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GlobeLand30: Operational global land cover mapping and big-data analysis

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Information regarding Land cover and change (LCC) over time is essential for a variety of Societal Benefits Areas (SBA), such as environmental change analysis, geographical condition monitoring, urban and rural management, earth surface process modeling, and sustainable development. Since the middle of 1990s, the international scientific communities have devoted tremendous efforts to Global Land Cover (GLC) mapping, and developed a number of coarser resolution (ranging from 300-m to 1 km) data products. As these products could not provide sufficient spatial details and are far from satisfactory for many applications, the Group on Earth Observations (GEO) and some other international organizations called for actions to move towards finer resolution GLC mapping and monitoring in 2010. In order to meet increasing user needs, China launched an operational GLC mapping project and produced a 30-m GLC data product, GlobeLand30, with 10 classes for years 2000 and 2010 (Chen et al., 2015). In September 2014, GlobeLand30 was donated by China to the United Nations for open access and international sharing. It was reported by *Nature* as "China: Open access to Earth land-cover map" (Chen et al., 2014) and recognized by international experts as "a milestone achievement in the Earth Observation and open geo-information access" (Ban et al., 2015). In order to further report the innovative developments and applications of GlobeLand30, *Science China Earth Sciences* has published a special issue, entitled "GlobeLand30 remote sensing mapping innovation and big data analysis", in the end of 2016.

An operational finer-resolution GLC mapping aims to deliver high quality data products and is therefore facing a number of significant scientific and technical challenges, such as characterization of complex landscapes with remote sensing and assurance of data product quality. Due to the high spectral heterogeneity within a single land cover class and significant spectral confusion among different classes, it is extremely difficult to achieve satisfactory thematic accuracy with single per-pixel spectral classifier for the entire globe. A Pixel-Object-Knowledge-based (POK-based) approach was developed to produce GlobeLand30 by integrating pixel-based classification, object-based processing and knowledge-based interactive verification (Chen et al., 2015). With the POK approach, the omission and commission errors caused by spectral confusion within and among land cover types have been significantly reduced, and an overall classification accuracy of 83% was achieved for GlobeLand30. It has been recognized as "feasible and reliable for global land cover mapping" (Ban et al., 2015). In the special issue of *Science China Earth Sciences*, the detailed methodology and operational utilization of the POK approach have been presented with two land cover classes, i.e., global cropland (Cao et al., 2016) and artificial surfaces (Chen X H et al., 2016). In addition, some other innovative methods developed for GlobeLand30 were also reported, such as geospatial-knowledge-based verification and improvement (Zhang et al., 2016) and spatial heterogeneity-based adaptive sampling (Chen F et al., 2016).

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As the world's first wall-to-wall 30-m GLC data product, GlobeLand30 provides more details of land cover patterns and permits the detection of land cover change at the scale of most human land activities (Arsanjani et al., 2016). It has been used by scientists and end users from more than 130 countries for land-cover status and change analysis, cause-and-consequence analysis, and earth system modelling (Chen et al., 2017). In this GlobeLand30 special issue, several GlobeLand30-based big-data analysis have been reported, such as the spatio-temporal pattern analysis of artificial surface use efficiency (Li et al., 2016; Kuang et al., 2016), climate effects analysis with Beijing Climate Center climate model simulations (Shi et al., 2016), and impact evaluation of terrestrial ecosystem carbon budgets (Lu et al., 2016) . These studies illustrated the usefulness and potential of GlobeLand30 for different fields.

Nowadays the world is paying great attention to the implementation of the United Nations 2030 Agenda with 17 sustainable development goals (SDGs). Many countries and international organizations have started or planned to carry out data-driven monitoring and spatial evidence-based analyses to track progress towards SDGs. The success of such endeavor greatly depends on the availability of reliable geospatial information, including GLC data at higher spatial, temporal, and thematic resolutions. In order to support the quantitative assessment and dynamic monitoring of SDGs in both China and other regions, China has started recently to develop the 2015 version of GlobeLand30, refine its wetland and cropland classes, and organize international validation. More efforts and closer collaboration should be devoted to operational GLC mapping and its big data analysis, such as GLC big data platforms, essential land cover variables for SDGs, and GLC knowledge-based services.

References

Arsanjani J J, Tayyebi A, Vaz E. 2016. GlobeLand30 as an alternative fine-scale global land cover map: Challenges, possibilities, and implications for developing countries. Habitat Int, 55: 25–31

Ban Y, Gong P, Giri C. 2015. Global land cover mapping using Earth observation satellite data: Recent progresses and challenges. Isprs-J Photogramm Remote Sens, 103: 1–6

Cao X, Chen X H, Zhang W W, Liao A P, Chen L J, Chen Z G, Chen J. 2016. Global cultivated land mapping at 30 m spatial resolution. Sci China Earth Sci, 59: 2275–2284

Chen F, Chen J, Wu H, Hou D Y, Zhang W W, Zhang J, Zhou X G, Chen L J. 2016. A landscape shape index-based sampling approach for land cover accuracy assessment. Sci China Earth Sci, 59: 2263–2274

Chen J, Ban Y, Li S. 2014. Open access to Earth land-cover map. Nature, 514: 434

Chen J, Chen J, Liao A, Cao X, Chen L, Chen X, He C, Han G, Peng S, Lu M, Zhang W, Tong X, Mills J. 2015. Global land cover mapping at 30 m resolution: A POK-based operational approach. Isprs-J Photogramm Remote Sens, 103: 7–27

Chen J, Cao X, Peng S, Ren H. 2017. Analysis and applications of GlobeLand30: A review. Isprs Int J Geo-Inf, 6: 230

Chen X H, Cao X, Liao A P, Chen L J, Peng S, Lu M, Chen J, Zhang W W, Zhang H W, Han G, Wu H, Li R. 2016. Global mapping of artificial surfaces at 30-m resolution. Sci China Earth Sci, 59: 2295–2306

Kuang W H, Chen L J, Liu J Y, Xiang W N, Chi W F, Lu D S, Yang T R, Pan T, Liu A L. 2016. Remote sensing-based artificial surface cover classification in Asia and spatial pattern analysis. Sci China Earth Sci, 59: 1720–1737

Li R, Kuang W H, Chen J, Chen L J, Liao A P, Peng S, Guan Z X. 2016. Spatio-temporal pattern analysis of aritificial surface use efficiency based on Globeland30 (in Chinese). Sci Sin Terr, 46: 1436–1445

Lu X H, Jiang H, Zhang X Y, Jin J X. 2016. Relationship between nitrogen deposition and LUCC and its impact on terrestrial ecosystem carbon budgets in China. Sci China Earth Sci, 59: 2285–2294

Shi X L, Nie S P, Ju W M, Yu L. 2016. Climate effects of the GlobeLand30 land cover dataset on the Beijing Climate Center climate model simulations. Sci China Earth Sci, 59: 1754–1764

Zhang W W, Chen J, Liao A P, Han G, Chen X H, Chen L J, Peng S, Wu H, Zhang J. 2016. Geospatial knowledge-based verification and improvement of GlobeLand30. Sci China Earth Sci, 59: 1709–1719

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