

# Measurements of Solar EUV fluxes on board the “CORONAS” satellites: equipment and main results

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## 1. Introduction

The CORONAS project is aimed at observation of the Sun in the wide wave-range. The CORONAS-I satellite has been launched to an orbit on 2 March 1994, the CORONAS-F satellite has been launched on 31 July 2001 (see for example Kazachevskaya et al., 1998; Oraevsky et al., 2002). Solar Ultraviolet Radiometer — SUVR provides measurements in the wavelength region  $\lambda < 130$  nm and also in the line  $L_\alpha$  ( $\lambda = 121.6$ ) nm. (Kazachevskaya et al., 1998).

## 2. Measurements Results

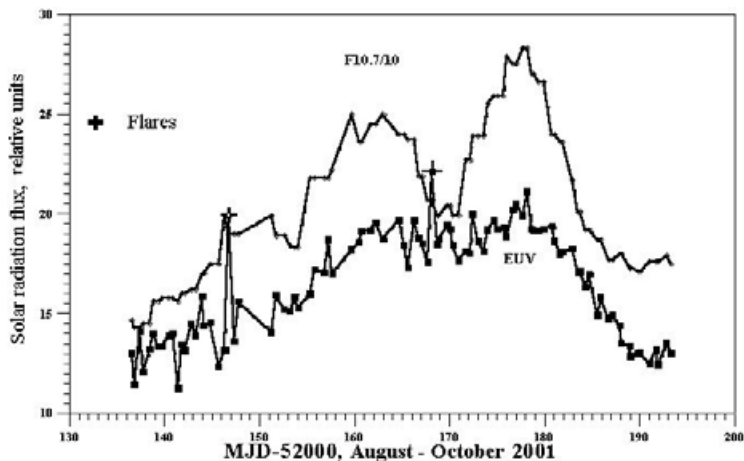
### 2.1. The data on the solar flux in the extreme ultraviolet region of the spectrum

Data on absolute values of Solar flux in the wave-range  $\lambda < 130$  nm and in the hydrogen line  $L_\alpha$  ( $\lambda = 121.6$  nm) were obtained on-board both CORONAS satellites. Measurements on-board CORONAS-I satellite were performed during a phase near the minimum of Solar activity. During the period from March to June of 1994 (index  $F_{10.7} = 80 - 100$ ) the Solar emission flux for  $\lambda < 130$  nm was on the average  $7.7 \text{ erg} \cdot \text{cm}^{-2} \cdot \text{s}^{-1}$  and the intensity of emission in the  $L_\alpha$  line was equal to  $(5.5 - 6.1) \text{ erg} \cdot \text{cm}^{-2} \cdot \text{s}^{-1}$ .

Measurements on-board CORONAS-F satellite were performed near the maximum of Solar activity. Radio flux - index  $F_{10.7}$  changed from 143 to 279. According to the measurements by the SUVR device the solar radiation intensity in the hydrogen  $L_\alpha$  line within the observational period was  $\sim 8 - 8.2 \text{ erg} \cdot \text{cm}^{-2} \cdot \text{s}^{-1}$ . The solar flux in the EUV region  $\lambda < 130$  nm on the average was about  $11 - 13 \text{ erg} \cdot \text{cm}^{-2} \cdot \text{s}^{-1}$ . The data obtained agree with the current ideas on the value of the radiation flux in these spectral regions (see, for example, Tobiska et al., 2000). The flux values correspond to the maximum phase of solar activity and so confirm the point of view on unusual behavior of the Sun in the 23d cycle.

### 2.2. Ultraviolet radiation flux variation with solar activity

On Board of the CORONAS-F satellite the measurements were conducted in the epoch of a maximum of solar activity when strong variations of the  $X$  - ray and EUV radiation were observed. Figure 1 shows the variations in the EUV radiation in the  $\lambda < 130$  nm region measured by the SUVR device within the period from 15 August to 11 October, 2001 (the data are presented in modified Julian days: 52000) and in the  $F_{10.7}$  index. The crosses denote two strong flares: on 25 August and 16 September 2001.



**Figure 1.** Variations in the flux of EUV radiation and F10.7 index, reduced by 10

For the same period we see also the flux of solar radio emission at a wavelength of 10.7 cm ( $F_{10.7}$ ) reduced by a factor of 10. For the sake of a convenience the variations in EUV measurements are normalized to the date of the beginning of the measurements: 15 August 2001. One can see that during this period strong variations in the fluxes are observed: the amplitude of variations is up to 80% and 40% for the radio emission fluxes and radiation in the EUV region of the spectrum, respectively.

### 3. Conclusions

The data on the solar ultraviolet flux in the spectral band  $\lambda < 130$  nm (the SUVR device) and in the vicinity of the hydrogen Lyman-alpha line with  $\lambda = 121,6$  nm (the VUSS device) were obtained. The CORONAS-I measurements were performed during a phase near the minimum of Solar activity (index  $F_{10.7} = 80 - 100$ ). During the period from March to June of 1994 the Solar emission flux for  $\lambda < 130$  nm was on the average  $7.7 \text{ erg} \cdot \text{cm}^{-2} \cdot \text{s}^{-1}$  and the intensity of emission in the  $L_{\alpha}$  line was equal to  $(5.5 - 6.1) \text{ erg} \cdot \text{cm}^{-2} \cdot \text{s}^{-1}$ . The CORONAS-F measurements were performed near the maximum of Solar activity (index  $F_{10.7} = 143 - 279$ ). The intensity of emission in the  $L_{\alpha}$  line was about  $\sim 8 - 8.2 \text{ erg} \cdot \text{cm}^{-2} \cdot \text{s}^{-1}$ . It is demonstrated that the flux values correspond to the maximum phase of solar activity, the fact confirming the point of view on unusual behavior of the Sun in the 23d cycle.

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### References

- Kazachevskaya T.V., Avdyshin S.I., Gonykh D.A., Lomovsky A.I., Nusinov A.A., Svidsky P.M., Tsigel'nitsky Y.N., Oraevsky V.N., Kopaev I.M. & Boldirev S.I. 1998 *Solar Physics*. **177**, 175–180.
- Oraevsky V.N., Sobelman I.I., Kuznetsov V.D. & Zhitnik I.A. 2002 *Uspekhi Fizicheskikh Nauk* **45**, 886–896.
- Tobiska W.K. 2000 *J. Atmos. Sol-Terr. Phys.* **62**, 1233–1240.