Gaia Intermediate Data Release Scenario

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1 Introduction

The Science Management Plan (SMP) of Gaia (ESA/SPC(2006)45) provides the overall principles and boundary conditions related to all scientific aspects of the mission. The plan covers the whole mission life time, including the period for the final data processing, but gets less detailed for topics the further down in the time line. SMP recognizes the need to have intermediate data releases prior to the final catalogue publication anticipated 2020 in the SMP. The definition of these details is left to the Gaia Science Team (GST) after consultation of the Gaia Data Processing and Analysis Consortium Executive (DPACE) and the Astronomy Working Group (AWG). The consultation process has been done stepwise both with DPACE and AWG.

In the first instance the release contents were iterated and afterwards the timing was adjusted to be compatible with the DPAC operations plan. This document records the agreed end result. Given the schedule dependency of the in-flight performance, the document is called Gaia Intermediate Data Release Scenario instead of Schedule. Scenario must be turned into a schedule after having made an assessment of the in-flight performance and the scope of the calibration issues which need to be tackled before data can be made public. The scenario is based on the assumption of nominal behavior of Gaia and all other aspects affecting the data quality.

It is noted that the Gaia data release policy concerns only Gaia data. Already before the start of the operations ground based support observations and simulations are performed for processing software development and calibration. The SMP does not cover data rights of these data and therefore it is only recommended that relevant elements are either published (e.g. ground based data) or made available for the scientific community (e.g. simulations using the Gaia Universe Model).

2 Mission timeline

Gaia spacecraft is designed for 5 years of operations preceded with a maximum of half a year commissioning phase. In addition to this nominal 5.5 years lifetime the design allows at least one year extension. The first Gaia data releases are most likely going to be the Science Alerts based on photometry (e.g. Supernovae) or astrometry (e.g. new asteroids). Science Alerts will start as soon as possible and will not be further detailed here. The final release is planned for three years after the end of the data taking phase and will not be addressed in this document. The launch of Gaia is scheduled for November 2013.

3 Release scenario

The SMP lists possible intermediate results:

- astrometric results: an interim release, with bright star accuracies of order 100 μarcsec, targeted within 3 years of the start of routine operations;
- spectroscopic and photometric results: one or two intermediate catalogues to be released between 2015–18;
- science alerts data (e.g. supernova or micro-lensing event): as soon as possible from the processing (within hours or days);

- intermediate products that result from the work of individual coordination units, as defined in the context of the Data Processing and Analysis Consortium

These suggestions can be elaborated and expanded to the release scenario with timing given relative to the launch. The list contains only the first occasion when certain type of data is anticipated to be released.

A release which forms the basic input data (e.g. spectra) for another planned DPAC release (e.g. astrophysical parameters) should be synchronized in such a way that the derived DPAC release is simultaneous with the release of the input data. The scheduling of such a release should be matched to that of the input data production without causing a significant delay.

Intermediate catalogue should only be released when sufficient quantifiable calibration has been established. The intermediate releases may include an error estimate for the full catalogue and not to every single source individually. An intermediate release should not be delayed for unquantifiable errors if they affect only a relatively small fraction of the catalogue and can be verbally explained as caveats to the catalogue users. A release with caveats should always encourage users to report back of discovered errors so that the processing for the next releases can be improved.

3.1 Launch+22 months release

Positions (α, δ) and G-magnitudes will be released if the formal standard errors of positions are acceptable. For the release it is assumed that at least 90 % of the sky can be covered. The release is for all objects with single star behavior. Those stars common to Hipparcos will be used to Hundred Thousand Proper Motion (HTPM) catalogue which will be part of the release.

During commissioning phase a special scanning mode covering the Ecliptic poles in every revolution is envisaged for calibration purposes. These data cover small fields around the poles with high redundancy. Any Ecliptic Pole data with adequately characterized calibration and successful processing will be released.

3.2 Launch+28 months release

Five parameter astrometric solution of objects with single star behavior will be released under the assumption that at least 90 % of the sky can be covered.

Integrated photometry BP/RP, with appropriate standard errors for sources where basic astrophysical parameter estimation has been verified (such parameters would also be released).

Mean radial velocities will be released for objects showing no radial velocity variation and for which an adequate synthetic template could be selected under the assumption that this can be done for 90 % of the bright stars on the sky.

3.3 Launch+40 months release

Orbital solutions together with the system radial velocity and five parameter astrometric solutions for binaries having periods between 2 months and 75 % of the observing time will be released.

Object classification and astrophysical parameters together with BP/RP spectra and/or RVS spectra they are based on will be released for spectroscopically and (spectro)photometrically well behaving objects.

Mean radial velocities will be released for those stars not showing variability and which have atmospheric parameter estimates available.

3.4 Launch+65 months release

Variable star classification will be released together with the epoch photometry used for the stars.

Solar system results will be released with preliminary orbital solutions and individual epoch observations.

Non-single star catalogues will be released.

4 Conclusions

Gaia is a survey mission providing data in publication ready catalogue format. The anticipated impact will span across several fields of astronomy and the scientific community will be very keen on results as soon as satisfactory in-orbit calibration has been established. This release scenario is based on nominal behavior of the satellite. After assessment of the calibration in-flight issues and the performance of Gaia, the data release scenario will be converted into a data release schedule.