

# Impact of the Astracommex Astra Satellites on Optical and Radio Observatories in Celestria

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## Abstract

The increasing deployment of low-Earth-orbit (LEO) satellite networks, particularly the Astra System by Astracommex, is raising concerns for ground-based astronomy, especially in wide-field optical and infrared surveys. Celestrian Space Agency operates ten large observatories in the territory of Celestria. This study focuses on the impacts of LEO satellite mega-constellations – mainly the Astra System – on astronomical research. Our analysis of archival data from 1 March 2017 to 1 March 2020 reveals approximately 3500 satellite trails traced back to satellites in the Astra System. There's a noticeable upward trend in the number of compromised images correlating with Astracommex's ongoing satellite launches. Twilight observations are most affected, with the proportion of streaked images soaring from under 0.5% in 2017 to 18% by 2020. Projections indicate that, upon the Astra system reaching 5000 satellites, nearly all twilight images from the ten Celestrian observatories might be affected.

## 1. INTRODUCTION

The Celestrian Space Agency maintains a network of ten large observatories, each strategically located on the middle or small-size islands of Celestria to mitigate the effects of artificial light from the urbanized main island. These observatories are positioned across the diverse islands of Celestria to ensure comprehensive coverage across Celestria's territory.

*[the rest is intentionally omitted]*

## 6. ASSESSMENT OF IMPACT TO THE PUBLIC

Astronomical studies, pursuing a range of critical topics from stellar populations to near-Earth object tracking, rely on unobstructed views of the sky. The emergence of satellite trails not only leads to data loss or reduced signal quality but also poses significant risks to time-sensitive and high-priority research. For instance, missing a near-Earth object<sup>25</sup> due to satellite interference could mean losing vital orbital data. Similarly, failing to capture a super-Earth exoplanet's transit or the optical counterpart of a gravitational wave source could result in irretrievable scientific opportunities.

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<sup>25</sup> Celestrian Space Agency has been an active member in the UN-endorsed International Asteroid Warning Network that discovers, monitors, and characterizing potentially hazardous near-Earth objects since 2017.

Furthermore, understanding the satellites' impact on large-scale studies (like those conducted by the Vera C. Rubin Observatory in the future) requires even more sophisticated modeling. Such research, often affected by systematic uncertainties rather than sample size limitations, includes precision cosmology measurements like gravitational weak lensing shear. The interference from these satellites could significantly impede progress in these fields, underscoring the need for comprehensive modeling to gauge their full impact.

*[the rest is intentionally omitted]*

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*The exhibit presented herein is based on the original research titled "Impact of the SpaceX Starlink Satellites on the Zwicky Transient Facility Survey Observations" by Przemek Mróz et al, published in The Astrophysical Journal Letters on 10 January 2022. The contents have been reproduced and adapted with fictional details exclusively for the purposes of the 2024 Foreign Direct Investment (FDI) Moot Court. This adaptation is not intended to represent the original work accurately and should not be used as a substitute for the original research.*