SpaceInn
Work Package 3.3

Accompanying report on the deliverables D3.8 due for April 30: reduced HARPS spectra with indicators

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Contents

1 Executive summary

In the framework of the SpaceInn project, the ground-based CoRoT complementary archive (Work Package 3.3) will contain 7103 spectra of the 261 stars observed with the HARPS spectrograph, mostly as complementary observations to the photometric light curves of many of the asteroseismological targets of the CoRoT satellite. A certain number of the archived spectra pertain to other, non-CoRoT targets: these objects were observed in order to better characterize the variability classes of the CoRoT targets.
We performed two Large Programmes (LP 182.D-0356 and LP 185.D-0056) with the HARPS spectrograph spanning over nine semesters, from December 2008 to January 2013, for a total of 135 nights of observations.
Our tasks until now have been the following:

- the spectra have been reduced, normalized, and converted in VO-compliant fits files;
- the mean line profile has been computed for each spectrum;
- the radial velocity, 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 vsin i have been computed, if possible, for all the components;
- the physical parameters $T_{\rm eff}$, $\log g$, and [Fe/H] have been computed for each target.

As a result, we have produced several different files, that are our D3.8 deliverables in the framework of the SpaceInn program. These are:

- $*$_full.fits: the main deliverables, these are the five columns reduced observed spectra, with wavelength (barycentric corrected, in Å), reduced flux, normalized flux, signal-to-noise ratio and echelle order;
- $*$_nor.fits: the automatically normalized spectra, with the orders merged (wavelength and normalized flux only);
- $*$_mean.fits: the mean line profiles of each spectrum;
- OBJECT_tbl.fits: a general overview of the object time series, with all the relevant parameters computed for each spectrum;
- OBJECT_profmed.ps: a postscript file that allows a quick look at the pulsational content of the time series;
- OBJECT_fit.ps: a postscript file with the observed spectrum in the 5160-5190 Å region and the best-fit synthetic spectrum.

An example of the header of a $*$_full.fits file is shown in App. A, while App. B is an extract of a comprehensive summary table that shows all the parameters computed for each spectrum. Additional information on the observation modes, the targets and the results of each HARPS run are reported in App. C.

All our output files are retrievable from:
http://www.spaceinn.eu/data-access/harps-spectra-of-corot-targets/
In total there are 75.5 Gbytes (hard-drive space) of data.

The future works of WP 3.3 will consist of the generation of simultaneous spectroscopic and photometric time series (D3.9, only for the CoRoT targets), and the creation of an online 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.

2 CoRoT ground-based observational program

The space mission CoRoT [Baglin et al., 2007] monitored several different kinds of pulsating stars for long periods of time, up to 150 days, in the asteroseismic CCDs. A large spectroscopic ground-based program was started simultaneously with the launch of the satellite (2006 December 27), in order to acquire high-resolution spectroscopy and high-quality photometry at the same time for most of the asteroseismological targets.
The ground-based observational 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 our work.

2.1 HARPS observations

We were awarded two Large Programmes (LP 182.D-0356 and LP 185.D-0056) with HARPS, enabling us to observe 15 nights at semester per nine semesters, from December 2008 to January 2013. The description of this complementary ground-based observational program is reported in several papers, see for example [Poretti et al., 2007], [Poretti et al., 2013], [Rainer et al., 2012], and [Uytterhoeven et al., 2009].
The detailed reports for all the HARPS observing runs are shown in App. C.
We obtained high signal-to-noise ratio spectral time series of a selection of the asteroseismological targets of CoRoT. We usually used HARPS in the high-efficiency mode EGGS, with resolution R=80,000, but some targets have been observed in the high-accuracy mode HAM (R=115,000), more apt to obtain very precise radial velocity measurements. Hot stars are not suitable for this kind of radial velocities study, because of their large $v \sin i$ values, so we preferred to observe them with the EGGS mode. This allowed us also to reduce the exposure times, and to increase the SNRs, which is very useful for a line profile variations (LPVs) analysis of the targets. We also note that the library of reference spectra used by the online reduction pipeline of HARPS does not include hot stars templates, again lowering the precision of the radial velocity measurements for hot stars.
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. 1), high enough to detect the solar-like oscillations in the radial velocity time series.
In addition to the main asteroseismological CoRoT targets, we observed single spectra of asteroseismological targets in the exo CCDs, in order to better characterize them. Other objects were observed as back-up and filling targets, aiming to better define the physical properties of the varability classes observed by CoRoT. In the end we acquired 7135 spectra of 261 targets: 32 of these spectra have been discarded for quality reasons, and the remaining 7103 will be stored in a web-based VO-compliant archive, along with additional files and information. The spectra cover most of the H-R diagram, in Fig. 2 the spectral type distribution of the targets is shown.

3 Reduction of the HARPS spectra

All the HARPS spectra were reduced using a semi-automated pipeline developed at the Brera Observatory [Rainer, 2003]. This was done because the online ESO pipeline gives as final outputs only reduced, calibrated and wavelength corrected one-dimensional spectra, with the echelle orders merged (see Fig. 3). This can be a problem when normalizing the spectra because of the distorted continuum. In addition to that, we lose information on the positions of the borders of the orders, which is very important for detailed spectroscopic analysis. In fact, the signal-to-noise ratio 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.

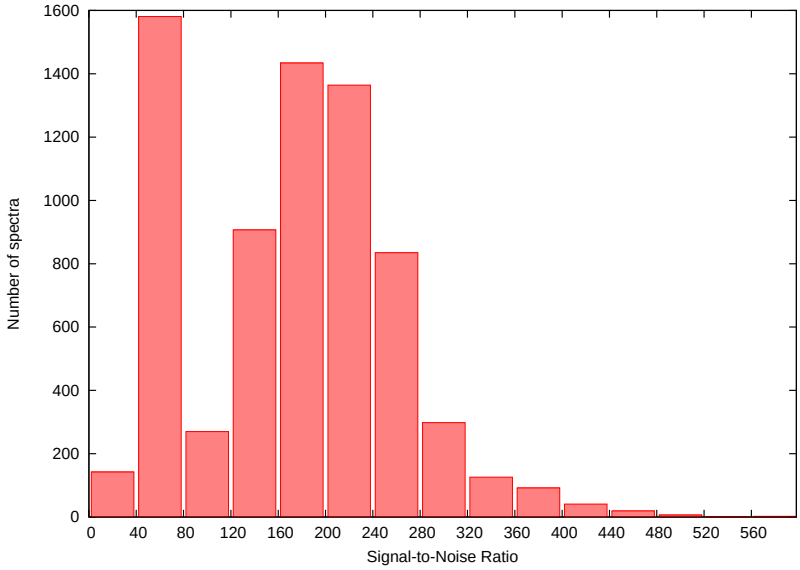

Figure 1: Distribution of the signal-to-noise ratio of the observed spectra. The peak between 40 and 80 is mostly caused by the 1160 spectra of HD046375.

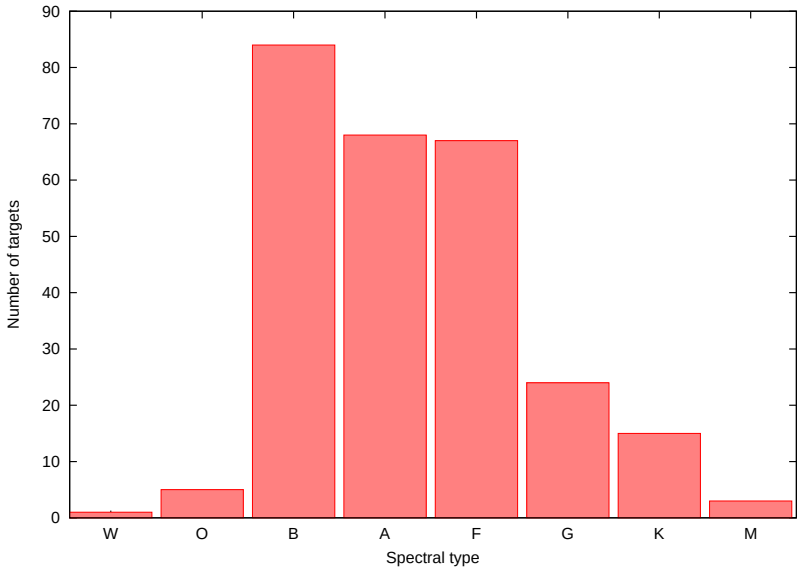

Figure 2: Distribution of the spectral types of our targets.

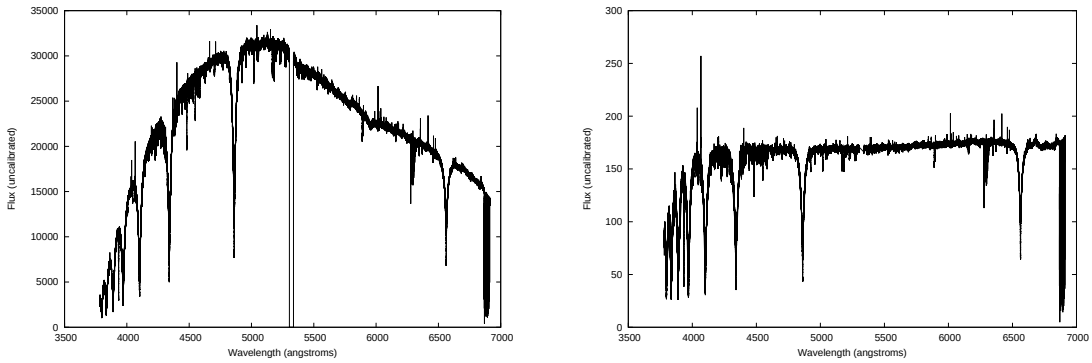

Figure 3: *Left:* Example of the output of the standard ESO pipeline, with the echelle orders merged. *Right:* Example of the output of the Brera pipeline: the echelle orders are separated and the normalization of the whole spectrum is much easier.

Our pipeline delivers two outputs for each spectrum:

- a five column ASCII file with wavelength, flux, normalized flux, signal-to-noise ratio and number of the echelle orders;
- a two column ASCII file with wavelength and normalized flux, with the echelle orders merged.

The normalization is done by an automated procedure, as such the normalized spectra are to be used with care, keeping in mind that the normalization will be particularly unreliable in the first orders and on the borders of the orders.

4 Indicators

The reduced spectra are the main deliverables of our work, nonetheless we provide many additional files and information, in order to better characterize the database. Because we wanted to support the asteroseimological exploitation of our data, we focused on results that will help the study of stellar variability, caused either by pulsations, activity or emissions.

4.1 Mean line profiles

We computed the mean line profiles of each spectrum using the LSD software [Donati et al., 1997] on the wavelength regions 4415-4805, 4915-5285, 5365-6505 Å, *i.e.* we cut the beginning of the spectra, where usually the SNR is very low and the automated normalization procedure fails, the end of the spectra, where most of the telluric lines are found, and the Balmer lines regions.
We used a 0.8 km/s step for the HAM spectra and a 1.4 km/s step for the EGGS spectra, aside for some cases of very fast rotators, where we were forced to compute the mean line profiles in a very large velocity range (up to 1000 km/s), and as such we increased the step up to 4 km/s for computational reasons.
The mean line profiles are very useful in the study of line profile variations, as can be seen in Fig. 4.
In order to provide a quick look at the pulsational content of the time series, we created for each target a postscript figure with the average of the mean line profiles of the spectra and their standard deviation from the average. This allows to identify immediately time series without line profile variations, or to

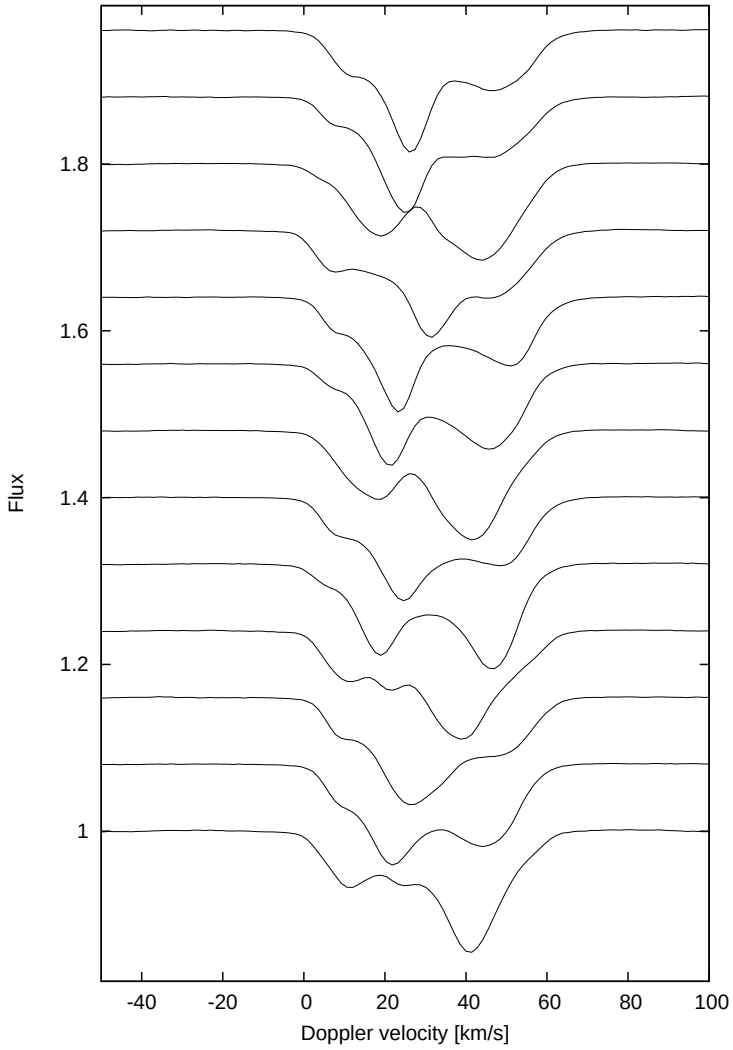

Figure 4: Mean line profiles of the δ Scuti star HD041641: the fluxes have been shifted for easier interpretation. The line profile variations are greatly enhanced by averaging a great number of spectral lines.

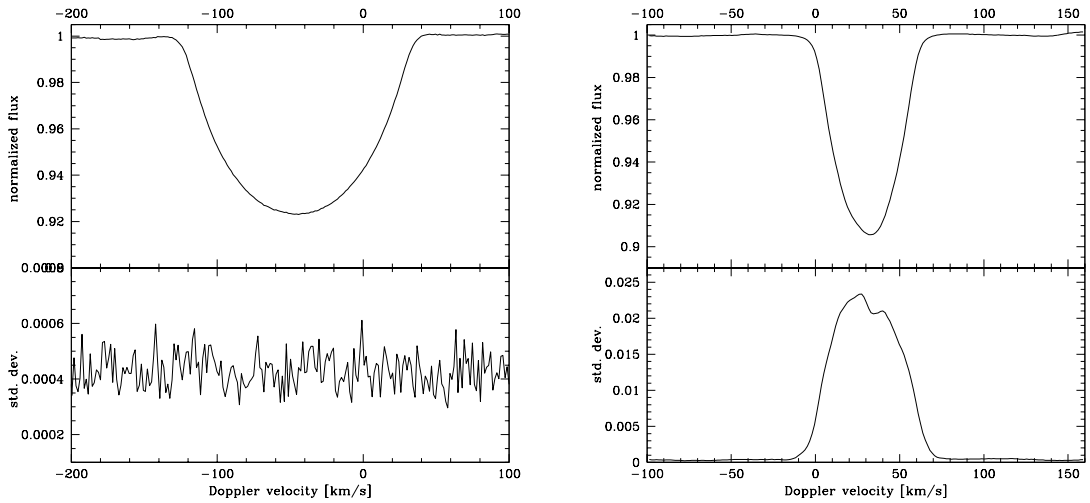

Figure 5: *Left:* average mean line profile and standard deviation for A-type star HD170133, where no line profile variations are present. *Right:* average mean line profile and standard deviation for A-type star HD041641, the line profile variations are clearly concentrated at the center of the line.

understand where the variations are located (at the center or at the border of the lines), as can be seen in Fig. 5.
In the case of EGGS spectra, the mean line profiles are fitted with a gaussian in order to estimate the radial velocity of the targets, while the radial velocities computed by the HARPS pipeline are used in the case of the HAM data. This is done because in the EGGS mode is not possible to use the simultaneous lamp calibration (the dedicated fiber is broken), and anyway most of our EGGS targets are hotter than the masks used by the ESO pipeline to compute the cross-correlation function. As such, we prefer to compute the radial velocities on the LSD profiles.
Other than to look at pulsations, the mean line profiles are used to estimate the $v \sin i$ of the stars and, if possible, to indicate the presence of differential rotation. This is done using the Fourier transform of the mean line profiles (see Fig. 6): the position of the first zero of the transform, q_1, is used to compute the $v \sin i$ value, while the q_2/q_1 ratio of the first two zero positions is an indication of solar-like differential rotation ($q_2/q_1 < 1.72$), anti-solar differential rotation ($q_2/q_1 > 1.83$), or probable rigid rotation ($1.72 < q_2/q_1 < 1.83$) [Reiners & Schmitt, 2002].

4.2 Activity index

We constructed an activity index from the Ca H and K lines, in order to better characterize the targets and to help to study the stellar variations due to the pulsations along with activity variations [Rainer et al., 2006]. The index is not calibrated on the Mount Wilson index, but it is mostly to be used to check for differences and not for its absolute values.
To compute the activity index, we first normalized the region around the H and K lines, that usually is not well normalized by our automated procedure. Then we computed the areas of four spectral

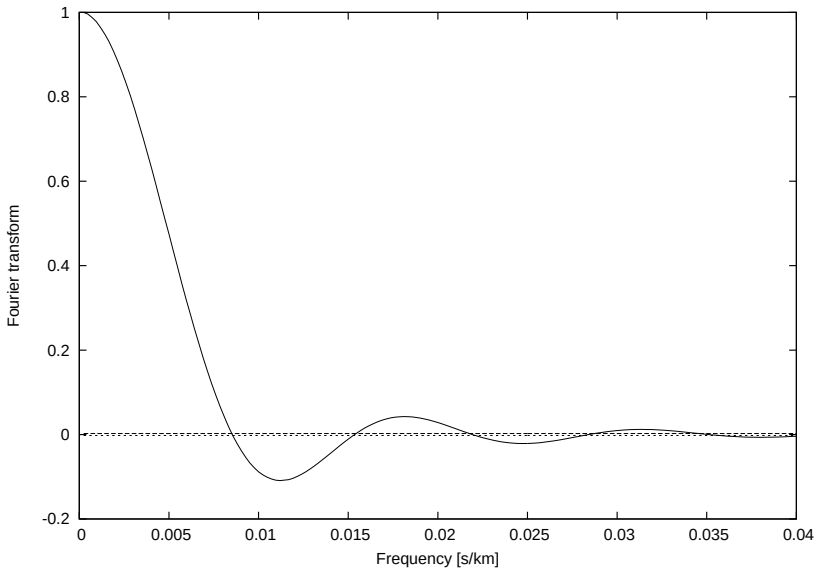

Figure 6: Fourier transform of the mean line profile of a HD170133 spectrum. The dashed lines show the region of uncertainty around the zero position (very small in this case).

regions: two regions of 2.5 Å each in the center of the H and K lines (A_H and A_K), and two regions of 10 Å each on the continuum (A_{c1} and A_{c2}).
We obtained two indexes, one for the H line and one for the K line:

$$I_{H,K} = \frac{A_{H,K}}{(A_{c1} + A_{c2})/2} \tag{1}$$

The final index is simply the average of the two individual ones:

$$I_{HK} = \frac{I_H + I_K}{2} \tag{2}$$

Values of I_{HK} larger than 0.2-0.3 show the presence of activity in solar-like stars. The index is not useful for hotter star (spectral type A or earlier), but it is automatically computed and as such it is given for all the spectra.
The activity index can be relied upon for more than one hundred stars of our sample.

4.3 Be V/R index

All the spectra have a true/false flag for the presence of emission in the Hα line. In the case of emission, a V/R index is given: it is simply the ratio between the peak of the emission in the blue and the peak of the emission in the red of the Hα line. If there is no emission, the V/R index is set to zero.
There are 40 stars in our targets with Hα emission, we computed the V/R index for all of their spectra.

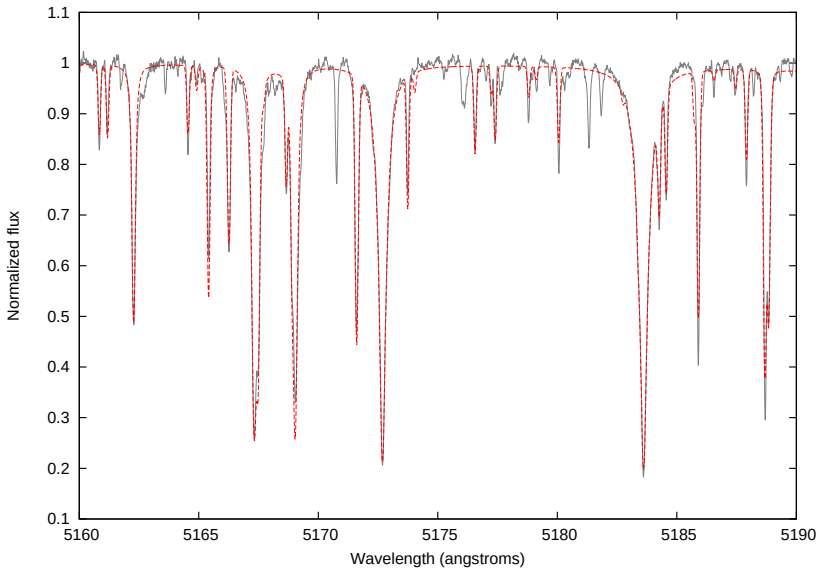

Figure 7: Observed spectrum of the δ Scuti star HD039996 (solid grey line) and best synthetic fit (red dashed line).

5 Physical parameters

The physical parameters of all the stars in the database are estimated using the SME software [Valenti & Piskunov, 1996] of spectral synthesis on a selected wavelength region (5160-5190 Å). We used the 3.3 version of the SME software and the stellar line lists from VALD [Piskunov et al., 1995]. In the majority of the cases we have several spectra for each star: we shifted them by their radial velocities and then we averaged them. We estimated the physical parameters ($T_{\rm eff}$, $\log g$, and [Fe/H]) on the average spectrum, in order to lessen the effect of the pulsations.
In the cases of very fast rotators, such as B-type stars, the result may not be very reliable. Because the estimation of the errors on the parameters may be tricky, we provide for each star a postscript figure with the observed spectrum and the best fit (see Fig. 7).
In some particular cases (e.g., very fast rotators, emission line stars, binary stars, and so on), we were not able to estimate the physical parameters with this method (see for example Fig. 8). In these cases, a postscript figure with only the observed spectrum in the 5160-5190 Å region is given.

6 Final outputs and how to retrieve them

The database provides several files for each observed object:

- $*$_full.fits: the main deliverables, these are the five columns reduced observed spectra, with wavelength (barycentric corrected, in Å), reduced flux, normalized flux, signal-to-noise ratio and echelle order.
- $*$_nor.fits: additional reduced spectra, automatically normalized and with the orders merged. They have two columns (barycentric corrected wavelength in Å, and normalized flux), it is

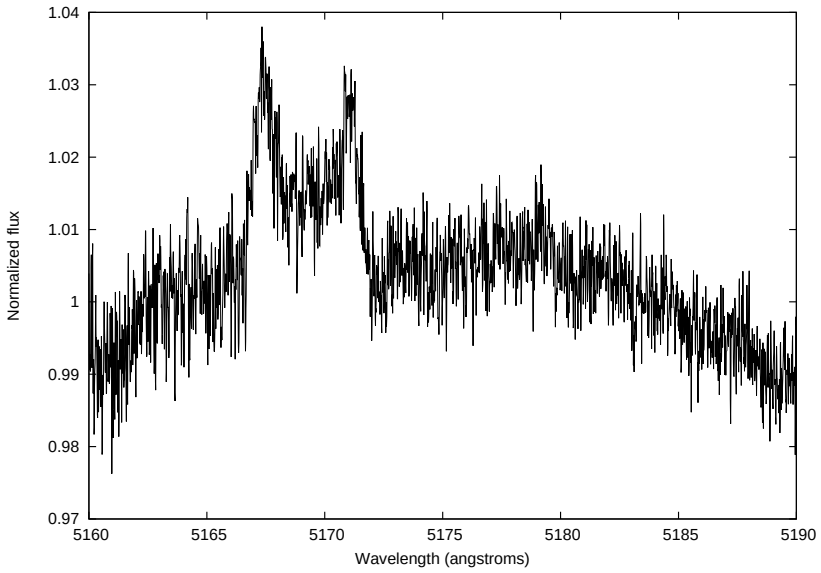

Figure 8: Observed spectrum of the Be star HD128293 in the 5160-1590 Å region. The emissions are clearly visible, it is not possible to fit this spectrum in order to estimate the physical parameters of the star.

important to remember that the normalization is done with an automated procedure and as such may not be always reliable.

- $*$_mean.fits: the mean line profiles of each spectrum computed with the LSD 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 the object time series, this table consists in:
  - the root names of the spectra,
  - the barycentric Julian dates at mid-exposure,
  - the signal-to-noise ratios 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 q_2/q_1 values and their errors,
  - the activity index I_H, using only the Ca H line, of each spectrum,
  - the activity index I_K, using only the Ca K line, of each spectrum,
  - the 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.ps: a postscript file that allows a quick look at the pulsational content of the time series (see Fig. 5). In the case of objects where a single spectrum was observed, the mean line profile of the spectrum is given instead.
- OBJECT_fit.ps: a postscript file with the observed spectrum in the 5160-5190 Å region and the best-fit synthetic spectrum (see Fig. 7). 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) will be stored also in the fits headers. An example of the header for a $*$_full.fits file is given in App. A. An extract of a comprehensive table with all the parameters computed for all the 7103 spectra is given in App. B.
The end result of the Work Package 3.3 (delivarable D3.10) will be an online archive with an user-friendly interface that will allow to query the database in different ways (by target, spectral type, variability class, and so on).

For now, the spectra are accessible from the SpaceInn website at the page:
http://www.spaceinn.eu/data-access/harps-spectra-of-corot-targets/
They 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 (see Fig. 9).
The whole dataset occupies around 75.5 Gbytes of hard-drive space.

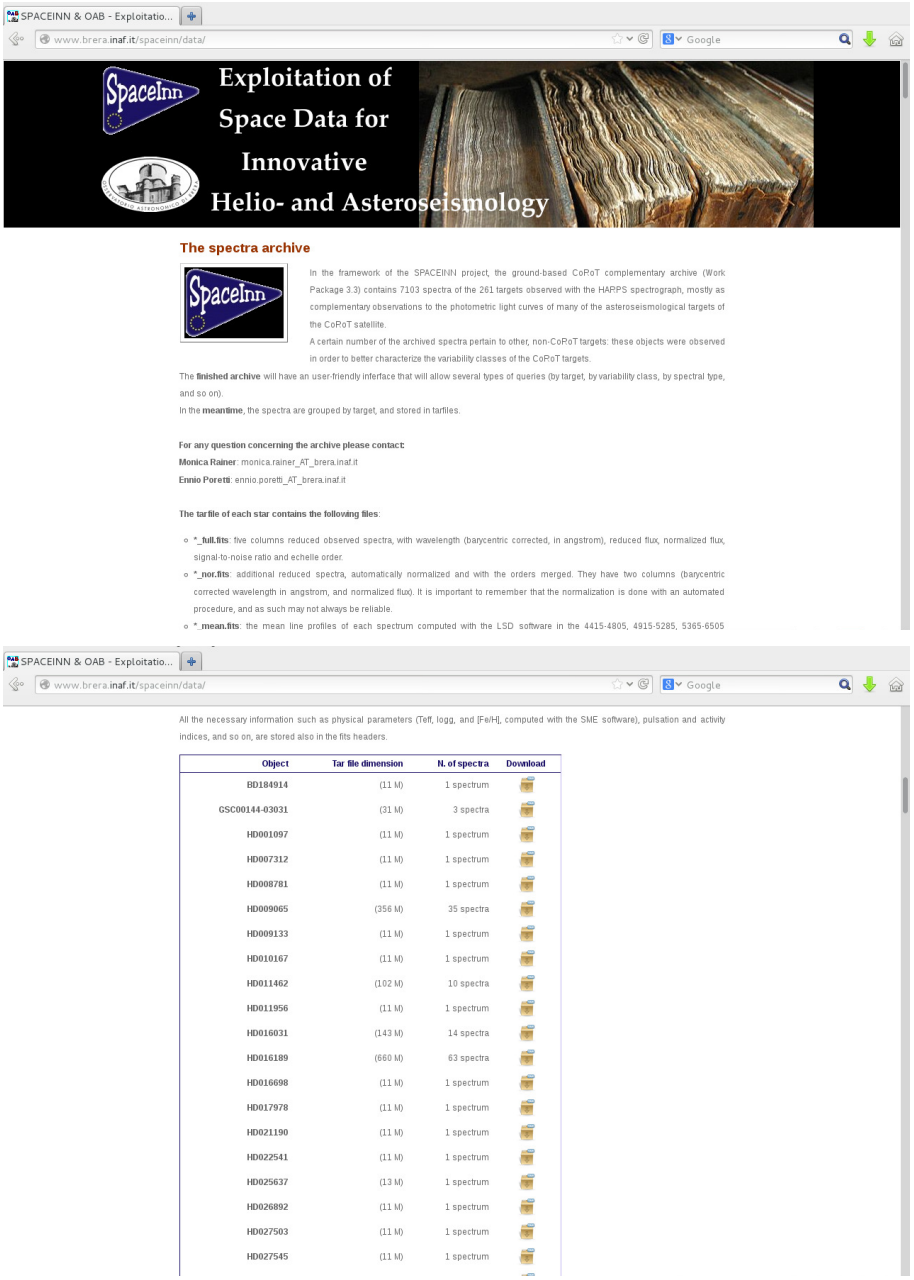

Figure 9: Screenshots of the webpage from where the tarfiles can be downloaded. *Top:* a brief overview of the contents of the tarfiles. *Bottom:* the table listing the 261 targets of the CoRoT ground-based program, the number of spectra observed for each target, the size of the relative tarfiles and the links to download them.

References

[Baglin et al., 2007] Baglin, A., et al., 2007, AIPC, 895, 201

[Donati et al., 1997] Donati, J.-F., et al., 1997, MNRAS, 291, 658

[Mayor et al., 2003] Mayor, M., et al., 2003, The Messenger, 114, 20

[Piskunov et al., 1995] Piskunov, N., et al., 1995, A&AS, 112, 525

[Poretti et al., 2007] Poretti, E., et al., 2007, MmSAIt, 78, 62

[Poretti et al., 2013] Poretti, E., et al., 2013, ASSP, 31, 39

[Rainer, 2003] Rainer, M., 2003, Laurea Thesis (in italian), Università degli Studi di Milano

[Rainer et al., 2006] Rainer, M., et al., 2006, ASPC, 349, 319

[Rainer et al., 2012] Rainer, M., et al., 2012, AN, 333, 1061

[Reiners & Schmitt, 2002] Reiners, A., & Schmitt J.H.M.M., 2002, A&A, 384, 155

[Uytterhoeven et al., 2009] Uytterhoeven, K., et al., 2009, AIPC, 1170, 327

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

A Header example

```
XTENSION= 'BINTABLE'           / binary table extension
BITPIX  =                    8 / array data type
NAXIS   =                    2 / number of array dimensions
NAXIS1  =                   20 / length of dimension 1
NAXIS2  =               404352 / length of dimension 2
PCOUNT  =                    0 / number of group parameters
GCOUNT  =                    1 / number of groups
TFIELDS =                    5 / number of table fields
TTYPE1  = 'WAVE    '
TFORM1  = 'E       '
TUNIT1  = 'angstrom'
TUCD1   = 'em.wl   '
TDMIN1  =              3781.73
TDMAX1  =               6913.1
TUTYP1  = 'Spectrum.Data.SpectralAxis.Value'
TTYPE2  = 'FLUX    '
TFORM2  = 'E       '
TUNIT2  = 'arbitrary'
TUTYP2  = 'Spectrum.Data.FluxAxis.Value'
TUCD2   = 'arith.ratio;phot.flux.density'
TTYPE3  = 'FNOR    '
TFORM3  = 'E       '
TUNIT3  = 'arbitrary'
TUCD3   = 'arith.ratio;phot.flux.density'
TTYPE4  = 'SNR     '
TFORM4  = 'E       '
TUNIT4  = '-       '
TUCD4   = 'stat.snr'
TTYPE5  = 'ORDER   '
TFORM5  = 'E       '
TUNIT5  = '-       '
TUCD5   = 'arith   '
VOCLASS = 'Spectrum V1.0'      / VO Data Model
VOPUB   = 'tbd     '           / VO Publisher Authority
VOPUBID = 'tbd     '           / VO Publisher ID URI
VOREF   = 'tbd     '           / Bibcode for archive citation
CONTACT = 'Monica Rainer, INAF-OAB'
EMAIL   = 'monica.rainer@brera.inaf.it'
TITLE   = 'HARPS spectra of CoRoT targets' / Dataset Title
AUTHOR  = 'CoRoT ground-based archive, INAF-OAB' / VO Creator
COLLECT1= 'High-resolution HARPS spectra' / Collection
BIBREF  = 'TBD     '           / Bibcode for object citation
OBJECT  = 'HD046375'           / Target name
RA      =          98.30259167 / [deg] Target RA
DEC     =           5.46292444 / [deg] Target DEC
RADECSYS= 'ICRS    '           / Coordinate system
EQUINOX =               2000.0
TELESCOP= 'ESO-3P6 '           / Telescope
INSTRUME= 'HARPS   '           / Instrument
MODE    = 'HAM     '           / Instrument mode
```

```
APERTURE= '--      '           / [arcsec] Aperture diameter
SPEC_RP =               115000 / Spectral resolving power
SPEC_VAL=                 5500 / [angstrom] Characteristic spectral coordinate
SPEC_BW =                 3000 / [angstrom] Width of spectrum
TMID    =        2456272.60808 / Exposure midpoint (MJD, d)
TELAPSE =                120.0 / Full exposure time
EXPOSURE=                120.0 / Exposure time
DER_SNR =                 40.0 / Mean S/N in the region 5805-5825 AA
BERV    =        9.71747955026 / [km/s] Barycentric correction (already applied)
VRAD    =              -0.9476 / [km/s] Barycentric radial velocity
VRAD_ERR=               0.0022 / [km/s] Error on barycentric radial velocity
VSINI   = '' / [km/s] Projected rotational velocity
VSIN_ERR= '' / [km/s] Error on projected rotational velocity
Q2Q1    = '' / q2/q1 of the mean profile Fourier transform
Q2Q1_ERR= '' / Error on q2/q1
SP_TYPE = 'K1IV    '           / Spectral type
MV      =                  7.84 / V magnitudine
BINARY  = 'no      '           / Star in multiple system
SINDEX  =               0.1772 / Ca HK activity index
HINDEX  =               0.1962 / Ca H activity index
KINDEX  =               0.1583 / Ca K activity index
VARIABLE= 'solar-like'         / Variability class
TEFF    =               5322.0 / [kelvin] Effective temperature
LOGG    =                 3.97 / [] Surface gravity
FEH     =                 0.36 / [dex] Fe/H determination
VTURB   =                  1.1 / [km/s] Turbolent velocity
EM_HALPH=                    F / [T/F] Halpha emission
HA_VR   =                  0.0 / V/R index for Halpha line
END
```

B Extract of the comprehensive parameters table

```
#1. Root name of the spectrum - 2. Name of the target - 3. Spectral type - 4. Variable type -
     5. Binary - 6. Teff - 7. logg - 8. Fe/H - 9. Halpha emission - 10. Mid-exposure BJD -
    11. SNR - 12. vrad - 13. vrad error - 14. vsini - 15. vsini error - 16. q2/q1 - 17. q2/q1
     error - 18. Halpha V/R - 19. S index - 20. CaH index - 21. CaK index - 22. vrad2 - 23.
    vrad2 error - 24. vsini2 - 25. vsini error - 26. vrad3 - 27. vrad3 error - 28. vsini3 -
    29. vsini3 error - 30. vrad4 - 31. vrad4 error - 32. vsini4 - 33. vsini4 error
BD184914_20100702_0949 BD184914     F5     dSct   no     7162.0 3.21   0.43   False
    2455379.92632 93.0688633934 -47.078 0.191 40.3477592    0.533252001   1.85495377
    0.106136605   0.0    0.2572 0.2591 0.2552 -      -      -      -      -      -      -
          -      -      -      -      -
GSC00144-03031_20101225_0428 GSC00144-03031 F     dSct   no     7822.0 3.41   0.09   False
    2455555.70198 110.851251684 23.946 0.047  9.17372513    5.31333065    -      -      0.0
        0.2182 0.2294 0.2069 -      -      -      -      -      -      -      -      -
          -      -      -
GSC00144-03031_20101230_0612 GSC00144-03031 F     dSct   no     7822.0 3.41   0.09   False
    2455560.77524 121.936376853 6.963  0.223  20.9350128    38.8330841    -      -      0.0
        0.2419 0.2305 0.2533 -      -      -      -      -      -      -      -      -
          -      -      -
GSC00144-03031_20110101_0459 GSC00144-03031 F     dSct   no     7822.0 3.41   0.09   False
    2455562.72367 109.234670931 22.201 0.079  17.8943729    0.427994639   1.94976747
    1.05257511    0.0    0.2248 0.2447 0.205  -      -      -      -      -      -      -
          -      -      -      -      -
HD001097_20110720_0942 HD001097     A4mF4Sr dSct   no     6595.0 3.7    0.31   False
    2455762.91443 123.783897714 21.076 0.453  66.4939499    0.626096964   3.49976397
    0.875948787   0.0    0.3504 0.3166 0.3842 -      -      -      -      -      -      -
          -      -      -      -      -
HD007312_20110718_0943 HD007312     F0III  dSct   no     8378.0 3.88   0.55   False
    2455760.90826 216.390880892 21.829 0.698  104.88 1.78   -      -      0.0    0.1653
    0.174  0.1565 -      -      -      -      -      -      -      -      -      -      -
          -
HD008781_20110718_0949 HD008781     F0II   dSct   no     7280.0 2.91   -0.23  False
    2455760.91436 132.444151752 2.978  0.08   22.7040634    2.02438903    2.24115419
    1.04040337    0.0    0.181  0.1926 0.1695 -      -      -      -      -      -      -
          -      -      -      -      -
HD009065_20110625_0920 HD009065     F0IV   dSct   no     7471.0 3.3    -0.41  False
    2455737.89409 277.359069319 -7.576 0.112  32.9436493    0.232988462   1.9147042
    0.0864099637  0.0    0.2094 0.2169 0.2019 -      -      -      -      -      -      -
          -      -      -      -      -
HD009065_20110625_0948 HD009065     F0IV   dSct   no     7471.0 3.3    -0.41  False
    2455737.91372 278.051889642 -6.563 0.117  33.3747749    0.423280805   1.9348377
    2.25142097    0.0    0.2089 0.2179 0.1999 -      -      -      -      -      -      -
          -      -      -      -      -
HD011462_20100701_1014 HD011462     B8V    bCep   no     11891.0 4.05  0.07   False
    2455378.93634 194.797980825 7.265  0.547  51.722805     5.43432331    1.94787145
    1.99479485    0.0    0.6698 0.3906 0.9491 -      -      -      -      -      -      -
          -      -      -      -      -
HD011956_20110718_1017 HD011956     A5V    dSct   no     8986.0 3.93   0.71   False
    2455760.9323  197.915672278 24.462 0.756  112.590569    1.58914459    1.83648419
    0.0503979921  0.0    0.193  0.1745 0.2114 -      -      -      -      -      -      -
          -      -      -      -      -
HD016031_20121211_0044 HD016031     F0V    no     no     5633.0 4.38   0.13   False
    2456272.54203 66.7   24.2478 0.007 0.89   0.01   -      -      0.0    0.1948 0.2181
    0.1714 -      -      -      -      -      -      -      -      -      -      -      -
```

```
HD016031_20121212_0050 HD016031     F0V    no     no     5633.0 4.38   0.13   False
    2456273.54629  82.1   24.2459 0.0054 1.1    0.01   -      -      0.0    0.2003 0.2198
    0.1807 -      -      -      -      -      -      -      -      -      -      -      -
HD016189_20120726_0825 HD016189     A5     dSct   no     7338.0 3.72   0.0    False
    2456134.87441  315.348717031  23.4501 0.1028 16.45  0.15   -      -      0.0    0.1998
    0.2165 0.1831 -      -      -      -      -      -      -      -      -      -      -
          -
HD016189_20120726_0929 HD016189     A5     dSct   no     7338.0 3.72   0.0    False
    2456134.90853  280.938640988  18.4923 0.0372 9.27   0.04   -      -      0.0    0.1775
    0.1895 0.1655 -      -      -      -      -      -      -      -      -      -      -
          -
HD016189_20120726_1022 HD016189     A5     dSct   no     7338.0 3.72   0.0    False
    2456134.94912  241.678822683  34.375 0.0212 8.36   0.02   -      -      0.0    0.1816
    0.1875 0.1757 -      -      -      -      -      -      -      -      -      -      -
          -
HD045418_20111218_0425 HD045418     B3.9   no     SB2    -      -      -      False
    2455913.69129  234.866089506  -15.442 1.836  224.26 5.72   -      -      0.0    0.751
    0.5477 0.9543 17.891 0.796  34.05  1.53   -      -      -      -      -      -      -
          -
HD045418_20111218_0534 HD045418     B3.9   no     SB2    -      -      -      False
    2455913.73958  250.800956936  -14.513 1.791  226.77 5.69   -      -      0.0    0.7485
    0.5463 0.9507 18.593 0.795  33.07  1.51   -      -      -      -      -      -      -
          -
HD045418_20111218_0645 HD045418     B3.9   no     SB2    -      -      -      False
    2455913.78895  269.738045765  -17.637 1.748  237.81 6.01   -      -      0.0    0.7524
    0.5493 0.9556 17.728 0.723  32.94  1.36   -      -      -      -      -      -      -
          -
HD110014_20120111_0849 HD110014     K2III  no     SB1    4988.0 3.42   0.63   False
    2455937.86881  249.299846236  -18.6375796997 0.00028647113003     1.65   0.01   -      -
          0.0    0.1816 0.1049 0.2582 -      -      -      -      -      -      -      -      -
          -      -      -      -
HD110014_20120111_0851 HD110014     K2III  no     SB1    4988.0 3.42   0.63   False
    2455937.87057  268.929755389  -18.6383759494 0.00026423647297     1.61   0.01   -      -
          0.0    0.1879 0.1117 0.264  -      -      -      -      -      -      -      -      -
          -      -      -      -
HD112999_20100618_0441 HD112999     B6V    Be     no     -      -      -      True
    2455365.70457  230.131817299  -19.214 1.722  242.144211     9.41956234     1.90233803
    0.14881441     1.011  0.7189 0.5376 0.9003 -      -      -      -      -      -      -      -
          -      -      -      -      -      -
HD113357_20100616_2351 HD113357     F0V    gDor   no     7377.0 4.08   0.21   False
    2455364.50614  293.871287018  -13.753 0.346  52.8031654     3.45846987     1.8600229
    2.06043196     0.0    0.2523 0.2621 0.2425 -      -      -      -      -      -      -      -
          -      -      -      -      -      -
HD170200_20110626_0547 HD170200     B8III  no     SB2    -      -      -      False
    2455738.7478   234.635149399  -53.362 1.893  215.87 6.13   -      -      0.0    0.6851
    0.4294 0.9407 92.838 0.433  14.33  0.64   22.053 0.074  1.1    0.02   -63.114 0.129
    17.4   0.21
HD170200_20110626_0840 HD170200     B8III  no     SB2    -      -      -      False
    2455738.86926  55.3101557884  -63.732 4.754  237.0  18.33  -      -      0.0    0.6899
    0.4379 0.9419 85.685 1.069  12.67  1.51   25.15  0.18   0.43   0.02   -59.317 0.308
    18.95  0.51
HD170200_20110627_0149 HD170200     B8III  no     SB2    -      -      -      False
    2455739.58262  276.550778942  -44.9  1.713  223.37 6.45   -      -      0.0    0.6989
    0.4534 0.9443 -23.62 7.372  24.01  5.18   36.911 0.075  1.04   0.02   -3.739 0.845
    14.5   0.86
```

C Reports on the HARPS observing runs

The reports on all the HARPS observing runs are listed in this Appendix. The runs covered the following time spans:

- First run: 2008 December 14-24 and 2009 January 2-7.
- Second run: 2009 June 20-30 and 2009 July 14-19.
- Third run: 2009 December 8-18 and 25-30.
- Fourth run: 2010 June 12-22 and 2010 June 30 - July 5.
- Fifth run: 2010 December 22 - 2011 January 1 and 2011 January 7-12.
- Sixth run: 2011 June 23 - July 3 and 2011 July 15-20.
- Seventh run: 2011 December 17-27 and 2012 January 7-12.
- Eigth run: 2012 June 24 - July 5 and 2012 July 23-28.
- Ninth run: 2012 December 10-20 and 2012 December 31 - 2013 January 5.

The reports give a summary of targets selection, weather conditions, and instrumental problems for each observing run. They contain also a progressively updated list of the articles published on the observed targets.

Report on the first run of the ESO LP 182.D-0356 (HARPS@3.6m)

E. Poretti, M. Rainer, and T. Semaan

Seismology Ground-Based Observation Working Group

March 16th, 2009; Version 1.0

EXECUTIVE SUMMARY.

After the completion of the ESO Large Programme 178.D-0361 with the FEROS instrument at the 2.2m ESO/MPI telescope, the ground–based spectroscopic observations related to the new ESO Large Programme 182.D-0356 are started with the HARPS instrument at the 3.6m ESO telescope in December 2008 and January 2009. The log of the these observations, some tips, the situation of the data analysis of the FEROS spectra and a look to the future are given. The following actions/items are emphasized:

1. All the 15 nights were characterized by excellent weather. The targets related to the CoRoT run LRa2 were observed. The observers made an excellent work and the survey of the CoRoT field has been performed exactly how expected;
2. The spectra have been fully reduced. Long timeseries are available for LPV analysis on the Be stars HD 51452 and HD 51193, and on the δ Sct star HD 50870. The short–period variable SX Phe has been observed at the beginning of the December nights as a filling program;
3. Several papers based on the FEROS observations have been submitted.

1. Introduction

The ground–based spectroscopic monitoring of the CoRoT targets continued in December 2008 and January 2009. Three sites have been involved: European Southern Observatory (La Silla, Chile; HARPS@3.6m), Observatoire de Haute Provence (France; SOPHIE@1.9m), Calar Alto (Spain; FOCES@2.2m). As in the previous cases, the goals of this fifth (the first of the HARPS series) internal report are to circulate useful information about the ESO observations within the team and to keep the record of the observations.

The next HARPS runs are scheduled from June 20 to 30, 2009 and from July 14 to 19, 2009. Interested observers are kindly requested to inform E. Poretti. The selection, also considering OHP and CAHA runs, has to be done before April 20th. The OHP runs are scheduled from 4 to 10 July and from 28 July to 3 August. The CAHA run (the last one, because the FOCES instrument will be not available after the end of October) is scheduled from June 12 to 16 (a second proposal asking for nights in July has been submitted). We can also count on 4 nights from June 30 to July 4 with the FIES instrument mounted at the NOT.

2. The previous spectroscopic observations and the related papers

Table 1 updates the list of the observed targets and the (chair)persons at work on the specific stars. After the First CoRoT International Symposium (Paris, February 2–5, 2009), many papers have been prepared and submitted for the A&A special feature. Two different strategies have been used to present the CoRoT results: the ground–based and space observations are analyzed either together (papers on HD 50844, HD 50846, HD 50209, HD 51146+HD50747, and HD 181231), or separately (papers on HD 49330 and HD 180642). The first paper on HD 49434 (Uytterhoeven et al., 2008) discussed only the preparatory photometry and spectroscopy; the new spectroscopic data and the CoRoT timeseries are the subjects of ongoing analyses.

The co-authorship policy has not been discussed in details, but we have probably found a satisfactory solution in the practice. The current procedure is to include the PIs of the Large Programmes (i.e., P. Amado, P. Mathias, E. Poretti), the observers of the specific star and, if the ESO data are used, M. Rainer, who reduced the ESO spectra for the whole team. Since the targets are selected on the basis of the instrumental performances, my feeling is that the PIs should be included even if not all the instruments have been used for the specific observations. The contribution of other instruments (HERCULES, FIES, NARVAL, FRESCO,...) should be evaluated case by case.

3. The spectroscopic data of stars observed in December 2008 and January 2009

Three targets have been selected for the spectroscopic observations with HARPS: the δ Sct variable HD 50870 and the two Be stars HD 51452 and HD 51193≡V746 Mon. The two Be stars were also observed at OHP, but we had only two full clear nights and partial observations on other few nights. We collected 52 and 53 spectra on HD 51193 and HD 51452, respectively. The new δ Sct star HD 49294 (discovered by CoRoT) was observed at CAHA. We had very bad weather in Calar Alto, too. We got three nights with useful data (67 spectra) in December and one in January (19 spectra), which in turn means around 25% and 10% of the awarded time.

4. The ESO observations

The weather in this first HARPS run was excellent, with 100% of good weather and no time lost due to technical reasons. The observers were Monica Rainer (INAF-Brera Observatory, 14–24 December, 2008) and Thierry Semaan (Meudon Observatory, 2-7 January, 2009). Table 2 reports the logs of both runs. The setup of the HARPS instrument is summarized in the Observing Block listed in the Appendix at the end of this report. Note in particular the Fast Readout Mode. There is no Atmospheric Dispersion Corrector.

The spectra collected at ESO have been fully reduced by M. Rainer. No public pipeline is available for HARPS and therefore the FEROS approach has been modified to be adapted to the HARPS spectra. For each star observed with HARPS we provide both the calibrated and normalized merged spectra. The spectra have been made available to the responsibles and, upon request, they could be sent to all interested CoIs.

We remind that the instrument must be set in the EGGS mode (i.e., lower resolution mode). Since August $20^{\rm th}$, 2008 the EGGS reference fiber is damaged and does not transmit light. Therefore, no sky spectrum is acquired. An error message appears during some of the standard calibrations at the beginning of the night, owing to the fact that the system tries to acquire a calibration lamp using the damaged fiber. There is no reason to worry about it because these calibrations will not be used anyway in the reduction. In the EGGS configuration the use of the second fiber was limited to the sky subtraction, therefore it does not affect the precision in the radial velocity measurements. The remaining fiber (the science fiber) is performing as expected. The EGGS resolution is R=80,000, as measured on the spectra we obtained.

The HARPS on-line pipeline has been modified by ESO staff to process smoothly all the data coming from the new configuration. The results are given as monodimensional merged and calibrated spectra. We do not use these spectra, but we reduced again the data to have both unmerged and merged calibrated and normalized spectra.

4.1. Observing cycle

Exposure times have been set to 1200 sec for HD 50870, and to 600 sec for HD 51452 and HD 51193. The observing sequence was

```
HD 50870 - HD 51452 - HD 50870  - HD 51193 -
HD 50870 - ...
```

The above sequence lasted 70 min, thus ensuring 7–8 cycles per night. Both observers have been very clever in following the cycle and adapting it to the particular circumstances, as in case of observations at large airmass. Moving from one target to the next requires about 2 min. Overheads for focusing are confirmed to be around 7 min. HD 34816 was observed at the beginning of the night to better define the blaze function (exposure time: 30 sec).

4.2. Length of the nights

The nights were about 8^h50^m long. At the declination value of the CoRoT field (-3°), the HARPS observations could be performed from -4^h25^m to $+4^h25^m$. At these extreme hour angles the airmass is 2.8, i.e., the critical telescope pointing limit. The CoRoT field could be observed for 8^h00^m in December and for 8^h35^m in January. The night of 19-20 December started at UT 00^h08^m≡ST 01^h21^m and ended at UT 08^h52^m≡ST 10^h06^m. The night of 6-7 January started at UT 00^h23^m≡ST 02^h51^m and ended at UT 09^h05^m≡ST 11^h34^m.

4.3. Weather statistics

We had no interruption of the observations due to bad weather or technical reasons. Therefore, we used the 100% of the awarded time.

4.4. Signal–to–noise ratio evaluation

The SNRs listed in Tab. 2 are the median values of the SNRs in the region 5805–5825 Å. They have been computed during our reduction taking into account photon noise, readout noise and flat field correction. At the telescope, the HARPS pipeline provides an estimate of the SNR at three different wavelengths or the observer can estimated it by plotting the SNR values in the different orders and taking the maximum values. In both cases our measured SNRs are about 0.8 times smaller than the values obtained from the reduction process at the telescope.

5. Backup and filling programs

Sunsets and sunrises almost perfectly bracketed the CoRoT observations in the December and January nights. Therefore, a very limited filling program was added to the nights of the first 10–d run only. SX Phe (P.I. E. Poretti) was observed for 60–70 min at the beginning of each night. In January, after the standard calibrations and the spectrum of the blaze star, it was immediately possible to point the CoRoT field. The backup programme was not used. We remind that both backup and filling programs have to be submitted by the PI 10 days before the observations and then approved by the ESO staff.

Table 1. Targets observed in the framework of the ESO ground–based complementary observations (LP 178.D-0361 with the FEROS intrument at the 2.2m ESO/MPI telescope). The responsible(s) of the analysis of the spectroscopic data are also listed.

Star	Type	Investigators Spectroscopic data	Papers
		Initial Run	
HD 50747, HD 51106	Am, SB2	Dolez	Submitted to A&A (Dolez et al.)
HD 50844	δ Sct	Mantegazza	Submitted to A&A (Poretti et al.)
HD 50846	Be, EB	Fremat and Desmet	To be submitted to MNRAS (Desmet et al.)
HD 292790	F8	Poretti	Just one spectrum
		Long run center direction (LRc1)	
HD 180642	β Cep	Briquet and Uytterhoeven	Submitted to A&A (Briquet et al.)
HD 181555	δ Sct	Mantegazza, Rainer and Zima	
HD 181231	Be	Neiner	Submitted to A&A (Neiner et al.)
		Long run anticenter direction (LRa1)	
HD 49434	γ Dor	Uytterhoeven (Dec. 2006-Jan. 2007)	Uytterhoeven et al., 2008, A&A 489, 1213
HD 49434	γ Dor	Mathias (Dec. 2007-Jan. 2008)	
HD 50209	Be	Floquet and Hubert	Submitted to A&A (Diago et al.)
HD 49330	Be	Hubert	Submitted to A&A (Floquet et al.)
		Long run center direction (LRc2)	
HD 172189	δ Sct, EB, SB2	Martín	
HD 171834	γ Dor	Mathias	
HD 171586	Ap	Weiss	

6. Appendix

Here we list the Observing Block of HD 50870 as saved from the P2PP software. The EGGS configuration with the science fiber only is defined by the `ACQUISITION.TEMPLATE.NAME` keyword. Consecutive exposures can be taken changing the `SEQ.NEXPO` keyword. For other objects, the lines `name, ra, dec, TARGET.NAME, DET1.WIN1.UIT1` must be changed. Note that the exposure time is in the `DET1.WIN1.UIT1` keyword.

```
IMPEX.VERSION "2.0"
type                    "O"
STTimeIntervals         ""
calibrationReq          ""
InstrumentComments      ""
userComments            ""
userPriority            "1"
LineNumber              "0"
name                    "HD50870"


comments                ""
objectClass             " Unknown           "
ra                      " 06:54:56.761"
dec                     "-03:20:21.890"
epoch                   "2000.0"
equinox                 "2000"
propDec                 "0.000000"
propRA                  "0.000000"
diffRA                  "0.000000"
diffDec                 "0.000000"
LineNumber              "0"
TARGET.NAME             "HD50870"
air_mass                        "5.0"
fractional_lunar_illumination "1.0"
sky_transparency                "Photometric"
moon_angular_distance           "30"
seeing                          "2.0"
StrehlRatio                     "0.0"
CONSTRAINT.SET.NAME             "No Name"


longDescription             ""
IPVersion                   "142.22"
instrument                  "HARPS"
LineNumber                  "0"
OBSERVATION.DESCRIPTION.NAME "HD50870"


ACQUISITION.TEMPLATE.NAME "HARPS_eggs_acq_objA"
TEL.TARG.RADVEL     "-99999.9"
DPR.TYPE            "STAR,DARK,FO"



TEMPLATE.NAME "HARPS_eggs_obs_all"
DET1.READ.SPEED    "416kHz,1,high"
DET1.WIN1.UIT1     "1200"
SEQ.NEXPO          "1"
DPR.CATG           "SCIENCE"
```

Table 2. Log of the observing runs (December 2008–January 2009) at ESO with the HARPS@3.6m instrument. The number of spectra and the measured SNR range are indicated for every star on each night.

Night	HD 50870	HD 51452	HD 51193	Seeing	Notes
	V=8.9	V=8.1	V=8.1		
Exp. Time	1200 sec	600 sec	600 sec		
December 14-15	13	7	8	0.″7–1.″4	
	[104-140]	[106-140]	[84-137]		
December 15-16	14	7	6	0.″7–1.″7	
	[120-167]	[121-165]	[117-151]		
December 16-17	13	6	7	0.″6–1.″4	
	[117-163]	[127-161]	[114-150]		
December 17-18	13	7	6	0.″8–1.″1	
	[110-165]	[127-164]	[131-154]		
December 18-19	13	7	7	0.″8–1.″5	
	[106-161]	[135-161]	[104-153]		
December 19-20	13	7	7	0.″6–1.″6	
	[124-174]	[147-172]	[120-160]		
December 20-21	14	6	7	0.″5–1.″2	
	[110-165]	[131-168]	[116-152]		
December 21-22	14	7	7	0.″6–1.″1	
	[107-166]	[125-167]	[133-154]		
December 22-23	15	7	6	0.″7–1.″3	
	[113-170]	[108-173]	[141-158]		
December 23-24	14	7	7	0.″6–1.″4	
	[90-170]	[134-166]	[97-157]		
January 2-3	14	7	7	1.″0–2.″0	Low SNR at beginning of night
	[87-135]	[98-144]	[83-129]		Better seeing (0.″8–1.″0) at end of night
January 3-4	15	8	7	0.″6–1.″3	
	[107-170]	[94-175]	[110-159]		
January 4-5	14	7	8	1.″0–1.″3	
	[95-161]	[93-156]	[83-145]		
January 5-6	15	8	7	0.″8–1.″5	
	[92-163]	[92-162]	[115-153]		
January 6-7	15	7	8	0.″8–1.″3	
	[114-174]	[128-179]	[107-158]		
Total	**209**	**105**	**105**		

Report on the second run of the ESO LP 182.D-0356 (HARPS@3.6m)

E. Poretti, J.C. Suarez, and M. Rainer

Seismology Ground-Based Observation Working Group

October 16th, 2009; Version 1.0

EXECUTIVE SUMMARY.

The ESO Large Programme 182.D-0356, started with the HARPS instrument at the 3.6m ESO telescope in December 2008 and January 2009, has continued with the runs in June and July 2009. The log of the these observations, the problems encountered in the spectra reduction, some tips, the situation of the publications, and a look to the future are given. The following actions/items are emphasized:

1. The observations in the 15 nights were disturbed by clouds, humidity, and wind. The δ Sct stars HD 174966 (SRc1) and HD 174532 (SRc2), the γ Dor star HD 171834 (LRc2), and the β Cep HD 170580 (LRc05) were observed to study line profile variations. Spectra were obtained for five red giants and for one HADS, all belonging to the CoRoT Additional Programs.
2. The filling program was completed. A backup program (HD 189631) was performed in two nights.
3. We are on the way to solve the serious instrumental problem we met in the reduction of the HARPS spectra.
4. The FEROS reduced spectra of the targets which have been published in a refereed paper have been deposited in the ESO archive.

1. Introduction

The ground–based spectroscopic monitoring of the CoRoT targets continued in June and July 2009. Four sites have been involved: European Southern Observatory (La Silla, Chile; HARPS@3.6m), Observatoire de Haute Provence (France; SOPHIE@1.9m), Calar Alto (Spain; FOCES@2.2m), Canary Islands (Spain; FIES@NOT). As in the previous cases, the goals of this sixth (the second of the HARPS series) internal report are to circulate useful information about the ESO observations within the team and to keep the record of the observations.

The next HARPS runs are scheduled from December 8 to 18, 2009 and from December 24 to 29, 2009. Monica Rainer (Brera Observatory) and Markus Hareter (Vienna University) will be the observers. There will be neither OHP and NOT (proposals not accepted) nor FOCES (decommissioned instrument) runs. We can only count on the equivalent of 6 additional nights in the interval from December 14 to 24, 2009, at the MERCATOR telescope (HERMES instrument; Canary Islands). Our program will be merged with the others running on the same nights.

A new proposal for a Large Programme lasting 6 ESO Periods (i.e., three years) was submitted answering the P85 call (September 2009).

2. The contribution of our LPs to the A&A special volume

The special A&A feature devoted to CoRoT is now available. Table 1 lists the references of the papers based on the spectra collected in the framework of the LP178.D-0361. We also mention that a paper based on the characterization of HD 172189 has been accepted for the publication in A&A (Crevey, Uytterhoeven, Martin-Ruiz et al., *HD 172189: another step in furnishing one of the best laboratories known for asteroseismic studies*, arXiv:0909.3435). Table 1 also lists the studies still pending and the new attributions. We also transferred to the ESO archive the reduced FEROS spectra of each target after the publication of the refereed paper, accomplishing for the ESO rules on the data obtained in a Large Programme.

Two different strategies have been used to present the CoRoT results: the ground–based and space observations are analyzed either together (papers on HD 50844, HD 50846, HD 50209, HD 51146+HD50747, and HD 181231), or separately (papers on HD 49330 and HD 180642). The first papers on HD 49434 (Uytterhoeven et al. 2008) and HD 172189 (Creevey et al. 2009) discussed only the preparatory photometry and spectroscopy; the new spectroscopic data and the CoRoT timeseries are the subjects of ongoing analyses.

The current policy about co-autorship is to include the PIs of the Large Programmes (i.e., P. Amado, P. Mathias, E. Poretti), the observers of the specific star and, if the ESO data are used, M. Rainer, who reduced the ESO spectra for the whole team. The contribution of other instruments (HER-

CULES, FIES, NARVAL, FRESCO,...) should be evaluated case by case. I suggest that in the second round of papers at least one of the above persons will be included in the first positions, to reward the great and long effort made to support CoRoT photometry with ground-based spectroscopy.

3. The spectroscopic data of stars observed in June and July 2009

The CoRoT observations performed by CoRoT from April to September in the Center direction were splitted into two Long Runs (LRc03 and LRc04), each spanning 80 days. The direction of the pointings were decided on the basis of the stellar content satisfying the science in the exofield. As a result, the asteroseismic targets had no relevant impact on the science of our Large Programme. Therefore, we firstly selected three targets already observed by CoRoT, namely the δ Sct HD 174966 (observed in the SRc01, just a couple of spectra were taken with FOCES in 2007), the δ Sct HD 174532 (SRc02, never observed in high-resolution spectroscopy), and the γ Dor star HD 171834 (LRc02, already observed with FEROS in 2008). Then, we added the β Cep star HD 170580, which will be be observed by CoRoT in 2010 (LRc05).

These stars were also observed:

- with the FIES instrument at the Nordic Optical Telescope by K. Uytterhoeven in a single run (4 nights from June 30 to July 4), getting 94 spectra of HD 174532, 48 spectra of HD 171834, 36 spectra of HD 170580, and 1 spectra of HD 174966;
- with the SOPHIE instrument at the Observatoire Haute Provence in two runs. P. Mathias and K. Uytterhoeven were the observer in the first (from July 4 to 13) and in the second (from July 30 to August 5) run, respectively. They got 42+40=82 spectra of HD 174966, 38+35=73 spectra of HD 174532, 19+23=42 spectra of HD 171834, 20+19=39 spectra of HD 180580;
- with the FOCES instrument at the Calar Alto Observatory in two runs (from June 12 to 16 and from July 1 to 16). Observations were performed in Service Mode (P.I. P. Amado) and the weather was good on 18.5 nights out of 21. We got 158 spectra of HD 174966, 154 spectra of HD 174532, and 163 spectra of HD 171834. This summary is preliminary because two nights still have to be reduced.

4. The ESO observations

The observers were Ennio Poretti (INAF-Brera Observatory, 20-30 June, 2009) and Juan Carlos Suarez (IAA, 14-19 July, 2009). Table 2 reports the logs of both runs. The setup of the HARPS instrument is summarized in the Appendix of the previous report. We just remind that the instrument must be set in the EGGS mode (i.e., lower resolution mode), corresponding to R=80,000, as measured on the spectra we obtained.

4.1. Instrumental problem in the spectra reduction

At the beginning of June Michele Floquet reported the detection of a strange feature in the HARPS spectra collected in the December-January runs. The mean profile of the HE I line at 4921 Å shows some "oscillations" in the spectra of the Be star HD 51452, both on the line profile and on the continuum. The peak-to-peak amplitude is 0.5% of the continuum. The origin is clearly instrumental and it was detected also in the spectra of the other stars observed in the same runs. Moreover, Peter De Cat promptly analyzed the spectra obtained with HARPS in July 2008. Though he observed with the instrument in the HAM configuration, the strange feature was noticed. These oscillations resulted to be strongly enhanced in the spectra obtained in June, the amplitude being raised to 2%. After interaction with the ESO staff, the problem was identified in the misalignement of a filter on the path of the flat-field lamp. Indeed, the "oscillations" were visible in the raw images of the flat field, but not in those of the stars (or, at least, they are not so evident). The strong misalignement occurred few weeks before, at the end of May 2009. The HARPS instrument scientist, Gaspare Lo Curto, corrected the misalignement and he sent us the HARPS spectra re-reduced with the new flat-field. The spurious oscillation was reduced to the same levle as in the December-January spectra. These spectra still show the oscillation in the mean profile of a given line, but very good mean LSD profile. Since this constitutes a serious problem for our analysis, we (i.e., Brera team and ESO staff) investigated new solutions. In late July, it seemed we got a good trade-off by removing the filter from the optical path of the calibration lamp. We asked ESO staff to re-run the complete reduction of the HARPS spectra (i.e., all those collected in December 2008, January, June and July 2009). For some other committments (including his move from Chile to Germany), G. Lo Curto has not yet been able to do it. He promised to run the new reduction in early November, when a version of the HARPS pipeline will be installed in Garching.

When the new spectra will be available to us, we will made them available to the PIs of the different stars. Note that the spectra with the residual oscillation are available if someone would like to play with them.

4.2. Observing cycle

Exposure times have been set to 1200 sec for HD 174966, to 600 sec for HD 174532, to 450 sec for HD 170580, and to 150 sec for HD 171834. However, these exposure times were often modified accordingly to the weather conditions (clouds, poor seeing, ...). The observing sequence was

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HD 170580 - HD 174966 - HD 174532 -
HD 171834 - HD 174966 - HD 174532 -
...
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The above sequence lasted 90 min, thus ensuring 5-6 cycles per night. Moreover, the spectra of five red giants (HD 171427, HD 170008, HD 169689, HD 169370, HD 169751) and of one HADS star belonging to the CoRoT Additional Programs (in the exofield) were obtained in the 10–nights run. HD 135240 was observed at the beginning of the night to better define the blaze function (exposure time: 150 sec).

4.3. Length of the nights

The nights were about 12^h30^m long. At the declination of the CoRoT field (from $+6°$ to $-3°$), the HARPS observations could be performed from -4^h20^m to $+4^h20^m$. At these extreme hour angles the airmass is 2.8, i.e., the critical telescope pointing limit. The CoRoT field could be observed for 9^h in both runs. The night of 23-24 June started at UT $22^h25^m \equiv$ ST 11^h51^m and ended at UT $10^h56^m \equiv$ ST 24^h23^m.

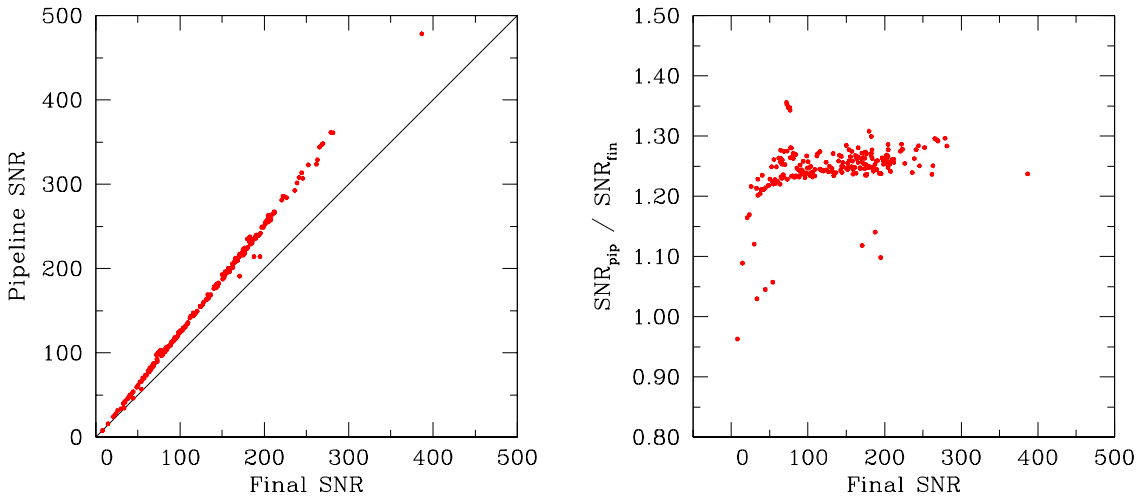

Fig. 1. Differences between on-line and calculated SNR values. *Left*: the values sorted by the HARPS lines vs. the values calculated on the reduced spectra. *Right*: the ratio between the two SNR values vs. the SNR.

Table 1. Targets observed in the framework of the ESO ground–based complementary observations (LP 178.D-0361 with the FEROS intrument at the 2.2m ESO/MPI telescope). The responsibles of the analysis of the spectroscopic data are also listed.

Star	Type	Investigators Spectroscopic data	Papers
		Initial Run	
HD 50747	Am		Dolez et al., 2009, A&A, 506, 159
HD 51106	SB2		Dolez et al., 2009, A&A, 506, 159
HD 50844	δ Sct		Poretti et al., 2009, A&A, 506, 85
HD 50846	Be, EB		Desmet et al., 2009, MNRAS, in press
		Long run center direction (LRc1)	
HD 180642	β Cep		Briquet et al., 2009, A&A, 506, 269
HD 181555	δ Sct	Mantegazza, Rainer and Zima	Michel et al., in preparation
HD 181231	Be		Neiner et al., 2009, A&A, 506, 143
		Long run anticenter direction (LRa1)	
HD 49434	γ Dor	Uytterhoeven (Dec. 2006-Jan. 2007)	Uytterhoeven et al., 2008, A&A 489, 1213
HD 49434	γ Dor	Mathias (Dec. 2007-Jan. 2008)	Rodriguez et al., in preparation
HD 50209	Be		Diago et al., 2009, A&A, 506, 125
HD 49330	Be		Floquet et al., 2009, A&A, 506, 103
		Long run center direction (LRc2)	
HD 172189	δ Sct, EB, SB2	Martín	
HD 171834	γ Dor	Mathias	
HD 171586	Ap	Weiss	Luftinger et al., in preparation
		Long run anticenter direction (LRa2)	
HD 50870	δ Sct	Mantegazza	
HD 51452	Be		
HD 51193	Be		

4.4. Weather statistics

The observations were often disturbed by clouds, humidity, and strong wind. In the first run we lost 29.0 hours (out of 125) due to bad weather (12.5 hours during the visibility of the CoRoT targets, 16.5 hours during the filling program). The CoRoT field was monitored for 73.5 hours, the filler stars for 22.5 hours. In two nights of the second run the strong wind hampered the pointing of the CoRoT field. Also considering a third night with high humidity, this means that the CoRoT field was observed for 17.5 hours only. The filler stars were monitored for 30.5 hours. Thus, in total, observations were performed for 48 hours (out of 62.5) in the second run.

4.5. Signal–to–noise ratio evaluation

The SNRs listed in Table 2 are the median values of the SNRs in the region 5802–5825 Å. They have been computed during our reduction taking into account photon noise, readout noise and flat field correction. At the telescope, the HARPS pipeline provides an estimate of the SNR at three different wavelengths (4500, 5500 and 6500 Å). Figure 1 shows how the SNR values given by the HARPS pipeline at 5500 Å are a little too optimistic. The displayed values should be reduced by a factor of 1.25 to get the real SNR values. At the telescope the observer can also estimate the SNR in another way, i.e., by plotting the SNR values in the different orders and taking the maximum values.

5. Backup and filling programs

The strong wind blowing from North forced J.C. Suarez to move to the *backup program* in two nights (16-17, 17-18 July). The backup star was HD 189631, the target of a multisite campaign chaired by P. De Cat. We add 49 HARPS spectra to the database.

Other targets have been observed at the beginning and at the end of nights (*filling program*), strictly following the ESO rules in the submission of these additional targets. In particular, the T Tau variable V2129 Oph was observed in the first parts of the 10-nights run: this monitoring was explicitely requested by J. Bouvier, the PI of a multisite campaign coordinated with the CHANDRA satellite. In total, 7 spectra were obtained. All the targets proposed by the CoIs of the Large Programme were observed. In addition to ϵ Lup (P.I. K. Uytterhoeven, 18 spectra) and HR 6139 (P.I. L. Mantegazza, 14 spectra), we observed:

Be stars (P.I. A.M. Hubert) – HD 87203 (1 spectrum), V337 Vel (1), V958 Cen (1), HD 131168 (1), HV Lup (3), HD 143578 (3), HD 144965 (1), HD 146444 (2), OZ Nor (2), V1063 Sco (1), NT Peg (1).

γ *Dor stars* (P.I. P. De Cat) – HD 11462 (1 spectrum), HD 79039 (1), HD 79416 (1), HD 80859 (1), HD 83297 (1), HD 85012 (1), HD 84809 (1), HD 86659 (1), HD 103257 (1), HD 118285 (1), HD 121190 (1), HD 131058 (1), HD 137785 (1), HD 206481 (1), HD 205879 (1). For some stars, the single spectrum is composed of 5 short–exposure spectra.

Table 2. Log of the observing runs (June 2009–July 2009) at ESO with the HARPS@3.6m instrument. The number of spectra and the measured SNR range are indicated for every star on each night. Spectra with low SNR have not been counted.

Night	HD 174966 V=7.7	HD 174532 V=6.9	HD 171834 V=5.4	HD 170580 V=6.7	Seeing	Notes
Exp. Time (Default)	1200 sec	600 sec	150 sec	450 sec		
June 20-21	4 [65-160]	3 [68-170]	12 [60-387]	1 [85]	1.″0–1.″7	
June 21-22	9 [90-180]	11 [80-245]	8 [64-158]	5 [100-200]	1.″1–1.″8	1^h lost due to bad weather
June 22-23	7 [144-190]	7 [128-180]	3 [180-195]	3 [124-158]	1.″1–1.″6	6.5^h lost due to bad weather
June 23-24	12 [154-212]	10 [172-227]	6 [150-260]	6 [140-200]	1.″1–1.″4	
June 24-25			5 [90-120]	1 [90]	1.″3	10^h lost due to bad weather
June 25-26	10 [127-207]	10 [90-250]	5 [140-240]	4 [113-200]	1.″1–1.″5	1^h lost due to bad weather
June 26-27	11 [120-243]	11 [149-265]	6 [187-267]	5 [98-208]	1.″0–1.″4	3^h lost due to bad weather
June 27-28	9 [84-163]	8 [76-189]	7 [93-203]	5 [77-170]	1.″4–1.″8	3^h lost due to bad weather
June 28-29	9 [103-206]	9 [124-205]	4 [140-225]	4 [133-186]	1.″0–1.″5	4.5^h lost due to bad weather
June 29-30	12 [140-220]	12 [104-260]	5 [170-220]	6 [130-207]	0.″7–1.″2	
July 14-15						Clouds, high humidity
July 15-16	9 [82-180]	10 [150-250]	9 [137-203]	10 [92-200]	1.″3–1.″8	
July 16-17		No CoRoT observations			1.″5–2.″0	Strong wind
July 17-18		No CoRoT observations			1.″5–2.″4	Strong wind
July 18-19	8 [107-180]	8 [108-216]	9 [180-190]	9 [100-180]	1.″3–1.″8	
Total ESO	**100**	**99**	**79**	**59**		
Total OHP	**82**	**73**	**42**	**39**		
Total NOT	**1**	**94**	**48**	**36**		
Total CAHA	**>158**	**>154**	**>163**	**0**		

LBV stars (P.I. K. Uytterhoeven) – HD 269858 (2).

We remind that both backup and filling programs have to be submitted by the PI 10 days before the observations and then approved by the ESO staff.

Report on the third and last run of the ESO LP 182.D-0356 (HARPS@3.6m)

E. Poretti, M. Rainer, and M. Hareter

Seismology Ground-Based Observation Working Group

May 4th, 2010; Version 1.0

EXECUTIVE SUMMARY.

The ESO Large Programme 182.D-0356 ended with the two runs of December 2009 with the HARPS instrument at the 3.6m ESO telescope. The log of these observations, the problems encountered and solved in the spectra reduction, some tips, the situation of the publications, and a look to the future are given. The following actions/items are emphasized:

1. All the 15 nights were characterized by excellent weather. The targets related to the CoRoT run LRa03 were observed. The observers made an excellent work and the survey of the CoRoT field was performed exactly how expected;
2. Long timeseries are available for LPV analysis on the hybrid δ Sct-γ Dor star HD 44195 and on the SPB star HD 43317. Other stars have been observed less frequently, but always as requested by the respective PIs ;
3. The spectra have been fully reduced. The problem of the continuous oscillations produced by the HARPS pipeline has been definitely solved.

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1. Introduction

The ground–based spectroscopic monitoring of the CoRoT targets continued in December 2009. Two sites were involved: European Southern Observatory (La Silla, Chile; HARPS@3.6m) and Mercator telescope (Canary Islands; HERMES@MERCATOR). There will be neither OHP and NOT (proposals not accepted) nor FOCES (decommissioned instrument) runs.

Unfortunately, the weather was horrible in the period from December 14 to 24, 2009, in the Canary Islands and no useful spectrum (actually, photon ...) could be taken in the equivalent time of 6 additional nights scheduled at the HERMES instrument.

As in the previous cases, the goals of this seventh (the third of the HARPS series) internal report are to circulate useful information about the ESO observations within the team and to keep the record of the observations.

The proposal for a new Large Programme lasting 6 ESO Periods (i.e., three years) was accepted (LP185.D-0056: *Extending the ground-based observations of CoRoT asteroseismic targets*). It has been submitted answering the P85 call in September 2009. The last runs of this LP will be in the ESO P90, i.e., December 2012-January 2013. The next HARPS runs are scheduled from June 12 to 22, 2010 and from July 1 to 6, 2009. Juan Carlos Suarez (IAA, Granada) and Katrien Uytterhoeven (CEA, Saclay) will be the observers. Spectroscopic observations are also scheduled with SOPHIE@OHP (from June 21 to July 3, P.I. P. Mathias) and with HERMES@MERCATOR.

2. Plan of the analyses and publications

Table 1 lists the stars observed in our Large Programmes and belonging to the CoRoT seismo programme. References to the papers already published are given. Table 1 also lists the pending studies, separated into "Papers in preparation" (analysis is finished, results have to be put together) and "Analyses in progress" (no result yet communicated by the responsibles). We also transferred to the ESO archive the reduced FEROS spectra of each target after the publication of the refereed paper, according to the ESO rules on the data obtained in a Large Programme.

The current policy about co-autorship is to include the PIs of the Large Programmes (i.e., P. Amado, P. Mathias, E. Poretti), the observers of the specific star and, if the ESO data are used, M. Rainer, who reduced the ESO spectra for the whole team. The contribution of other instruments (HERCULES, FIES, HERMES, NARVAL, FRESCO,...) should be evaluated case by case. I still remind you of my suggestion: at least one of the above persons will be included in the first positions in the second round of papers, to reward the effort made to support CoRoT photometry with full-reduced ground-based spectroscopy.

Table 1. Targets observed in the framework of the ESO ground–based complementary observations. The responsibles of the analysis of the spectroscopic data are also listed.

Star	Type	Investigators Spectroscopic data	Papers
	Published results		
HD 50747, HD 51106	IR01 - LP 178.D-0361		Dolez et al., 2009, A&A, 506, 159
HD 50844	IR01 - LP 178.D-0361		Poretti et al., 2009, A&A, 506, 85
HD 50846	IR01 - LP 178.D-0361		Desmet et al., 2010, MNRAS, 401, 418
HD 181231	LRc01 - LP 178.D-0361		Neiner et al., 2009, A&A, 506, 143
HD 180642	LRc01 - LP 178.D-0361		Briquet et al., 2009, A&A, 506, 269
HD 50209	LRa01 - LP 178.D-0361		Diago et al., 2009, A&A, 506, 125
HD 49330	LRa01 - LP 178.D-0361		Floquet et al., 2009, A&A, 506, 103
	Papers in preparation		
HD 181555	LRc01 - LP 178.D-0361	L. Mantegazza	Michel et al.
HD 49434 - Paper II	LRa01 - LP 178.D-0361	K. Uytterhoeven	Chapellier et al.
HD 171586	LRc02 - LP 178.D-0361	T. Luftinger	Luftinger et al.
HD 46149	SRa02 - LP 182.D-0356	P. Degroote	Degroote et al.
	Analyses in progress		
HD 49434 - Paper III	LRa01 - LP 178.D-0361	K. Uytterhoeven	Uytterhoeven et al.
HD 172189 - Paper III	LRc02 - LP 178.D-0361	S. Martín	Martín et al.
HD 171834	LRc02 - LP 178.D-0361, LP 182.D-0356	K. Uytterhoeven	
HD 50870	LRa02 - LP 182.D-0356	L. Mantegazza	Mantegazza et al.
HD 51452	LRa02 - LP 182.D-0356	M. Floquet	
HD 51193	LRa02 - LP 182.D-0356	M. Floquet	
HD 174966	SRc01 - LP 182.D-0356	L. Mantegazza	Garcia-Hernandez et al.
HD 174532	SRc02 - LP 182.D-0356	L. Mantegazza	
HD 170580	LRc05 - LP 182.D-0356	C. Aerts	
HD 44195	LRa03 - LP 182.D-0356	E. Poretti	
HD 43317, HD 51756	LRa03, LRa02 - LP 182.D-0356	P. Papics	
HD 51844, HD 49310	LRa02, SRa01 - LP 182.D-0356	M. Hareter	
Red giants	All LPs, not still observed by CoRoT	T. Morel	

3. The ESO observations

The ESO observations performed in December 2009 were related to the LRa03 field. Five stars were observed in the seismo field with CoRoT: HD 44195 (7.56, F0; hybrid γ Dor-δ Sct); HD 43317 (6.6, B3 IV; SPB); HD 43587 (5.71, G0 V; solar-like); HD 43823 (7.38, F2); HD 43913 (7.88, A0). All these stars except for HD 43587 were observed with HARPS. We also monitored other stars belonging to previous CoRoT Runs: HD 51756 (7.2, B0.5, LRa02), HD 46149 (7.6, O8.5, SRa02), HD 49310 (9.1, A0, SRa01), HD 51844 (8.6, F0, LRa02), and HD 50230 (9.0, B3, LRa01). Moreover, we also took one spectrum of the red giants HIP 28485≡HD 40726 (V=7.0), HIP 29526≡HD 42911 (V=7.4), and HIP 29575≡HD 43023 (V=5.8). These stars are suitable targets for a next CoRoT Long Run.

The observing sequence was

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HD 44195 - HD 44195 - HD 43317
...
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The other stars were observed with the cadence suggested by the respective PIs. In particular, HD 51756 replaced HD 43317 in the sequence once in the night, around meridian.

Exposure times have been set to 700 sec for HD 44195, to 300 sec for HD 43317, and to 500 sec for HD 51756. However, these exposure times were often modified accordingly to the weather conditions (clouds, poor seeing, ...).

The observers were Monica Rainer (INAF-Brera Observatory, 8-18 December, 2009) and Markus Hareter (Vienna University, 25-30 December, 2009). Table 2 reports the logs of both runs. The setup of the HARPS instrument is summarized in the Appendix of the first report of the LP182.D-0356 (Poretti et al., March 2009). We just remind that the instrument must be set in the EGGS mode (i.e., lower resolution mode), corresponding to R=80,000, as measured on the spectra we obtained. As a tip for future observers, it seems that in some cases the HARPS pipeline does not run properly. In particular, it crashes if we request to calculate the radial velocity for a hot star (too few lines). Therefore, when preparing future OBs, the value in the "Target Radial Velocity" keyword has to be set to "99999" for hot stars, so that the pipeline will not calculate the radial velocity value. In case of additional troubles for cool stars, try to solve the problem changing the default value it from "-99999.9" to "-99999" (i.e., without any decimal), or viceversa.

3.1. Instrumental problem in the spectra reduction

In the previous report we described the history of the discovery of spurious "oscillations" in the spectra reduced with the

HARPS pipeline. The cause was individuated in a misalignement of a filter on the path of the flat-fiels lamp. The good news are that the ESO staff (and namely the HARPS instrument scientist, Gaspare Lo Curto) re-ran the complete reduction of the HARPS spectra collected in December 2008, January, June and July 2009. The new spectra were made available to us in early Febraury 2010, and after some positive checks they were distributed to the PIs of the different stars.

3.2. Length of the nights

The nights were about 8^h50^m long. At the declination value of the CoRoT field ($+5^\circ$), the HARPS observations could be performed from -4^h05^m to $+4^h05^m$. At these extreme hour angles the airmass is 2.8, i.e., the critical telescope pointing limit. The CoRoT field could be observed for 8^h00^m, but actually we stayed a bit longer time on the field since the red giants could be observed before the rising of HD 44105 and HD 43317. The night of 8-9 December started at UT 00^h21^m≡ST 00^h52^m and ended at UT 09^h01^m≡ST 9^h31^m.

HD 34816 was observed at the beginning of the night to better define the blaze function (exposure time 120 sec, SNR around 400).

3.3. Weather statistics and technical problems

We had no interruption of the observations due to bad weather. Very minor technical problems occurred. Twenty–minutes were lost at the beginning of the last night due to some difficulties in the switching between HAM and EGGS mode.

Therefore, we practically used the 100% of the awarded time.

3.4. Signal–to–noise ratio evaluation

The SNRs listed in Table 2 are the median values of the SNRs in the region 5802–5825 Å. They have been computed during our reduction taking into account photon noise, readout noise and flat field correction. The smallest SNR values are those of the spectra at the greatest airmasses. At the telescope, the HARPS pipeline provides an estimate of the SNR at three different wavelengths (4500, 5500 and 6500 Å). We still confirm that the SNR values given by the HARPS pipeline at 5500 Å are a little too optimistic, by a factor of 1.25. At the telescope the observer can also estimate the SNR in another way, i.e., by plotting the SNR values in the different orders and taking the maximum values.

4. Backup and filling programs

Sunsets and sunrises almost perfectly bracketed the CoRoT observations in the December nights. Therefore, the observers ran a very limited filling program. In the 10–d run a few spectra of the δ Sct stars X Cae and BR Hyi (P.I. L. Mantegazza) and of the γ Dor stars HD 11462, HD 33331, and HD 40494 (P.I. P. De Cat) were taken at the beginning of the night. In the 5-d run one spectrum of X Cae was taken at the beginning of the first night and only observations of CoRoT stars were performed afterwards.

The backup programme (complementary monitoring of γ Dor stars observed in the framework of multisite campaigns, P.I. P. De Cat) was not used. We remind that both backup and filling programs have to be submitted by the PI 10 days before the observations and then approved by the ESO staff.

Table 2. Log of the observing runs (December 2009) at ESO with the HARPS@3.6m instrument. The number of spectra and the SNR range (values obtained from the reduced spectra) are indicated for every star on each night. Spectra with low SNR have not been counted.

Night Exp. Time (Default)	HD 44195 V=7.6 700 sec	HD 43317 V=6.6 300 sec	HD 51756 V=7.2 500 sec	Other CoRoT targets	Seeing
December 8-9	25 [140-210]	12 [160-235]	1 [205]	HD 46149, HD49310, HIP 28485	0.″8–1.″6
December 9-10	27 [170-215]	14 [175-215]	1 [210]	HD 50230	0.″6–1.″0
December 10-11	27 [165-220]	14 [180-245]	1 [205]		<1.″0
December 11-12	20 [160-260]	10 [150-230]	1 [200]		
December 12-13	26 [150-220]	12 [165-235]	1 [180]	HD 51844, HIP 29575	<1.″0
December 13-14	25 [130-205]	13 [150-235]	1 [185]	HD 43823	<1.″0
December 14-15	26 [170-210]	13 [155-220]	1 [200]		<1.″0
December 15-16	26 [130-220]	13 [130-245]	1 [190]	HD 43913, HIP 29526	0.″5–1.″0
December 16-17	26 [130-210]	15 [130-230]	1 [215]		0.″6–1.″0
December 17-18	29 [170-210]	16 [175-215]	1 [180]	HD 50230, HIP 28485	0.″4–0.″8
December 25-26	24 [140-220]	11 [160-220]	1 [195]	HD 49310	0.″5–1.″5 >1.″5 for 1 hour
December 26-27	26 [170-230]	12 [190-225]	1 [190]	HD 51844	0.″5–0.″7
December 27-28	26 [160-235]	12 [145-215]	1 [205]	HD 49310	0.″7–1.″4
December 28-29	26 [140-220]	11 [150-220]	1 [190]	HD 46149, HD 51844	0.″7–1.″6
December 29-30	28 [170-230]	13 [175-210]	1 [185]	HD 51844	<0.″8
Total	**387**	**191**	**15**		

Report on the first run of the ESO LP 185.D-0056 (HARPS@3.6m)

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Seismology Ground-Based Observation Working Group

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EXECUTIVE SUMMARY.

The ESO Large Programme 185.D-0056 started with the HARPS instrument at the 3.6m ESO telescope in June and July 2010. The log of the these observations, the problems encountered, some tips, the situation of the publications, and a look to the future are given. The following actions/items are emphasized:

1. The observations in the 15 nights were disturbed by clouds, humidity, and wind. The δ Sct star HD 170699, the Be star HD 171219, the β Cep HD 170580 were observed to study line profile variations. Spectra were also obtained for the B-star HD 170783 and for the CP star HD 170973. All these stars are belonging to the LRc05 and LRc06 CoRoT pointings. Moreover, we observed the bright red giant HR 7349 (LRc01).
2. Different filling programmes were run at the beginning and end of night. They were also used as backup programmes when strong wind from North hampered the pointing of the CoRoT field.
3. For the first time we had serious technical problems. HARPS did not work properly in the the EGGS configuration and we were forced to observe in the HAM configuration in one full night. Moreover, another full night was lost due to guiding problems.

1. Introduction

The ground–based spectroscopic monitoring of the CoRoT targets continued in June and July 2010. Two sites have been involved: European Southern Observatory (La Silla, Chile; HARPS@3.6m) and Observatoire de Haute Provence (France; SOPHIE@1.9m). As in the previous cases, the goals of this eigth (the fourth of the HARPS series) internal report are to circulate useful information about the ESO observations within the team and to keep the record of the observations.

The next HARPS runs are scheduled from December 22, 2010 to January 1, 2011 and from January 7 to 12, 2011. Interested observers are kindly requested to inform E. Poretti. Note that the two runs are separated by 6 days only and therefore the observations could be conducted by just one observer. In such a case, we will ask ESO to give full support to the observer for the whole period. In Period 86 HARPS will be offered in the polarimetric mode too. We submitted a request (a short proposal) to the OPC to use the instrument in such mode. We have been informed that " *the OPC judged that the intended polarimetric observations represent too large a deviation from the original goals and observational strategy of the Large Programme to allow them to be approved on the basis of a mere change request. The OPC recommended that, in future periods, you request additional time for such observations via full formal proposals to be submitted by the corresponding deadlines*".

To complement the HARPS observations of the next CoRoT pointing there will be a SOPHIE@ OHP run from December 10 to 20 (P.I.: P. Mathias). We will evaluate the possibility to take complementary spectra from the MERCATOR telescope (HERMES instrument; Canary Islands).

2. Status of publications

Table 1 lists the status of the analyses of the spectroscopic timeseries, and the new attributions as well. After publication of the results in a refereed journal, the reduced spectra have been made available to the community through the ESO archive (ESO rule for Large Programmes). New papers with respect to the previous report are highlighted in red.

I suggest that in the second round of papers at least one of the scientists in the ground-based activities will be included in the first positions, to reward the great and long effort made to support CoRoT photometry with high-resolution spectroscopy.

3. The spectroscopic data of stars observed in June and July 2010

The CoRoT observations performed by CoRoT from April to September 2010 in the Center direction were splitted into two Long Runs (LRc05 and LRc06), each spanning 80 days. The asteroseismic targets are: HD 170699 (δ Sct, V=7.0), HD 170580

(β Cep, V=6.7), HD 170973 (CP star, V=6.4), HD 170783 (B star, V=7.7), and HD 171219 (Be star, V=7.6).

The Red Giant HD 171264 (V=8.1) was too faint and not very appealing. We replaced it with the bright Red Giant HR 7349≡HD 181907 (V=5.8) observed by CoRoT in the LRc01 (Carrier et al. 2010, A&A 509, A73).

These stars were also observed with SOPHIE@OHP (June 21-28, 2010) and HERMES@Mercator.

4. The ESO observations

The observers were Juan Carlos Suarez (IAA, 12-22 June, 2010) and Katrien Uytterhoeven (CEA, 1-6 July, 2010). Tables 2 and 3 report the logs of both runs. The setup of the HARPS instrument is summarized in the Appendix of the previous report. We just remind that the instrument must be set in the EGGS mode (i.e., lower resolution mode), corresponding to R=80,000, as measured on the spectra we obtained. We definitely solved the instrumental problem affecting the HARPS spectra collected in 2009. The corrected spectra were distributed to the respective PIs (see Tab. 1) in March.

Observers are requested to carefully check the value of the `TEL.TARGET.RADVEL` keyword in the Observing Blocks. It must be "–99999.9" or "–99999" for the cold stars. In such a case the HARPS pipeline calculates a very accurate value of the star's radial velocity. For stars with spectral type earlier than F0, there is no template in the HARPS library and the RV value is not reliable. Often the pipeline crashes. In such a case, but only for hot stars, put "99999" in the `TEL.TARGET.RADVEL` keyword. See also the report of the third run of the LP 182.D-0356.

4.1. Observing cycle

Exposure times have been set to 700 sec for HD 170699, to 400 sec for HD 170973, to 500 sec for HD 170580, 210 sec for HR 7349, and to 1200 sec for HD 171219. However, these exposure times were often modified accordingly to the weather conditions (clouds, poor seeing, ...). The observing sequence was

```
HR 7349 - HD 170699 - HD 171219 - HD 170699 - slot - ...
```

In the "slot" we put HD 170973 at the beginning and end of night and, in alternance, HD 170580 and HD 170783 during the night.

HD 135240 was observed at the beginning of the night to better define the blaze function (exposure time: 150 sec).

4.2. Length of the nights

The observations spanned about 12^h30^m in June and about 11^h30^m in July. At the declination of the CoRoT field (from $+6^\circ$ to -3°), the HARPS observations could be performed from -4^h20^m to $+4^h20^m$. At these extreme hour angles the airmass is 2.8, i.e., the critical telescope pointing limit. The CoRoT field could be observed for about 9^h in both runs. The night of 23-24 June started at UT 22^h25^m≡ST 11^h51^m and ended at UT 10^h56^m≡ST 24^h23^m. The night of 1-2 July started at UT 23^h03^m≡ST 12^h59^m and ended at UT 10^h32^m≡ST 24^h30^m.

4.3. Weather statistics

The observations were often disturbed by clouds, humidity, and strong wind. In the first run we lost 33.5 hours (out of 125) due to bad weather (26.5 hours during the visibility of the CoRoT targets, 7.0 hours during the filling programme). In particular, two full nights were lost (15-16 and 18-19 June). Moreover, 2^h and 9^h of the CoRoT time could not be used due to strong wind from North on the 12-13 and 17-18 June, respectively.

In the second run we lost 20.5 hours (out of 57.5) due to bad weather (16 hours during the visibility of the CoRoT targets, 4.5 hours during the filling programme). Moreover, 5^h and 1^h of the CoRoT time could not be used due to strong wind from North on the nights of 4-5 and 5-6 July, respectively.

4.4. Technical reasons

For the first time we had to face severe technical problems. They were of different nature (a slight drift in the EGGS fiber, problems in closing the EGGS shutter and in the calibration procedure). In the first run we lost 20 hours, 9 during the CoRoT time, 11 of the filling programme. We used the HAM configuration in one full night (14-15 June) to bypass the EGGS malfunction. The step in wavelength of the HAM spectra has been made the same of the EGGS ones. We lost 1 full night for the guiding problems (19-20 June), common to both HAM and EGGS configurations.

After some maintenance and repair procedures, the ESO staff solved the problem and in the second run we lost 15^m in the twilight of the night of 1-2 July only.

4.5. Overall statistics

In the first run we lost 53.5 hours due to bad weather and technical problems. The CoRoT field was monitored for 43.5 hours, the filler and backup stars for 28.0 hours (11 hours of the CoRoT time had to be given to the backup programme due to the wind from North).

In the second run we lost 20.5 hours due to bad weather and technical problems. The CoRoT field was monitored for 24.0 hours, the filler and backup stars for 13.0 hours (7 hours of the CoRoT time had to be given to the backup programme due to the wind from North).

We had a bonus of 4^h40^m in the extra-night of June 30-July 1 (3^h50^m for the CoRoT field, 50^m for the filler programme).

4.6. Signal–to–noise ratio evaluation

The SNRs listed in Table 3 are the median values of the SNRs in the region 5802–5825 Å. They have been computed during our reduction taking into account photon noise, readout noise and flat field correction. We confirm that the values provided by the HARPS pipeline at the telescope are in general overestimated by a factor of 1.25.

5. Backup and filling programmes

The strong wind blowing from the North forced the observers to move to the *backup programme* during 4 (partial) nights (17-18 and 12-13 June, 4-5 and 5-6 July). The backup programme was composed of a list of γ Dor, SPB, Be stars to be observed once.

Other targets have been observed at the beginning and at the end of nights (*filling programme*), strictly following the

Table 1. Targets observed in the framework of the ESO ground–based complementary observations. The responsibles of the analysis of the spectroscopic data are also listed.

Star	CoRoT run - ESO LP	Investigators Spectroscopic data	Papers
	Published results[*]		
HD 49434	LRa01 - LP 178.D-0361		Uytterhoeven et al. 2008, A&A, 489, 1213
HD 50747, HD 51106	IR01 - LP 178.D-0361		Dolez et al. 2009, A&A, 506, 159
HD 50844	IR01 - LP 178.D-0361		Poretti et al. 2009, A&A, 506, 85
HD 50846	IR01 - LP 178.D-0361		Desmet et al. 2010, MNRAS, 401, 418
HD 181231	LRc01 - LP 178.D-0361		Neiner et al. 2009, A&A, 506, 143
HD 180642	LRc01 - LP 178.D-0361		Briquet et al. 2009, A&A, 506, 269
HD 50209	LRa01 - LP 178.D-0361		Diago et al. 2009, A&A, 506, 125
HD 49330	LRa01 - LP 178.D-0361		Floquet et al. 2009, A&A, 506, 103
HD 46149	SRa02 - LP 182.D-0356		Degroote et al. 2010, A&A, in press
HD 49434 - Paper II	LRa01 - LP 178.D-0361		Chapellier et al. 2010, accepted
	Papers in preparation		
HD 181555	LRc01 - LP 178.D-0361	L. Mantegazza	Michel et al.
HD 171586	LRc02 - LP 178.D-0361	T. Luftinger	Luftinger et al.
	Analyses in progress		
HD 49434 - Paper III	LRa01 - LP 178.D-0361	K. Uytterhoeven	Uytterhoeven et al.
HD 172189 - Paper III	LRc02 - LP 178.D-0361	S. Martín	Martín et al.
HD 171834	LRc02 - LP 178.D-0361, LP 182.D-0356	K. Uytterhoeven	
HD 50870	LRa02 - LP 182.D-0356	L. Mantegazza	Mantegazza et al.
HD 51452	LRa02 - LP 182.D-0356	M. Floquet	
HD 51193	LRa02 - LP 182.D-0356	J. Gutierrez-Soto	
HD 174966	SRc01 - LP 182.D-0356	L. Mantegazza	Garcia-Hernandez et al.
HD 174532	SRc02 - LP 182.D-0356	L. Mantegazza	
HD 170580	LRc05 - LP 182.D-0356, LP185.D-0056	C. Aerts	
HD 44195	LRa03 - LP 182.D-0356	E. Poretti	
HD 43317, HD 51756	LRa03, LRa02 - LP 182.D-0356	P. Papics	
HD 51844, HD 49310	LRa02, SRa01 - LP 182.D-0356	M. Hareter	
Red giants	All LPs, not still observed by CoRoT	T. Morel	
HR 7349	LRc01 - LP185.D-0056	F. Carrier	
HD 170699	LRc05, LRc06 - LP 185.D-0056	L. Mantegazza	
HD 170973	LRc05, LRc06 - LP 185.D-0056	Th. Luftinger	
HD 170783	LRc05, LRc06 - LP 185.D-0056	C. Aerts	
HD 171219	LRc05 - LP 185.D-0056	C. Neiner	

[*] Reduced spectra now available in the ESO archive at
http://archive.eso.org/cms/eso-data/data-packages/178-d-0361/hd-49434-feros-spectroscopic-time-series-data-release-v1-0/
http://archive.eso.org/cms/eso-data/data-packages/178-d-0361/hd-50844-feros-spectroscopic-time-series-data-release-v1-0/
http://archive.eso.org/cms/eso-data/data-packages/178-d-0361/hd-49330-feros-spectroscopic-time-series-data-release-v1-0/
http://archive.eso.org/cms/eso-data/data-packages/178-d-0361/hd-51106-hd-50747-feros-spectroscopic-time-series-data-release-v1-0/
http://archive.eso.org/cms/eso-data/data-packages/178-d-0361/hd-180642-feros-spectroscopic-time-series-data-release-v1-0/
http://archive.eso.org/cms/eso-data/data-packages/178-d-0361/hd-181231-feros-spectroscopic-time-series-data-release-v1-0/
http://archive.eso.org/cms/eso-data/data-packages/178-d-0361/hd-50209-feros-spectroscopic-time-series-data-release-v1-0/

ESO rules in the submission of these additional targets. In addition to ϵ Lup (P.I. K. Uytterhoeven, 9 spectra, SNR between 170 and 335), HD 137949 (P.I. F. Leone, 10 spectra, SNR 110-250), HD 91024 (P.I. C. Aerts, 16 spectra, SNR 110-260), we observed:

Be stars (P.I. A.M. Hubert) – 1 spectrum of Mis 379, Mis 270, MQ TrA, μ Lup, HD 146596, V846 Ara, μ Cen, HD 156398, HD 146501 (SNR=120), θ Cir, V946 Cen, HD 151113, HD 147302, HD 155851, V817 Cen, μ^2 Cru, HD 124834, CO Cir, γ Cir, CK Cir, HD 216113 (SNR=90). SNR values are in the range 165-230, if not differently noted. Two spectra of CV Cir (SNR 120 and 200).

γ Dor and SPB stars (P.I. P. De Cat) – HD 112409 (2 spectra), HD 85693 (2), HD 110606 (2), HD 90872 (2), HD 138521 (1, SNR=105), HD 152635 (2), HD 197451 (1 EGGS; 2 HAM, SNR 70 and 140), HD 201985 (1 EGGS, SNR=85; 1 HAM, SNR=65), HD 224288 (1), HD 206481 (2, SNR 110 and 175), HD 214291 (6), HD 205879 (1), HD 10167 (1), HD 11462 (1), HD 109799 (1), HD 113357 (2), HD 152565 (2), HD 155854 (1), HD 121190 (1), HD 131058 (1), HD 132200 (1), HD 137785 (1),

Table 2. General description of the nights

Night	Seeing DIMM	Lost time Bad weather	Lost time Technical Reasons	Notes
June 12-13	1.″9–2.″6	2^h15^{min}	1^h15^{min}	EGGS fiber lost. Clouds, strong wind.
June 13-14	1.″8–2.″0	6^h20^{min}	2^h	Dome control. Clouds.
June 14-15	<1.″5		3^h30^{min}	EGGS shutter, observations in HAM mode.
June 15-16		$12h30^{min}$		Clouds all the night.
June 16-17	1.″2		45^{min}	EGGS calibration problem.
June 17-18	1.″4–1.″8			Strong wind from North, backup programme.
June 18-19		12^h30^{min}		Fog, high humidity (100%).
June 19-20			12^h30^{min}	Guiding problems, both HAM and EGGS.
June 20-21	1.″0			No problems.
June 21-22	1.″3–1.″9			Thin cirrus.
June 30-July 1	0.″85			Extra half-night
July 1-2	0.″5–0.″9		15^{min}	Telescope control stuck. Seeing 1.″0–1.″2 end-of-night
July 2-3	1.″3–2.″4	1^h10^{min}		Strong wind.
July 3-4	2.″0–3.″0	9^h45^{min}		Strong wind.
July 4-5	>2.″0	4^h15^{min}		Strong wind.
July 5-6	>2.″0	5^h15^{min}		Strong wind (4.″5 end-of-night), backup programme.

HD 149989 (1), HD 153580 (1), HD 79416 (2), HD 84809 (1), HD 86659 (1). SNR values are in the range 130-240, if not differently noted.

A-F stars (P.I. M. Hareter) – HD 114839 (2 spectra, SNR 105 and 185), HD 209775 (2, SNR 125 and 190), BD+18°4914 (1 spectrum, SNR=80).

CARMENES scientific case (P.I. P. Amado) – The M-dwarf star Gl 570B has been monitored on two nights in the framework of the preparation of the scientific case of the spectrograph CARMENES, which will be mounted at the 2.2m telescope of Calar Alto. Gl 570B has been monitored for 2 hours (46 spectra, T_{exp}=120 sec, SNR from 27 to 53) in the night of 12-13 June and for 85 min (52 spectra, T_{exp}=60 sec, SNR from 50 to 60) in the night of 2-3 July. Notice that in the second night we got the same SNR of the first one with half exposure time. Indeed, the first night was very windy, with a poor seeing (about 2″), while the beginning of the second night was quite good (seeing around 1.″3; see Table 2).

We remind that both backup and filling programmes have to be submitted by the PI 10 days before the observations and then approved by the ESO staff. The stars belonging to other accepted proposals are rejected. This occurred for several stars of the backup and filling programmes proposed for the June-July runs.

Table 3. Log of the observing runs (June 2010–July 2010) at ESO with the HARPS@3.6m instrument. The number of spectra and the measured SNR range are indicated for every star on each night. Spectra with low SNR have not been counted.

Night Exp. Time (Default)	HD 170699 V=7.0 700 sec	HD 170580 V=6.7 500 sec	HD 170973 V=6.4 400 sec	HD 170783 V=7.7 1100 sec	HD 171219 V=7.6 1200 sec	HR 7349 V=5.8 210 sec
June 12-13	8 [123-190]	2 [135-220]	–	1 [107]	–	4 [150-230]
June 13-14	3 [120-152]	–	1 [145]	–	2 [125-141]	1 [133]
June 14-15 (HAM spectra)	11 [104-204]	1 [180]	1 [97]	2 [130-154]	6 [109-198]	6 [123-191]
June 15-16	–	–	–	–	–	–
June 16-17	15 [113-233]	2 [182-230]	1 [202]	2 [164-201]	7 [143-223]	7 [193-288]
June 17-18	6 [172-225]	1 [202]	1 [185]	–	3 [161-182]	2 [212-222]
June 18-19	–	–	–	–	–	–
June 19-20	–	–	2 [58-67]	–	–	–
June 20-21	12 [103-173]	3 [120-152]	1 [160]	2 [121-140]	6 [97-166]	10 [109-206]
June 21-22	11 [110-181]	2 [136-153]	2 [83-150]	2 [155-168]	5 [105-177]	7 [104-187]
Jun 30-Jul 1	6 [204-240]	1 [184]	1 [220]	–	2 [198-226]	19 [152-245]
July 1-2	22 [176-230]	5 [165-220]	2 [218-237]	4 [203-257]	11 [165-235]	22 [199-282]
July 2-3	15 [137-228]	2 [255-255]	2 [190-255]	2 [195-203]	7 [144-227]	14 [193-294]
July 3-4	1 [112]	–	–	–	–	8 [180-243]
July 4-5	–	1 [97]	–	–	–	6 [164-212]
July 5-6	–	2 [154-185]	2 [123-168]	–	–	10 [106-245]
Total ESO	**110**	**22**	**16**	**15**	**49**	**116**
Total OHP	**31**	**15**	**10**	–	**13**	–

Report on the second run of the ESO LP 185.D-0056 (HARPS@3.6m)

E. Poretti, M. Rainer

Seismology Ground-Based Observation Working Group

August 22, 2011; Version 1.1

EXECUTIVE SUMMARY.

The ESO Large Programme 185.D-0056 (HARPS@3.6m) continued with the second run. The log of the observations performed in December 2010 and January 2011, a tip on the preparation of the Observing Blocks, and the situation of the publications are given. The following actions/items are emphasized:

1. All the 15 nights were characterized by excellent weather. The targets related to the CoRoT runs LRa04 and LRa05 were observed. The observations in both runs were secured by Monica Rainer. The survey of the CoRoT field was performed exactly how expected;
2. Long timeseries are available for LPV analysis on the δ Sct star HD 41641, on the suspected γ Dor variable HD 43338, and on the Be star HD 43285. Other stars have been observed less frequently, but always as requested by the respective PIs;
3. Spectroscopic observations were also performed at OHP (HD 41641, HD 43285, and HD 43338) and at Mercator telescope (HD 42597);
4. The spectra have been fully reduced and distributed to the respective PIs.

1. Introduction

The ground–based spectroscopic monitoring of the CoRoT targets continued in December 2010 and January 2011. Three sites were involved: European Southern Observatory (La Silla, Chile; HARPS@3.6m), Observatoire de Haute Provence (France; SOPHIE@1.9m), and Mercator telescope (Canary Islands; HERMES@MERCATOR).

As in the previous cases, the goals of this ninth (the fifth of the HARPS series) internal report are to circulate useful information about the ESO observations within the team and to keep the record of the observations. The next HARPS runs are scheduled from June 23 to July 3, 2011 and from July 15 to 20, 2011. Luciano Mantegazza (INAF-OA Brera) and Markus Hareter (Vienna University) will be the observers. Spectroscopic observations are also scheduled with SOPHIE@OHP from May 27 to June 8 and from June 20 to July 1 (P.I. P. Mathias).

2. Status of publications

Table 1 lists the stars observed in our Large Programmes, the status of the analyses of the spectroscopic timeseries, and the new attributions as well. New papers with respect to the previous report are highlighted in red. After publication of the results in a refereed journal, the reduced spectra have been made available to the community through the ESO archive (ESO rule for Large Programmes).

The current policy about co-autorship is to include the PIs of the Large Programmes (i.e., P. Amado, P. Mathias, E. Poretti), the observers of the specific star and, if the ESO data are used, M. Rainer, who reduced the ESO spectra for the whole team. The contribution of other instruments (HERCULES, FIES, HERMES, NARVAL, FRESCO,...) should be evaluated case by case. I suggest that in the second round of papers at least one of the scientists in the ground-based activities will be included in the first positions, to reward the great and long effort made to support CoRoT photometry with high-resolution spectroscopy.

3. The ESO observations

The observer was Monica Rainer (INAF-Brera Observatory) for both runs, i.e., from December 22, 2010 to January 1, 2011 and from January 7 to 12, 2011. She stayed in Chile between the two runs, after a troublesome agreement with ESO. During her stay, a strong earthquake (grade 7 of the Richter scale) occurred in Chile on January 3.

The ESO observations performed in December 2010 were related to the LRa04 and LRa05 fields. The usual 160-d long run was split into two runs of 80 d. The solar-like variable HD 42618 (6.84; G4) was the only target observed in both runs.

The other four stars observed in the seismo field of LRa04 were: HD 43338 (7.63, F0; suspected γ Dor), GSC00144-03031

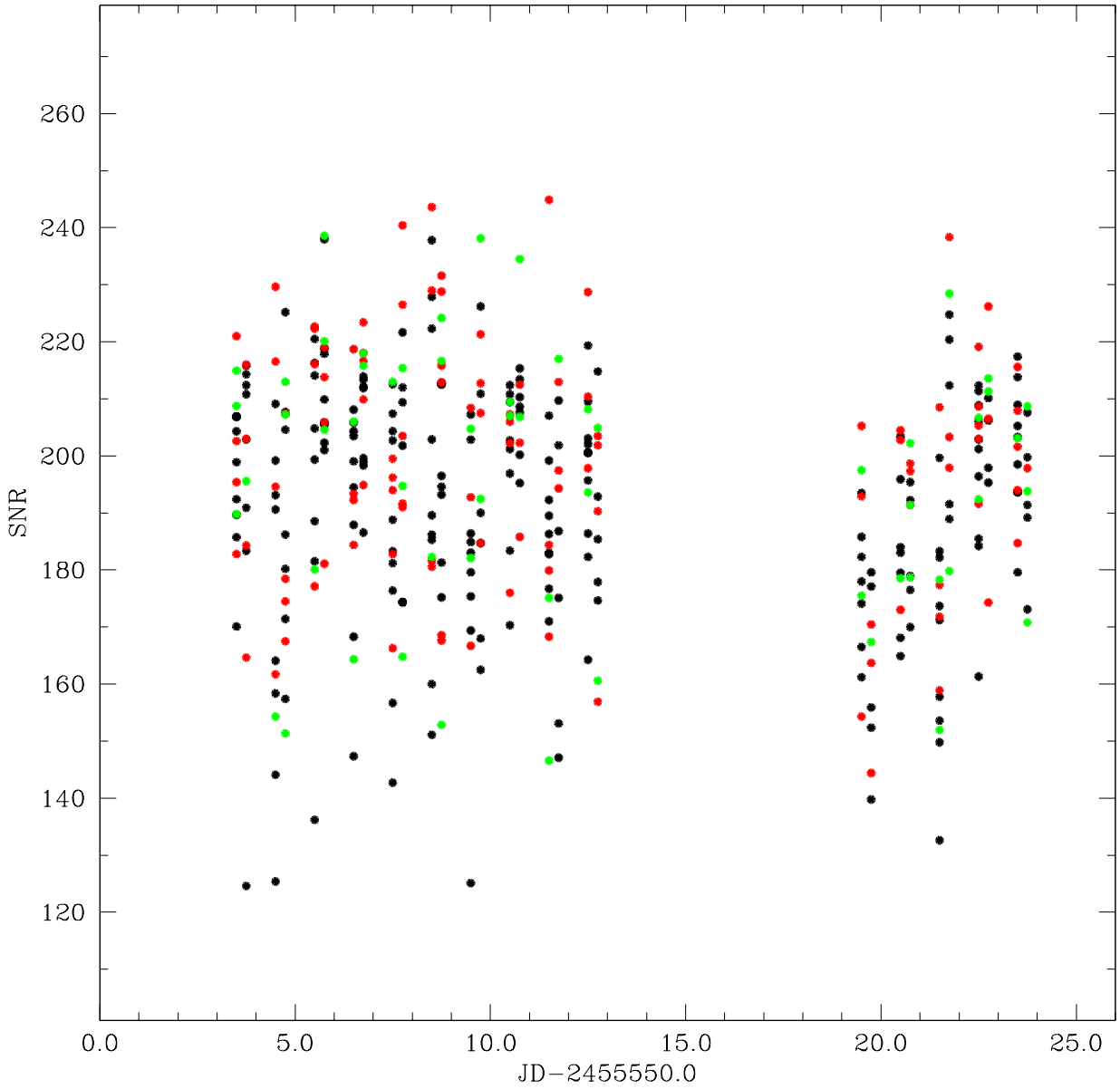

Fig. 1. SNR values of the HARPS spectra. Black filled circles: HD 41641; red filled circles: HD 43285; green filled circles: HD 43338.

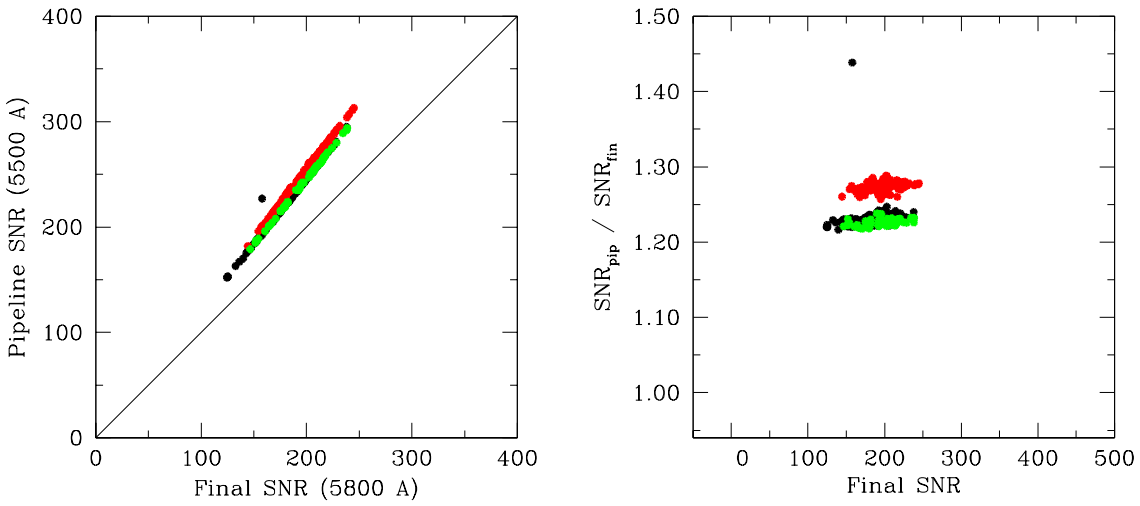

Fig. 2. Differences between on-line and calculated SNR values. *Left*: the values sorted by the HARPS lines (at 5500 Å) vs. the values calculated on the reduced spectra (at 5800 Å). *Right*: the ratio between the two SNR values vs. the SNR. Black filled circles: HD 41641; red filled circles: HD 43285; green filled circles: HD 43338.

Table 1. Targets observed in the framework of the ESO ground–based complementary observations. The responsibles of the analysis of the spectroscopic data are also listed.

Star	CoRoT run – ESO LP	Investigators Spectroscopic data	Papers
	Published results[*]		
HD 49434	LRa01 - LP 178.D-0361	Uytterhoeven et al. 2008, A&A, 489, 1213	
HD 50747, HD 51106	IR01 - LP 178.D-0361	Dolez et al. 2009, A&A, 506, 159	
HD 50844	IR01 - LP 178.D-0361	Poretti et al. 2009, A&A, 506, 85	
HD 50846	IR01 - LP 178.D-0361	Desmet et al. 2010, MNRAS, 401, 418	
HD 181231	LRc01 - LP 178.D-0361	Neiner et al. 2009, A&A, 506, 143	
HD 180642	LRc01 - LP 178.D-0361	Briquet et al. 2009, A&A, 506, 269	
HD 50209	LRa01 - LP 178.D-0361	Diago et al. 2009, A&A, 506, 125	
HD 49330	LRa01 - LP 178.D-0361	Floquet et al. 2009, A&A, 506, 103	
HD 46149	SRa02 - LP 182.D-0356	Degroote et al. 2010, A&A, 519, A38	
HD 49434 - Paper II	LRa01 - LP 178.D-0361	Chapellier et al. 2010, A&A, 2011, 525, A23	
HD 51756	LRa02 - LP182.D-0356	Papics et al., 2011, A&A, 528, A123	
CoRoT 101155310	LRc01 - LP 182.D-0356	Poretti et al. 2011, A&A, 528, A147	
	Papers in preparation		
HD 181555	LRc01 - LP 178.D-0361	L. Mantegazza	Michel et al.
HD 171586	LRc02 - LP 178.D-0361	T. Luftinger	Luftinger et al.
HD 172189 - Paper III	LRc02 - LP 178.D-0361	S. Martín	Martín et al.
HD 50870	LRa02 - LP 182.D-0356, LP 185.D-0056	L. Mantegazza	Mantegazza et al.
HD 51193	LRa02 - LP 182.D-0356	J. Gutierrez-Soto	
HD 174966	SRc01 - LP 182.D-0356	L. Mantegazza	Garcia-Hernandez et al.
	Analyses in progress		
HD 49434 - Paper III	LRa01 - LP 178.D-0361	K. Uytterhoeven	Uytterhoeven et al.
HD 171834	LRc02 - LP 178.D-0361, LP 182.D-0356	K. Uytterhoeven	
HD 51452	LRa02 - LP 182.D-0356	M. Floquet	
HD 174532	SRc02 - LP 182.D-0356	L. Mantegazza	Fox et al.
HD 170580	LRc05 - LP 182.D-0356, LP185.D-0056	A. Thoul	
HD 44195	LRa03 - LP 182.D-0356	E. Poretti	
HD 43317	LRa03, LRa02 - LP 182.D-0356	P. Papics	
HD 51844, HD 49310	LRa02, SRa01 - LP 182.D-0356	M. Hareter	
Red giants	All LPs, not still observed by CoRoT	T. Morel	
HD 170699	LRc05, LRc06 - LP 185.D-0056	L. Mantegazza	
HD 170973	LRc05, LRc06 - LP 185.D-0056	Th. Luftinger	
HD 170783	LRc05, LRc06 - LP 185.D-0056	M. Briquet	
HD 171219	LRc05 - LP 185.D-0056	C. Neiner	
HD 41641	LRa05 - LP 185.D-0056	L. Mantegazza	
HD 43285	LRa04 - LP 185.D-0056	C. Neiner	
HD 43338	LRa04 - LP 185.D-0056	Ph. Mathias	
GSC00144-03031	LRa04 - LP 185.D-0056	E. Poretti	
HD 50890	IRa01 - LP 185.D-0056	Th. Morel	Barban et al.
HD 49566	SRa01 - LP 185.D-0056	Th. Morel	Hekker et al.
HD 43587	LRa03 - LP 185.D-0056	P. Boumier	Boumier et al.
HD 42597	LRa05 - LP 185.D-0056	P. Degroote	
HD 42299	LRa04 - LP 185.D-0056		
HD 42787	LRa04 - LP 185.D-0056	H. Bruntt	
HD 42089	LRa05 - LP 185.D-0056	H. Bruntt	
HD 42618	LRa04, LRa05 - LP 185.D-0056		

[*] Reduced spectra available in the ESO archive.

(10.2, F0; HADS), HD 43285 (6.05, Be), and HD 42787≡V1389 Ori (6.48, M2III; semiregular variable).

The other four stars observed in the seismo field of LRa05 were: HD 41641 (7.86, A5, a δ Sct star discovered in the preparatory work), HD 42597 (7.05, B1V), HD 42089 (6.65, G0V), and HD 42299 (7.64, A3).

All these stars were observed with HARPS. We also monitored other stars belonging to previous CoRoT Runs: the solar-like star HD 43587 (5.70, G0V, LRa03), the red-giants HD 50890 (6.06, G6 III, IRa01) and HD 49566 (7.71, G5, SRa01), and the δ Sct star HD 50870 (8.88, F0, LRa02, a good target for the end-of-night).

HD 41641 and HD 43285 were monitored intensively and the observations of the other CoRoT targets were secured by the "slot" in the observing sequence

```
HD 41641 - HD 43285 - HD 41641 - slot - ...
...
```

Exposure times have been set to 1200 sec for HD 41641 and to 300 sec for HD 43285. However, these exposure times were modified by the observer accordingly to the weather conditions (clouds, poor seeing, ...). Table 2 reports the logs of both runs.

The setup of the HARPS instrument is summarized in the Appendix of the first report of the LP182.D-0356 (Poretti et al., March 2009). We just remind that the instrument must be set in the EGGS mode (i.e., lower resolution mode), corresponding to R=80,000, as measured on the spectra we obtained. As a tip for future observers, the value in the "Target Radial Velocity" keyword has to be set with particular care. It must be set to "99999" for hot stars, so that the pipeline will not calculate the radial velocity value (it crashes due to the too few lines). It must be set to "-99999" for cool stars. Note that decimal figures are not admitted anymore.

3.1. Length of the nights

The nights were about 8^h50^m long. At the declination value of the CoRoT fields (+6°), the HARPS observations could be performed from -4^h05^m to $+4^h05^m$. At these extreme hour angles the airmass is 2.8, i.e., the critical telescope pointing limit. The CoRoT fields LRa04 and LRa05 could be observed for 8^h00^m, but targets of other runs (HD 50870 and HD 50890) could be observed a bit longer. HD 34816 was observed at the beginning of the night to better define the blaze function (exposure time 100 sec, SNR around 300).

The night of 22-23 December started at UT 00^h12^m≡ST 02^h01^m and ended at UT 09^h09^m≡ST 10^h33^m. The night of January 11-12 started at UT 00^h10^m≡ST 02^h52^m and ended at UT 09^h16^m≡ST 11^h59^m.

3.2. Weather statistics and technical problems

We had no interruption of the observations due to bad weather. Minor technical problems occurred: the observer lost 2^h30^m for guiding and pointing problems, mostly at the beginning of three nights in the second run. Therefore, we could use the 98% of the awarded time.

3.3. Signal–to–noise ratio evaluation

The SNRs listed in Table 2 are the median values of the SNRs in the region 5802–5825 Å. They have been computed during our reduction taking into account photon noise, readout noise and flat field correction. The smallest SNR values are those of the spectra at the greatest airmasses. They can be clearly identified in Fig. 1, where the SNR values of the spectra of HD 41641, HD 43285, and HD 43338 are plotted.

At the telescope, the HARPS pipeline provides an estimate of the SNR at three different wavelengths (4500, 5500 and 6500 Å). We still confirm that for our stars (B-A-F spectral types) the SNR values given by the HARPS pipeline at 5500 Å are a little too optimistic when compared with the values we measured at 5800 Å(Fig. 2, left panel). The ratio between the two SNR values is around 1.23 for A-F stars and around 1.28 for B stars (Fig. 2, right panel).

4. Backup and filling programs

Sunsets and sunrises bracketed almost perfectly the CoRoT observations in the December nights. Therefore, a very limited filling program was used. In the 10–d run a few spectra of the γ Dor stars HD 41814 and HD 75202 (P.I. P. De Cat) were taken at the beginning of the night. In the 5-d run some series of spectra of the bright HADS variable AI Vel were taken at the end of four nights (25, 26, 25, and 28 spectra, respectively; P.I. E. Poretti).

The backup programme (complementary monitoring of SPB and γ Dor stars; P.I. P. De Cat) was not used. We remind that both backup and filling programs have to be submitted by the PI 10 days before the observations and then approved by the ESO staff.

Table 2. Log of the observing runs (December 2010 and January 2011) at ESO with the HARPS@3.6m instrument. The number of spectra and the SNR range (values obtained from the reduced spectra) are indicated for every star on each night. Spectra with low SNR have not been counted.

Night Exp. Time (Default)	HD 41641 V=7.9 1200 sec	HD 43285 V=6.0 300 sec	HD 43338 V=7.6 900 sec	Other CoRoT targets	Seeing
December 22-23	16 [125-215]	8 [164-221]	4 [190-209]	HD 42299, HD42597, HD 50890	$<1''.0$
December 23-24	15 [125-210]	8 [141-230]	4 [151-213]	HD 42299, HD42597, HD 50890, HD 42618	$1''.7$–$2''.0$
December 24-25	16 [136-238]	8 [177-222]	4 [180-238]	HD 42299, HD42597, GSC00144-03031, HD 50870	$<1''.0$
December 25-26	17 [147-214]	9 [184-223]	4 [164-218]	HD 42299, HD42597, HD 43587, HD 50890	$\leq 1''.0$
December 26-27	16 [143-222]	10 [166-240]	4 [165-215]	HD 42299, HD42597, HD 42618, HD 50870	$0''.5$–$1''.8$
December 27-28	16 [151-238]	10 [168-244]	4 [153-224]	HD 42299, HD42597, HD 50870	$0''.8$–$1''.7$
December 28-29	15 [125-226]	7 [167-221]	4 [182-238]	HD 42299, HD42597, HD 50870	$2''.0$
December 29-30	15 [170-215]	7 [176-212]	4 [207-234]	HD 42299, HD42597, GSC00144-03031	$<1''.0$
December 30-31	15 [147-210]	7 [168-245]	3 [147-217]	HD 42299, HD42597, HD 43587, HD 50890, HD50870	$>1''.5$
Dec. 31 - Jan 1	15 [164-220]	7 [157-229]	4 [161-208]	HD 42299, HD42597, GSC00144-03031, HD 50870	$1''.0$
January 7-8	12 [140-193]	6 [144-205]	3 [167-197]	HD 42299, HD42597, HD 50870	$1''.5$–$2''.6$
January 8-9	12 [168-203]	6 [173-204]	4 [178-202]	HD 42299, HD42597	$0''.7$–$1''.9$
January 9-10	14 [133-225]	7 [159-238]	4 [152-228]	HD 42299, HD42597, HD 43587	$1''.4$–$2''.5$
January 10-11	14 [161-212]	8 [174-226]	4 [192-214]	HD 42299, HD42597, HD 42618	$\leq 1''.0$ $<1''.0$
January 11-12	14 [173-217]	6 [185-216]	4 [171-209]	HD 42299, HD42597,	
Total ESO	**222**	**114**	**58**		
Total OHP	**57**	**43**	**45**		
Total MERCATOR				**200 spectra of HD 42597**	

Report on the third run of the ESO LP 185.D-0056 (HARPS@3.6m)

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Seismology Ground-Based Observation Working Group

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EXECUTIVE SUMMARY.

The ESO Large Programme 185.D-0056 (HARPS@3.6m) continued in June and July 2011, with the first radial velocity survey of red giants. The log of the the observations, the problems encountered, some tips in the use of HARPS in the HAM mode, the situation of the publications, and a look to the future are given. The following actions/items are emphasized:

1. the observations were devoted to the red giants in the open cluster NGC 6633 using the HAM configuraton. A few other CoRoT targets belonging to other pointings were observed;
2. the first 10-nights run had excellent weather conditions, with just one night lost; the second 5-nights run was more disturbed, with only 2 good nights;
3. different filling programmes were run at the beginning and end of night.
4. we had no technical problems and in particular the switch between HAM and EGGS worked properly and rapidly.

1. Introduction

The ground–based spectroscopic monitoring of the CoRoT targets continued in June and July 2011. Two sites have been involved: European Southern Observatory (La Silla, Chile; HARPS@3.6m) and Observatoire de Haute Provence (France; SOPHIE@1.9m).

The next HARPS runs are scheduled from December 17, 2011 to 27, 2011 and from January 7 to 12, 2012. Thierry Morel (Liege University) and Monica Rainer (Brera Observatory) will be the observers. No other observations with other instruments are scheduled, the OHP proposal has not been accepted. We will evaluate the possibility to take complementary spectra from the MERCATOR telescope (HERMES instrument; Canary Islands).

2. Status of publications

Table 1 lists the status of the analyses of the spectroscopic timeseries, and the new attributions as well. New entries with respect to the previous report are highlighted in red. After publication of the results in a refereed journal, the reduced spectra have been made available to the community through the ESO archive (ESO rule for Large Programmes).

The current policy about co-autorship is to include the PIs of the Large Programmes (i.e., P. Amado, P. Mathias, E. Poretti), the observers of the specific star and, if the ESO data are used, M. Rainer, who reduced the ESO spectra for the whole team. The contribution of other instruments (HERCULES, FIES, HERMES, NARVAL, FRESCO,...) should be evaluated case by case. Moreover, in the second round of papers at least one of the scientists in the ground-based activities will be included in the first positions, to reward the great and long effort made to support CoRoT photometry with high-resolution spectroscopy.

3. The spectroscopic data of stars observed in June and July 2011

The CoRoT observations ran from April 5 to June 30 (LRc07) and from July 6 to early October 2011 (LRc08) in the Center direction. The asteroseismic targets were the same for both runs, i.e., HD 170053 (K2 III, V=7.3), HD 170031 (K5, V=8.2), HD 170231 (K2, V=8.7), HD 170174 (K2, V=8.3), and HD 170200 (B8, V=5.7). All these stars are in the field of the open cluster NGC 6633.

The fact that four stars out of five are red giants (HD 170053, HD 170031, HD 170231, and HD 170174) imposed a change in the observational strategy with respect to previous runs. The sharp lines of these slow rotators are more suitable for the study of the radial velocity variations than of the line profile ones. Therefore, we used HARPS in the HAM (high resolution) configuration, instead of the EGGS (high efficiency) one. The corresponding increase in the exposure times imposed a limit to the number of targets. After a quick look to the CoRoT N0 photometric data (courtesy from Reza Samadi),

we omitted the less promising target HD 170174 from the continuous monitoring.

We had the same problems in the observations scheduled at OHP. We agreed with P. Mathias to observe HD 170031 and HD 170053 in the high–resolution mode with SOPHIE, since otherwise the OHP time series would be dense enough. We observed HD 170031 and HD 170053 from both sites and we could obtain accurate radial velocity curves. The end of night in OHP coincided with the beginning of night in La Silla and the telescopes could point to the same star for 45 minutes. This allowed us to calculate the exact amount of the systematic difference (a few $\mathrm{m\,s^{-1}}$) between the two spectrographs and consequently to improve the quality of the radial-velocity curves.

A few other CoRoT targets were observed at ESO. They are HD 172046 (upon request from P. De Cat), HD 169392AB (from R. Garcia), and HD 169556 (from G. Verner).

3.1. Saving the log of the night and the RV measurements

At the end of night it is possible to save two log-files, i.e., the log of all spectra (spectra_harps) and the list of the radial velocities measured by the pipeline (rv_harps).

To do it, digit

```
cd /diska/home/harusr
```

in the pipeline computer (whaldrs2). It is advisable to create a subdirectory with your name:

```
mkdir yourname
cd yourname
```

then digit the two commands:

list_spectra_harps yyyy-mm-dd > yyyy-mm-dd_log.vdb

list_rv_harps yyyy-mm-dd > yyyy.mm.dd_rv.vdb

After that, you can ftp the two text files everywhere you like. If you want to see the data of your targets, both raw and reduced, first open a window in the whaldrs2 computer. To do that, in the screen of the HARPS pipeline click with the left button of the mouse outside any window: a small window will then appear; click with the left button of the mouse on `harusr on whaldrs2` and the window of the desired computer will appear. The raw and reduced spectra are in

```
/data/raw/yyyy-mm--dd
/data/reduced/yyyy-mm-dd
```

3.2. The HAM observing blocks

An example of observing block requiring the HAM mode is reported in the Appendix. The Thorium lamp must be put on the second fiber. As in the case of the observation of cold stars in the EGGS mode, Observers are requested to carefully check the value of the `TEL.TARGET.RADVEL` keyword. It must be "−99999". In such a case the HARPS pipeline calculates a very accurate value of the star's radial velocity. Still better, it is recommened to substitute the "−99999" value with the value calculated by the pipeline from the first spectra of the star. We remind that for stars with spectral type earlier than F0, there is no template in the HARPS library and the RV value is not reliable. Often the pipeline crashes. In such a case, but only for hot stars, put "99999" in the `TEL.TARGET.RADVEL` keyword. See also the report of the third run of the LP 182.D-0356.

3.3. Observing cycle

Exposure times have been set to 450 sec for HD 170053 (V=7.3), to 900 sec for HD 170031 (V=8.2), and to 1200 sec for HD 170231 (V=8.7). We achived the goal to get errors not larger than 1 $\mathrm{m\,sec^{-1}}$ (i.e., SNR=150 at 600 nm) on the radial velocity values. To study the line profile variations of HD 170200 (V=5.7) the exposure time was set to 300 sec to get SNR=200 in the blue. All the spectra of these stars were taken in the HAM mode. The exposure times were often modified accordingly to the weather conditions (clouds, poor seeing, ...).

The red giants HD 170053, HD 170031, and HD 170231 were observed in sequence and the observers tried to allocate three spectra per night of HD 170200. As a result, we got 10-11 cycles of the three red giants per night. The other CoRoT targets HD 172046, HD 169566, and HD 169392AB were observed in EGGS mode. This implies that for the first time the observers switched from EGGS to HAM modes during the night. The procedure took 1-2 minutes and worked fine all times but one (15 min lost). As a result, the observers performed 10-11 cycles of the three red giants per (good) night and also completed the survey of other targets as requested.

The calibration star HD 135240 was observed at the beginning of the night both in HAM end EGGS mode to better define the blaze function (HAM exposure time: 300 sec).

3.4. Length of the nights

The observations spanned about 12^h in June and about 11^h30^m in July. At the declination of the CoRoT field (from $+6°$ to $-3°$), the HARPS observations could be performed from -4^h20^m to $+4^h20^m$. At these extreme hour angles the airmass is 2.8, i.e., the critical telescope pointing limit. In the case of the LRc07 pointing ($+6°$), the CoRoT field could be observed for about 8^h in both runs.

3.5. Weather statistics

The observations in the 10-nights run were exceptionally good for the month of June. In the first run we lost 12.25 hours (out of 120) due to bad weather (11.25 hours during the visibility of the CoRoT targets, 1.0 hour during the filling programme).

In the second run we lost three full nights i.e., 34.5 hours (out of 57.5) due to bad weather (24 hours during the visibility of the CoRoT targets, 10.5 hours during the filling programmes).

4. Backup and filling programmes

Other targets have been observed at the beginning and at the end of nights (*filling programme*), strictly following the ESO rules in the submission of these additional targets. We remind that both backup and filling programmes have to be submitted by the PI 10 days before the observations and then approved by the ESO staff. The stars belonging to other accepted proposals are rejected. This occurred for several stars of the backup and filling programmes proposed for the June-July runs.

In addition to HR 6139 (P.I. L. Mantegazza, 5 spectra on 3 nights) and HD 91024 (P.I. C. Aerts, 19 spectra on 9 nights), we observed:

γ Dor and SPB stars (P.I. P. De Cat) – HD 163899 (1 spectrum), HD 91201 (1), HD 73654 (1), HD 112409 (1), HD 155854 (1), HD 224288 (1), HD 138521 (1), HD 133803 (1), HD 85693

Table 1. Targets observed in the framework of the ESO ground–based complementary observations. New entries are in red. The responsibles of the analysis of the spectroscopic data are also listed.

Star	CoRoT run – ESO LP	Investigators Spectroscopic data	Papers
	Published results		
HD 49434	LRa01 - LP 178.D-0361	Uytterhoeven et al. 2008, A&A, 489, 1213	
HD 50747, HD 51106	IR01 - LP 178.D-0361	Dolez et al. 2009, A&A, 506, 159	
HD 50844	IR01 - LP 178.D-0361	Poretti et al. 2009, A&A, 506, 85	
HD 50846	IR01 - LP 178.D-0361	Desmet et al. 2010, MNRAS, 401, 418	
HD 181231	LRc01 - LP 178.D-0361	Neiner et al. 2009, A&A, 506, 143	
HD 180642	LRc01 - LP 178.D-0361	Briquet et al. 2009, A&A, 506, 269	
HD 50209	LRa01 - LP 178.D-0361	Diago et al. 2009, A&A, 506, 125	
HD 49330	LRa01 - LP 178.D-0361	Floquet et al. 2009, A&A, 506, 103	
HD 46149	SRa02 - LP 182.D-0356	Degroote et al. 2010, A&A, 519, A38	
HD 49434 - Paper II	LRa01 - LP 178.D-0361	Chapellier et al. 2010, A&A, 2011, 525, A23	
HD 51756	LRa02 - LP182.D-0356	Papics et al., 2011, A&A, 528, A123	
CoRoT 101155310	LRc01 - LP 182.D-0356	Poretti et al. 2011, A&A, 528, A147	
	Papers in preparation		
HD 181555	LRc01 - LP 178.D-0361	L. Mantegazza	Michel et al.
HD 171586	LRc02 - LP 178.D-0361	T. Luftinger	Luftinger et al.
HD 172189 - Paper III	LRc02 - LP 178.D-0361	S. Martín	Martín et al.
HD 50870	LRa02 - LP 182.D-0356, LP 185.D-0056	L. Mantegazza	Mantegazza et al.
HD 51193	LRa02 - LP 182.D-0356	J. Gutierrez-Soto	
HD 174966	SRc01 - LP 182.D-0356	L. Mantegazza	Garcia-Hernandez et al.
HD 50230	LRa01 - LP 182.D-0356	P. Degroote	Degroote et al.
	Analyses in progress - Line profile variations		
HD 49434 - Paper III	LRa01 - LP 178.D-0361	K. Uytterhoeven	Uytterhoeven et al.
HD 171834	LRc02 - LP 178.D-0361, LP 182.D-0356	K. Uytterhoeven	
HD 51452	LRa02 - LP 182.D-0356	M. Floquet	
HD 174532	SRc02 - LP 182.D-0356	L. Mantegazza	Fox et al.
HD 170580	LRc05 - LP 182.D-0356, LP185.D-0056	A. Thoul	
HD 44195	LRa03 - LP 182.D-0356	E. Poretti	Poretti et al.
HD 43317	LRa03, LRa02 - LP 182.D-0356	P. Papics	
HD 170699	LRc05, LRc06 - LP 185.D-0056	L. Mantegazza	
HD 170973	LRc05, LRc06 - LP 185.D-0056	Th. Luftinger	
HD 170783	LRc05, LRc06 - LP 185.D-0056	M. Briquet	
HD 171219	LRc05 - LP 185.D-0056	C. Neiner	
HD 41641	LRa05 - LP 185.D-0056	L. Mantegazza	
HD 43285	LRa04 - LP 185.D-0056	C. Neiner	
HD 43338	LRa04 - LP 185.D-0056	Ph. Mathias	
HD 42597	LRa05 - LP 185.D-0056	P. Degroote	
HD 170031, HD 170231	LRc07, LRc08 - LP 185.D-0056	T. Morel, E. Poretti (RV)	
HD170053	LRc07, LRc08 - LP 185.D-0056	T. Morel, E. Poretti (RV)	
HD 170200	LRc07, LRc08 - LP 185.D-0056	P. Degroote	
	Analyses in progress - Binarity and/or physical parameters		
HD 51844, HD 49310	LRa02, SRa01 - LP 182.D-0356	M. Hareter	
Red giants	All LPs, not still observed by CoRoT	T. Morel	
GSC00144-03031	LRa04 - LP 185.D-0056	E. Poretti	Poretti et al.
HD 50890	IRa01 - LP 185.D-0056	Th. Morel	Barban et al.
HD 49566	SRa01 - LP 185.D-0056	Th. Morel	Hekker et al.
HD 43587	LRa03 - LP 185.D-0056	P. Boumier	Boumier et al.
HD 42299	LRa04 - LP 185.D-0056		
HD 42787	LRa04 - LP 185.D-0056	H. Bruntt	
HD 42089	LRa05 - LP 185.D-0056	H. Bruntt	
HD 42618	LRa04, LRa05 - LP 185.D-0056	M. Hall	I. Roxburgh et al.
HD 170174	LRc07, LRc08 - LP 185.D-0056	T. Morel	
HD 172046	LRc02 - LP 185.D-0056	P. De Cat	
HD 169392AB	LRc03 - LP 185.D-0056	H. Bruntt	Garcia et al.
HD 169556	LRc03 - LP 185.D-0056	H. Bruntt	Verner et al.

Table 3. General description of the nights

Night	Seeing DIMM	Lost time Bad weather	Lost time Technical Reasons	Notes
June 23-24	0.″5–1.″0			
June 24-25	0.″5–1.″2			
June 25-26	0.″7–1.″5			Thin clouds
June 26-27	0.″5–1.″5			
June 27-28	$\sim$1.″2			Simultaneous observations with OHP
June 28-29	$< 0.''8$			
June 29-30	0.″4–0.″8		15^{min}	EGGS-HAM switch
June 30-July 1	$\sim$0.″9	5^h30^{min}		Clouds first part of night
July 1-2	$\sim$1.″0			
July 2-3	1.″5–2.″5	6^h45^{min}		Strong wind
July 15-16		12^h30^{min}		Wind, rain
July 16-17		12^h30^{min}		Snow, ice
July 17-18	2.″0			
July 18-19		12^h30^{min}		Clouds
July 19-20	1.″0		20^{min}	Pipeline stall

Table 2. Number of spectra collected in the OHP and ESO runs from May to July 2011

		10-n run	5-n run	Total
ESO observations LRc07 and LRc08				
HD	170031	92	19	111
HD	170231	81	19	100
HD	170053	84	18	102
HD	170174	1	–	1
HD	170200	26	5	31
ESO observations other runs				
HD	172046	4	1	1
HD	169392A	1	–	1
HD	169392B	1	–	1
HD	169556	–	1	1
OHP observations				
HD	170031			76
HD	170053			175

(1), HD 90872 (1), HD 113357 (1), HD 79416 (1), HD 149989 (1), HD 110606 (1), HD 126516 (1), HD 152565 (1), HD 86659 (1), and HD 188032 (2 spectra).

B-A-F stars (P.I. M. Hareter) – EE Cha (2 spectra), EF Cha (2), HD 144277 (4), υ Sco (3), μ^1 Sco (3), ζ^1 Sco (3). Moreover, 13 additional spectra of HD 144277 were taken on the night July 2-3, when the strong wind hampered the pointing in the direction of the CoRoT field.

δ Sct stars (P.I. E. Poretti) - Gravity darkening effect: 35 spectra of WZ Scl and 38 spectra of ρ Pav at end of 9 nights of the first run (all except the first). $v \sin i$ determinations: 1 spectrum of 32 stars at end of two nights of the second run.

5. Appendix

Here we list the Observing Block of HD 170031 as saved from the P2PP software. The HAM configuration with the science fiber only is defined by the `ACQUISITION.TEMPLATE.NAME` keyword. Consecutive exposures can be taken changing the `SEQ.NEXPO` keyword. For other objects, the lines `name, ra, dec, TARGET.NAME, DET1.WIN1.UIT1` must be changed. Note that the exposure time is in the `DET1.WIN1.UIT1` keyword.

```
IMPEX.VERSION "2.0"
type                    "O"
STTimeIntervals         ""
calibrationReq          ""
InstrumentComments      ""
userComments            "HD170031 K5 V=8.19"
userPriority            "1"
LineNumber              "0"
name                    "A0-HD170031-HAM"


comments                ""
objectClass             " Unknown            "
ra                      " 18:27:07.390"
dec                     " 06:04:11.413"
epoch                   "2000.0"
equinox                 "2000"
propDec                 "0.000000"
propRA                  "0.000000"
diffRA                  "0.000000"
diffDec                 "0.000000"
LineNumber              "0"
TARGET.NAME             "HD170031"


air_mass                        "5.0"
fractional_lunar_illumination "1.0"
```

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sky_transparency               "Photometric"
moon_angular_distance          "30"
seeing                         "2.0"
StrehlRatio                    "0.0"
CONSTRAINT.SET.NAME            "No Name"


longDescription               ""
IPVersion                     "150.28"
instrument                    "HARPS"
LineNumber                    "0"
OBSERVATION.DESCRIPTION.NAME "HD170031"


ACQUISITION.TEMPLATE.NAME "HARPS_ech_acq_thosimult"
TEL.TARG.RADVEL          "-99999"
INS.OPTI6.NAME           "THAR2"
DPR.TYPE                 "STAR,WAVE,K5"



TEMPLATE.NAME "HARPS_ech_obs_all"
DET1.READ.SPEED   "416kHz,1,high"
DET1.WIN1.UIT1    "900"
SEQ.NEXPO         "1"
DPR.CATG          "SCIENCE"
```

Report on the fourth run of the ESO LP 185.D-0056 (HARPS@3.6m)

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Seismology Ground-Based Observation Working Group

June 7, 2012; Version 1.0

EXECUTIVE SUMMARY.

The ESO Large Programme 185.D-0056 (HARPS@3.6m) continued with the fourth run. The log of the observations performed in December 2011 and January 2012, a tip on the preparation of the Observing Blocks, the data backup, and the situation of the publications are given. The following actions/items are emphasized:

1. The monitoring of the CoRoT targets related to the SRa04, SRa05, and LRa06 runs was successful, although for the first time we had some bad weather during December observations;
2. Long timeseries are available for LPV analysis on the early B-stars HD 45418 and HD 45546, on the B9-star HD 45975, and on the subgiant HD 45398. Other CoRoT stars have been observed less frequently, but always as requested by the respective PIs;
3. The spectra have been fully reduced and distributed to the respective PIs;
4. No other spectroscopic campaign was performed with another instrument.

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1. Introduction

The ground–based spectroscopic monitoring of the CoRoT targets continued involving the European Southern Observatory (La Silla, Chile; HARPS@3.6m) only. The proposal submitted to use SOPHIE@1.9m at OHP was not accepted. Additional spectra on some targets will be taken at the HERMES@MERCATOR instrument (Canary Islands) at end of 2012.

As in the previous cases, the goals of this eleventh (the seventh of the HARPS series) internal report are to circulate useful information about the ESO observations within the team and to keep the record of the observations. The next HARPS runs are scheduled from June 24 to July 5, 2012 and from July 23 to 28, 2011. Ennio Poretti (INAF-OA Brera) and Juan Carlos Suarez (IAA Granada) will be the observers.

2. The ESO observations

Thierry Morel (Université de Liege) was the observer for the first 10-nights run (December 17-27, 2011), Monica Rainer and Francesco Borsa (INAF-OA Brera) for the second 5-nights run (January 7-12, 2012).

The HARPS observations were related to the SRa04 (September 30-November 28, 2011), SRa05 (November 29, 2011-January 9, 2012), and LRa06 (January 10-March 29, 2012) runs. The CoRoT targets were:

- SRa04: HD 45975, HD 45418, HD 45398, HD 45546, and HD 45517. All these stars are located in the open cluster NGC 2264;
- SRa05: HD 48784, HD 49429, HD 48977, HD 48752, and HD 49566;
- LRa06: HD 49933, HD 50230, HD 49385, HD 49585, and HD 49608.

The stars of primary interest for studying line profile variations were HD 45975 (late B-type star with chemical peculiarities), HD 49585 (Be star), HD 45418 and HD 45546 (early B-type stars). Moreover, the Be star HD 43913 (monitored by CoRoT in the LRa03) was also observed. The K0 subgiant HD 45398 was intensively monitored to study the radial velocity variations associated to solar-like oscillations. All the other targets were observed at least once to provide a very high SNR HARPS spectrum.

The observing sequence was

```
HD 45975 - HD 45418 - HD 45546 - HD 45398 - slot - ...
```

The Be stars HD 49585 and HD 43913 were put in the slot once or twice per night, the other stars at least once in the whole observing run. Moreover, 3 spectra of V588 Mon and V589 Mon were taken. These pre-main sequence δ Sct stars were not observed by CoRoT in the Exofield, but they were observed with MOST. A few spectra of HD 50870 were also taken to verify the binarity of this δ Sct star. Table 1 reports the logs of both runs. As usual, the exposure times were

modified by the observer accordingly to the weather conditions (clouds, poor seeing, ...).

The SNRs listed in Table 1 are those estimated by the HARPS pipeline at 5500 Å. The smallest SNR values are those of the spectra at the greatest airmasses.

The setup of the HARPS instrument is summarized in the Appendix of the first report of the LP182.D-0356 (Poretti et al., March 2009). We just remind that we are currently using HARPS both in the HAM (high–resolution, R=115,000) and in the EGGS mode (high–efficiency, R=80,000). Calibrations must be run in both modes during daytime. Do not take care of a message error during the EGGS calibrations. It is due to the fact that one optical fiber is damaged.

As a tip for future observers, the value in the "Target Radial Velocity" keyword has to be set with particular care. It must be set to "99999" for hot stars, so that the pipeline will not calculate the radial velocity value (it crashes due to the too few lines). It must be set to "-99999" for cool stars. Note that decimal figures are not admitted anymore.

2.1. Saving the log of the night and the RV measurements

At the end of night it is mandatory to save two log-files, i.e., the log of all spectra (spectra_harps) and the list of the radial velocities measured by the pipeline (rv_harps).
To do it, digit

```
cd /diska/home/harusr
```

in the pipeline computer (whaldrs2). It is advisable to create a subdirectory with your name:

```
mkdir yourname
cd yourname
```

then digit the two commands:

list_spectra_harps /data/reduced/yyyy-mm-dd > yyyy-mm-dd_log.vdb

list_rv_harps /data/reduced/yyyy-mm-dd > yyyy.mm.dd_rv.vdb

After that, you can ftp or copy the two text files everywhere you like.

2.2. Saving the data

Following the new ESO procedures about the backup and storage of the data, it is also mandatory to save the raw and reduced spectra. To do so, open a window in the whaldrs2 computer, by clicking with the left button of the mouse outside any window in the screen of the HARPS pipeline: a small window will then appear. Click with the left button of the mouse on `harusr on whaldrs2` and the window of the desired computer will appear. The raw and reduced spectra are in

```
/data/raw/yyyy-mm-dd
/data/reduced/yyyy-mm-dd
```

Copy them on your directory (see above) and then ftp on your own computer. You can also ask to the daytime telescope operator to plug your hard disk directly to the computer and automatically download the raw and reduced spectra after the end of every night. In this case, you should take care of the following advices:

– your hard disk should be formatted as ext2;

– be careful to check that alla the data have been transferred before leaving La Silla. Because of new policy the data are kept on the LaSilla computer only for a short time before being cancelled.

2.3. Length of the nights

The nights were about 8^h30^m long. At the declination value of the CoRoT fields ($-4°$), the HARPS observations could be performed from -4^h15^m to $+4^h15^m$. At these extreme hour angles the airmass is 2.8, i.e., the critical telescope pointing limit. HD 34816 was observed at the beginning of the night (both in HAM and EGGS modes) to better define the blaze function (exposure times 200 and 100 sec, respectively, giving a SNR around 300).

The night of 19-20 December started at UT 00^h40^m≡ST 01^h45^m and ended at UT 08^h50^m≡ST 09^h57^m. The night of January 8-9 started at UT 00^h32^m≡ST 02^h57^m and ended at UT 09^h03^m≡ST 11^h29^m.

2.4. Weather statistics and technical problems

For the first time we had some bad weather in the December run. One night was fully lost (23-24 December), two half nights were partially lost (24-25 and 26-27 December). We also had some tecnical problems (HAM guide) on the nights of 17-18 and 21-22 December). In the second run we lost 1^h10^m for bad weather on the night of 9-10 January and still guiding problems on the nights of 10-11 (10^m) and 11-12 (20^m) January. Therefore, we could use the 74% of the awarded time.

3. Backup and filling programs

Sunsets and sunrises bracketed almost perfectly the CoRoT observations in the December nights. Therefore, a very limited filling program was used. A few spectra (EGGS mode) of δ Sct stars RX Cae, V435 Car, AA Col, EQ Eri, HV Eri, XZ Men, AK Men, V1247 Ori, V1359 Ori, YY Pic, UZ Ret, and TX Ret (P.I. E. Poretti) were taken at the beginning of the nights of the 10–d run. In the 5-d run some series of spectra (HAM mode) of the bright (V=4.66) subgiant HD 110014 were taken at the end of four nights (16, 19, 18, 21, and 24 spectra, respectively).

The backup programme (intensive monitoring of SX Phe and AI Vel) was not used. We remind that both backup and filling programs have to be submitted by the PI 10 days before the observations and then approved by the ESO staff.

4. Status of publications

Table 2 list the papers based on spectroscopic observations of the CoRoT targets. New papers with respect to the previous report are highlighted in red. After publication of the results in a refereed journal, the reduced spectra have been made available to the community through the ESO archive (ESO rule for Large Programmes). Table 3 lists the stars observed in our Large Programmes, the status of the analyses of the spectroscopic timeseries, and the new attributions as well.

The current policy about co-autorship is to include the PIs of the Large Programmes (i.e., P. Amado, P. Mathias, E. Poretti), the observers of the specific star and, if the ESO data are used, M. Rainer, who reduced the ESO spectra for the whole team. The contribution of other instruments (HERCULES, FIES, HERMES, NARVAL, FRESCO,...) should be evaluated case by case. I suggest that in the second round of papers at least one of the scientists in the ground-based activities will be included in the first positions, to reward the great

Table 1. Log of the observing runs (December 2011 and January 2012) at ESO with the HARPS@3.6m instrument. The number of spectra and the SNR range (values obtained from the pipeline at the telescope) are indicated for every star on each night. Spectra with low SNR have not been counted.

Night Exp. Time (Default)	HD 45975 V=7.5 900 sec	HD 45418 V=6.5 400 sec	HD 45546 V=5.0 100 sec	HD 45398 V=6.9 400 sec HAM	Be stars	Other CoRoT targets	Seeing
December 17-18	6 [240-311]	6 [261-321]	6 [240-300]	6 [160-207]	HD43913: 1 HD49585: 1	V589 Mon, HD50870, HD50230, HD 45517, HD48784, HD49429, HD48977	$0\farcs5 - 1\farcs0$
December 18-19	8 [240-314]	8 [273-363]	9 [252-363]	8 [144-202]	HD43913: 1 HD49585: 1	V588 Mon	$0\farcs5 - 0\farcs8$
December 19-20	8 [271-342]	10 [273-334]	11 [276-322]	8 [151-187]	HD43913: 2 HD49585: 1	HD49566	$0\farcs5 - 0\farcs6$
December 20-21	8 [249-302]	10 [261-322]	11 [258-321]	9 [141-200]	HD43913: 2 HD45985: 1	HD48752	$0\farcs6 - 0\farcs8$
December 21-22	7 [205-280]	9 [226-310]	11 [168-304]	8 [127-167]	HD43913: 1 HD45985: 1	HD49385	$0\farcs8 - 1\farcs2$
December 22-23	7 [157-306]	9 [206-340]	10 [144-351]	9 [57-204]	HD43913: 2 HD45985: 2		$0\farcs6 - 1\farcs5$
December 23-24				Clouds			
December 24-25	2 [249-286]	4 [263-413]	5 [125-278]	4 [106-163]	HD43913: 0 HD45985: 0	HD50870	$0\farcs7 - 1\farcs3$
December 25-26	6 [230-303]	8 [226-296]	10 [164-295]	8 [121-209]	HD43913: 1 HD45985: 1	V588 Mon, V589 Mon	$0\farcs8 - 1\farcs0$
December 26-27	2 [230-297]	7 [287-317]	7 [237-366]	5 [128-196]	HD43913: 1 HD45985: 1	HD49608	$0\farcs7 - 0\farcs9$
January 7-8	4 [240-270]	14 [220-290]	14 [200-310]	12 [125-160]	HD 43913: 2 HD45985: 2	V589 Mon	$< 1\farcs0$
January 8-9	5 [190-255]	12 [180-250]	12 [140-265]	8 [125-180]	HD 43913: 2 HD45985: 1		$0\farcs7 - 0\farcs9$
January 9-10	7 [210-270]	8 [225-290]	8 [215-270]	7 [115-187]	HD 43913: 1 HD45985: 1	HD 50230	$0\farcs7 - 0\farcs9$
January 10-11	5 [260-280]	11 [250-280]	11 [230-260]	11 [150-180]	HD 43913: 2 HD45985: 2	V588 Mon, RR17	$0\farcs7 - 0\farcs9$
January 11-12	–	20 [245-275]	16 [230-275]	1 [114]	HD 43913: 2 HD45985: 2	HD 50870, RR17	$0\farcs6 - 1\farcs6$
Total ESO	**75**	**136**	**141**	**104**			

and long effort made to support CoRoT photometry with high-resolution spectroscopy.

Table 2. Papers based on the ground–based complementary observations. New entries are in red.

Star	CoRoT run – ESO LP	Papers
HD 49434	LRa01 - LP 178.D-0361	Uytterhoeven et al. 2008, A&A, 489, 1213
HD 50747, HD 51106	IR01 - LP 178.D-0361	Dolez et al. 2009, A&A, 506, 159
HD 50844	IR01 - LP 178.D-0361	Poretti et al. 2009, A&A, 506, 85
HD 50846	IR01 - LP 178.D-0361	Desmet et al. 2010, MNRAS, 401, 418
HD 181231	LRc01 - LP 178.D-0361	Neiner et al. 2009, A&A, 506, 143
HD 180642	LRc01 - LP 178.D-0361	Briquet et al. 2009, A&A, 506, 269
HD 50209	LRa01 - LP 178.D-0361	Diago et al. 2009, A&A, 506, 125
HD 49330	LRa01 - LP 178.D-0361	Floquet et al. 2009, A&A, 506, 103
HD 46149	SRa02 - LP 182.D-0356	Degroote et al. 2010, A&A, 519, A38
HD 49434 - Paper II	LRa01 - LP 178.D-0361	Chapellier et al. 2010, A&A, 2011, 525, A23
HD 51756	LRa02 - LP182.D-0356	Papics et al., 2011, A&A, 528, A123
CoRoT 101155310	LRc01 - LP 182.D-0356	Poretti et al. 2011, A&A, 528, A147
HD 50870	LRa02 - LP 182.D-0356, LP 185.D-0056	Mantegazza et al. 2012, A&A, 542, A24
HD 43317	LRa03, LRa02 - LP 182.D-0356	Papics et al. 2012, A&A, in press
HD 50230	LRa01 - LP 182.D-0356	Degroote et al. 2012, A&A, in press

Table 3. Targets observed in the framework of the ESO ground–based complementary observations. New entries are in red. The responsibles of the analysis of the spectroscopic data are also listed.

Star	CoRoT run – ESO LP	Investigators Spectroscopic data	Papers
	Papers in preparation		
HD 169392AB	LRc03 - LP 185.D-0056	H. Bruntt	Mathur et al.
HD 51452	LRa02 - LP 182.D-0356	M. Floquet	Neiner et al.
HD 181555	LRc01 - LP 178.D-0361		Michel et al.
HD 171586	LRc02 - LP 178.D-0361	T. Luftinger	Luftinger et al.
HD 172189 - Paper III	LRc02 - LP 178.D-0361	S. Martín	Martín et al.
HD 51193	LRa02 - LP 182.D-0356	J. Gutierrez-Soto	
HD 174966	SRc01 - LP 182.D-0356		Garcia-Hernandez et al.
	Analyses in progress - Line profile variations		
HD 49434 - Paper III	LRa01 - LP 178.D-0361	K. Uytterhoeven	Uytterhoeven et al.
HD 171834	LRc02 - LP 178.D-0361, LP 182.D-0356	K. Uytterhoeven	
HD 174532	SRc02 - LP 182.D-0356		Fox et al.
HD 170580	LRc05 - LP 182.D-0356, LP185.D-0056	A. Thoul	
HD 44195	LRa03 - LP 182.D-0356	E. Poretti	Poretti et al.
HD 170699	LRc05, LRc06 - LP 185.D-0056		
HD 170973	LRc05, LRc06 - LP 185.D-0056	Th. Luftinger	
HD 170783	LRc05, LRc06 - LP 185.D-0056	M. Briquet	
HD 171219	LRc05 - LP 185.D-0056	Janot-Pacheco et al.	
HD 41641	LRa05 - LP 185.D-0056		
HD 43285	LRa04 - LP 185.D-0056	E. Alecian	
HD 43338	LRa04 - LP 185.D-0056	Ph. Mathias	
HD 42597	LRa05 - LP 185.D-0056	P. Degroote	
HD 170031, HD 170231	LRc07, LRc08 - LP 185.D-0056	T. Morel, E. Poretti (RV)	
HD170053	LRc07, LRc08 - LP 185.D-0056	T. Morel, E. Poretti (RV)	
HD 170200	LRc07, LRc08 - LP 185.D-0056	P. Degroote	
HD 45975	SRa04 - LP 185.D-0056	T. Morel	Alecian et al.
HD 45418	SRa04 - LP 185.D-0056	M. Briquet	
HD 45546	SRa04 - LP 185.D-0056	J. Telting	
HD 45398	SRa04 - LP 185.D-0056	E. Poretti (RV)	
HD 43913	LRa03 - LP 185.D-0056	C. Neiner	Neiner et al.
HD 49585	LRa06 - LP 185.D-0056	C. Neiner	Neiner et al.
	Analyses in progress - Binarity and/or physical parameters		
HD 51844, HD 49310	LRa02, SRa01 - LP 182.D-0356	M. Hareter	
Red giants	All LPs, not still observed by CoRoT	T. Morel	
GSC00144-03031	LRa04 - LP 185.D-0056	E. Poretti	Poretti et al.
HD 50890	IRa01 - LP 185.D-0056	Th. Morel	Barban et al.
HD 49566	SRa01 - LP 185.D-0056	Th. Morel	Hekker et al.
HD 43587	LRa03 - LP 185.D-0056	P. Boumier	Boumier et al.
HD 42299	LRa04 - LP 185.D-0056		
HD 42787	LRa04 - LP 185.D-0056	H. Bruntt	
HD 42089	LRa05 - LP 185.D-0056	H. Bruntt	
HD 42618	LRa04, LRa05 - LP 185.D-0056		Barban et al.
HD 170174	LRc07, LRc08 - LP 185.D-0056	T. Morel	
HD 172046	LRc02 - LP 185.D-0056	P. De Cat	
HD 169556	LRc03 - LP 185.D-0056	H. Bruntt	Verner et al.
V588 Mon, V589 Mon	SRa04 - LP 185.D-0056	K. Zwintz	Zwintz et al.
HD 45517	SRa04 - LP 185.D-0056		
HD 48752	SRa05 - LP 185.D-0056	P. De Cat	
HD 48977	SRa05 - LP 185.D-0056	A. Thoul	

Report on the last two runs of the ESO LP 185.D-0056 (HARPS@3.6m)

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Seismology Ground-Based Observation Working Group

September 10, 2013; Version 1.0

EXECUTIVE SUMMARY.

The ESO Large Programme 185.D-0056 (HARPS@3.6m) has finished in January 2013, a few months after the CoRoT fatal malfunction. We report here on the observations performed in June-July 2012 and December 2012-January 2013.

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1. Introduction

The ground–based spectroscopic monitoring of the CoRoT targets continued in June and July 2012 and finished in January 2013. Only European Southern Observatory (La Silla, Chile; HARPS@3.6m) has been involved in the observations.

2. The ESO observations in June-July 2012

Ennio Poretti (INAF-OA Brera) was the observer for the first 10-nights run (June 24-July 5, 2011; the 28-29 June night belongs to another LP), Juan Carlos Suarez (IAA Granada) for the second 5-nights run (July 23-28, 2012). The HARPS observations were related to the LRc09 (April 10-July 5, 2012) and LRc10 (July-September 2012) runs. The CoRoT targets were:

- *LRc09:* HD 179079 (solar-like star, 7.96, G5), HD 178484 (red giant, 6.56, K0), HD 178169 (8.43, A3), HD 179192 (8.31, B8), and HD 178243 (8.71, A0);
- *LRc10:* HD 169689 (eclipsing red giant, 5.65, G8III+B), HD 169822 (solar-like, 7.78, G7), HD 170133 (δ Sct, 8.5, A2), HD 170270 (K5 giant, 7.4), and V585 Oph (semiregular variable, M6, V >8.8).

The primary targets of the CoRoT observations were the planet-hosting, solar-like star HD 179079, observed to detect the reflected light, if any, and the eclipsing binary HD 169689. At least one spectrum was taken for any of the other targets (Table 1). Two other CoRoT targets were observed. They are HD 170200 (LRc07+LRc08, upon request from C. Aerts and P. Degroote) and HD 172046 (LRc02, from P. De Cat). The calibration star HD 135240 was observed both in HAM end EGGS mode at the beginning of the night to better define the blaze function.

Several filling/backup programs were also used, since pointing restrictions occurred several times. In addition to HD 91024 (P.I. C. Aerts, 2+5=7 spectra on 7 nights), 18 Sco (230 spectra on 7 nights in the 10-n run, agreed extension of a campaign chaired by M. Bazot), and GJ570B (15 spectra on the July 27 night, P.I. P. Amado), we observed:

SPB stars (P.I. P. De Cat) – HD 163899 (2 spectra on the first night) and HD 172910 (1 spectrum on the first night).

δ Sct stars (P.I. E. Poretti) – *June 24*: HZ Vel, NT Hya, MP Vel, MT Vel, V344 Vel, V527 Car, V743 Cen, and V388 Pav (first spectrum). *June 25*: AK Ant and V668 CrA. *June 26*: V336 Vel and HD 1015513. *June 27*: RX Sex, IW Vel, V947 Cen, V954 Cen, V950 Cen (first spectrum), and HD 104036. *June 29*: AZ Ant. *June 30*: V353 Vel and SU Crt. *July 1*: VY Crt, HD 120500, MX Vir, and V388 Pav (second spectrum). *July 2*: HD 129231, V853 Cen (2 spectra), IO Lup, BT Cir, and IN Lup. *July 4*: V950 Cen (second spectrum) and MP Hya. *July 24*: V922 Sco. All the above stars were observed in the EGGS mode. The slow rotators HD 184552 (4+11=15 spectra on 7 nights), HD 16189 (6+19=25 spectra on 8 nights) were observed more intensively in HAM mode.

WASP stars (P.I. A. Triaud) – A few stars were observed on an exchange basis with the ESO LP 089.C-0151, as agreed with ESO. They are: WASP-69≡SW2100-0505 (2 spectra on June 24), WASP-70≡SW2101-1325 (1 spectrum on June 25, 1 on June 26, 1 on June 29, 1 on June 30, 1 on July 1), WASP-8≡SW2359-3501 (1 spectrum on June 29, 1 on June 30), and WASP-53≡SW0207-2039 (1 spectrum on June 29, 1 on June 30).

3. The ESO observations in December 2012 and January 2013

The last HARPS runs of the ESO LP185.D-0056 were scheduled from December 10, to 20, 2012 and from December 31, 2012 to January 5, 2013. Valentina Schmid (Leuven University) and Marco Scardia (Brera Observatory) were the observers. The first three hours of the 19-20 Dec night were lost for high

Table 1. Number of spectra collected in the ESO runs in June and July 2012

			LRc09 and LRc10 targets		
		Mode	10-n run	5-n run	Total
HD	179079	HAM	259	2	261
HD	178484	HAM	93	53	146
HD	169689	HAM	107	48	155
HD	178169	EGGS	23	4	27
HD	170133	EGGS	27	6	33
HD	179192	EGGS	1	–	1
HD	169822	HAM	–	115	115
HD	170270	HAM	–	1	1
HD	178243	EGGS	1	–	1
V585 Oph		EGGS	–	1	1
			Targets other runs		
HD	170200	HAM	8	2	10
HD	172046	HAM	9	2	11

umidity. The last three hours of the January 1-2 night lost for a techical failure of the telescope (oil pump).

The stars observed with CoRoT in the LRa09 pointing are HD 46375 (V=7.84, solar-like star with non-transiting planet; Gaulme et al. 2010, A&A 518, L153), HD 46202 (V=8.20, β Cep-like star; Briquet et al. 2011, A&A 527, A112), HD 46149 (V=7.59, $P_{rot} \sim 11$ d; Degroote et al. 2010, A&A 519, A38), HD 46150 (V=6.75; Blomme et al. 2011, A&A 533, A4), and HD 46223 (V=7.32; ibidem). All these stars were already observed in the SRa02 (Oct. 8-Nov. 11, 2008) and the quoted references give details about the analysis of the photometric data. However, only HD 46149 was previously observed in the HARPS spectroscopic programme.

The LRa09 stars were selected for the programme of this run and HD 46375 was considered as main target. We also added HD 46769 (V=5.79, observed in the LRa03, March 2010) and HD 45975 (V=7.46, observed in the SRa04, January 2012). The monitoring of these stars was very satisfactory (Table 2). We also planned to follow HD 43913 (V=7.86, observed in LRa03), but we were forced to put it aside since it was too much time consuming. The LRa09 started on early October 2012 and actually lasts one month only, since CoRoT stopped the observations in early November due to the second, fatal failure of the electronic chains.

The calibration star HD 34816 was observed both in HAM end EGGS mode at the beginning of the night to better define the blaze function. A limited filling programme was performed and restricted to HD 16031 (V=9.85, HAM mode, PI S. Desidera; 9+5=14 spectra), HD 290327 (V=8.94, HAM mode, PI S. Desidera; 7+0=7 spectra), HD 16189 (V=7.00, EGGS mode, PI N. Nardetto; 43+0=43 spectra), and HD 67523 (V=2.81, HAM mode, PI N. Nardetto; 0+356=356 spectra).

Table 2. Number of spectra collected in the last ESO runs in December 2012 and January 2013

			LRa09 targets		
		Mode	10-n run	5-n run	Total
HD	46375	HAM	777	383	1160
HD	46202	EGGS	41	16	57
HD	46149	EGGS	26	9	35
HD	46150	EGGS	20	9	29
HD	46223	EGGS	20	8	28
			Targets other runs		
HD	46769	HAM	46	16	62
HD	45975	EGGS	1	1	2