The CoRoT Legacy Book

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II.5
Where to find the CoRoT data?

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1. The different levels of the CoRoT products

The CoRoT data to be used for science are N2 (level 2) data. They derive from the raw telemetry received by the ground station by several successive layers of processing:

- N0 (or L0): the raw telemetry from the satellite reformatted to understandable information;
- N1 (or L1): stars' light curves with usual standard corrections (e.g. background, offset, timestamps, cosmic rays, jitter, PSF...);
- N2 (or L2): stars' light curves with additional specific corrections or flags (hot pixels, jumps, gain drifts..), and associated metadata.

N2 products are "science-ready" products.

⋆ CNES is responsible for archiving level 0 and level 1 data:
  The N0 products are available under request at CNES/SERAD;
  N1 products are available at CNES and at IAS/IDOC, also under request.
⋆ IAS and CDS are responsible for archiving level 2 data:
  The N2 products are publicly available at CDS and at IAS/IDOC.
⋆ N2 data are also available at the mirrors of the IAS archive at LAEX in Spain and NASA Exoplanet Archive.

The present addresses of these archives are given in Table II.5.1.

2. The CNES archive

CNES is responsible for the archiving of CoRoT Level 0 and Level 1 data, as well as of the relevant documentation and software. This task is done within the SERAD project (Service de Référencement et d'ARchivage des Données).

N1 products have a low level of correction for instrumental effects, whereas N0 products have no correction, only conversion from TM to reconstructed meaningful data. They may however be of interest for researchers who need to work with raw data, for instance for training algorithms in the frame of the preparation of new projects. Their proper use therefore implies a reasonable level of technical and/or scientific skills. A non-professional use of these data could be misleading, and could lead to wrong interpretations. Therefore, the access to the N0 and N1 data is possible for the scientific community through authentication.

As for other CNES missions, CoRoT data are archived in STAF, the long-term facility for data archiving on disks and tapes. This CNES service guarantees long term preservation of data files. SIPAD-NG, a generic tool developed by CNES, is used for the diffusion of archived data to final users through a web interface. This web-server also gives access to a selection of documents related to the CoRoT mission.

For the CoRoT mission, following Table II.5.2 presents the list and volumes of archived data.

Level 0 data produced by CMC in CNES are FITS files grouped in tar.gz packages to reduce the number of files to manage. For each observation run, for each data type, there is one tar.gz package for each identifier. For instance, there are four tar.gz packages for the data type AN0_FULLIMAGE in each run, one for each value of the half-CCD identifier.

Level 1 data, produced by LESIA after final reprocessing, are FITS files. In one run, for one data type, there are one or two FITS files for each identifier. When there are two FITS files for the same identifier, start and stop dates (always included in file names) are used to differentiate them.

CoRoTSky databases have been extracted as text files to be archived.

Table II.5.1. List of the different archives.

Archive		URL	Location
CNES	N0, N1	https://sipad-corot.cnes.fr/	Toulouse, France
IAS	N2, N1	idoc-corot.ias.u-psud.fr/	Orsay, France
CDS[1]	N2	http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=B/corot	Strasbourg, France
CAB	N2	sdc.cab.inta-csic.es/corotfa/jsp/searchform.jsp	Madrid, Spain
NASA	N2	exoplanetarchive.ipac.caltech.edu/applications/ETSS/CoRoT_exo_index.html and exoplanetarchive.ipac.caltech.edu/applications/ETSS/CoRoT_astero_index.html	Pasadena, USA

Notes. (1) Long-term archive.

Table II.5.2. Volume of the data archived at CNES.

Level 0 data	24 data types	244 266 files	350 Go
L1 data	20 data types	630 735 files	2.5 To
L1 Housekeeping parameters	101 data types	214 932 files	54.8 Go
L0 Auxiliary data	4 data types	223 files	200 Mo
L0 Housekeeping parameters	20 data types	548 files	14 Go
L1 Auxiliary data	8 data types	208 files	8.2 Go
CoRoTSky data	2 data types	78 files	21 Mo

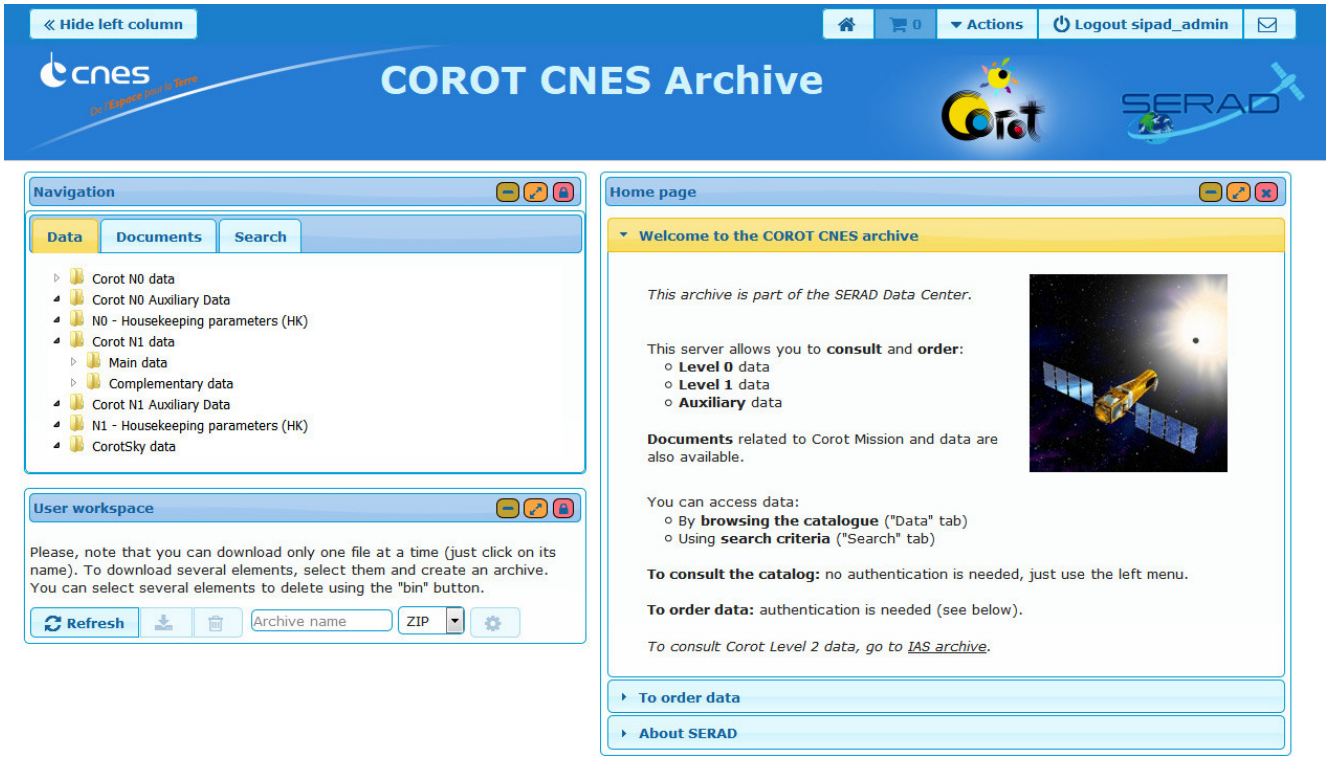

Fig. II.5.3. CNES interface for CoRoT data. © CNES

All the archived data and the selection of documents are available[1]. This web server offers a web interface to search, select and order CoRoT data (Fig. II.5.3). Data of the same type are grouped in datasets and datasets are grouped in directories. A short description of data (content and formats) is available for each dataset. Users can browse the list of data using a treeview or using selection criteria. Visualization of the list of existing data is available for any public user. Registration is required to order data. Access to level 0 data is limited to expert users to prevent incorrect use of those data. Access to level 1 data is open more widely.

[1] https://sipad-corot.cnes.fr/

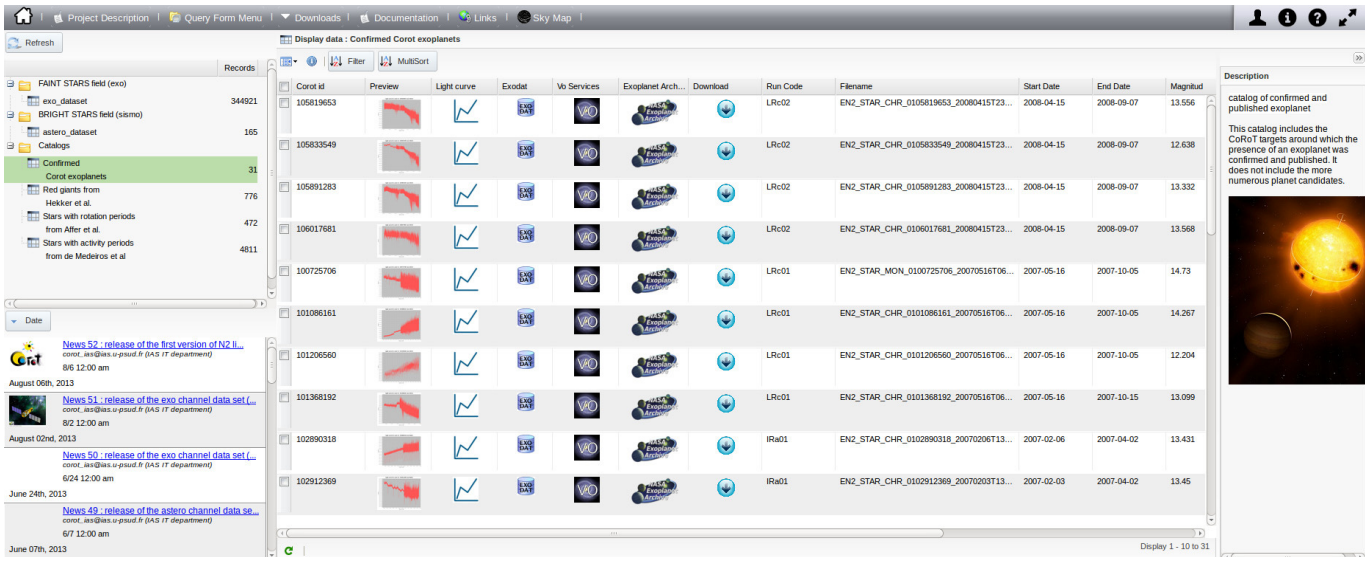

Fig. II.5.4. IAS interface for CoRoT data. © IAS

3. The IAS archive

The original CoRoT archive (the "mission archive") is located at the Institut d'Astrophysique Spatiale (IAS) in France. In order to ensure a wide access to the community at large, two other public archives are synchronized with the IAS archive: the NASA Exoplanet Archive in the USA, the other at the Centro de Astrobiologìa (CAB, Spain). In addition to these archives, the Centre de Données de Strasbourg will ensure the permanence on the very long-term of CoRoT data access through their VizieR tool. The data available at these different archives are identical, each archive providing different interfaces to access them.

At IAS, two interfaces allow the search through all "bright" stars ($6 < \mathrm{mV} < 9$, commonly used for asteroseismology, but not only), and "faint" stars ($10 < \mathrm{mV} < 16$, initially observed for exoplanet search and used for many more purposes). This represents a total of 165 light curves for bright stars and 176 492 for faint stars. They can be searched and selected using various criteria, such as their magnitude, their position in the sky, their spectral type, etc. In the case of faint stars, star selection can also be performed using the CoRoT Variable Classification (see Debosscher et al. 2009), which provides the probability for a star to belong to a given class of variable stars (such as β Cephei, δ Scuti, T Tauri, etc.). Another way to search for data is the use of published catalogues for some kinds of targets: for example red giant stars, or list of stars with a known period of rotation (Fig. II.5.4).

In addition to these interfaces, it is also possible to retrieve a whole run (including several thousands of targets) through the IAS archive.

For a given target, data are available in the form of FITS files, as well as VOTables.

For some targets, the light curves are computed on the ground from downloaded small images ("imagettes") recorded aboard. Both light curves (N2) and imagettes (N1) are available, allowing a view of the target and its surrounding pixels on the detector. For each target, a file called WINDESCRIPTOR summarizing the context of the observed target is also available. Further information is provided for a target through a link to the Exodat database such as spectral type, magnitudes in various bands, names of the target in different catalogues (USNO, 2MASS...). Some interactive tools allow the user to get more information about the targets selected. For example, a preview of the light curve is available, leaving to the user the possibility of a global view or a more detailed one by zooming interactively at his convenience. Another tool is provided through a link to the NASA Exoplanet Archive: a periodogram of the selected data is computed at request.

In addition to the N2 data, ready for the scientific use, N1 data are available under request for specific purposes.

4. Distribution of CoRoT data through the VizieR database at CDS

VizieR is the reference database for tabular data from astronomical catalogues and tables published in scientific papers. Tables are stored, along with homogeneous "metadata". This metadata consists of a range of information describing the data, such as the magnitude system used, the coordinate system and its epoch, the units of the columns, the type of data (magnitudes, sizes, positions...), stored as Unified Content Descriptors. This set of metadata can be queried, allowing users to discover catalogues relevant for their research. Another strength of this approach is that VizieR allows for instance to perform cone queries in all of the >14 000 catalogues stored in one simple click. Vizier is fully VO-compatible and communicates with a number of important astronomical resources and software such as the CDS SIMBAD database, Aladin and TOPCAT.

These features have made VizieR a very popular resource among astronomers, and as a result, there have been 300 000 queries/day during the last year. Thousands of astronomers have decided that VizieR is the right place to make their data available to the community, and institutional data providers such as ESO and ESA have also trusted the service to distribute their surveys. The VizieR team has worked in close collaboration with the CoRoT project to distribute their data. The VizieR interface allows users to quickly discover and access the mission data, and ulterior catalogues using this data.

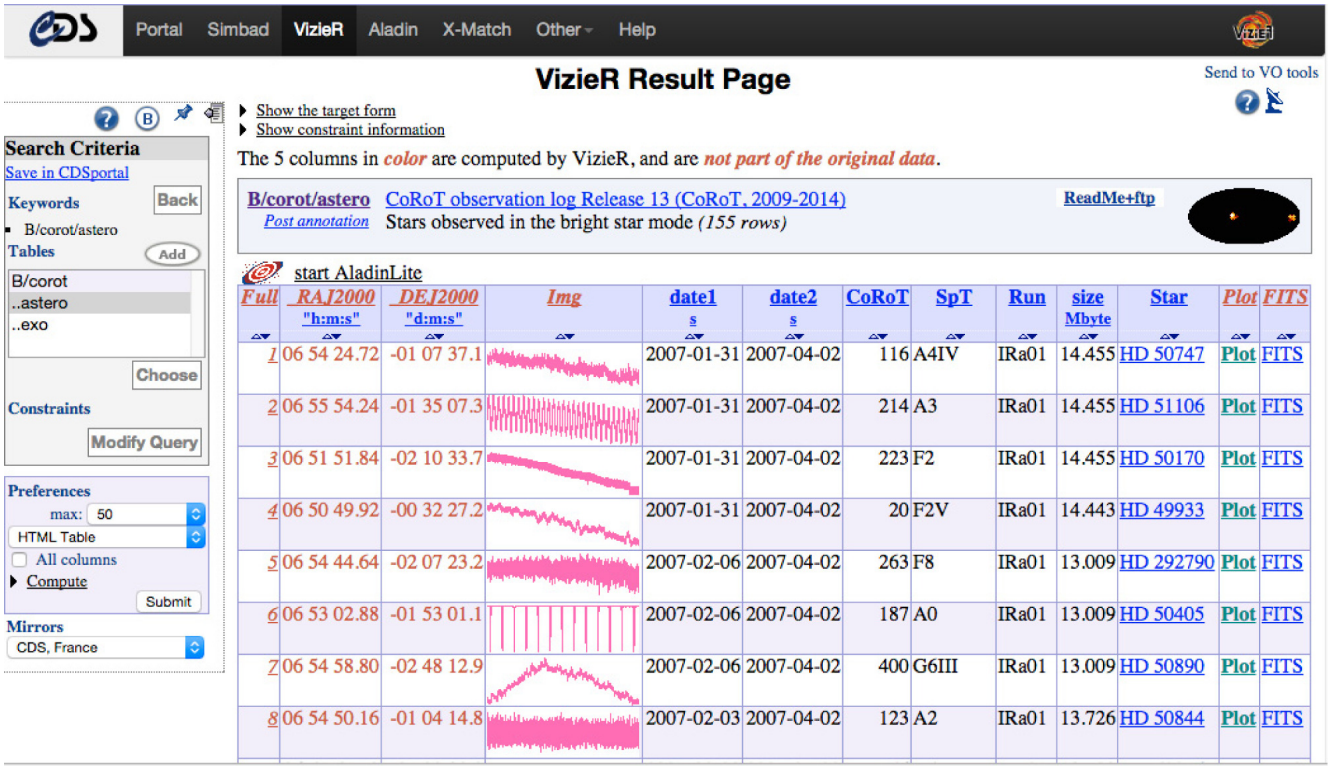

Fig. II.5.5. VizieR interface for CoRoT data. © CDS

The query web page allows to search CoRoT data by constraints on the observations or objects' parameters. The results web page was specifically designed to allow rapid browsing through the light curves, as shown on Fig. II.5.5.

The CoRoT catalogue acts in VizieR as any other catalogue, which means that users do not need to know about CoRoT observations to get CoRoT data when it exists: a simple cone search intersecting the CoRoT field or a query for photometric time-series through VizieR will retrieve and display CoRoT data, among other relevant catalogues[2].

References

Debosscher, J., Sarro, L. M., Lopez., M., et al. 2009, A&A, 506, 519

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[2] The service can be accessed at http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=B/corot and at http://cdsarc.u-strasbg.fr/assocdata/?obs_collection=B/corotforVOaccess