

Project Details

ROSES ID: NRA-02-OSS-01

Selection Year: 2003

Program Element: Independent Investigation: LWS

Project Title:

Long-Term Solar Irradiance Variations Over Solar Cycles 21 to 23

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Project Member(s):

- Turmon, Michael J; COI; Jet Propulsion Laboratory
- Bogart, Richard Steven; COI; Stanford University

Summary:

In response to NRA 02-OSS-01, this proposal is submitted to the Living with a Star Targeted Research and Technology Program. The main goal of the proposed research is to study the long-term changes observed in total solar and UV irradiances over three consecutive solar cycles and their relations to solar magnetic field variations. The proposed research is divided into three major research tasks. (1) We will analyze the total solar irradiance and the Mg II h & k core-to-wing ratio (Mg c/w) composites. In particular, we will compare the SOHO/VIRGO total irradiance and the UARS/SUSIM Mg c/w data, which are used in the irradiance composites for solar cycle 23, with additional total and UV irradiance measurements. The main goal of this research task is to clarify whether the high irradiance values during the maximum of solar cycle 23 reflect real solar effects, rather than unidentified instrumental effects. (2) We will compare the spatially resolved sunspot and faculae data derived from the SOHO/MDI and Kitt Peak magnetic field observations for solar cycle 23 and will estimate their contribution to total and UV irradiance variations. As part of this research effort, we will also compare the MDI and Kitt Peak labeled images used for identifying sunspots and faculae in order to develop a more homogeneous image processing and classification system. (3) We will study the relation between the long-term variations of solar irradiance and the averaged absolute values of the magnetic field strength derived from the Kitt Peak measurements over solar cycles 21 to 23. Using advanced statistical techniques, we will estimate the contribution of magnetic fields to the observed irradiance variations as a function of the solar cycle and from one cycle to another one. The proposed research falls into LWS's "basic research" category. Specifically, it addresses one of LWS's major tasks: how solar irradiance variations are related to solar magnetic activity and what is their potential effect on climate. The proposed research is related to the "Helioseismic and Magnetic Imager" (HMI) experiment and it will provide analysis tools (both image processing and time series analysis techniques) to examine the HMI photometric and magnetic field measurements. The proposed research is a three-year effort. The science team of the proposed research consists of Dr. Judit M. Pap (Principal Investigator, Goddard Earth Sciences and Technology Center, University of Maryland Baltimore County), Dr. Richard Bogart (Co-Investigator, Stanford University), Dr. Michael Turmon (Co-Investigator, Jet Propulsion Laboratory), Dr. Harrison Jones (Collaborator, Goddard Space Flight Center Southwest Station at Kitt Peak), Dr. Claus Frohlich (Collaborator, Physikalisch-Meteorologisches Observatorium Davos, World Radiation Center), and Dr. Linton Floyd (Collaborator, Interferometrics Inc./Naval Research Laboratory).

Publication References:

Summary: "

Reference: Pap, Judit UMDBC - Long-Term Solar Irradiance Variations Over Solar Cycles 21 to 23

Summary: no summary

Reference: Gy?ri, L.; Baranyi, T.; Turmon, M.; Pap, J. M.; (2004), Study of differences between sunspot area data determined from ground-based and space-borne observations, Advances in Space Research, Volume 34, Issue 2, p. 269-273, doi: 10.1016/j.asr.2004.02.009