Impact of Rubin precursor observations on Microlensing events in Roman

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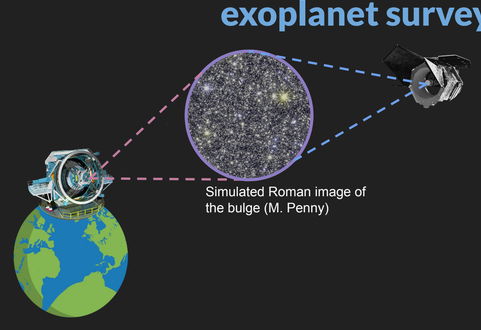
Motivation

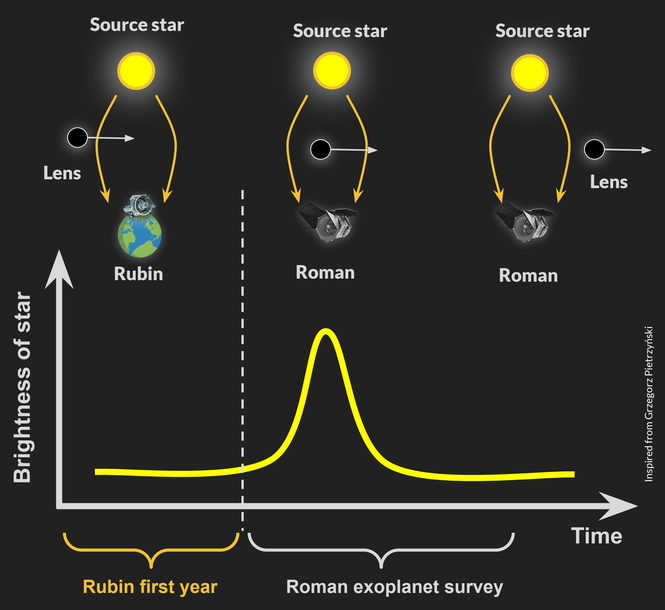


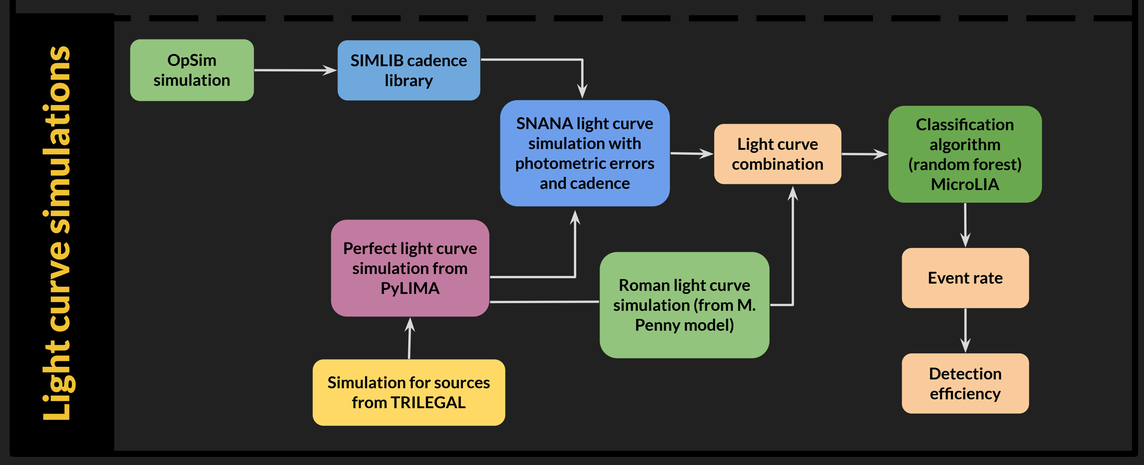
- The Roman space mission is expected to be launched about one year after Rubin starts science operations
- Roman will carry out a microlensing survey towards the galactic bulge in 2.2 sq.deg. Will have blocks of 72 day seasons with a 15 min cadence.
- Can Rubin precursor data improve the detection of microlensing events in Roman, in particular by providing a baseline for the sources?

Aims

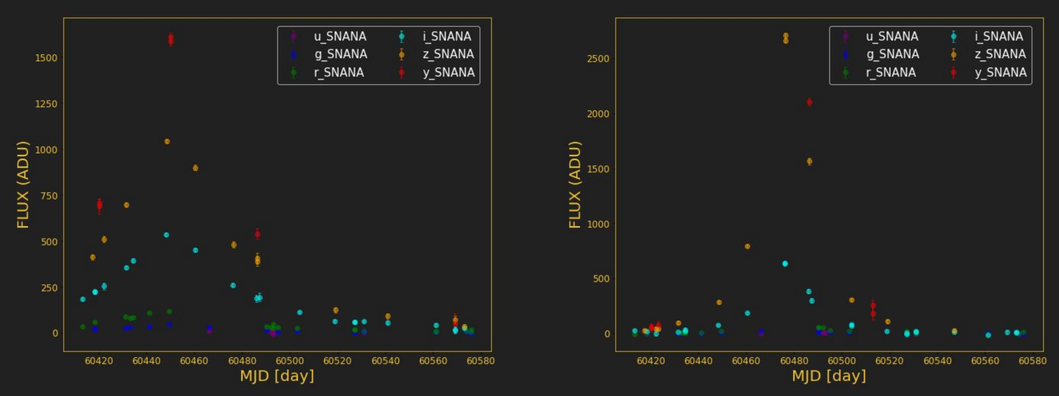
This study seeks to assess the scientific return of adding Rubin data to Roman from the standpoint of identifying microlensing events. There are two main objectives

- The best way to distinguish a microlensing event from other types of variability is to make sure that they have a flat baseline in the light curve. Rubin offers the possibility to measure the baseline on a longer timescale prior to an event happening in Roman data. So one goal is quantify by how much these observations will improve the detectability of microlensing events in Roman.

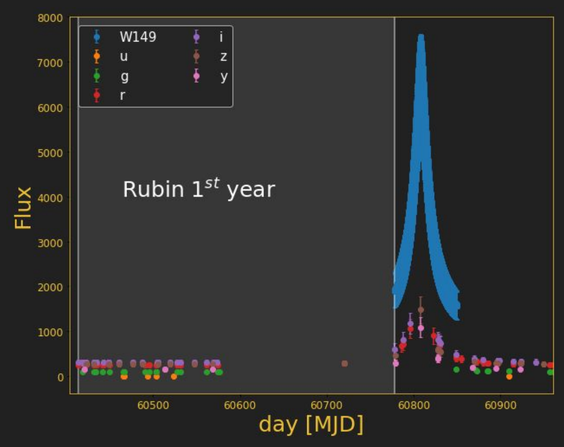




First results



Above two Rubin light curves with the fluxes including uncertainties derived from SNANA and with the cadence from OpSim.



Here we have a combination for the two light curves associated to the Roman and Rubin telescopes.

Parallax effect is not considered yet here.

Work in progress

This work is in process and we hope obtain information that allow us to determine a good strategy for the data combination and improve the detectability for microlensing events. Here we list a few further steps

- Adding the parallax effect for both Roman and Rubin.
- Update the TRILEGAL sources to the LSST simulation.
- Train MicroLIA with a diversity of light curves with realistic LSST cadence and errors (e.g. using PLAsTiCC/ELAsTiCC light curves) in order to classify our simulations.

References

[1] E. Bachelet, M. Norbury, V. Bozza, R. Street, *pyLIMA : an open source package for microlensing modeling. I. presentation of the software and analysis on single lens models*, arXiv:1709.08704 [astro-ph.EP]

[2] Richard Kessler et al, *SNANA: A Public Software Package for Supernova Analysis*, arXiv:0908.4280 [astro-ph.CO]

[3] D. Godines, E. Bachelet, G. Narayan and R.A. Street, *A machine learning classifier for microlensing in wide-field surveys*, arXiv:2004.14347 [astro-ph.IM].