The Mission Accessible Near-Earth Objects Survey (MANOS): three years of photometry

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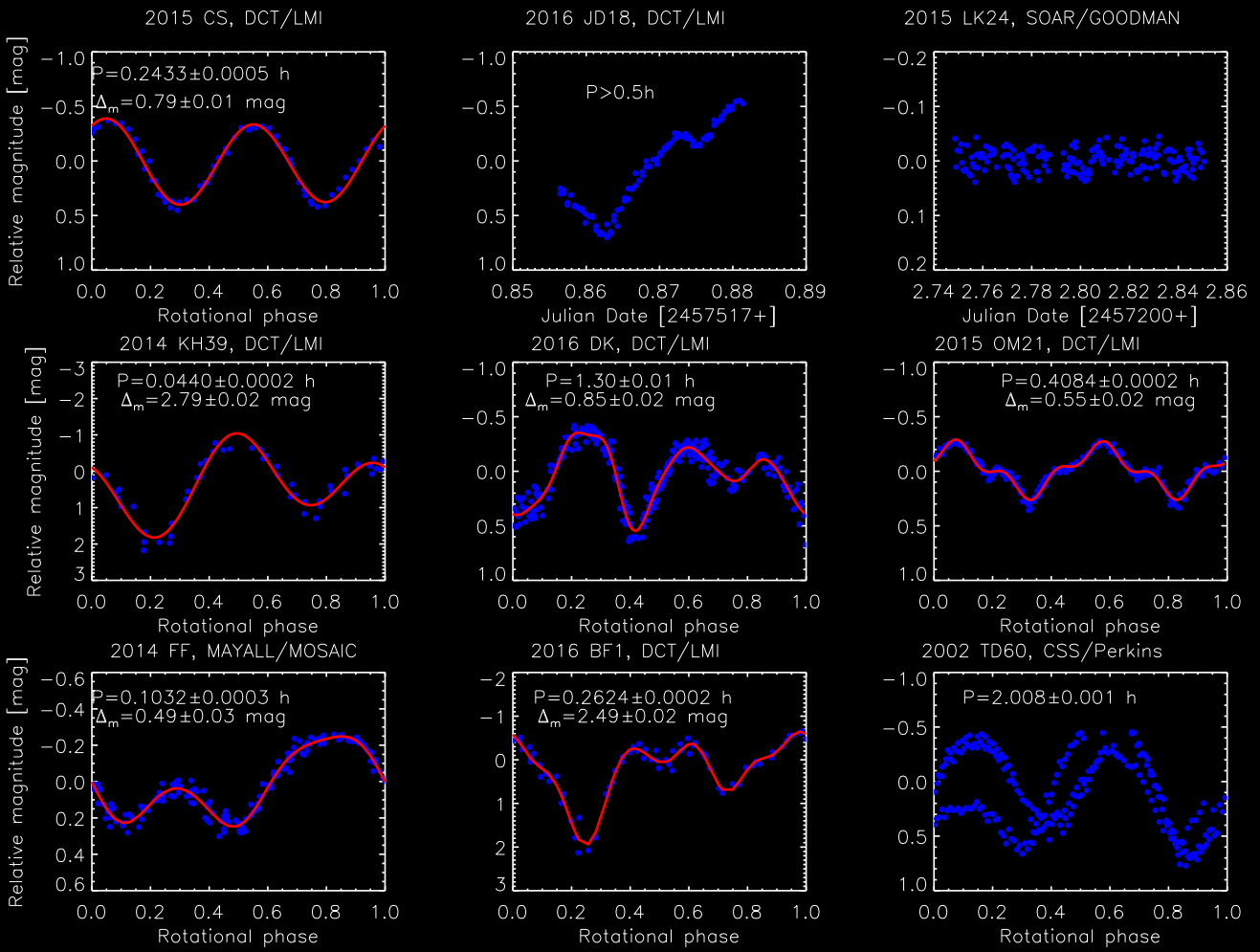
What is MANOS?

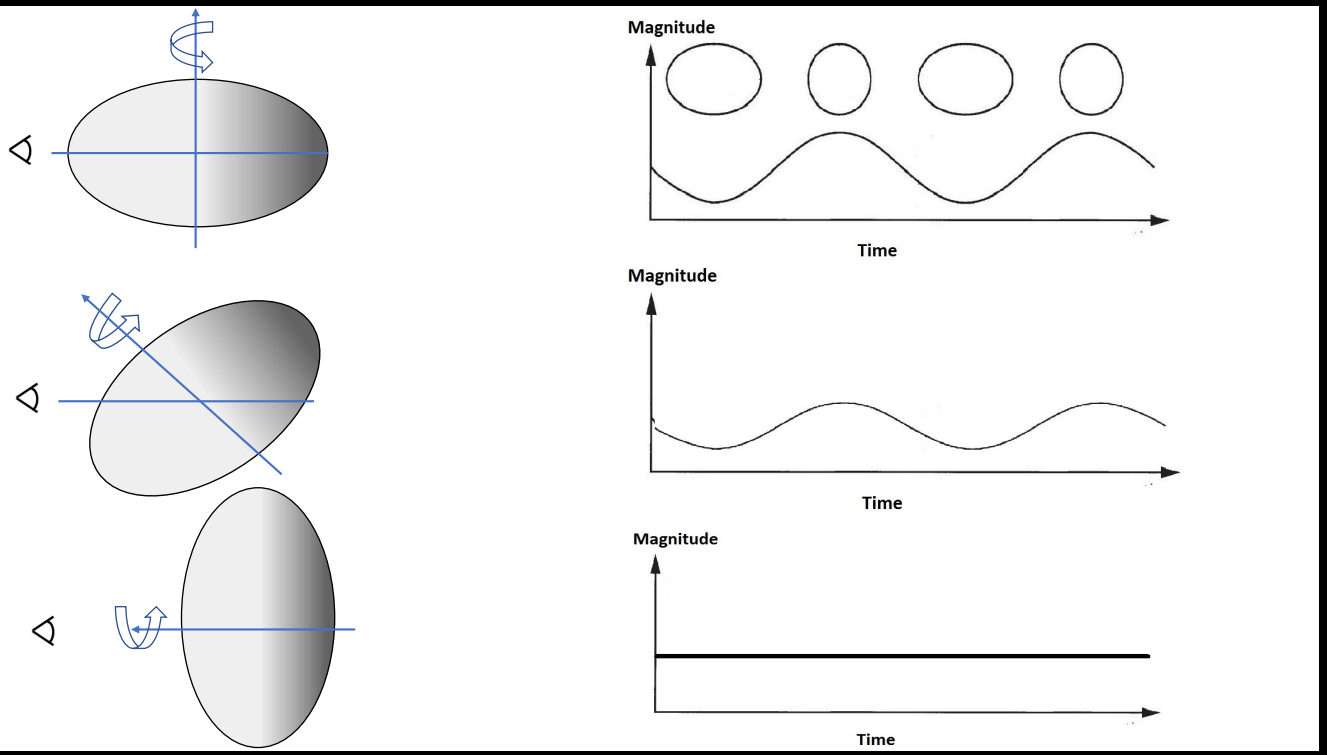
- Multi-year survey awarded by NOAO: 2013B-2016B, and funded through NASA NEOO (PI: N. Moskovitz).
- Goal: Catalog physical properties of several hundred of sub-km Near-Earth Objects (NEOs).
- Target selection: NEO has to be mission accessible, focus on small objects (diameter $<$1 km).
- Two techniques: **spectroscopy** for composition, taxonomic class and albedo; **photometry** for astrometry (refine orbit), and lightcurve: rotational properties, morphology $\Rightarrow$ object fully characterized, observed with both techniques.
- Main facilities: 8.1 m Gemini Telescopes (north and south), 4.3 m Discovery Channel Telescope (DCT), 4.1 m Southern Astrophysical Research telescope (SOAR), 4 m Mayall Telescope, 2.2 m University of Hawaii telescope, and 1.3 m SMARTS telescope.

MANOS: lightcurves



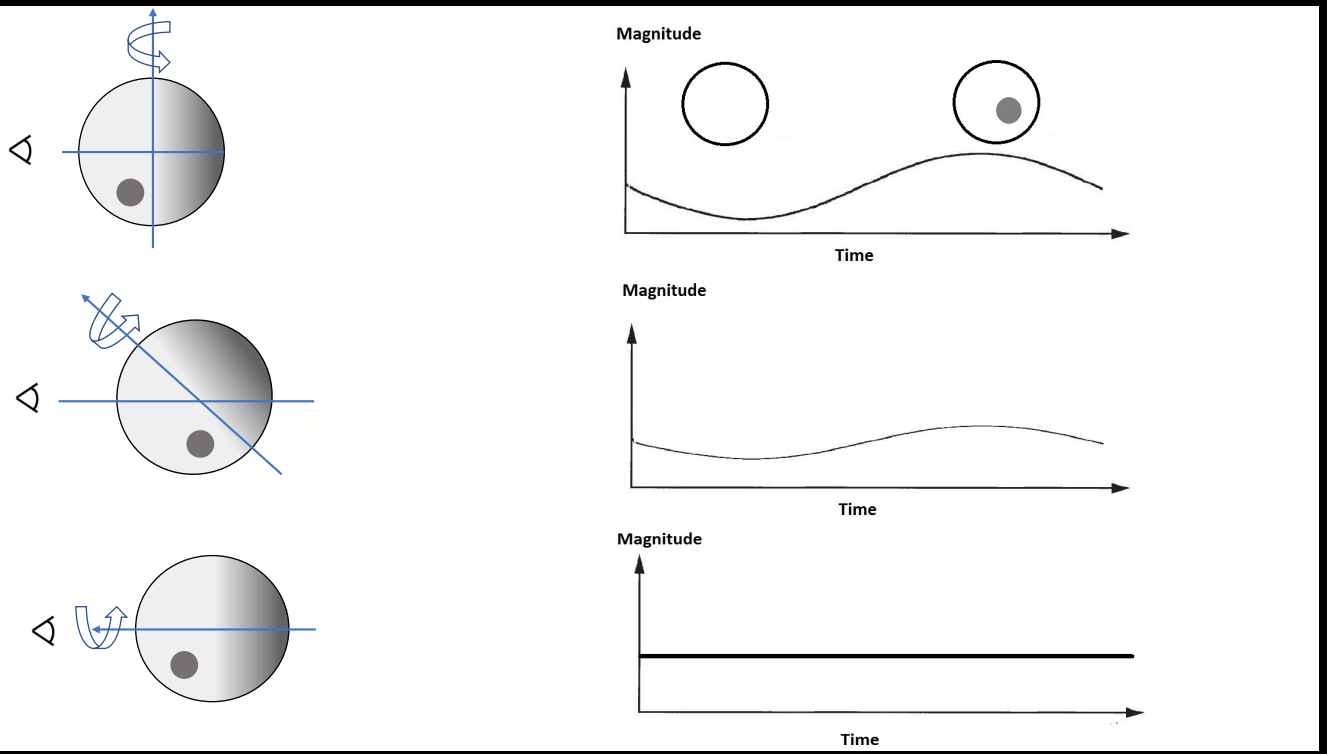
- Lightcurves for 250 NEOs.
- Large diversity of lightcurves.
- Three main category: Full lightcurve with at least one full rotation of the NEO, Partial lightcurve with an increase/decrease of the object's brightness, Flat lightcurve without clear variability.
- Symmetric/Asymmetric lightcurve.
- Complex lightcurve.
- Tumblers.

Lightcurves



- Lightcurve amplitude gives information about the object's shape. What can we learn about the shape distribution of the NEO population?
- Lightcurve amplitude varies with spin axis orientation.
- Lightcurve morphology depends on shape of the object.
- Lightcurve amplitude varies with observing circumstances: phase angle.

Lightcurves



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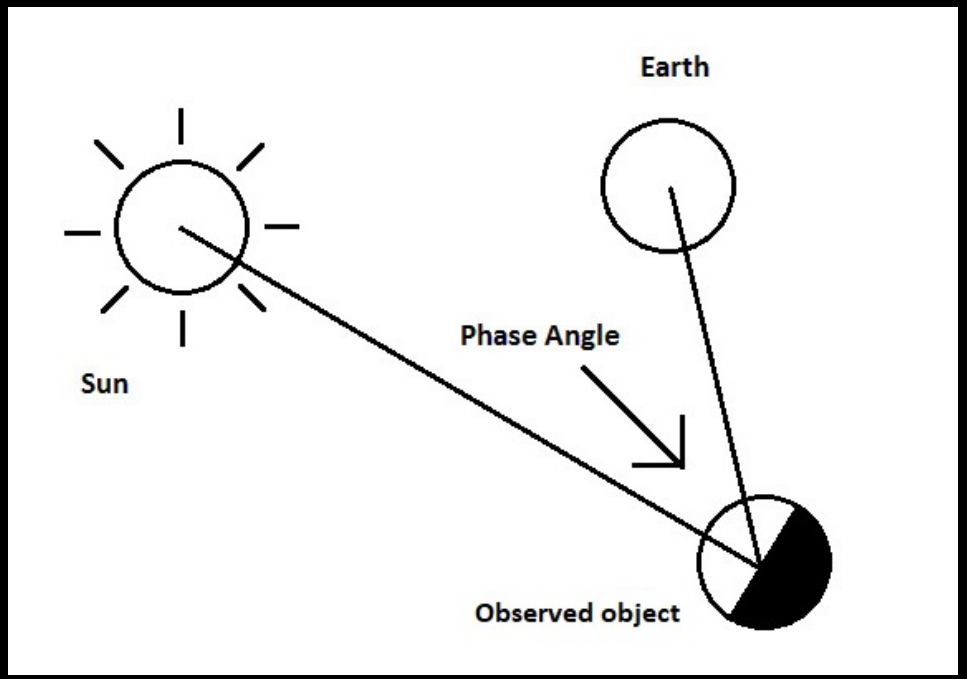

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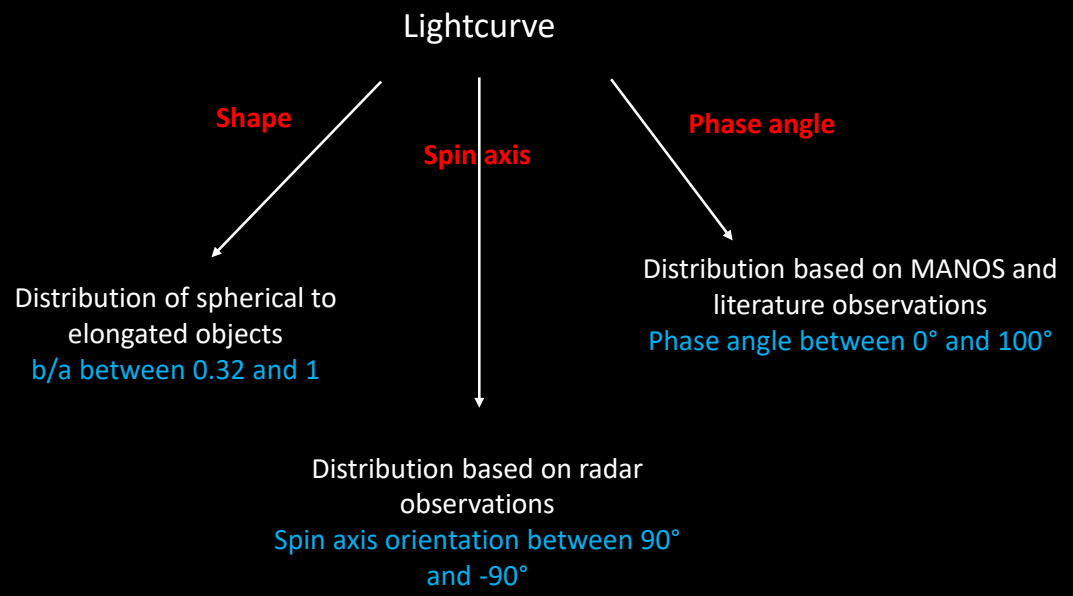
Lightcurves: synthetic population



- Δm (shape, spin axis, phase angle).
- Synthetic population
- MANOS + literature versus synthetic population
- Normalized histogram for uniform distribution of shape.
- Normalized histogram of the sample: good agreement.
- With excess of spherical and elongated objects: not so good match.

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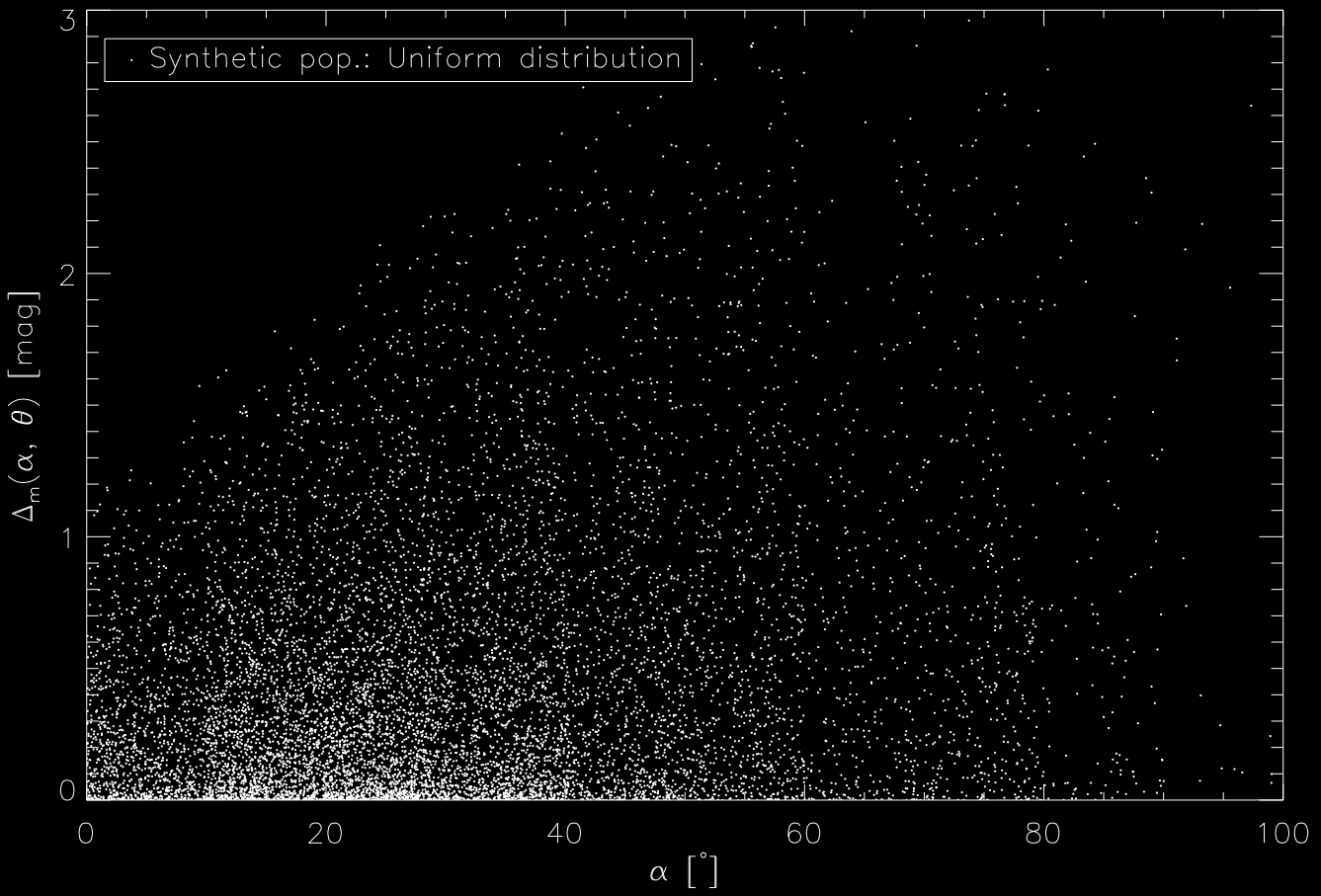

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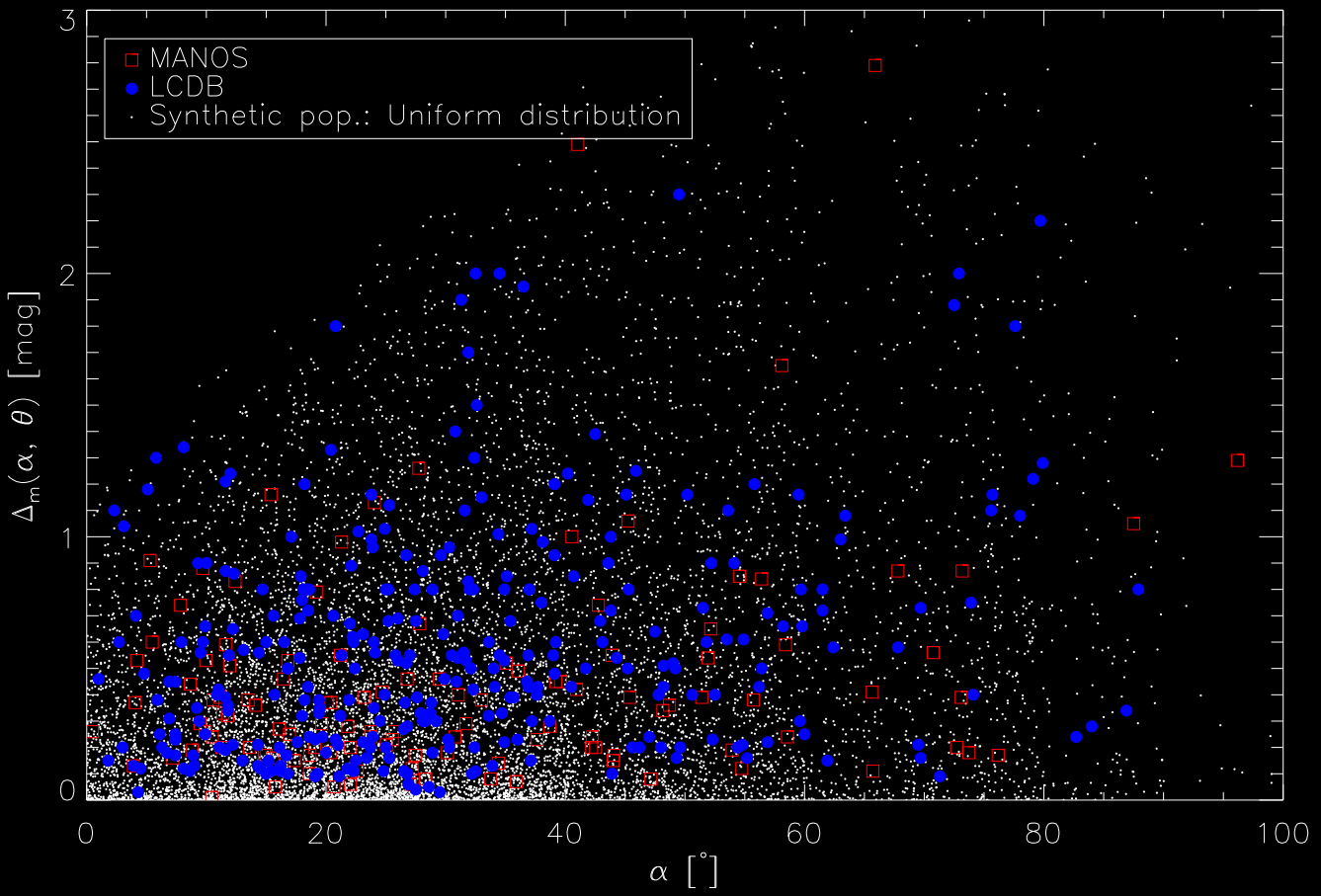

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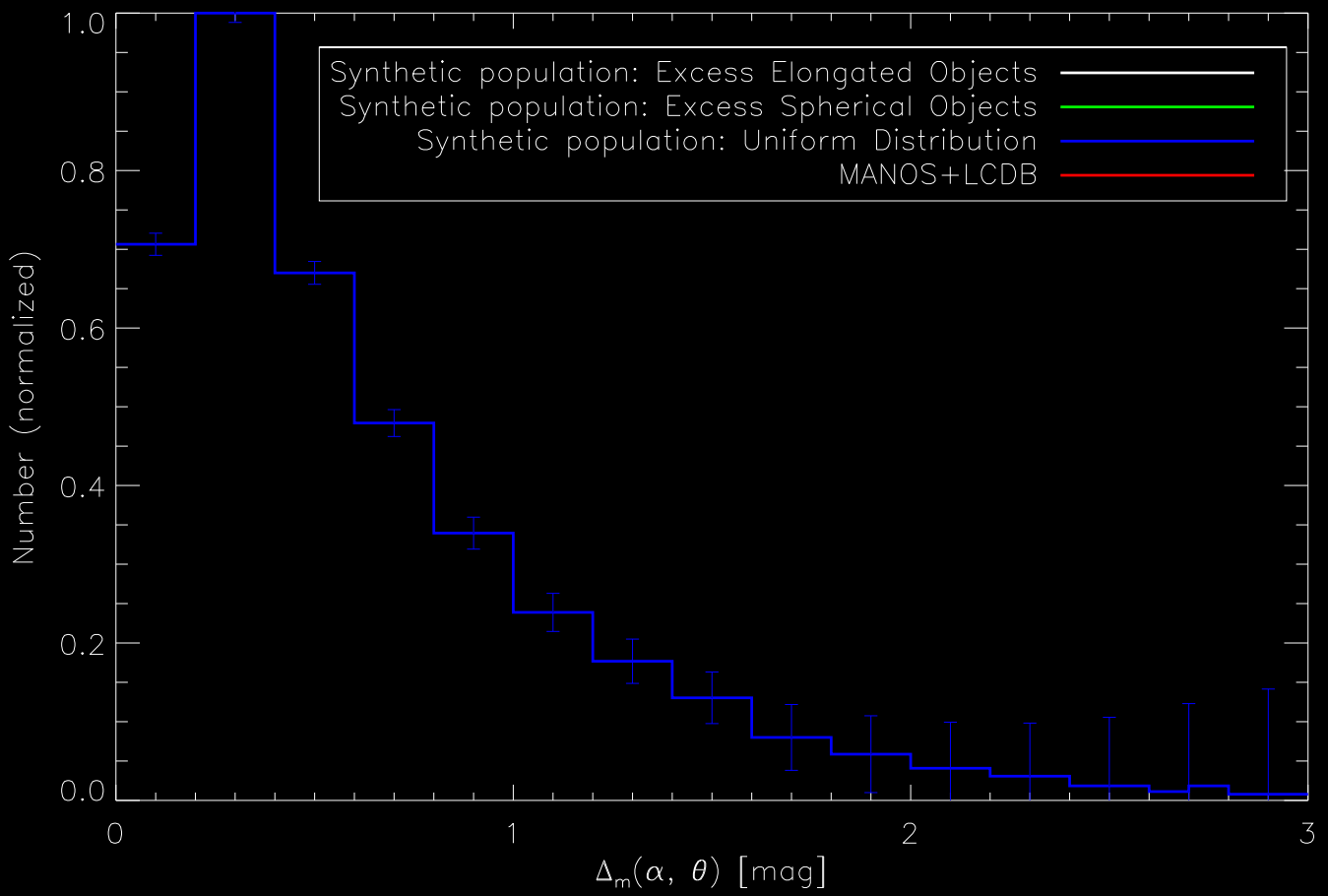

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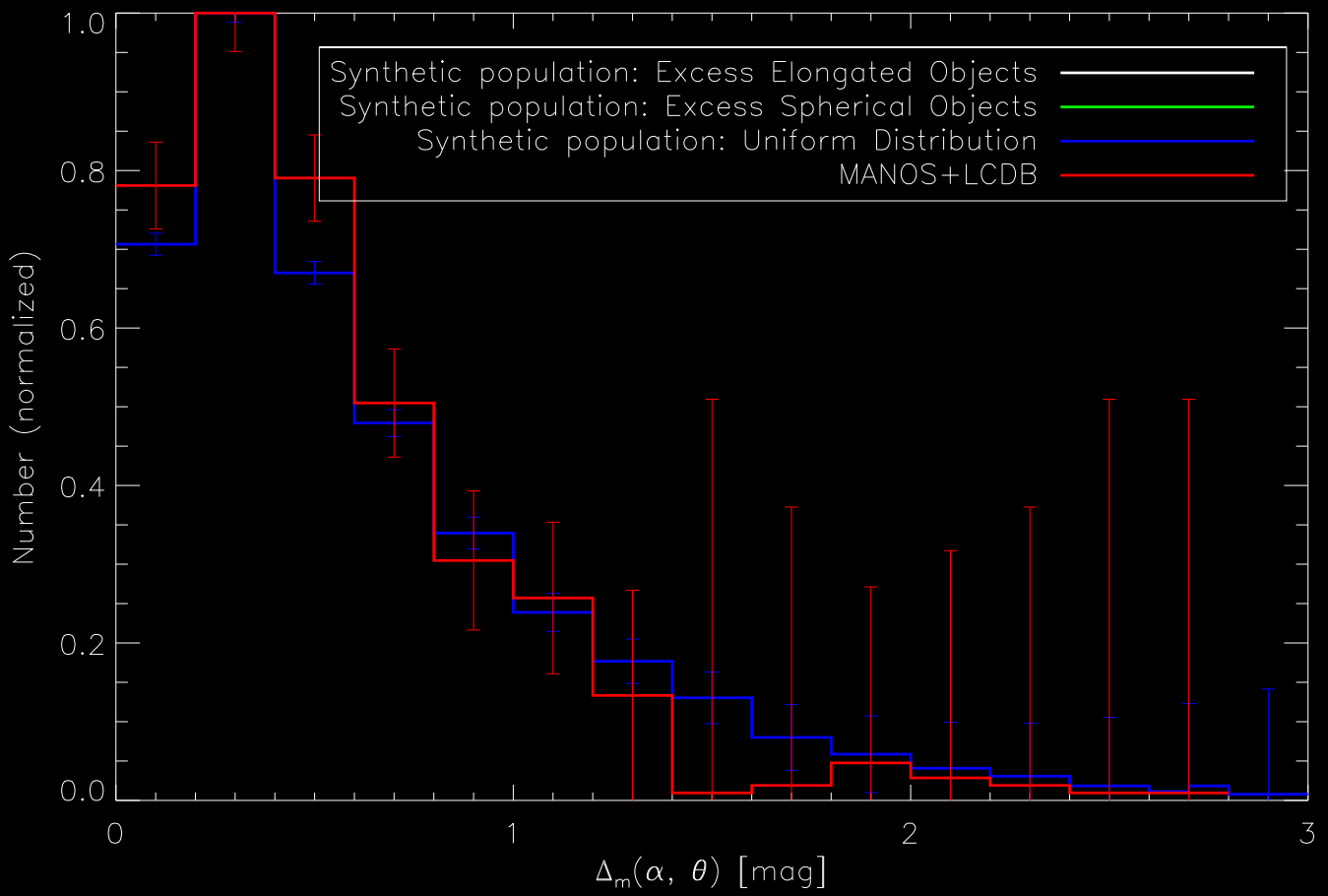

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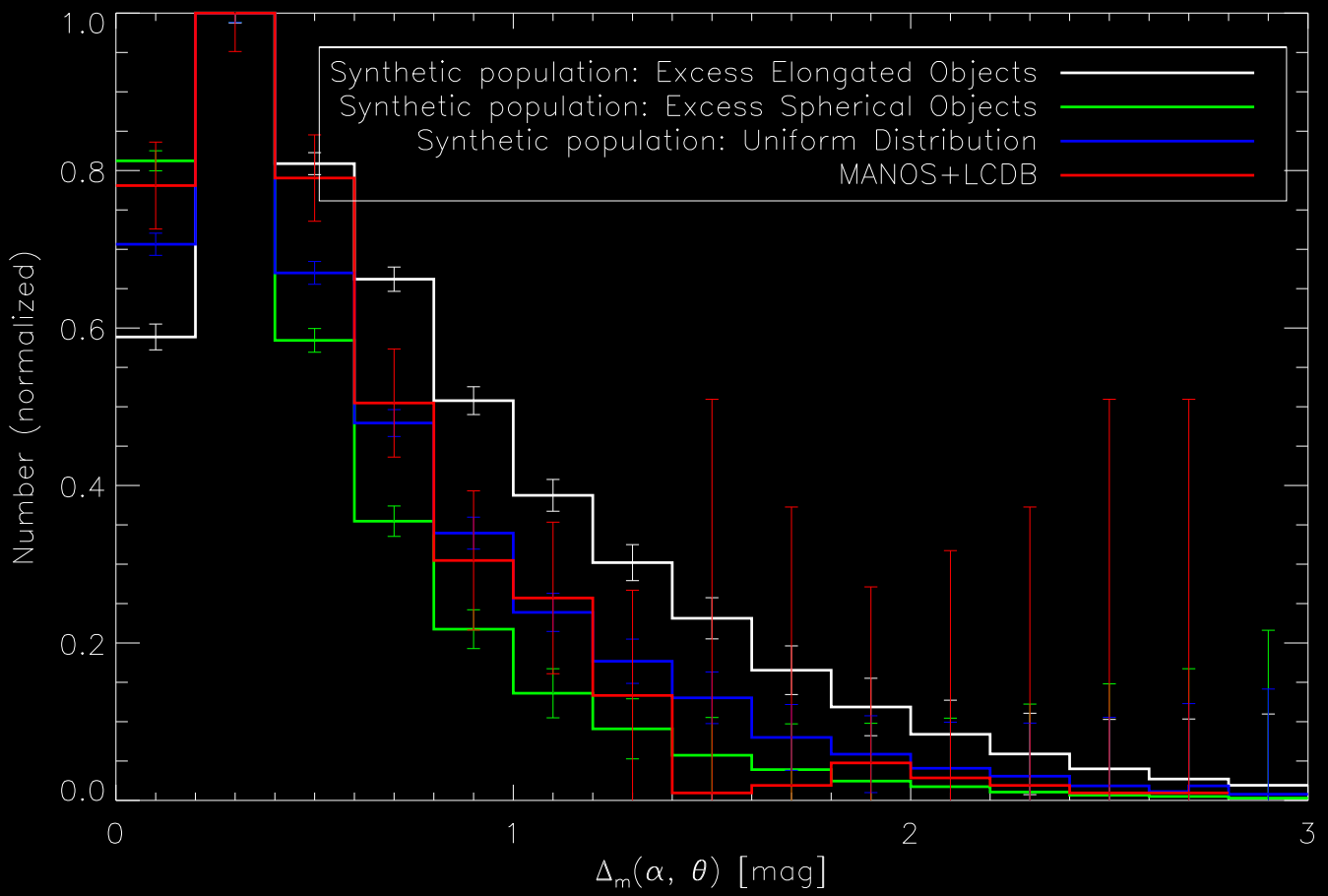

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