# Solar Irradiance Measurements

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This is a brief review of the values we have developed for the solar constant and solar spectrum and of certain research areas which evolved from that effort. It all began with the solar simulation in the SES chamber of Building 10 and our questioning what precisely it was that we were trying to simulate. There have been many indicators during the past year that the solar irradiance values which we proposed are becoming a standard for national and international usage. The Space Vehicles Design Criteria Monograph, SP 8005, was printed last year; the demand was such that a second printing is soon to be made. For user's convenience 10,000 copies of a wallet size card giving these values were put out by Spectrolab. An invited paper published by Optical Spectra received a wi circulation, 35,000 copies, 3,000 of them overseas. An article presenting these values is due to be published in the forthcoming Van Nostrand Reinhold Encyclopedia of Physics. The standard has been approved by the Institute of Environmental Sciences and is soon to be published in the official book of Standards of ASTM. The Radiation Commission of the IAMAP (International Association of Meteorology and Atmospheric Physics) has started the process for giving their official sponsorship of the standard, as also the WMO, CIMO (World Meteorological Organization, Commission for Instruments and Methods of Observation) through the forthcoming revised Guide for users at meteorological ground stations around the world. The CAENEX (Complex Atmospherics Energetics Experiment), the program of the Soviet Commission of GARP, has these values as the standard for calibration. A book entitled "The Extra-terrestrial Solar Spectrum" is soon due for publication by the Institute of Environmental Sciences; it is concerned mainly about these standard values. The Chapter on Solar Radiation in the Handbook of Geophysics and Space Environments is being revised in accordance with this standard. Many users, especially in areas of atmospheric pollution, meteorology, radiation biology, SST, etc., expressed a wish for a more detailed spectrum. Such a spectrum giving irradiance at 1A intervals

in the range 3000 to 6100 A has been prepared. It is based on our data from the Perkin-Elmer monochromator, but normalized to the standard curve. The more laborious parts of this work which required a special data reader and computer operations were done by the National Center of Atmospheric Research and the Institute of Defence Analysis.

Brief mention might be made of some of the other programs which developed out of the solar radiation research. The MSS experiment of the ERTS needed a calibration with reference to the Sun. This was done at Santa Barbara and Table Mountain where the solar irradiance was measured using some of our CV 990 instrumentation. A similar calibration is now being planned for the VISSR (Visible Infrared Spin Scan Radiometer) of the SMS (Synchronous Meteorological Satellite).

Our work in solar radiometry led us to organize an international comparison of working standard pyranometers. It was the first time such a comparison was attempted. It was held on the roof of Building 7. Twenty instruments from 12 nations took part in it. The results showed large differences, for example, 16% for Chile, 6% for India and Argentina. Our method will be adapted for the pyranometers to be used in GATE (GARP Atlantic Tropical Experiment) at the Miami Center of NOAA and a program of similar comparisons to be made periodically is being considered by WMO.

The solar radiation research led also to a study of possible variations in the solar constant and solar spectrum. Measurements over an extended period of time are being planned. Low cost piggy-back experiments on the U-2 are feasible, and some of these will give an essential support for the ERB (Earth Radiation Budget) experiment of Nimbus F. More importantly the design group of the Atmospheric Science Facility (ASE) of the Space Shuttle is studying this problem in some detail and a payload modeled after our CV 990 equipment is being designed by the ASF contractors.

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