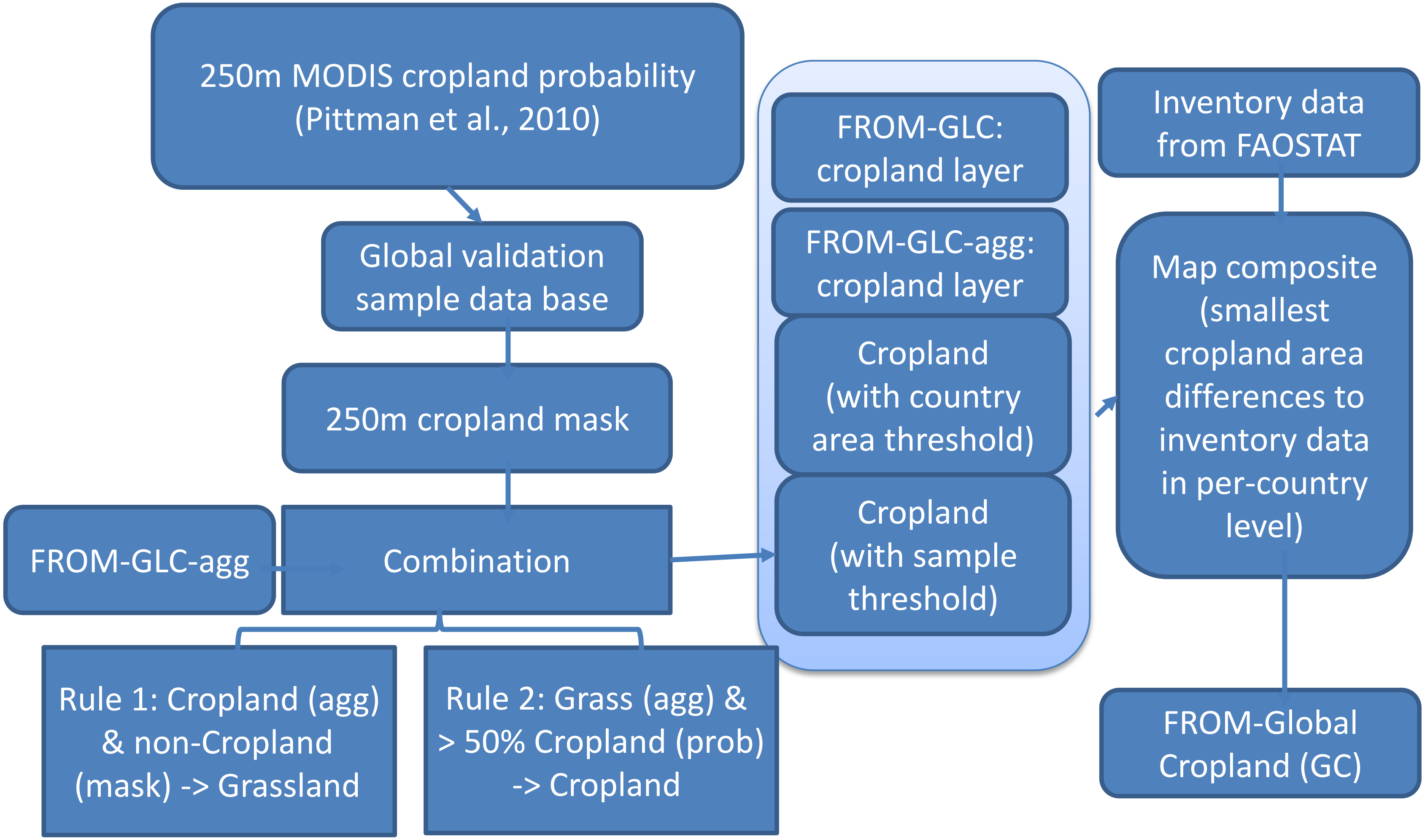


30 m global cropland mask – FROM-GC initiative led by Le Yu


160°W
140°W
120°W
100°W
80°W
60°W
40°W
20°W
0°
20°E
40°E
60°E
80°E
100°E
120°E
140°E
160°E
180°
80°N
60°N
40°N
20°N
0°
20°S
40°S
60°S
80°S

Global Cropland Distribution, UA/PA approx. 60%

FROM-Global Cropland



250m MODIS cropland probability (Pittman et al., 2010)

Global validation sample data base

250m cropland mask

FROM-GLC-agg

Combination

Rule 1: Cropland (agg) & non-Cropland (mask) -> Grassland

Rule 2: Grass (agg) & > 50% Cropland (prob) -> Cropland

FROM-GLC: cropland layer

FROM-GLC-agg: cropland layer

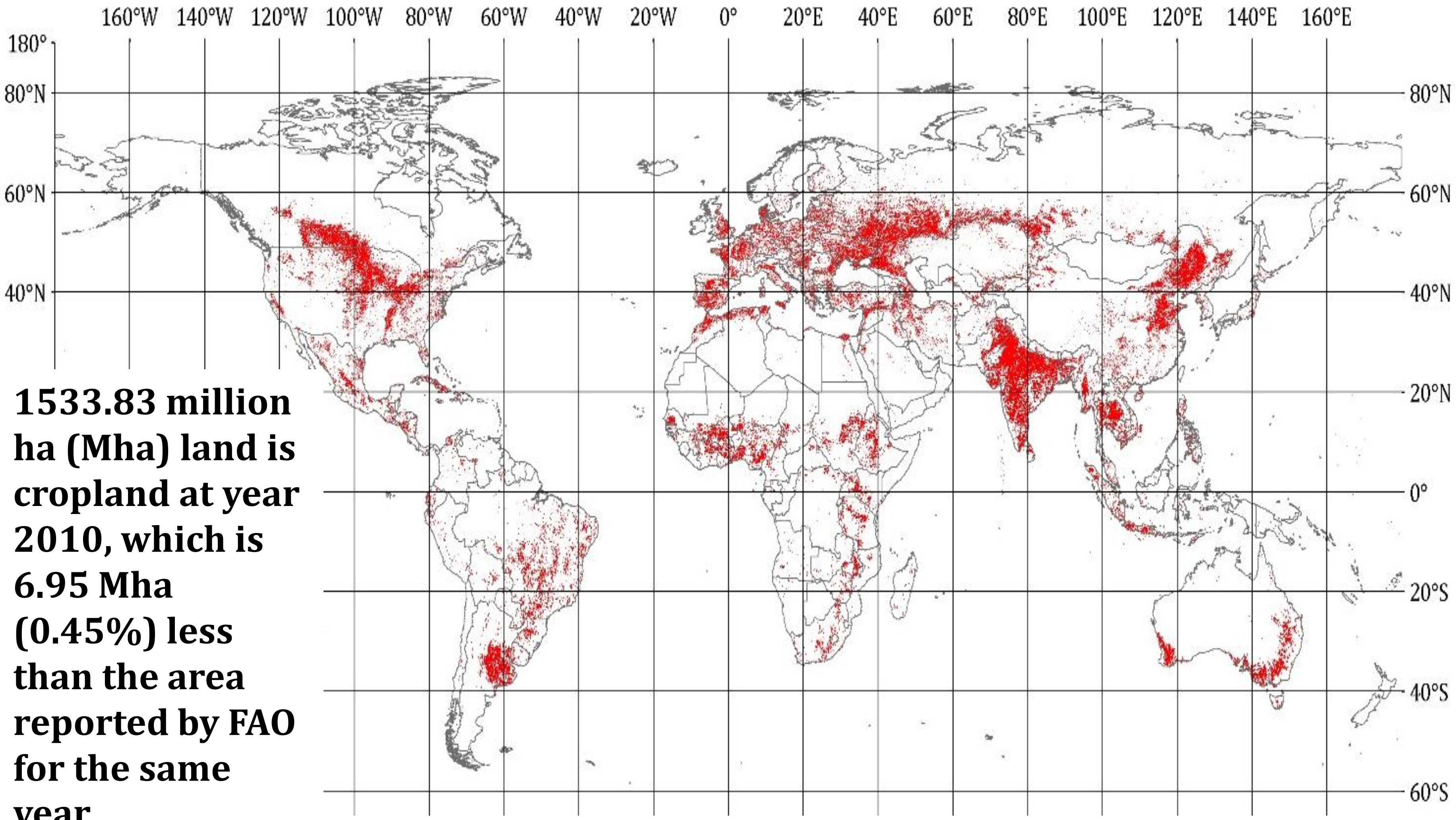
Cropland (with country area threshold)

Cropland (with sample threshold)

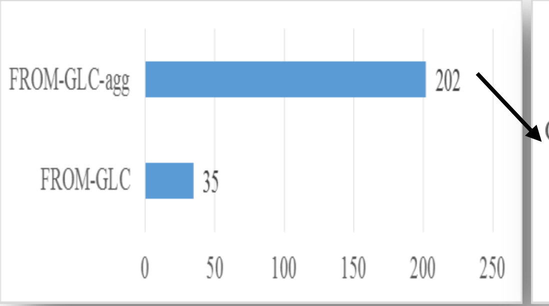
Inventory data from FAOSTAT

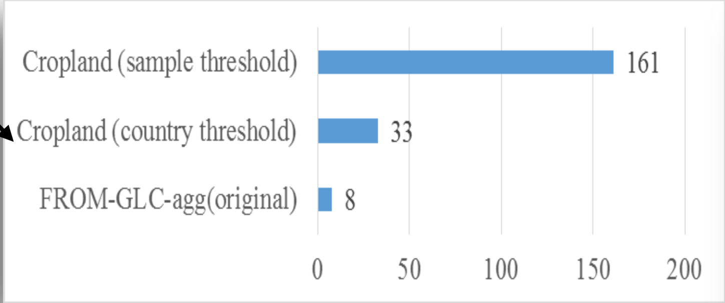
Map composite (smallest cropland area differences to inventory data in per-country level)

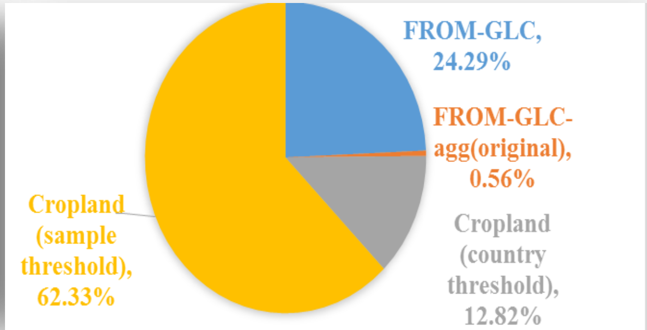
FROM-Global Cropland (GC)

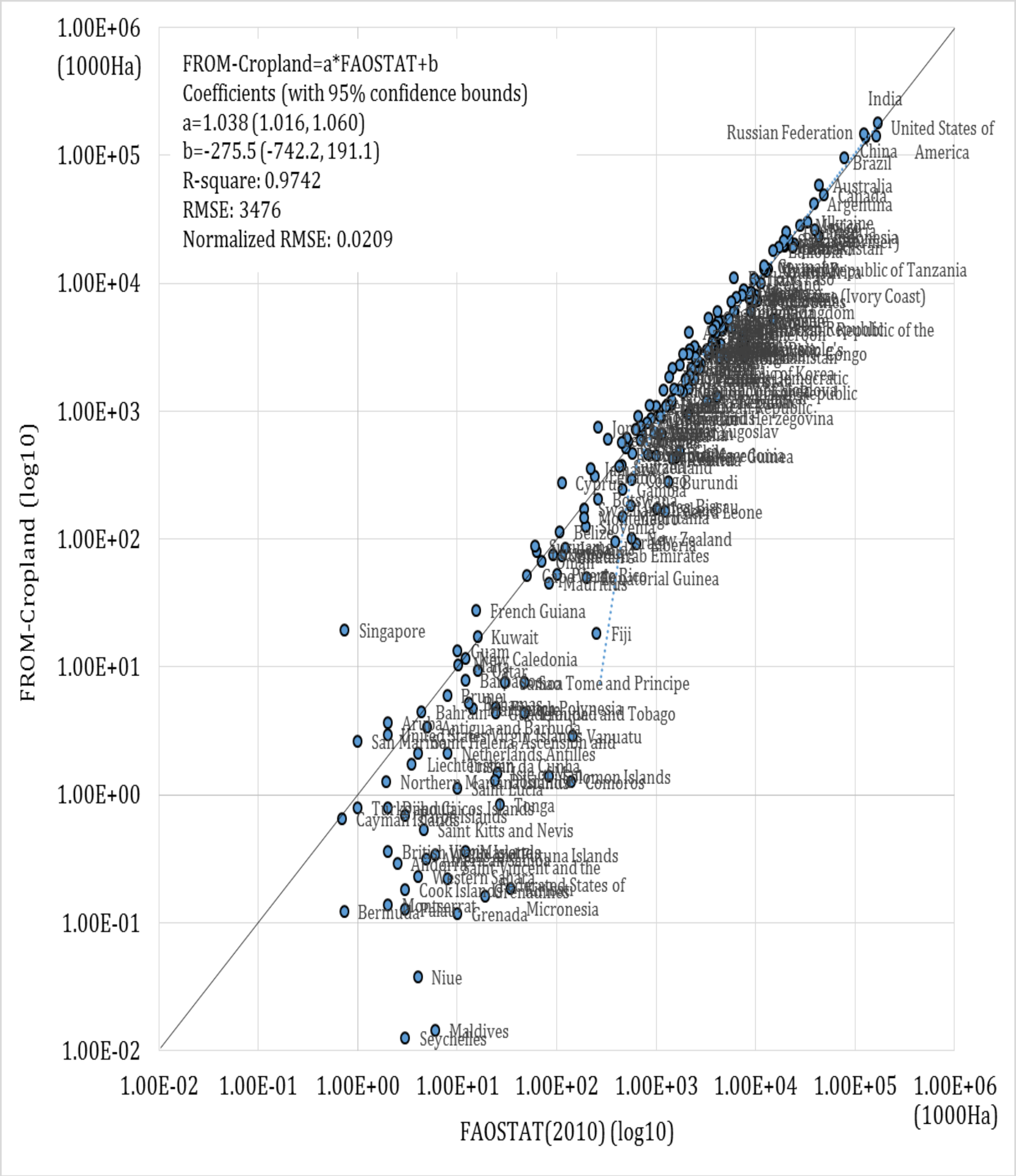

160°W
140°W
120°W
100°W
80°W
60°W
40°W
20°W
0°
20°E
40°E
60°E
80°E
100°E
120°E
140°E
160°E
180°
80°N
60°N
40°N
20°N
0°
20°S
40°S
60°S

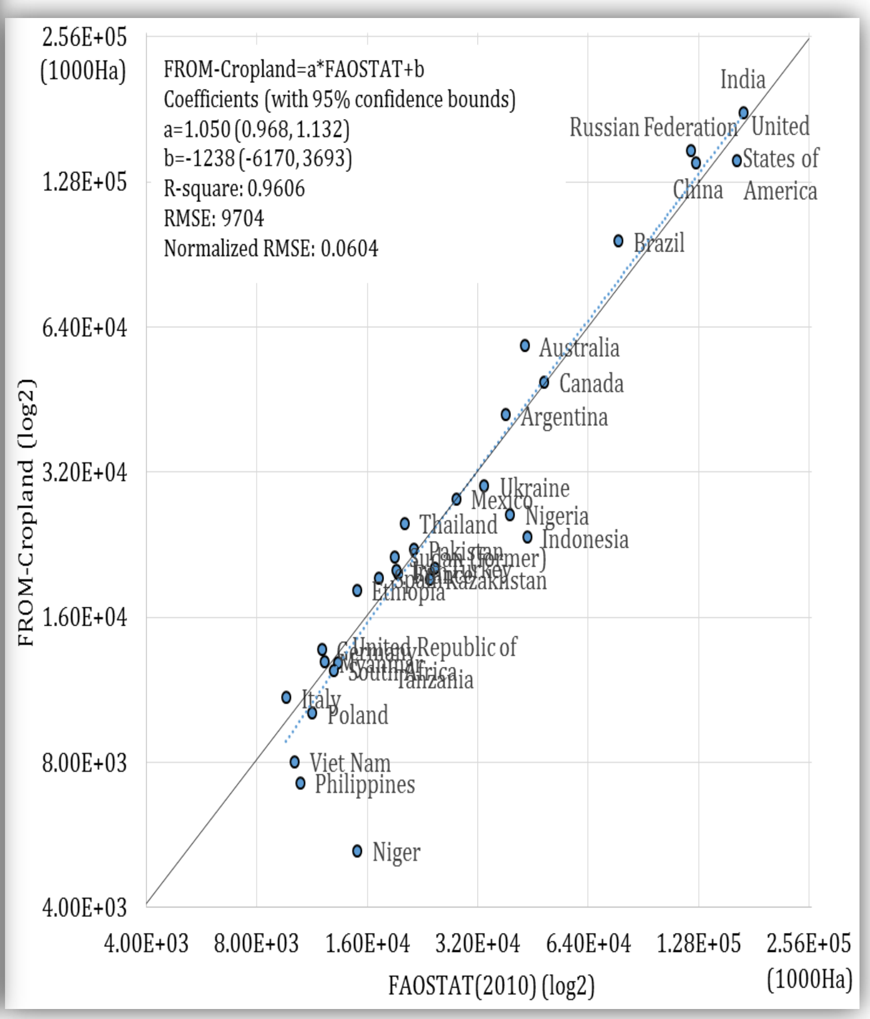
1533.83 million ha (Mha) land is cropland at year 2010, which is 6.95 Mha (0.45%) less than the area reported by FAO for the same year.

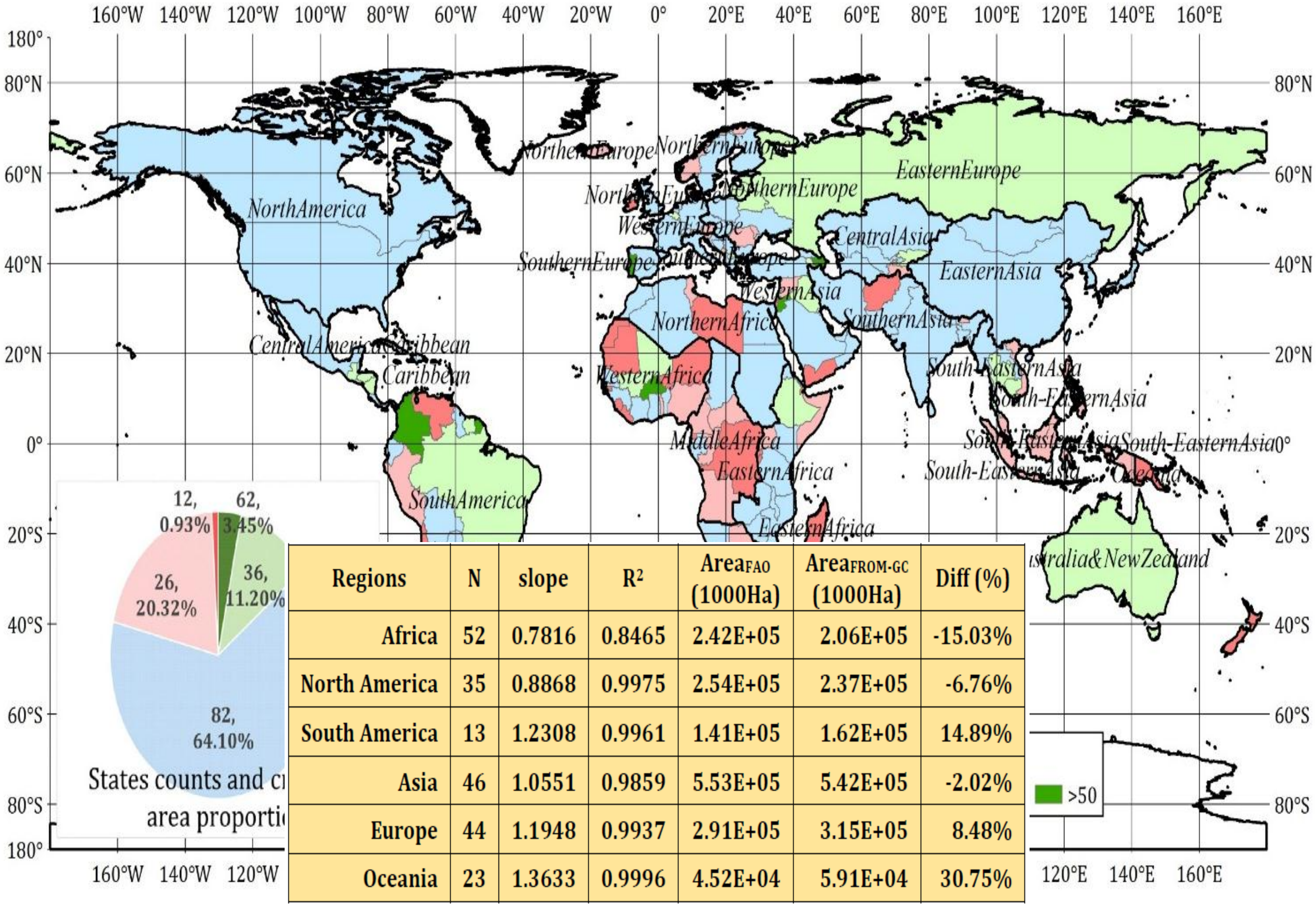







FROM-Cropland=a*FAOSTAT+b
Coefficients (with 95% confidence bounds)
a=1.038 (1.016, 1.060)
b=-275.5 (-742.2, 191.1)
R-square: 0.9742
RMSE: 3476
Normalized RMSE: 0.0209
1.00E+06
(1000Ha)
1.00E+05
1.00E+04
1.00E+03
1.00E+02
1.00E+01
1.00E+00
1.00E-01
1.00E-02
FROM-Cropland (log10)
1.00E-02
1.00E-01
1.00E+00
1.00E+01
1.00E+02
1.00E+03
1.00E+04
1.00E+05
1.00E+06
(1000Ha)
FAOSTAT(2010) (log10)
India
Russian Federation
United States of America
China
Brazil
Australia
Canada
Argentina
Ukraine
United Republic of Tanzania
(Ivory Coast)
Herzegovina
Burundi
Sierra Leone
New Zealand
United Arab Emirates
Equatorial Guinea
Mauritius
French Guiana
Singapore
Kuwait
Fiji
New Caledonia
Sao Tome and Principe
Trinidad and Tobago
Vanuatu
Antigua and Barbuda
Saint Helena Ascension and
Netherlands Antilles
Solomon Islands
Comoros
Saint Lucia
Tonga
Saint Kitts and Nevis
Cayman Islands
Wallis and Futuna Islands
Western Sahara
Micronesia
Grenada
Bermuda
Montserrat
Niue
Maldives
Seychelles

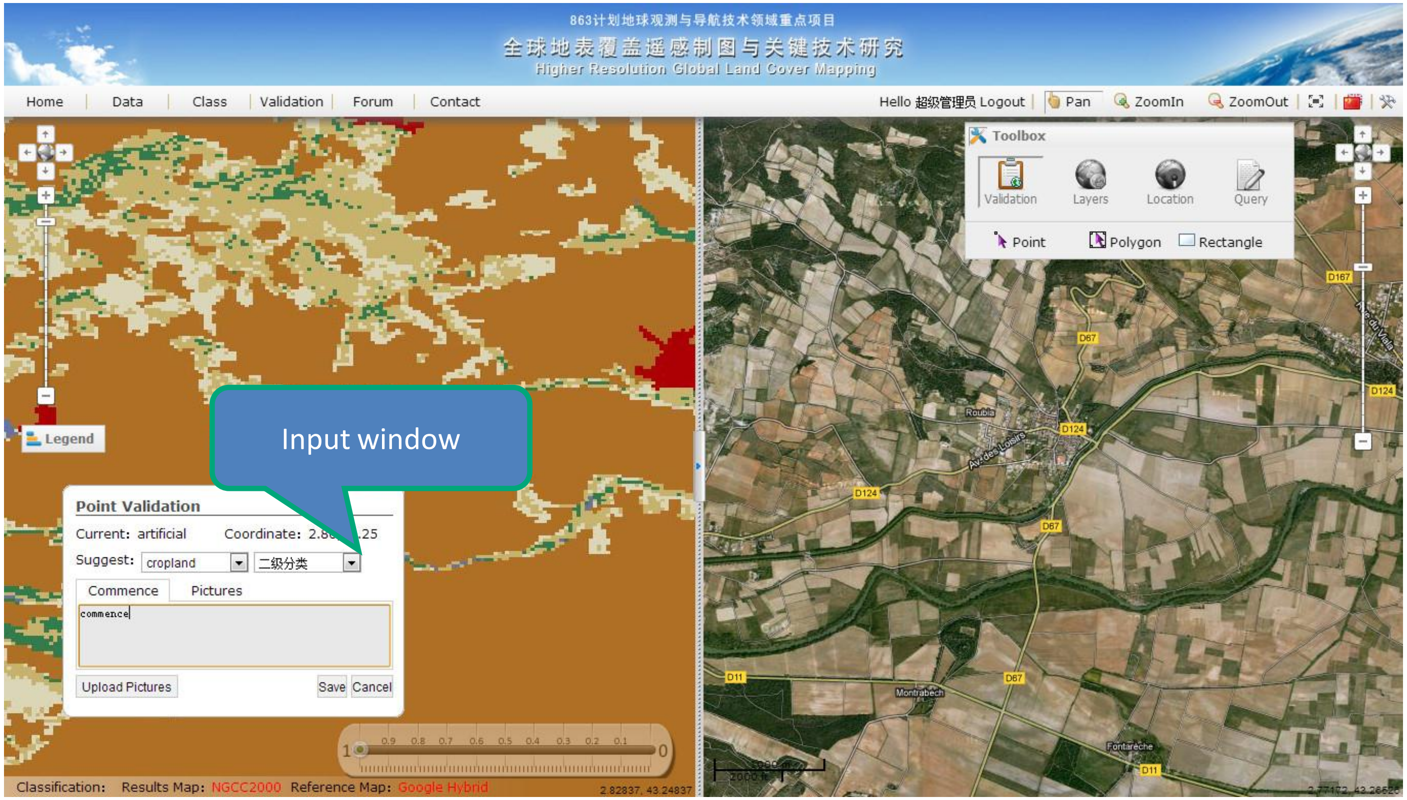

FROM-Cropland=a*FAOSTAT+b
Coefficients (with 95% confidence bounds)
a=1.050 (0.968, 1.132)
b=-1238 (-6170, 3693)
R-square: 0.9606
RMSE: 9704
Normalized RMSE: 0.0604
2.56E+05
(1000Ha)
1.28E+05
6.40E+04
3.20E+04
1.60E+04
8.00E+03
4.00E+03
FROM-Cropland (log2)
4.00E+03
8.00E+03
1.60E+04
3.20E+04
6.40E+04
1.28E+05
2.56E+05
(1000Ha)
FAOSTAT(2010) (log2)
India
Russian Federation
United States of America
China
Brazil
Australia
Canada
Argentina
Ukraine
Mexico
Nigeria
Thailand
Indonesia
Pakistan
Sudan (former)
Turkey
Spain
Kazakhstan
Ethiopia
Germany
United Republic of Tanzania
Myanmar
South Africa
Italy
Poland
Viet Nam
Philippines
Niger


160°W
140°W
120°W
100°W
80°W
60°W
40°W
20°W
0°
20°E
40°E
60°E
80°E
100°E
120°E
140°E
160°E
180°
80°N
60°N
40°N
20°N
0°
20°S
40°S
60°S
80°S
NorthernEurope
NorthernEurope
EasternEurope
NorthernEurope
NorthernEurope
NorthAmerica
WesternEurope
CentralAsia
SouthernEurope
SouthernEurope
EasternAsia
WesternAsia
NorthernAfrica
SouthernAsia
CentralAmericaCaribbean
Caribbean
WesternAfrica
South-EasternAsia
South-EasternAsia
MiddleAfrica
South-EasternAsia
South-EasternAsia
EasternAfrica
South-EasternAsia
Oceania
SouthAmerica
EasternAfrica
Australia&NewZealand
12, 0.93%
62, 3.45%
26, 20.32%
36, 11.20%
82, 64.10%
States counts and c
area proporti
>50

Regions	N	slope	R^2	$Area_{FAO}$ (1000Ha)	$Area_{FROM\text{-}GC}$ (1000Ha)	Diff (%)
Africa	52	0.7816	0.8465	2.42E+05	2.06E+05	-15.03%
North America	35	0.8868	0.9975	2.54E+05	2.37E+05	-6.76%
South America	13	1.2308	0.9961	1.41E+05	1.62E+05	14.89%
Asia	46	1.0551	0.9859	5.53E+05	5.42E+05	-2.02%
Europe	44	1.1948	0.9937	2.91E+05	3.15E+05	8.48%
Oceania	23	1.3633	0.9996	4.52E+04	5.91E+04	30.75%

Finally

Web-based Validation


863计划地球观测与导航技术领域重点项目
全球地表覆盖遥感制图与关键技术研究
Higher Resolution Global Land Cover Mapping
Home
Data
Class
Validation
Forum
Contact
Hello 超级管理员 Logout
Pan
ZoomIn
ZoomOut
Toolbox
Validation
Layers
Location
Query
Point
Polygon
Rectangle
Legend
Upload Pictures
Save
Cancel
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

Input window

Point Validation

Current: artificial

Coordinate: 2.8… …25

Suggest: cropland 二级分类

Commence | Pictures

commence

Classification: Results Map: NGCC2000 Reference Map: Google Hybrid

2.82837, 43.24837

30m Land Cover Data(left) and Google Images(Right)

- Images and mapping results
- Convenient tools for on-line evaluat.
- Post-analysis and modification

Call for Participation to Validation

- More information
  - www.globallandcover.com.cn
- Contact: glc@ngcc.cn
- Future Mtg: April 29-30, 2013, Beijing
  - Presentation of the results of GLC mapping
  - Evaluation of the data products
- Future Mtg: June 25-27, 2013, Nairobi
  - Presentation of the results of GLC mapping
  - Contact: luliang@berkeley.edu

Acknowledgements

- Le Yu, Yuanyuan Zhao, Luanyun Hu, Qinchuan Xin, Nicholas Clinton, Tsinghua University
- Lu Liang, Yanlei Chen, Liheng Zhong, UC Berkeley
- Zhenguo Niu, Jie Wang, Lei Wang, Peng Zhu, Wei Fu, Huabing Huang, Institute of Remote Sensing and Digital Earth, CAS
- Congcong Li, Yue Xu, Xueyan Li, Jin Chen, Beijing Normal University, China
- Fangdi Sun, Nanjing University
- Jun Chen, National Geomatics Center, China
- Zhiliang Zhu, US Geological Survey

🟥 Cropland

🟪 Validation

🟦 Algorithm

🟩 Wetland Change

🟩 Forest

🟥 Settlement

Thank you for your attention!