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WSO-UV Field Camera Unit: science case and ground support with 1-m class telescopes

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Abstract. We present here the new imaging instrument onboard the WSO–UV (World Space Observatory - Ultraviolet) project for observations in the UV (115–310 nm) spectral range. We describe the key scientific drivers of the instrument and Ground based instrumentation of the 1–m class telescopes to support space UV observations. The World Space Observatory–Ultraviolet is a Russian-Spanish space mission born as a response to the growing up demand for UV facilities by the astronomical community. It is the only 2-meter class on–orbit telescope in the after HST epoch fully devoted to UV observations.

Key words: ultraviolet – space mission – ground support

1. Introduction

World Space Observatory UltraViolet (WSO–UV) is a new generation space mission dedicated to astronomical observations in the UV spectral range(Shustov et al. (2018)). The observatory includes a 170 cm aperture telescope capable of high-resolution spectroscopy and long slit low-resolution spectroscopy with the WUVS (WSO-UV Spectrographs) instrument; moreover UV imaging will be available with the Field Camera Unit (FCU) instrument. WSO will work as a space observatory with a core program, guaranteed time for the project partners and time open to the world-wide community. WSO-UV is a third mission of the SPEKTR (spectrum) series of the Russian Federal Space Program together with Spektr-R (on orbit since 2011) and Spektr-RG (with Russian ART-XC and e-Rosita payloads, launch date is 2019). Its launch date is 2025. The WSO-UV project is led by the Institute of Astronomy of the Russian Academy of Sciences. The main instrument is a high-resolution spectrograph. It is supplemented by a low-resolution spectrograph. The imaging cameras are designed by INASAN (Russia) and the Universidad Complutense de Madrid (Spain). The key scientific drivers of the WSO-UV project are described in (Boyarchuk et al. (2016)). Here we present the science case of the FCU and describe our approach to the ground support of the mission.

2. FCU instrument science case

WSO-UV will work as a space targeted observatory with a Core Program, an Open Program for scientific projects from the world-wide community and national (Funding Bodies) programs for the project partners. Hereby we briefly summarize the main scientific issues of the FCU. They are (but not limited to): planetary nebulae studies; supernovae studies; variable sources study at a short timescale (order of 40 ms); exoplanetary atmospheres; protostellar jets; comets in UV; the galactic globular clusters; asteroseismology (Sachkov et al. (2004)).

3. FCU preliminary layout

The FCU includes two channels (Sachkov et al. (2014)):

A Far Ultraviolet (FUV) channel with an MCP detector for observations in 115 - 176 nm spectral range. A Near Ultraviolet (NUV) channel with a CCD detector for observations in 174 - 310 nm spectral range.

Main characteristics of the FUV channel are:

– Solar blind detector.

– Diffraction-limited imaging in FUV.

– High sensitivity in photon-counting mode.

– High time resolution.

Main characteristics of the NUV channel are:

– Wide field of view.

– High dynamic range.

– High angular resolution.

– Low resolution field spectroscopy.

– Possibility for extended spectral range: 115–1000 nm.

4. Call for the core program application and ground support for WSO-UV

Because of the fact that preparatory observations are required for several proposals, The WSO–UV Science Team decided to make a first Core Program Call for applications in 2018, several years before the launch date. The PI of such application should have a permanent position in astronomy/astrophysics in Russia or in Spain, countries that fund the WSO–UV project. The members of the team that make an application may include participants from any country. The detailed information on the Call can be found on the web site of the Joint Centre of Ultraviolet Astronomy: http://jcuva.space.

For the successful operation of the WSO–UV space mission we are preparing ground based telescopes with spectroscopic instrumentation. The 2–m telescope of Terscol observatory will play a significant role as well as 1–m telescopes of Simeiz branch of INASAN (Gorynya et al. (1996)) and SAO RAS. For radial velocity measurements the spectrograph polarimeter will be prepared (Panchuk et al. (2018)).

5. Conclusions

The WSO–UV project is an efficient multipurpose orbital observatory for high and low resolution spectroscopy, high sensitivity imaging and slitless spectroscopy in the ultraviolet. The imaging instrument FCU onboard WSO–UV will be the first UV camera to be flown to a geosynchronous orbit. The WUVS spectrographs will deliver spectroscopic performance on a range of astronomical sources, combining high sensitivity, low background and high resolution at FUV and NUV wavelengths.

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