

A new population of low-mass stars in the Taurus-Auriga region unveiled from the Galex and Gaia surveys

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Abstract

The Taurus-Auriga molecular cloud complex (TAMC) is one of the nearest and best-studied star-forming region, providing an ideal environment to investigate early stellar evolution. Its relative proximity (~140 pc), low extinction, and sparse stellar population allow for high-resolution studies of young stars, particularly T Tauri stars (TTs), which represent a key phase in the transition from protostar to main-sequence star.

Using a combination of ultraviolet GALEX data and astrometric Gaia data a set of 10 potential TTS candidates were identified in the region indeed, five of them were found to be actual TTs. The remaining 5 sources have been observed with the FIES instrument in the Nordical Optical Telescope (NOT) to discriminate their nature.

In this contribution, we present the data from these five stars and the analysis of their permitted and forbidden optical emission lines. These spectral diagnostics provide insight into the nature and physical conditions of distinct components of the star, including the atmosphere and the presence of extended gas envelopes and jets. Three of the sources, one of them a binary, to be accreting pre-main sequence stars. The other two are magnetically active late-type M stars.

These results confirm the usefulness of blind UV searches to reveal these populations

Presentation Preference:

- Oral Presentation
- Poster Presentation
- No preference

Student Participation: x

Far-ultraviolet diffuse emission as a tracer of galactic extinction at the North Galactic Pole

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Abstract

Interstellar extinction in the ultraviolet is more sensitive than in the Optical or Infrared wavebands. We investigate the efficiency of Far-Ultraviolet (FUV) data from the Galaxy Evolution Explorer (GALEX) as a high-resolution tracer for this extinction towards the North Galactic Pole (NGP). We have created 6' resolution maps of a 20 ° field centered on the NGP. After removing the extragalactic background, the map reveals structures such as the Haikala clouds. A direct comparison with Planck's reddening map shows a moderate correlation ($\rho = 0.57$). We validated the reliability of our map against a standard Milky Way extinction law. We conclude that the FUV intensity can be a reliable tracer for interstellar extinction, providing significant improvement in resolution over existing extinction maps in regions having low optical depth ($\tau < 0.1$) and near high galactic latitude regions.

Presentation Preference:

- Oral Presentation
- Poster Presentation
- No preference

Student Participation:

The Auroral Planetary Imaging and Spectroscopy (APIS) service : a facilitated access to UV planetary observations of the Solar System

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Abstract

The Auroral Planetary Imaging and Spectroscopy (APIS) online service <http://apis.obspm.fr> was released at the occasion of the Magnetospheres of the Outer Planets meeting held in Athens, in Aug. 2013. This service provides an open and interactive access to processed auroral observations of the outer planets and their satellites, especially Saturn and Jupiter, which are of peculiar interest for the magnetospheric community. Precisely, APIS enables the user to access a conditional search interface which queries : (a) a high level database made of quasi-all public HST, Cassini/UVIS (aimed at extending to Juno/UVS) auroral observations - including data acquired in support to New Horizons, Cassini or Juno (with polar projections including the spacecraft magnetic footpath), (b) external databases - now including Hisaki/EXCEED planetary long-term observations acquired since 2013. The APIS interface also enables the user to interactively work with the data online through plotting tools developed by the Virtual Observatory (VO) community, such as Aladin for images - and now Cassis for spectra. This service is VO compliant and the associated databases can therefore be queried by external VO portals such as VESPA or CDPP/AMDA. The diversity of available data and the capability to sort them out by relevant physical criteria shall in particular facilitate statistical studies, on long-term scales and/or multi-instrumental multi-spectral combined analysis.

Presentation Preference:

- Oral Presentation
- Poster Presentation
- No preference

Student Participation:

Star Formation in the Local Group as Viewed with UVIT

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Abstract

The star formation history of local group galaxies can be revealed by various methods which measure the stellar population. Here we use multiband photometric observations, from ultraviolet to far-infrared, to measure the stellar light, interstellar gas emission, dust attenuation and dust emission simultaneously. The modelling program Cigale, which models these four components, is used to determine the contributions of each component to the observed spectrum. This gives constraints on the stellar population properties as well as gas and dust properties. The stellar properties of interest here are the modelled star formation history, including ages and masses of star formation episodes. The star formation history of a few local group galaxies is discussed. In general the addition of multiband UV photometry with the UVIT instrument on Astrosat improved the measurements of star formation history, especially for the most recent star formation episodes (less than ~100 Myr).

Presentation Preference:

- Oral Presentation
- X Poster Presentation
- No preference

Student Participation:

Ultraviolet scattering polarization from space particles in the upper layers of the Earth's atmosphere

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Abstract

Tons of cosmic material from leftovers of comets and asteroids enter the Earth's atmosphere every day. Most of the studies of this influx usually rely on meteor observations and ground-based meteorite searches. Although a global space-based monitoring is still missing, there is an increase in interest in Earth observation projects for meteor and meteoroid detections from space. This extraterrestrial influx attracted by the Earth makes the surroundings of low Earth orbit a rich source of information about chemistry and physical properties of near-Earth bodies. However, there is scant information about cosmic dust and small meteoroids in the Earth atmosphere since they are difficult to be detected with the current facilities. In this work, we propose to use the dust grain polarization as a tool to detect and characterise these small meteoroid grains. For that, we build a density model of the infalling dust in the upper layers of the Earth's atmosphere (above altitudes of 100 km) attending to different features and parameters obtained from measurements of meteorites, meteor showers, and cometary dust observations. Then, we compute the expected signal of radiation and polarization of these infalling dust particles as viewed from a satellite in low Earth orbit with the Monte Carlo code RADMC-3D. Ultraviolet wavelength range offers a great opportunity to explore this low size range of the space particles since the wavelength is comparable to the size of the grains of interest. Scattering will be the dominant radiative process and scattered radiation gathered lot of information about the grain properties such as the morphology, the size or the composition.

Presentation Preference:

- Oral Presentation
- Poster Presentation
- No preference

Student Participation: X

Gamma-ray burst observations by nanosatellites and the prospect of UV detections of accompanying KNe by QUVIK mission

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Abstract

Short gamma-ray bursts (GRBs) or short GRBs with extended emission, sometimes called hybrid GRBs, can be detected by nanosatellites, as already proven by GRBAlpha and VZLUSAT-2 missions. These energetic extra-galactic events are produced in mergers of compact objects involving neutron stars and can be accompanied by a kilonova detectable in the ultraviolet (UV) band. The mission called Quick Ultra-Violet Kilonova surveyor (QUVIK), currently in development, will be a small satellite with a moderately fast repointing capability, with the main goal to measure the brightness evolution of kilonovae (KNe) in the UV band and distinguish between different explosion scenarios. It will also greatly benefit the study of GRBs and their afterglows. There have been observed fifteen GRBs with claims of KNe so far, however majority of KNe were observed in the optical or near-infrared bands. Only three KNe accompanying gamma-ray bursts GRB 170817A, GRB 211211A, GRB 230307A have been observed also in a UV band. The agile QUVIK is expected to provide crucial UV observations within the first few hours of rapidly dimming UV light of blue KNe. The binary neutron stars merger detection rate of the full LIGO-Virgo-KAGRA gravitational wave network expected during the O5 observing run is 190 (+410,-130) per year. From the UV luminosities of KNe predicted by the radiative transfer code POSSIS 2.0 we expect that the detectable kilonovae rate for QUVIK's limiting AB magnitude of 21.5 will be 5 (+10,-3) per year. This would greatly increase the number of KNe detected in UV and help their deeper understanding. In this work, we present the expected detectability of KNe with QUVIK, summarise the current knowledge of the KNe luminosity distribution and constraints following from the UV light curves of KNe.

Presentation Preference:

- Oral Presentation
- Poster Presentation
- No preference

Student Participation:

Reconstructing the interstellar UV field in the surface of Serpens West with Gaia DR3

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Abstract

The Serpens molecular cloud is a well-known site of active star formation near the Galactic plane and has been deeply studied over the years. However, the region that spans from $l = 18^\circ$ to $l = 28^\circ$ and from $b = 6^\circ$ to $b = 12^\circ$ did not receive much attention until recently, and only few extinction studies and YSOs searches have been performed, revealing that the star formation rate is very low compared to the rest of the complex. In this work, we present the reconstruction of the interstellar UV radiation field at the surface of the cloud to test if there are significative fluctuations of the field across it and also with respect to the standard Habings field.

Presentation Preference:

- Oral Presentation
- Poster Presentation
- No preference

Student Participation: **X**

Extreme ultraviolet spectroscopic data from the Hisaki satellite

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Abstract

Hisaki is a Japanese extreme ultraviolet spectroscopic satellite launched in September 2013 and was designed primarily to monitor planetary atmospheres and magnetospheres in the solar system [1-3]. It was equipped with a 20 cm aperture primary mirror and a spectrograph that covered 55-145 nm spectral range. By the end of its operation in December 2023, Hisaki conducted observations of the upper atmospheres and auroras of Mercury, Venus, Mars, Jupiter, and Saturn, as well as neutral gas and plasma torus in Jupiter and Saturn systems. Observations of comets, interstellar medium, and EUV stars have also been carried out. Data downlinked from the satellite to the ground were stored in data server at ISAS/JAXA, and Level-2 data products were generated through ground data pipeline processing [4]. A part of the Level-2 data is released via ISAS DARTS [5]. While the HISAKI satellite operation has been terminated, the observation data from the HISAKI satellite still contribute significant scientific outputs in planetary science and astronomical communities. Therefore, processing of unpublished data for release, work on converting the data to PDS4, and development of common data analysis tools using Python are in progress.

- [1] Yoshioka, K., et al., 2013, The extreme ultraviolet spectroscope for planetary science, EXCEED, Planetary and Space Science, doi: 10.1016/j.pss.2013.06.021.
- [2] Yoshikawa, I., et al., 2014, Extreme Ultraviolet Radiation Measurement for Planetary Atmospheres/Magnetospheres from the Earth-Orbiting Spacecraft EXCEED, Space Science Reviews, doi: 10.1007/s11214-014-0077-z
- [3] Yamazaki, A., et al., 2014, Space Science Reviews, doi: 10.1007/s11214-014-0106-y, Field-Of-View guiding camera on the HISAKI (SPRINT-A) satellite
- [4] Kimura, T., et al., 2019, Development of ground pipeline system for high-level scientific data products of the Hisaki satellite mission and its application to planetary space weather, Journal of Space Weather and Space Climate, doi: 10.1051/swsc/2019005
- [5] <https://darts.isas.jaxa.jp/en/missions/hisaki>

Presentation Preference:

- Oral Presentation
- Poster Presentation
- No preference

Student Participation:

Development of a High Dynamic Range Photon-Counting UV Detector for Astronomy

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Abstract

We present the development and performance of an innovative photon-counting detector for far-ultraviolet (FUV/EUV) astronomical applications, designed to overcome the dynamic range and lifetime limitations of traditional Microchannel Plate (MCP) based systems. The detector pairs new-generation MCPs, with ALD passivation, with custom readout electronics designed to maximize their potential.

At the core of the system is the MIRA readout integrated circuit (ASIC), specifically developed for this detector. The detector's long operational lifetime is enabled by MIRA's ultra-low noise, which allows the MCPs to be operated at a lower gain, thus mitigating aging effects. High spatial resolution ($\leq 35 \mu\text{m}$) is achieved through a small-pitch anode ($35 \mu\text{m}$) and an integrated Charge-Sharing Compensation Logic (CSCL) in the ASIC, which precisely localizes each event. Finally, to ensure a high dynamic range and count rate, each pixel integrates two alternating counters, creating a dead-time-free readout architecture.

A first 32×32 pixel hybrid detector prototype (MCP + ASIC) has been assembled and characterized, and an improved version of the electronics is under development. The goal of this program is to realize a complete detector system that combines high resolution, wide dynamic range, and long durability to serve future astronomical space missions.

Presentation Preference:

- Oral Presentation
- Poster Presentation
- No preference

Student Participation: