RVs with GIANO-B @ TNG

I. Carleo & the GIARPS Team

EPRV IV

17-21 March 2019

GIARPS in a nutshell

Aim: high resolution VIS-NIR spectra
+ high precision radial velocities

Method: simultaneous use of

- HARPS-N (0.38 μm < λ< 0.69 μm)
- GIANO-B (0.95 μm < λ < 2.45 μm)

Management: Italian Exo-planetary community through the Premiale WOW, with a particular effort by the GAPS team (funds, manpower, observing time)

GAPS
GLOBAL ARCHITECTURE OF PLANETARY SYSTEMS

Main actions

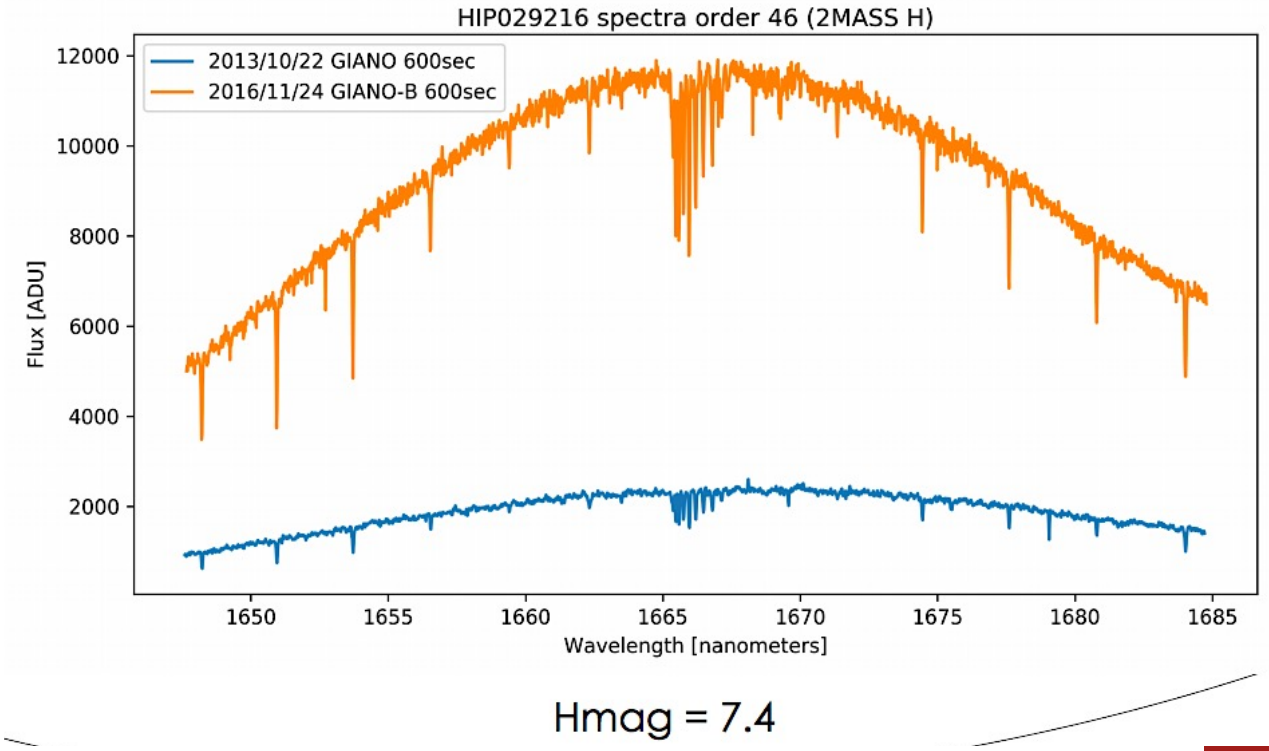
- Transferring GIANO from Nasmyth-A to B
- Feeding GIANO through a new train of optics rather than fibers, long slit
- Insertion of a dichroic to split the VIS and NIR light to HARPS-N and GIANO
- New reduction pipeline for GIANO-B: GOFIO

The removal of GIANO fibers implies:

- Higher efficiency
- Elimination of modal noise
- Stable slit illumination with a closed loop active tip/tilt mirror

Flux ratio between the spectra in the NIR bands

- J: 4.4
- H: 4.7
- K: 5.3



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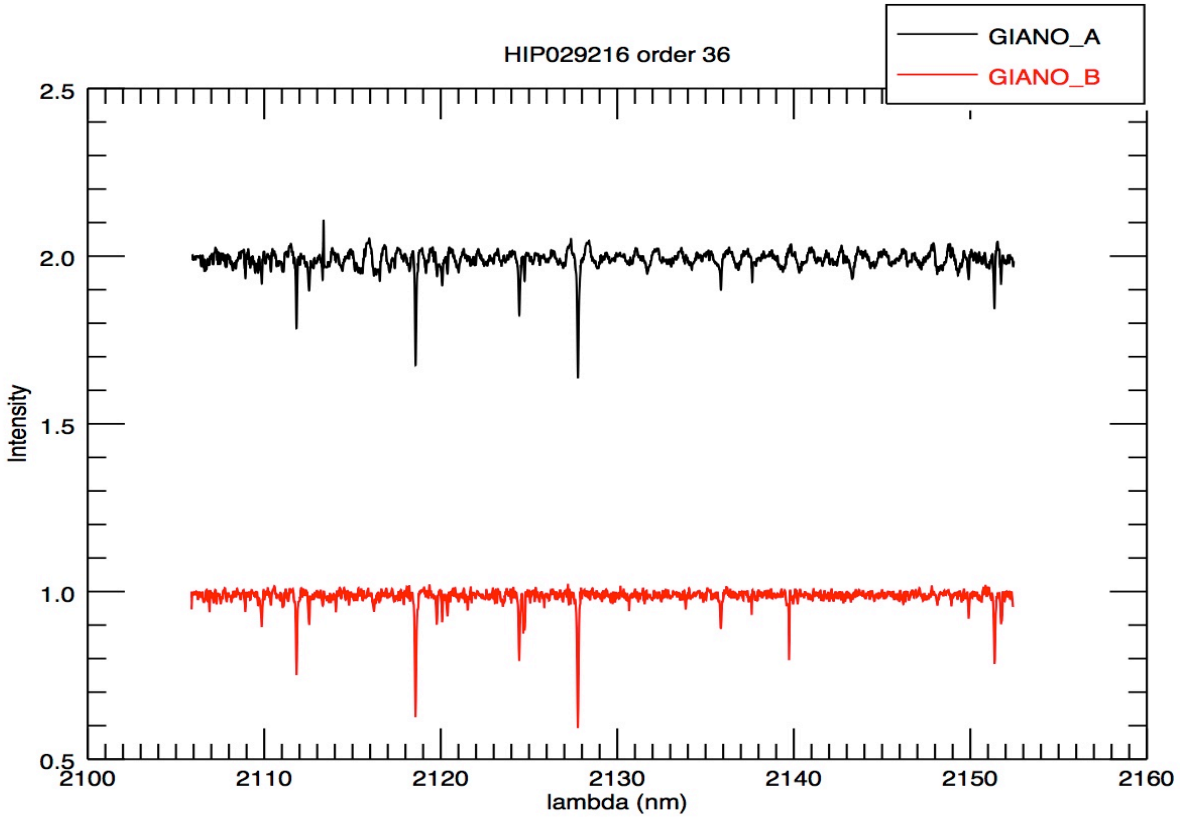

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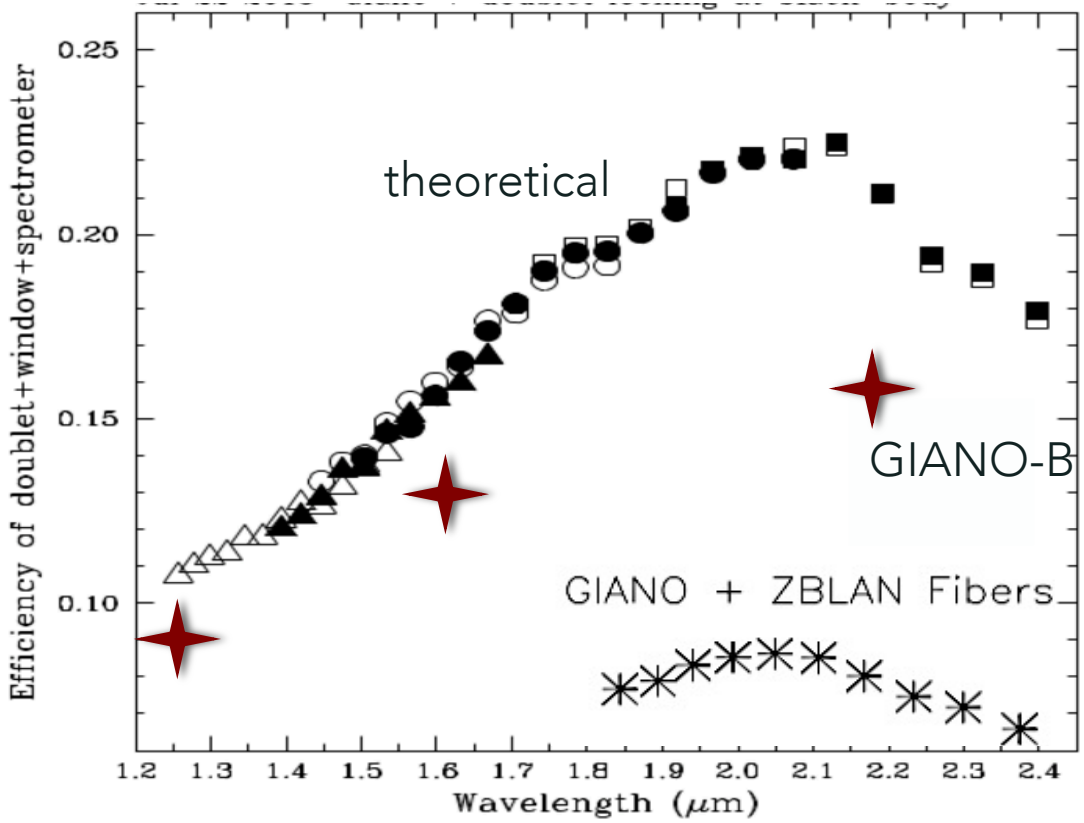
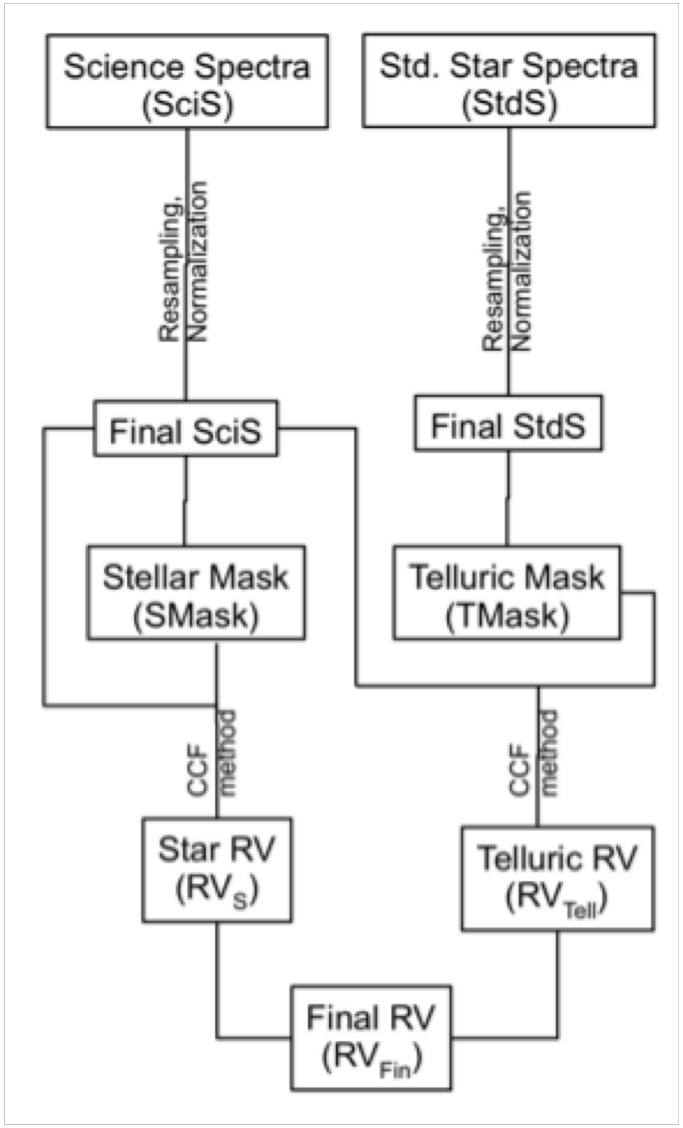


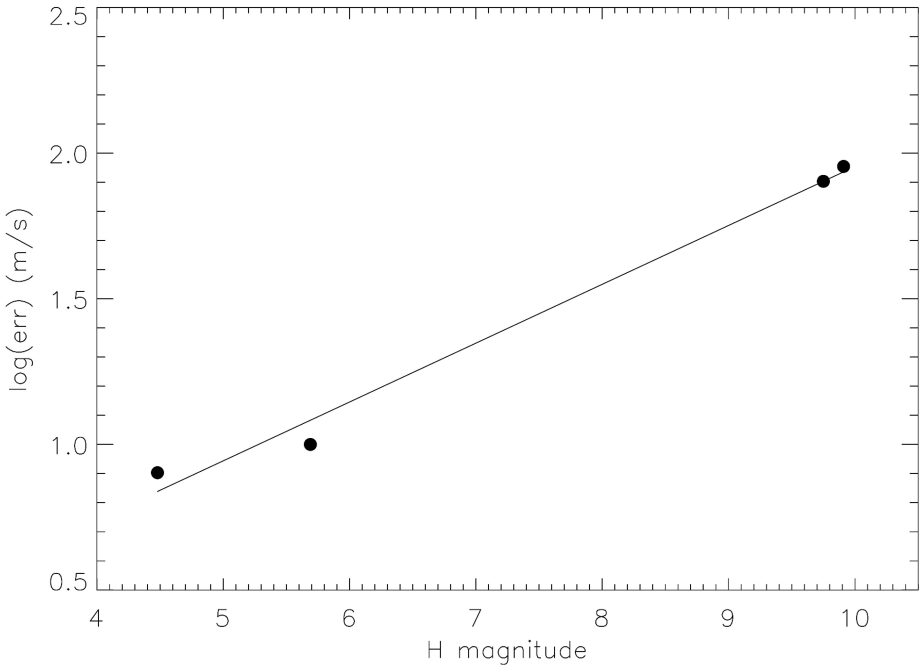
Adapted from Tozzi et al. 2014, SPIE paper

RVs: telluric method

Carleo et al, 2016



RV accuracy = 8m/s for Hmag = 5



RVs: telluric method

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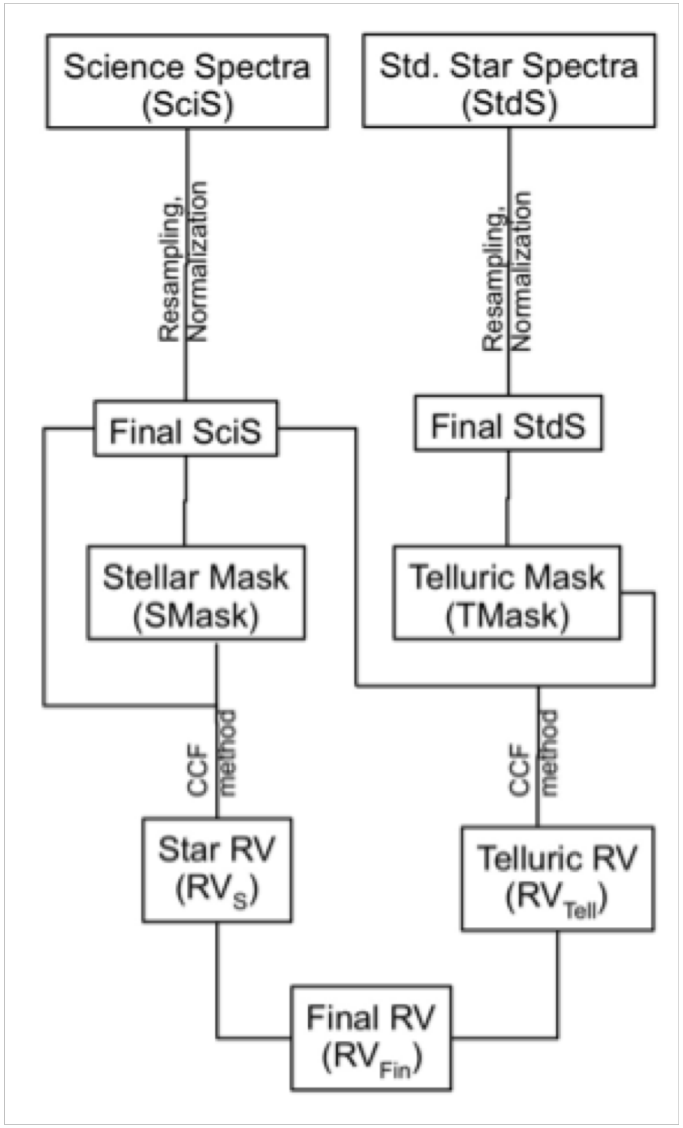

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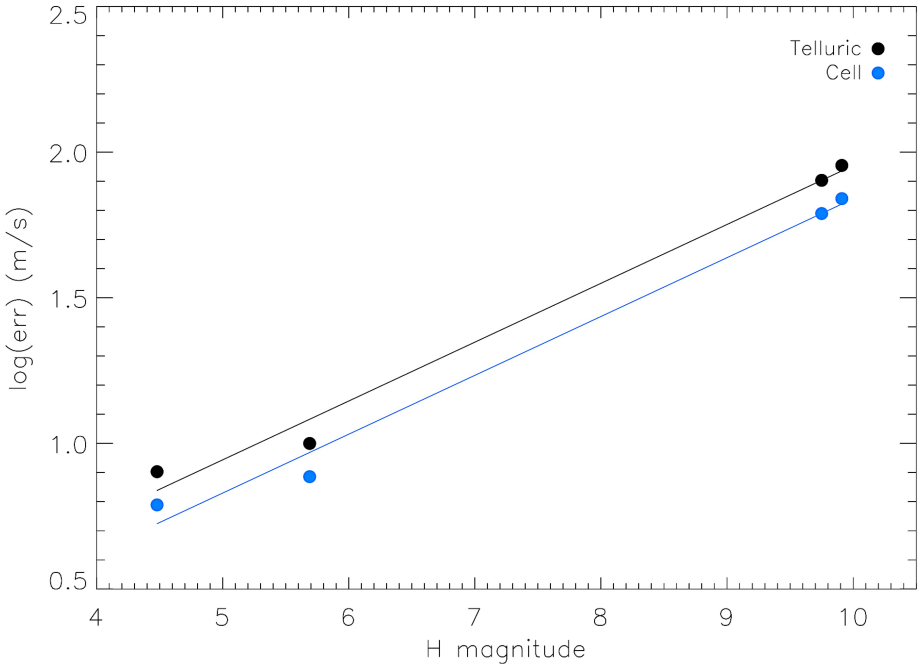
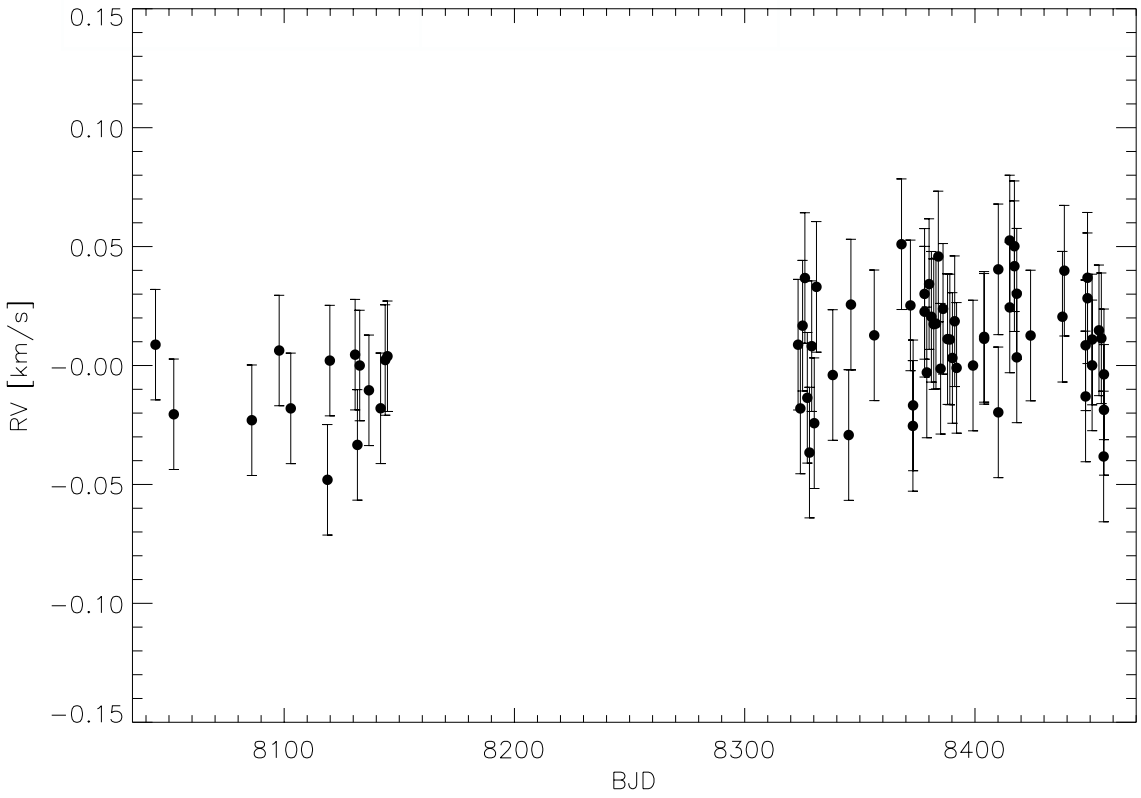
Absorption Cell: 3m/s



RV standard star

- HD 3765 - SpT = K2

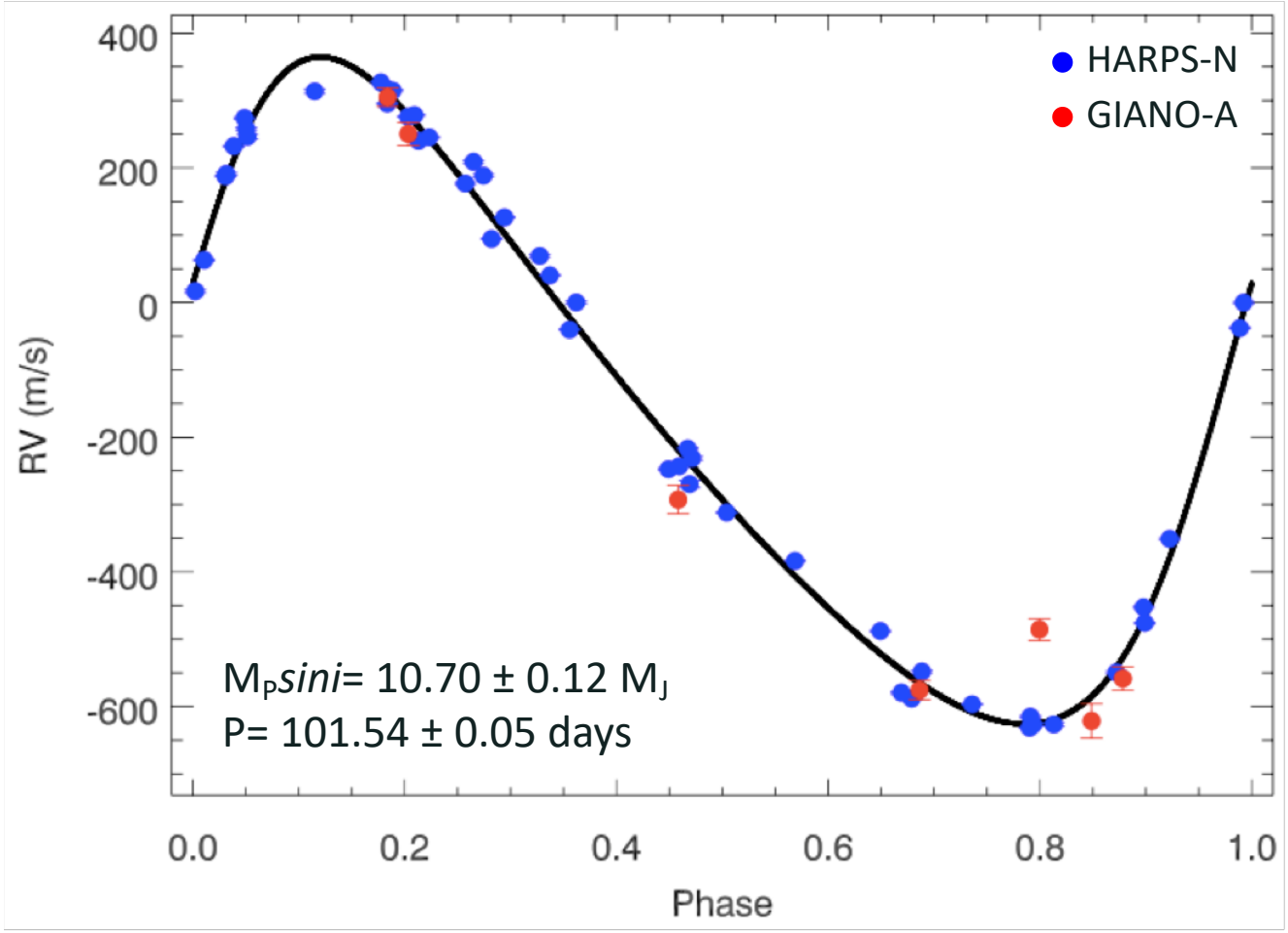
rms scatter (m/s)	Internal error (m/s)	Typical S/N
23	25	160



TYC 4282-605-1

K-giant

González-Alvárez et al., 2017



Available to the scientific community from April 2017

Semester Apr – Sep 2017: GAPS makes use of its own observing time to further test GIARPS (science verification)

Semester Oct – Mar 2017/2018: GAPS2.0 Pilot Program

Semester Apr – Sep 2018: GAPS2.0 Large Program

Objective: search and characterization of very young Hot Jupiters

BD+20 1790

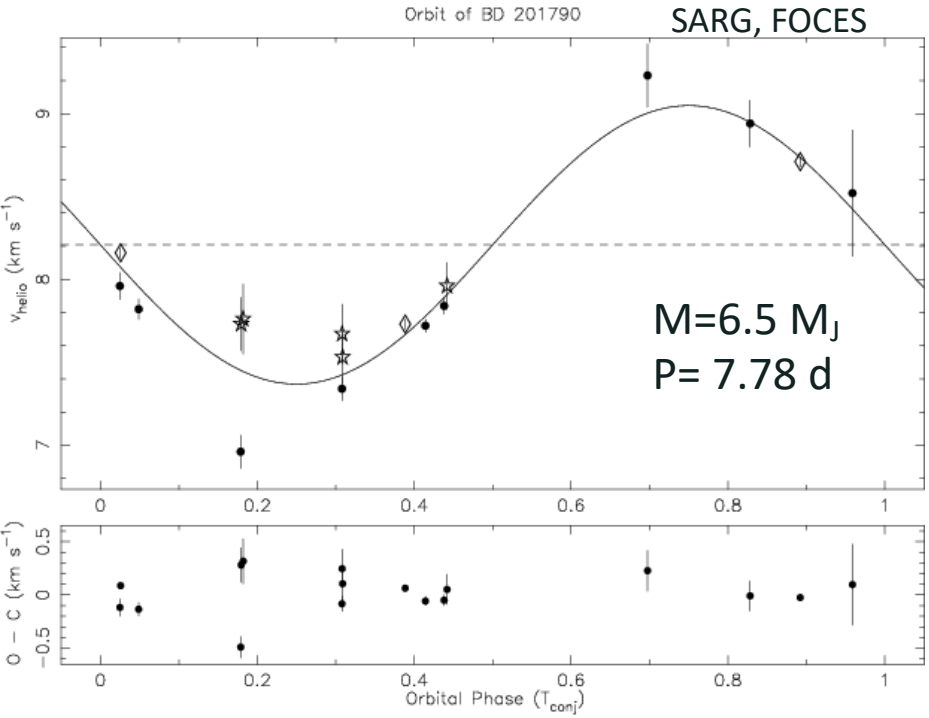
SpT = K5V vsini= 10 km/s P_{rot} = 2.76 d

$logR'_{HK}$ = -3.7 (Hernán-Obispo+2015)

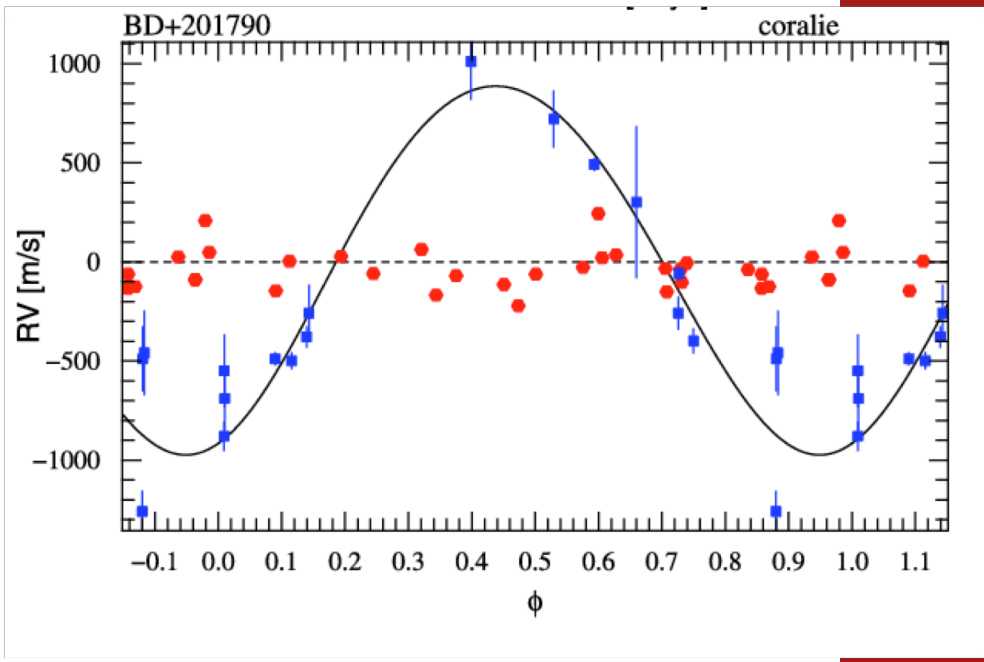
Age ≈ 150 Myr (Bell+2015)

Hernán-Obispo et al. 2010

SARG, FOCES



Figueira et al. 2010



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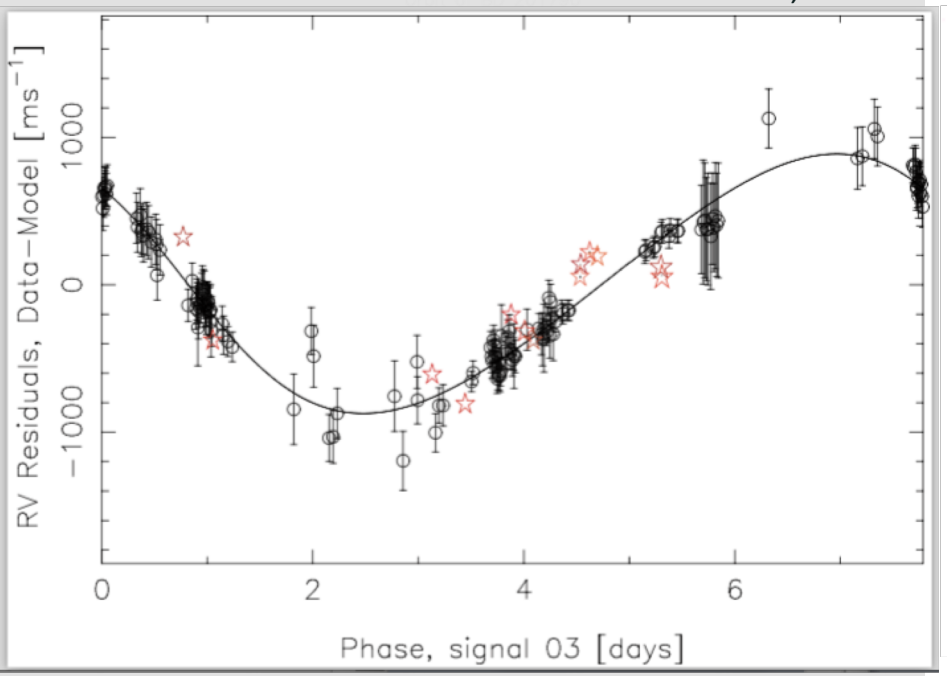
HARPSN, HERMES



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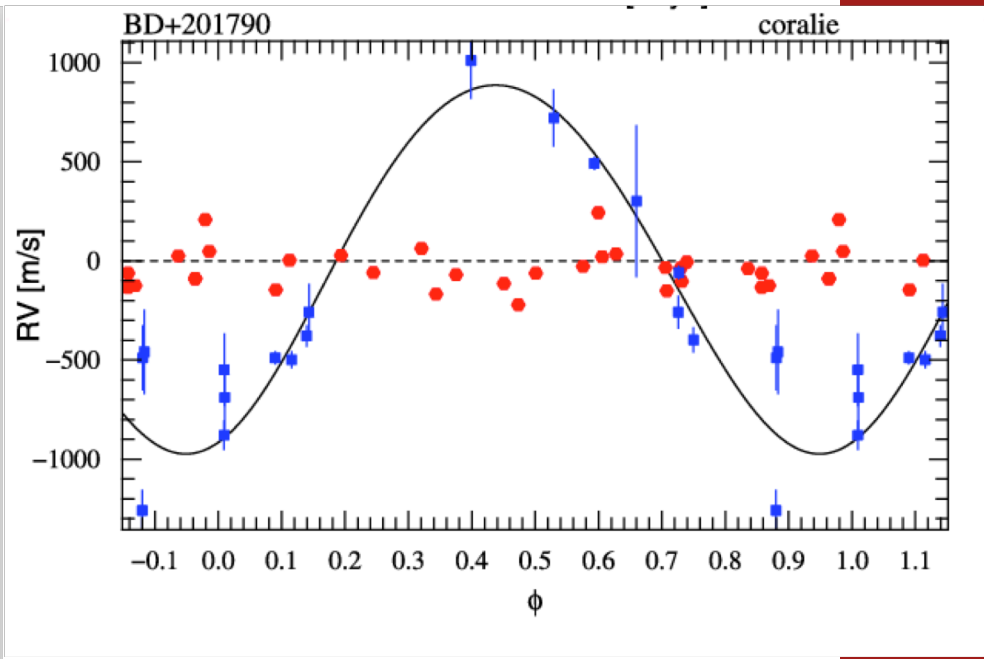
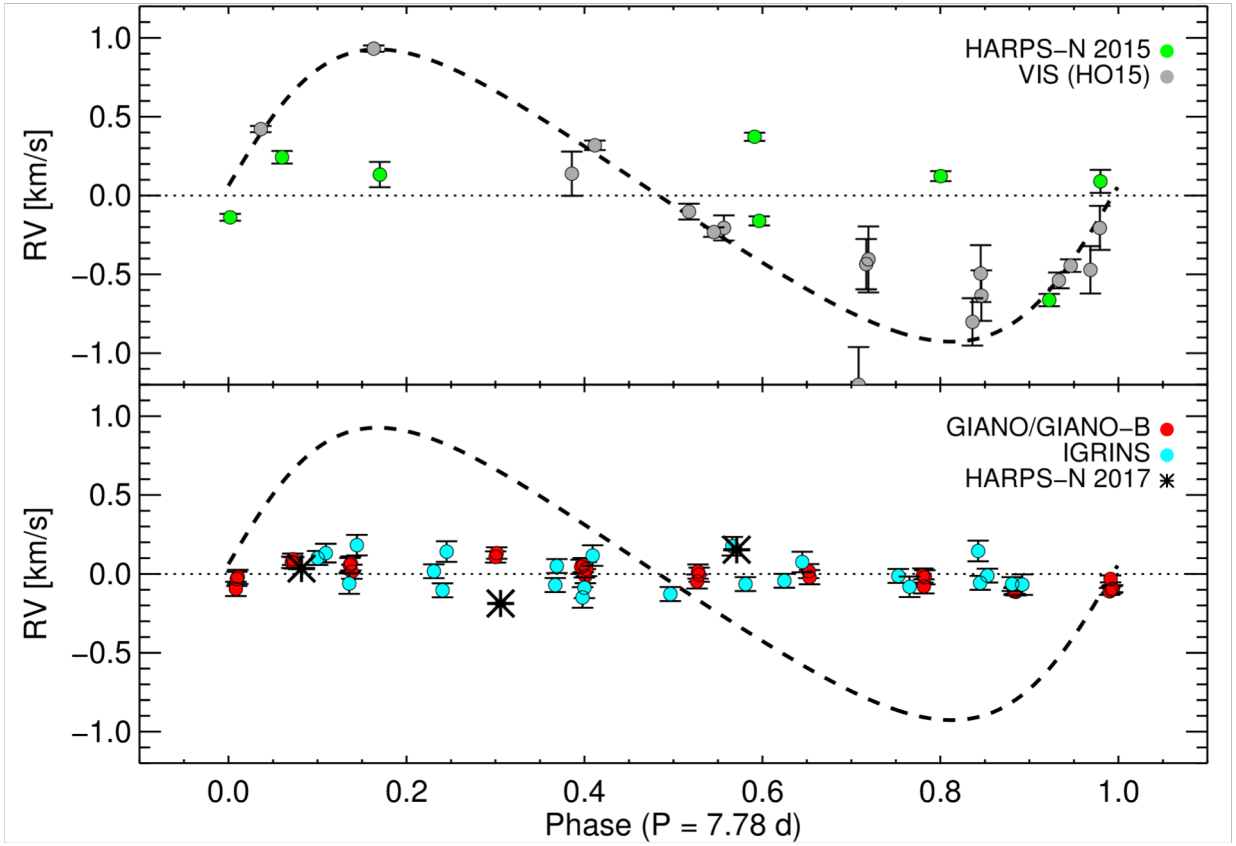


BD+20 1790 Carleo et al, 2018



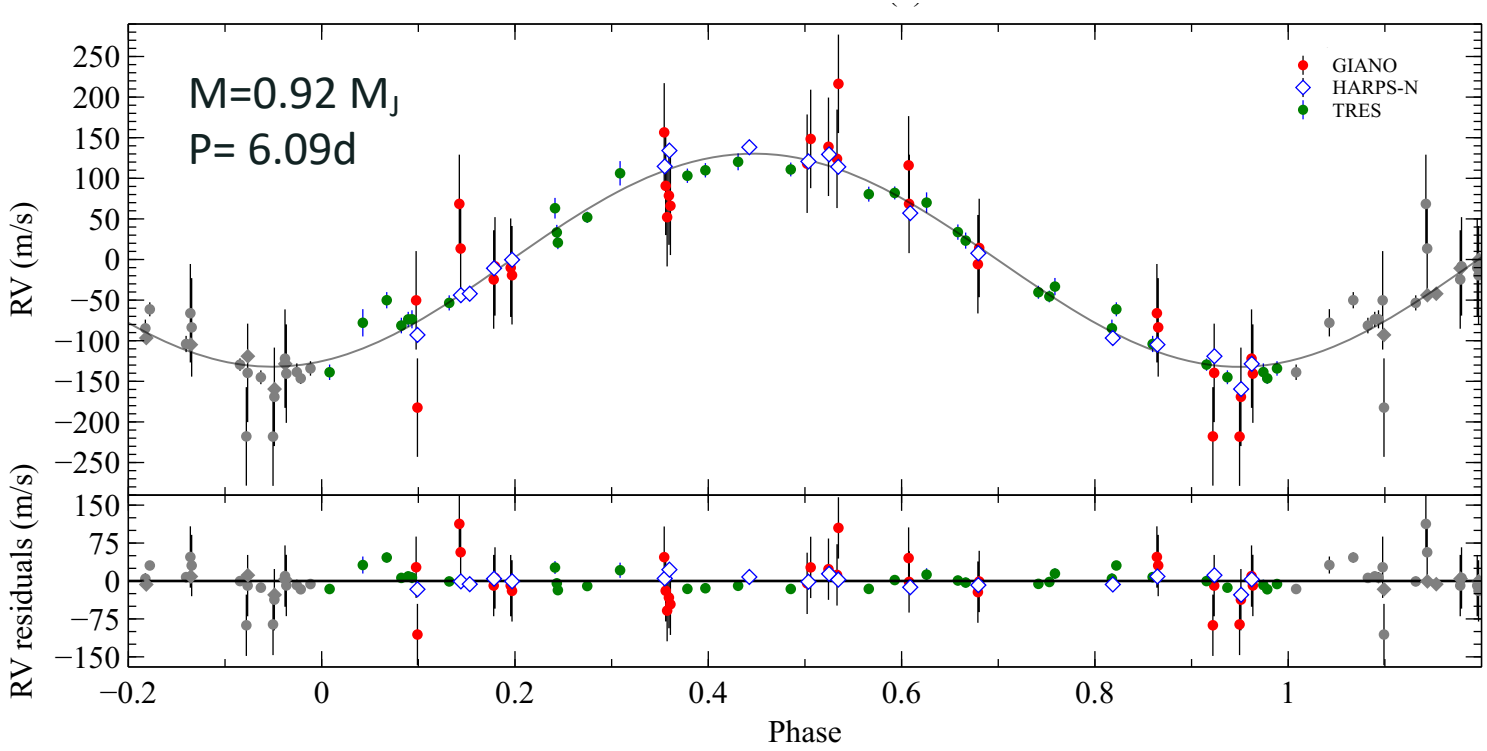
Only previously known case orbiting a star between 20 to 200 Myr old (Rizzuto et al. 2017; David et al. 2018)

YO13

Carleo et al, to be subm.

SpT = K5 vsini= 3 km/s P_{rot} = 11.98 d Age ≈ 625 Myr

INSTRUMENT	rms scatter (m/s)	Internal error (m/s)	Typical S/N
GIANO - B	119	61	39
HARPS - N	105	3	42



Eccentricity ~ 0

GIANO-B: RV precisions

SpType	Hmag	SNR	vsini (km/s)	Internal error (m/s)	RV r.m.s. scatter (m/s)
M4.5V	4.8	163	3.0	19	19
G1V	5.1	141	1.0	31	24
K2V	5.3	163	1.7	25	23
K5V	7.0	72	10.0	36	130
K4.5	7.8	39	3.0	61	40
M0	8.6	27	30.5	769	946