Analysis of the daily cycles in the data on air pollution through the use of advanced analytical tools

Algorithm "sunflower" for analysis of variables with diurnal cycle from meteorology to air pollution

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dr. Primož Mlakar, dr. Dejan Gradišar,
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www.meis.si

Project:

L1—4154	Development of the meteorological measurements based model for solar energy availability estimation in Slovenia

one of the goals of the project:

to invent new efficient way
for statistical comparative analysis
of solar radiation data

- very useful also for air pollution science

What do we wish to observe in measured data?

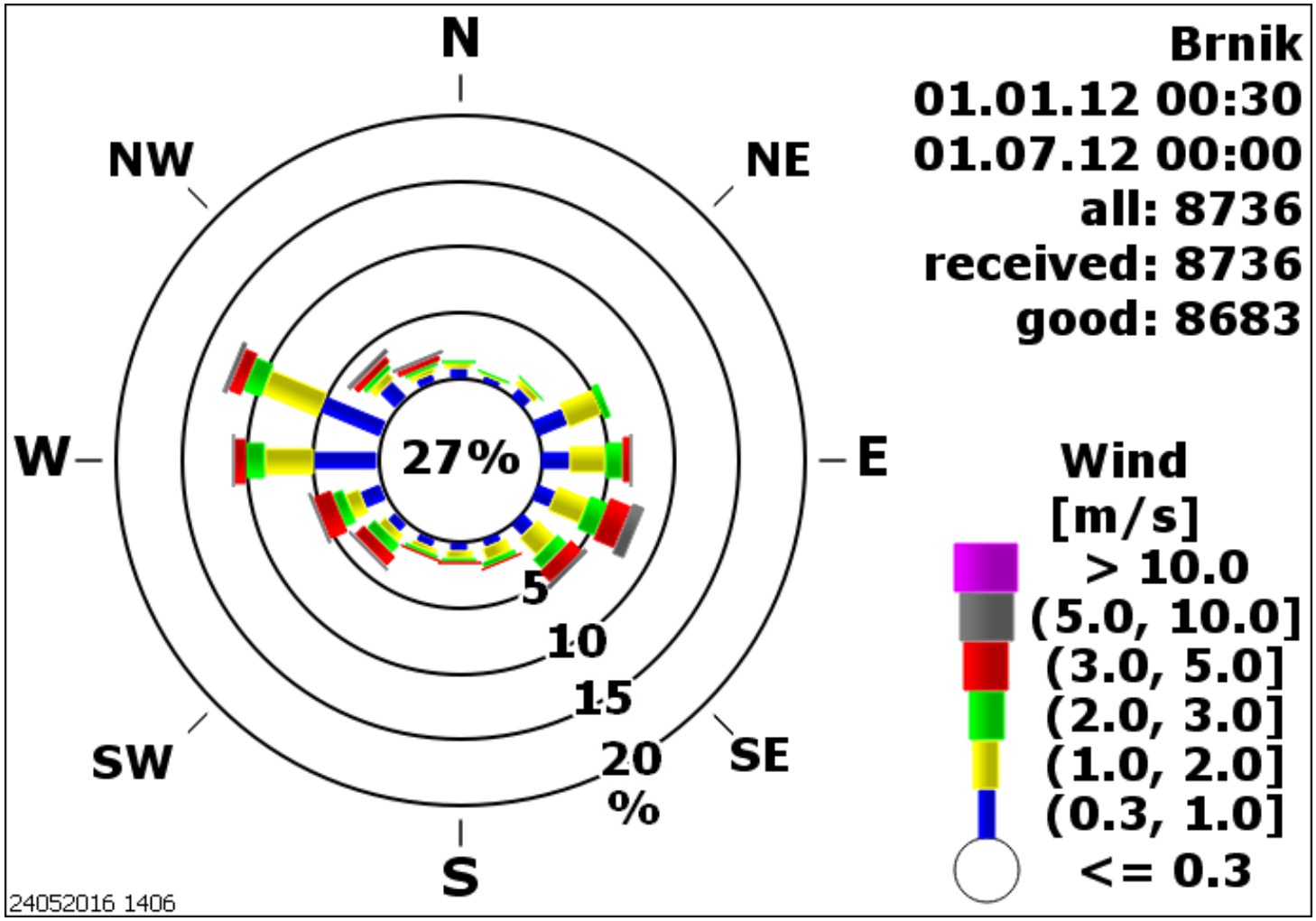
Events with daily frequency and phase shift,

time series of observations for different interval length (one day, week, month, year...),

Comparison of:

- **samples for different places**
- **samples for months or seasons**

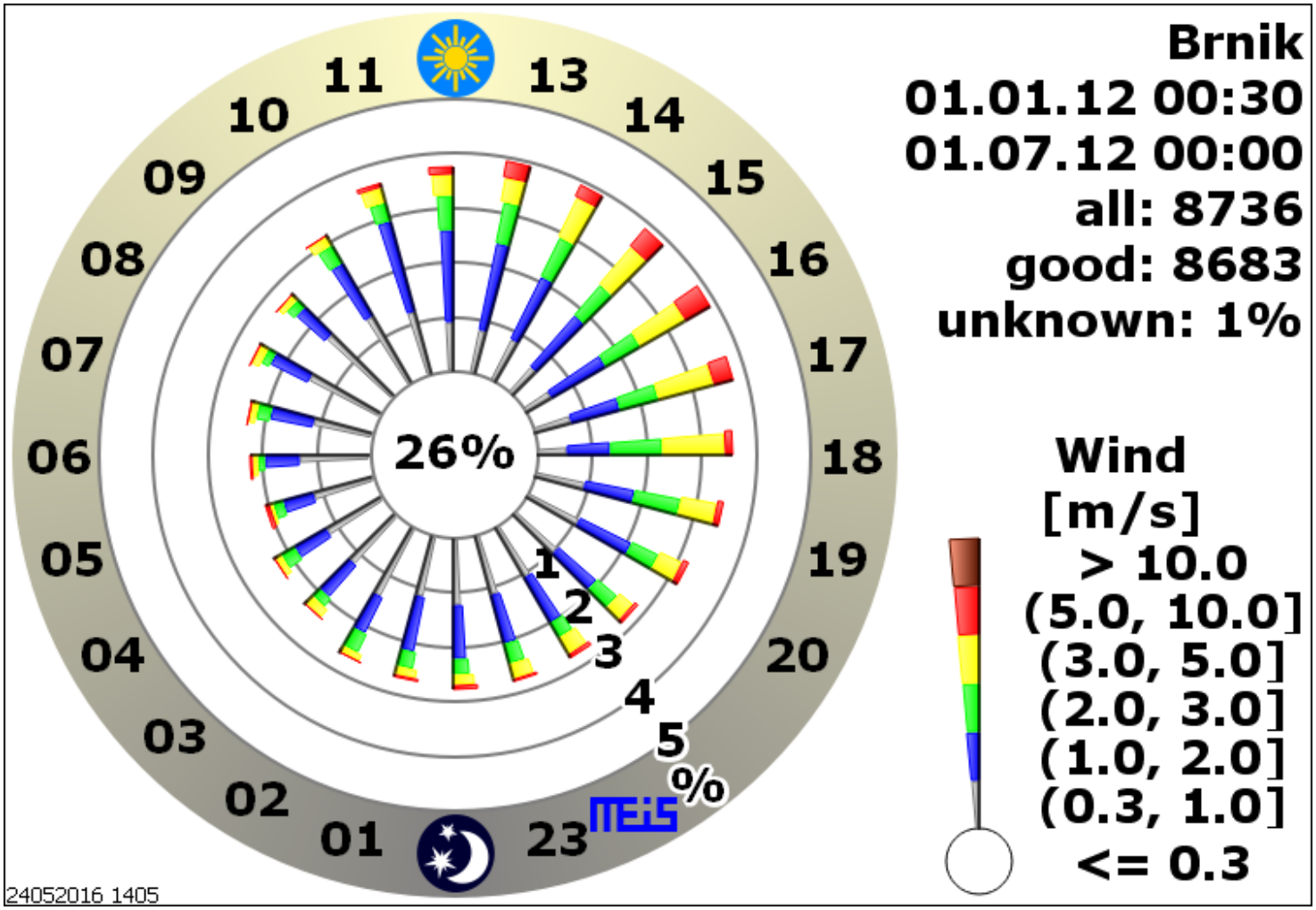
"CLASSICAL" WIND ROSE



HALF HOUR DATA FOR HALF YEAR 2012, BRNIK

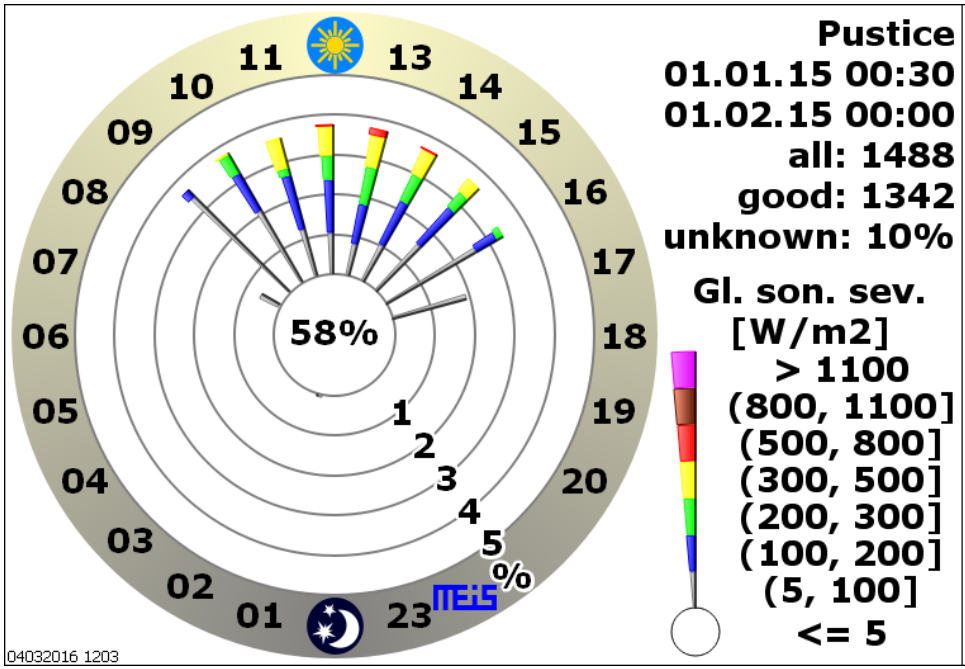
SUNFLOWER DIAGRAM OF WIND SPEED

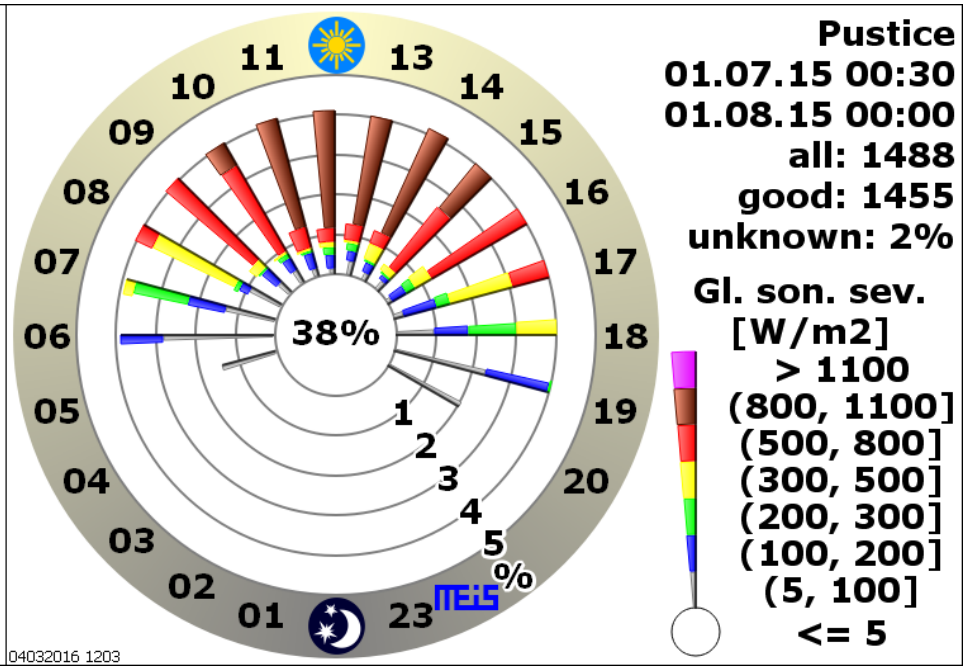
the same data as shown on previous wind rose



HALF HOUR DATA FOR HALF YEAR 2012, BRNIK

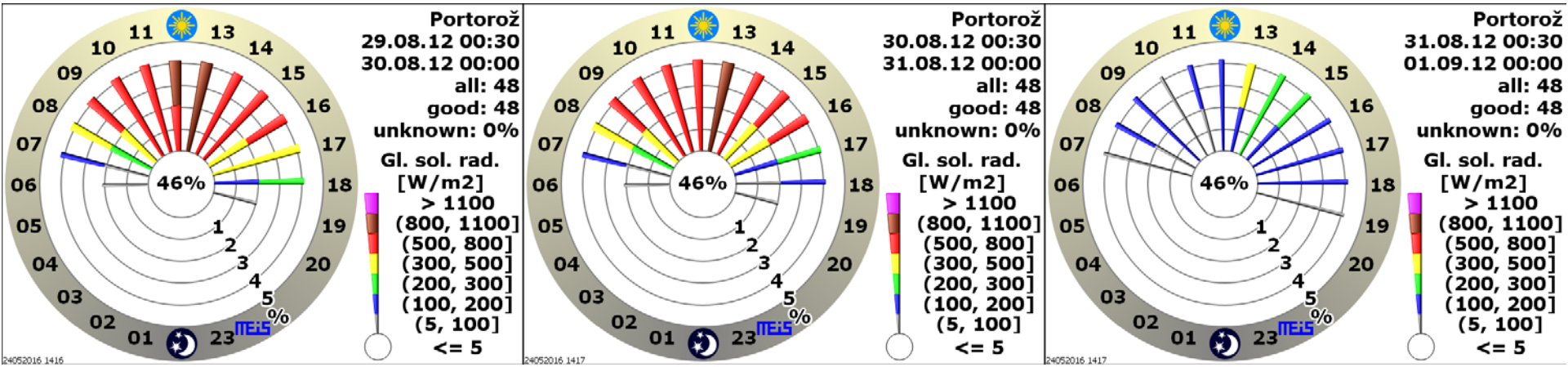
SUNFLOWER DIAGRAM
basic variant





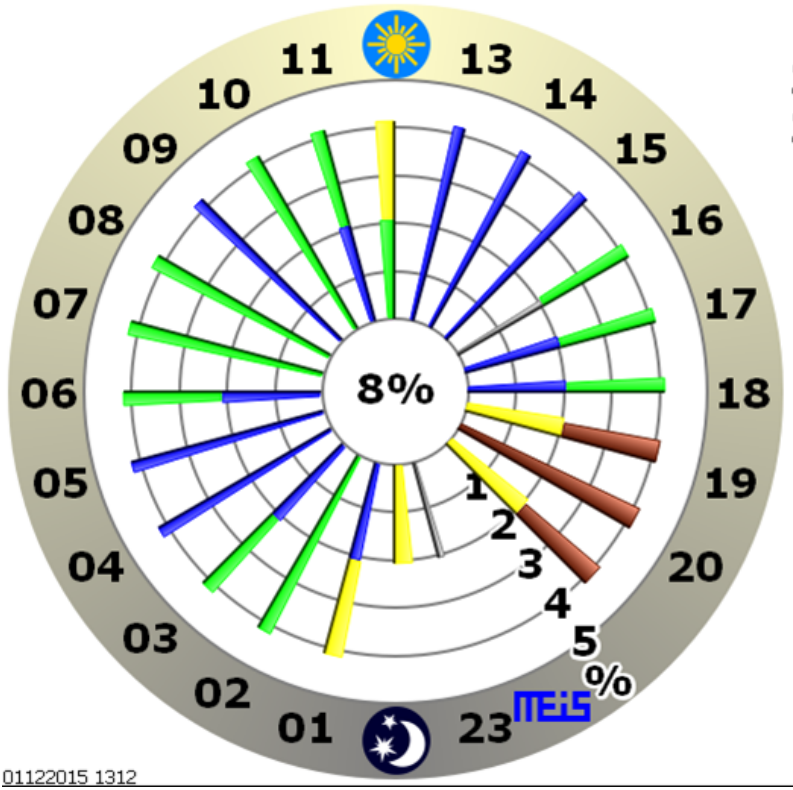
TWO MONTHS OF HALF HOUR DATA, GLOB. SOLAR RAD., JANUARY 2015 AND JULY 2015

SUNFLOWER DIAGRAMS
global solar radiation



THREE CONSECUTIVE DAYS IN PORTOROŽ, AUGUST 2012

SUNFLOWER DIAGRAMS OF PM10



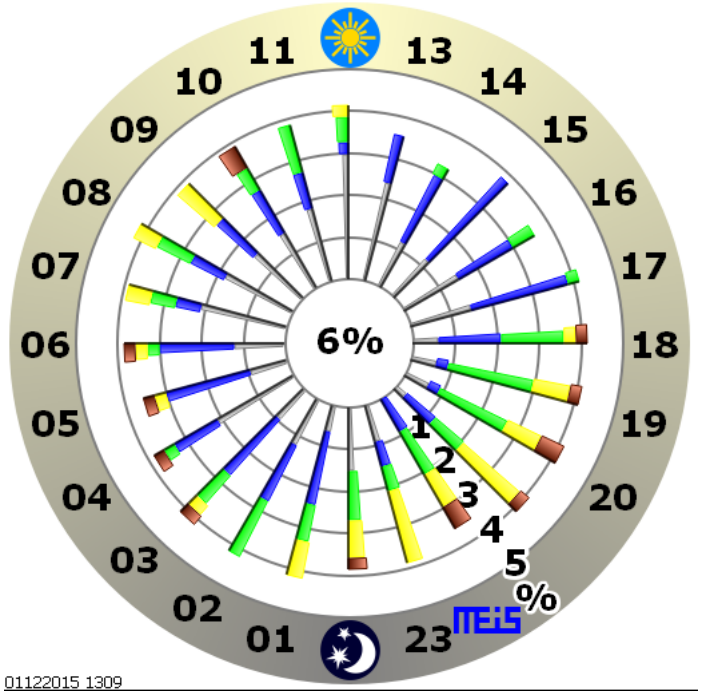
01122015 1312

Celje
26.11.15 00:00
26.11.15 23:30
all: 48
good: 48
unknown: 0%

PM10
[ug/m3]
> 50.0
(40.0, 50.0]
(30.0, 40.0]
(20.0, 30.0]
(10.0, 20.0]
<= 10.0

<< Celje ANAS
26. nov. 2015

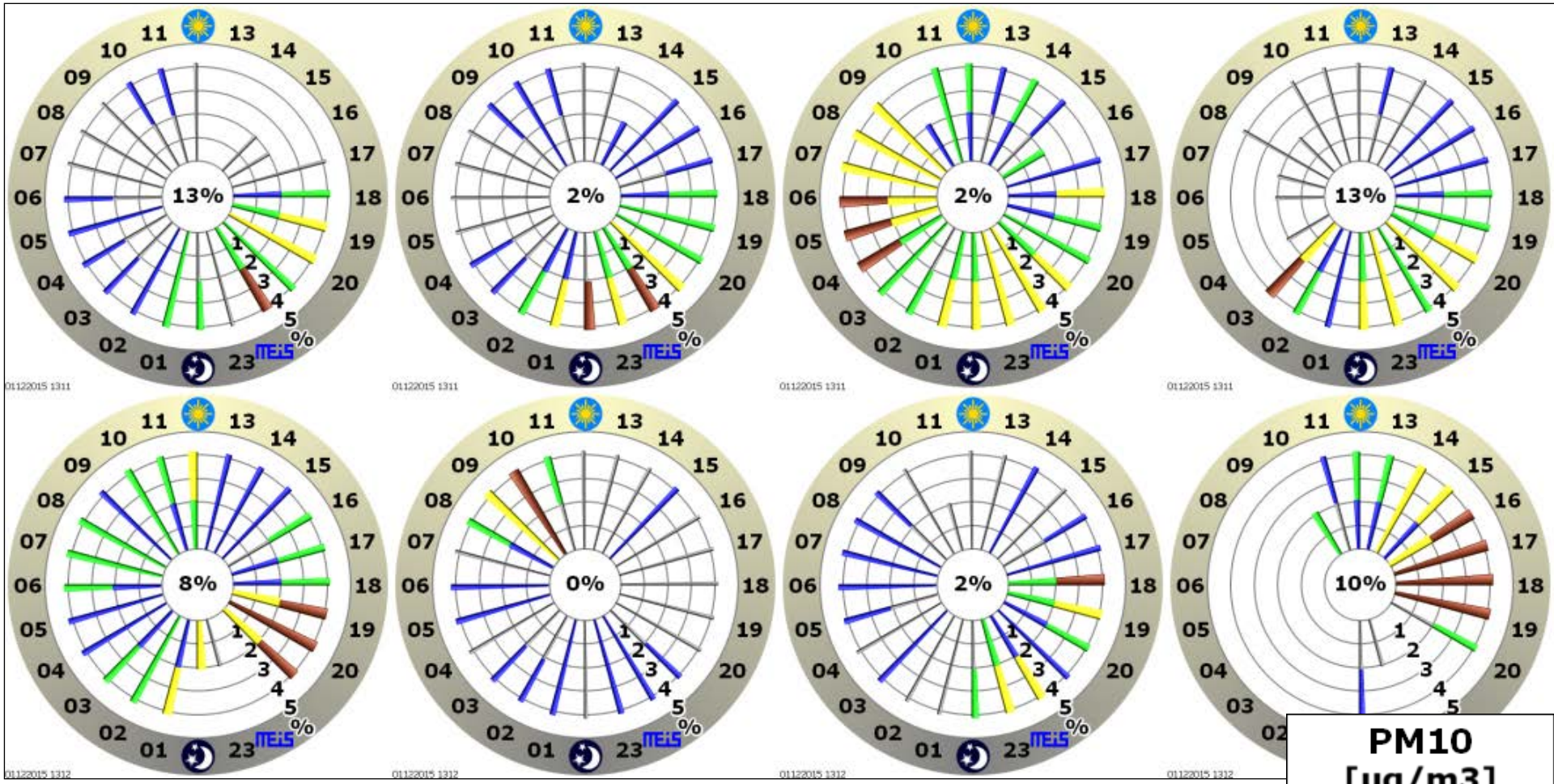
22.-28. nov. 2015



01122015 1309

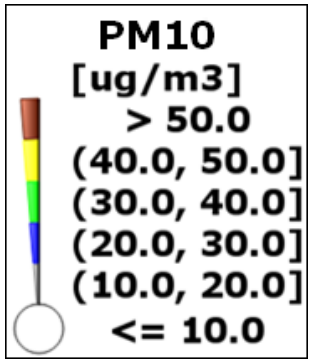
MEiS

SUNFLOWER DIAGRAMS OF PM10



EIGHT CONSECUTIVE DAYS, CELJE

SUNFLOWER DIAGRAMS OF PM10, ZAGORJE, by months



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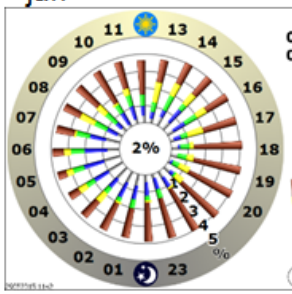

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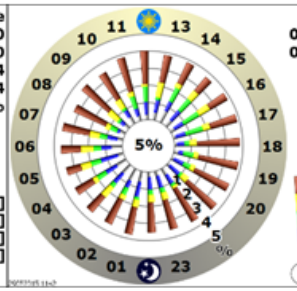
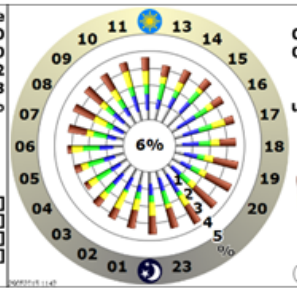


mar



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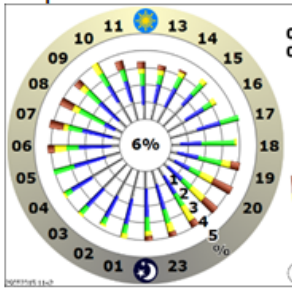

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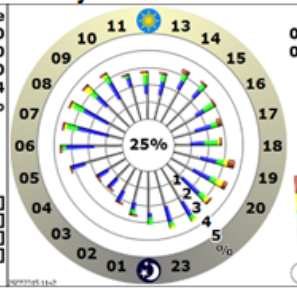

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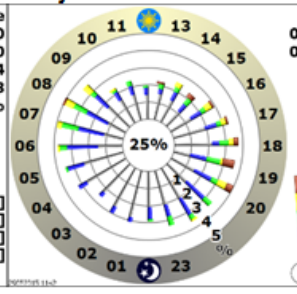

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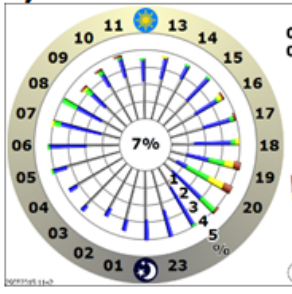
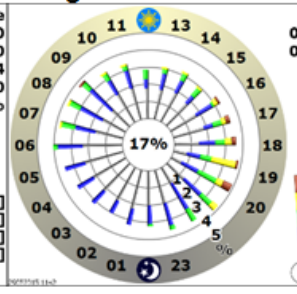


avg



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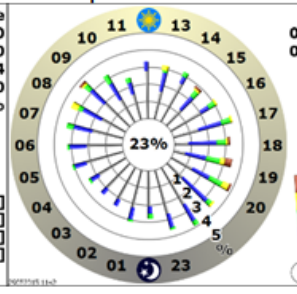

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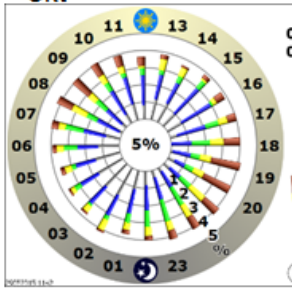

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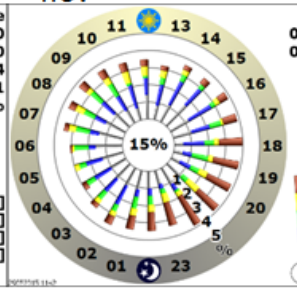

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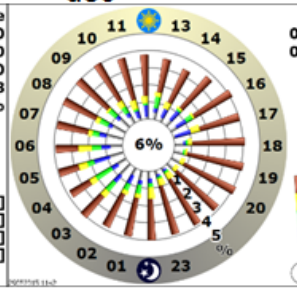
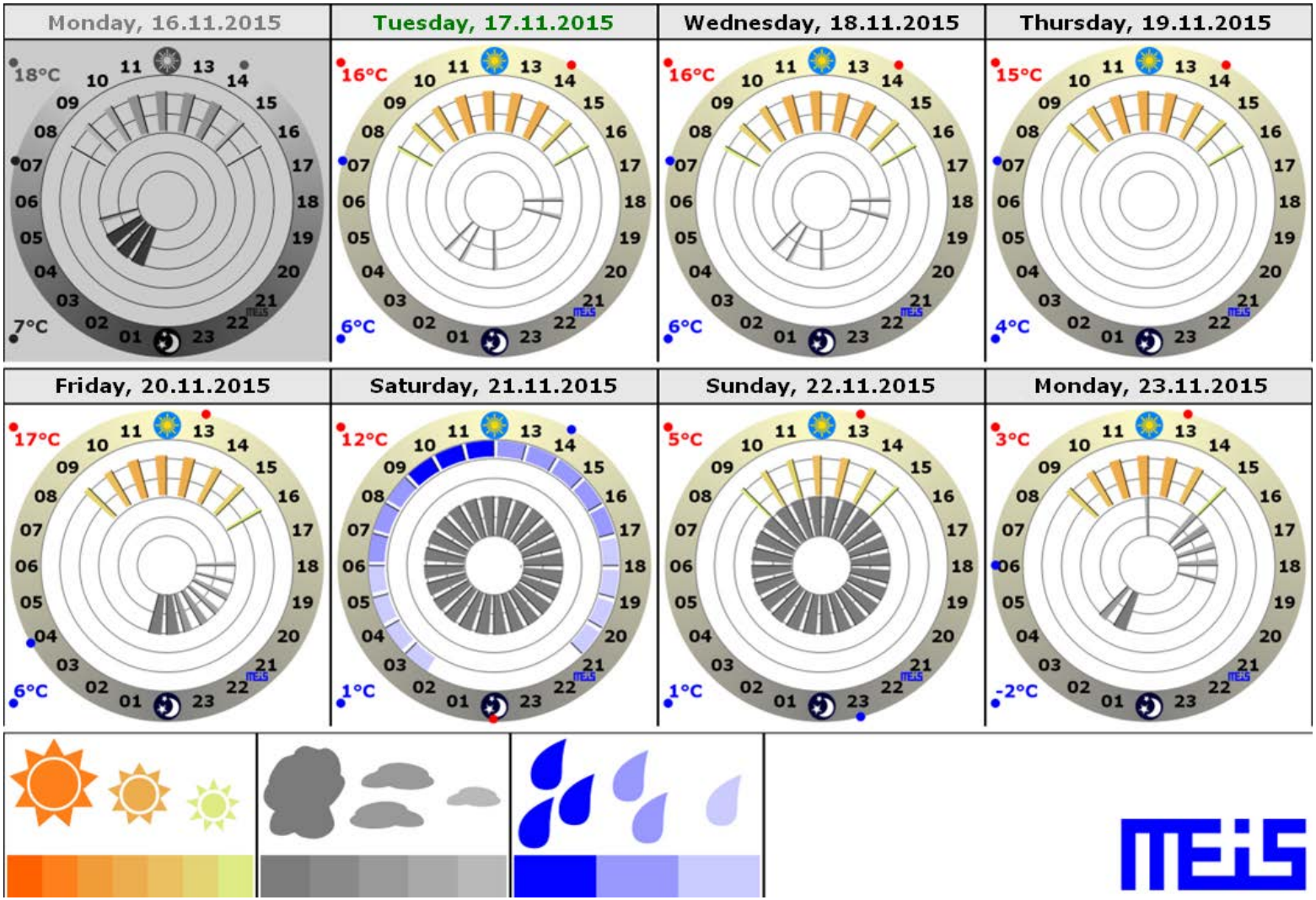


WEATHER FORECAST



one week period (weather forecast in one hour steps for seven days ahead), sun is shown with intensity of orange colour, clouds with intensity of gray colour, precipitation with intensity of blue colour. Forecast should be read from gray shaded yesterday's forecast, than to right for today, tommorow and day after, bottom line flowers are for days that follow.

FROM IDEA TO INTEGRATED IMPLEMENTATION

as tool over database in testbed environment

....

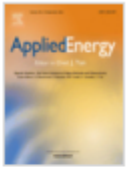
aprox. 3 years

FOR MORE EXAMPLES SEE THE ARTICLE:

ELSEVIER

Applied Energy

Volume 154, 15 September 2015, Pages 592–602



Radial frequency diagram (sunflower) for the analysis of diurnal cycle parameters: Solar energy application

Marija Zlata Božnar[a], Boštjan Grašič[a], Primož Mlakar[a], Jacyra Soares[b], Amauri Pereira de Oliveira[b], Tássio Santos Costa[b]

Thank you for your attention!