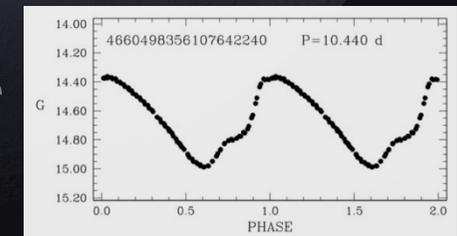
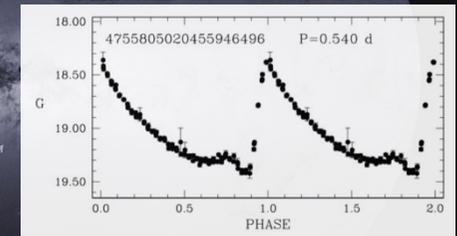
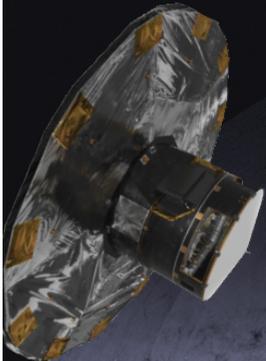


THE GAIA-LSST SYNERGY: FROM PUSATING STARS AND STAR FORMATION HISTORY TO WD PLANETS

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A. Pulsating Stars and Star Formation History

We will use RR Lyrae stars and Cepheids, together with the CMD of the resolved stellar populations to:

1. Trace the stellar generations in galaxies in and beyond the Local Group;
2. Measure distances to the systems hosting RR Lyrae stars and Cepheids;
3. Map their 3D structures, radial trends, halos, streams and discover new satellites, UFDs in particular;
4. Study their star formation histories;

By combining the above information we will derive hints on how the MW, M31 and galaxies alike, have formed.

B. WD Planets

We want to observe the first WD planetary transits or set robust upper limits to the presence of planets in close orbits around WDs.

- Assuming a 1% rate of MS planets with $P_{\text{orb}} < 200$ d; $M > 10 M_J$ and considering a transit probability of 0.1 we need to observe ≈ 1000 WDs to catch 1 transit.
- With LSST we will obtain ~ 800 photometric measurements in 10 yrs for $\sim 170,000$ WDs with $G < 20$ mag discovered by Gaia.

Partecipanti e relative responsabilità/interessi

PI Contact: **Gisella Clementini** – *INAF Osservatorio Astronomico di Bologna* (variable stars: distance scale & stellar population tracers)

Alternative PIs: **V. Ripepi** (*OA-Capodimonte*) (variable stars: distance scale & stellar population tracers), **R. Silvotti** (*OA-Torino*) (WD planetary systems)

Junior members Post-Docs: **M. Cignoni** (*Univ.-Pisa*) (star formation history), **F. Cusano** (*OA-Bologna*), **T. Muraveva** (*OA-Bologna*) (variable stars: distance scale & stellar population tracers);

Junior members PhD: **A. Garofalo** (*OA-Bologna*) (variable stars: distance scale & stellar population tracers);

Other participants: M. Marconi, I. Musella, M.I. Moretti, R. Molinaro, S. Leccia (*OA-Capodimonte*) (variable stars); E. Brocato (*OA-Roma*), M. Cantiello, G. Raimondo (*OA-Teramo*) (distance scale).

Connessioni con osservazioni di altre *facilities*

- 1) Gaia-LSST synergy: The main aim of our project is to enlarge Gaia's horizon for pulsating variable stars as standard candles and stellar population tracers as well as the team expertise in star formation recovery into the space/time domain of LSST.
- 2) LBT/VLT/VISTA/ELT-LSST synergy: LBT (MODS, LUCI, PEPSI) in the North; in the South VLT and VISTA/MOONS for closer objects and ELT for the farthest ones will be used for spectroscopic follow-up of RR Lyrae stars and Cepheids (radial velocities and abundances) in and beyond LG systems observed/discovered by Gaia and LSST.
- 3) JWST-LSST synergy: JWST will also be the natural complement in the NIR for the optical observations with LSST as well as for follow-up with high-resolution imaging and mid-resolution spectroscopy.
- 4) TESS-Gaia-LSST synergy: a proposal has been submitted to include about 1,200 WDs in the core program of TESS to search for planetary transits around this stars. R.S. is a member of the TESS TSWG.

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

1. We need to identify and characterize pulsating variable stars (mainly Cepheids & RR Lyrae) from LSST time-series.
2. To this end, we will exploit the expertise we have developed in this field over the years, and more specifically, over more than 10 years of membership into CU7 (Variability) of Gaia's DPAC.
3. Tools and pipelines we specifically developed as responsables of the specific processing of RR Lyrae stars and Cepheids observed by Gaia will be adapted to deal with LSST data.
4. Timing: the Gaia Cepheid & RR Lyrae pipeline is in place and almost fully developed, adaptations for the LSST processing can start already. Overlap between Gaia and LSST is expected to begin in 2019 and last until 2021 or more depending on approval of further extensions of the Gaia mission.