ESA's Flyeye Telescope Network

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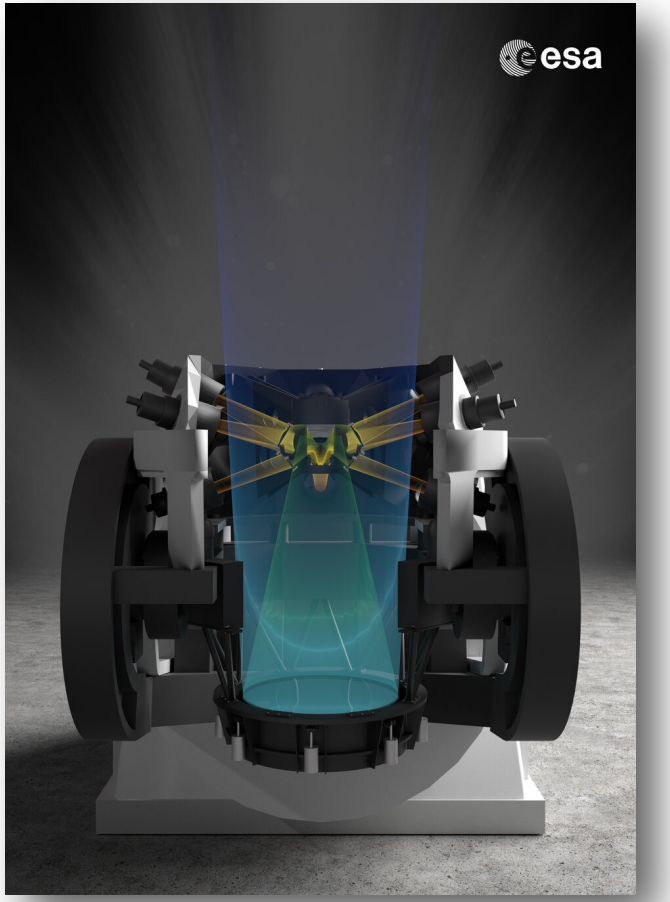
FLYEYE-1 TELESCOPE

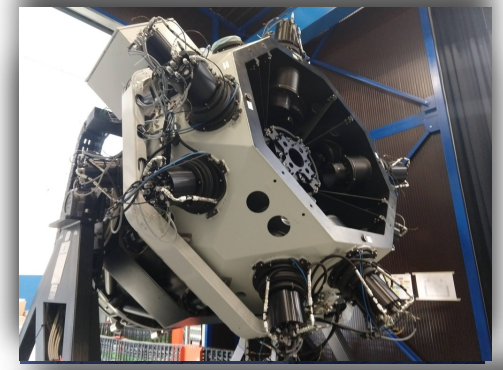
ESA is building a survey telescope network *dedicated to discovering smaller asteroids in a direct collision course with Earth.*

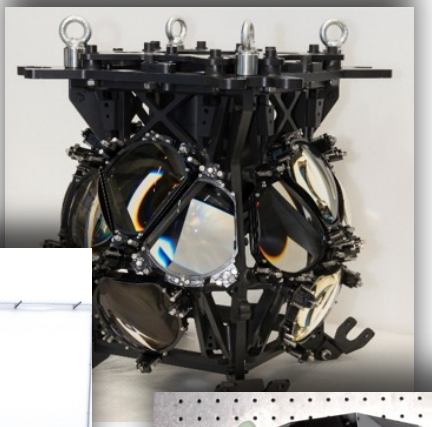


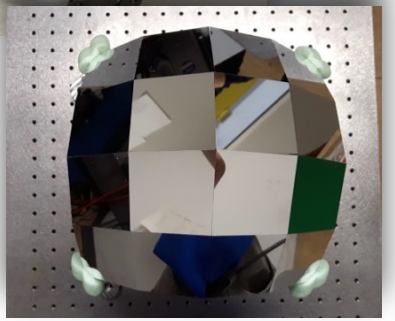
The Flyeye-1 telescope is a 1-metre class telescope with 16 cameras and a ***6.7°x6.7°*** *field of view. It will be able to perform a* **complete scan of the observable sky down to V~21.5 every 2-3 nights.**

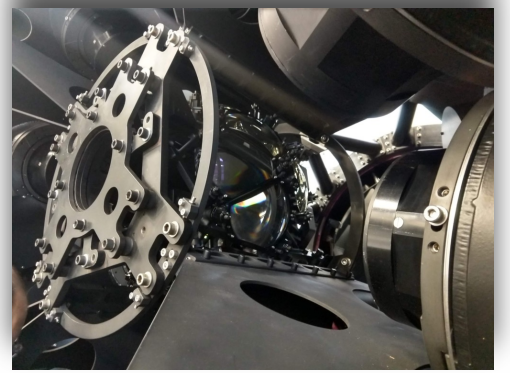
There is funding to build other large field of view telescopes: Flyeye-2 will feature an upgraded configuration and is currently undergoing Preliminary Design Review.

FLYEYE-1 STATUS









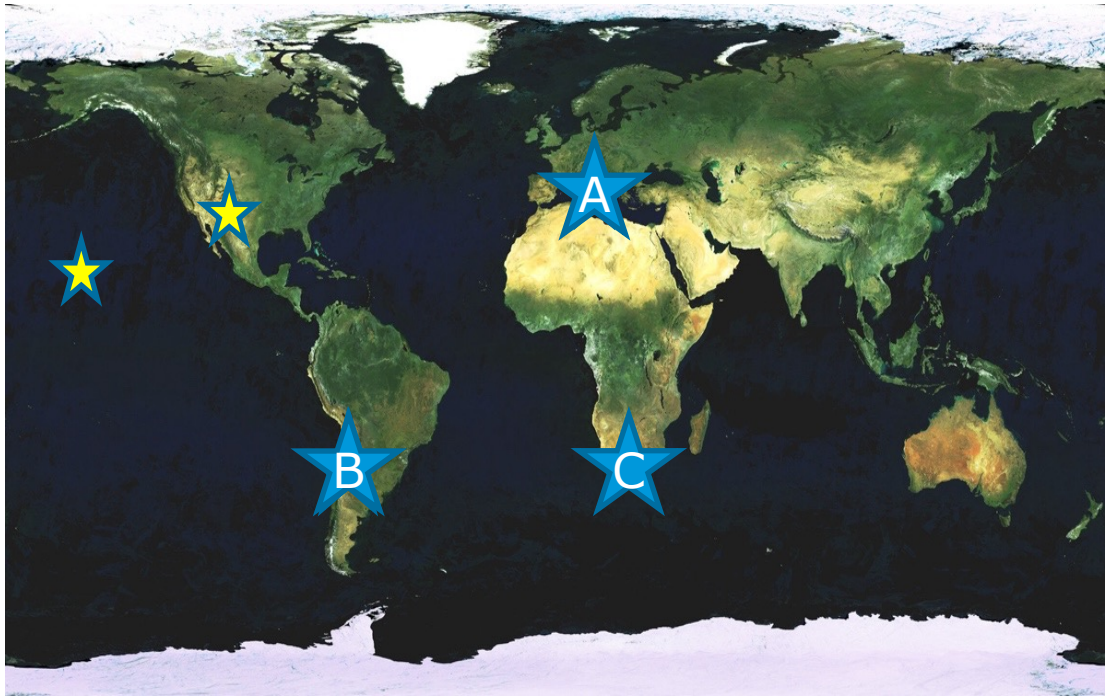
- Telescope passed Factory Acceptance Test at the end of 2022.
- On-sky testing with fully integrated telescope & mount to begin in 2024.
- Will be ready for first light in its final location in the Northern Hemisphere by 2025.

Ideal Location for Flyeye-2

Want to answer the following questions:

- Will Rubin Observatory LSST detect the majority of imminent impactors in the Southern Hemisphere? Is it worth building more survey telescopes in the South?
- If majority of survey telescopes are in the Northern Hemisphere, is it worth building more survey telescopes in the North?
- Does longitude affect detection rate?

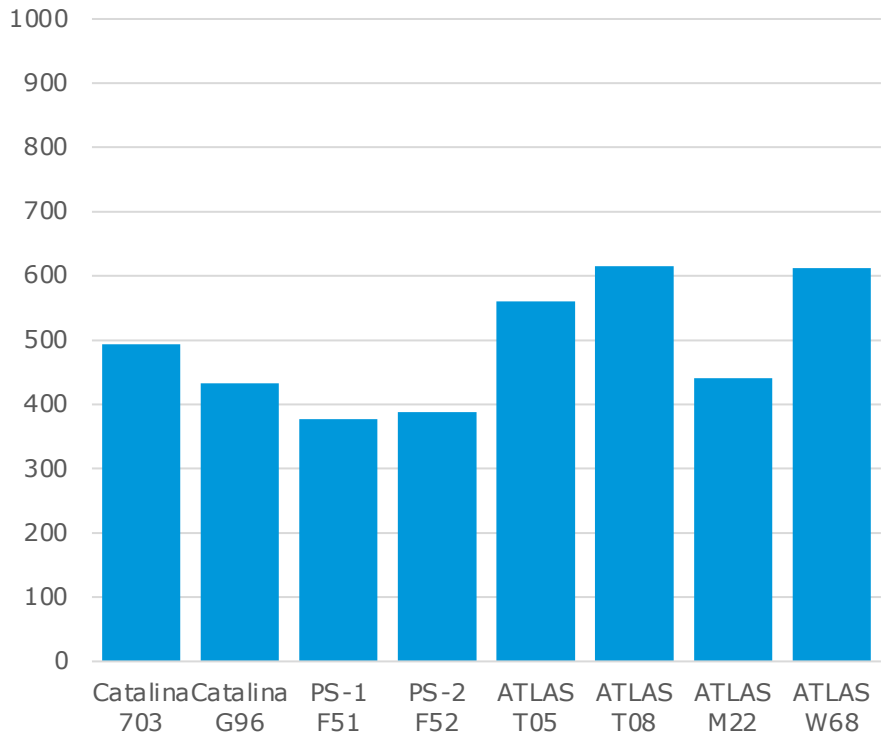
Simulations



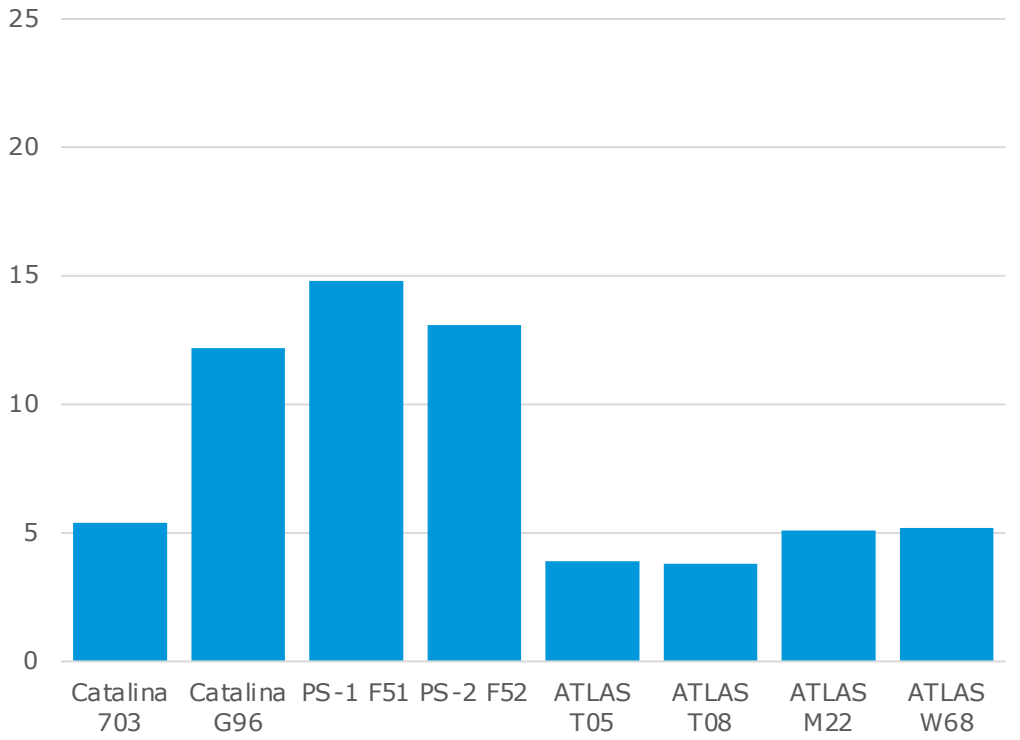
- Simulated ~3000 H=25 impacting asteroids provided by S. Chesley (Chesley et al., IEEE Aerospace Conference 2019).
- Assumed all impacting in a single year.
- Took pointings of existing telescopes from MPC, for LSST one year of pointings from a simulated survey, modelled an expected Flyeye observing strategy.
- Tested to see how many impactors would be detected by existing and planned surveys plus Flyeye-2 in locations A, B and C.

Results: Individual Detections Existing telescopes

Number of Impactors discovered before impact



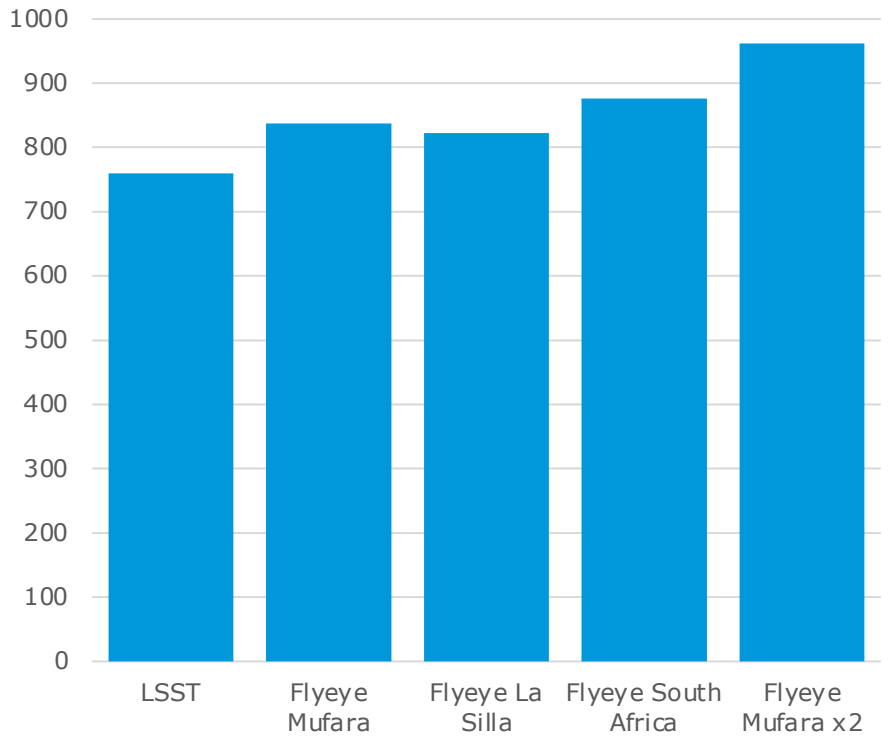
Average days before impact



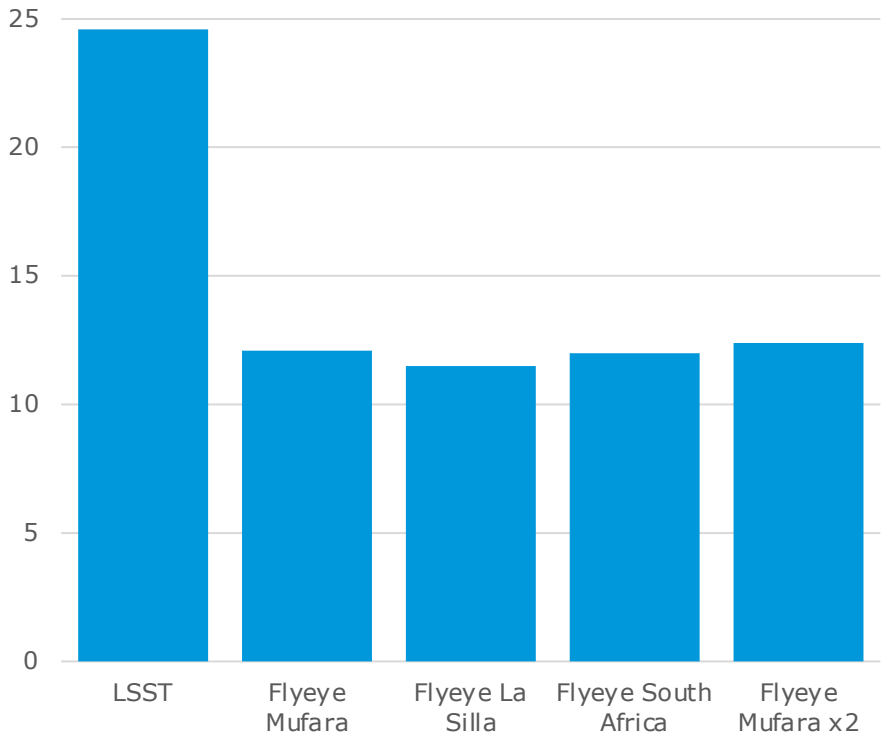
Current surveys are able to find more-or-less similar number of impactors, with a warning time related to their limiting magnitude.

Results: Individual Detections Existing telescopes

Number of Impactors discovered before impact

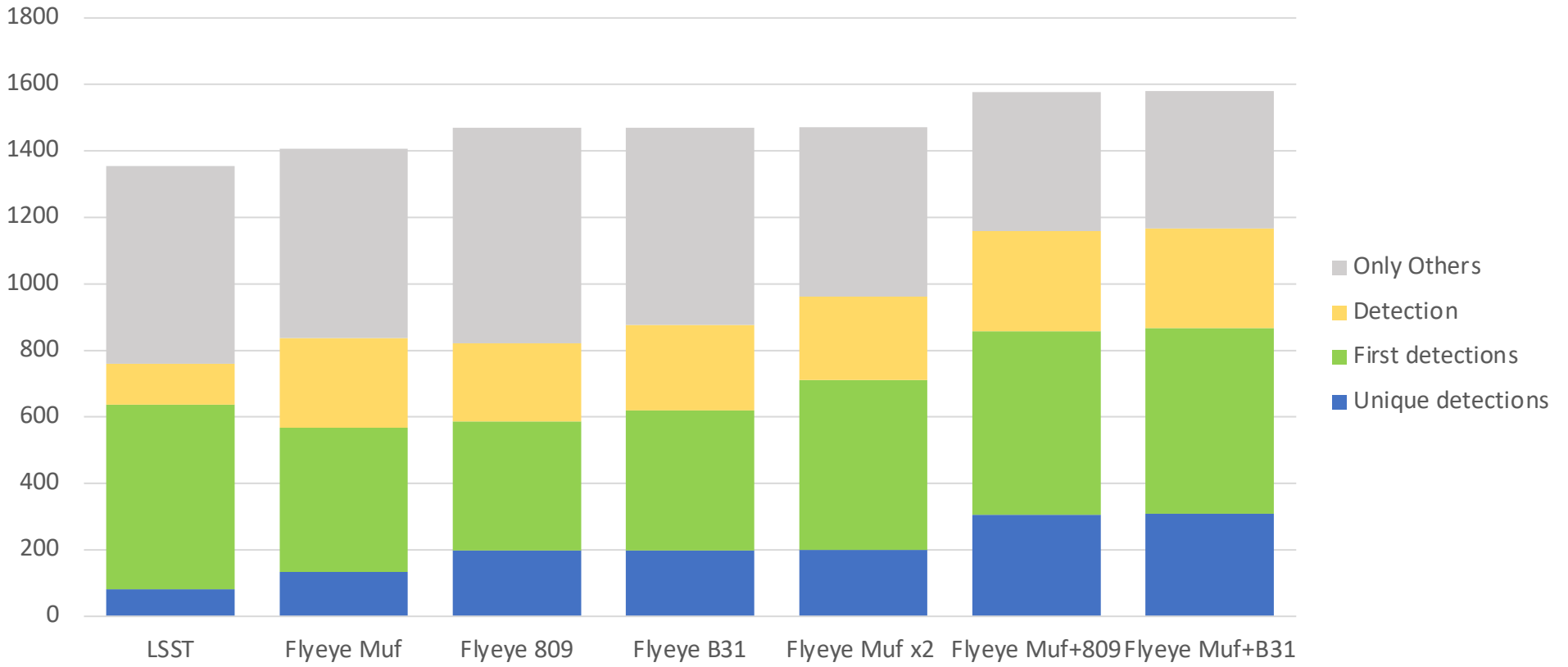


Average days before impact



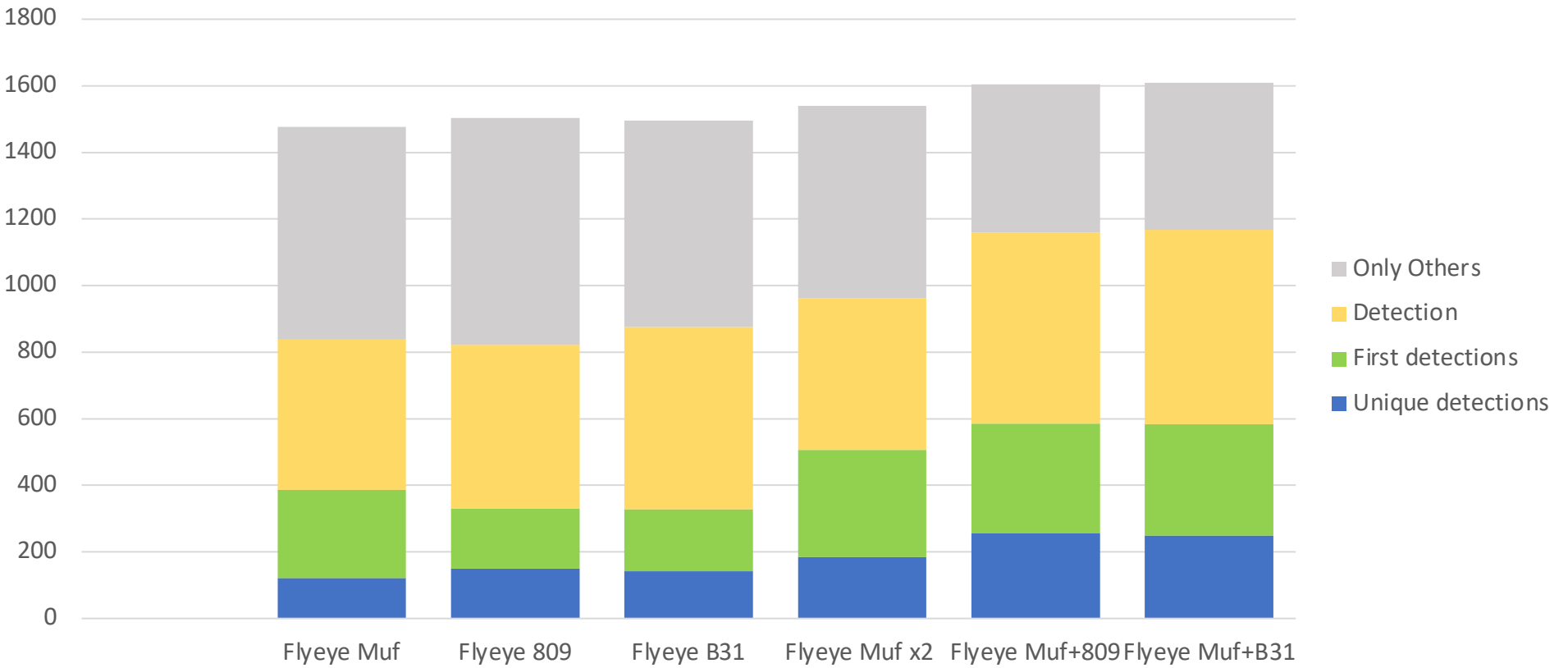
With the Flyeye (and LSST) we will be capable of discovering a lot more impactors than the current surveys.

Total Number of Impactors Detected by Flyeye & LSST



For H=25 objects, simulations show a slightly higher number of detected impactors for a Flyeye-2 in the Southern Hemisphere compared to two in the North. (For smaller, H=28 objects, we find no statistical difference.)

Total Number of Impactors Detected After LSST



When including detections from LSST to the others, the number of first detections goes down,
As expected, but the contribution of unique detections from each configuration is still substantial.

Conclusions

- For H=25 objects, simulations show a **small preference for the Southern hemisphere** for the ideal location for Flyeye-2 and **no statistical difference** for H=28 objects.
- **No longitudinal difference** was found.
- **LSST will not overdominate the discovery of impacting asteroids** in the South.
- Between the sites, **the average number of clear nights will make the biggest difference**.
- **Weather models favour La Silla** for the ideal location for Flyeye-2.