



## MW-Gaia WG2 Workshop

### Stellar variability, stellar multiplicity: periodicity in time & motion

Sofia (Bulgaria), 6th-8th June 2023

The workshop [Stellar variability, stellar multiplicity: periodicity in time & motion](#) took place as hybrid in the Sofia Tech Park, Sofia, Bulgaria, from 6<sup>th</sup> to 8<sup>th</sup> June 2023.

This was the fourteenth workshop of the CA18104 COST Action MW-Gaia and the sixth workshop of the Working Group 2 (WG2). The format of the workshop was based on invited talks (25+5min), contributed talks (15+5 min) and poster presentations (2-3 min)

The number of (non-invited) participants was limited to about 40. The selection of participants was based on the relevance of the proposed abstract, the importance of the workshop for the advancement of the career of the applicant as well as diversity (in gender, country, etc). As with all COST actions, early-career scientists were given priority.

#### Scientific motivation of the workshop

Stellar variability, intrinsic as in pulsating stars and extrinsic as in binaries, plays a crucial role in many fields of astrophysics, from stellar evolution, to the distance scale, to the study of structure and formation of the Milky Way. Gaia DR3 published light curves and characteristic parameters for about 10.5 million variable sources. This number is expected to increase by an order of magnitude in DR4. The workshop will focus on the impact that Gaia is having on a number of different fields addressed by stellar variability

#### Day One

Session 1: Setting the scene had as a chair Gisella Clementini (Bologna). The first Invited talk by Berry Holl (Geneva, online) was “Gaia-DR3 papers on variable star classifications and light curves in the Gaia-DR3 Special Issue of A&A”. Session 2: Classical pulsating stars (Cepheids, RR Lyrae stars) followed with an Invited talk by Marcella Marconi (Naples, in person) “Theoretical efforts in the modelling of Cepheid and RR Lyrae properties in the Gaia bands: from Gaia distances to stellar physics in pulsating stars”

After the coffee break, there were three contributed talks:

- ✓ “Stellar pulsation modeling of Classical Cepheids: new determinations of structural parameters and individual distance” by Roberto Molinaro (Naples, in person)
- ✓ “Constraints on evolutionary status of Cepheid variables from cluster membership” by Ignacio Negueruela (Alicante, online)

- ✓ “MULTiepoch Disparity Examination of H-Alpha and infraRed (MUDEHaR)” by Gonzalo Holgado (Tenerife, in person)

Then we had the invited talk “Metallicities of Gaia DR3 RR Lyrae stars” by Alessia Garofalo (Bologna, in person)

After the lunch break, Laurent Eyser (Geneva) was the chair and a contributed talk by Ranaivomanana Tahina Princy (Nijmegen, in person) “Classification of variable stars observed in multiple filters with MeerLICHT and BlackGEM” ended session 2.

Session 3: Structure of our Galaxy with RR Lyrae stars and Cepheids, began with two invited talks:

- ✓ “RR Lyrae stars as tracers of the structure and formation of the Milky Way halo” by Vasily Belokurov (Cambridge, online)
- ✓ “Cepheids to trace the disc and the spiral arms of the Milky Way” by Vincenzo Ripepi (Naples, in person)

And four contributed talks to finish the day

- ✓ “The distance scale of Type II Cepheids in the Magellanic Clouds” by Teresa Sicignano (Naples, in person)
- ✓ “Are the Ultra Long Period Cepheids standard candles?” by Ilaria Musella (Naples, in person)
- ✓ “Stellar variability for 145 million Gaia DR3 sources from photometric dispersions” Contributed talk, Jesús Maíz Apellániz, Centro de Astrobiología, Spain - In presence
- ✓ “Young, (metal-)rich and not alone: formation of thin-disc RR Lyrae stars through binary evolution” by Giuliano Iorio (Padova, online)

## Day Two

The morning chair was Svetla Tsvetkova (Sofia) and the Session 1: Classical pulsating stars (delta Scuti, Long Period Variables) began with one invited talk “Long Period Variables in the Gaia era” by Thomas Lebzelter (Vienna, in person). Followed by two contributed talks:

- ✓ “Variability study of galactic AGB stars with Gaia data” by Fran Jiménez-Esteban (Madrid, in person)
- ✓ “Magnetic field study in semi-regular pulsating giants” by Renada Konstantinova-Antova (Sofia, in person)

Session 2: Binaries, pulsating stars in eclipsing binary stars (e.g. binarity of Cepheids and RR Lyrae stars), disentangling methods, binaries in clusters, use of binary stars in astrophysics opened with two invited talks:

- ✓ “Binary stars, eclipses and pulsations” by John Southworth (Keele, in person)
- ✓ “Massive binaries in the Gaia era” by Laurent Mahy (Brussels, in person)

And the morning finished with two contributed talks:

- ✓ “The multiplicity fraction in 202 open clusters from Gaia” by Judit Donada Olliu (Barcelona, online)

- ✓ “The binary fraction in star clusters” by Priya Shah (Hyderabad, online)

The chair of the afternoon was Ivanka Stateva (Sofia) and began with an invited talk by Alexandre Gallenne (Concepción, in person) “Long-Baseline interferometry of binary stars”. And two contributed talks to finish the session:

- ✓ “The new 1.5-meter robotic telescope for the Rozhen Observatory” by Evgeni Semkov (Sofia, in person)
- ✓ “Low-mass and sub-stellar eclipsing binaries in stellar clusters” by Nicolas Lodieu (Tenerife, online)

Session 3: Chemically peculiar stars - Early and late stages of evolution (magnetic CP stars, using BP/RP Gaia spectra; T Tau, FU Ori etc.) began with an invited talk by Ernst Paunzen (Masaryk, online) “CP stars using BP/RP Gaia spectra”

After the coffee break a contributed talk by Natalia Positek (Wrocław, in person) “The problem of variability of chemically peculiar Am stars” and an invited talk by Zsófia Nagy (Konkoly, in person) “Early and late stages of evolution”.

### Day Three

The chair of the morning was Fran Jimenez-Esteban (Madrid) on the Session 1: Chemically peculiar stars - Early and late stages of evolution (magnetic CP stars, using BP/RP Gaia spectra; T Tau, FU Ori etc.) with two contributed talks:

- ✓ “Broadening of Ga II spectral lines by collision with charged particles for research of variable stars” by Milan Dimitrijević (Belgrade, in person)
- ✓ “Mercury-manganese stars in the observations of TESS satellite” by Ewa Niemczura (Wrocław, in person)

And Session 2: Synergies and connections between Gaia and other surveys of variable stars – OGLE, LSST, ZTF with two invited talks:

- ✓ “Synergies and connection between the Gaia and OGLE catalogs of variable stars” by Igor Soszynski (Warsaw, in person)
- ✓ “Rubin’s LSST as a large-scale time-domain photometric survey” by Zeliko Ivezić (Washington, in person)

After the coffee break, two contributed talks:

- ✓ “Generating LSST synthetic photometry from Gaia XP spectra” by Lovro Palaversa (Zagreb, in person)
- ✓ “Supercomputer 'Bura' as a computing facility for time-domain astrophysics” by Tomislav Jurkic (Rijeka, in person)

And an invited talk by Ashish Mahabal (Pasadena, in person) “Synergies and connections between Gaia and other surveys of variable stars”

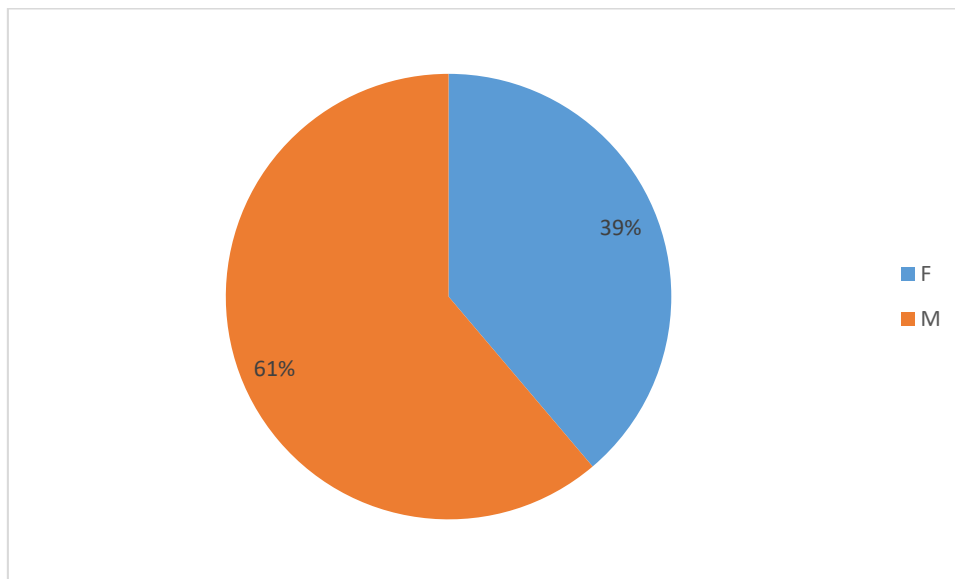
The chair of the last session Carme Jordi (Barcelona) was the Poster session (Short presentations, 2-3 min per poster):

- ✓ “Distance - Luminosity discrepancy for binaries with the B[e] phenomenon” by Anatoly Miroshnichenko (Greensboro)

- ✓ “Searching for photometric variability of massive star candidates in IC342” by Antoniya Valcheva (Sofia)
- ✓ “Cepheid Metallicity in the Leavitt Law (C- MetaLL) survey: II.High-resolution spectroscopy of the most metal poor Galactic Cepheids” by Erasmo Trentin (Postdam)
- ✓ “Evidence of H $\alpha$  periodicity in the Be/black hole binary MWC 656” by Kiril Stoyanov (Sofia)
- ✓ “Photometric observations of the Dwarf Novae stars - DX And, AR And and RX And” by Luba Dankova (Sofia)
- ✓ “Variation of emission profile parameters, connected with the binarity of Pleione” by Lubomir Iliev (Sofia)
- ✓ "The classification intricacy of different type of Cepheid variable stars and the case of RU Camelopardalis" by Monika I. Jurkovic (Belgrade)
- ✓ “Reactive collisions between electrons H $^+$  2 and HD $^+$  molecular cations in the Early Universe: Ro-vibrational transitions and dissociative recombination” by Nicolina Pop (Timisoara)
- ✓ “Identification and characterization of detached white dwarf red dwarf pairs using Gaia and ZTF” by Stefan Stefanov (Sofia)

And the workshop finished with a talk by Nic Walton (Cambridge, in person) about “MWGaia, the Action and Doctoral Network with an update on next steps” and the Concluding Remarks by Laurent Eyer (Geneva, in person).

### The workshop in numbers

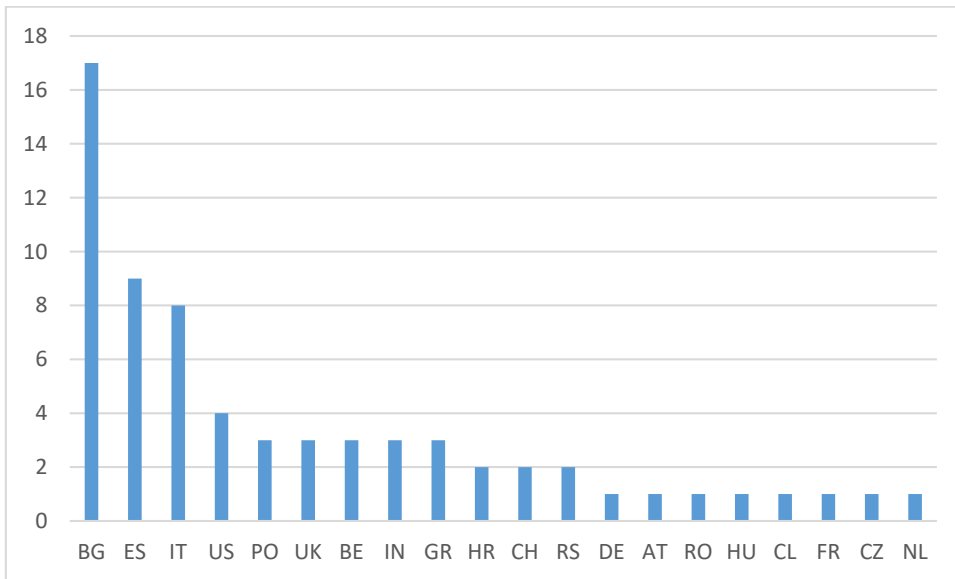


The workshop was attended by 67 researchers (XX remotely), 39% of them female.

The SOC and LOC had a 40 (4 out of 10) and a 67% (4 out of 6) of female researchers respectively.

There were 6 session chairs, 4 female (67%).

From the total, 28 participants (42%, including invited speakers) had financial support by the COST Action.



There were researchers from 20 different countries in Europe (mostly Bulgaria), also US, India and Chile.

There were 42 presentations. 46% of female participants presented while 73% of male participants did. There were 14 Invited talks (21% female), 19 Contributed talks (32% female) and 9 Posters (33% female)

Regarding career stage there were 3 PhD students (4% of young researchers).

Report prepared by Lola Balaguer-Núñez.