Supplementary Material

Consistency Analysis and Accuracy Assessment of Three Global 30-m Land-Cover Products Over the European Union Using the LUCAS Dataset

Yuan Gao [1,2], Liangyun Liu [1,*], Xiao Zhang [1], Xidong Chen [1,3], Jun Mi[1,3], and Shuai Xie [1,3]

[1] Key Laboratory of Digital Earth Science, Aerospace Information Research Institute, Chinese Academy of Sciences, Beijing 100094, China; 18210013010@stu.xust.edu.cn (Y.G.); liuly@radi.ac.cn (L.L.); zhangxiao@radi.ac.cn (X.Z.); chenxd@radi.ac.cn (X.C.); mijun19@mails.ucas.ac.cn (J.M.); xieshuai@radi.ac.cn (S.X.)

[2] College of Geomatics, Xi'an University of Science and Technology, Xi'an 710054, China

[3] University of Chinese Academy of Sciences, Beijing 100049, China

* Correspondence: Corresponding author: liuly@radi.ac.cn; Tel.: + 86-10-8217-8163

Part A: the calculation of the similarity of each land- cover types between GLC_FCS30 and the target legends

Based on the works of Mozak [46], we calculated the similarity of each land- cover types by four steps:

Step 1: translation of the nomenclatures of each land- cover types into EAGLE model. Specifically, the land- cover types were mapped to the land cover components (LCC) of EAGLE model singly according to a certain coding rules. Among them, the LCC and the coding rules was derived from Arnold [42] and the translation results were shown in Table S1-S2.

Table S1. EAGLE matrix of the target legends.

target legends / Land cover components (LCC)	Cropland	Forest	Grassland	Shrubland	Wetland	Water	Inpervious Surface	Bareland	Permanent snow/ice
Permanent Snow	xx	xx	xx	xx	xx	xx	xx	0	3
Ice and Glaciers	xx	xx	xx	xx	xx	xx	xx	0	3
Inland Water	1	xx	xx	xx	2	3	xx	xx	x
Coastal Water	xx	xx	xx	xx	2	3	xx	xx	x
Open Sea	xx	xx	xx	xx	2	3	xx	xx	x
Everngreen Broadleaved Trees	1	3	1	1	1	0	0	1	xx
Deciduous Broadleaved Trees	1	3	1	1	1	0	0	1	xx
EverngreenConiferous Trees	1	3	1	1	1	0	0	1	xx
DeciduousConiferous Trees	1	3	1	1	1	0	0	1	xx
Regular Shrubs	1	1	1	3	1	0	0	1	xx

Dwarf Shrubs	**1**	**1**	**1**	**3**	**1**	**0**	**0**	**1**	**xx**
Regular Graminaceous	**2**	**1**	**3**	**1**	**0**	**0**	**0**	**1**	**xx**
Reeds (high growth)	**2**	**1**	**1**	**0**	**3**	**0**	**0**	**1**	**xx**
Non-Graminaceous (forbs, ferns)	**2**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**xx**
Succulents and Others	**x**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**xx**
Lichens	**x**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**xx**
Mosses	**x**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**xx**
Consolidated Surface	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**0**	**2**	**xx**
sand, grit	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**0**	**2**	**xx**
clay, silt	**xx**	**xx**	**xx**	**xx**	**1**	**x**	**0**	**2**	**xx**
pebbles, gravel	**xx**	**xx**	**xx**	**xx**	**1**	**x**	**0**	**2**	**xx**
Mineral Fragments	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**x**	**2**	**xx**
Bare Soils	**0**	**1**	**1**	**1**	**0**	**xx**	**x**	**2**	**0**
Natural Deposits	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**x**	**2**	**xx**
Buildings	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**2**	**x**	**xx**
Other Constructions	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**2**	**x**	**xx**
Waste Materials	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**2**	**x**	**xx**
Other Artificial Surfaces	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**2**	**x**	**xx**

Table S2. EAGLE matrix of GLC_FCS30 classification system.

GLC_FCS30 / LCC	Rainfed cropland	Irrigated cropland	Evergreen broadleaf forest	Deciduous broadleaf forest	Evergreen needleleaf forest	Deciduous needleleaf forest	Mixed forest	Shrubland	Grassland	Sparse vegetation	Wetlands	Impervious surface	Bare areas	Water	Permanent ice and snow
Permanent Snow	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	0	xx	3
Ice and Glaciers	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	0	xx	3
Inland Water	x	1	xx	xx	xx	xx	xx	xx	xx	xx	2	xx	xx	3	x
Coastal Water	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	2	xx	xx	3	x
Open Sea	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	2	xx	xx	3	x
Everngreen Broadleaved Trees	1	0	3	0	0	0	4	1	1	0	1	0	1	0	xx
Deciduous Broadleaved Trees	1	0	0	3	0	0	4	1	1	0	1	0	1	0	xx
EverngreenConiferous Trees	1	0	0	0	3	0	4	1	1	1	1	0	1	0	xx
DeciduousConiferous Trees	1	0	0	0	0	3	4	1	1	1	1	0	1	0	xx
Regular Shrubs	1	0	1	1	1	1	1	3	1	2	1	0	1	0	xx
Dwarf Shrubs	1	0	1	1	1	1	1	3	1	2	1	0	1	0	xx
Regular Graminaceous	2	2	1	1	1	1	1	1	3	2	0	0	1	0	xx
Reeds (high growth)	2	2	1	1	1	1	1	0	1	2	3	0	1	0	xx

Non-Graminaceous (forbs, ferns)	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**0**	**0**	**1**	**0**	**xx**
Succulents and Others	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**1**	**0**	**xx**
Lichens	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**xx**
Mosses	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**xx**
Consolidated Surface	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**0**	**xx**	**0**	**2**	**xx**	**xx**
sand, grit	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**0**	**xx**	**0**	**2**	**xx**	**xx**
clay, silt	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**0**	**1**	**0**	**2**	**x**	**xx**
pebbles, gravel	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**0**	**1**	**0**	**2**	**x**	**xx**
Mineral Fragments	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**0**	**xx**	**x**	**2**	**xx**	**xx**
Bare Soils	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**0**	**x**	**2**	**xx**	**0**
Natural Deposits	**xx**	**xx**	**xx**	**x**	**xx**	**xx**	**xx**	**xx**	**xx**	**0**	**xx**	**x**	**2**	**xx**	**xx**
Buildings	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**x**	**xx**	**2**	**x**	**xx**	**xx**
Other Constructions	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**x**	**xx**	**2**	**x**	**xx**	**xx**
Waste Materials	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**x**	**xx**	**2**	**x**	**xx**	**xx**
Other Artificial Surfaces	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**x**	**xx**	**2**	**x**	**xx**	**xx**

Step 2: transformation of the codes into a fuzzy model. According the study of Mozak [46], code values from EAGLE concept should conformed into a fuzzy function for the implementation of semantic similarity calculation. And Table S3 illustrated the transformation of values into a fuzzy function that defines the possibility of a LCC belonging to a certain land cover class.

Table S3. transformation of the code values into a fuzzy function.

code	fuzzy function	code	fuzzy function
xx	$f(xx) = 0$	2	$f(2) = 0.66$
x	$f(x) = 0$	3	$f(3) = 1$
0	$f(0) = 0$	4	$f(4) = 1$
1	$f(1) = 0.33$		

Step 3: determination of the weights of EAGLE matrix. For further calculations, we first determinated the weights of EAGLE matrix also according to the study of Mozak [46]. And the weights of each classification system were shown in Table S4-S5.

TableS4. weights for each LC types of the target legends target legends.

LCC \ target legends	Cropland	Forest	Grassland	Shrubland	Wetland	Water	Inpervious Surface	Bareland	Permanent snow/ice
Permanent Snow	0	0	0	0	0	0	0	0	0.5
Ice and Glaciers	0	0	0	0	0	0	0	0	0.5
Inland Water	0.016	0	0	0	0.066	0.333	0	0	0
Coastal Water	0	0	0	0	0.066	0.334	0	0	0
Open Sea	0	0	0	0	0.066	0.333	0	0	0
Everngreen Broadleaved Trees	0.014	0.225	0.00875	0.01625	0.00875	0	0	0.01	0
Deciduous Broadleaved Trees	0.014	0.225	0.00875	0.01625	0.00875	0	0	0.01	0
EverngreenConiferous Trees	0.014	0.225	0.00875	0.01625	0.00875	0	0	0.01	0

DeciduousConiferous Trees	0.014	0.225	0.00875	0.01625	0.00875	0	0	0.01	0
Regular Shrubs	0.014	0.0325	0.013	0.45	0.00875	0	0	0.01	0
Dwarf Shrubs	0.014	0.0325	0.013	0.45	0.00875	0	0	0.01	0
Regular Graminaceous	0.3	0.00875	0.9	0.012	0	0	0	0.01	0
Reeds (high growth)	0.3	0.00875	0.013	0	0.6	0	0	0.01	0
Non-Graminaceous (forbs, ferns)	0.3	0.00875	0.013	0.012	0	0	0	0.01	0
Succulents and Others	0	0	0	0	0	0	0	0.01	0
Lichens	0	0	0	0	0.066	0	0	0	0
Mosses	0	0	0	0	0.066	0	0	0	0
Consolidated Surface	0	0	0	0	0	0	0	0.12857	0
sand, grit	0	0	0	0	0	0	0	0.12857	0
clay, silt	0	0	0	0	0.00875	0	0	0.12857	0
pebbles, gravel	0	0	0	0	0.00875	0	0	0.12857	0
Mineral Fragments	0	0	0	0	0	0	0	0.12857	0
Bare Soils	0	0.00875	0.013	0.011	0	0	0	0.12857	0
Natural Deposits	0	0	0	0	0	0	0	0.12858	0
Buildings	0	0	0	0	0	0	0.25	0	0
Other Constructions	0	0	0	0	0	0	0.25	0	0
Waste Materials	0	0	0	0	0	0	0.25	0	0

Other Artificial Surfaces	0	0	0	0	0	0	0.25	0	0						

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37 **Table S5.** weights for each LC types of GLC_FCS30 classification system.

LCC \ GLC_FCS30	Rainfed cropland	Irrigated cropland	Evergreen broadleaf forest	Deciduous broadleaf forest	Evergreen needleleaf forest	Deciduous needleleaf forest	Mixed forest	Shrubland	Grassland	Sparse vegetation	Wetlands	Impervious surface	Bare areas	Water	Permanent ice and snow
Permanent Snow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Ice and Glaciers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Inland Water	0	0.1	0	0	0	0	0	0	0	0	0.066	0	0	0.33	0
Coastal Water	0	0	0	0	0	0	0	0	0	0	0.066	0	0	0.33	0
Open Sea	0	0	0	0	0	0	0	0	0	0	0.066	0	0	0.34	0
Everngreen Broadleaved Trees	0.016	0	0.85	0	0	0	0.2125	0.02425	0.00875	0	0.00875	0	0.01	0	0
Deciduous Broadleaved Trees	0.017	0	0	0.85	0	0	0.2125	0.02425	0.00875	0	0.00875	0	0.01	0	0
EverngreenConiferous Trees	0.017	0	0	0	0.85	0	0.2125	0.02425	0.00875	0.025	0.00875	0	0.01	0	0
DeciduousConiferous Trees	0.016	0	0	0	0	0.85	0.2125	0.02425	0.00875	0.025	0.00875	0	0.01	0	0
Regular Shrubs	0.017	0	0.0485	0.0485	0.0485	0.0485	0.0485	0.425	0.013	0.05	0.00875	0	0.01	0	0
Dwarf Shrubs	0.017	0	0.0485	0.0485	0.0485	0.0485	0.0485	0.425	0.013	0.05	0.00875	0	0.01	0	0
Regular Graminaceous	0.3	0.3	0.01325	0.01325	0.01325	0.01325	0.01325	0.0176	0.9	0.0375	0	0	0.01	0	0

Reeds (high growth)	0.3	0.3	0.01325	0.01325	0.01325	0.01325	0.01325	0	0.013	0.0375	0.6	0	0.01	0	0
Non-Graminaceous (forbs, ferns)	0.3	0.3	0.01325	0.01325	0.01325	0.01325	0.01325	0.0176	0.013	0.0375	0	0	0.01	0	0
Succulents and Others	0	0	0	0	0	0	0	0	0	0.0375	0	0	0.01	0	0
Lichens	0	0	0	0	0	0	0	0	0	0	0.066	0	0	0	0
Mosses	0	0	0	0	0	0	0	0	0	0	0.066	0	0	0	0
Consolidated Surface	0	0	0	0	0	0	0	0	0	0	0	0	0.12857	0	0
sand, grit	0	0	0	0	0	0	0	0	0	0	0	0	0.12857	0	0
clay, silt	0	0	0	0	0	0	0	0	0	0	0.00875	0	0.12857	0	0
pebbles, gravel	0	0	0	0	0	0	0	0	0	0	0.00875	0	0.12857	0	0
Mineral Fragments	0	0	0	0	0	0	0	0	0	0	0	0	0.12857	0	0
Bare Soils	0	0	0.01325	0.01325	0.01325	0.01325	0.01325	0.0178	0.013	0.7	0	0	0.12857	0	0
Natural Deposits	0	0	0	0	0	0	0	0	0	0	0	0	0.12858	0	0
Buildings	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0
Other Constructions	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0
Waste Materials	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0
Other Artificial Surfaces	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0

Step 4: calculation of the overlap between land- cover types. After transformation of the codes into a fuzzy model, we calculated the semantic overlap of the land cover components between the two land- cover types according to the following equation (S1):

$$o(LCC_A, LCC_B) = \int \min(f_{LCC_A}(x), f_{LCC_B}(x))dx / \int f_{LCC_B}(x)dx \quad \text{(S1)}$$

Finally, based on the obtained semantic overlap $o(LCC_A, LCC_B)$ of the land cover components between the two land- cover types, we calculated the final semantic overlap $O(C_A, C_B)$ between the two land- cover types according to the equation S2:

$$O(C_A, C_B) = \sqrt{\sum_i^{|U|} W_{B_i} * o\left(LCC_{A_i}, LCC_{B_i}\right)^2} \quad \text{(S2)}$$

where the W_{B_i} is the weights for each land- cover types determinated in the ***step 3***. And the final similarity matrix between GLC_FCS30 classification system and the target legends were shown in Table S6.

Table S6. Similarity matrix between GLC_FCS30 classification system and the target legends.

GLC_ FCS30	Rainfed cropland	Irrigated cropland	Evergreen broadleaf forest	Deciduous broadleaf forest	Evergreen needleleaf forest	Deciduous needleleaf forest	Mixed forest	Shrubland	Grassland	Sparse vegetation	Wetlands	Impervious surface	Bare areas	Water	Permanent ice and snow
Cropland	1	1	0.4789	0.4789	0.4789	0.4789	0.4789	0.4741	0.6921	0.4330	0.5748	0	0.3000	0.1896	0
Forest	0.5701	0.4743	1	1	1	1	1	0.4925	0.4450	0.5274	0.3433	0	0.3495	0	0
Grassland	0.7416	0.6708	0.4925	0.4925	0.4925	0.4925	0.4925	0.4925	1	0.5534	0.3433	0	0.3495	0	0
Shrubland	0.5000	0.3873	0.4789	0.4789	0.4789	0.4789	0.4789	1	0.4301	0.5863	0.2291	0	0.3349	0	0
Wetland	0.6325	0.6325	0.4503	0.4503	0.4503	0.4503	0.4503	0.4354	0.2720	0.3354	1	0	0.3664	0.6600	0
Water	0	0.3162	0	0	0	0	0	0	0	0	0.4450	0	0	1	0
Inpervious Surface	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Bareland	0.5701	0.4743	0.4925	0.4925	0.4925	0.4925	0.4925	0.4925	0.4450	0.9014	0.3679	0	1	0	0
Permanent snow/ice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Part B: The percent area of agreement and disagreement by each class of each pair of products

Table S7. The percent area of agreement and disagreement by each class of GlobeLand30-2010 product and GLC_FCS30-2015 product.

		GlobeLand30-2010									
		CRP	**FST**	**GRS**	**SHR**	**WET**	**WAT**	**IMP**	**BAL**	**PSI**	**total.**
GLC_FCS30-2015	**CRP**	**0.2411**	0.0454	0.0042	0.0099	0.0019	0.0036	0.0178	0.0014	0.0000	0.3252
	FST	0.0861	**0.2332**	0.0091	0.0477	0.0114	0.0106	0.0078	0.0024	0.0001	0.4085
	GRS	0.0682	0.0196	**0.0062**	0.0055	0.0004	0.0008	0.0047	0.0013	0.0000	0.1065
	SHR	0.0116	0.0082	0.0026	**0.0100**	0.0001	0.0002	0.0007	0.0007	0.0000	0.0342
	WET	0.0042	0.0102	0.0023	0.0065	**0.0058**	0.0010	0.0004	0.0004	0.0000	0.0308
	WAT	0.0024	0.0059	0.0003	0.0011	0.0006	**0.0133**	0.0005	0.0003	0.0001	0.0244
	IMP	0.0209	0.0043	0.0006	0.0010	0.0002	0.0006	**0.0123**	0.0002	0.0000	0.0399
	BAL	0.0015	0.0042	0.0012	0.0048	0.0007	0.0007	0.0001	**0.0019**	0.0003	0.0154
	PSI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	**0.0002**	0.0005
	total.	0.4359	0.3311	0.0265	0.0864	0.0210	0.0308	0.0442	0.0088	0.0007	**0.5241**

Note：CRP: cropland, FST: forest, GRS: grassland, SHR: shrubland, WET: wetland, WAT: water, IMP: impervious surface, BAL: bare land, PSI: permanent snow/ice

Table S8. The percent area of agreement and disagreement by each class of GlobeLand30-2010 product and FROM_GLC30-2015 product.

		GlobeLand30-2010									
		CRP	**FST**	**GRS**	**SHR**	**WET**	**WAT**	**IMP**	**BAL**	**PSI**	**total.**
FROM_GLC30-2015	**CRP**	**0.2007**	0.0273	0.0033	0.0065	0.0014	0.0019	0.0131	0.0004	0.0000	0.2547
	FST	0.1021	**0.2376**	0.0090	0.0465	0.0120	0.0093	0.0091	0.0020	0.0000	0.4276
	GRS	0.1101	0.0542	**0.0129**	0.0292	0.0065	0.0033	0.0085	0.0050	0.0002	0.2300
	SHR	0.0023	0.0013	0.0005	**0.0019**	0.0000	0.0000	0.0001	0.0001	0.0000	0.0062
	WET	0.0002	0.0001	0.0000	0.0000	**0.0001**	0.0000	0.0000	0.0000	0.0000	0.0004
	WAT	0.0034	0.0069	0.0004	0.0013	0.0008	**0.0157**	0.0007	0.0004	0.0001	0.0298
	IMP	0.0159	0.0032	0.0004	0.0006	0.0001	0.0005	**0.0125**	0.0002	0.0000	0.0333
	BAL	0.0013	0.0001	0.0001	0.0004	0.0000	0.0000	0.0001	**0.0006**	0.0002	0.0029
	PSI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	**0.0002**	0.0003
	total.	0.4358	0.3306	0.0266	0.0865	0.0209	0.0308	0.0442	0.0089	0.0007	**0.4822**

Note：CRP: cropland, FST: forest, GRS: grassland, SHR: shrubland, WET: wetland, WAT: water, IMP: impervious surface, BAL: bare land, PSI: permanent snow/ice

Table S9. The percent area of agreement and disagreement by each class of FROM_GLC30-2015 product and GLC_FCS30-2015 product.

		FROM_GLC30-2015									
		CRP	**FST**	**GRS**	**SHR**	**WET**	**WAT**	**IMP**	**BAL**	**PSI**	**total.**
GLC_FCS30-2015	**CRP**	**0.1642**	0.0679	0.0736	0.0012	0.0002	0.0036	0.0133	0.0011	0.0000	0.3251
	FST	0.0367	**0.2849**	0.0771	0.0022	0.0001	0.0083	0.0044	0.0002	0.0000	0.4139
	GRS	0.0307	0.0319	**0.0395**	0.0004	0.0000	0.0007	0.0031	0.0001	0.0000	0.1065
	SHR	0.0051	0.0120	0.0143	**0.0021**	0.0000	0.0002	0.0004	0.0002	0.0000	0.0343
	WET	0.0026	0.0154	0.0123	0.0000	**0.0000**	0.0008	0.0003	0.0000	0.0000	0.0314
	WAT	0.0011	0.0056	0.0024	0.0000	0.0000	**0.0151**	0.0003	0.0001	0.0001	0.0248
	IMP	0.0132	0.0068	0.0076	0.0001	0.0000	0.0006	**0.0115**	0.0002	0.0000	0.0401
	BAL	0.0008	0.0059	0.0138	0.0001	0.0000	0.0008	0.0001	**0.0011**	0.0001	0.0226
	PSI	0.0000	0.0000	0.0002	0.0000	0.0000	0.0001	0.0000	0.0003	**0.0002**	0.0007
	total.	0.2544	0.4303	0.2408	0.0061	0.0004	0.0303	0.0334	0.0033	0.0004	**0.5186**

Note：CRP: cropland, FST: forest, GRS: grassland, SHR: shrubland, WET: wetland, WAT: water, IMP: impervious surface, BAL: bare land, PSI: permanent snow/ice

Part C: Adjusted confusion matrix of four products

Table S10. Adjusted confusion matrix of GlobeLand30-2010 product.

	Reference										U.A. %	c.i. UA± %
	CRP	**FST**	**GRS**	**SHR**	**WET**	**WAT**	**IMP**	**BAL**	**PSI**	**total.**		
CRP	**0.4759**	0.0086	0.0468	0.0016	0.0010	0.0005	0.0015	0.0001	0	0.5360	88.79	0.01
FST	0.0016	**0.3338**	0.0010	0.0036	0.0018	0.0009	0.0001	0.0001	0	0.3428	97.36	0
GRS	0.0004	0.0016	**0.0103**	0.0018	0.0025	0.0001	0.0001	0.0006	0	0.0175	59.05	0.04
SHR	0.0014	0.0115	0.0014	**0.0273**	0.0046	0.0003	0.0001	0.0014	0	0.0481	56.75	0.03
WET	0.0001	0.0003	0.0001	0.0000	**0.0062**	0.0001	0.0000	0.0000	0	0.0068	91.88	0.04
WAT	0.0001	0.0004	0.0001	0.0000	0.0007	**0.0283**	0.0000	0.0000	0	0.0296	95.75	0.01
IMP	0.0011	0.0002	0.0002	0.0000	0.0000	0.0000	**0.0104**	0.0000	0	0.0119	87.39	0.04
BAL	0.0000	0.0002	0.0005	0.0002	0.0005	0.0000	0.0000	**0.0056**	0.0001	0.0072	78.06	0.06
PSI	0	0.0000	0.0000	0	0	0	0	0.0001	**0.0001**	0.0002	43.83	0.42
total.	0.4806	0.3566	0.0603	0.0345	0.0174	0.0303	0.0123	0.0078	0.0002	1.00		
P.A.%	99.01	93.6	17.12	79.12	35.81	93.41	84.88	71.43	47.4	**O.A. (%) = 88.90±0.34**		
c.i. PA±%	0.01	0	0.01	0.04	0.01	0.01	0.03	0.05	0.33			

Note：CRP: cropland, FST: forest, GRS: grassland, SHR: shrubland, WET: wetland, WAT: water, IMP: impervious surface, BAL: bare land, PSI: permanent snow/ice; P.A.: producer accuracy, U.A.: user accuracy, O.A.: overall accuracy, c.i.: confidence interval.

67 **Table S11.** Adjusted confusion matrix of GLC_FCS30-2015 product.

	Reference										U.A. %	c.i. UA± %
	CRP	**FST**	**GRS**	**SHR**	**WET**	**WAT**	**IMP**	**BAL**	**PSI**	**total.**		
CRP	**0.3351**	0.0122	0.0104	0.0025	0.0028	0.0008	0.0015	0.0009	0.0000	0.3660	91.53	0.01
FST	0.0080	**0.3792**	0.0037	0.0086	0.0075	0.0032	0.0003	0.0009	0.0000	0.4116	92.14	0.01
GRS	0.0406	0.0045	**0.0465**	0.0025	0.0009	0.0002	0.0003	0.0012	0.0000	0.0967	48.11	0.02
SHR	0.0109	0.0093	0.0035	**0.0163**	0.0001	0.0001	0.0003	0.0009	0.0000	0.0412	39.5	0.03
WET	0.0003	0.0018	0.0006	0.0001	**0.0071**	0.0001	0.0000	0.0000	0	0.0101	70.19	0.06
WAT	0.0000	0.0000	0.0000	0.0000	0.0005	**0.0454**	0.0000	0.0008	0.0002	0.0469	96.68	0.01
IMP	0.0040	0.0003	0.0004	0.0001	0.0001	0.0000	**0.0142**	0.0001	0	0.0192	73.96	0.04
BAL	0.0017	0.0011	0.0005	0.0001	0.0007	0.0004	0.0000	**0.0026**	0.0000	0.0071	36.12	0.07
PSI	0	0	0.0000	0	0	0.0000	0	0.0003	**0.0008**	0.0011	75.59	0.16
total.	0.4006	0.4084	0.0656	0.0303	0.0197	0.0502	0.0166	0.0075	0.0011	1.00		
P.A.%	83.64	92.86	70.95	53.64	36.15	90.41	85.46	34.14	77.4	**O.A. (%) = 84.33±0.40**		
c.i. PA±%	0	0.01	0.03	0.04	0.02	0.01	0.04	0.06	0.14			

68 Note：CRP: cropland, FST: forest, GRS: grassland, SHR: shrubland, WET: wetland, WAT: water, IMP:
69 impervious surface, BAL: bare land, PSI: permanent snow/ice; P.A.: producer accuracy, U.A.: user accuracy,
70 O.A.: overall accuracy, c.i.: confidence interval.

71 **Table S12.** Adjusted confusion matrix of FROM_GLC30-2015product.

	Reference										U.A. %	c.i. UA ±%
	CRP	**FST**	**GRS**	**SHR**	**WET**	**WAT**	**IMP**	**BAL**	**PSI**	**total.**		
CRP	**0.2955**	0.0237	0.0135	0.0042	0.0025	0.001	0.0031	0.0004	0.0000	0.3439	85.93	0.01
FST	0.0603	**0.3038**	0.0104	0.0104	0.0101	0.0063	0.0033	0.0009	0.0000	0.4055	74.91	0.01
GRS	0.0956	0.0360	**0.0348**	0.0104	0.0151	0.0036	0.0035	0.0048	0.0001	0.2038	17.09	0.01
SHR	0.0005	0.0003	0.0001	**0.0005**	0.0000	0.0000	0.0000	0.0000	0	0.0015	35.82	0.16
WET	0.0000	0.0000	0.0000	0.0000	**0.0000**	0.0000	0.0000	0.0000	0.0000	0.0000	28.44	5.67
WAT	0.0098	0.0071	0.0010	0.0005	0.0006	**0.0061**	0.0010	0.0003	0.0000	0.0264	23.13	0.03
IMP	0.0033	0.0011	0.0003	0.0001	0.0001	0.0001	**0.0116**	0.0001	0.0000	0.0168	69.21	0.04
BAL	0.0006	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0006**	0.0000	0.0018	35.73	0.14
PSI	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	**0.0001**	0.0003	42.09	0.36
total.	0.4657	0.3723	0.0601	0.0261	0.0285	0.0172	0.0225	0.0073	0.0004	1.00		
P.A.%	63.46	81.59	57.96	2.06	0	35.6	51.68	8.81	33.9	**O.A. (%) = 65.31±0.50**		
c.i. PA±%	0	0.01	0.04	0.01	0	0.05	0.03	0.03	0.23			

72 Note：CRP: cropland, FST: forest, GRS: grassland, SHR: shrubland, WET: wetland, WAT: water, IMP:
73 impervious surface, BAL: bare land, PSI: permanent snow/ice; P.A.: producer accuracy, U.A.: user accuracy,
74 O.A.: overall accuracy, c.i.: confidence interval.