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MEMORIAL SESSIONS

70 YEARS OF LOW-FREQUENCY RADIO ASTRONOMY IN UKRAINE

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Throughout the more than one-hundred-year history of the National Academy of Sciences of Ukraine, low-frequency radio astronomy has remained one of the country's priority areas of both fundamental and applied research. This field was established during the mid-1950s by the outstanding scientist Academician Semen Ya. Braude, with the unwavering support of Academician Borys Ye. Paton, President of the National Academy of Sciences of Ukraine.

Among Semen Braude's many remarkable contributions to radiophysics, geophysics, radar engineering, and applied military research, his greatest legacy is undoubtedly the creation of the Ukrainian school of low-frequency radio astronomy, together with its unique experimental facilities and internationally recognized scientific achievements.

Over the past seventy years, several generations of his colleagues, students, and successors have not only preserved this scientific heritage but have continuously expanded it through the modernization of UTR-2, URAN-1...URAN-4, and the construction of entirely new instruments such as GURT, mobile antenna arrays, and specialized systems for future ground-based and space missions.

Ukraine's independence in 1991 opened a new era of international collaboration and integration into the global radio astronomy community. The scientific achievements obtained during recent decades, particularly through international collaborations, are now widely recognized. The Ukrainian radio telescopes UTR-2, URAN, and GURT have become indispensable components of the worldwide development of low-frequency radio astronomy and have contributed significantly to the realization of next-generation facilities including LOFAR, NenuFAR, LWA, MWA, and SKA-Low.

These achievements fully justify Semen Braude's visionary decision to establish a new school of low-frequency radio astronomy in the 1950s, recognizing long before most others the extraordinary astrophysical importance of this wavelength range.

80-TH ANNIVERSARY OF GAMOW'S HYPOTHESIS ON COSMOLOGICAL NUCLEOSYNTHESIS

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In his paper *Expanding Universe and the Origin of Elements*, published in 1946, George Gamow developed the idea that the observed abundance of chemical elements was determined during the early stages of the expansion of the Universe. In contrast to the equilibrium interpretation of element abundances discussed at that time, Gamow proposed that primordial nucleosynthesis was a nonequilibrium process governed by the rapid expansion of the hot and dense Universe. He showed that the characteristic time scale of cosmic expansion was sufficiently short to prevent the establishment of nuclear statistical equilibrium and suggested that the primordial chemical composition was formed during this brief early epoch of cosmic expansion. The report is devoted to the physical ideas presented in this paper and their development during the subsequent eighty years. The observational tests

National University on May 2, 2025, in the NOAA 4079 group. The $I \pm V$ spectra of this sunspot were recorded using a Sony NEX-5 digital camera in diffraction orders 36-38 of the Echelle spectrograph. The magnetic fields were measured by the Zeeman splitting of 17 spectral lines Fe I, Cr I, Mn I, Ni I and Ti I, which have effective Lande factors g_{eff} from -0.012 to 2.143 and the heights of formation of their centers in the sunspot umbra from 47 to 453 km. The following main effects are found: (1) in the height range of 50-450 km, the magnetic field has a negative height gradient of about -1.4 G/km; (2) the magnetic fields by the FeI 5434.5 and FeI 5576.1 lines with the smallest Lande factors (-0.014 and -0.012, respectively) have similar lateral profiles across the spot and reach intensities of 6-8 kG, which is significantly higher in absolute value than by other spectral lines with larger Lande factors. Such super-strong magnetic fields by these FeI lines with very small Lande factors mostly have the S-polarity, opposite to the N-polarity of the magnetic field by other spectral lines. This indicates that the magnetic field structure in the spot was at least two-component, with a weaker background component and a stronger small-scale (spatially unresolved) component, which had a local strengths, probably greater than 6-8 kG. We also found evidences to weak splitting of the bisectors of the $I \pm V$ profiles at distances of 0.2-0.3 Å from the centers of the FeI 5434.5 and FeI 5576.1 lines, which may indicate the gigantic magnetic fields of the Mega-gauss range.

ON THE POSSIBLE INFLUENCE OF SOLAR ACTIVITY ON THE OCCURRENCE OF ANOMALOUS WEATHER PHENOMENA

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This study attempts to find the cause of the abnormally cold January 2026 in Ukraine under the influence of solar activity. For this purpose, the average monthly values of air temperature (the website of the Central Geophysical Observatory named after Boris Sreznevsky www.cgo-sreznevskiy.kiev.ua) and solar activity (the website of the Space Weather revised series of relative Wolf numbers of the International Data Center of the Royal Observatory of Belgium www.swpc.noaa.gov) were used for the period 1880-2025.

The data of measurements of magnetic fields in sunspots for the last few years were also used. The main results are as follows:

(1) Over the past 145 years, a significant increase in temperature in Kyiv has been observed, with a trend increase of approximately 4 degrees. However, against the background of this trend, significant deviations from the average value (i.e. anomalies) are observed, which for January temperatures reach 9 degrees.

(2) For January temperatures in Kyiv over the past 145 years, 5 cases were found when negative temperature anomalies coincided with an accuracy of 1-2 years with the beginning of the 22-year Hale cycle – the cycle of changing the polarity of magnetic fields in sunspots.

(3) For the average annual temperatures in Kyiv for 2022-2025, a positive correlation was found between the anomalies of these temperatures and deviations from the average value of magnetic field strengths in large sunspots

with a diameter in the range of 22-44 Mm. The latest data were used based on the results of measurements of the magnetic field in sunspots on the horizontal solar telescope of the AO KNU. If this correlation persists, there should be a small positive anomaly of the annual temperature in 2026 (by 1-2°C), since in the first half of 2026 there is a slight increase in the magnetic field intensities in sunspots relative to the average value in recent years.

CHROMOSPHERIC MAGNETIC FIELD DIAGNOSTICS IN A SUNSPOT USING THE H-ALPHA LINE BISECTORS

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Magnetic fields in solar chromosphere have been studied much less than in the photosphere. In particular, there are no direct data on the magnetic field strength modulus for the chromosphere. For this purpose, we studied the $I + V$ and $I - V$ profiles of the H-alpha line in the spectrum of a sunspot observed on July 17, 2023 on the Echelle spectrograph of the horizontal solar telescope of the Astronomical Observatory of the Taras Shevchenko National University of Kyiv. According to visual measurements using the Fe I 5250.2 line ($g = 3.0$), the photospheric magnetic field in this sunspot reached 2870 G, its polarity was N. The sunspot spectrum was photographed on an ORWO WP3 photographic plate and scanned with an Epson Perfection V 550 scanner. The methodology for processing the corresponding scanograms to obtain quantitative scientific information is presented in the article at the following link: <https://doi.org/10.1093/mnras/stad1816>.

We found that splitting of bisectors of the $I + V$ and $I - V$ profiles of the H-alpha line turned out to be unequal in different parts of the line profile; it mostly increased when moving from the wings of the line to its core. At the same time, for some areas of the sunspot, the maximum splitting of the bisectors in the core of the line corresponded to magnetic fields of more than 3000 G, i.e. even stronger than at the photospheric level. Also, theoretical calculations within the framework of the Unno theory (1956) indicate that a similar appearance of the bisectors is possible only at very strong fields, which sometimes exceed 10 kG. Some details and the validity of this conclusion are planned to be discussed during the report.

STRANGE SOLAR ACTIVE REGION NOAA 14478

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On June 25, 2026, one of the largest active regions in recent times, NOAA 14478, appeared in the southern