‘Skypollution’
How artificial light and satellite networks are impacting our night skies and research

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What is ‘Skypollution’?

light pollution

impacts by satellite networks

Jeremy Stanley (2021)

Martínez-Vázquez et al. (2019)
Satellite networks – in a nutshell

...up to 100,000 satellites in large constellations could be launched into Earth orbit in the coming decade

...many will be located in low-earth orbits (<800km), 60,000 between 300 – 1200km

...major impacts on astronomical observations due to satellite streaks

...biggest problem: no/only few information on satellites before they are in orbit

e.g. Williams et al. (2021)
Simulated streak probability

Simulated streak probability for Leopold Figl Observatory, Austria
1.5m mirror telescope, FoV: $5.6 \times 3.8$ arcmin$^{-2}$
Number of total satellites included: 52 704
Sky sector $>30^\circ$ above horizon, Sun altitude $<-18^\circ$
2021-06-21 22:40:04 UTC

Binder et al. (2021)
What about times without satellites?

...will become extremely rare

...must be planned around winter times (bad meteorological conditions!)

shadowing effects are included ->

Binder et al. (2021)
A more detailed look

Minutes of No Satellite Illumination per Night in Mitterschöpfl, Austria in 2021

Seiser (2021)
Worldwide effects

Simulation including 52,704 satellites
(Starlink, OneWeb, Kuiper System, GW-A59, GW-2)

Number of satellites above horizon at any time, if all reach their final positions ->
What we must avoid - I

- light pollution
- satellite networks
- VISIBLE impacts by satellites
What we must avoid - II

...the ‘death’ of observational astronomy

⇒ the answer does not have to be ‘no satellites’!

BUT: to ensure both, we need necessary information on upcoming satellites
Some recommendations...

There is the strong need of international agreements, legal frameworks and/or licensing requirements for satellites

...on visibility impacts:
• design missions with a maximum value of their appearance: fainter than visual magnitude 7 during ALL flight phases

...on satellite networks:
• promulgate necessary information on satellites such as surface reflectance, antenna parameters, predicted/real-time ephemerides
• work together with astronomical community

Most important: reliable information!
Thank you!

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