

Local Extrasolar Planets



The big picture

1. Increase human resources and networks for national Astronomy
2. Develop new areas of research and do quality science
3. Promote science in Chile



The Pioneers

■ Wolfgang Gieren

■ Maria Teresa Ruiz

■ Grzegorz Pietrzynski

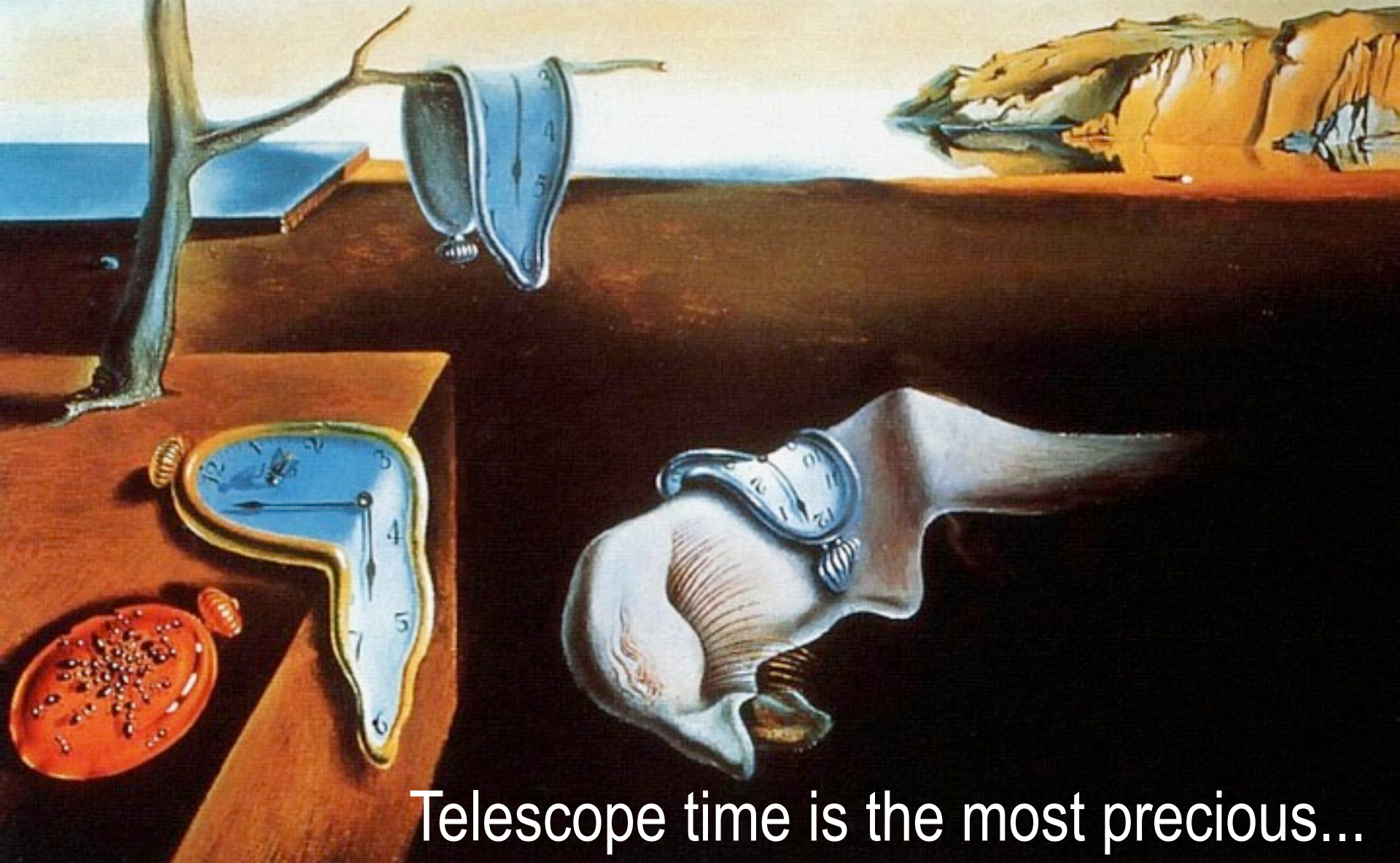
■ Dante Minniti

School on Extrasolar Planets and Brown Dwarfs
Santiago, 2003

Invited Lecturers:

Michel Mayor, Scott Tremaine, Gill Knapp, France Allard

It is all about time...



Telescope time is the most precious...

The Pioneers

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■ Grzegorz Pietrzynski

■ Dante Minniti

The first exoplanet for us:

M. Konacki, G. Torres, D. D. Sasselov, G. Pietrzynski, A. Udalski, S. Jha, M. T. Ruiz, W. Gieren, & D. Minniti,
"A Transiting Extrasolar Giant Planet Around the Star
OGLE-TR-113", 2004, ApJ, 609, L37"

The Pioneers

 Paul Butler

 Debra Fischer

 Dante Minniti

The First Planets from the N2K Consortium

Fischer et al., ``A Hot Saturn Planet Orbiting HD 88133, from the N2K Consortium", 2005, The Astrophysical Journal, 620, 481

Sato, et al., ``The N2K Consortium. II. A Transiting Hot Saturn around HD 149026 with a Large Dense Core", 2005, The Astrophysical Journal, 633, 465

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■ Grzegorz Pietrzynski

■ Dante Minniti

2006-2007 ESO Large Programme 666 Extrasolar Planets and Brown Dwarfs

“OGLE-TR-211 – A new inflated Hot Jupiter from the OGLE Survey and the ESO LP666 spectroscopic follow-up program”, 2008, *Astronomy & Astrophysics*, 482, 299

“A transiting planet among 23 new near-threshold candidates from the OGLE survey - OGLE-TR-182”, 2008, *Astronomy & Astrophysics*, 487, 749

The Pioneers

 Paul Butler

 Debra Fischer

 Dante Minniti

The Magellan Planet Search
21 planets

The 2nd Generation

 Patricio Rojo

 James Jenkins

 Andres Jordan

 Max Moyano

 Rudy Kurtev

 ...

Red Optical Planet Survey: A radial velocity search for low mass M dwarf planets

J.R. Barnes, J.S. Jenkins, H.R.A. Jones, P. Rojo, P. Arriagada, A. Jordan, **D. Minniti**, M. Tuomi, S.V. Jeffers, & D. Pinfield, “ROPS: A New Search for Habitable Earths in the Southern Sky”, 2012, Monthly Notices of the Royal Astronomical Society, 424, 591 ([arXiv:1204.6283](https://arxiv.org/abs/1204.6283))

Exoplanet Studies

Search for giant planets in M 67 using radial velocities:
using radial velocities on 88 stars discovery of 3 planets

M.T. Ruíz
C. Melo
P. Rojo

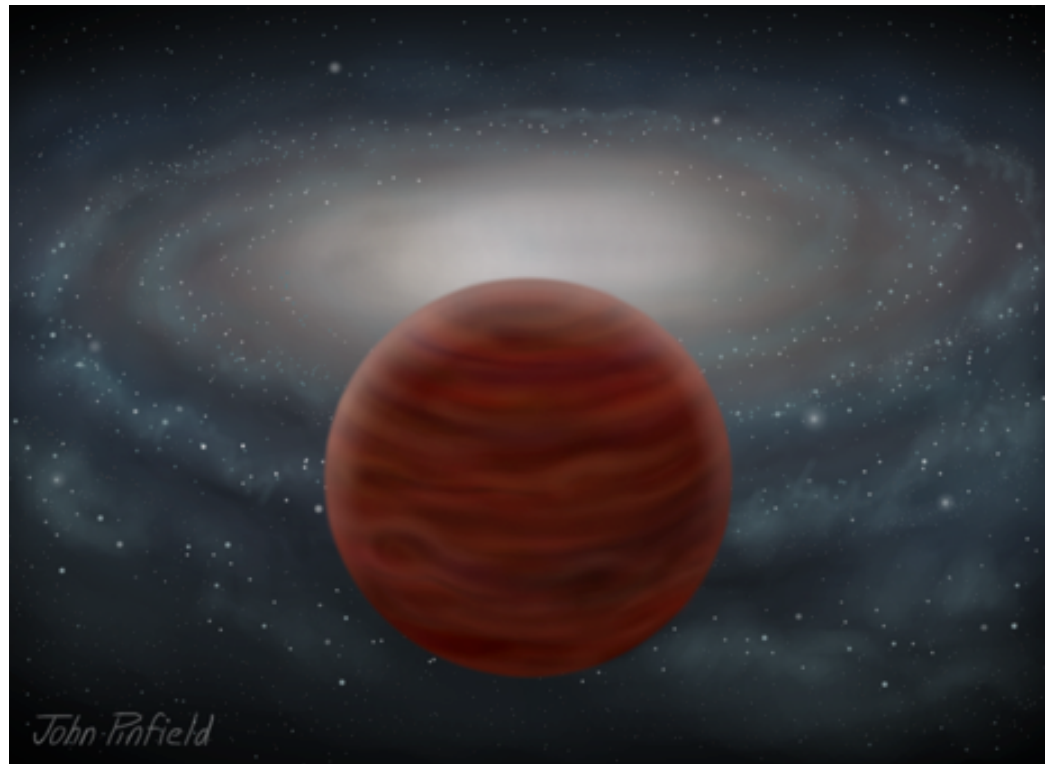


ESO PRESS RELEASE 15/01/2014 M67

Exoplanet Studies

Brown Dwarfs in the VISTA Hemisphere Survey
and Brown Dwarfs in UKIDSS and WISE.

Determined the substellar birth rate from UKIDSS



M.T. Ruíz
J. Jenkins

PRESS RELEASE RAS PR 13/55 20/11/2013

The Galaxy's ancient brown dwarf population revealed

Radial Velocity Studies



Discovery of the 7 planet system GJ667C, which contains three low mass planets in the Habitable Zone

Long running Calan-Hertfordshire Extrasolar Planet Search program with the Coralie and HARPS spectrographs

J. Jenkins

BD-Dwarf Searches

R. Kurtev, J. Borissova



The VVV and GPS Surveys will provide a sample of new M, L and T dwarfs in the Southern Galactic plane. Follow-up with multi-epoch photometry, astrometry and spectroscopy would enable confirmation, and a variety of other studies.

1. Hungarian Automated Telescope HAT-South at Las Campanas

2. HATPI

Discovery of several transiting exoplanets



A. Jordán

The 3rd Generation

 Sergio Hoyer

 Ignacio Toledo

 Sebastian Ramírez

 Felipe Pérez

 Claudio Cáceres

 Joyce Pullen

 Juan Carlos Beamín

 Matias Radiczcz

 José Gallardo

 Daniela Iglesias

 José Miguel Fernández

 Matías Díaz

 Matías Jones

 Bárbara Rojas

 Pamela Arriagada

The 3rd Generation



**Jose Miguel
Fernandez**



**Claudio
Caceres**



**Pamela
Arriagada**



**Daniela
Villegas**



**Sebastian
Ramirez**



**Ignacio
Toledo**



Rodrigo Diaz

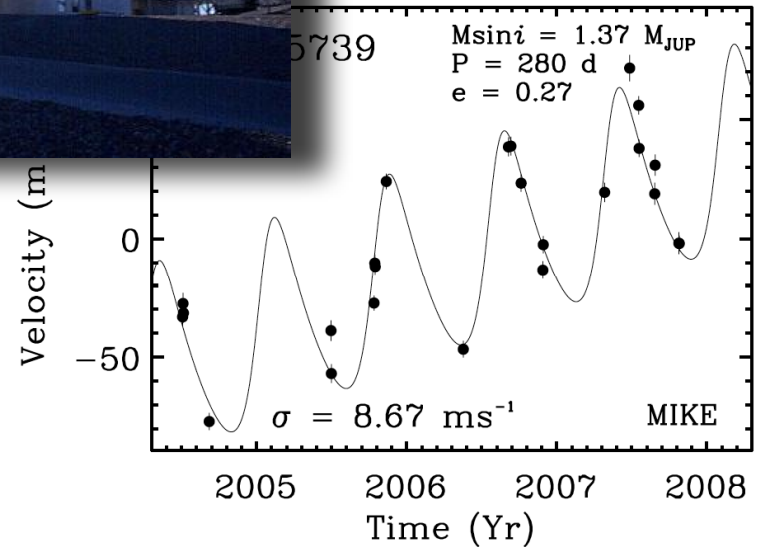
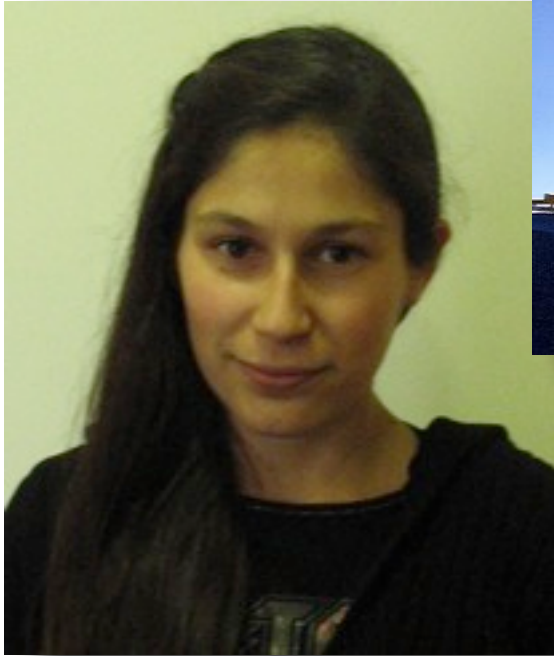


Joyce Pullen



Sergio Hoyer

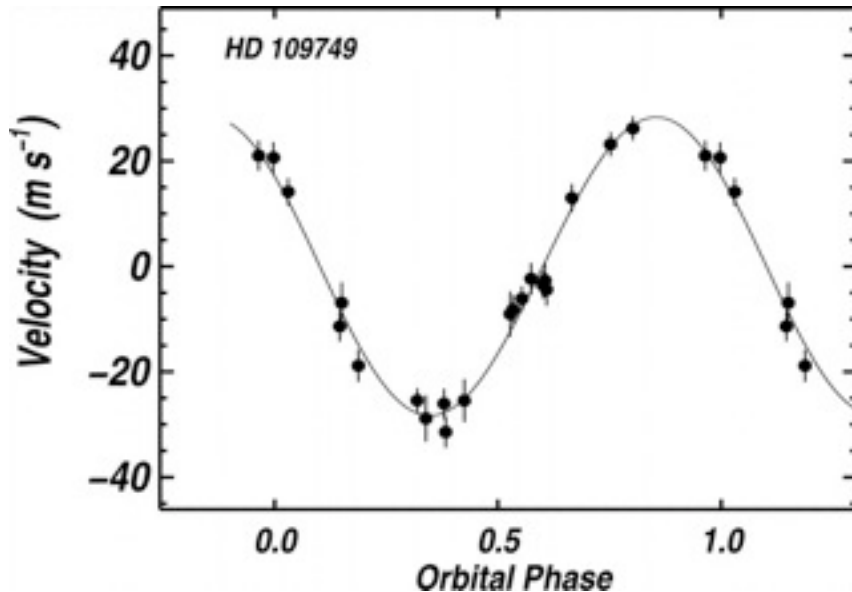
The 3rd Generation



Pamela Arriagada
Lic 2008
PhD 2011

“The Magellan Radial Velocity Search for
Extrasolar Planets in the Solar Neighborhood”,
with P. Butler, M. Lopez, D. Minniti

Magellan exoplanet *RV* search



Discovery of a hot super-Earth and a candidate in the sub-Saturn desert range around the K7/M0 dwarf star GJ 221

P. Arriagada

P. Butler

M. Diaz

J. Jenkins

D. Minniti



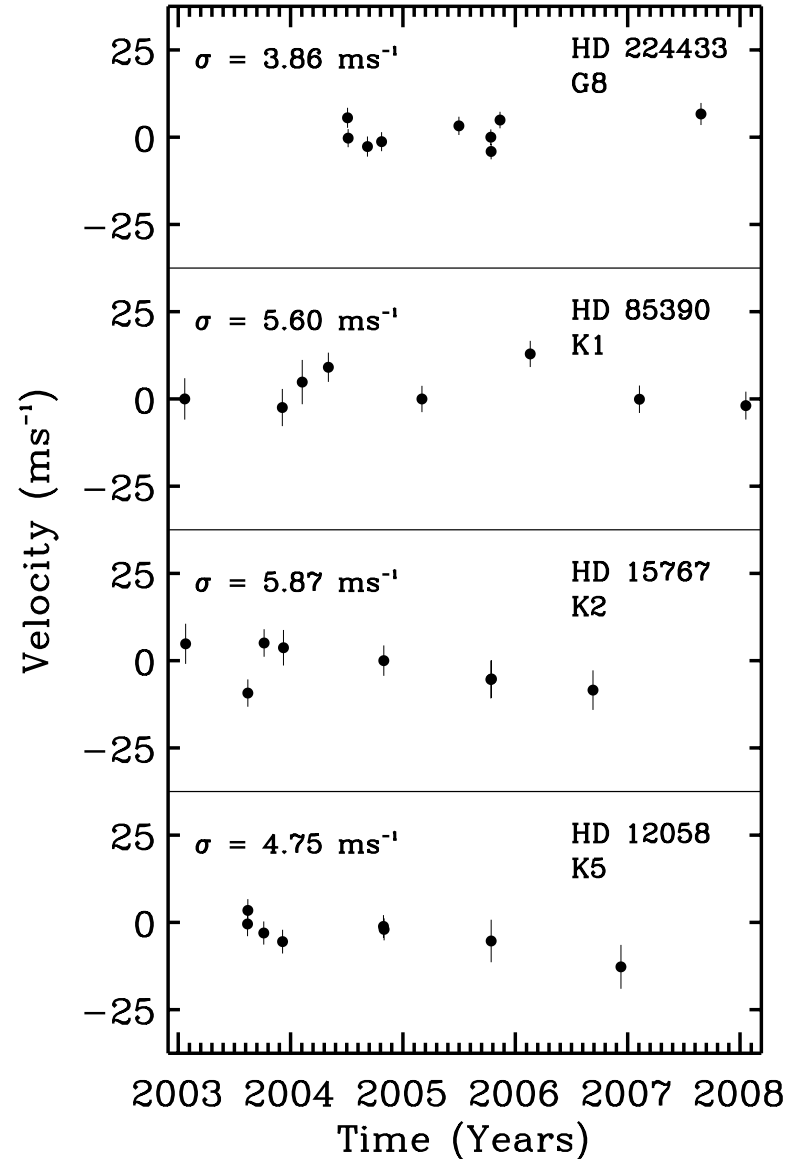
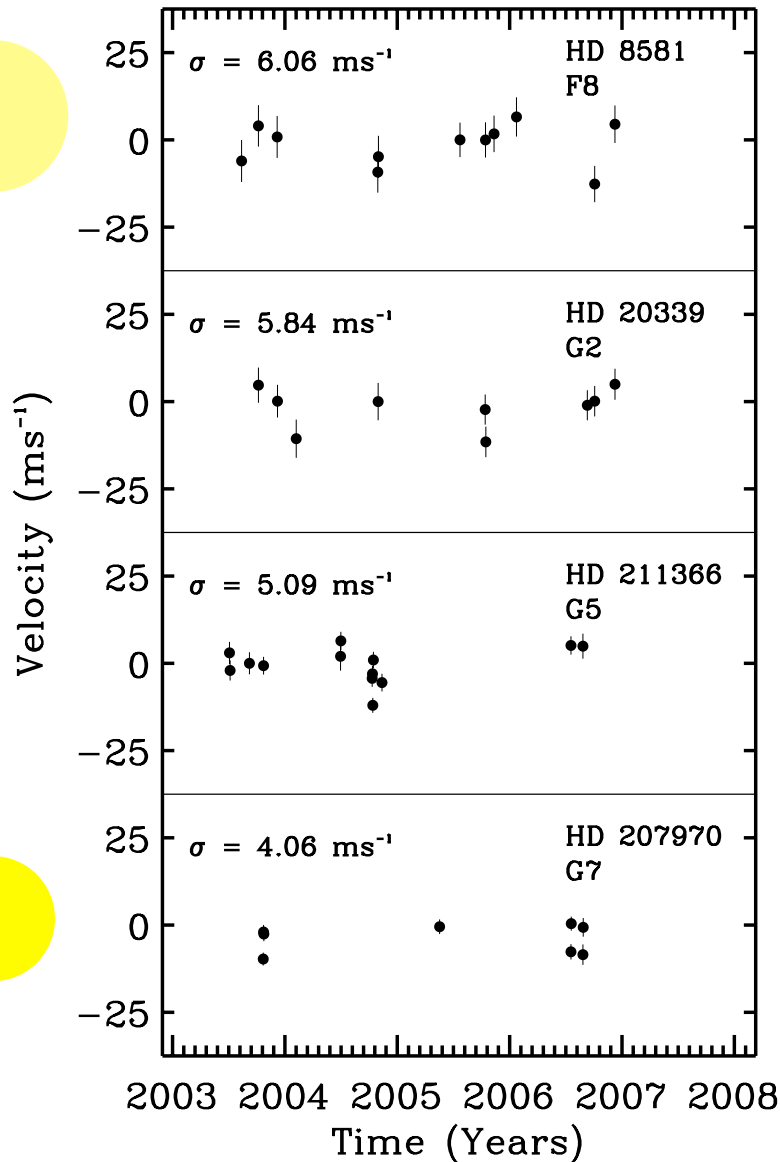


Magellan Telescopes at Las Campanas Observatory

MPS: The Magellan Planet Search

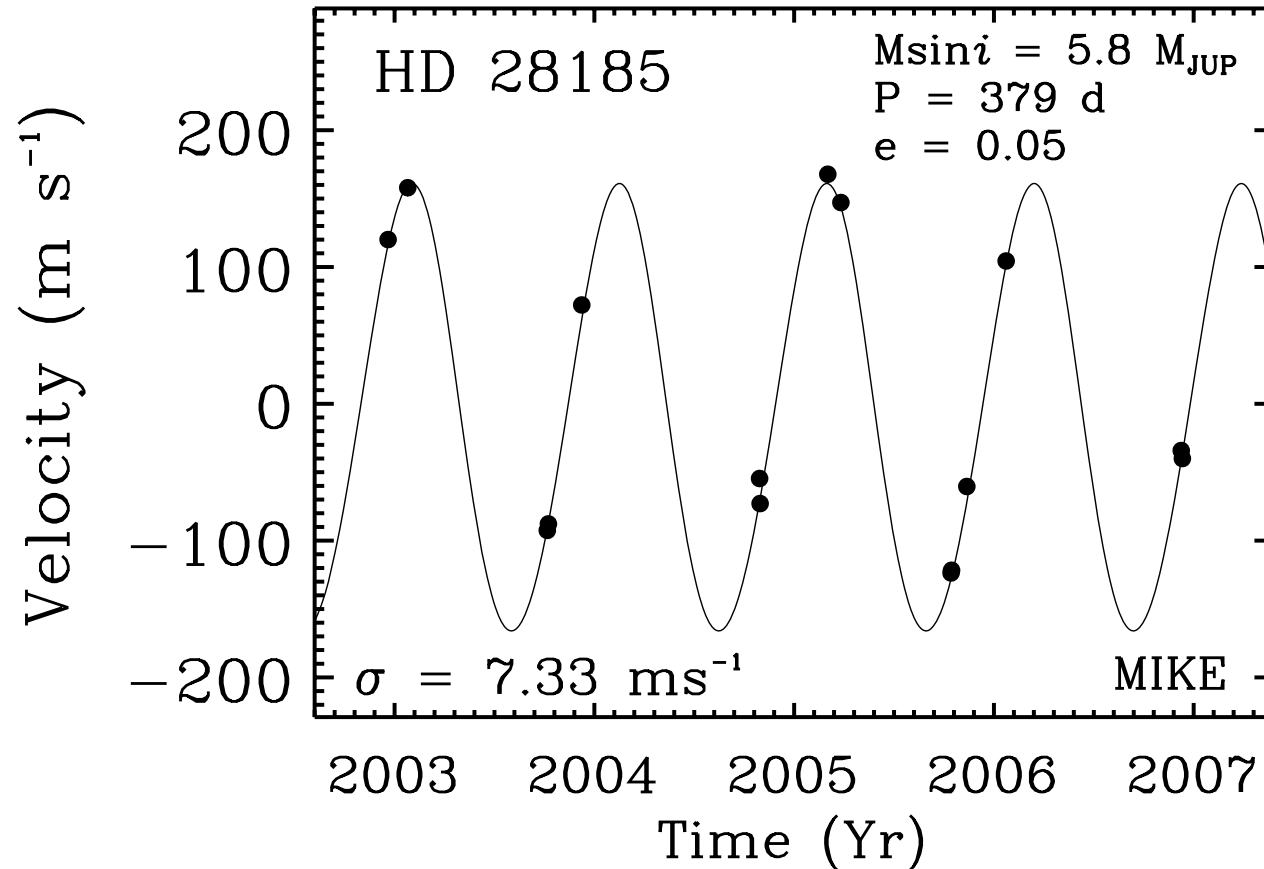
- Search for planets around Solar-type nearby stars
- Observations: ~ 30 nights with Magellan; 2003-2009
- MIKE spectrograph: $R \sim 50000$, red channel
- ~ 400 stars, not on previous samples
- Not metallicity biased
- Focus on fainter stars $7 < V < 9.5$
- Exclude known close binaries, giants, and active stars

Constant radial velocity stars

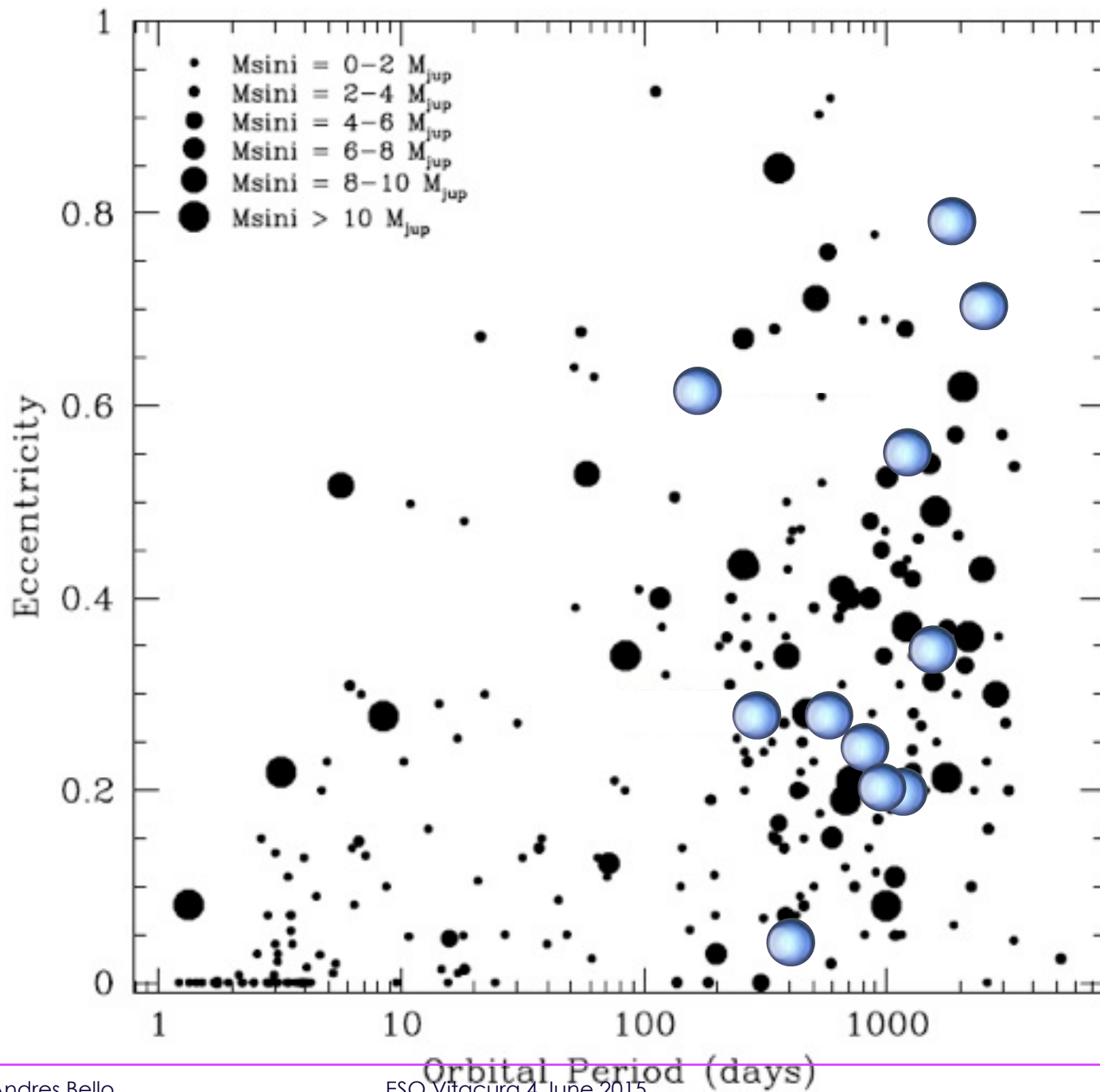


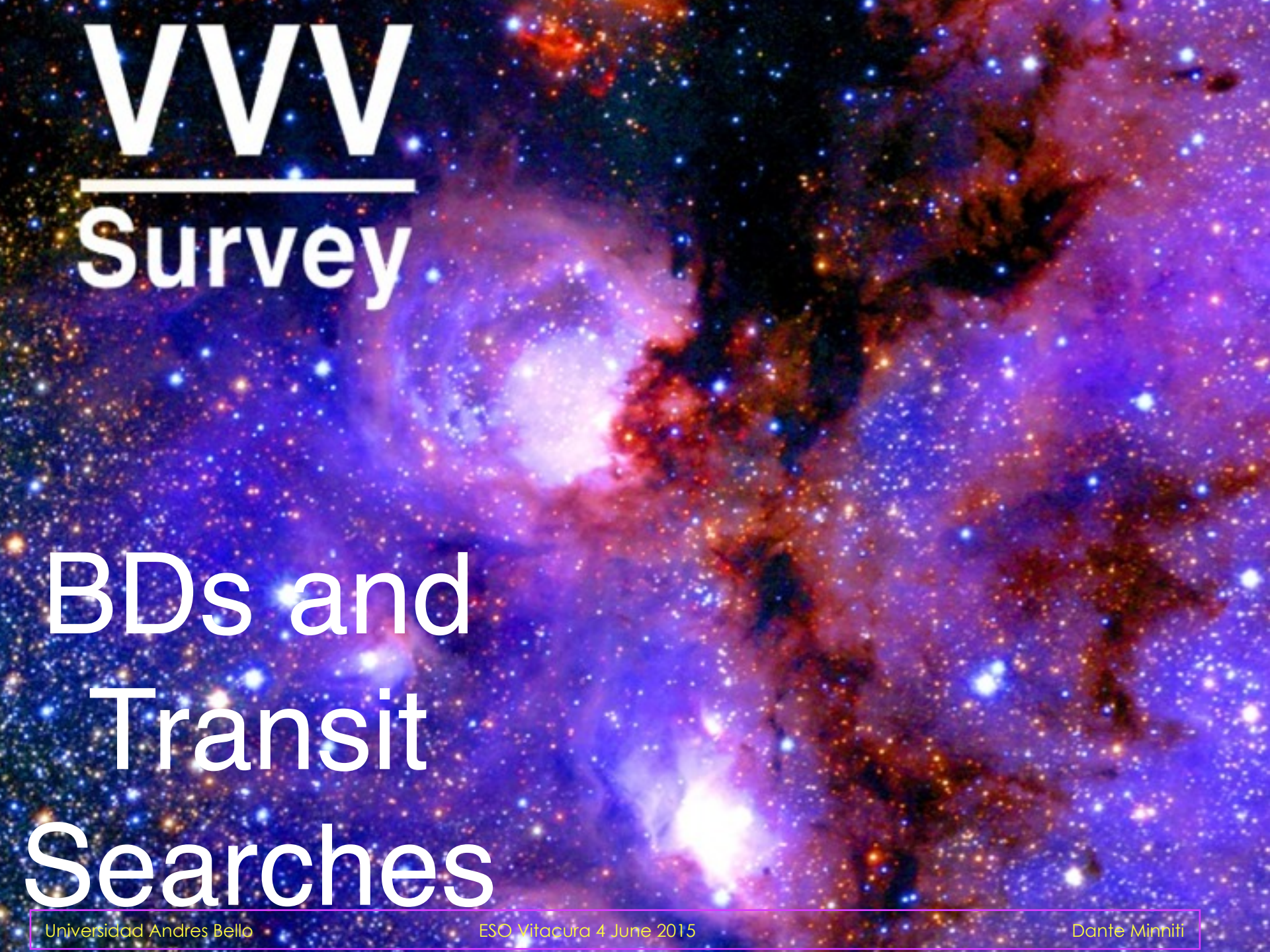
They allow to check our RVs for different spectral types

MPS Planets



A very massive planet in an Earth-like orbit





VVV

Survey

BDs and Transit Searches

Search for Brown Dwarfs

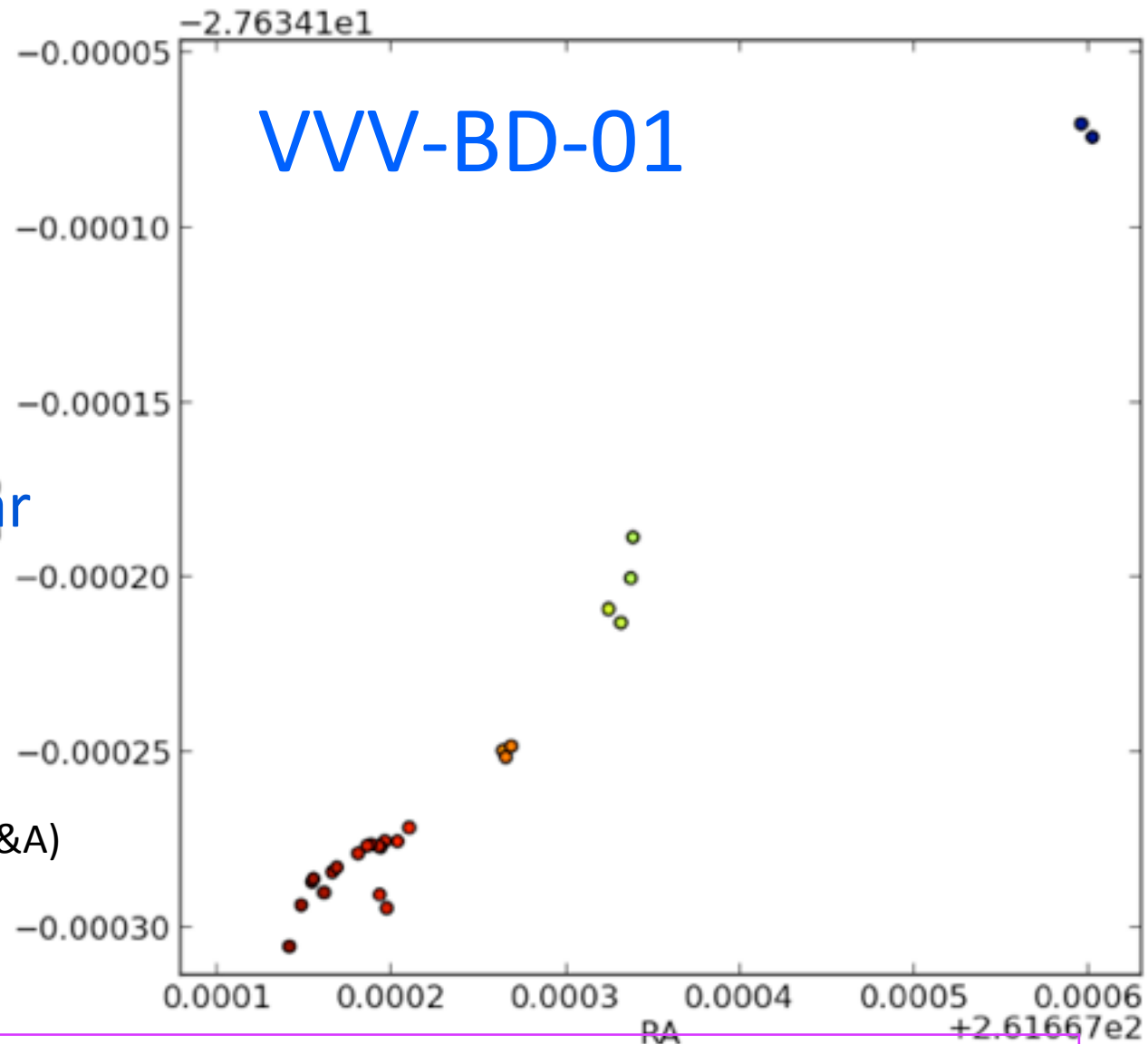
Juan Carlos Beamin, Mariusz Grakzyk, Rudy Kurtev, Valentin Ivanov, et al.

Search for Brown Dwarfs

D=17pc

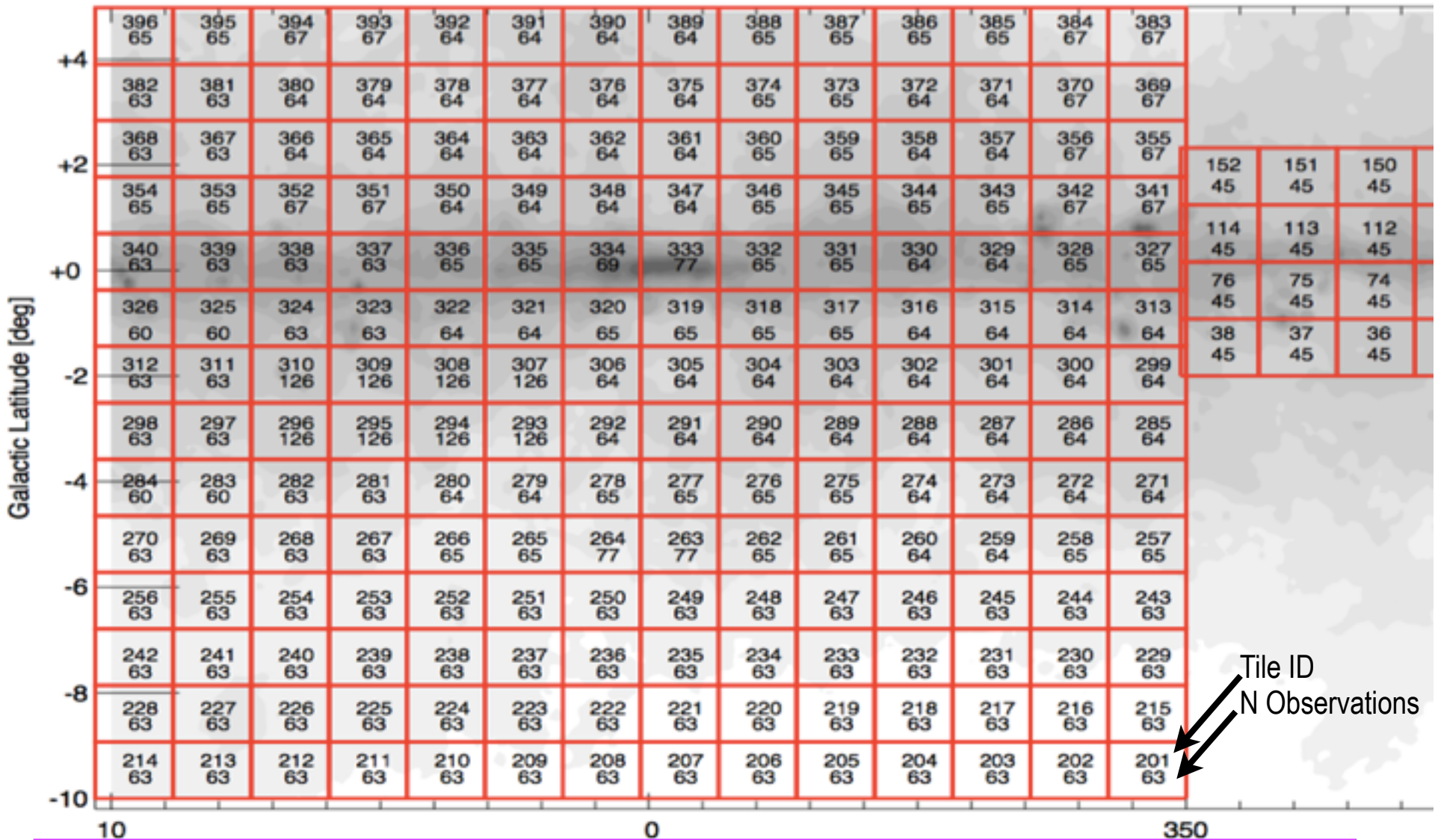
a peculiar new solar
neighbor showing
parallactic motion

J. C. Beamin, et al. (2013, A&A)



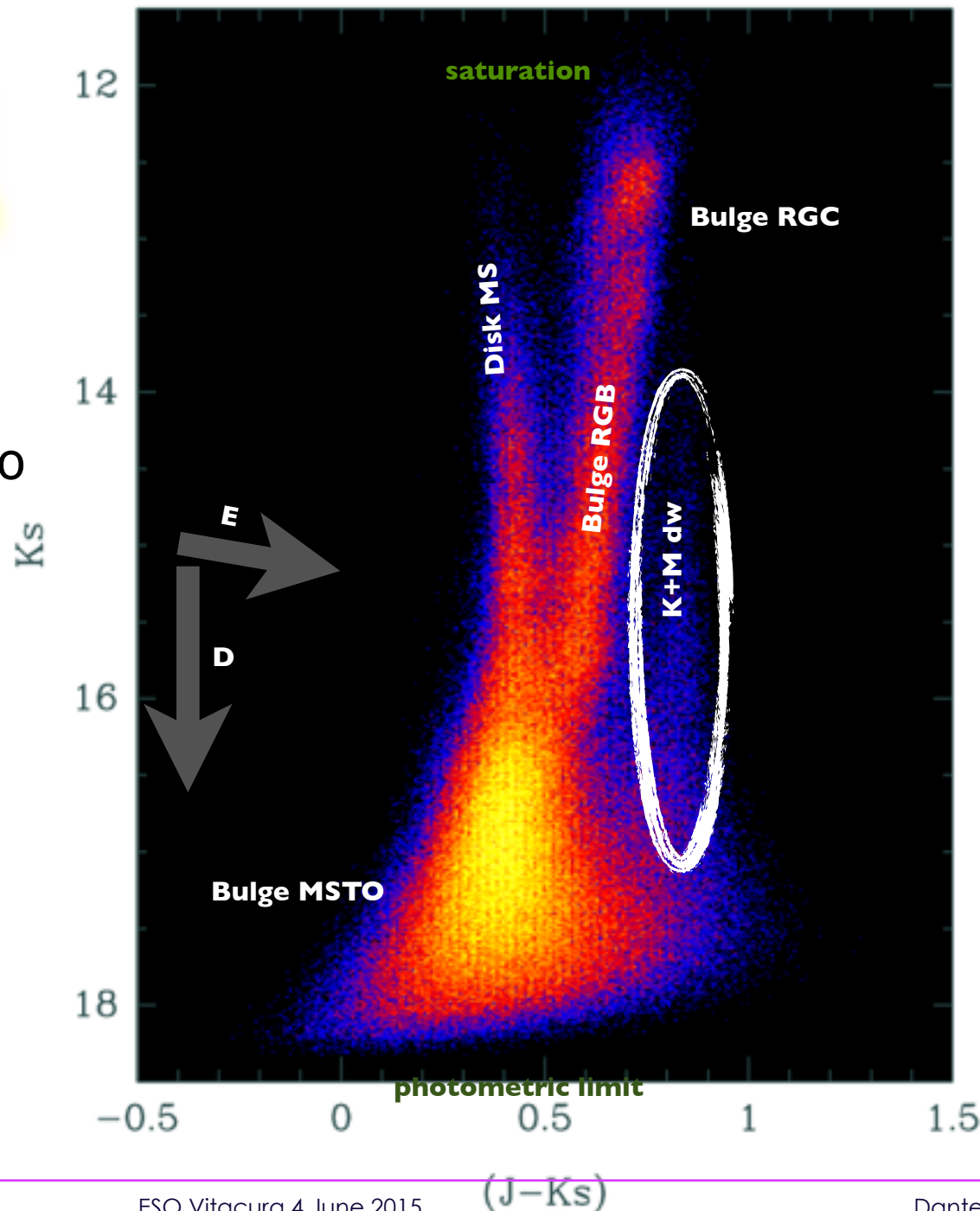
Number of Epochs: Bulge

Maren Hempel



SEARCH FOR TRANSITING EXTRASOLAR PLANETS

Main motivation: to build up the statistics by selecting a very large sample of small stars (M dwarfs) to search for extrasolar planetary transits



Barbara Rojas
Roberto Saito,
Francisco Surot
Daniela Iglesias

Selection of M-stars in the VVV tile b201 using multicolor photometry in ZYJHKs

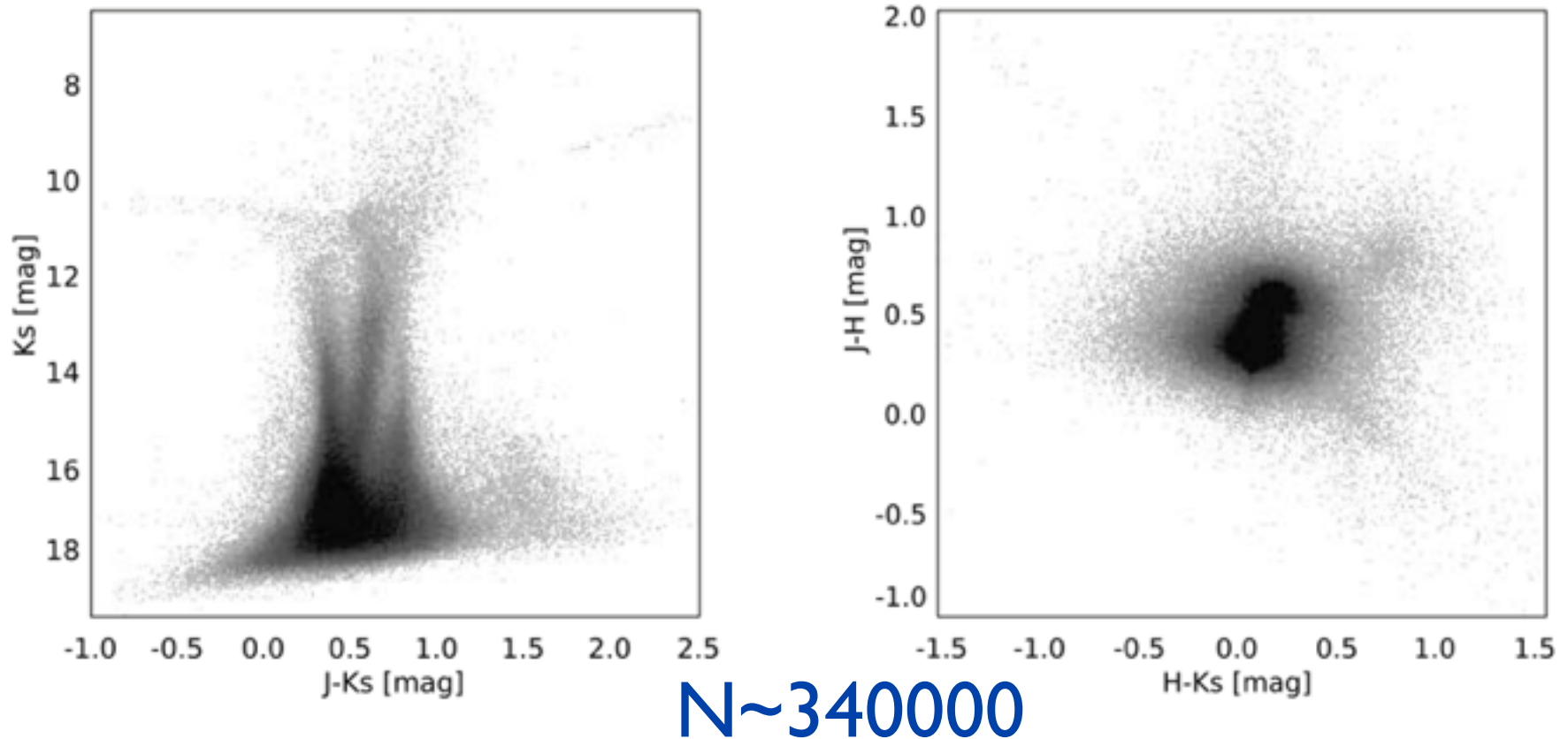
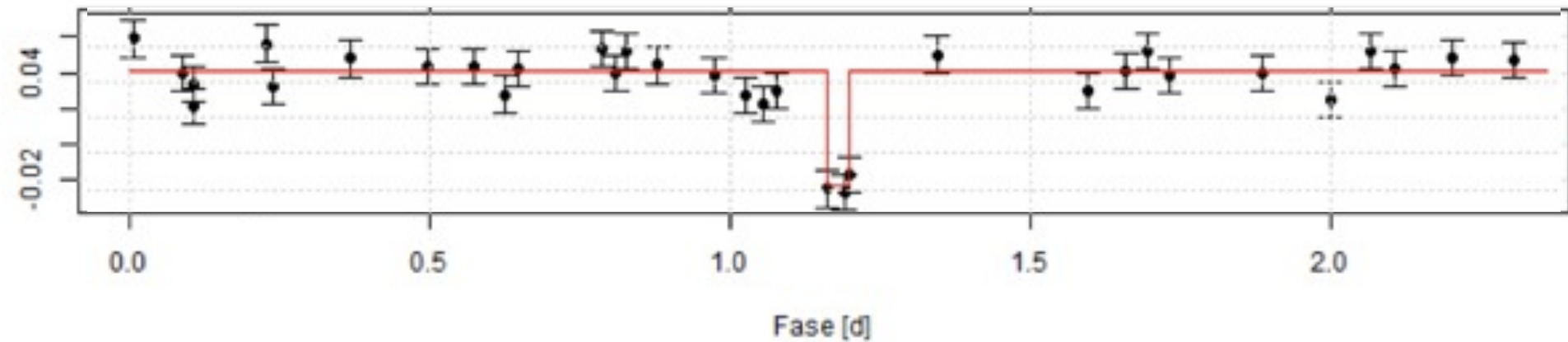


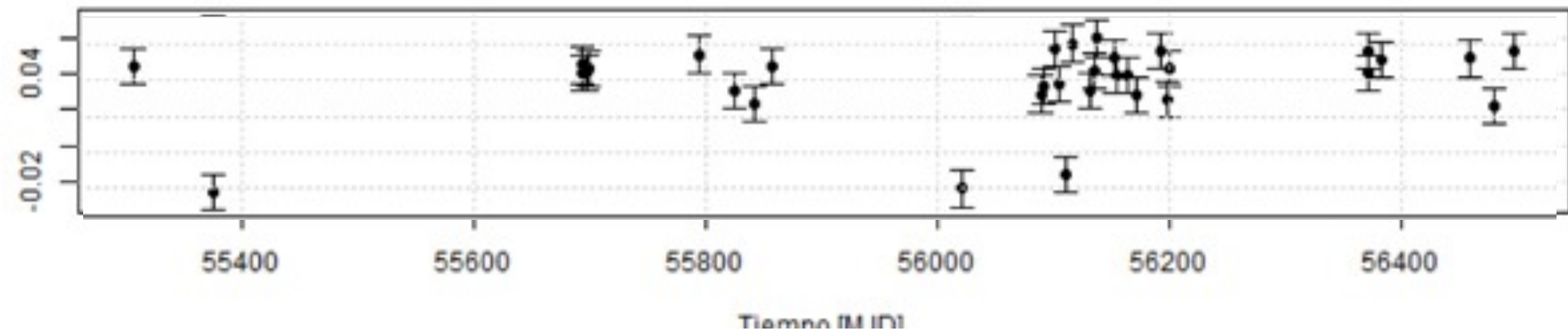
Figure 4.1: Color-magnitude diagram and color-color diagram of all the objects observed in tile b201. Left: $J-K_s$ versus K_s density diagram. Right: $H-K_s$ versus $J-H$ density diagram. Gray shades indicate the least crowded areas while black indicates the most dense (over 99th percentile).

Barbara Rojas, et al. 2014, A&A

b2030138614, $T = 2.35798$ d, $\Delta K = 0.064 \pm 0.006$ dex, $\delta = 5.69\%$, $\tau = 0.842 - 4.874$ hrs, $R_p = 0.0316 R_{\text{sol}}$



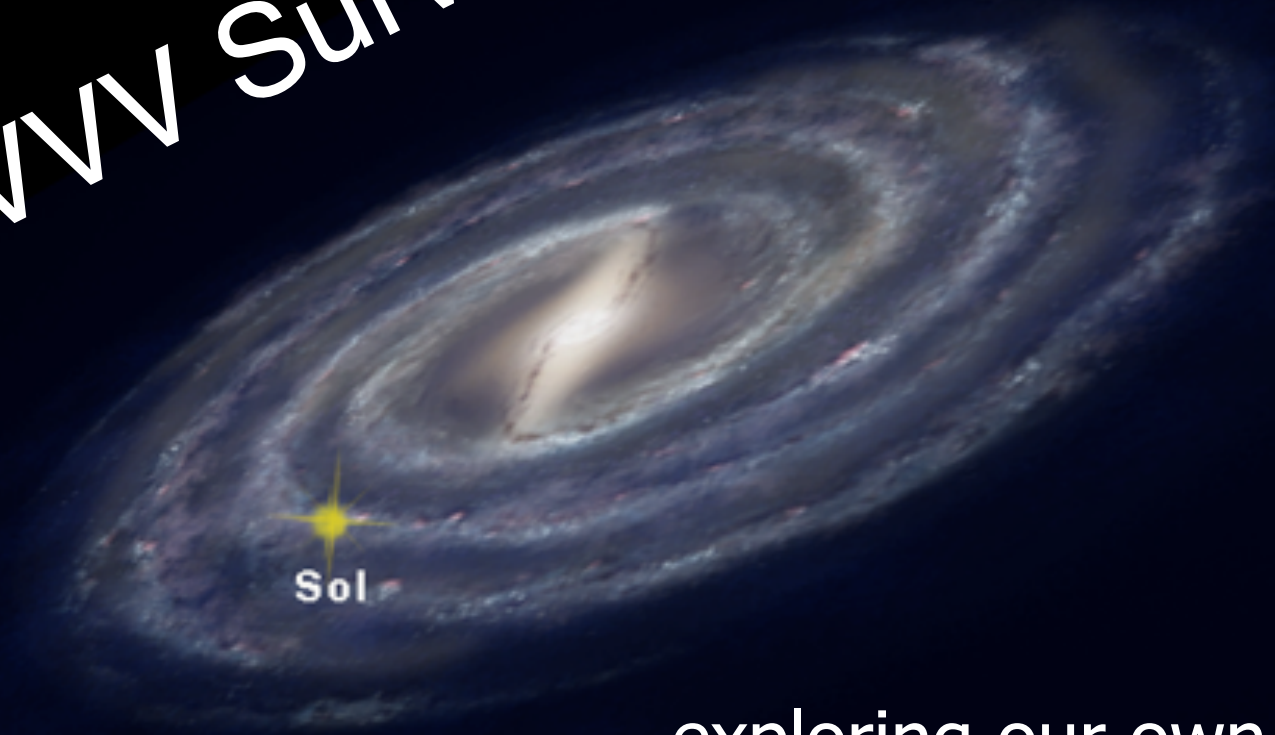
b2030138614, $K = 11.868 \pm 0.079$, $M_{6.6} \pm 4.0$



Example of a super-Earth transit candidate in a M6.6 star

Barbara Rojas
Roberto Saito,
Francisco Surot
Daniela Iglesias

The VV Survey...



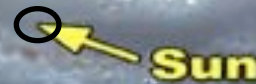
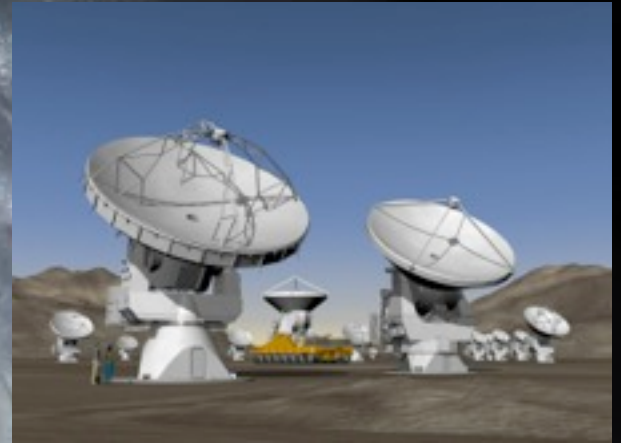
exploring our own galaxy,
increasing Southern collaborations,
promoting Astrophysics at all levels,
& securing resources for future generations.

The Future



AMPS Extrasolar Planets

ALMA M-stars Planet Survey



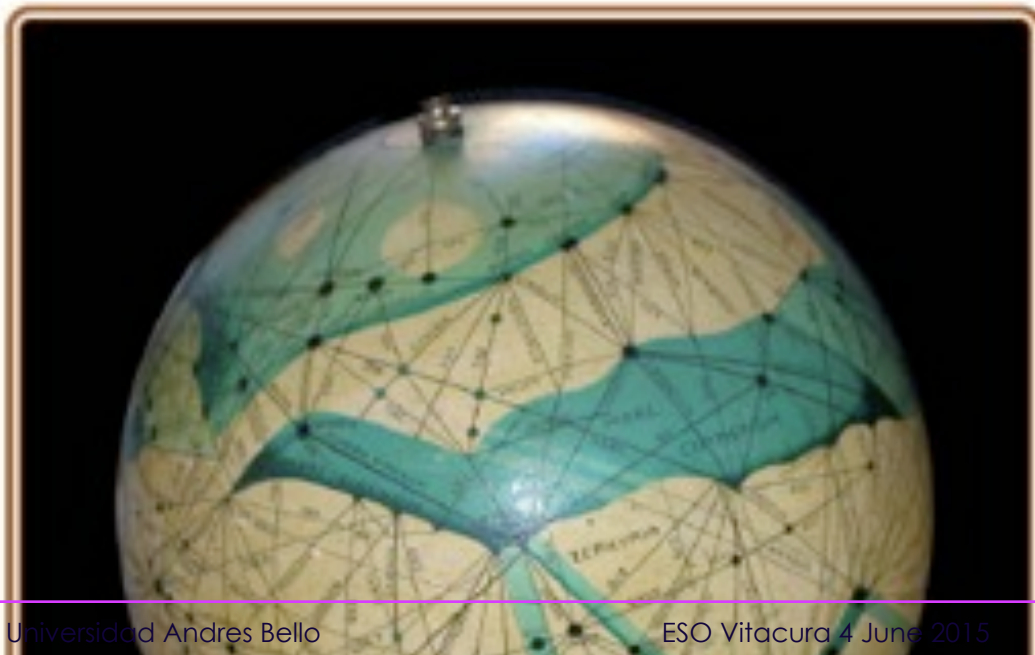
Search for exoplanets in the Solar neighborhood with ALMA

Local Extrasolar Planets

THE PONTIFICAL ACADEMY OF SCIENCES

Study Week on
Astrobiology

6-10 November 2009 • Casina Pio IV





13-15 JANUARY 2010
SANTIAGO, CHILE

ASTROBIO 2010

Life on Earth: Origin and Evolution

Extremophiles on Local Environments:

Antarctica

Atacama

The Deep Ocean

The Solar System: Search for Life on Mars, Europa, Titan

Beyond the Solar System: Search and Study of Extrasolar Planets

Stellar Habitable Zones and Galactic Habitable Zone

Future Perspectives on Astrobiology

SCIENTIFIC ORGANIZING COMMITTEE:

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Armando Azua - Universidad Católica

Andrea Buccino - IAFE, Argentina

Victor Gallardo - Universidad de Concepción

Doug Geisler - Universidad de Concepción

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Gerónimo Villanueva - NASA GSFC

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9 - 13 DECEMBER 2013
SANTIAGO CHILE

ASTROBIO2013

TOPICS:

1. Life on Earth: Origin of Life, Evolution, Climate Change
2. Extremophiles in Local Environments: Antarctica, Atacama, and the Deep Ocean
3. Exploration of the Solar System: Life searches on Mars, Europa, Titan, and elsewhere
4. Beyond our Solar System: Search and Study of Extrasolar Planets, Biomarkers
5. Molecules of life: first observations with ALMA, astrochemistry
6. Stellar Habitable Zones and Galactic Habitable Zone, Artificial life, Communication
7. Future Perspectives on Astrobiology: the role of JWST, E-ELT and GMT

SCIENTIFIC ORGANIZING COMMITTEE:

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Maren Hamoy (UC)
Javier Alonso (UC)
Jose Gallardo (ALMA)
Amanda Azua (UAndes)

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astrobio 2015
28sep - 02oct
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Acknowledgments

