
SUNSHINE DURATION

Tadeja Ovsenik-Jeglič

Preface

The sun is the source of all the energy that impinges on Earth. It radiates light as a black body at a temperature of about 6000 K, so it emits UV radiation, visible light and IR light. On its path through the atmosphere the radiation weakens due to light scattering and absorption.

At the meteorological stations that form part of the Environmental Agency of the Republic of Slovenia measurements are performed of bright sunshine duration, solar global radiation and diffuse radiation, while at some stations UVB and IR radiation is also measured. In 2005 bright sunshine duration was measured at 22 meteorological stations, while solar global radiation was measured at 21 meteorological stations.

The relief of the landscape that covers the horizon and sometimes even obstacles within the vicinity of the measuring site can reduce the measured duration of sunshine.

The measured data is corrected with the result that the effect of geographical, urban and fauna obstacles on the data is removed.

Daily sunshine duration

The daily pattern of sunshine duration for 4 months for Ljubljana for the 2001-2005 period is presented in Figure 1.

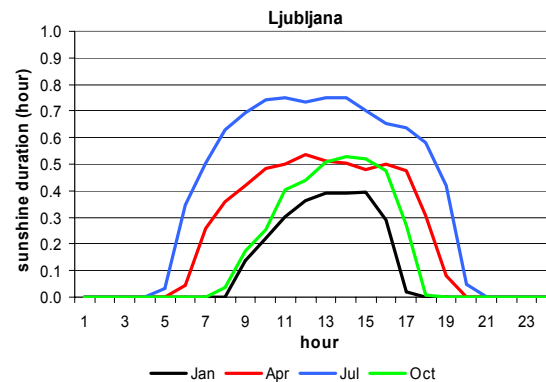


Figure 1. Daily pattern of sunshine duration for 4 months for Ljubljana

From a similar graph for Kredarica (2514 m above sea level) we see that in the mountains in the afternoon the sun is hidden by clouds that emerge through the rising of warm air on the sunny side of the mountain. Considering the average daily sunshine

duration we find that the sun shone for a little over 5 hours per day on average in most places; at Kredarica for 5.1 hours, in Ljubljana for 5.0 hours, in Rateče for 5.6 hours and in Novo mesto for 5.3 hours per day. The exception is Portorož, where on average the sun shone for 6.6 hours per day.

Monthly sunshine duration

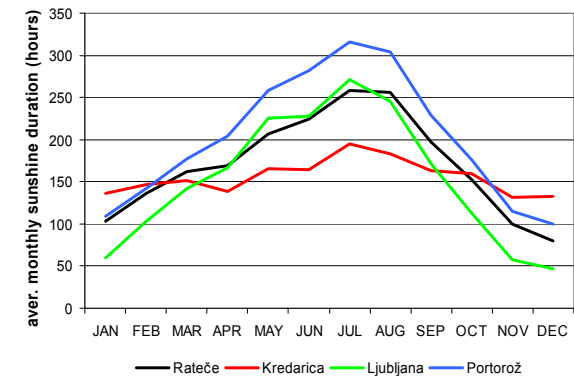


Figure 2. Yearly course of average monthly sunshine duration for 4 meteorological stations

In Figure 2 monthly values of sunshine duration for the 1971-2000 period are presented for 4 places in climatologically different areas of Slovenia. Portorož receives the most sunshine in all months of the year, except in winter (2416 hours per year on

average). During winter, sunny weather is most common at Kredarica since lower lying land areas are often covered by low clouds and fog. The differences in average monthly sunshine duration between the stations in inner parts of the country are not so outstanding. On average, the sun shines in Rateče for 2048 hours a year, in Murska Sobota for 1960 hours and in Ljubljana for 1832 hours.

Completely cloudy days

Let us now consider completely cloudy days, namely, when the measured sunshine duration was zero. In Novo mesto, Murska Sobota and Ljubljana there are on average 74 to 82 such days per year, at Kredarica the sun does not appear on average for 91 days a year. In Portorož, which is exposed to the sun the most often, there are 52 completely cloudy days a year on average, while the figure for Rateče is 61 days.

The frequency distribution of the daily sunshine duration for Ljubljana for summer and winter is presented in Figure 3. Considering similar graphs for other stations we find that at all the meteorological stations

the sky is often completely cloudy during winter. In Portorož we have long-lasting sunny weather during both summer and winter, and at Kredarica there is frequent sunny weather during winter and more cloudy weather during summer than at other stations.

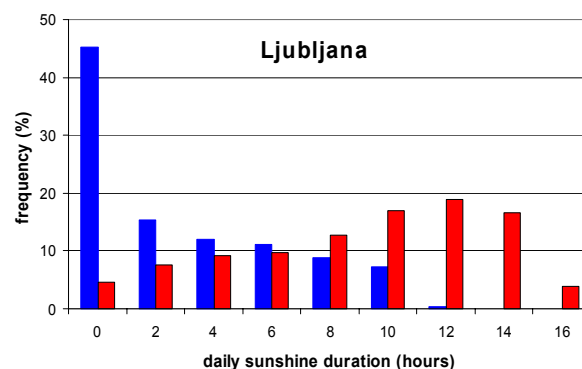


Figure 3. Frequency distribution of daily sunshine duration for Ljubljana for summer and winter (blue columns-winter, red columns-summer)

Trends and extremes

In our analysis of sunshine duration in the 40-year period we studied linear trends for separate months for some stations with a continuous time series of sunshine duration measurements. The trend of an increase in the duration of sunshine is observed. For

some months and some stations positive statistically significant linear trends were found. In Table 1 the months with the maximal and minimal sunshine duration for 10 meteorological stations for the 1971-2005 period are presented. The highest monthly sunshine duration (367 hours) was measured at Portorož in July 1988.

Table 1. Maximal and minimal monthly sunshine duration in the 1971-2005 period.

Station	Max. sunshine duration (hours)	Month, year of max. sunsh.dur.	Min. sunshine duration (hours)	Month, year of min. sunsh.dur.
Kredarica	279	Jul. 1983	58	Nov. 2000
Rateče	339	Jul. 1983	29	Dec. 1995
Nova Gorica	333	Jul. 1994	49	Dec. 1981
Postojna	374	Jul. 1983	34	Dec. 1995
Ljubljana	325	Aug. 1992	7	Dec. 1995
Novo mesto	335	Jul. 1988	4	Dec. 1995
Celje	324	Aug. 1992	12	Dec. 1995
Maribor	347	May 1979	12	Nov. 1993
Murska Sobota	343	Jun. 2000	14	Dec. 1995
Portorož	367	Jul. 1988	44	Dec. 1985

The spatial distribution of sunshine duration differs for winter, spring, summer and autumn. The difference is obvious in the spatial distribution between summer when the Primorje region is the most exposed to sun, and winter when Alpine region (besides Primorje) gets the most sun radiation.