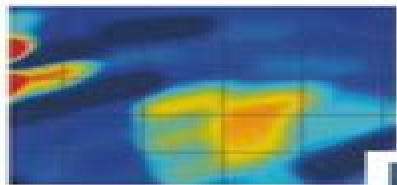


# SOFT X-RAY EMISSION FROM CLUSTERS OF GALAXIES AND RELATED PHENOMENA

RICHARD LIEU  
JONATHAN MITTAZ  
Editors



# Soft Xray Emission From Clusters Of Galaxies And Related Phenomena

**Wayne Orchiston**



## **Soft X-ray Emission From Clusters Of Galaxies And Related Phenomena:**

**Soft X-Ray Emission from Clusters of Galaxies and Related Phenomena** R. Lieu, Jonathan Mittaz, 2013-11-09 Since the discovery of the cluster soft excess CSE over eight years ago its properties and origin have been the subject of debate With the recent launch of new missions such as XMM Newton and FUSE we are beginning to answer some of the complex issues regarding the phenomenon This conference proceedings is an attempt to bring together the latest research results and covers both observational and theoretical work on the CSE and related topics One of the main topics is the possible relationship between the CSE and the warm hot intergalactic medium WHIM which is believed to harbor 50% of the baryons in the near Universe New data from both XMM Newton and FUSE have indicated a possible causal link between the WHIM and CSE Evidence is based on the apparent detection of O VII emission lines in the soft excess spectrum of the outskirts of several clusters as well as reports of absorption lines at local and higher redshifts seen in the spectra of distant sources as signature of the WHIM However while there has been considerable optimism in attributing a substantial fraction of the cluster soft excess flux to WHIM emission other work shows that for example the amount of WHIM material predicted by theoretical simulations falls way short of that necessary to account for the CSE Other work indicates that at the cores of some cluster this excess emission is so strong it is impossible to invoke the thermal model without at the same time enlisting radically new physics Thus alternative interpretations involving non thermal processes are also reported and being pursued in earnest Whatever the origin of CSE may turn out to be results in this book show that it has become beyond reasonable doubt that the phenomenon itself is observationally established This book reports the scientific progress made by bringing together scientists from a wide range of disciplines It clearly demonstrates the importance of such meetings and participants if we are to solve this puzzle This volume is aimed at scientists and graduate students in astronomy who want to learn about the latest results on cluster soft excess observations and theoretical implications *Outskirts of Galaxy Clusters (IAU C195)* International Astronomical Union. Colloquium, 2004-12-16 This book contains the proceedings of the International Astronomical Union Colloquium no 195 held in Torino Italy in 2004 The meeting investigated the formation of galaxies within a full cosmological context focusing on the outer regions of galaxy clusters The observed correlation of optical and radio properties of galaxies with their environment indicates that the formation and evolution of galaxies is intimately linked to the formation of large scale structure With chapters written by leading authorities in the field this timely volume investigates the role of the environment in determining the properties of galaxies It describes the distribution of matter and galaxies on the largest scales in the Universe the processes of cluster and galaxy formation their role and interplay This is a valuable collection of review articles for professional astronomers *The Sun and the Heliosphere as an Integrated System* Giannina Poletto, Steve T. Suess, 2013-06-05 9 MHD Turbulence in the Heliosphere Evolution and Intermittency 253 Bruno Bavassano Roberto Bruno and Vincenzo Carbone 1 Introduction 254 2 MHD Turbulence Evolution 255 2 1 Ecliptic

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**Discovering Postmodern Cosmology** Jerome Drexler, 2008 Learn how a world class inventor scientist is currently tackling the greatest scientific mysteries of the universe and succeeding With his new book Drexler provides a viable baseline to jump start debate on a standard model for postmodern cosmology It is the first book to not only address these seven unsolved cosmic mysteries shown in this book s subtitle but also offer plausible explanations for each of them The correlation of these seven cosmic phenomena by Drexler offers a revolutionary advance in cosmological research and potentially broad acceptance and use of the related concepts This book was written for open minded cosmologists astronomers astrophysicists physicists engineers students enthusiasts and those at NASA NSF DOE and ESO who want to understand postmodern cosmology The author s five years of cosmology research and his successes convinced him that his postmodern cosmology model is correctly based upon the relationships and linkages of these seven cosmic phenomena

**Questions of Modern Cosmology** Mauro D'Onofrio, Carlo Burigana, 2009-07-09 Are we living in the golden age of cosmology Are we close to understanding the nature of the unknown ingredients of the currently most accepted cosmological model and the physics of the early Universe Or are we instead approaching a paradigm shift What is dark matter and does it exist How is it distributed around galaxies and clusters Is the scientific community open to alternative ideas that may prompt a new scientific revolution as the Copernican revolution did in Galileo s time Do other types of supernovae exist that can be of interest for cosmology Why have quasars never been effectively used as standard candles Can you tell us about the scientific adventure of COBE How does the extraction of the Cosmic Microwave Background anisotropy depend on the subtraction of the various astrophysical foregrounds These among many others are the astrophysical philosophical and sociological questions surrounding modern cosmology and the scientific community that Mauro D Onofrio and Carlo Burigana pose to some of the most prominent cosmologists of our time Triggered by these questions and in the spirit of Galileo s book Dialogue Concerning the Two Chief World Systems the roughly 40 interview partners reply in the form of essays with a critical frankness not normally found in reviews monographs or textbooks

**Cores to Clusters** M.S. Nanda

Kumar,M. Tafalla,P. Caselli,2008-04-07 It was with pleasure that CAUP became for three days the core to the cloud of star formation experts all over the world Close to the celebration of its 15th anniversary therefore still in the early stages of institutional evolution we are proud of our multiple activities in Astronomy a productive research centre classified as Institution of excellence within the Portuguese research units but also an Institution of Public Utility as recognised by the Government Fifteen years ago we choose to play a role not only in research as expected from any research centre but also in the training of the future astronomers and the promotion of science and scientific culture This choice is clearly stated in our by laws and also in the multiple activities we have carried out since Along the years we have organized on a regular basis international Workshops similar to Cores to Clusters Sometimes we have chosen to organize international conferences of a larger size On other occasions the choice has been for smaller and more informal discussion meetings Or even doctoral schools with very different objectives In common all those meetings have always had besides the formal registered participants a group of informal participants our undergraduate students of Astronomy so eager to be in touch with the real world

Identification Of Dark Matter, The - Proceedings Of The Fifth International Workshop Neil J C Spooner,Vitaly Kudryavtsev,2005-05-12 The prestigious Identification of Dark Matter workshop series was initiated to assess the status of work that attempts to identify the constitution of dark matter In particular it aims to review the success of current methods that are used in the search for dark matter as well as the new techniques that are likely to improve prospects for detecting possible dark matter candidates in the future In the 5th International Workshop special emphasis was placed on the recent results obtained in experiments searching for baryonic and non baryonic dark matter This volume comprises the high quality review articles and papers contributed by leaders and promising young physicists who attended the conference It provides the most recent updates on dark matter searches from both experimental and theoretical points of view The proceedings have been selected for coverage in Index to Scientific Technical Proceedings ISTP ISI Proceedings Index to Scientific Technical Proceedings ISTP CDROM version ISI Proceedings CC Proceedings Engineering Physical Sciences

*Light Pollution Handbook* Kohei Narisada,Duco Schreuder,2013-06-05 This book deals with light pollution and about the ways to reduce it Light pollution is one of the negative side effects of artificial outdoor lighting The term light pollution is an unhappy one but as no better alternative seems to exist it will be used throughout this book The function of all outdoor lighting is to enhance the visibility or the aesthetics in the nighttime environment The light should come where it is needed If not it is spilled causing economic and environmental losses as well as disturbance and discomfort The overall effects are termed light pollution a major form of light pollution is the glow extending over the night sky Sky glow is discussed in many astronomical textbooks and in many popular brochures The present book is primarily aimed at those responsible for outdoor lighting installations Thus an engineering approach has been chosen The level of the book is that of college or University level The book is organized in two parts The first seven chapters cover the areas of general interest and conclude with

recommendations The second part deals with the scientific and engineering elaboration of the first part A number of examples are included that refer to specific outdoor lighting installations and projects that are directly related to the reduction of light pollution Finally some information is given about the authors      **The Initial Mass Function 50 Years**

**Later** Edvige Corbelli, Francesco Palla, Hans Zinnecker, 2007-10-06

The idea to celebrate 50 years of the Salpeter IMF occurred during the recent IAU General Assembly in Sydney Australia Indeed it was from Australia that in July 1954 Ed Salpeter submitted his famous paper The Luminosity Function and Stellar Evolution with the first derivation of the empirical stellar IMF This contribution was to become one of the most famous astrophysics papers of the last 50 years Here Ed Salpeter introduced the terms original mass function and original luminosity function and estimated the probability for the creation of stars of given mass at a particular time now known as the Salpeter Initial Mass Function or IMF The paper was written at the Australian National University in Canberra on leave of absence from Cornell University USA and was published in 1955 as 7 page note in the Astrophysical Journal Vol 121 page 161 To celebrate the 50th anniversary of the IMF along with Ed Salpeter's 80th birthday we have organized a special meeting that brought together scientists involved in the empirical determination of this fundamental quantity in a variety of astrophysical contexts and other scientists fascinated by the deep implications of the IMF on star formation theories on the physical conditions of the gas before and after star formation and on galactic evolution and cosmology The meeting took place in one of the most beautiful spots of the Tuscan countryside far from the noise and haste of everyday life      *The New Astronomy: Opening the*

*Electromagnetic Window and Expanding our View of Planet Earth* Wayne Orchiston, 2005-10-18 This is an unusual book combining as it does papers on astrobiology history of astronomy and sundials but after all Woody Sullivan is an unusual man In late 2003 I spent two fruitful and enjoyable months in the Astronomy Department at the University of Washington UW working on archival material accumulated over the decades by Woody for a book we will co author with Jessica Chapman on the early development of Australian astronomy The only serious intellectual distraction I faced during this period was planning for an IAU colloquium on transits of Venus scheduled for June 2004 in England where I was down to present the Cook paper I knew Woody was also interested in transits and indeed anything remotely connected with shadows see his paper on page 3 and in discussing the Preston meeting with him it transpired that his 60th birthday was timed to occur just one week later This was where the seed of Woodfest began to germinate Why not invite friends and colleagues to join Woody in Seattle and celebrate this proud event I put the idea to Woody and others at UW they liked it and Woodfest was born

*Kristian Birkeland* Alv Egeland, William J. Burke, 2005-10-04 At the beginning of the 20th century Kristian Birkeland 1867-1917 a Norwegian scientist of insatiable curiosity addressed questions that had vexed European scientists for centuries Why do the northern lights appear overhead when the earth's magnetic field is disturbed How are magnetic storms connected to disturbances on the sun To answer these questions Birkeland interpreted his advanced laboratory simulations and daring

campaigns in the Arctic wilderness in the light of Maxwell's newly discovered laws of electricity and magnetism Birkeland's ideas were dismissed for decades only to be vindicated when satellites could fly above the earth's atmosphere Faced with depleting stocks of Chilean saltpeter and the consequent prospect of mass starvation Birkeland showed his practical side inventing the first industrial scale method to extract nitrogen based fertilizers from the air Norsk Hydro one of modern Norway's largest industries stands as a living tribute to his genius Hoping to demonstrate what we now call the solar wind Birkeland moved to Egypt in 1913 Isolated from his friends by the Great War he yearned to celebrate his 50th birthday in Norway The only safe passage home via the Far East brought him to Tokyo where he passed away in the late spring of 1917

**Organizations and Strategies in Astronomy** Andre HECK, 2013-06-05 Anyone who doubts that astronomy is enjoying a golden age has only to browse the pages of Organizations and Strategies in Astronomy Vol 5 Our golden age is defined not only by the enormity of new discoveries of dark energy dark matter extra solar planets and the evolution of Mars but also by the breadth diversity and creativity within our community This volume records our history in a period of such rapid change and growth that individual astronomers are hard pressed to keep abreast of their own fields and neighborhoods much less of developments world wide Since the 1950's changes in the landscape of astronomy are manifold We have witnessed two epochs of big telescope construction the 4 meter class telescopes of the 60s and 70s and the 8 to 10 meter class telescopes of the 90s continuing through today We accomplished the transition from photographic to digital data and we continue to improve the size and sensitivity of astronomical detectors We have witnessed the flowering of radio astronomy and the opening of the full electromagnetic spectrum through space astronomy We have seen the growth of national and international astronomy facilities and a dramatic broadening of the accessibility of data both through observing facilities available through open competition based on scientific merit and through deep rich archives of data **Plasma**

**Astrophysics, Part I** Boris V. Somov, 2006-12-22 This well illustrated monograph is devoted to classic fundamentals current practice and perspectives of modern plasma astrophysics The first part of the book is unique in covering all the basic principles and practical tools required for understanding and work in plasma astrophysics The second part represents the physics of magnetic reconnection and flares of electromagnetic origin in space plasmas in the solar system single and double stars relativistic objects accretion disks their coronae The level of the book is designed mainly for professional researchers in astrophysics The book will also be interesting and useful to graduate students in space sciences geophysics as well as to advanced students in applied physics and mathematics seeking a unified view of plasma physics and fluid mechanics The New Rosetta Targets Luigi Colangeli, Elena Mazzotta Epifani, Pasquale Palumbo, 2013-11-08 This volume collects papers presented as invited and contributed talks or posters at the workshop on The NEW Rosetta targets Observations simulations and instrument performances which was held in Capri on October 13-15 2003 More than 100 scientists covering different fields such as optical and radio astronomy laboratory experiments and modelling of comet physics and processes as well as several

Principal Investigators of the instruments on board Rosetta participated to this highly interdisciplinary workshop The Rosetta mission was programmed for launch in January 2003 towards the short period comet 46P Wirtanen and the asteroids 140 Siwa and 4979 Otawara However due to problems with the Ariane V launcher the launch was postponed and the European Space Agency had to identify new mission targets suitable for a launch window at the end of February 2004 The short period comet 67P Churyumov Gerasimenko was chosen as primary target for the new baseline together with one or two asteroids to be selected depending on the  $v$  available after the Rosetta probe interplanetary orbit insertion After the successful launch of the mission on March 2nd 2004 the new baseline foresees a double flyby with asteroids 21 Lutetia and 2867 Steins on the way towards the rendezvous with the primary target that will be reached in 2014 The papers included in this volume cover different complementary fields observations of the new Rosetta targets laboratory experiments theoretical simulation of comet environment and processes performances of the experiments on board Rosetta spacecraft also in view of the new mission targets After the postponement of the mission launch comet 67P Churyumov Gerasimenko was the subject of an intense observation campaign between February and June 2003

The Sun and Space Weather Arnold Hanslmeier, 2007-06-19 The field of solar physics and solar terrestrial relation now called space weather is evolving rapidly As in the first edition it is assumed that it is inevitable for the reader to get some basic knowledge in solar physics since the Sun is the main driver for space weather The term space weather itself has been gaining more and more attention during the past years as our society becomes more and more dependent on satellites which are vulnerable to varying conditions in space Space weather efforts and investigations are being made all over the world and more and more is known about the complex relations of processes on the Sun and the Earth and its space environment The term space climate nowadays includes the long term variations caused mainly by the Sun on the Earth and the interplanetary space As in the first edition of the book this edition also covers these topics but new chapters have been introduced e.g. a chapter on real time space weather forecasts and some main space weather data sources All the chapters have updated information taking into account the results of new satellite missions and telescopes The book also includes a great amount of new literature more than 340 original citations so that the reader is able to go into more details if required in the respective chapters

*Penetrating Bars through Masks of Cosmic Dust* David L. Block, Ivânio Puerari, K. C. Freeman, R. Groess, Elizabeth K. Block, 2004-11-29 THE EDITORS DAVID L BLOCK AND KENNETH C FREEMAN SOC CO CHAIRS IVANIO PUERARI ROBERT GROESS AND LIZ K BLOCK 1 Harvard College Observatory 1958 The past century has truly brought about an explosive period of growth and discovery for the physical sciences as a whole and for astronomy in particular Galaxy morphology has reached a renaissance The year 1958 The date October 1 The venue Harvard College Observatory The lecturer Walter Baade With amazing foresight Baade penned these words Young stars supergiants and so on make a terrific splash lots of light The total mass of these can be very small compared to the total mass of the system Dr Layzer then asked the key question the discussion raises



the point of what this classification would look like if you were to ignore completely all the Population I and just focus attention on the Population II We stand on the shoulders of giants The great observer E E Barnard in his pioneering efforts to photograph the Milky Way devoted the major part of his life to identifying and numbering dusty holes and dust lanes in our Milky Way No one could have dreamt that the pervasiveness of these cosmic dust masks not only in our Galaxy but also in galaxies at high redshift is so great that their penetration is truly one of the pioneering challenges from both space borne telescopes and from the ground

**Starbursts** Richard de Grijs, Rosa M. González Delgado, 2006-05-11 Starbursts are important features of early galaxy evolution Many of the distant high redshift galaxies we are able to detect are in a starbursting phase often apparently provoked by a violent gravitational interaction with another galaxy In fact if we did not know that major starbursts existed these conference proceedings testify that we would indeed have difficulties explaining the key properties of the Universe These conference proceedings cover starbursts from the small scale star forming regions in nearby galaxies to galaxy wide events at high redshifts one of the major themes of the conference proved to be scalability i e can we scale up the small scale events to describe the physics on larger scales The key outcome of this meeting and these proceedings is a resounding yes to this fundamental yet profound question The enhanced synergy facilitated by the collaboration among observers using cutting edge ground and space based facilities theorists and modellers has made these proceedings a true reflection of the state of the art in this very rapidly evolving field

**How does the Galaxy work?** Emilio Javier Alfaro, Enrique Perez, José Franco, 2006-03-30 The international conference How does the Galaxy work? Agalactic tertulia rd th with Don Cox and Ron Reynolds was held during the week of 23 to 27 of June 2003 in the marvelous city of Granada Spain This week marked the beginning of one of the hottest summers that we have ever lived but in contrast the meeting was one of the coolest events that we can remember First it certainly was a rst class scientific reunion with an excellent program talented speakers and alive discussions in a friendly atmosphere Second the whole event was embedded in the passionate Andalusian way of life a true tertulia well seasoned with tasty tapas and perfectly marinated in cool and dry sherry wine Third the celebration was framed by some of the most beautiful settings that one can imagine we enjoyed the magnificent splendor of the Alhambra the unique Muslim Jewish Christian flavor of the Albaicin and the magical gipsy heartbeat of Sacromonte Last but not least all discussions whether they were during the sessions or at a bar table were sprinkled with the charm and wit of the two guests of honor Don Cox and Ron Reynolds The idea of having a scientific feast to celebrate their 60th birthday in Granada was actually conceived at a bar table in Seville with plenty of manzanilla at hand a couple of summers ago That perhaps was the difficult part of the project The rest was relatively easy to achieve because Don and Ron are not only remarkable astronomers but they are also great human beings Indeed we had a very positive response from all parties involved every person we talked to was enthusiastic about the celebration and wanted to give their own point of view in this tertulia

**Adventures in Order and Chaos** George Contopoulos, 2007-09-21 For many years I was

organizing a weekly seminar on dynamical astronomy and I used to make some historical remarks on every subject including some anecdotes from my contacts with many leading scientists over the years I described also the development of various subjects and the emergence of new ideas in dynamical astronomy Then several people prompted me to write down these remarks which cannot be found in papers or books Thus I decided to write this book which contains my experiences over the years I hope that this book may be helpful to astronomy students all over the world During my many years of teaching as a visiting professor in American Universities 1962 1994 Yale Harvard MIT Cornell Chicago Maryland and Florida I was impressed by the quality of my graduate students Most of them were very bright asking penetrating questions and preparing their homework in a perfect way In a few cases instead of a final examination I assigned to them some small research projects and they presented their results at the end of the course They were excellent in preparing the appropriate slides and in presenting their results in a concise and clear way

**Solar Journey: The Significance of Our Galactic Environment for the Heliosphere and Earth** P.C. Frisch, 2006-09-12 Written by experts who created the field this volume explores uncharted scientific territory with articles discussing the effect of our galactic environment on the heliosphere planetary system and Earth Leading experts in diverse fields discuss the physical changes expected as the heliosphere adjusts to its galactic environment Topics include the interaction between solar wind and interstellar dust and gas cosmic ray modulation magnetospheres variations in the solar environment and the cosmic ray isotope record preserved in paleoclimate data

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