
Extragalactic Radio Sources – From Beams to Jets



**EDITED BY J. ROLAND, H. SOL
and G. PELLETIER**

Jets In Extragalactic Radio Sources

**Ronald L. Snell, Stanley Kurtz, Jonathan
Marr**



Jets In Extragalactic Radio Sources:

Extragalactic Radio Sources Jacques Roland, Hélène Sol, Guy Pelletier, 1992-06-26 The physics of active galactic nuclei the origin of extragalactic jets and the formation of extended extragalactic radio sources are among the most interesting challenges of modern astrophysics This book contains the proceedings of the 7th meeting of the Institut d Astrophysique de Paris which drew together both theorists and observers in this exciting field Recent observational data at X ray optical and radio wavelengths is discussed and new theoretical developments concerning beam and jet formation models are considered Special treatment is given to plasma physics problems related to particle acceleration magnetic reconnection beam plasma interaction and coherent emission The volume will be of use to all students and researchers who are working in this field

Jets in Extragalactic Radio Sources Klaus Meisenheimer, 1993 The existence of jets emanating from the central sources of radio galaxies and quasars was perhaps the most important discovery for our understanding of the nature of active galactic nuclei These proceedings present reviews and research papers on extragalactic radio sources The book begins with a discussion of the phenomenology and models of radio sources The main parts devoted to detailed studies of jets by VLBI to the information obtained about the structure of the central source as deduced from variability studies to production confinement and velocity of jets as well as to numerical simulations of the jet phenomenon Reviews of the two best studied jets those in the radio galaxy M87 and the quasar 3C273 illustrate our current observational picture of extragalactic radio jets in all accessible wavelength ranges A section on the influence of the environment on radio galaxies concludes the book This topical volume addresses researchers and graduate students in astrophysics

Jets in Extragalactic Radio Sources Hermann-Josef Röser, Klaus Meisenheimer, 2014-03-12 The existence of jets emanating from the central sources of radio galaxies and quasars was perhaps the most important discovery for our understanding of the nature of active galactic nuclei These proceedings present reviews and research papers on extragalactic radio sources The book begins with a discussion of the phenomenology and models of radio sources The main parts devoted to detailed studies of jets by VLBI to the information obtained about the structure of the central source as deduced from variability studies to production confinement and velocity of jets as well as to numerical simulations of the jet phenomenon Reviews of the two best studied jets those in the radio galaxy M87 and the quasar 3C273 illustrate our current observational picture of extragalactic radio jets in all accessible wavelength ranges A section on the influence of the environment on radio galaxies concludes the book This topical volume addresses researchers and graduate students in astrophysics

Extragalactic Radio Sources D.S. Heeschen, C.M. Wade, 2012-12-06 IAU Symposium 97 Extragalactic Radio Sources was held at Albuquerque New Mexico August 3-7 1981 It was co sponsored by IAU Commissions 28 40 47 and 48 and by URSI Commission J Financial and organizational support were provided by the National Radio Astronomy Observatory the University of New Mexico and the National Science Foundation A wide variety of interesting objects and phenomena can be covered under the heading Extragalactic Radio

Sources and a diverse set of topics was in fact discussed at the symposium Radio galaxies quasars Seyfert galaxies and BL Lacertids received the most attention but normal galaxies the galactic center and even SS433 were also discussed While the unifying theme of the symposium was radio emission studies at all wavelengths X ray UV optical IR and radio were included In general the emphasis was on individual objects and the physical processes associated with them but there were also papers on statistical studies and cosmology The symposium was attended by 209 scientists from 18 countries

The Physics of Extragalactic Radio Sources David De Young, 2002 Extragalactic radio sources are among the most unusual and spectacular objects in the universe with sizes in excess of millions of light years radiated energies over ten times those of normal galaxies and a unique morphology They reveal some of the most dramatic physical events ever seen and provide essential clues to the basic evolutionary tracks followed by all galaxies and groups of galaxies In *The Physics of Extragalactic Radio Sources* David De Young provides a clearly written overview of what is currently known about these objects A unique feature of the book is De Young's emphasis on the physical processes associated with extragalactic radio sources their evolution their environment and their use as probes to solve other astrophysical problems He also makes extensive use of the large amount of data now available from observations at x ray optical and radio wavelengths to illustrate his main points *The Physics of Extragalactic Radio Sources* will be a comprehensive introduction to the field for graduate students and a useful summary for astrophysicists

Jets in Extragalactic Radio Sources Hermann-Josef Röser, Klaus Meisenheimer, 1993-01-01 The existence of jets emanating from the central sources of radio galaxies and quasars was perhaps the most important discovery for our understanding of the nature of active galactic nuclei These proceedings present reviews and research papers on extragalactic radio sources The book begins with a discussion of the phenomenology and models of radio sources The main part is devoted to detailed studies of jets by VLBI to the information obtained about the structure of the central source as deduced from variability studies to production confinement and velocity of jets as well as to numerical simulations of the jet phenomenon Reviews of the two best studied jets those in the radio galaxy M87 and the quasar 3C273 illustrate our current observational picture of extragalactic radio jets in all accessible wavelength ranges A section on the influence of the environment on radio galaxies concludes the book This topical volume addresses researchers and graduate students in astrophysics

Parsec-Scale Radio Jets J. Anton Zensus, Timothy J. Pearson, 1990-08-16 Quasars and active galaxies are the most powerful emitters of radiation in the universe Modern radio telescope arrays have shown that the ultimate energy source resides in the central few parsecs of the galactic nucleus and powers the emitting regions by way of two oppositely directed relativistic jets of energy This volume presents the latest observations and theories of these remarkable objects Topics discussed include superluminal motions the physics of jets and shock fronts in jets related optical observations and cosmic evolution Particular attention is given to the unified theories which attempt to show that many of the phenomena in powerful extragalactic objects are different aspects of a single basic mechanism the main difference in their appearance is a

result of their different orientation with respect to the observer

Stellar Jets and Bipolar Outflows L. Errico, Alberto A. Vittone, 2012-12-06 In the last few years great improvements in the study of stellar jets and bipolar outflows have been achieved both observationally and theoretically High resolution observations at various frequencies radio IR optical and X ray of these features in different types of objects have shown a large variety of morphologies at all scales often revealing contrasting symmetries which do not allow straightforward kinematic interpretations valid for all cases In particular at present it seems very difficult to give a statistical definition of what the standard properties of jets and bipolar outflows are On the theoretical side the identification of physical processes capable of producing the observed rich morphological variety of jets and bipolar outflows and supporting them over long lifetimes is still controversial Furthermore several models are actively discussed in an attempt of reaching a complete understanding of the phenomenon The workshop provided an unique opportunity for both observers and theoreticians to gather together and produce an updated and exhaustive picture of the field In addition the meeting has been enriched by the presentation of some works on jets in external galaxies This topic was focused on what people working on stellar jets could learn from colleagues working on extragalactic jets and vice versa Invited papers were prepared with the aim of giving the state of the art about scientific subjects contributed papers and some selected poster papers presented on the contrary very recent results in the various fields

Physics of Energy Transport in Extragalactic Radio Sources Alan H. Bridle, Jean A. Eilek, 1985

Astrophysical Jets A. Ferrari, A. Pacholczyk, 2012-12-06 Attilio Ferrari I want to recall here the basic points I raised at the beginning of the Workshop as the main targets of discussion in the name of the Scientific Committee I attempted to focus the attention of participants on the fact that in many instances we tend to discuss jets in terms of simple physics more or less as one did at the time extragalactic radio sources were discovered for instance we still use equipartition arguments However we must realize that processes in jets leading to their morphologies and energetics clearly depend on complex plasma phenomena Therefore the same standard arguments used to derive characteristic parameters should be questioned some of the speakers were invited to attempt a critical analysis of this point and in fact I believe that this inquisitive attitude was actually present all along the Workshop Observers were asked to choose the parameters to be used in a statistical sample of jets For this they were urged first of all to distinguish between primary and secondary features For instance are knots and wiggles common to all jets Are relativistic flow velocities expected in all active nuclei Are jets denser or lighter than the external medium On the theoretical side I asked to discuss whether or not existing models are in accordance with the limited statistical sample that we have today And which should be the lines of development to be pursued first and to what extent

The Nature of Compact Objects in Active Galactic Nuclei Andrew Robinson, Roberto Juan Terlevich, 1994-03-03 What evidence is there for and against unified schemes for active galactic nuclei AGN How do the AGN populations evolve over cosmological timescales And what can the variability of their UV and X ray emission tell us These are just some of the exciting issues addressed in this

volume of papers collected from the 33rd Herstmonceux conference in Cambridge AGN are among the most spectacular objects known to astronomy Yet despite years of intense and wide ranging research the debate continues what is their fundamental source of power Rapid progress has been made towards answering this question by a variety of large scale multi wavelength monitoring campaigns and the latest generation of satellite borne observations This volume provides a valuable overview and timely update of the exciting and rapidly developing field of AGN research essential reading for graduate students and researchers

The Formation and Disruption of Black Hole Jets Ioannis Contopoulos, Denise Gabuzda, Nikolaos Kylafis, 2014-11-10 This book reviews the phenomenology displayed by relativistic jets as well as the most recent theoretical efforts to understand the physical mechanisms at their origin Relativistic jets have been observed and studied in Active Galactic Nuclei AGN for about half a century and are believed to be fueled by accretion onto a supermassive black hole at the center of the host galaxy Since the first discovery of relativistic jets associated with so called micro quasars much more recently it has seemed clear that much of the physics governing the relativistic outflows in stellar X ray binaries harboring black holes and in AGN must be common but acting on very different spatial and temporal scales With new observational and theoretical results piling up every day this book attempts to synthesize a consistent unified physical picture of the formation and disruption of jets in accreting black hole systems The chapters in this book offer overviews accessible not only to specialists but also to graduate students and astrophysicists working in other areas Covered topics comprise Relativistic jets in stellar systems Launching of AGN jets Parsec scale AGN jets Kiloparsec scale AGN jets Black hole magnetospheres Theory of relativistic jets The structure and dynamics of the inner accretion disk The origin of the jet magnetic field X ray observations phenomenology and connection with theory

Hot Spots in Extragalactic Radio Sources Klaus Meisenheimer, Hermann-Josef Röser, 1989-03-30 This collection of papers presents a rather complete review of current knowledge of hot spots in some strong extragalactic radio sources An overview of known results along with new data on radio observations and optical observations is given in the first and second parts of the book Recent computational techniques which allow modelling and simulations of hot spots and jet behaviour are presented in the third part The fourth part discusses particle acceleration and shock front phenomena The articles will help the reader to appreciate the role hot spots play as laboratories for studying the interaction of jets with the surrounding medium and for testing our understanding of the overall source dynamics The book is a valuable complement to the existing literature and an excellent introduction to this fairly new field of research

Beams and Jets in Astrophysics Philip A. Hughes, 1991-01-25 This book is the first to provide students and researchers in the field of astrophysical jets with a comprehensive and up to date account of current research An important feature of the book is that it combines discussions of both extragalactic and Galactic jets There are ten chapters authored by fourteen active researchers each of whom is an expert on their chosen topic and the book has been edited to provide a cohesive account of this field of study This is the first volume to integrate studies of jets on all length scales It will

be an important textbook for graduate students and a valuable reference source for researchers in many areas of extragalactic and Galactic astronomy. It will also be of interest to plasma physicists and space scientists. *Astronomy and Astrophysics Abstracts* S. Böhme, W. Fricke, H. Hefele, I. Heinrich, W. Hofmann, D. Krahn, V. R. Matas, L. D. Schmadel, G. Zech, 2013-12-14 *Astronomy and Astrophysics Abstracts* which has appeared in semi annual volumes since 1969 is devoted to the recording summarizing and indexing of astronomical publications throughout the world. It is prepared under the auspices of the International Astronomical Union according to a resolution adopted at the 14th General Assembly in 1970. *Astronomy and Astrophysics Abstracts* aims to present a comprehensive documentation of literature in all fields of astronomy and astrophysics. Every effort will be made to ensure that the average time interval between the date of receipt of the original literature and publication of the abstracts will not exceed eight months. This time interval is near to that achieved by monthly abstracting journals compared to which our system of accumulating abstracts for about six months offers the advantage of greater convenience for the user. Volume 31 contains literature published in 1982 and received before July 15 1982 some older literature which was received late and which is not recorded in earlier volumes is also included. We acknowledge with thanks contributions to this volume by Dr J Bouska Prague who surveyed journals and publications in Czech and supplied us with abstracts in English. *Scientific and Technical Aerospace Reports*, 1991 Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database. *The Role of VLBI in Astrophysics, Astrometry and Geodesy* Franco Mantovani, Andrzej Kus, 2004-06-22 A masterly survey of the last 13 years of Very Long Baseline Interferometry reviewed in light of the most advanced astronomical observations. Topics covered include Nonthermal emission from extragalactic radio sources Principles of synchrotron emission in relation to astrophysics Theory of relativistic jets Young powerful radio sources and their evolution Scintillation in extragalactic radio sources Radio and optical interferometry Radio polarimetry Unified schemes Deep fields Tropospheric and ionospheric phase calibration Supernovae VLBI for geodesy and geodynamics

Literature 1988, Part 1 U. Esser, H. Hefele, Inge Heinrich, W. Hofmann, D. Krahn, V. R. Matas, Dr. Lutz D. Schmadel, G. Zech, 2013-11-11 From the reviews *Astronomy and Astrophysics Abstracts* has appeared in semi annual volumes since 1969 and it has already become one of the fundamental publications in the fields of astronomy astrophysics and neighbouring sciences. It is the most important English language abstracting journal in the mentioned branches. The abstracts are classified under more than a hundred subject categories thus permitting a quick survey of the whole extended material. The AAA is a valuable and important publication for all students and scientists working in the fields of astronomy and related sciences. As such it represents a necessary ingredient of any astronomical library all over the world. *Space Science Reviews* 1 Dividing the whole field plus related subjects into 108 categories each work is numbered and most are accompanied by brief abstracts. Fairly comprehensive cross referencing links relevant papers to more than one category and exhaustive author and subject

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Fundamentals of Radio Astronomy Ronald L. Snell, Stanley Kurtz, Jonathan Marr, 2019-04-24 As demonstrated by five Nobel Prizes in physics radio astronomy has contributed greatly to our understanding of the Universe Courses covering this subject are therefore very important in the education of the next generation of scientists who will continue to explore the Cosmos This textbook the second of two volumes presents an extensive introduction to the astrophysical processes that are studied in radio astronomy Suitable for undergraduate courses on radio astronomy it discusses the physical phenomena that give rise to radio emissions presenting examples of astronomical objects and illustrating how the relevant physical parameters of astronomical sources can be obtained from radio observations Unlike other radio astronomy textbooks this book provides students with an understanding of the background and the underlying principles with derivations available for most of the equations used in the textbook Features Presents a clear and concise discussion of the important astronomical concepts and physical processes that give rise to both radio continuum and radio spectral line emission Discusses radio emissions from a variety of astronomical sources and shows how the observed emissions can be used to derive the physical properties of these sources Includes numerous examples using actual data from the literature

Radio Galaxies at TeV Energies Dorit Glawion, 2020-05-13 It is common believe that the centers of all galaxies exhibit supermassive black holes with masses ranging from millions up to billions of the mass of our Sun By accreting surrounding matter the luminosity of these galactic nuclei can outshine the emission of their host galaxies If this is the case they are called active galactic nuclei Some of these objects eject powerful outflows composed of plasma called jets These jets can produce non thermal radiation which observable across the entire electromagnetic spectrum from radio up to the gamma ray frequencies At highest frequencies TeV range most of the detected active galaxies have jets directed along or close to the line of sight However also galaxies with larger angles to the line of sight showing fascinating features were discovered in seeming contradiction to traditional models for these so called radio galaxies Thus the latter are of particular importance for understanding active galactic nuclei in general This Special Issue contains reviews and research articles about the current knowledge of radio galaxies at TeV energies including observational results and theoretical models It is intended to guide the interested reader deeper into this fascinating discipline of modern day astronomy

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