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SpaceInn
Work Package 3.3

Accompanying report on the deliverables D3.9 due for June 30: simultaneous spectroscopy and photometry

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1 Executive summary

The ground-based CoRoT complementary archive (Work Package 3.3) contains 7103 spectra of the 261 stars observed with the HARPS spectrograph, mostly as complementary observations to the photometric light curves of 71 of the asteroseismological targets of the CoRoT satellite. The remaining archived spectra pertain to other, non-CoRoT targets: these objects were observed in order to better characterize the variability classes of the CoRoT targets.
In the framework of the SpaceInn project, we are now presenting the deliverables D3.9, *i.e.* the addition of the CoRoT light curves to our archive, in order to allow the study of the simultaneous photometry and spectroscopy of the objects. A brief summary of all the work done until now (deliverables D3.8) is given.
Our tasks until now have thus been the following:

- the spectra have been reduced, normalized, and converted in VO-compliant FITS files (D3.8);
- the mean line profiles have been computed for each spectrum (D3.8);
- the radial velocity, $\mathrm{vsin}\, i$, a binarity flag, a CaHK activity index, and an Hα emission index have been computed for each spectrum. In the case of double or multiple systems, the radial velocities and $\mathrm{vsin}\, i$ have been computed, if possible, for all the components (D3.8);
- the physical parameters $\mathrm{T_{eff}}$, $\log g$, and [Fe/H] have been computed for each target (D3.8);
- the public CoRoT light curves of the 71 CoRoT targets present in our archive have been added to the archive (D3.9);
- it is possible to retrieve the simultaneous spectroscopy and photometry of these 71 targets from the archive (D3.9);
- we have begun working on the archive query interface and plotting capabilities (future D3.10).

In addition to that, some format changes have been made to several of the spectroscopic FITS file in the archive.
Several papers have already been published using data from the archive and acknowledging the SpaceInn contribution.

All spectroscopic and photometric files are retrievable from:
http://www.spaceinn.eu/data-access/harps-spectra-of-corot-targets/

The future work of WP 3.3 will consist of the creation of an online interactive VO-compliant database, where all the data will easily be retrieved and viewed (D3.10). The query interface will allow to request the data by star identification, spectral type, and variable type. This work is already underway.

2 CoRoT ground-based spectroscopic archive

The space mission CoRoT [Baglin et al., 2007] was launched on the 27th of December 2006 and operated until October 2013. The asteroseismic goal of the satellite was achieved by monitoring several different kinds of pulsating stars for long periods of time, up to 150 days. To support and complement this study, a large ground-based observational program was carried on using high-resolution spectrographs to observe the CoRoT targets simultaneously with the satellite.
The results of this program, along with the photometric time series of the satellite and various stellar parameters are stored in the CoRoT ground-based spectroscopic archive.

3 Spectroscopy in the archive

The ground-based program started with the Large Programme 178.D-0361 using the FEROS spectrograph at the 2.2m telescope of the ESO-LaSilla Observatory, but then it moved on to the high-resolution echelle spectrograph HARPS at the 3.6m telescope of the same observatory [Mayor et al., 2003], which became the main instrument of this work (Large Programmes LP 182.D-0356 and LP 185.D-0056). Other spectrographs used were SOPHIE@1.9m at the Haute-Provence Observatory, FOCES@2.2m at the Calar Alto Observatory, FIES@NOT and HERMES@MERCATOR at the Observatory of Roque de Los Muchachos, CORALIE@1.2m at the ESO-LaSilla Observatory, and HERCULES@1m at the Mount John Observatory.
The CoRoT ground-based spectroscopic archive contains the HARPS spectra only, in order to offer an homogeneous group of data. In total, the archive hosts 7103 spectra of 261 stars. 71 of these stars were CoRoT targets, while the rest of the objects were observed as back-up and filling targets, aiming at better defining the physical properties of the variability classes observed by CoRoT. The spectra cover most of the H-R diagram: their spectral type distribution is shown in Fig. 1.
We used HARPS mostly in the high-efficiency mode EGGS, with resolution R=80,000, because most of our targets are hot stars with large $v \sin i$ values. As such, these targets are not suitable for the more precise radial velocities studies carried on using the high-accuracy mode HAM (R=115,000). Using the EGGS mode, we were able to reduce the exposure times, and to increase the signal-to-noise ratios (SNRs), which is very useful for a line profile variations (LPVs) analysis of the targets. Only the cooler targets were observed in the HAM mode.
Most of the spectra observed with EGGS have SNRs around 200 at about 5800 Å, while the HAM spectra usually have a SNR around 150 in the same region, with the exception of HD046375, whose 1160 spectra cluster around 50 (see Fig. 2), high enough to detect the solar-like oscillations in the radial velocity time series. The high number of spectra on a single target were acquired as a pilot study to support one of the scientific goals of the CoRoT second extension, *i.e.*, to have a full asteroseismic picture of the stars hosting exoplanets.

3.1 Reduction of the HARPS spectra

The online ESO pipeline gives as final outputs one-dimensional spectra with the echelle orders merged, which can be a problem when normalizing the whole spectrum because of the distorted continuum. In addition to that, we lose information on the pixel-by-pixel SNRs and on the positions of the borders of the orders, which are important for detailed spectroscopic analysis: in fact the SNR decreases greatly on the borders of the orders and the spectral lines in these regions may be distorted because of a lack of continuum on both sides of the lines. In order to improve the quality of our spectra, we reduced them using a semi-automated pipeline developed at the Brera Observatory [Rainer, 2003]. For each observed spectrum, we obtain two output files:

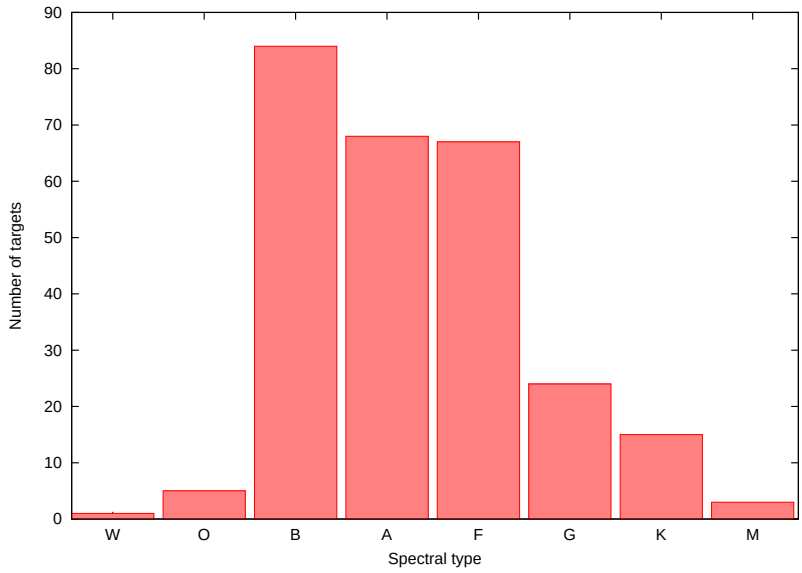


Figure 1: Distribution of the spectral types of our targets.

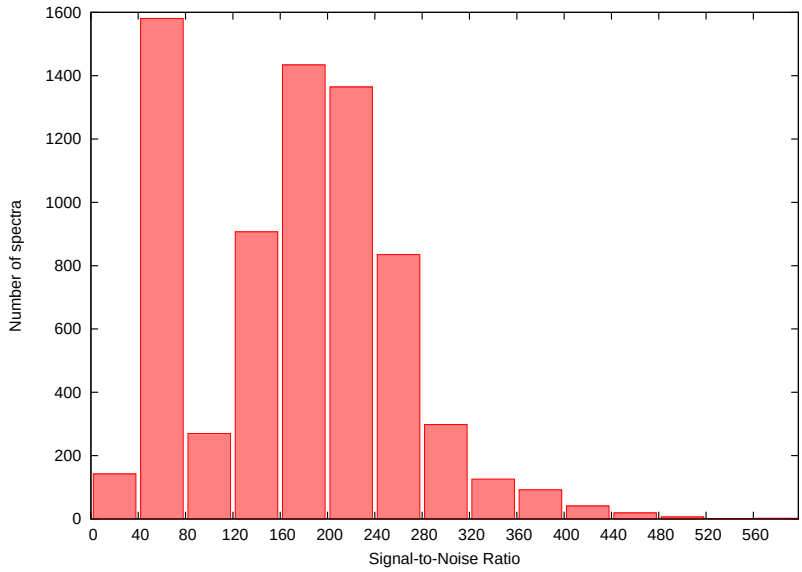


Figure 2: Distribution of the SNRs of the observed spectra. The peak between 40 and 80 is mostly caused by the 1160 spectra of HD046375.

- a five column ASCII file with wavelength, flux, normalized flux, SNR and number of the echelle orders;
- a two column ASCII file with wavelength and normalized flux, with the echelle orders merged (which is similar to the standard pipeline output, but better normalized).

The files were then converted in FITS files with VO-compliant structure and header and stored in the archive as ∗_full.fits (the five column tables) and ∗_nor.fits (the two column tables).
The raw HARPS data are available on request, or they can be downloaded directly from the ESO archive[1].

3.2 Indicators and physical parameters

In order to support the asteroseismological exploitation of the data, different kinds of indicators and secondary files have been computed to be provided alongside the spectra. The additional spectral files are the following:

- ∗_mean.fits: the mean line profiles of each spectrum computed with the LSD [Donati et al., 1997] software in the 4415-4805, 4915-5285, 5365-6505 Å regions. The files consist of two columns: Doppler velocity and normalized flux.
- OBJECT_tbl.fits: a general overview of each object time series, this table consists in:
  - the root names of the spectra,
  - the barycentric Julian dates at mid-exposure,
  - the SNRs of the spectra in the 5805-5825 Å region,
  - the radial velocities of the spectra and their errors,
  - the projected rotational velocities of the spectra and their errors,
  - the ratios q_2/q_1 of the first two zero positions of the Fourier transform of the mean line profiles and their errors,
  - an activity index I_H, using only the Ca H line, of each spectrum,
  - an activity index I_K, using only the Ca K line, of each spectrum,
  - an averaged activity index I_{HK} of each spectrum,
  - the emission index V/R of each spectrum,
  - in the case of double or multiple systems, the radial velocities, $v \sin i$ and their errors will be listed, if possible, for all the components.
- OBJECT_profmed.pdf: a PDF file that allows a quick look at the pulsational content of the time series. In the case of objects where a single spectrum was observed, the mean line profile of the spectrum is given instead.
- OBJECT_fit.pdf: a PDF file with the observed spectrum in the 5160-5190 Å region and the best-fit synthetic spectrum. In the case of objects where the fit was not possible, only the observed spectrum is given.

All the necessary information (such as physical parameters, pulsation and activity indices, and so on) are stored also in the FITS headers of the ∗_full.fits and ∗_nor.fits files.
In the last year, some minor corrections have been made on the format of the spectral data, particularly in the OBJECT_tbl.fits files. The Julian Date stored in the second column of the table has been converted to modified Julian Date (JD − 2400000.5), and the name of the data columns have been changed.

[1] http://archive.eso.org/eso/eso_archive_main.html

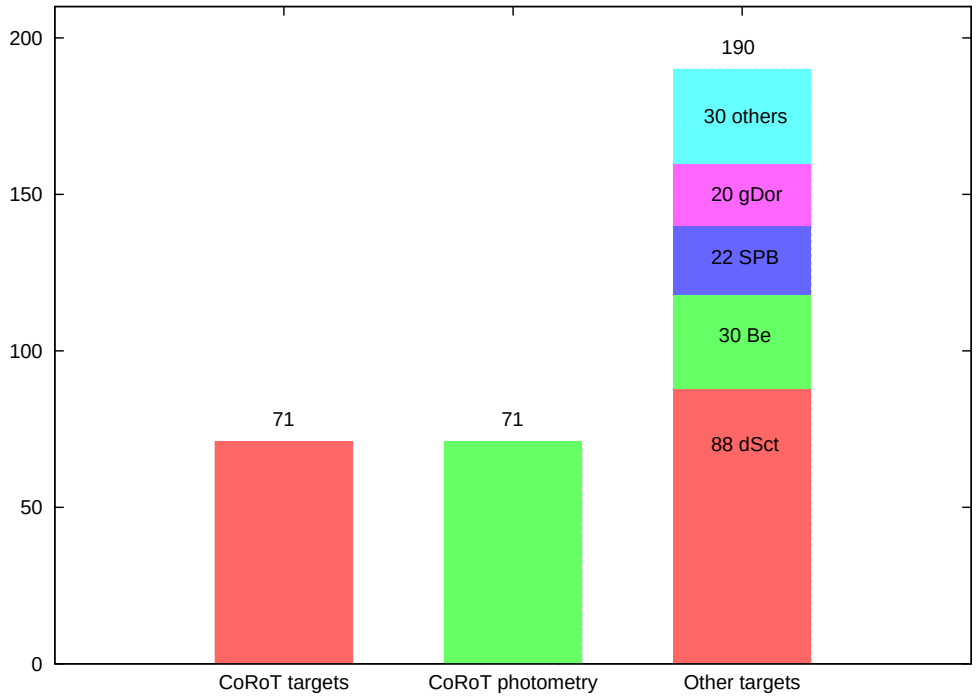


Figure 3: Targets present in the archive. First column: CoRoT targets with spectra. Second column: CoRoT targets with light curves. Third column: other targets with spectra.

4 Photometry in the archive

The main targets of the spectroscopic campaign were chosen among the CoRoT asteroseismological targets. These objects (71 stars of the 261 observed during the ground-based program) have been observed by CoRoT and their light curves have been retrieved from the CoRoT public archive and stored in our database alongside the spectra (see Fig. 3). In some cases, the targets were observed with CoRoT more than once, resulting in more than one set of photometric data per target.
The CoRoT data are the N2 data[2], which means that they are ready to be used for scientific analysis without any *a priori* knowledge of the instrument.
The reduction of the CoRoT data follows these steps:

- the N0 data are the time-stamped raw data produced at the CoRoT Mission Center (CNES), and they are not available outside of the CoRoT Mission or Data Center;
- the N1 data are corrected from instrumental effects only at the first order, and they were mostly used for alarm mode and instrument check;
- the N2 data are the main output of the CoRoT mission: they consist of the corrected light curves and they are available to the public one year after their processing.

[2]http://idoc-corot.ias.u-psud.fr/jsp/doc/DescriptionN2v1.3.pdf

The N2 light curves are provided as FITS files, with some auxiliary information stored in the header. The FITS files contain three tables: N1 data, N2 data in the heliocentric frame with irregular time sampling, and N2 data in the heliocentric frame with regular 32 seconds sampling.
Any further reduction of the CoRoT light curves will be added to the archive as soon as it will be made public.
The photometry and spectroscopy in the archive mostly overlap, because the aim of the spectroscopic campaign was to observe the CoRoT targets simultaneously with the satellite. This was not always possible, because the allotted spectroscopic observing time sometimes did not match well with the photometric observations of the targets most suited for ground-based observations. The list of the CoRoT targets in the archive along with the time-base of both spectroscopic and photometric observations is shown in App. A. The temporal base of the spectroscopic observations is much smaller than that of the photometric ones (typically 10+5 nights against 30-150 days), but nevertheless it is possible to study the stellar variations in the light curve and, for example, in the radial velocity curve at the same time.

5 Archive interface

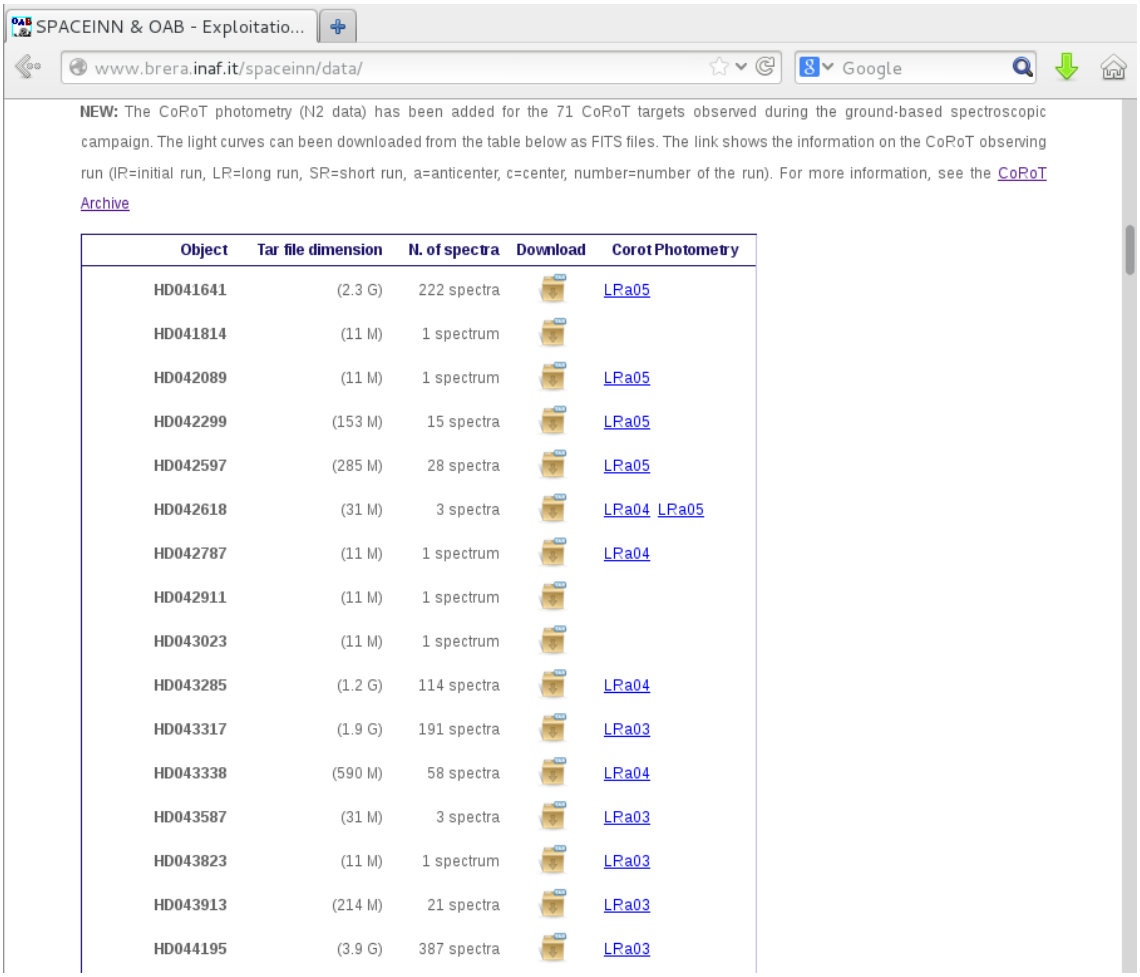
At the moment, all the data are accessible from the SpaceInn website[3], and both the spectroscopy (along with the indicators) and the photometry can be downloaded (see Fig. 4)
We are already working on the archive interface, which will allow the user to query the database in different ways (see Fig. 5). The results of the search will be displayed in a list (see Fig. 6), and they can either be downloaded or plotted online. It will be possible to plot the spectroscopic time series and the light curves simultaneously (see Fig. 7 and Fig. 8): the spectroscopic time series consist of the files OBJECT_tbl.fits, as such any of the columns can be plotted (radial velocity, projected rotational velocity, q_2/q_1, activity indices and emission index).
This work is still in the preliminary phases, and as such it is not available for public use.

6 Publications

The following papers have used data stored in the archive, acknowledging the SpaceInn findings and contribution:

- Lagarde N., et al., A&A accepted, *Models of red giants in the CoRoT asteroseismology fields combining asteroseismic and spectroscopic constraints*
- Zwintz K., et al., 2014, Science 345, 550, *Echography of young stars reveals their evolution*
- Zwintz K., et al., 2014, A&A 567, 4, *Refining the asteroseismic model for the young δ Scuti star HD 144277 using HARPS spectroscopy*
- Hareter M., et al., 2014, A&A 567, 124, *HD 51844: An Am δ Scuti in a binary showing periastron brightening*
- Morel T., et al., 2014, A&A 564, 119, *Atmospheric parameters and chemical properties of red giants in the CoRoT asteroseismology fields*
- Boumier P., et al., 2014, A&A 564, 34, *Seismic analysis of HD 43587Aa, a solar-like oscillator in a multiple system*

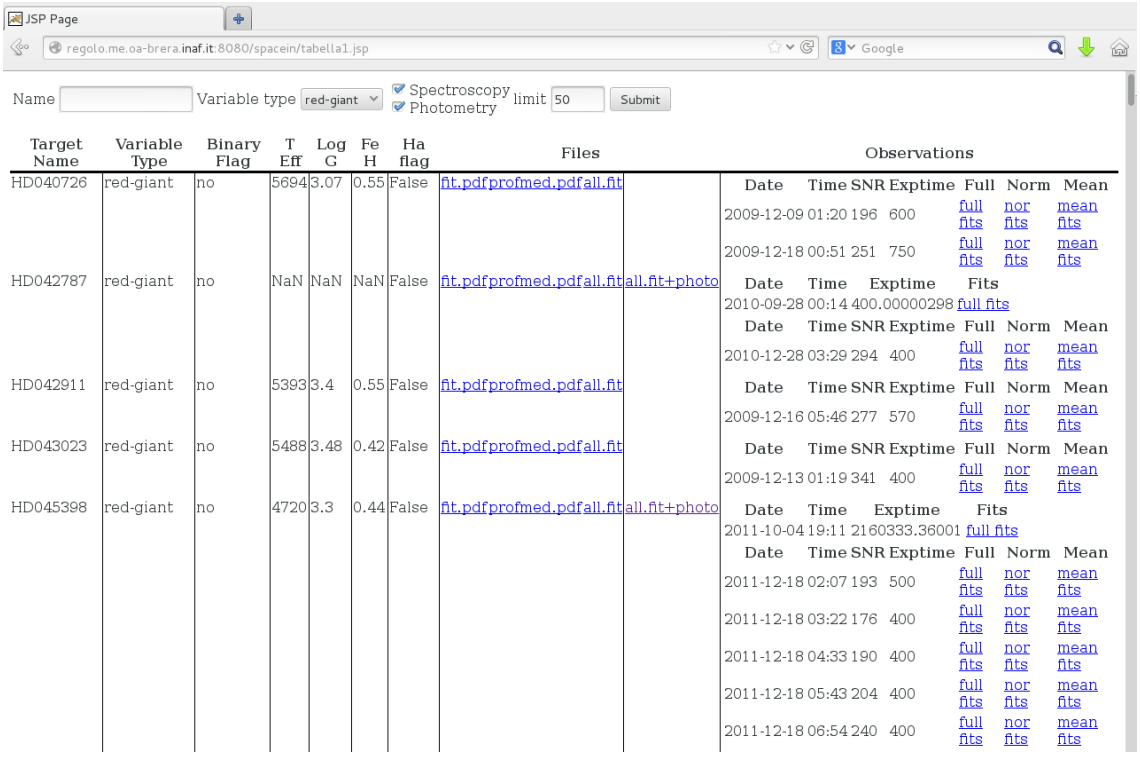
[3]http://www.spaceinn.eu/data-access/harps-spectra-of-corot-targets/



Object	Tar file dimension	N. of spectra	Download	Corot Photometry
HD041641	(2.3 G)	222 spectra		LRa05
HD041814	(11 M)	1 spectrum		
HD042089	(11 M)	1 spectrum		LRa05
HD042299	(153 M)	15 spectra		LRa05
HD042597	(285 M)	28 spectra		LRa05
HD042618	(31 M)	3 spectra		LRa04 LRa05
HD042787	(11 M)	1 spectrum		LRa04
HD042911	(11 M)	1 spectrum		
HD043023	(11 M)	1 spectrum		
HD043285	(1.2 G)	114 spectra		LRa04
HD043317	(1.9 G)	191 spectra		LRa03
HD043338	(590 M)	58 spectra		LRa04
HD043587	(31 M)	3 spectra		LRa03
HD043823	(11 M)	1 spectrum		LRa03
HD043913	(214 M)	21 spectra		LRa03
HD044195	(3.9 G)	387 spectra		LRa03

Figure 4: The spectroscopic and photometric data are available to the public for download.

Figure 5: The archive query interface. It is possible to query by name or variability type, and either the spectroscopy data, the photometry data or both can be checked.



JSP Page

regolo.me.oa-brera.inaf.it:8080/spacein/tabella1.jsp

Name | Variable type red-giant | Spectroscopy | Photometry | limit 50 | Submit

Target Name	Variable Type	Binary Flag	T Eff	Log G	Fe H	Ha flag	Files		Observations
HD040726	red-giant	no	5694	3.07	0.55	False	fit.pdf profmed.pdf all.fit		Date Time SNR Exptime Full Norm Mean 2009-12-09 01:20 196 600 full fits nor fits mean fits 2009-12-18 00:51 251 750 full fits nor fits mean fits
HD042787	red-giant	no	NaN	NaN	NaN	False	fit.pdf profmed.pdf all.fit	all.fit+photo	Date Time Exptime Fits 2010-09-28 00:14 400.00000298 full fits Date Time SNR Exptime Full Norm Mean 2010-12-28 03:29 294 400 full fits nor fits mean fits
HD042911	red-giant	no	5393	3.4	0.55	False	fit.pdf profmed.pdf all.fit		Date Time SNR Exptime Full Norm Mean 2009-12-16 05:46 277 570 full fits nor fits mean fits
HD043023	red-giant	no	5488	3.48	0.42	False	fit.pdf profmed.pdf all.fit		Date Time SNR Exptime Full Norm Mean 2009-12-13 01:19 341 400 full fits nor fits mean fits
HD045398	red-giant	no	4720	3.3	0.44	False	fit.pdf profmed.pdf all.fit	all.fit+photo	Date Time Exptime Fits 2011-10-04 19:11 2160333.36001 full fits Date Time SNR Exptime Full Norm Mean 2011-12-18 02:07 193 500 full fits nor fits mean fits 2011-12-18 03:22 176 400 full fits nor fits mean fits 2011-12-18 04:33 190 400 full fits nor fits mean fits 2011-12-18 05:43 204 400 full fits nor fits mean fits 2011-12-18 06:54 240 400 full fits nor fits mean fits

Figure 6: Results of the search in the archive. All the different data are listed (spectra, photometry, comprehensive tables and PDF files.

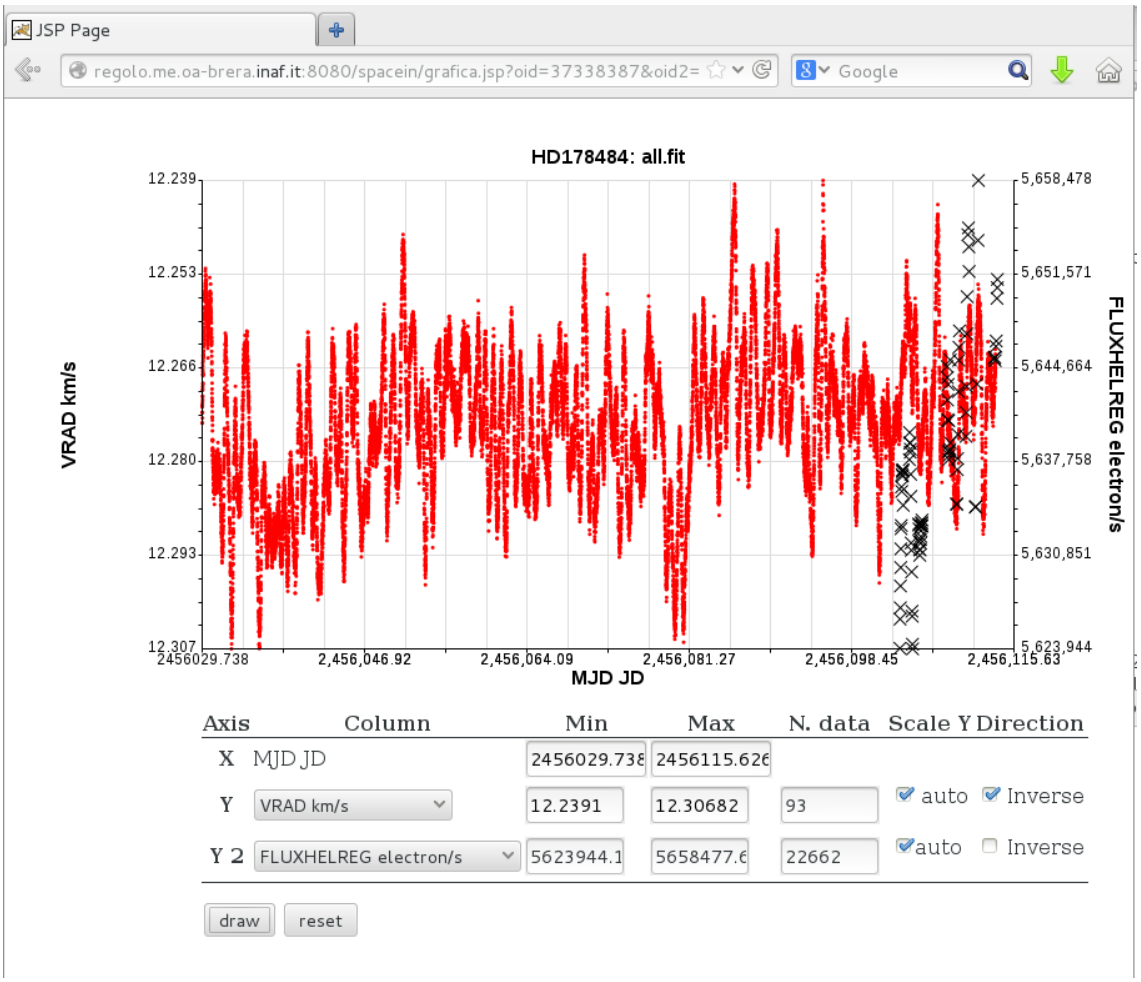


Figure 7: Simultaneous plot of the CoRoT light curve (red dots) and the radial velocity curve (black crosses) of the red giant HD178484. Instead of the radial velocities, it is possible to plot any of the other spectroscopic indicators, *i.e.* $v \sin i$, q_2/q_1, activity indices or emission index.

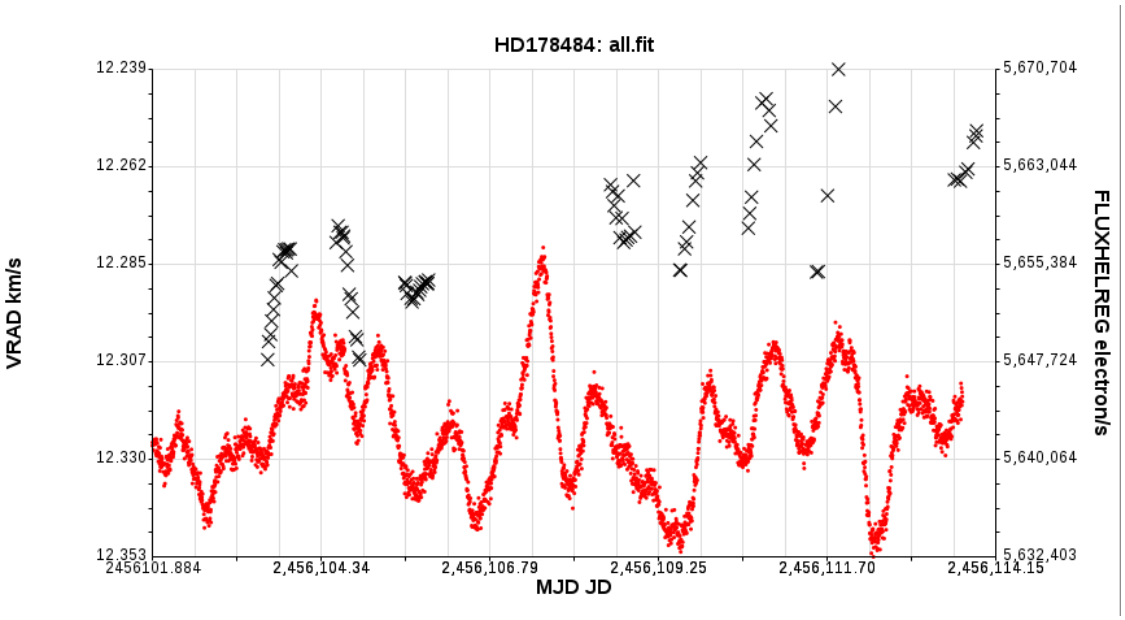


Figure 8: Zoom of the simultaneous plot of the CoRoT light curve and the radial velocity curve of HD178484.

- Nardetto N., et al., 2014, A&A 561, 151, *Understanding the dynamical structure of pulsating stars. HARPS spectroscopy of the δ Scuti stars ρ Puppis and DX Ceti*
- Morel T., et al., 2014, A&A 561, 35, *A search for pulsations in the HgMn star HD 45975 with CoRoT photometry and ground-based spectroscopy*
- Aerts C., et al., 2013, A&A 557, 114, *Low-amplitude rotational modulation rather than pulsations in the CoRoT B-type supergiant HD 46769*

7 Conclusions

The CoRoT ground-based spectroscopic archive contains all the HARPS spectra observed during the ground-based campaign and their relative indicators along with the CoRoT N2 light curves. Several papers have alredy been published using the data stored in the archive.
We are alredy working on the deliverables D3.10, which will result in an user-friendly interface that will allow to query the database in different ways (by target, spectral type, variability class, and so on) and then to either retrieve the data or to plot them online.

For now, the spectra, the indicators and the CoRoT light curves are accessible from the SpaceInn website at the page:
http://www.spaceinn.eu/data-access/harps-spectra-of-corot-targets/
The spectra and all the spectroscopic additional files are stored in 261 tarfiles, one for each target. Information on the size of the tarfiles and on the number of spectra observed for each target are given. The light curves are directly available as FITS files.

References

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[Valenti & Piskunov, 1996] Valenti, J.A., & Piskunov, N., 1996, A&AS, 118, 595

A CoRoT targets in the archive

Target	CoRoT ID	Sp. time-base	Ph. time-base	Variability type
GSC00144-03031	21960	25-12-2010 01-01-2011	28-09-2010 16-12-2010	δ Scuti
HD041641	5685	23-12-2010 12-01-2011	17-12-2010 22-03-2011	δ Scuti
HD042089	5631	29-12-2010 29-12-2010	17-12-2010 22-03-2011	solar-like
HD042299	4977	23-12-2010 12-01-2011	17-12-2010 22-03-2011	δ Scuti
HD042597	5175	23-12-2010 12-01-2011	17-12-2010 22-03-2011	β Cephei
HD042618	4910	24-12-2010 11-01-2011	28-09-2010 16-12-2010	solar-like
-	-	-	17-12-2010 22-03-2011	-
HD042787	4471	28-12-2010 28-12-2010	28-09-2010 16-12-2010	red-giant
HD043285	4111	23-12-2010 12-01-2011	28-09-2010 16-12-2010	Be
HD043317	3412	09-12-2009 30-12-2009	01-10-2009 01-03-2010	SPB/β Cephei
HD043338	4243	23-12-2010 12-01-2011	28-09-2010 16-12-2010	γ Doradus
HD043587	3474	26-12-2010 10-01-2011	01-10-2009 01-03-2010	solar-like
HD043823	3093	14-12-2009 14-12-2009	01-10-2009 01-03-2010	none
HD043913	2951	16-12-2009 16-12-2009	01-10-2009 01-03-2010	Be
-	-	18-12-2011 12-01-2012	-	-
HD044195	3072	09-12-2009 30-12-2009	01-10-2009 01-03-2010	δ Scuti/γ Doradus
HD045398	2069	18-12-2011 12-01-2012	04-10-2011 28-11-2011	red-giant
HD045418	2031	18-12-2011 12-01-2012	04-10-2011 28-11-2011	none
HD045517	2153	18-12-2011 18-12-2011	04-10-2011 28-11-2011	none
HD045546	2070	18-12-2011 12-01-2012	04-10-2011 28-11-2011	β Cephei
HD045975	1824	18-12-2011 11-01-2012	04-10-2011 28-11-2011	HgMn
-	-	12-12-2012 05-01-2013	-	-
HD046149	1818	09-12-2009 29-12-2009	08-10-2008 12-11-2008	none
-	-	11-12-2012 05-01-2013	-	-
HD046150	1781	11-12-2012 05-01-2013	08-10-2008 12-11-2008	none
HD046202	1773	11-12-2012 05-01-2013	08-10-2008 12-11-2008	β Cephei
HD046223	1718	11-12-2012 05-01-2013	08-10-2008 12-11-2008	none
HD046375	1889	11-12-2012 05-01-2013	08-10-2008 12-11-2008	solar-like
HD046769	614	11-12-2012 05-01-2013	02-03-2010 29-03-2010	none
HD048752	3573	21-12-2011 21-12-2011	05-03-2008 31-03-2008	none
-	-	-	29-11-2011 09-01-2012	-
HD048784	3619	18-12-2011 18-12-2011	05-03-2008 31-03-2008	δ Scuti
-	-	-	29-11-2011 09-01-2012	-
HD048977	2820	18-12-2011 18-12-2011	05-03-2008 31-03-2008	SPB
-	-	-	29-11-2011 09-01-2012	-
HD049310	3905	09-12-2009 28-12-2009	05-03-2008 31-03-2008	none
HD049385	18	22-12-2011 22-12-2011	18-10-2007 03-03-2008	solar-like
-	-	-	10-01-2012 29-03-2012	-
HD049429	2983	18-12-2011 18-12-2011	05-03-2008 31-03-2008	red-giant
-	-	-	29-11-2011 09-01-2012	-
HD049566	3437	12-01-2011 12-01-2011	05-03-2008 31-03-2008	red-giant
-	-	20-12-2011 20-12-2011	29-11-2011 09-01-2012	-
HD049585	4	18-12-2011 12-01-2012	10-01-2012 29-03-2012	Be
HD050230	44	10-12-2009 18-12-2009	18-10-2007 03-03-2008	SPB/β Cephei
		18-12-2011 10-01-2012	10-01-2012 29-03-2012	
HD050870	546	15-12-2008 08-01-2009	13-11-2008 08-03-2009	δ Scuti
-	-	25-12-2010 08-01-2011	-	-
-	-	18-12-2011 12-01-2012	-	-

Target	CoRoT ID	Sp. time-base	Ph. time-base	Variability type
HD050890	400	23-12-2010 31-12-2010	06-02-2007 02-04-2007	red-giant
HD051193	714	15-12-2008 08-01-2009	13-11-2008 08-03-2009	Be
HD051452	871	15-12-2008 08-01-2009	13-11-2008 08-03-2009	Be
HD051756	579	09-12-2009 30-12-2009	13-11-2008 08-03-2009	none
HD051844	1043	13-12-2009 30-12-2009	13-11-2008 08-03-2009	δ Scuti
HD169370	9310	22-06-2009 22-06-2009	01-04-2009 02-07-2009	red-giant
HD169392A	9161	26-06-2011 26-06-2011	01-04-2009 02-07-2009	solar-like
-	-	05-07-2012 05-07-2012	-	-
HD169556	9071	20-07-2011 20-07-2011	01-04-2009 02-07-2009	solar-like
HD169689	9540	25-06-2012 28-07-2012	04-07-2009 29-09-2009	red-giant
-	-	-	06-07-2012 01-10-2012	-
HD169751	9198	24-06-2009 24-06-2009	01-04-2009 02-07-2009	red-giant
HD169822	9775	23-07-2012 28-07-2012	04-07-2009 29-09-2009	solar-like
-	-	-	06-07-2012 01-10-2012	-
HD170008	9861	29-06-2009 29-06-2009	04-07-2009 29-09-2009	red-giant
HD170031	8852	24-06-2011 20-07-2011	06-04-2011 28-06-2011	red-giant
-	-	-	06-07-2011 30-09-2011	-
HD170053	9109	24-06-2011 20-07-2011	06-04-2011 28-06-2011	red-giant
-	-	-	06-07-2011 30-09-2011	-
HD170133	9436	25-06-2012 26-07-2012	04-07-2009 29-09-2009	δ Scuti
-	-	-	06-07-2012 01-10-2012	-
HD170174	8943	02-07-2011 02-07-2011	06-04-2011 28-06-2011	red-giant
-	-	-	06-07-2011 30-09-2011	-
HD170200	8831	24-06-2011 20-07-2011	06-04-2011 28-06-2011	none
-	-	25-06-2012 25-07-2012	06-07-2011 30-09-2011	-
HD170231	9044	24-06-2011 20-07-2011	06-04-2011 28-06-2011	red-giant
-	-	-	06-07-2011 30-09-2011	-
HD170270	9368	24-07-2012 24-07-2012	06-07-2012 01-10-2012	red-giant
HD170580	8252	21-06-2009 19-07-2009	06-04-2010 05-07-2010	β Cephei
-	-	13-06-2010 06-07-2010	08-07-2010 24-09-2010	-
HD170699	8301	13-06-2010 04-07-2010	06-04-2010 05-07-2010	δ Scuti
-	-	-	08-07-2010 24-09-2010	-
HD170783	8303	13-06-2010 03-07-2010	06-04-2010 05-07-2010	Be
-	-	-	08-07-2010 24-09-2010	-
HD170973	8081	14-06-2010 06-07-2010	06-04-2010 05-07-2010	α^2 Canum Venaticorum
HD171219	8385	14-06-2010 03-07-2010	08-07-2010 24-09-2010	Be
HD171427	8583	27-06-2009 27-06-2009	11-04-2008 07-09-2008	red-giant
HD171834	8567	21-06-2009 19-07-2009	11-04-2008 07-09-2008	γ Doradus
HD172046	8310	24-06-2011 18-07-2011	11-04-2008 07-09-2008	none
-	-	25-06-2012 25-07-2012	-	-
HD174532	7655	21-06-2009 19-07-2009	09-09-2008 06-10-2008	δ Scuti
HD174966	7528	21-06-2009 19-07-2009	11-04-2007 08-05-2007	δ Scuti
HD178169	7981	25-06-2012 25-07-2012	10-04-2012 05-07-2012	none
HD178243	8013	05-07-2012 05-07-2012	10-04-2012 05-07-2012	none
HD178484	7986	25-06-2012 28-07-2012	10-04-2012 05-07-2012	red-giant
HD179079	8111	25-06-2012 25-07-2012	10-04-2012 05-07-2012	solar-like
HD179192	8197	01-07-2012 01-07-2012	10-04-2012 05-07-2012	none
HD181907	8774	13-06-2010 06-07-2010	11-05-2007 15-10-2007	red-giant
V585 Oph	9287	24-07-2012 24-07-2012	06-07-2012 01-10-2012	red-giant