

The Sun in Time: Activity and Environment

Manuel Güdel

Paul Scherrer Institute, Würenlingen and Villigen,
CH-5232 Villigen PSI, Switzerland

Max Planck Institute for Astronomy, Königstuhl 17,
D-69117 Heidelberg, Germany
email: guedel@astro.phys.ethz.ch

<http://www.astro.phys.ethz.ch/staff/guedel/guedel.html>

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Abstract

The Sun's magnetic activity has steadily declined during its main-sequence life. While the solar photospheric luminosity was about 30% lower 4.6 Gyr ago when the Sun arrived on the main sequence compared to present-day levels, its faster rotation generated enhanced magnetic activity; magnetic heating processes in the chromosphere, the transition region, and the corona induced ultraviolet, extreme-ultraviolet, and X-ray emission about 10, 100, and 1000 times, respectively, the present-day levels, as inferred from young solar-analog stars. Also, the production rate of accelerated, high-energy particles was orders of magnitude higher than in present-day solar flares, and a much stronger wind escaped from the Sun, permeating the entire solar system. The consequences of the enhanced radiation and particle fluxes from the young Sun were potentially severe for the evolution of solar-system planets and moons. Interactions of high-energy radiation and the solar wind with upper planetary atmospheres may have led to the escape of important amounts of atmospheric constituents. The present dry atmosphere of Venus and the thin atmosphere of Mars may be a product of early irradiation and heating by solar high-energy radiation. High levels of magnetic activity are also inferred for the pre-main sequence Sun. At those stages, interactions of high-energy radiation and particles with the circumsolar disk in which planets eventually formed were important. Traces left in meteorites by energetic particles and anomalous isotopic abundance ratios in meteoritic inclusions may provide evidence for a highly active pre-main sequence Sun. The present article reviews these various issues related to the magnetic activity of the young Sun and the consequent interactions with its environment. The emphasis is on the phenomenology related to the production of high-energy photons and particles. Apart from the activity on the young Sun, systematic trends applicable to the entire main-sequence life of a solar analog are discussed.

Sun In Time

Scott Horton



Sun In Time:

Hotter Than the Sun: Time to Abolish Nuclear Weapons Scott Horton, 2022-07-09 This book contains interviews conducted over more than a decade with experts of all descriptions including Daniel Ellsberg Seymour Hersh Gar Alperovitz Hans Kristensen Gordon Prather Joe Cirincione and more about the threat of nuclear war between major and minor powers the nuclear arms industrial complex the nuclear programs and weapons of the so called rogue states of Iraq Iran Syria Israel and North Korea the bitter truths and eternal lessons of America's nuclear bombing of Japan in World War II and the dedicated activists working to abolish the bomb for all time

Time's Pendulum Jo Ellen Barnett, 1999 A look at man's attempts to accurately measure time shows how the concept of time has steadily evolved and broadened our perception of the world

The Sun in Time Charles Philip Sonett, Mark S. Giampapa, Mildred Shapley Matthews, 1991 An interdisciplinary approach to solar physics as eighty nine contributors trace the evolution of the Sun and provide a review of our current understanding of both its structure and its role in the origin and evolution of the solar system

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The Enigmatic Realm of **Sun In Time**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing lacking extraordinary. Within the captivating pages of **Sun In Time** a literary masterpiece penned with a renowned author, readers embark on a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting affect the hearts and minds of those who partake in its reading experience.

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