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Detecting China's urban built-up areas expansion over the last decade based on the deep learning through NPP-VIIRS images

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Abstract Accurate spatial extent changes in urban built-up areas are essential for detecting urbanization, analyzing the drivers of urban development and the impact of urbanization on the environment. In recent years, nighttime light images have been widely used for urban built-up areas extraction, but traditional extraction methods need to be improved in terms of accuracy and automation. In this experiment, a U-Net model was built and trained with the NPP-VIIRS and MOD13A1 data in 2020. We used the optimal tuning model to inverse the spatial extent of built-up areas in China from 2012 to 2021. Through this model, we analyzed the changing trend of built-up areas in China from 2012 to 2021. The results showed that U-Net outperformed random forest (RF) and support vector machine (SVM), with an overall model accuracy (OA) of 0.9969 and mIOU of 0.7342. Built-up areas growth rate is higher in the south and northwest, but the largest growth areas are still concentrated in the east and southeast, which is consistent with China's economic development and urbanization process. This experiment produced a method to extract China's urban built-up areas effectively and rapidly, which provides some reference value for China's urbanization.