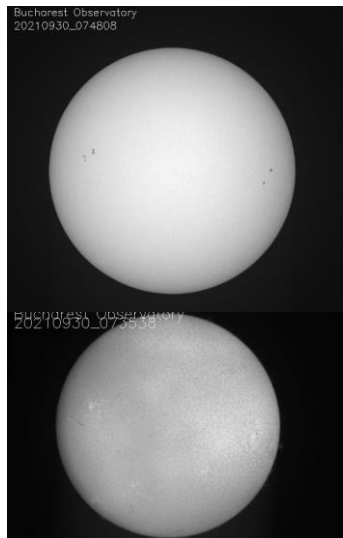# ISWI contribution from Romania

Participating institutes
Astronomical Institute of the Romanian Academy[1]
Institute of Geodynamics of the Romanian Academy[2]
Institute of Space Science[3]
National Institute for Earth Physics[4]
"Dunărea de jos" University of Galați[5]
Romanian Space Agency[6]

Expertise
Solar Physics
Solar wind
Space Weather
Space weather impact on magnetosphere and ionosphere

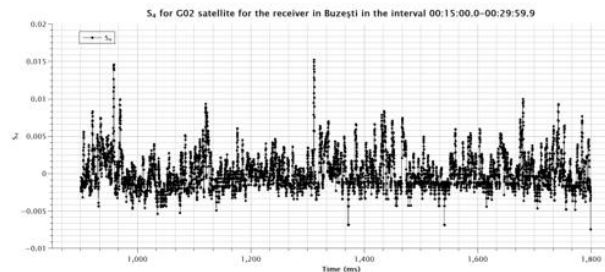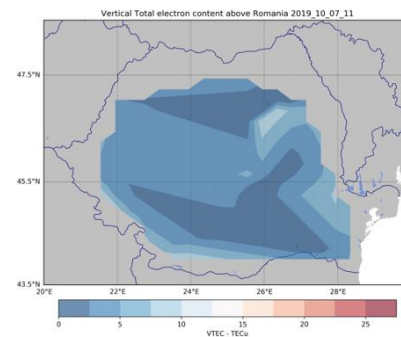[1]AIRA, [2]IGSSSAR, [3]ISS, [4]INFP, [5]UGAL, [6]ROSA

HSS Catalogue
@IGSSSAR/AIRA
http://www.geodin.ro/varsiti/

Solar Observations @AIRA

Space Weather Bulletin in Romanian @AIRA
Solar filaments calatogue @AIRA
http://92.87.254.21/~solar/products.html

Ionospheric Monitoring Service @ISS/ROSA
http://hephaistos.spacescience.ro/safespace/select.php

ESA Space Weather FORIND product @ISS
https://swe.ssa.esa.int/forind-federated

Romanian Infrastructure

AIRA – 2 optical telescopes, 1 Callisto spectrometer, 2 SID monitors
INFP/ISS – 31 permanent GNSS stations (monitoring and prediction of ionospheric activity)
ISS – Solar Observatory
IGSSSAR – network of repeat geomagnetic measurements (magnetometers)

AIRA: https://eeris.eu/ERIO-2000-000A-0046
IGSSSAR: https://eeris.eu/ERIO-2000-000Y-0445
ISS: https://eeris.eu/ERIO-2000-000S-0061
INFP: https://eeris.eu/ERIO-2000-000Q-0068
UGAL: https://eeris.eu/ERIO-2000-000C-0062
ROSA: https://eeris.eu/ERIO-2000-000S-0027

Complex interdisciplinary research of Solar activity impact on the Earth's environment

TABLE 1 | The resulting logistic regression coefficients following the non-linear logistic regression model for normalized values (first row) and for standardized values (second row).
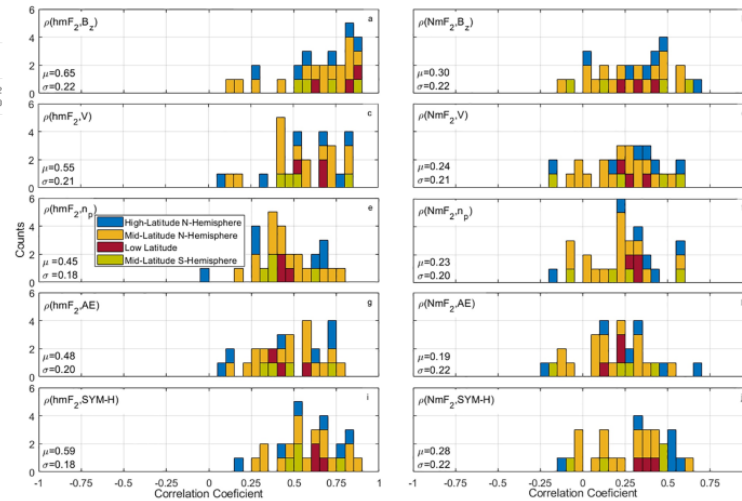
Independent variable/coefficient	V$_{20R}$	AW$_{CME}$	MPA$_{CME}$	Acc$_{CME}$	Pos$_{CME}$	b$_0$
Regression coefficient	−1.8616	34.4414	−0.3007	21.4110	9.1932	−44.7622
Regression coefficient *ST	−0.1706	8.3054	−0.0862	0.8432	9.2338	−31.9990

Geoeffectiveness Prediction of CMEs – Non linear regression model (Besliu-Ionescu and Mierla, 2020)
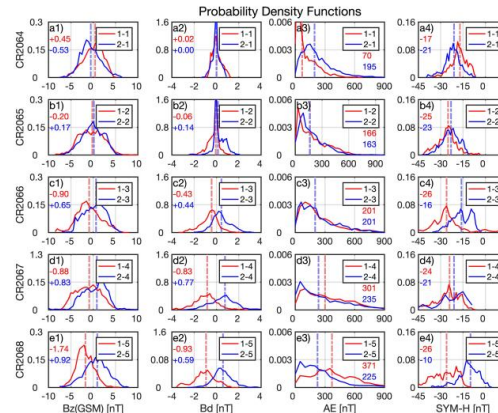
Summary of regression coefficients

	Regression Coefficient	Corresponding Value
1	Initial Speed (V0)	-0.9988
2	Maximum Speed (VM)	0.0051
3	Delta V Max (DVM)	-0.0061
4	Duration (dt)	0.0053
5	Minimum Value of Bz (Bz_min)	0.1425
6	Interplanetary magnetic conditions (IMF)	0.0843
7	Free term (b0)	7.6450

Geoeffectiveness Prediction of HSSs – Non linear regression model (Besliu-Ionescu and Maris Muntean, 2020)
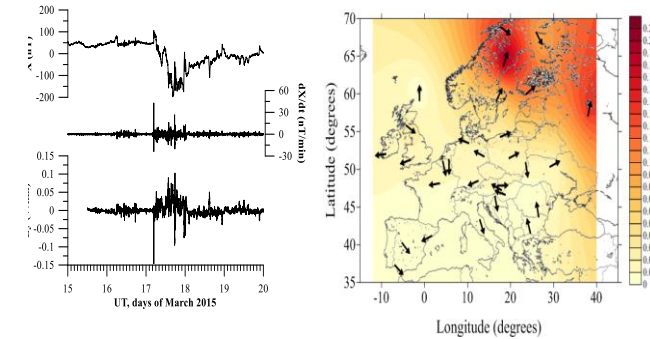

Figure 7. Histograms of the correlation coefficients between the ionospheric parameter spectra and the spectra of the solar wind and geomagnetic indices: (a) hmF$_2$ and B$_z$; (b) NmF$_2$ and B$_z$; (c) hmF$_2$ and V; (d) NmF$_2$ and V; (e) hmF$_2$ and n$_p$; (f) NmF$_2$ and n$_p$; (g) hmF$_2$ and AE; (h) NmF$_2$ and AE; (i) hmF$_2$ and SYM-H; (j) NmF$_2$ and SYM-H. Each histogram covers the entire group of 28 ionosonde stations, while the color blocks depict the contributions from the subgroups containing the locations within specific latitude ranges. For each pair of variables, the median and standard deviation are listed.

Correlation coefficients between the ionospheric parameter spectra and the spectra of the solar wind and geomagnetic indices (Negrea et al. 2021)
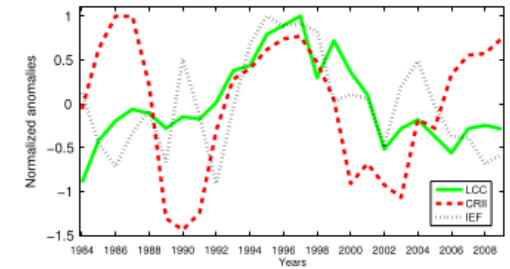

St Patrick geomagnetic storm, March 2015, Surface geoelectric field – Emax (Geoelectric hazard maps) (Demetrescu et al., 2018; Dobrica et al., 2016)

Probability Density Functions

Figure 8. Temporal evolution of the R-M effect using probability density functions. Columns from left to right: IMF Bz(GSM) component, Bd, AE index and SYM-H index. Rows from top to bottom: CR2064, CR2065, CR2066, CR2067, CR2068. Colors have the same meaning as in previous figures: red (blue) for sequence 1 (sequence 2). Each panel depicts the PDFs for the two HSS/CIR events within the same Carrington rotation. Colored numbers give their median values, also depicted as vertical lines.

Temporal evolution of the R-M effect using probability density functions (Munteanu et al. 2019)

Figure 5. Variation of average mid–high latitude (30°–75°N and S) low cloud cover (green continuous line), interplanetary electric field (black dots) and cosmic ray induced ionization (CRII) at 700 hPa (red dash). CRII is calculated using the atmospheric ionization model of Usoskin et al (2010).

Variation of average mid–high latitude low cloud cover, interplanetary electric field and cosmic ray induced ionization (CRII) (Voiculescu et al. 2013)