NAC 2010

65^{th} Dutch Astronomy Conference

Contents

http://www.astro.ru.nl/wiki/meetings/nac2010

Conference venue:

Van der Valk Hotel Nijmegen-Cuijk
Raamweg 10
5431 NH Cuijk
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JRH 2010

1 Welcome

Welcome to the 65th Dutch Astronomy Conference!

This years meeting is organized by the Department of Astrophysics at Radboud University Nijmegen. The Department has been established in February 2001. It is a honor for this young and vibrant department to host again the NAC meeting after the 58th Dutch Astronomy Conference in 2003.

On behalf of the organizers it is my pleasure to welcome you all to Cuijk. I wish you an interesting meeting with fruitful discussions.

Jörg R. Hörandel
(chair of the organizing committee)

2 Organizing Committee

C. Custers, H. Falcke, E. Gebhardt, P. Groot, J.R. Hörandel (chair), D. Maurits, G. Nelemans

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3 Program

Wednesday, May 19th, 2010

10:00 Registration

12:00 Lunch

Opening and Session 1

13:00 Welcome
Paul Groot

13:05 Opening
Paul Mengde – Mayor of Cuijk

13:10 Introduction
Jörg R. Hörandel

13:15 LOFAR and the path towards SKA I3
Mike Garret

13:45 The Pan-STARRS1 sky survey and early results I2
Stephen Smartt

14:15 FRaTs: a real-time search for fast radio transients with LOFAR C26
Sander ter Veen

14:30 The European pulsar timing array C11
Roy Smits

14:45 Early results from pulsar observations with LOFAR C13
Jason Hessels

15:00 Coffee — Poster Session

Session 2

15:30 Detecting high-energy cosmic rays with LOFAR C40
Arthur Corstanje

15:45 NuMoon: Detecting cosmic rays and neutrinos with the lunar Cherenkov technique C23
Clancy James

16:00 Detecting ultra high-energy neutrinos with LOFAR C44
Maaijke Mevius

16:15 Science with APERTIF; a wide-field radio camera for surveys on the WRST C45
Marc Verheijen

16:30 Magnetar oscillations C9
Maarten van Hoven

16:45 High performance gravitational n-body simulations on a planet-wide distributed super computer C28
Derek Groen

17:00 The imprint of a symbiotic binary progenitor on the properties of Kepler's supernova remnant C54
Alexandros Chiotellis

17:15 Break

17:30 Willem de Graaff Price
Stichting de Koepel

18:00 Hotel check-in

19:00 Dinner

Thursday, May 20th, 2010

Session 3

9:00	Recent results from Fermi *Martin Pohl*	I1
9:30	Self-regulated evolution of galaxies and supermassive black holes *Joop Schaye*	I6
10:00	Coffee — Poster Session	

Session 4

10:30	The Pierre Auger Cosmic Ray Observatory: recent results and future plans *John Kelley*	C24
10:45	Ultra high-energy cosmic rays from Centaurus A? *Sarka Jiraskova*	C6
11:00	Search for cosmic particle accelerators *Jelena Petrovic*	C7
11:15	First results from the "void galaxy survey": probing the lowest density environment *Thijs van der Hulst*	C38
11:30	Thermal imaging of extrasolar planets *Matthew Kenworthy*	C29
11:45	High-precision measurements of thermal emission from exoplanets *Ernst de Mooij*	C8
12:00	Lunch	

Session 5

13:00	The microwave sky according to Planck *Matthias Bartelmann*	I4
13:30	The 5.4 minute orbital period binary HM Cnc *Paul Groot*	C2
13:45	SimpleX, radiative transport on unstructured grids *Chael Kruip*	C37
14:00	Social Event – A self-guided tour of Cuijk (on foot, a map and information will be provided) – A visit to Museum Het Valkhof in Nijmegen (by bus) – A visit to the Africa Museum near Nijmegen (by bus) – Sporting activities (football, volleyball, frisbee, ...) at the hotel	
18:15	Dinner	

20:15 Poster Awards
Paul Groot, Jörg R. Hörandel

20:30 Pastoor Schmeitsprijs
Piet van der Kruit

20:45 Evening Lecture: Discovery of "impossible" anaerobic ammonium and methane-munching microbes I8
Mike Jetten

Friday, May 21st, 2010

Session 6

9:00	The Herschel space observatory *Xander Tielens*	I5
9:30	Herschel/HIFI first results on massive star formation: water in the DR21 region *Matthieu Marseille*	C4
9:45	Laboratory pathways to molecular complexity in space *Sergio Ioppolo*	C31
10:00	Coffee — Poster Session	

Session 7

10:30	The weak wind problem in stellar winds of massive stars *Lianne Muijres*	C12
10:45	The comparison of stellar mass to total halo mass for 16 252 galaxies *Edo van Uitert*	C16
11:00	The formation of supermassive black holes in the cosmic dark ages *Dominik Schleicher*	C21
11:15	Low-frequency spectral-index studies of giant radio galaxies *Emanuela Orrù*	C20
11:30	Searching for helical magnetic fields in active galactic nuclei *Mehreen Mahmud*	C48
11:45	Planetary radio interferometry and Doppler experiment *Giuseppe Cimo*	C27
12:00	Lunch	

Session 8 and Closing

13:00	Mapping the Milky Way with VLBI Astrometry *Andreas Brunthaler*	I7
13:30	Weak lensing from space: first cosmological constraints from three-point shear statistics *Elisabetta Semboloni*	C15
13:45	Growing up in the city: galaxy populations in a $Z \sim 3$ protocluster *Ernst Kuiper*	C10
14:00	Measuring weak lensing flexion *Malin Velander*	C47
14:15	Variations in the Kennicutt-Schmidt relation with physical parameters *Jarle Brinchmann*	C3
14:30	Closing *Paul Groot*	
14:35	End of conference	

4 Posters

Posters are presented throughout the conference. Authors should be present at their posters during the coffee breaks. A price will be awarded to the authors of the three best posters.

1. C5: Allegro: preparing for Early Science with ALMA
2. C14: The chemical structure of W49A - results from the JCMT Spectral Legacy Survey
3. C17: Burgers' dynamics, the Cosmic Web and its Hierarchical evolution
4. C18: Evolving Dark Energy and Cosmic Horizons
5. C19: Two shell collisions in the GRB afterglow phase
6. C22: An accurate timescale for Star Formation and chemical enrichment of the Sculptor dSph
7. C25: Propagation of Galactic cosmic rays
8. C30: A surface reaction model for the formation of interstellar molecules
9. C32: Searching for Solid State PAH Features in the Laboratory and in Space
10. C33: The Void Galaxy Survey
11. C34: Status of the air shower array for LOFAR
12. C35: On the possible correlation between the high energy electron spectrum and the cosmic-ray secondary to primary ratios
13. C36: A Simultaneous GBT/Fermi Study of Crab Giant Pulses
14. C39: The system characteristics of Auger Engineering Radio Array (AERA)
15. C41: The energetic teenage phase of star formation; molecular outflows from protostars in Ophiuchus
16. C42: Sequencing the Building Blocks of Star Formation in the Serpens Molecular Cloud
17. C43: The CosmoGrid simulation
18. C46: Detecting Ultra High Energy Neutrinos and Cosmic Rays using the Moon
19. C49: A Spitzer survey of S-type stars
20. C50: The first intermediate-resolution spectrum of a massive star candidate in NGC 55
21. C51: Average Mass Transfer Rate and Cooling of SAX J1808.4-3658
22. C52: CO mixed with CH3OH: the answer to the non-detection of the 2152cm-1 band?

23. C53: A surface abundance comparison for Carbon Enhanced Metal Poor (CEMP) stars

24. C55: Formation and evolution of Carbon-Enhanced Metal-Poor stars

25. C56: The Hydrodynamics of Eta Carinae

26. C57: Comparison of optical and NIR velocity dispersions of early-type galaxies in the Fornax cluster

27. C58: The GRS 1915+105 plateau state compared to the canonical hard state

28. C59: The chemical composition and location of crystalline forsterite in the disk of HD100546

29. C60: Probing the early cosmic star formation with the faintest dwarfs

30. C61: Alfven waves and turbulence in the solar corona and solar wind

31. C62: The accretion/ejection paradigm in YSO: from optical/NIR to FIR observations

32. C76: METIS

33. C77: The UV-Excess survey of the Northern Galactic Plane

34. C78: A relativistically broadened OVIII Lyalpha line in the ultra-compact X-ray binary 4U 0614+091

5 Invited Talks

Invited # I1 Session 3

Recent results from Fermi

Fermi has been observing the GeV sky for the past 20 months. I will review a selection of results on GRBs, AGNs, pulsars, SNRs, and diffuse sources in the context of measurements in other wavebands. Emphasis will be placed on the implications for both the interpretation of current observations and the planning of future studies.

Presenter: Martin Pohl, Potsdam

Invited # I2 Session 1

The Pan-STARRS1 sky survey and early results

The Panoramic Survey Telescope and Rapid Response System (Pan-STARRS) has begun deployment with the Pan-STARRS Telescope No. 1 (PS1) at Haleakala Observatories, Maui, Hawaii. PS1 is a 1.8 m telescope with a 1.4 gigapixel camera, giving a field of view of seven square degrees. A Science Consortium has been formed consisting of 10 institutes, with european involvement from the UK (Queen's, Durham and Edinburgh) and Germany (MPIA Heidelberg, MPE Garching). The PS1 Science Consortium has started a 3 year survey mission, with science goals ranging from earth impactors to high-z quasars. I will present the survey strategies, technical capabilities of the system, and science goals of the mission. I will focus on transient object science and present first science results from PS1 discoveries.

Presenter: Stephen Smartt, Belfast

Invited # I3 Session 1

LOFAR and the path towards SKA

I will present the latest status on lofar - in particular progress regarding the construction, roll-out and commissioning of the telescope. In addition, I will also report on some of the observations that seennow being made, including the first images using baselines that include lofar stations in Germany. I will also look towards the future and report on lofar's impact on the Square Kilometre Array project and in particularnthe shape and form of the SKA Phase 1 design.

Presenter: Michael Garret, ASTRON

Invited # I4 Session 5

The microwave sky according to Planck

Launched on May 14, 2009, the Planck satellite is now observing the microwave sky at frequencies between 30 and 857 GHz with high sensitivity and angular resolution. Starting from the physics of the CMB and the foreground microwave emission, the talk will describe how Planck is designed to reach the best possible limits in observations of the microwave sky. The primary and some of the secondary scientific goals will be outlined, and it will be described how the satellite performs so far.

Presenter: Matthias Bartelmann, Heidelberg

Invited # I5 Session 6

The Herschel space observatory

The Herschel Space Observatory, the fourth cornerstone mission in the European Space Agency (ESA) science program, was launched on May 14, 2009. Herschel has been designed to perform imaging photometry and spectroscopy in the far infrared and sub-millimeter part of the spectrum, covering approximately the 55–672 m range and thus bridging the traditional space infrared range with the groundbased capabilities. This wavelength region is covered by two cameras/medium resolution spectrometers (PACS and SPIRE) and a very high resolution heterodyne spectrometer (HIFI). The Dutch space agency, SRON is the PI institute for HIFI.
Herschel will study the cool and dark, dusty Universe. Key objectives include studying early epoch galaxy building, revealing the cosmologically evolving AGN-starburst symbiosis, unravelling the mechanisms involved in the formation of stars and planetary systems, detailing late stages of stellar evolution, elucidating the interaction between successive generations of stars and the interstellar medium, and, last but not least, probing the chemistry of space. In this talk, I will review the scientific capabilities of Herschel and its first results, with the emphasis on HIFI.

Presenter: Xander Tielens, Leiden

Invited # I6 Session 3

Self-regulated evolution of galaxies and supermassive black holes

I will use results from the OverWhelmingly Large Simulations (OWLS) project to investigate the physics driving the growth of galaxies and supermassive black holes. Feedback from star formation and from accretion onto black holes can regulate the growth of low and high-mass galaxies, respectively. This self-regulation has some counter-intuitive implications. For example, the galaxy star formation rate is insensitive to the star formation law and the mass of the black hole is insensitive to the efficiency of the AGN feedback. Finally, I will argue that the masses of supermassive black holes are controlled by their host dark haloes rather than by their host stellar bulges.

Presenter: Joop Schaye, Leiden

Invited # I7 Session 8

Mapping the Milky Way with VLBI Astrometry

With astrometric VLBI observations we can now reach accuracies at a level of ~ 10 micro-arcseconds. This enables us to measure trigonometric parallaxes and proper motions of high mass star forming regions in the Milky Way out to several kpc with accuracies of a few percent. Using this method, we can trace the spiral arms of the Milky Way and it's rotation curve. First results for 18 star forming regions suggest a significant higher rotation speed of the Milky Way, and that massive star forming regions rotate on average slower than the Milky Way.

Presenter: Andreas Brunthaler, Bonn

Invited # I8 Evening lecture

Discovery of "impossible" anaerobic ammonium and methane-munching microbes

Anaerobic oxidation of methane by Methylomirabilis oxyfera and of ammonium by anammox bacteria are recent discoveries in the methane and nitrogen cycle catalyzed by completely unrelated microbes. However, the processes share many interesting aspects. Once they were deemed biochemically impossible and non-existent in nature, but have now been identified as important players in global methane and nitrogen cycling containing many unique features. Anammox bacteria can make hydrazine, a powerful rocket fuel, and can be applied in waste water treatment. M. oxyfera can produce its own oxygen from nitric oxide. As early earth and other planets have abundant methane in their atmosphere it is tempting to speculate about the origin of these unique bacteria and their contribution to the evolution of the nitrogen and methane cycle.

Presenter: Mike Jetten, Radboud University Nijmegen

6 Contributions

Contribution # 2 Session 5

The 5.4 minute orbital period binary HM Cnc

The ultracompact binary HM Cnc has recently been shown by us from phase resolved spectroscopy to have an orbital period of only 5.4 minutes. It is thereby, by far, the shortest orbital period system known. From Keck spectroscopy of this very faint system (B=20.5) we can deduce that the system consists of an interacting pair of white dwarfs, that is losing orbital energy at an extreme rate due to gravitational wave emission. The evolutionary status and evolutionary history of the system can be deduced by combining our observations with binary evolution calculations. It will be the most significant, known, system to be detected with the future gravitational wave mission LISA.

Paul Groot, Department of Astrophysics, Radboud University Nijmegen
Gijs Roelofs, Harvard-Smithsonian Center for Astrophysics
Danny Steeghs, University of Warwick
Arne Rau, MPE, Garching/Caltech
Tom Marsh, University of Warwick
Gijs Nelemans, Radboud University Nijmegen

Presenter: Paul Groot, Department of Astrophysics, Radboud University Nijmegen

Contribution # 3 Session 8

Variations in the Kennicutt-Schmidt relation with physical parameters

The Kennicutt-Schmidt (K-S) relation is a scaling law between the gas surface density and the star formation rate surface density and it holds over an impressive range of scales. Here we combine a newly developed technique to estimate gas content from optical spectroscopy from the SDSS with resolved HI and molecular data from several groups to explore the dependence of this relationship with other physical parameters. We show that the K-S relation depends on the local stellar surface density and/or the local gas fraction and discuss various theoretical interpretations of this result.

Jarle Brinchmann, Leiden Observatory

Presenter: Jarle Brinchmann, Leiden Observatory

Herschel/HIFI first results on massive star formation : water in the DR21 region

Water is a key molecule in the star formation process, but its spatial distribution in massive star-forming regions is not well known. We studied the distribution of the water line in DR21, a luminous massive star-forming region thanks to the data obtained during the phase of verification of the high-resolution spectrometer (HIFI) of the Herschel spatial telescope. Observations show a complex line profile including a massive core self-absorption, outflow wings emissions and foreground cloud absorption. Modeling shows that the water abundance lays around 2e-10 relative to H2, being less extended than dust emission. The H2O/13CO ratio increases by 3 orders of magnitude in outflows, which is probably due to the evaporation of water-rich ice mantles on dust grains.

Matthieu Marseille, SRON - Groningen
Floris Van der Tak, SRON - Groningen
Fabrice Herpin, Laboratoire d'Astrophysique de Bordeaux
Friedrich Wyrowski, MPIfR-Bonn
Alain Baudry, Laboratoire d'Astrophysique de Bordeaux
Sylvain Bontemps, Laboratoire d'Astrophysique de Bordeaux
Wilfried Frieswijk, Kapteyn Astronomical Institute
Russ Shipman, SRON - Groningen
Ewine F. Van Dishoeck, Leiden University

Presenter: Matthieu Marseille, SRON - Groningen

Contribution # 5 Poster

Allegro: preparing for Early Science with ALMA

In this talk I will review the ongoing activities of Allegro and present the current status of ALMA. After that, I will focus on the upcoming Early Science observations with ALMA, scheduled for 2011. I will discuss the capabilities of the array when Early Science starts, and how prospective users can be prepared for proposal submission. Several important aspects for ALMA users will be discussed, such as the Observing Tool for proposal preparation, the data analysis software CASA and the ALMA simulator.

Wilfried Frieswijk, Kapteyn Astronomical Institute
Michiel Hogerheijde, Leiden Observatory
Christian Brinch, Leiden Observatory
Dominik Schleicher, Leiden Observatory
Floris Van der Tak, SRON

Presenter: Wilfried Frieswijk, Kapteyn Astronomical Institute

Contribution # 6 Session 4

UHECRs from Centaurus A?

Relativistic jets and giant lobes of radio galaxies are potential sources of ultra-high energy cosmic rays (UHECRs) and very-high energy neutrinos. I will discuss physical conditions in and around Centaurus A, the nearest radio galaxy (FRI). I will show the latest results from the Chandra, Fermi, Pierre Auger and ATCA+Parkes observing campaigns along with theoretical considerations which constrain Centaurus A as a source of the UHECRs.

Sarka Jiraskova, Radboud University Nijmegen
Peter Biermann, MPI Bonn, Germany
Judith Croston, University of Southampton, UK
Justin Bray, University of Adelaide, Australia
Heino Falcke, Radboud University Nijmegen
Ilana Feain, CSIRO, Australia
Ray Protheroe, University of Adelaide, Australia
Frank Israel, Sterrewacht Leiden
Marijke Haverkorn, ASTRON
Jörg R. Hörandel, Radboud University Nijmegen

Presenter: Sarka Jiraskova, Radboud University Nijmegen

Contribution # 7 Session 4

Search for cosmic particle accelerators

The origin of ultra-high energy cosmic rays (UHECRs) and neutrinos is still a mystery. Hadronic acceleration theory suggests that they should originate in same sources, together with gamma-rays. While gamma-rays have been linked to astrophysical sources, no point source of UHECRs or neutrinos have been found so far. We present a multi-messenger approach in the search for cosmic particle accelerators: correlation between arrival directions of neutrinos and UHECRs, and its application on Antares neutrino telescope and Pierre Auger Observatory observations.

Jelena Petrovic, Nikhef

Presenter: Jelena Petrovic, Nikhef

Contribution # 8 Session 4

High-precision measurements of thermal emission from exoplanets

Measurements of the secondary eclipse of transiting hot-Jupiters, the moment the planet passes behind the star, allows us to measure the light coming from the planet, either from emission or from reflection. We have obtained measurements of the secondary eclipses of exoplanets with both ground- and space-based observatories at optical and near-infrared wavelengths. These observations probe the thermal emission of hot-Jupiters at, and beyond the peak of their spectral energy distribution, providing complementary information to Spitzer Space Telescope observations.

Ernst de Mooij, Sterrewacht Leiden

Presenter: Ernst de Mooij, Sterrewacht Leiden

Contribution # 9 Session 2

Magnetar Oscillations

Quasi-Periodic Oscillations observed during the tails of SGR giant flares are commonly interpreted as torsional oscillations of magnetars. From the theoretical perspective, the oscillatory dynamics is complicated by the strong interaction between the shear modes of the crust and (a continuum of) magnetohydrodynamic Alfven-like modes in the core. We study the dynamics which arises through this interaction both analytically and numerically, and present several results. We discuss the interesting finding that discrete global modes frequently reside near the edges of the core Alfven continuum instead of near the crustal frequencies. We argue that magnetar QPOs give evidence that the proton and neutron components in the core are dynamically decoupled and that at least one of them is a quantum fluid.

Maarten Van Hoven, Leiden Observatory and Lorentz Institute
Yuri Levin, Leiden Observatory and Lorentz Institute

Presenter: Maarten Van Hoven, Leiden Observatory and Lorentz Institute

Contribution # 10 Session 8

Growing up in the city: Galaxy populations in a $z \sim 3$ protocluster

Galaxy clusters represent the densest large-scale environments in the Universe and as such they are excellent laboratories for studying the influence of environment on galaxy formation and evolution. Ideally we would study these structures across cosmic time. However, for redshifts greater than ~ 1.5 finding galaxy clusters becomes very difficult. One of the most successful methods of detecting galaxy clusters involves studying the surroundings of high-z radio galaxies. These HzRGs are very luminous and massive and therefore likely to reside in overdense or 'protocluster' regions. I present the results of a galaxy population study of one such protocluster at z=3.13 using a large multi-wavelength dataset spanning U band to 8 micron. In addition to already identified populations of Lya and [OIII] emitters we select protocluster galaxy candidates using the Lyman break and Balmer break spectral features (LBGs and BBGs). We show that the field contains an overdensity of star forming LBGs, but not of redder and older BBGs. We also determine the properties of all protocluster candidates and compare these to the properties of field galaxies in order to study the influence of environment on galaxy evolution at $z \sim 3$. We find no significant differences in terms of mass, star formation rate and UV slope. However, within the protocluster itself the galaxies with the largest masses and star formation rates are found near to the central radio galaxy. This indicates that at $z \sim 3$ the protocluster environment has already started influencing galaxy evolution. We conclude that this protocluster is still in the early stages of its formation.

Ernst Kuiper, Leiden Observatory

Presenter: Ernst Kuiper, Leiden Observatory

The European Pulsar Timing Array

In Europe, five 100-m class telescopes are being used to form the European Pulsar Timing Array (EPTA).
Pulsars are rapidly rotating, highly magnetised neutron stars that emit radio waves from their magnetic pole that are observed as pulses. The time of arrival (TOA) of these pulses are known for their stability. A special class of pulsars, called millisecond pulsars (MSP), even compete with the accuracy of atomic clocks. Keeping track of the TOA's of different MSP's over the sky allows for high-precision timing experiments which can even be used to detect one of the holy grails of physics: gravitational waves.
Gravitational waves (GW) are small disturbances in space-time, caused by the motion of masses. These waves are so weak that only the strongest waves, caused by rapid motion of dense stars or black-holes, have a chance of being detected. A pulsar timing array (PTA) uses an array of MSP's as the endpoints of a galaxy-scale GW detector. It is sensitive to GW's with a frequency in the nano-Hertz regime, which corresponds to the regime of the stochastic GW background caused by the coalescence of super-massive black holes in the early universe. This makes PTA's complimentary to other GW detectors such as LIGO, VIRGO and LISA.
The EPTA will compete with its Australian and American counterparts, the Parkes Pulsar Timing Array and the North American Nanohertz Observatory for Gravitational Waves. Recently the EPTA has made a giant "leap" forward thanks to European funding of the Large European Array for Pulsars (LEAP). This prestigious project involves coherently combining the five EPTA-telescopes to make the equivalent of a fully steerable 194-m dish. This will improve the TOA's by an order of magnitude, possibly leading to a first detection of GW's within five years.

Roy Smits, University of Manchester / Astron
Michael Kramer, Max Planck Institute for Radio Astronomy
Ben Stappers, University of Manchester
Cees Bassa, University of Manchester
Gemma Janssen, University of Manchester
Ramesh Karuppusamy, Max Planck Institute for Radio Astronomy
Kejia Lee, Max Planck Institute for Radio Astronomy

Presenter: Roy Smits, University of Manchester / Astron

Contribution # 12 Session 7

The weak wind problem in stellar winds of massive stars

The evolution of massive stars, the properties of their supernova explosions and the nature of the compact objects that they leave behind are strongly affected by their mass-loss history. For these reasons the study of the mass-loss processes that massive stars may suffer is fundamental. In this talk, I will focuss on line-driven winds of early-type objects. Theoretical predictions seem in reasonable agreement with the observations for very luminous stars. However, if the luminosity of a star drops below $logL \approx 5.3 logL_sun$, the theoretical mass-loss rates overestimate the mass-loss as derived from observations by two orders of magnitude. I will present my new theoretical predictions for the mass-loss rates of O-type stars and explain why this discrepancy exists.

Lianne Muijres, Anton Pannekoek Instituut UvA
Alex de Koter, Anton Pannekoek Instituut UvA
Jorick Vink, Armagh Observatory

Presenter: Lianne Muijres, Anton Pannekoek Instituut UvA

Contribution # 13 Session 1

Early Results from Pulsar Observations with LOFAR

The LOw Frequency ARray (LOFAR) promises to open a new window on the transient radio sky on timescales of nanoseconds to years. An important aspect of this will be the study of radio-emitting neutron stars in their various incarnations: slow pulsars, young pulsars, millisecond pulsars, magnetars, rotating-radio transients, extreme nullers, et cetera. Pulsars and their brethren are the prototype of the more general "fast-transients", of which it is hoped many exciting new source classes await discovery. I will discuss LOFAR's impressive ability to observe pulsars and fast transients and will present some impressive early observational results prior to the official opening of the telescope this June.

Jason Hessels, ASTRON/UvA

Presenter: Jason Hessels, ASTRON/UvA

Contribution # 14 Poster

The chemical structure of W49A - results from the JCMT Spectral Legacy Survey

With a luminosity of $L_{IR} > 10^7 L_{Sun}$ and a mass of $M > 10^7 M_{Sun}$, W49A is the most active star-forming region in the Galactic disk. By resolving its structure at mm/submm wavelengths, we hope to use it to understand the high star formation rates seen in some external galaxies, such as starburst galaxies. The JCMT Spectral Legacy Survey (Plume et al, 2007) observed a 2x2 arcminutes field with 15" angular resolution around the center of W49A in the frequency range between 330 and 363 GHz and extended it to 373 GHz. The 345 GHz band contains various molecular lines as tracers of different physical properties like CO isotopes, high density tracers as HNC and HCN, SiO (shock tracer) and CH3OH (grain evaporation). Analysing the spatial and velocity information provided by the survey we aim to understand the physics and chemistry of this region with conclusions on extragalactic starburst sources. The different components with different physical and chemical structure will be probed with a higher angular resolution (1") in a follow-up survey with the SMA.

Zsofia Nagy, Kapteyn Astronomical Institute & SRON
Floris Van der Tak, SRON Netherlands Institute for Space Research
Marco Spaans, Kapteyn Astronomical Institute
Gary Fuller, University of Manchester
Rene Plume, University of Calgary

Presenter: Zsofia Nagy, Kapteyn Astronomical Institute & SRON

Weak lensing from space: first cosmological constraints from three-point shear statistics.

We use weak lensing data from the Hubble Space Telescope COSMOS survey to measure the second- and third-moments of the cosmic shear field, estimated from about 450,000 galaxies with average redshift 1.3
We present a detection of the third-order moment of the aperture mass statistic and verify that the measurement is robust against systematic errors caused by point spread function (PSF) residuals and by the intrinsic alignments between galaxies. The amplitude of the measured three-point cosmic shear signal is in very good agreement with the predictions for a WMAP7 best-fit model, whereas the amplitudes of potential systematics are consistent with zero.
We perform a likelihood analysis using the measurement of the third-order moment of the aperture mass statistic M_{ap}^3 and find that the $\Omega_m - \sigma_8$ degeneracy direction is well fitted by the relation: $\sigma_8(\Omega_m/0.30)^(0.49) = 0.78^{+0.11}_{-0.26}$ which is in good agreement with the best fit relation obtained by using the measurement of M_{ap}^2: $\sigma_8(\Omega_m/0.30)^(0.67) = 0.70^{+0.11}_{-0.14}$.
We present the first measurement of the more generalised three-point shear statistic $M_{ap}^3(\theta_1, \theta_2, \theta_3)$ and find a very good agreement with the WMAP7 best-fit cosmology. The cosmological interpretation of $M_{ap}^3(\theta_1, \theta_2, \theta_3)$ gives $\sigma_8(\Omega_m/0.30)^{0.46} = 0.69^x r^{+0.08}_{-0.14}$. Furthermore, the combined likelihood analysis of $M_{ap}^3(\theta_1, \theta_2, \theta_3)$ and $M_{ap}^2(\theta)$ improves the accuracy of the cosmological constraints to $\sigma_8(\Omega_m/0.30)^{0.50} = 0.69^{+0.07}_{-0.12}$, showing the high potential of this combination of measurements to infer cosmological constraints.

Elisabetta Semboloni, Leiden University, Leiden Observatory
Tim Schrabback, Leiden University, Leiden Observatory
Ludovic Van Waerbeke, University of British Columbia
Sanaz Vafaei, University of British Columbia
Jan Hartlap, Argelander-Institut fur Astronomie
Stefan Hilbert, Argelander-Institut fur Astronomie

Presenter: Elisabetta Semboloni, Leiden University, Leiden Observatory

Contribution # 16 Session 7

The comparison of stellar mass to total halo mass for 16 252 galaxies.

Dark matter plays an important dynamical role in the formation of galaxies. Therefore it is expected that several properties of galaxies such as galaxy luminosity and stellar mass are related to the total (baryonic + dark) halo mass. In this talk we will present the first results of the comparison between stellar and total halo mass of 16 252 galaxies. The stellar masses are based on photometric fits to colours of galaxies in the SDSS dr7, the total masses are determined using the weak gravitional lensing signal measured around galaxies in the RCS2 survey, a nearly 900 square degree imaging survey. We study the stellar to total mass ratio for spiral and elliptical galaxies as a function of stellar mass, and investigate whether the signal evolves as a function of redshift.

Edo Van Uitert, Leiden Observatory, Leiden University
Henk Hoekstra, Leiden Observatory, Leiden University

Presenter: Edo Van Uitert, Leiden Observatory, Leiden University

Contribution # 17 Poster

Burgers' dynamics, the Cosmic Web and its Hierarchical evolution

Since Zel'dovich (1970) we have seen how the structure in the Universe can be seen in terms of pancakes, filaments, clusters and voids. These are the structures that build the Cosmic Web. The adhesion model (Gurbatov, Saichev & Shandarin 1989) is an extension of the Zel'dovich formalism, describing the structural elements of the cosmic web in terms of singularities in the solution of the inviscid Burgers' equation. It has been shown to agree rather well compared to 2D N-body simulations (Kofman, Pogosyan & Shandarin 1990). We explore a range of applications. To this end we developed implementations of two algorithms. The first is the efficient algorithm by Weinberg & Gunn (1990) involving approximate particle trajectories. The other method by Noullez & Vergassola (1993) provides us with a geometric formalism that enables us to study hierarchical structure formation in a highly idealised environment. On this poster we present and discuss the results regarding the hierarchically evolving cluster mass, void volume and filament distributions.

Johannes Hidding, Kapteyn Institute
Rien Van de Weijgaert, Kapteyn Institute

Presenter: Johannes Hidding, Kapteyn Institute

Contribution # 18 Poster

Evolving Dark Energy and Cosmic Horizons

Recent observations have revealed that the Universe undergoes cosmic acceleration, and the existence of a dominant, pervasive fluid, Dark Energy, has been proposed to explain this acceleration. Much of the recent focus has been on the possibility that this Dark Energy component evolves, changing its nature as the Universe expands. Here, I consider the cosmological influence of such evolution, especially with regards to the Cosmic Horizons that govern our past, current and future view of the Universe.

Pim Van Oirschot, RU, IMAPP
Geraint Lewis, IoA, University of Sydney

Presenter: Pim Van Oirschot, RU, IMAPP

Contribution # 19 Poster

Two shell collisions in the GRB afterglow phase

Strong optical and X-Ray flares often appear in the afterglow phase of Gamma-Ray Bursts (GRBs). We perform high resolution numerical simulations of late collisions between two ultra-relativistic shells in order to explore these events. Such consecutive shells can be formed due to the variability in the central source of a GRB. We examine the case where a cold uniform shell collides with a self similar Blandford and McKee shell (Blandford & McKee 1976) in a constant density environment and consider cases with varying Lorentz factor for the uniform shell. We produce the corresponding light curves and spectra for the afterglow phase and examine the occurrence of optical flares in the several cases. We conclude that occurrence of optical flares is possible for small opening angles of the jet. For our simulations we use the Adaptive Mesh Refinement version of the Versatile Advection Code (Keppens et al. 2003; Meliani et al. 2007) and the radiation code BLAST (Van Eerten & Wijers 2009).

Alkiviadis Vlasis, Centre for Plasma Astrophysics, K.U.Leuven, Belgium
Hendrik Van Eerten, Center for Cosmology and Particle Physics, NYU
Zakaria Meliani, Centre for Plasma Astrophysics, K.U.Leuven, Belgium
Rony Keppens, Centre for Plasma Astrophysics, K.U.Leuven, Belgium

Presenter: Alkiviadis Vlasis, Centre for Plasma Astrophysics, K.U.Leuven, Belgium

Low frequency spectral index studies of giant radio galaxies.

The energy evolution of radio galaxies can be traced by observations and spectral studies of the radio lobes. The low-frequency spectral index information is crucial to derive the injected energy distribution of the radiating particles, and to study the energy transport from the nucleus to the lobes of these sources. Up to now, spectral studies have been often limited in frequency, resolution and sensitivity. In this talk I will show some results of a low frequency spectral analysis on giant radio galaxies (GRG); these are radio galaxies with a projected linear size > 1 Mpc. According to the current interpretation GRG are old sources which have evolved in a low-density ambient medium. For these sources we estimated the radiative age by fitting a synchrotron model of emission. A discussion will be done about the future prospectives which are opening up for such a kind of studies with LOFAR, SKA etc etc.

Emanuela Orrù, Radboud University Nijmegen

Presenter: Emanuela Orrù, Radboud University Nijmegen

The formation of supermassive black holes in the cosmic dark ages

Supermassive black holes observed at $z \sim 6$ are usually assumed to originate either from the remnants of the first stars, or from intermediate mass black holes with up to $\sim 10^5$ solar masses. To form such intermediate mass black holes, the gas in primordial galaxies needs to collapse without fragmenting. In this talk, I discuss the chemical, radiative and magnetic conditions in the first galaxies that may form such black holes. I will first focus on the chemical conditions, as a suppression of cooling may help to prevent the gas from fragmenting. We show, however, that even in the presence of strong photodissociating radiation, the gas temperature keeps decreasing with density, so that fragmentation cannot be ruled out on thermodynamical grounds. However, recent numerical simulations reported the presence of strong supersonic turbulence in such galaxies, which may lead to the rapid amplification of seed magnetic fields by the small-scale dynamo. I present a detailed model that describes the growth of such seed fields, and a set of numerical simulations that supports this hypothesis. This enhances the transport of angular momentum and thus helps to form more massive black holes. Finally, I will discuss how ALMA may probe the first supermassive black holes in the universe, based on detailed models for the chemistry in X-ray dominated regions.

Dominik Schleicher, Leiden Observatory / ESO Garching
Marco Spaans, Kapteyn Institute Groningen
Robi Banerjee, Zentrum fuer Astronomie der Universitaet Heidelberg, ITA
Sur Sharanya, Zentrum fuer Astronomie der Universitaet Heidelberg, ITA
Ralf Klessen, Zentrum fuer Astronomie der Universitaet Heidelberg, ITA

Presenter: Dominik Schleicher, Leiden Observatory / ESO Garching

Contribution # 22 Poster

An accurate timescale for Star Formation and chemical enrichment of the Sculptor dSph.

The Sculptor dwarf Spheroidal is a Milky Way satellite with a dominant old (>10 Gyr) population. Even in the short time that it formed stars it built up a certain degree of complexity with at least two distinct stellar populations formed over 2-3Gyr, with different spatial distributions, kinematics and metallicities. Sculptor has been the target of large spectroscopic surveys with VLT/FLAMES both to determine high resolution abundances of a range of chemical elements in the centre of the galaxy and low resolution Ca II triplet metallicities and kinematics over the whole galaxy. I will present new sensitive BVI imaging data from CTIO/MOSAIC covering the entire galaxy and a detailed study of the stellar population of Sculptor, including the main sequence turnoff properties and make the link to the chemical evolution history coming from the spectroscopic studies. This will provide an accurate timescale for the star formation and chemical enrichment timescales in this relatively simple system that formed most of its stars at redshift, $z \sim 5$.

Thomas de Boer, Kapteyn Astronomical Institute

Presenter: Thomas de Boer, Kapteyn Astronomical Institute

NuMoon: Detecting Cosmic Rays and Neutrinos with the WSRT and the lunar Cherenkov technique

The lunar Cherenkov technique is a method to detect the highest-energy cosmic rays and their predicted counterparts, the ultra-high energy neutrinos. By pointing a radio-telescope at the Moon, nano-second-scale bursts of coherent Cherenkov radio-waves produced via the Askaryan effect from the interactions of these particles in the Moon's outer layers might be observed. The NuMoon project's goal is to use low-frequency radio-telescopes, such as Westerbork and LOFAR, to achieve an effective detector volume of more than one million cubic / ten million square kilometres to neutrinos/cosmic rays at the very highest energies. In this contribution, we give an overview of the lunar Cherenkov technique, where novel techniques have been used to allow telescopes such as the VLA/EVLA, WSRT, Goldstone, Parkes, and the ATCA to perform radio astronomy on nanosecond time-scales. Focussing on the NuMoon project's 2007-2008 observations at Westerbork, we present limits from 50 hr of observations on a flux of both ultra-high energy neutrinos and cosmic rays. Finally, I mention the next-generation of radio-telecopes – of which the first is LOFAR – which will provide an unprecedented sensitivity to these highest-energy particles.

Clancy W. James, IMAPP, Radboud University Nijmegen
Heino Falcke, IMAPP, Radboud University Nijmegen; ASTRON
Sander ter Veen, Department of Astrophysics/IMAPP, Radboud University Nijmegen
Olaf Scholten, KVI, University of Grongingen
Maaijke Mevius, KVI, University of Grongingen
Kalpana Singh, Inter-University for High Energy Physics, Vrije Universiteit Brussel; KVI, University of Grongingen
Stijn Buitink, Lawrence Berkely National Laboratory, Berkely, California
Ben Stappers, Jodrell Bank Centre for Astrophysics, University of Manchester

Presenter: Clancy W. James, IMAPP, Radboud University Nijmegen

The Pierre Auger Cosmic Ray Observatory: Recent Results and Future Plans

The Pierre Auger Cosmic Ray Observatory is a hybrid air shower experiment which uses multiple detection techniques to investigate the origin, spectrum, and composition of ultra-high energy cosmic rays. We present recent results on these questions, including the status of correlations with astrophysical objects such as active galactic nuclei. Future plans are also discussed, including enhancements underway at the southern site in Argentina.

John Kelley, Radboud University Nijmegen
Pierre Auger Collaboration,

Presenter: John Kelley, Radboud University Nijmegen

Contribution # 25 Poster

Propagation of Galactic cosmic rays

The bulk of Galactic cosmic rays consists of mostly protons and light, fully ionized nuclei up to iron. From their presumed origins in supernova remnants they propagate through the Galactic magnetic field in a diffuse process. In order to understand this propagation the ratio of secondary to primary cosmic-ray elements is studied. Secondary cosmic-ray nuclei are essentially not present at the source (e.g. boron) and are only produced in spallation processes in the interstellar medium from heavier nuclei (e.g. carbon). Hence, the ratio of boron to carbon is a measure of the amount of material traversed from source to observer. The balloon-borne cosmic-ray detector TRACER (Transition Radiation Array for Cosmic Energetic Radiation) is designed to measure cosmic-ray nuclei with single element resolution up to very high energies, and to facilitate a large geometric aperture by using a transition radiation detector. TRACER was launched in two long-duration balloon flights, in Antarctica, in 2003, and subsequently, after significant detector upgrades, from Kiruna, Sweden, in 2006. The data cover the elements from boron (Z=5) to iron (Z=26), and reach energies of up to 10 TeV per nucleon. We use a simple propagation model to derive the relative cosmic-ray abundances and spectral slopes at the sources. Specific constraints on interstellar propagation come from the relative abundances of secondary elements such as boron. We will present new results on the boron abundance obtained in the 2006 flight.

Andreas Obermeier, Radboud Universiteit Nijmegen
M. Ave, University of Chicago
P. Boyle, University of Chicago
Jörg R. Hörandel, Radboud Universiteit Nijmegen
D. Müller, University of Chicago

Presenter: Andreas Obermeier, Radboud Universiteit Nijmegen

FRaTs: a real-time search for Fast Radio Transients with LOFAR

The transient radio sky is known to contain pulsars, giant pulses and RRaTs and there is still a lot of undiscovered parameter space. For an effective survey of the sub-second radio sky, both a large field of view and a long observation time is needed. However, to determine the source location a high angular resolution is required. Also one wants to efficiently discriminate against RFI and atmospheric effects. LOFAR is at the moment the largest low frequency radio telescope with its center in the Netherlands and will be opened on the 12th of June of this year. In this contribution we explain how the different technologies used in LOFAR can be used for an optimal survey of the sub-second radio sky in real-time. We also show results obtained from first test runs on pulsars and observations of lightning.

Sander ter Veen, Radboud University Nijmegen
Heino Falcke, Radboud University Nijmegen & ASTRON (Dept. of Astronomy)

Philippe Zarka, Observatoire de Paris (LESIA)
Pim Schellart, Radboud University Nijmegen
Michael Wise, ASTRON (Radio Observatory)
Ralph Wijers, University of Amsterdam
Rob Fender, University of Southampton (School of Physics & Astronomy)
Jörg R. Hörandel, Radboud University Nijmegen
Olaf Scholten, KVI/University of Groningen
Steve Rawlings, Oxford University
Andreas Horneffer, Radboud University Nijmegen
Clancy W. James, Radboud University Nijmegen

Presenter: Sander ter Veen, Radboud University Nijmegen

Planetary Radio Interferometry and Doppler Experiment (PRIDE)

The Planetary Radio Interferometry and Doppler Experiment (PRIDE) is a proposed multi-disciplinary enhancement of the scientific suite of interplanetary missions. The essence of PRIDE is the estimation of the state-vector of a spacecraft using Very Long Baseline Interferometry (VLBI) tracking and multi-station Doppler measurements in phase-referencing mode. PRIDE will exploit the technique of VLBI observations of spacecraft and natural celestial reference radio sources by a network of Earth-based radio telescopes. We will present the current status of the PRIDE program and we will describe the scientific topics that can be addressed by the PRIDE measurements.

Giuseppe Cimo, Joint Institute for VLBI in Europe
Leonid Gurvits, Joint Institute for VLBI in Europe
Sergei Pogrebenko, Joint Institute for VLBI in Europe
Guifre Molera, Helsinki University of Technology
PRIDE Team,

Presenter: Giuseppe Cimo, Joint Institute for VLBI in Europe

High Performance Gravitational N-body simulations on a Planet-wide Distributed Supercomputer

We report on the performance of our cold dark matter cosmological N-body simulation which was carried out concurrently using supercomputers across the globe. We achieved to run simulations on 60 to 750 cores distributed over a variety of supercomputers in Amsterdam (the Netherlands, Europe), in Tokyo (Japan, Azia), Edinburgh (UK, Europe) and Espoo (Finland, Europe). Regardless the network latency of 0.32 seconds and the communication over 30.000 km of optical network cable we are able to achieve $\sim 87\%$ of the performance compared to an equal number of cores on a single supercomputer. We argue that using widely distributed supercomputers in order to acquire more compute power is technically feasible, and that the largest obstacle is introduced by local scheduling and reservation policies.

Derek Groen, Leiden Observatory
Simon Portegies Zwart, Leiden Observatory
Tomoaki Ishiyama, Center for Computatinal Astrophysics, Tokyo
Junichiro Makino, Center for Computatinal Astrophysics, Tokyo
Steven Rieder, Leiden Observatory

Presenter: Derek Groen, Leiden Observatory

Contribution # 29 Session 4

Thermal Imaging of Extrasolar Planets

We present results from our direct searches for extrasolar giant planets around nearby stars using the 6.5m MMTO telescope, and describe how looking at thermal wavelengths (three to five microns) enables us to look for cooler effective temperature objects (T<1200K). We also describe the coronagraphic optics that increase our detection sensitivites close in to the parent star. For the closest systems, our detection limits are as low as 2 to 5 Jupiter masses.

Matthew Kenworthy, Leiden
Phil Hinz, Steward Observatory, Tucson, AZ, USA
John Codona, Steward Observatory, Tucson, AZ, USA

Presenter: Matthew Kenworthy, Leiden

Contribution # 30 Poster

A surface reaction model for the formation of interstellar molecules

Molecules play an important role in many astrophysical environments, since they are important evolants and radiation shielders. Many molecules in the interstellar and circumstellar medium are assumed to be formed on the surfaces of dust particles. These include H2, H2O and CH3OH. The conditions under which these molecules form are very divers. This poses a problem when modelling the surface chemistry, since different regimes require different computational treatments to keep the computational load reasonable. In the high density regime the rate equations approach is generally used, whereas in the low density regime the stochastic master equation approach is more appropriate. Based on the mathematical description of Brownian motion a new model for the formation of molecular hydrogen out of atomic hydrogen is proposed. With this we aim for a more universal model for surface chemistry. Currently it is investigated whether this model will give the same results as the master equation and the rate equation approach. The main adVantage of the new model is that it allows a wider range of different surfaces of dust particles.
This research is part of a bachelor research project.

Arthur Vromans, Sterrewacht Leiden
Herma Cuppen, Leiden Observatory, Leiden University

Presenter: Arthur Vromans, Sterrewacht Leiden

Laboratory Pathways to Molecular Complexity in Space

Space infrared observations with the ISO-SWS and Spitzer telescopes showed that species like carbon dioxide, formic acid, formaldehyde, methanol and water, are present as ice in the interstellar medium (ISM). The observed abundances cannot be explained by direct accretion from the gas phase only, and, it is very likely that their synthesis takes place on grains by surface reactions. These follow particle bombardment (atoms, ions, electrons) or photo-processing of the ice mantles. Details of the involved solid state reaction schemes are largely lacking, and the solid state reaction schemes used in astrochemical models may still be very incomplete. Laboratory work combined with theoretical models are needed to disentangle the solid state astrochemical networks.
Recently, we have investigated in the laboratory the low temperature formation of formaldehyde and methanol upon CO-hydrogenation [1] and solid water and hydrogen peroxide upon solid O2 [2] and O3 hydrogenation [3]. The measurements have been performed under ultra high vacuum conditions and the chemical formation paths upon H-atom exposure are visualized using both spectroscopic and mass spectrometric techniques.
This contribution shows how interstellar reaction schemes are quantified in a laboratory setting and how the results can be used to conclude on molecular abundances in space.
References:
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[2] Ioppolo, S., Cuppen, H. M., Romanzin, C., Van Dishoeck, E. F., Linnartz, H., ApJ, 2008, 686, 1474
[3] Romanzin, C., Ioppolo, S., Cuppen, H. M., Van Dishoeck, E. F., Linnartz, H., to be submitted to Chem. Phys. Lett., 2010

Sergio Ioppolo, Leiden Observatory
Herma Cuppen, Leiden Observatory
Claire Romanzin, LPMAA, Pierre and Marie Curie University
Ewine F. Van Dishoeck, Leiden Observatory
Harold Linnartz, Leiden Observatory

Presenter: Sergio Ioppolo, Leiden Observatory

Contribution # 32 Poster

Searching for Solid State PAH Features in the Laboratory and in Space

Based on the observation of Unidentified InfraRed (UIR) emission bands, polycyclic aromatic hydrocarbons (PAHs) are concluded to be omnipresent throughout all phases of the interstellar medium. Towards dense clouds, however, the strength of the UIR bands decreases. It is here where small molecules - H2O, CO2, CO and others - are observed to form thin icy layers on top of cold interstellar dust grains. It is logical that the larger and highly non volatile PAHs will behave identical resulting in ices with dilute amounts of PAHs.
In the Sackler Laboratory for Astrophysics, Leiden Observatory, the near UV/Vis spectra of a series of neutral PAHs and their photoproducts trapped in water ice have been measured at astronomical releVant temperatures, using a new sensitive solid state spectrometer. The typical conditions resemble those in dense clouds. In parallel VLT/FORS data have been recorded towards a cold cloud surrounding the embedded object MWC297. An attempt is made to compare the optical PAH absorption features observed in a water matrix in the laboratory to the dark part of the cloud surrounding the embedded object. For this a wavelet analysis is used. The first results are presented.
References: Bouwman, J., Cuppen, H.M., Bakker, A., Allamandola, L. J., Linnartz, H., 2010, A&A, 511, A33 Bouwman, J., Paardekooper, D.M., Cuppen, H.M., Linnartz, H., Allamandola, L.J., 2009, ApJ, 700, 56
This work is part of a bachelor research project.

Michiel Meijer, Leiden Observatory
J Bouwman, Raymond and Beverly Sackler Laboratory for Astrophysics, Leiden Observatory
K. M. Pontoppidan, California Institute of Technology, Division for Geological and Planetary Sciences
Ewine F. Van Dishoeck, Leiden Observatory
L. J. Allamandola, NASA-Ames Research Center, Space Science Division
Harold Linnartz, Raymond and Beverly Sackler Laboratory for Astrophysics, Leiden Observatory

Presenter: Michiel Meijer, Leiden Observatory

Contribution # 33 Poster

The Void Galaxy Survey

The void galaxy survey consists of a multiwavelength observational study of void galaxies. The galaxies are located in the deepest troughs of voids that were identified from the SDSS DR7 survey sample. The identification is uniquely based on a pure (tessellation-based) geometric procedure, guaranteeing an objective census of the void galaxy population in the nearby Universe. The aim of the project is to compare the physical intrinsic properties of void galaxies and to assess in how far they differ from the regular field population in terms of morphology, brightness, colour, star formation activity and (HI) gas content. Living in the most pristine regions in the local Universe, the survey will yield essential insights on the first stages of galaxy formation and on environmental influences on the galaxy formation process. In this poster, we will present the first results of our program. This will involve a discussion of the finished pilot program of 15 galaxies, along with some of the unique constellations we have encountered. Amongst others, special attention will be devoted to the polar ring galaxy we have found in a tenuous wall between voids and on the elongated group of three void galaxies (one being a ring galaxy) embedded within a common HI cloud or stream.

Burcu Beygu, PhD
Kathryn Stanonik, PhD
Rien Van de Weijgaert, Prof.
Thijs (J.M.) Van der Hulst, Prof.
Jacqueline Van Gorkom, Prof.
Tom Jarrett, Dr.
Erwin Platen, Dr.
George Rhee, Assoc. Prof.

Presenter: Burcu Beygu, PhD

Contribution # 34 Poster

Status of the air shower array for LOFAR

LOFAR is a new form of radio telescope which can detect radio emission from air showers induced by very high energy cosmic-rays. To complement the radio detection, we are setting up a small particle detector array LORA (LOfar Radboud Air shower array) within the LOFAR core area. It will help in triggering and confirming the radio trigger of the LOFAR antennas. LORA consists of 5 stations with 4 detectors each. The detectors are plastic scintillators and they are placed within an area of 300m diameter with spacings (50-100)m between them. At this conference, we will present the current status of LORA.

Satyendra Thoudam, Radboud University Nijmegen
G. Van Aar, Radboud University Nijmegen
Martin Van den Akker, Radboud University Nijmegen
Lars Bähren, Radboud University Nijmegen
Arthur Corstanje, Radboud University Nijmegen
Heino Falcke, Radboud University Nijmegen, ASTRON
Jörg R. Hörandel, Radboud University Nijmegen
Andreas Horneffer, Radboud University Nijmegen
Clancy W. James, Radboud University Nijmegen
John Kelley, Radboud University Nijmegen
Maaijke Mevius, KVI
Olaf Scholten, KVI
Kalpana Singh, KVI
Sander ter Veen, Radboud University Nijmegen

Presenter: Satyendra Thoudam, Radboud University Nijmegen

Contribution # 35 Poster

On the possible correlation between the high energy electron spectrum and the cosmic-ray secondary to primary ratios

Observations of high energy cosmic-ray electrons by the Fermi-LAT and the HESS experiments between 20 GeV and 5 TeV have found that the energy spectrum follow a broken power-law with spectral indices roughly -3 and -4 with a break at around 1 TeV. On the other hand, measurements of cosmic-ray secondary-to-primary ratios like the boron to carbon ratio indicate a possible change in the slope at energies around 100 GeV/n. Here, we present a possible explaination for the observed break in the electron spectrum and its possible correlation with the observed flattening in the secondary-to-primary ratios at higher energies. In our model, we assume that cosmic-rays, after acceleration, remain confined within the sources before they are released into the interstellar medium. During this time, the high-energy electrons suffer from radiative energy losses and the cosmic-ray nuclei undergo nuclear fragmentations due to their interactions with the matter.

Satyendra Thoudam, Radboud University Nijmegen
Jörg R. Hörandel, Radboud University Nijmegen

Presenter: Satyendra Thoudam, Radboud University Nijmegen

Contribution # 36 Poster

A Simultaneous GBT/Fermi Study of Crab Giant Pulses

We report on the last results from the correlation analysis of the Crab radio giant pulses (GPs) with Fermi photons. Radio observations were carried out with the 100-m Robert C. Byrd Green Bank Telescope at the frequency of 8.9 GHz for about of 10.5 h of contemporaneous time with Fermi Space Telescope. These observations are part of the ongoing campaign with two other telescopes, the 140-ft telescope at Green Bank Observatory (WV) and 42-ft telescope at Jodrell Bank Observatory (UK). No correlation found between photons and 2-min bursts of radio GPs up to a 40-min formally possible lag between them. Using the Bayesian approach we put a conservative limit on average gamma-ray flux increase during GPs to be less than 10 integral fluxes of the Crab pulsar. The lack of correlation, if genuine, implies that radio GPs are primarily caused by enhanced coherence rather than enhanced pair creation.

Vladislav Kondratiev, ASTRON
Anna Bilous, University of Virginia
Maura McLaughlin, West Virginia University
Scott Ransom, NRAO
Maxim Lyutikov, Purdue University
Duncan Lorimer, West Virginia University
Glen Langston, NRAO
Mitch Mickaliger, West Virginia University
Ben Stappers, University of Manchester

Presenter: Vladislav Kondratiev, ASTRON

Contribution # 37 Session 5

SimpleX, radiative transport on unstructured grids

The SimpleX algorithm is an efficient and versatile method for radiative transfer in complex geometries. It uses a transport grid that is constructed from discrete points describing the physical medium. This connection between the medium and the computational grid results in a natural scale for the photon transport: the local mean free path. We will discuss the properties of SimpleX in the context of large-scale simulations of the epoch of reionization.

Chael Kruip, Sterrewacht Leiden
Jan-Pieter Paardekooper, Sterrewacht Leiden
Vincent Icke, Sterrewacht Leiden

Presenter: Chael Kruip, Sterrewacht Leiden

First results from the "Void Galaxy Survey": probing the lowest density environment

Cosmic voids are an essential element of the cosmic web and may harbour a systematically different population of galaxies. We began to observe the HI in several tens of galaxies in the deepest voids exclusively selected from the SSDS survey by means of a unique geometric procedure which guarantees that the galaxies are located at or near the deepest troughs of the voids. The void selection is completely independent of intrinsic galaxy properties, so that we have a true objective census of the properties of void galaxies, and hence of the issue of environmental influence on galaxy formation and evolution.
Results for the first two dozen galaxies indicate that void galaxies do appear to have significantly different properties, apparently residing in a more youthful state of star formation and possessing larger and less distorted supplies of gas than their counterparts in denser environments. A surprising result is the discovery of several galaxies with signs of recent interaction and accretion as witnessed by the structure of the HI and the presence of small companion galaxies. We will present two tell-tale examples of such systems with respectively a polar disk and a polar disk in formation. These pose a challenge for classical galaxy formation theories.

Thijs (J.M.) Van der Hulst, Kapteyn Astronomical Institute, University of Groningen
Rien Van de Weijgaert, Kapteyn Astronomical Institute, University of Groningen
Burcu Beygu, Kapteyn Astronomical Institute, University of Groningen
Jacqueline Van Gorkom, Columbia University, New York
Kathryn Stanonik, Columbia University, New York

Presenter: Thijs (J.M.) Van der Hulst, Kapteyn Astronomical Institute, University of Groningen

Contribution # 39 Poster

The system characteristics of Auger Engineering Radio Array (AERA)

The new generation of radio telescope arrays with digital interferometry is capable of measuring radio pulses from the highest energy cosmic rays. As initial installation phase of Pierre Auger Observatory, AERA is being built to detect and characterize cosmic rays in the frequency range of coherent emission (below 100 MHz). Based in Malarge, Argentina, AERA covers 20 km area of the total Auger South field (3000 km). Some 150 antennas will be co-located with the Auger fluorescence and surface detectors expecting to observe about 5000 cosmic ray events per year. The results will provide a better understanding of the radio emission mechanisms in the air showers and will evaluate the capability of radio detection of cosmic rays in the large scale of Auger observation. The presentation introduces the subsystems of AERA and their performances and shows the test results and data samples of the prototype station along with the latest progress and the project time schedule.

Amin Aminaei, Radboud University Nijmegen
Pierre Auger Collaboration,

Presenter: Amin Aminaei, Radboud University Nijmegen

Detecting High Energy Cosmic Rays with LOFAR

High energy cosmic rays have been detected with energies up to some 10^20 eV. When these cosmic rays hit the Earth's atmosphere they produce cascades of secondary particles, called extensive air showers. These air showers emit radio pulses which can be measured by LOFAR, for primary energies of 10^16 eV and higher. The high sensitivity and excellent calibration will make LOFAR a unique tool to study the radio properties of single air showers and thus test and refine our theoretical understanding of the radio emission process.
Cosmic rays arrive at random times and from random directions from all over the sky. The radio signal of an air shower is a short pulse of about 10 ns. So in order to measure cosmic rays we need to trigger on air showers. We therefore perform a real-time search for short pulses in the datastream of single dipoles, and then check for coincidences at the level of a LOFAR station. When a good air shower candidate is found, a dump of the recorded raw antenna signals is initiated. This data is then analyzed offline. I will present the current status of our efforts and the work that still needs to be done to enable LOFAR to measure cosmic-ray air showers.

Arthur Corstanje, Radboud University Nijmegen
Martin Van den Akker, Radboud University Nijmegen
Lars Bähren, Radboud University Nijmegen
Heino Falcke, Radboud University Nijmegen, ASTRON
Jörg R. Hörandel, Radboud University Nijmegen
Clancy W. James, Radboud University Nijmegen
John Kelley, Radboud University Nijmegen
Maaijke Mevius, Kernfysisch Versneller Instituut
Olaf Scholten, Kernfysisch Versneller Instituut
Kalpana Singh, Kernfysisch Versneller Instituut
Satyendra Thoudam, Radboud University Nijmegen
Sander ter Veen, Radboud University Nijmegen

Presenter: Arthur Corstanje, Radboud University Nijmegen

Contribution # 41 Poster

The energetic teenage phase of star formation; molecular outflows from protostars in Ophiuchus

Molecular outflows are distinctive of the earliest phases of star formation: even when a very young protostar is still deeply embedded and not detectable in the mid infrared, its continuing growth to maturity is announced by energetic jets, pushing material outwards over tens of thousands of AU. These molecular outflows tend to open up and slow down with evolution before they completely disappear in the later stages of star formation. Therefore, high spatial resolution studies of outflows in star-forming regions at all evolutionary stages are crucial for better understanding the star formation process. While this has been done extensively for very young objects, the "teenage" phase has only been explored for the strongest and most easily detected outflows.
^{12}CO J=3-2 observations taken with the HARP-B instrument at the JCMT of 17 sources in the ρ Ophiuchus star-forming region are presented. The high-velocity line wings of this CO line are not only tracers of molecular outflows, they can also be used to derive actual physical properties such as the outflow mass, size and velocities. The flow momentum rate depends on these three parameters and is a measure of the intrinsic strength of the outflow. Existing correlations between the strength of the outflow and physical properties of the protostar itself, such as bolometric luminosity, are confirmed and further extended with the "teenage" protostars surveyed here. This gives better insight in these relations for a wider range of evolutionary stages, which will enable more accurate modeling of the early years of star formation in the future.

Nienke Van der Marel, Leiden
Lars Kristensen, Leiden
Ruud Visser, Leiden
Tim Van Kempen, Harvard
Ewine F. Van Dishoeck, Leiden

Presenter: Nienke Van der Marel, Leiden

Contribution # 42 Poster

Sequencing the Building Blocks of Star Formation in the Serpens Molecular Cloud

Stars form deep inside molecular clouds which are not observable in the optical regime. Long wavelength observations are needed to probe deep into these dark clouds and study the early stages of star formation. In addition, powerful jets emitted by embedded protostars serve as beacons signaling their presence. Rotational transitions of molecules at long wavelengths can be used to study both physical and chemical conditions inside the cloud and along its outflows. Due to the compactness of the parent clouds, high spatial resolution observations are needed to obtain a better understanding of the star formation process. Recent adVances in long wavelength instrumentation and modeling techniques make such studies feasible with high accuracy.
Observations of carbon monosulfide (CS) J = 3-2 and J = 5-4 observations taken by EMIR on IRAM-30m and the A3 receiver on the James Clerk Maxwell Telescope (JCMT) probe the cold high density regions of molecular clouds. Observations of CO J = 6-5 and J = 7-6 are also obtained by CHAMP+ on the Atacama Pathfinder EXperiment (APEX), which is mapping the warm gas surrounding the protostars. CS observations trace the cold density gas within the outflows associated with one of the protostars, SMM4. However, the CO observations show the presence of warm gas in the vicinity of the protostars. Both CS and CO observations indicate the relative age of the protostars within the Serpens Cloud with SMM1 being the oldest of them all. The density and temperature distribution derived will be useful for upcoming Herschel observations.

Daniel Harsono, Sterrewacht Leiden
Lars Kristensen, Sterrewacht Leiden
Ewine F. Van Dishoeck, Sterrewacht Leiden
Michiel Hogerheijde, Sterrewacht Leiden
Ruud Visser, Sterrewacht Leiden

Presenter: Daniel Harsono, Sterrewacht Leiden

Contribution # 43 Poster

The CosmoGrid simulation

In this poster we show the first results from the CosmoGrid simulation: a simulation of 2048^3 dark matter particles performed over a grid of supercomputers.

Steven Rieder, Sterrewacht Leiden
Derek Groen, Sterrewacht Leiden
Simon Portegies Zwart, Sterrewacht Leiden

Presenter: Steven Rieder, Sterrewacht Leiden

Contribution # 44 Session 2

Detecting Ultra High Energy Neutrinos with LOFAR

When an ultra-high energy (UHE) neutrino hits the Moon, it initiates an hadronic cascade below the surface. The cascade has a negative charge excess that propagates faster than the local speed of light, producing a short pulse of radio Cherenkov emission. The NuMoon project aims to detect these lunar radio pulses on Earth with low frequency radio telescopes. In a first phase the measurement was performed with the Westerbork Radio Synthesis Telescope array, resulting in an upper limit on the neutrino flux an order of magnitude below previous existing limits. We are currently preparing to perform this measurement with LOFAR. The expected sensitivity of LOFAR reaches flux limits within the range of some theoretical production models. I will discuss the challenges of detecting UHE neutrinos with LOFAR.

Maaijke Mevius, KVI

Presenter: Maaijke Mevius, KVI

Science with APERTIF; a wide-field radio camera for surveys on the WSRT

APERTIF is an innovative new receiver system, based on phased array technology. Operating in the 21-cm band, APERTIF will enhance the field-of-view of the WSRT by a factor of 30 and the bandwidth by a factor of 2, thus transforming this forty-year-old telescope into an effective survey facility. As a technology and science pathfinder for the Square Kilometre Array, APERTIF blazes the trail toward a viable implementation of phased array feeds for the SKA. In this presentation, the concept and benefits of phased array feeds will be dicussed briefly, and results will be presented from the APERTIF prototype system, currently installed in one of the dishes of the WSRT. The focus will be on the scientific surveys that can be performed with APERTIF, in particular blind volume-limited HI surveys out to a redshift of z=0.4. APERTIF surveys will detect and image the distribution and kinematics of atomic hydrogen gas in 10^5 galaxies, detect radio continuum emission from 10^7 galaxies, detect 1000 pulsars and map the large-scale magnetic fields in the Milky Way and other galaxies. Science teams will be forged later this year as APERTIF is expected to become operational in 2013.

Marc Verheijen, Kapteyn Astronomical Institute
Tom Oosterloo, ASTRON
Wim Van Cappellen, ASTRON

Presenter: Marc Verheijen, Kapteyn Astronomical Institute

Contribution # 46 Poster

Detecting Ultra High Energy Neutrinos and Cosmic Rays using the Moon

The probabilty to detect Ultra High Energy (UHE) neutrinos and cosmic rays (> 10^20 eV) is very low, therefore, large detecting volumes are needed. It has been proposed to use the Moon as particle detector for these UHE neutrinos/cosmic rays. The signal of such a particle hitting the Moon can be detected with radio telescopes on Earth. This method will be explained and upper limits from measurements with WSRT as well as expected sensitivities of LOFAR will be shown.

Maaijke Mevius, KVI
NuMoon Collaboration,

Presenter: Maaijke Mevius, KVI

Contribution # 47 Session 8

Measuring Weak Lensing Flexion

Weak gravitational lensing is a powerful tool for studying the matter distribution around galaxies. Since this technique is independent of the type of matter, it provides the most direct tool to map the invisible dark matter. To do this the image distortion, which is caused by the foreground gravitational potential and is imprinted onto the observed shapes of background galaxies, must be determined. We present a pipeline that is able to measure not only the first order lensing signal called shear, but also higher order distortions known as flexion. We also present the first attempt to measure flexion signal around galaxies using this pipeline and data from the Hubble Space Telescope COSMOS survey.

Malin Velander, Leiden Observatory
Konrad Kuijken, Leiden Observatory

Presenter: Malin Velander, Leiden Observatory

Searching for Helical Magnetic Fields in Active Galactic Nuclei

Several studies have shown systematic Faraday Rotation gradients across the parsec-scale jets of a number of Active Galactic Nuclei, interpreted as evidence for helical magnetic (B) fields- the gradients were taken to be due to the systematic variation of the line-of-sight B field across the jet. I present here results for parsec-scale Faraday Rotation Measure (RM) distributions for several of these sources, confirming previous results and showing interesting new features. We observe transverse RM gradients across the jets of several of these sources (as expected, if they have helical magnetic fields), and confirm the presence of the gradients over time and at different wavebands. Furthermore, I will also discuss an interesting new feature observed with the RM distributions in some of these sources: a reversal in the direction of these gradients that happens either with distance from the core or over time in the jet! This provides new evidence to support "magnetic-tower" type models in which field lines emerging from the central region of the accretion disk and closing in the outer region of the accretion disk are both "wound up" by the differential rotation of the disk. This provides new insights about the geometry of the jet B fields, confirmation that these gradients are dynamic, and also evidence for the Poynting-Robertson Battery model of Contopoulos and Kazanas (1998).

Mehreen Mahmud, Joint Institute for VLBI in Europe
Denise Gabuzda, University College Cork, Ireland

Presenter: Mehreen Mahmud, Joint Institute for VLBI in Europe

Contribution # 49 Poster

A Spitzer survey of S-type stars

During the late evolutionary stages, a low to intermediate mass star (1 to 8 M) evolves to become a red giant, first only burning hydrogen in a shell on the red giant branch (RGB) and later helium ignites in a shell round a oxygen- and carbon-rich stellar core on the asymptotic giant branch (AGB). During this AGB phase, the stellar envelope becomes enriched in s-process elements (like Zr, La and Tc) and C. This enrichment changes the overall appearance of the AGB stars.
In oxygen rich M stars (C/O < 1) approximately all C atoms will be consumed by CO and molecules like TiO, SiO and ZrO will be present. In carbon-rich stars (C/O > 1) the dominant molecules are CH, C2 and C2H2. Due to the gradual enrichment in C, some stars pass through an evolutionary phase where the C/O ratio in the stellar atmosphere is close to unity. Because most carbon and oxygen is locked up in CO the star shows features not usually seen in AGB stars (like ZrO, LaO, YO etc). This kind of AGB star is generally called an S star.
The dust condensation is different in all three cases: silicates are formed around oxygen rich objects, graffite, amorphous carbon and silicon carbide are formed in carbon rich environments. When C/O is very close to unity, both O and C are almost completely consumed in CO, in which case the theory of dust formation is not yet well understood. On this poster we present a Spitzer spectroscopic survey of a sample of 90 S stars. This sample is homogeneous and only consists of true AGB stars. Of all these stars, Spitzer IRS SL and LL spectra were taken. The stars represent the complete MS-S-SC sequence, where the chemical composition of the star changes from oxygen rich to carbon rich.

Kristof Smolders, KULeuven

Presenter: Kristof Smolders, KULeuven

Contribution # 50 Poster

The first intermediate-resolution spectrum of a massive star candidate in NGC 55

Obtained as part of the X-Shooter science demonstration in August and September 2009, we present the first intermediate-resolution spectrum of a massive star candidate in NGC 55, a LMC-like galaxy at $\sim$ 2 Mpc. Based on the morphological analysis of the UBV (300-550 nm) and VIS (550-1000 nm) spectrum and on the modeling of the nebular lines, we discuss the nature and evolutionary status of the central object and its influence on the surrounding interstellar medium. Extension of this pilot project in the framework of the Dutch XShooter GTO is presented.

Olga Hartoog, Sterrenkundig Instituut "Anton Pannekoek"
Hugues Sana, Sterrenkundig Instituut "Anton Pannekoek"
Alex de Koter, Sterrenkundig Instituut "Anton Pannekoek"
Lex Kaper, Sterrenkundig Instituut "Anton Pannekoek"

Presenter: Olga Hartoog, Sterrenkundig Instituut "Anton Pannekoek"

Contribution # 51 Poster

Average Mass Transfer Rate and Cooling of SAX J1808.4-3658

The heating and cooling of neutron stars in low-mass X-ray binary transients (LMXBTs) are governed by the long-term (on the order of 10^4 years) average accretion rate onto the compact object. Determining this rate is challenging, since we cannot observe these systems for such periods of time. This project tries to constrain the average accretion rate in LMXBTs by generating lightcurves that last 10^4 years using random variables based on observed values. The mass transfer rates of lightcurves with a sequence of outbursts that match the observations are then selected, and used to determine the long-term average accretion rate of the source. This poster presents the results of applying this method to SAX J1808.4-3658, which has a very low observed mass accretion rate and thus appears to be unusually cold. A preliminary analysis of our results shows that the cooling rate of SAX J1808 is not seriously affected by the uncertainty on the mass accretion history. We can therefore conlude that SAX J1808 could indeed be extremely cold and cools down on very short timescales that require a soft Equation of State, unless some unknown physical phenomenon makes the source colder than it should be.

Frank Tramper, Astronomical Institute 'Anton Pannekoek'
Alessandro Patruno, Astronomical Institute 'Anton Pannekoek'
Rudy Wijnands, Astronomical Institute 'Anton Pannekoek'

Presenter: Frank Tramper, Astronomical Institute 'Anton Pannekoek'

Contribution # 52 Poster

CO mixed with CH3OH: the answer to the non-detection of the 2152cm-1 band?

Found in a wide variety of objects, carbon monoxide is the second most abundant molecule in the interstellar medium, providing important information about the physico-chemical conditions of such objects. First reported by Soifer et al., solid interstellar CO absorbs near 4.67m (Hagen, Allamandola and Greenberg 1980), and this feature can be found in infrared spectra of young stellar objects (YSOs) embedded in molecular clouds. These infrared (width, shape and position) profiles are sensitive to the presence of a secondary molecule, as well as the physico-chemical processes in the ice. A VLT spectroscopic survey of embedded young low mas stars shows the 4.67um stretching vibrational mode of solid CO, which can be decomposed in 3 components, the so-called red, middle and blue components, each one with its characteristic centre and widths (Pontoppidan et al.). The red component in the interstellar CO ice profile is attributed to the presence of polar molecules such as H2O or CH3OH (Sandford et al. 1988 and Tielens et al. 1991). H2O, as the main ice mantle species, is usually considered to be the counter molecule. However, H2O mixed in CO ices does not provide the width and the absence of the 2152cm-1 band in the observed spectra, as was demonstrated by laboratory studies (Fraser et al. 2004). We suggest a different scenario to explain the observed feature: CH3OH mixed with CO, since it can be formed from CO, and can explain the width and the absence of 2152cm-1. This new insight will shine a different light on the evolutionary scenario of the build-up of ice mantles in YSOs.

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Eduardo Penteado, Leiden Observatory
Herma Cuppen, Leiden observatory

Presenter: Eduardo Penteado, Leiden Observatory

Contribution # 53 Poster

A surface abundance comparison for Carbon Enhanced Metal Poor (CEMP) stars.

CEMP stars are Galactic Halo stars with enhancements of carbon and, in many cases s-elements. Comprising about 20% of the most metal poor stars, they represent a significant part of the oldest galactic population. CEMP stars are believed to originate from a binary system, in which the secondary star has accreted matter from the wind of its thermally pulsing AGB companion. As the primary evolves to a white dwarf and the secondary turns off the main sequence, this star becomes observable. In this research we attempt to match these observed surface abundances with the results from a simulated grid of binary stars. The comparison will give constraints on the characteristics of the observed systems and provides tests of the AGB nucleosynthesis and binary evolution treatment of the code.

Jeroen Veefkind, Sterrenkundig Instituut Utrecht
Onno Pols, Sterrenkundig Instituut Utrecht
Robert Izzard, Institut d'Astronomie et d'Astrophysique, Universit Libre de Bruxelles

Presenter: Jeroen Veefkind, Sterrenkundig Instituut Utrecht

The imprint of a symbiotic binary progenitor on the properties of Keplers supernova remnant

Type Ia supernova remnants (SNRs) hold important clues about their progenitor systems. In that respect Keplers SNR (SN 1604) is an important object. This SNR, which has now been established as Type Ia SNR, has a dense, nitrogen-rich shell in the northwest at roughly 2.5 pc from the explosion center. Given the height of the SNR above the Galactic plane, $\sim$ 600 pc, it is likely that the shell originates from the progenitor system. We show that the properties of Keplers SNR, such as its morphology, its dynamics, and the high nitrogen abundance, can be explained by a non-conservative mass transfer scenario in which wind accretion occurs from a 4-5 Msun AGB star. This scenario puts strong constraints on the progenitor system, as it requires that sufficient and stable mass transfer occurs, whereas at the same time the wind properties, hydrodynamic evolution and time scales must be such that the shell matches the properties of the shell in Keplers SNR. In our model this is satisfied if both the wind and systemic velocity are 15-30 km/s, with a donor star mass loss rate of $10^{-}6 - 10^{-}5$ Msun/yr and an accretion efficiency of 5 - 15%. We verified this scenario with 2D hydrodynamic modeling of the creation of the shell and the SNR. In addition we use the approach of Soberman et al. (1997) to show that all criteria are met to lead to a Type Ia explosion.

Alexandros Chiotellis, Utrecht University
Klara Schure, Utrecht University
Jacco Vink, Utrecht University

Presenter: Alexandros Chiotellis, Utrecht University

Contribution # 55 Poster

Formation and evolution of Carbon-Enhanced Metal-Poor stars

Very metal-poor stars observed in the Galactic halo constitute a window on the primordial conditions under which the Milky Way was formed. The typical mass of these stars is low, and therefore they have hardly evolved since they were formed. A large fraction of these stars show a great enhancement in the abundance of carbon and other heavy elements. One explanation of such observational evidence is to consider that these stars have undergone a mass transfer from a more massive binary companion during its asymptotic giant branch (AGB) phase. This scenario is supported by the evidence that these carbon-enhanced metal-poor (CEMP) stars are mostly found in spectroscopic binary systems. A full comprehension of the way CEMP stars form and evolve is needed in order to enlighten different crucial topics of modern astrophysics: the stellar evolution, particularly the processes occuring during the AGB phase; the interactions between stars in binary systems; the early evolution of the Milky Way. We are starting a project with the aim to understand different aspects which need to be clarified yet: (1) how do the abundances of low-mass metal-poor stars evolve after accreting nuclear-processed material from an evolved asymptotic giant star, (2) what are the consequences of this mass transfer for the overall population of CEMP stars and (3) its implications for the initial mass function at early epochs.

Carlo Abate, Utrecht University

Presenter: Carlo Abate, Utrecht University

Contribution # 56 Poster

The Hydrodynamics of Eta Carinae

Eta Carinae, one of the most extreme and fascinating objects in our Galaxy, is a supermassive interacting binary at the centre of a bipolar nebula, expanding at about 500 km s1. Finding the mechanisms behind Etas appearance and behaviour is the main goal of this investigation. I have produced numerical models of this nebula, in parallel with participation in several major observational campaigns. I presume that the gaseous skirt surrounding Eta is an equatorial excretion disk formed in the early stages of the interacting binary, that the bipolar Homunculus nebula above and below this plane is due to the collision between the material ejected in the 1840 Giant Eruption and the disk, and the Little Homunculus similarly in the smaller 1890 eruption. These eruptions have probably contributed to the very large eccentricity of the present binary orbit. Due to this eccentricity the flow behaviour differs drastically from what happens in a circular binary. I have extensively explored the general types of flow pattern expected here. Presently I will construct specific models for quantitative comparison with this wonderful object, which many believe to be a key to understanding a variety of hitherto unexplained phenomena in and around massive stars, be they binary or single.

Vincent Icke, Sterrewacht Leiden

Presenter: Vincent Icke, Sterrewacht Leiden

Contribution # 57 Poster

Comparison of optical and NIR velocity dispersions of early-type galaxies in the Fornax cluster

Dust in early-type galaxies can influence the observed kinematics, but the effect was still unclear, as previous studies were in disagreement and were based on biased or inhomogeneous samples. For the first time, we use a complete magnitude-limited ($B_T = 14.2$), well-balanced (11 lenticulars, 11 ellipticals) sample of galaxies to compare the optical and NIR velocity dispersions and to investigate the effect of dust on the velocity dispersion. The optical velocity dispersions were taken from Kuntschner (2000), the NIR velocity dispersions were determined based on the CO band head using our ISAAC (VLT) spectra.

Joachim Vanderbeke, Universiteit Gent
Maarten Baes, Universiteit Gent
Aaron Romanowsky, University of California Observatories/ Lick Observatory
Linda Schmidtobreick, ESO La Silla Paranal Observatory

Presenter: Joachim Vanderbeke, Universiteit Gent

Contribution # 58 Poster

The GRS 1915+105 plateau state compared to the canonical hard state

The microquasar GRS 1915+105 is a very peculiar black hole binary in the constellation of Aquila, that exhibits accretion-related states that are not observed in any other stellar-mass black hole system. One of these states, however – referred to as the plateau state – may be related to the canonical hard state (HS) of black hole X-ray binaries. Both the plateau and HS are associated with steady, relatively lower X-ray emission and flat/inverted radio emission, that is sometimes resolved into compact, self-absorbed jets. However, while generally black hole binaries quench their jets when the luminosity becomes too high, GRS 1915+105 seems to sustain them despite the fact that it accretes at near- or super-Eddington rates. In order to investigate the relationship between the plateau and the HS, we fit two multi-wavelength observations using a steady-state outflow-dominated model, developed for HS black hole binaries. The data sets consist of quasi-simultaneous observations in radio, near-infrared and X-ray bands. Interestingly, we find both significant differences between the two plateau states, as well as between the best-fit model parameters and those representative of the HS. We discuss our interpretation of these results, and the possible implications for GRS 1915+105's relationship to canonical black hole candidates

Pieter Van Oers, University of Southampton

Presenter: Pieter Van Oers, University of Southampton

Contribution # 59 Poster

The chemical composition and location of crystalline forsterite in the disk of HD100546

HD 100546 is one of a few isolated nearby Herbig stars which has been used in that past as a prototype object for studying protoplanetary disks around intermediate mass stars. At an age of 10 Myr it is one of the oldest stars with a massive, gas rich disk. Mineralogical studies of the dust surrounding HD100546 show strong contributions of crystalline silicates, in particular forsterite, also at low temperatures. These features make the mid infrared spectrum very similiar to solar system comets like Hale Bopp (Malfait et al. 1998). Its large mid infrared excess is remeniscent of a ring-like gap at about 10 AU (Bouwman et al 2003), which has been confirmed in both gas and dust (e.g. Grady et al 2005, Benisty et al 2010). Using the Herschel Space Observatory, a PACS spectral scan (52-210 micron) of HD100546 was obtained as part of the Science Demonstration Phase in the DIGIT (Dust, Ice and Gas in Time) key programme, as well as additional VISIR imaging and Hubble scattered light images. We present a 2D radiative transfer model of HD100546 taking into account its complex geometry and mineralogy, and link its outcome to a previous study of the mineralogy by Sturm et al. (in prep.). We use this model to fit the 69 micron forsterite feature observed with Herschel PACS. The exact shape and wavelength of this feature depend on the dust temperature (Suto et al. 2006) and iron content, which allows us to constrain the location of the crystalline material within the disk.

Gijs Mulders, University of Amsterdam
Rens Waters, University of Amsterdam
Carsten Dominik, University of Amsterdam
Bernhard Sturm, MPIA Heidelberg
J Bouwman, MPIA Heidelberg
Neil Evans, The University of Texas
DIGIT group, Herschel Key programme

Presenter: Gijs Mulders, University of Amsterdam

Contribution # 60 Poster

Probing the early cosmic star formation with the faintest dwarfs

Ultra faint dwarf spheroidal galaxies (UFs) are the least luminous and the least metal-rich stellar systems ever known ($L < 10^{3-5} L_{sun}, [Fe/H] < -2$). The Fe-Luminosity relation derived for UFs constitutes a natural extension towards lower metallicity of that of "classical" ($L > 10^5 L_{sun}$) dwarf spheroidal galaxies (dSphs), suggesting that the formation of all these Milky Way (MW) satellites has been governed by the same physical processes. However while classical dSphs and UFs together span more than four orders of magnitude in luminosity, their total mass is roughly the same within the innermost 300 pc. Why is then the star formation so inefficient in UFs? Moreover recent observations of metal-poor stars in dSphs have revealed that $[Fe/H] < -3$ stars represent the 25% of the total stellar population in UFs, while they are extremely rare in classical dSphs. What this observation imply? Are these galaxies among the first star-forming objects in the MW system? We investigate the nature of UFs in a general cosmological context, simultaneously accounting for various classical dSphs and MW properties, including their Metallicity Distribution Function (MDF). The model successfully reproduces the observed Fe-Luminosity relation and the mean MDF of UFs. We found that UFs are left-overs of H2-cooling minihaloes; they are the oldest dSphs in the MW systems formed at $z > 8.5$, i.e. before the reionization epoch.

Stefania Salvadori, Kapteyn Astronomical Institute, Groningen
Andrea Ferrara, Scuola Normale Superiore, Pisa, Italy

Presenter: Stefania Salvadori, Kapteyn Astronomical Institute, Groningen

Contribution # 61 Poster

Alfvn waves and turbulence in the solar corona and solar wind

In situ solar wind measurements of MHD turbulence first showed, 30 years ago, that Alfvn waves propagating away from the sun are a dominant component, at least in high speed streams at solar minimum. Such waves should presumably have a solar origin, and indeed, recent observations confirm the presence of Alfvnic-type fluctuations in the solar corona. The density gradients, naturally arising from the stratification of the solar atmosphere, partially reflects Alfvn waves, triggering non-linear interactions that lead to the development of turbulence in the high Reynolds number solar corona and solar wind. We explore the conditions under which such mechanism can efficiently dissipate the wave energy coming from the inner solar atmosphere which results into the heating of the solar corona and into the acceleration of the solar wind, also highlighting the different properties of reflection driven turbulence in an expanding medium with respect to the homogenous, non expanding case.

Andrea Verdini, Royal Observatory of Belgium - SIDC
Eric Buchlin, IAS
Roland Grappin, Observatoire de Meudon, LUTH
William H Matthaeus, Bartol Research Institute, University of Delaware
Marco Velli, JPL

Presenter: Andrea Verdini, Royal Observatory of Belgium - SIDC

Contribution # 62 Poster

The accretion/ejection paradigm in YSO: from optical/NIR to FIR observations

Stellar jets are observed in association with young accreting stars and are believed to play a key role in the overall star formation process. For example, they may be responsible for the removal of excess angular momentum from the material in the disk, thus letting it move toward the star and accrete onto it. My research activity has been aimed to study the physics and the origin of stellar jets through the analysis of observations taken mainly in the optical and the near-infrared wavelength range. In order to investigate the jet structure both on large scales (from hundreds of AU up to parsec scales) and at their base (on scales between a few and hundred AU) I used spectral diagnostic techniques to analyse observations taken at different angular/spectral resolution. This approach allowed me to address some outstanding issues related to: the propagation and subsequent impact of jets on the interstellar medium and the associated chemistry; the mechanism that accelerates/collimates the jet and how this is related to accretion; and finally the role of jets, if any, in the formation of both massive stars and brown dwarfs. I will present the main results of my work and then I will discuss how the analysis of observations acquired the Herschel space telescope will allow me to extend the study of jets and protoplanetary disks to the far-infrared range.

Linda Podio, Kapteyn Astronimical Institute, University of Groningen

Presenter: Linda Podio, Kapteyn Astronimical Institute, University of Groningen

Contribution # 76 Poster

METIS

METIS (Mid-infrared ELT Imager and Spectrograph) is a proposed instrument for the E-ELT. It is the only instrument concept for the E-ELT that covers the thermal IR wavelengths from 2.9 14 m (L/M and N-band). It has two main instrument modes: 1. A diffraction limited imager at L/M, and N band with an approximately 18x18 wide FOV. The imager also includes coronagraphy at L and N-band and low-resolution (900 R 5000) long slit spectroscopy at L/M and N band and polarimetry at N-band. 2. An IFU fed, high resolution spectrograph at L/M [2.9 5.3m] band. The IFU field of view shall be about 0.4x1.5, and the spectral resolution R 100,000. With these possibilities METIS will have a large potential for ground breaking science. The main science drivers for METIS are: - Proto-planetary Disks and Formation of Planets - Physical and Chemical Properties of Exoplanets - The Formation History of the Solar System - The Growth of Supermassive Black Holes - Morphologies and Dynamics of High-z Galaxies Besides the above mentioned main science cases there are many more smaller science cases. In this poster we will show you the results of the Phase A study, including both the hardware and simulations of its science capabilities.

Frank Molster, NOVA
Bernhard Brandl, Univ Leiden
Joris Blommaert, MPIA
Alistair Glasse, CEA Saclay
Rainer Lenzen, UK-ATC
Eric Pantin, KU Leuven
Lars Venema, NOVA-ASTRON

Presenter: Frank Molster, NOVA

Contribution # 77 Poster

The UV-Excess survey of the Northern Galactic Plane

The UV-Excess Survey of the Northern Galactic Plane (UVEX) images a 10185 wide band, centered on the Galactic Equator using the 2.5mtr Isaac Newton Telescope (La Palma) in four bands (U, g, r and HeI5875) down to 21st-22nd magnitude (20th in HeI5875). See Groot et al., 2009 for a full description of the survey. Through an automatic field-to-field algorithm a catalogue of blue UV-excess sources is selected from the colour-colour and colour-magnitude diagrams of the first 200 square degrees UVEX data. Spectroscopic follow-up of 115 UV-excess sources shows that this sample contains hydrogen and helium white dwarfs, but also quasars and Halpha emission line stars such as Cataclysmic Variables. In the plane of the Milky Way these intrinsically blue, low-luminosity population of objects is visible against a background of higher luminosity, more distant and therefore more reddened (main-sequence) objects.

Kars Verbeek, RU Nijmegen

Presenter: Kars Verbeek, RU Nijmegen

Contribution # 78 Poster

A relativistically broadened OVIII Lyalpha line in the ultra-compact X-ray binary 4U 0614+091

Ultra-compact X-ray binaries consist of a neutron star or black hole that accretes material from a white dwarf-donor star. In the case of 4U 0614+091 oxygen-rich material from a CO or ONe white dwarf is flowing to the neutron star. The enriched with oxygen disc can reflect X-rays emitted by the neutron star giving a characteristic emission spectrum. We have analyzed high-resolution RGS and low-resolution MOS spectra of 4U 0614+091 obtained by the XMM-Newton satellite. We detect a broad emission feature at 0.7 keV in both instruments, which we interpret as O VIII Lyalpha emission caused by reflection of X-rays off highly ionized oxygen, in the strong gravitational field around the neutron star.

O.K. Madej, Astronomical Institute, Utrecht University
P.G. Jonker, SRON, Netherlands Institute for Space Research
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C. Pinto, SRON, Netherlands Institute for Space Research
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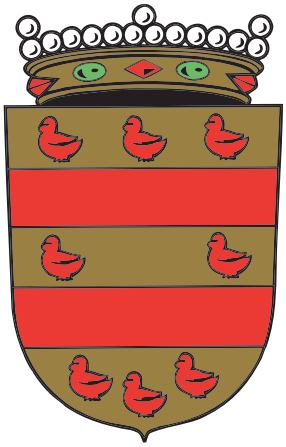

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