



Supplement of

An improved global land cover mapping in 2015 with 30 m resolution (GLC-2015) based on a multisource product-fusion approach

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Grid ID	1 degree	2 degree	4 degree
0119	0.647	0.757	0.844
0317	0.641	0.589	0.872
0603	0.735	0.765	0.971
0817	0.515	0.636	0.723
1206	0.929	0.952	0.976

Table S1. Relationship between the overall accuracy of the fusion method and the size of subregions.

Table S2.	Classification	systems of the	ree GLC	products and	l the trans	lation table.
		-/				

Id	GLC-2015	Globeland30	FROM_GLC	GLC_FCS30
10	Cropland	Cultivated land	Rice paddy	Rain-fed cropland
			Greenhouse	Herbaceous cover
			Other/orchard	Tree or shrub cover (orchard)
			Bare farmland	Irrigated cropland
			Pasture	
20	Forest	Forest	Broadleaf, leaf-on	Evergreen broadleaved forest
			Broadleaf, leaf-off	Deciduous broadleaved forest
				Open/closed deciduous broadleaved forest
			Needleleaf, leaf-on	Evergreen needleleaved forest
				Open/closed evergreen needleleaved forest
			Needleleaf, leaf-off	Deciduous needleleaved forest
				Open/closed deciduous needleleaved forest
			Mixed leaf, leaf-on	Mixed leaf forest
			Mixed leaf, leaf-off	
30	Grassland	Grassland	Natural grassland	Grassland
			Grassland, leaf-off	
40	Shrubland	Shrubland		Shrubland
			Shrubland, leaf-on	Evergreen shrubland
			Shrubland, leaf-off	Deciduous shrubland
50	Wetland	Wetland	Marshland	Wetlands
			Mudflat	

			Marshland, leaf-off	
60	Water bodies	Water bodies	Water	Water body
70	Tundra	Tundra	Shrub and brush	
			tundra	
			Herbaceous tundra	Lichens and mosses
80	Impervious surfaces	Artificial surfaces	Impervious surfaces	Impervious surfaces
90	Bare land	Bare land	Bare land	Sparse vegetation
				Sparse shrubland
				Sparse herbaceous cover
				Bare areas
				Consolidated/unconsolidated bare areas
	Permanent snow and	Permanent snow and	Snow	Dominion out ice and show
100	ice	ice		remanent ice and show
			Ice	

Table S3. Classification systems of three national-scale LC products and the translation table.

Id	GLC-2015	CLCD	CLUDs	NLCD 2016
10	Cropland	Cropland	Rice paddy	Pasture
			Bare farmland	Cropland
			Orchard	
20	Forest	Forest	Wooden land	Deciduous forest
				Evergreen forest
				Mixed forest
30	Grassland	Grassland	Grassland, highly-covered	Grassland
			Grassland, medium-	

covered

			Grassland, lowly-covered	
40	Shrubland	Shrub	Shrubland	Shrubland
50	Wetland	Wetland	Marshland	Woody wetlands
			Tidal flat	Herbaceous wetlands
			Salt marsh	
			Flooded flat	
60	Water bodies	Water	Rivers	Water
			Lakes	
			Reservoir and ponds	
70	Tundra			
80	Impervious surfaces	Impervious	Urban	Urban, open space
			Rural	Urban, low intensity
			Other construction sites	Urban, med. Intensity
				Urban, high intensity
90	Bare land	Barren	Sandy land	Barren
			Gobi desert	
			Barren	
			Bare rocky land	
100	Permanent snow and ice	Snow/ice	Permanent snow and ice	Ice/snow

Table S4. Information of Ecological Zone and its abbreviation across the globe.

Domain	Ecological Zone				
Name	Name	Abbreviation			
Tropical	Tropical rainforest	TAr			
	Tropical desert	TBWh			
	Tropical moist forest	TAwa			
	Tropical dry forest	TAwb			
	Tropical shrubland	TBSh			
	Tropical mountain system	TM			
	Subtropical humid forest	SCf			
0 1 4 1 1	Subtropical dry forest	SCs			
subtropical	Subtropical desert	SBWh			
	Subtropical steppe	SBSh			

	Subtropical mountain system	SM
	Temperate oceanic forest	TeDo
	Temperate continental forest	TeDc
Temperate	Temperate mountain system	TeM
	Temperate steppe	TeBSk
	Temperate desert	TeBWk
	Boreal coniferous forest	Ba
Boreal	Boreal mountain system	BM
	Boreal tundra woodland	Bb
Polar	Polar	Р
Water	Water	Water

Table S5. Comparison of mapping accuracy for the GLC-2015, CLCD, and CLUD via point-based samples.

		Cronland	Forest	Creasiand	Shrubland	Shrubland Wetland	Water	Impervious	Bare	Permanent	OA
		Cropiand	Forest	Grassland	Shrubland	wetland	bodies	surfaces	land	snow and ice	(Kappa coefficient)
CLC 2015	PA	0.844	0.965	0.968	0.316	0.598	0.896	0.905	0.891	0.793	0.888
GLC-2015	UA	0.930	0.928	0.803	0.923	0.870	0.741	0.899	0.962	0.958	(0.864)
CLCD	PA	0.812	0.893	0.939	0.079	0.009	0.742	0.671	0.767	0.737	0.783
CLUD	UA	0.812	0.874	0.635	0.600	1.00	0.857	0.793	0.907	0.808	(0.734)
CLUD	PA	0.715	0.590	0.793	0.158	0.704	0.691	0.759	0.763	0.439	0.702
CLUD	UA	0.779	0.800	0.604	0.062	0.864	0.807	0.782	0.753	0.893	(0.639)

Table S6. Comparison of mapping accuracy for the GLC-2015 and NLCD 2016 via point-based samples.

		Cronland			GL 11 1	Watland	Water	Impervious	Bare	Permanent	OA
	Cropia		rorest	Grassiand	Shrubland	wenand	bodies	surfaces	land	snow and ice	(Kappa coefficient)
CLC 2015	PA	0.890	0.958	0.917	0.869	0.903	0.935	0.867	0.911	1.00	0.910
GLC-2015	UA	0.944	0.932	0.815	0.972	0.878	0.977	0.903	0.689	1.00	(0.893)
NI CD 2016	PA	0.824	0.760	0.617	0.862	0.873	0.830	0.800	0.446	0.750	0.778
NLCD 2016	UA	0.849	0.982	0.594	0.641	0.899	0.902	0.714	0.439	1.00	(0.736)

Table S7. Comparison of mapping accuracy for the GLC-2015, CLCD, and CLUD via patch-based samples.

		Cronland	Famoat	Guardand	Sharph load	d Wetland	Water	Impervious	Bare	Permanent	OA
		Cropiand	rorest	Grassianu	Shrubland	Shi doland Wetland		surfaces	land	snow and ice	(Kappa coefficient)
CL C 2015	PA	0.915	0.914	0.512	0.002	0.000	0.915	0.837	0.397	0.841	0.857
GLC-2015	UA	0.929	0.922	0.075	0.005	0.000	0.770	0.805	0.953	0.700	(0.789)
CLCD	PA	0.916	0.914	0.497	0.000	0.000	0.846	0.742	0.280	0.856	0.836
CLCD	UA	0.900	0.925	0.065	0.000	0.000	0.873	0.757	0.930	0.633	(0.755)
CLUD	PA	0.831	0.782	0.478	0.002	0.385	0.823	0.703	0.280	0.875	0.754
CLUD	UA	0.892	0.906	0.041	0.000	0.023	0.733	0.686	0.900	0.652	(0.647)

Table S8. Comparison of mapping accuracy for the GLC-2015 and NLCD 2016 via patch-based samples.

Courte	I Front	Considerat	Charlen d	Wetless I	Water	Impervious	Bare	OA
Cropia	id Forest	Grassiand	Shrubland	wetland	bodies	surfaces	land	(Kappa coefficient)

GL G 2015	PA	0.924	0.514	0.788	0.905	0.024	0.911	0.747	0.691	0.845
GLC-2013	UA	0.873	0.718	0.840	0.916	0.019	0.916	0.686	0.691 0.683 0.676 0.361	(0.787)
NH CD 2016	PA	0.871	0.369	0.787	0.686	0.054	0.906	0.796	0.676	0.769
NLCD 2016	UA	0.879	0.809	0.788	0.847	0.001	0.913	0.395	0.361	(0.690)

Table S9. The error metric for the land cover classification obtained by MV method based on the global pointbased samples.

	Cronland	Foract	Greedand	Shrubland	Wetland	Water bodies	Tundra	Impervious	Poro land	Permanent	Total	РΔ
	Cropiand	Forest	Grassiand	Shi ublanu	wettand	water boules	Tunura	surfaces	Bare land	snow and ice	10141	IA
Cropland	3549	180	551	164	33	18	6	82	71	0	4654	0.763
Forest	503	7729	350	575	225	21	40	69	125	2	9639	0.802
Grassland	119	193	1874	107	47	12	16	35	167	1	2571	0.729
Shrubland	361	415	761	1269	75	10	38	37	395	0	3361	0.378
Wetland	174	237	111	70	863	71	29	14	137	3	1709	0.505
Water bodies	128	118	34	57	122	1477	65	17	176	4	2198	0.672
Tundra	0	129	171	116	9	17	1297	1	331	3	2074	0.625
Impervious surfaces	118	11	23	23	7	2	3	1262	38	0	1487	0.849
Bare land	149	25	399	179	58	43	67	72	4532	9	5533	0.819
Permanent snow and ice	2	7	19	10	7	36	17	0	114	899	1111	0.809
Total	5103	9044	4293	2570	1446	1707	1578	1589	6086	921	34337	
UA	0.695	0.855	0.437	0.494	0.597	0.865	0.822	0.794	0.745	0.976		
OA						0.721						
Kappa						0.671						

Table S10. The error metric for the land cover classification obtained by SC method based on the global pointbased samples.

	Cropland	Forest	Grassland	Shrubland	Wetland	Water bodies	Tundra	Impervious	Bare land	Permanent	t Total ce	PA
								surfaces		snow and ice		
Cropland	3136	138	865	246	72	19	9	76	92	3	4656	0.674
Forest	273	7467	645	772	162	19	157	72	48	24	9639	0.775
Grassland	75	95	1903	140	40	15	77	37	179	12	2573	0.740
Shrubland	184	146	954	1545	56	31	82	62	296	11	3367	0.459
Wetland	73	273	406	125	676	42	49	15	43	6	1708	0.396
Water bodies	56	89	72	34	252	1519	43	35	81	8	2189	0.694
Tundra	9	44	102	55	53	13	1703	2	80	14	2075	0.821
Impervious surfaces	68	7	45	16	8	8	5	1242	83	5	1487	0.835
Bare land	49	24	423	136	130	100	91	58	4480	44	5535	0.809
Permanent snow and ice	1	4	10	1	11	14	26	0	44	1000	1111	0.900
Total	3924	8287	5425	3070	1460	1780	2242	1599	5426	1127	34340	
UA	0.799	0.901	0.351	0.503	0.463	0.853	0.760	0.777	0.826	0.887		
OA						0.718	3					
Kappa	0.672											

			0	•					U			
		Cronland	Forest	Greesland	Shruhland	Watland	Water	Tundro	Impervious	Bare	Permanent	OA
		Cropiand	Forest	Grassiand	Shi ubland	wetiand	bodies	Tunura	surfaces	land	snow and ice	(Kappa coefficient)
DOFT	PA	0.887	0.895	0.629	0.589	0.301	0.939	0.701	0.757	0.682	0.825	0.836
DSEI	UA	0.916	0.844	0.617	0.714	0.511	0.917	0.872	0.713	0.599	0.767	(0.566)
MV	PA	0.891	0.872	0.580	0.452	0.172	0.930	0.831	0.709	0.620	0.779	0.801
	UA	0.890	0.882	0.569	0.448	0.166	0.944	0.827	0.717	0.612	0.779	(0.497)
	PA	0.877	0.856	0.276	0.177	0.178	0.870	0.803	0.690	0.472	0.675	0.718
SC	UA	0.885	0.869	0.268	0.171	0.180	0.883	0.769	0.707	0.473	0.675	(0.391)

Table S11. Mapping accuracy of different data fusion methods with the global patch-based samples.



Figure S1. The relationship between the overall accuracy and the weight of local accuracy in BPA construction.



Figure S2. The spatial distribution of the selected $4^{\circ} \times 4^{\circ}$ grids where the comparison between DSET and RF classifier was implemented.



Figure S3. The box-plot of the producers' accuracy of (a) cropland, (b) forest, (c) grassland, (d) shrubland, (e) wetland, (f)water bodies, (g) impervious surfaces, and (h) bare land for different continents.



Figure S4. The box-plot of the users' accuracy of (a) cropland, (b) forest, (c) grassland, (d) shrubland, (e) wetland, (f)water bodies, (g) impervious surfaces, and (h) bare land for different continents.



Figure S5. Areal comparison of various land cover classes among GLC products over six continents.



Figure S6. Areal comparison of various land cover classes among GLC products over the top40 countries.



Figure S7. Areal comparison of various land cover classes among GLC products over different ecoregions.



Figure S8. Comparing the crop extent from GLC-2015 and other widely used products in three agricultural regions of Egypt (30.365°N, 30.189°E), China (27.508°N, 110.976°E), and USA (41.449°N, 99.934°W).



Figure S9. Comparing the forest extent from GLC-2015 and other widely used products in three forestdominated regions of Congo (4.044°S, 25.851°E), China (35.791°N, 109.594°E), and USA (38.626°N, 78.189° E).



Figure S10. Comparing the wetland extent from GLC-2015 and other widely used products in three wetlanddominated regions of Canada (49.549°N, 95.701°W), USA (30.647°N, 82.5201°W), and Sundarbans (22.044° N, 89.203°E).



Figure S11. Comparing the impervious extent from GLC-2015 and other widely used products in three megacities: Tokyo (35.925°N, 139.716°E), Shanghai (31.148°N, 121.451°E), and New York (40.907°N, 73.936° W).



Figure S12. Areal comparison of various land cover classes among the GLC-2015, CLCD and CLUD. Class IDs 10, 20, 30, 40, 50, 60, 80, 90, and 100 denote cropland, forest, grassland, shrubland, wetland, water bodies, impervious surfaces, bare land, and permanent snow and sea ice, respectively.



Figure S13. Areal comparison of various land cover classes among the GLC-2015 and NLCD 2016. Class IDs 10, 20, 30, 40, 50, 60, 80, 90 denote cropland, forest, grassland, shrubland, wetland, water bodies, impervious surfaces, and bare land, respectively.



Figure S14. Visual comparison between mapping results from DSET and other data fusion methods for different continents. (a) to (f) are examples for Europe, Asia, Africa, North America, South America, and Oceania, respectively.



Figure S15. Scatter plots between the DSET and RF based on the global point-based samples.



Figure S16. The box plot of the overall accuracy comparison between the DSET and RF for different continents.