30–meter Global Land Cover Dataset

GlobeLand30

Product Description

30-meter Global Land Cover Dataset
(GlobeLand30)
Product Description

National Geomatics Center of China
May, 2014

Catalogue

1.Introduction

Land cover refers to the synthesis of various material types as well as their natural attributes and features on the earth's surface. Its spatial distribution reflects the process of socio-economic activities of human beings, and determines the hydrothermal and mass balance on the surface, which directly changes the biogeochemistry cycle, land-atmosphere moisture, energy and carbon cycle, and even climatic change. Scientifically accurate measurement of spatial distribution and dynamic change of global land cover is of great significance to the research on global change.

In order to support the research on global change and the development of earth system modes effectively, the Ministry of Science and Technology of China has launched the National High Technology Research and Development Program of China (863 Program) named "remote sensing mapping and research on key technologies of global land cover" in 2010. As one outcome of the project, GlobeLand30-2010, mapping product of global land cover at 30-meter spatial resolution derived from remote sensing images in 2010 is produced.

The dataset covers land area from 80° N to 80° S, consists of 10 land cover types, namely cultivated land, forest, grassland, shrubland, wetland, water bodies, tundra, artificial surfaces, bareland, permanent snow and ice.

This manual is a simplified introduction to GlobeLand30-2010 Product, including details about data resources used for classification, classification scheme and workflow, data organization and accuracy assessment etc. The manual aims to provide a reference for scholars and potential users for using the Globeland30-2010 product.

2.Data Resources

2.1 Image Data

The classification images used for data generation of

GlobeLand30–2010 are mainly 30m multispectral images, including Landsat TM and ETM+ multispectral images and multispectral images of Chinese Environmental Disaster Alleviation Satellite (HJ–1). Cloudless images acquired over vegetation growing seasons within ± 1 year from 2010 were selected. In case the area missing suitable images, the time frame is extended.

2.1.1 Landsat TM/ETM+ Images

All Landsat TM and ETM+ images are downloaded from USGS (http://landsat.usgs.gov/) at Level 1T. Geometric and radiometric corrections were applied to the Landsat images, which were then registered to the WGS–84 coordinate system and UTM projection. 9907 scenes of Landsat TM and ETM+ images were downloaded from USGS, about 80% of them were acquired within the time frame from 2009 to 2011 (Table 1). Figure 1 shows seasonal distribution of the 9907 images.

Table1 Acquisition Time Statistics of Landsat Image

Year	2009年	2010年	2011年	Others
Proportion	30.59%	41.06%	9.14%	19.21%

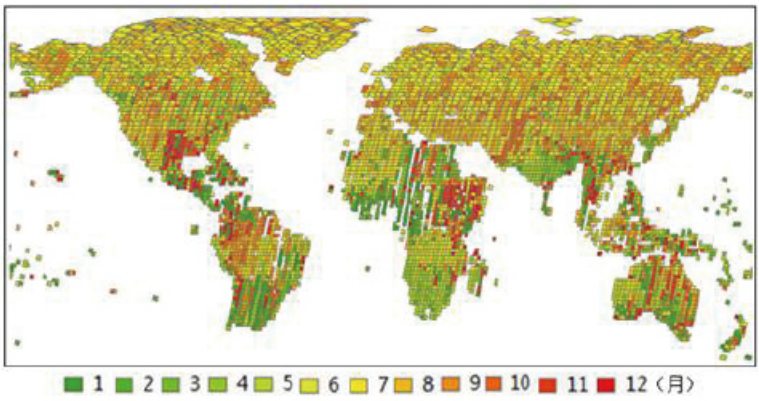

Figure 1 the Seasonal Acquisition of Landsat TM and ETM+ Images

The preprocessing of Landsat TM and ETM+ images includes atmospheric and topographic correction. The atmospheric correction employed the updated version of Fast Line-of-Sight Atmospheric Analysis of Spectral Hypercube (FLAASH) algorithm, while topographic correction used Smoothed COS method (SCOS).

Due to the heavy cloud in the equator and north polar areas, Landsat7 ETM+SLC-off images were used to make a supplement. Neighborhood Similar Pixel Interpolator (NSPI) was applied to interpolate 1354 scenes of ETM+SLC-off images to fill the data gap of these areas (Figure 2).

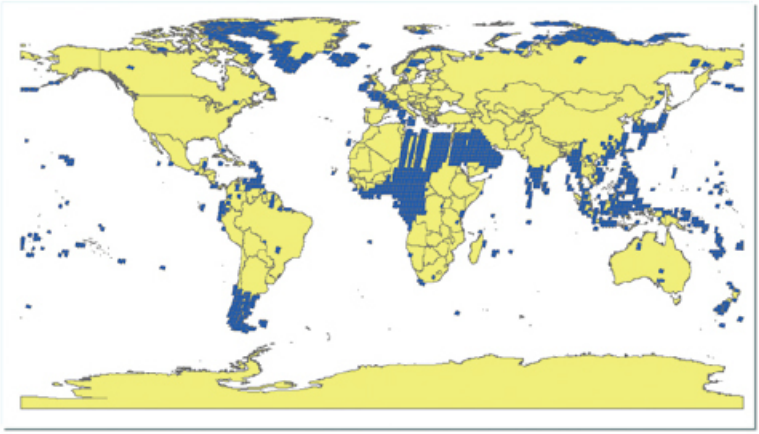

Figure 2 Coverage Area of ETM+SLC-off Images of GlobeLand30-2010

2.1.2 HJ-1 Satellite Images

HJ-1 is a Chinese remote sensing satellite, aiming at environmental monitoring and disaster prevention and reduction. HJ-1A Satellite carries multispectral camera (CCD) and hyper spectral imager (HSI). HJ-1B satellite is loaded

with multispectral camera (CCD) and infrared multispectral imager (IRS) (http://www.cresda.com/).

1465 scenes of multispectral images of HJ-1 were used to derive land cover information, covering 60% of the total land area of the globe (Figure 3), with the acquisition time ranging from September 2008 to December 2011.

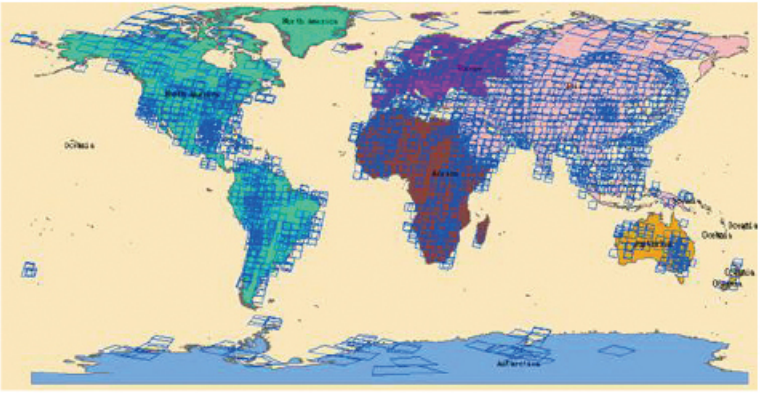

Figure 3 Coverage Area of HJ-1 Satellite Images of GlobeLand30-2010

2.2 Auxiliary Data

Ancillary datasets and reference materials were used to support sample selection, classifier training and accuracy assessment (Table 2).

Table 2 the usage and websites of different data types

Code	Auxiliary Data Type	Linkage	Usage
1	Reference Data		Extract the sample data, check the classification results.
1.1	Existing land cover data		
1.1.1	National Land Use Dataset of America (NLCD):	http://www.epa.gov/mrlc	

Code	Auxiliary Data Type	Linkage	Usage
1.1.2	1:250 000 Land Cover Data of Canada (Land cover, Circa2000)	http://www.geobase.ca	
1.1.3	Land Cover Data of Europe (CORINE Land Cover2000)	http://www.eea.europa.eu	
1.1.4	Land Cover Data of Australia (National Dynamic Land Cover Dataset, DLCD)	http://www.ga.gov.au/	
1.2	Thematic Data		
1.2.1	Global Lakes and Wetlands Database (GLWD)	http://worldwildlife.org/	
1.2.2	Wetland directory data	http://ramsar.wetlands.org	
1.3	Global fundamental geospatial data		
2	MODIS NDVI data	https://lpdaac.usgs.gov/	Extract forest, shrubland, grassland,bareland.
3	Global DEM data		Extract auxiliary information from water bodies and wetlands.
4	Global eco-geography classified region data	http://www.worldwildlife.org	Extract technical scheme from forest, shrubland, grassland,bareland.

2.3 Positional Accuracy

According to the introduction of technical documents on Landsat website, the geometric corrected plane root mean square (hereinafter referred to as "RMS") error of TM/ETM+ images of Level 1T are ±75 meters. The plane geometry

accuracy tests for all TM/ETM+ images by selecting obvious object points, with the help of Google Earth and orthophoto images at 1m resolution are conducted before land cover classification. 171 scenes of all the Landsat images fail to meet the accuracy requirement in the test, thus correcting process is conducted again with all the images so as to guarantee that the edge join error of all Landsat images is within 1 pixel.

Global ETM+ embedded product (GeoCover2000) is used in HJ–1 image as a controlled source for geometry rectification. The overlapping RMS error between the rectification images and Landsat images is less than 1.5 pixels (45m).

The overall positional accuracy is ±75 meters, with the worst positional accuracy better than 90 meters.

3.Classification Scheme

The classification system includes ten land cover types, namely cultivated land, forest, grassland, shrubland, wetland, water bodies, tundra, artificial surfaces, bareland, permanent snow and ice. Please refer to Table 3 for the illustration of each type:

Table 3 Classification of GlobeLand30

Code	Type	Content
10	Cultivated land	Lands used for agriculture, horticulture and gardens, including paddy fields, irrigated and dry farmland, vegetation and fruit gardens, etc.
20	Forest	Lands covered with trees, with vegetation cover over 30%, including deciduous and coniferous forests, and sparse woodland with cover 10 – 30%, etc.
30	Grassland	Lands covered by natural grass with cover over 10%, etc.
40	Shrubland	Lands covered with shrubs with cover over 30%, including deciduous and evergreen shrubs, and desert steppe with cover over 10%, etc.

Code	Type	Content
50	Wetland	Lands covered with wetland plants and water bodies, including inland marsh, lake marsh, river floodplain wetland, forest/shrub wetland, peat bogs, mangrove and salt marsh, etc.
60	Water bodies	Water bodies in the land area, including river, lake, reservoir, fish pond, etc.
70	Tundra	Lands covered by lichen, moss, hardy perennial herb and shrubs in the polar regions, including shrub tundra, herbaceous tundra, wet tundra and barren tundra, etc.
80	Artificial Surfaces	Lands modified by human activities, including all kinds of habitation, industrial and mining area, transportation facilities, and interior urban green zones and water bodies, etc.
90	Bareland	Lands with vegetation cover lower than 10%, including desert, sandy fields, Gobi, bare rocks, saline and alkaline lands, etc.
100	Permanent snow and ice	Lands covered by permanent snow, glacier and icecap.

4.Classification Workflow

4.1 Minimum Mapping Unit

The minimum mapping unit (hereinafter referred to as "MMU") refers to the smallest patch used for quality control. Area patch larger than the size of the MMU should go through quality control process. As for the linear features such as rivers, the minimum width is adopted for control. The MMU varies from type to type, which is determined by the following factors:

- Spatial distribution of the surface features (size, density, etc.);
- Scale characteristics of the type of features;
- Workload of the human-computer interactive editing and checking;
- Minimum accuracy requirement for classification of the

features.

4.2 Representational Accuracy

The lowest classification accuracy refers to the minimal accuracy guaranteed by land covers. The classification accuracy of each type is determined by the scale requirement and difficulty of classification.

Please refer to Table 4 for the classification accuracy and quality control of the MMU for each land cover type.

Table 4 the Lowest Classification Accuracy and MMU of GlobeLand30–2010

Serial Number	Type	Minimum Spot of Quality Constraint (Width)
1	Cultivated land	6*6 pixels
2	Forest	8*8 pixels
3	Shrub land	10*10 pixels
4	Grassland	10*10 pixels70%
5	Wetland	9*9 pixels
6	Water bodies	Planar water: 3*3 pixels; linear water: 3–pixel width
7	Tundra	To implement according to the MMU of quality constraint for meadow, wetland, bare land and bushwood.
8	Artificial Surfaces	Rural–urban fringe zone: 8*8 pixels; scattered cluster artificial cover: 4*4 pixels; roads and residential area distributed along the roads: 5–pixel width
9	Bareland	6*6 pixels
10	Perennial snow or ice	3*3 pixels

4.3 Hierarchical Classification Workflow

The GlobeLand30–2010 product was derived using a

hierarchical extraction method. Each land cover type was classified one by one, with the constraints of the mask of other land cover types. The workflow is to extract only one land cover type at a time, and then mask the class after the extraction. The classification is carried out for the next land cover type, and then mask, until all classes were derived.

The order of land cover type extraction is as the following:

1) Water bodies
2) Wetland
3) Artificial surfaces
4) Cultivated land
5) Permanent snow and ice
6) Bareland, forest, shrubland and grassland
7) Tundra

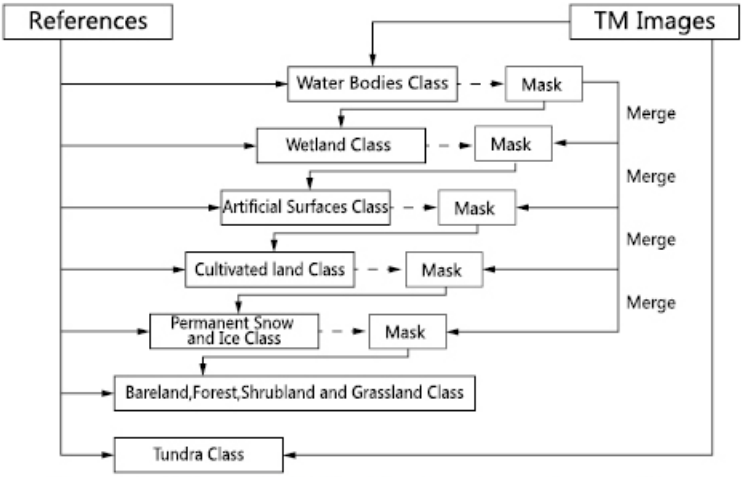

Figure 4 Hierarchical Classification Strategies per Type

4.4 Single–factor Classification Method

All single–factor land cover types adopt the method based on "Pixel–Object–Knowledge" (POK). This method includes

three steps, namely pixel classification, object filter and human–computer interactive check and verification, in order to exploit the advantages of each classification algorithm to the full, and make full use of various knowledge and human experience to enhance the classification quality.

(1) Pixel Classification

According to the characteristics of the spectrum, texture and other features of each land cover, this step selects the pixel classification algorithm, which can realize the extraction of relatively high accuracy. Through analyzing the difficulty in type extraction, optimizing the process of classification technology, controlling the quality of the training sample, the classification accuracy of pixel method is enhanced.

The classification methods for the pixel method include MLC, SVM, threshold value method and its improved method, etc. Selection is implemented after images and reference materials, algorithm effectiveness, classification efficiency and other factors being taken into overall consideration.

The classification result of the pixel method contains a large volume of small pixels as well as incomplete and discontinuous units.

(2) Object Filter

This step carries out object segmentation of multiple scale to each scene of multispectral images, and the segmentation scales include 10, 20, 30, 50, 100 pixels, etc. According to the spatial geometry shape and size of land cover types in each scene of images to be classified, select the segmented object with appropriate size and filter the classification result of the pixel method.

The filter adopts the threshold value method and counts the

pixel number ratio of segmented object. If he classification object exceeds threshold value (generally, 60% to 70%), then the unit will be selected; otherwise filtered.

Through object filter, the salt and pepper phenomenon of the pixel classification method can be eliminated. Meanwhile, the mapping unit of classification result is consistent with the shape of actual land cover. However, the phenomenon of certain mapping unit error and negligence exists, which requires human–computer interactive check and verification.

(3) Human–computer Interactive Check and Verification

Based on the developed integrated service platform of multisource reference materials, this step adopts the way of human–computer interaction to check the classification result of object filter, eliminating error mapping units and supplements neglected mapping units. Main contents of check and verification include: edit error and neglected mapping units by making use of the vector results of multiple scales rather than drawing the outline of mapping units; determine the key checking area rapidly by making use of the distribution knowledge and rules of the land cover; enhance the pertinence of artificial check through calculating mapping units with quality problems by dint of reference materials. For example, wetlands are distributed in areas with the gradient of less than 3° generally, any mapping unit with the gradient of larger than 3° can be screened by making use of this rule, so as to check and verify with emphasis.

5.The GlobeLand30 Product

5.1 Coordinate System

GlobeLand30–2010 dataset adopts the following reference coordinate system.

- Coordinate System: WGS84

- Reference Ellipsoid: WGS84 Ellipsoid
- Projection: UTM Projection
- Zoning: 6° Zoning

5.2 Data Tiles

GlobeLand30–2010 product is organized in tiles:

- 60° N – 60° S: 5° (latitude)*6° (longitude);
- 60 – 80° N and 60 – 80° S: 5° (latitude)*12° (longitude).

The number of map tiles in GlobeLand30–2010 is 853 (Figure 5). The range of one map tile is a rectangular area, 7500 meters (250pixels) extending from the minimum bounding rectangle made up of 4 angular points of defined map tile.

Figure 5 GlobeLand30–2010 Product Tiled Diagram

5.3 Data Composition and Format

5.3.1 Contents of Data Package

GlobeLand30–2010 data tile consists of five parts, namely classification result file, coordinate information file, index map file of classification images, metadata file and illustrative file. Among them:

—— Classification result file: refers to the file storing the classification information of land covers.

—— Coordinate information file: refers to the file recording the coordinate information of classification result data.

—— Index map file of classification images: refers to the vector layer file recording the range and acquisition time of each scene of classification images.

—— Metadata file: refers to the file recording the metadata information of classification result;

—— Illustrative file: refers to the file describing the classification result data and explaining the data copyright.

5.3.2 Classification Data Format

The raster data format is adopted for the storage of the earth's land cover classification data, with the non-destructive GeoTIFF compression format and the 256 indexed color pattern of the 8 Bit. The pixel value of the raster images represents certain type of the earth's land coverage; see Table 3 for the specific corresponding relationship between the pixel values and the types.

5.3.3 The coordinate information file format

TIFF WORD format is adopted for the storage of the coordinate information. The specific format sample is as follows:

N35_30_2000LC030. tfw the file name

30. 000000000000000

0.0

0.0

-30. 000000000000000

203088.91200000001 The east direction coordinate of the upper left of the image, not any projection zone No. is added.

3884658.3599999999 The north direction coordinate on the upper left of the image

5.3.4 The document of classification of images connected with chart

SHP format is adopted for the classification of images connected with chart (Shape file format), including the layer of the classification images connected with chart and the subdivision range layer; see Table 5 for its attribute table structure.

Table 5 the file data model of classification of images connected with chart

Layer Type	Geometric Type	Layer Identification	Attribute Items	Data Type
Images Connected with Chart	Plane	TM /ETMScene	Sensor	Integer
			Resolution	Integer
			Path/Row	Hollerith type
			Date	Date type
Subdivision Range	Plane	MapSheetRange	MapSheetName	Hollerith typeThe length of 16

5.3.5 Metadata file

XML format is adopted for metadata file; see the Appendix for the attribute items included.

5.3.6 Documentation

PDF format is adopted for the storage of the documentation.

5.4 File Designation and Organization

5.4.1 The Rules for the Subdivision

The rules for the data of GlobeLand30–2010 subdivision naming are as follows:

The abbreviation of north or south latitude (1 bit) +6° zone Number (2 bits)+"_"+ the initial latitude (2 bits)+ "_"+ the age of the products (4 bits) + LC (the abbreviation of land cover)+ the resolution (3 bits) + Among them, North latitude is abbreviated to "N", South latitude is abbreviated to "S";

6° zone Number: the zone number value of the 6° zone where the figure is located. For the image crossing two 6°

subdivision zones, its central longitude shall be put as the central longitude of the base 6° zone, and the number shall be put as the base zone number.

Starting latitude: put the latitude value of the edge line at the lower left corner of the figure in the northern hemisphere, and put the latitude value of the edge line at the top right corner of the figure in the southern hemisphere, as shown in the figure.

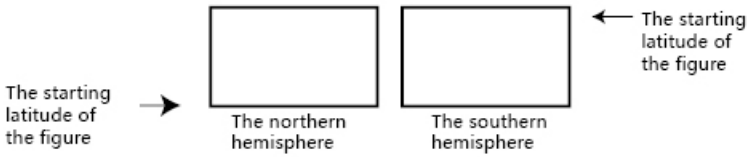

Figure 6 the Schematic Diagram for Image Subdivision's Starting Latitudes in Northern Hemisphere and Southern Hemisphere

Year of product: refers to the year of the earth's surface products, for example 2000, 2010, etc.

Resolution: it is only accurate to the whole number of 1 meter, for numbers less than 3 bits, 0 shall be added to the front, like 30 Meter shall be indicated by 030.

For example: Image of N19_25_2000LC030 means the 30–meter land cover data in the rectangle area between 25° and 30° north latitude in zone 19 of north hemisphere (range of 108° – 114° east longitude) in the year of 2000.

5.4.2 Data Organization

GlobeLand30–2010 data subdivision products are stored according to a separate directory, whose catalogue is named by the subdivision name. All the documents stored in the directory include the classification results document, the coordinate information document, the basic classification images connected with chart document, the metadata file and the descriptive

documents etc.

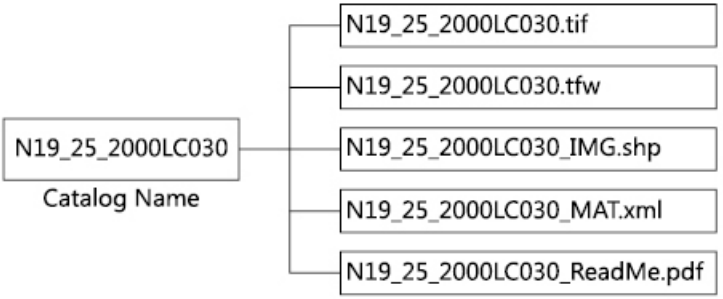

Figure 7 the Data Organization Example of GlobeLand30

In order to facilitate the data copying and downloading, the subdivision data are compressed, forming a zipped file, the name of which is the same as the catalogue.

6.Accuracy

In order to objectively evaluate the classification accuracy of GlobeLand30–2010, units such as Tongji University in Shanghai, Chinese Academy of Science, Chinese Academy of Agricultural Science and Chinese Academy of Forestry etc., are invited to conduct a third party accuracy evaluation.

6.1 Sampling Scheme

For accuracy assessment, a two–level sampling scheme was adopted. The first level is the frame sampling, with map tiles taken as the sampling unit. The second level is the feature sampling, with a selected pixel in the tile as the sampling unit. Through calculating the sample size of each sample unit and reasonably distributing samples with regard to spatial variability, a considerable quantity of samples are used to test the accuracy of land cover classification.

During the first–level sampling, the quantity of sample tiles to be selected is calculated according to the assessment model.

The quality evaluation of each selected tile is conducted through the second-level sample model. In the second-level sampling, the quality status is judged by calculating the sample quantity of each class ni (i = 1, 2, 3···10), testing each unit, getting the statistic results and calculating the confusion matrix and the perimeters of each class.

6.2 Accuracy Assessment

According to the map tiles and map area of each continent, eighty tiles, which are calculated according to the sampling formula, were selected from the total 853 tiles for accuracy assessment. The map quantity of each continent is assigned according to the proportion of the land area in each continent, among which, Asia has 26 tiles, Europe 6, Africa 18, America 25 and Oceania 5.

The second-level sampling of the features based on the 80 map samples in the first level is conducted, and the sampling results of the features of each subdivision by processing each map unit are gained. The reference materials mainly include Google Earth high resolution images, TM images, DCP (Degree Confluence Project) verified points, online authentic landscape photos, etc. Sampling points are independently judged by three groups of technical staff. After analyzing and comparing with the reference materials, every sampling point is judged and marked by "completely right", "completely wrong" or "uncertain".

All in all, nine types and over 150,000 test samples are evaluated in terms of accuracy. The overall accuracy of GlobeLand30-2010 reaches 83.51%. The Kappa indicator is 0.78. The accuracy of each type is as the following (Tundra is not included).

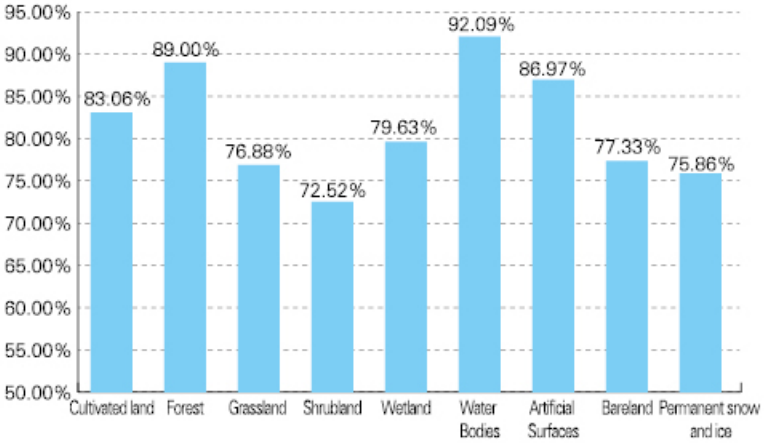

Figure 8 Accuracy of Each type in GlobeLand30–2010

Confusion Matrix of accuracy can be seen in Table 6.

Table 6 Confusion Matrix of Accuracy Evaluation in GlobeLand30–2010

		Classified Type									
		Cultivated Land	Forest	Grass land	Shrub land	Wet land	Water Bodies	Artificial Surfaces	Bare land	Permanent Snow & Ice	Actual Sum
Actual Type	Cultivated Land	28016	1333	1346	624	125	75	143	415	2	32079
	Forest	2373	52538	3202	993	769	46	135	223	41	60320
	Grass land	1593	2176	21241	890	216	54	92	546	57	26865
	Shrub land	542	821	512	7404	29	11	15	234	7	9575
	Wet land	136	1175	393	68	5082	229	7	85	1	7176
	Water Bodies	189	503	186	27	138	5329	13	48	5	6438
	Artificial Surfaces	699	296	265	103	15	29	2756	94	12	4269
	Bareland	181	188	472	101	8	14	8	5657	72	6701
	Permanent snow & ice	0	4	11	0	0	0	0	13	619	647
	Classified Sum	33729	59034	27628	10210	6382	5787	3169	7315	816	154070

Note: The accuracy assessment of the tundra type is not conducted.

7. Acknowledgement

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Please visit http: //glc30.tianditu.com for the detailed information of the products. If you want to know further about the technical problems, please contact Professor Chen Lijun. His contact information is as follows:

Lijun Chen Ph.D

National Geomatics Center of China (NGCC)

Address: 28 lianhuachi West Road, Beijing, 100830, China

Tel: +86–10–63880216

Cellphone: +86–13641011589

E–Mail: chenlj@nsdi.gov.cn

Appendix: Metadata

Table 7 the Metadata of the Global Land Cover Data Products

Serial Number	Content	Metadata Item Name in English	Name in Chinese	Data Type	Length	Filling Requirements	Sample for Filling
1	MapSheet Information	ProductName	Product Name	Hollerith type	60	It can not be empty.	GlobeLand30
2		MapSheetName	The name of picture	Hollerith type	16	It can not be empty.	N19_15_2000LC030
3		ReferenceCoordinate	The reference coordinate system	Hollerith type	5	Fill out the reference coordinate system used by the products	WGS84
4		System	Elevation system	Hollerith type	5	Fill out the elevation system used by the products	EGM96
5		ElevationSystem	The map projection	Hollerith type	3	Fill out the used projection	UTM
6		MapProjection	The longitude range of the pictures	Hollerith type	16	The degree, minute and second format, the degree has 3 bits, the minute 2 bits, and the second 2 bits. "E" and "W" are used to distinguish East longitude from West longitude in the previous, for the picture without a complete longitude range, fill out the actual longitude range. 2 longitudes are separated with "–" between them.	W0720000–0680000
7		LongitudeRange	The latitude range of the pictures	Hollerith type	14	The degree, minute and second format, the degree has 2 bits, the minute 2 bits, and the second 2 bits. "N" and "S" are used to distinguish North Latitude from South Latitude in the previous, for the picture without a complete latitude range, fill out the actual latitude range. 2 latitudes are separated with "–" between them.	N150000–200000
8		LatitudeRange	Zone No. of the6° Subdivision Zone	Integer	2	Fill out the Zone No. of 6° subdivision zone where the picture is located	11

Table 7 the Metadata of the Global Land Cover Data Products

Serial Number	Content	Metadata Item Name in English	Name in Chinese	Data Type	Length	Filling Requirements	Sample for Filling
9		6° ZoneNumber	The central longitude	Hollerith type	4	"W" and "E"are used to distinguish west longitude and east longitude, the degree is shown by 3 bits.	111W
10		CentralMeridian	The coordinate unit	Hollerith type	5	The unit used by the product coordinate	meter
11		X coordinate Constant	The additive constant of X coordinate	Hollerith type	14	Fill out the additive constant of the abscissa	500000 Meters
12	Product Information	Year	The year of the products	The numerical type	4	When filling out the period of the land cover data products, just the year is needed to be filled in, such as 2000 or 2010.	2010
13		SpatialResolution	The resolution of data	The numerical type	3	As for the resolution of the global land cover products, fill out 30 or 250.	30
14		LandCoverImageFormat	The imagery format of land cover	Hollerith type	7	The file format used for the products	GeoTiff
15		LandCoverImageMode	land Cover Image Mode	Hollerith type	10	The image storage mode of the land cover product document	IndexColor
16		format of Coordinate File	Format of coordinate information file	Hollerith type		Fill out the format of the coordinate information file	TFW
17		SouthWestAbs	The coordinates of X pointat the southwest corner of picture	The numerical type	12.2		4300478.85
18		SouthWestOrd	The coordinates of Y point at the southwest corner of the picture	The numerical type	12.2		413169.74

Table 7 the Metadata of the Global Land Cover Data Products

Serial Number	Content	Metadata Item Name in English	Name in Chinese	Data Type	Length	Filling Requirements	Sample for Filling
19		SouthWestAbs	The coordinates of X point at the northwest corner of the picture	The numerical type	12.2		4318981.77
20		NorthWestOrd	The coordinates of Y point at the northwest corner of the picture	The numerical type	12.2		413372.63
21		NorthEastAbs	The coordinates of X point at the northeast corner of the picture	The numerical type	12.2		4318773.61
22		NorthEastOrd	The coordinates of Y point at the northeast corner of the picture	The numerical type	12.2		4318773.61
23		SouthEastAbs	The coordinates of X point at the southeast corner of the picture	The numerical type	12.2		4300270.95
24		SouthEastOrd	The coordinates of Y point at the southeast corner of the picture	The numerical type	12.2		434877.62
25		ImageSource	The classification imagery	Hollerith type	50	Fill out the data about the main imagery used in the classification, for example including TM, ETM, HJ-1, HJ-1 etc. Fill out according to the actual imagery situation used in each period of the LC classification.	TM

Table 7 the Metadata of the Global Land Cover Data Products

Serial Number	Content	Metadata Item Name in English	Name in Chinese	Data Type	Length	Filling Requirements	Sample for Filling
26		ImageSourceInfomationFile Format	Data source	Hollerith type	3	Cutting the imagery into subdivisions to get them connected with the vector formats of the picture	SHP
27		FirstClassNumber	The information file format of data source	The numerical type	2	Fill out the quantity of the first class of the classification system	10
28		FirstClassList andValue	The name and value of the first class type	Hollerith type	200	Fill out the names and values of the first class in English	Croplands:10; Forests:20; Grasslands:30; Shrublands:40; Wetland:50; Water bodies:60; Tundra:70; Imperviousarea:80; Barren Land:90; Permanent snow/ ice:100
29	Production And CopyrightInfor mation	Producer	Product development Unit	Hollerith type	40	Fill out the names of the bureau level when involving Provincial Bureau level, the company should fill out the center.	Shaanxi Administration of Surveying, Mapping and Geoinformation
30		ProduceDate	Product development Time	Date type	4	Fill out the final time when the formal results formed (to the year only)	2012

Table 7 the Metadata of the Global Land Cover Data Products

Serial Number	Content	Metadata Item Name in English	Name in Chinese	Data Type	Length	Filling Requirements	Sample for Filling
31		Copyright owners	The copyright owner	Hollerith type	40		National Administration of Surveying Mapping and Geoinforamtion
32		Distributor	The distributor	Hollerith type	50		National Geomatics Center of China
33		Address	Address	Hollerith type	50		28 Lianhuachixi Road,Haidian, Beijing, China
34		Post Code	Post Code	Hollerith type	6		100830
35		Tel	Telephone Number	Hollerith type	13		0086-63880127
36		Fax	Fax	Hollerith type	13		0086-63880217
37		WebSite	Website	Hollerith type	40		www.globallandcover.com
38		Email	Email	Hollerith type	20		glc@ngcc.cn


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