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The 6th conference "Baltic Applied Astroinformatics and Space Data Processing" (BAASP 2019) dedicated to the 25th anniversary of the VIRAC

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The Engineering Research Institute "Ventspils International Radio Astronomy Centre" of Ventspils University of Applied Sciences (ERI VIRAC of VUAS) founded in 1994, celebrated its 25th anniversary in 2019. One of the main events dedicated to this date was the conference "The 6th Baltic Applied Astroinformatics and Space Data Processing" (BAASP 2019) held in Ventspils from 21 to 23 August 2019.

Keywords: VIRAC, BAASP 2019, radioastronomy, space science

1 Introduction

Ventspils International Radio Astronomy Centre (VIRAC) was established in 1994 with the aim to develop the research activities in radio astronomy and astrophysics. The instrumental base for the centre comprises two fully steerable parabolic antennas, RT-16 and RT-32 with mirror diameter of 16 m and 32 m and LOFAR station – low frequency phased array. The intensive reconstruction and instrumental refurbishment carried out since 2014 made it possible to use radio telescopes for the international scale fundamental and applied research in the field of radio astronomy and applied space science. One of the most important aspects of this work is VIRAC participation in the VLBI (Very Long Baseline Interferometry) international experiments. Since 2011 VIRAC has been involved in several large infrastructure projects such as "Establishing National Significance Research Centre for Information, Communications and Signal Processing Technologies" and "LOFAR-Latvia", which allowed speeding-up of the upgrading activities related to the radio telescopes RT-32 and RT-16 as to its fitting with appropriate VLBI receiving and recording equipment as well as building a

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completely new radio astronomical instrument – low frequency phased array antenna field (LOFAR-Latvia). One of the main scientific objectives for the VIRAC radio astronomical observatory is VLBI observations in centimeter and meter wavelengths in collaboration with the global VLBI networks, such as European VLBI network (EVN), International LOFAR Telescope (ILT), and others. The new receiving and recording systems provide a high stability of the time frame, which is prerequisite for all VLBI observations.

2 The BAASP conference

The first International Scientific Conference "Baltic Applied Astroinformatics and Space Data Processing" was organized to raise the profile and visibility of the VIRAC and to share new ideas and developments. It took place on May 7–8 of 2012 in Ventspils. The aim of BAASP conference is to be a platform for cross-border partnership and knowledge transfer for astronomers, astrophysicists, space researchers and engineers, as well as for experts in related research disciplines such as informatics, electronics, satellite technology, geodesy and environment sciences. While the general scope of BAASP is wide, the specific themes of BAASP 2019 are astrophysics, space technologies and remote sensing. Space science is being fundamentally influenced and empowered by computation and information technology, and it stimulates further technological developments. Astronomy, in common with many other fields, is becoming exponentially data-rich, and the tasks of data management, data acquisition, and knowledge discovery become central to our research organisation, bringing together many technical and methodological challenges. Information technology also provides the stage where we collaborate and interact, publish, preserve, use and disseminate knowledge. The general philosophy is to be future-oriented, which determines the emerging discipline of astroinformatics. Recent challenges are directed towards more human-oriented, highly personalized and trustworthy systems enabling their users to cope with a large variety of frameworks, technologies, data volumes and tools needed to accommodate emerging scientific applications. Therefore, one of the areas of focus here is quantitative and qualitative methods for exploiting, predicting, and understanding the value that the state-of-the-art information and communication technologies bring to space science, astronomy, geodesy and related fields. The scope of the Conference covers fundamental and applied research that is related to space technologies and includes the following: Space science – including space and atmospheric physics, Earth observation and remote sensing from space, planetary sciences, astrochemistry, space geodesy, astronomy and astrophysics; Space engineering – including communications, navigation, space operations, satellite design, testing, and implementation, engineering of new generation radio telescope frontend and backend solutions; Space and industrial solutions – including data acquisition, signal processing, data correlation, data recording, transfer, processing and archiving high performance and cloud computing techniques.

The first BAASP 2012 conference was successful and it was decided to make this conference a regular event. After seven years, the 6th International Scientific Conference "Baltic Applied Astroinformatics and Space data Processing 2019" (BAASP 2019) was held on 21–23 August 2019 at Ventspils University of Applied Sciences



Figure 1 BAASP 2019 conference participants group photo. Ventspils University of Applied Sciences, August 21, 2019.

and organised by the Engineering Research Institute "Ventspils International Radio Astronomy Centre" (VIRAC) of Ventspils University of Applied Sciences. The Conference was dedicated to the 25th anniversary of the VIRAC institute. The event saw a record number of participants in 2019 – 55 (Fig. 1 and Fig. 2), who made a total of 43 scientific presentations. The Conference was divided into 6 scientific sessions: Galactic Astronomy, Remote Sensing, Research of Sun Studies, Data Processing Methods, Extragalactic Astronomy, Instrumentation for Space Technologies and VLBI Methods. The organisers invited six world-class scientists to be keynote speakers – Dr. Leonid Gurvits, Joint Institute for VLBI ERIC (JIVE), the Netherlands; Dr Dmitry Wiebe, Institute of Astronomy of the RAS, Russia; Dr Vasily Beskin, P.N. Lebedev Physical Institute RAS, Russia; Dr Oleg Ulyanov, Institute of Radio Astronomy of NASU, Ukraine; Dr Gino Tuccari, Institute of Radioastronomy of Bologna, Italy and Dr Francisco Colomer, director of Joint Institute for VLBI ERIC (JIVE), the Netherlands. In their exciting presentations, they talked about future applications of VLBI technology, radio pulsars, evolution of astrochemistry and the planets, low-frequency radio astronomical instrumentation and its data processing techniques. The opening event of the conference was also attended by representatives from the Ministry of Education and Science of Latvia – Lana Frančeska Dreimane and Kaspars Karolis, representatives from Ventspils University of Applied Science, the SJSC "Electronic Communications Office" of Latvia as well as guests from other organizations in Latvia. The Conference was attended by scientists from eight countries – Latvia, Estonia, Italy, Sweden, Finland, the Netherlands, Russia and Ukraine.



Figure 2 Tour to RT-32 radio telescope. VIRAC, Irbene, group photo, August 22, 2019.

In 2019, the key focus of BAASP 2019 was Astrophysics, Remote Sensing and New Generation Radio Electronics. Astrophysics is driven by the exploitation of astronomical observations, which includes data processing, interpretation, and putting the results in an appropriate scientific context to understand the underlying physical phenomena. The path from observations to discoveries was the focus of BAASP 2019. Remote sensing is another example, where technologically complex investment ultimately yields scientific and commercially useful results. Besides observations of the Earth, it also includes the Moon and other planets, satellites, even comets, and asteroids in the Solar system. With BAASP 2019, we aimed to promote a discussion on aspects of data processing and interpretation in remote sensing. New generation radio electronics is the basis of new discoveries in astrophysics and radio astronomy since novel technology implementations of new modern radio systems enhance the properties of current radioastronomy instrumentation, thus improving specific observing capabilities. The development of both signal processing hardware and software was also the scope of BAASP 2019.

Selected scientific articles are published in two journals: articles on the development of scientific instruments in the Latvian Journal of Physics and Technical Sciences and articles on research in fundamental astronomy and astrophysics in this journal.

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