Fundación Galileo Galilei - INAF
Telescopio Nazionale Galileo
28°45'14.4"N 17°53'20.6"W 2387.2m A.S.L.

Science with high-resolution spectrographs at Telescopio Nazionale Galileo

Ennio Poretti

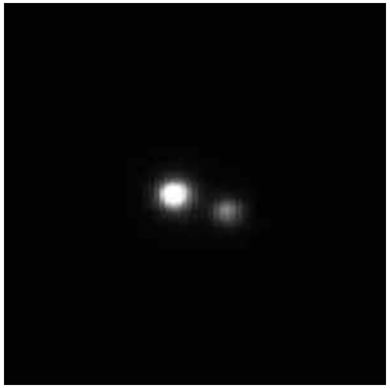
TNG Director

La Palma (Canary Islands, Spain)

Area: 2 kmq

Altitude: 2.396 m

Daniel López



Instrument	Date
TNG	June, 9^{th} 1998
OIG	Dec, 10^{th} 1998
ARNICA	Dec, 18^{th} 1998
AdOpt	Dec, 18^{th} 1998
DOLORES	May, 20^{th} 2000
SARG	June, 9^{th} 2000
NICS	September, 17^{th} 2000
HARPS-N	March, 21^{st} 2012
GIANO	July, 27^{th} 2012
GIANO-B	Oct, 27^{th} 2016
GIARPS	March, 14^{th} 2017

M1 diameter	3.58m
Focal length	38.5m (f/11)
M2 diameter	0.875m
M2 baffle diam.	1.165m
Scale	5.36arcsec/mm
Vignetting-free field	25arcmin diameter

Harps-N

Milestone	Date
Kick Off	September 1st, 2010
Start of integration	October 1st, 2011
Acceptance Geneva	January 1st, 2012
Commissioning	March/April 2012
Inauguration	April 23rd, 2012
Start of operations	May 1st, 2012
Open time	August 1st, 2012

Spectrograph type	Fiber fed, cross-disperser echelle spectrograph
Spectral resolution	R= 115'000
Fiber field	FOV = 1"
Wavelength range	383 nm - 690 nm
Total efficiency	e = 8 % @ 550 nm (incl. telescope and atmosphere @ 0.8" seeing)
Sampling	s = 3.3 px per FWHM
Calibration	ThAr + Simultaneous reference (fed by 2 fibers)
CCD	Back illuminated CCD 4k4 E2V chips (graded coating)
Pixel size	15 µm
Environment	Vacuum operation - 0.001 K temperature stability

The birth of the Italian Exoplanetary Science: the GAPS collaboration

Global Architecture of Planetary Systems

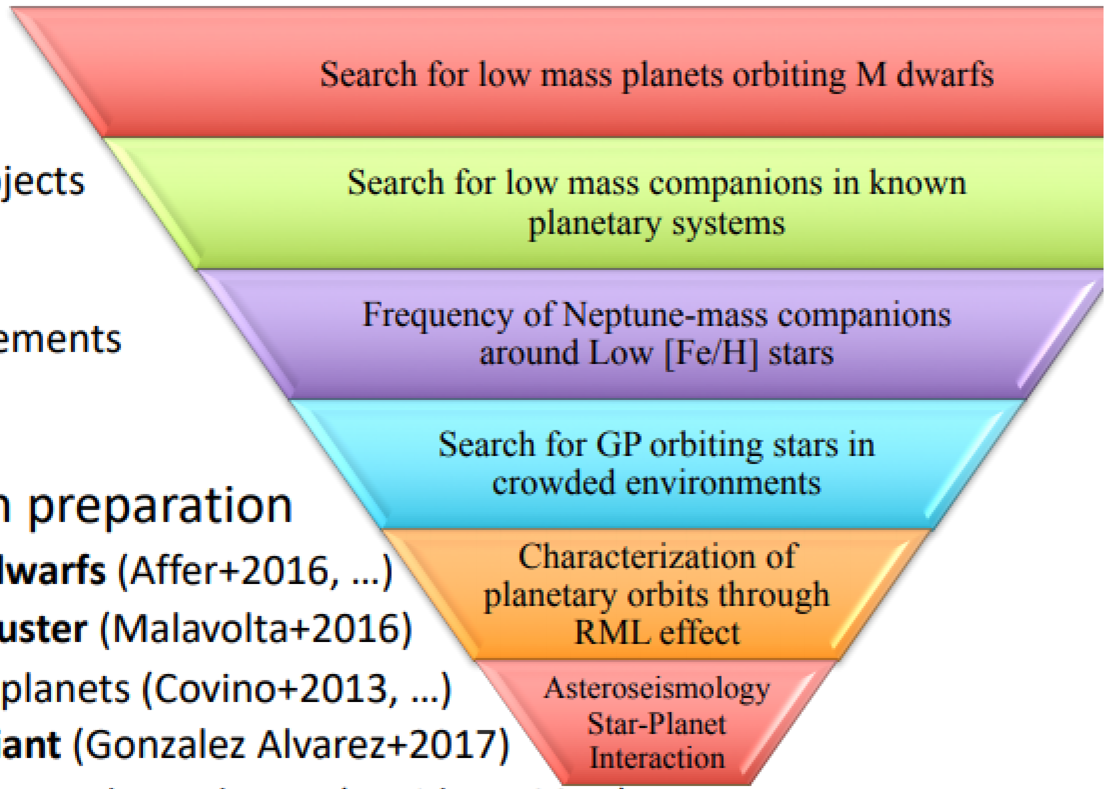
GAPS:

- 30 to 40 nights/semester from AOT32
- Nearly 8000 spectra for more than 300 objects

- 78 INAF/associates + 19 foreigners
- Regular meetings to keep track of advancements
- Strong involvement of young researchers

25 refereed papers + submitted / in preparation

- Detection of low-mass planets around **M dwarfs** (Affer+2016, …)
- The first multi-planet system in an **open cluster** (Malavolta+2016)
- **Rossiter-McLaughlin** for a large sample of planets (Covino+2013, …)
- Detection of a giant planet around a **red giant** (Gonzalez Alvarez+2017)
- The first wide binary in which both components host planets (Desidera+2014)
- Giant **planet migration** history via improved parameters for 231 planets (Bonomo+2017)

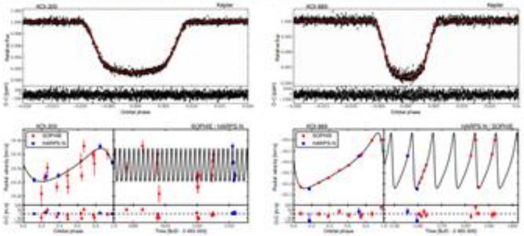


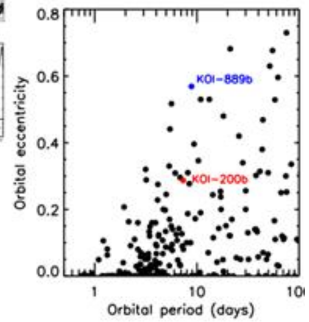
A&A 554, A114 (2013)
DOI: 10.1051/0004-6361/201321394

Astronomy & Astrophysics

KOI-200 b and KOI-889 b: Two transiting exoplanets detected and characterized with *Kepler*, SOPHIE, and HARPS-N

G. Hébrard[1,2], J.-M. Almenara[3], A. Santerne[3,4], M. Deleuil[3], C. Damiani[3], A. S. Bonomo[3,5], F. Bouchy[3], G. Bruno[3], R. F. Díaz[3], G. Montagnier[1,2], and C. Moutou[3]





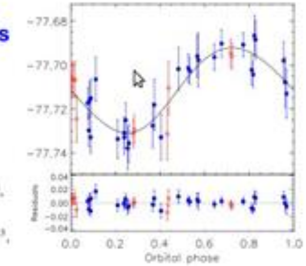
A&A 572, A2 (2014)
DOI: 10.1051/0004-6361/201424617

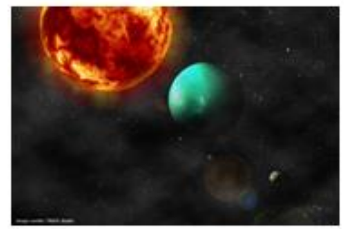
Astronomy & Astrophysics

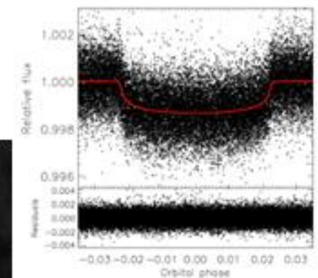
Characterization of the planetary system Kepler-101 with HARPS-N★,★★

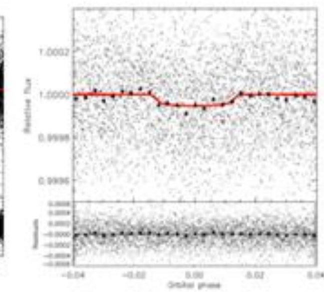
A hot super-Neptune with an Earth-sized low-mass companion

A. S. Bonomo[1], A. Sozzetti[1], C. Lovis[2], L. Malavolta[3,4], K. Rice[5], L. A. Buchhave[6,7], D. Sasselov[6], A. C. Cameron[8], D. W. Latham[6], E. Molinari[9,10], F. Pepe[2], S. Udry[2], L. Affer[11], D. Charbonneau[6], R. Cosentino[9], C. D. Dressing[6], X. Dumusque[6], P. Figueira[12], A. F. M. Fiorenzano[9], S. Gettel[6], A. Harutyunyan[9], R. D. Haywood[8], K. Horne[8], M. Lopez-Morales[6], M. Mayor[2], G. Micela[11], F. Motalebi[2], V. Nascimbeni[4], D. F. Phillips[6], G. Piotto[3,4], D. Pollacco[13], D. Queloz[2,14], D. Ségransan[2], A. Szentgyorgyi[6], and C. Watson[15]









Bonomo et al. 2014

A&A 567, L6 (2014)
DOI: 10.1051/0004-6361/201424339

Astronomy & Astrophysics

Letter to the Editor

The GAPS programme with HARPS-N at TNG

IV. A planetary system around XO-2S★,★★

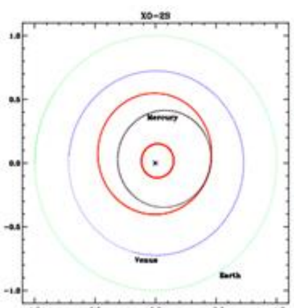
S. Desidera[1], A. S. Bonomo[2], R. U. Claudi[1], M. Damasso[2,3], K. Biazzo[4], A. Sozzetti[2], F. Marzari[5,1], S. Benatti[1], D. Gandolfi[4,6], R. Gratton[1], A. F. Lanza[4], V. Nascimbeni[7,1], G. Andreuzzi[8], L. Affer[9], M. Barbieri[7], L. R. Bedin[1], A. Bignamini[10], M. Bonavita[1], F. Borsa[11], P. Calcidese[3], J. M. Christille[3,12], R. Cosentino[4,8], E. Covino[13], M. Esposito[14], P. Giacobbe[2], A. Harutyunyan[8], D. Latham[15], M. Lattanzi[2], G. Leto[4], G. Lodato[16], C. Lovis[17], A. Maggio[9], L. Malavolta[7,17], L. Mancini[18], A. F. Martinez Fiorenzano[8], G. Micela[9], E. Molinari[8,19], C. Mordasini[18], U. Munari[1], I. Pagano[4], M. Pedani[8], F. Pepe[17], G. Piotto[7,1], E. Poretti[11], M. Rainer[11], I. Ribas[20], N. C. Santos[21,22], G. Scandariato[4], R. Silvotti[2], J. Southworth[23], and R. Zanmar Sanchez[4]

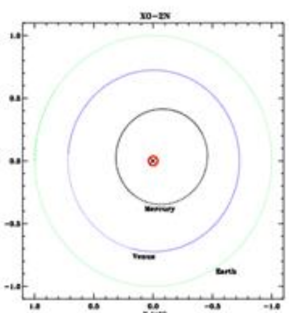
The GAPS Programme with HARPS-N@TNG

V. A comprehensive analysis of the XO-2 stellar and planetary systems *

M. Damasso[1,2], K. Biazzo[3], A.S. Bonomo[1], S. Desidera[4], A.F. Lanza[3], V. Nascimbeni[4,5], M. Esposito[6,7], G. Scandariato[3], A. Sozzetti[1], R. Cosentino[3,8], R. Gratton[4], L. Malavolta[5,9], M. Rainer[10], D. Gandolfi[3,11], E. Poretti[10], R. Zanmar Sanchez[3], I. Ribas[12], N. Santos[13,14,15], L. Affer[16], G. Andreuzzi[8], M. Barbieri[4], L. R. Bedin[4], S. Benatti[4], A. Bernagozzi[2], E. Bertolini[2], M. Bonavita[4], F. Borsa[10], L. Borsato[5], W. Boschin[8], P. Calcidese[2], A. Carbognani[2], D. Cenadelli[2], J.M. Christille[2,17], R.U. Claudi[4], E. Covino[18], A. Cunial[5], P. Giacobbe[1], V. Granata[5], A. Harutyunyan[8], M. G. Lattanzi[1], G. Leto[3], M. Libralato[4,5], G. Lodato[19], V. Lorenzi[8], L. Mancini[20], A.F. Martinez Fiorenzano[8], F. Marzari[4,5], S. Masiero[4,5], G. Micela[16], E. Molinari[8,21], M. Molinaro[22], U. Munari[4], S. Murabito[6,7], I. Pagano[3], M. Pedani[8], G. Piotto[4,5], A. Rosenberg[6,7], R. Silvotti[1], J. Southworth[23]

Parameter	XO-2N	XO-2S
T_{eff} [K]	5332±57	5395±54
log *g* [cgs]	4.44±0.08	4.43±0.08
[Fe/H] [dex]	0.43±0.05	0.39±0.05
Microturb. ξ [km s^{-1}]	0.88±0.11	0.90±0.10
$V\sin I_{\star}$ [km s^{-1}]	1.07±0.09	1.5±0.3
Mass [$M_{\odot}$]	0.97±0.05	0.98±0.05
	0.96±0.05	-
Radius [$R_{\odot}$]	$1.01^{+0.1}_{-0.07}$	$1.02^{+0.09}_{-0.06}$
	$0.998^{+0.011}_{-0.032}$	-
Age [Gyr]	$7.9^{+2.3}_{-3.0}$	$7.1^{+2.5}_{-2.9}$
	$7.8^{+1.2}_{-1.3}$	-
Luminosity [$L_{\odot}$]	0.70±0.04	0.79±0.14

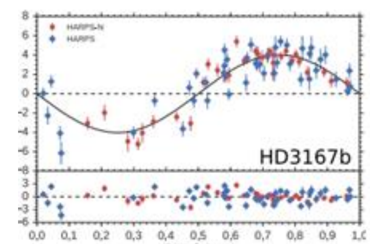


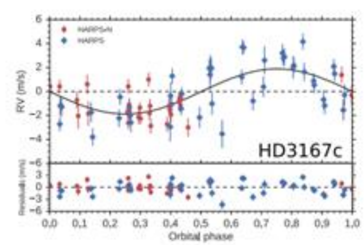


The Astronomical Journal, 154:123 (15pp), 2017 September
https://doi.org/10.3847/1538-3881/aa832a

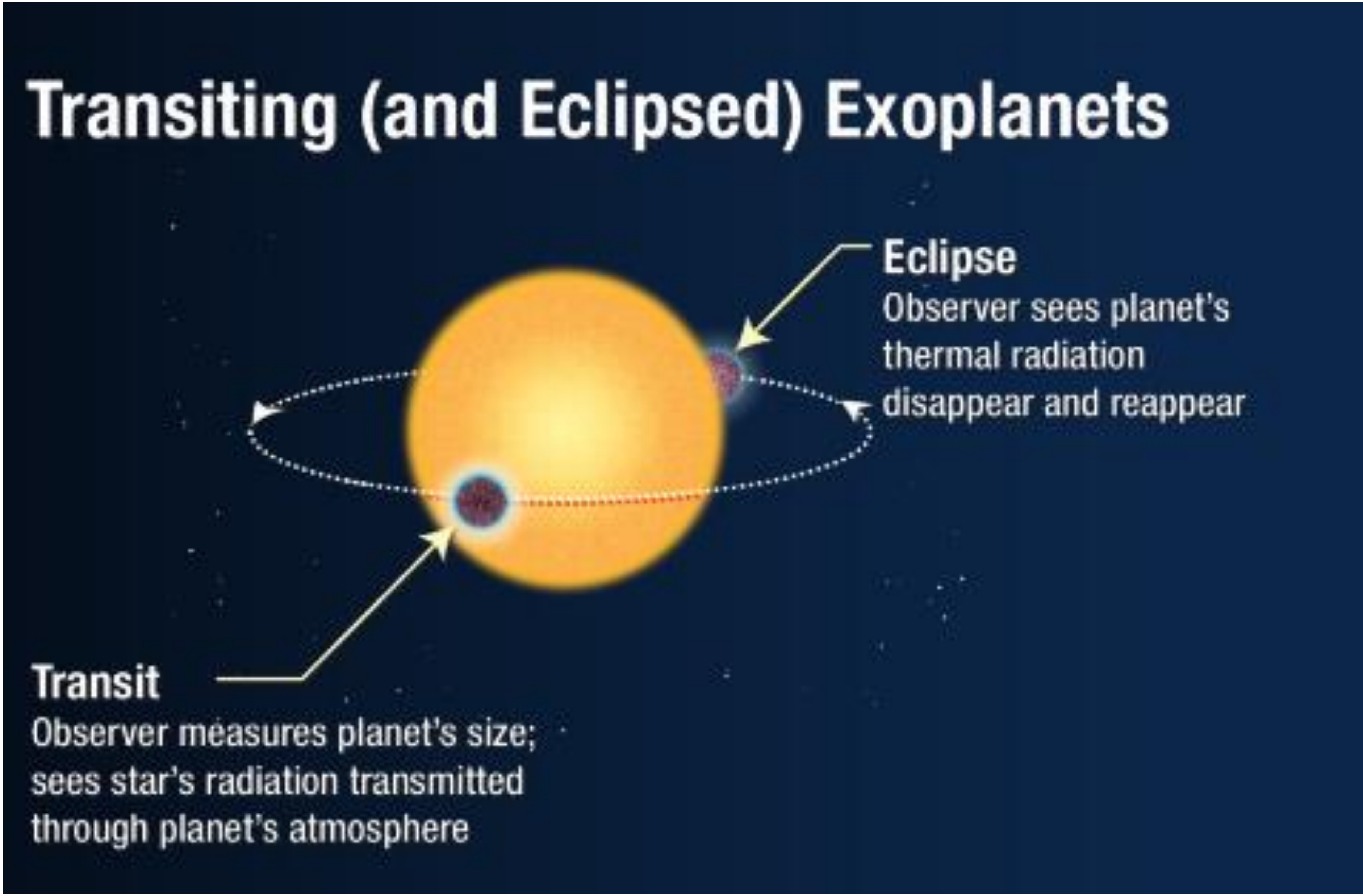
The Transiting Multi-planet System HD 3167: A 5.7 $M_{\oplus}$ Super-Earth and an 8.3 $M_{\oplus}$ Mini-Neptune

Davide Gandolfi[1], Oscar Barragán[1], Artie P. Hatzes[2], Malcolm Fridlund[3,4], Luca Fossati[5], Paolo Donati[6], Marshall C. Johnson[7], Grzegorz Nowak[8,9], Jorge Prieto-Arranz[8,9], Simon Albrecht[10], Fei Dai[11,12], Hans Deeg[8,9], Michael Endl[13], Sascha Grziwa[14], Maria Hjorth[10], Judith Korth[14], David Nespral[8,9], Joonas Saario[15], Alexis M. S. Smith[16], Giuliano Antoniciello[1], Javier Alarcon[17], Megan Bedell[18], Pere Blay[8,15], Stefan S. Brems[19], Juan Cabrera[16], Szilard Csizmadia[16], Felice Cusano[20], William D. Cochran[13], Philipp Eigmüller[16], Anders Erikson[16], Jonay I. González Hernández[8,9], Eike W. Guenther[2], Teruyuki Hirano[21], Alejandro Suárez Mascareño[8,22], Norio Narita[23,24,25], Enric Palle[8,9], Hannu Parviainen[8,9], Martin Pätzold[14], Carina M. Persson[4], Heike Rauer[16,26], Ivo Saviane[17], Linda Schmidtobreick[17], Vincent Van Eylen[3], Joshua N. Winn[11], and Olga V. Zakhozhay[27]
[1] Dipartimento di Fisica, Università di Torino, via P. Giuria 1, I-10125 Torino, Italy; davide.gandolfi@unito.it
[2] Thüringer Landessternwarte Tautenburg, Sternwarte 5, D-07778 Tautenburg, Germany
[3] Leiden Observatory, University of Leiden, PO Box 9513, 2300 RA, Leiden, The Netherlands

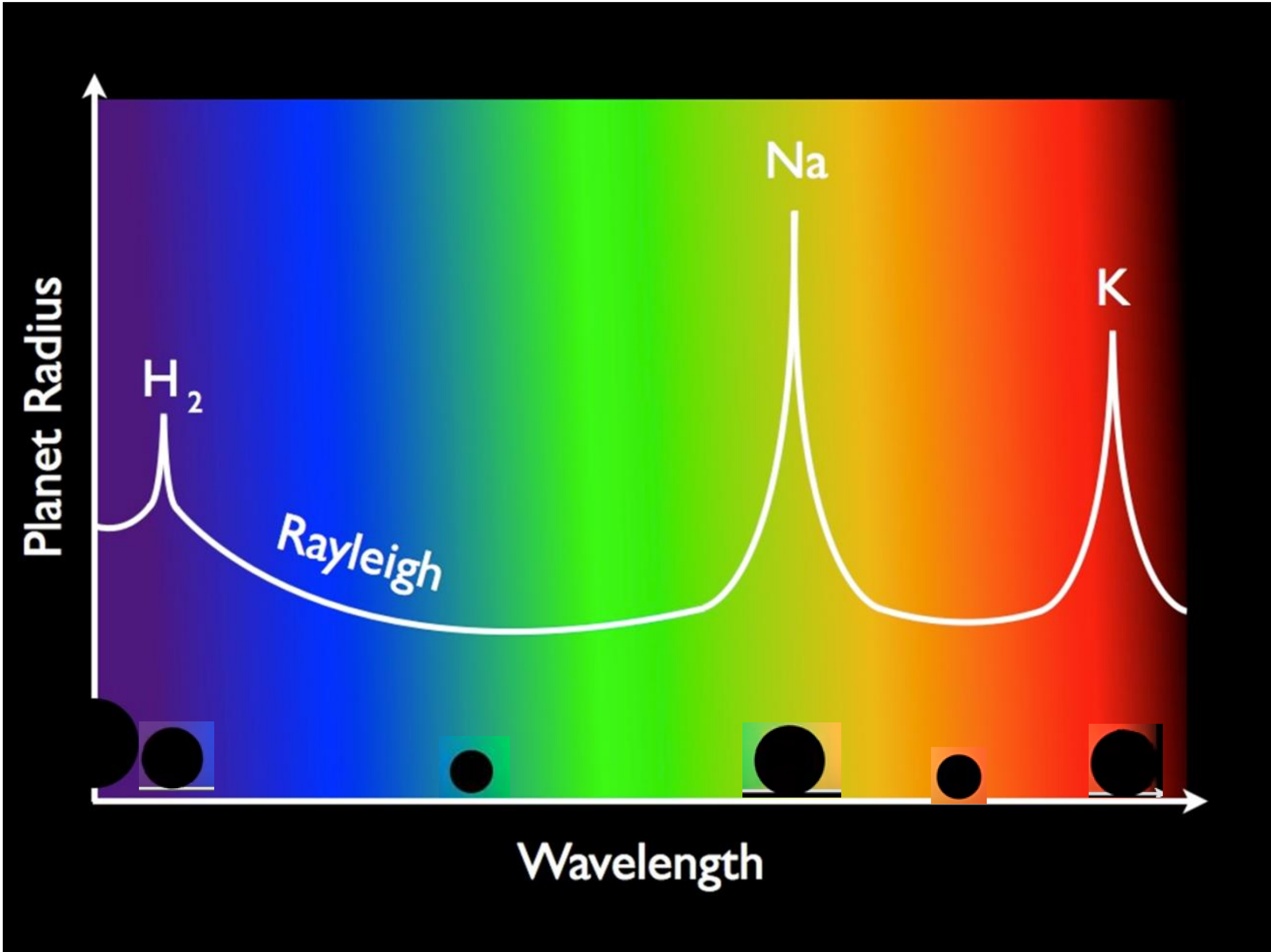




TRANSMISSION SPECTROSCOPY



Credits: M. Swain


Planet Radius
H2
Rayleigh
Na
K
Wavelength

A&A 590, A84 (2016)
DOI: 10.1051/0004-6361/201628334

Astronomy & Astrophysics

Chromatic line-profile tomography to reveal exoplanetary atmospheres: application to HD 189733b

F. Borsa, M. Rainer, and E. Poretti

INAF–Osservatorio Astronomico di Brera, via E. Bianchi 46, 23807 Merate (LC), Italy
e-mail: francesco.borsa@brera.inaf.it

Received 18 February 2016 / Accepted 25 March 2016

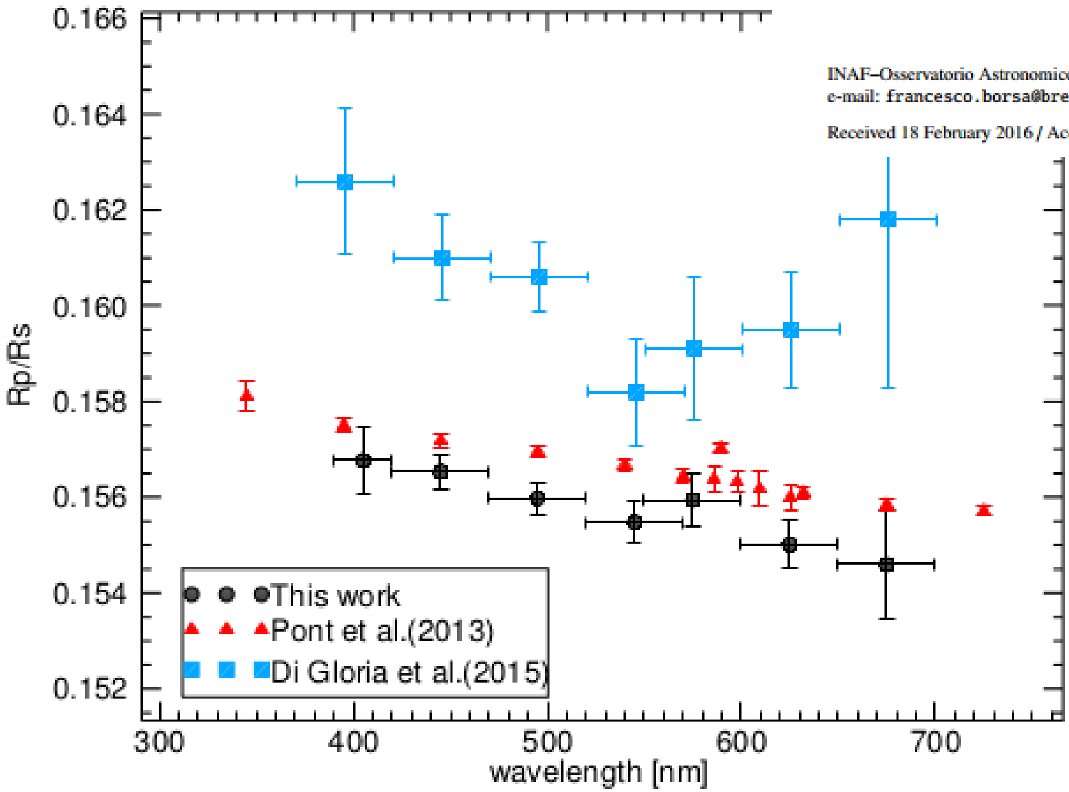
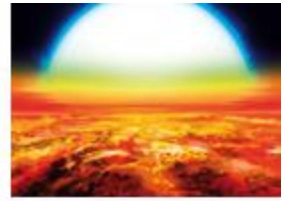
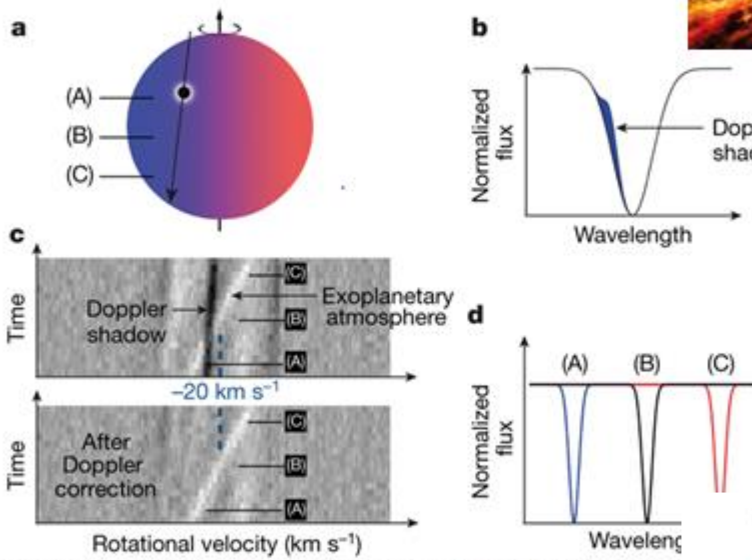


Fig. 3. Broadband transmission spectrum of HD 189733b as calculated with this method (black circles). For comparison, red triangles are HST observations by Pont et al. (2013), light-blue squares are measurements from Di Gloria et al. (2015) using the chromatic RM effect on the same dataset of this paper. The vertical shift is due to the different transit parameters used between different papers.

Iron and titanium in the atmosphere of Kelt-9b

Hoeijmakers et al. 2018





, Schematic of the orbital geometry of the exoplanet (represented by the black filled circle). The arrow indicates the orbital trajectory of the exop
lue and red shading represent the bluer and redshifted regions on the stellar disk caused by stellar rotation. **b**, The obscuration of part of the ste
the stellar absorption line (as in blue shaded area). **d**, As the exoplanet progresses in its orbit, its projected orbital velocity shifts from being blu
oint C). **c**, These two distinct signatures show up in the cross-correlation function (CCF; grey scale; top) as a Doppler shadow (deficit in the CCF
part of the stellar disk) and a bright streak (enhancement in the CCF at the instantaneous radial component of the orbital velocity of the planet),
planet, we model and subtract the Doppler shadow from the CCF (bottom). The systemic radial velocity of the KELT-9 system (

SPADES: Sensing Planetary Atmospheres with Differential Echelle Spectroscopy

(Wyttenbach et al. 2015)

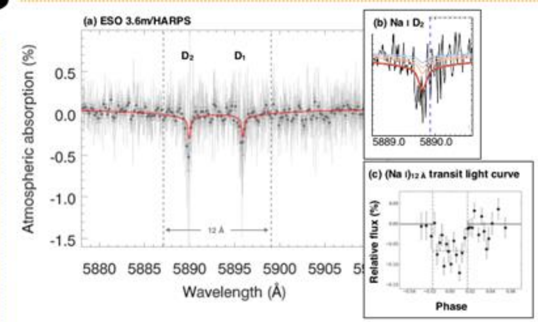


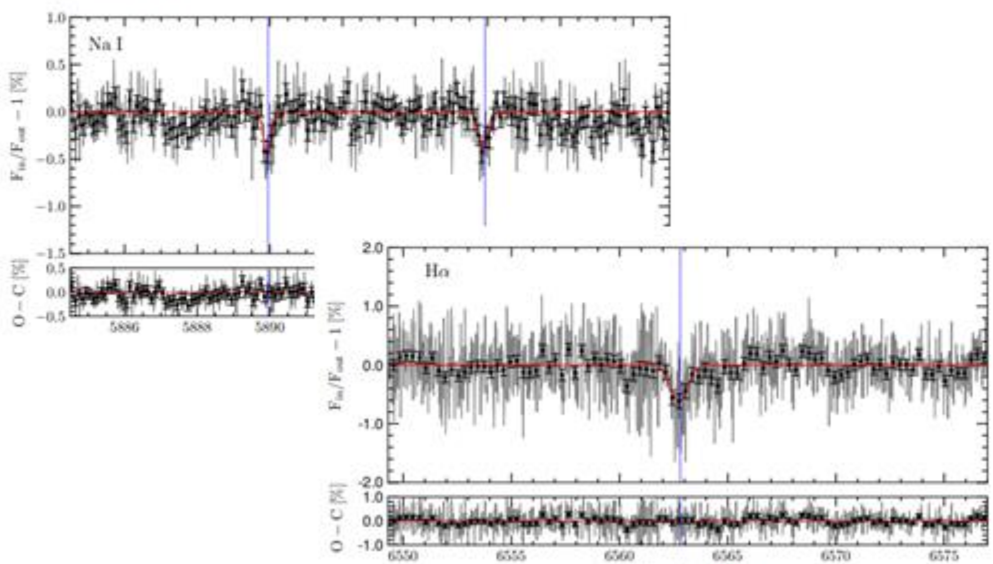
Figure 2 | New transmission spectrum of HD 189733b around the Na I doublet obtained with (a) HARPS on ESO 3.6m telescope in La Silla at $R \sim 115{,}000$ (Wyttenbach+2015). The data are shown unbinned (light grey) and binned by 10x (dark grey dots with error bars). A 1,600 K isothermal atmospheric model (red curve) is adjusted to the continuum, but does not reach the peak absorption in the lines. Panel (b) shows a zoom on the D_2 line with models of increasing temperature (from blue to red). The line core is best-fit with a temperature >3,000 K. The line is significantly blue shifted with respect to the rest-frame wavelength of the line (dashed blue line), which indicates the presence of strong winds blowing from the hot day side of the planet. Panel (c) shows the transit light curve obtained by integrating over a 12 Å band around the doublet.

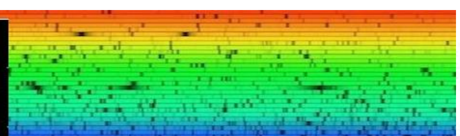
A&A 616, A151 (2018)

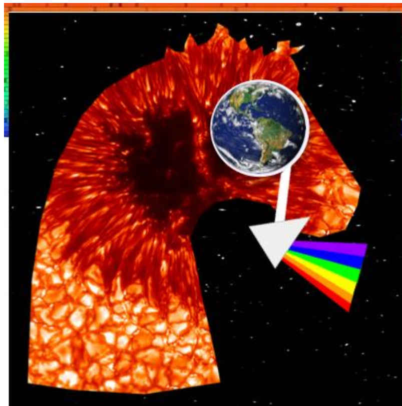
Na I and Hα absorption features in the atmosphere of MASCARA-2b/KELT-20b*

N. Casasayas-Barris[1,2], E. Pallé[1,2], F. Yan[3], G. Chen[1,2,4], S. Albrecht[5], L. Nortmann[1,2], V. Van Eylen[6], I. Snellen[6], G. J. J. Talens[6], J. I. González Hernández[1,2], R. Rebolo[1,2,7] and G. P. P. L. Otten[6]

[1] Instituto de Astrofísica de Canarias, Vía Láctea s/n, 38205 La Laguna, Tenerife, Spain
e-mail: nuriacb@iac.es







HoRSE : High Resolution Spectroscopy for Exoplanet atmospheres

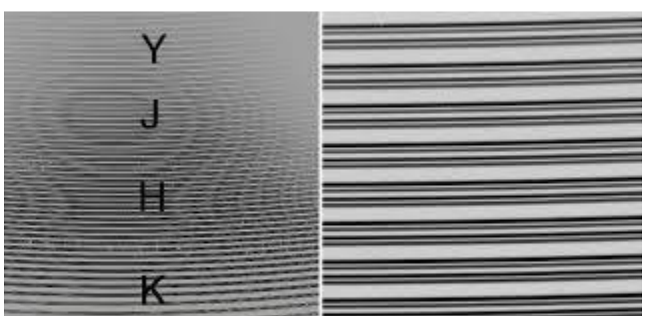
1-5 Oct 2018 Nice (France)

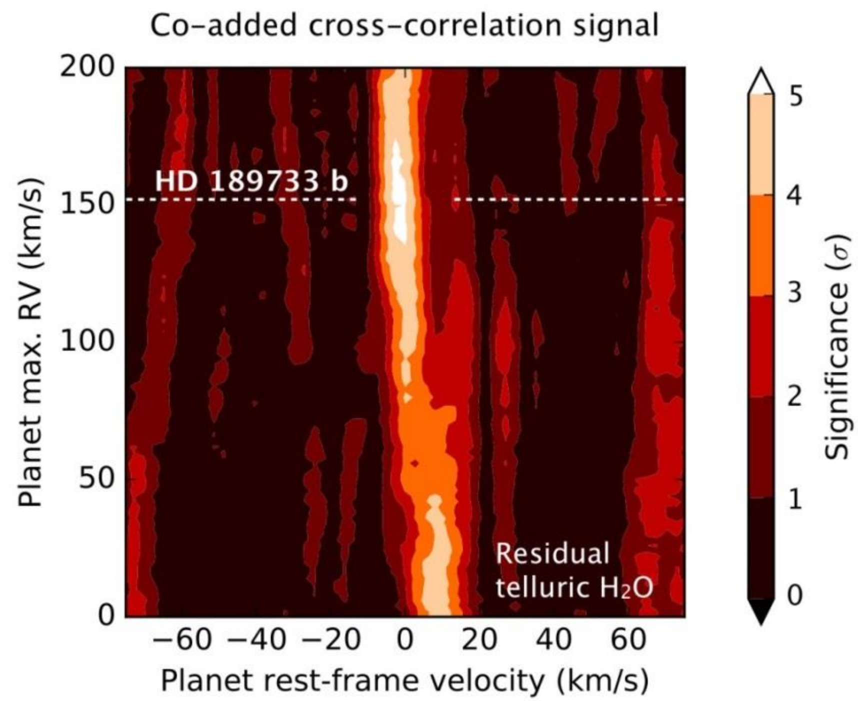
GIANO

(Cold) Slit Echelle spectrograph.

R = 50000.

0.9-2.45 micron in a single exposure





Detection of the water in the atmosphere of HD189733b

(Brogi et al., A&A 2018)

Stars

A&A 578, A64 (2015)
DOI: 10.1051/0004-6361/201525741

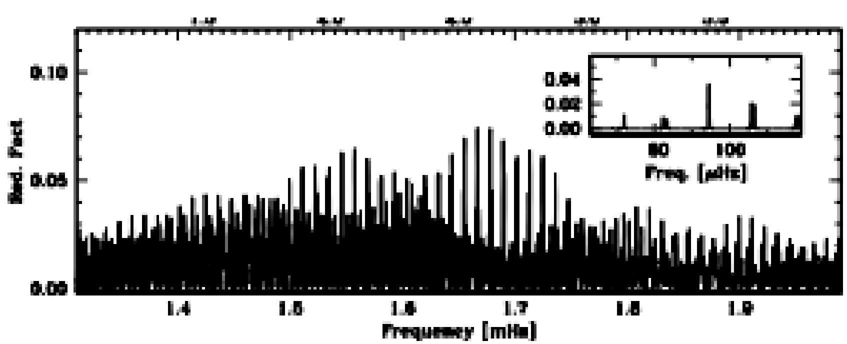
Astronomy & Astrophysics

The GAPS programme with HARPS-N at TNG

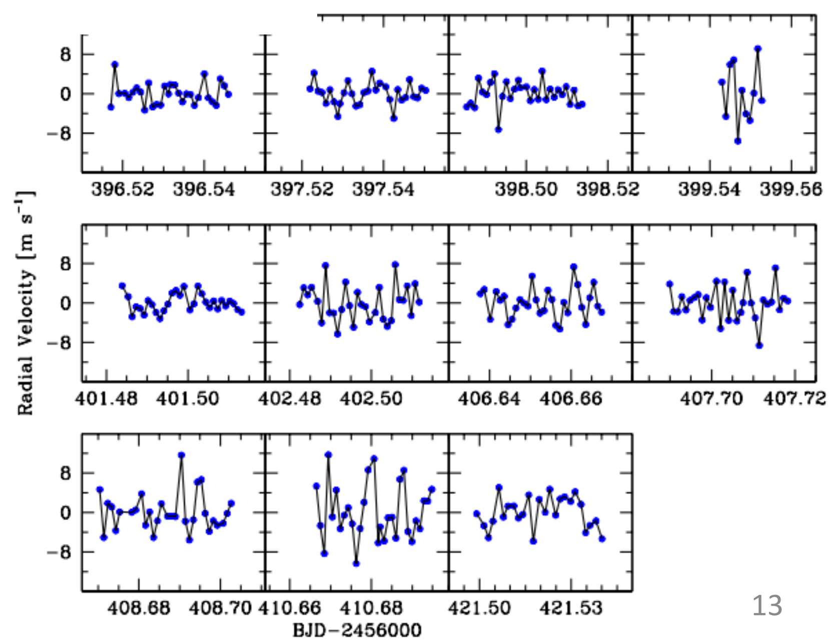
VII. Putting exoplanets in the stellar context: magnetic activity and asteroseismology of τ Bootis A⋆,⋆⋆

F. Borsa[1], G. Scandariato[2], M. Rainer[1], A. Bignamini[3], A. Maggio[4], E. Poretti[1], A. F. Lanza[2], M. P. Di Mauro[5], S. Benatti[6], K. Biazzo[2], A. S. Bonomo[7], M. Damasso[7], M. Esposito[8,9], R. Gratton[6], L. Affer[4], M. Barbieri[10], C. Boccato[6], R. U. Claudi[6], R. Cosentino[2,11], E. Covino[12], S. Desidera[6], A. F. M. Fiorenzano[11], D. Gandolfi[2,13], A. Harutyunyan[11], J. Maldonado[4], G. Micela[4], P. Molaro[3], E. Molinari[11,14], I. Pagano[2], I. Pillitteri[4,15], G. Piotto[6,16], E. Shkolnik[17], R. Silvotti[7], R. Smareglia[3], J. Southworth[18], A. Sozzetti[7], and B. Stelzer[4]

From the evolutionary point of view, τ Boo is at the beginning of the main sequence phase of core hydrogen burning, with an age of 0.9 ± 0.5 Gyr. The model built allowed us to further constrain the value of the stellar mass to 1.38 ± 0.05 $M_\odot$ and thus, using i = 44.5 ± 1.5° (Brogi et al. 2012), the mass of the planet to 6.13 ± 0.17 M_{Jup}.



g exoplanets in the stellar context: the pathfinder case of τ Bootis A



A&A 597, A73 (2017)
DOI: 10.1051/0004-6361/201629400

Astronomy & Astrophysics

HARPS-N high spectral resolution observations of Cepheids I. The Baade-Wesselink projection factor of δ Cep revisited⋆

N. Nardetto[1], E. Poretti[2], M. Rainer[2], A. Fokin[3], P. Mathias[4,5], R. I. Anderson[6], A. Gallenne[7,8], W. Gieren[8,9], D. Graczyk[8,9,10], P. Kervella[11,12], A. Mérand[7], D. Mourard[1], H. Neilson[13], G. Pietrzynski[10], B. Pilecki[10], and J. Storm[14]

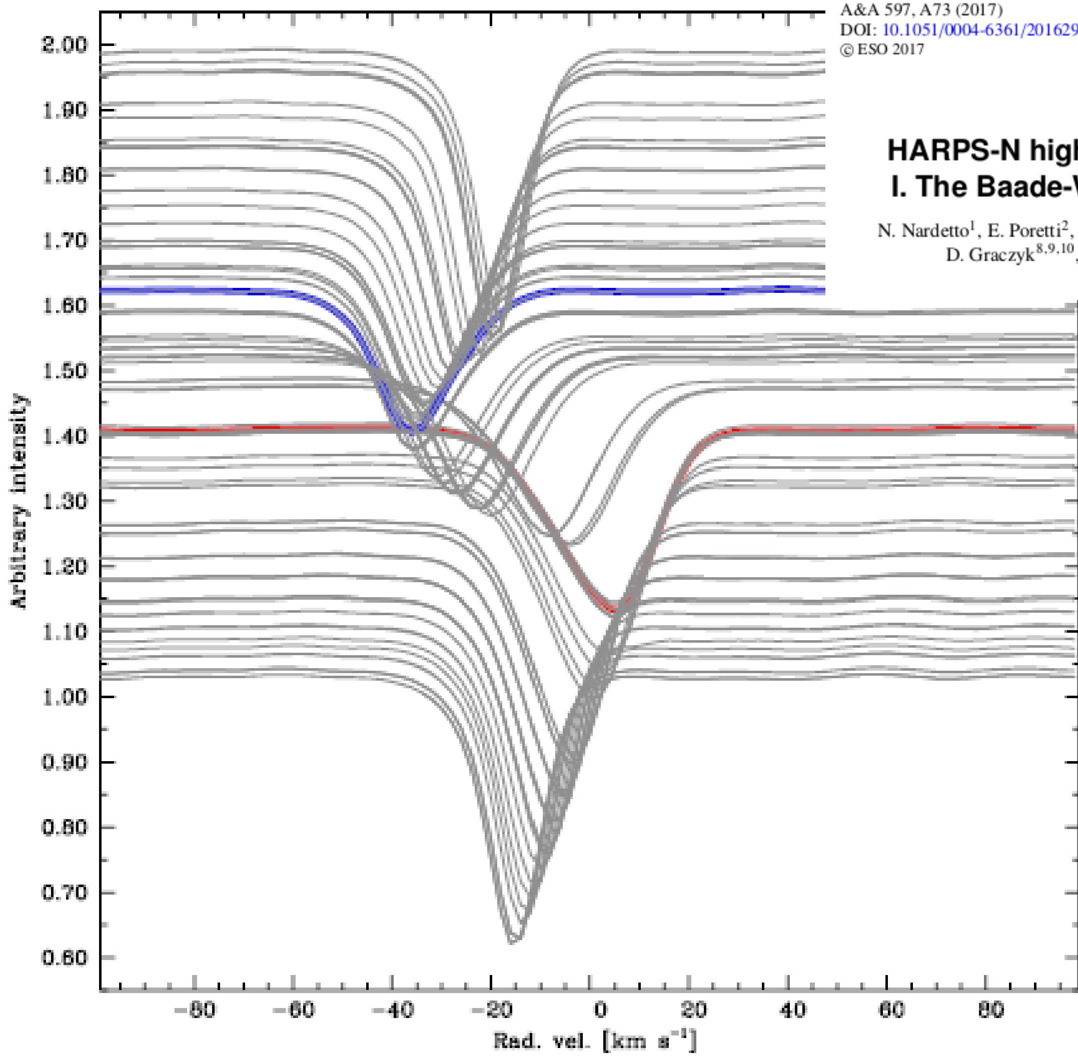
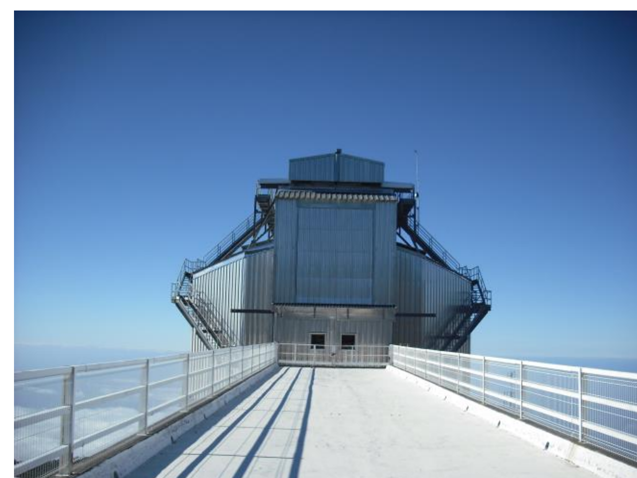
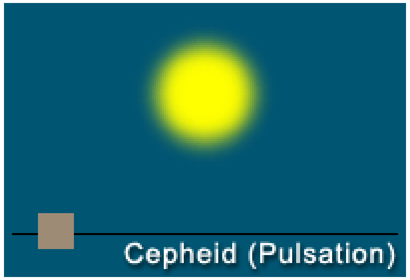
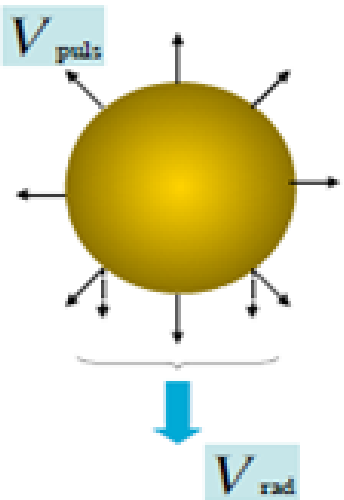


Fig. 1. Mean line profile changes during the pulsation cycle of δ Cep. The line profile with the highest receding motion is highlighted in red, the one with the highest approaching motion in blue.

Harps-N

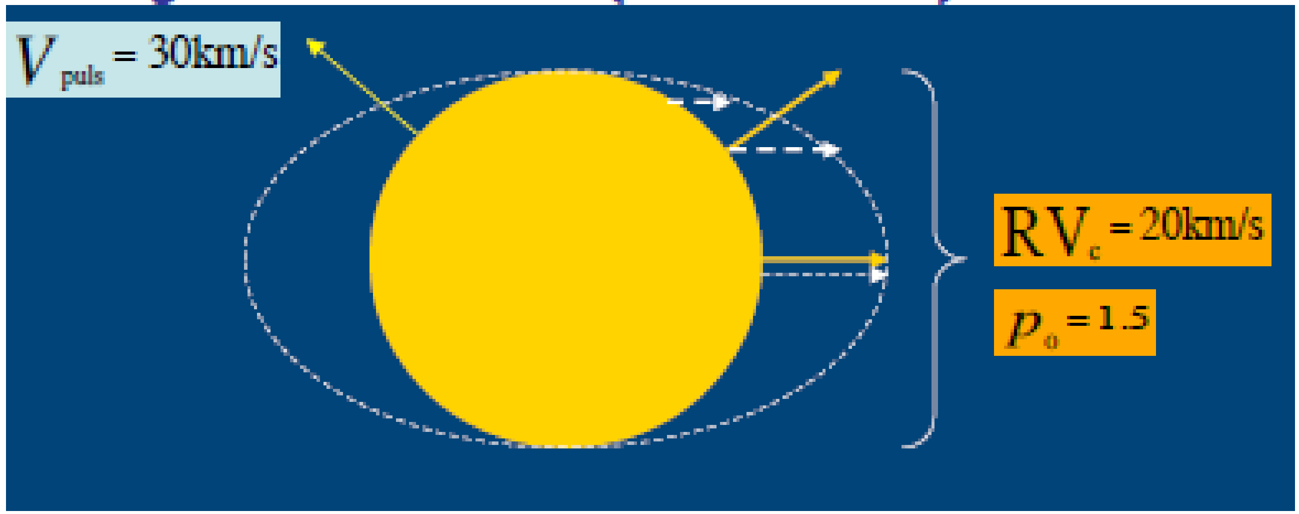




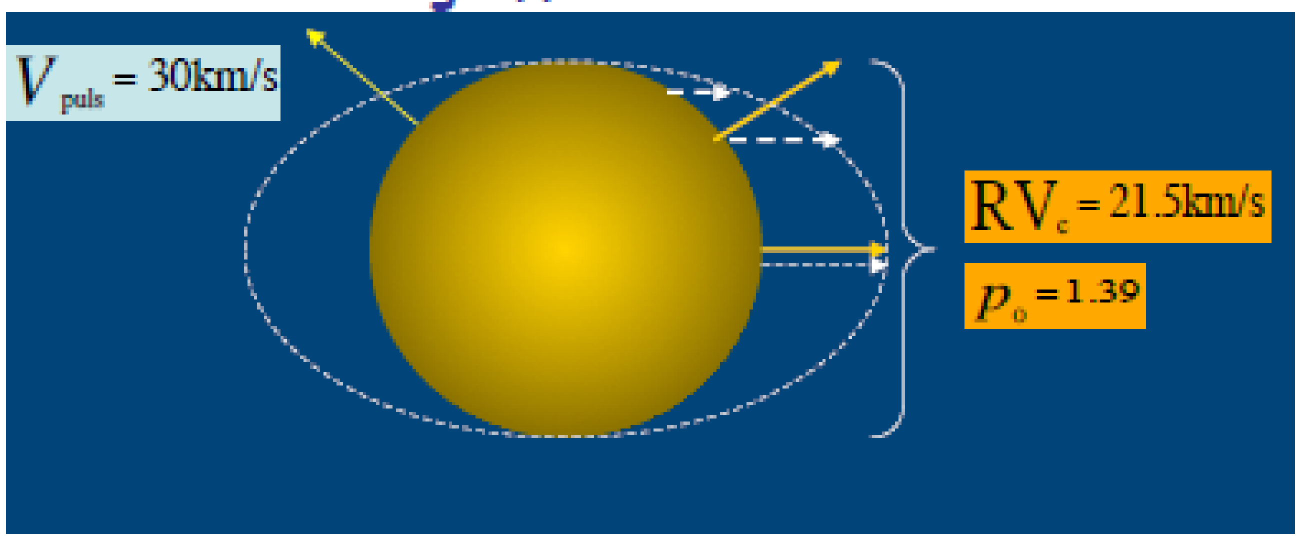


$$p = \frac{V_{puls}}{V_{rad}}$$

• A geometric effect (uniform disk)

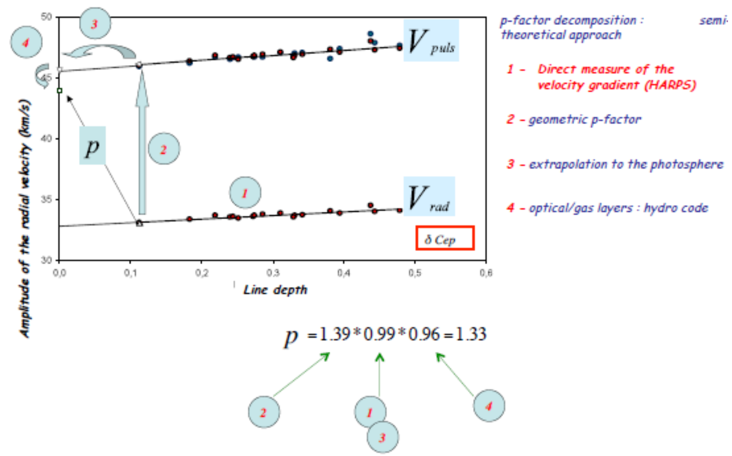


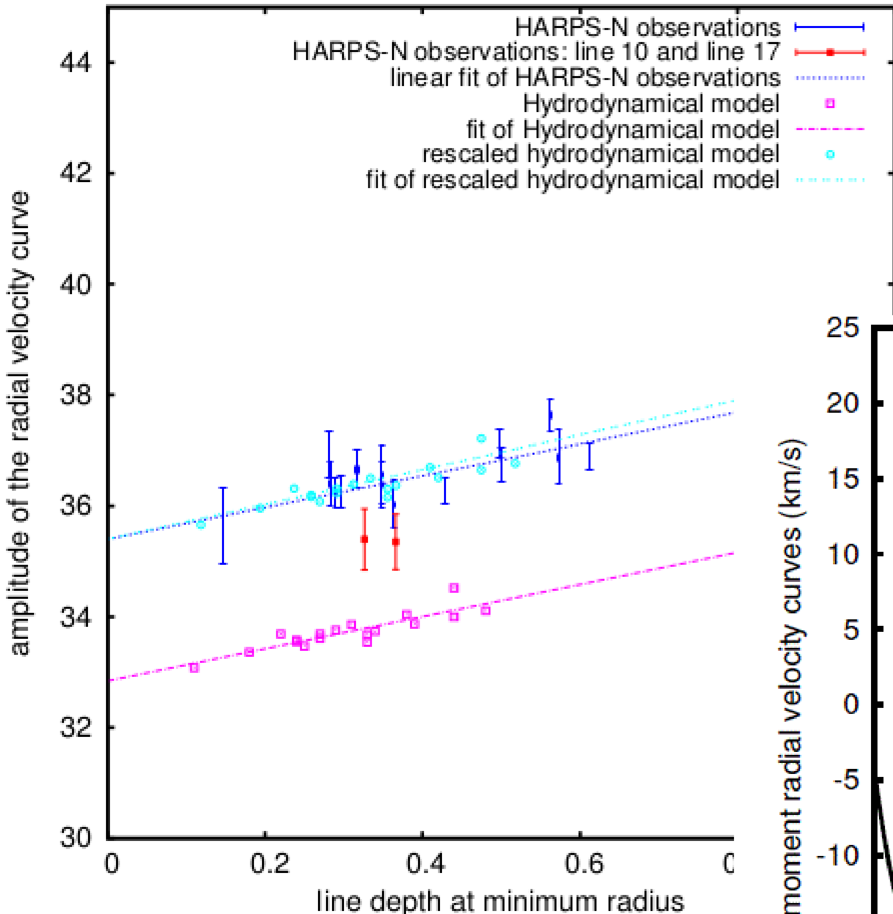
• Limb-darkening effect

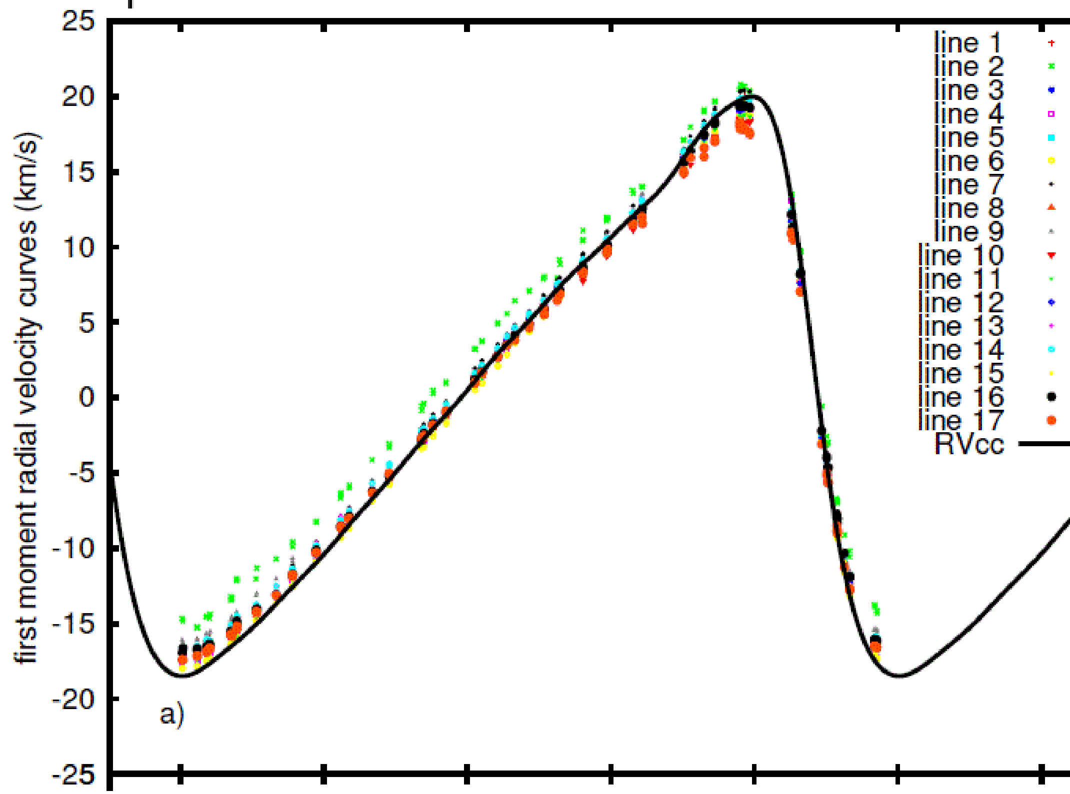


THE RV_c VALUES OF THE 17 LINES AND THE RV_{cc-g} CURVE

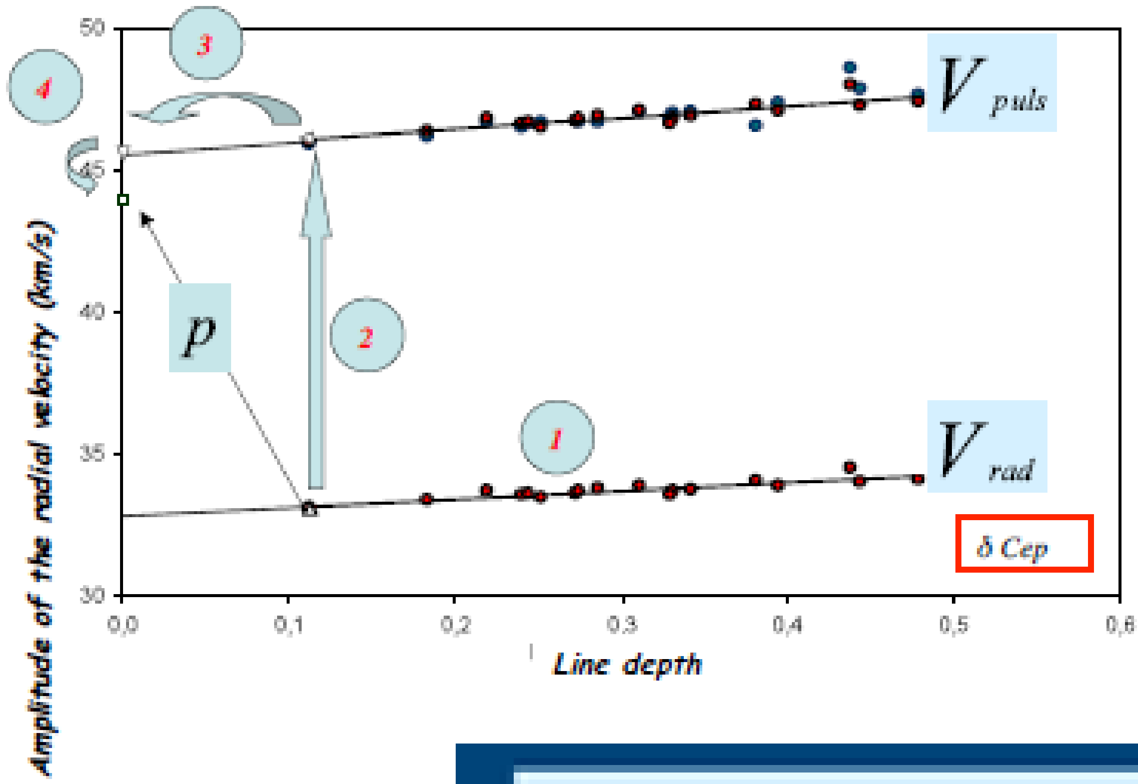
The p-factor decomposition







The p-factor decomposition



p-factor decomposition : semi-theoretical approach

1 – Direct measure of the velocity gradient (HARPS)

2 – geometric p-factor

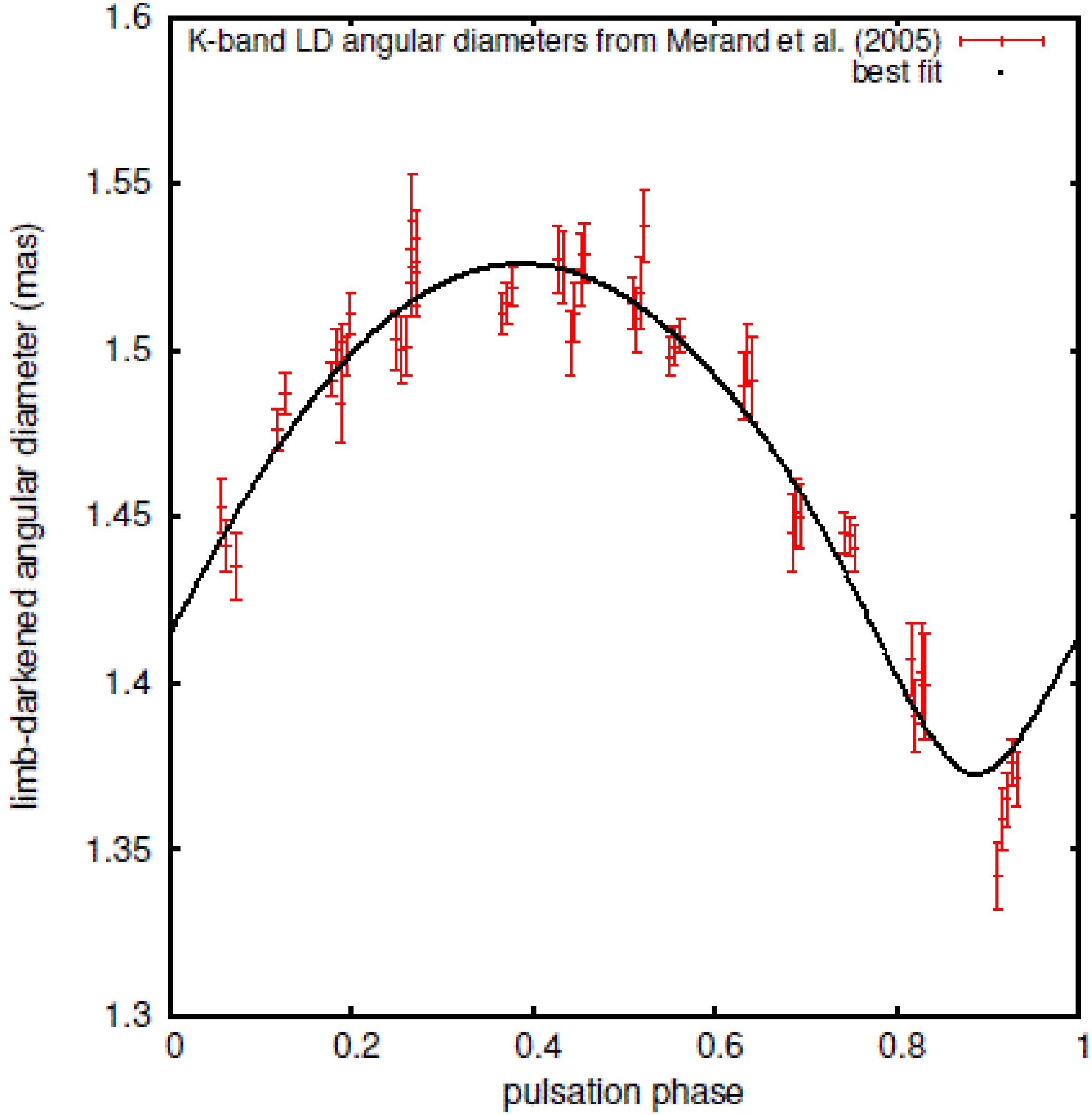
3 – extrapolation to the photosphere

4 – optical/gas layers : hydro code

$$p = p_o \cdot f_{grad} \cdot f_{o-g}$$

INTERFEROMETRIC Baade-Wesselink METHOD

$$\theta_{\rm model}(\phi_i) = \overline{\theta} + 9.305\,\frac{p_{\rm cc-g}}{d}\left(\int RV_{\rm cc-g}(\phi_i)\,d\phi_i\right)\ [\rm mas].$$



Impact of the projection factor in the distance scale context

THE ASTROPHYSICAL JOURNAL, 699:539–563, 2009 July 1 doi:10.1088/0004-637X/699/1/539

A REDETERMINATION OF THE HUBBLE CONSTANT WITH THE *HUBBLE SPACE TELESCOPE* FROM A DIFFERENTIAL DISTANCE LADDER*

ADAM G. RIESS[1,2], LUCAS MACRI[3], STEFANO CASERTANO[2], MEGAN SOSEY[2], HUBERT LAMPEITL[2,4], HENRY C. FERGUSON[2], ALEXEI V. FILIPPENKO[5], SAURABH W. JHA[6], WEIDONG LI[5], RYAN CHORNOCK[5], AND DEVDEEP SARKAR[7]
[1] Department of Physics and Astronomy, Johns Hopkins University, Baltimore, MD 21218, USA
[2] Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, USA; ariess@stsci.edu
[3] George P. and Cynthia W. Mitchell Institute for Fundamental Physics and Astronomy, Department of Physics, Texas A&M University, 4242 TAMU, College Station, TX 77843-4242, USA
[4] Institute of Cosmology and

THE SHOES PROJECT

- Started in 2007 by Riess, Macri & collaborators to reduce systematic uncertainty in H_0 by:

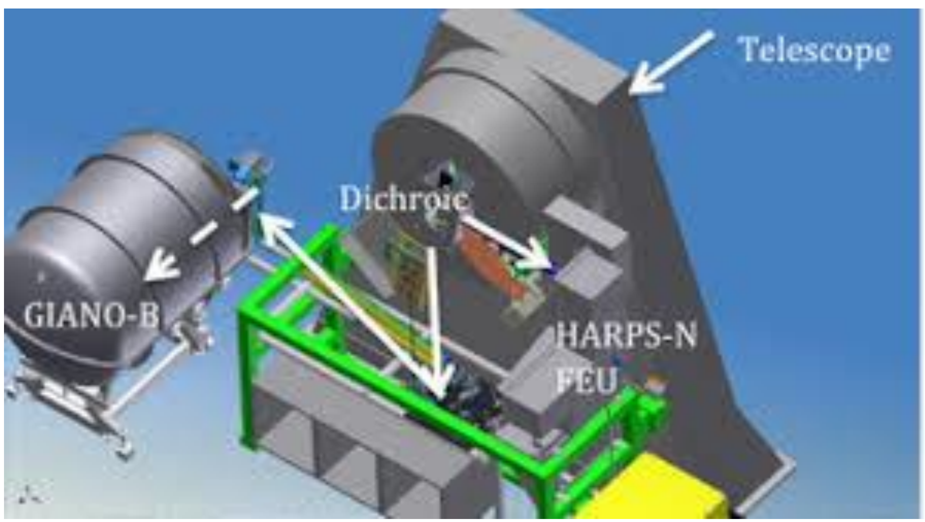
A set of 10 parallax measurements to Galactic ... was recently obtained by Benedict et al. (2007) using ... Guidance Sensor on *HST*. Parallax measurements re... "gold standard" of distance measurements, and unlike previous HIPPARCOS measurements, the *individual precision* of this set of measurements is high, averaging $\sigma = 8\%$ for each. We have not made use of additional distance measures to Galactic Cepheids based on the Baade–Wesselink method or stellar associations as they are much more uncertain than well-measured parallaxes, and the former appear to be under refinement due to uncertainties in their projection factors, as discussed by Fouqué et al. (2007) and van Leeuwen et al. (2007).

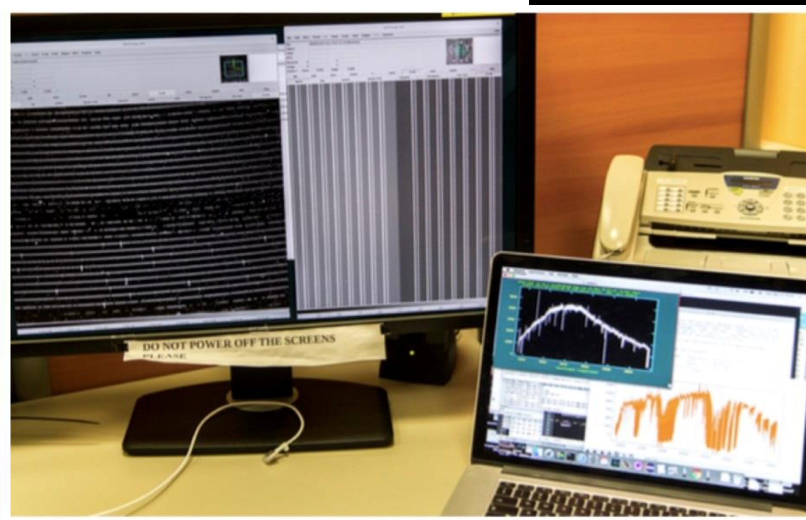
- **HARPS-N**, high-resolution spectrograph (R=115000) operating in the visible
- **GIANO**, high-resolution spectrograph (R=50000) operating in the near infrared

Combined together by moving GIANO to Nasmyth B focus (**GIANO-B**)

Action taken by the Italian Community : GAPS, GIANO Team, and TNG staff . Funded by own budget.

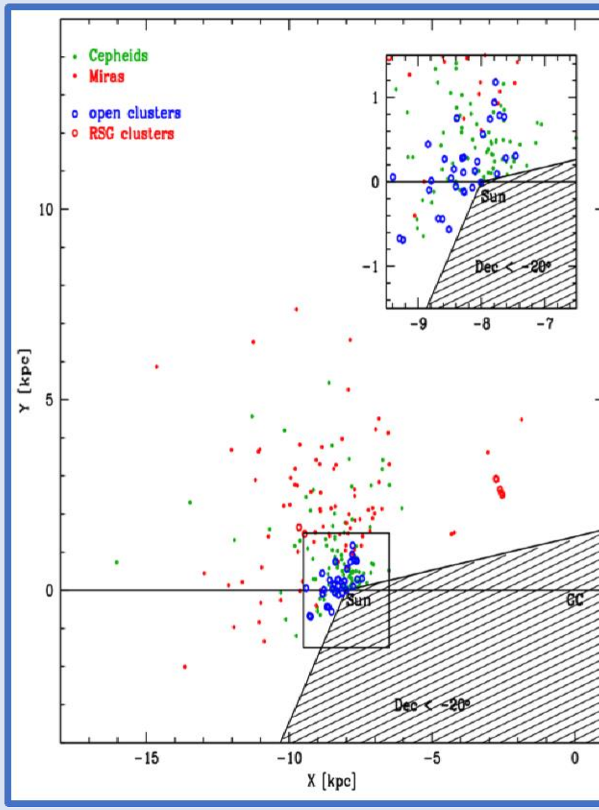
GIANO-B and HARPS-N now combined in the **GIARPS** observing mode.
Simultaneous visible and infrared spectra of the same target.





SPA - Stellar Population Astrophysics

The detailed, age-resolved chemistry of the Milky Way disk



SPA is a TNG Large Program granted 80 nights of observing time to use HARPS-N, GIANO-B and GIARPS and obtain high resolution, high quality spectra of about 500 luminous stars in the Milky Way disk and associated clusters, with different ages and at different Galactocentric distances, including the poorly explored inner disk.

These spectra will allow us to measure the full set of iron-peak, CNO, alpha, light and neutron-capture elements and to provide a detailed mapping of possible gradients, cosmic spreads and other inhomogeneities of individual abundances and abundance ratios, thus constraining timescales and overall formation and chemical enrichment scenarios, and providing key tests of stellar models.

THE SPA TEAM

The SPA Team is composed of **33 researchers** from 10 Italian and international institutes.

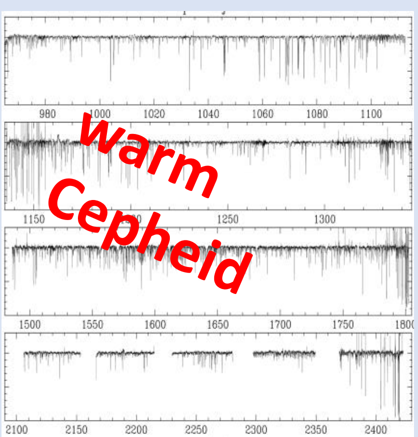
L. Origlia (**PI**), G. Andreuzzi, G. Bono, V. Braga, A. Bragaglia, T. Cantat-Gaudin, E. Carretta, S. Cassisi, G. Catanzaro, G. Cescutti, E. Dalessandro, R. da Silva, V. D'Orazi, G. Fiorentino, A. Frasca, K. Fukue, L. Inno, N. Kobayashi, A. Lanzafame, B. Lemasle, S. Lucatello, L. Magrini, D. Magurno, M. Marconi, N. Matsunaga, M. Monelli, A. Mucciarelli, E. Oliva, D. Romano, N. Sanna, O. Straniero, M. Tosi, A. Vallenari

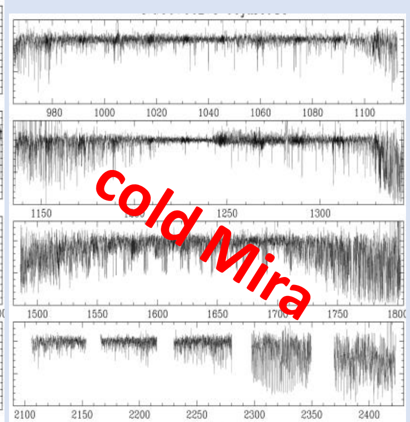
SPA - Stellar Population Astrophysics

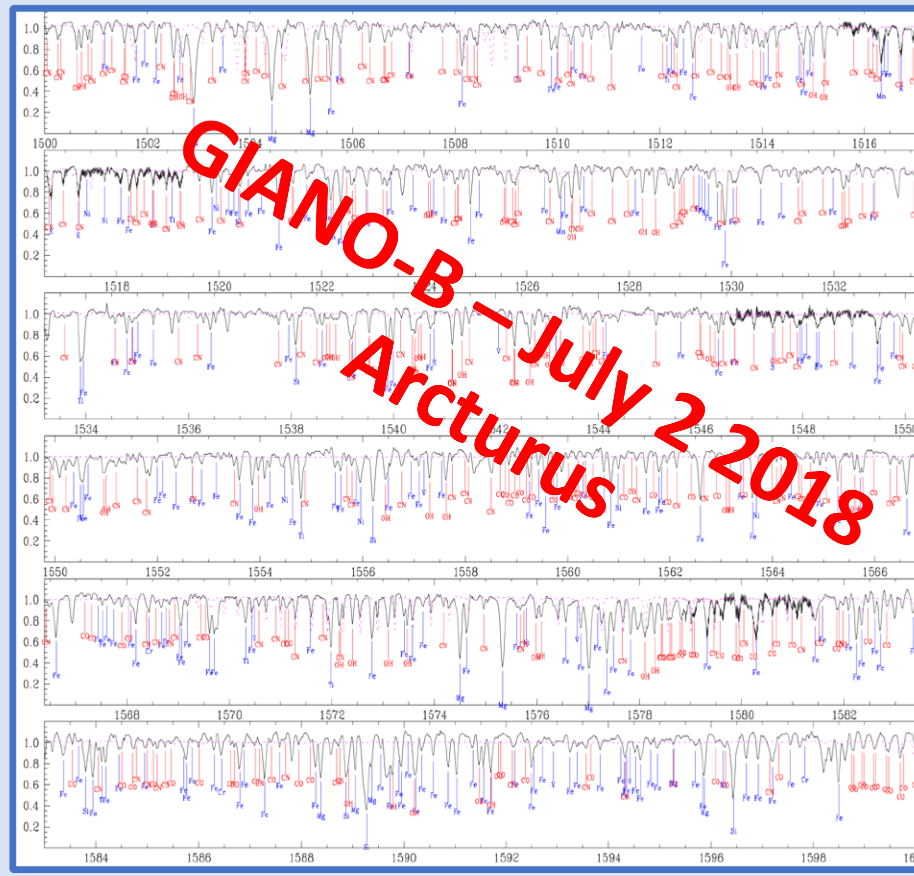
The detailed, age-resolved chemistry of the Milky Way disk

- ✓ TNG-AOT37: **7n** Jul 2018, **6n** August 2018
  - *successful runs, about 80 stars observed*
  - *ongoing data reduction and chemical analysis*

- ➢ TNG-AOT38: **5n** Nov 2018, **4n** Dec 2018, **4n** Jan 2019







GHOsT

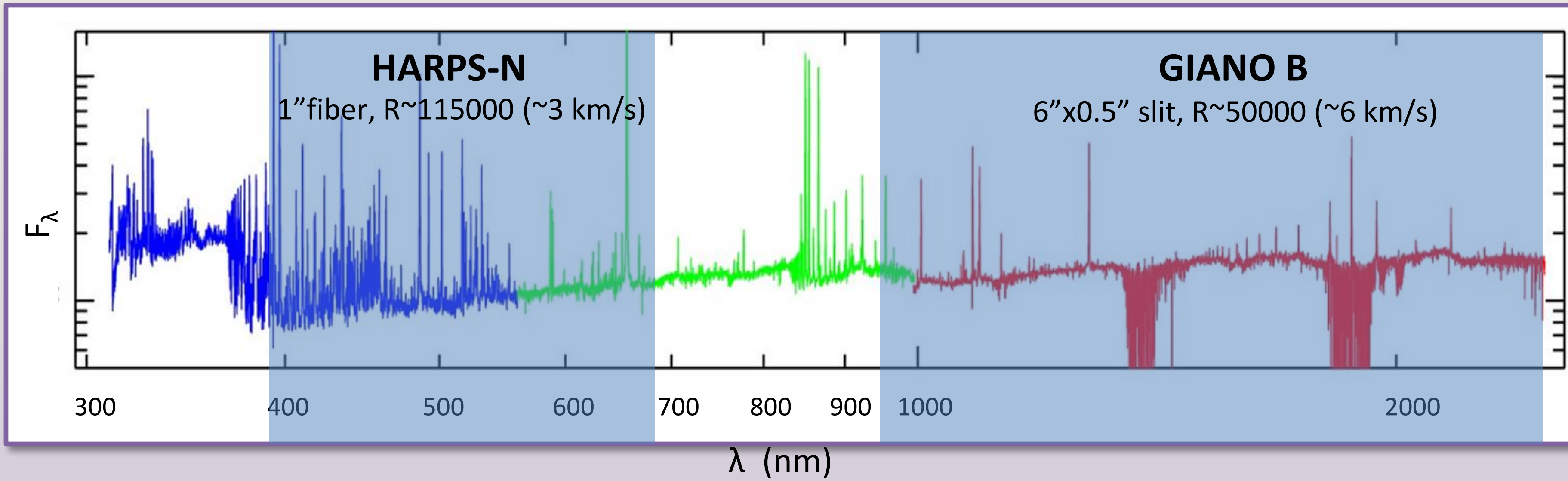
GIARPS High-resolution Observations of T Tauri Stars

PI: *S. Antoniucci (**OAR**)*

Co-Is: *B. Nisini, T. Giannini, F. Vitali, A. Di Paola, A. Giunta (**OAR**), K. Biazzo, A. Frasca (**OACt**), J. M. Alcalà (**OACn**), D. Fedele, L. Podio, F. Bacciotti, N. Sanna (**OAA**), E. Rigliaco (**OAPd**), U. Munari (**OAPd-Asiago**), C. F. Manara (**ESO**), A. Harutyunyan (**TNG-FGG**), G. Herczeg (**KIAA**)*

GHOsT Project

GIARPS is the only instrument now available with simultaneous (avoid systematics!) optical-NIR coverage at high spectral resolution



Aims: → derive stellar and accretion/ejection parameters simultaneously and homogeneously
→ characterize the components of the system on a statistically significant sample of T Tauri stars

Sample: → ~ 80 objects in the Taurus-Auriga star-forming region

Method: → analysis of line fluxes, profiles, and absorption features at optical and NIR wavelengths

GIANO + HARPS-N

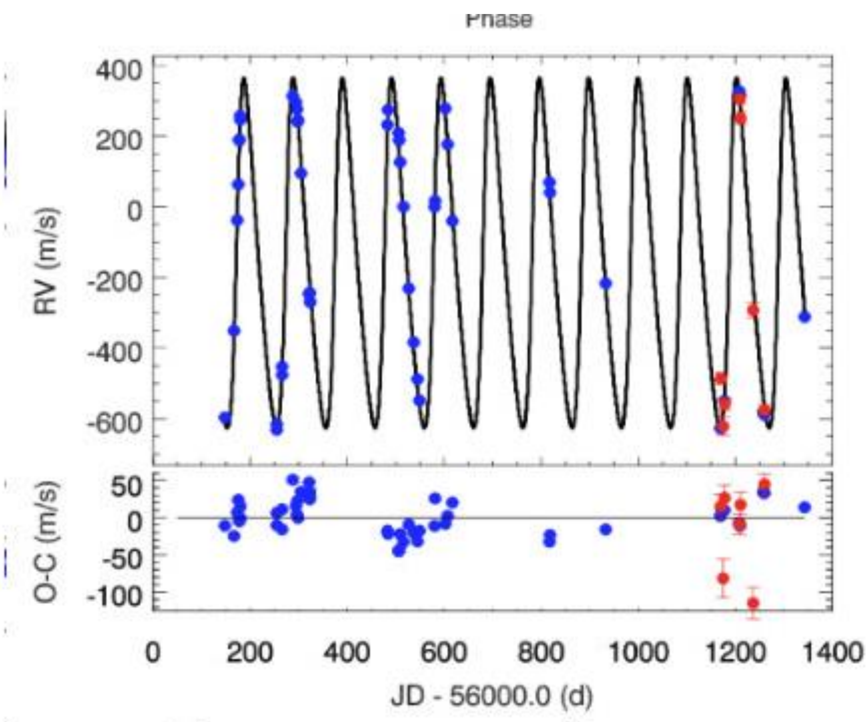
A&A 606, A51 (2017)
DOI: 10.1051/0004-6361/201731124

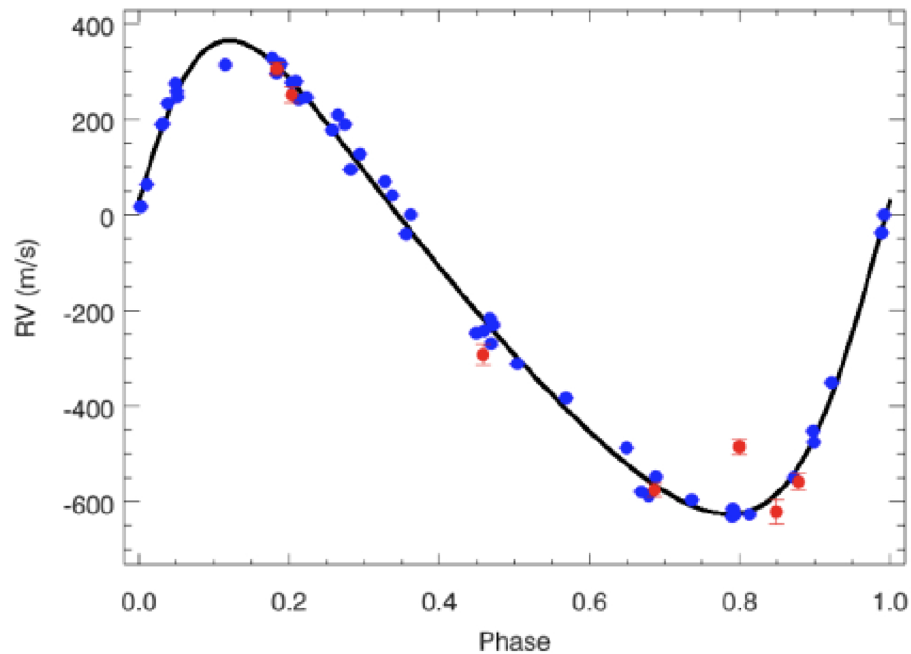
Astronomy & Astrophysics

The GAPS Programme with HARPS-N at TNG

XV. A substellar companion around a K giant star identified with quasi-simultaneous HARPS-N and GIANO measurements*

E. González-Álvarez[1,2], L. Affer[1], G. Micela[1], J. Maldonado[1], I. Carleo[3,4], M. Damasso[4,5], V. D'Orazi[3], A. F. Lanza[6], K. Biazzo[6], E. Poretti[7], R. Gratton[3], A. Sozzetti[5], S. Desidera[3], N. Sanna[8], A. Harutyunyan[9], F. Massi[8], E. Oliva[8], R. Claudi[3], R. Cosentino[9], E. Covino[10], A. Maggio[1], S. Masiero[1], E. Molinari[9,11], I. Pagano[6], G. Piotto[3,4], R. Smareglia[12], S. Benatti[3], A. S. Bonomo[5], F. Borsa[7], M. Esposito[10], P. Giacobbe[5], L. Malavolta[3,4], A. Martinez-Fiorenzano[9], V. Nascimbeni[3,4], M. Pedani[9], M. Rainer[7], and G. Scandariato[6]

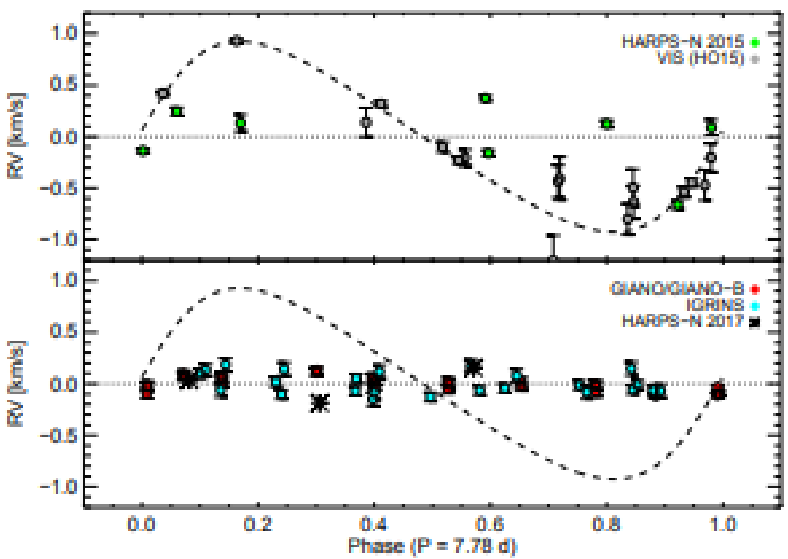




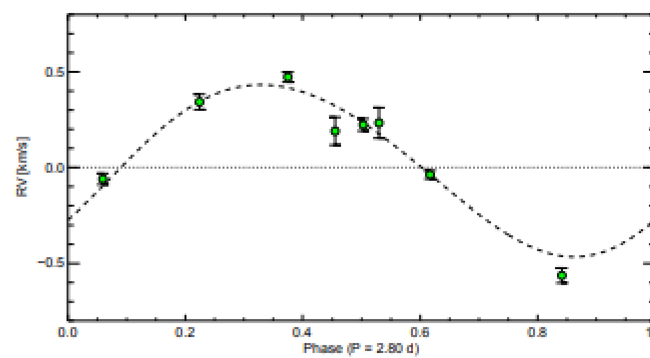
A&A 613, A50 (2018)

Multi-band high resolution spectroscopy rules out the hot Jupiter BD+20 1790b
First data from the GIARPS Commissioning

I. Carleo[1,2], S. Benatti[2], A. F. Lanza[3], R. Gratton[2], R. Claudi[2], S. Desidera[2], G. N. Mace[4], S. Messina[3], N. Sanna[5], E. Sissa[2], A. Ghedina[6], F. Ghinassi[6], J. Guerra[6], A. Harutyunyan[6], G. Micela[7], E. Molinari[6,16], E. Oliva[5], A. Tozzi[5], C. Baffa[5], A. Baruffolo[2], A. Bignamini[8], N. Buchschacher[9], M. Cecconi[6], R. Cosentino[6], M. Endl[4], G. Falcini[5], D. Fantinel[2], L. Fini[5], D. Fugazza[10], A. Galli[6], E. Giani[5], C. González[6], E. González-Álvarez[7,11], M. González[6], N. Hernandez[6], M. Hernandez Diaz[6], M. Iuzzolino[5,12], K. F. Kaplan[4], B. T. Kidder[4], M. Lodi[6], L. Malavolta[1], J. Maldonado[7], L. Origlia[13], H. Perez Ventura[6], A. Puglisi[5], M. Rainer[10], L. Riverol[6], C. Riverol[6], J. San Juan[6], S. Scuderi[3], U. Seemann[14], K. R. Sokal[4], A. Sozzetti[15] and M. Sozzi[5]



Previous data interpreted as a signal induced by stellar activity (P_{rot}=2. 80 d) found by photometry



New GIARPS data do not support the previous Keplerian solution (P=7.78 d)

Fig. 3. Phase-folded HARPS – N RVs (2015, reprocessed from HO15 dataset) at stellar rotational period.

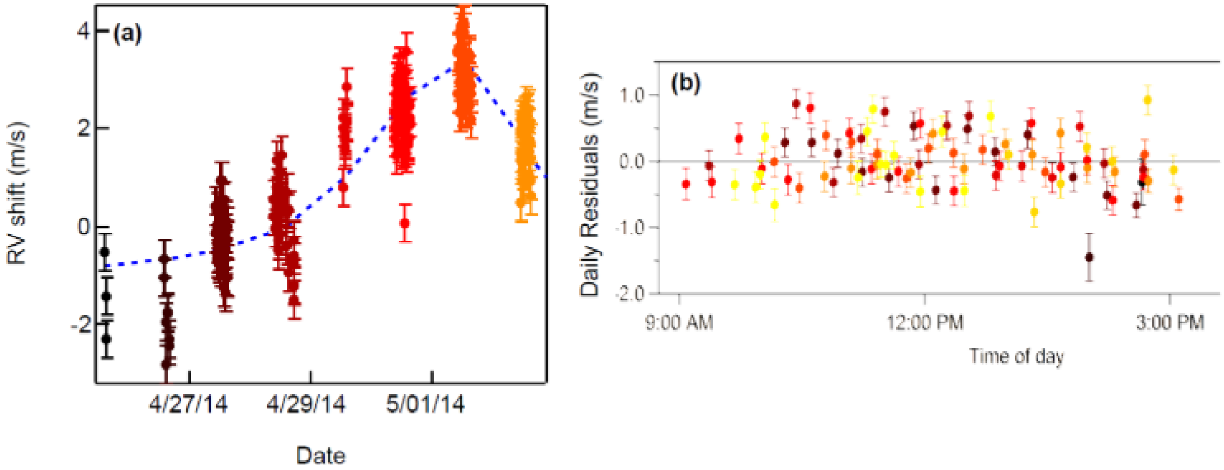
GIARPS MODE TO REMOVE SIGNAL AMBIGUITIES

(stellar activity vs keplerian motion)

The Sun as a star

David Phillips, Xavier Dumusque, TNG staff, et al.

LCST (Low Cost Solar Telescope) operating daytime.
It feeds HARPS-N spectrograph.



Initial results from the LCST. Left: Solar RVs after subtracting expected velocities with a fit (blue dashed line) using solar photometry. Right: daily residuals show a standard deviation <40cm/s.

LOCNES: Low Cost NIR Extended Solar Telescope

Claudi R.[a], Ghedina A.[b], Pace E.[c], Gallorini L.[c], Di Giorgio A.–M.[d], Liu S.–J.[d], Tozzi A.[e], Carleo I.[a], Lanza A.F.[f], Micela G.[g], Molinari E.[h], Poretti E.[b], Phillips D.[g], and Tripodo G.[i]

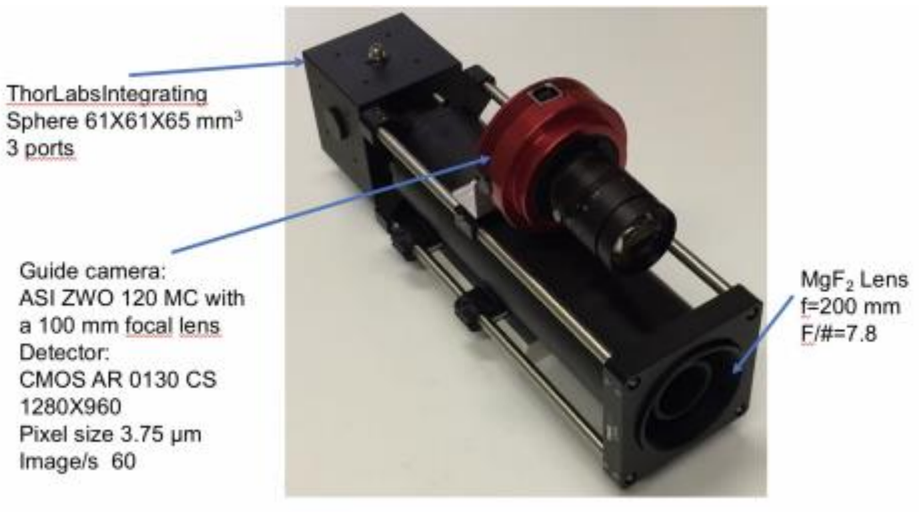
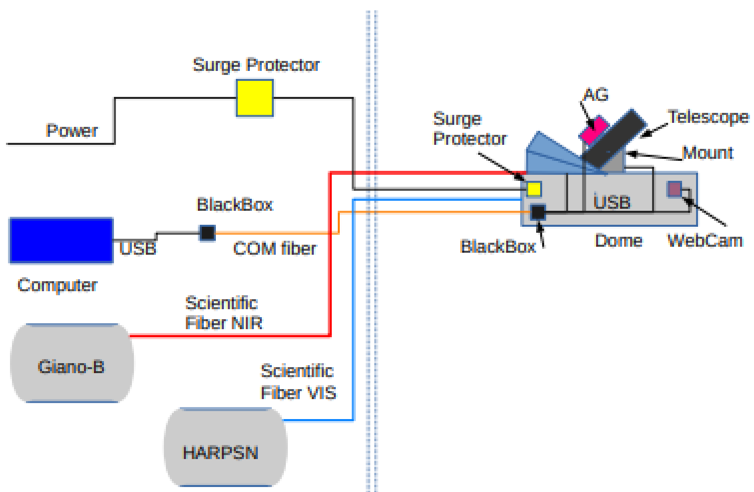


Figure 3. The LOCNES telescope.



CONCLUSIONS: SONG-TNG COMPLEMENTARY ACTIVITIES

TNG not very suitable for asteroseismology, too few nights in a very competitive context. In other words, you were right to realize a dedicated instrument like SONG.

HARPS-N showed that the high-resolution spectrographs can investigate the dynamical effects in the atmosphere of Cepheids line-by-line (projection factor). SONG can do the same for bright Cepheids.

Helioseismology (SONG) and solar activity (LCST, LOCNES) can exchange results.

Many SONG scientific cases could benefit from an extension to the near-infrared with GIANO-B. The simultaneous HARPS-N visible spectra (GIARPS mode) allow a straight cross-check.

TNG is an Italian facility, but there are regular calls for non-Italian scientists.

AOT 39 (2019A) TIME BREAKDOWN

- 47 nights ongoing INAF-Large Programs
- 40 nights Harps-N Consortium GTO
- 4 nights Long-Term Program on Gravitational Wave Events

- 31 nights Spanish CAT
- 8 nights CCI International Time Program
- 10 nights OPTICON H2020 TNA Program

- 10 nights joint NOT-INAF call
- 12 nights for the INAF-TAC

CALL FOR PROPOSAL TNG & REM also featuring LONG-TERM PROGRAMS, GTO and NOT-TIME

AOT 39 (2019A) is now open for proposals

Applications for observing time for the period

April 1st, 2019 - September 30th, 2019

are solicited and should be submitted by
Friday, 23rd November, 2018, 12:00 UT

http://www.tng.iac.es/news/2018/10/19/aot39/

COMMON OFFER FOR OBSERVING TIME TNG-NOT

The astronomical communities of Italy, Denmark, Finland, Iceland, Norway and Sweden may apply for reserved observing time offered jointly on the TNG and NOT telescopes. Rules for applicants may be found here.
Accordingly, Italian scientists can now submit normal observing proposals to the NOT, and vice versa. Nordic astronomers will have access to 10 TNG nights; proposals will be evaluated by the INAF-TAC. Italian astronomers will have access to 20 nights with the NOT telescope; proposals will be evaluated by the NOT-OPC. Applications must use the proposal form for the telescope they requesting.

INAF staff and Associates will benefit of the same FGG funding scheme as for TNG observations.