IAU Centre for the Protection of the Dark and Quiet Sky

Space Situational Awareness and astronomical observations: a two-way street

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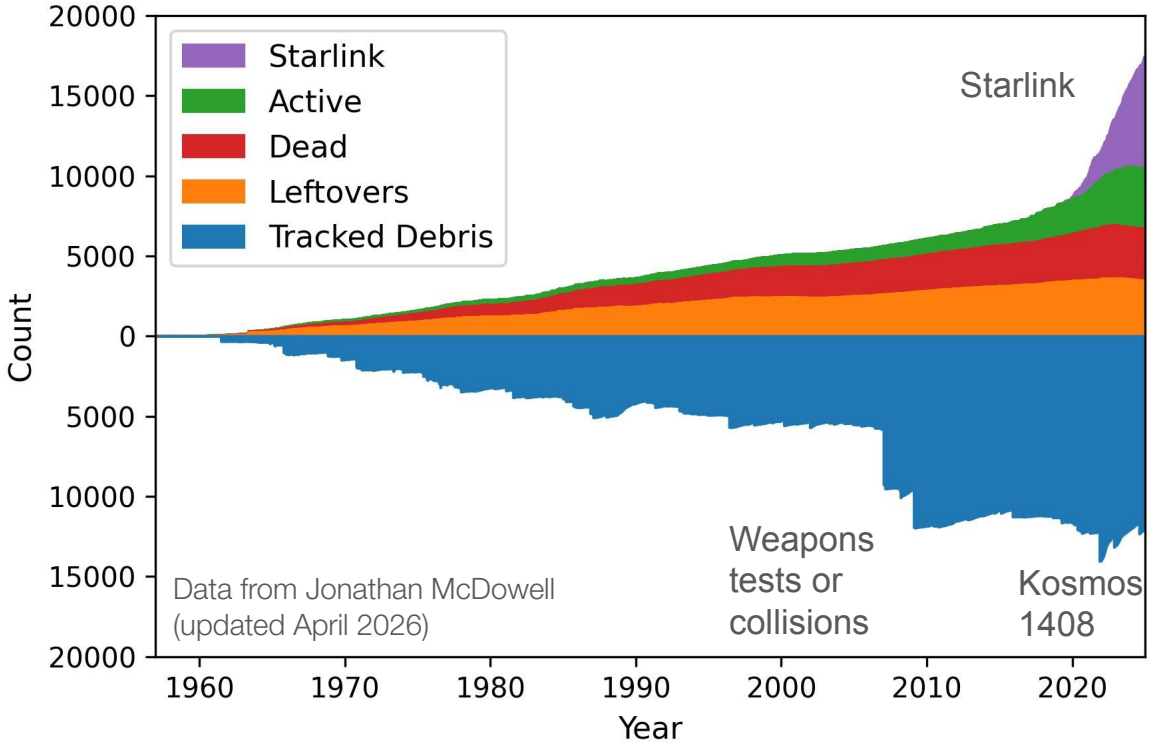
NAM, 22 July 2026

Rapidly increasing numbers of satellites



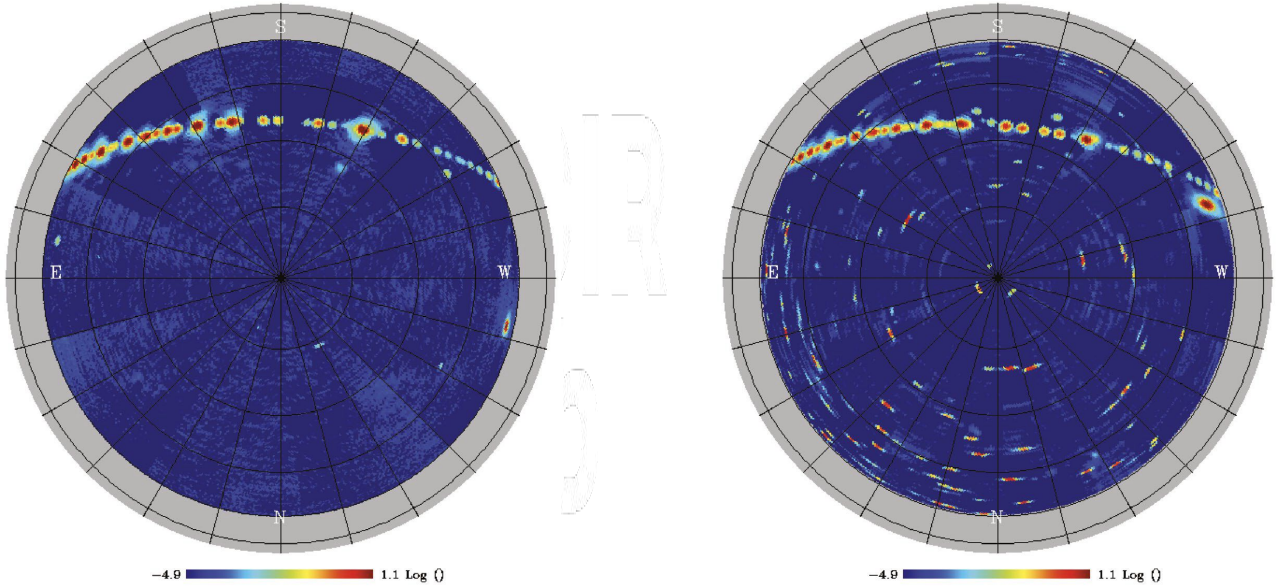
3.5 million proposed!

Impact on the night sky - bad for astro, great for SSA?

Pentre Ifan burial chamber, Pembrokeshire, Wales - Max Alexander “Our Fragile Space”

Impact on radio observations

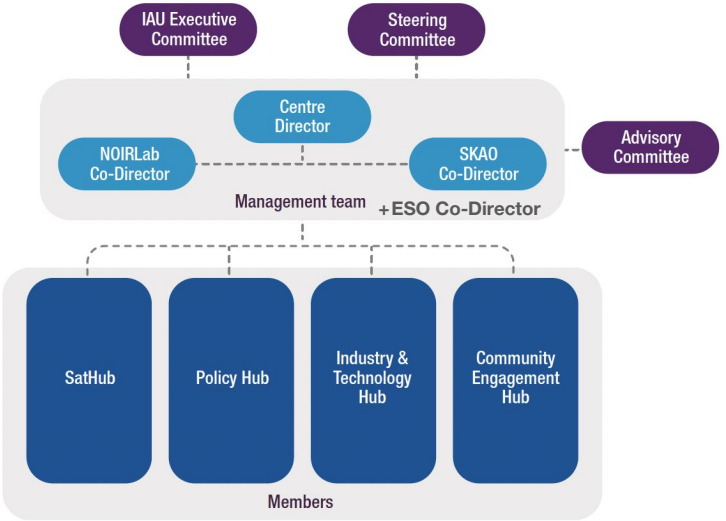
Observations from QUIJOTE telescopes from Teide Observatory (Tenerife)



2014 vs. 2024: The increase in satellite signals at 10-20GHz is clearly visible between the geostationary band and the new satellite constellation signals.

Centre for the Protection of Dark and Quiet Sky

- Centre of expertise of the International Astronomical Union, hosted by the SKAO; NSF NOIRLab; and ESO
- International cooperation among software engineers, observers, astronomers, satellite industry folk, policy experts, space lawyers, government officials
- Our mission:
  coordinate efforts and unify voices across the global astronomical community to protect the dark and quiet sky from satellite constellation interference.

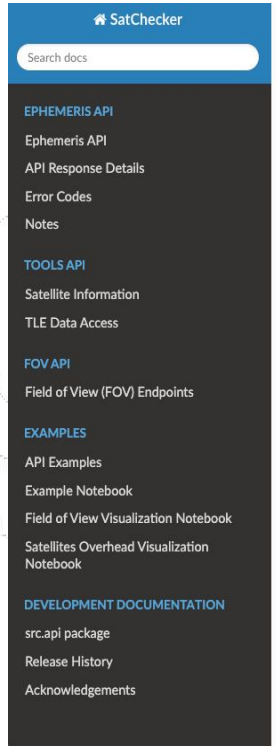


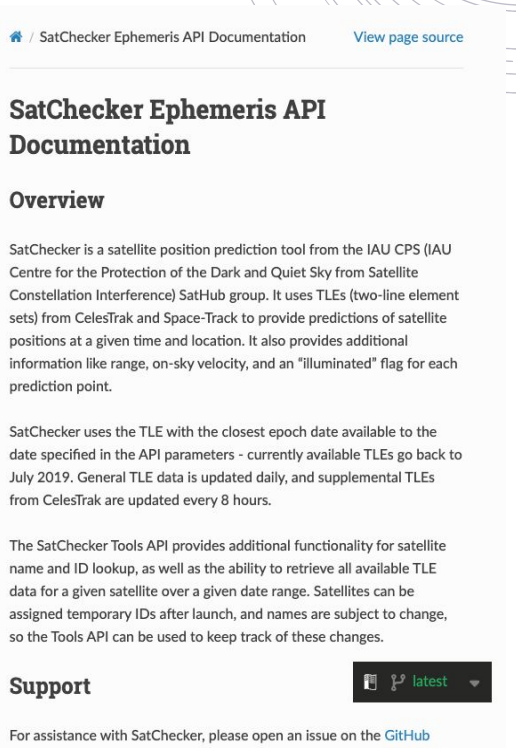
Four hubs

- **SatHub**
  - Satellite observations and data analysis to understand problem + find mitigations during data processing. Developing **SatChecker** and **SCORE** (amongst other software).
- **Industry & Technology Hub**
  - Fosters collaboration between the astronomy and satellite operator communities
- **Policy Hub**
  - Studies national and international policies and regulations related to the use of space
- **Community & Engagement Hub**
  - Builds bridges between all involved stakeholders and affected communities

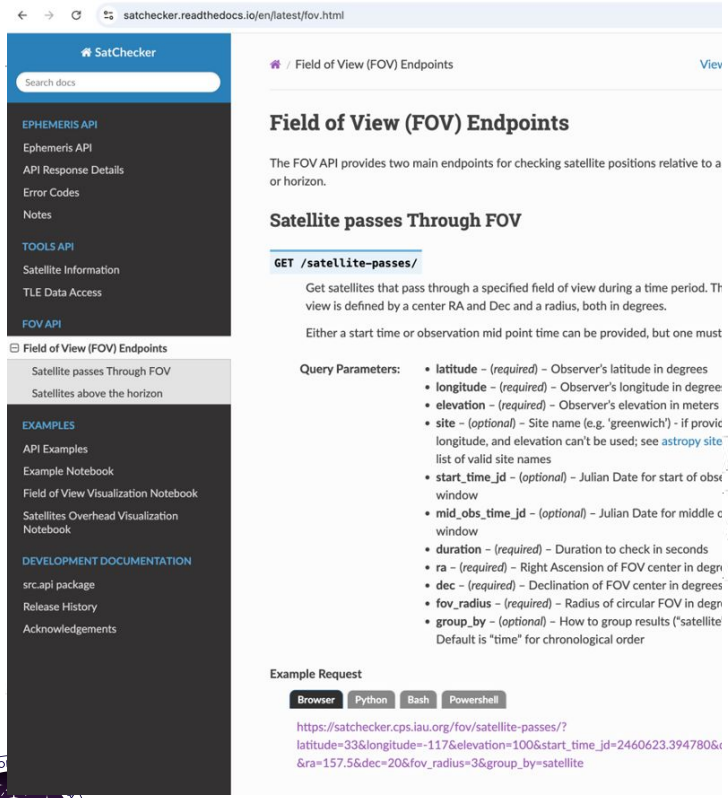
SatChecker

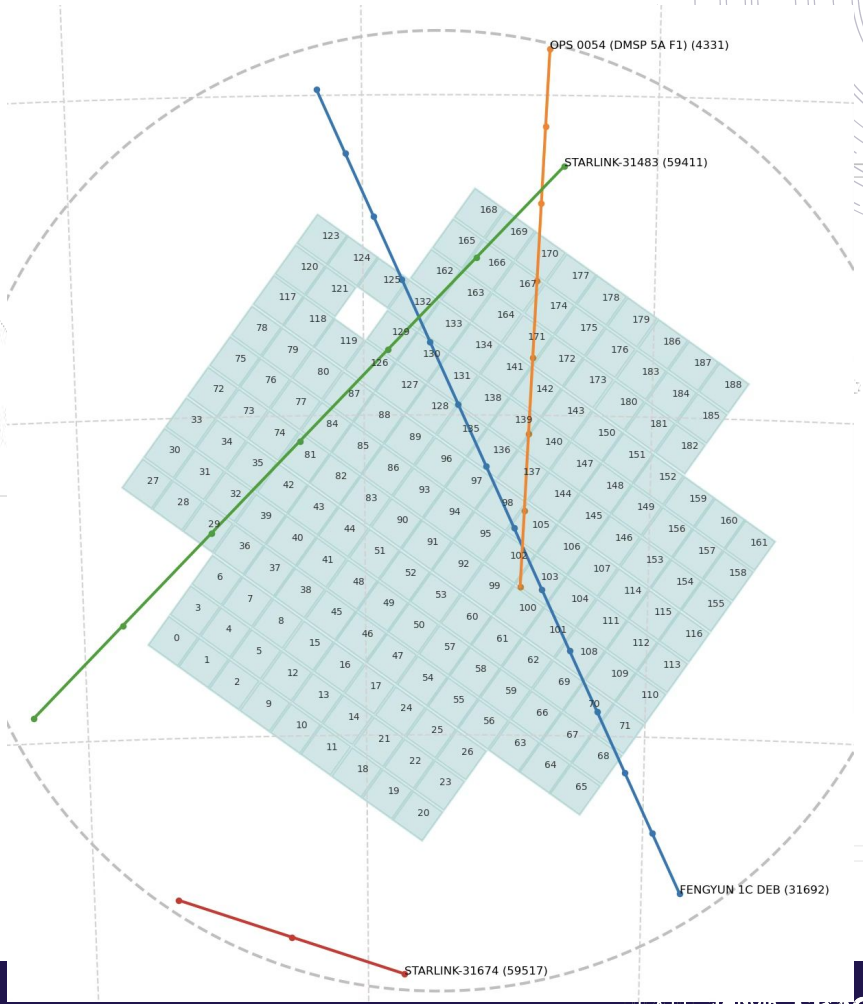
- API for predicting satellite positions (single satellite) and transits (field of view (FOV) predictions)
- Best predictions of satellite positions based on public and more precise operator provided data
- Define RA/Dec center, radius, and time window; get all satellites overhead at a given time/location
- Access to all archival TLE data (back to 1959)
- Satellite metadata: NORAD ID, COSPAR ID, launch/decay dates, etc.
- API docs:
  https://satchecker.readthedocs.io/en/latest/
  https://satchecker.cps.iau.org/api/docs/



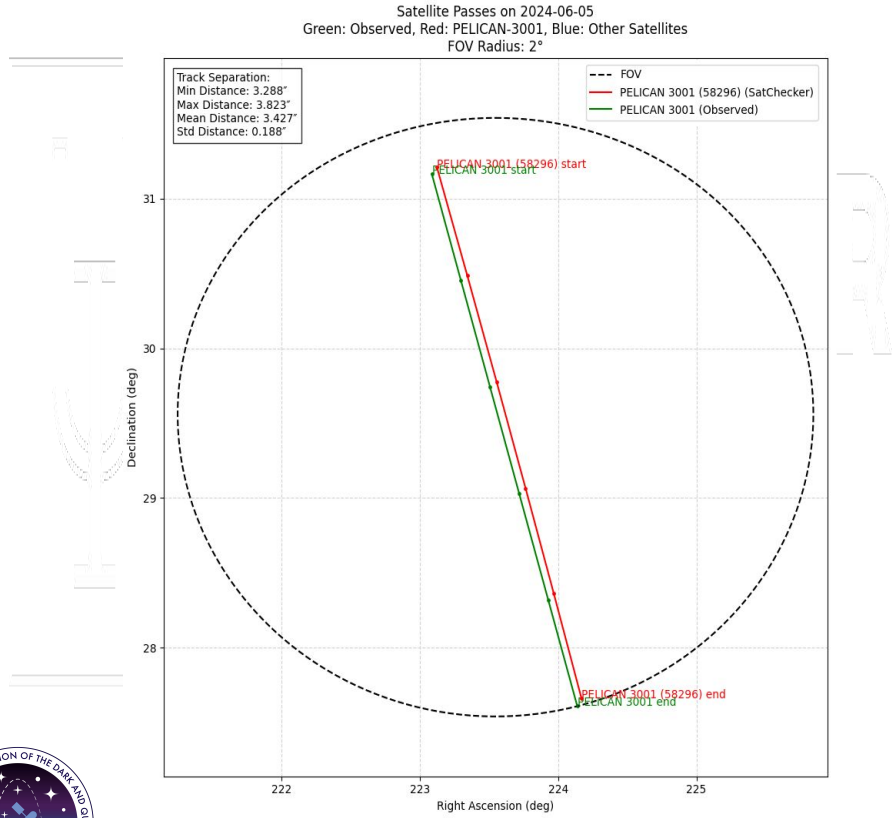


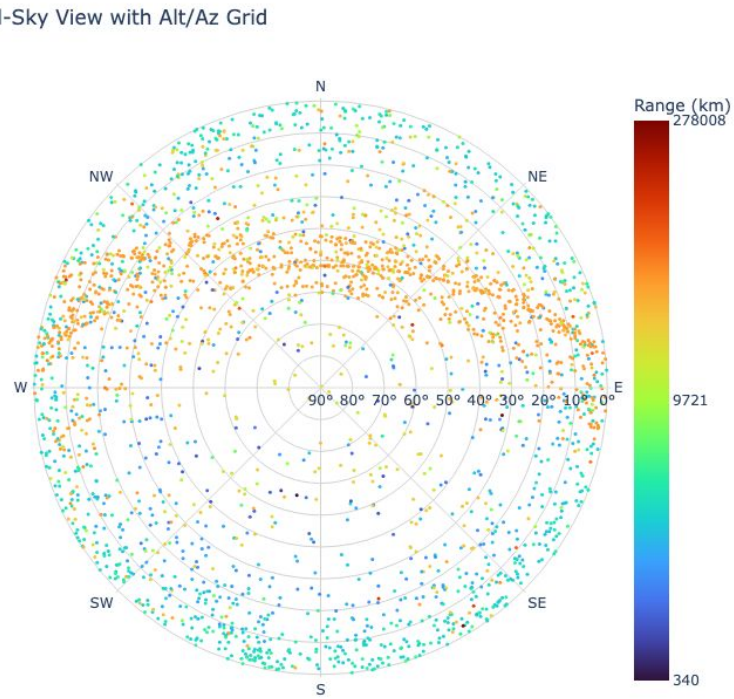
Forecast positions in FOV





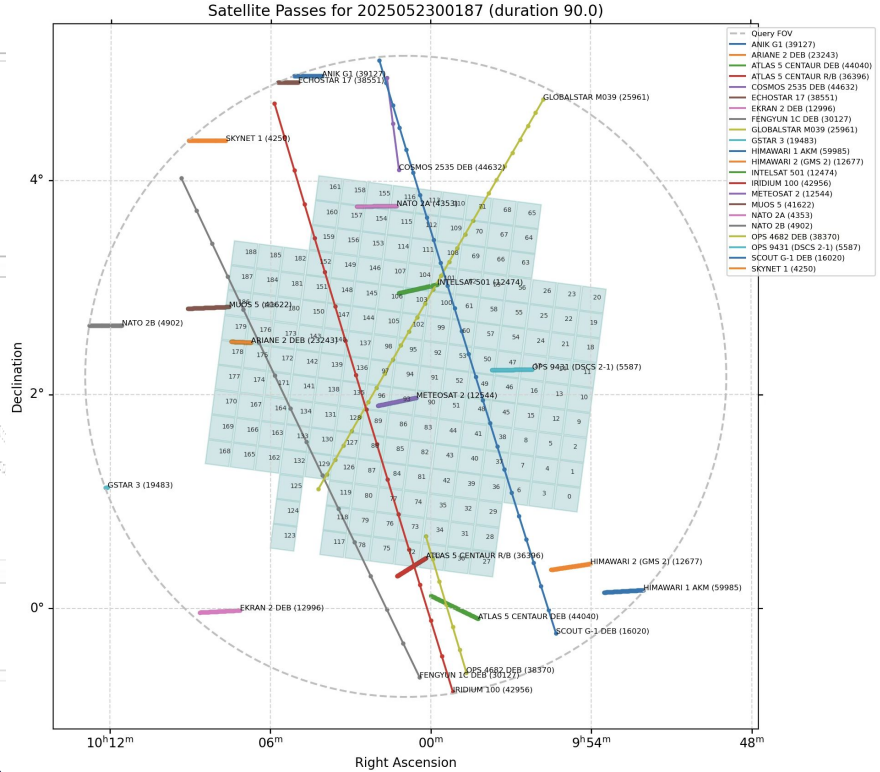
SatChecker Field of View service





SatChecker + Rubin observations

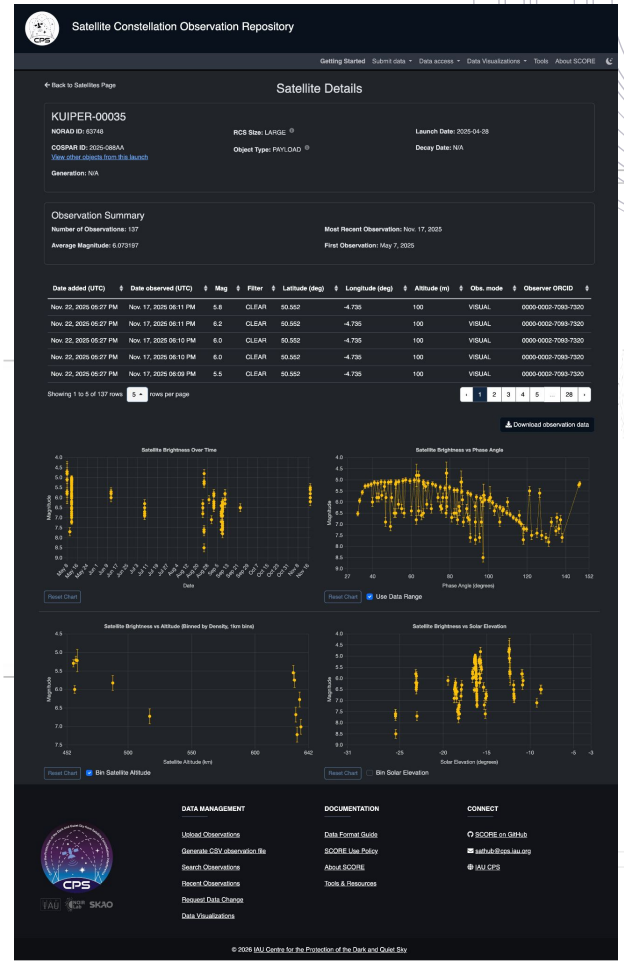
From Jangid et al. poster at
2025 Rubin Community Workshop



https://community.lsst.org/t/rrb-satellite-constellations-and-lsst-new-tools-and-impact-assessments/10729

Satellite Constellation Observation Repository (SCORE)

- Open data set to collect brightness and position observations of satellites
- Can be used to characterize satellites as actually observed or validate position/brightness predictions
- APIs to upload / download data
- Attribution using ORCID
- Cross referenced with SatChecker
- https://score.cps.iau.org/



SCORE statistics

Starlink
469 satellites · **3073** obs ·
Avg: **5.89** mag

Kuiper
102 satellites · **2484** obs ·
Avg: **6.17** mag

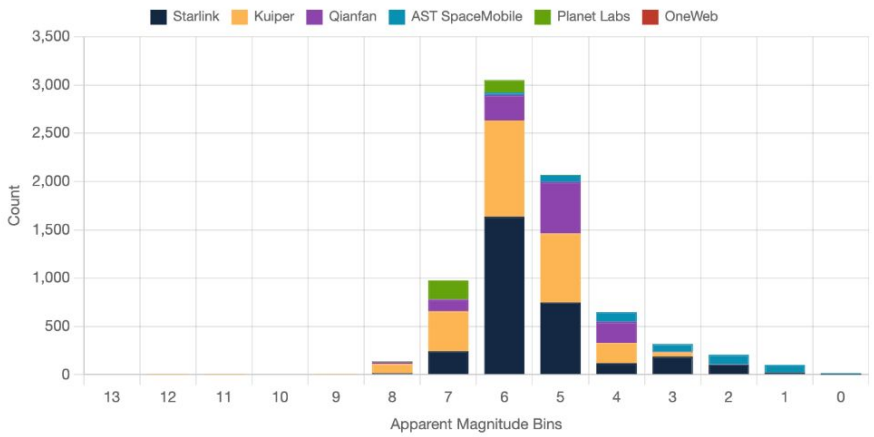
Qianfan
73 satellites · **1166** obs ·
Avg: **5.72** mag

AST SpaceMobile
6 satellites · **472** obs ·
Avg: **3.58** mag

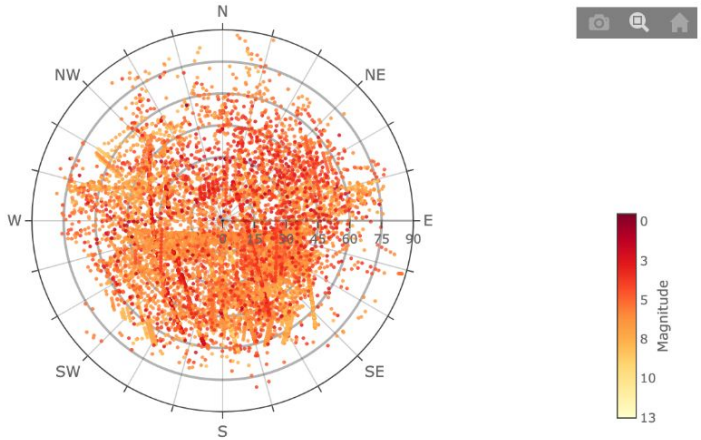
Planet Labs
1 satellites · **338** obs ·
Avg: **7.03** mag

OneWeb
4 satellites · **5** obs ·
Avg: **2.96** mag

Observations by Apparent Magnitude



All Observations



Conclusions

- Increasing numbers of satellite observations in astronomy data - may be useful for SSA, particularly optical brightness measurements and colour information
- Also radio (transmissions, unintended emission) & thermal (infrared/submm) data
- Important to openly share improved positions + brightness data via SCORE (historical information also very useful for astronomy...!)
- Current position accuracy is an issue as it can be few arcmin off - want 1 arcsec / 1 sec accuracy. Astro observations can help with orbital positions?
- Astro want satellites fainter, SSA brighter - what's the middle ground? Could SSA just use retroreflectors and GPS tracking?

Thanks for listening!

Please join us! It's free, and you can join in conversations on Slack & elsewhere!

Join at cps.iau.org - or use QR code below!