

Title:**First Light Pollution Monitoring Station in Panama: Integrating Ground-Based and Remote Sensing Techniques.****Abstract:**

This project aims to establish the first light pollution monitoring station in Panama. Light pollution alters the brightness, color, and spectrum of the night sky, disrupts the nocturnal navigation of key nocturnal pollinators, and affects tree growth. This study will measure night sky brightness, color, and spectrum in rural (rainforest), semi-urban, and urban environments near the Panama Canal to assess its ecological impact.

A combination of ground-based and remote sensing techniques will be employed at three sites along the Panama Canal: Colón (Caribbean site), Gamboa-STRI (central site), and INDICATIC (Pacific site). Ground-based methods include a dichroic filter system with four-channel photometers for light pollution with a telescopic encoder, a professional astronomical camera with a CCD fisheye lens and five Johnson filters (UV, B, V, R, and IR), a commercially modified Nikon D5600a for astrophotography, and spectrometers to assess night sky quality. Remote sensing will involve drones for glare localization, imagery from the International Space Station (ISS), the Defense Meteorological Satellite Program (DMSP) Operational Linescan System (OLS), and an environmental mapping spectrometer from the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) or Environmental Mapping (EnMAP), subject to availability.

Preliminary ground-based measurements near Balboa Port and the Gamboa Titan Crane reveal significant brightness variations. Additionally, reference measurements along the Pacific coast are being conducted to establish pristine night sky baselines for comparison with sites along the Panama Canal. This comprehensive approach will provide an unprecedented characterization of light pollution in the region by integrating terrestrial and satellite data within a multidisciplinary framework.