

3. IZRAČUN

OPAZOVANJE SONCA ZA DOLOČITEV GEOGRAFSKE DOLŽINE

1. Splošni podatki

Datum: 22.05.2003

Opazovalec: Sašo Ekart

Zapisnik: Dunja Vrenko

Opazovališče: terasa FGG

Vrednosti v celici:

PODAJ	PODANO
IZRAČUN	ISKANO

	[° ' "]	[h m s]
Φ'	46 03 00,00	
Λ'	14 30 00,00	00 58 00,00
h [m]		330

Instrumenti: KERN E2, Roelofsova prizma, aneroid, t
GPS-sprejemnik, prenosni računalnik.

2. Podatki opazovanja

cilj	krog	SEČ	stoparica	V
		[h m s]	[h m s]	[° ' "]
-	-	07 36 00,00	00 00 00,00	---
Sonce	L	----	00 01 22,75	58 30 19,00
Sonce	D	----	00 04 31,14	301 58 58,00
Sonce	D	----	00 05 01,98	302 04 11,00
Sonce	L	----	00 05 58,93	57 42 08,00
-	-	07 43 00,00	00 06 56,87	---

METEOROLOŠKI PODATKI	SEČ	temperatura zraka [°C]	aneroid [mbar]
	[h m s]		
pred opazovanjem	08 36 00,00	14,0	984,0
po opazovanju	08 43 00,00	14,0	984,0

3. Redukcija opazovanih časovnih trenutkov

krog	SEČ [h m s]	stoparica [m s]	intervali [m s]	redukcija [s]	reduc. int. [° ' "]
-	07 36 00,00	00 00,00			
L	07 37 23,37	01 22,75	01 22,75	00,62	01 23,37
D	07 40 33,18	04 31,14	03 08,39	01,41	03 09,80
D	07 41 04,25	05 01,98	00 30,84	00,23	00 31,07
L	07 42 01,62	05 58,93	00 56,95	00,43	00 57,38
-	07 43 00,00	06 56,87	00 57,94	00,44	00 58,38

*(zadnji-prvi)

*=	00 07 00,00	*=	06 56,87	Σ=	06 56,87	Σ=	03,13	Σ=	07 00,00
	00 06 56,87								
							03,13		

$$RED = \frac{03,13}{06 \ 56,87} = \frac{27,03 \text{ s/h}}{00,45 \text{ s/m}}$$

sredina	SEČ [h m s]	M [h m s]
1.girus	07 38 58,27	06 38 58,27
2.girus	07 41 32,94	06 41 32,94

$$sredina = \frac{L + D}{2}$$

$$M = SEČ - 1h$$

4. Izračun navideznih zenitnih razdalj

	[° ' "]	[° ' "]
L	58 30 19,00	57 42 08,00
D	301 58 58,00	302 04 11,00
L-D+360°	116 31 21,00	115 37 57,00
z'	58 15 40,50	57 48 58,50

$$z' = 180^\circ + \frac{L - D}{2}$$

$$r = r_0 \cdot \frac{p_{mbar}}{1013.2} \cdot \frac{273}{273 + t^{\circ}C}$$

$$r_0 = 60,15'' \cdot \tan z'$$

$$p = \frac{R}{d} \cdot \sin z'$$

$$z = z' + r - p$$

5. Izračun pravih zenitnih razdalj

R [m]	p _{mbar}	984,0	984,0
6400000	t°C	14,0	14,0
d [m]		[° ' "]	[° ' "]
1,50E+11	z'	58 15 40,50	57 48 58,50
	r ₀	00 01 37,24	00 01 35,58
	r	00 01 29,83	00 01 28,29
	p	00 00 07,48	00 00 07,45
	z	58 17 02,85	57 50 19,35

6. Besselova interpolacija

interpolirana količina δ

i	opomba	Datum03		$f_i = \delta_i$		I.razlika		II.razlika	
		UT = t_i [h]		[° ' "]	["]	["]			
-1	priloga2	21,05	00,00	20 03 18,30	$d_{-1/2}^I$	733,00	d_0^{II}	-20,80	
0	priloga2	22,05	00,00	20 15 31,30	$d_{1/2}^I$	712,20	d_1^{II}	-20,90	
1	priloga2	23,05	00,00	20 27 23,50	$d_{3/2}^I$	691,30			
2	priloga2	24,05	00,00	20 38 54,80	$d_{3/2}^I - d_{-1/2}^I$	-41,70	$d_0^{II} + d_1^{II}$	-41,70	

$$(d_{3/2}^I - d_{-1/2}^I) = (d_0^{II} + d_1^{II})$$

h [h]	24	24
(t =) M [h m s]	06 38 58,27	06 41 32,94
f_0 [° ' "]	20 15 31,30	20 15 31,30
p	0,277063	0,278853
B_2	-0,050075	-0,050274
$p \cdot d_{1/2}^I$ ["]	197,32	198,60
$p \cdot d_{1/2}^I$ [° ' "]	00 03 17,32	00 03 18,60
$B_2 \cdot (d_{1/2}^I - d_{-1/2}^I)$ ["]	02,09	02,10
$B_2 \cdot (d_{1/2}^I - d_{-1/2}^I)$ [° ' "]	00 00 02,09	00 00 02,10
δ [° ' "]	20 18 50,71	20 18 52,00

$$p = \frac{t - t_0}{h}$$

$$B_2 = \frac{p \cdot (p - 1)}{4}$$

$$f = f_0 + p \cdot d_{1/2}^I + B_2 \cdot (d_0^{II} + d_1^{II})$$

interpolirana količina **E**

i	opomba	Datum03	fi = Ei			I.razlika	II.razlika
		ti [h]	[° ' "]	[° ' "]	[° ' "]	["]	["]
-1	priloga2	21,05	180	52	21,80		
		00,00				$d_{-1/2}^I$	
0	priloga2	22,05	180	51	24,90	-56,90	d_0^{II}
		00,00				$d_{1/2}^I$	-08,40
1	priloga2	23,05	180	50	19,60	-65,30	d_1^{II}
		00,00				$d_{3/2}^I$	-08,00
2	priloga2	24,05	180	49	06,30	-73,30	
		00,00				$d_{3/2}^I - d_{-1/2}^I$	$d_0^{II} + d_1^{II}$
						-16,40	-16,40

$$(d_{3/2}^I - d_{-1/2}^I) = (d_0^{II} + d_1^{II})$$

h [h]	24	24
M [h m s]	06 38 58,27	06 41 33
f ₀ [° ' "]	180 51 24,90	180 51 24,9
p	0,277063	0,278853
B ₂	-0,050075	-0,050274
p · d _{1/2} ^I ["]	-18,09	-18,21
p · d _{1/2} ^I [° ' "]	-00 00 18,09	-00 00 18,21
B ₂ · (d _{1/2} ^I - d _{-1/2} ^I) ["]	00,82	00,82
B ₂ · (d _{1/2} ^I - d _{-1/2} ^I) [° ' "]	00 00 00,82	00 00 00,82
E [° ' "]	180 51 07,63	180 51 07,52
E [h m s]	12 03 24,51	12 03 24,50

$$p = \frac{t - t_0}{h}$$

$$B_2 = \frac{p \cdot (p - 1)}{4}$$

$$f = f_0 + p \cdot d_{1/2}^I + B_2 \cdot (d_0^{II} + d_1^{II})$$

7. Izračun časovnega kota Sonca

	[° ' "]	[° ' "]
zmanjšuje z	58 17 02,85	57 50 19,35
$\Phi = \Phi_{LJ}$	46 03 00,00	46 03 00,00
δ	20 18 50,71	20 18 52,00
t	64 55 55,36	64 17 22,39
kvadrant	$\cos(t) > 0$; IV	$\cos(t) > 0$; IV
$360^\circ - t$	295 04 04,64	295 42 37,61
t [h m s]	19 40 16,31	19 42 50,51

$$\cos t = \frac{\cos z - \sin \phi' \cdot \sin \delta}{\cos \phi' \cdot \cos \delta}$$

nebesno telo je na	$\cos(t) > 0$	$\cos(t) < 0$	z
zahodni strani (W)	I. kvadrant	II. kvadrant	povečuje
vzhodni strani (E)	IV. kvadrant	III. kvadrant	zmanjšuje

8. Izračun astronomske dolžine

	[h m s]	[h m s]
SEČ	07 38 58,27	07 41 32,94
t	19 40 16,31	19 42 50,51
E	12 03 24,51	12 03 24,50
Λ	00 57 53,53	00 57 53,07

srednja vrednost

Λ	[h m s]
	00 57 53,30

4. PRILOGE

-Priloga 1: Zapisnik opazovanj

-Priloga 2: navidezne koordinate Sonca za mesec MAJ 2003