Intercalibration of DMSP-OLS and NPP-VIIRS to Develop Enhanced Night-time Light Time-series for Evaluating the Urban Development Pattern of Major Indian Metropolitan cities

Mohd Galib, Sutapa Bhattacharya, Rishikesh Bharti

Indian Institute of Technology Guwahati, India

Introduction

This study emphasises to understand the pattern of urban development in four different major metropolitan cities of India by exploring the potential of multi-resolution night time light (NTL) datasets available in public domain.

Data and Methodology

Database-

S. No.	Data	Source
1.	DMSP-OLS	National Oceanic and Atmospheric Administration (NOAA)
2.	SNPP-VIIRS	National Oceanic and Atmospheric Administration (NOAA)
3.	Landsat	United States Geological Survey(USGS)
4.	Ancillary Data	Google Earth Engine

DMSP-OLS: Defense Meteorological Satellite Program-operational line scan

SNPP-VIIRS: Suomi National Polar-orbiting Partnership's Visible Infrared Imaging
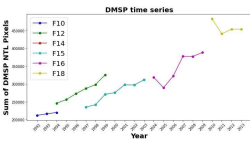
Calibration

Figure 3: Uncalibrated DMSP Night time Light (NTL) time series for Chennai city
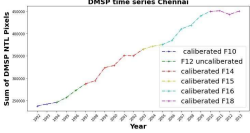

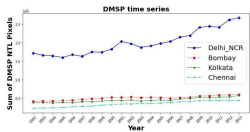Figure 4: DMSP NTL time series after calibration for Chennai city

Figure 5: Calibrated DMSP NTL time series for all cities

Results

Uncalibrated DMSP 2011 — Enhanced VIIRS like DMSP 2011

Figure 7: Before and after calibration of DMSP image of Chennai in year 2011

Uncalibrated DMSP 2001 — Enhanced VIIRS like DMSP 2001

Figure 8: Before and after calibration of DMSP image of Chennai in year 2001

Validation

Enhanced VIIRS like DMSP 1992 — LULC - 1992

Urban · Waterbodies · Vegetation · Scrubs/Barren
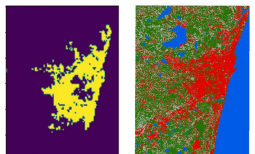
Figure 11: Validation between final enhanced VIIRS like DMSP 1992 image and corresponding ML-classified Landsat image

Conclusion

- There is a significant over estimation of night time light by coarser resolution DMSP sensors, which could be efficiently corrected by cross calibrating with the finer resolution VIIRS data products.
- It was observed that all the cities have significantly expanded in 30 years study period. However, the rate of urban expansion in NCR (Delhi) and Chennai is comparatively more.
- Moreover, there is further scope to improve our results by incorporating more advanced techniques to cross calibrate the different datasets.

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