

INSTITUT D'AERONOMIE SPATIALE DE BELGIQUE

**3 - Avenue Circulaire
B - 1180 BRUXELLES**

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**New ultraviolet solar flux measurements at 2000 Å
using a balloon borne instrument**

by M. ACKERMAN, D. FRIMOUT, and R. PASTIELS

BELGISCH INSTITUUT VOOR RUIMTE-AERONOMIE

**3 - Ringlaan
B - 1180 BRUSSEL**

NEW ULTRAVIOLET SOLAR FLUX MEASUREMENTS AT 2000 Å USING A BALLOON BORNE

INSTRUMENT

by

M. ACKERMAN, D. FRIMOUT and R. PASTIELS

Abstract

Data on the Solar UV flux of interest for the atmospheric optical window at 2000 Å are presented. They have been obtained by means of a balloon borne spectrometer.

Résumé

Des données relatives au rayonnement ultraviolet solaire susceptible de pénétrer dans la fenêtre optique atmosphérique de 2000 Å sont présentées. Elles ont été obtenues au moyen d'un spectromètre embarqué à bord d'une nacelle stratosphérique.

Samenvatting

Gegevens in verband met de ultraviolette zonnestraling die in staat is door te dringen in het atmosferisch optisch venster van 2000 Å worden hier voorgesteld. Zij werden verkregen door middel van een spectrometer aan boord van een stratosferische schuit.

Zusammenfassung

Angaben über der ultravioletten Sonnenstrahlung im Gebiet des 2000 Å optischen Fenster werden vorgestellt. Sie wurden mit einem Spectrometer in einer stratosphärischen Gondel erhalten.

FOREWORD

This is the summary of a communication presented at the I.A.U. Symposium nr 41 held in Garching in 1970. It will be published in the proceedings of the symposium (Reidel, Publ. Cy).

AVANT-PROPOS

Ce texte résume une communication présentée au 41e Symposium de l'U.A.I. à Garching en 1970. Il sera publié dans les proceedings du symposium (Reidel, Publ. Cy.).

VOORWOORD

Deze tekst is een samenvatting van een mededeling voorgedragen op het 41e Symposium van de I.A.U. te Garching in 1970. Hij zal verschijnen in de proceedings van dit symposium (Reidel, Publ. Cy.).

VORWORT

Dieser Text ist eine Zusammenfassung einer Vorstellung zur 41. Symposium des U.A.I. in Garching 1970. Er wird bei Reidel Publishing Company herausgegeben werden.

A grating monochromator has been flown from Aire-sur-l'Adour (Landes) on May 10, 1968, April 19, 1969 and October 3, 1969. The instrumentation and the experimental procedure have been described previously (Ackerman et al., 1968) as well as the results of the first flight. For the two subsequent flights the wavelength marking was improved by increasing the number of the telemetered wavelength marking pulses. For the last flight the FM-FM analog telemetry system was replaced by a PCM telemetry system in such a way that the data analysis was completely made by means of a computer. Float altitudes were respectively 34, 38 and 37 km. From 1850 Å to 3000 Å up to 90 spectra per flight of the solar radiation penetrating into the atmosphere were telemetered to the ground. The solar zenith distance was ranging from 30° to 60°. The equivalent slit width was equal to 19 Å in the case of the first experiment and was equal to 14.6 Å for the two subsequent flights.

Calibration of the instrument on the International Pyrheliometric Scale 1956 was performed before and after each flight by using a sodium salicylate coated photomultiplier and a Reeber thermopile .

By extrapolation to zero air mass, solar fluxes in the absence of atmospheric attenuation have been deduced from the change of the measured fluxes with the solar zenith distance. The results are presented in Figure 1. A curve has been fitted at best to the data points and has been reproduced in Figure 2 where our measurements can be compared with other results. Solar fluxes for various black body temperatures of the sun are also shown. The sharpness of the 2085 Å discontinuity indicated by Bonnet (1968) is confirmed. The values given by Detwiler et al. (1961) are slightly lower above 2150 Å and higher, below 2050 Å than those reported here. These agree reasonably well with the values published by Widing et al. (1970) which are higher by about a factor of two at 1850 Å than the values given by Parkinson and Reeves (1969).

The actual situation shows the need of new experiments.

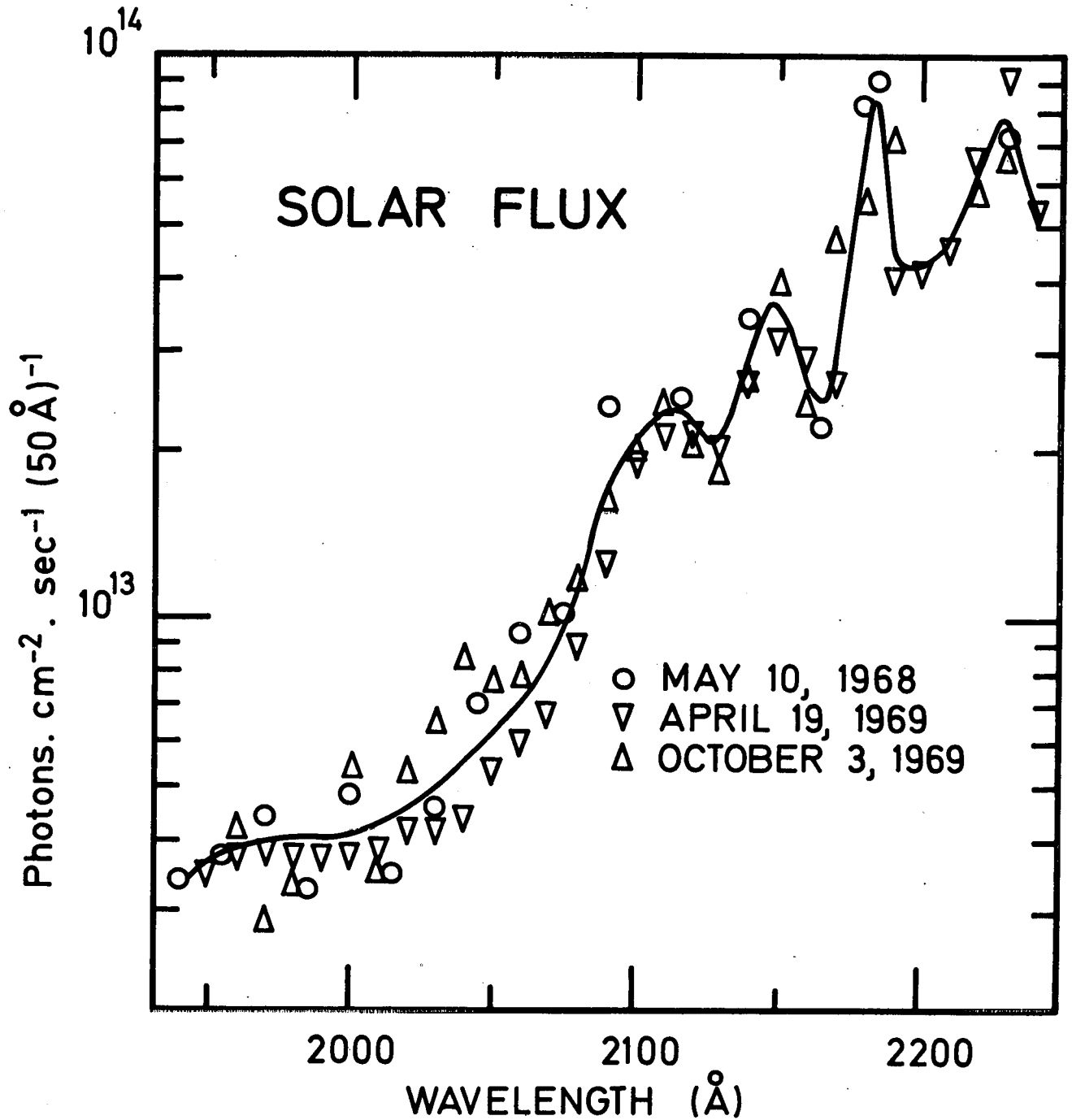


Fig. 1.- Solar flux at one AU. versus wavelength. A curve has been fitted at best to the experimental data of three balloon flights.

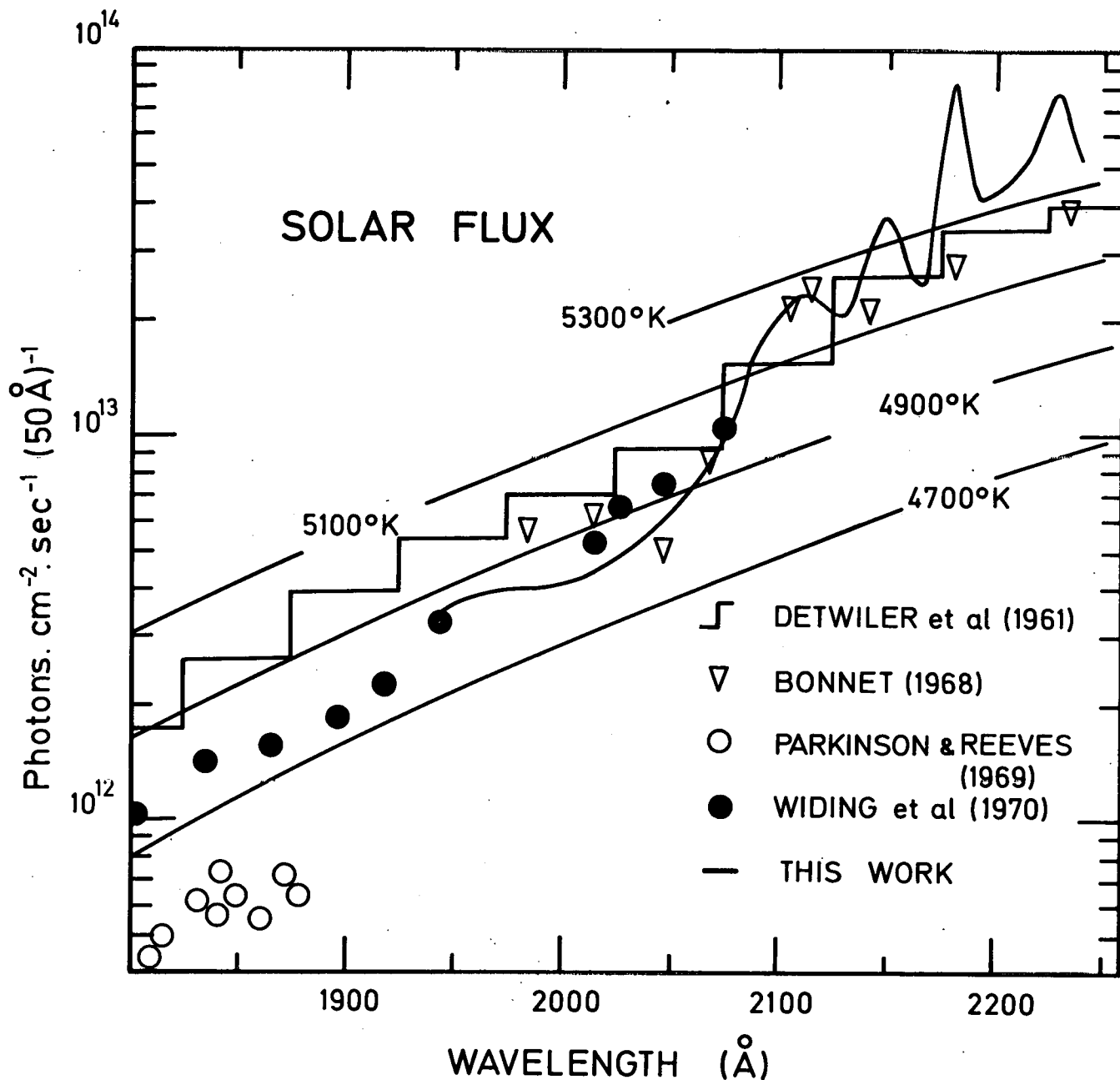


Fig. 2.- Values of the solar flux at one AU. versus wavelength obtained by various authors. Fluxes for several solar black body temperatures in °K are also shown.

REFERENCES

- ACKERMAN, M., FRIMOUT, D. and PASTIELS, R. : 1968, Mesure du rayonnement ultraviolet Solaire par ballon stratosphérique, Ciel et Terre , 84, 408-19.
- BONNET, R.M. : 1968, Stigmatic spectra of the Sun between 1800 Å and 2800 Å, Space Res. 458-472.
- DETWILER, C.R. , GARRETT, D.L., PURCELL, J.D., and TOUSEY, R. : 1961, The intensity distribution in the Ultraviolet Solar Spectrum, Ann. Géophys. 17, 9-18.
- PARKINSON, W.H. and REEVES, E.M. : 1969, Measurements in the Solar Spectrum between 1400 and 1875 Å with a Rocket Borne Spectrometer, Solar Phys., 10, 342-7.
- WIDING, K.G., PURCELL, J.D., and SANDLIN, G.D.: 1970, The UV Continuum 1450-2100 Å and the problem of the Solar Temperature Minimum, Solar Phys. 12, 52-62.