The relationship between air temperatur and surface temperature of different substrates

Dragojle Jarnević Elementary School, Karlovac - 2024/2025

Students: Jona Doždor, Mia Jeretina and Iva Tomić

Mentor: Marija Šako

INTRODUCTION

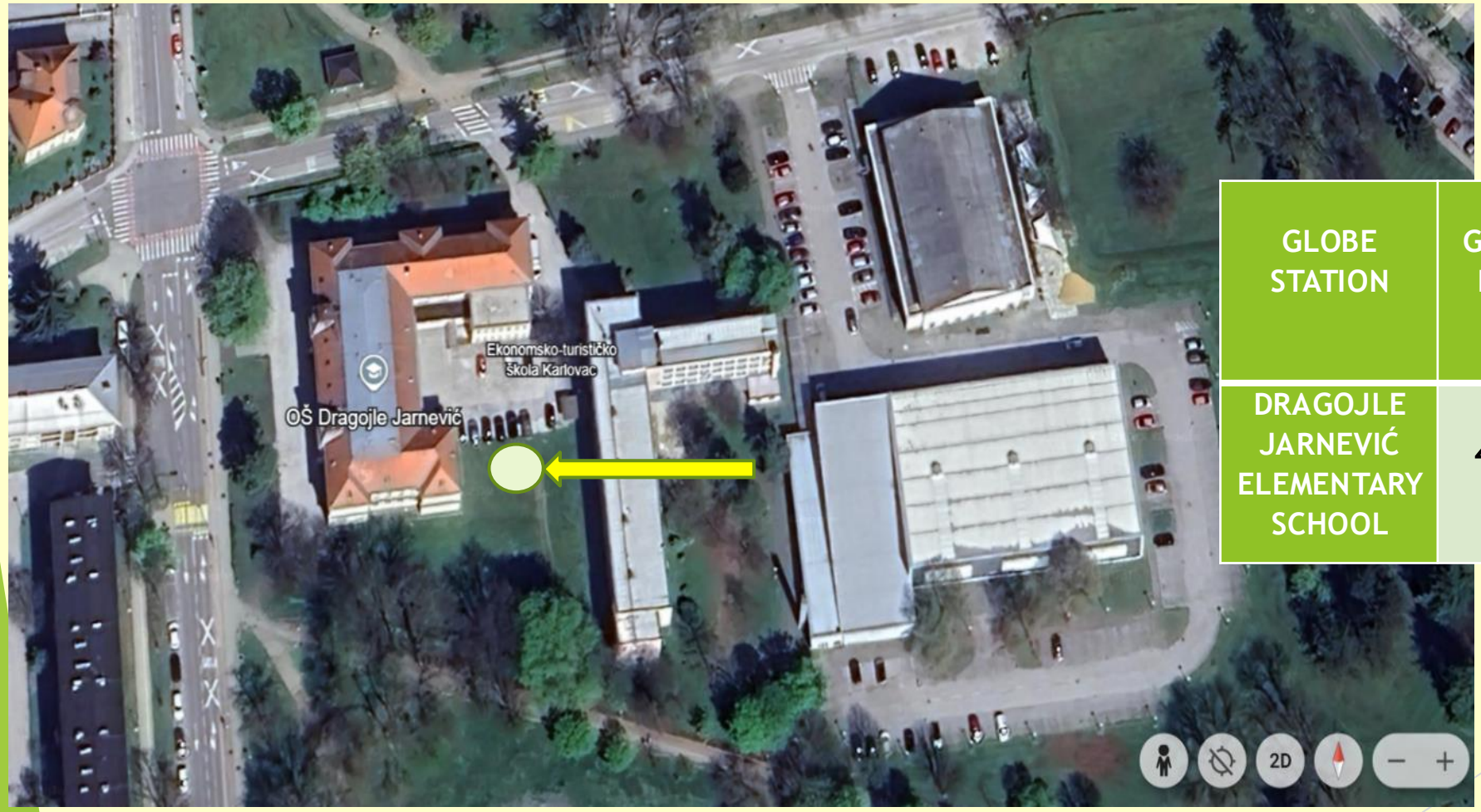
- Topic of project teaching 2024/2025 – AIR
- air is one of the basic living conditions

Regular measurement of air temperature and grass surface temperature

We noticed interesting things in the movements of air temperature and surface temperature of grass

We extended the measurements to the surface temperature of the asphalt and metal fence

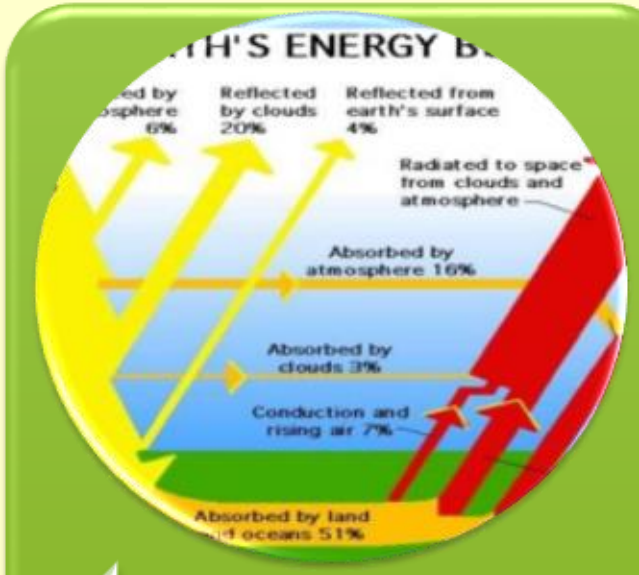
Geographical position and location of GLOBE becomes Dragojla Jarnević Elementary School



GLOBE STATION	GOGRAPHIC LATITUDE (°)	LONGITUDE (°)	ALTITUDE (m)
DRAGOJLE JARNEVIĆ ELEMENTARY SCHOOL	45. 489	15.56	116

Satellite image of the D. Jarnević Elementary School and the atmospheric station (geoportal.dgu.hr)

The goal of the GLOBE Group



EXPLORE

- The relationship between air temperature and surface temperature of different substrates

PROVE

- that the surface temperature of the asphalt and metal fence is higher than the term air temperature

POTICATI

- Protecting the green spaces in our local community and
- Planting more native tree species in green areas

Research questions and hypotheses

1. Will the term air temperature be lower than the surface temperature of different substrates?

- The term air temperature is lower than the surface temperature of different substrates.

2. Will the surface temperature of the asphalt and metal fence be higher than the surface temperature of the grass surface?

- Asphalt and a metal fence made of grass will have a higher surface temperature.

Research questions and hypotheses

3. Does a higher amount of precipitation affect the reduction of the difference between the term air temperature and the surface temperature of the asphalt?

- A higher amount of precipitation reduces the difference between the term air temperature and the surface temperature of the asphalt.

4. Does a higher amount of cloudiness affect the lowering of the surface temperature of asphalt and grass?

- A larger amount of cloudiness affects the lowering of the surface temperature of asphalt and grass.

Research methods

- Research period - 1.11.2023 – 15.2.2025
- Data collection in local time from 12:15 to 13:00
- Data: air temperatures, surface temperatures of grass, asphalt and metal fences, clouds and precipitation
- We have the highest number of measurements from November and December 2023, January, November and December 2024, January 2025.

Measuring instruments

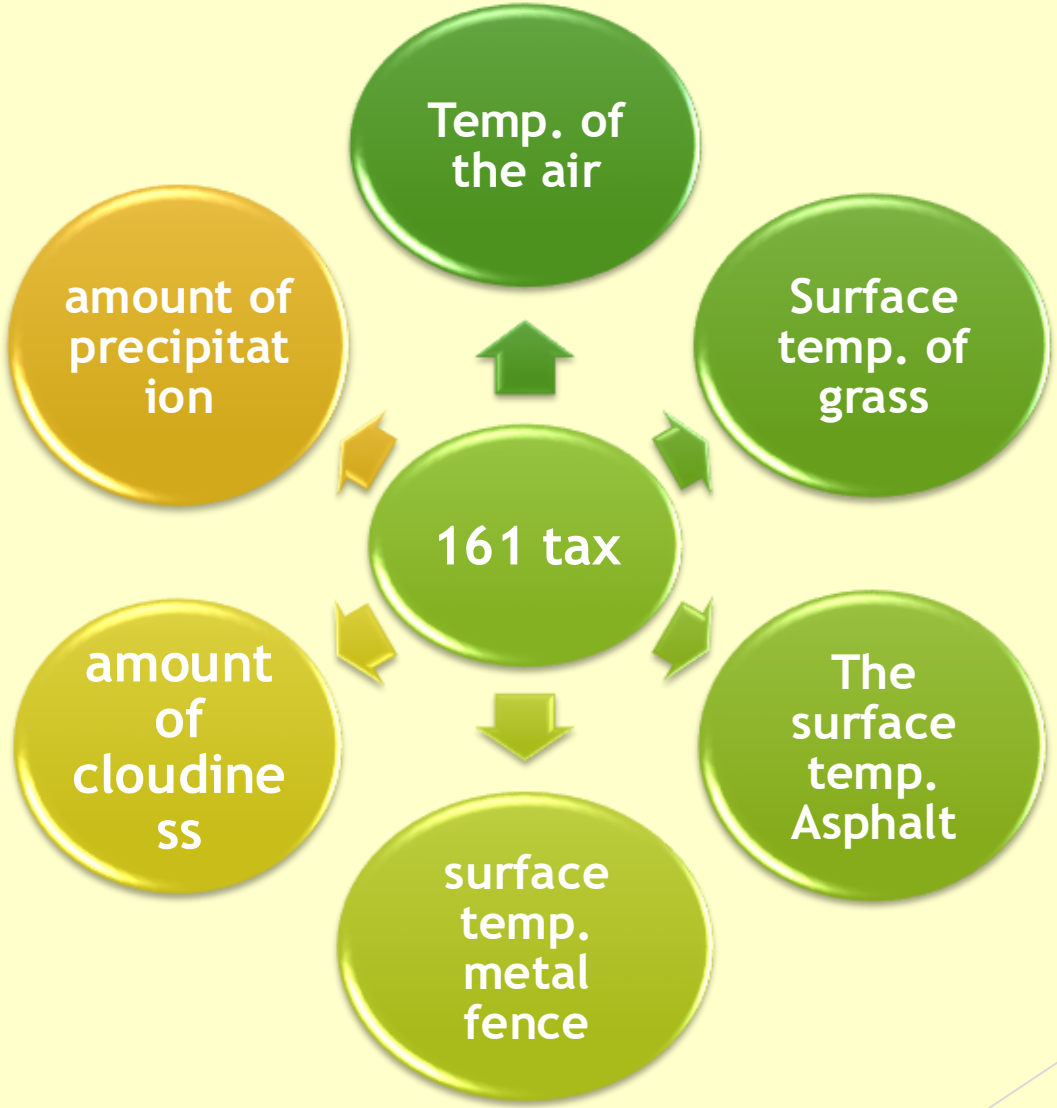
Digital thermo-hygrometer
30.5002 TFA Dostmann

Infrared Thermometer
PRO – ICT320

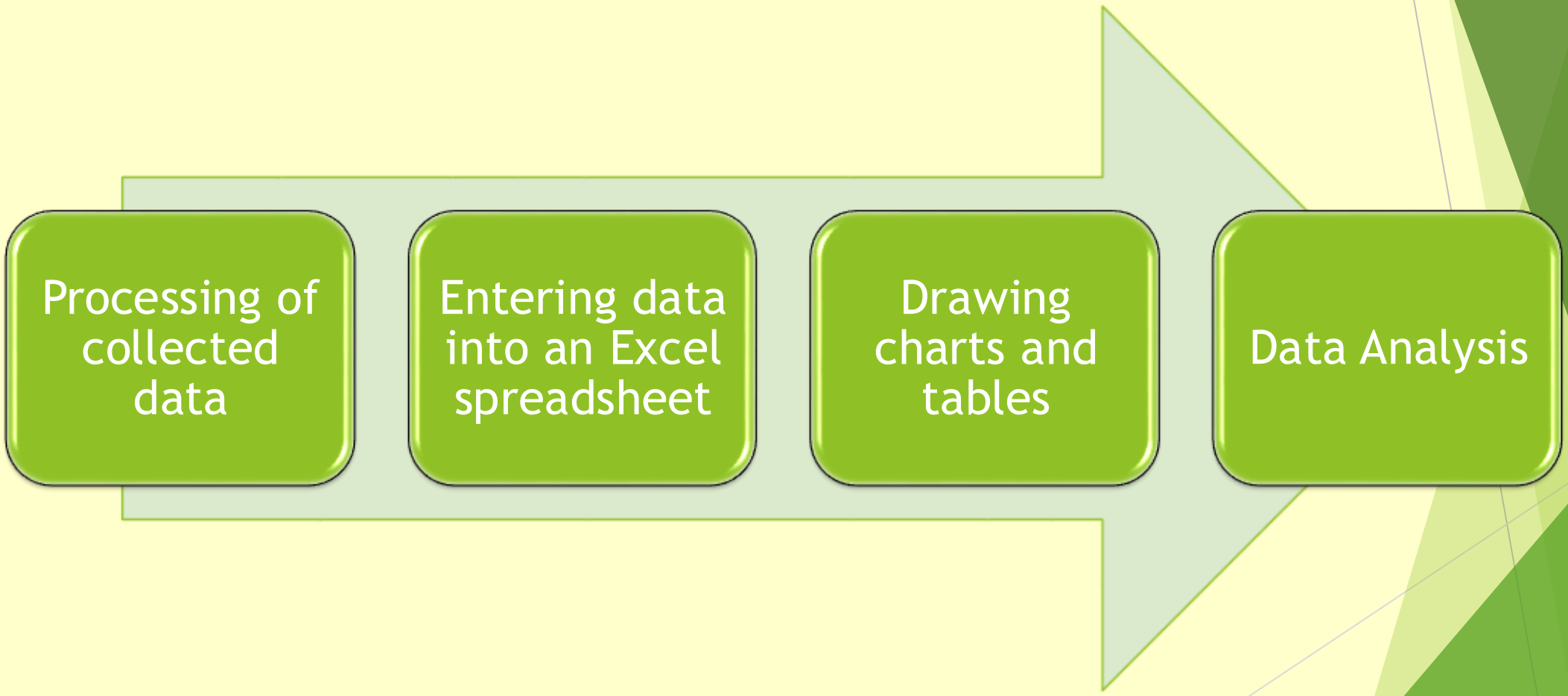
Hellmannov
Rain gauge

Display and analysis of data

161 days of measurement in the period from 1 November 2023 to 15 February 2025 - a total of 966 data



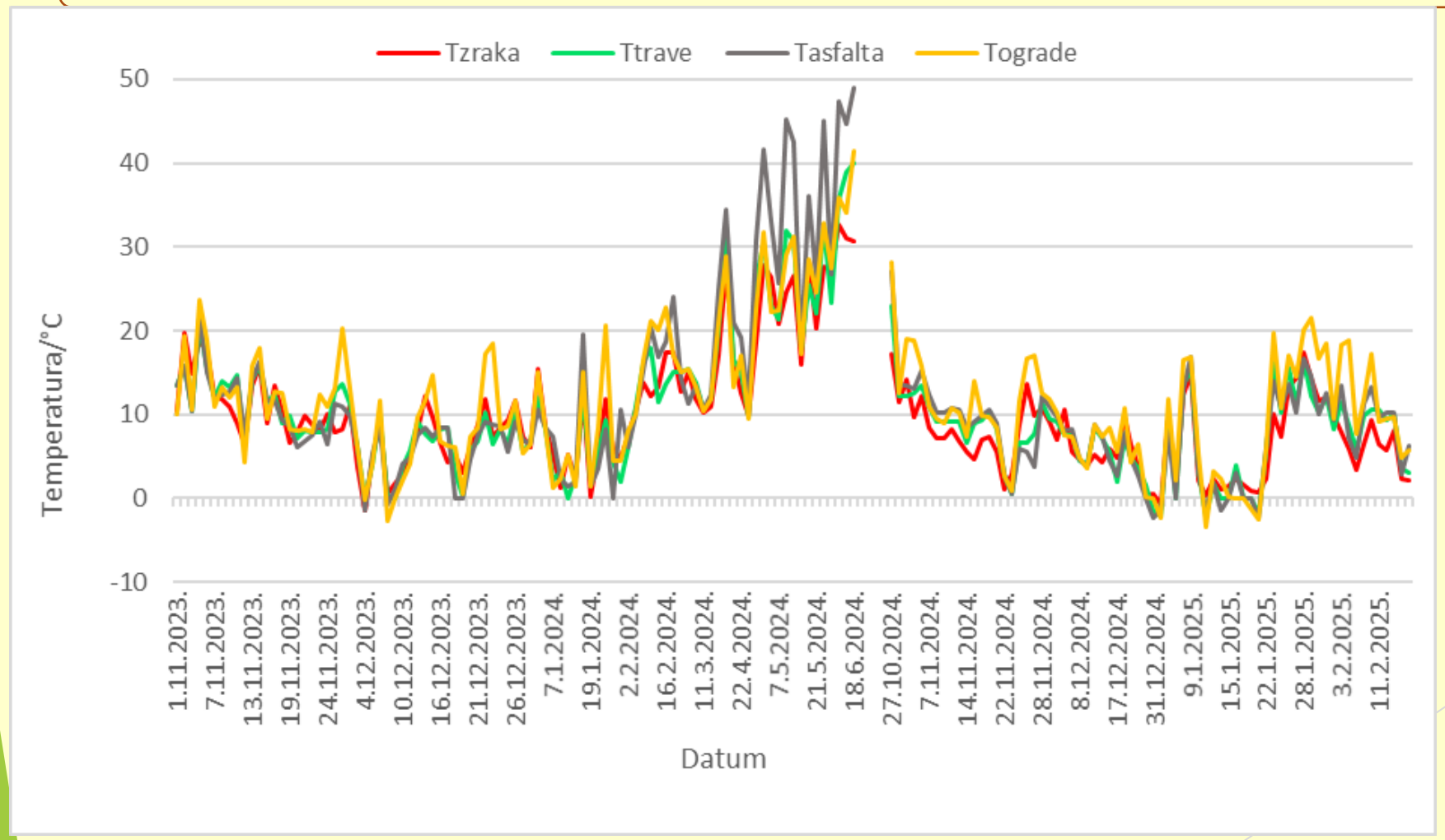
Display and analysis of data



Data display – measuring stations of the D. Jarnević Elementary School

Term air temperature

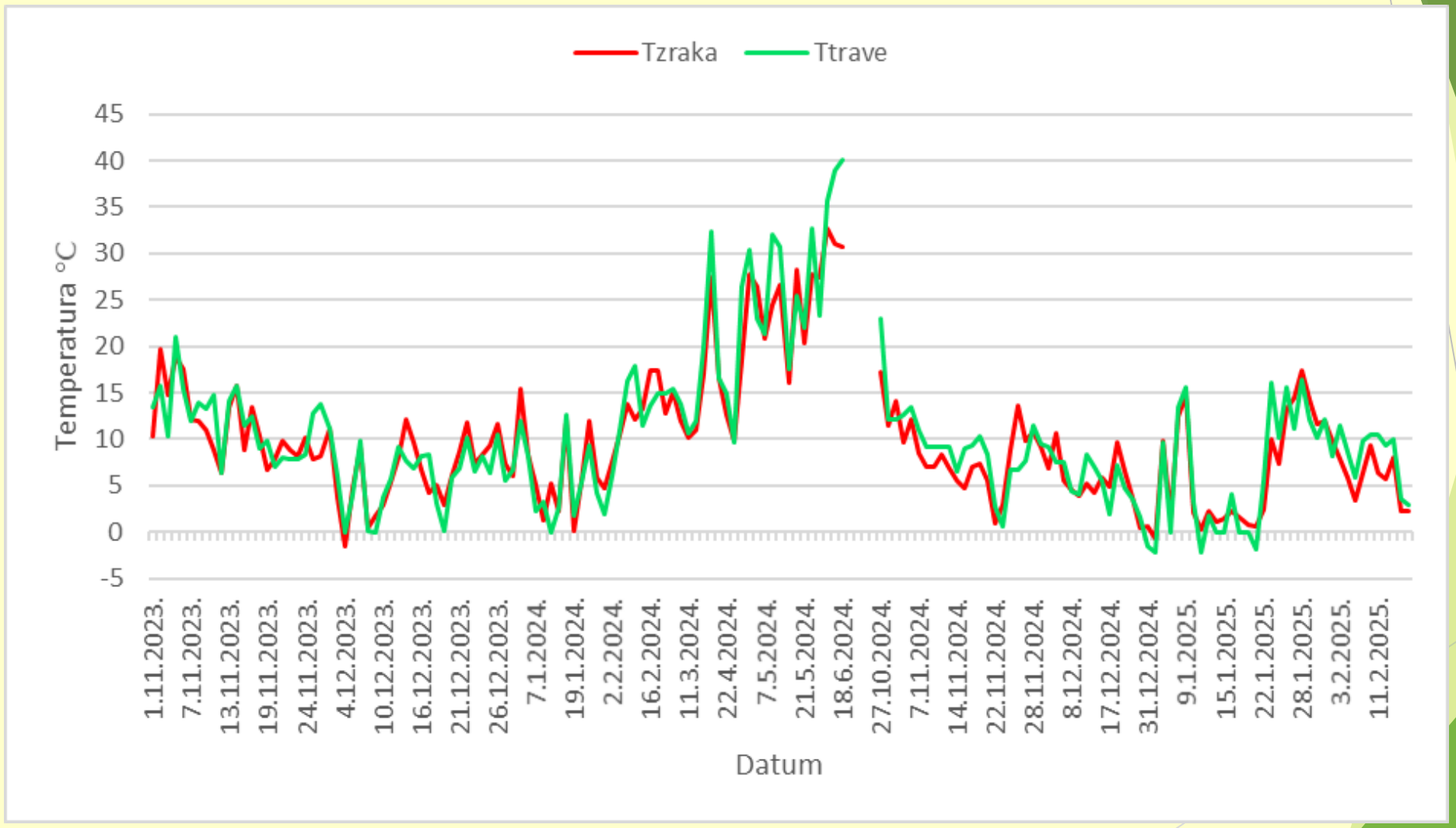
surface temperature of grass, asphalt and metal fence



We can see the connection between the temperature

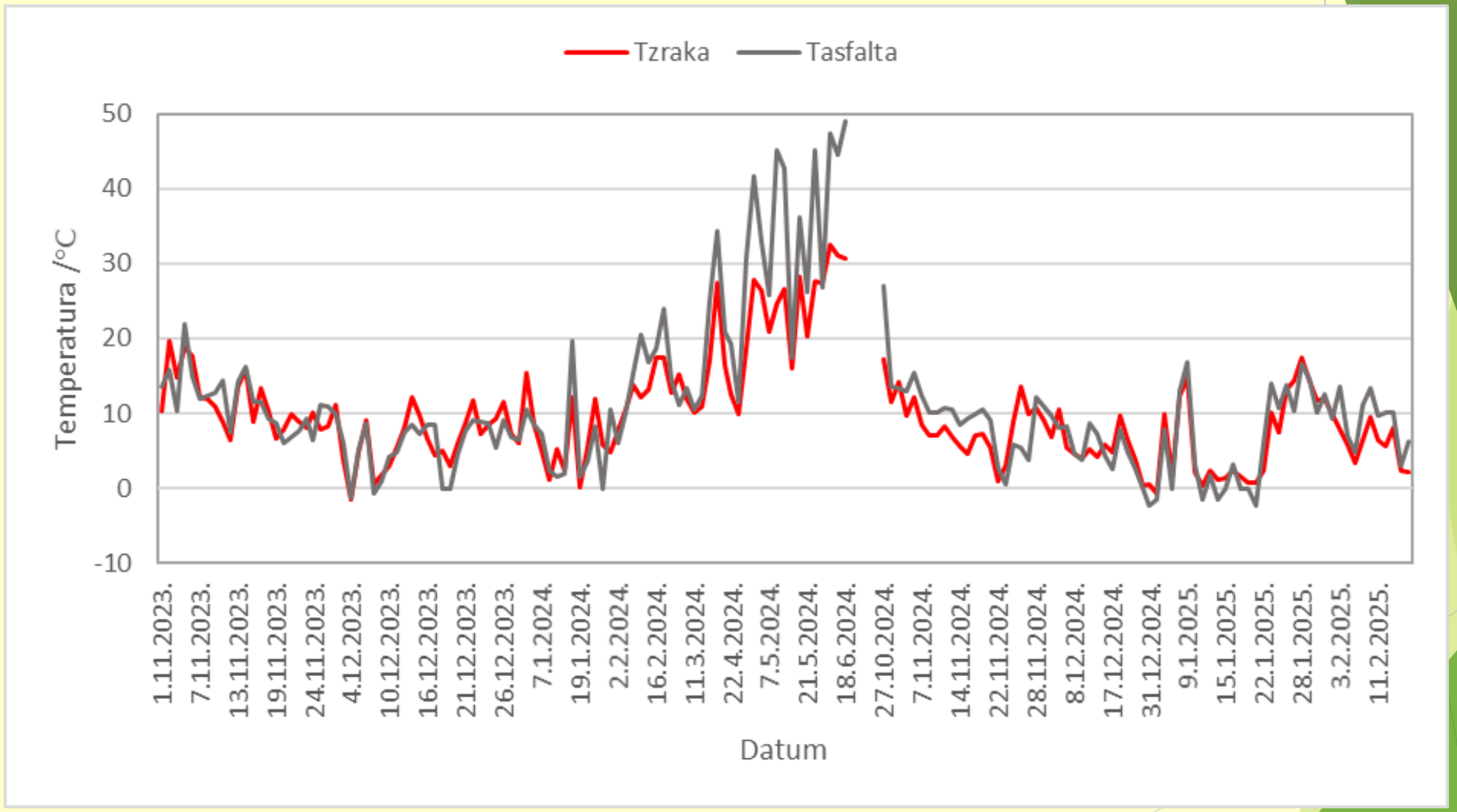
With the increase in air temperature, the surface temperature of various substrates also increases

Display of air temperature term and grass surface temperature



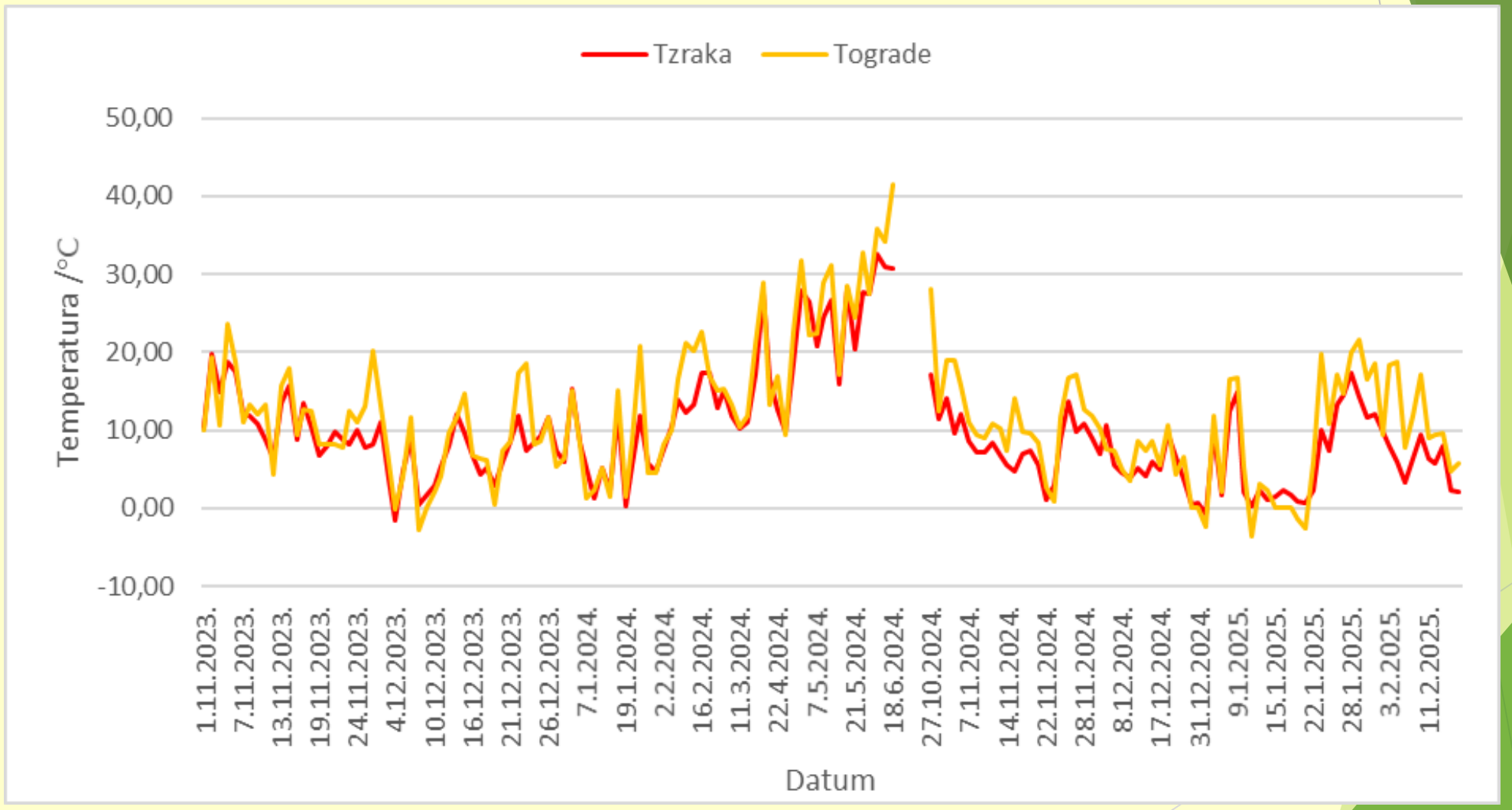
For most days, the surface temperature of the grass is higher than the term air temperature

Display of air temperature and surface temp. of asphalt



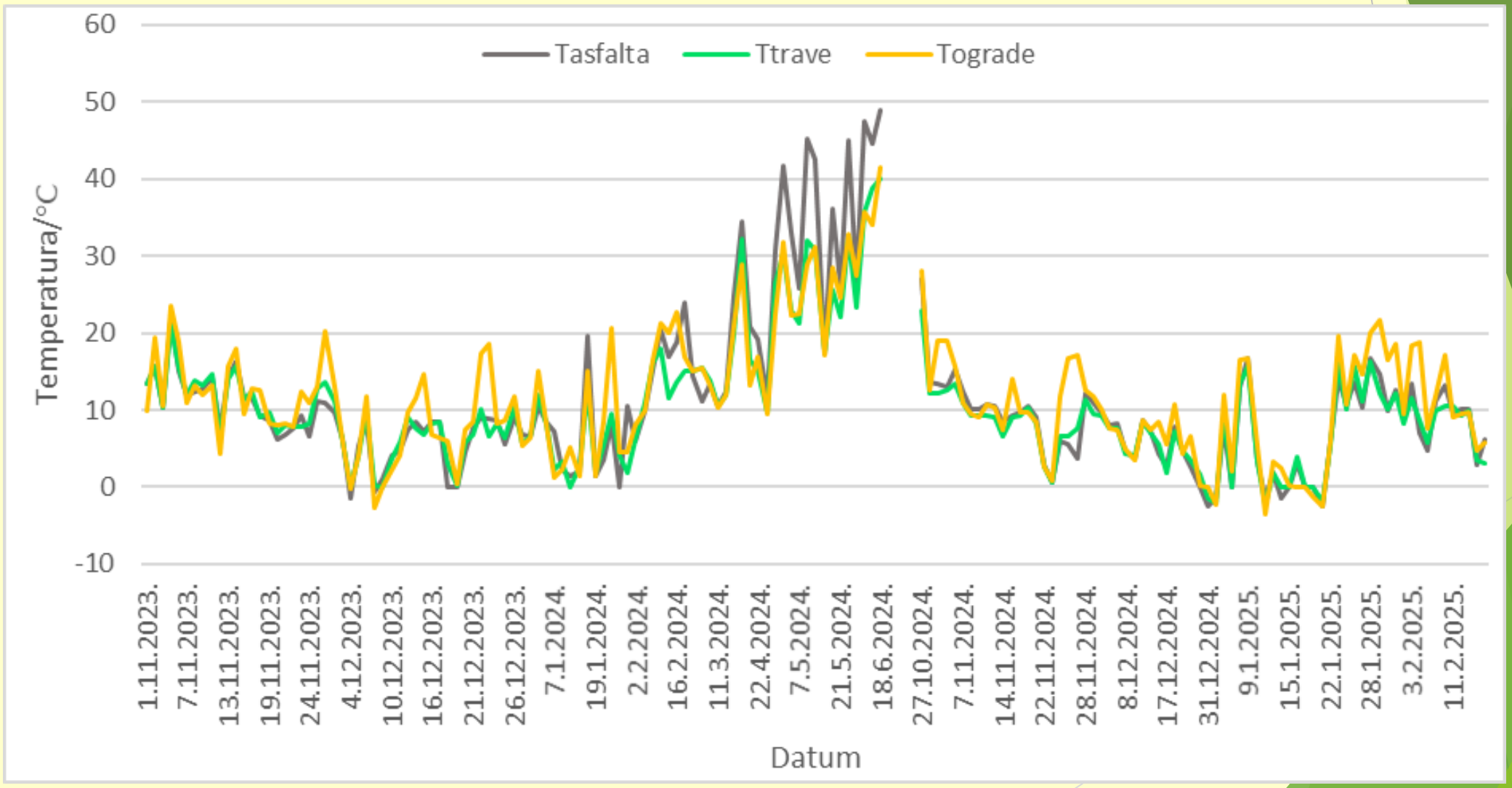
For most days, the surface temperature of the asphalt is higher than the term air temperature

Display of the term air temperature and the surface temperature of the metal fence



For most days, the surface temperature of the metal fence is higher than the term air temperature

Display of surface temperature of grass, asphalt and metal fence



Average temperatures for 161 days of measurement

Measurements	Number of days of measurement	Average temperature(°C)
Term air temperature	161	9.81
Surface temperature of the grass	161	10.33
Asphalt surface temperature	161	11.32
The surface temperature of the metal fence	161	11.86

Expected lowest Term temperature air

Surprisingly the highest Surface temperature Metal fences

Our atmospheric station before the renovation and during the renovation of the school

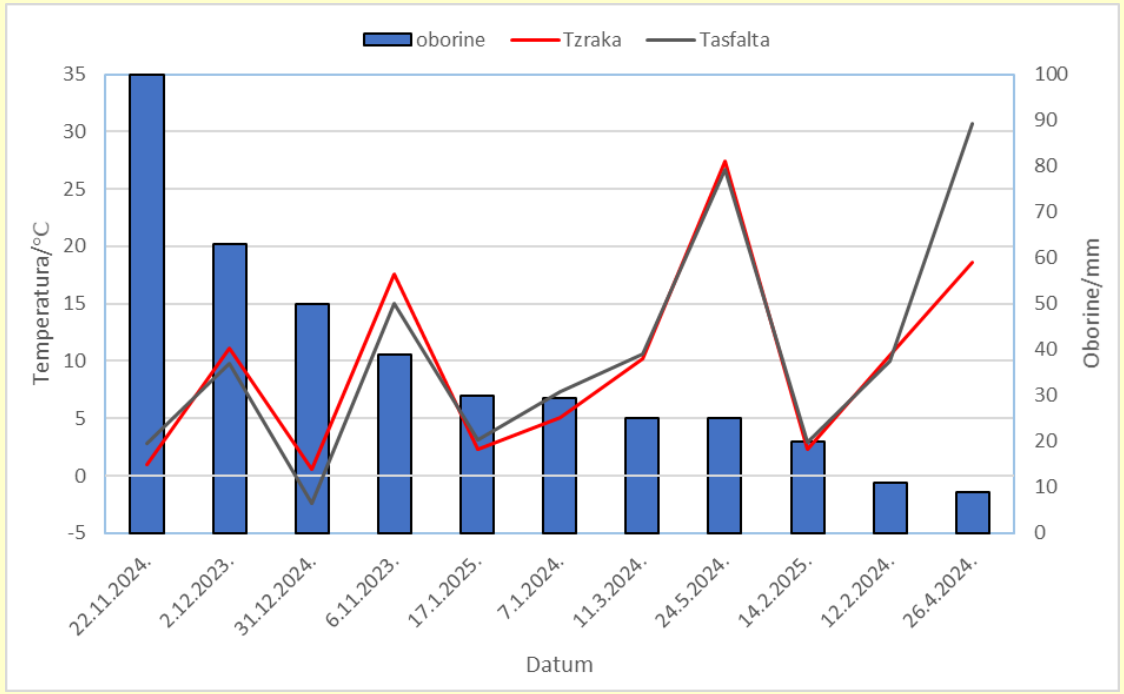
https://karlovacki.hr/krenulo-je-preseljenje-os-dragojla-jarnevic-u-privremene-prostore-pri-os-braca-seljan/

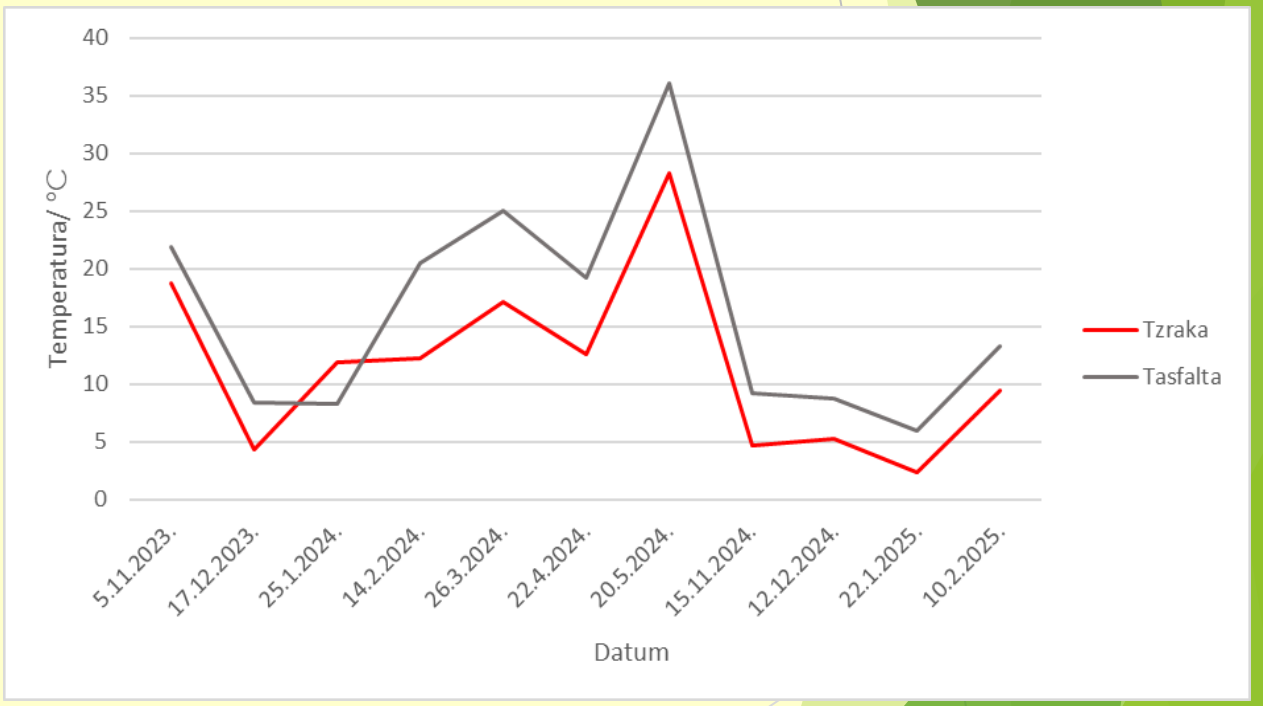
https://radio-mreznica.hr/os-dragojle-jarnevic-bit-ce-obnovljena-do-kraja-ove-godine/

Measurement days with the highest amount of precipitation by month

Measurement dates	The amount of rain (mm)	Term air temperature (°C)	Asphalt surface temperature (°C)	The difference between air temperature and asphalt (°C)
6.11.2023.	39	17,6	15,0	2,6
2.12.2023.	63	11,1	9,8	1,3
7.1.2024.	30	5,1	7,3	2,2
12.2.2024.	11	10,5	10,0	0,5
11.3.2024.	25	10,2	10,6	0,4
26.4.2024.	9	18,6	30,7	12,1
24.5.2024.	25	27,4	26,7	0,7
22.11.2024.	100	1,0	2,8	1,8
31.12.2024.	50	0,6	-2,4	3,0
17.1.2025.	30	2,3	3,1	0,8
14.2.2025.	20	2,3	2,9	0,6

Difference between air temperature and surface temperature of asphalt on days with and without precipitation

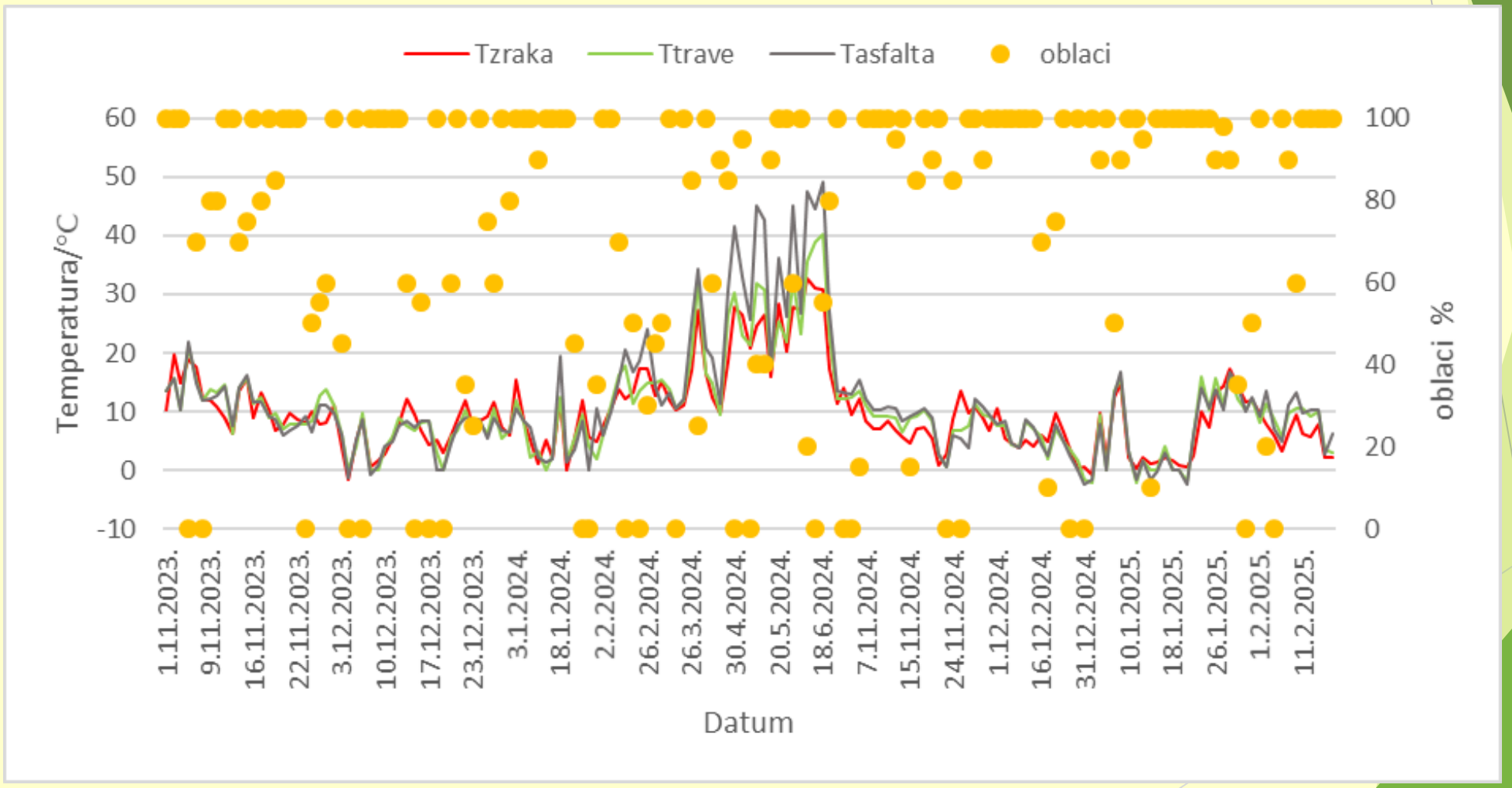




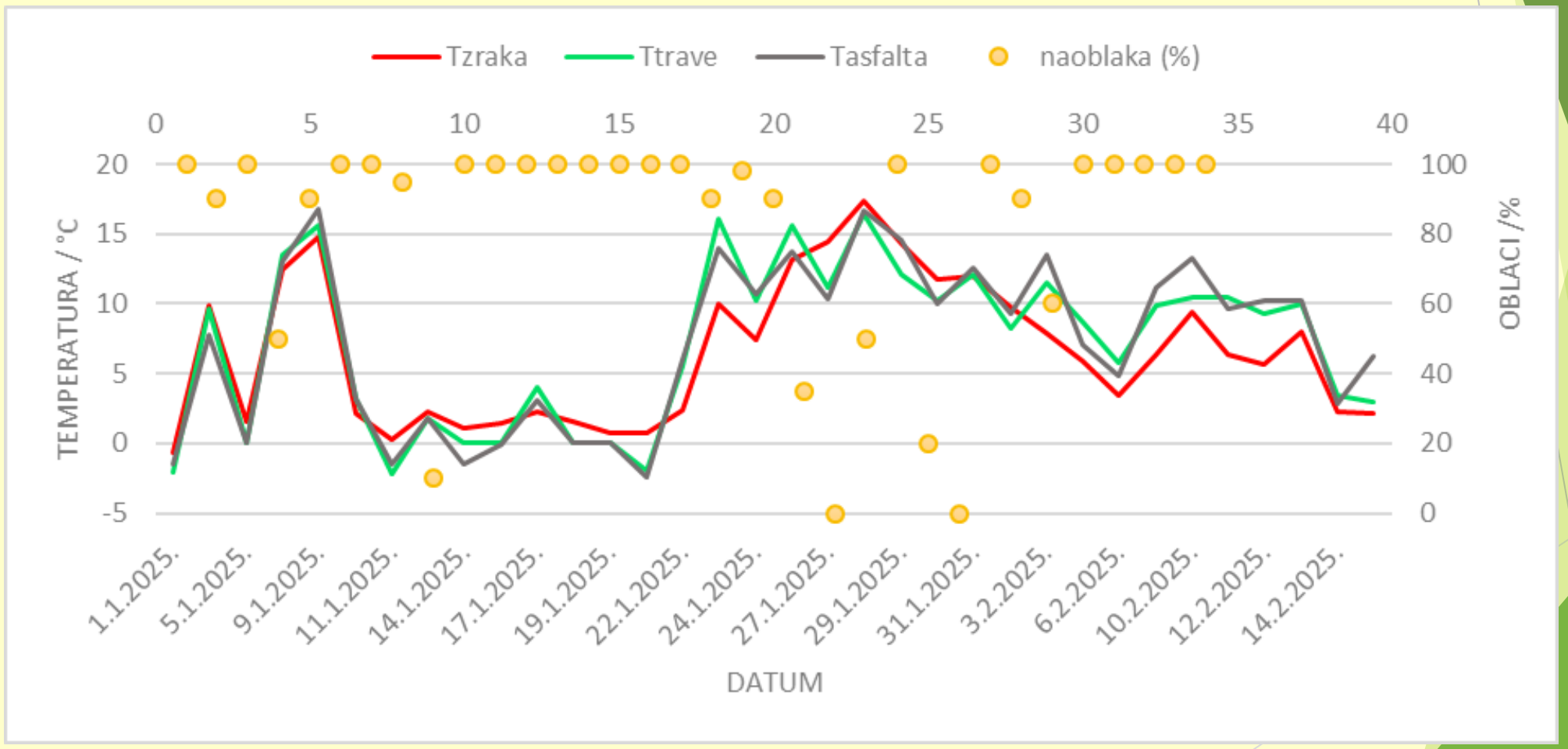
Days with precipitation – smaller temperature difference

Days without precipitation – greater temperature difference

Display of air temperature, surface temperature of grass, asphalt and amount of clouds (1.11.2023.-15.2.2025.)



Display of term air temperature, surface temperature of grass, asphalt and amount of clouds (1.1.2025.-15.2.2025.)



CONCLUSIONS

- Term air temperature and surface temperature of different substrates – interconnected
- The surface temperature of various substrates on most days is higher than the term air temperature
- The surface temperature of artificial substrates heats up more than the surface temperature of natural substrates

CONCLUSIONS

The average is the lowest term air temperature, and the highest is the average surface temperature of the metal fence and asphalt

On days with a higher amount of precipitation, the difference between the term air temperature and the surface temperature of the asphalt decreases, and on days without precipitation, the difference between temperatures increases

The most difficult thing for us was to connect the influence of the amount of cloudiness on the term air temperature and the surface temperature of grass and asphalt

The analyzed part indicates the influence of a larger amount of cloudiness on the air temperature and surface temperature of grass and asphalt

1. The hypothesis has been confirmed

2. The hypothesis has been confirmed

3. The hypothesis has been confirmed

4. Hypothesis - partially confirmed

Our contribution to the local community

To make the authorized in the city aware that in the future they are planning:

- increase green spaces with more trees
- reduce the presence of artificial surfaces that heat up faster
- make our city even more pleasant to live in

Literature:

- 1. GLOBE Databasewww.globe.gov
- 2. GLOBE Croatia Program - Atmosphere – Surface Temperaturehttp://globe.hr/upute-za-provedbu/
- 3. Surface temperature of different types of soil – link to workhttps://www.globe.gov/documents/10157/fba7943f-b4ef-4344-97b0-9fb367c1ffba
- 4. Orešić, D., Tišma, I., Vuk, R., Bujan, A., Kralj, P. 2020. Gea 2 - Geography Textbook in 6th Grade, Školska knjiga, Zagreb 2020

THANK YOU FOR YOUR ATTENTION

https://gradonacelnik.hr/izdvojeno/grad-u-parku-cak-tri-karlovacka-izabrana-su-u-top-10-najljepsih-u-zemlji-jedan-je-dobio-i-priznanje-strucnog-zirija-evo-price-o-promenadi-arboretumu-i-vrbanicevom-perivoju/

Povezanost temperature zraka s površinskom temperaturom različitih podloga

OŠ Dragojle Jarnević, Karlovac - 2024./2025

Učenici: Jona Doždor, Mia Jeretina i Iva Tomić

Mentor: Marija Šako

UVOD

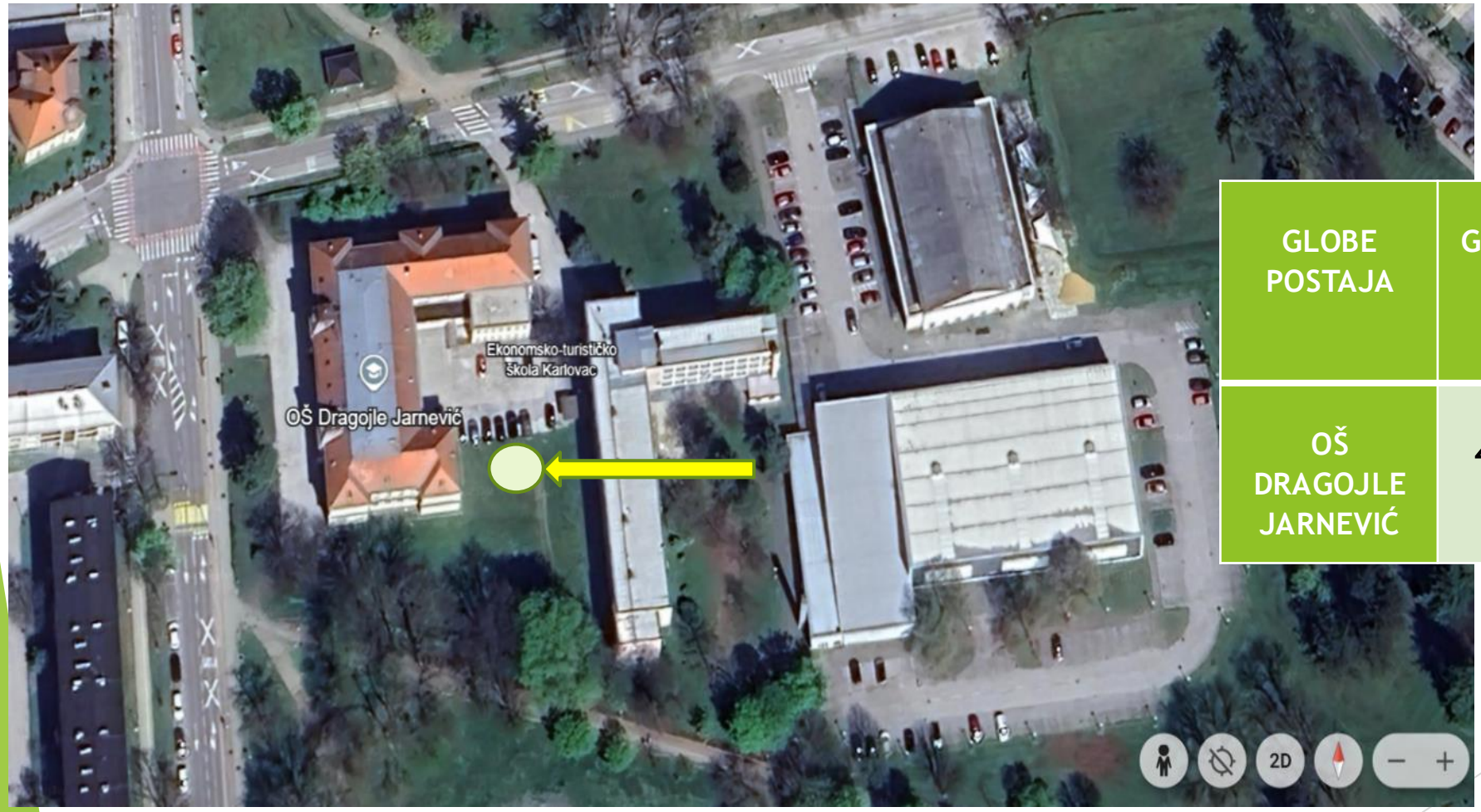
- **tema projektne nastave 2024./2025. - ZRAK**
- **zrak je jedan od osnovnih životnih uvjeta**

Redovito mjerenje terminske temperature zraka i površinske temperature trave

Uočili smo zanimljivosti u kretanja temperature zraka i površinske temperature trave

Mjerenja smo proširili na površinsku temperaturu asfalta i metalne ograde

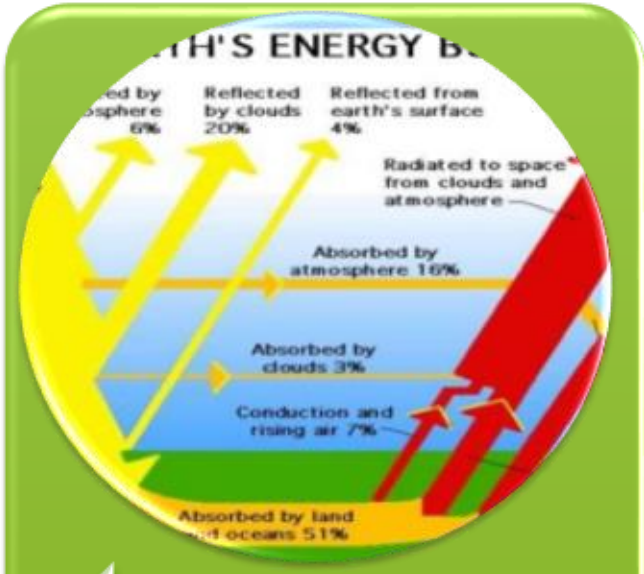
Geografski položaj i smještaj GLOBE postaje OŠ Dragojle Jarnević



GLOBE POSTAJA	GOGRAFSKA ŠIRINA (°)	GEOGRAFSKA DUŽINA (°)	NADMORSKA VISINA (m)
OŠ DRAGOJLE JARNEVIĆ	45. 489	15.56	116

Satelitska snimka OŠ D. Jarnević i atmosferske postaje (geoportal.dgu.hr)

Cilj GLOBE skupine



ISTRAŽITI

- povezanost temperature zraka i površinske temperature različitih podloga

DOKAZATI

- da je površinska temperatura asfalta i metalne ograde viša od terminske temperature zraka

POTICATI

- očuvanje zelenih površina u našoj lokalnoj zajednici i sadnja više domaćih vrsta drveća na zelenim površinama

Istraživačka pitanja i hipoteze

1. Hoće li terminska temperatura zraka biti niža od površinske temperature različitih podloga?

- Terminska temperatura zraka niža je od površinske temperature različitih podloga.

2. Hoće li površinska temperatura asfalta i metalne ograde biti viša od površinske temperature travnate podloge?

- Višu površinsku temperaturu imat će asfalt i metalna ograda od travnate podloge.

Istraživačka pitanja i hipoteze

3. Utječe li veća količina oborina na smanjenje razlike između terminske temperature zraka i površinske temperature asfalta?

- Veća količina oborina utječe na smanjenje razlike između terminske temperature zraka i površinske temperature asfalta.

4. Utječe li veća količina naoblake na snižavanje površinske temperature asfalta i trave?

- Veća količina naoblake utječe na snižavanje površinske temperature asfalta i trave.

Metode istraživanja

- razdoblje istraživanja - 1.11.2023. – 15.2.2025.
- prikupljanje podataka po lokalnom vremenu od 12:15 do 13:00 sati
- podaci: terminske temperature zraka, površinske temperature trave, asfalta i metalne ograde, količine naoblaka i količine oborina
- najveći broj mjerenja imamo iz studenog i prosinca 2023., siječnja, studenog i prosinca 2024., siječnja 2025.

Mjerni instrumenti

Digital thermo-hygrometer
30.5002 TFA Dostmann

infracrvenim termometrom
PRO – ICT320

Hellmannov
kišomjer

Prikaz i analiza podataka

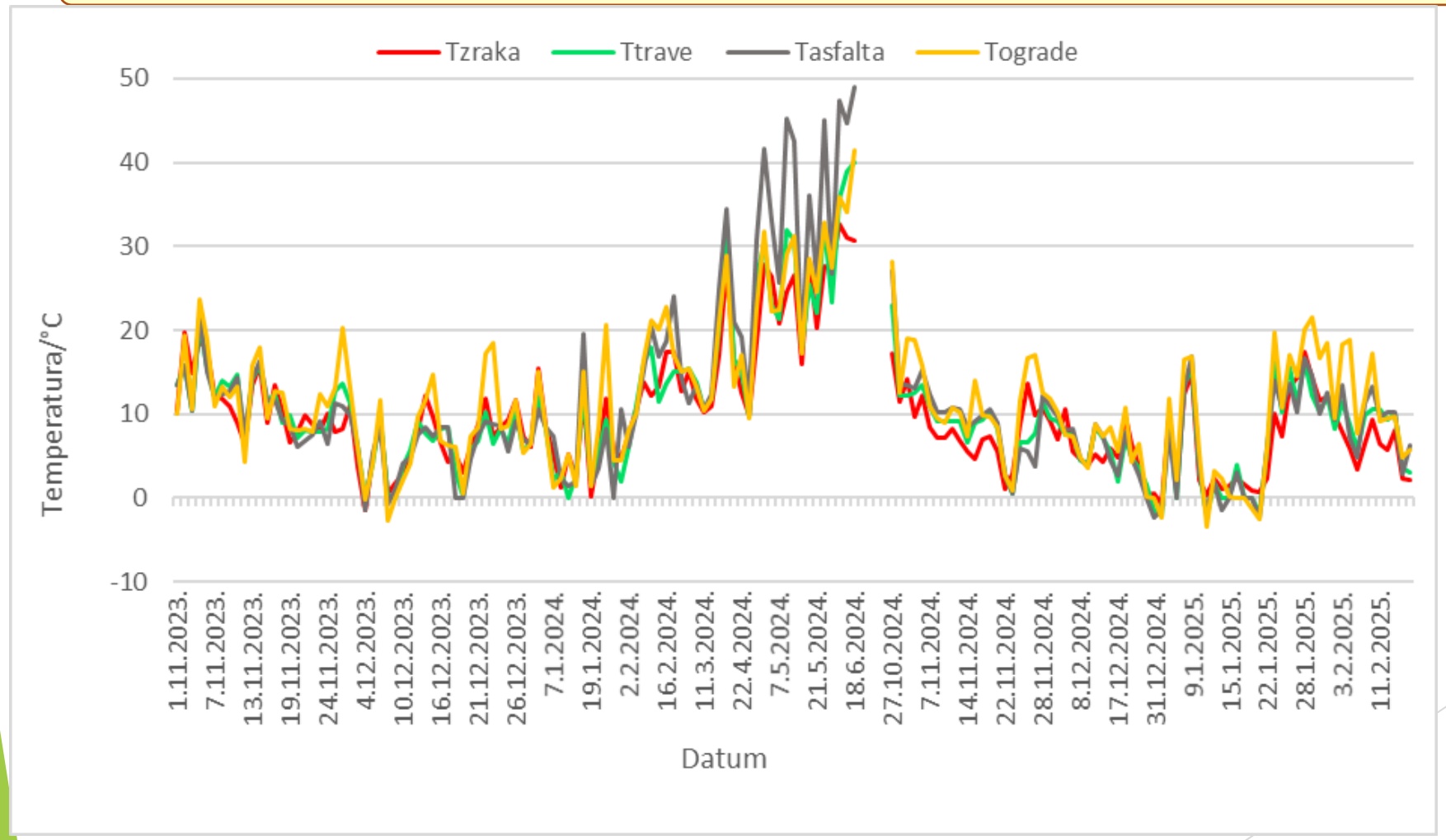
161 dan mjerenja u razdoblju od 1. studenog 2023. do 15. veljače 2025. - ukupno 966 podataka

Prikaz i analiza podataka

Prikaz podataka – mjerne postaje OŠ D. Jarnević

terminska temperatura zraka

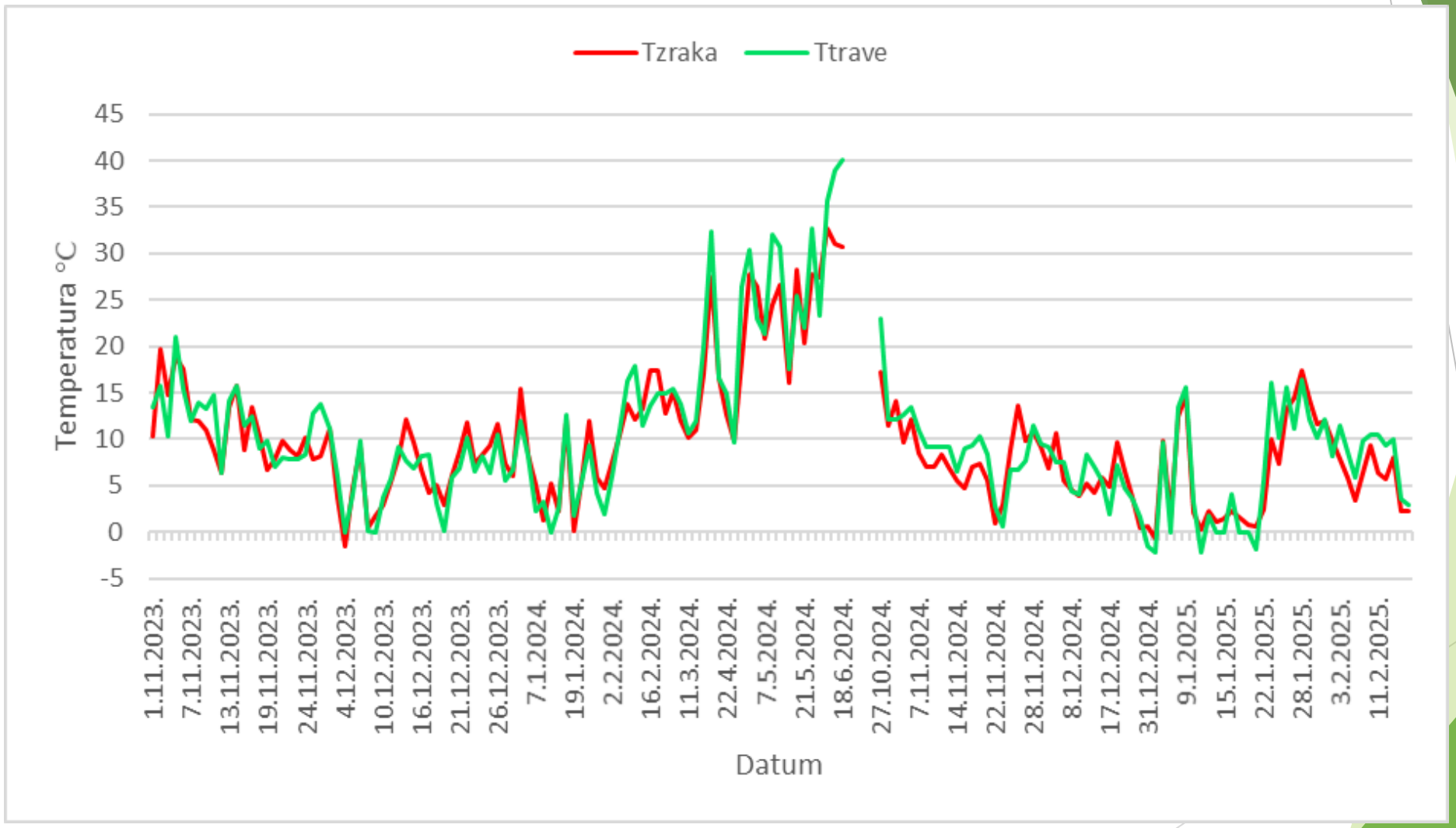
površinska temperatura trave, asfalta i metalne ograde



uočavamo povezanost temperatura

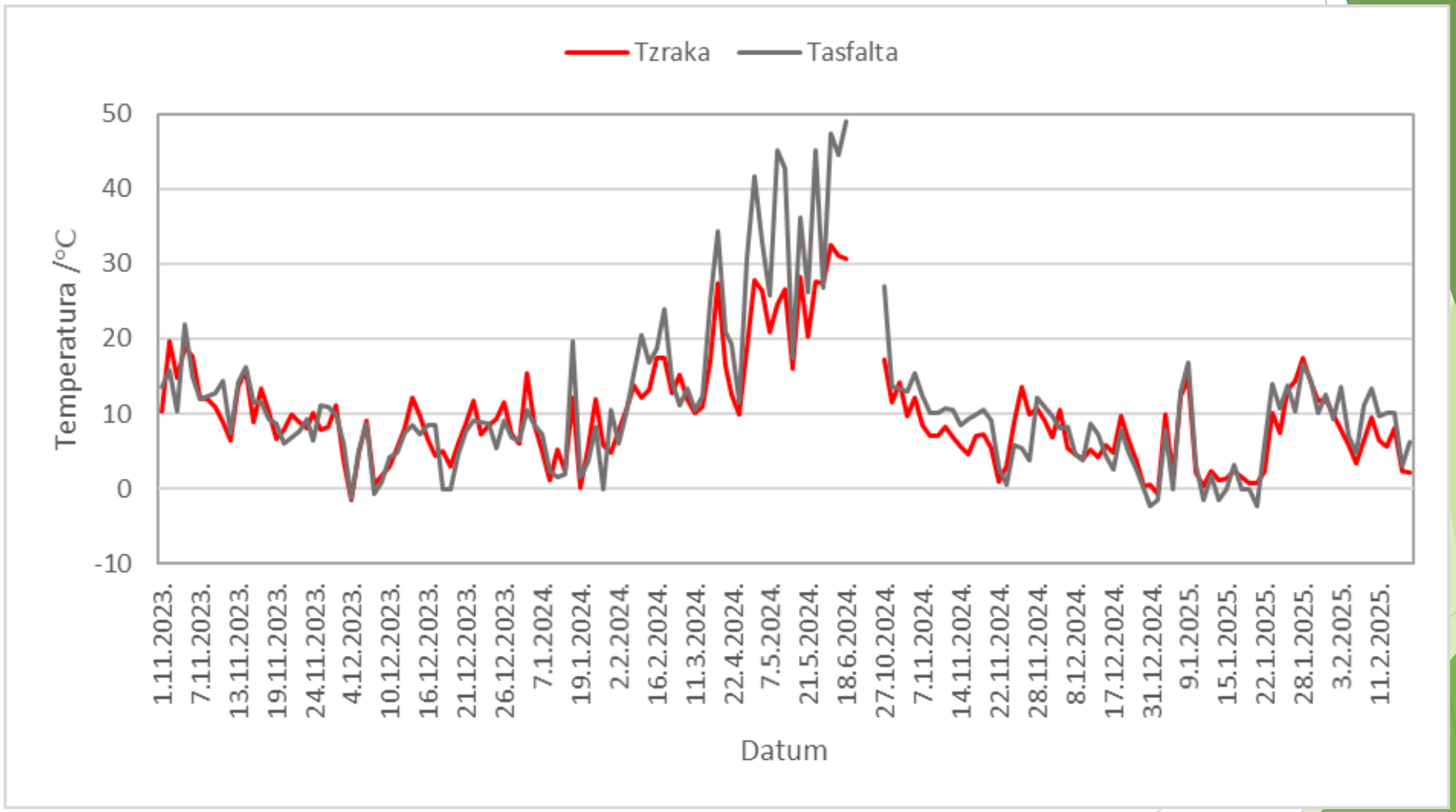
porastom temperature zraka raste i površinska temperatura različitih podloga

Prikaz terminske temperatura zraka i površinske temperatura trave



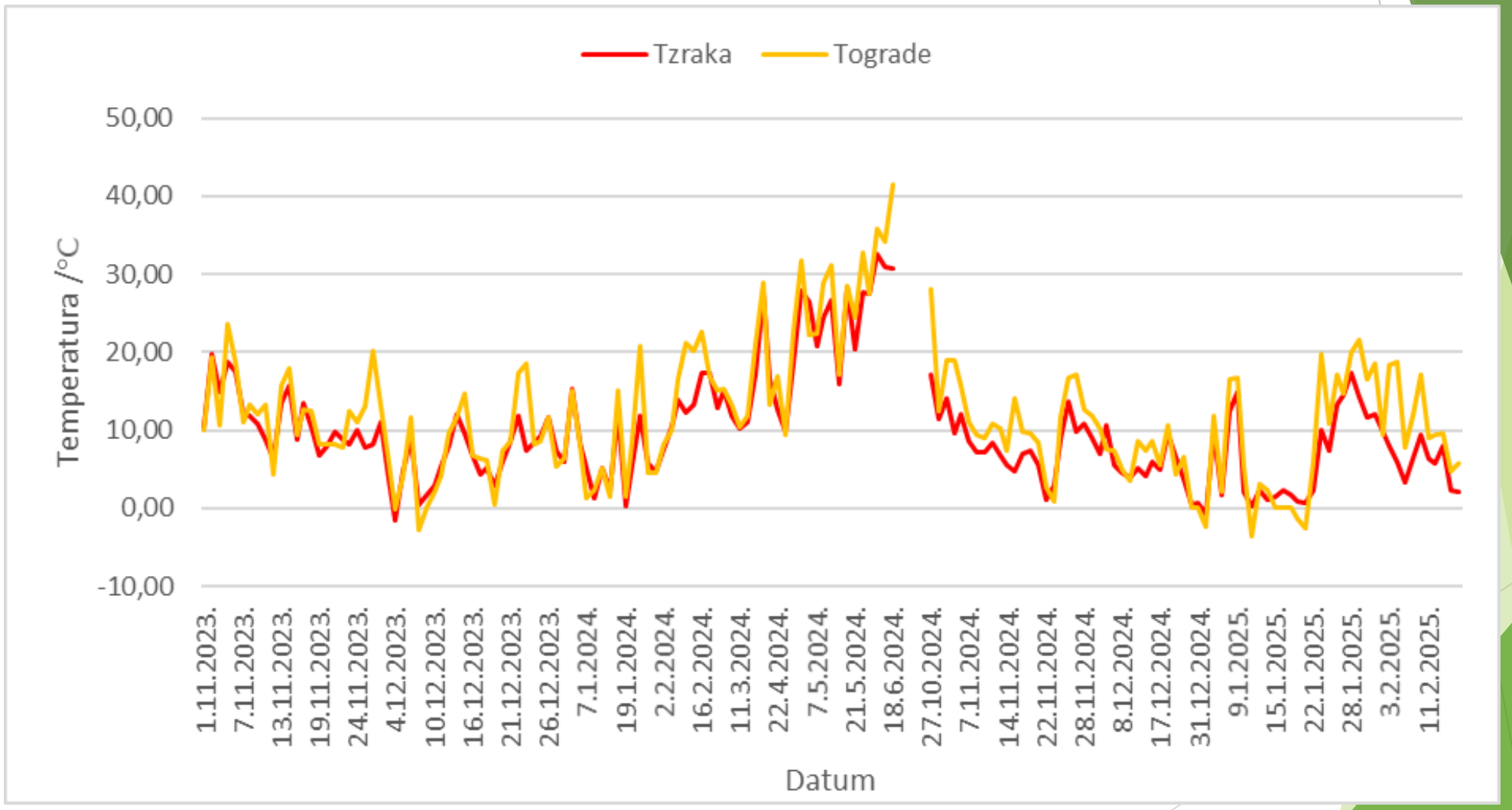
Veći broj dana površinska temperatura trave viša je od terminske temperature zraka

Prikaz terminske temperatura zraka i površinske temp. asfalta



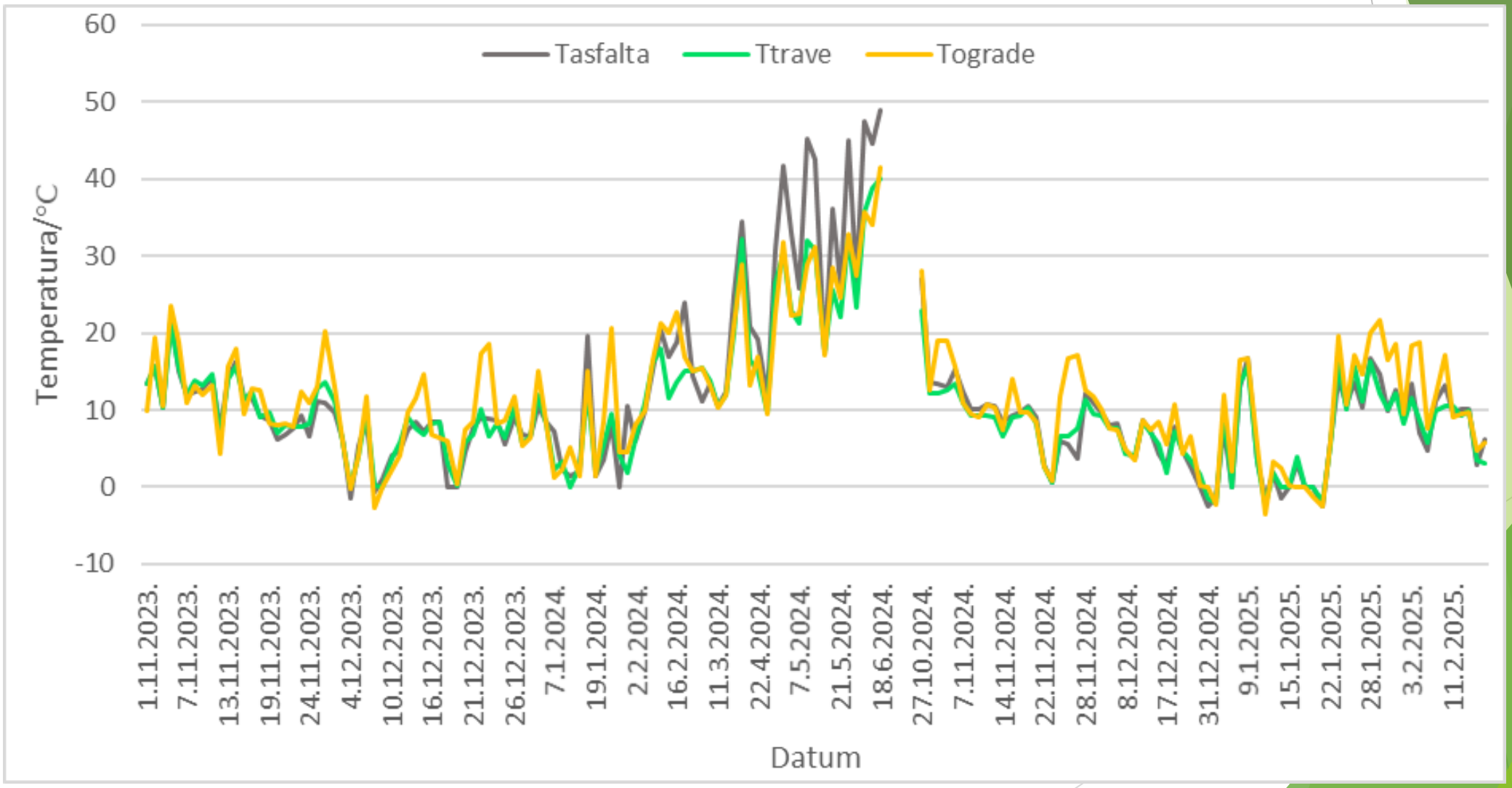
Veći broj dana površinska temperatura asfalta je viša od terminske temperature zraka

Prikaz terminske temperature zraka i površinske temperature metalne ograde



Veći broj dana površinska temperatura metalne ograde je viša od terminske temperature zraka

Prikaz površinske temperature trave, asfalta i metalne ograde



Prosječne temperature za 161 dan mjerenja

mjerenja	broj dana mjerenja	prosječna temperatura (°C)
terminska temperatura zraka	161	9.81
površinska temperatura trave	161	10.33
površinska temperatura asfalta	161	11.32
površinska temperatura metalne ograde	161	11.86

Očekivano najniža terminska temperatura zraka

Iznenađujuće najviša površinska temperatura metalne ograde

Naša atmosferska postaja prije obnove i za vrijeme obnove škole

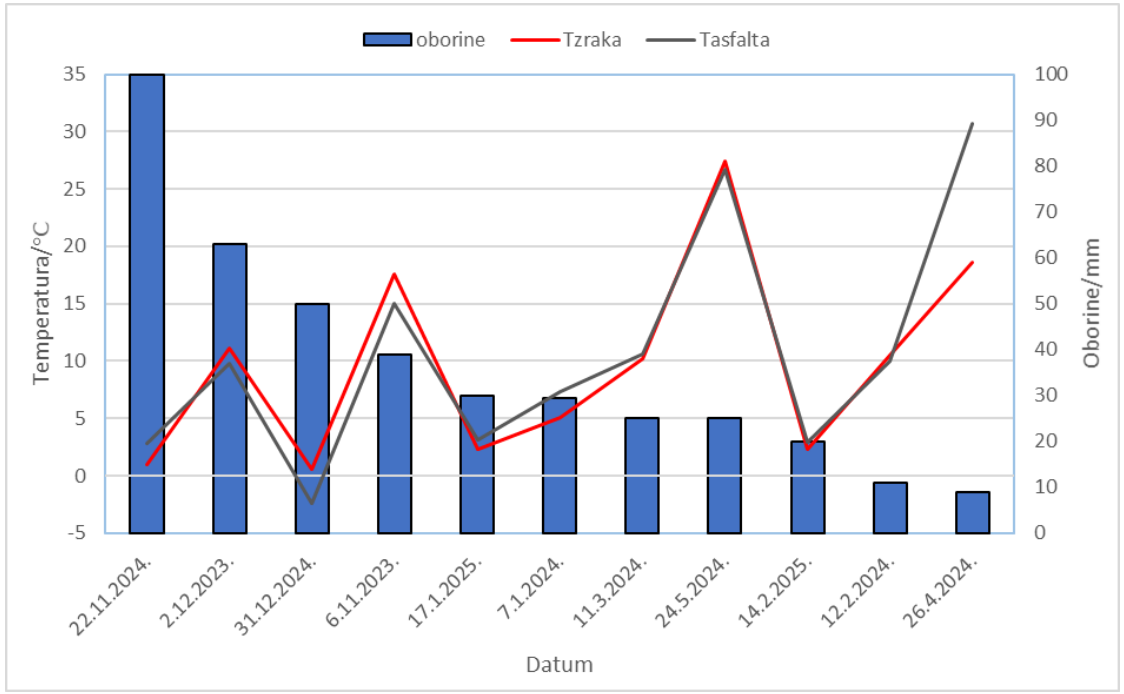
https://karlovacki.hr/krenulo-je-preseljenje-os-dragojla-jarnevic-u-privremene-prostore-pri-os-braca-seljan/

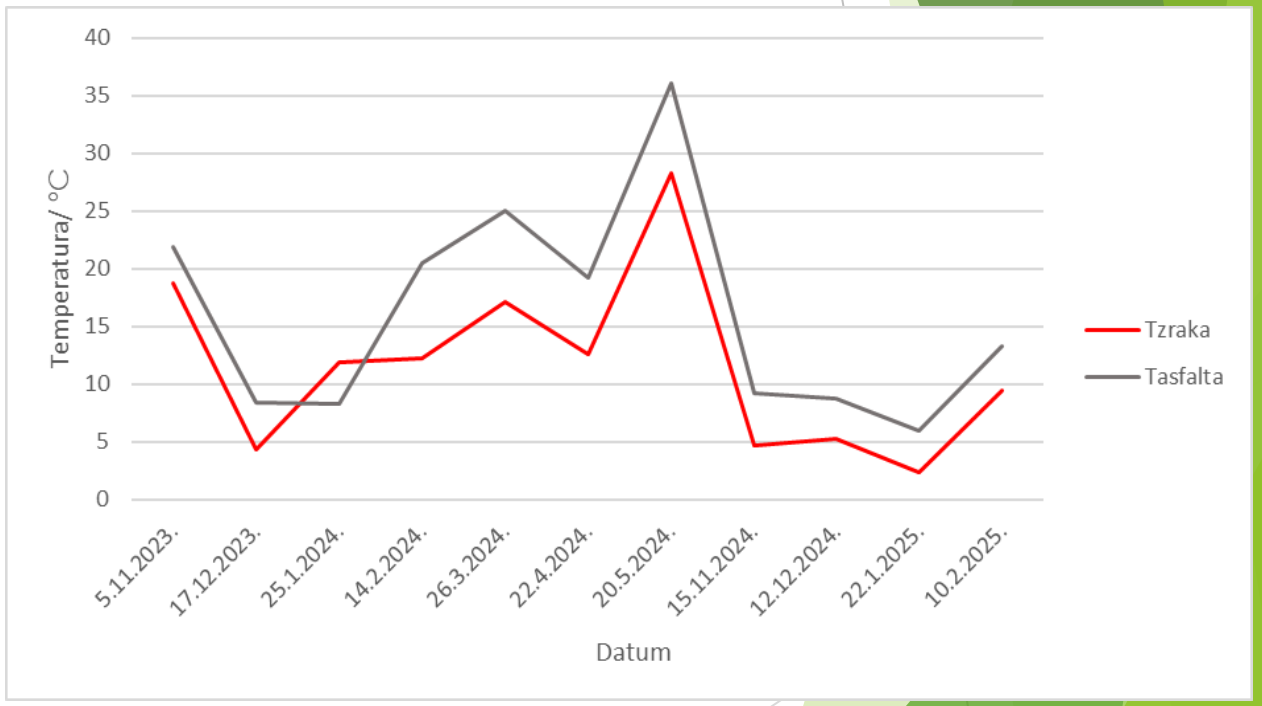
https://radio-mreznica.hr/os-dragojle-jarnevic-bit-ce-obnovljena-do-kraja-ove-godine/

Dani mjerenja s najvećom količinom oborina po mjesecima

datumi mjerenja	količina kiše (mm)	terminska temperatura zraka (°C)	površinska temperatura asfalta (°C)	razlika temperature zraka i asfalta (°C)
6.11.2023.	39	17,6	15,0	2,6
2.12.2023.	63	11,1	9,8	1,3
7.1.2024.	30	5,1	7,3	2,2
12.2.2024.	11	10,5	10,0	0,5
11.3.2024.	25	10,2	10,6	0,4
26.4.2024.	9	18,6	30,7	12,1
24.5.2024.	25	27,4	26,7	0,7
22.11.2024.	100	1,0	2,8	1,8
31.12.2024.	50	0,6	-2,4	3,0
17.1.2025.	30	2,3	3,1	0,8
14.2.2025.	20	2,3	2,9	0,6

Razlika između temperature zraka i površinske temp. asfalta u dane s oborinom i bez oborina

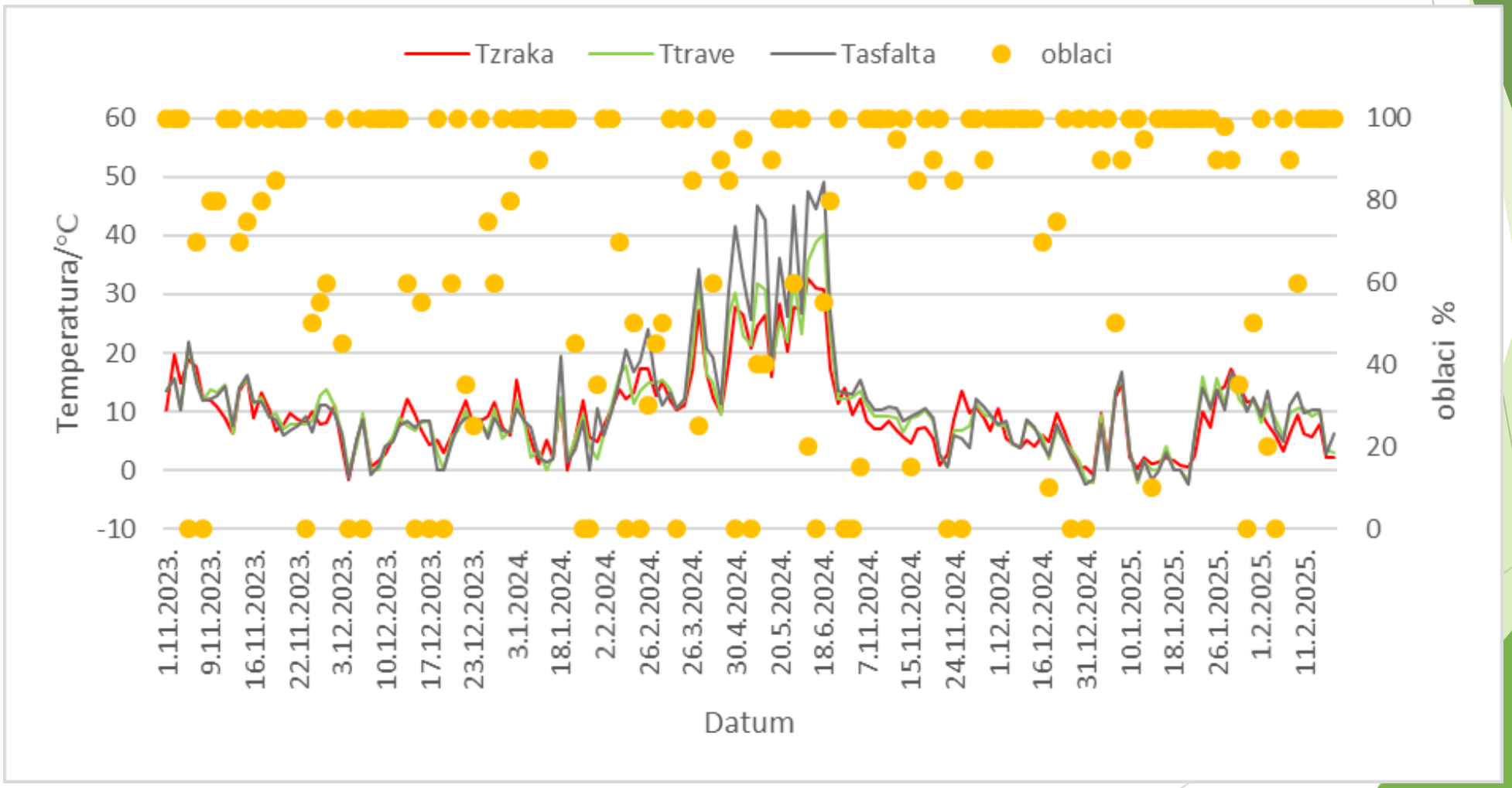




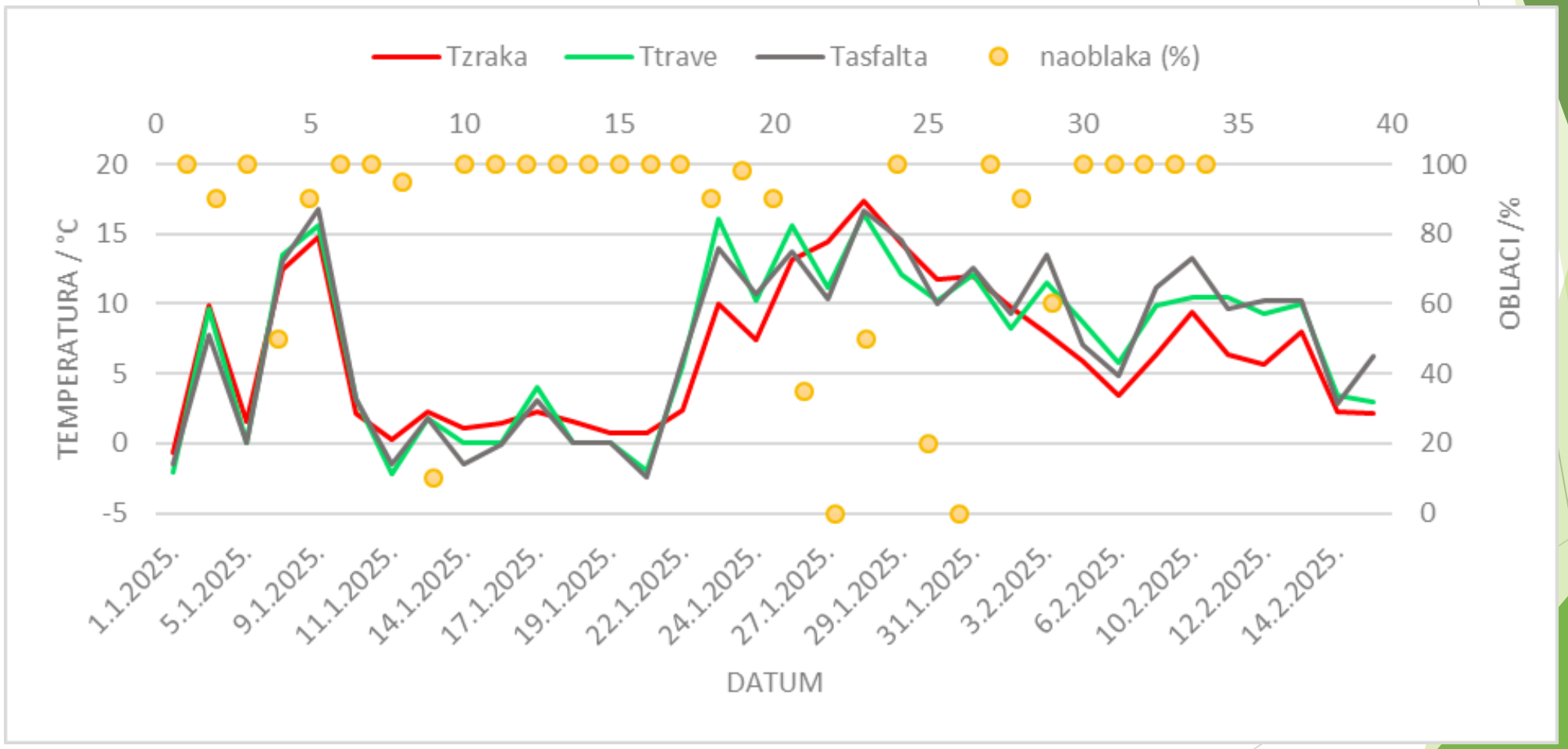
Dani s oborinama – manja temperaturna razlika

Dani bez oborina – veća temperaturna razlika

Prikaz terminske temperature zraka, površinske temperature trave, asfalta i količine naoblake (1.11.2023.-15.2.2025.)



Prikaz terminske temperature zraka, površinske temperature trave, asfalta i količine naoblake (1.1.2025.-15.2.2025.)



ZAKLJUČCI

- Terminska temperatura zraka i površinska temperatura različitih podloga – međusobno povezane
- Površinska temperatura različitih podloga u najvećem broju dana je viša od terminske temperature zraka
- Površinska temperatura umjetnih podloga više se zagrijava od površinske temperature prirodne podloge

ZAKLJUČCI

Prosječno najniža je terminska temperatura zraka, a najviša prosječna površinska temperatura metalne ograde i asfalta

U dane s većom količinom oborina snižava se razlika između terminske temperature zraka i površinske temperature asfalta, a u dane bez oborina povećava se razlika između temperatura

Najteže nam je bilo povezati utjecaj količine naoblake na terminsku temperaturu zraka i površinsku temperaturu trave i asfalta

Analizirani dio ukazuje na utjecaj veće količine naoblake na temperaturu zraka i površinsku temperaturu trave i asfalta

1.Hipotezu - potvrdili

2. Hipotezu - potvrdili

3. Hipotezu - potvrdili

4. Hipotezu -djelomično potvrdili

Naš doprinos za lokalnu zajednicu

Osvijestiti ovlaštene u gradu da u budućnosti planiraju:

- povećati zelene površine s više drveća
- smanjiti zastupljenost umjetnih površina koje se brže griju
- naš grad učiniti još ugodnijim za život

Literatura:

- 1. GLOBE baza podataka www.globe.gov
- 2. Program GLOBE Hrvatske - Atmosfera – površinska temperatura http://globe.hr/upute-za-provedbu/
- 3. Površinska temperatura različitih vrsta tla – veza na rad https://www.globe.gov/documents/10157/fba7943f-b4ef-4344-97b0-9fb367c1ffba
- 4. Orešić, D., Tišma, I., Vuk, R., Bujan, A., Kralj, P. 2020. Gea 2 - udžbenik geografije u 6. razredu, Školska knjiga, Zagreb 2020. godine

HVALA NA POZORNOSTI

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