

# Extended Gaia with LSST: a tool for increasing TESS and PLATO science

- \* The principal objective of this team is to use our astro-photometric tools on LSST images to extend to fainter stars the Gaia-mission catalog. This extension will include colors, magnitudes, absolute astrometry linked to the Gaia absolute astrometric system; including proper motions, and other data products (such as variability, as we will deal with individual epoch-images).
- \* Numerous scientific applications might take advantage of this effort, however, our ultimate goal is to use our derived catalog and our newly developed technique to exploit the TESS and PLATO data, in the search for and to characterize exo-planets; especially those not detectable with traditional techniques. Our techniques will extend the overall number of monitored targets by TESS and PLATO by several order of magnitudes and will enable unbiased estimates of the exo-planets radii.
- \* A particular and immediate application, which is one of our sub-projects, will be to use the LSST level-2 data products to select and prioritize potential targets to be proposed for the PLATO v2.0 input catalog.

# Partecipanti e relative responsabilità/interessi

1. PI Scientist: L. R. BEDIN

Coding, Astrometry and photometry.

Synergies with Gaia, TESS, and PLATO

Search for and characterization of Exo-planets.

Variability, high proper-motion stars, stellar populations.

2. Jr. Researcher: V. NASCIMBENI (/ for G. Piotto)

Exo-Planets

3. Jr. Researcher: A. P. MILONE / A. F. MARINO

Milky Way / Stellar populations

4. Jr. Researcher: M. LIBRALATO / D. NARDIELLO (/ for G. Piotto)

Milky Way / Exo-planets

5. PhD. Researcher: L. Colombo (/Piotto)

## Other potential Collaborators:

D. Magrin, J. Farinato, V. Viotto, R. Ragazzoni: CHEOPS/PLATO V2

J. Rees, S. Desidera, S. Randich, U. Munari, P. Ochner, A. Siviero, D. Bettoni, C. Boccato,

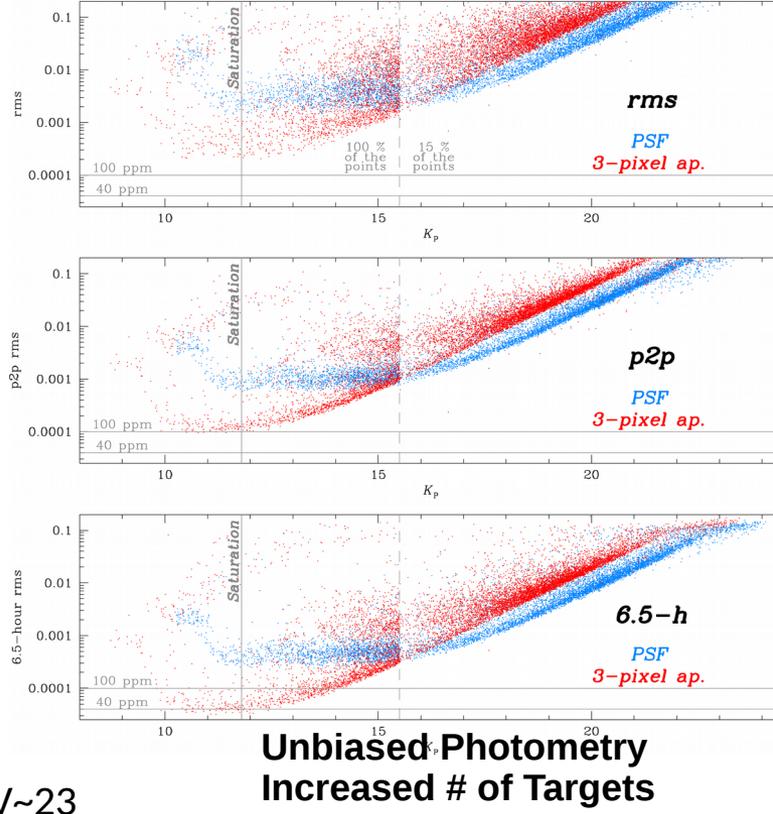
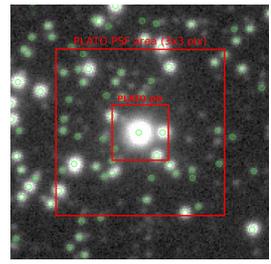
M. Montalto, P. Marrese, I. Pagano, A. Sozzetti, G. Piotto, V. Granata: exoplanets/transients/variables/outreach

# Conessioni con osservazioni di altre *facilities*

- Gaia (on-going)
- Kepler/K2 (on-going)
- TESS (2018) will download full images with 30min cadence
- PLATO (>=2025) expected macro-regions downloaded
- CHEOPS?possibly

Demonstration papers for our technique applied to the K2 case

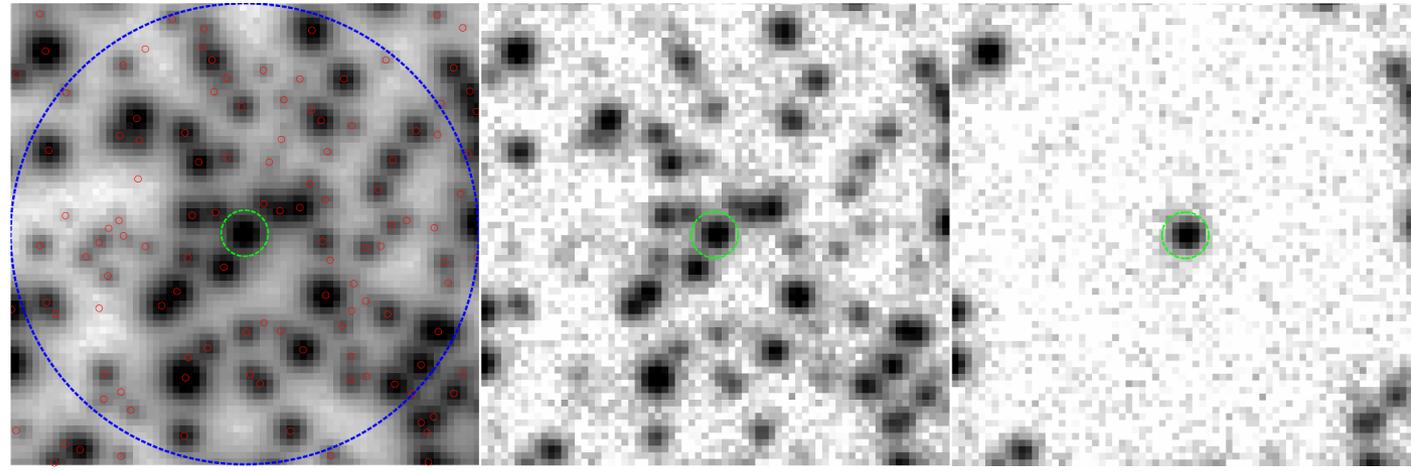
- <http://adsabs.harvard.edu/abs/2016MNRAS.456.1137L>
- <http://adsabs.harvard.edu/abs/2016MNRAS.463.1780L>
- <http://adsabs.harvard.edu/abs/2016MNRAS.463.1831N>



- Kepler/K2 --- pixel size 4"x4", nominal V~16 we go down to mag V~23
- PLATO --- pixel size 15"x15", nominal 4-13 we will go down to mag V~19
- TESS --- pixel size 21"x21", full sky V <12 we will extend down to V~16

Our method requires

- optimal GD correct.
- optimal PSFs
- complete input list
- perfect transf.
- color transf.



# Tipo di analisi dati prevista/necessaria, inclusa di sviluppo e cadenza temporale

- Starting from raw data: independent data reduction, astrometry and photometry, as usual our approach deliver a gain in precision of a factor 2-3 with respect to competitors using standard/traditional methodologies. ePSFs + local approach. As done for other ground-based wide-field imagers we reached the state of the art and release to the public the best available geometric distortion solution

WFI@2.2m ( Anderson, Bedin et al. 2006 )

LBC@LBT ( Bellini & Bedin 2010 )

HAWK-I@VLT ( Libralato, Bellini, Bedin et al. 2014 )

VISTA@VLT ( Libralato, Bellini, Bedin et al. 2015 )

We will initially focus on a pilot field, once procedures and results will be solid and well tested, we will move to the entire data base.

- We intend to take full advantage of the access to the LSST's consortium hardware promised as part of the deal. We are confident and aim at having our method to deliver the astrometry in the final LSST catalog (possibly also photometry of PSs).
- The fine tune of the tools might take ~2 years since beginning of data collection or even more depending on the human resources available.