

## Developing a new cross-sensor calibration model for DMSP-OLS and Suomi-NPP VIIRS night-time light imageries

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**Introduction:** Due to a unique capability in detecting light at the Earth's surface, remotely sensed nighttime light (NTL) imageries have been widely utilized as an indicator of human settlements and activities. Currently, global-scale NTL data are acquired by two satellite sensors, i.e., DMSP-OLS and VIIRS, but the data collected by the satellites are not consistency because of sensor degradation, noise contamination and sensor performance differences between DMSP-OLS and VIIRS (Figure 1a). This inconsistency problem hinders the valuable potential of DMSP-OLS and VIIRS to be used for long-term applications.

**Methods:** To address this issue, we proposed a method for generating long-term and consistent NTL data:

- A logistic model was employed to estimate and smooth the missing DMSP-OLS data;
- Lomb-Scargle Periodogram technique was used to statistically examine the presence of seasonality of monthly VIIRS time series;
- Seasonal effect, noisy and unstable observations in VIIRS were eliminated by the BFAST time-series decomposition algorithm;
- We proposed and applied a residuals corrected geographically weighted regression model (GWRc) to generate DMSP-like VIIRS data;

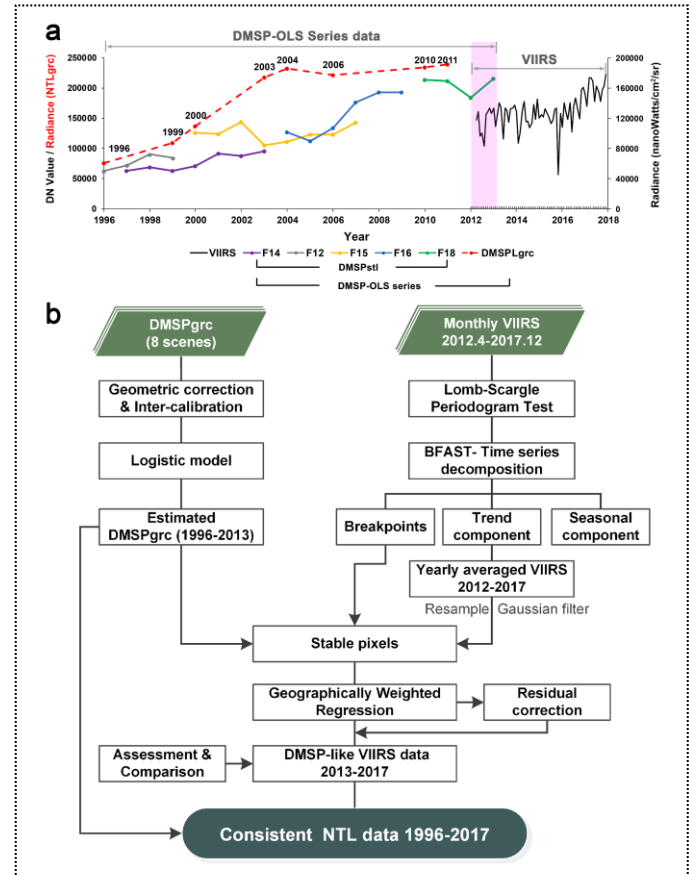
### Fund usage and outcomes:

- The fund was used to attend AAG Annual Conference held in Washington D.C., on April 2-7, 2019.
- The supported research was presented in AAG and was awarded the first place of RSSG paper competition.
- The supported research has been published in a top peer-review journal ([doi:10.1016/j.isprsjprs.2019.04.019](https://doi.org/10.1016/j.isprsjprs.2019.04.019))

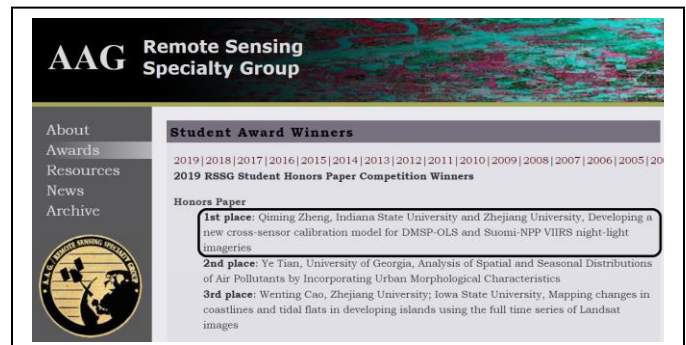
### FOR FURTHER READING:

Verbesselt, J., Hyndman, R., Zeileis, A., & Culvenor, D. (2010). Phenological change detection while accounting for abrupt and gradual trends in satellite image time series. *Remote Sensing Of Environment*, 114(12), 2970-2980

Zheng, Q., Weng, Q., & Wang, K. (2019). Developing a new cross-sensor calibration model for DMSP-OLS and Suomi-NPP VIIRS night-time light imageries. *ISPRS Journal of Photogrammetry and Remote Sensing*, 153, 36-47.



**Figure 1.** Inconsistency problem of DMSP-OLS and VIIRS night-time light data (a) and the framework of our proposed method (b).



**Figure 2.** With the support of IndianaView, I participated the Student Honors Paper Competition of Remote Sensing Specialty Group of AAG 2019 and won the first place.