

RESULTS OF OBSERVATIONS OF THE SUN AND INNER PLANETS MADE AT THE BELGRADE OBSERVATORY

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SUMMARY: In this paper we present the results $(O - C)_\alpha$, $(O - C)_\delta$ and related data obtained during 1991 at Belgrade Observatory from diurnal observations of the Sun, Mercury, Venus and Mars with the Large Meridian Circle.

It is 18 years now since systematic observations of the Sun, Mercury, Venus and Mars with the Large Meridian Circle ($d=190$ mm, $f=2578$ mm) of the Belgrade Observatory have been going on. These observations are the continuation of our observations published in Sadžakov et al. (1976, 1981, 1982a, 1982b, 1983, 1985, 1988, 1991) and Dačić et al. (1989, 1992).

The observations are relative, the reference stars being taken from the FK5 (FK4). The data treatment includes the circle division corrections as well as corrections for flexure, collimation and refraction (calculated according to Pulkovo Tables). No account is taken of the "day-night" corrections and the personal errors. One limb of the planets was observed when these were phased, otherwise both limbs were observed. For observations of the Sun we use a

filter from high-quality glass.

The Sun's right ascension was deduced, as usual, from the trailing front and back limbs and the declination from settings on the upper and lower limbs.

We obtained ephemeris of the Sun, Mercury, Venus and Mars for 1991, from the Institute of Theoretical Astronomy, in Sankt-Petersburg.

The temperature inside the pavilion was read off before and after the observation at two places, to the north and to the south of the instrument. The mean temperature was used in the reductions.

The number of observations of the Sun and planets in 1991 is presented in Table 1, where N - the number of reference stars transits; n - the number of observing tours; $k=N/n$ - the average number of reference stars transits per observing tours.

Table 1. Data on Observations

| Object observ. | N | n | k |
|----------------|-----|----|---|
| Sun | 172 | 51 | 3 |
| Mercury | 13 | 4 | 3 |
| Venus | 153 | 44 | 4 |
| Mars | 10 | 2 | 5 |

Mean annual differences $(O-C)_\alpha$ and $(O-C)_\delta$ for the Sun and planets; $\epsilon_{(O-C)}$ - mean errors of single observations; n - the number of observations are summarized in Table 2.

Table 2. (O-C) Differences and their Errors for the Observed Objects

| Objects | $(O-C)_\alpha$ | ϵ_α | n | $(O-C)_\delta$ | ϵ_δ | n |
|---------|----------------|-------------------|----|----------------|-------------------|----|
| Sun | -0.006 | ± 0.024 | 51 | +0.03 | ± 0.28 | 49 |
| Mercury | -0.002 | ± 0.015 | 4 | +0.09 | ± 0.24 | 4 |
| Venus | +0.006 | ± 0.026 | 44 | -0.01 | ± 0.28 | 44 |
| Mars | +0.036 | ± 0.004 | 2 | -0.17 | ± 0.01 | 2 |

The error of a single observation was determined according to the formula

$$\epsilon_{(O-C)} = \pm \left[\frac{\sum \nu_i^2}{(n-1)} \right]^{1/2}$$

where

ν_i - the deviation (O-C) of the mean value,
n - the number of observations.

The results of the observations in right ascension and declination of the Sun, Mercury, Venus and Mars in 1991, as obtained on each particular day of observation, are compared with the ephemeris positions and given in Tables 3 through 6. Tables 3-6 comprise eleven columns namely the following ones:

Date - the date of observation;

Observ. - observers: 1 - S. Sadžakov, 2 - M. Dačić, 3 - Z. Cvetković, 4 - G. Damljanović;

$t^\circ\text{C}$ - mean temperature inside the pavilion;

Ba - atmospheric pressure in mm Hg;

n - the number of the reference FK5 stars;

R. A. - observed right ascensions (hours, minutes and seconds of time);

$(O-C)_\alpha$ - (O-C) of the right ascensions (seconds of time);

DEC - observed declinations (degrees, minutes and seconds of arc);

$(O-C)_\delta$ - (O-C) of the declinations (seconds of arc);

E_p - epoch of observation;

Clamp - clamp position.

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REFERENCES

- Dačić, M., Sadžakov, S., Cvetković, Z.: 1989, *Bull. Obs. Astron. Belgrade*, 139, 49.
- Dačić, M., Sadžakov, S., Cvetković, Z.: 1992, *Bull. Astron. Belgrade*, 145, 115.
- Sadžakov, S., Dačić, M.: 1985, *Bull. Obs. Astron. Belgrade*, 135, 47.
- Sadžakov, S., Dačić, M., Cvetković, Z.: 1991, *Bull. Obs. Astron. Belgrade*, 143, 21.
- Sadžakov, S., Dačić, M., Stančić, Z.: 1988, *Bull. Obs. Astron. Belgrade*, 138, 78.
- Sadžakov, S., Dačić, M., Šaletić, D.: 1976, *Publ. Dept. Astron. Belgrade*, 6, 119.
- Sadžakov, S., Dačić, M., Šaletić, D.: 1981, *Publ. Obs. Astron. Sarajevo*, 1, 69.
- Sadžakov, S., Dačić, M., Šaletić, D.: 1982 a, *Bull. Obs. Astron. Belgrade*, 132, 45.
- Sadžakov, S., Dačić, M., Šaletić, D.: 1983, *Bull. Obs. Astron. Belgrade*, 133, 45.
- Sadžakov, S., Dačić, M., Šaletić, D., Ševarlić, B.: 1982 b, *Sun and Planetary System*, D. Reidel Publ. Comp. Dordrecht, Holland, 445.

**РЕЗУЛТАТИ ПОСМАТРАЊА СУНЦА И УНУТРАШЊИХ ПЛАНЕТА
УРАЂЕНИХ НА БЕОГРАДСКОЈ ОПСЕРВАТОРИЈИ**

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У овом раду дају се резултати $(O-C)_\alpha$ и $(O-C)_\delta$ и њиховарајући подаци добијени у току 1991.

године на Београдској опсерваторији из дневних посматрања Сунца, Меркура, Венере и Марса на Великом Мериђијанском Кругу.