Static and dynamic monitoring of human activities in urban areas using VIIRS day-night band

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ABSTRACT: Observation of nighttime light is the representative method for monitoring human activities using satellite remote sensing. With the advent of the Visible Infrared Imaging Radiometer Suite (VIIRS) sensor on the Suomi National Polar-orbiting Partnership (NPP) Satellite, observations at higher spatial resolution and with higher accuracy became possible than when using the Defense Meteorological Satellite Program's Operational Linescan System (DMSP-OLS), and it increased the potential to utilize nighttime light data for urban monitoring. In this study, world's urban areas were monitored statically and dynamically using VIIRS day-night band.

Firstly, by comparing the total nighttime light (TNL) and socioeconomic indicator as GDP, population and energy consumption for each country, the relationship between the TNL from NPP-VIIRS and each indicator was investigated. In addition, it was revealed how the relationships differ according to the level of development of the country.

Secondly, a dynamic monitoring of nighttime light was conducted. Using NPP-VIIRS data obtained every day, a yearly transition of nighttime light was observed at some areas. By analyzing the transition, population flows in the event of disasters, trips or homecoming visits can be detected from nighttime light. To check the accuracy of population flows from nighttime light, validation was performed using GPS log data in the areas where GPS data is available. In addition, by observing how nighttime light changes in the event of floods and forest fires, the possibility of disaster detection by nighttime light was investigated.

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