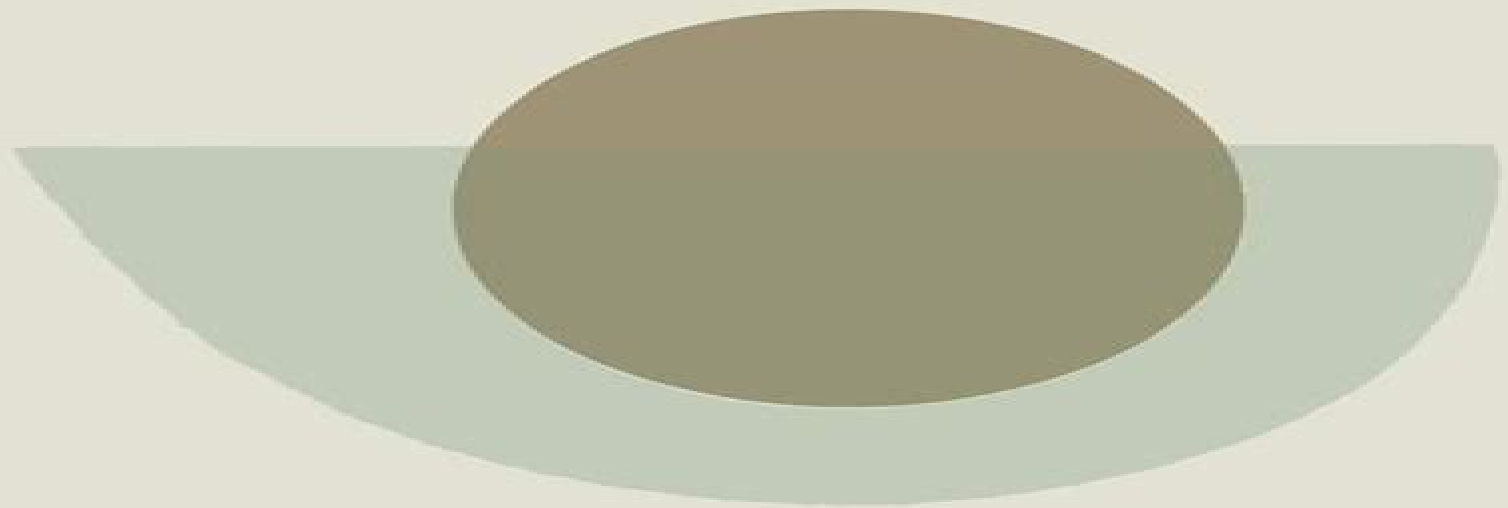


**Geophysics and Astrophysics Monographs**

# **Solar Flares**

**Zdeněk Švestka**



**D. Reidel Publishing Company**

# Solar Flares Geophysics Astrophysics Monographs

**Richard Frank Donnelly**



## **Solar Flares Geophysics Astrophysics Monographs:**

*Solar Flares* Zdenek Svestka, 2012-12-06 This book is the first part of the originally planned publication by Z Svestka and L D de Feiter Solar High Energy Photon and Particle Emission The second part with the original title was to be published by de Feiter in about one year from now However to the deep sorrow of all of us Dr de Feiter died suddenly and unexpectedly when the present book was in print Thus unfortunately de Feiter's second part may not appear Due to the fact that the originally planned publication was divided into two parts the present book is mainly descriptive and concerned with the flare morphology It was expected that theoretical interpretations would be extensively developed in the second part prepared by de Feiter In particular this refers to the theoretical back grounds of radio emissions particle acceleration and particle propagation in space Only in Chapter II concerning the low temperature flare do we go deeper into the theoretical interpretations anticipating that de Feiter would have been concerned mainly with the high energy physics Still the book includes discussions on all important aspects of flares and thus can present the reader with a complete picture of the complex flare phenomenon It is clear that many observed data on flares can be interpreted in different ways Helicities in

Geophysics, Astrophysics, and Beyond Kirill Kuzanyan, Nobumitsu Yokoi, Manolis K. Georgoulis, Rodion Stepanov, 2023-12-19 Presents cutting edge studies of helicities from different research fields Helicities play essential roles in numerous geophysical astrophysical and magnetohydrodynamic phenomena thus are studied from various disciplinary viewpoints Helicities in Geophysics Astrophysics and Beyond draws together experts from different research fields to present an interdisciplinary and integrated approach to helicity studies This synthesis advances understanding of the fundamental physical processes underlying various helicity related phenomena Volume highlights include Concise introduction to fundamental properties of helicities Recent developments and achievements in helicity studies Perspectives from different fields including geophysics space physics solar physics plasma physics atmospheric and nonlinear sciences A cohesive mathematical physical observational experimental and numerical strategy for helicity studies A synthesized framework for the application of helicity to real world problems The American Geophysical Union promotes discovery in Earth and space science for the benefit of humanity Its publications disseminate scientific knowledge and provide resources for researchers students and professionals *Biological Effects and Physics of Solar and Galactic Cosmic Radiation Part B* Charles E.

Swenberg, Gerda Horneck, E.G. Stassinopoulous, 2012-12-06 Space missions subject human beings or any other target of a spacecraft to a radiation environment of an intensity and composition not available on earth Whereas for missions in low earth orbit LEO such as those using the Space Shuttle or Space Station scenario radiation exposure guidelines have been developed and have been adopted by spacefaring agencies for exploratory class missions that will take the space travellers outside the protective confines of the geomagnetic field sufficient guidelines for radiation protection are still outstanding For a piloted Mars mission the whole concept of radiation protection needs to be reconsidered Since there is an increasing

interest of many nations and space agencies in establishing a lunar base and for exploring Mars by manned missions it is both timely and important to develop appropriate risk estimates and radiation protection guidelines which will have an influence on the design and structure of space vehicles and habitation areas of the extraterrestrial settlements This book is the result of a multidisciplinary effort to assess the state of art in our knowledge on the radiation situation during deep space missions and on the impact of this complex radiation environment on the space traveller It comprises the lectures by the faculty members as well as short contributions by the students given at the NATO Advanced Study Institute Biological Effects and Physics of Solar and Galactic Cosmic Radiation held in Armacao de Pera Portugal 12-23 October 1991 *Catalogs of the Scripps Institution of Oceanography Library* Scripps Institution of Oceanography. Library, 1980 **Solar-terrestrial Predictions Proceedings: Solar activity predictions** Richard Frank Donnelly, 1979 **Physics of the Sun** P.A. Sturrock, 2013-12-01 This volume together with its two companion volumes originated in a study commissioned by the United States National Academy of Sciences on behalf of the National Aeronautics and Space Administration A committee composed of Tom Holzer Dimitri Mihalas Roger Ulrich and myself was asked to prepare a comprehensive review of current knowledge concerning the physics of the sun We were fortunate in being able to persuade many distinguished scientists to gather their forces for the preparation of 21 separate chapters covering not only solar physics but also relevant areas of astrophysics and solar terrestrial relations It proved necessary to divide the chapters into three separate volumes that cover three different aspects of solar physics Volumes I and III are concerned with The Solar Interior and with Astrophysics and Solar Terrestrial Relations This volume devoted to The Solar Atmosphere covers not only the chromosphere and corona but also the principal phenomena usually referred to as solar activity The emphasis is on identifying and analyzing the relevant physical processes but each chapter also contains a great deal of descriptive material *Solar activity reports* Richard Frank Donnelly, 1979 *Physics of the Solar Corona* Markus Aschwanden, 2006-08-26 A thorough introduction to solar physics based on recent spacecraft observations The author introduces the solar corona and sets it in the context of basic plasma physics before moving on to discuss plasma instabilities and plasma heating processes The latest results on coronal heating and radiation are presented Spectacular phenomena such as solar flares and coronal mass ejections are described in detail together with their potential effects on the Earth *Solar Prominences* Einar Tandberg-Hanssen, 2011-11-11 o beaute sans seconde Seul semblable li toi SOLEIL pour tout le monde JEAN FRANc OIS SARASIN 1615 1654 The last decade has seen the publication of monographs covering most areas of solar activity flares Smith and Smith 1963 sunspots Bray and Loughhead 1964 and the corona Billings 1966 Consequently of all the major manifestations of solar activity only prominences are without a comprehensive and unified treatment in the current literature The present book is written in an attempt to remedy this situation and to furnish an account of some of the most spectacular and most beautiful aspects of solar activity Our ultimate aim is an understanding of the physical processes involved I hope that this book may provide if only a small step

toward this goal After an historical introduction and some general definitions Chapter I proceeds with an account of several classification schemes for prominences Most of the observational material is presented in Chapter II and forms the basis on which different models of prominences are built in Chapter III Chapters IV and V give most of the physics of prominences treating as they do the formation and stability of these objects The interaction of prominences with other manifestations of solar activity is the subject of Chapter VI and the final Chapter VII considers prominences in the larger context as an integral part of the corona

**Introduction to Solar Radio Astronomy and Radio Physics** A. Krüger, 2012-12-06 1 1 Short History of Solar Radio Astronomy Since its birth in the forties of our century solar radio astronomy has grown into an extensive scientific branch comprising a number of quite different topics covering technical sciences astrophysics plasma physics solar terrestrial physics and other disciplines Historically the story of radio astronomy goes back to the times of James Clerk Maxwell whose well known phenomenological electromagnetic field equations have become the basis of present time radio physics As a direct consequence of these equations Maxwell was able to prognosticate the existence of radio waves which fifteen years later were experimentally detected by the famous work of Heinrich Hertz 1887 88 However all attempts to detect radio waves from cosmic objects failed until 1932 which was mainly due to the early stage of development of receiving techniques and the as yet missing knowledge of the existence of a screening ionosphere which was detected in 1925 Therefore famous inventors like Thomas Edison and A E Kennelly as well as Sir Oliver Lodge were unsuccessful in receiving any radio emission from the Sun or other extraterrestrial sources Another hindering point was that nobody could a priori expect that solar radio emission should have something to do with solar activity so that unfortunately by chance some experiments were carried out just at periods of low solar activity This was also why Karl Guthe Jansky at the birth of radio astronomy detected galactic radio waves but no emission from the Sun

**Solar Neutrons and Related Phenomena** Lev Dorman, 2010-07-15 Short Historical Overview In the 1940s two phenomena in the field of cosmic rays CR forced scientists to think that the Sun is a powerful source of high energy particles One of these was discovered because of the daily solar variation of CR which the maximum number of CR observed near noon referring to the existence of continuous flux of CR from the direction of the Sun this became the experimental basis of the theory that CR originate from the Sun or for that matter from within the solar system Alfven 1954 The second phenomenon was discovered when large fluxes of high energy particles were detected from several solar arcs or solar CR These are the called ground level events GLE and were first observed by ionization chambers shielded by 10 cm Pb and detected mainly from the secondary muon component CR that they caused during the events of the 28th of February 1942 the 7th of March 1942 the 25th of July 1946 and the 19th of November 1949 The biggest such event was detected on the 23rd of February 1956 see the detailed description in Chapters X and XI of Dorman M1957 The first phenomenon was investigated in detail in Dorman M1957 by first correcting experimental data on muon temperature effects and then by using coupling functions to determine the change in particle energy caused by the

solar diurnal CR variation      *Solar-terrestrial Predictions Proceedings: Prediction group reports* Richard Frank Donnelly, 1979      **Magneto-Fluid Dynamics** Paul Lorrain, Francois Lorrain, Stephane Houle, 2007-10-31

Magnetohydrodynamics MHD concerns the interaction between magnetic fields and conducting fluids We are concerned here with macroscopic inter actions and when the conducting fluid is a plasma time scales are very much longer than the plasma period Plasma periods vary widely but are short say 10 second We prefer the term Magneto F i Z i Dynamics MFD because the disci pline concerns mostly plasmas various liquid conductors and the liquid part of the Earth s core It seems that the only applications of MFD to water are the induction of electric currents in the oceans by the Earth s magnetic field and ship propulsion But even MFD is not quite appropriate because that term also includes solid conductors that move in magnetic fields This book is meant for graduate and upper division undergraduate stu dents in Physics Geophysics and Astrophysics as well as for practicing sci entists in these fields This book is no more than a brief introduction to MFD because this vast subject is closely related to many others namely Astrophysics Elec trodynamics Fluid Dynamics Geophysics Oceanography Plasma Physics Thermonuclear Fusion etc We sketch the fundamentals and provide many Examples as well as Case Studies related to natural phenomena MFD sorely needs a rethink it must of course be totally compatible with Physics On the contrary it is the custom to discuss the shapes of imaginary magnetic field lines without ever referring to the required electric currents      **Solar and Space Weather Radio Physics** Bin Chen, Dale E. Gary, Nicole Vilmer, 2021-07-28

**Literature 1982, Part 2** Siegfried Böhme, Professor Dr. Walter Fricke, Herbert Hefele, Inge Heinrich, Wilfried Hofmann, Dietlinde Krahn, Vladimir R. Matas, Dr. Lutz D. Schmadel, Gert Zech, 2013-11-09 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 documenta tion 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 accumu lating abstracts for about six months offers the advantage of greater convenience for the user Volume 32 contains literature published in 1982 and received before February 11 1983 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 Bou a Prague who surveyed journals and publications in Czech and supplied us with abstracts in English      **Transport and Energy Conversion in the Heliosphere** J.-P. Rozelot, L. Klein, J.-C. Vial, 2008-01-11 The book contains courses taught to a public of Ph D students post docs and confirmed researchers in all fields of heliospheric plasma physics It aims at identifying physical issues which are common to two different fields of astronomy solar and magnetospheric physics

Emphasis is given to basic processes of transport and conversion of energy magnetic reconnection is discussed in detail from the viewpoints of MHD and kinetic physics Processes of charged particle acceleration are reviewed and compared with recent observations The subject is introduced by a summary of MHD and the basic structures and parameters of the solar atmosphere terrestrial ionosphere and magnetosphere are reviewed The book combines a pedagogic and comprehensive presentation of physical issues and raises fully open questions with the complementary and sometimes conflicting views of geophysicists and solar physicists The book's focus while basic opens new avenues

**Gamma-Ray Astronomy** E.L. Chupp, 2012-12-06 Observation of discrete energy electromagnetic emissions from celestial objects in the radio IR optical IN and X ray spectral regions has dramatically advanced our knowledge in the field of astrophysics It is expected that identification of nuclear  $\gamma$  ray line emissions from any cosmic source would also prove to be a powerful new tool for probing the Universe Since the publication of Morrison's work in 1958 many experiments were carried out searching for evidence of  $\gamma$  ray lines from cosmic sources however with little success Only a few positive experimental results have been reported in spite of an expenditure of considerable effort by many people in particular the possible Galactic Center emission line 473 to 530 keV and  $\gamma$  ray lines at several energies e.g. 0.5 MeV and 2.2 MeV associated with large solar flares Both of these observations are unconfirmed by independent observations ca. 1975 The high energy  $\gamma$  rays 30 MeV from the Galactic Center are at least partly due to the decay of  $\pi^0$  mesons which are of unique energy 67.5 MeV in the  $\pi^0$  rest frame only The reasons for the limited amount of data available in this field even though early theoretical predictions were very optimistic regarding fluxes of nuclear lines are that experimental efforts are plagued with high backgrounds and low fluxes and that development of instruments with telescopic properties in the energy range of interest is difficult

*Introduction to Advanced Astrophysics* V. Kourganoff, 2012-12-06 The purpose of this textbook is to provide a basic knowledge of the main parts of modern astrophysics for all those starting their studies in this field at the undergraduate level The reader is supposed to have only a high school training in physics and mathematics In many respects this Introduction to Advanced Astrophysics could represent a volume of the Berkeley Physics Course Thus the primary audience for this work is composed of students in astronomy physics mathematics physical chemistry and engineering It also includes high school teachers of physics and mathematics Many amateur astronomers will find it quite accessible In the frame of approximations proper to an introductory textbook the treatment is quite rigorous Therefore it is also expected to provide a firm background for a study of advanced astrophysics on a postgraduate level A rather severe selection is made here among various aspects of the Universe accessible to modern astronomy This allows us to go beyond simple information on astronomical phenomena to be found in popular books and to insist upon explanations based on modern general physical theories More precisely our selection of topics is determined by the following considerations The study of the solar system the Moon and the planets has recently progressed at a tremendous rate However the very rich harvest of observations provided by space research is mainly purely

descriptive and is perfectly presented in review papers of Scientific American Science Physics Today and similar magazines

**Ionospheric Techniques and Phenomena** A. Giraud, M. Petit, 2012-12-06 If our eyes were radio rather than optical wide band detectors it is well known that for us the brightest object in the sky would still be the Sun that planets stars and the Milky Way would still shine feebly and that we would still occasionally be blinded by man made sources What is less well known is that quite a different earthbound overcast would hover about us with its climatic zones its seasonal changes its unpredictable storms and scintillating transparency To be sure we can get a sort of glimpse of this peculiar type of weather when we tune our receiver to radio broadcasting from some remote spot or photograph the Earth from space at certain specific wavelengths Nevertheless no one has ever looked at the ionized shroud of the Earth without the help of sophisticated apparatus and this is one of the reasons why in this domain the phenomena are not easily abstracted from the use of specific techniques For generations the study of the ionosphere has been deeply interwoven with the practice of radio communication and detection Today however ionospheric physics is best thought of as a branch of space physics that part of physics which deals with processes at work in the solar system and methods developed for its exploration *An Introduction to Nuclear Astrophysics* J. Audouze, S. Vauclair, 2012-12-06 TO NUCLEAR ASTROPHYSICS The Formation and the Evolution of Matter in the Universe JEAN AUDOUZE Institut d Astrophysique de Paris France and SYLVIE VAUCLAIR DAPHE Observatoire de Meudon France and Institut d Astrophysique Paris D REIDEL PUBLISHING COMPANY DORDRECHT HOLLAND BOSTON U S A LONDON ENGLAND Library of Congress Cataloging in Publication Data Audouze Jean An introduction to nuclear astrophysics Geophysics and astrophysics monographs v 18 En and updated translation of L Astrophysique nucleaire Includes bibliographies and index Nuclear astrophysics I Vauclair Sylvie joint author II Title III Series QB464 A9313 1979 523 01 9 7 79 20752 ISBN 13 978 90 277 1053 6 e ISBN 13 978 94 009 9477 5 DOI 10 1007 978 94 009 9477 5 Published by D Reidel Publishing Company P O Box 17 Dordrecht Holland Sold and distributed in the U S A Canada and Mexico by D Reidel Publishing Company Inc Lincoln Building 160 Old Derby Street Hingham Mass 02043 U S A All Rights Reserved Copyright 1980 by D Reidel Publishing Company Dordrecht Holland Softcover reprint of the hardcover 1st edition 1980 No part of the material protected by this copyright notice may be reproduced or utilized in any form or by any means electronic or mechanical including photocopying recording or by any informational storage and retrieval system without written permission from the copyright owner TABLE OF CONTENTS IX FOREWORD INTRODUCTION xi XXI ACKNOWLEDGEMENTS CHAPTER I THE OBSERVATIONAL BASIS OF NUCLEAR ASTROPHYSICS 1 1 The Importance of the Four Fundamental Interactions 1 1 2



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