

Mapping Urban Expansion Across North America Using Multi-Temporal Landsat and Nighttime Lights Data

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Abstract Text:

Urban expansion and the associated changes in land cover have important climatic, hydrologic, biophysical and ecologic and socio-economic impacts on the environment. Yet, despite today's abundance of remote sensing data, an automated characterization of large-scale historical changes in urban spatial extent remains a challenge due to the inherent complexity and variability of the urban environment, the lack of a spectral signature unique to urban land cover, and the absence of an unambiguous definition of what is urban versus non-urban.

Here we present a consistent, robust, scalable, physically- based methodology for characterization of urban expansion using Landsat observations. We use atmospherically corrected Landsat Global Land Survey time series, Web-enabled Landsat data time series, DMSP-OLS and NPP-VIIRS nighttime lights, for mapping the built-up and vegetated

components of urban settlements at 30m resolution through multi-temporal standardized spectral mixture analysis. The methodology is tested and validated over the North American continent where it provides a first quantification of urban expansion and vegetation abundance changes from 1990 to 2010.

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