M U N I

COMMENTARY TO HABILITATION THESIS[1]

Periodic stellar variability among A-F spectral type stars

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The Habilitation thesis is a compilation of my most distinct publications regarding stellar variability among stars with temperatures between 6500 and 10000 K. The goal of all these efforts has been to identify common features and correlations between the observational characteristics of variable stars, their improved classification, and the underlying causes of their behaviour. A better understanding of stellar pulsations, processes in stellar atmospheres, and stellar multiplicity is essential because it impacts many applications of variable stars in astrophysics, for example, distance determination. The thesis comprises my research on main-sequence, as well as on horizontal-branch stars, represented by seven first- and one second-author papers. Apart from that, I have participated in general studies dedicated to stellar variability, research focused on exoplanets, instrumentation and collaboration with citizen astronomers. According to the NASA ADS database, my efforts have resulted in the publication of 152 papers and conference proceedings (38 of them as the first author) with almost 1800 citations (without self-citations). Only about two-thirds of these are listed in WoS and/or SCOPUS databases.

The thesis begins with a brief introduction and is followed by my investigations of large samples of RR Lyrae stars in the Galactic bulge and the Galactic field to study the modulation (the Blazhko effect) and binarity of these old, radially pulsating stars. We discovered a gap in the modulation-period distribution at around 1000 days, which we named the Blazhko valley. We sorted Blazhko stars into six groups, considering the shapes of their modulation envelopes, and showed that there are basically no differences between Blazhko and non-Blazhko stars. We showed that spectroscopic confirmation of binary candidates with an RR Lyr component is an absolute necessity. The third chapter of the thesis is dedicated to chemically peculiar (CP) stars in binary systems. We studied a tight binary system HD 99458 can contain the first magnetic CP star which pulsates as a δ Sct pulsator. Magnetism, δ Sct pulsations and binarity are not expected to work together in such configuration. The other presented systems is 50 Dra, which consists of two slowly-rotating metallic chemically peculiar components that most likely show high-order g-mode oscillations. In the fourth chapter of the thesis, I continue with my most recent results on stellar variability classification

[1] The commentary must correspond to standard expectations in the field and must include a brief characteristic of the investigated matter, objectives of the work, employed methodologies, obtained results and, in case of co-authored works, a passage characterising the applicant's contribution in terms of both quality and content.

based on TESS space-mission data, where I thoroughly discuss shortcomings in classification and reveal substantial discrepancies between classification in various catalogues.

[1][2] **SKARKA, M.*(corresponding author)***, J. LISKA, R. F. AUER, Z. PRUDIL, A. JURANOVA and A. SODOR. The SERMON project: 48 new field Blazhko stars and an investigation of modulation-period distribution. *Astronomy & Astrophysics* [online]. 2016, **592**(Article A144). ISSN 1432-0746. Available at: doi:10.1051/0004-6361/201628855

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
-	100	80	90

[2] PRUDIL, Z. and **M. SKARKA**. Blazhko effect in the Galactic bulge fundamental mode RR Lyrae stars - I. Incidence rate and differences between modulated and non-modulated stars. *Monthly Notices of the Royal Astronomical Society* [online]. 2017, **466**(3), 2602–2613. ISSN 1365-2966. Available at: doi:10.1093/mnras/stw3231

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
-	100	50	80

[3] SKARKA, M.*(corresponding author)*, J. LISKA, R. DREVENY, E. GUGGENBERGER, A. SODOR, T. G. BARNES and K. KOLENBERG. A cautionary tale of interpreting O-C diagrams: period instability in a classical RR Lyr Star Z CVn mimicking as a distant companion. *Monthly Notices of the Royal Astronomical Society* [online]. 2018, **474**(1), 824–837. ISSN 1365-2966. Available at: doi:10.1093/mnras/stx2737

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
20	80	60	70

[4] SKARKA, M.*(corresponding author)*, P. KABATH, E. PAUNZEN, M. FEDURCO, J. BUDAJ, D. DUPKALA, J. KRTICKA, A. HATZES, T. PRIBULLA, S. PARIMUCHA, Z. MIKULASEK, E. GUENTHER, S. SABOTTA, M. BLAZEK, J. DVORAKOVA, L. HAMBALEK, T. KLOCOVA, V. KOLLAR, E. KUNDRA, M. SLECHTA and M. VANKO. HD 99458: First time ever Ap-type star as a δ Scuti pulsator in a short period eclipsing binary?. *Monthly Notices of the Royal Astronomical Society* [online]. 2019, **487**(3), 4230–4237. ISSN 1365-2966. Available at: doi:10.1093/mnras/stz1478

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
20	80	60	60

[5] SKARKA, M.*(corresponding author)*, Z. PRUDIL and J. JURCSIK. Blazhko effect in the Galactic bulge fundamental mode RR Lyrae stars - II. Modulation shapes, amplitudes,

[2] Bibliographic record of a published scientific result, which is part of the habilitation thesis.

and periods. *Monthly Notices of the Royal Astronomical Society* [online]. 2020, **494**(1), 1237–1249. ISSN 1365-2966. Available at: doi:10.1093/mnras/staa673

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
-	100	70	80

[6] SKARKA, M.*(corresponding author)*, J. ZAK, M. FEDURCO, E. PAUNZEN, Z. HENZL, M. MASEK, R. KARJALAINEN, J. P. Sanchez ARIAS, A. SODOR, R. F. AUER, P. KABATH, M. KARJALAINEN, J. LISKA and D. STEGNER. Periodic variable A-F spectral type stars in the northern TESS continuous viewing zone I. Identification and classification. *Astronomy & Astrophysics* [online]. 2022, **666**(Article A142). ISSN 1432-0746. Available at: doi:10.1051/0004-6361/202244037

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
5	100	90	90

[7] SKARKA, M.*(corresponding author)* and Z. HENZL. Periodic variable A-F spectral type stars in the southern TESS continuous viewing zone. *Astronomy & Astrophysics* [online]. 2024, **688**(Article A25). ISSN 1432-0746. Available at: doi:10.1051/0004-6361/202450711

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
-	100	95	100

[8] SKARKA, M.*(corresponding author)*, J. LIPTAK, E. NIEMCZURA, Z. MIKULASEK, M. CABEZAS, M. VITKOVA, R. KARJALAINEN and P. KABATH. 50 Dra: Am-type twins with additional variability in a non-eclipsing system. *Astronomy & Astrophysics* [online]. 2025, **698**(Article A48). ISSN 1432-0746. Available at: doi:10.1051/0004-6361/202452341

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
20	100	60	80