

DP 0.3 Overview

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What is DP0.3?

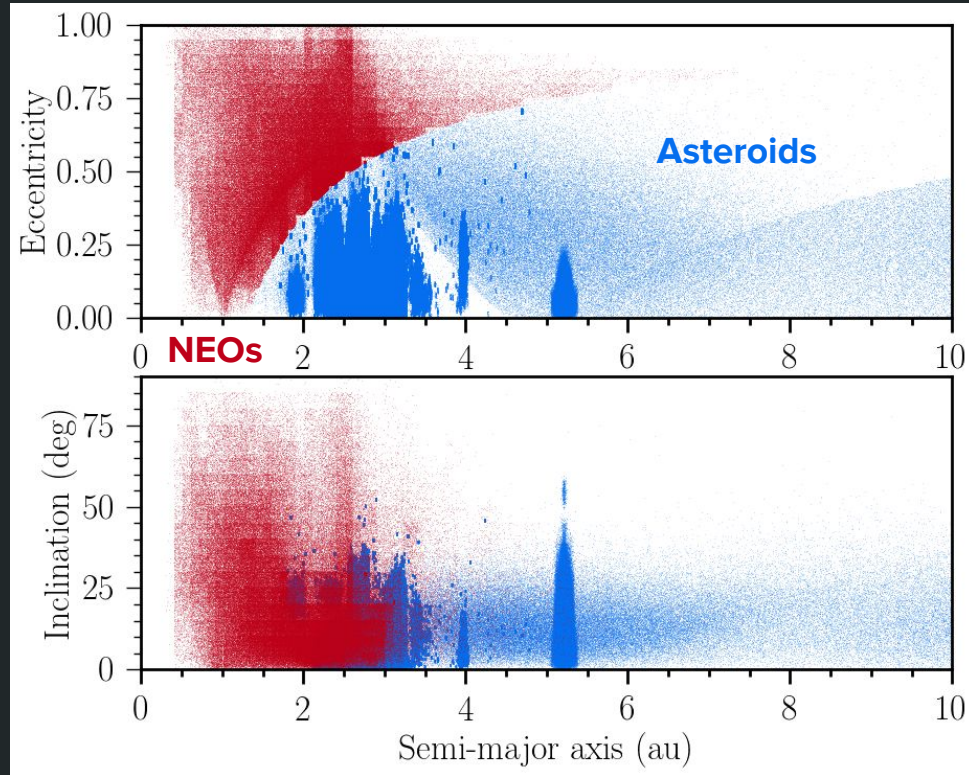
- Data set containing simulated catalogs from the first year of operations as well as the full 10yr survey (roughly a billion total measurements)
 - Data products mimic what will be delivered by the real survey (SSObjects, diaSource, MPCORB tables) and uses a prototype of the daily processing pipeline
 - Note: catalogs only - no simulated images!
- Simulations use v3.0 cadence
- Astrometric and photometric errors match expectations as a function of magnitude
- Simulated linking matches design goals (95% completeness under many conditions)
- Same database system as will be used during operations

Schematics of the processing for DP0.3

- Hybrid catalog
 - Inputs: S3M, MPCORB, (+NEOs)
 - Outputs: Hybrid Catalog Objects
- ObjectsInField
 - Inputs: V3.0 Baseline cadence, orbital parameters (source populations)
 - Outputs: ephemerides
- SurveySimPP
 - Inputs: ephemeris, orbital parameters, colors
 - Outputs: Detection catalog
- Daily data products pipeline (prototype)
 - Simulated linking
 - Orbit fits
 - Absolute magnitude fits per band
- Note: for more details on ObjectsInField and surveySimPP: talk to Steph Merritt and Grigori Fedorets

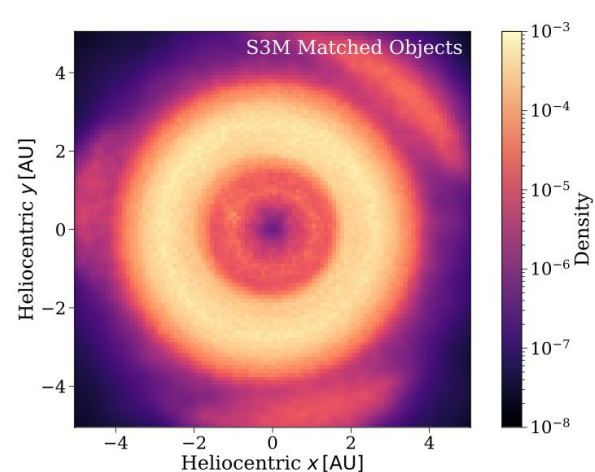
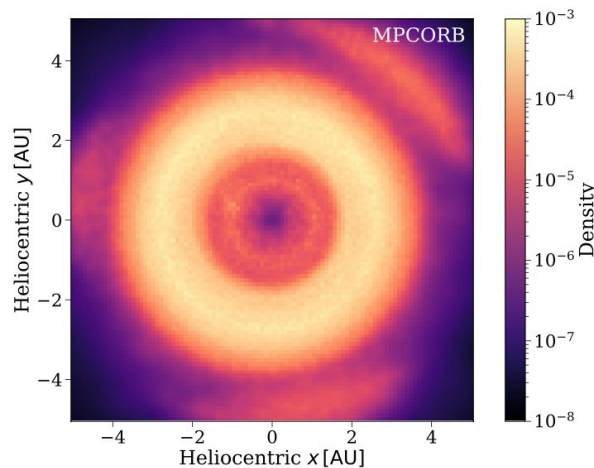
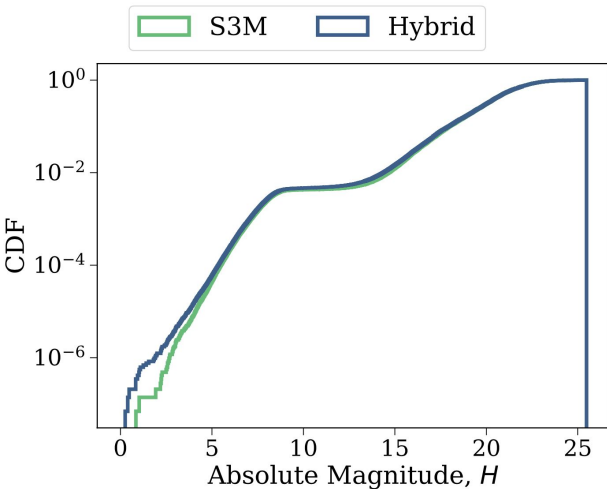
Source populations

- Granvik NEO model ([Granvik et al 2018 - Icarus, Vol. 312, p 181-207](#))
- Pan-STARRS Synthetic Solar System model (S3M, [Grav et al 2011 - PASP, Vol 123, 902, 423](#))
- Catalog has been “hybridized” to account for objects that are already in the MPC (by T. Wagg et al)
- Population of interstellar objects (by A. Heinze)
- Some oddities (TBD!)



Hybrid catalog (by T. Wagg)

- The Minor Planet Center has over 1 million objects already, and a good fraction of these will be recovered by LSST
- To avoid overestimating discovery rates in the bright/near complete regime, objects from S3M are replaced by their most similar real counterparts in the source population



Interstellar objects (A. Heinze)

- Objects are simulated according to a realistic distribution of Galactic velocities from local stars and realistic impact parameters
 - Times of perihelion passage are chosen so that objects become maximally close to the Sun during survey operations
- Orbits are integrated using n-body simulations
- Simple power law absolute magnitude distribution
- Population probably overestimates ISO rates - so use these only for testing pipelines!

Simulated linking (by J. Moeyens)

difi: “Did I Find It?”. Python code that was designed to answer two questions:

- **What should an idealized linking algorithm find in these labelled observations?**
- Given these linkages found, how did my linking algorithm perform?

Tracklet-metric:

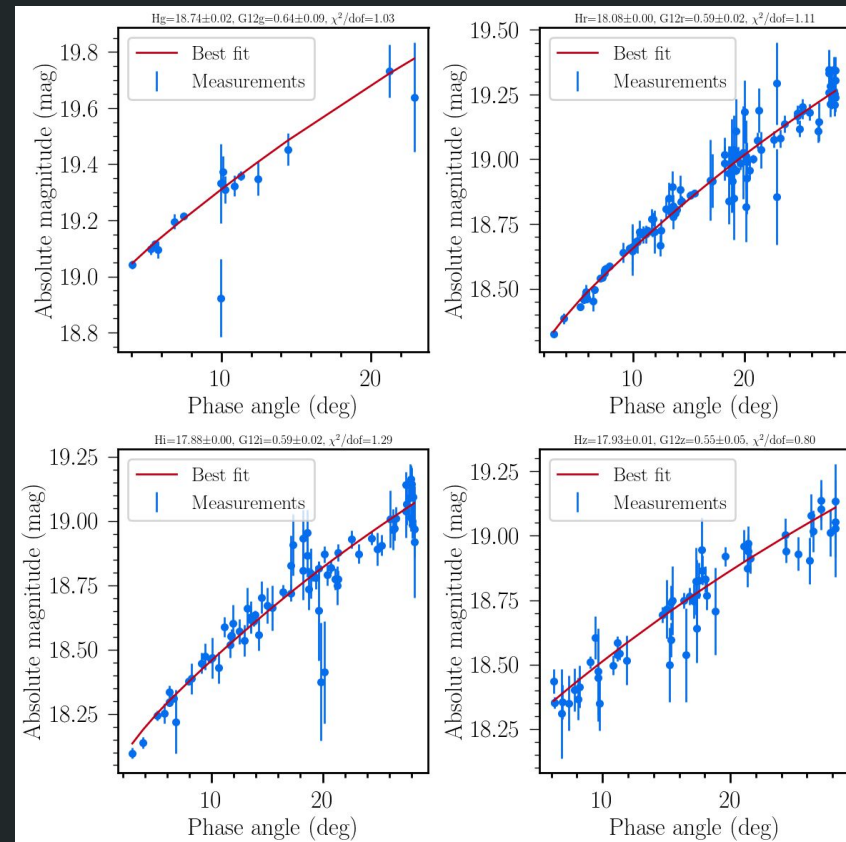
- 2 observations on at least 3 unique nights within a 15 day window
- Tracklets must be astrometrically separated by more than 1 arcsecond
- Consecutive detections cannot be separated by more than 90 minutes
- Each discovery opportunity (each set of three tracklets) has a 95% chance of being successfully linked



<https://github.com/moeyensj/difi>

Daily data processing pipeline

- Will be run daily by the survey and deliver survey products for all linked objects:
 - Orbit fits (currently using openorb)
 - Absolute magnitudes (HG12 system) per band
 - Matched to MPCORB catalog (that is, will have MPC identifiers for all objects)
- Left: example of a randomly chosen object



First look at the data preview

- There is a preliminary version of the catalog available in the Rubin Science Platforms!
 - This is not meant for long term usage (like DP0.3 will be) and will be replaced by DP0.3 - do not rely on this data yet!
 - Timeline for actual DP0.3: ~August (+/- a month)
- **This is not a public release - please do not share it with people outside the sprint.**
 - **Avoid unofficially announcing it online (eg posting about it on Twitter or whatever platform exists nowadays)**
- Link for RSP: <https://data.lsst.cloud/>

Weekly 21 is now the new recommended (default) image for notebooks

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Let's look at a very simple notebook!!!! Files on slack, both in Jupyter Notebook and pdf form

Note: must be run on RSP because of table queries

Discussion

- What sorts of tutorials do you think will be helpful for DP0.3?
- Any other (small!!!) things we could do to improve the simulated data?
- Anything else you'd like to talk about related to DP0.3?