27th Young Scientists' Conference on Astronomy and Space Physics

Report of Contributions

https://indico.global/e/13387

Contribution ID: **1** Type: **not specified**

Using multi-messenger observations to study high-energy particle dynamics in our Universe

Monday 26 April 2021 18:00 (50 minutes)

Cosmic-ray, neutrino, and gamma-ray observations combined with traditional electromagnetic wave observations provide a unique and powerful tool to explore how particles get accelerated and propagated in our Universe. This overview presentation will highlight recent results and future expectations using these multi-messenger observations to study extreme environments throughout the cosmos.

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Presenter: Ms PARK, Nahee (Queen's University, Kingston Ontario K7L3N6, Canada)

Session Classification: High energy astrophysics

Contribution ID: **2** Type: **not specified**

The curvature emission model of peculiar isolated neutron star 2XMM J104608.7-594306. (12+3)

Monday 26 April 2021 19:05 (15 minutes)

We construct non-thermal emission theory, interpreting the observational properties of a newly discovered pulsar 2XMM J104608.7-594306 in X-rays that is believed to be thermally emitting isolated neutron star. A different approach of curvature emission scenario is considered, giving the spectral energy distribution that is in a good agreement with the XMM-Newton observational data, which can be also successfully fitted with the pure Planckian spectral shape. We do not argue against thermal emission model relying on spectral analysis results, as additional observational properties are required for distinguishing between existing emission scenarios.
The work was supported by Shota Rustaveli National Science Foundation of Georgia (SRNSFG) [FR-18-14747]

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Session Classification: High energy astrophysics

Contribution ID: **3** Type: **not specified**

X-ray analysis of the structure of relativistic AGN jets of Cygnus A (12+3)

Monday 26 April 2021 19:25 (15 minutes)

Cygnus A is a giant elliptical galaxy, one of the most powerful radio galaxy. Like other radio galaxies, its activity is determined by active galactic nucleus (AGN) - supermassive black hole, surrounded by accretion disk, and with two relativistic jets, diverging in opposite directions from the supermassive black hole. We investigate the two hotspots - A and B - at the end of the eastern relativistic jet of Cygnus A. We analyze the X-ray emission of these hotspots using observational data from Chandra Data Archive and estimate the mechanism(s) of generation of X-ray emission.

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Session Classification: High energy astrophysics

Contribution ID: **4** Type: **not specified**

Investigation of the detectability of gamma-ray bright GRBs with future neutrino observatories (12+3)

Monday 26 April 2021 19:45 (15 minutes)

Gamma-ray bursts are thought to be accelerators of cosmic rays and a source of high-energy astrophysical neutrinos. Nevertheless, none of previous GRBs researches have shown a correlation between particular events and high-energy neutrinos. In the light of the first detection of TeV gamma-ray emission from GRB190114C, our goal is to explore the possibility of detecting the neutrino fluxes coming from similar events based on the observed gamma-ray fluxes.
We present a calculation of neutrino fluxes from GRB190114C for different neutrino telescopes, and we calculate the total integrated emission expected from similar sources.

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Session Classification: High energy astrophysics

Contribution ID: **5** Type: **not specified**

Prospects for gamma-ray observations of Hercules cluster (12+3)

Monday 26 April 2021 20:05 (15 minutes)

Galaxy clusters (GCs) are the largest and most massive gravitationally bound objects in the large-scale
structure of the Universe. Due to keV temperatures of virialized gas in the intracluster medium (ICM) and presence of cosmic rays (CRs), GCs are effective sources of thermal X-ray radiation and non-thermal leptonic (synchrotron) radio emission. GCs are also store-rooms for hadronic CRs, but non-thermal hadronic gamma-ray emission (mainly, due to pp collisions and subsequent pion decay) from GCs has not been detected yet.
In this work we simulate the expected non-thermal hadronic gamma-ray and neutrino emission from dominant part of Hercules cluster - GC A2151 - and estimate a perspective of detection of this emission by existing (Fermi-LAT, LHASSO, IceCube) and planned (CTA, IceCube-Gen2) ground-based and space-based detectors.

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Session Classification: High energy astrophysics

Contribution ID: **6** Type: **not specified**

Analysis of The Magnetic CV IGR J15038−6021 (12+3)

Monday 26 April 2021 20:25 (10 minutes)

IGR J15038−6021 is a Galactic X-ray source known to have an iron emission line and a hard X-ray spectrum. Here, we report on X-ray observations of the source withXMM-Newton and NuSTAR. Timing analysis of the XMM data shows a significant detection of 1646s period. The signal has a pulsed fraction of 22 in the 0.3−12 keV range. The X-ray spectrum is consistent with the continuum emission mechanism being due to thermal Bremsstrahlung, but partial covering absorption and reflection are also required. In addition, we use the IP mass (IPM) model, which suggests that the white dwarf in this system has a high mass, possibly approaching the Chandrasekhar limit.

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Session Classification: High energy astrophysics

Contribution ID: **7** Type: **not specified**

Cosmic Rays and the Circumgalactic Medium

Tuesday 27 April 2021 19:00 (50 minutes)

Galaxies evolve embedded in a vast gaseous halo that dwarfs the mass and spatial extent of stars in the galactic disk. Photoionization modeling suggests that cold circumgalactic gas has significantly lower densities than expected by theoretical predictions based on thermal pressure equilibrium with hot CGM gas. In this talk, I will demonstrate the impact of cosmic ray physics on the formation and physical properties of cold gas in the circumgalactic medium (CGM). Using a combination of idealized and cosmological zoom-in simulations, I will demonstrate how cosmic ray pressure can help counteract gravity to keep cold gas in the CGM for longer, thereby increasing the predicted cold mass fraction and decreasing the predicted cold gas inflow rates. Efficient cosmic ray transport, by streaming or diffusion, redistributes cosmic ray pressure from the cold gas to the background medium, resulting in cold gas properties that are in-between those predicted by simulations with inefficient transport and simulations without cosmic rays. Cosmic rays can significantly reduce galactic accretion rates and resolve the tension between theoretical models and observational constraints on the properties of cold CGM gas.

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **8** Type: **not specified**

The connection between star formation and BH accretion in the local Universe (12+3)

Tuesday 27 April 2021 15:05 (15 minutes)

A connection between Supermassive Black Holes (SMBH) and galaxy growth has been suggested by a number of studies, based on empirical correlations between BH mass and integrated galaxy properties as galaxy bulge mass, total stellar mass, velocity dispersion and star formation rate (SFR). In particular current studies show that SFR and AGN activity appear to follow similar patterns with cosmic time (i.e. redshift), indicating that the evolution of galaxies and their central SMBH proceeds in a coherent way.

So far most studies have explored intermediate/high redshift ranges, mainly due to the lack of large, homogeneous X-ray surveys at low redshift. In our work we intend to study the AGN activity as a function of stellar mass and star-formation rate in local Universe. Starting from a parent sample of galaxies from the Sloan Digital Sky Survey (SDSS DR8) with spectroscopic SFR estimates, and applying standard multiwavelength AGN selection criteria (optical BPT-diagrams, X-ray/optical ratio etc) we derived the fraction of efficiently-accreting AGNs and investigated the properties of their host galaxies (star-formation, mass). We then measured the distribution of specific black hole accretion rate (sBHAR) using X-ray detections from the 3XMM-Newton Serendipitous Source Catalogue (3XMM DR8) finding systematically higher values of sBHAR for galaxies with active star-formation than for quiescent ones, for all ranges of stellar masses. Finally, taking into account the variable XMM sensitivity across the sky, we infer the intrinsic sBHAR distribution in the local Universe, showing that nuclear activity in local galaxies peaks at very low accretion rates.

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **9** Type: **not specified**

OPTICAL MONITORING RESULTS OF BLAZAR PKS1222+216 (12+3)

Tuesday 27 April 2021 15:20 (15 minutes)

We present the results of photometric observations and research of blazar PKS1222+216 with high temporal resolution (30–60 s) in the B, V and R filters of Johnson/Bessel system. The observations were performed with the AZT-8 (D = 0,7 m; F = 2.8 m; CCD PL4710-1-BB-E2V) telescope of the observation station Lisnyky of Astronomical Observatory of Taras Shevchenko National University of Kyiv during 2018-2020. The fluxes of energy from the research object have been turned into visible stellar magnitudes using the standard stars. The substrate, dark current, flat-field were taken into account during processing. Light curves for PKS 1222+216 were plotted and they were examined for the apparent magnitude variations over the observation period. Intraday variability was investigated too. The variability of colour indexes with time was plotted. The correlations between changes of brightness in optical and gamma ranges were detected in addition.

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **10** Type: **not specified**

Searching for signatures of chaos in gamma-ray light curves of selected Fermi-LAT blazars (12+3)

Tuesday 27 April 2021 15:35 (15 minutes)

Blazar variability appears to be stochastic in nature. However, a possibility of low-dimensional chaos was considered in the past, but with no unambiguous detection so far. If present, it would constrain the emission mechanism by suggesting an underlying dynamical system. We rigorously searched for signatures of chaos in \textit{Fermi}-Large Area Telescope light curves of 11 blazars. The data were comprehensively investigated using the methods of nonlinear time series analysis: phase-space reconstruction, fractal dimension, maximal Lyapunov exponent (mLE). We tested several possible parameters affecting the outcomes, in particular the mLE, in order to verify the spuriousness of the outcomes. We found no signs of chaos in any of the analyzed blazars. Blazar variability is either truly stochastic in nature, or governed by high-dimensional chaos that can often resemble randomness.

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **11** Type: **not specified**

RESULTS OF PHOTOMETRIC RESEARCH OF AGN MARKARIAN 501 AND MARKARIAN 421 (12+3)

Tuesday 27 April 2021 16:05 (15 minutes)

Hereby we present the results of photometric observations and research of two BL Lacertae objects: Markarian 501 and Markarian 421. The observations were performed with the AZT-8 (D = 70 cm, F = 2.8 m) telescope of the observation station Lisnyky of Astronomical Observatory of Taras Shevchenko National University of Kyiv during 2018-2020. The AZT-8 equipped with the PL4710-1-BB-E2V CCD and broadband Johnson/Bessel UBVRI filters system. The substrate (bias), dark current, flat-field were taken into account during processing. The fluxes of energy from the objects of research with the help of standard stars have been turned into visible stellar magnitudes. Light curves for the observational period, and in case of Mrk 421, light curves during one night, were plotted and examined for apparent magnitude and color index changes. The errors of the above-mentioned observations and calculations were counted.

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **12** Type: **not specified**

Backward and forward orbital integration of the Milky Way globular cluster system. (12+3)

Tuesday 27 April 2021 16:20 (15 minutes)

Thanks to the last years great success of the European Space Agency space mission GAIA and the latest data release of the 3D stellar positions and velocities in our Galaxy we now have a very accurate and homogenous data for the Milky Way Globular Cluster (GC) system space positions and velocities up to 200 kpc of Galactocentric distances. Based of the GC system current coordinates and velocities from the combined mixed catalogues of Baumgardt 2019 and Vasiliev 2019
we perform the full orbital calculations of 152 GC's in our Galaxy combined gravitational potential. For the Milky Way potential, we use one of the recent combined Bulge + Disk + Halo model Bajkova & Bobylev 2020. For the cluster's
orbital integration, we use our high order parallel dynamical N-body code phi-GPU CUDA (Berczik at al. 2011). Using this external potential, we first integrate the GC systems up to 5 Gyr back in time (reverse integration set) and after check the integration results with the forward integration set. Using these orbital data set we check the "collisions"conditions of GC's. In the second part of our work we check in details these potential "collisions"again using our phi-GPU CUDA N-body integration code. As a main result of our simulations we determine the mass exchange rate (for a last few Gyrs) between the individual GC's and also examine the possible rotation angular momentum exchange rate between the clusters.

References:

Baumgardt, 2019 https://people.smp.uq.edu.au/HolgerBaumgardt/globular/parameter.html
Vasiliev, 2019 https://ui.adsabs.harvard.edu/abs/2019MNRAS.484.2832V/abstract
Bajkova & Bobylev, 2020 https://ui.adsabs.harvard.edu/abs/2020arXiv200813624B/abstract
Berczik et al., 2011 https://ui.adsabs.harvard.edu/abs/2011hpc..conf....8B/abstract

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **13** Type: **not specified**

Classification of compact star-forming galaxies using machine learning (12+3)

Tuesday 27 April 2021 16:35 (15 minutes)

Abstract: Enter abstract text below. The extent of the abstract should be limited to 37 lines. Any mathematical expressions or special characters write with LaTeX coding. *
We use different machine learning techniques to create and compare classifiers for the search of compact star-forming galaxies (CSFGs). The methods considered were: k-nearest neighbours, deep neural network, and gradient boosting. All models were optimized on a dataset compiled from two subsamples. A subset of $\sim 43,000$ CSFGs was carefully selected from the SDSS Data Release 16 and extended with $\sim 3,700,000$ objects also from SDSS DR 16, which were already automatically classified based on spectra available. As the input variables for a model, we use six parameters, according to six photometric magnitudes of SDSS \textit{ubgriz} bands. Each model outputs a probability of an object being a CSFG.
After hyperparameters tuning and optimizing the precision-recall tradeoff, we found that gradient boosting is the most effective classifier with $\sim 84\%$ precision and $\sim 84\%$ recall. Therefore, we expect that the developed classifier could provide a reliable instrument for CSFG selection based on photometric data.

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **14** Type: **not specified**

Distance moduli to the galaxies with machine learning regression methods (12+3)

Tuesday 27 April 2021 16:50 (15 minutes)

We consider a data driven approach as an alternative to the traditional photometric techniques to determine distance moduli m-M to the galaxies. In our first work (Elyiv et al., 2020, Astron. & Astrophys.) we tested the five machine learning regression techniques for inference of $m - M$: linear, polynomial, k-nearest neighbors, Gradient boosting, and artificial neural network and obtained rms error 0.35 mag, which corresponds to relative error 16 %. The two samples of galaxies were compiled from the NED and limited 1500 km/s < VLG < 60000 (30000) km/s.
In this work, our target dataset consists of 55 922 galaxies at 0.9 < z < 2 from the SDSS DR14. We used key observable parameters such as the corrected Petrosian fluxes and Petrosian radius in u, g, r, i, z bands as input explanatory variables for training and the redshift as target parameter. We tested the usage of four machine learning regressions (linear, polynomial, k-nearest neighbors and Gradient boosting) to predict redshifts applying these observable parameters.
We found that usage of the KNN regression model with distance weights, euclidean distance (p = 2), and 13 neighbors for redshift is the most effective. The obtained root-mean-square error for the calculated redshift is equal to 0.082, which corresponds to relative error 5%. It does not depend almost on the distance to the galaxy and is comparable with methods based on Tully-Fisher and Fundamental Plane relations. The proposed model is complementary to the existing photometric redshift methodologies.

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **15** Type: **not specified**

XMM-Newton X-ray galaxies identified with the HyperLEDA database (12+3)

Tuesday 27 April 2021 17:25 (15 minutes)

The 4XMM-DR10 catalogue is the largest database of X-ray sources, the last version of which contains 575158 unique X-ray. The aim of our work was to obtain a sample of X-ray galaxies. To reach this goal, we created the sample based on the HyperLEDA database that consists of 7181 objects. In the current work, we present general properties of the sample, namely the distribution in equatorial coordinates, radial velocity distribution, morphological type, and X-ray flux. This sample can be used for future deep studies of X-ray properties of galaxies.

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **16** Type: **not specified**

Advanced morphology of VIPERS galaxies (12+3)

Tuesday 27 April 2021 17:40 (15 minutes)

We calculated morphological parameters for test sample of 4659 galaxies from VIPERS survey. These parameters includes Gini, M20, Concentration, Asymmetry and Smoothness. Results correlate with the distribution of these parameters for other simulated and observed samples. We also studied dependence of these parameters with Sersic power index of radial distribution of surface brightness of galaxy image.

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **17** Type: **not specified**

Time dilation and black holes (12+3)

Tuesday 27 April 2021 17:55 (15 minutes)

Black holes are one of the most mysterious objects in the universe. These objects(as you know) attracts particles towards it. It's is formed when a heavy star dies,it forms a 4d curve in the space-time and attracts everything towards it. With this curvature,time is also effected. The more we go closer to the black hole the more the time gets dilated. This is explained by Einstein's famous twin paradox in his special theory of relativity. Inside the black hole the time stops.
The time dilation formula is given below-t = t0/(1-v2/c2)1/2
where: t = time observed in the other reference frame
t0 = time in observers own frame of reference (rest time)
v = the speed of the moving object
c = the speed of light in a vacuum

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **18** Type: **not specified**

Studying the Extremely Faint Universe to Understand Galaxy Evolution (12+3)

Tuesday 27 April 2021 18:10 (15 minutes)

Galaxies interact with each other forming bigger galaxies, following the hierarchical scenario, where bigger structures evolve from smaller ones. Here, I will explore how signatures of hierarchical evolution can be found in the distribution of light, kinematics and dynamics of nearby galaxies while in the meantime understand the difficulties on the carried out research that is done in this field.

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **19** Type: **not specified**

Comprehensive study of changes in the pulsation period of Galactic Cepheid variables

Tuesday 27 April 2021 18:25 (10 minutes)

Investigating period changes of classical Cepheids through the framework of $O-C$ diagrams provides a unique insight to the evolution and nature of these variable stars. In this work, we carried out the $O-C$ diagram calculation of 148 Galactic Cepheids with century long coverage. In multiple cases we observed peculiar $O-C$ behaviours that indicated the possible presence of a formerly undetected companion star, either through phase jumps or slips, or through light-time effect. Some Cepheids show large amplitude period fluctuations, that cannot be explained by the current stellar evolutionary models. By estimating the pulsation period change rates we found that the number of Cepheids exhibiting decreasing period is significantly lower than those of showing increasing period, which cannot be explained solely by the difference in the number of the crossing modes. By compiling the colour-magnitude diagrams of the investigated Cepheids using the recently published \emph{Gaia} EDR3 data we found that the period change rate varies notably between the two edges of the instability strip for short period Cepheids, which indicates that the rate of period change can also provide valuable information for the determination of physical parameters. We also found that 49 Cepheids in our sample showed period fluctuations. By quantifying the strength of fluctuations we found that for long period ($P > 18$ days) Cepheids they scale linearly with the logarithm of the pulsation period, while for short period stars the fluctuation strength is seemingly independent of the pulsation period. Most notably, we found fluctuations for every pulsation period length with a clear exception for bump Cepheids, which can only be explained through a quenching mechanism, which is in agreement with the current models of radial pulsation of Cepheids.

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Session Classification: Extragalactic astrophysics and cosmology

Contribution ID: **20** Type: **not specified**

V4142 Sgr a Double Periodic Variable with an accretor surrounded by the accretion-disk's atmosphere

Wednesday 28 April 2021 15:00 (50 minutes)

We present a a detailed study of the Double Periodic Variable V4142 Sgr based on photometric and spectroscopic analysis. We re-analized and improved an orbital period of 30.633 ± 0.002 days and a long cycle of 1201 ± 14 days. Our spectral analysis reveals Hα absorption with a persistent $V \leq R$ asymmetry emission which is considered evidence of a possible wind in the hotspot region. In addition, we find an cold and evolved donor star of $M_{\rm d} = 1.11 \pm 0.2$ M$_{\odot}$, $T_{\rm d} = 4500 \pm 125$ K and a $R_{\rm d} = 19.4 \pm 0.2$ M$_{\odot}$ and a rejuvenated B-dwarf companion of $M_{\rm g} = 3.86 \pm 0.3$ M$_{\odot}$, $T_{\rm g} = 14380 \pm 700$ K and $R_{\rm g} = 6.35 \pm 0.2$ R$_{\odot}$. The gainer is surrounded by concave and geometrically thick disk creating its own atmosphere around of main component of a radial extension $R_{\rm d} = 22.8 \pm 0.3$ R$_{\odot}$, contributing ˜ xx percent of the total luminosity of the system at the V-band.The disk is characterized by a hot-spot roughly placed where the stream hits the disk and an additional bright-spot separated $102\overset{\circ}{.}5 \pm 0\overset{\circ}{.}04$ degree apart along the disk edge rim in the direction of the orbital motion. The system is seen under inclination $81\overset{\circ}{.}5 \pm 0\overset{\circ}{.}3$ and to a distance $d = xx \pm xx$ pc. Doppler maps of the emission lines reveals sites of enhanced line emission in the 2th and 3th velocity quadrants, the first one corresponds to the hot-spot ad the second to the bright spot detected by the light curve analysis. In addition, the Balner line emission shown a disk with horseshoe-shaped.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **21** Type: **not specified**

The ALMA view of the eruptive protobinary Haro 5a IRS (12+3)

Wednesday 28 April 2021 15:50 (15 minutes)

FUors are young stellar objects characterized by a sudden increase in accretion rate, followed by a slower decline in brightness. Eruptive young stars can sometimes be accompanied by bipolar molecular outflows which can significantly alter the system's environment. Additionally, these energetic processes might represent an important factor in clearing out the environment of the protostar, thus playing a role in advancing the system from Class I to Class II. Here I present the results from our ALMA observations of Haro 5a IRS, a FUor-like protobinary system located in the Orion Star Forming Region. Our work focuses on the ^{12}CO and ^{13}CO detections of two bipolar molecular outflows emanating from the system, and their interactions with the surrounding environment. We measure the geometrical properties of the outflows, and estimate their physical properties which we put into context by comparing them with other protostellar outflows. Finally, I present our C^{18}O observations and the kinematic analysis of the system, including the gas in each disk and in their immediate circumbinary environment, which shows traces of infalling material.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **22** Type: **not specified**

Barium stars preserving the traces of slow neutron-capture process (12+3)

Wednesday 28 April 2021 16:05 (15 minutes)

Barium stars (Ba stars) have got special spectrum enriched in the elements of the slow neutron-capture process (s-process), created in asymptotic giant branch (AGB) stars. However, these stars have not reached the AGB phase yet, thus they preserve accreted material from an already evolved companion.
In this work, we have studied the elemental abundances of 55 Ba stars, comparing their observed abundances to the predictions of numerical AGB nucleosynthesis models. A detailed figure has been produced for each star, directly showing the observations and the estimations of the best-fitting models, transformed into the system of the Ba star. This method has given ideal fit in most of the cases, therefore proved to be a highly uncertain, but robust and inclination-independent mass-estimation method of these systems.
The mass distribution of the initial AGB mass has been derived, which is descriptive regarding the nature of these systems. For some stars, we have found that far less massive models describe the observations than previously estimated based on orbital parameters.
This algorithm provides a general algorithm for the detailed study of the system of Ba stars and can therefore be used to refine the AGB models and the still unknown details of mass transfer in these binaries.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **23** Type: **not specified**

Multicomponent photoionization modelling of the HII regions surrounding continuous star-forming regions.(12+3)

We represent the method of modelling of the HII regions surrounding continuous star-forming regions. The complex “bubble-like” structure of the HII region has been divided into internal and external components. Internal components correspond to the region of free expansion of superwind and the cavity of superwind correspondinly, while the external ones - to a layer of gas, compressed by a superwind shock, and hydrodynamically undisturbed outer part of HII region. Fluxes of this radiation were calculated during modelling using radiative transfer equations which take account of all important processes in the HII region that are causing this transfer. The chemical abundances, mechanical luminosity, Lyc-spectra, mass loss rate were determined in the region of free expansion of the superwind using evolutionary population synthesis models of star-formation region. The evolutionary grid of multicomponent photoionization models of HII regions with central continuous star-forming regions was calculated.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **24** Type: **not specified**

Broad-band polarimetry: technique, calibration and standards (12+3)

Wednesday 28 April 2021 16:20 (15 minutes)

Polarization is an important property of light. It has been regularly detected in scattered light and it could be emitted from the sources with a strong magnetic field (e.g. magnetic cataclysmic binary systems, neutron stars, etc.) and its properties are linked to the internal geometry of a source of radiation and scattering environment. As a consequence, polarimetry complements photometric and spectroscopic studies of sources of radiation and has made possible many astrophysical discoveries.
We processed the large data set obtained using single-channel aperture photometer-polarimeter installed on the 2.6-m Shajn mirror telescope (SMT) at the Crimean astrophysical observatory (Ukraine). It contains high time resolution measurements of various polarimetric standards, magnetic cataclysmic binaries, comets, moons and asteroids obtained in 2002-2017. The polarimeter was equipped with a fast rotating quarter wave plate, and this construction allows us to measure all four Stokes parameters simultaneously. Contrary to classic algorithm used earlier, based on determination of Stokes parameters from linear combinations of intensities obtained on different wave plate angles, we implemented least squares approach. This way we got some benefits including better accuracy of results.
Due to fast rotation of the phase plate, we can exclude influence of majority of atmospheric phenomena, but the correct elimination of the sky background is still necessary.
Polarimetry requires precisely measured high polarization standards and zero-polarization stars. Measurements of zero-polarization stars are used to compute the instrumental polarization. Contrary to classic approach, when instrumental polarization is measured during each night, we found it possible to use continuous functions that describe behavior of instrumental polarimetric system of the instrument during large time intervals.
We obtained Stokes parameters for hundred of polarization standards in this research. Generally, data are consistent with the published catalogs. Dozen stars show non-consistent values, that may argue for the presence of variable sources of radiation or interstellar medium with variable properties thus these objects must not be used as polarimetric standards and sometimes require further investigation.
Using described approach, we processed large data set obtained during observations of cataclysmic binaries and solar system objects.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **25** Type: **not specified**

Summarization on Circumgalactic Medium, methods of studying it and building a theoretical framework (12+3)

Wednesday 28 April 2021 16:50 (15 minutes)

Circumgalactic medium (CGM) has many similarities with interstellar and intergalactic medium yet there are still many questions regarding its nature, inner motion, and interaction with other media. This work is summarizing the general theoretical background of CGM, listing currently available research methods, including computer modeling, and giving a kick-start for future analysis. The main topic will be observations of Milky Way CGM specifically, its inflows and outflows, evolution, temperature and density distribution, multiphase nature. Most of the information was gathered from the 2020 "Fundamentals of Gaseous Halos (HALO21) - KITP" conference.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **26** Type: **not specified**

Photometric and spectrophotometric study of UGSU-type dwarf nova Gaia18awg, based on ground and space observations in optical and X-ray wavelengths (12+3)

Wednesday 28 April 2021 17:05 (15 minutes)

In this work we present optical, X-ray, UV photometry, X-ray spectroscopy of dwarf nova Gaia18awg (ASASSN-16le).We report an analysis of photometry, spectroscopy and measurements of physical, orbital characteristics. Gaia18awg is a U Gem + SU Uma dwarf nova system. That system showing non-periodic outbursts and super-outbursts, superhumps during superoutbursts. From Lisnyky (MPC 585) data we determined superhump period. This system shows positive (calculated) and negative (observed) superhumps with periods of 1.647 and 1.56-hr, respectively, and we identify an orbital period of 1.60-hr. We determined the hitherto unknown masses of the two components, their radii and orbital characteristics (like binary separation, semi-major and semi-minor axis). Analysis of the X-ray spectra showed strong Fe Kα lines at 6.7-6.8KeV, Fe L complex around 1.1KeV, Ne Kα , Mg Kα , Si Kβ lines with energies 0.9KeV, 1.3KeV, 1.83KeV respectively. EPIC-pn, RGS photometry shows dominant soft x-rays during quiescence. We interpreted this as the radiation of the boundary layer.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **27** Type: **not specified**

Stellar flare morphology across the HRD (12+3)

Wednesday 28 April 2021 17:20 (15 minutes)

Stellar flares are the most easily observable manifestations of magnetic activity. With the advent of high precision spaceborn photometry, our knowledge on flares increased significantly. While most of the studies so far focused on simple observables like flare energy or amplitude, here we aim to use all the morphological information encoded in the flare light curves. Using data from the Kepler and TESS missions, we search for changes in flare shapes, using principal component analysis and automated clustering. We also aim to construct new flare templates for different types of stars, including flaring giants.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **28** Type: **not specified**

Comprehensive study of changes in the pulsation period of Galactic Cepheid variables (12+3)

Wednesday 28 April 2021 17:35 (15 minutes)

Investigating period changes of classical Cepheids through the framework of $O-C$ diagrams provides a unique insight to the evolution and nature of these variable stars. In this work, we carried out the $O-C$ diagram calculation of 148 Galactic Cepheids with century long coverage. In multiple cases we observed peculiar $O-C$ behaviours that indicated the possible presence of a formerly undetected companion star, either through phase jumps or slips, or through light-time effect. Some Cepheids show large amplitude period fluctuations, that cannot be explained by the current stellar evolutionary models. By estimating the pulsation period change rates we found that the number of Cepheids exhibiting decreasing period is significantly lower than those of showing increasing period, which cannot be explained solely by the difference in the number of the crossing modes. By compiling the colour-magnitude diagrams of the investigated Cepheids using the recently published \emph{Gaia} EDR3 data we found that the period change rate varies notably between the two edges of the instability strip for short period Cepheids, which indicates that the rate of period change can also provide valuable information for the determination of physical parameters. We also found that 49 Cepheids in our sample showed period fluctuations. By quantifying the strength of fluctuations we found that for long period ($P > 18$ days) Cepheids they scale linearly with the logarithm of the pulsation period, while for short period stars the fluctuation strength is seemingly independent of the pulsation period. Most notably, we found fluctuations for every pulsation period length with a clear exception for bump Cepheids, which can only be explained through a quenching mechanism, which is in agreement with the current models of radial pulsation of Cepheids.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **29** Type: **not specified**

Investigating horizontal branch variable stars in the globular cluster NGC 5897 with space photometric methods (12+3)

Wednesday 28 April 2021 17:50 (15 minutes)

The Kepler space telescope observed multiple globular clusters during the K2 mission. These high-quality and continuous measurements constitute a unique opportunity to investigate RR Lyrae stars found in these old clusters. NGC5897 was observed by Kepler in Campaign 15. First, we used Gaia DR2 data to obtain the color-magnitude diagram of the globular cluster. We verified the known RR Lyrae stars and identified new variable candidates based on their position on the horizontal branch in the diagram. We then employed differential aperture photometry for these selected targets. Here we present new continuous light curves of 12 RR Lyrae stars from NGC 5897, including the light curve of one newly discovered RR Lyrae star in the cluster. We perform Fourier analysis, and we find modulation peaks in two stars and estimate the period of the modulation. We also find new low-amplitude modes in 4 cases. We classify the RR Lyrae stars based on their Fourier parameters, and find that there are 3 RRab and 10 RRc stars in our sample. Finally, we compare their pulsational frequencies to other RR Lyraes from OGLE, previous K2 and ground-based observations of the M3 cluster. In our sample all stars have periods longer than the usual mean RRab or RRc periods. One RRc shows a 0.61-mode and three stars show 0.68-modes, the latter being generally rarer than the 0.61-mode in the known RR Lyraes. These significant differences are likely to be caused by the really low metallicity of the cluster.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **30** Type: **not specified**

Study of the EPIC 246257206 EA variable star system discovered with the Kepler Space Telescope(12+3)

Wednesday 28 April 2021 18:05 (15 minutes)

Variable stars are stars of variable brightness. This means that their brightness doesn't remain constant throughout time. Eclipsing variables are binary stars where two stars orbit periodically around their common center of mass. When one of them is situated in front of the other relative to the observer, the total brightness of the system decreases. These brightness variations depend only on geometric factors. There are three types of eclipsing variables: EA (well defined eclipses with constant brightness outside the eclipses), EB (well defined eclipses with brightness variations outside the eclipses) and EW (the eclipses are not noticeable).
Throughout this investigation an unregistered variable star has been found through observations taken by the Kepler Space Telescope. With this data, and with data from other land and space observatories its period, amplitude and distance to the Earth was calculated in order to find out the cause of variability of the star and to register it in the Variable Star Index. Photometric observations were taken from the Kepler Space Telescope, from the Minor Planet Center (MPC) L94 observatory and from the MPC J38 observatory. Astrometric observations were taken from the Gaia space telescope. The PanSTARRS telescope was used to validate Kepler's K2 data. The star found is EPIC 246257206. Analyzing the photometric data using the Lomb-Scargle periodogram, the period 0.2198 ± 0.0004 days was obtained. Analyzing its phased light curve and the value of the period, it can be concluded that the star is an EA type eclipsing variable. Using the parallax method and the observations taken by GAIA, it has been calculated that the EA variable star EPIC 246257206 is 7.0832 ± 0.0002 light years away from Earth.The most peculiar aspect of the star is its amplitude, of only 0,5 magnitudes (astronomical unit referring to the brightness of the star). This is probably due to the fact that the eclipses produced are grazing eclipses: in the plane that both stars are observed, they are not overlapping totally but partially. This, therefore reduces the total brightness change of the system. To confirm this, spectroscopic observations of the system are suggested. With these type of observations, joint with the already conducted photometric observations, the system could be modeled and its orbit can be calculated. With this information, it is possible to figure out the nature of the eclipses. Its small amplitude also suggests the possibility of a third body in the system that also blocks part of the light. To confirm this an investigation searching for transit-timing variation is also recommended.
In summary, to characterize the EPIC 246257206 star, its distance to the Earth, its amplitude and its period had to be determined. These values allowed to conclude that the star EPIC 246257206, located at (7, 0832 ± 0, 0002) ·10ˆ2 light years away from the Earth, presents a variability of 0,05 magnitudes periodically every 0,2198 ± 0,0004 days due to the eclipses formed by the two stars that constitute the binary system. This can be viewed at its webpage at the International Star Index site.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **31** Type: **not specified**

HIGH PRECISION DIFFUSE INTERSTELLAR MEDIUM RADIO SPECTROSCOPY THROUGH LOW-FREQUENCY CARBON RADIO RECOMBINATION LINES (12+3)

Wednesday 28 April 2021 18:20 (10 minutes)

The main obstacles for low-frequency radio spectroscopy of the interstellar medium lie in the low intensities of studied features and high level of terrestrial interferences. Growing interest to carbon radio recombination lines (RRLs) studies at decametric wavelengths encourage world radio astronomers to search for new methods and hardware which are able to overcome the existing difficulties. Huge experience obtained at UTR-2 observatory in this field makes reliable foundation for developing of this branch of the low-frequency radio spectroscopy. During more than forty years of the carbon RRLs studies using UTR-2 radio telescope the sign correlometers of various constructions were used as back-end facilities. Previously they operated in rather narrow frequency band which was been widened up to 1.2 MHz for the last model of such equipment. But this value is still not adequate to the modern requirements because improving of sensitivity and reliability of spectral experiments requires expanding of the analysis band. The other disadvantage of the sign correlometers consists in the limited dynamic range. In order to resolve existing problems a modern spectrometer based on 16-bit analog-to-digital converter and efficient digital signal processors has been chosen for spectral observations at UTR-2 observatory. This device is called DSP-Z and is widely used for various radio astronomical investigations. Huge dynamic range and analysis band up to 32 MHz open new opportunities for high precision radio spectroscopy with UTR-2 radio telescope. Good illustrations of the new perspectives arisen with installing of this modern equipment are given by results of our observations carried out in the directions to Cassiopeia A in October 2019. Spectra with more than hundred low-frequency carbon RRLs within the bandpass have been measured. Line parameters are in good agreement with those obtained during similar studies with different world instruments and allow us to associate the line formation medium with diffuse HI clouds lying in the line of sight. An experimental test of previously announced theoretical assumptions regarding the dependence of line intensity as a function of frequency for Cassiopeia A direction has been made. Also, additional ways for achieving even greater sensitivity are discussed. Taking into account the advantages of new proposed methods, we may hope that great prospects for high sensitive low-frequency spectroscopy with Ukrainian radio telescopes UTR-2, URAN, GURT (including cooperation with European and world instruments) will be opens up.

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Session Classification: Stellar Astrophysics and Interstellar Medium

Contribution ID: **32** Type: **not specified**

Magnetic switchbacks and associated with them plasma waves in the young solar wind: Parker Solar Probe observations at 35.7 solar radii

Thursday 29 April 2021 18:00 (50 minutes)

Parker Solar Probe (Fox et al., 2016) is the first spacecraft to go close enough to the Sun to sample the in-situ characteristics of the young solar wind during its formation aiming to trace the flow of energy that heats and accelerates the solar corona and solar wind; to determine the structure and dynamics of the plasma and magnetic fields at the sources of the solar wind; and to explore mechanisms that accelerate and transport energetic particles. A recent major discovery of PSP was the presence of large numbers of localized radial velocity spikes associated with the magnetic structures containing the sudden deflections of the magnetic field at 35.7-50 solar radii in the local radial magnetic field near the first PSP perihelion (Kasper et al. 2019; Bale et al. 2019, and others). The resent results related to the switchback and associated wave activity is presented.

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Session Classification: Solar physics and heliosphere; Atmospheric studies and space geophysics

Contribution ID: **33** Type: **not specified**

Active asteroids: mystery in the Main Belt

Friday 30 April 2021 11:00 (50 minutes)

Abstract: Enter abstract text below. The extent of the abstract should be limited to 37 lines. Any mathematical expressions or special characters write with LaTeX coding. *
Active asteroids are relatively new objects to study in the Solar system; they have asteroid-like orbits but exhibit comet-like activity. The study of active asteroids allows one to cross the traditionally drawn lines between the research focused on inactive asteroids and active comets, and to motivate reevaluations of classical assumptions about small Solar System objects. Sometimes active asteroids are called 'transition objects'or 'continuum objects', which are not necessarily the transitional evolutionary states between asteroids and comets; they simply belong to the general population of small Solar system bodies.
Active asteroids are interesting to study because they possess many properties typical of comets (e.g., relatively primitive compositions, ejection of the surface and subsurface material) allowing us to study regions of the Solar system that are not sampled by classical comets.

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Session Classification: Solar System & Exoplanets

Contribution ID: **34** Type: **not specified**

Phase and color ratio method for searching areas with an anomalous optical roughness on the Vesta surface (12+3)

Friday 30 April 2021 10:00 (15 minutes)

The last decade has become a significant time for robotic exploration bodies of the solar system. Among such research programmes was The Dawn Mission to asteroid Vesta and dwarf planet Ceres, whose results allow us to carry out a detailed analysis of asteroid (4) Vesta surface properties by using methods that were developed and effectively used in the analysis of the Moon data.

Images of asteroid (4) Vesta obtained by Dawn's framing camera were used in our research. The Framing Camera (FC) has one clear and seven band-pass filters (from 0.44 μm to 0.98 μm), which cover one of the Vesta's pyroxene absorption band with maximum at 0.9 μm. We received maps of the spatial distribution of color index C(749nm/918nm) and C(749nm/978nm) to determine band depth. Maps of color index C(749nm/428nm) illustrates spectral slope in the visible wavelength range and by maps of C(428nm/978nm) we can obtain general spectral slope. Therefore, phase ratio method is the simplest approach for analyzing phase functions over a surface. In our research, we used two aligned images of the same area in clear filter, but acquired at different phase angles $_1$ and $_2$.The resulting phase ratio image provide a map on which we can find regions with anomalous optical roughness. Comparison of the albedo images and maps of color index and phase ratio allows to identify evidence of slope processes and variations of chemical composition. For image processing and analysis was used ISIS software (The Integrated System for Imagers and Spectrometers).

We built maps of the spatial distribution of color index for three areas: both Numisia and Cornelia craters and area Aricia Tholus. Results of analysis will be presented at the conference meeting.

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Session Classification: Solar System & Exoplanets

Contribution ID: **35** Type: **not specified**

ASTROMETRIC AND PHOTOMETRIC OBSERVATIONS OF TROJAN ASTEROID HEKTOR (624) (12+3)

Friday 30 April 2021 10:15 (15 minutes)

Since NASA is planning Lucy Mission to Trojan asteroids, comparative ground and space photometry are very important for calibrating further ground-based photometric observations. The asteroid Trojan Hektor (624) was observed at the Lisnyky astronomical station (MPC 585). For observations we used the 0.7 m (f/4) reflector AZT-8 with FLI PL4710 CCD camera and filter R of Johnson –Cousins photometric system. A total of 147 images were taken during two nights, 93 of which were used in astrometry, photometry and asteroid physical parameters calculations. Astrometric observations was published in the M.P.S. 1351729-30 circular.
The orbit of Hektor (624) and residuals (O-C) for both coordinates (RA and Decl.) were determined using Find Orb (version Mar. 17, 2019) software, combining our own observations with other observations from the MPC database over the last 2 years. For 2020-10-05 (33 obs.) the (O-C) RA residual is −0.404 ±σ 0.159″, the (O-C) Decl. residual 0.433 ±σ 0.182″; for 2020-10-14 (60 obs.) the (O-C) RA residual is 0.082 ±σ 0.092″ and the (O-C) Decl. residual is 0.346 ±σ 0.055″.
Based on the photometric observed data, the physical parameters of Hektor 624 were calculated, namely: visible brightness (average value 2020/10/05 −14.00m and 2020/10/14 −13.76m), absolute brightness (average value 7.92m), as a result of the asteroid's rotation and its elongated shape, the visible diameter decreased in this range –D 220km –194 ± 28km (2020-10-05), D 241km –185 ± 28km (2020-10-14), geometric albedo (0.021 and 0.024), color factor (0.51), temperature 119.6-119.8K. Our results of physical parameters are in good agreement with the results of other researchers in the database Asteroids with Satellites Database-Johnston's Archive.
Key words: Trojan asteroid, astrometry, photometry

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Session Classification: Solar System & Exoplanets

Contribution ID: **36** Type: **not specified**

Investigations of two distant comets C / 2014 B1 (Schwartz) and C / 2012 K6 (Mgnaught) at heliocentric distances from 4-9 AU (12+3)

Friday 30 April 2021 10:30 (15 minutes)

Using the software Astrometrica and Maxlm DL5 to the observed data for two distant comets C / 2014 B1 (Schwartz) and C / 2012 K6 (McNaught) obtained on the 2nd telescope at Terskol, their values of apparent magnitude were obtained. Using the value of the visible stellar magnitude, the absolute stellar magnitude, dust productivity in the form of the parameter Afρ were calculated, and the color value was also found. The morphology of the comet coma for the studied comets was investigated using digital filters. The data obtained were comparable with data for other distant comets.

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Session Classification: Solar System & Exoplanets

Contribution ID: **37** Type: **not specified**

Observation of the Perseid meteor shower at the period 2017-2020

Friday 30 April 2021 10:45 (15 minutes)

In this work, the results and analysis of my observations of the Perseid meteor shower at the maximum of its activity on 12-13 August in 2017 - 2020 are presented. They were the one-sided visual observations, that were carried out in Kyiv by the astronomical group of gymnasium № 59. Observations and processing of data observations were carried out using the methodology of the International Meteorological Organization (IMO).
At the beginning of visual observations, the following data are recorded:
the exact time of observations start, the equatorial coordinate of the center of the field,
the presence or absence of the clouds.
The main parameters of the visual focusing of an individual meteor is its magnitude in maximum brightness is estimated in comparison with stars that are in the field of view; the exact hour to flight; meteor direction motion across the celestial sphere, that allows to evaluate approximately whether the meteor is streaming or sporadic; the existence of intensiveness and time of existence the tail from the meteor; meteor color.
According to the observation of meteors for a certain period of time, it is possible to calculate such an important parameter as the zenithal hourly rate ZHR of meteors, which in its turn allows us to estimate the spatial density of the meteor swarm.
After the conducted observations, these data were entered into the table and were submitted online to the IMO website. The results were counted, brought to a table, and built the dependency schedule of ZHR from time for analysis of the data. The results learned were compared with average IMO data.

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Session Classification: Solar System & Exoplanets

Contribution ID: **38** Type: **not specified**

DETERMINATION OF THE CORRELATION COEFFICIENT OF PHOTOMETRIC PARAMETERS OF SELECTED SHORT-PERIODIC JUPITER FAMILY COMETS OF THE AND SOLAR ACTIVITY (12+3)

Friday 30 April 2021 12:00 (10 minutes)

The report considers the analysis of the correlation coefficient of photometric parameters of selected short-period Jupiter family comets on the Wolf number and the area of sunspots. It is shown that the correlation coefficient of photometric parameters of some comets is not very strongly related to the activity of the Sun.

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Session Classification: Solar System & Exoplanets

Contribution ID: **39** Type: **not specified**

STUDY OF COMET DUST TAIL SYNCHRONES C/2020 F3 (poster)

Friday 30 April 2021 11:50 (10 minutes)

Based on observations of the comet C/2020 F3 (NEOWISE) from July 23 to August 11, 2020, the dust tail of the comet was studied at the Gissar Astronomical Observatory of the Institute of Astrophysics of the NAST. The cometocentric coordinates of the comet's tail were determined by Moiseev's method and the effective acceleration of dust particles of the comet's tail was calculated. The results show that the comet tail dust particles have a synchronous origin. Comet tails are formed as a result of successive brightness from the surface of the comet nucleus.

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Session Classification: Solar System & Exoplanets

Contribution ID: **40** Type: **not specified**

Penetration of electric field from the near-ground ULF source to the ionosphere under different configurations of the geomagnetic field

Thursday 29 April 2021 18:50 (15 minutes)

The problem of the penetration of electric fields from atmospheric near-Earth ULF electric current sources to the ionosphere is investigated both within the dynamic simulations of the Maxwell equations in the frequency domain and within the simplified quasi-stationary approach.
Two cases of the geomagnetic filed lines are considered. The first case is the penetration of the geomagnetic filed lines deeply into the magnetosphere, whereas the second one is the return of these lines into the Earth's surface. The proper boundary conditions are formulated.
It is demonstrated that in the first case the results of the dynamic simulations differ essentially from the quasi-electrostatic approach and the quasi-stationary approach is not valid there. In the second case the results of simulations are qualitatively the same both within the dynamic approach and within the quasi-electrostatic one. The values of the densities of atmospheric electric currents \sim 0.1 μA/mˆ{2} were used. Simulations have shown that the values of the electric fields within the ionosphere F-layer may reach 5 –10 mV/m and more.

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Session Classification: Solar physics and heliosphere; Atmospheric studies and space geophysics

Contribution ID: **41** Type: **not specified**

Plasma Wave Recognition by Multipoint Filtering Techniques

Thursday 29 April 2021 19:05 (15 minutes)

Turbulent wave fluctuations of plasma parameters obtained from the spacecraft measurements have mixed manifestations of spatial and temporal scales due to the dynamics of the considered environment. Decomposing of such plasma perturbations into frequency and spatial range have allowed us to analyse power distribution in branches of dispersion equations. We have demonstrated efficiency of each specific method in resolving $\omega - k$ distribution in magnetospheric events. These techniques such as k-filtering, MSR (Multi-point Signal Resonator), phase difference methods yield the power spectrum $P = P(\omega, k)$ in four-dimensional (ω, k) space, and thereafter for a fixed value of the frequency $_0$ it is possible to study the power distribution of fluctuation in spatial dimensions.
The work was conducted in the frame plasma physics program of the National Academy of Sciences of Ukraine, the grant Az. 97 742 from the Volkswagen Foundation ("VWStiftung") and International Institution of Space Research (ISSI-BJ).

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Session Classification: Solar physics and heliosphere; Atmospheric studies and space geophysics

Contribution ID: **42** Type: **not specified**

Multicomponent photoionization modelling of the HII regions surrounding continuous star-forming regions.(12+3)

Thursday 29 April 2021 19:20 (15 minutes)

We represent the method of modelling of the HII regions surrounding continuous star-forming regions. The complex "bubble-like" structure of the HII region has been divided into internal and external components. Internal components correspond to the region of free expansion of superwind and the cavity of superwind correspondinly, while the external ones - to a layer of gas, compressed by a superwind shock, and hydrodynamically undisturbed outer part of HII region. Fluxes of this radiation were calculated during modelling using radiative transfer equations which take account of all important processes in the HII region that are causing this transfer. The chemical abundances, mechanical luminosity, Lyc-spectra, mass loss rate were determined in the region of free expansion of the superwind using evolutionary population synthesis models of star-formation region. The evolutionary grid of multicomponent photoionization models of HII regions with central continuous star-forming regions was calculated.

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Session Classification: Solar physics and heliosphere; Atmospheric studies and space geophysics