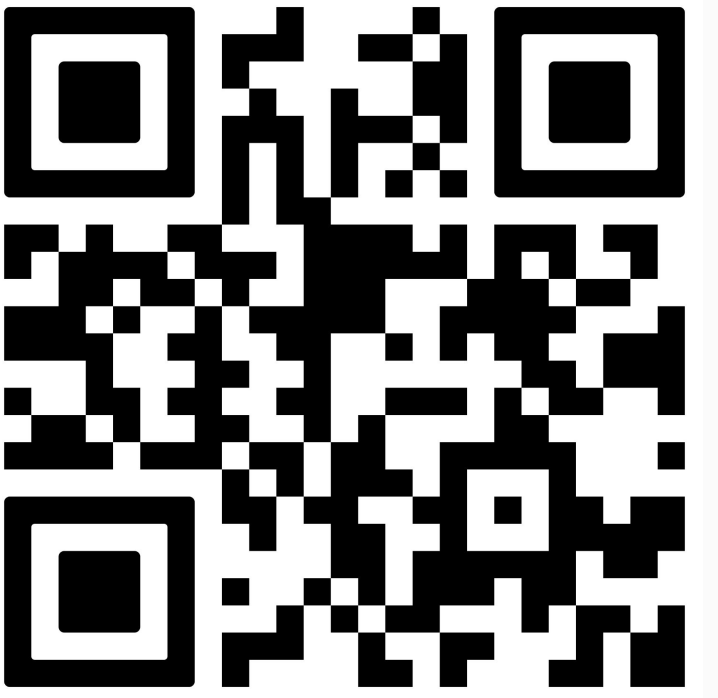


<https://astro.bas.bg/project-sun/>

Abstract: We present work carried out during the joint Bulgarian-Austrian research project on solar chromospheric and coronal activity. The aims of the project are to develop observing capability in Bulgaria to complement Austrian monitoring instruments, and to study chromospheric signatures of quiet sun and pre-eruptive active regions and multi-wavelength manifestation of solar eruptive phenomena, their morphology and kinematics. We have recently set up a narrow field of view solar imaging system at Belogradchik Astronomical Observatory, equipped with a DayStar Energy Rejection Filter (ERF) and a Hydrogen Alpha (H α) Quantum filter, which is used to capture high-resolution images of solar prominences and sunspots, and is complementary to the Kanzelhöhe Patrol Instrument (KPI). A recent study presents a quantitative comparison between confined, eruptive and all M-class solar flares over the last two solar cycles. The properties of the SFs, related radio bursts and the parent sunspots (Hale type and total area) were examined. We have recently developed hybrid (algorithmic and machine learning) models for automated segmentation of on-disk solar features (prominences and filaments) using Kanzelhöhe Observatory data. Here we showcase these and other results.



1. To set up a Bulgarian Chromospheric Telescope (BCT), and develop standardized solar observing methodology and products, complementary to the Kanzelhöhe Patrol Instrument (KPI) by means of strong technical cooperation between the team members.
2. To carry out combined solar observations with the two instrument suites and external (freely available space-based) resources, in order to study chromospheric signatures of quiet sun and pre-eruptive active regions and multi-wavelength manifestation of solar eruptive phenomena, their morphology and kinematics.

- Task 3.1: Project web-site
- Task 3.2: Scientific dissemination

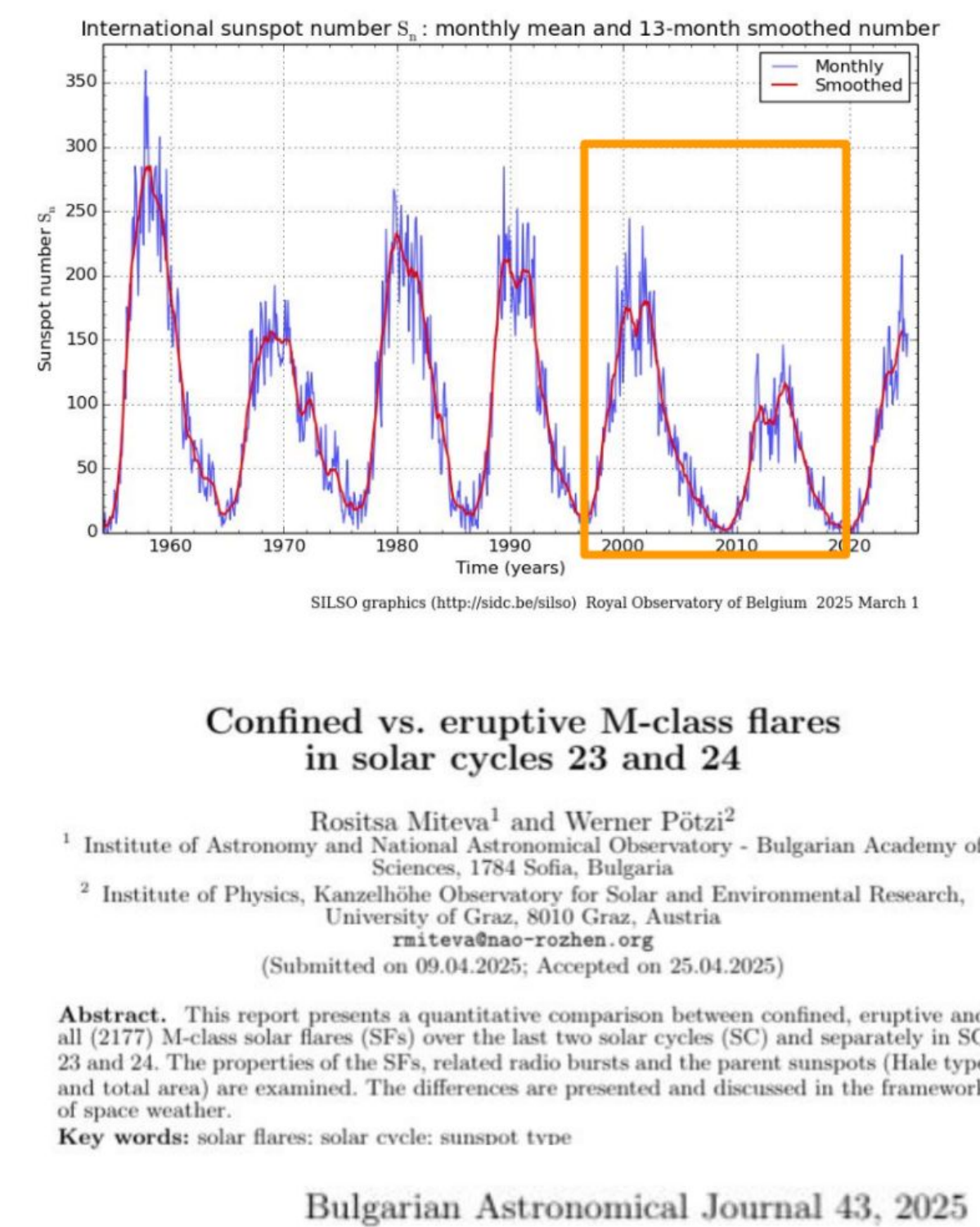
Dr. Werner Poetzi
13-17.05.2025
AQ-Belogradchik

- solar observations
- software installation
- discussions

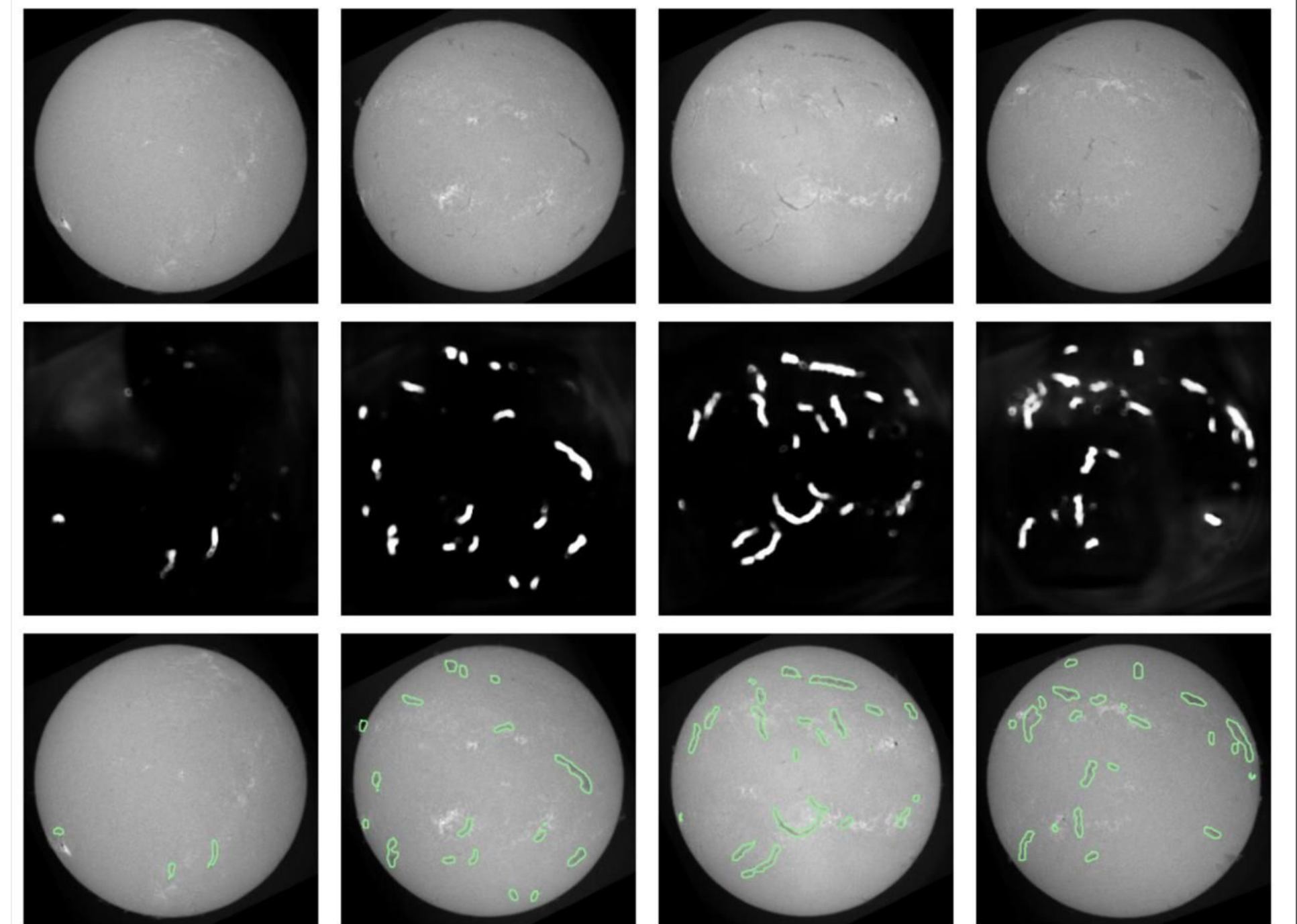
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- M-class: GOES soft X-ray (1-8 Å) flux, 10^{-5} to 10^{-4} W/m²
<https://www.swpc.noaa.gov/products/goes-x-ray-flux>
- Confined: no associated (parent) coronal mass ejection (no magnetized plasma eruptions) & no particle events
- Time coverage: 1997-2009 & 2010-2019
<https://www.sidc.be/SILSO/monthlyssnplot>
- Event sample: ~990
- Analyses: timings, location, sunspot type, radio burst (I & III type) associations

(e-poster)



- Adopted our wavelet and data-driven image segmentation techniques for ground-based optical instrument data (K-Cor, Kanzelhöhe, Belogradchik, Rozhen data)
- Trained and optimized a U-Net ensemble of models for **filament recognition and tracking**
- Used Kanzelhöhe full-disk synoptic observations for training data
- Average IOU 0.76 on validation set
- Figure shows sample output masks (middle row) and overlays on observations (bottom row)



- Developed a new synoptic H-alpha imaging system at Belogradchik Observatory
- System currently in testing
- Initial results: successful observations of active regions and prominences
- Development of observational products for serving online



<https://astro.bas.bg/project-sun/>

The activities under this bilateral cooperation are supported by the Bulgarian National Science Foundation project No. KP-06-Austria/5 (14-08-2023) and Austria's Agency for Education and Internationalisation (OeAD) project No. BG 04/2023.

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