RESULTS FROM THE BULGARIAN-AUSTRIAN PROJECT ON SOLAR AND CORONAL ACTIVITY

Momchil DECHEV (1)
Rositsa MITEVA (1)
Werner POETZI(2)
Kamen KOZAREV(1)
Oleg STEPANYUK(1)
Pencho MARKISHKI (1)
Georgi LATEV (1)

(1) Institute Of Astronomy and NAO, BAS, Bulgaria

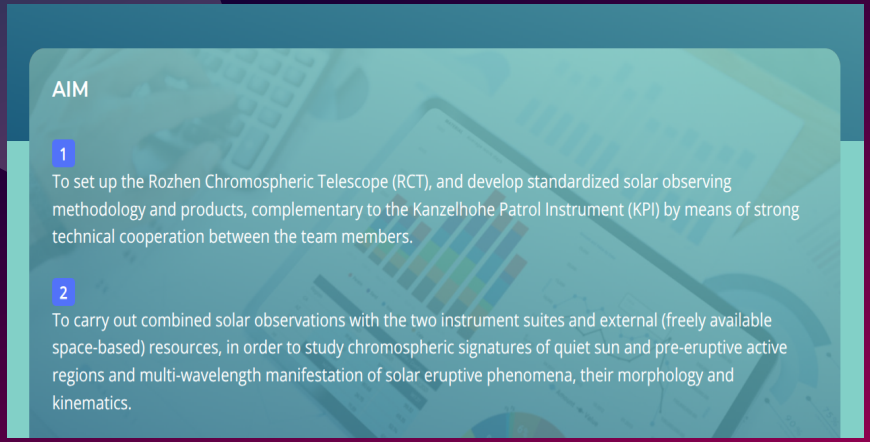
(2) Univeristy of Graz and Kanzelhöhe Solar Observatory, Austria

National Space Forum, 27 – 29 October 2025, Sofia

Bulgarian-Austrian project

Joint Observations and Investigations of Solar Chromospheric and Coronal Activity (2023-2025)

Bg-PI: R. Miteva
At-PI: W. Poetzi



Aim 1: Technical & Instrumental 🛠️

- To set up the Rozhen Chromospheric Telescope (RCT) and develop a standardized solar observing methodology and data products.
- Complementary Capability: The RCT data is designed to be complementary to the observations from the Kanzelhohe Patrol Instrument (KPI) in Austria, allowing for coordinated, dual-site observations.

Key Focus: Strong technical cooperation for telescope installation, data processing, and quality control.

Aim 2: Scientific Investigation 🔬

To carry out combined solar observations utilizing both ground-based (RCT, KPI) and freely available space-based resources.
- Research Focus 1: Study chromospheric signatures of the quiet Sun and pre-eruptive active regions.
- Research Focus 2: Conduct a multi-wavelength manifestation study of solar eruptive phenomena, focusing on their morphology and kinematics (how they move).

Work Packages

Work Package #1

Technical support of NAO-Rozhen Chromosphere Telescope and observation campaigns with KSO facilities

- Task 1.1: Telescope installation
- Task 1.2: Data processing
- Task 1.3: Observation Campaign
- Task 1.4: Image enhancement

Work Package #2

Joint investigations of solar chromospheric and coronal activity

- Task 2.1: Chromospheric Signatures of Quiet Sun and Pre-Eruptive Configurations
- Task 2.2: Multi-wavelength study of solar activity phenomena, their morphology and kinematics

Work Package #3

Dissemination of the project results

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

Work Packages
Task 1.1

Work Packages
Task 1.2, 1.3, 1.4

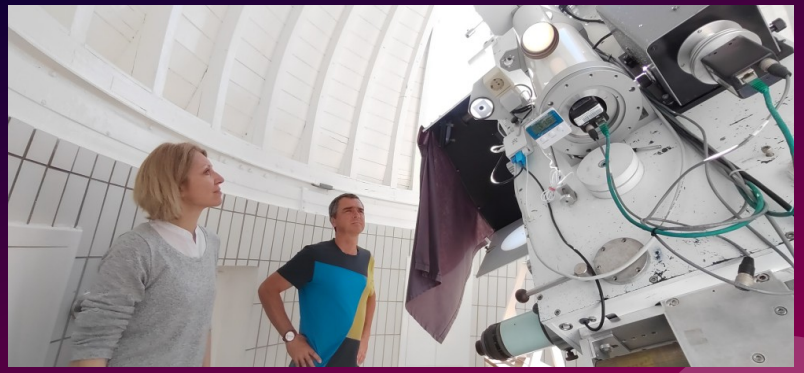
Dr. Werner Pőtzi
1-6 November 2023, Bulgaria

Institute of Astronomy - Sofia and National Astronomical Observatory (NAO) – Rozhen

- presentation on the Austrian instruments for solar observations, data products and processing techniques
- inspection of the Bulgarian solar observational capabilities at NAO-Rozhen
- participation in several work discussions under the project with the Bulgarian team members

Dr. Oleg Stepanyuk
17-19 April 2024, Austria

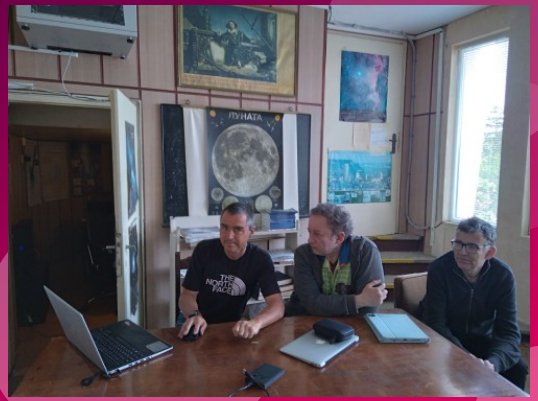
PhD Christoph Schirninger
21-26.10.2024, Sofia



Dr. Rositsa Miteva
& Dr. Momchil Dechev
16-22.06.2025,
KSO, Austria

Dr. Werner Poetzi

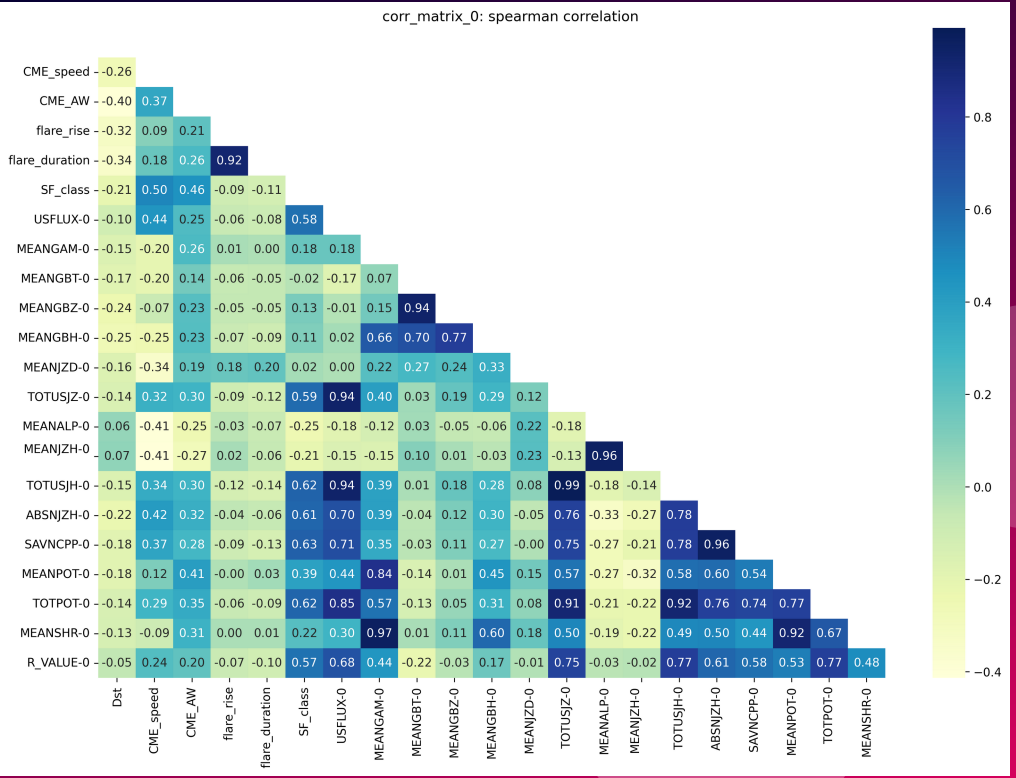
13-17.05.2025
AO-Belogradchik



Work Packages
Work package #2 Results

The 60 geo-effective active regions (ARs) were selected from SHARP data (http://jsoc.stanford.edu/doc/data/hmi/sharp/sharp.htm) with a 12 min time resolution is used to quantify the magnetic properties of the ARs. The SHARP parameters calculated over 4 time periods are used in the analyses. Namely, before the solar flare onset, during solar flare rise time, solar flare decline time, the entire solar flare duration.

In addition, the correlation matrices for the subsets of strong (stronger than -100 nT) and weak GSs (with Dst index from -50 nT to -100 nT) were presented.



Work Packages
Work package #2 Results

4 Publicataions:

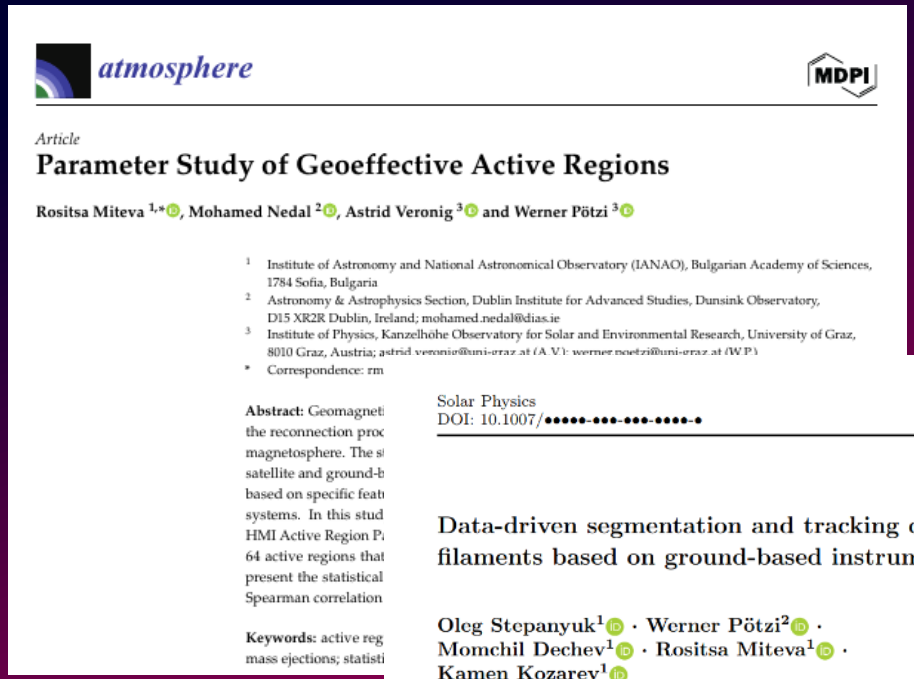
1) Miteva et al., “New Bulgaria-Austrian project ‘Joint observations and investigations of solar chromospheric and coronal activity”, Proceedings of the SES-2023 conference, e-ISSN 2603-3321, pp. 63-66;

2) Rositsa Miteva, Mohamed Nedal, Astrid Veronig, Werner Poetzi, “Parameter Study of Geoeffective Active Regions”, Atmosphere 2024, 15(8), 930, https://doi.org/10.3390/atmos15080930;

3) Miteva, R., Poetzi, W., “Confined vs. eruptive M-class flares in solar cycles 23 and 24”, Bulgarian Astronomical Journal, 43, 2025, 34-44, https://astro.bas.bg/AIJ/issues/n43/RMiteva.pdf;

4) Markishki, P., Dechev, M., Poetzi, W., Miteva, R., Kozarev, K., “Hα Imaging of Solar Phenomena Using a Modified Schmidt-Cassegrain Telescope at Astronomical Observatory – Belogradchik”, Bulgarian Astronomical Journal, 43, 2025, 89-97, https://astro.bas.bg/AIJ/issues/n43/Pmarkishki.pdf;

Oleg Stepanyuk Werner Poetzi Momchil Dechev Rositsa Miteva Kamen Kozarev, “Data-driven segmentation and tracking of solar filaments based on ground-based instrument data”, Solar Phys…. – in preparation



atmosphere

MDPI

Article

Parameter Study of Geoeffective Active Regions

Rositsa Miteva [1,*], Mohamed Nedal [2], Astrid Veronig [3] and Werner Pötzi [3]

[1] Institute of Astronomy and National Astronomical Observatory (IANAO), Bulgarian Academy of Sciences, 1784 Sofia, Bulgaria
[2] Astronomy & Astrophysics Section, Dublin Institute for Advanced Studies, Dunsink Observatory, D15 XR2R Dublin, Ireland; mohamed.nedal@dias.ie
[3] Institute of Physics, Kanzelhöhe Observatory for Solar and Environmental Research, University of Graz, 8010 Graz, Austria; astrid.veronig@uni-graz.at (A.V.); werner.poetzi@uni-graz.at (W.P.)
* Correspondence: rm

Abstract: Geomagneti
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64 active regions that
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Spearman correlation

Keywords: active reg
mass ejections; statisti

Solar Physics
DOI: 10.1007/●●●●●-●●●-●●●-●●●●-●

Data-driven segmentation and tracking of solar filaments based on ground-based instrument data

Oleg Stepanyuk[1] · Werner Pötzi[2] · Momchil Dechev[1] · Rositsa Miteva[1] · Kamen Kozarev[1]

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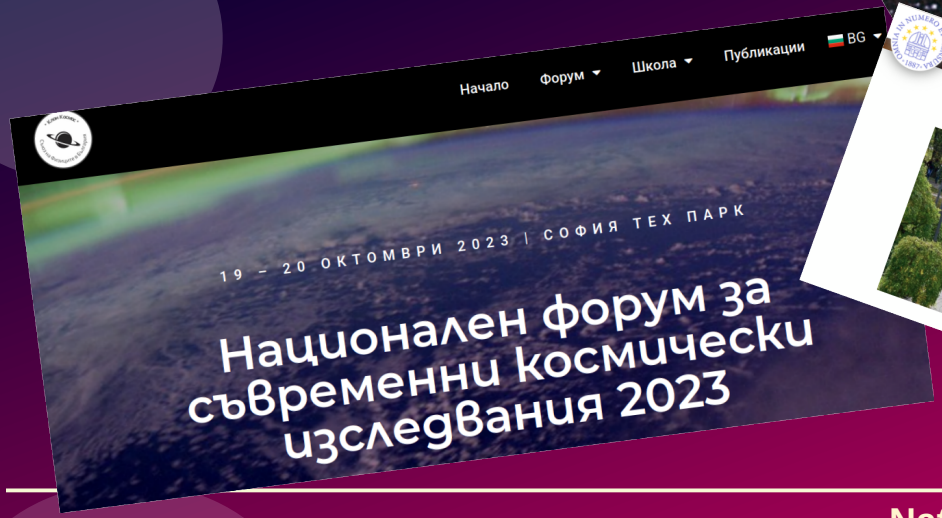
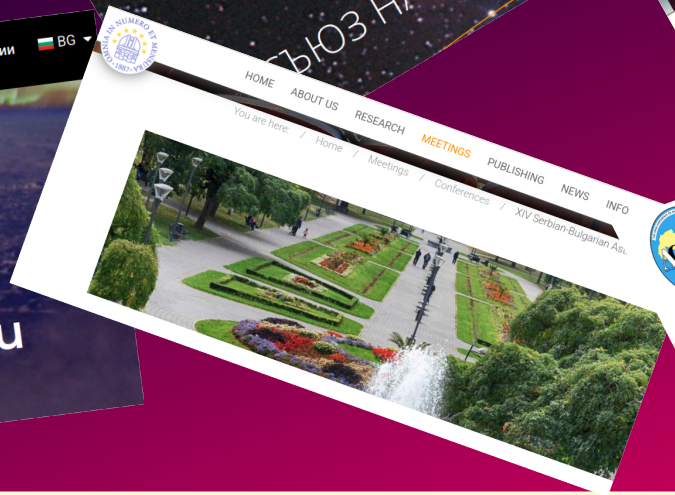
Abstract The dynamic behavior of solar prominences and filaments is a precursor to coronal mass ejections (CMEs), which can disrupt Earth's magnetosphere and affect satellite communications. Systematic ground-based solar observations, conducted with high temporal resolution, are instrumental in monitoring these structures. Analysis of the morphological changes and destabilization processes of filaments and prominences captured in datasets can help identify early warn-

Work Packages

Work package #2 Results

16 Presentations





Work Packages
Work package #3

Project-SUN HOME WORK PACKAGES TEAM RESULTS CONTACT

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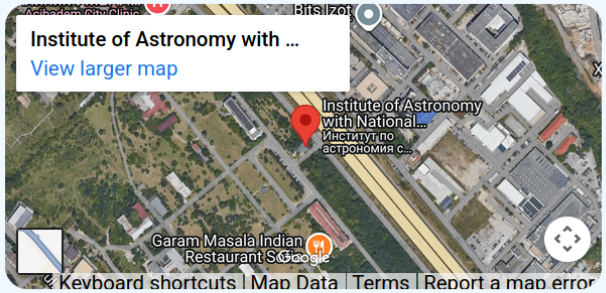

Bulgarian office

72, Tsarigradsko chaussee Blvd., Sofia, 1482, Bulgaria

Phone 359-2-9741910
Email office@astro.bas.bg

Austrian office

Universitätsplatz 3, Graz, 8010, Austria

Phone 000-000-0000
Email info@uni-graz.at

SUN-Project

Resources

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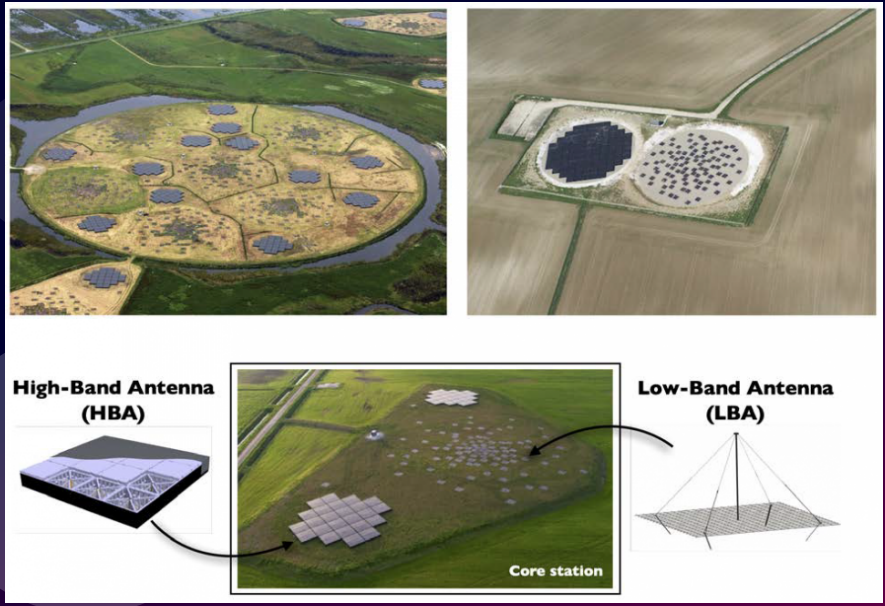
Information

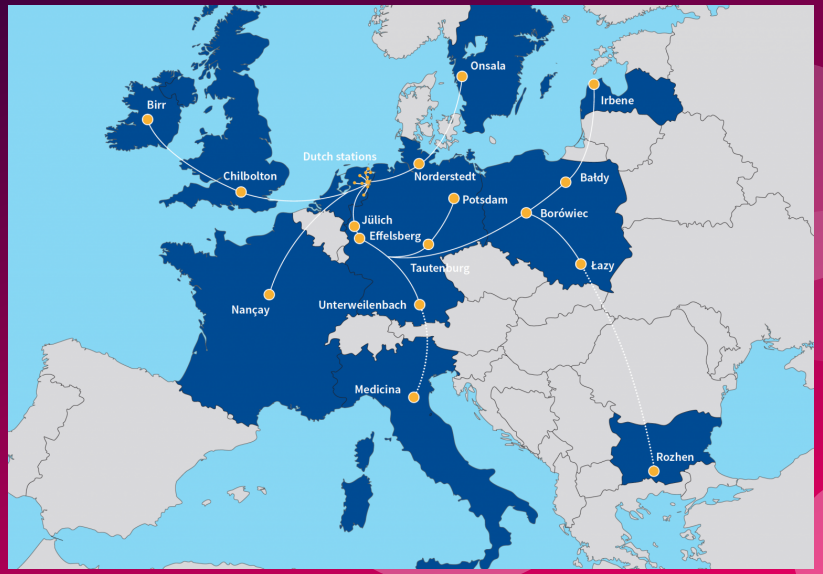
305-240-9671
office@astro.bas.bg

Lofar-BG



Top left: the Superterp core of LOFAR. Top right: The Chilbolton UK LOFAR station. Bottom: a core station with schematics of the HBA and LBA antennas. Credit: ASTRON

LOFAR is a multi-functional, highly innovative, pan-European distributed low-frequency radio telescope, operating between 10 and 240 MHz. It was developed by the Dutch Institute for Radio Astronomy (ASTRON) with the goal of exploring the early, distant Universe, solar activity, and the terrestrial atmosphere.



Acknowledgements

Bilateral project: Bulgaria-Austria https://astro.bas.bg/project-sun/
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Thank You for Your Attention!