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1. Introduction

This is the third report concerning research in astronomy in the Central and East European (CEE) Countries, where we summarize the information gathered in 10 targeted visits to Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Romania, Serbia, and Slovakia. The visit to Poland was cancelled, since UCBiR withdrew its participation in ASTRONET and no replacement partner was identified, but Poland has subsequently joined ESO. Targeted visits were not made to Albania, Bosnia and the Former Yugoslav Republic of Macedonia, since the numbers of researchers in astronomy are very small there. Slovenia was not visited, since a proper partner there was not identified, and Ukraine was not visited due to the difficult situation in its eastern parts. Representatives of all the countries of the region were invited to the final workshop in Prague June 4-5, 2015.

2. Targeted visits – towards national roadmaps

Forum meetings on Astronomy were held in the ten visited countries and concluded on the need for internal reforms that would facilitate joining the major European research organizations. The visits were part of the preparations for deliverable D3.3 “Report on options for involving each community in future major European astronomy projects” and included in Task 3.3 “Help in developing national roadmaps”.

Internal discussions should then formulate the long term plans of the community, expressed in Roadmaps to be presented to the national authorities. The long term vision should discuss the role of local telescopes, publication strategies including local and European journals, the adequacy of the national education system, and the available human resources.

3. Methods and aims

In this report, we describe the 10 targeted visits to Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Romania, Serbia, and Slovakia made between September 2014 and March 2015 by an ASTRONET WP3 Working Group (WG) composed of Jean-Marie Hameury, Nick Kylafis, Laurits Leedjäv, Birgitta Nordström, Míla Hůlová, Emma Olsson, Jan Palouš and Nedelia Popescu. During these visits, Forum meetings on astronomy were held in each country. ASTRONET was introduced, and the information collected in reports D3.1 “Status and opportunities of the astronomical community in each country” and D3.2 “Suitable measures to expedite the integration of communities in mainstream astronomy” was given. Representatives of the astronomical communities presented the main national achievements in astronomy at the national level and described existing or future links to the main European organizations. In some cases, representatives of the ministries or national funding bodies commented on the position of astronomy and on possible ways forward. In all cases, one of the main points discussed was the relationship of

the local community with the large European research organizations in astronomy, primarily ESO and ESA. This discussion was complemented by a video presentation from ESO in Chile. Reports on the individual visits are summarized in the Appendix A.

4. Final workshop

A final workshop was held in Prague, where the working group of the work package 3 informed on the work of the first two tasks, and presented the preliminary conclusions for the third task. Representatives from all the countries were invited and gave brief presentations about each country. A general discussion based on the targeted visits concluded the workshop, which led to the conclusions summarised in Sections 5 – 10 of this document. The program of the workshop can be found in the Appendix B.

A main conclusion of the final workshop was that the workshop in itself had been very valuable. One recommendation for the future is therefore to create a forum for regular discussions between these countries, where common interests can be identified and corresponding common plans be prepared.

5. Forum meetings on Astronomy in visited countries

The WG's request to hold a Forum meeting on astronomy during our visit to each country triggered vigorous local activity, resulting in a meeting of astronomers, funding agencies and/or representatives of ministries. In some cases, the meeting demonstrated a need for a permanent national forum, where various smaller projects could be discussed and some level of synergy and coordination on the national level be achieved. A nice example was the Forum organized in Croatia, which was attended by the deputy minister for Science, the chair of the national funding agency, and representatives of the astronomical community. As an outcome of the WG visit, a proposal was formulated that a permanent strategy forum under the leadership of the ministry should be established.

A clear result of our visit and a firm recommendation by ASTRONET is that National Fora on Astronomy (NFA) should be established or revitalized everywhere. The NFAs should formulate a long term vision for astronomy in the country, over-bridge any fragmentation of research, and liaise with the large European organizations in astronomy.

6. Publications

Original research should be properly published, and a high-quality refereeing process is very important. This is difficult in local journals with limited readership, which can prevent the results from being known to the broader scientific community. A general goal should be to publish in the relevant international journals with good impact; there may however be cases where results should be published in more specialized journals. A top European journal like A&A is in fact not expensive per published article, provides high-quality refereeing and, together with the CDS in Strasbourg, gives electronic access to all data sets in its publications. Therefore, the scientific value of maintaining a local journal should be carefully discussed and analysed, as it

was done in 1968 when several smaller national journals merged to form A&A as a common European journal of internationally competitive standard

7. International contacts

A deliberate aim of the targeted visits was to try to break the isolation of some communities. There are places with many contacts to collaborators abroad, and where frequent contacts are maintained on a personal basis. Other places are more isolated, and proper contacts are missing. To establish, maintain and improve the connection to large European centres in astronomy, where usually the large European projects are performed as well, is extremely important, connecting the local projects to the European Vision and Roadmap on astronomy.

Local facilities with small telescopes may provide useful complementary data in long-term follow-up of big projects performed with large telescopes, but the cost of their maintenance and the use of limited human resources should be monitored, and the limitations of the local climate should be taken into account. However, the local telescopes are not used most efficiently (lack of sufficient man-power, climate constraints, etc.), and general accessibility of the data, their format, and inter-connection to astronomical data centres, should be guaranteed. Therefore, based on established or newly initiated collaboration related to large European projects, cross-border strategies should be developed to use these facilities commonly (e.g. via remote or robotic operation possibilities) and coordinated, focusing on priority projects. Some of these national facilities might also be repurposed for pure training and public outreach.

8. Training: PhD studies and post-docs

The system of education should include open PhD programs, and there should be short-term postdoctoral positions, which must be open to other countries. This is not only a question of salaries, since most PhDs and post-docs are able to cope with local conditions. More essential are high-quality projects and access to top-level observing facilities and high-quality data. These opportunities do or will soon exist due to partnerships in the projects and via Virtual observatory tools, and the education and recruitment systems should be developed so as to identify and encourage the brightest young brains to develop the technical skills and international contacts and outlook needed to bring their communities to the forefront of astronomy in 2025 and beyond.

Furthermore, there should be mandatory mobility programs for young scientists, which would allow short and mid-term exchange visits during PhD and postdoctoral studies. This is crucial for the formation of young researchers. In addition, the exchange between various groups and networking should be supported.

9. Relation to large projects and organisations, notably ESO and ESA

The relation to ESO and ESA and their large European projects were discussed during all our visits to the region. Currently, the Czech Republic is the member of ESO and Poland almost finished its entrance procedure. As concerns ESA, the

Czech Republic, Estonia, Hungary, Poland and Romania are members, Bulgaria and Lithuania have cooperation agreements, and Latvia, Slovakia and Slovenia are participating in the Plan for European Cooperating States. It is a challenge for ESO and ESA to provide a realistic way for the East and Central-European astronomical communities to become included in the long-term development of European astronomy. ESO's future relations to the astronomical communities in the non-ESO EU Member States should be on the agenda of the ESO New Member States Working Group. The question is how these communities could not only become users of these infrastructures, but participate in the future strategy discussions. In addition to the ESO New Member States Working Group, the future organisation for sustainable coordination of astronomy – the successor to ASTRONET – could also play such a role. The impact of joining ESA and ESO can boost the development of small and medium size enterprises (SMEs) in the field of the high technology sector of the country. In this way the country can get back a significant fraction of the participation fee in these organizations in form of offers for SMEs. This fact may significantly increase the size of the community having interest in joining these organizations (in particular ESO).

10. Options and action items for the way forward

10.1 Background and basic facts

Long-term strategic planning must necessarily be based on a hard look a couple of decades into the future, and into the past. What is already clear is that astronomy in the 21st century will be very different from that known by the previous generation of astronomers: large data sets of unprecedented quality and uniformity from front-line facilities at all wavelengths will become available to everyone equipped with good internet access and Virtual Observatory tools. The era of Big Data and data-mining will require new tools, skills and ways to collaborate, and the new data sets will be both produced, analysed, and published by international teams of tens or hundreds of astronomers.

10.2 The key asset: Human resources

A look at the panoply of multi-messenger observatories and research facilities slated for completion in another decade makes two facts clear: (1): Each will produce a deluge of data to be analysed by researchers with skills that are yet to be developed; and (2): with few if any exceptions, they will – for clear factual reasons – be located in countries far from their scientific home base, or in space. Brain power, not passport, will be the key to scientific and personal success beyond 2025. The clear conclusion is that the astronomical communities everywhere, also in the New Member States, should focus on developing their human resources to excel in the world of tomorrow. Inexpensive ways to address this task, including the following:

A pan-European network of experienced mentors – both women and men – could be set up with limited effort, using Skype or similar electronic means. This can provide the crucial first contact to other scientific fields and environments, and bright students are in demand in high-level research groups everywhere.

Similarly, it is very important to encourage the brightest young scientists of a country

to spend longer periods in institutions abroad. Having even a small number of future scientific leaders in a country can work wonders, so a small number of grants, awarded in competition, will suffice. Some 'brain drain' is inevitable in any such system, but it should be countered by return programs offering positions at institutes in the home country after several years abroad. By also having programs for recruiting excellent researchers from abroad (brain-gain), this can be neutralized. This provides fast and effective connections to contemporary astronomical research elsewhere.

10.3 Optical-infrared (OIR) observing facilities

The fact is that the astro-climate of the European continent is not ideal for front-line OIR telescopes. Radio astronomy fares somewhat better in this regard, thanks to improved noise filtering techniques, but for basic physical reasons radio telescopes still need to be large – hence expensive – to provide sensitivity and resolution. Multi-messenger facilities of other types – LSST, ALMA, LOFAR, SKA, CTA, IceCube, LIGO/VIRGO, JWST, X-ray/gamma-ray missions, Kepler/PLATO, Gaia... – are generally located far from any home country, if not in space.

Realistic and/or proven ways to improve the situation include the following:

- Establish consortia to renovate existing, but mothballed medium-class telescopes at good sites (La Silla, Calar Alto, ...) for remote or robotic operation; proven expertise in such renovations exists.
- Equip the existing European 2-m class telescopes with identical, versatile FOSC-type instruments and coordinate their use in joint projects to allow for the weather pattern at each individual site. Standardising their design on a proven prototype, series production, and a coordinated joint purchase can reduce the unit price of such instruments considerably.
- If national telescopes are of insignificant size ($\lesssim 1\text{m}$) or non-existing, join forces to equip one national 2-2.5-m telescope at a reasonable site in the region to become competitive in a jointly chosen field, and operate it jointly for research and training. Proximity to a university with an active physics department will be an asset.
- Discuss an option for joint entry into ESO for several smaller countries under one umbrella, reducing membership fees (and corresponding voting rights) for each and explore the case for paying the entrance fee from the EU structural funds.
- Alternatively, establish partnerships with ESO and/or ESA and/or ASTRONET and/or its successor to contribute skilled national manpower in-kind to the scientific exploitation of data from new large, common facilities. This would improve the scientific returns of the existing investments in their construction and operation, for the benefit of all.
- The successor to ASTRONET could play a constructive role in creating a platform for ~annual discussions among representatives of the CEE-countries, where common goals and actions the above and other points can be explored.

10.4 Future European coordination of astronomy

Mainstream astronomy is growing at an exponential rate, and we need to mobilise the human resources in all of Europe. For this process to become effective, it is high time for radically new courses of action. The basis exists in the updated ASTRONET Infrastructure Roadmap, which already describes the agreed key goals and tools for European astronomy in the time frame 2020 – 2025. Our vision for the future is one European community of astronomers analysing data from a full complement of multi-messenger facilities. Most or all of these will, for valid scientific reasons, be located outside most national or continental borders, or even off the surface of the Earth. We already have the means to access the data regardless of physical or geographical origin, and European astronomers will jointly possess or develop the necessary, equally diverse skills. Cooperation and coordination are the keys to joint success.

In the future, coordination of European astronomy by the organisation succeeding ASTRONET can play a crucial role in formulating common European strategies in astronomy and astrophysics. In cooperation with National Fora for astronomy, it should create a platform for discussions and exchanges of ideas on the following and/or similar topics:

- Training of future astronomers and instrumentation engineers: pools of mentors, PhD supervisors, schools, workshops and training meetings;
- A discussion forum for the best use of human resources: return programmes, short term visits, open calls for PhDs and post-docs;
- A discussion forum for visions for local infrastructures: equipment upgrades, standard instruments, networking, coordination;
- Help with formation of consortia for renovation and/or robotisation of existing telescopes and corresponding joint research programmes;
- Help to facilitate data access via the Virtual Observatory, and with data mining in the archives.

Many similar initiatives can be imagined and be brought to fruition without impossibly large investments. The key to success is to not let the failure of some prevent the development of alternative, more promising approaches: “Never ever give up!”

APPENDIX A

TARGETED VISITS

Forum on Astronomy in Bulgaria

Meeting of ASTRONET with representatives of the major actors in astronomy in Bulgaria

18th November 2014

Bulgarian Academy of Sciences, Sofia

The purpose of this ASTRONET visit is to better understand the structure of astronomical scientific research in Bulgaria and to discuss the connection to ASTRONET Science Vision for European Astronomy and ASTRONET Infrastructure Roadmap: A Strategic Plan for European Astronomy.

Participants

ASTRONET

Jean-Marie Hameury (Observatoire Astronomique Strasbourg), Miluše Hůlová (Astronomical Institute, CAS), Nick Kylafis (University of Crete), Birgitta Nordström (Niels Bohr Institute, Copenhagen), Emma Olsson (Swedish Research Council), Jan Palouš (Astronomical Institute, CAS)

BULGARIA

Tanyu Bonev (Institute of astronomy and National astronomical observatory), Evgeni Hristov Semkov (Institute of astronomy and National astronomical observatory), Yanita Zherkova (Ministry of Education and Science), Ekaterina Batchvarova (Bulgarian Academy of Sciences), Valeri Golev (Sofia University), Antoaneta Antonova (Sofia University), Ilian Iliev (Institute of astronomy and National astronomical observatory)

Program

09:00- 09:15 *Welcome and introduction*

Tanyu Bonev & Jan Palouš

09:15- 09:45 *Presentation of ASTRONET and the road map update*

Jean-Marie Hameury

09:45 - 10:15 *Presentation of the main general conclusions from WP3 D.3.1 and 3.2*

Jan Palouš and Birgitta Nordström

10:15 - 10:30 *Publication analysis*

Emma Olsson

10:30 - 11:00 *Coffe / Tea Break*

11:00 - 11:30 *Astronomy in Bulgaria current situation and future perspective*

Evgeni Semkov

11:30 12:00 *Funding of astronomy and astrophysics in Bulgaria: current situation and long term planning*

Yanita Zherkova

12:00 12:30 *European Southern Observatory*
Valentin D. Ivanov (Video connection to ESO Chile)

12:30 14:00 Lunch

14:00 *A joint discussion* on the needs, obstacles, opportunities and future plans of astronomy in Bulgaria, both as a national community and in relation to joint European efforts, such as the ASTRONET roadmap, ESO, ESA and funding available at the European level (especially the new Horizon 2020), and how this could be aided by local actors and coordination on the European level.

Brief summary of the meeting

The meeting started by a welcome by *Tanyu Bonev* together with *Jan Palouš* from ASTRONET, after which *Jean-Marie Hameury* former coordinator of ASTRONET, presented the workpackages and plans included in ASTRONET. Thereafter *Jan Palouš* and *Birgitta Nordström* from the ASTRONET workpackage 3 working group presented the main general conclusions from the first two tasks of the work package. It was noted that the number of astronomers in Bulgaria may be overestimated, a more accurate number would be around 50 in total. The method for analysing the publication data was presented by *Emma Olsson* from the ASTRONET WP3 working group.

Evgeni Semkov presented astronomy and astrophysics in Bulgaria. He presented the main institutions and the number of staff. In the discussion it was noted that there are no postdoc positions in Bulgaria, as those that are hired after PhD are hired as assistant professors. It was also noted that there was an unusually low number of PhD students, which is due to that grants are needed in order to hire PhD student, as only a few positions are provided by the university. There is a limited number of such positions, and therefore grants are needed in order to hire PhD students. A problem for Bulgarian astronomers is that in recent years there has been no call in fundamental science, and therefore no grants have been awarded. The Bulgarian astronomers felt that there was a weak support from the government in terms of funding, and that there is a lack of the everyday basic resources, such as computers, being able to educate/train young people etc.

Another problem concerning recruitment is that young Bulgarians do not chose the career as astronomers, even though the Bulgarian public's and media's interest in astronomy is high.

Professor Semkov also presented information about the local research infrastructure used by the Bulgarian astronomers. The 2m telescope at Rozhen observatory's control system has been upgraded with a grant from the National science fund, which increased the number of nights used for observations.

Statistics for Bulgarian publications was presented. Bulgarian astronomy ranks better than other scientific domains in Bulgaria (according to the 2010 Science and Engineering Indicators). The plans for the local journal, the Bulgarian Astronomical Journal (BAJ), is that it will be included in Scopus data base, and there is also hope that it will be included in Web of Science in the near future.

ESO was presented via video link from Chile by *Valentin D. Ivanov*, who showed the advantages and benefits given by the membership in ESO to astronomers. Information on current and planned research, current and future facilities, studentships at ESO, and observing time allocation process was also given.

Yanita Zherkova from the Ministry of Education and Science presented funding scheme of astronomy and astrophysics in Bulgaria: current situation and long-term planning. In general, the long term goal of the Bulgarian government is to reach a level of investment in R&D of about 1.5% of the GDP by 2020 from the current level of 0.64% (2012). Bulgaria has a national strategy for scientific research since 2011, and an action plan for 2015-2020. National roadmaps for research infrastructure have been developed by selecting via bottom-up proposals from research groups. Within astronomy RACIO (Regional astronomical center for research and education) was selected. The current strategy is developed as SMART¹ specialization. On the overall level, the Bulgarian strategy in science is to be in line with the European strategies.

Discussions

Funding, research infrastructure and strategies

In the discussion with the representative from the ministry the question was raised whether it would be possible to start a European Joint Programming Initiative to support astronomy, as the Bulgarian strategy in science is generally aimed to be in line with the European strategies. With regards to participation in international research infrastructure projects it was argued that building and maintaining research infrastructures contain less risk-taking for an individual country if it is done with other countries in collaboration. A possibility would be to consider contacting ESO in order to discuss the possibility of creating a dedicated program, co-sponsored by Bulgarian ministry and ESO, e.g. for stays for students and PhDs with the purpose of training. Such a solution would naturally be a matter of negotiation between the Bulgarian government and ESO.

There was also a discussion on the strategic importance to also invest in fundamental science for a country, as it is the growing base for the new technologies in the future with perspectives usually on the level of 20 years or more.

The point was argued that to have a healthy fundamental science community one has to have regular (yearly) calls and use international reviewers when distributing grant money, and that it is more important to have regular calls than the actual amount of money distributed in the individual calls.

The strategy for the development of astronomy in Bulgaria is summarised in the RACIO project which is part of the National roadmap for research infrastructures. Presently, this project is merely a document, accepted by the government, but not funded in any way. In addition, despite the claims of the Bulgarian government to be

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in line with the European strategies, there is no targeted funding planned for astronomy and astrophysics for the near future.

Publication strategy

The Bulgarian astronomers' publication strategy to ensure the visibility of the results and what are the plans are for the future for the BAJ was discussed. Normally the results from observations with the local telescopes are published in BAJ. Due to publication charges it was considered to be difficult to publish in foreign journals. Bulgarian astronomers feel that publication in BAJ is a good stepping point for master students and PhDs. Here the visitors commented that in many other countries master students publish in the international journals, such as A&A. and that there are summer schools for A&A publishing summer schools for students.

Recruitment of young scientists

One matter of importance is to make sure that young scientists return. Good conditions for doing research, such as resources and access to state-of-the-art facilities and computing is instrumental in attracting the best young people. This has been considered an issue as the Bulgarian astronomers feel that the lack of fundamental science funding leads to problems in attracting students, and many of them rather go abroad. In addition to this the reputation of the education dropped a few years ago adding to the recruitment problem. As funding for universities is based on number of students it is hard for the universities to resolve this themselves, they need help by the government. Apart from the funding level, temporary positions at the level of postdocs, and a funding program for such positions, should be introduced. This would facilitate the transfer of knowledge, by repatriating young scientist. In addition to postdocs this program should contain the possibility for hiring foreign professors.

Another action that could help addressing the recruitment issue is membership in ESO. A Bulgarian example would be the importance of the membership of CERN for nuclear physics. Nuclear physicists now find many good students, who also make their diploma theses in CERN. It is quite likely the same would be true for astronomy membership in ESO (and its coming E-ELT highly prioritized in the ESFRI roadmap).

Forum on astronomy in Croatia

Meeting of ASTRONET with representatives of the major actors in astronomy in Croatia

17th February 2015

Ministry of Science, Education and Sports, Zagreb

The purpose of this ASTRONET visit is to better understand the structure of astronomical scientific research in Croatia and to discuss the connection to “ASTRONET Science Vision for European Astronomy” and “ASTRONET Infrastructure Roadmap: A Strategic Plan for European Astronomy”.

Participants

ASTRONET

Jean-Marie Hameury (Observatoire Astronomique Strasbourg), Miluše Hůlová (CAS), Nick Kylafis (University of Crete, Department of physics), Laurits Leedjäv (Tartu Observatory), Emma Olsson (Swedish Research Council), Jan Palouš (CAS)

CROATIA

Roko Andričević (Deputy Minister, Ministry of Science, Education and Sports), Ivan Pejić (Assistant minister), Dario Vretenar (Croatian Science Foundation), Krešimir Pavlovski (University of Zagreb), Dijana Dominis Prester (University of Rijeka), Nikola Godinović (University of Split), Vibor Jelić (Institute Ruđer Bošković), Dubravka Kotnik-Karuza (University of Rijeka), Vernesa Smolčić (University of Zagreb), Dejan Vinković (University of Split), Bojan Vršnak (University of Zagreb)

Program

- 9:00 – 9:15 *Welcome and introduction*
Roko Andričević & Jan Palouš:
- 9:15 – 9:45 *Presentation of ASTRONET and the roadmap update*
Jean-Marie Haumery
- 9:45 – 10:15 *Presentation of the main conclusions from WP3 D3.1 and 3.*
Jan Palouš and Laurits Leedjäv
- 10:15 – 10:30 *Publication analysis*
Emma Olsson
- 10:30 – 11:00 *Coffee/Tea Break*
- 11:00 – 11:15 *Astronomy in Croatia – an overview*
Krešimir Pavlovski:
- 11:15 – 11:25 *Experience with ERC starting grant*
Vernesa Smolčić
- 11:25 – 11:35 *Very high energy gamma-ray astronomy in Croatia: MAGIC and CTA*
Nicola Godinović
- 11:35 – 11:45 *Solar physics and space weather research in Croatia*
Bojak Vršnak
- 11:45 – 11:55 *Big data era in sky and Earth observations*
Dejan Vinkovi
- 11:55 – 12:05 *Microlensing search for other Earth: Experience in PLANET collaboration*

- Dijana Dominis Prester
- 12:05 – 12:15 : *Radio-astronomy in Croatia: <LOFAR and todards SKA*
Vobor Jelić
- 12:15 – 13:00 *A joint discussion* on the needs, obstacles, opportunities and future plans of astronomy in Croatia, both as a national community and in relation to joint European efforts, such as the ASTRONET Roadmap, ESO, ESA and funding available at the European level (especially the new Horizon 2020), and how this could be aided by local actors and coordination on the European level.
- 13:00 Lunch
- 14:30 *European Southern Observatory*
Koraljka Mužić (Video connection to ESO, Chile)

Brief summary of the meeting

The meeting started with welcome by the deputy minister of science *Roko Andričević*, who mentioned that a priority of the Croatian government was to sign an agreement with ESA, followed by a brief introduction by *Jan Palouš* and *Krešimir Pavlovski*. This was followed by an overview of the ASTRONET activities, objectives and roadmap update by *Jean-Marie Hameury*, and a presentation of the results and objectives of workpackage 3 by *Jan Palouš* and *Laurits Leedjärv*. The method for analysing the publication data was presented by *Emma Olsson* from the ASTRONET WP3 working group.

Assistant minister will analyze the ASTRONET documents carefully and the Ministry will do its best to support Croatian astronomy and astrophysics.

K. Pavlovski presented astronomy and astrophysics in Croatia, starting with a brief history of astronomy, information over the number of astronomers², and funding of astronomy. Croatian astronomers publish in top journals, and in this context better than physics in Croatia³. Croatian students have in many cases observation experience from observing at the largest telescopes at ESO or elsewhere. Of great importance to Croatian astronomy is that the connection to Croatian excellent scientists abroad is strong. They are often coming back for visits and are involved in doctoral training in Croatia. Also important is that good young scientists returns, however there is still a lot of Croatian astronomers abroad. A great help has been the repatriation program of Ministry of science creating special positions for recruiting back excellent young scientists. Professor Pavlovski also reported in the Croatian involvement in international collaborations.

Croatian scientists are also currently, involved in many collaborations with various large European programs: Spitzer, Chandra, Kepler, Brite constellation, where Croatian scientists serve as PIs or Co-PIs. There is collaboration on MAGIC and last week a contract signed on cooperation with LOFAR. For the future it would be important to cooperate with ESO and ESA to land contracts also for industry.

2 In Croatia there are a number of researchers that would not label themselves as astronomer or astrophysics that published papers in the area of astronomy and astrophysics now and then, which gives a problem when counting astronomers.

3 According to the Nature index: <http://www.nature.com/nature/supplements/nature-index-2014-global/>

Although successful, weak point is that Croatian astronomers are too dispersed and need to make their own priorities, and that there is a need for groups with critical mass.

Vernesa Smolcic presented her experience with an ERC starting grant and the creation of a small international group with the help of the grant. She is involved in SKA and precursors, and among other things a member of the SKA continuum core group responsible for a SKA science book chapter. *Nikola Godinovic* presented on the involvement in MAGIC & CTA. He is a full member in MAGIC since June 2009, which is funded through Croatian Science Fundation, from different institutions and from the Ministry. Plans to apply for further EU-funding was presented.

Bojan Vrsnak presented a program focused on solar physics & space weather trying to bridge gap between observation and theory. They participate in projects EU-FP7, COST, ALMA and in a lot of bilateral projects. Plans for applying for further EU-grants was presented. *Dejan Vinkovic* reported on big data from sky and earth observations. There is COST action, Big-sky-earth, which is a transdisciplinary action. Technological challenges are similar in many projects. Bottlenecks are becoming algorithms and data handling in the area of geoinformatics and astroinformatics, where essential is building up of computer science to increase the competitiveness of a country. *Dijana Dominis Prester* reported on a project on microlensing. She participates in widefield surveys OGLE and MOA, where they built follow up teams based on alerts. She also presented on other projects and the challenges that comes with these surveys, such as the need to be well coordinated between teams and telescopes to get data that can be analyzed together. *Vibor Jelic* reported on radioastronomy; LOFAR and the way towards SKA⁴, and tasks in the fields of technology development, system engineering, software development and computing, and signal processing.

Discussion

The discussion was mostly concerning the need for coordination and strategic plans, and that Croatian astronomy and astrophysics has to be in the strategic plans of the Croatian government.

It is unclear which body should be the natural part for organizing Croatian researchers active in fields related to astronomy and astrophysics, and a first step would be to organize a proper forum for these discussions. There is also the need for Croatia to have a strategy with regards to the EU H2020 program for Space. For astronomers it is of importance to be influential also in the government discussions concerning ESA. For ESA there is a combination of the bottom up and the top down approaches as there is interest both by the community and the government. Croatian astronomers also need to organize themselves in order to be able to give input to the Croatian research and innovation road map. It was considered very positive that that the deputy minister and the assistant minister attended the meeting, and that the current meeting in itself had been helpful in aiding communication. A short discussion was also held on the economic situation in the country. However, it was concluded that having sort of forum where astronomers working in different field meet is helpful if one want to influence the national research infrastructure road map, with common priorities by the whole community it would be easier to be heard. It is essential for a

4 Croatia member of the scientific collaboration, even if it is not formally a member of SKA

community is to have a discussion forum, to have a common vision, and to have good people and good ideas.

Forum on Astronomy in the Czech Republic

Meeting of ASTRONET with representatives of the major actors in astronomy in the Czech Republic

17th March 2015

Academic Conference Center (AKC), Prague

The purpose of this ASTRONET visit is to better understand the structure of astronomical scientific research in the Czech Republic and to discuss the connection to ASTRONET Science Vision for European Astronomy and ASTRONET Infrastructure Roadmap: A Strategic Plan for European Astronomy.

Participants

ASTRONET

Jean-Marie Hameury (Observatoire Astronomique Strasbourg), Míla Hůlová (Astronomical Institute CAS), Laurits Leedjärv (Tartu Observatory), Jan Palouš (Astronomical Institute CAS)

CZECH REPUBLIC

Miroslav Bárta, Jan Čechura, Jim Dale, Petr Hadrava, Petr Heinzl, Petr Kabath, Vladimír Karas, Pavel Koubský, Frédéric Marin, Petr Pravec, Cyril Ron, Pavel Suchan, Jiří Svoboda, Petr Škoda, Miroslav Šlechta, Richard Wunsch (all Astronomical Institute CAS); Marek Wolf (Astronomical Institute Charles University).

Program

- 9:00 - 9:15 *Welcome and introduction*
Petr Hadrava & Jan Palouš
- 9:15 - 9:45 *Presentation of ASTRONET and the road map update*
Jean-Marie Hameury
- 9:45 - 10:15 *Presentation of the main general conclusions from WP3 D.3.1 and 3.2*
Jan Palouš and Laurits Leedjärv
- 10:15 - 10:30 *Publication analysis*
prepared by Emma Olsson, presented by Jan Palouš
- 10:30 - 11:00 Coffee / Tea Break
- 11:00 -12:00 *Astronomy in the Czech Republic - current situation and future perspective*
Petr Hadrava & Vladimír Karas & Petr Heinzl & Miroslav Bárta
- 12:00 - 12:30 *European Southern Observatory*
Petr Kabath
- 12:30 *A joint discussion on the needs, obstacles, opportunities and future plans of astronomy in the Czech Republic, both as a national community and in relation to joint European efforts, such as the ASTRONET Roadmap, ESO, ESA and funding available at the European level (especially the new Horizon 2020), and how this could be aided by local actors and coordination on the European level.*

Brief summary of the meeting

The meeting started with an introduction and welcome by *Petr Hadrava* and *Jan Palouš*, followed by an overview of the ASTRONET activities, objectives and roadmap update given by *Jean-Marie Hameury*, a presentation of the results and objectives of Workpackage 3 by *Laurits Leedjäv* and *Jan Palouš* who also presented publication analysis.

Astronomy in Czech Republic was presented by *Petr Hadrava*, *Vladimír Karas*, *Petr Heinzl* and *Miroslav Bárta*.

Petr Hadrava presented summary of what Czech Astronomy is today and what are possibilities for its future development. He presented data on the number of astronomers in various Czech institutions dealing with astronomy, the research topics and the research infrastructure. Observing facilities include both local telescopes and a part in a remotely controlled telescope on ESO observatory La Silla in Chile. Czech Republic is involved in several astronomy projects in space (mainly in X-ray domain) and in large international projects like Pierre-Auger observatory. The Czech Republic is a member of intergovernmental organizations ESO and ESA. It is also a member of SOLARNET building the GREGOR 1.5 m telescope for solar observations on Tenerife. The European Solar Telescope is in preparation. It deserves a discussion what are the methods and instruments the astronomers in the Czech Republic will need in future – probably, optical and millimeter interferometry should be included.

Vladimír Karas (Director of the Astronomical Institute of the Czech Academy of Sciences – CAS) presented the Astronomical institute. There is an evaluation system of the institutes of the CAS, general evaluation every five years. The Institute is involved in ESO and ESA and in many projects within the Framework of FP7. For example the Black Hole Research is coordinated from Czech Republic. The Institute is also actively involved in ALMA project. There is a healthy involvement of young generation in successful postdocs programs. The promotion of young scientists is realized also through the J. E. Purkyně Fellowship. Its objective is to attract outstanding creative scientists from abroad to work in research institutes of the CAS, both Czech scientists working abroad for a long-time period and top foreign scientists, usually under forties, that are to be ensured adequate financial support at CAS institutes. The Fellowship is granted for five years at maximum. There is a public outreach programme in the Institute with one full time public relation person. The Institute organizes four times per year an inter-department meeting, and there are meetings with universities on education.

Petr Heinzl presented Czech Space Activities in astrophysics, solar and space research. Czech Republic is a full member of ESA since 2008. The Czech Republic participates in several ESA programmes: Solar Orbiters, PROBA 3, JUICE, etc. There is an intention to establish Czech Space Agency and to increase funding to reach the level of other similar countries.

Miroslav Bárta presented the Czech node of the European ALMA Regional Centre ARC at Ondřejov – one of the seven nodes accros Europe (ALMA Regional Centres head is in ESO Garching). The role of the ARC nodes is the service towards users community, support of users in all stages of their projects. Another task is the ALMA-system knowledge dissemination and spreading awareness on ALMA among scientific community. Ondřejov ARC also participates on the extension of ALMA observations to the Sun. Currently there is a call for the support of the ARC in

Ondřejov as a Research Infrastructure pending at the Ministry of Education, Youth and Sports.

Petr Kabath presented on the European Southern Observatory. The presentation was followed by a joint discussion on the needs, obstacles, opportunities and future plans of astronomy in the Czech Republic, both as a national community and in relation to joint European efforts, such as the ASTRONET Roadmap, ESO, ESA and funding available at the European level (especially the new Horizon 2020), and how this could be aided by local actors and coordinated on the European level. Participants tried to compare conditions for astronomy in the Czech Republic and France: 300 hundred millions euros per year for astronomy in France (30 times more funding, 6 times more population), percentage of astronomers approximately the same, each astronomer five times richer, in instrumentations maybe ten times difference.

Another important discussed topic was the development of the instruments and question if some new fields should be open. It must be borne in mind that if there is built a new large instrument, the next generation will be obliged to use it. Question is what are the fields the Czech astronomical community have to be engaged in? ALMA is very good direction for the future. Determining factor is that Czech astronomical community is a small one. Unfortunately, the present situation is influenced by the period of declining budget. Some projects were stopped like telescope in South Bohemia or project concerning radioastronomy, limited by number of people and money currently available. There was a discussion if to built a new telescope in South Bohemia, on site with very favourable astro-climate. But after considering all the circumstances, it was decided that it would be much more favourable to get long observing time access on the Danish telescope on La Silla, so the idea died.

Participants of the meeting came to the conclusion that it is not recommended to close all local telescopes – they should run for educational purposes and for long terms projects, some of these investments should go on, but their quantity should be reduced as running telescopes is too expensive, even in France they have the same problem and therefore some facilities were closed. It should be reasonably balanced between small and large facilities. Especially for such a small astronomical community as the Czech one, it is very important to ensure access to the top level instruments at ESO and elsewhere.

In this context, it was noted that one of the weak points in the Czech Republic is nearly no involvement of Czech companies or groups in new ESO instrumentation, especially in comparison with ESA. There is quite good involvement of the Czech companies and many groups in building instruments in ESA. Important is, that during the GA IAU in 2006 in Prague, the idea of consortium in space science was created. If somebody is not in such consortium, it is more difficult to be involved. Individual contacts are also very important.

It was also stated that knowledge in instrumentation is quite low in the Czech Republic, no company has particular experience with astronomical instrumentation, there is a lack of education in instrumentation. An example is the spectroscopy in

Czech conditions: there are mirrors produced, but there is practically no experience in construction of spectrographs and understanding to needs of spectroscopy. It seems also that students of Czech universities are not sufficiently educated in instrumentation. In this context should be an important opportunity the holding of summer school on active optics in March 2017 in Prague. General education at the universities should be more oriented to modern international instrumentation (ESO and others) already on the level of Master studies. Students should get known what are possibilities, how to use data from new observations and from data archives.

Forum on Astronomy in Estonia

Meeting of ASTRONET with representatives of the major actors in astronomy in Estonia

16th September 2014

Tartu Observatory

The purpose of this ASTRONET visit was to better understand the structure of astronomical scientific research in Estonia and to discuss the roadmap for Estonian astronomy and its connection to “ASTRONET Science Vision for European Astronomy” and “ASTRONET Infrastructure Roadmap: A Strategic Plan for European Astronomy”.

Participants

ASTRONET:

Jean-Marie Hameury (Observatoire Astronomique Strasbourg), Miluše Hůlová (CAS), Birgitta Nordström (Niels Bohr Institute, Copenhagen), Emma Olsson (Swedish Research Council), Jan Palouš (CAS), Laurits Leedjärv (Tartu Observatory)

Estonia:

Madis Saluveer (Estonian Research Council, head of the department of research financing)

Tartu Observatory:

Anna Aret, Tõnis Eenmäe, Jaan Einasto, Maret Einasto, Urmas Haud, Indrek Kolka, Jaan Laur, Tiina Liimets, Jaan Pelt, Anu Reinart (director of Tartu Observatory), Enn Saar, Arved Sapar, Antti Tamm, Elmo Tempel, Jaan Vennik, Kristiina Verro, Tõnu Viik

Guests:

Radu Stoica (Lille University, France – visitor to Tartu Observatory)

Program of the meeting

- 9:00 – 9:15 *Welcome and introduction*
Laurits Leedjärv & Jan Palouš
- 9:15 – 9:45 *Presentation of ASTRONET and the road map update*
Jean-Marie Hameury
- 9:45 – 10:15 *Presentation of the main general conclusions from WP3 D.3.1 and 3.2*
Jan Palouš and Birgitta Nordström
- 10:15 – 10:30 *Publication analysis*
Emma Olsson
- 10:30 – 11:00 *Coffe / Tea Break*
- 11:00 – 11:30 *Astronomy in Estonia – current situation and future perspective*
Laurits Leedjärv
- 11:30 – 12:00 *Funding of research in Estonia, and on astronomy and astrophysics in this context: current situation and long term planning*
Madis Saluveer – Estonian Research Council
- 12:00 – 12:30 *European Southern Observatory*
Petr Kabath (Video connection to ESO – Chile)
- 12:30 – 14:00 *Lunch*

14:00 *A joint discussion* on the needs, obstacles, opportunities and future plans of astronomy in Estonia, both as a national community and in relation to joint European efforts, such as the ASTRONET Roadmap, ESO, ESA and funding available at the European level (especially the new Horizon 2020), and how this could be aided by local actors and coordination on the European level.

Brief summary of the meeting

The meeting started with an introduction and welcome. This was followed by an overview of the ASTRONET activities, objectives and roadmap update given by *Jean-Marie Hameury* and a presentation of the results and objectives of Workpackage 3 by *Birgitta Nordström* and *Jan Palouš*. The method for analysing the publication data was presented by *Emma Olsson* from the ASTRONET WP3 working group.

Thereafter astronomy in Estonia was presented by *Laurits Leedjärv*. It was made known that the number of researchers in astronomy in Estonia has decreased since the data for D3.1 was taken. There was also a discussion about the estimate on the expenditure on astronomy, the two ways of estimating that were used in D3.2 may overestimate the expenditure by a factor of about 1.5. It was made known that Estonian astronomers have had a modest involvement in European projects, however the FP7 REGPOT EstSpace 2008-2011, among other things, helped to repatriate young Estonian researchers. Estonia has a PECS agreement with ESA, and is on its way to full membership, which is expected in 2015. In the roadmap from 2010, also membership in ESO had been envisaged, and a proposal was made by astronomers to the ministry of education and research on Oct 1, 2012. However, this was not set as the highest priority by the ministry due to lack of funds, and the relatively small community.

The head of research funding at the Estonian Research Council, *Madis Saluveer*, presented the funding structure of Estonia. The funding instruments available in Estonia were presented. The Estonian government has had regular updated strategies for R&D&I, the current one being “Knowledge-based Estonia” 2014-2020. The Infrastructure roadmap of Estonia includes as future prospects membership in the European Space Agency (ESA) and Membership in the European Southern Observatory (ESO). The funding for R&D from different sources was also presented for the years 2010-2014. Noteworthy is that the structural funds is about 34% of the total funding, and near to 40% if co-funding is included, while baseline funding is only around 4%. For the funding instruments relevant for basic research, there is the targeted funding – from 2012 institutional support – which support larger groups of researchers, and personal funding. He also presented a table on citations for 10 years which shows that Estonian astronomy is under the world average in citations.

ESO was presented via video link from Chile by *Petr Kabath*, who discussed advantages and benefits membership in ESO gives to astronomers in the Czech Republic. Information on studentships at ESO, observation and time allocation process was given.

Discussion

Funding system in Estonia

As in many countries, one of the main problems is lack of funding. There is an over-subscription of about 1:6 for the calls. The general trend is that the grants have increased in size, leading to fewer being awarded. Positions have not been permanent, but given out for five years. As the competition from abroad has not been tough, in part due to the low salary level, the positions have in practice been permanent. However, the different time horizons for the different funding instruments is an issue, as the positions are for five years, institutional funding is for six years while personal grants are for four years, which can give mismatches. The proportion between the personal grants and institutional grants should be adjusted. In some sense, the institutional grants are also dependent on the individual researchers as the combined merits of a group of researchers matter. Oversubscribed calls is a problem for astronomers. Better distribution, not only money is the solution. Some over-subscription is necessary, a factor of three is good, six is too high similar to "Lottery". The proportion between the institutional funding and the individual funding should be adjusted, the institutional funding is also very important.

Participation in joint European efforts such as ESA and ESO

Very important for Estonia is to participate in international structures, and to participate in collaborative projects. This is very important for young people. There is already a lot of research cooperation with other countries, many papers have authors from many countries. Investment in local infrastructures should be compared to investment to European infrastructures. Infrastructure should be joint investment, however there may be various difficulties complicating the joint venture. It may be difficult for example to get money for helping Latvians to build the telescope with the help of Estonian funds. Participation in common big infrastructures processes is difficult, but how to convince politicians/RC to build in another country. Sometimes the argument can be to be on the forefront of the technology: to go beyond the possibilities of any small country by international collaboration. The astronomers have done this trying to convince governments to join ESO. The main argument against is that ESO is too expensive for Estonia as the number of astronomers is small, and that the total funding of astronomy will grow to double.

Getting access to high level instrumentation

There are several ways how to get access to high level instrumentation. First is to enter ESO, however, to convince the government may be uneasy task. Another potential way is joining a consortium building new instruments. For example NTT on La Silla has a call for instrumentation. There is a call for consortia building instruments for E-ELT. Collaboration with groups building instruments for space may be beneficial since combining skills might higher the level of knowledge in companies so that they may be able to compete for ESO tenders. Possible other options are: collaboration with astronomers from ESO member state countries, and buying observing time.

Impact of astronomical papers

It has been shown in the presentation of the Estonian Research Council that Estonian papers are cited less than the global average astronomical papers. Astronomy papers have strong dispersion of citations in the field, stellar much less than average. Lifetime of stellar physics papers is longer than in cosmology: 3-4 years in cosmology, and 10 years in stellar physics. Citations also reflect differences in domains, it needs to be analysed more carefully. Another problem is that 18% of papers are published in Baltic Astronomy with low citation average. European astronomers decided about joining A&A, why keep the small journals? The general feeling is that international journals should be enough and that Baltic Astronomy is not needed.

Long term planning and road-map for infrastructures

ASTRONET would appreciate a partner on national level to discuss the vision, long term planning and road-map for infrastructure building. A potential partner is the IAU National Committee on Astronomy in Estonia, which should be more active. ASTRONET would be happy to know what are Estonian needs, what you would like to do in ten years perspective. There needs to be a permanent body on national level, triggering and organizing the discussion. It may also help in discussion with funding agencies, ministries. It would be useful to have a document showing the relation to ASTRONET science vision and road map. It is important that such effort is made in collaboration with the Estonian funding agency. The funding agency has an important role in defining the boundaries for the exercise. From the ministerial side: astronomy is very much acknowledged – national pride.

Conclusions:

- Astronomers in Estonia should take bigger part in large projects such as SLOAN, PLANCK, GAIA;
- Internal reforms should be performed to strengthen cooperation between different groups such as stellar (spectroscopy) and cosmology;
- The importance of astronomy and astrophysics as the educational tool should be explained to different governmental evaluation bodies;
- An internal discussion forum should be established, to discuss the long term plans and road-map for infrastructure development in Estonia.

Forum on Astronomy in Hungary

Meeting of ASTRONET with representatives of the major actors in astronomy in Hungary

16th February 2015

Hungarian Academy of Sciences, Budapest

The purpose of this ASTRONET visit is to better understand the structure of astronomical scientific research in Hungary and to discuss the connection to ASTRONET Science Vision for European Astronomy and ASTRONET Infrastructure Roadmap: A Strategic Plan for European Astronomy.

Participants

ASTRONET

Jean-Marie Hameury (Observatoire Astronomique Strasbourg), Miluše Hůlová (CAS), Nick Kylafis (University of Crete), Laurits Leedjärv (Tartu Observatory), Emma Olsson (Swedish Research Council), Jan Palouš (CAS),

HUNGARY

Péter Ábraham (general director of the Research center of Astronomy and Earth Sciences), Zsolt Bagoly (Eötvös University of Sciences, Budapest), Lajos Balázs (ASTRONET contact person of HAS), László Kiss (Scientific secretary of Research Center of Astronomy and Earth Sciences), Maria Lugaro ("Momentum" program leader at Research center of Astronomy and Earth Sciences), Katalin Oláh (Scientific adviser, Research Center of Astronomy and Earth Sciences), László Szabados (President of the Committee of Astronomy and Space Physics of HAS), László Szarka (Head of research excellence centres of HAS), Fruzsina Tar (Head of the Hungarian Space Office)

Program

- 9:00-9:15 *Welcome and introduction*
Lajos Balázs & Jan Palouš
- 9:15-9:45 *Presentation of ASTRONET and the road map update*
Jean-Marie Hameury
- 9:45-10:15 *Presentation of the main general conclusions from WP3 D.3.1 and 3.2*
Jan Palouš and Nick Kylafis
- 10:15-10:30 *Publication analysis*
Emma Olsson
- 10:30-11:00 *Coffee / Tea Break*
- 11:00-11:30 *Astronomy in Hungary - current situation and future perspective*
Lajos Balázs
- 11:30-12:00 *Funding of astronomy and astrophysics in Hungary: current situation and long term planning*
László Szarka

12:00-13:00 *A joint discussion* on the needs, obstacles, opportunities and future plans of astronomy in Hungary, both as a national community and in relation to joint European efforts, such as the ASTRONET Roadmap, ESO, ESA and funding available at the European level (especially the new Horizon 2020), and how this could be aided by local actors and coordination on the European level.

13:00-14:00 Lunch

14:00-14:30 *European Southern Observatory*
Koraljka Muzic (Video connection to ESO Chile)

Brief summary of the meeting

The meeting started with an introduction and welcome by *Lajos Balazs* and *Jan Palouš*, followed by an overview of the ASTRONET activities given by *Jean-Marie Hameury*, objectives and roadmap update, and a presentation of the results and objectives of work package 3 by *Nick Kylafis* and *Jan Palouš*. The method for analysing the publication data was presented by *Emma Olsson* from the ASTRONET WP3 working group.

Hungarian astronomy was presented by *Lajos Balázs*. A short historical exposé of Hungarian astronomy was followed by an overview of the Hungarian research. Currently there is international cooperation with Radionet and VLBI, and with OPTICON, which is useful for access to intermediate size telescopes. National research infrastructure resources are of smaller scale and is used for variable stars and minor bodies of the solar system. There is also partnership in the Virtual observatory.

Hungarian astronomers participate in many different international projects: in space through PECS agreement with ESA in Herschel, COROT, AKARI, ROSETTA, and GAIA and proposed missions CHEOPS and THESEUS. There is also participation in the NASA Kepler mission. On the ground, the ALMA instrument is used in international cooperation, computational astrophysics is developing with studies of protoplanetary discs. There is involvement in the construction of MATISSE instrument for ESO VLTI.

Lajos Balázs also presented the main strengths and weaknesses of Hungarian astronomy. Among the strengths are that there is a well-educated staff with successful international cooperation (ESO, ESA, EU FP7). The publication activity of Hungarian astronomers is at the international level. He further described as the main weaknesses that there is no coherent strategy. There is also an insufficient technical background and Hungarian astronomers have no direct access to large instruments (which is partially solved with international cooperation). As opportunities was mentioned the hope that fully joining ESA will give access to large international programs. There is also the “Momentum program” of HAS, which intends to attract motivated young scientists back to Hungary. As threats were mentioned that the lack of a coherent strategy can give rise to marginalization. Hungary is also experiencing a brain-drain, which is partly addressed by the previously mentioned Momentum program. However, a lack of funding is experienced, and Hungarian astronomers experience an erosion of the current level of funding.

László Szarka, head of research excellence centres of the Hungarian academy of sciences, presented the new research Centre in astronomy and earth science in Sopron. Part of its budget (25%) is raised on excellence base for human resources and Momentum program, trying to reverse brain drain to brain gain.

Hungary is considering participation in SKA as part of the initiatives by Hungarian astronomers. The decision will be taken during the year. Selection criteria is not entirely know, one would probably be research excellence (with no problem for astronomy). The prime target in this should, for Hungarian astronomers, be the E-ELT, the question is whether Hungary can join ESO in the future.

Head of the Hungarian Space Office *Fruzsina Tar* described how difficult is to find money for space related industry and research. Positive step will be joining ESA and the discussion on priorities. There is also openness to start discussions on ESO if one can rise the funding. She mentions that some ESA programs that can be reached/achieved by also astronomers. Hungary will become full member of ESA in the autumn (September/October) 2015. The presentation lead further to a discussion on ESA and ESO. For the Space Office there is an openness to join if it can be considered together with a space strategy, as it could be beneficial to Hungary. However, the Hungarian space office may not be the ones to implement it.

Hungarian astronomer feels that ESO is the most natural for them. However the question is only how and when can one make the step towards joining. There are preparations are made, and Hungarian astronomers submits ESO proposals every semester with good success rates. A large fraction of publications uses ESO data rather than national telescopes. One can therefore say that, scientifically, Hungarian astronomers are a part of ESO albeit through publications and using facilities through collaborations. As the new office of HAS is preparing national road map, which should be ready by September this year. The most natural way to move towards joining ESO would be to get ESO into the national road map.

It was also discussed that ten years plan for Hungarian astronomy should be constructed. The last one was done ten years ago. Part in this should be how to integrate Hungarian astronomy in the European Research Area. HAS should produce a roadmap for astronomy. It is not fixed how it may be related/connected to the ASTRONET road map. In Hungary, there is now a new office for national infrastructure for research, which last November produced forming a basis for infrastructures. It includes ESO, and it may will form the basis of the new ten years plan, however it is not clear yet how it will work.

When it comes to structural funds the lions share goes to the ELI laser infrastructure. Hungarians astronomers has the feeling that as things have been so turbulent in Hungary for the last five years, it is hard to predict what happens for more than half a year in advance.

Forum on Astronomy in Latvia

Meeting of ASTRONET with representatives of the major actors in astronomy in Latvia

17th September 2014

University of Latvia, Riga

The purpose of this ASTRONET visit is to better understand the structure of astronomical scientific research in Latvia and to discuss the connection to “ASTRONET Science Vision for European Astronomy” and “ASTRONET Infrastructure Roadmap: A Strategic Plan for European Astronomy”.

Participants

ASTRONET

Jean-Marie Hameury (Observatoire Astronomique Strasbourg), Miluše Hůlová (CAS), Laurits Leedjärv (Tartu Observatory), Emma Olsson (Swedish Research Council), Jan Palouš (CAS),

LATVIA:

Vidvuds Beldavs (Baltic Photonics, Institute of Atomic Physics and Spectroscopy), Ilgmars Eglītis (Institute of Astronomy of University of Latvia), Juris Freimanis (Ventspils International Radioastronomy Center), Amara Graps (Institute of Astronomy, University of Latvia), Antons Pujāts (University of Latvia), Irena Pundure (Institute of Astronomy, University of Latvia), Kalvis Salmiņš (Laser station "Riga", Institute of Astronomy, University of Latvia), Ansis Zariņš (Institute of Geodesy and Geoinformatics)

Program of the meeting

- 9:00 – 9:15 *Welcome*
Antons Pujāts
Introduction
Ilgmars Eglītis & Jan Palouš
- 9:15 – 9:45 *Presentation of ASTRONET and the road map update*
Jean-Marie Hameury
- 9:45 – 10:15 *Presentation of the main general conclusions from WP3 D.3.1 and 3.2*
Jan Palouš and Laurits Leedjärv
- 10:15 – 10:30 *Publication analysis*
Emma Olsson
- 10:30 – 11:00 *Coffe / Tea Break*
- 11:00 – 12:00 *Astronomy in Latvia – current situation and future perspective*
Ilgmars Eglītis: Astronomy in Latvia in optic range
Kalvis Salmiņš: Geodynamical Station
Juris Freimanis : VIRAC 2014 - 2020
- 12:00 – 12:30 *European Southern Observatory*
Petr Kabath (Video connection to ESO – Chile)
- 12:30 – 14:00 *Lunch*

Amara Graps: Funding of astronomy and astrophysics in Latvia: current situation and long term planning

14:00 *A joint discussion* on the needs, obstacles, opportunities and future plans of astronomy in Latvia, both as a national community and in relation to joint European efforts, such as the ASTRONET Roadmap, ESO, ESA and funding available at the European level (especially the new Horizon 2020), and how this could be aided by local actors and coordination on the European level.

Brief summary of the meeting

The meeting started with an introduction and welcome. This followed by an overview of the ASTRONET activities given by *Jean-Marie Hameury*, objectives and roadmap update, and a presentation of the results and objectives of work package 3 by *Laurits Leedjärv* and *Jan Palouš*. The method for analysing the publication data was presented by *Emma Olsson* from the ASTRONET WP3 working group.

A discussion followed where it was made known that the number of researchers in astronomy in Latvia is nearer 30 rather than 50 as given in D3.1. Many astronomers are involved in astronomy-related engineering. Many have master rather than PhD degree, so they can be counted as supporting staff. There was also a discussion about the estimate on the expenditure on astronomy, the two ways of estimating that were used in D3.2 may overestimate the expenditure by a factor of about 1.5.

Ilgmars Eglītis presented astronomy in the optic range. The Institute of Astronomy is quite small and suffers from a problem of aging researchers. A general problem is the low public funding amount in science and in astronomy, which leads to that the possible salaries are so small that young people search employment somewhere else. There is also a problem also with the stability of the funding and problems to make predictions of the future funding. Another problem experienced by the researcher is the very complex and time-consuming procurement procedure in university. As the Institute of Astronomy is very small at 2010 was signed association agreement with Institute of Atomic Physics and Spectroscopy and the Institute of Geodesy and Geoinformatics to reach a critical mass of researchers, resolve the problems with projects administrator. Together they have an EU Regpot grant called FOTONIKA. With another grant the possibility for young researchers to work for up to 4 months during long visits in the institutes of the National Academy of Science of Ukraine has been realized. Due to the local funding situation cooperation with different foreign institutes is very urgent. Professor Eglītis also presented the activities at the Astrophysical Observatory in Baldone. *Kalvis Salmiņš*: presented the geodynamical station and the current and planned research there. *Juris Freimanis* presented the International Radio Astronomy Centre (VIRAC), where basic science radioastronomy is done with the 32 m telescope at Ventspils. The government is providing funding for a current upgrade. Also applied research, such as applied electronics, remote sensing and high performance computing, is done. This is necessary for it to be a sustainable institution as astronomy as such is not a priority by the Latvian government. The principal aim is to become a global research service provider in space technology. Ventspils VIRAC implements this task maintaining high

standards of the research and science-related services, with the client-oriented attitude. The basic science part is thus partly cross-financed from applied science. VIRAC is the Associated Partner of the EVN (European VLBI network) and is full partner in the FP7, projects NEXPreS and RADIONET3 being implemented by EVN. The strategic goal is the full involvement in European-scale astronomical research, becoming full partner of EVN and to collaborate with the ESA. Latvia is working on a PECS- agreement with ESA, awaiting a decision by Latvian government it could be realized maybe next year.

In a video-link to Santiago de Chile *Petr Kabath* provided information on ESO. It is relevant to Latvia, since top optical astronomy needs access to high technology telescope in good climate. Astronomers in Latvia use NOT, since the travel is less expensive compared with travel to Chile. Cooperation with PI from ESO country is the most realistic solution for Latvian astronomers.

In the discussion the organisation of Latvian astronomy was touched upon. Within the country there are three domains: optical, radio, and space research, that has been joined in the Fotonika programme. Working further in this direction is seen as the way forward for Latvia. There is an opportunity for good research by increased national collaboration/cooperation between optical and radio observations. International collaboration can be set up through the VLBI, and Latvian astronomers are currently trying to get funding through this. It is necessary to repair the 32 m radio to be a bigger partner in the collaboration.

The discussion also touched the publication strategy. In general publications should rather be in A&A and ApJ than in Baltic astronomy to increase international visibility of the results. However, some research areas do not fit the A&A subjects, and there is a problem with ApJ because of the page charges. A publication strategy is also important as the ministry uses papers that are in Thomson Reuter and Scopus, when they calculate the distribution of the basic resources. Latvian astronomers plan to continue the collaboration with applied sciences and the collaboration in photonics as the European funding is a basic source of funding for Latvian funding, the national funding so small that it is merely an addition⁵.

Latvian astronomers perceive that the main problem is the general attitude that science is not important for the population, even though there is popular science journals, and radio programs with astronomical themes. Public outreach is essential in communicating the importance of scientific research. When distributing funding the university is mostly looking at education (i.e the number of students) rather than scientific results. It has become hard to attract young people to science as many go abroad. In additions to this reforms in secondary school, mean that only a small number of young people are educated in physics, mathematics and chemistry to do a university degree in these topics.

Conclusions

5

Around 10-20% is coming from national funding. Generally institutions only have 8-9% direct funding. About half of the total budget comes from European funding.

- Latvia needs a common strategy for coming six years to have reasonable project proposals that will be submitted in areas of photonics and space research, areas chosen to fit in to the government prioritization and Latvian smart specializations.
- Joint centre for astrophysics is proposed including optical and radio astronomy and remote sensing.
- More involvement in big European projects needed, as this is a major source of funding.
- Public outreach should use the public interest in astronomy and space research to promote the importance of doing fundamental research.

Forum on Astronomy in Lithuania

Meeting of ASTRONET with representatives of the major actors in astronomy in Lithuania

18th September 2014

Planetarium, Vilnius

The purpose of this ASTRONET visit is to better understand the structure of astronomical scientific research in Lithuania and to discuss the connection to “ASTRONET Science Vision for European Astronomy” and “ASTRONET Infrastructure Roadmap: A Strategic Plan for European Astronomy”.

Participants

ASTRONET

Jean-Marie Hameury (Observatoire Astronomique Strasbourg), Míla Hůlová (CAS), Laurits Leedjäv (Tartu Observatory), Jan Palouš (CAS, Working Package 3 Leader)

LITHUANIA

Gražina Tautvaišienė (Institute of Theoretical Physics and Astronomy, Vilnius University), Aušra Vilutiene (Director of the Research Foundation of the Research Council of Lithuania)

Total number of participants: 19 (one of them via Skype)

Program of the meeting

9:00 – 9:15 *Welcome and introduction*

Gražina Tautvaišienė & Jan Palouš

9:15 – 9:35 *Presentation of ASTRONET and the road map update*

Jean-Marie Hameury

9:35 – 9:55 *Presentation of the main general conclusions from WP3 D.3.1 and 3.2*

Jan Palouš and Laurits Leedjäv

9:55 – 10:20 *Coffe / Tea Break*

10:20 – 10:50 *Astronomy in Lithuania – current situation and future perspective*

Gražina Tautvaišienė

10:50 – 11:20 *Funding of astronomy and astrophysics in Lithuania: current situation and long term planning*

Aušra Vilutiene

11:20 – 11:50 *European Southern Observatory*

Petr Kabath (Video connection to ESO – Chile)

11:50 – 12:20 *A joint discussion on the needs, obstacles, opportunities and future plans of astronomy in Lithuania, both as a national community and in relation to joint European efforts, such as the ASTRONET Roadmap, ESO, ESA and funding available at the European level (especially the new Horizon 2020), and how this could be aided by local actors and coordination on the European level.*

12:20 – 12:40 *Presentation of Planetarium*

Brief summary of the meeting

Welcome and introduction were presented by *Gražina Tautvaišienė* from the Institute of Theoretical Physics and Astronomy of Vilnius University. *Jan Palouš* introduced representatives of ASTRONET. *Jean-Maie Hameury* presented ASTRONET and the road map update. The main general conclusions from WP3 D.3.1 and 3.2 were presented by *Jan Palouš* and *Laurits Leedjārv*. The publication analysis presented by *Jean-Marie Hameury*.

Gražina Tautvaišienė talked about current situation and future perspective of astronomy in Lithuania. Lithuania has a long tradition in astronomical research which is successfully continued nowadays by several dozens of professional astronomers, postdoctoral researchers and doctoral students, working at four research institutions. Most of the research done corresponds to the highest international standards and thus clearly deserves continuation into the future. At the same time, limited access to telescopes and instruments, and constrained funding, require careful consideration when managing available resources to achieve the maximum return for the science and society. This calls for urgent re-evaluation of the future science goals and priorities, supplemented with specific plans to achieve them in the most efficient way and with the limited expenditure involved. One clear lesson that can be drawn from the experience of similarly sized countries is that a small country cannot be competitive in all areas of scientific research, even in a single field of astronomy and astrophysics. Therefore, while Lithuanian astronomers are clearly aware that the diversity of astronomical research directions in Lithuania has to be maintained and fostered, they think that it is necessary to focus on a smaller number of the most competitive research fields, to exploit the human and material resources in the most efficient way possible. Lithuanian astronomers believe that the following areas of research offer the highest promise for the competitive Lithuanian contribution Europe- and world-wide:

- origin and evolution of galaxies;
- evolutionary history of the Milky Way;
- life cycles of stars, star clusters and stellar populations.

To achieve these goals, apart of the Moletai Observatory, access to the following research infrastructures will be needed:

- 8-10m class telescopes, with state-of-the-art spectroscopic and imaging capabilities;
- 2-4 m class telescopes, preferably – located on a single site, such as Observatorio de Roques Muchachos (ORM), La Palma, Spain, equipped with medium to high resolution spectrographs and wide field imaging CCD cameras;
- large ground-based spectroscopic and photometric survey facilities, such as RAVE, LSST, PanSTARRS, SDSS and so forth (in part, access to their data can be acquired via the resources of Virtual Observatories);
- current and future space observatories, such as CoRoT, Kepler, Herschel, Gaia, JWST;
- new-generation ground-based telescopes and observatories, such as ALMA, TMT, GMT, E-ELT.

Professor Tautvaišienė noted that access to some of the facilities listed above may be obtained at minor added costs. Access to 8-10m and 2-4m class telescopes, as well as future ground-based telescopes, however, will require additional investment. She also stressed that investment in human resources should be one of the priority tasks. This is becoming especially urgent facing the fact that a generation of skilled senior researchers is retiring now to be replaced by new, young researchers. Training a new generation of Lithuanian astronomers is therefore a task of fundamental importance. This calls for substantial additional investments in human resources, both in terms of staff and funding.

Changing scientific priorities of the Lithuanian astronomy, partly because of the generational shift, is another factor that encourages to create a comprehensive strategy for the use of existing and new observing facilities. This is even more so important because Lithuanian community has no direct access to modern telescopes and instruments, something that has to be remedied urgently in order to ensure the continuation of the international competitiveness of Lithuanian astronomical research. While the investment needed at Moletai Astronomical Observatory (MAO) may lead to a number of interesting scientific results and it would probably not be the most efficient one in the longer run as access to larger and more efficient telescopes of 2-8m in size is vital in order to keep Lithuanian astronomy internationally competitive. The instruments at MAO are relatively small and while they can still be used for certain scientific tasks, the majority of Lithuanian astronomical community, and especially its younger generation, will be left without access to world-class observing facilities if MAO would be chosen to become the only national infrastructure in astronomy.

Lithuanian membership at ESO would be very beneficial since it would provide at once direct access to the instruments available at the leading European research infrastructure, including E-ELT, 8 m VLT telescopes and several smaller 2-4m class instruments. If done in combination with accessing membership at ORM, this combination would provide access to top-class astronomical observing facilities both at northern and southern hemispheres. One obvious drawback related with the membership at ESO is its high price.

Aušra Vilutiene, Director of Research Foundation, presented funding of research in Lithuania: current situation and long term planning. She clarified Lithuanian R&D System and the main actors within it, and informed that the investments in R&D represents 0.92 % of GDP.

The director presented the main activities of the Research Council of Lithuania, She explained the different approaches used for funding of research projects, where a Top-down approach is used for long-term national research programmes and development programmes, a bottom-up approach is used for research projects initiated by researchers or researcher groups. She also gave statistical data on projects in astronomy and astrophysics.

ESO was presented via video link from Chile by **Petr Kabath**, who also summarized advantages and benefits given by the membership in ESO to astronomers in the Czech Republic. Information on studentships at ESO, and observing time allocation process was also given.

A joint discussion:

- As one of the main topics of discussion was the question of joining ESO. The Lithuanian astronomical community considers it as one of the main goals. The price of the observing time with ESO facilities was discussed. Another question was whether there would be a possibility of joining ESO together with Estonia and Latvia, although this would not be in line with the ESO constitution. There was also a discussion on paying ESO from the EU structural funds.
- Lithuania sees as an intermediate step joining the community on Canary Islands at ORM;
- the publication analysis was discussed: it was mentioned that the Baltic Astronomy may be discontinued starting from 2015;
- Lithuanian participants expressed their view that estimate on spending in astronomy given by ASTRONET in D3.2 is higher than in reality;
- the total number of projects funded in Lithuania is declining, but the number of projects related to astronomy is increasing;
- A general road map for research infrastructure in Lithuania is prepared this year. There is also Lithuanian Science Vision based on the European science vision;
- There are common projects: EUROPLANET (with Estonia), and ERASMUS Plus (astrobiology);
- However, astronomy is not considered as one of main directions in Lithuania;

Forum on Astronomy in Romania

Meeting of ASTRONET with representatives of the major actors in astronomy in Romania

19th November 2014

ROSA Headquarters, Bucharest

The purpose of this ASTRONET visit is to better understand the structure of astronomical scientific research in Romania and to discuss the connection to “ASTRONET Science Vision for European Astronomy” and “ASTRONET Infrastructure Roadmap: A Strategic Plan for European Astronomy”.

Participants

ASTRONET

Míla Hůlová (Astronomical Institute ASCR), Nick Kylafis (University of Crete), Birgitta Nordström (Niels Bohr Institute, Copenhagen University), Emma Olsson (Swedish Research Council), Jan Palouš (Astronomical Institute CAS)

ROMANIA

Marius-Ioan Piso (Romanian Space Agency ROSA), Marian-Doru Suran (Astronomical Institute of Romanian Academy), Nedelia Antonia Popescu (Astronomical Institute of Romanian Academy), Cristina C. Popescu (Astronomical Institute of Romanian Academy), Alin Nedelcu (Astronomical Institute of Romanian Academy), Dumitru Procopi (Astronomical Institute of Romanian Academy), Mirela Brai (Astronomical Institute of Romanian Academy), Aurelia Meghea (Romanian Academy, Office for Projects & Grants) Georgeta Predeanu (Romanian Academy, Office for Projects & Grants) Sorin Zgura (Institute for Space Science ISS), Laurentiu Caramete (Institute for Space Science ISS), Radu Aurelian (Institute for Space Science ISS), Oana Sandu (Romanian Space Agency ROSA)

Program

- 9:00 – 9:15 *Welcome and introduction*
Marius-Ioan Piso & Jan Palouš
- 9:15 – 9:45 *Presentation of ASTRONET and the road map update*
Nick Kylafis
- 9:45 – 10:15 *Presentation of the main general conclusions from WP3 D.3.1 and 3.2*
Jan Palouš and Birgitta Nordström
- 10:15 – 10:30 *Publication analysis*
Emma Olsson
- 10:30 – 11:00 *Coffe / Tea Break*
- 11:00 – 11:30 *Astronomy in Romania – current situation and future perspective*
Marian-Doru Suran + Sorin Zgura
- 11:30 – 12:00 *Funding of astronomy and astrophysics in Romania: current situation and long term planning*
Aurelia Meghea

12:00 – 12:30 *European Southern Observatory*

Valentin D. Ivanov (Video connection to ESO – Chile)

12:30 – 14:00 Lunch

14:00 A joint discussion on the needs, obstacles, opportunities and future plans of astronomy in Romania, both as a national community and in relation to joint European efforts, such as the ASTRONET Roadmap, ESO, ESA and funding available at the European level (especially the new Horizon 2020), and how this could be aided by local actors and coordination on the European level.

Brief summary of the meeting

Meeting started with the welcome by *Marian-Doru Suran* and *Jan Palouš*. ASTRONET was presented by *Nick Kylafis* and its WP3 by *Birgitta Nordström & Jan Palouš*. The method for analysing the publication data was presented by *Emma Olsson* from the ASTRONET WP3 working group.

Funding of astronomy and astrophysics in Romania: current situation and long-term planning was presented by *Marius-Ioan Piso*, chair person of ROSA, who is managing national programs related to earth and security. He represents Romania in international organizations, EU, ESA etc. forming national plans of research and development. Romania is member of ESA since 2011.

In Romania the ministries are distributing the science funds: Ministry of national education has the department for research; the Romanian Academy of Sciences, which is financing the basic research, has very limited funds. Universities have no specific funds for research, but can use their own resources for research: student fees, research grants and contracts. There is a small Program of grants from Ministry of education and smaller programs of support for postdocs and very young PhDs.

A national research and development plan was composed by ministry first in 2001. It contains space and aeronautics, and a part on space and security. It also includes basic research and astronomy. A new planning process was started, however, but it was delayed by elections. There is the subcommittee for space in the parliament.

The national strategy for R&D until 2020 was approved recently. There is no specific WP for astronomy & astrophysics, however, there is the “SMART” WP focusing on space and security, which may contain astronomy. There is an agreement with EU, which may enable to access structural funding for infrastructure in the area of space. The Romanian involvement in ESA was also presented. The law which ratified the agreement with ESA includes national support programs STAR – space technology and defense research. The next call for proposals of this program will be in 2015.

The policy towards ESA is to define several national niches in which Romania should be best in Europe. To this end, centres of competence have been established including atmospheric radar, small launchers, nano satellites, very small telescopes in formation flight, test components for JUICE mission, test for geostationary satellites. The centres create close link between applied science, industry and basic science and contribute to convincing politicians on the value of basic science.

Basic science is producing very valuable industrial and societal returns within 5-20 years, and is a necessary part of the eco-system. Here the concern is not funding, but people, as many have left especially for the US. A mechanism of networking and

putting together resources, not only funding but also human resources, may help with mitigating this. There is a big potential in the repatriation of national living in foreign countries.

There is a need for strong institutions and long-term plans, which are necessary for space research and astronomy. Common long-term plans over national borders are important, however, as it is hard to keep long term plans going in a small country. Therefore international cooperation between individuals should be followed by governmental agreements. Creating projects and networks might be the most effective mechanisms to reach the “critical mass”. A possibility is to establish common eastern European facility might be a way. It should be done in collaboration with universities and research institutes, who are perfect partners for long-term plans as they are stable.

Romanian Academy participation at European Research projects *Aurelia Meghea* (Office of project and grants) presented the current open calls in Horizon 2020 that is relevant to space physics and astronomy. European funds are of great importance for the national researchers and the total funding of research. There are also national calls in relation to the Smart specialization, where space physics and astronomy are important, which should be explored by the national researchers. The fact that both astronomy and space is explicitly mentioned in the Romanian Smart specialization means that Romanian astronomers have a great opportunity and are in a good position to increase the funds available for astronomical research by preparing, formulate and sending in applications to both the EU calls (foremost in the Space area) and the national calls (e.g. ICT, space and security or technology transfer).

ESO presentation - *Valentin D. Ivanov* presented ESO history, current available facilities, research and activities, and future plans, including the E-ELT. The advantages with being part of ESO are for example that it increases the public interest in natural sciences by the publications of results, directly stimulates the high-tech industry of the country by purchasing their products.

Astronomy in Romania was discussed by *Marian Doru Suran* of the Astronomical institute (AI) of the Romanian academy of Sciences, who presented numbers of researchers and institutional funding. All funding from Romanian Academy goes towards salaries and overheads. AI also publishes the Romanian Astronomical Journal, which is supported by the national committee of astronomy. The number of publications in the Romanian Astronomical Journal is decreasing, mostly due to younger people selecting international journals. A change of generation is needed, and the wish is to both repatriate Romanian scientists from abroad and hire new scientists. A problem is that only a few local instruments have funding. Romania needs to participate in ESO, and ESO major projects (E-ELT and ALMA) to support the Romanian astronomers' need for state of the art research infrastructure. A significant increase in funding is however a condition, but as a benefit this may increase the formation of spin-off companies producing high-tech instrumentation for ground and space telescopes.

Sorin Zgura presented the Institute of space science (ISS) where, as the opposite of the AI, the budget is project-based and the base funding is small. The researchers of the institute participate in many programs.. During the discussion that followed it was

identified that the two main institutions, AI and ISS, are so similar in terms of scientific domains, they should consider to collaborate. It was proposed to establish a forum in Romania where the long-term plans and intentions will be discussed. The formulations of strategic projects by the institute of atomic physics, ISS and IA are in progress, however, it does not include ground-based astronomy. These plans will be included in the new strategy of Romanian R&D, with a special plan in the space section.

The publication strategy was discussed. Romanian Astronomical Journal belongs to the National committee of astronomy, who wants to keep it, although many Romanian researchers already chose to publish elsewhere. For ISS each collaboration has its own publishing policy, and they therefore have to follow the policy of collaboration.

Forum on Astronomy in Serbia

Meeting of ASTRONET with representatives of the major actors in astronomy in Serbia

7th November 2014

Astronomical Observatory, Beograd

The purpose of this ASTRONET visit is to better understand the structure of astronomical scientific research in Serbia and to discuss the connection to “ASTRONET Science Vision for European Astronomy” and “ASTRONET Infrastructure Roadmap: A Strategic Plan for European Astronomy”.

Participants

ASTRONET

Jean-Marie Hameury (Observatoire Astronomique Strasbourg), Member of the WP3 working group, former ASTRONET Project Coordinator and ASTRONET Executive Committee Chair, Jan Palouš (Astronomical Institute ASCR), ASTRONET Board and Executive Committee Member, Working Package 3 Leader, Birgitta Nordström (Niels Bohr Institute, Copenhagen University), Member of the WP3 working group, Emma Olsson (Swedish Research Council), Member of the WP3 working group, Míla Hůlová (Astronomical Institute ASCR), Member of the WP3 working group.

SERBIA

Zoran Knežević (Astronomical Observatory Belgrade, AOB), Slobodan Ninković (AOB), Zorica Cvetković (AOB), Gojko Đurašević (AOB), Srđan Samurović (AOB), Rade Pavlović (AOB), Luka Popović (AOB), Darko Jevremović (AOB), Goran Damljanović (AOB), Oliver Vince (AOB), Bora Jovanović (AOB), Edi Bon (AOB), Predrag Jovanović (AOB), Nataša Todorović (AOB), Nemanja Martinović (AOB), Ana Vudragović (AOB), Monika Jurković (AOB), Milica Mičić (AOB), Miroslav Mičić (AOB), Milena Jovanović (AOB), Ivana Milić-Žitnik (AOB), Atila Čeki (AOB), Olivera Latković (AOB), Milan Stojanović (AOB), Dragana Ilić (Department of Astronomy).

Program

09:00 – 09:15	<i>Welcome and introduction</i> Zoran Knežević & Jan Palouš
09:15 – 09:45	<i>Presentation of ASTRONET and the road map update</i> Jean-Marie Hameury
09:45 – 10:15	<i>Presentation of the main general conclusions from WP3 D.3.1 and 3.2</i> Jan Palouš and Birgitta Nordström
10:15 – 10:30	<i>Publication analysis</i> Emma Olsson
10:30 – 11:00	Coffee / Tea Break
11:00 – 11:30	<i>Astronomy in Serbia – current situation and future perspective</i> Zoran Knežević

11:30 – 12:00	<i>Funding of astronomy and astrophysics in Serbia</i> Branko Bugarsky, The Ministry of Education, Science and Technological Development of the Republic of Serbia
12:00 – 12:30	<i>European Southern Observatory situation and long term planning</i>
12:30	Petr Kabath (Video connection to ESO – Chile) A joint discussion on the needs, obstacles, opportunities and future plans of astronomy in Serbia, both as a national community and in relation to joint European efforts, such as the ASTRONET Roadmap, ESO, ESA and funding available at the European level (especially the new Horizon 2020), and how this could be aided by local actors and coordination on the European level.

Brief summary of the meeting

The meeting started by a welcome by the director of the Astronomical Observatory of Belgrade, *Zoran Knežević*, together with *Jan Palouš* from ASTRONET, after which *Jean-Marie Hameury* former coordinator of ASTRONET, presented the workpackages and plans included in ASTRONET. Thereafter *Jan Palouš* and *Birgitta Nordström* from the ASTRONET work package 3 working group presented the main general conclusions from the first two tasks of the work package. There was a brief discussion on the estimate of the spending on astronomy in Serbia, and the general feeling was that 1.9 million euro is an overestimate, and a realistic number is around half of this. As the data for average salary was not available in the Eurostat data used the director agreed to provide the ASTRONET working group with a number. The method for analysing the publication data was presented by *Emma Olsson* from the ASTRONET WP3 working group.

Zoran Knežević presented Astronomy in Serbia, number of researchers, age structure and the funding situation. Regarding the age structure there is a good percentage of younger researchers in astronomy. The financial support is mostly project based, with a normal duration of 4-5 years. 35% of grant awarded in the projects goes to “overheads“, e.g. administrative cost etc., the projects also covers travels, equipment and salaries. The projects are normally quite heterogeneous, as they are needed to finance the salaries of the staff, and all the research areas of the scientific staff therefore need to be included in the projects. The average salary for a researcher is around 600 euro per month, and is set on a national level (e.g. the institutes themselves do not set the salaries). Due to the financial crisis the salaries for researchers have currently been cut by 10%. Noted was also the very direct correspondence with salary category and the individual performance evaluation set directly by a point system depending on how many papers, and in which journals, each researcher publishes (based on a 5-year total prior to the application for a new project cycle).

In addition to the national funding, European projects are important for funding. Serbian astronomers are involved in the project BELISSIMA⁶ (an FP7 REGPOT project), VAMDC⁷ (FP7 Infrastructure project, now completed), STARDUST⁸ (MC Initial Training Network). Aiming to more involvement in European activities. Serbia is also involved in the ERASMUS Master course ASTROMUNDUS, a member of COST, and SREAC (was supported by Unesco). Two astronomy publications are produced in Serbia: the Serbian Astronomical Journal and Publications of the Astronomical Observatory of Belgrade. The education in astronomy is present at all levels, from the elementary school to the PhD studies.

In the nearby future there is a plan is to build a 1.4 m robotic telescope. Serbian astronomers also plan to participate in the American project LSST.

For Serbia, one of the more important goals is membership in the EU and to define its role in the Union.

The assistant minister *Branko Bugarsky* presented the funding of astronomy and astrophysics in Serbia.

Serbian astronomers are ranked highly according to evaluation process done by international reviewers. The number of publications is increasing, and also the impact factor of the publications is increasing.

The plan regarding basic funding is that a new call will be in May 2015 for the nationally funded projects, which will be for five years. The strategy for fundamental research by the ministry is to have a bottom up approach, as there is no need to force basic science to fulfil strategic needs. The hope is to, by the end of the year, conclude the credit from European investment bank to renew old equipment.

Serbia is, in the beginning of December, going to present their science and research policy to the EU as part of the EU accession negotiations.

The level of funding will depend on the decision about the budget that will be taken by the parliament in January, and will hopefully increase. The funding for basic institutional costs – the running of institutes, administration etc. was recently increased. Coming changes in institutional funding may decrease the part of the external projects that goes to administrative costs may decrease.

The current GERD in Serbia is 0.34 % of GDP, which, together with the loan from the European investment bank, sums up to 0.42% in total. The forecast for next year is it will be 0.42%. The assistant minister also informed that Serbia is in the process of developing a new strategic plan for the next year. The process has been initiated by ministry.

ESO was presented via video link from Chile by *Petr Kabath*, who showed the advantages and benefits given by the membership in ESO to astronomers in the Czech Republic. Information on current and planned research, studentships at ESO, and observing time allocation process was also given. There are two observing

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Belgrade Initiative for Space Science, Instrumentation and Modelling in Astrophysics

7 Virtual Atomic and Molecular Data Center

8 STARDUST – the Asteroid and Space Debris Network

modes: visitor's mode and service mode. When PI is from ESO member state, ESO covers the travel expense for successful proposals.

Discussion

The joint discussion took a starting point from the fact, and opportunity, that a new strategic plan for Serbian research was going to be developed by the government. The Serbian astronomers will have to find their own niche. As there have been limited access to observational facilities for many years, many astronomers have moved to theoretical and numerical work. There is a need for access to top level observing facilities to develop this part. In the longer plan joining ESO would be the correct step.

Building on their skills Serbian astronomers work with LSST and participate in building of software in preparation for the survey. A problem in this context is that funding required is a long term commitment, while the available funding, in project form is short term. A solution to this has been to „pay up front“ to LSST instead of paying per year. This option has made it viable to participate in LSST. However, this is still subject to final approval by the ministry.

Joining ESO would be more expensive, and give the problem with access to long-term funding. However, it was discussed if the plans of Serbia to join EU may help with joining ESO, as there is monetary support for new member states, and some of it may be used for the initial costs of joining ESO.

A comment was made that it is important to have HPC and observations together.

There was a short discussion on ESA membership, but it is more costly than ESO membership.

It was also discussion options on how to raise the level of observational skills in a country. One option would be to apply for observing time via OPTICON.

Another possible way is via national telescopes at La Silla, where the cost needed to be covered is basically the operation cost. Buying observational time is a also way to build competence.

Concluding remarks

Serbian astronomers would wish to work on a strategy, both in mid-term and long-term perspective, both concerning access to infrastructure and priorities for recruitment etc. When doing this, ASTRONET could help by providing examples of road maps from other countries.

A question is how to get the ministry interested in the strategy produced by the astronomers. This is especially problematic as there are frequent changes at the political level. The absence of a separate funding agency was seen as problematic. However, having a clear plan and agreed on priorities may help when talking to the politicians.

The new telescope was discussed. The role for the telescope will be: 1. Need to start observing in transient 2. Follow up, networking (e.g GAIA) 3. Education/training. It also serves to reincarnate observational astronomy in the country. The next natural step would be to apply for time on bigger telescope. It was argued that this was not excluding each other but rather complementary. The national telescope should serve for a new level of participation in international level.. The plan in Serbia is to have a

robotic telescope and a minimum number of employees, which reduces expenses to absolute minimum.

Another way to raise the level of observational skills could be to approach ESO to make an agreement on studentships at ESO. Options could be joint funding of PhD theses or programs for students to train at top level infrastructures. If one wished to approach ESO for such agreements, it is necessary that there is a national plan for developing the observational capabilities, and that the country contributes part of the funding.

A discussion of impact of published results followed. Serbia could consider joining the A&A. However, there were some reluctance if this also should mean closing the Serbian Astronomical Journal. The feeling was that the salary categories based on publications, with more points to those publishing in the top 20% journals should stimulate the astronomers to publish in the best journals.

Forum on Astronomy in Slovakia

Meeting of ASTRONET with representatives of the major actors in astronomy in Slovakia

9th February 2015

Astronomical Institute, Slovak Academy of Sciences, Stará Lesná

The purpose of this ASTRONET visit is to better understand the structure of astronomical scientific research in Slovakia and to discuss the connection to ASTRONET Science Vision for European Astronomy and ASTRONET Infrastructure Roadmap: A Strategic Plan for European Astronomy.

Participants

ASTRONET

Jean-Marie Hameury (Observatoire Astronomique Strasbourg), Míla Hůlová (Astronomical Institute ASCR), Laurits Leedjärv (Tartu Observatory), Jan Palouš (Astronomical Institute ASCR)

SLOVAKIA

Aleš Kučera (Astronomical Institute, SAS), Martin Vaňko (Astronomical Institute, SAS), Ján Rybák (Astronomical Institute, SAS), Theodor Pribulla (Astronomical Institute, SAS), Luboš Neslušan (Astronomical Institute, SAS), Marek Husárik, (Astronomical Institute, SAS), Štefan Parimucha (Institute of Physics, Faculty of Science, University of P. J. Šafárik, Košice), Leonard Kornoš (Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava)

Program

09:00 - 09:15 *Welcome and introduction*

Aleš Kučera & Jan Palouš

09:15 - 09:45 *Presentation of ASTRONET and the road map update*

Jean-Marie Hameury

09:45 - 10:15 *Presentation of the main general conclusions from WP3 D.3.1 and 3.2*

Jan Palouš and Laurits Leedjärv

10:15-10:30 *Publication analysis*

Jan Palouš

10:30-11:00 *Coffee / Tea Break*

11:00-11:30 *Astronomy in Slovakia - current situation and future perspective*

Aleš Kučera

11:30-12:00 *Funding of astronomy and astrophysics in Slovakia: current situation and long term planning*

Aleš Kučera

12:00-13:00 *A joint discussion* on the needs, obstacles, opportunities and future plans of astronomy in Slovakia, both as a national community and in relation to joint European efforts, such as the ASTRONET Roadmap, ESO, ESA and funding available at the European level (especially the new Horizon 2020), and how this could be aided by local actors and coordination on the European level.

13:00-14:00 Lunch

14:00-14:30 *European Southern Observatory*
Koraljka Muzic (Video connection to ESO Chile)

Brief summary of the meeting

The meeting started by a welcome by the director of the Astronomical Institute of the Slovak Academy of Sciences, *Aleš Kučera*, together with *Jan Palouš* from ASTRONET, after which *Jean-Marie Hameury*, former coordinator of ASTRONET, presented the Work Packages and plans included in ASTRONET.

Jan Palouš and *Laurits Leedjäv* from the ASTRONET Workpackage 3 working group presented the main general conclusions from the first two tasks of the Work Package. There was a brief discussion on the data relating to Slovak Astronomy reached by the working group's analysis. Representatives of the Slovak astronomical community basically agreed with these data. The method for analysing the publication data was presented by *Jan Palouš*. It was followed by a debate about the meaning, requirements, importance of the local astronomical journal in the Slovak Republic, but also in other countries generally.

Aleš Kučera presented Astronomy in Slovakia, the main institutions, the research areas and the number of researchers. He focused on research potential of the Astronomical Institute of the Slovak Academy of Sciences and primarily mentioned that this institute coordinates the Center of space research. There is new instrumentation in the Centre obtained in frame of three Structural funds projects. Astronomical Institute itself has long experience in investigation of the solar atmosphere (corona, chromosphere, fine structures, active phenomena) using large ground based instruments as VTT, SST, THEMIS DOT; own research programs at ESA (and NASA) missions, e.g. SoHO (CDS, MDI, SUMER...) TRACE, HINODE, and the local infrastructure has been updated. There is also ground-based observational support for ESA missions aimed at photometric detection of transiting planets (PLATO and TESS) and characterization of planet atmospheres using infrared spectroscopy (ESM). In a summary of information on astronomy in Slovakia *Aleš Kučera* concluded that there is quite a good infrastructure but the future is not very promising. Major problems and obstacles are: every year unclear budget (obviously less and less); No clear and stable plans from Government for future; Emphasis on projects financing – less institutional sources, no time to work in quiet; Problem with students and young generation - less and less people and emigration abroad.

Whereas *Róbert Szabó*, Secretary of the Government office of the Slovak Republic Ministry of Education, Science and Sport, excused from the meeting, *Aleš Kučera* explained also funding of astronomy and astrophysics in Slovakia: current situation and long term planning. He talked about the new strategy in Ministry of Education, Science, Research and Sport of the Slovak Republic prioritizes five scientific fields, unfortunately, there is not astronomy among them. On the other hand, they can use category Excellence Science. The principal funding sources are provided by the government directly for the Slovak Academy of Science (SAS) from its own state budget chapter, and for universities (through Ministry of Education, Science, Research and Sports (MESRS)). Besides of that additional funding comes from national and international grant agencies. Slovakian funding agencies are:

A) Grant Agency VEGA (joint advisory body of the and an auxiliary body of the presidium of the SAS and of MESRS for projects selected for funding from institutional finance resources under two sub-chapters of the State Budget: (a) the University-based science and technology, and (b) the Slovak Academy of Science. Key activity of the VEGA is to support basic research in the Slovak Academy of Sciences and Universities in general and institutional finance in particular);

B) Grant Agency SRDA (Slovak Research and Development Agency); open agency for everyone in Slovakia who performs science, research and technology work.

C) Agency for Structural Funds of EU (ASFEU) managed by MESRS. It is for grants preferably oriented to improve research infrastructure in Slovakia

At the moment Slovakia is a new member of PECS (ESA) and there is expectation to be full member of ESA in next five years. Slovakia is not ESO member and therefore no funding comes for astronomy and space research by these channel. Extraordinary investments to astronomical infrastructure are now given using the structural funds of the EU (new 1,3-m telescope for Near Earth Asteroids studies, multichannel coronal polarimeter and other modern post-focal detectors, 0.5m telescope of P.J.Šafárik University). Institutions responsible for the preparation of long term, strategic plans in astronomy/astrophysics are: Slovak Academy of Sciences, Ministry of Education, Science, Research and Sport of the Slovak Republic, National Committee for Astronomy. Strategic plan for astronomy does not exist. The biggest problem is small running money. For example the Astronomical Institute could not run without grants. Regarding salaries, they expect significant changes, due to the restructure of the Slovak Academy of Sciences – from 2016 the institutes will obtain the status of public research institutions.

Main topic of the joint discussion was funding. ERC grants are also discussed, however, none of Slovak astronomical community asked for. Representatives of the Slovak astronomical community noted big changes against past time. People are tired from preparing proposals for projects each year, they have less time for work. There is no road map of Astronomy in Slovakia. Director of the Astronomical Institute is not sure if it would be useful to have a roadmap (to small astronomical community and nobody from ministry will take care about it). Money goes to health, agriculture, army; government don't support astronomy, which is a big problem also for education. There is also problem of stability of the science policy in Slovakia (changes reflects the changes at the post of Minister of Education, Science, Research and Sport).

ESO was presented via video link from Chile by *Koraljka Muzic*, she showed the advantages and benefits given by the membership in ESO to astronomers in member countries. Information on current and planned research, studentships at ESO and observing time allocation process was also given.

APPENDIX B

FINAL WORKSHOP

Integration of new Member States in the future of Europe astronomy

ASTRONET - WP3

Concluding workshop
Prague 4 - 5 June 2015
Academic Conference Centre
Husova 4a, Prague 1

Program

June 4th 2015

12:00 - 14:00 Registration + lunch

14:00 - 14:10 Jan Palouš: Integration of new Europe States in Astronomy - WP3

14:10 - 14:40 Nick Kylafis: Analysis of the key research areas to be developed - D3.1

14:40 - 15:10 Laurits Leedjärv: Identify the key financial needs - D3.2

15:10 - 15:30 Emma Olsson: Publication Analysis

15:30 - 16:00 Jan Palouš: Targeted Visits: Lessons Learned

16:00 - 16:30 coffee/tee break

16:30 - 17:00 Johannes Andersen: Strategies with Local Telescopes

17:00 - 17:30 Birgitta Nordström: Local Journals and A&A

17:30 - 18:00 Denis Mourard: Future of ASTRONET

19:00 Dinner – Restaurant Století, Karolíny Světlé 21/320, Prague 1

June 5th 2015

Presentations on Astronomy in Associate and other countries of the Region

9:00 - 9:15 Laurits Leedjärv: Estonia;

9:15 - 9:30 Ilgmars Eglitis: Latvia;

9:30 - 9:45 Gražina Tautvaišienė: Lithuania;
9:45 - 10:00 Zoran Knežević: Serbia;
10:00 - 10:15 Evgeni Semkov: Bulgaria;
10:15 - 10:30 Marian Suran: Romania;
10:30 - 10:45 Aleš Kučera: Slovakia;
10:45 - 11:00 Lajos Balazs: Hungary
11:00 - 11:30 coffee/tee
11:30 - 11:45 Krešimir Pavlovski: Croatia;
11:45 - 12:00 Gordana Apostolovska: Macedonia
12:00 - 12:15 Petr Berczik: Ukraine
12:15 - 12:30 Petr Hadrava: Czech Republic;
12:30 - 13:00 other countries
13:00 - 14:00 lunch
14:00 - 16:00 Jan Palouš: Drafting D3.3
16:00 END

Participants:

Johannes	ANDERSEN	Denmark
Antoaneta	ANTONOVA	Bulgaria
Gordana	APOSTOLOVSKA	Macedonia
Lajos G.	BALAZS	Hungary
Peter	BERCZIK	Ukraine
Zsuzsanna	BERCZIK	Ukraine
Ilgmars	EGLITIS	Latvia
Petr	HADRAVA	Czech Republic
Míla	HŮLOVÁ	Czech Republic
Petr	KABATH	Czech Republic
Zoran	KNEŽEVIC	Serbia
Elisabeth	KOHLER	France
Michaela	KRAUS	Estonia
Aleš	KUČERA	Slovakia
Nick	KYLAFIS	Greece
Laurits	LEEDJÄRV	Estonia
Denis	MOURARD	France
Birgitta	NORDSTRÖM	Denmark
Emma	OLSSON	Sweden
Jan	PALOUŠ	Czech Republic
Krešimir	PAVLOVSKI	Croatia
Luboš	PEREK	Czech Republic
Evgeni Hristov	SEMKOV	Bulgaria
Marian	SURAN	Romania
Gražina	TAUTVAIŠIENĖ	Lithuania
Martin	VAŇKO	Slovakia