The BRITE SONG

Aldebaran, Beta Cas et al. – the headlines

Paul Beck[1] & Rainer Kuschnig[2]

[1] Instituto de Astrofisica de Canaries

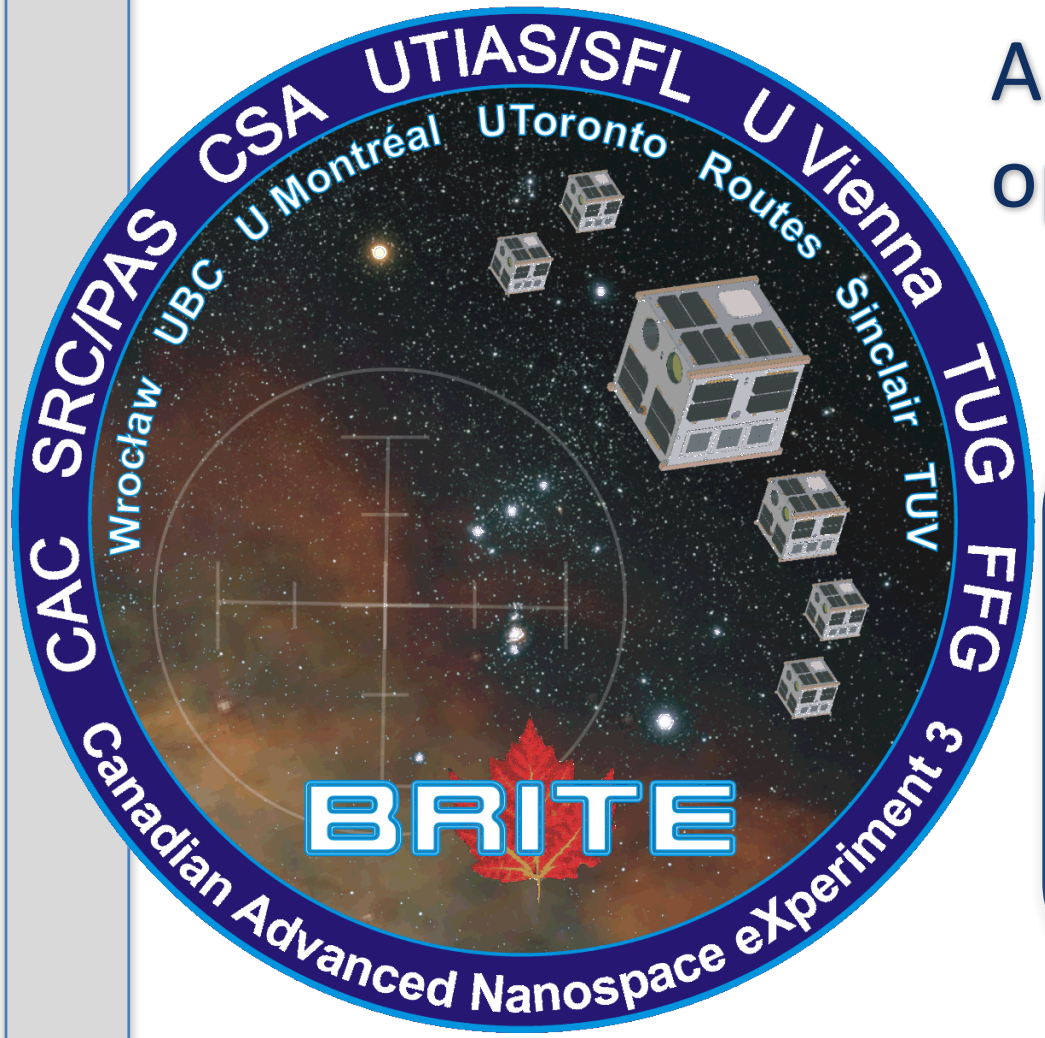
[2] Graz Univeristy of Technology

Konstanze Zwintz (Innsbruck University)

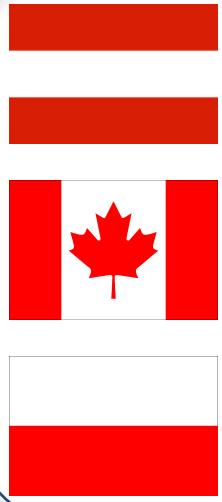
Thomas Kallinger, Werner W. Weiss (Vienna Univ.)

@BeckPaulG

BRIght Target Explorer



A Constellation of 5 operational nanosatellites:
20 x 20 x 20 cm



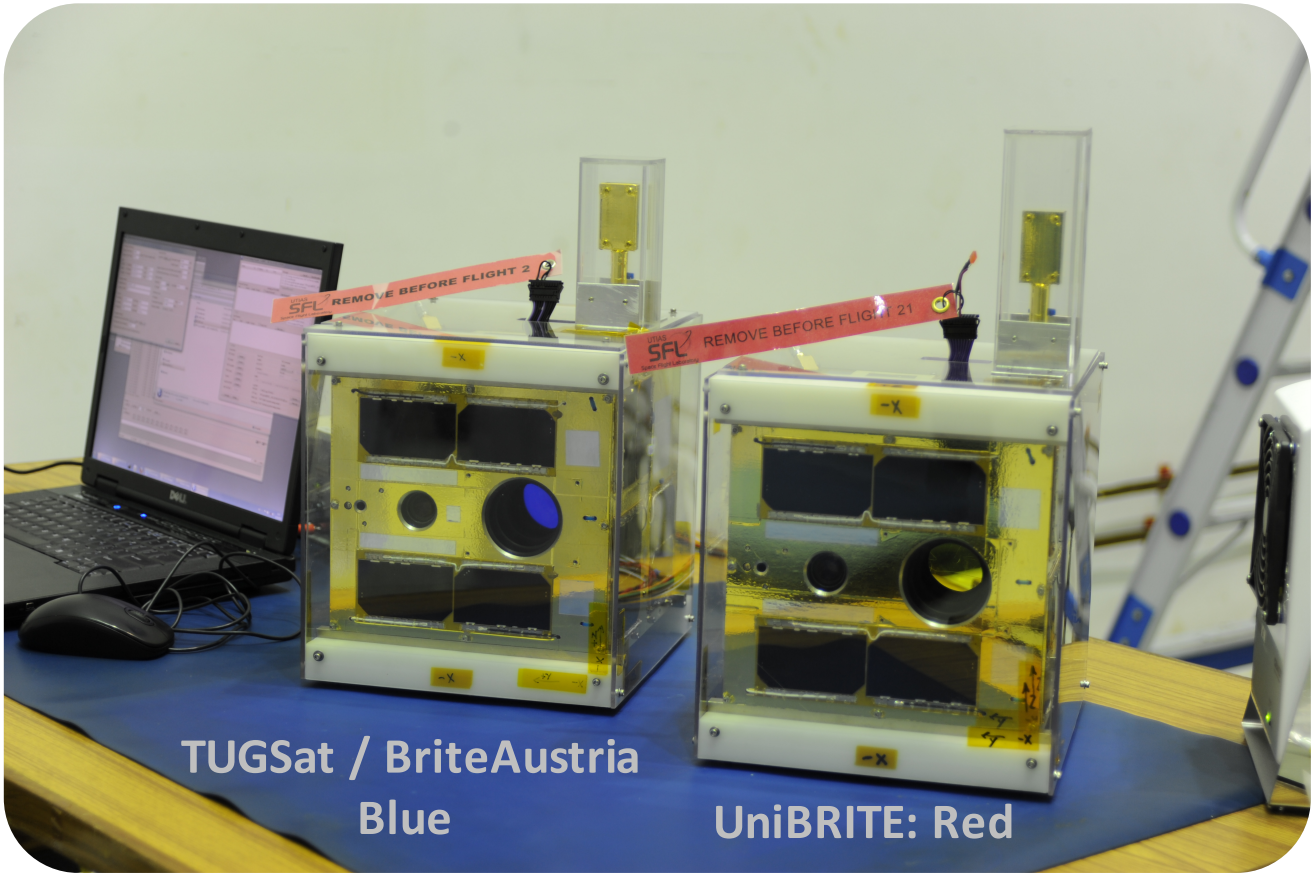
AUSTRIA: 02/2013
UniBrite (R) & TUGSat (B)

CANADA: 06/2014
Toronto (R) [Montreal, B]

POLAND: 11/2013 & 08/2014
Lem (B) & Hewliusz(R)

TugSat & UniBRITE

The first Austrian Satellites



picture: pre-launch lab at ISRO India, courtesy of SFL

BLUE 400-450 nm RED 550-700 nm

funded since 2006 (FFG/TUG, Uni Wien) – launched Feb. 2013 India


Field of View
~ 24 deg

Typical BRITE targets

Naked eye stars

- **Filters, Telescope & CCD**
  - 3 cm aperture
  - V < 4 mag (<6.5 mag)
- **Orbit & Attitude**
  - ~100 min <> 14/day
  - 15 to 30 min obs/orbit
  - Obs. Season: <160 days
  - Orbit-to-Orbit: 1%

→ **Target requirements**

- **Photometric Variabiltiy**
  - > 100 ppm (brightest)
- **Frequency domain**
  - Nyquist: > 80µHz (1 dpt/orbit)
  - Freq. Res: ~0.08µHz

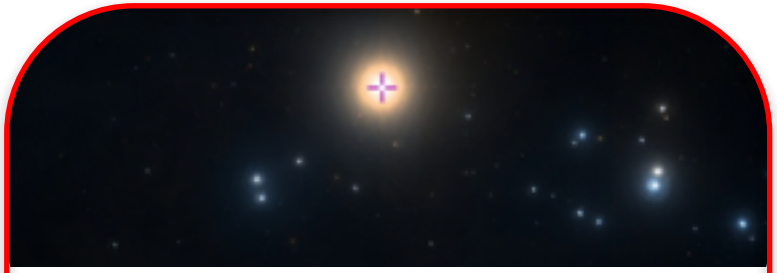
→ **Optimal Targets**

- Heat-driven pulsators
- Long-periodic giants

→ **32 camp.: >550 stars (2018)**

Parallel SONG/BRITE Campaigns

Projects suited to exploit the synergies of both instruments



Giant: Aldebaran (DDT, P7 & P8)

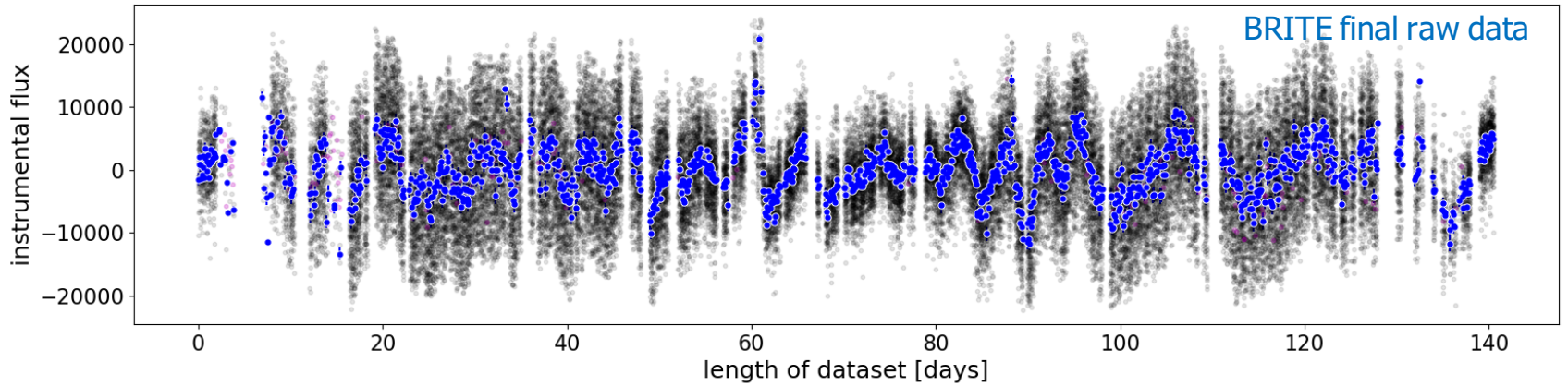
- Direct comparison of photometric and radial velocity amplitudes (Talk GH)

δ Scuti: Beta Cas (P8)

- Analysis of absorption line profile variations (Fourier-Parameter-Fit, Moments)

Both programs: Slit #6 (R=90.000)

α Tau: Aldebaran



BRITE Lem: Blue

Exposure: 3”
140 days with

50600 individual datapoints
1560 orbital median points

BRITE Toronto: Red

Exposure: 5” (Science driven)
Saturated

→ Halo photometry

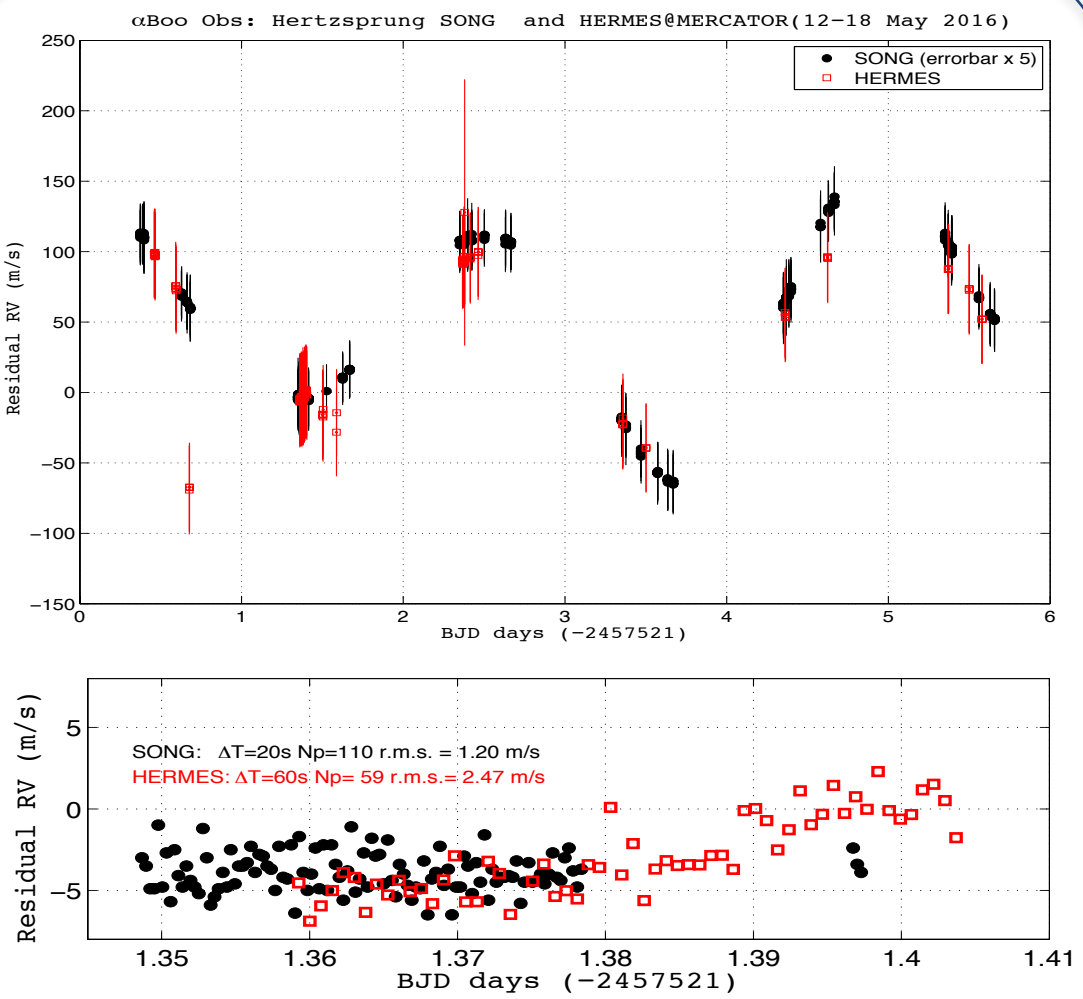
α

P6 P7/DDT P8

Aldebaran b (Hatzes+ 2015, Farr+ 2018)

M=6.47 ±0.53 M_{jup}; P=629.96 ±0.9 days

SONG/Hermes: Arcturus



BRITE

- poorly populated field
- single target
- few guide stars

→ TESS is coming

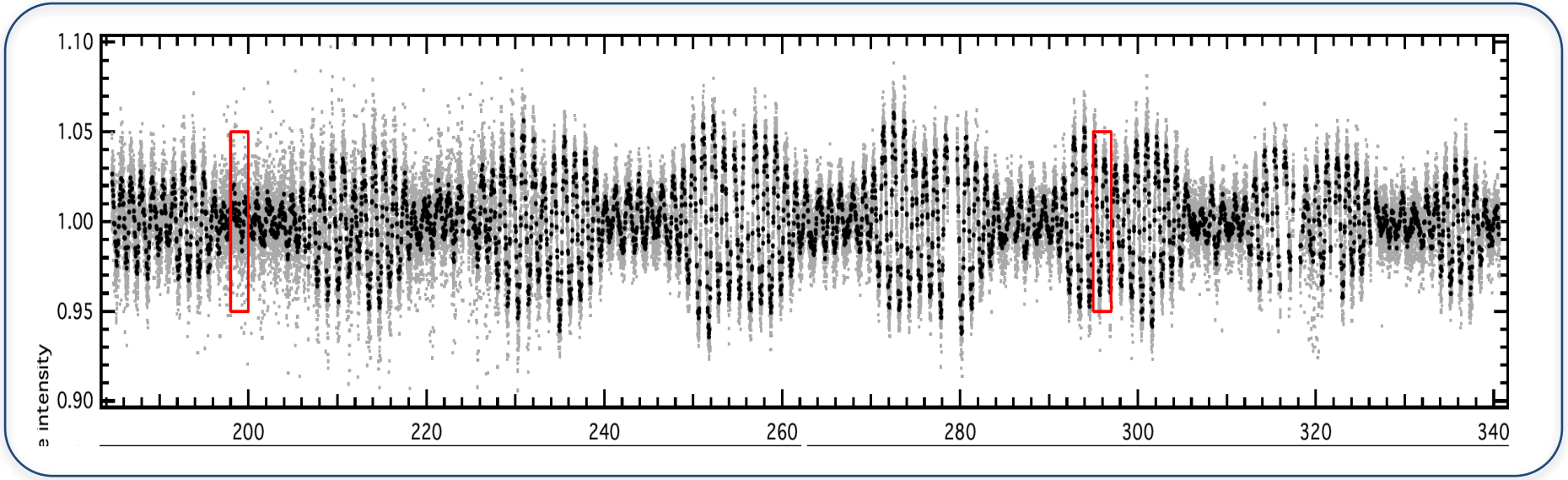
Comparison with Hermes

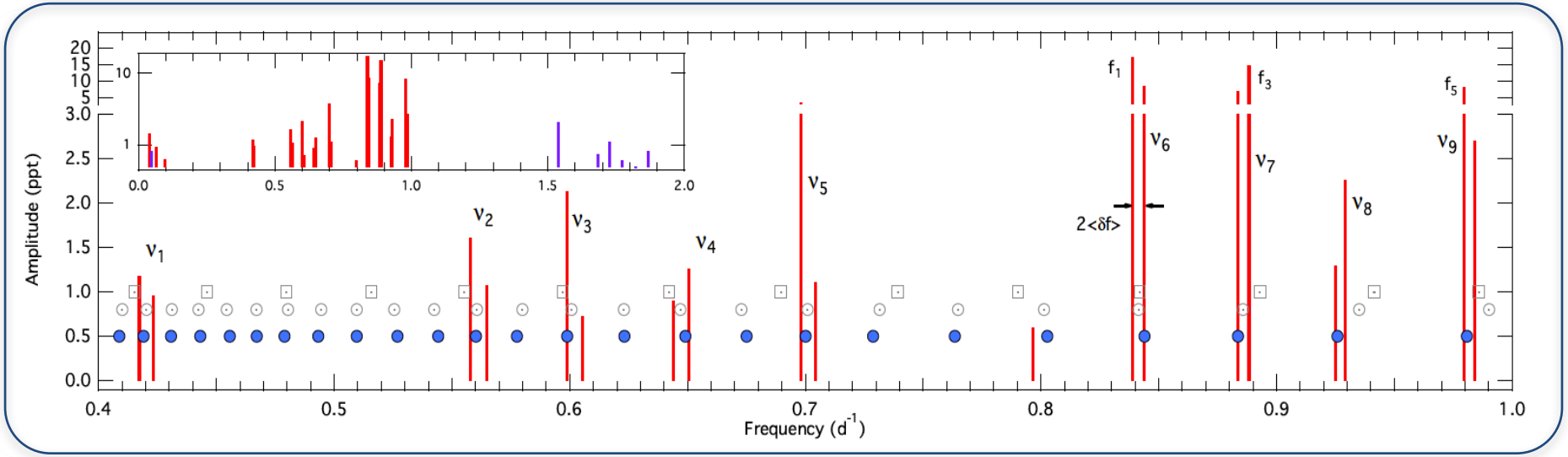
- 6 day comparison (May 2016)
  - SONG: I2
  - Hermes: Sim ThAr (LRF)
  → Good agreement
- ~8 years: Ca H&K (Hermes)
  - unconclusive (back then)

→ TIGRE time series?

Previous Campaigns: HD201433 (SPB)

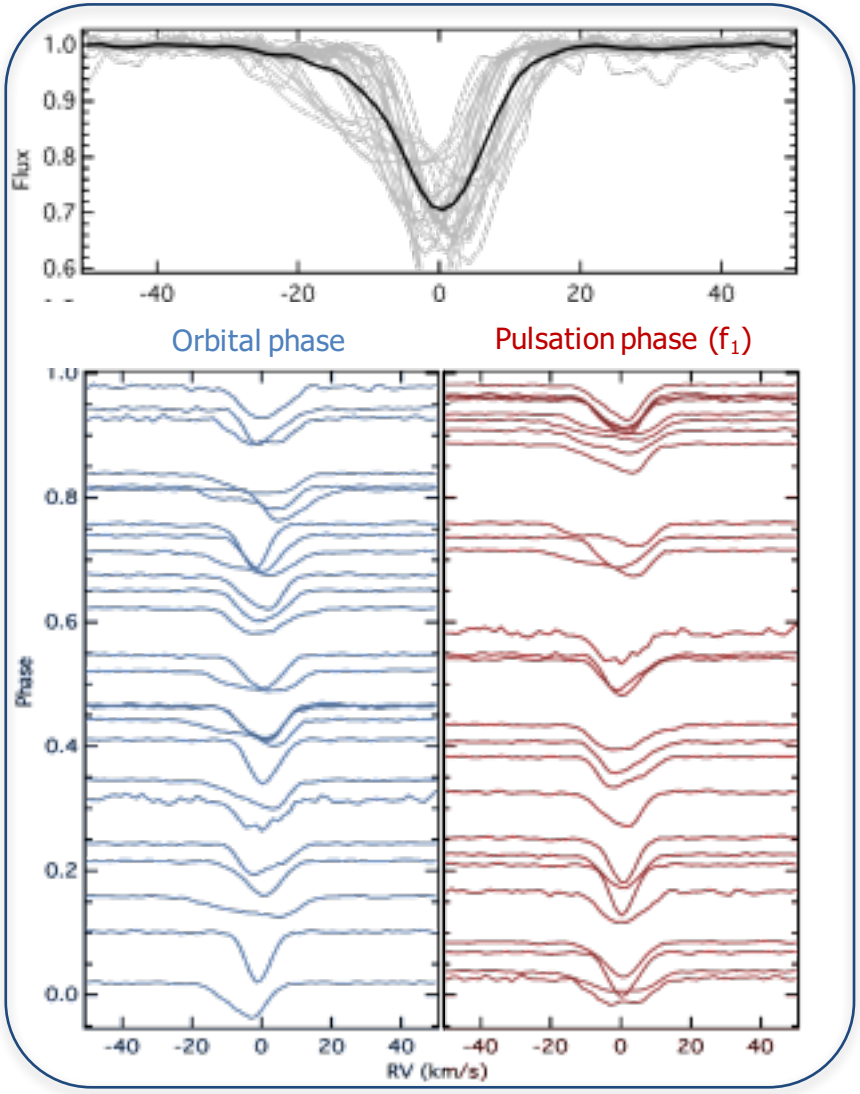
Kallinger, Weiss, Beck et al. (2017, A&A 603, A13)





BRITE Target: HD201433

Kallinger, Weiss, Beck et al. (2017, A&A 603, A13)



LPV (Fe II 423.3nm) from HERMES spectra in HD 201433

HD201433 : B9V /SPB in a triple system

- 3.3 & 154 days periods
- Frequencies extracted
- 9 rotational split modes:
  solid body rotator with spun up surface

Observations:

- BRITE: 140 days
- Hermes: 2017: LPV

→ LPV originate from oscillations
→ Hints for additional frequencies (spec)

- If done on full scale:
  - Mode identification
    l, m, pro/retrograde


SONG
STELLAR OBSERVATIONS NETWORK GROUP
CAC SRC/PAS CSA UTIAS/SFL U Vienna TUG FFG
Wroclaw UBC U Montréal UToronto Routes Sinclair TUV
BRITE
Canadian Advanced Nanospace eXperiment 3
Photo: Paul Beck

Summary & Outlook

- **BRITE/TESS & SONG science cases are as diverse** as the number of stellar classes/objects.
  → Flexibility with SONG:
  observing mode & data products

- **Optimal combination with SONG + BRITE & K2/TESS**
  → Freq. resolution: Long-time base photometry
  → Simultaneous RV and PV
  → Diff. sensitivity to spherical harmonics
  & Potential mode Identification

- **Remaining BRITE-Constellation Mission & Archive**
  - Estimated Mission lifetime: ~2 years
  - Predefined target fields are revisited
  - Proprietary time : 1 year
  - Vicky: 'cross-branding' in archive: SONG / BRITE