List of publications

Dr. Lisa Bugnet

Top 5 publications are indicated by the ✪ symbol

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17 Referee articles, among which :
4 first author articles
4 major contributions
9 minor contributions

321 citations (H-index=10)

First Author Articles

Theoretical projects :

4. ✪ Magnetic signatures on mixed-mode frequencies
   I. An axisymmetric fossil field inside the core of red giants.
   Astronomy and Astrophysics 650 A53
   DOI : 10.1051/0004-6361/202039159
   cited : 3

   ***Bugnet, L.** et al., 2021*

   Abstract : Internal magnetic fields are one amongst the most serious candidates that are currently studied to solve two major problems of stellar astrophysics : 1) The angular momentum transport inside stars of all type and all ages is poorly constrained in our stellar models, resulting in core rotation rate estimates ten times larger than measured rotation rates for red giants. 2) Two population of red giants have been discovered, showing very different power density for their dipolar oscillation mode : intermediate-mass stars tends to have much lower dipolar amplitudes than low-mass stars. Stars more massive than ~ 1.1 $M_\odot$ are known to develop a convective core during the main-sequence : the dynamo process due to this convection could be the origin of a strong magnetic field, trapped inside the core of the star for the rest of its evolution. Such magnetic fields should impact mixed modes inside the core of red giants, and their signature should be visible in asteroseismic data. To unravel which constraints can be obtained from these observations, we theoretically investigate the effects of a plausible mixed axisymmetric magnetic field with various amplitudes on the mixed-mode frequencies of red giants. Applying a perturbative method, we estimate the magnetic splitting of the frequencies of simulated mixed dipolar modes that depends on the magnetic field strength and its configuration. The effects of the mass and the metallicity of the stars are explored, and we infer an upper limit for the strength of the field and the associated lower limit for the timescale of its action to redistribute angular momentum in stellar interiors. Finally, we estimate the internal magnetic field amplitude needed along the evolution for its signature on oscillation frequencies to be detectable inside *Kepler*, TESS and PLATO data.

3. ✪ Sounding the internal magnetism of stars using asymptotic magneto-asteroseismology.
   Astronomy and Astrophysics 647 A122
   DOI : 10.1051/0004-6361/202039180
   cited : 4

   Mathis, S., **Bugnet, L.*** et al., 2021*
   **S. Mathis and L. Bugnet equally contributed to this work.*

   Abstract : We theoretically study the impact of an axisymmetric stable fossil field on the oscillation frequency of solar-like stars along their evolution. A complete asymptotic analysis is derived, showing the potential of asteroseismology to probe the magnetism at each depth as this has recently been done for stellar rotation ; we show that low-frequency gravity modes coupled with acoustic modes may allow to probe the radial magnetic field component inside the core of red giants through data inversion.

Data analysis projects :

2. ✪ FliPer$_{\text{Class}}$: In search of solar-like pulsators among TESS targets
   Astronomy and Astrophysics 624 A79
   DOI : 10.1051/0004-6361/201834780
   cited : 5

   ***Bugnet, L.** et al., 2019*
   : `https://github.com/lbugnet/FLIPER_CLASS`

Abstract : In this paper, we present a classification algorithm built to recognize solar-like pulsators among classical pulsators from TESS data. This machine learning algorithm relies on the global amount of power contained in the power spectral density (PSD), also known as the flicker in spectral power density (FliPer). Because each type of pulsating star has a characteristic background or pulsation pattern, the shape of the PSD at different frequencies can be used to characterize the type of pulsating star. Using noisy TESS-simulated data from the TESS Asteroseismic Science Consortium (TASC), we classify pulsators with a 98% accuracy. Among them, solar-like pulsating stars are recognized with a 99% accuracy, which is of great interest for a further seismic analysis of these stars.

1. ✪ FliPer: A global measure of power density to estimate surface gravities of main-sequence solar-like stars and red giants
   Astronomy and Astrophysics 620 A38
   DOI : 10.1051/0004-6361/201833106
   cited : 18

   ***Bugnet, L.** et al., 2018*
   : `https://github.com/lbugnet/FLIPER`

   Abstract : In this work, we present a new metric called FliPer (Flicker in spectral power density, in opposition to the standard Flicker measurement which is computed in the time domain) ; it is able to extend the range for which reliable surface gravities can be obtained ($0.1 < \log g < 4.6$ dex) without performing any seismic analysis for stars brighter than *Kp* < 14. FliPer takes into account the average variability of a star measured in the power density spectrum in a given range of frequencies. Using a large set of asteroseismic targets it is possible to calibrate the behaviour of surface gravity with FliPer through machine learning. This calibration made with a random forest regressor covers a wide range of surface gravities from main-sequence stars to subgiants and red giants, with very small uncertainties from 0.04 to 0.1 dex. FliPer also constrains the surface gravities of main-sequence dwarfs using only long-cadence data for which the Nyquist frequency is too low to measure the acoustic-mode properties.

Major contributions

4. TESS Data for Asteroseismology (T'DA) Stellar Variability Classification Pipeline: Set-Up and Application to *Kepler* Q9 data
   The Astronomical Journal 162 5
   DOI : 10.3847/1538-3881/ac166a
   cited : 4

   *Audenaert, J., [...], **Bugnet, L.** et al., 2021*

   Abstract : This is a collaborative effort to gather automatic methods for the automatic classification of oscillating stars observed during the TESS mission. The article describes the different algorithms composing the pipeline, and FliPer parameters are included into a large random forest procedure.

3. ROOSTER: a machine-learning analysis tool for *Kepler* stellar rotation periods
   Astronomy and Astrophysics 647 A125
   DOI : 10.1051/0004-6361/202039947
   cited : 5

   *Breton, S.N., Santos, A.R.G., **Bugnet, L.** et al., 2021*

   Abstract : We adapted the FliPer$_{\mathrm{Class}}$ random forest classifier to detect stars that present rotation signals in the asteroseismic data, and to retrieve the correct rotation period from various non-automatic measurements

2. Surface Rotation and Photometric Activity for *Kepler* Targets. I. M and K Main-sequence Stars
   The Astrophysical Journal Supplement Series, 244, 1
   DOI : 10.3847/1538-4365/ab3b56
   cited : 38

   *Santos, A. R. G., García, R. A., Mathur, S., **Bugnet, L.** et al., 2019*

   Abstract : We study $\sim 1,000$ stars observed by *Kepler* to determine why some solar-type stars do not present detectable modes of oscillations. The strong magnetic activity and/or the chemical composition of some stars could originate this non-detection. My contribution allowed to build the studied non-oscillating solar-type star sample by using the FliPer$_{\mathrm{Class}}$ method.

1. ✪ Revisiting the impact of stellar magnetic activity on the detection of solar-like oscillations by *Kepler*
   Frontiers in Astronomy and Space Sciences
   DOI : 10.3389/fspas.2019.00046
   cited : 14

   *Mathur, S., García, R.A., **Bugnet, L.** et al., 2019*

   Abstract : We study $\sim 1,000$ stars observed by *Kepler* to determine why some solar-type stars do not present detectable modes of oscillations. The strong magnetic activity and/or the chemical composition of some stars could originate this non-detection. My contribution allowed to build the studied non-oscillating solar-type star sample by using the FliPer$_{\mathrm{Class}}$ method. This study provides a sample of well characterized stars on which I will base the search for surface magnetism in Axis B of my proposed research.

Minor contributions

9. Detections of solar-like oscillations in dwarfs and subgiants with Kepler DR25 short-cadence data
   Accepted for publication in AA

   *Mathur, S., [...], **Bugnet, L.** et al. 2021*

8. Horizontal shear instabilities in rotating stellar radiation zones
   II. Effects of the full Coriolis acceleration
   Astronomy and Astrophysics 635 A133
   DOI : 10.1051/0004-6361/201936863
   cited : 5

   *Park. J., Prat, V., Mathis, S. & **Bugnet, L.***

7. The K2 Galactic Archaeology Program Data Release 2: Asteroseismic Results from Campaigns 4, 6, and 7
   The Astrophysical Journal Supplement Series 251 23
   DOI : 10.3847/1538-4365/abbee3
   cited : 11

   *Zinn, J.C. [...], **Bugnet, L.** et al., 2021*

6. Detection and characterisation of oscillating red giants: first results from the TESS satellite
   The Astrophysical Journal Letter, 889 :L34
   DOI : 10.3847/2041-8213/ab6443
   cited : 20

   *Silva Aguirre V. [...] **Bugnet, L.** et al., 2020*

5. Age dating of an early Milky Way merger via asteroseismology of the naked-eye star ν Indi
   Nature Astronomy, 4, 382-389
   DOI : 10.1038/s41550-019-0975-9
   cited : 28

   *Chaplin, W.J. [...] **Bugnet, L.** et al., 2020*

4. A Hot Saturn Orbiting An Oscillating Late Subgiant Discovered by TESS
   The Astronomical Journal 157 6
   DOI : 10.3847/1538-3881/ab1488
   cited : 55

   *Huber, D. [...] **Bugnet, L.** et al., 2019*

3. A Search for Red Giant Solar-like Oscillations in All *Kepler* Data
   Monthly Notices of the Royal Astronomical Society 610
   DOI : 10.1093/mnras/stz622
   cited : 16

   *Hon, M. [...] **Bugnet, L.**, 2019*

2. TESS's first planet. A super-Earth transiting the naked-eye star π Mensae
   Astronomy and Astrophysics 619 L10
   DOI : 10.1051/0004-6361/201834289
   cited :68

   *Gandolfi, D. [...] **Bugnet, L** et al., 2018*

1. HD 89345: a bright oscillating star hosting a transiting warm Saturn-sized planet observed by K2
   Monthly Notices of the Royal Astronomical Society 478 4866V
   DOI : 10.1093/mnras/sty1390
   cited :20

   *Van Eylen, V. [...] **Bugnet, L.** et al., 2018*

Contributions *in prep*

- Magnetic signatures on mixed-mode frequencies
  II. Period spacings as a probe of red giant's internal magnetism.

  Bugnet, L. 2022

- Unveiling stellar nature through oscillation pattern recognition

  Bugnet, L., Le Saux, A. et al., 2022

- Impact of rotation on stochastic excitation of acoustic modes in solar-type stars

  Deckx van Ruys, A. , Mathis, S., **Bugnet, L.**, et al., 2022

- Can we detect deep axisymmetric toroidal magnetic fields in stars ?
  The magnetic traditional approximation of rotation

  Dhouib, H., Mathis, S., **Bugnet, L.**, et al., 2022

- Estimation of stellar masses from non-seismic methods in the scope of the PLATO mission

  Bugnet, L., A. Ellien, and PLATO Science Management collaboration et al., 2022