

Preface

The IAU Colloquium No. 143 *The Sun as a Variable Star: Solar and Stellar Irradiance Variations* was held on June 20 – 25, 1993 at the Clarion Harvest House, Boulder, Colorado, USA. The main objective of this Colloquium was to review the most recent results on the observations, theoretical interpretations, empirical and physical models of the variations observed in solar and stellar irradiances. A special emphasis of the Colloquium was to discuss the results gained on the climatic impact of solar irradiance variability.

Study of changes in solar and stellar irradiances has been of high interest for a long time. Determining the absolute value of the luminosity of stars with different ages is a crucial question for the theory of stellar evolution and energy production in stellar interiors. Observations of the temporal changes of solar and stellar irradiances – in the entire spectral band and at different wavelengths – provide an additional tool for studying the physical processes below the photosphere and in the solar-stellar atmospheres. Since the Sun's radiative output is the main driver of the physical processes within the Earth's atmosphere, study of irradiance changes is an extremely important issue for climatic studies as well. Climatic models show that small, but persistent changes in solar irradiance may influence the Earth's climate. Furthermore, to understand the human effect on global climatic change, the role of irradiance variations (as a significant source of the natural climate changes) in terrestrial and climatic processes must be revealed.

The Colloquium was a historical meeting since this was the first time when a conference sponsored by the International Astronomical Union was entirely devoted to irradiance variations and their climatic impact. 200 scientists from 30 countries participated in this Colloquium. It was divided into six sessions as defined by their key topics: (1) General Reviews on Observations of Solar and Stellar Irradiance Variability; (2) Observational Programs for Solar and Stellar Irradiance Variability; (3) Variability of Solar and Stellar Irradiance Related to the Network, Active Regions (Sunspots and Plages), and Large-Scale Magnetic Structures; (4) Empirical Models of Solar Total and Spectral Irradiance Variability; (5) Solar and Stellar Oscillations, Irradiance Variations and their Interpretation; and (6) The Response of the Earth's Atmosphere to Solar Irradiance Variations and Sun-Climate Connections. A special 1-day session of the "*Solar Electromagnetic Radiation Study for Solar Cycle 22*" (SOLERS22) was held on June 25, 1993, where the five working groups discussed their progress and future plans on measuring the absolute value of total solar and spectral irradiances and studying their temporal variations.

There were 38 invited talks and 110 contributed poster papers presented at the Colloquium. These papers have demonstrated that the solar energy output changes on different time scales: the short-term (from minutes to months) variations are related to surface modulations mainly caused by the evolution of active regions; the solar-cycle-related long-term variations are directly linked with the evolution of magnetic fields over the activity cycle; while the secular variations over centuries are associated with long-term internal modulations. Although considerable information exists on solar-stellar irradiance variations, their physical origin is not well-understood. The lack of adequate physical models of irradiance variations for predicting the solar-induced climatic changes led to extensive discussions of the consequences of the planned delay or even a possible termination of irradiance observations performed in space. Based on these discussions, the Scientific Organizing Committee released a resolution that addressed this issue to the leaders of the Space Agencies concerned. The resolution was also forwarded to the General Secretary of the International Astronomical Union by the President of IAU Commission 10.

The proceedings of the Colloquium have been printed in two volumes. This volume

contains the invited papers in the order of their presentation at the Colloquium within the listed key topics. The contributed papers have been published separately in a special issue of *Solar Physics* (Vol. 152, 1994) that will also appear in book format by Kluwer Academic Publishers.

This volume has been edited with a \LaTeX formatting program released on September 30, 1993 by Alison Woollatt. Ferenc Váradi provided his technical expertise in the \LaTeX typesetting. The editors invested considerable effort into making the proceedings uniform throughout. We are responsible for any errors that may have been introduced in this process.

Judit M. Pap
Pasadena, CA, USA

Claus Fröhlich
Davos, Switzerland

Hugh S. Hudson
Honolulu, HI, USA

Sami K. Solanki
Zürich, Switzerland

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