# Satellite Trails in the HATPI Survey: mitigation and analysis

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UN/SKAO Workshop 2025
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The HATPI Instrument

- Hungarian-made Automated Telescope, PI for π steradian coverage

- Optical telescope at Las Campanas Observatory, Chile

- Ultra-wide field, high-cadence time domain survey - observes the entire night sky above 35º at 20″/pix every 45 sec, with 5σ detection threshold of *Gaia* G = 16 mag
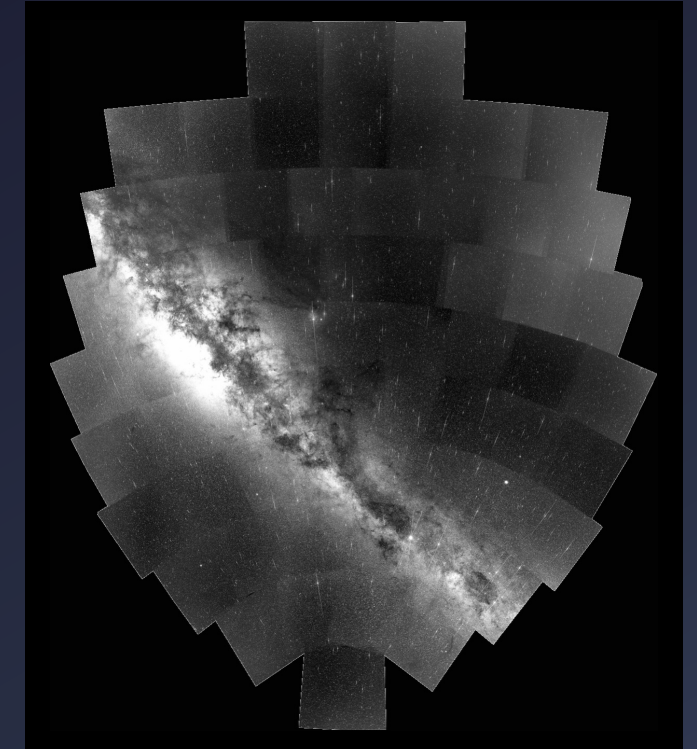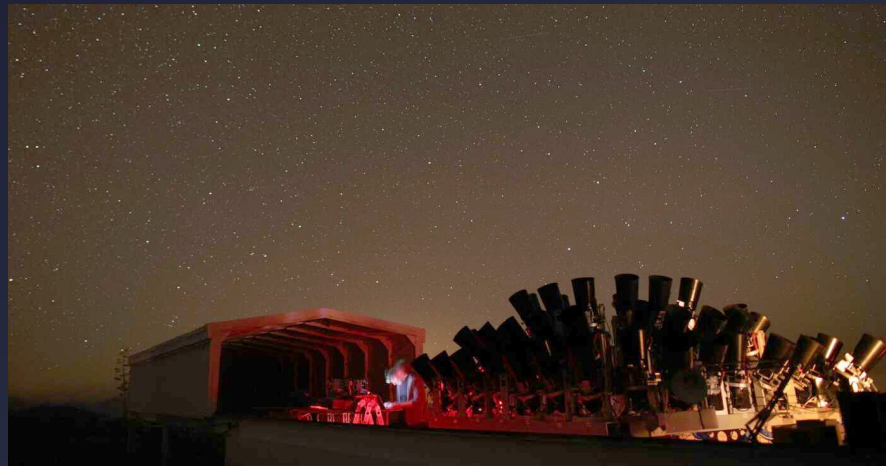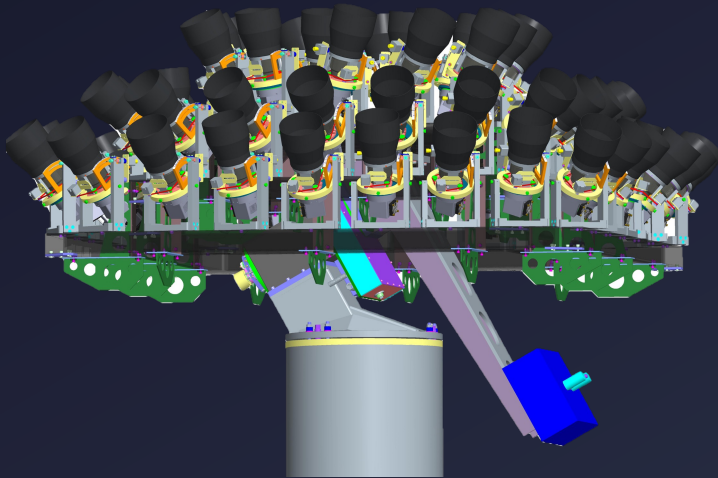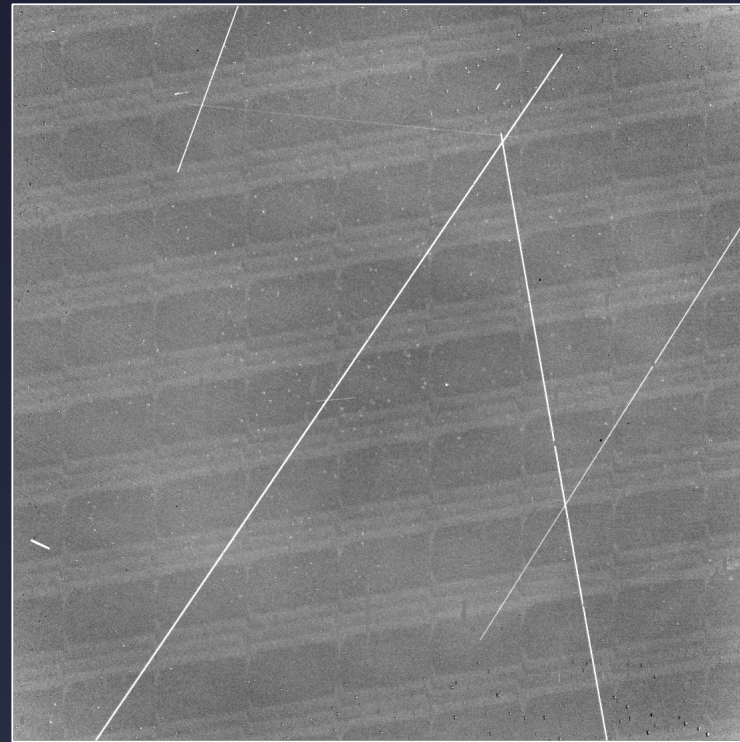

HATPI Team:
Gáspár Bakos (PI), Andrés Jordán (co-PI), **Joel Hartman**, Zoltán Csurby, Attila Bódi, Geert Jan Talens, Anthony Keys; extended team Ferenc Rózsa, Antoine Thibault, **István Domsa**, **Sándor Pigai**, **Adriana Gaitan**; and more!

Satellite trails in HATPI
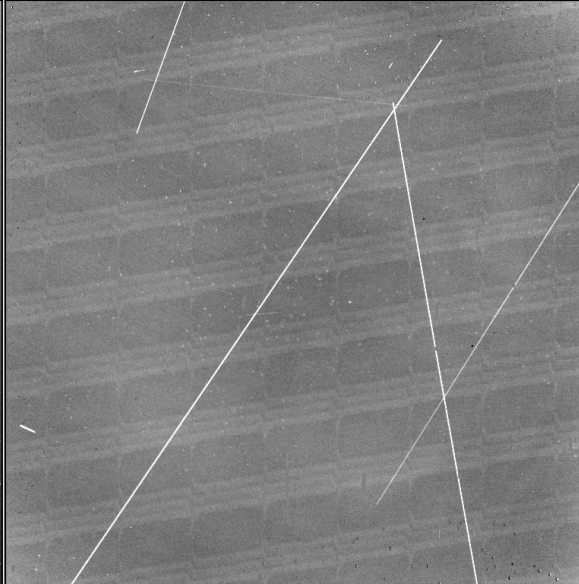
Reduced Image

Subtracted Image

We expect O(100,000) trails for O(10,000) unique objects every HATPI new moon night.

Trail detection pipeline

Reduced image   **Subtracted image**
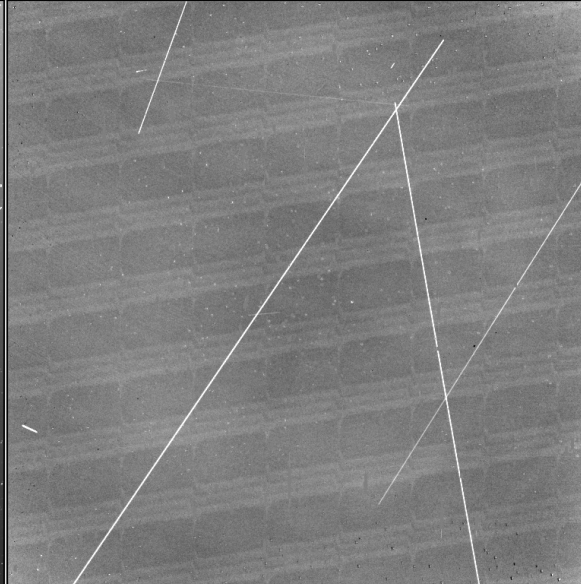

Goals

1. Mask out satellite trails in data

2. Conduct statistical analyses: the **most comprehensive to date**

3. Differentiate man-made objects from nearby Solar System objects

Trail detection pipeline

Reduced image **Subtracted image** `sattrails` **mask**
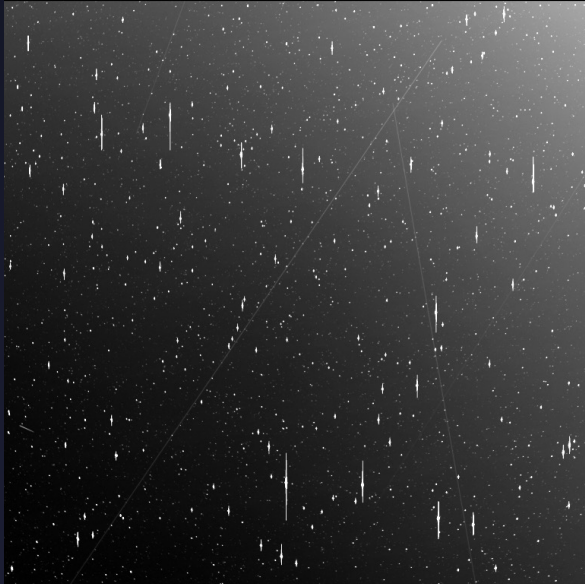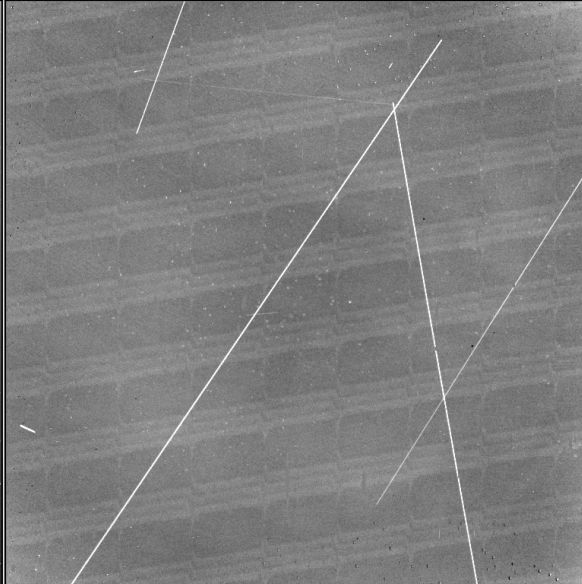

`sattrails`: **a neural network for trail detection**

Uses an attention u-net architecture to detect linear features in both reduced and subtracted images.
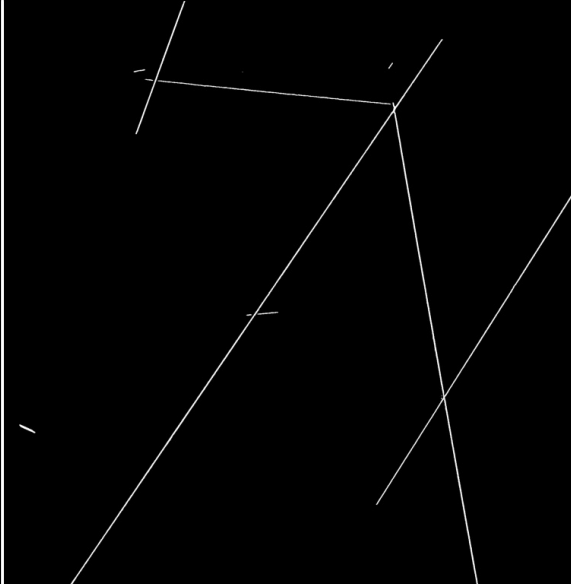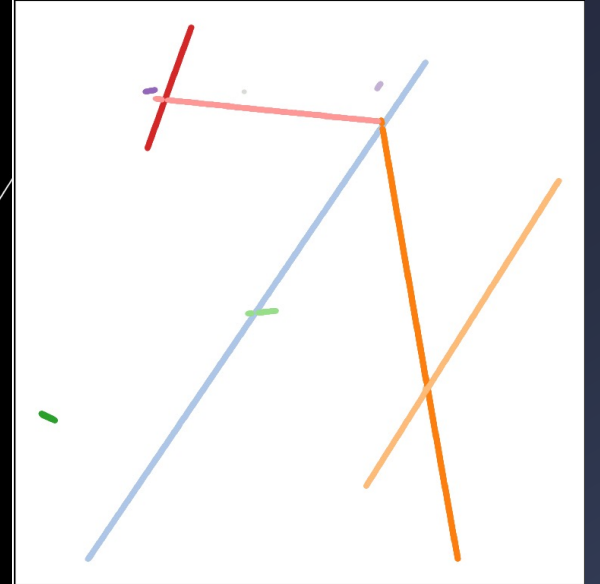
Trail detection pipeline

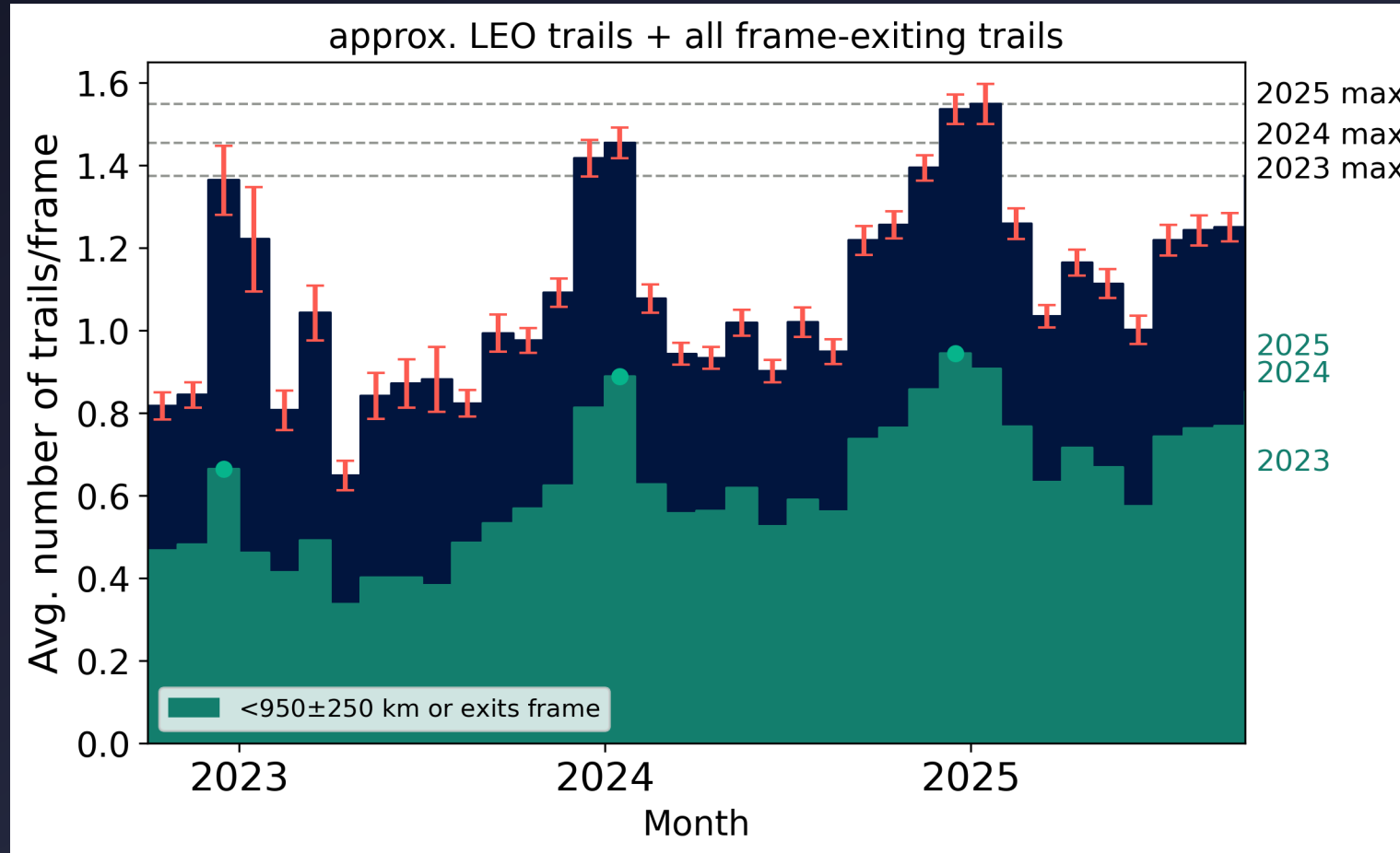**Reduced image**   **Subtracted image**   `sattrails` **mask**   **Postproc: 9 trails**

Postprocessing: trail identification & analysis

Differentiate individual trails, then identify object, get brightness/orbital information

Preliminary results of sattrail statistics

approx. LEO trails + all frame-exiting trails

LEO = Low Earth Orbit
(< 2000 km altitude)