First impressions on the Gaia harvest of variable objects in DR3
Teaser presentation for DR3

Laurent Eyer, University of Geneva
On behalf of CU7/DPCG teams

+ ALL DPAC (CU3,5,6)

EAS 2021 from home, Pully, Switzerland
Monday, June 28, 2021
12h10-12h20 (CET)
## Gaia Data Releases for the “Variables”: An iterative approach

<table>
<thead>
<tr>
<th></th>
<th>Input Data from CU3,5,6</th>
<th>Output Data to the Gaia Archive</th>
<th>Number of variability classes</th>
<th>Number of sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DR1 (Sept. 2016)</strong></td>
<td>FoV G-band</td>
<td><strong>FoV G-band</strong> +Parameters</td>
<td>2 Variability Types</td>
<td>3,194</td>
</tr>
<tr>
<td></td>
<td>FoV G-band (per CCD Phot.) +Astrometry +BP/RP integrated</td>
<td><strong>FoV G-band</strong> +BP/RP integrated +Parameters</td>
<td>7 Variability Types</td>
<td>550,737</td>
</tr>
<tr>
<td><strong>DR3 (first half of 2022)</strong></td>
<td>FoV G-band (per CCD Phot.) Astrometry BP/RP integrated +BP/RP spectra +Radial Velocity</td>
<td><strong>FoV G-band</strong> BP/RP integrated +Parameters</td>
<td>24+1 Variability Types</td>
<td>14,000,000</td>
</tr>
</tbody>
</table>

**Notes:**
- DR3: (first half of 2022)
- Epoch data: Time series of Epoch data: Time series of...
### Some statistics

- ~14,000,000 sources
  - (A) ~1,300,000 objects in GAPS: Gaia Andromeda Photometric Survey (pencil beam of 5.5 deg), variable objects or not (detected as) variable (Riello et al. in prep)
  - (B) ~2,500,000 galaxies, without time series
  - (C) 10,000,000 objects

- ~2,000 with radial velocity time series
Method

Gaia data

Attribute Definition
Classifiers or Matched filters

Training sets

Enormous work by Rimoldini, Gavras et al

Specific Object Studies

Many teams

2.5 billion sources
260 billion measurements

Higher completeness
Lower contamination
Some examples: R Coronae Borealis stars

R Coronae Borealis star

drop > 6 mag
SuperNovae

Panos Gavras
SuperNovae

Panos Gavras
Microlensing: A new event

Lukasz Wyrzykowski, Katarzyna Kruszynska, Kris Rybicki (Warsaw), Nami Mowlavi, Isabelle Lecoeur-Taibi, Berry Holl (Geneva), Dafydd Evans (Cambridge)

Parameters of the fit in the Gaia archive

see presentation of L.Wyrzykowski @ this conference
Long period variables

Nami Mowlavi, Thomas Lebzelter, Isabelle Lecoër-Taibi, Michele Trabucchi

RP spectra used to distinguish between C-rich or O-rich LPVs
Parameters from the structure function in the Gaia archive
Eclipsing binaries

Nami Mowlavi, Isabelle Lecoeur-Taibi, Berry Holl, Fabio Barblan

Special treatment by the Non-Single-Star group: see Arenou's presentation @ this meeting
First transiting Exoplanet

In DR3:
list of candidates
+
treatment of known exoplanets

See
Aviad Panahi’s presentation
@ this conference

Gaia Image of the Week, March 2021
Variable white dwarfs

Interesting to compare with Thinh Nguyen Poster @ this conference
Cepheids with BP, G, RP and RVS

Vincenzo Ripepi, Gisella Clementini, Roberto Molinaro, Silvio Leccia, Ilaria Musella, Alessia Garofalo, Tatiana Muraveva

See V. Ripepi’s presentation @ this conference
RR Lyrae stars

About 2,000 Cepheids and RR Lyrae stars with radial velocities

Gisella Clementini, Vincenzo Ripepi, Alessia Garofalo, Tatiana Muraveva, Roberto Molinaro, Silvio Leccia
RR Lyrae stars

RR Lyrae stars: ~270,000 (with RVS time series for about 1,200)
Special focus on RR Lyrae stars

About 270,000 stars
Special focus on RR Lyrae stars

LMC
Special focus on RR Lyrae stars
Special focus on RR Lyrae stars

Sagittarius Dwarf
Special focus on RR Lyrae stars

Bulge (with strong extinction)
Special focus on RR Lyrae stars

Sculptor
Conclusion

Gaia DR3 will be a real festival of variability results!