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PRL Ka Amrut Vyakhyaan-24

Wednesday, 12 January 2022

@ 10:00 AM (IST)

"Societal and Economic Impacts of Space Weather"

Prof. Daniel N. Baker

Director,

Laboratory for Atmospheric and Space Physics,

University of Colorado, Boulder, Colorado

YouTube https://youtu.be/TUswTYLT-Mo

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Speaker: Prof. Daniel N. Baker

Director, Laboratory for Atmospheric and Space Physics,

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Abstract

This talk describes space weather impacts and their economic and societal costs. Modern technological society is characterized by a complex set of interdependencies among its critical infrastructures. These are vulnerable to the effects of intense geomagnetic storms and solar storms. Strong currents flowing in the ionosphere can disrupt and damage Earth-based electric power grids and contribute to the accelerated corrosion of oil and gas pipelines. Magnetic storm-driven ionospheric disturbances interfere with high-frequency radio communications and navigation signals from Global Positioning System (GPS) satellites. Exposure of spacecraft to solar particles and radiation belt enhancements can cause temporary operational anomalies, damage critical electronics, degrade solar arrays, and blind optical systems such as imagers and star trackers. Moreover, intense solar particle events present a significant radiation hazard for astronauts during the high-latitude segment of the International Space Station (ISS) orbit as well as for future human explorers of the Moon and Mars. In addition to such direct effects as spacecraft anomalies or power grid outages, a thorough assessment of the impact of space weather events on present-day society must include the collateral effects of space-weather-driven technology failures. For example, polar cap absorption events due to solar particles can degrade – and, during severe events, completely black out – radio communications along transpolar aviation routes. A complete picture of the socioeconomic impact of space weather must include both direct, as well as collateral, effects of space-weather-driven technology failures on dependent infrastructures and services. It is also imperative that we—as a technological society—develop a truly operational space weather observing and modeling system in which the benefits of accurate forecasts are clearly established.

The Speaker

Prof. Daniel N. Baker is Director of the Laboratory for Atmospheric and Space Physics, University of Colorado – Boulder. He is Distinguished Professor of Planetary and Space Physics at CU and is Professor of Astrophysical and Planetary Sciences, Professor of Physics, and Professor of Aerospace Engineering Sciences. Dr. Baker received his Ph.D. working under Prof. James A. Van Allen and subsequently worked with Prof. Edward C. Stone at the California Institute of Technology. He was Group Leader for Space Plasma Physics at Los Alamos National Laboratory (1980-87) and was Division Chief at NASA's Goddard Space Flight Center (1987-1994). Dr. Baker presently holds the Moog-Broad Reach Endowed Chair of Space Sciences at CU. He has edited nine books and published over 800 refereed papers. He is a lead investigator on numerous NASA space missions such as RBSP, MMS, and IMAP. He is an elected member of the U. S. National Academies (NASEM). Dr. Baker was the winner of the AIAA James Van Allen Space Environments Medal in 2010. Dr. Baker was chosen as the Dr. Vikram A. Sarabhai Professor of the Physical Research Laboratory, India in 2015. Dr. Baker was the recipient of the Shen Kuo Medal of the International Association of Geomagnetism and Aeronomy (IAGA) for his interdisciplinary work in space and Earth sciences in 2015. He also received the Colorado Governor's Award for High-Impact Research related to his Space Weather research (2016). Dr. Baker was awarded the American Geophysical Union's highest honor the William Bowie Medal (2018) and the Hannes Alfven Medal of the European Geosciences Union (2019).

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About PRL

The Physical Research Laboratory (PRL), known as the “cradle of space science” in India, is one of the premier research institutes founded in 1947 by Prof. Vikram Sarabhai, a renowned Cosmic Ray Scientist, a great visionary and institution builder. PRL played a seminal role in producing a highly motivated cadre of space scientists and the technologists of highest international repute. The first scientific rocket launched from Thumba on 21st November-1963 and many other rockets launched thereafter contained payloads developed at PRL. Dr. Sarabhai initiated many of these scientific and technical activities at PRL which eventually led to the formation of the Indian Space Research Organization (ISRO). Therefore, PRL is known as the “cradle of space science” in India. Further, the research in the area of Plasma Physics expanded to the formation of the Institute of Plasma Research (IPR).

As an institution PRL is unique in that it conducts fundamental research in a wide range of research areas from the Earth to the cosmos, and comprising Astronomy and Astrophysics; Solar Physics; Space and Atmospheric Sciences; Theoretical Physics; Geosciences; Atomic, Molecular and Optical Physics, Astrochemistry; and Planetary Sciences and Space Exploration. PRL is one of the rare research institutes of international repute wherein research in such diverse fields of sciences is carried out using several state-of-the-art experimental facilities that exist under one umbrella.

Along with the ongoing research, several new initiatives have been taken up during the last few years. The Multi-Application Solar Telescope (MAST) at Udaipur Solar Observatory has been operationalized. PRL initiated scientific programmes in frontier areas of research, which include a search for exo-planets, laboratory studies of interstellar grains, laboratory synthesis of cold astromolecules and experimental studies in the field of quantum optics. PRL is also developing several scientific payloads as a part of ISRO’s larger vision and contributing to roadmap for competitive scientific exploration of the solar system and beyond. In particular, PRL has been contributing significantly not only in building instruments for space missions, such as Chandrayaan-1, Chandrayaan-2, AstroSat and upcoming Aditya-L1, Chandrayaan-3 and planetary and space missions, but also by bringing out new and insightful science results.

PRL contributes to several national and international research programmes and to human resource development through its Doctoral and Post-Doctoral Programmes, capacity building programmes, such as UN Course on Space Science, and science and engineering internship programmes. PRL contributes significantly to society through its Outreach Programmes by periodically organizing science exhibitions and Open Houses, planned visits of students of various school and college to PRL, and popular talks at various institutions to not only share the excitements of the advancements of contemporary scientific findings but also to encourage students to take up sciences as their research career.

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