Gaia
DPAC
Data Processing & Analysis Consortium

GWP-947 Auxiliary data

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Abstract

The purpose of this document is to provide a preliminary list of Catalogs to select the clusters to be used to validate Gaia Data in the GWP-947. This list will be updated in the future including all the relevant objects. The cluster selection for each data release will be presented in a series of subsequent technical notes.

Document History

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1 Introduction

1.1 Scope and Objectives

Our objective is to use clusters to validate the first data releases of the Gaia Catalog. For that several tests were proposed on the Arenou (FA-061). Here we define the list of Catalogs of the clusters to be used as the auxiliary data in GWP-947.

2 First data release: HTPMC

Accordingly to the current scheme, in the first data release, the Hundred Thousand Proper motion Catalog (Mignard (FM-040)) will be available (positions, and proper motions), together with positions, and integrated G magnitudes for 90% of the sky. Details can be found at Prusti (TJP-011) The majority of the test will be performed using open clusters while only a few tests makes use of globular clusters.

2.1 Open cluster and association Catalogs

The list of catalogs of open clusters and association includes:

- Hipparcos clusters from Francis & Anderson (2012). About 42 candidate clusters and 45 associations are listed in the quoted catalog. The cluster list can be found at this link

- The Extended Hipparcos Catalog (XHIP) data can be found at the Vizier XHIP Catalog

- Hipparcos stars with information about RV, metallicity if requested in the first or subsequent Gaia data release are given by Anderson & Francis (2012) and can be found at this link

- Hipparcos clusters having RV, metallicity, and having more than 100 stars:
  Hyades
  Pleiades
  alpha Per
  Collinder 70

2.2 Globular clusters

Photometry of globulars (external regions) can be used to check photometry and completeness down to G=20. Clusters having a distance modulus of (m-M)~13-14 can be sampled 2-3 mag below the turnoff. These clusters are: 47Tuc, OmegaCen, NGC6656 (M22), NGC6752, NGC6397, NGC6121, NGC6809 (M55), NGC6838 (M71). NGC6121 and NGC6752 and NGC 6397 are the closest objects (according to the Harris catalogue (1996, AJ, 112, 1487, and subsequent revisions) (`http://physwww.physics.mcmaster.ca/~harris/mwgc.dat`).

These clusters are well studied and their photometry can be found in Stetson Database of globular clusters including data from several archives, from HST to ground based observations (ESO telescopes for instance). In the case of OmegaCen, 47Tuc and M22 several thousands of images are analysed. Monelli et al. (2013) is the first paper of a series where these data will be published. The data of about 30 clusters are at moment available at `http://www.iac.es/proyecto/sumo/`. More clusters will be published in the near future. We quote among others the Treasury program by Sarajedini - MAST ACS globular cluster survey (`http://archive.stsci.edu/prepds/acsggct/`) including the data of about 70 clusters (Sarajedini et al., 2007). This Catalog is also included in Stetson Data Base.

3 First+ data release

The subsequent data release will have an increasing degree of complexity.

3.1 Open clusters

External catalogs to be used as source for selecting few selected open clusters can include:

- WEBDA data base `http://www.univie.ac.at/webda/Welcome.html` In particular we quote Mermilliod et al. (2008) and Mermilliod et al. (2009) on RV with membership information (already included in WEBDA).

- Dias et al. (2014) giving proper motions of the optically visible open clusters based on the UCAC4 catalog.Data at

  `http://cdsarc.u-strasbg.fr/viz-bin/qcat?J/A+A/564/A79`

- Kharchenko et al. (2012) 3784 OCs with their parameters from literature. The latest version is by Kharchenko et al. (2013) where from an input list of 3784 targets, they confirm that 3006 are real objects, the vast majority of them are open clusters,

but associations and globular clusters are also present. For each confirmed object they determine the position of the cluster centre, the apparent size, proper motion, distance, colour excess, and age. It supersedes Kharchenko+2012 and the complete catalog of 3006 confirmed MW clusters is available at CDS. It can be queried from:

`http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=J/A+A/`
`558/A53` Besides the list of clusters and their properties, there are the individual catalogs around all MW OCs, with RA, Dec, BV (ASCC) JHK (2mass), pm, RV

- Conrad et al. (2014) about 110 OCs from RAVE Investigation on Galactic open Clusters. They extract RVs and [M/H] from RAVE via a cross-match with the Catalog of Stars in Open Cluster Areas (CSOCA). They determined RV for 110 clusters and [M/H] for 81 open clusters, However they often list only a few stars per cluster. Data at

  this link.

- GES data at CASU can be used to compare RV, metallicities, magnitudes, PM. These data provide homogeneous information. In particular, of the already observed clusters:
  M11 has BVRI WFI photometry in a field of 30 arcmin; VPHAS photometry; (see Cantat et al 2014,A&A in press); membership and metallicity for about 1200 stars
  NGC 6819: Platais et al. (2013). (PM > 15000 stars in a field of 1 deg CFHT).
  TR 20 Donati et al. (2014) : catalogue with coords, mags, RVs at CDS:

  `http://vizier.u-strasbg.fr/viz-bin/VizieR-3?-source=J/A%`
  `2bA/561/A94`
  NGC 4815 Friel et al. (2014)

  Data at : this link

- Kepler and Corot clusters can provide precise information about gravity, Teff. We quote NGC 6791 and NGC 6819: Basu et al. (2011) (34 red giant stars in NGC 6791 and 21 in NGC 6819; 12<V> 16).

  Data at this link;

  Membership determinations of red giants from asteroseismology for NGC 6791, NGC 6819, and NGC 6811: Stello et al. (2011). For NGC6819 we have radial velocities for about 480 members (Hole et al. (2009)). Data at:

  `http://vizier.cfa.harvard.edu/viz-bin/VizieR?-source=J/AJ/`
  `138/159.`

  Proper motions (limited accuracy) and membership are derived also by Platais et al. (2013). Data will be at CDS (in process)

  Kepler is still working and will provide data on more open clusters (near ecliptic). Names TBC. Data of Kepler Input Catalog (Kepler Mission Team, 2009)

at `http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=V/133`;

of Kepler-INT survey (Greiss+, 2012)

and `http://vizier.cfa.harvard.edu/viz-bin/VizieR?-source=J/AJ/144/24`.

- Heiter et al. (2014): Teff, log(g), metallicity determination from literature high resolution spectroscopy for 458 stars in 78 open clusters from 86 publications to form the final set.

  Data at this link

- APOGEE : they will have hundreds of clusters observed; in each of them maybe only tens of members, but lots of field stars in the cluster vicinity. Good for RV comparison (and for cluster parameters). First publication about 28 OCs: Frinchaboy et al. (2013). Data at:

  `http://adsabs.harvard.edu/abs/2013ApJ...777L...1F`

  and SDSS DR10 website:

  `https://www.sdss3.org/dr10/`

- Auxiliary catalogs prepared for CU6 and including RV are listed at mdb.cu6.auxiliarydata. In addition to the AP for CU6 calibration described in Soubiran et al. (CS-011), CU6 is currently preparing a compilation of RVs for the CU6 validation which will also include some stars in clusters

The above catalogs can be used also in the target selection of the first data release.

3.2 Globular clusters

High resolution spectroscopic information (T_{eff}, log(g), $[Fe/H]$) of a large number of globulars is available in literature and will be described in due time,

4 Catalogs for algorithm testing

The purpose of these catalogs is to test the algorithms. For this we need to have a comparable data volume as the Gaia Catalog, and variety of parameters. We can use:

- IGSL as if it was Gaia catalogue

- Hipparcos Catalog

• CU2 testing Catalogs generated using GOG can be used. In principle there are 597 open clusters in GaiaSimu (but their members are simulated, thus of course not matching to existing stars).

4.1 Applicable Documents

Arenou (FA-061)	CU9 Validation Test Specification
O'Mullane et al. (WOM-086)	CU9 Software Development Plan
Prusti (TJP-011)	Gaia Intermediate data release scenario
Soubiran et al. (CS-011)	Auxiliary data for CU6 processing

4.2 Reference Documents

Anderson, E., Francis, C., 2012, VizieR Online Data Catalog, 5137, 0, ADS Link

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    `GAIA-C3-TN-OCA-FM-040`,
    URL `http://www.rssd.esa.int/cs/livelink/open/2939272`

Monelli, M., Milone, A.P., Stetson, P.B., et al., 2013, MNRAS, 431, 2126, ADS Link

[WOM-086], O'Mullane, W., Luri, X., Gracia, G., 2014, *CU9 Software Development Plan*,
    `GAIA-C9-PL-ESAC-WOM-086`,
    URL `http://www.rssd.esa.int/cs/livelink/open/3237698`

Platais, I., Gosnell, N.M., Meibom, S., et al., 2013, AJ, 146, 43, ADS Link

[TJP-011], Prusti, T., 2012, *Gaia Intermediate Data Release Scenario*,
    `GAIA-CG-PL-ESA-TJP-011`,
    URL `http://www.rssd.esa.int/cs/livelink/open/3145458`

Sarajedini, A., Bedin, L.R., Chaboyer, B., et al., 2007, AJ, 133, 1658, ADS Link

[CS-011], Soubiran, C., Lecampion, J., Chemin, L., 2014, *Auxiliary data for CU6 - atmospheric parameters - version 2*,
    `GAIA-C6-TN-LAB-CS-011`,
    URL `http://www.rssd.esa.int/cs/livelink/open/3214057`

Stello, D., Meibom, S., Gilliland, R.L., et al., 2011, ApJ, 739, 13, ADS Link

4.3 Definitions, acronyms, and abbreviations