Global Land Cover with Fine Classification System at 30m in 2020 (GLC_FCS30-2020) **User Guides**

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> **Introduction**

Land cover products are fundamental to many applications in environmental monitoring, land management, and global change studies. They are also an important input to climate change modeling, greenhouse gas inventories, and biodiversity conservation planning. The characterization of land cover has become a discipline with a central influence on many research fields.

In response to the increasingly urgent application demands for global 30-m fine land-cover product, our team produced and released the 2015 global 30-m land-cover product with fine classification system in September 2019 (GLC_FCS30-2015, http://data.casearth.cn/sdo/detail/5d904b7a0887164a5c7fbfa0) which contained 30 land-cover types and provided effective data support for global fine land cover applications. The independent validation assessment, using 45000 samples derived by combining multi-source priori validation datasets, indicated that the GLC_FCS30-2015 achieved the overall accuracy of 82.5% and kappa coefficient of 0.784 in the Level-1 validation system (containing 10 basic land-cover types) and overall accuracy of 68.7% and kappa coefficient of 0.662 in the Level-2 validation system (containing 24 fine land-cover types) (Zhang et al. 2020). In addition, Gao et al. (2020) used the open validation dataset (LUCAS) to assess the performances of GlobeLand30, GLC_FCS30 and FROM_GLC products, the final results showed that the overall accuracy of the GlobeLand30-2010 product was the highest at 88.90±0.68%; this was followed by GLC_FCS30-2015 (84.33 ±0.80%) and FROM_GLC-2015 (65.31±1.0%).

Since the release of GLC_FCS30-2015 products, our research team has further optimized the GLC_FCS30-2015 product by combining the multi-source auxiliary datasets and prior knowledge of experts, and produced the new global 30-meter land-cover product with fine classification system in 2020 (GLC_FCS30-2020). The specific optimization points include:

First, the GLC_FCS30-2015 provided a global 30-m land-cover product with 30 land-cover types, however, the 14 LCCS level-2 detailed land-cover types were applied only for certain regions, rather than globally. The new GLC_FCS30-2020 combined the quantitative retrieval models and multi-source datasets to improve the diversity of global land-cover types for five forest types.

Secondly, the new GLC_FCS30-2020 product has further improved the classification performance for three typical land-cover types (impervious surfaces, water body and cropland) comparing with GLC_FCS30-2015. Specifically, the problems that impervious surfaces was a little over-estimation over high-latitude areas and some mountain shadows was misclassified as water body, have been improved.
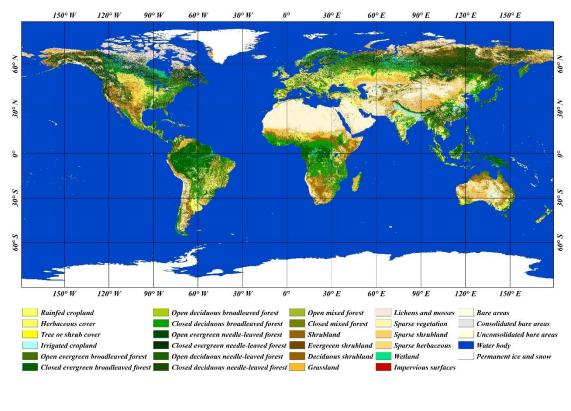
Lastly, in view of the small amount of discontinuous spatial transitions in GLC_FCS30-2015 products, the optimization measures have also been applied in the new GLC_FCS30-2020 products.

➢ Classification system

LC id	Classification System	Color	
10	Rainfed cropland	(255,255,100)	
11	Herbaceous cover	(255,255,100)	
12	Tree or shrub cover (Orchard)	(255,255,0)	
20	Irrigated cropland	(170,240,240)	
51	Open evergreen broadleaved forest	(76,115,0)	
52	Open evergreen broadleaved forest	(0,100,0)	
61	Open deciduous broadleaved forest (0.15<fc<0.4)	(170,200,0)	
62	Closed deciduous broadleaved forest (fc>0.4)	(0,160,0)	
71	Open evergreen needle-leaved forest (0.15< fc <0.4)	(0,80,0)	
72	Closed evergreen needle-leaved forest (fc >0.4)	(0,60,0)	
81	Open deciduous needle-leaved forest (0.15< fc <0.4)	(40,100,0)	
82	Closed deciduous needle-leaved forest (fc >0.4)	(40,80,0)	
91	Open mixed leaf forest (broadleaved and needle-leaved)	(160,180,50)	
92	Closed mixed leaf forest (broadleaved and needle-leaved)	(120,130,0)	
120	Shrubland	(150,100,0)	
121	Evergreen shrubland	(150,75,0)	
122	Deciduous shrubland	(150,100,0)	
130	Grassland	(255,180,50)	
140	Lichens and mosses	(255,220,210)	
150	Sparse vegetation (fc<0.15)	(255,235,175)	
152	Sparse shrubland (fc<0.15)	(255,210,120)	
153	Sparse herbaceous (fc<0.15)	(255,235,175)	
180	Wetlands	(0,220,130)	
190	Impervious surfaces	(195,20,0)	
200	Bare areas	(255,245,215)	
201	Consolidated bare areas	(220,220,220)	
202	Unconsolidated bare areas	(255,245,215)	
210	Water body	(0,70,200)	
220	Permanent ice and snow	(255,255,255)	
250	Filled value	(255,255,255)	

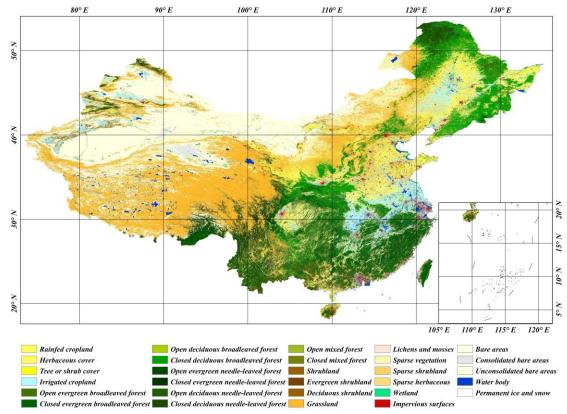## ➢ Overview of GLC_FCS30-2020

Based on Global 30-m land-cover product with fine classification system in 2015 (GLC_FCS30-2015), our team proposed to combine with the 2019-2020 time series Landsat surface reflectance data, Sentinel-1SAR data, DEM terrain elevation data, global thematic auxiliary dataset and prior knowledge dataset to produce the new GLC_FCS30-2020 products as shown in the figures below:

GLC_FCS30-2020: Global Land Cover Product with Fine Classification System in 30m for 2020

Rainfed cropland	Open deciduous broadleaved forest	Open mixed forest	Lichens and mosses	Bare areas
Herbaceous cover	Closed deciduous broadleaved forest	Closed mixed forest	Sparse vegetation	Consolidated bare areas
Tree or shrub cover	Open evergreen needle-leaved forest	Shrubland	Sparse shrubland	Unconsolidated bare areas
Irrigated cropland	Closed evergreen needle-leaved forest	Evergreen shrubland	Sparse herbaceous	Water body
Open evergreen broadleaved forest	Open deciduous needle-leaved forest	Deciduous shrubland	Wetland	Permanent ice and snow
Closed evergreen broadleaved forest	Closed deciduous needle-leaved forest	Grassland	Impervious surfaces	

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Irrigated cropland	Closed evergreen needle-leaved forest	Evergreen shrubland	Sparse herbaceous	Water body
Open evergreen broadleaved forest	Open deciduous needle-leaved forest	Deciduous shrubland	Wetland	Permanent ice and snow
Closed evergreen broadleaved forest	Closed deciduous needle-leaved forest	Grassland	Impervious surfaces	

➢ **References**

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