



The ESO 1m telescope

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ESO-UCN agreement for the use of 1m telescope

signed on: June 10, 2016

3.5 years: June 2016 to December 2019

- Upgrade control system (telescope and enclosure)
- Implement system for remote operations
- Install instruments
- 3.5 years research program



The ESO 1m telescope

1966: The first telescope installed in La Silla
(provisional dome)



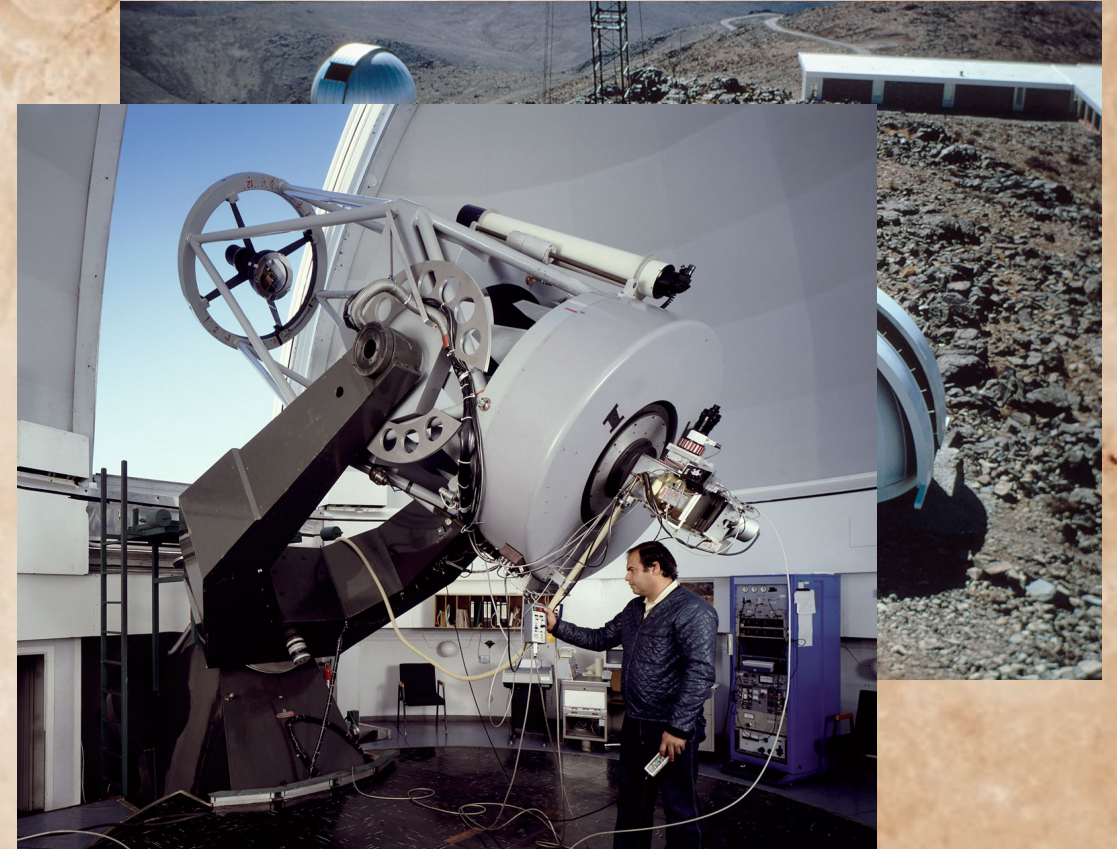


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**1968-1994: Photometric telescope
(permanent dome)**

**1996-2001: DENIS survey
(Epchtein et al. 1997, the Messenger, 87, 27)**





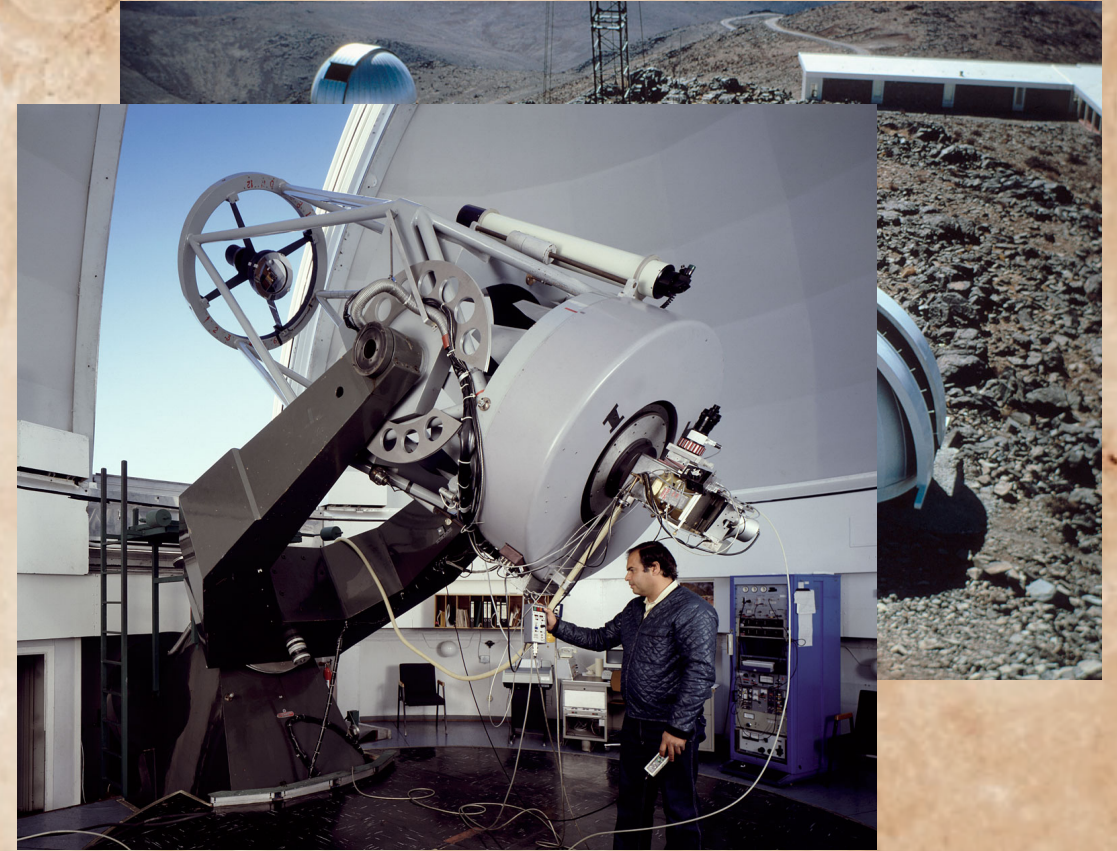
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2012-2015: Bochum Univ. (in collaboration with UCN)
(lucky imaging of binary stars)



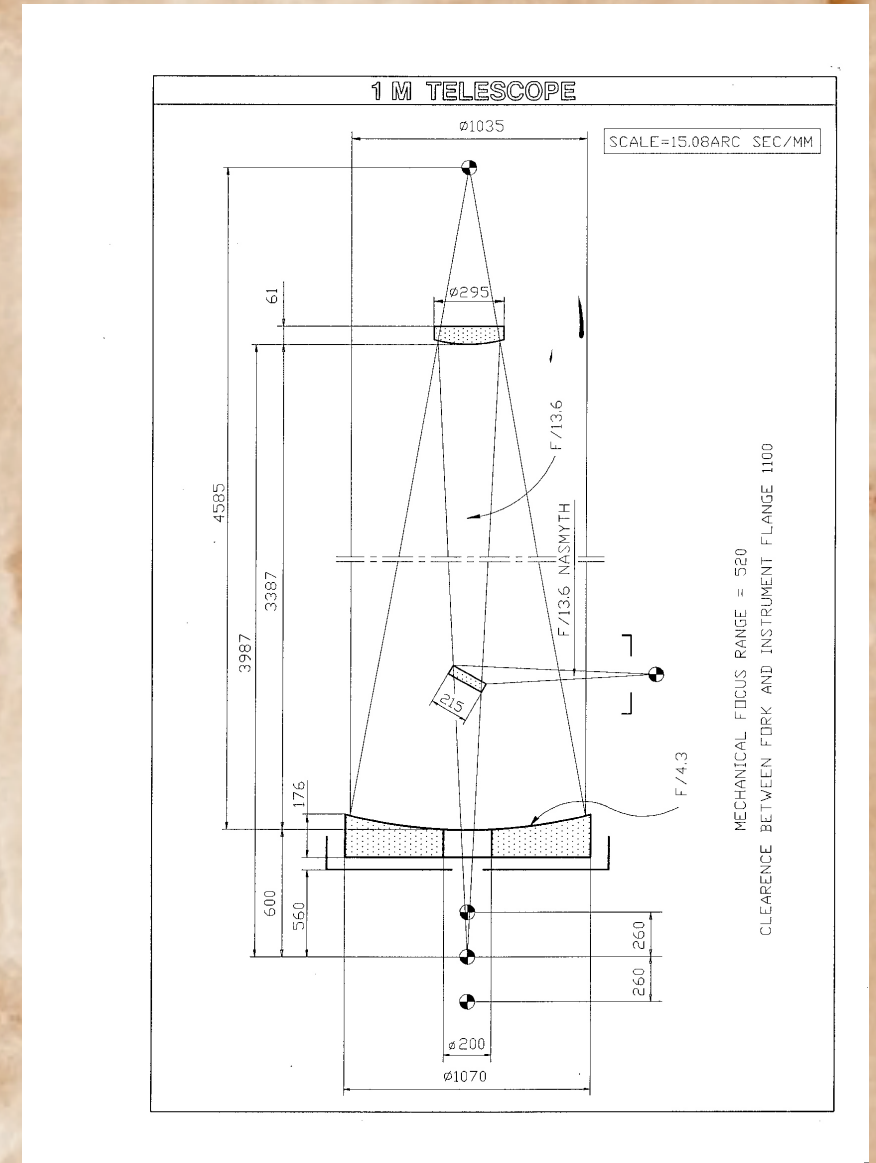


The ESO 1m telescope

Cassegrain design, 1m aperture

Focal ratio $f/13.6$

Scale 15.08"/mm





Ongoing projects



FIDEOS spectrograph

Pontificia Universidad Católica (PUC), Santiago



TUCAN camera

Universidad de Antioquia (UdA), Medellín



Budget (2015-2019):

UCN: ~54.000 USD
~47.500 USD (internal funds)
~6.500 USD (external funds)
~46.500 USD compromised (internal funds)

PUC: ~175.000 USD (Fondef project)

UdA: ~54.500 USD (internal funds)



Timeline

2015 Jul-2016 Apr

System upgrade

(dome, computers, control system, pointing model, physical space, etc.)



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FIDEOS *in situ* operations

2017 Jan-Jul: commissioning

2017 Jul-Dec: early science

2018 Jan-Jun: FIDEOS science *in situ*



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2018 Jun-Aug

Remote operations: tests and implementation

2018 Sep-to date

FIDEOS remote operations



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2019

TUCAN commissioning

2019 Jan-Mar: equipment acquisition

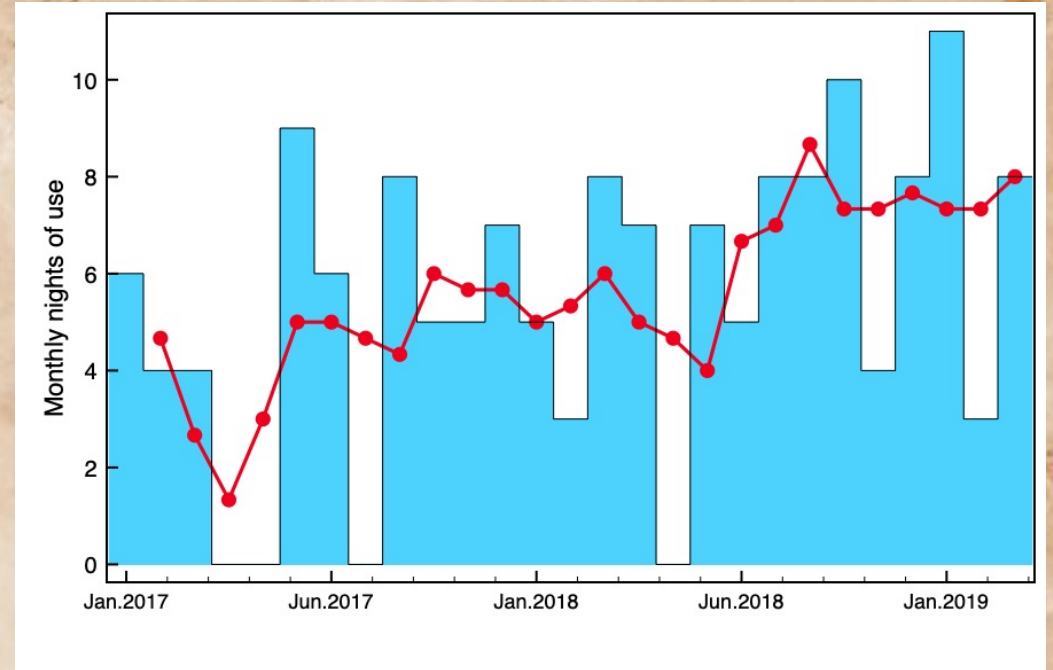
2019 Apr-Aug: configuration

2019 Sep: installation, first light



Telescope operations

Jan.2017 – Mar.2019: 149 nights of telescope operations



~40% for science

~60% for FIDEOS commissioning, remote connection tests, early science

Expected for 2019: ~ 130-160



Fideos spectrograph



Fiber-fed, high-resolution Echelle spectrograph

Developed by PUC Astro-Engineering center

L. Vanzi

A. Zapata

M. Flores

R. Brahm

M. Tala Pinto

S. Rukdee

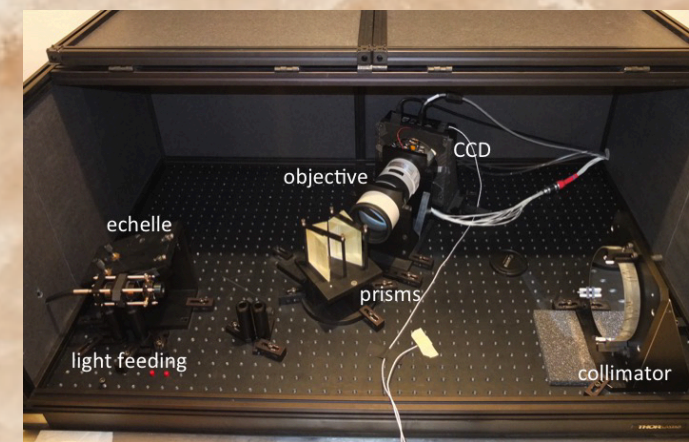
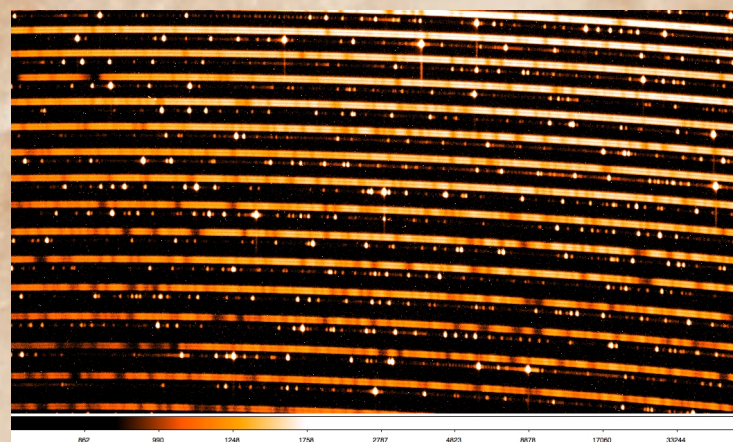
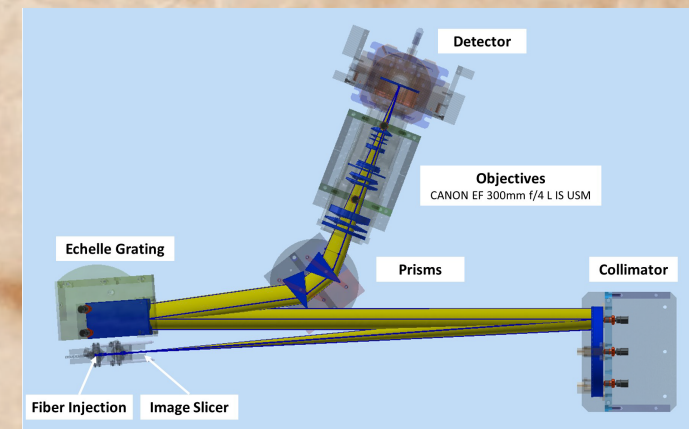
M. Jones

S. Ropert

T. Shen

S. Ramirez

V. Suc





Fideos spectrograph

Technical specifications



Fiber-fed, high-resolution Echelle spectrograph

(Vanzi et al. 2018, MNRAS, 477, 5041)

$R \sim 43,000$

420-800 nm spectral range

1.9" fiber entrance on the sky

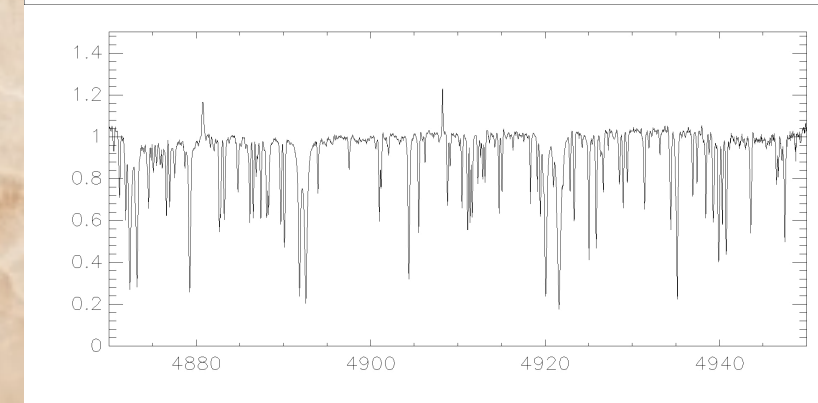
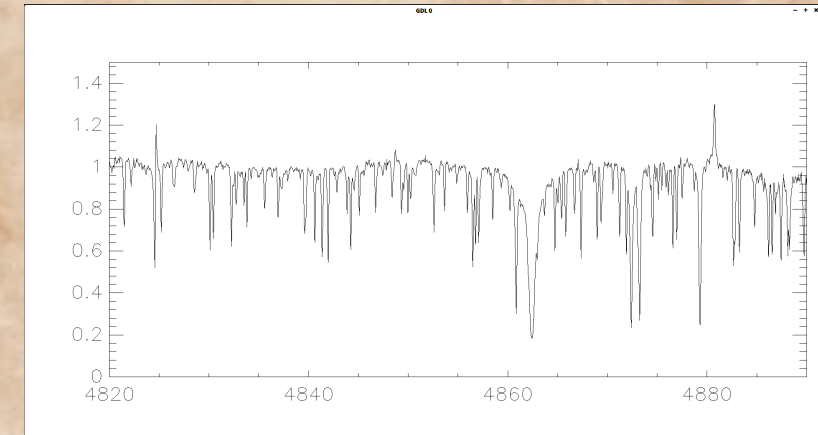
Second fiber for simultaneous wavelength calibration

Efficiency : $\sim 8\%$ at 550 nm

$\sim 4\%$ at 455 and 730 nm

Pipeline: reduction, extraction

(measurements: RV, vsini, stellar parameters)





Fideos spectrograph

Thermal stability



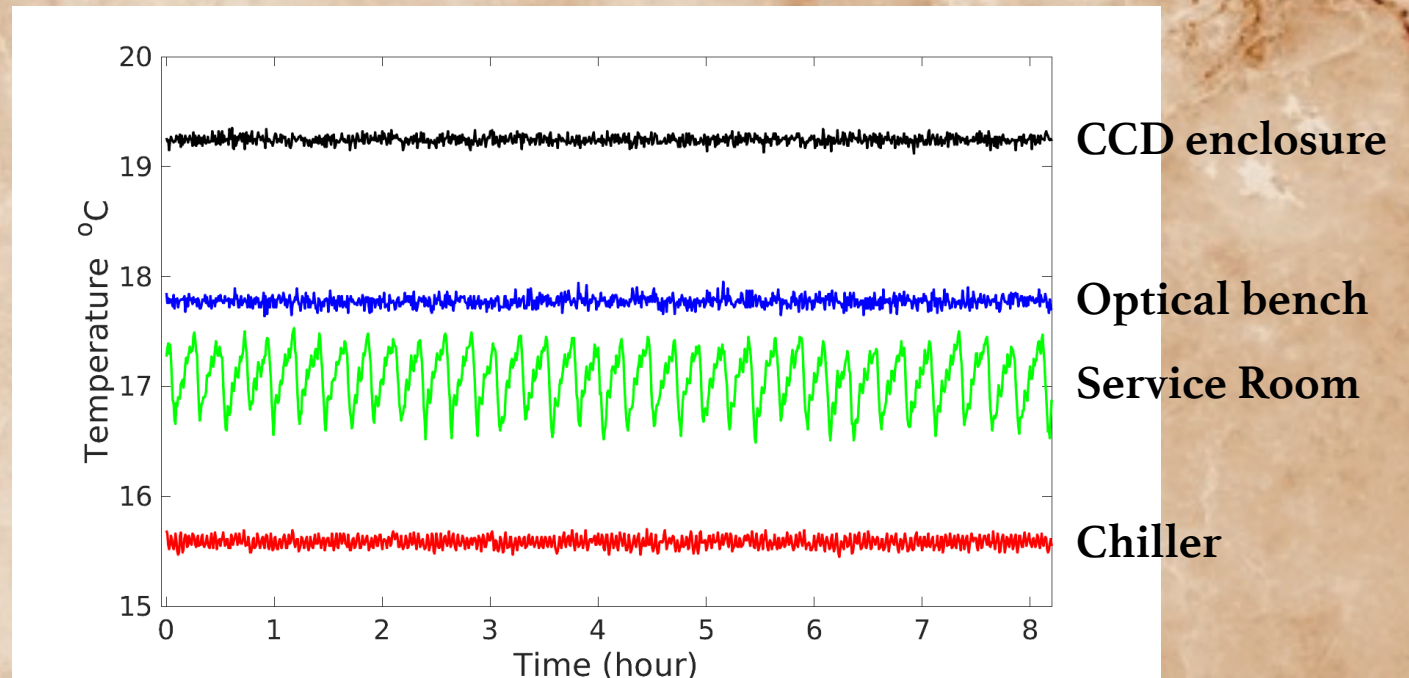
FIDEOS temperature is stabilized to <0.1 °C

thermally isolated room (FIDEOS room, 1st floor)

thermoelectric cooling to -35°

chiller at camera enclosure

air conditioning at service room





Fideos spectrograph

RV precision



Wavelength calibration solution \rightarrow lower limit to RV error: 4 ms^{-1}



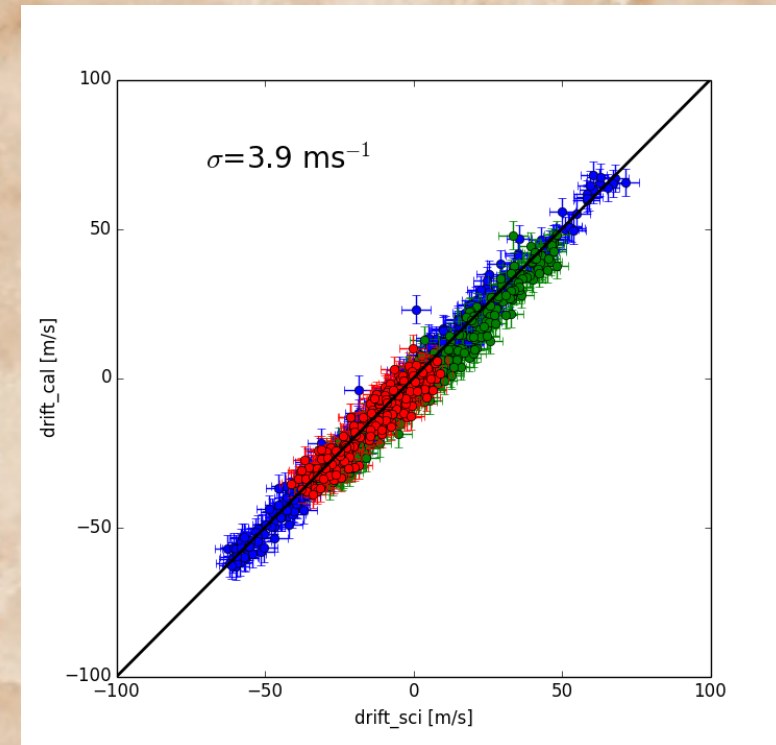
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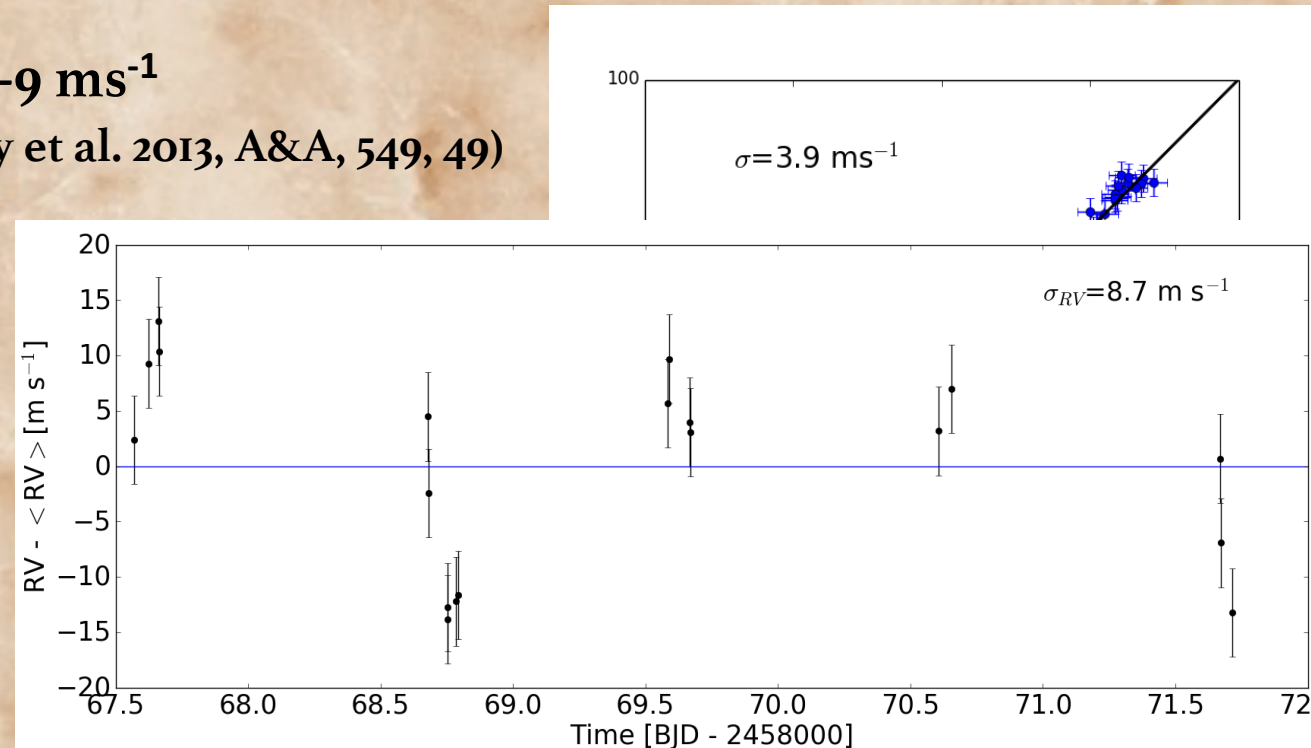


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Measurements on HD10700 (AM: 1.0-1.7): $\sigma \sim 8\text{-}9 \text{ ms}^{-1}$

Atmospheric effect (Bouchy et al. 2013, A&A, 549, 49)
(no ADC)





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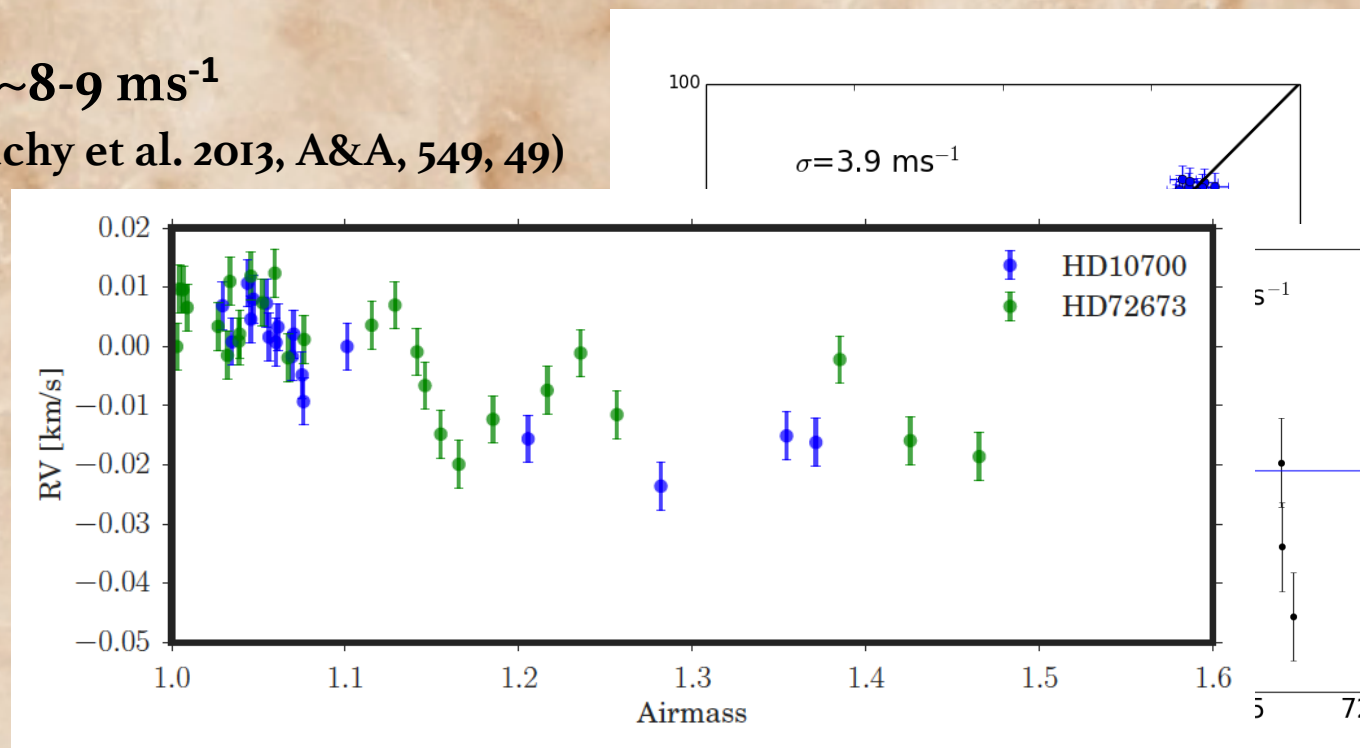
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(no ADC)

Measurements on HD10700 and HD72673:

(AM: 1.0-1.1): $\sigma \sim 5 \text{ ms}^{-1}$

(AM: 1.0-2.0): $\sigma \sim 10 \text{ ms}^{-1}$





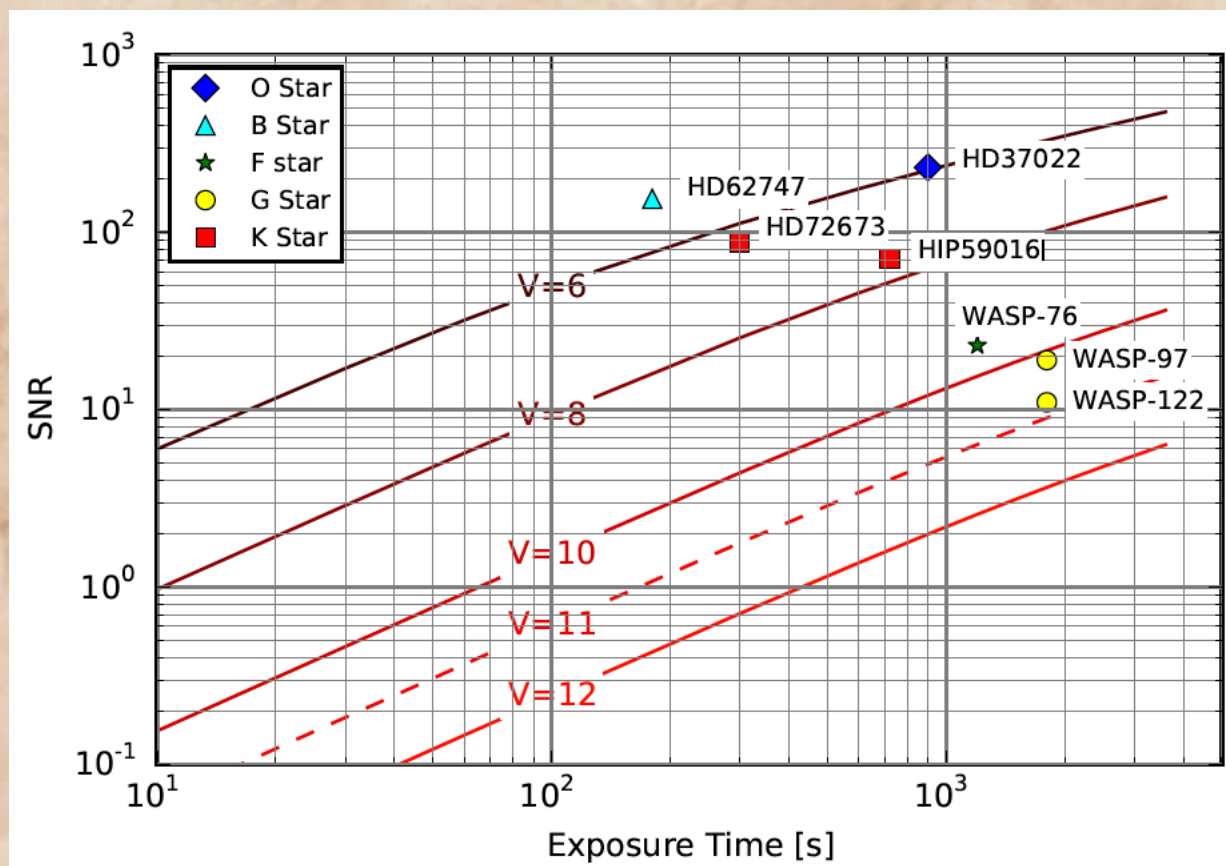
Fideos spectrograph

Magnitude limit



Nominal magnitude limit: $V=11$

(S/N=10 for 1800s exposures)





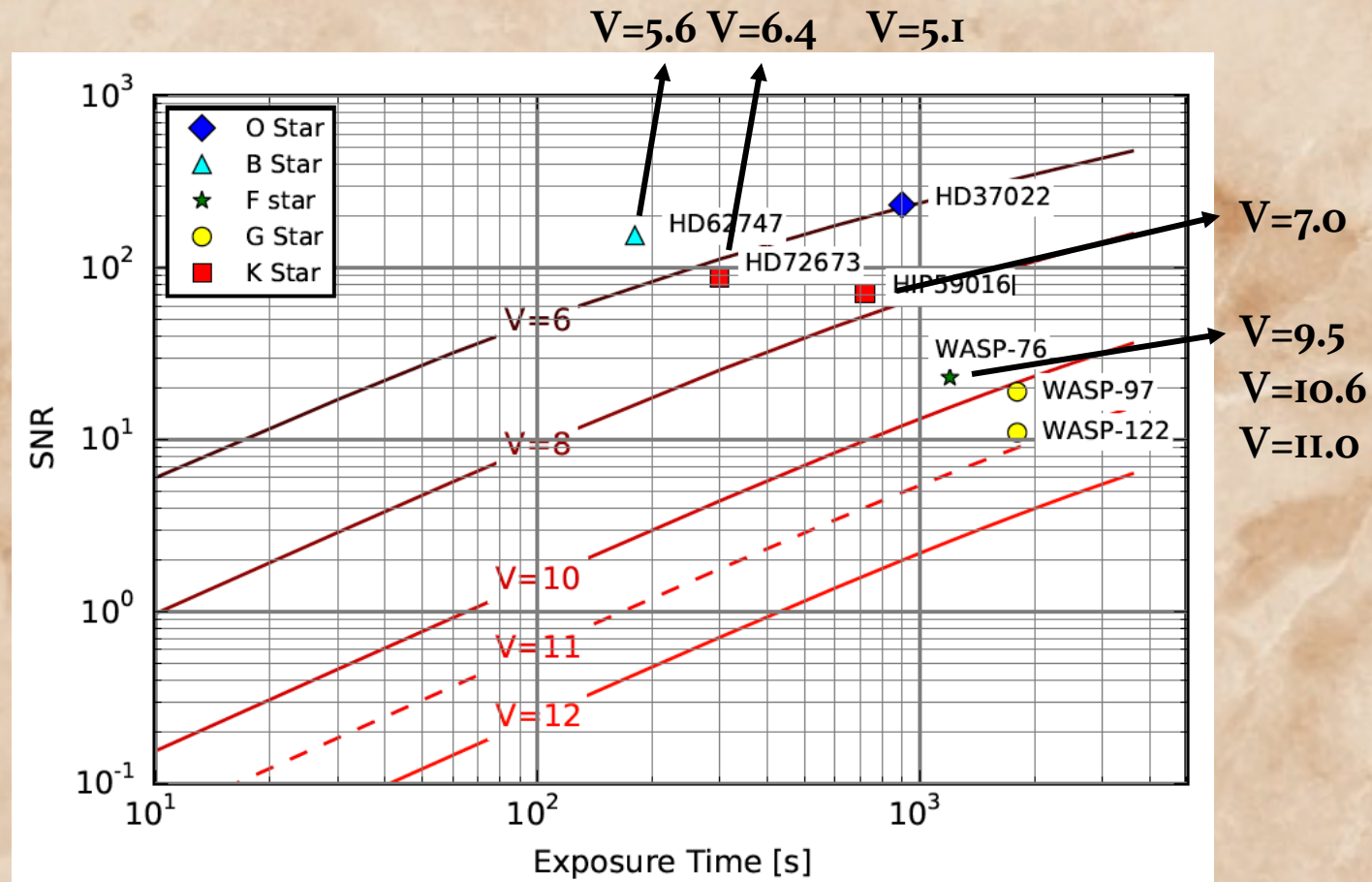
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Fideos spectrograph

Early science

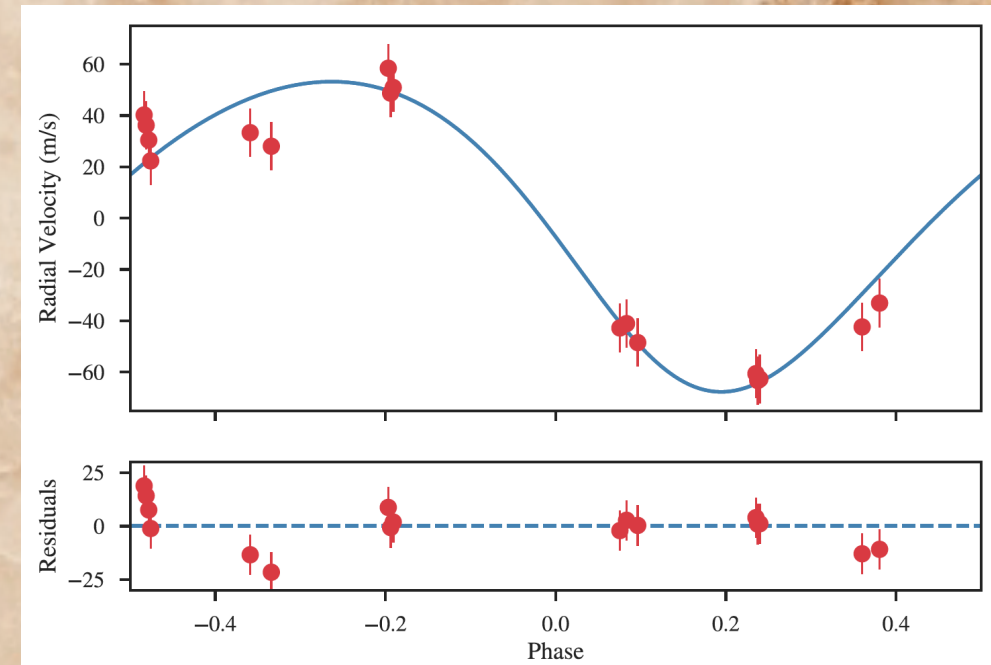


HD75289: $V=6.4$, G0V star with a non-transiting hot Jupiter ($P=3.5$ days)
(Udry et al. 2000, A&A, 356, 590)

6 nights, 2-3 spectra per night, 600-900s exposures
Simultaneous calibration mode
(S/N=130-220)

RV curve analysis recovers the literature results
(Wang & Ford 2011, MNRAS, 418, 1822)

$K=60.0 \pm 3.7 \text{ ms}^{-1}$





Fideos spectrograph

Science



Main goal:

extrasolar planets

first scientific paper currently in preparation

ongoing: follow-up monitoring of TESS candidates

Additional:

stellar populations and clusters

bright stars in open clusters and remnants

bright halo BHB stars (V=8-11)

long-period field binaries

absorbing ISM clouds



Tucan Camera



**UCN – Universidad de Antioquia (UdA), Medellin collaboration
agreement signed on: January 29, 2018**

Imaging camera at the lateral focus of FIDEOS interface

54.474 USD

PI at UdA: E. Silva-Villa



Tucan Camera



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Imaging camera at the lateral focus of FIDEOS interface



FLI microline ML09000

Under commissioning

March 2019:

Equipment retained at customs in Santiago

3056 x 3056, 12 μm pixels

0.18" /pixel

9'x9' FoV

Bessel UBVRI + H α filter

Thermoelectric cooling





Tucan Camera



Chile: Tucan camera available to Fideos users (UCN, PUC, Chilean community)

Germán Chaparro	(ECCI)
Jaime Forero	(UniAndes)
Santiago Vargas	(UNal)
Benjamín Calvo-Mozo	(UNal)
Ignacio Ferrin	(UdeA)
Jorge Zulaga	(UdeA)
Beatriz Sabogal	(UniAndes)
Alejandro García	(UniAndes)
Juan Carlos Muñoz-Cuartas	(UdeA)
Carlos Molina	(UdeA)
Pablo Restrepo Cuartas	(UdeA)
Esteban Silva-Villa	(UdeA)

Colombia: extension to the Colombian community

(40 nights per year)

- 20 nights for UdeA faculties
- 11 nights for Colombian community
- 9 nights for students projects/thesis



Tucan Camera



Colombia: a growing community with no access to astronomical facility

- **First direct access of Colombian community to observational time**
- **Train young Colombian students**
- **Strengthen the UCN-UdA scientific collaboration**
- **Strengthen collaborations within Colombian community**



Tucan Camera



Tucan scientific cases (tentative):

- Variable stars
- Minor bodies in the Solar System
- Stellar clusters in the Milky Way

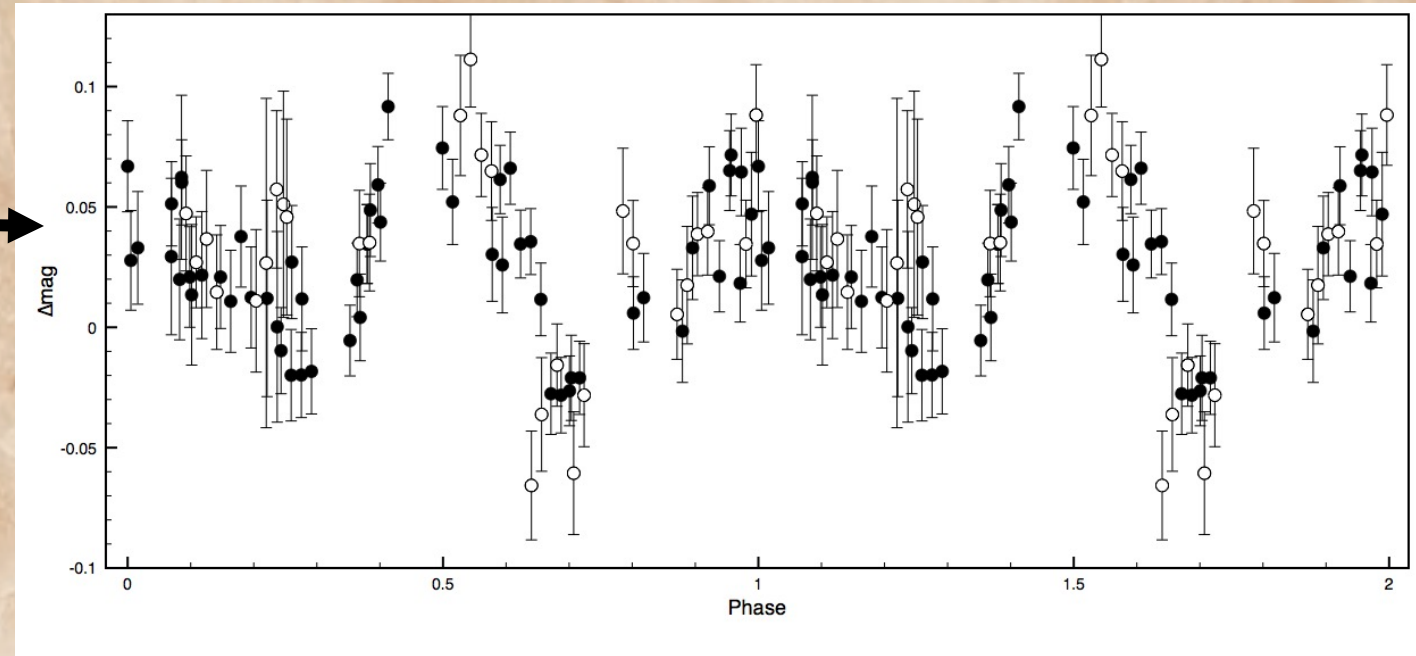


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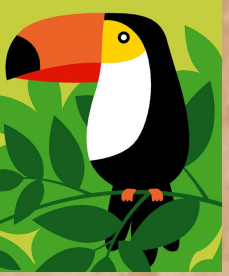
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Lightcurve (relative magnitudes) of TNO 2002GZ32 (V=20)
In white light, at Swope (1m) telescope, LCO



Tucan Camera



Tucan scientific cases (tentative):

- Variable stars
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- But also (feasibility to be tested):

Alternating FIDEOS and TUCAN:

“simultaneous” spectro+photometric monitoring of variable sources



Conclusions



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- **Remote operations ongoing**
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- **Likely offered to CNTAC for 10% Chilean time this year**
- **Undersubscribed schedule (collaborations welcome) [cmoni@ucn.cl]**



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