Ciencia presente y futura con CARMENES & 1er encuentro EXONET

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Lugar: Instituto de Astrofísica de Andalucía (IAA-CSIC), Granada

Organizador: Centros españoles del consorcio CARMENES+exonet

The CARMENES project and consortium

Pedro J. Amado (IAA-CSIC)

on behalf of the CARMENES consortium

CARMENES project summary

- German-Spanish Consortium: 11 Institutions to build an instrument for the 3.5-m CAHA
- To search for Earth-like “habitable” planets around low-mass stars (M dwarfs)
  - Number and formation mechanisms
  - Properties and “habitability” (also from follow-up)
- Radial velocity survey of 300 M stars, simultaneously in visible light and near-IR
- 750 “useful” nights guaranteed.
- Survey on-going since Jan 1, 2016
- Funded by MPG, CSIC, National German and Spanish funds, Andalucía Regional funds and European FEDER funds + others.

Unión Europea
Fondo Europeo de Desarrollo Regional
“Una manera de hacer Europa”

MAX-PLANCK-GESELLSCHAFT

CSIC

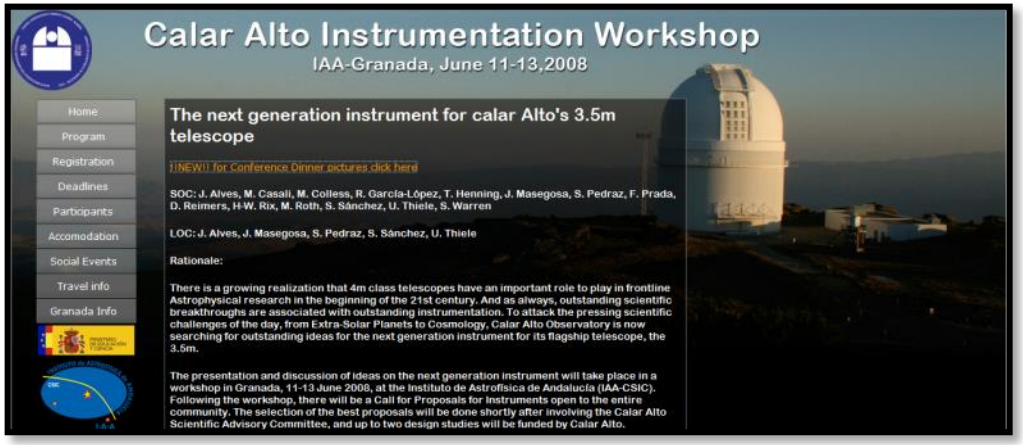
Calar Alto

DFG

Quirrenbach, Amado & the CARMENES Consortium, 2012 (SPIE, 8446-25)

Amado, Quirrenbach & the CARMENES Consortium, 2012, (Highlights of Spanish Astrophysics VII, in press, eprint arXiv:1210.5465)

CARMENES previous steps



A high resolution multi-object spectrograph for Calar Alto

Eike Guenther, Thueringer Landessternwarte

Up to now, most infrared high resolution spectrographs have only limited spectral ranges. However, the large detector arrays that are now available allows us to built cross-

A high-resolution near-infrared spectrograph for the CAHA 3.5-m telescope

Pedro J. Amado González , IAA

In this talk, we present a proposal for a new instrument for the 3.5m telescope at Calar Alto, Almería, Spain. This instrument will be a high-resolution near-infrared spectrograph

Multi-Object High-Resolution Spectrograph

Andreas Quirrenbach, Landessternwarte Heidelberg

Scientific drivers, technical approaches, and potential consortium arrangements for the construction of a (massively?) multiplexed high-resolution spectrograph will be discussed.

Pre-selection	January 2009
CDR	October 2009
pCDR	July 2010
Green light	November 2010
PDR	July 2011
optics-FDR	April 2012
FDR	February 2013
MAIV	October 2015 (2.5y)
Commissioning	December 2015
Start of Survey (GTO)	January 1st, 2016
End of Survey	End 2020

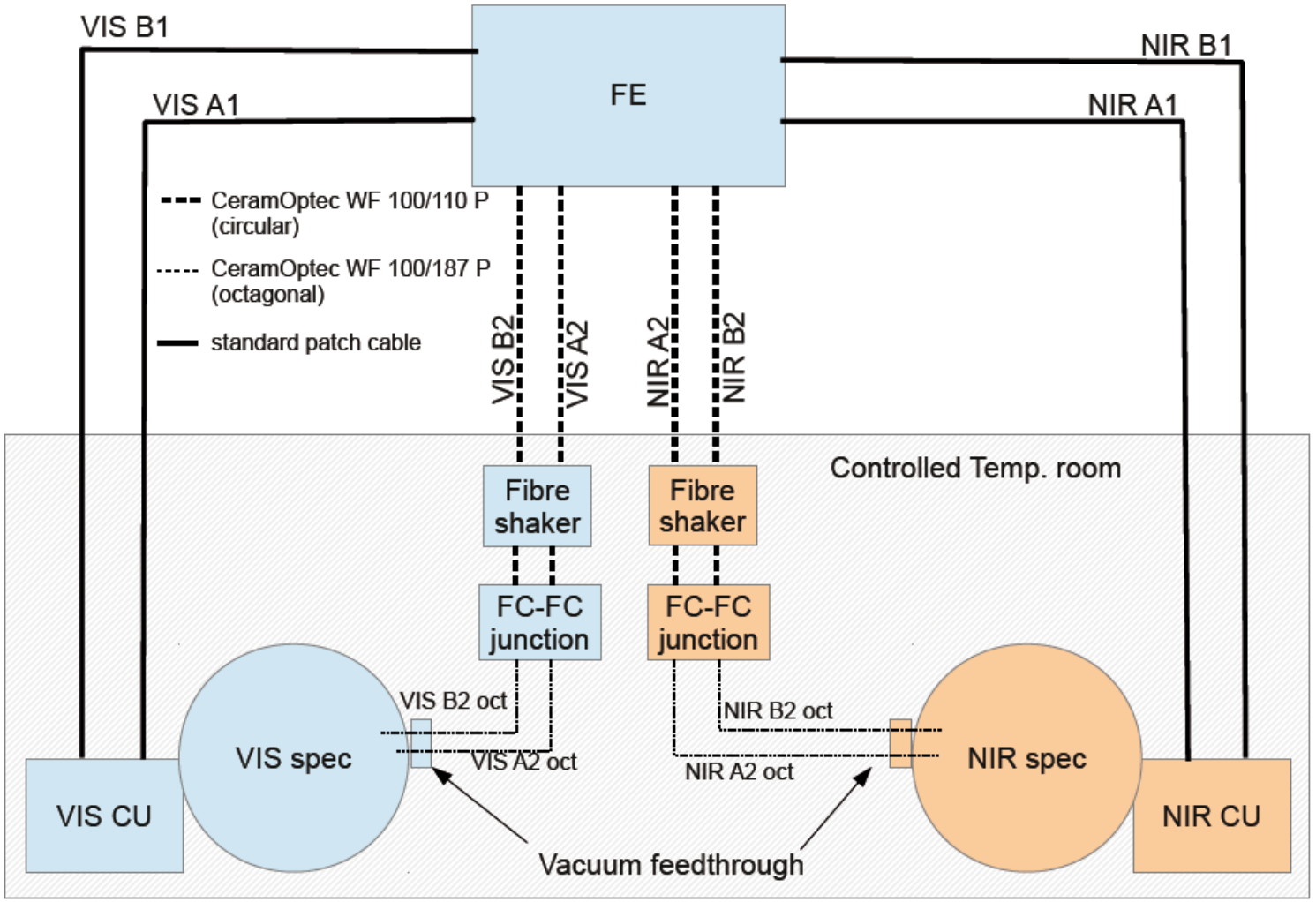
The CARMENES instrument

Calar **A**lto **R**esolution search for **M** dwarfs with **E**xoearths with **N**ear-infrared and optical **E**chelle **S**pectrographs

- Single-purpose, high-stability instrument
- Wide wavelength coverage for discrimination against intrinsic variability
- Precision requirement ~5 m/s (SNR=150, J=9, 15min; goal 1 m/s)

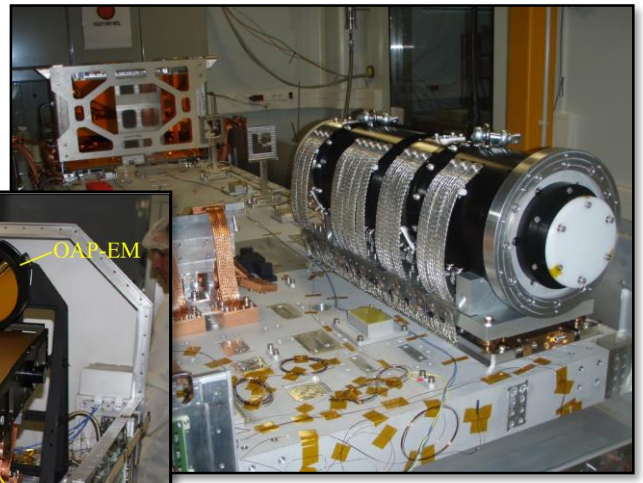
Basic engineering parameters	**VIS channel**	**NIR channel**
Δλ [nm]	520-960 (61 orders)	960-1710 (28 orders)
Cross disperser	Grism, LF5 glass	Grism, infrasil
Working T [K]	In vacuum at ~295	In vacuum at ~140
Detector(s)	1 x 4kx4k e2v CCD231-84	2 x 2kx2k Hawaii 2-RG (2.5 μm)
Calibration λ	UNe & UAr lamps [F-P etalon]	UNe [F-P etalon]
Optical parameters	R=93,500, 2.5-pix sampling (>2.3 pix), 7-pix inter-fibre spacing	R=80,400, 2.8-pix sampling(>2.3 pix), 7-pix inter-fibre spacing

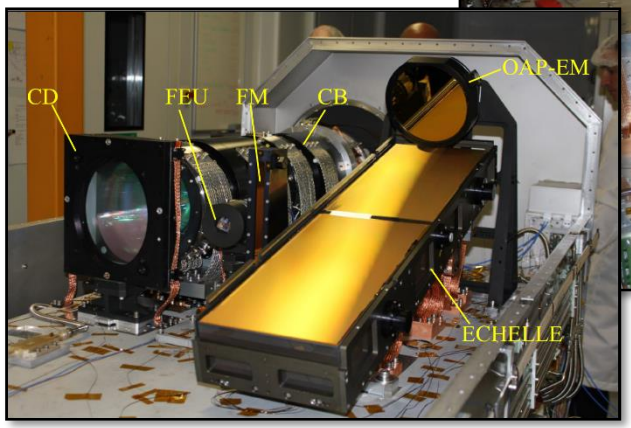
The CARMENES instrument

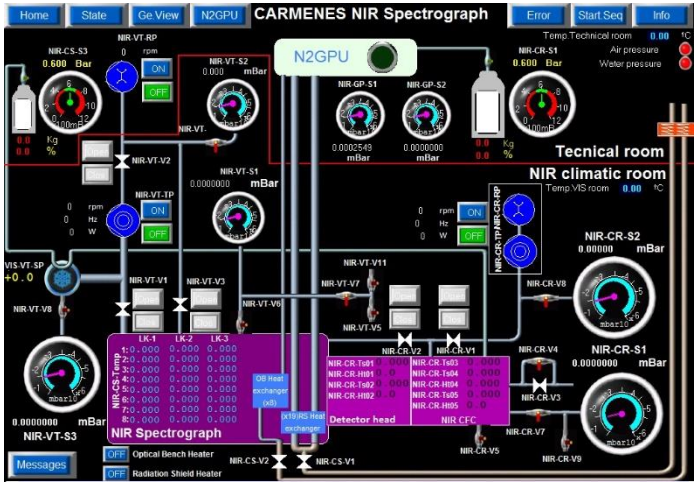


Spanish contribution

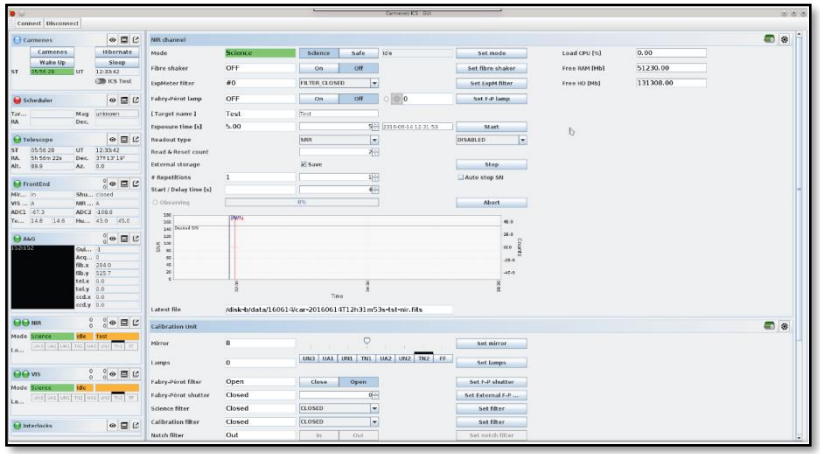
NIR Channel (IAA, Granada)





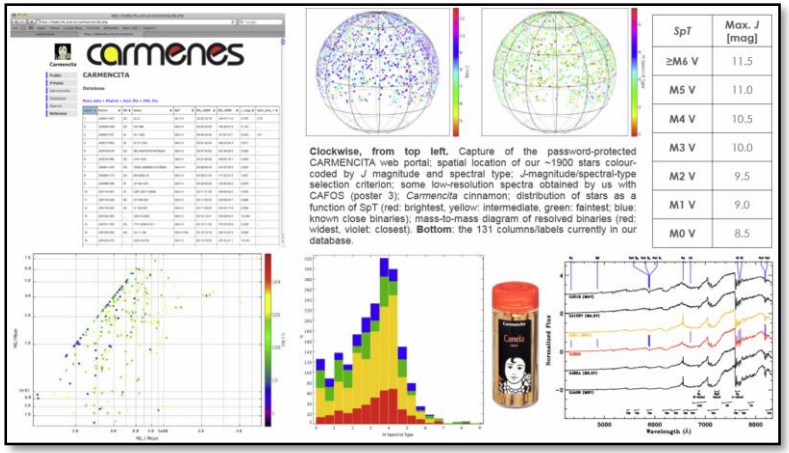


Interlocks (CAHA, Almeria)



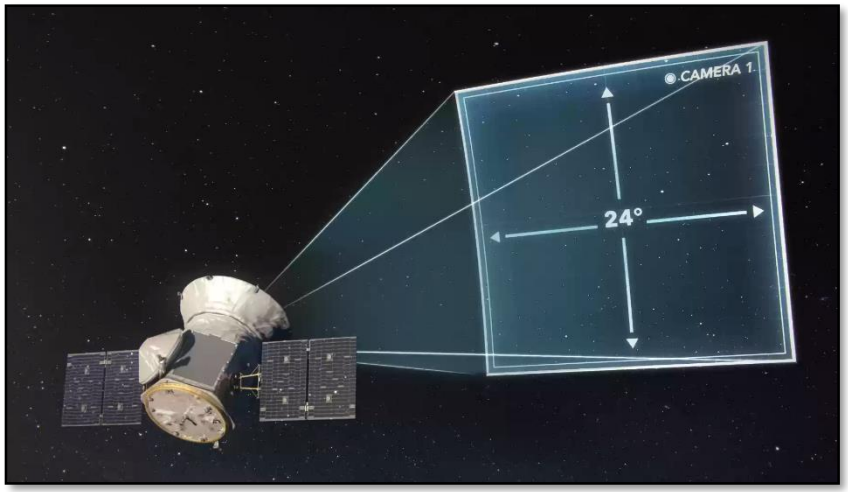
ICS & Scheduler (ICE, Barcelona)

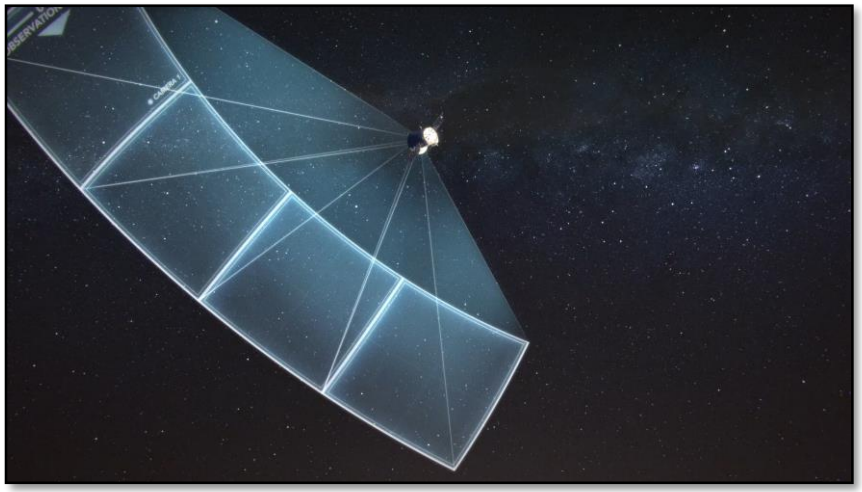
CARMENCITA (CAB, Madrid)



CARMENES beyond 2020

- CARMENES II presented at the “New Instrumentation and Legacy Projects for Calar Alto” workshop in Oct 2016
- LoI submitted to the call for new instrumentation
- CARMENES II Phase A to be started at the end 2018/start 2019
- Main drivers:
  - CARMENES technical upgrade
  - Competitive posible science case:
    - Extension of the current survey
    - Survey of exoplanet atmospheres
    - TESS follow-up



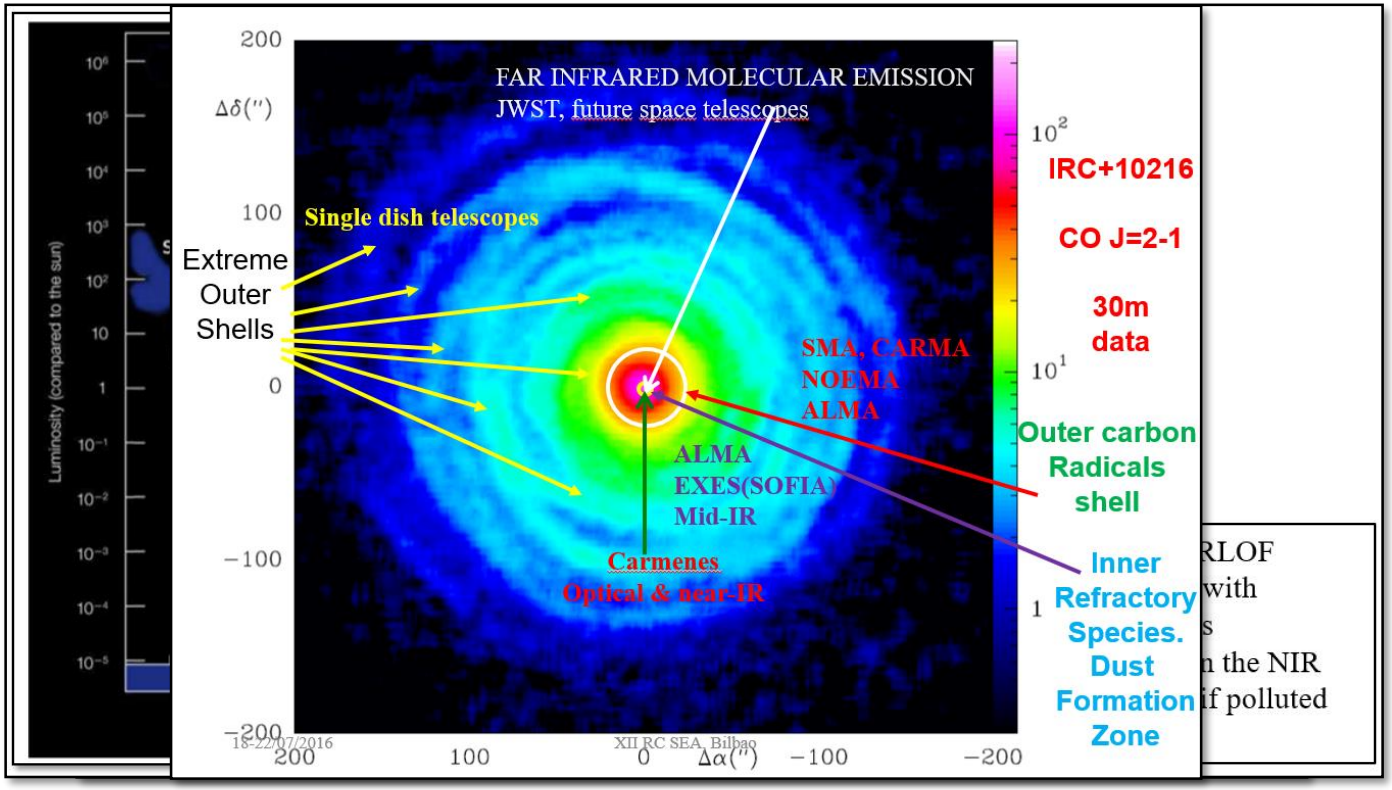


Exoplanets…and much more

CARMENES useful for:

- Measuring RVs with extremely high precision (useful if your amplitudes are small)
- Obtaining high-resolution, large-spectral-coverage spectra in the NIR
- Increasing the spectral information by adding to the NIR the simultaneous observations in the VIS.
- Comparing the information provided by the simultaneous spectra taken in the VIS and the NIR.

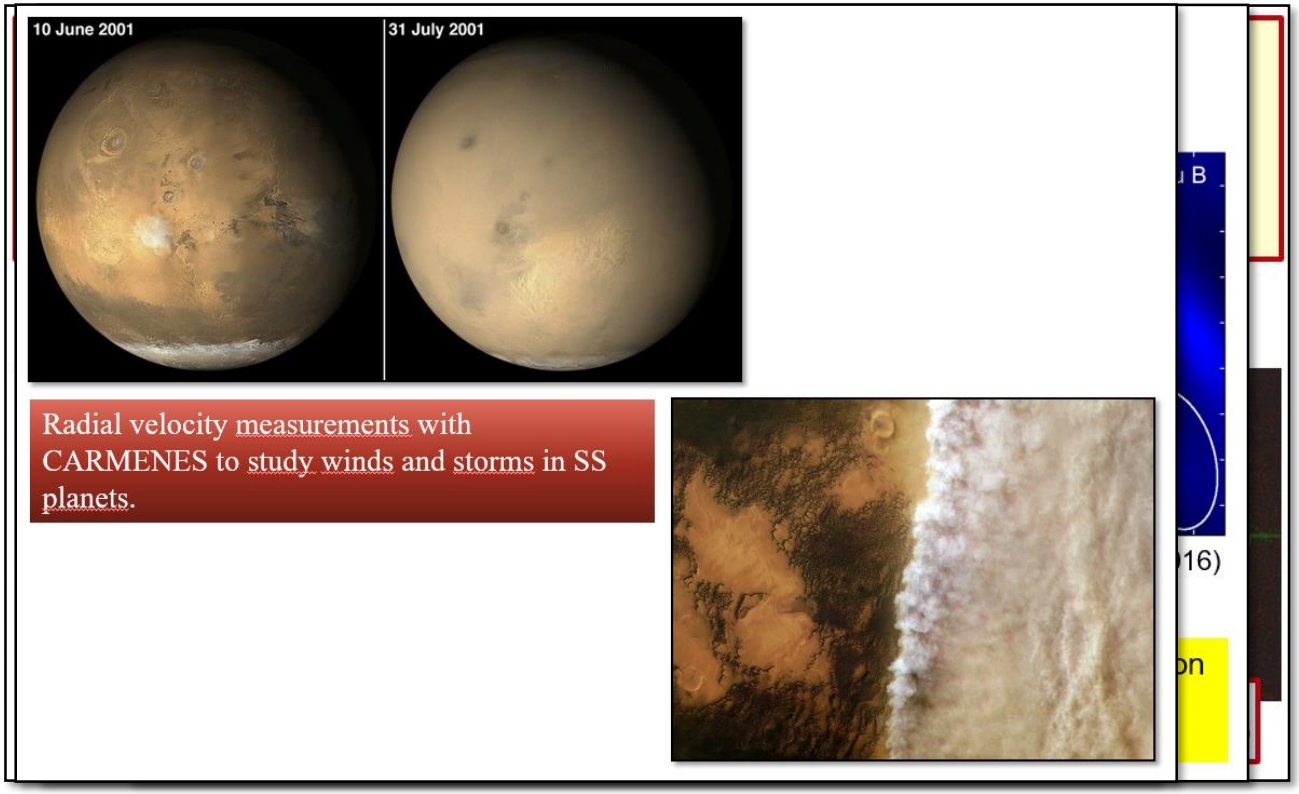
Exoplanets…and much more



Line surveys in the near/mid-IR of dust formation in evolved stars (AGBs)

Hot stellar winds, atmospheres

Exoplanets…and much more



Search for planet candidates in observed transit spectra

The formation of planetary debris disks

Winds in Solar System planets

High-resolution

Stellar oscillations
Hot subdwarfs in binaries
Line surveys in the near/mid-IR of dust formation in evolved stars (AGBs)