

PROBING THE IMPACT OF SOLAR ACTIVITY ON THE CLIMATE OF GREECE

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ABSTRACT

We are studying the impact of the solar activity on the climate in Greece, by looking for correlations between solar and terrestrial indices. Solar indices indicative of our star’s activity include the number of sun spots, 10.7 cm radio flux, solar irradiance intensity, and galactic cosmic rays. Terrestrial weather indices include six parameters, temperature, relative air humidity, direction and intensity of wind, atmospheric pressure and rainfall. The meteorological data come from 12 weather stations based in several places around Greece. We present work in progress.



Fig. 1: Location of Meteorological Stations.

Number (WMO)	Name (Position)	Latitude	Longitude	Altitude
613	Florina	40 48N	21 25E	619,4
614	Kastoria	40 45N	21 27E	657
622	Mikra	40 53N	22 97E	2
627	Alexandroupoli	40 86N	25 95E	4
641	Kerkira	39 61N	19 91E	1
642	Ioannina	39 69N	20 83E	475
648	Larissa	39 65N	22 46E	74
667	Mytilini	39 05N	26 60E	4
687	Araxos	38 15N	21 42E	11
689	Patra	38 15N	21 44E	1
710	Tripoli	37 52N	22 40E	653
715	Tatoli	38 11N	23 78E	225
716	Elliniko	37 89N	23 74E	43
754	Iraklio	35 34N	25 18E	39

Fig. 2: Table of Meteorological Stations.

METHODOLOGY

The meteorological data we use refer to time series obtained from the Hellenic Meteorological Service (HMS). Figure 1 presents the sites of the fully equipped weather stations delivering the data we used. Figure 2 shows the geographical coordinates of the stations.

Solar data consist of time series measurements of Sunspots (SN), F10,7 cm Radioflux, Total Solar Irradiance (TSI) and of Galactic Cosmic Rays (GCR). They were obtained in order of appearance from the Royal Observatory of Belgium, Brussels, World Data Center SILSO (Sunspot Index and Long-term Solar Observations) and are subject to license conditions of CC BY-NC4.0 (<https://goo.gl/PXrLYd>), from SOLAR2000 model, from the National Oceanic and Atmospheric Administration (NOOA), from NOAA by the Bartol Research Institute and are supported by the National Science Foundation (grant ATM-0000315).

Data processing was done with Microsoft Office Excel 2007 and for the creation of the graphs was used the Grapher 8 program of Golden Software.

The period from year 1975 to 2005 was chosen as the time range of the graphs, since in this time period we have measurements for both solar and meteorological data in their entirety. The time span covers two full 11-year solar cycles, the 21st and 22nd and a portion of the 23rd cycle. Within this time period the four solar indices show three maxima and three minima.

RESULTS

Figures 3 to 9 show some indicative graphs resulting from our analysis. The bottom plots of figures, colored in blue, show the solar indices: From bottom to top, the sunspot number, , F10.7 cm radio flux, total solar irradiance, and galactic cosmic rays are displayed

The upper part of Figures 3 – 9 display the meteorological parameter under analysis.

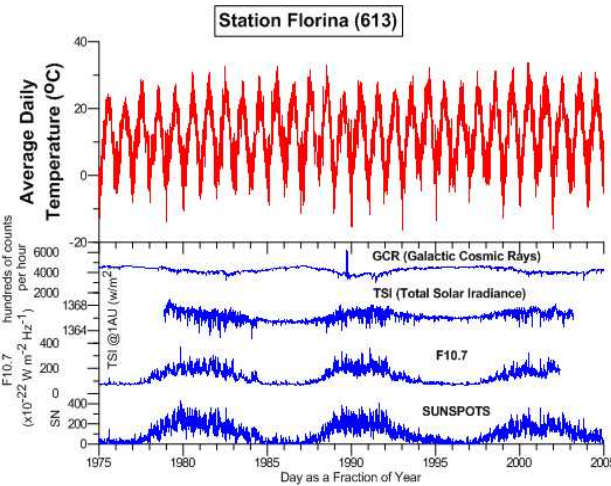


Fig. 3: The average daily temperature for the Meteorological Station (MS) of Florina and the daily values of the four solar parameters studied.

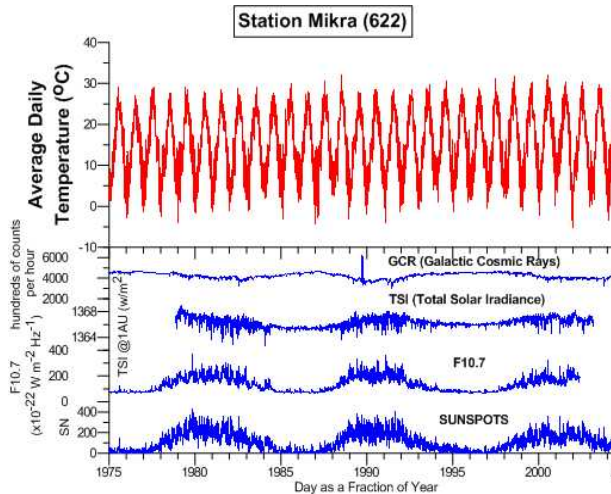


Fig. 4: As in Figure 3, but for MS Mikra.

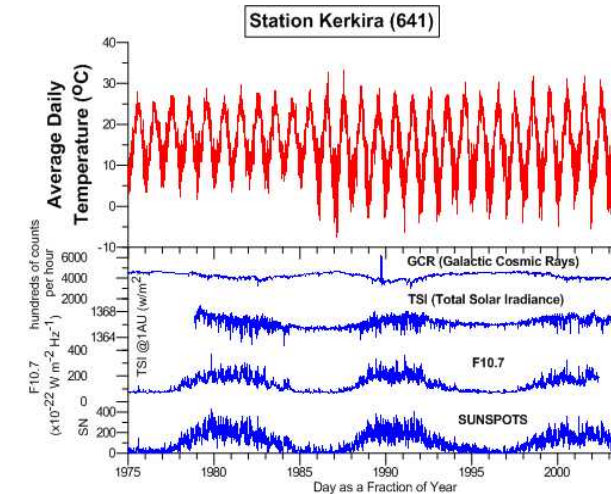


Fig. 5: As in Figure 3, but for MS Kerkira.

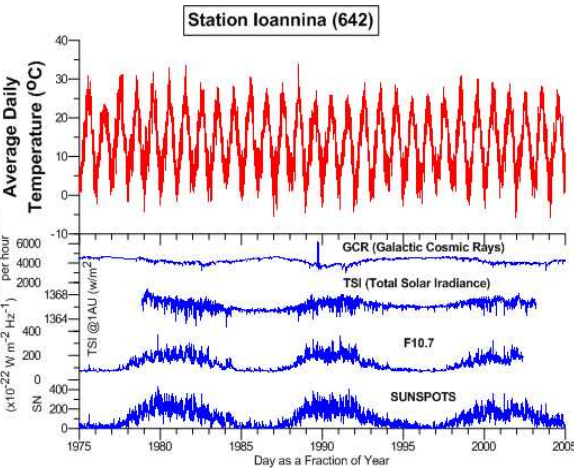


Fig. 6: As in Figure 3, but for the MS of Ioannina.

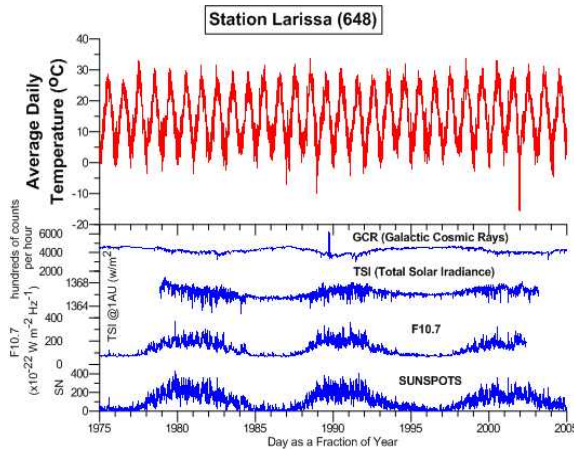


Fig. 7: As in Figure 3, but for the MS of Larissa.

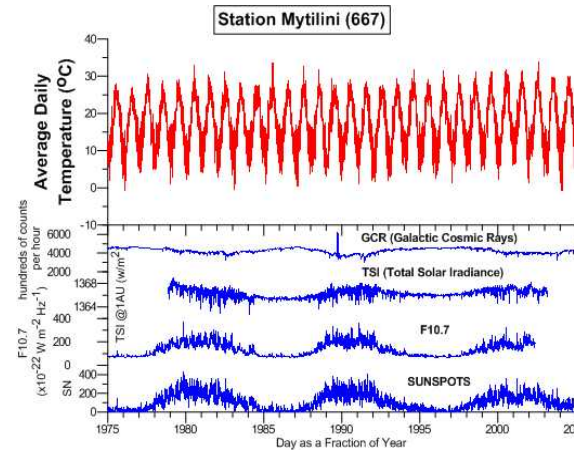


Fig. 8: As in Figure 3, but for the MS of Mytilini.

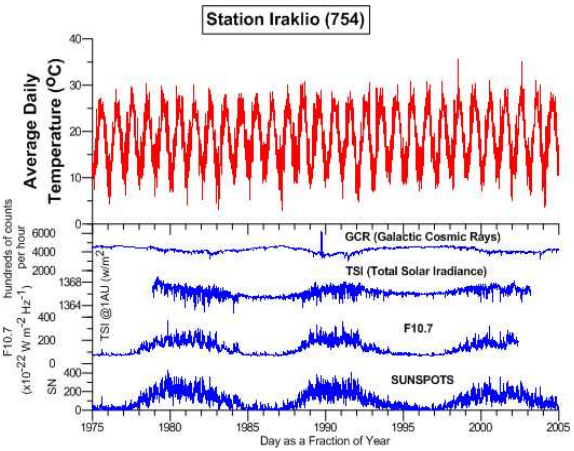


Fig. 9: As in Figure 3, but for the MS of Iraklio.

CONCLUSIONS

Our preliminary results do not reveal any clear trend between the solar and meteorological parameters, which would indicate solar influence on the climate (see for example Audu & Okeke, 2019 and Ismailova & Voloshkina, 2016). Some diagrams hinted faint indications of some correlation patterns, which we need to search in detail.

BIBLIOGRAPHY

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