

## **Supervisor's report on Ph.D. dissertation**

Title: Interaction between solar convection and magnetic fields

Student: Marta García Rivas

The main topic of Marta García Rivas' Ph.D. thesis is the analysis of the role of magnetic fields in the evolution of sunspots and pores in active regions. The work builds on previous studies that highlighted the influence of vertical magnetic fields on the stability of sunspot umbrae.

The thesis consists of three peer-reviewed papers, with Marta García Rivas as the first author, accompanied by a relatively brief but focused introduction. The introduction is divided into three chapters: (1) a summary of current knowledge regarding the role of magnetic fields in the stability of sunspots, (2) an explanation of spectropolarimetry, radiative transfer, and inversion codes, and (3) a detailed description of the observational data used in the thesis. The remainder of the thesis reproduces the three peer-reviewed papers, followed by a concise summary.

The first paper focuses on analyzing the evolution of magnetic properties at the boundary of an evolving pore, revealing clear similarities to studies of the magnetic properties at umbra boundaries in sunspots. The second paper compares different datasets, aiming to resolve discrepancies between them, which is illustrated through the analysis of a decaying sunspot. The third paper examines the formation process of individual penumbral filaments, identifying common characteristics in their development.

In addition to these core papers, an appendix includes another peer-reviewed paper accepted for publication. This work is based on an observational campaign coordinated by Marta García Rivas, which, despite not yielding data directly relevant to the thesis's main focus, resulted in a thorough analysis of a flaring region.

Throughout her Ph.D. studies, Marta García Rivas coordinated numerous observational campaigns and demonstrated considerable effort to obtain ground-based data relevant to her thesis topic.

Furthermore, she successfully applied for and executed a student grant from the Grant Agency of Charles University. Beyond her research, Marta also contributed significantly to the institute's public relations activities. Notably, she established a successful outreach event, "Chat with an Astronomer," which emphasizes the role of women in science.

I would like to emphasize her independence and meticulous approach to scientific research. At no point did she present me with incorrect results. Marta consistently examined her findings in detail, comparing them with previous studies and carefully considering their implications. As a result, my role was more that of a mentor than a supervisor; I merely suggested additional directions for her to explore and helped clarify her ideas through mutually beneficial discussions.

I believe that the three (four) peer-reviewed publications, on their own, demonstrate the scientific capabilities of Marta García Rivas and her ability to perform research at a very high level. I am confident that Marta García Rivas has grown into an independent scientist, and I fully support her being awarded the Ph.D. degree.

In Ondřejov, 10. 9. 2024

Jan Jurčák