

LEA Astro-PF
period of validity of the convention of the LEA: 2009-2012

Scientific managers:

Grazyna Stasinska, LUTH, UMR 8102, Observatoire de Paris
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REPORT FOR THE YEAR 2011



A. TRANSNATIONAL MOBILITY

A.1- Organization of workshops within the LEA

Four LEA Astro-PF workshops took place in 2011, funded by the Polish side (except for the travels of the French participants, which were partly funded by the French side)

1- "VIPERS Collaboration Meeting"

organizer: Agnieszka Pollo

Total number of participants : ~40

number of French participants: 10

number of Polish participants: 7

Place and date: Krakow, Poland, 21-23 September 2011

<http://vipers2011.fuw.edu.pl>

The VIMOS Public Extragalactic Redshift Survey (VIPERS, <http://vipers.inaf.it/>) project is an ongoing ESO Large Program using the multispectrograph VIMOS at the VLT to measure 100000 redshifts for galaxies at $0.5 < z < 1.2$. In Krakow was organized the 4th VIPERS Science Team meeting, devoted to discussions on:

- the present status of the Survey (>35 000 redshifts already internally available to the team), plans for completion of the survey and future internal and public releases of the data

- scientific output from the data and on-going papers. The rough agenda of the meeting is available from the meeting's web page: http://vipers2011.fuw.edu.pl/docs/KrakowAgenda_v2_1.pdf.

Main scientific topics discussed were related to properties and clustering of galaxies at $z \sim 1$.

2- "Slim disk workshop"

organizer: Wlodzimierz Kluzniak

Total number of participants : ~50

number of French participants: ~4

number of Polish participants: ~12

Place and date: Warsaw (CAMK), Poland, 1-8 July 2011

<http://users.camk.edu.pl/as/slimworkshop/>

topics:

Validity of the alpha prescription

Disk vertical structure: radiative transfer, velocity

Thermal stability of slim disks

QPOs and disk oscillations

The Eddington Limit

Black hole spectra: calculations, fitting the data

Spinning up the black hole

Black hole spin: spectra, iron line, QPOs, polarization, limit cycle

Unsolved problems, research projects for near future with long (90min) panel discussion

3- "CTA SITE Workshop"

organizer: Tomek Bulik

Total number of participants: 11

French: 3

Polish: 3

Place and date: Sep 1-2 2011. Astr. Obs Univ of Warsaw
<https://www.cta-observatory.org/indico/conferenceDisplay.py?confId=103>

The workshop addressed the current work in search of the site for CTA. Major accomplishments in the workshop were decisions on the satellite ground data cross correlation, and plans for using long term numerical weather modeling.

4- "Physical and chemical aspects of late stages of stellar evolution"

organizer: Ryszard Szczerba

total number of participants: 59

nb of French participants: 5

nb of Polish participants: 9

place and date: NCAC, Warsaw, Poland, 29 Aug - 1 Sep, 2011

http://www.ncac.torun.pl/ncac_symp/

The main reason for organizing this conference was to deliver the 1st NCAC medal to prof. Alain Omont from IAP for his great involvement in establishing the Polish-French collaboration in astrophysics and for his outstanding scientific achievements in many fields of astrophysics. During the conference different aspects of late stages of stellar evolution were discussed, including the most important discoveries and future prospects resulting from the recent space missions as well as ground based projects in Milky Way and the Local Group of Galaxies, especially for low and intermediate-mass stars.

A.2 - Invitation of researchers from Polish laboratories, in French laboratories

* object of the invitation : collaboration with G. Mamon

dates : 25.02.2011 - 12.03.2011 and
10.10.2011 - 04.11.2011

name of the visiting person : Maciej Bilicki, PhD student

laboratory of origin : CAMK

inviting laboratory Institut d'Astrophysique de Paris, UMR 7095 CNRS, Universite Pierre et Marie Curie

* object of the invitation : collaboration with S. Colombi, collaboration with G. Mamon

dates : 14/03-28/03, 20/07-31/07, 03/11-14/11/2011

name of the visiting person : Michal Chodorowski, senior researcher

laboratory of origin : CAMK

inviting laboratory : Institut d'Astrophysique de Paris, UMR 7095 CNRS, Universite Pierre et Marie Curie

* object of the invitation: collaboration with the VIPERS group in LAM (Marseille)

dates 3-16.11.2011

name of the visiting person: Agnieszka Pollo, senior researcher

laboratory of origin: Center for Theoretical Physics/Jagiellonian University/National Center for Nuclear Research

inviting laboratory: Laboratoire d'Astrophysique de Marseille

* Object of the invitation: Collaboration with Paris 7

Dates: 25.09.2011 - 02.10.2011

Name of the visiting person: Jakub Mielczarek

Laboratory of origin: Astronomical Observatory of the Jagiellonian University
Inviting laboratory: APC - Astroparticule et Cosmologie, Universite Paris Diderot Paris 7

* object of the stay: Collaboration with J. Marquette
dates: one week in May 2011, paid by the Polish side + 7-11 Nov, 2011
name of the visiting person: Alexander Schwarzenberg-Czerny, senior researcher
laboratory of origin: CAMK
inviting laboratory : Institut d'Astrophysique de Paris, UMR 7095 CNRS, Universite Pierre et Marie Curie

* object of the invitation: collaboration with E. Gourgoulhon
dates: 8-15.06 and 29.11 - 07.12
name of the visiting person: Michal Bejger, post-doc
laboratory of origin: CAMK
inviting laboratory: LUTH, UMR 8102, Observatoire de Paris

* object of the invitation: collaboration with E. Gourgoulhon
dates: 29/11 - 7/12 2011.
name of the visiting person: Odele Straub, PhD student
laboratory of origin: CAMK
inviting laboratory: LUTH, UMR 8102, Observatoire de Paris

* object of the invitation: collaboration with E. Gourgoulhon
dates: 17-20/11 and 25/11- 5/12 2011
name of the visiting person: Morgane Fortin, PhD student
laboratory of origin: CAMK
inviting laboratory: LUTH, UMR 8102, Observatoire de Paris

* object of the invitation: collaboration with E. Gourgoulhon and M. Fortin
dates: 26.03 - 9.04
name of the visiting person: Leszek Zdunik, senior researcher
laboratory of origin: CAMK
inviting laboratory: LUTH, UMR 8102, Observatoire de Paris

* object of the invitation: Habilitation of dr Micaela Oertel,
collaboration with Silvano Bonazzola
dates: 30 March - 4 April 2012
name of the visiting person: Pawel Haensel, Professor
laboratory of origin: CAMK
inviting laboratory: LUTH, UMR 8102, Observatoire de Paris

* object of the invitation: collaboration in Montpellier
dates: 16-22 January 2011
name of the visiting person: Marek Jamrozy, senior researcher
laboratory of origin: Krakow Observatory
inviting laboratory: Université de Montpellier

* object of the invitation: collaboration with G. Stasinska
dates: 24.01.2011 - 5.02.2011
name of the visiting person: Dorota Koziel-Wierzbowska, assistant

laboratory of origin: Krakow Observatory
inviting laboratory: LUTH, UMR 8102, Observatoire de Paris

* object of the invitation: collaboration with G. Stasinska
dates: 24.01.2011 - 5.02.2011
name of the visiting person: Ryszard Szczerba, senior researcher
laboratory of origin: CAMK, Torun
inviting laboratory: LUTH, UMR 8102, Observatoire de Paris

* object of the invitation : Collaboration with CRAL (Lyon)
dates : 3-31 January 2012 (paid by the Polish side on the 2011 budget)
name of the visiting person: Boud ROUKEMA, senior researcher
laboratory of origin : TCfA, UMK, Torun
inviting laboratory : CRAL, Obs Lyon

* object of the invitation: Collaboration with Loic Villain
dates: 11-17 April 2011
name of the visiting person : Dorota Gondek-Rosinska senior researcher
laboratory of origin : University of Zielona Gora, CAMK
inviting laboratory : LUTH, Observatoire de Paris

* object of the invitation: collaboration with L. Ben Jaffel
dates: 4-18/05/2011, 4-17/10/2011 (partly paid by ASTRO PF Polish side), and 13-23/12/2011
name of the visiting person: Romana Ratkiewicz, senior researcher
laboratory of origin: Space Science Research PAS, Warsaw
inviting laboratory: IAP

* object of the invitation: collaboration with L. Ben Jaffel
dates: 4-18/05/2011
name of the visiting person: Marek Strumik, PhD student
laboratory of origin: Space Science Research PAS, Warsaw
inviting laboratory: IAP

* object of the invitation: collaboration with Y. Gallant
dates: 2.10 - 22.10.2011
name of the visiting person: Anna Zajczyk, PhD student
laboratory of origin: Nicolaus Copernicus Astronomical Center, Torun, Poland
inviting laboratory: Laboratoire de Physique Theorique et Astroparticules, UM2, Montpellier, France

* object of the invitation: collaboration with O. Chesneau
dates: 4.09.2011 - 15.10.2011 (partly funded by the Polish side)
name of the visiting person: Madgalena Otulawska-Hypka
laboratory of origin: CAMK, Warsaw
inviting laboratory: Observatoire de Nice

* object of the invitation: collaboration with J.F. Glicenstein dates: 13 - 24 June 2011
name of the visiting person: Anna Barnacka
quality: student
laboratory of origin: Nicolaus Copernicus Astronomical Center, Warszawa, Poland
inviting laboratory: DSM/IRFU/SPP, CEA/Saclay, F-91191 Gif-sur-Yvette, France

A.3 - Stays, in the Polish laboratories, of researchers from French laboratories.

* object of the stay: LEA Astro-PF meeting, collaboration with Dorota Koziel, collaboration with R. Szczerba and participation in the workshop "Physical and chemical aspects of late stages of stellar evolution"

dates: 10/15/01/2011, 28/08 - 16/09/2011

name of the visiting person: Grazyna Stasinska, senior researcher

laboratory of origin: LUTH, UMR 8102, Observatoire de Paris

inviting laboratory: Copernicus Center, Warsaw

* Object of the stay: Collaboration with Krakow Observatory

Dates: 31.03.2011 - 01.05.2011

Name of the visiting person: Thomas Cailleteau

Laboratories of origin: Laboratoire de Physique Subatomique et de Cosmologie, Grenoble

Inviting laboratory: Astronomical Observatory of the Jagiellonian University

* object of the stay: Collaboration with A. Schwarzenberg-Czerny

dates: dates 5-19 May 2011, 3-10 October 2011

name of the visiting person: Jean-Baptiste Marquette, senior researcher

laboratories of origin: Institut d'Astrophysique de Paris, UMR 7095 CNRS, Universite Pierre et Marie Curie

inviting laboratory: Copernicus Center, Warsaw

* Object of the stay : collaboration with M. Bejger, P. Haensel & J.L. Zdunik, and O.

dates : 30.06-6.07

name of the visiting person : Ericourgoulhon, senior researcher

laboratory of origin: LUTH, UMR 8102, Observatoire de Paris

inviting laboratory: Copernicus Center, Warsaw

* Object of the stay : collaboration with M. Bejger, P. Haensel & J.L. Zdunik, and O.

dates : 31 jan – 6 Febr 2011 and 1 juil - 6 juil 2011

name of the visiting person : Frédéric Vincent, PhD student

laboratory of origin: LUTH, UMR 8102, Observatoire de Paris

inviting laboratory: Copernicus Center, Warsaw

* Object of the stay: Collaboration with D. Gonddek-Rosinska

dates 15-22 May; 17-31 July 2011

name of the visiting person Loic Villain, senior researcher

laboratories of origin LMPT, Univ. Tours, LUTH, Observatoire de Paris

inviting laboratory CAMK, University of Zielona Gora

A few additional visits of French researchers were funded by the LEA Astro-PF, in relation with the LEA workshops mentioned above.

A.5 – Seminars

1. Thomas Cailleteau : "Loop quantum cosmology and a way to test it via perturbations in the CMB", Krakow Observatory, April 2011

2. Boud Roukema: "Matched disc strategies for T^3 parameter estimates" (CRAL, Lyon, jan 2012)
3. Dorota Koziel-Wierzbowska: "FR II galaxies in the SDSS" CAMK astro-PF meeting january 2011
4. Agnieszka Pollo: "VIMOS Public Extragalactic Redshift Survey" (VIPERS) CAMK astro-PF meeting january 2011
5. Alex Schwarzenberg-Czerny: "Populations of variable red giants in the Magellanic Clouds" CAMK astro-PF meeting january 2011
6. Loic Villain "On differential rotation of compact stars", 20 May 2011, Instytut Matematyczny PAN, Warsaw

B. WORK IN COLLABORATION

B.1 - Progress report of the scientific project of the LEA

The report is organized by general topics A--F

A Galaxies and Cosmology

Is the 2MASS clustering dipole convergent?

French side : Gary Mamon, Thomas Jarrett

Polish side : Maciej Bilicki, Michal Chodorowski

The growth of the clustering dipole of galaxies from the Two Micron All Sky Survey (2MASS) was studied. It was found that the dipole does not converge before the completeness limit of the survey. The observed growth of the dipole was compared with the theoretically expected, conditional one, for the Λ CDM power spectrum and cosmological parameters constrained by WMAP. The observed growth turned out to be within 1σ confidence level of its theoretical counterpart once the proper observational window of the 2MASS flux-limited catalog was included. It was showed that for a given flux limit and a corresponding distance limit, the 2MASS flux-weighted window passes less large-scale signal than the top-hat one. It was concluded that the growth of the 2MASS dipole for effective distances greater than 200 Mpc h^{-1} is only apparent. Since for the window function of 2MASS the predicted growth is consistent with the observed one, one can compare the two to evaluate $\beta = \Omega_m^{0.55} / b$. The result is $\beta = 0.38 \pm 0.04$, which leads to an estimate of the density parameter $\Omega_m = 0.20 \pm 0.08$.

The correlation function in redshift space at mildly non-linear scales

French side S. Colombi

Polish side M. Chodorowski

Colombi and Chodorowski started a collaboration on this project in December 2010. Measurements of the spatial correlation function of galaxies in redshift surveys serve as a tool to estimate the value of the cosmological parameter Ω_m , the growth rate of density fluctuations and the length of a 'standard ruler' in the Universe. They are thus currently very 'hot' topics in cosmology. In order to reach the goals outlined above, not only very precise measurements are needed, but also a very accurate modeling of the correlation function of galaxies. The latter is very non-trivial, because the galaxy distribution is given not in real, but in redshift space (redshift z instead of distance r). The so-called 'redshift distortions' of clustering greatly complicate the way in which the galaxies are viewed in redshift space.

The classical model of the galaxy correlation function in redshift space (Hamilton 1992) is valid only for small fluctuations and in the limit of an infinitely remote observer. However, in reality fluctuations are not small and the observer is always at a finite distance from the source. Moreover, besides a large-scale, coherent component of their velocity, galaxies have a small-scale, random component. Working on all of these three issues, thus far Chodorowski and Colombi have managed to calculate the (linear) generalization of the Hamilton formula for large opening angles. Still, this paper is not written up yet. They have also managed to account for the effect of the random component of the galaxy motion on the correlation function. Initially They were thinking of publishing this result as a separate work, but eventually they decided to combine it with the calculations of nonlinear effects. The latter turned out to be the most difficult part of the investigations. Using their ingenious nonlinear 'Ansatz' they have obtained some improvement over the Hamilton formula. However, they think that they can provide further improvement, so this work is still in progress.

Global topological feedback due to inhomogeneities

French side : Blanloeil, Martin

Polish side : Roukema, Kazimierczak

On the theoretical side, Roukema, Buchert, and Blanloeil have mainly focussed on the Lemaitre-Tolman-Bondi (LTB) family of exact solutions of the Einstein equations, which generalises beyond the Friedmann-Lemaitre-Robertson-Walker (FLRW) solutions, offering a practical tool for considering the relation between the topology of the Universe and the inhomogeneous nature of the real Universe. In particular, they have found interesting consequences of the free function defining the big bang time in the LTB models. They consider generalisations of the bang time function in more generic inhomogeneous models, both with simply connected and multiply connected spatial topology.

On the observational side, Roukema, Martin, Kazimierczak and Buchert are studying practical observational strategies for checking the 3-torus FLRW model of the Universe, which presently fits the cosmic microwave background data better than the infinite flat model, but has not yet been constrained by multiple images of ordinary, gravitationally collapsed astrophysical objects.

Cosmological footprints of loop quantum cosmology

French side : Barrau, Cailleteau, Grain

Polish side : Mielczarek

The authors have constructed a theory of cosmological perturbations in the framework of loop

quantum cosmology.

Based on this theory it will be now possible to investigate footprints of the Planck epoch in the spectrum of anisotropy and polarization of the cosmic microwave background (CMB) radiation. In particular, quantum corrections to the phase of cosmic inflation can be studied. The considerations were performed for both, the scalar and vector perturbations. Based on this research, they wrote two articles, which are currently processed in *Classical and Quantum Gravity*. In their earlier research they have performed similar analysis of the tensor perturbations (gravitational waves). Based on that, they have derived predictions regarding the B-type polarization of the CMB.

Gravitational waves in an anisotropic universe

French side : Geiller

Polish side : Mielczarek

Geiller and Mielczarek have initiated analysis of the gravitational waves in the anisotropic universe. This work will be continued in the near future. The aim is to find an answer to the following question: "Can the effects of anisotropy in the early universe be tested observationally?"

FRII radio galaxies in the SDSS

French side : G. Stasinska

Polish side : D. Koziel-Wierzbowska

In 2011 D. Koziel-Wierzbowska and G. Stasinska finished the first part of their collaboration involving studies of FRII radio galaxies in the SDSS. Starting from the Cambridge Catalogues of radio sources, they have created a sample of 401 FRII radio sources that have counterparts in the main galaxy sample of the DR7 of the SDSS and analysed their radio and optical properties. They found that the luminosity in the H α is strongly correlated with the radio luminosity. They showed that the absence of emission lines in about one third of our sample is likely due to a detection threshold and not to a lack of optical activity. Compared to classical AGN hosts in the main galaxy sample of the SDSS, their FRII galaxies show a larger proportion of objects with very hard ionizing radiation field and large ionization parameter. On the other hand, a few objects are ionized by a softer radiation field.

They also found that the black hole masses and stellar masses in FRII galaxies are very closely related. A comparison sample of line-less galaxies in the SDSS follows exactly the same relation, although the masses are smaller. This suggests that the FRII radio phenomenon occurs in normal elliptical galaxies, preferentially in the most massive ones. The M_{BH} vs M^* relation in a comparison sample of radio-quiet AGNs is very different, suggesting that these galaxies are still building their central black holes. All results are published in Koziel-Wierzbowska & Stasinska, 2011.

Marek Sikora, from CAMK, is very interested in our results and entered the collaboration to extend it towards theoretical aspects.

Clustering of galaxies in the VVDS Surveys

French side : O. Lefèvre and the French side of the VIPERS team
Polish side : Pollo and the Polish side of the VIPERS team

The aim of the project is the analysis of the evolution of clustering of galaxies and relations between properties of galaxies, their host dark matter haloes and large scale structure of the Universe. The data are from deep spectroscopic ESO surveys: VVDS (existing) VIPERS (on-going), VUDS (just started).

In 2011 the authors worked on the preparation of the VIPERS catalog: by now 41% of the planned survey area has been observed and data reduced. They prepared the codes for the clustering analysis of these data, and made the preliminary analysis of the properties of the green valley galaxies below and above $z=1$ in the VIPERS catalog. They made the measurements of the luminosity dependence of clustering properties of the VVDS-Wide galaxies. They started the observations and data reduction of the VIPERS Ultra-Deep Survey, aiming at galaxies at $z>2$.

B High Energy Astrophysics

HESS collaboration

French side : C. Boisson, H. Sol, Y. Gallant

Polish side : R.Moderski, B.Rudak, A. Barnacka, A. Zajczyk, T.Bulik, M. Sikora, W. Kluzniak, M. Jamrozy

HESS is one of the leading observatories studying *very high energy* gamma-ray astrophysics. The HESS collaboration involves institutions from over 12 countries, among which Poland and France play an important role. In 2011 HESS has discovered gamma-ray emission in pulsars, BL Lac objects, radio galaxies, stellar clusters, supernova remnants. There are several specific Polish-French collaborations within the HESS project, some of which are described in this report.

Radio observations of extended Galactic gamma-ray sources

French side : Y. Gallant

Polish side : M. Jamrozy

A long-standing collaboration exists between the Montpellier and Krakow groups in the framework of the HESS experiment. Yves Gallant is co-convenor of the HESS Working Group on supernova remnants, pulsars and their nebulae, and Marek Jamrozy is co-convenor of the HESS Working Group on multiwavelength observation, with specific responsibility for the radio domain.

In the past several years, many new very high energy gamma-ray sources have been discovered in the Galaxy, in particular by the HESS telescopes; most of these sources are significantly extended, and many remain unidentified. While several radio surveys of the Galactic plane exist, their sensitivity is generally insufficient to identify the radio counterparts of these gamma-ray sources. Deeper, dedicated radio observations thus have the potential to reveal new supernova remnants or pulsar wind nebulae, the two most numerous classes of identified very high energy gamma-ray sources.

The aim of the visit was to organise radio observation proposals, and plan the necessary data analysis, for selected gamma-ray sources, taking into account the respective capabilities of interferometers such as the EVLA, GMRT and ATCA.

The CTA project

French side : C. Boisson, H. Sol

Polish side : R. Moderski, T. Bulik

The CTA project is the next generation Cherenkov telescope. It involves many institutions in the World. It is still in a preparatory phase.

C Stellar structure

Pulsating Stars in LMC/SMC using EROS data

French side : J-B. Marquette, J-P. Beaulieu

Polish side : A. Schwarzenberg-Czerny, M. Wisniewski

The carbon-to-oxygen (C/O) ratio of asymptotic giant branch (AGB) stars constitutes an important index of evolutionary and environment/metallicity factor. The authors develop a method for mass C/O classification of AGBs in photometric surveys without using periods, with particular stress to their EROS survey. For this purpose they rely on the slopes in the tracks of individual stars in the colour-magnitude diagram. They demonstrate that their method enables the separation of C-rich and O-rich AGB stars with little confusion. For the Magellanic Clouds they demonstrate that this method works for several photometric surveys and filter combinations. As they rely on no period identification, the results are relatively insensitive to the phase coverage, aliasing, and time-sampling problems that plague period analyses. For a subsample of our stars, they verify their C/O classification against published C/O catalogues. With their method they are able to produce C/O maps of the entire Magellanic Clouds. Their purely photometric method for classification of C- and O-rich AGBs constitutes a method of choice for large, near-infrared photometric surveys. Because the method depends on the slope of colour-magnitude variation but not on magnitude zero point, it remains applicable to objects with unknown distances.

Another topic was to identify RR Lyr in the EROS catalogue, analyse its content and completeness by comparison with MACHO & OGLE in overlapping SMC/LMC fields. The authors performed preliminary analysis of single-periodic variables, employing the TATRY code. They analysed prospects for employing RR Lyr in metallicity mapping of LMC/SMC, to extend their 2009 result on M33 metallicity mapping using Cepheids.

D Advanced stages of stellar evolution and interstellar medium

Post-AGB objects

French side : G. Stasinska

Polish side : R. Szczerba, N. Siodmiak, J. Borkowski

The authors have continued working on the second edition of the Torun catalogue of post-AGB objects, revising profoundly the classification criteria. The new catalogue was presented at the on planetary nebulae symposium in July 2011. The revised version of the catalogue will be made available on line in 2012.

Bipolar Nebulae

French side : O. Chesneau

Polish side : M. Otulakowska-Hypka

The collaboration between Olivier Chesneau and Magdalena Otulakowska-Hypka which started in September 2011 concerns the expanding dusty bipolar nebula around the nova V1280 Sco. A publication is almost ready at the moment and is going to be sent in a few weeks at the latest.

Studies of optically obscured pulsar wind nebulae

French side : Y. Gallant

Polish side : A. Zajczyk

The aim of the visit of A. Zajczyk to France was to work on NIR data of the pulsar wind nebula G21.5-0.9: spectroscopy and imaging in [FeII] 1.64 μ m filter of optically obscured supernova remnants (Kes 75 and G310.6-1.6). The data were obtained during summer 2011 with the ISAAC/VLT instrument as a result of last year's observational proposal. A. Zajczyk carried out the reduction and preliminary analysis of the spectroscopic data of G21.5-0.9.

The scientific stay resulted also in submission of an observing proposal for VLT/ISAAC (which was accepted). The proposal aims to study the central parts (the immediate vicinity of the pulsar) of selected PWNe (Kes 75 and G292.0+1.8) through polarimetric observations in the near infrared band.

E Dense matter, compact stars and gravitational radiation

Physics of compact stars and black holes

French side : Gourgoulhon, F. Vincent, M. Fortin

Polish side : Bejger, Zdunik, Haensel, Straub, Fortin, Abramowicz

M. Fortin, M. Bejger, P. Haensel and J.L. Zdunik studied the spin up of neutron stars including interaction with accretion disk via magnetic field. Rotating stellar models were calculated using the LORENE code developed in Paris Observatory - LUTH Meudon.

The millisecond pulsar PSR J1903+0327 rotating at 465 Hz has the second largest precisely-measured mass 1.67 and a weak surface magnetic field. Using intrinsic PSR J1903+0327 parameters evaluated from radio observations (mass, rotation period, magnetic field) and a model of spin evolution during the "recycling" phase (spin-up by accretion from a low-mass companion lost afterwards) that takes into account the accretion-induced magnetic field decay, the authors aim to calculate the mass of its neutron star progenitor at the onset of accretion. The influence of magnetic field in the "recycling" process is crucial - it leads to a significant decrease of the spin-up rate and larger accreted masses, in comparison to the B=0 mode.

E. Gourgoulhon, P. Haensel, J.L. Zdunik:

A neutron star crust, which is formed by accretion of matter from a companion in a low-mass X-ray binary (LMXB), has a stiffer equation of state (EOS) than catalyzed matter. At a given neutron star mass, the radius of a star with an accreted crust is therefore larger than for the usually considered star built of catalyzed matter. Using a compressible liquid drop model of nuclei, the authors

calculated the EOSs corresponding to different nuclear compositions of the ashes of X-ray bursts in LMXB.

These EOSs are then applied to study the effect of different formation scenarios on the neutron-star mass-radius relation. The authors derived a formula that relates the difference in radius to the difference in the crust EOS. The formula is valid for any EOS of the liquid core. The rotation of the neutron star makes the radius larger. The authors derive an approximate formula that gives the difference in equatorial radii as a function of stellar rotation frequency. For this purpose they used calculation of rotating neutron stars performed with very high accuracy using the LORENE code.

M. Fortin, L. Zdunik, P. Haensel and J. Margueron modeled the thermal evolution of both isolated and accreting neutron stars which enables them to put constraints on the poorly known composition, structure, superfluid and thermal properties of their interior.

M. Bejger and E. Gourgoulhon continued a project that aims at simulating the binary neutron stars in the inspiral phase, calculating their tidal deformation and studying the influence of the equation of state on the GW frequency. They have also studied the signal propagation in the dense matter.

O. Straub, F. Vincent, M. Abramowicz, E. Gourgoulhon made significant progress in the computation of the emission processes that occur in the vicinity of Sgr A*, assuming that the black hole is surrounded by a toroidal accretion structure named Polish doughnut. The accurate computation of the emitted spectrum is still a work in progress and will be concluded in the coming weeks by a publication in a rank A journal. This work is a theoretical study preparing the observations of the black hole at the galactic center, Sgr A*, with the future VLT instrument GRAVITY.

Differentially rotating neutron stars

French side: Loic Villain

Polish side: Dorota Gondek-Rosinska

Following their previous work on differentially rotating neutron stars (Ansorg et al., published in MNRAS 2009), the authors studied the influence of the degree of differential rotation and of the equation of state on astrophysical properties of neutron stars, such as the gravitational mass, the angular momentum and stability .

F Heliosphere and astrospheres, planets

The solar wind - interstellar medium interaction

French side: Lotfi Ben-Jaffel, Frederic Vincent

Polish side: Jolanta Grygorczuk, Romana Ratkiewicz, Marek Strumik

During 2011 the authors have been working on a database using their improved 3D MHD code thanks to the computer resources recently obtained at IAP for this project (48 cores computer + 128 Gb ram memory and 10 terab disk storage). The database consists of results for spherical as well as nonspherical conditions of the solar wind, and mostly, for the angle between the interstellar magnetic field (LIMF) and inflow vectors described by $\alpha = 0$ to 90 deg., and $\beta = -90$ to 90 deg. every 5 deg. The range of the strength of the LIMF is from 1.8 to 4.2 microGauss. All

calculations have been done for a dense grid. The authors have analyzed their database and chosen a lot of promising cases for further discussions. In 2011 they have published two papers, and one is under preparation.

B.3 - OTHER COMMON ACTIVITIES

Activities with researchers of the partner laboratories outside the framework of the LEA, projects submitted within the framework of national or European calls, industrial contracts (Object, framework, dates, short description).

B.2 - Co-supervision of PhD students and/or participation in jurys

a) Theses Co-supervised or in transnational Co-supervision

*Title of thesis: " SW-LISM interaction"

name of the student: **Frédéric Vincent**

principal laboratory: IAP

name of Co-supervisors in each laboratory: L. Ben-Jaffel (IAP) and R. Ratkiewicz (CBK, Warsaw)

thesis defended in October 2011 (note: there are two persons named Frederic Vincent in the LEA Astro-PF, who both defended their thesis in 2011. The other one works on dense matter, but the main topic of his thesis was outside the Astro-PF collaboration)

*Title of thesis: Motion of the Local Group as a cosmological probe

name of the student: **Maciej Bilicki**

principal laboratory: CAMK, ul. Bartycka 18, 00-716 Warszawa

name of Co-supervisors in each laboratory:

CAMK, Warsaw : M. Chodorowski

IAP, G. Mamon

expected year of defense: 2012

*Title of thesis: Studies of pulsars and their nebulae in the era of Fermi and HESS-II

name of the student: **Anna Zajczyk**

principal laboratory: Nicolaus Copernicus Astronomical Center, Warszawa Poland

name of Co-supervisors in each laboratory:

NCAC, Torun : Prof. Bronislaw Rudak

UM2: Dr. Yves Gallant

expected year of defense: 2012

*Title of thesis: Détection et étude de l'émission au TeV des pulsars avec H.E.S.S. 2

Name of the student: **Anna Barnacka**

Principal laboratory: Nicolaus Copernicus Astronomical Center, Warszawa, Poland

Co-supervisor: Rafał Moderski (CAMK)

Co-supervisor: Jean-Francois Glicenstein, DSM/IRFU/SPP, CEA/Saclay

Expected year of defense: 2012

*Title of thesis: "Evolution and dynamics of neutron stars: from microphysics to astrophysics"

name of the student: **Morgane Fortin**

principal laboratory: CAMK, LUTH

name of Co-supervisors in each laboratory: J. Leszek Zdzunik (CAMK), Ericourgoulhon (LUTH)

expected year of defense: 2012

*Title of thesis: "The maximum mass of differentially rotating neutron stars"

name of the student: Anna Snopek

principal laboratory: University of Zielona Gora

name of Co-supervisors in each laboratory: Dorota Rosinska + Loic Villain

expected year of defense: 2013

*Title of thesis: "Properties of rotating strange stars"

name of the student: Magdalena Szkudlarek

principal laboratory: University of Zielona Gora

name of Co-supervisors in each laboratory: Dorota Rosinska + Loic Villain

expected year of defense: 2014

*Title of thesis: "Astrophysical sources of gravitational waves "

name of the student: Marcin Kucaba

principal laboratory: University of Zielona Gora

name of Co-supervisors in each laboratory: Dorota Rosinska + Loic Villain

expected year of defense: 2014

*Title of thesis: thesis based on EROS (France) and ASAS (Poland) data

name of the student: **M. Wisniewski**

principal laboratory: CAMK, ul. Bartycka 18, 00-716 Warszawa

name of Co-supervisors in each laboratory:

CAMK, Warsaw : A Schwarzenberg-Czerny

IAP: J-B Marquette

expected year of defense: not defined yet

b) Participation in juries of PhD or habilitation thesis

- R. Ratkiewicz (CBK) was a member the Jury of the thesis of **Frederic Vincent** and participated as a referee. Vincent obtained his diploma with the "Félicitations du Jury".
- Pawel Haensel (CAMK) was member of the Jury of the habilitation of **Mikaela Ortel** (LUTH) in April 2012

B.3 - OTHER COMMON ACTIVITIES

Activities with researchers of the partner laboratories outside the framework of the LEA, projects submitted within the framework of national or Europeans calls, industrial contracts (Object, framework, dates, short description).

HESS Collaboration (High Energy Stereoscopic System) international collaboration aiming at studying high energy cosmic rays. Allows for studies of high energy radiation from cosmic sources (AGN, supernovae, blazars, etc.) using large arrays of detectors. Observations started in 2004.

Poland: R.Moderski, B.Rudak, A. Barnacka, A. Zajczyk, T.Bulik, M. Sikora, W. Kluzniak (CAMK)

France: J.-F. Glicenstein (CEA Saclay), H.Sol, C.Boisson, J.-M.Martin (LUTH Meudon)

CompStar The new Physics of Compact Stars Research Networking Program of European Science Foundation. European Collaboration aiming at theoretical and observational studies of neutron stars, dense matter and supernovae. 2008-2013.

Poland: P. Haensel, J.L. Zdunik, M. Bejger, W. Kluzniak (CAMK) P.
D. Gondek-Rosinska (Uniwersytet Zielonogorski)

France: J.Margueron, N. Van Giai, E. Khan, M. Urban M. Grasso (IPN Orsay)
S. Bonazzola, E. Gourgoulhon, B. Carter, P. Grandclement, J. Novak, M. Oertel (LUTH Meudon)

VIRGO Collaboration - European Gravitational Observatory

International collaboration aiming at detecting of gravitational waves using laser interferometric observatory in Cascina near Pisa (Italy).

France: Luc Blanchet (IAP) S. Bonazzola, E.Gourgoulhon, J.Novak, P.Grandclement (LUTH)
Poland: M.Bejger, T.Bulik (CAMK), D.Rosinska (Univ.Zielona Gora) A.Krolak (Institute of Mathematics PAN)

CTA: The Cherenkov Telescope Array

The CTA project is an initiative to build the next generation ground-based very high energy gamma-ray instrument. It will serve as an open observatory to a wide astrophysics community and will provide a deep insight into the non-thermal high-energy universe. CTA is included in the 2008 roadmap of the European Strategy Forum on Research Infrastructures (ESFRI). It is one of the "Magnificent Seven" of the European strategy for astroparticle physics published by ASPERA, and highly ranked in the "strategic plan for European astronomy" (leaflet) of ASTRONET.

France: C. Boisson (LUTH), H. Sol (LUTH)
Poland: T. Bulik (Obs Warsaw), R. Moderski (CAMK)

VIPERS: The "VIMOS Public Extragalactic Redshift Survey" is an ongoing ESO Large Program to map in detail the spatial distribution of normal galaxies over an unprecedented volume of the $z \sim 1$ Universe. At this redshift, VIPERS fills a unique niche in galaxy surveys, optimizing the combination of 5-band accurate photometry from the CFHTLS with the multiplexing capability of VIMOS.

France: Christophe Adami (LAM Marseille), Stephane Arnouts (CFHT & LAM), Vincent Le Brun (LAM Marseille), Olivier Le Fevre (LAM Marseille), Yannick Mellier (IAP Paris), Henry Joy McCracken (IAP Paris), Lidia Tasca (LAM Marseille), Melody Wolk (IAP Paris) Poland:
Agnieszka Pollo (Warsaw), Kasia Malek (Warsaw), Janusz Krywult (Krakow)

"Neutron stars and black holes as sources of gravitational radiation", MNiSW,
N N203 511238

France: Loic Villain (Université de Tours)
Poland: Dorota Rosinska (Univ. Zielona Gora)

"Astrophysical sources of gravitational waves" , Foundation of Polish Science,
2008-2011

France: Loic Villain (Université de Tours)

Poland: Dorota Rosinska (Univ. Zielona Gora)

C. COMMON SCIENTIFIC PRODUCTION

a) List of publications in journals with referees

note : many collaborations are just starting and have not produced any common publication yet.

1. Barnacka, A.; Glicenstein, J.-F.; Moudden, Y.
First evidence of a gravitational lensing-induced echo in gamma rays with Fermi LAT,
2011A&A...528L...3B
2. Bejger, M.; Zduńik, J. L.; Haensel, P.; Fortin, M. "Compression of matter in the center of
accreting neutron stars", 2011, A&A., 536, A92,
3. Bejger, M.; Fortin, M.; Haensel, P.; Zduńik, J. L "Implications of parameters of PSR
J1903+0327 for its progenitor neutron star", 2011, A&A., 536, A87
4. Bilicki, Maciej; Chodorowski, Michał; Jarrett, Thomas; Mamon, Gary A. The Astrophysical
Journal, Volume 741, Issue 1, article id. 31 (2011). Is the Two Micron All Sky Survey
Clustering Dipole Convergent?
5. T. Cailleteau, J. Mielczarek, A. Barrau and J. Grain, Anomaly-free scalar perturbations with
holonomy corrections in loop quantum cosmology, arXiv:1111.3535 [gr-qc]. Submitted to
Classical and Quantum Gravity.
6. Gerin, M.; Kaźmierczak, M.; Jastrzebska, M.; Falgarone, E.; Hily-Blant, P.; Godard, B.;
de Luca, M. "The tight correlation of CCH, and c-C3H2 in diffuse and translucent clouds",
2011A&A...525A.116G
7. L. Guzzo, D. Maccagni, H. J. McCracken, Y. Mellier, A. Pollo, D. Vergani and E. Zucca,
The contribution of minor mergers to the growth of $LB > LB^*$ galaxies since $z \sim 1$ from
spectroscopically identified pairs, Astronomy & Astrophysics, 530, A20, 2011, published
8. Koziel-Wierzbowska, D.; Stasińska, G., FR II radio galaxies in the Sloan Digital Sky
Survey: observational facts, 2011, MNRAS, 415, 1013
9. J. Mielczarek, T. Cailleteau, A. Barrau and J. Grain, Anomaly-free vector perturbations with
holonomy corrections in loop quantum cosmology, arXiv:1106.3744 [gr-qc]. Submitted to
Classical and Quantum Gravity.
10. Miszalski, B.; Mikołajewska, J.; Köppen, J.; Rauch, T.; Acker, A.; Cohen, M.; Frew, D. J.;
Moffat, A. F. J.; Parker, Q. A.; Jones, A. F.; Udalski, A., 2011A&A...528A..39M
The influence of binarity on dust obscuration events in the planetary nebula M 2-29 and its
analogues

11. Moudden, Y.; Barnacka, A.; Glicenstein, J.-F.; Venault, P.; Calvet, D.; Vivier, M.; Fontaine, G. The topological second-level trigger of the HESS phase 2 telescope, 2011APh...34..568M
12. M. Strumik, L. Ben-Jaffel, R. Ratkiewicz and J. Grygorczuk, Comparison of Heliospheric Models with Observations of the Voyager and IBEX Spacecraft Astrophysical Journal Letters, 741:L6 (5pp), 2011
13. Vieira, R. G.; Gregorio-Hetem, J.; Hetem, A.; Stasińska, G.; Szczerba, R., Distinguishing post-AGB impostors in a sample of pre-main sequence stars, 2011, A&A 526, 24
14. Wiśniewski, M. et al. Oxygen- and carbon-rich variable red giant populations in the Magellanic Clouds from EROS, OGLE, MACHO, and 2MASS photometry. A&A 530, 8 (2011).
15. Zajczyk, A.; Gallant, Y. A.; Slane, P.; Reynolds, S. P.; Bandiera, R.; Gouiffès, C.; Le Floch, E.; Comerón, F.; Koch Miramond, L. 2011arXiv1105.4373Z
Infrared imaging and polarimetric observations of the pulsar wind nebula in G21.5-0.9
16. Zdzunik, J. L.; Haensel, P. "Formation scenarios and mass-radius relation for neutron stars", 2011, A&A., 530, A137
17. Roukema, Buchert, Blanloeil, "On the topological implications of inhomogeneity", in preparation
18. Roukema, France, Kazimierczak, Buchert, "Matched disc versus pencil beam strategies for Λ CDM parameter estimates", in preparation
19. Otulawska-Hybka, Chesneau: "The expanding dusty bipolar nebula around the nova V1280 Sco" to be submitted

There are in addition many publications resulting from large collaborations involving members of the LEA Astro-PF

VIPERS

1. Granett, B. R.; Guzzo, L.; Coupon, J.; Arnouts, S.; Hudelot, P.; Ilbert, O.; McCracken, H. J.; Mellier, Y.; Adami, C.; Bel, J.; ... Pollo...and 25 coauthors
The power spectrum from the angular distribution of galaxies in the CFHTLS-Wide fields at redshift ~ 0.7 , 2011arXiv1112.0008G
2. López-Sanjuan, C.; Le Fèvre, O.; de Ravel, L.; Cucciati, O.; Ilbert, O.; Tresse, L.; Bardelli, S.; Bolzonella, M.; Contini, T.; Garilli, B.; ...Pollo and 7 coauthors
The VIMOS VLT Deep Survey. The contribution of minor mergers to the growth of $L_B \gtrsim L_B^*$ galaxies since $z \sim 1$ from spectroscopically identified pairs, 2011A&A...530A..20L
3. Cassata, P.; Le Fèvre, O.; Garilli, B.; Maccagni, D.; Le Brun, V.; Scodreggio, M.; Tresse, L.; Ilbert, O.; Zamorani, G.; Cucciati, O.; Pollo and 11 coauthors

The VIMOS VLT Deep Survey: star formation rate density of Ly α emitters from a sample of 217 galaxies with spectroscopic redshifts $2 \leq z \leq 6.6$, 2011A&A...525A.143C

4. de la Torre, S.; Meneux, B.; De Lucia, G.; Blaizot, J.; Le Fèvre, O.; Garilli, B.; Cucciati, O.; Mellier, Y.; Pollo, A.; Abbas, U.; and 31 coauthors
Comparison of the VIMOS-VLT Deep Survey with the Munich semi-analytical model. I. Magnitude counts, redshift distribution, colour bimodality, and galaxy clustering, 2011A&A...525A.125D
5. Cucciati, O.; Tresse, L.; Ilbert, O.; Le Fevre, O.; Garilli, B.; Le Brun, V.; Cassata, P.; Franzetti, P.; Maccagni, D.; Scodreggio, M.; Zucca, E.; Zamorani, G.; Bardelli, S.; Bolzonella, M.; Bielby, R. M.; McCracken, H. J.; Zanichelli, A.; Vergani, D.; Pollo, A., The Star Formation Rate Density and Dust Attenuation Evolution over 12 Gyr with the VVDS Surveys, *Astronomy & Astrophysics*, 2012, accepted

HESS:

papers involving Barnacka & Glicenstein:

1. "A new SNR with TeV shell-type morphology: HESS J1731-347", H.E.S.S. Collaboration; (.....; Barnacka,; Glicenstein, J. F.;.....), 2011, A&A., 531, A81, printed
2. "Revisiting the Westerlund 2 field with the HESS telescope array", HESS Collaboration; (.....; Barnacka,; Glicenstein, J. F.;.....) 2011, A&A., 531, L18, printed
3. "HESS J1943+213: a candidate extreme BL Lacertae object", H.E.S.S. Collaboration; (.....; Barnacka,; Glicenstein, J. F.;.....), 2011, A&A., 529, A49, printed
4. "Detection of very-high-energy γ -ray emission from the vicinity of PSR B1706-44 and G 343.1-2.3 with H.E.S.S.", HESS Collaboration; (.....; Barnacka,; Glicenstein, J. F.;.....), 2011, A&A., 528, A143, printed
5. "Discovery of the source HESS J1356-645 associated with the young and energetic PSR J1357-6429", HESS Collaboration; (.....; Barnacka,; Glicenstein, J. F.;.....), 2011, A&A., 533, A103, printed
6. "First evidence of a gravitational lensing-induced echo in gamma rays with Fermi LAT", Barnacka, A.; Glicenstein, J.-F.; Moudden, Y., 2011, A&A., 528, L3, printed
7. "Simultaneous multi-wavelength campaign on PKS 2005-489 in a high state", HESS Collaboration; (.....; Barnacka,; Glicenstein, J. F.;.....), 2011, A&A., 533, A110, printed
8. "Design concepts for the Cherenkov Telescope Array CTA: an advanced facility for ground-based high-energy gamma-ray astronomy", CTA Collaboration, (.....; Barnacka,; Glicenstein, J. F.;.....), 2011, ExA., 32, 193, printed
9. "H.E.S.S. constraints on dark matter annihilations towards the sculptor and carina dwarf galaxies", H. E. S. S. Collaboration; (.....; Barnacka,; Glicenstein, J. F.;.....); H.E.S.S. Collaboration, 2011, APh., 34, 608, printed
10. "Search for Lorentz Invariance breaking with a likelihood fit of the PKS 2155-304 flare data taken on MJD 53944", Hess Collaboration; (.....; Barnacka,; Glicenstein, J. F.;.....), 2011, APh., 34, 738, printed
11. "H.E.S.S. Observations of the Globular Clusters NGC 6388 and M15 and Search for a Dark Matter Signal", (.....; Barnacka,; Glicenstein, J. F.;.....), 2011, ApJ., 735, 12, printed
12. "Search for a Dark Matter Annihilation Signal from the Galactic Center Halo with H.E.S.S.", (.....; Barnacka,; Glicenstein, J. F.;.....), 2011, PhRvL, 106, 1301, printed
13. "The topological second-level trigger of the HESS phase 2 telescope", Moudden, Y.;

Barnacka, A.; Glicenstein, J.-F.; Venault, P.; Calvet, D.; Vivier, M.; Fontaine, G., 2011, APh., 34, 568

Papers involving Jamrozy and Gallant

1. H. E. S. S. Collaboration: Abramowski, A., ..., Gallant, Y.A., ... Jamrozy, M., et al., H.E.S.S. constraints on dark matter annihilations towards the sculptor and carina dwarf galaxies, 2011, APh, 34, 608
2. HESS Collaboration: Abramowski, A., ..., Gallant, Y.A., ... Jamrozy, M., et al., Detection of very-high-energy γ -ray emission from the vicinity of PSR B1706-44 and G 343.1-2.3 with H.E.S.S., 2011, A&A, 528, 143
3. Hess Collaboration: Abramowski, A., ..., Gallant, Y.A., ... Jamrozy, M., et al., Search for Lorentz Invariance breaking with a likelihood fit of the PKS 2155-304 flare data taken on MJD 53944, 2011, APh, 34, 738
4. H. E. S. S. Collaboration: Abramowski, A., ..., Gallant, Y.A., ... Jamrozy, M., et al., Search for a Dark Matter Annihilation Signal from the Galactic Center Halo with H.E.S.S., 2011PhRvL.106p1301A
5. H.E.S.S. Collaboration: Abramowski, A., ..., Gallant, Y.A., ... Jamrozy, M., et al., HESS J1943+213: a candidate extreme BL Lacertae object, 2011, A&A, 529, 49
6. H.E.S.S. Collaboration: Abramowski, A., ..., Gallant, Y.A., ... Jamrozy, M., et al., A new SNR with TeV shell-type morphology: HESS J1731-347, 2011, A&A, 531, 81
7. H.E.S.S. Collaboration: Abramowski, A., ..., Gallant, Y.A., ... Jamrozy, M., et al., Very-high-energy gamma-ray emission from the direction of the Galactic globular cluster Terzan 5, 2011, A&A, 531L, 18
8. H. E. S. S. Collaboration: Abramowski, A.; ..., Gallant, Y.A., ... Jamrozy, M., et al., H.E.S.S. Observations of the Globular Clusters NGC 6388 and M15 and Search for a Dark Matter Signal, 2011,ApJ, 735, 12
9. HESS Collaboration: Abramowski, A., ..., Gallant, Y.A., ... Jamrozy, M., et al., Discovery of the source HESS J1356-645 associated with the young and energetic PSR J1357-6429, 2011, A&A, 533, 103
10. HESS Collaboration: Abramowski, A., ..., Gallant, Y.A., ... Jamrozy, M., et al., Simultaneous multi-wavelength campaign on PKS 2005-489 in a high state, 2011, A&A, 533, 110H

17 papers involving Boisson & Bulik 2011

b) List of other publications (books, edition of proceedings, communications for proceedings). Authors, title, specify the kind of publication

1. Moudden, Y.; Venault, P.; Barnacka, A.; Calvet, D.; Glicenstein, J.-F.; Vivier, M.
The Level 2 Trigger of the H.E.S.S. 28 Meter Cherenkov Telescope, [2011ITNS...58.1685M](#)

2. Bilicki, Maciej; Chodorowski, M.; Mamon, G. A.; Jarrett, T. H.
Is the 2MASS Dipole Convergent?
American Astronomical Society, AAS Meeting #218, #220.02; Bulletin of the American
Astronomical Society, Vol. 43, 2011

3. Fall AGU Meeting, December 5-9, 2011, San Francisco, CA, USA
Lotfi Ben-Jaffel and Romana Ratkiewicz
The Local Interstellar Medium Magnetic Field: Back to the Old Times! poster

4. Snopek, D. Gondek-Rosinska, I. Kowalska, L. Villain, M. Kucaba,
M. Szkudlarek, M. Ansorg, On the maximum mass of differentially
rotating neutron stars, 2011, Proceedings of the Moriond Workshop 2011, la Tuilly, Italy, in press

5. Miszalski, B.; Acker, A.; Parker, Q. A.; Boffin, H. M. J.; Frew, D. J.; Mikolajewska, J.;
Moffat, A. F. J.; Napiwotzki, R., 2011apn5.procE.109M Dense circumstellar nebulae in
wide binary central stars

6. Miszalski, B.; Acker, A.; Parker, Q. A.; Boffin, H. M. J.; Frew, D. J.; Mikolajewska, J.;
Moffat, A. F. J.; Napiwotzki, R. 2011apn5.confA.109M Dense circumstellar nebulae in
wide binary central stars

7. "Thermal evolution of neutron stars and constraints on their internal properties ", Fortin, M.;
Zdunik, J. L.; Haensel, P.; Margueron, J., 2011, Proceedings of the Annual meeting of the
French Society of Astronomy and Astrophysics Eds.: G. Alecian, K. Belkacem, R. Samadi
and D. Valls-Gabaud, pp.573-576

8. Szczerba, R.; Siódmiak, N.; Stasińska, G.; Borkowski, J.; García-Lario, P.; Suárez, O.;
Hajduk, M.; García-Hernández, D. A.
The second release of the Toru'n catalogue of Galactic post-AGB objects: Classification,
morphology and spectra. 2011arXiv1110.3924S

c) List of presentations in conferences Co-signed by LEA partners

1. Is the 2MASS Dipole Convergent?, Bilicki, M.; 2011-05-24, 218th AAS Meeting, Boston, MA, USA (oral)
2. Cosmology with 2MASS, Bilicki, M.; 2011-07-15, Cosmic Web Morphology and Topology; Warsaw (oral)
3. Cosmic flows from 2MASS, Bilicki, M.; 2011-12-19, Cosmic Flows: Myth, Reality, and Prospects; Haifa, Israel (oral)
4. Understanding Relativistic Jets, Krakow, Poland, 23-26, May 2011 Dorota Koziel-Wierzbowska & Grazyna Stasinska, "FR II Radio Galaxies - the SDSS View" - (poster)
5. F. Vincent: Slim disk workshop in July 2011 at CAMK: Modeling the accretion structure at the Galactic Center with an ion torus (poster).

d) List of patents in joint ownership

not applicable

e) Other coproductions (databases, platforms, Web sites, gates sets of themes)

- Contribution to the scientific library LORENE (<http://www.lorene.obspm.fr/>)
- « The Toruń catalogue of Galactic post-AGB and related objects » by Ryszard Szczerba, Natasza Siódmiak, Grażyna Stasińska, Jerzy Borkowski (<http://www.ncac.torun.pl/postagb>) is available since 2007. An upgraded version will be made available in 2012.

D. OBSERVATIONS

The LEA Astro-PF programme is very dynamic and has reached quite a number of achievements, thanks to its flexible functioning and to the fundings from both the French and Polish sides.

There are, however, a number of difficulties. Funding on the French side has steadily decreased since the beginning of the LEA. For 2011, part of the expenses that should have been covered by the French side were covered by the Polish side.

We are now in the embarrassing situation where the funding from the French side is 20 kEuros for 2012, while it is about 50 kEuros from the Polish side. Note that Poland's economical situation is not better than that of France, and that its PIB per capita is much smaller.

The fact that we now have to comply with the instructions of the CNRS to spend all the attributed money before november, and 75% of it before july makes it particularly difficult for the management of the LEA.

There were some serious difficulties with timely payment from the French side. For example Maciej Bilicki had to wait until 02 January to receive full amount for his stay between 10 October and 04 November.