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THE WEATHER IN THESSALONIKI DURING THE FIRE OF THE EIGHTEENTH TO THE TWENTIETH OF AUGUST 1917

by

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Summary: *This paper contains a meteorological and historical chronicle of the great fire of August 1917, which destroyed the greater part of the city of Thessaloniki, Greece.*

From the available evidence it is concluded that the principal cause of the blaze's rapid expansion over such a wide area was the strong local wind —the Vardaris— and an artificial sea breeze produced through the high temperatures created by the huge fire over a large expanse of the sea-side city.

The city of Thessaloniki (φ 40° 37′ N, λ 22° 57′ E) stretches in an amphitheatre around the inner Thermaic Gulf. Prior to the 1917 it was about 7.5 km long with a disproportionately narrow breadth not exceeding approximately 1.5 km. The city thus forms a crescent which is divided into two distinct districts north and south of the White Tower.

The most important section of the northern district was Thessaloniki «within the walls», measuring approximately 2.0 x 1.5 km., in which were to be found the principal buildings, the administrative centre, the banks, hotels, the more important commercial and industrial premises, the big ware-houses and all the most significant Roman and Byzantine monuments.

Thessaloniki was the second city of both the Byzantine and Ottoman Empires, as it is of the modern Greek State. Stone buildings covered only a small part of this section, along the main arteries (Fig. 1),and most of it consisted of a welter of mainly wooden or half-wooden (tsatmades) buildings set on narrow crooked streets and lanes. Dominating the more elevated quarters were the picturesque but wretechedly tiny dwellings of the economically less advantaged classes. The section of the city «south of the walls» included open spaces, plenty of grass, sprawling cemeteries, small homes and some attractive villas [13,16].

It is impossible today to estimate even roughly the actual population of Thessaloniki during that phase of the First World War. This is be-

cause Thessaloniki's native population of approximately one hundred and sixty thousand had been swollen by the followers of Eleftherios Venizelos' political movement from southern Greece, by a large number of refugees from Bulgarian-occupied Eastern Macedonia, as well as by Greek and allied military units, comprising men of every colour and origin, from the nearby Macedonian Front.

The climate of Thessaloniki is mediterranean with a noticeable continental influence from the Balkan Peninsula to its north. Winters as a whole are reasonably mild, although every so often periods of bitter cold befall the city [1,2], while summers are usually warm and generally dry with a few warm days of uncomfortable atmospheric hymidity. In Thessaloniki September can be regarded as a summer month [2,15].

In summer the monthly average temperature of the air varies between 26° C and 27° C for July and August, and around 22°-24° C in June and September. June is usually warmer than September, while the highest monthly average temperatures are recorded in July. The annual absolute maximum temperature has exceeded 40° C on a number of occasions. The summer reduction in rainfall, however, appears rather late in Thessaloniki, for while the warmest months are usually June, July and August, the months with the lowest rainfall are July, August and Septemher. During these three months an average of between 60 to 80 mm of rain falls in Thessaloniki, which is just about 15% of the annual total. Such a volume of summer rainfall precludes characterizing this season in Thessaloniki even as very dry, much less rainless, as is the rule in more southern areas of Greece. These summer rains fall mostly in the afternoons and are generally accompanied by thermal storms; either they consist of large widely-spaced drops or are passing downpours of brief but furious intensity, and normally everything dries out on the warm ground within a short time. Such is the average summer climate.

In certain rare instances, however, such as the summer of 1917, more than three months can pass in Thessaloniki without any measurable rainfall. And in fact, from June 29th until October 11th (new calendar) 1917, except for a few drops no rainfall was recorded at the Co-capital's two meteorological observatories [2,3,4].

In Thessaloniki's summer wind rose [3] the northern and south-western components show particular emphasis. Of these, the northern is attributable to the high frequency of Etesian winds and to the local wind the Vardaris, while the south-western is due to the sea breeze.

Etesian winds constitute one of the chief characteristics of the

Fig. 1. The sea-front of Thessaloniki before the fire of 1917 (Archives of B. Kyriazopoulos).

mediterranean climate. In Thessaloniki these seasonal air currents blow with reasonable steadiness throughout the summer period, with a normal speed of between 5 and 10 m/sec. They are at their most frequent during August, lasting on an average for between 2 and 4 days; by the time they reach Macedonia they are rather warm north winds [2].

The Vardaris, on the other hand, is the most important local wind in Northern Greece. It descends into Greece from the high plains of Serbia through the low line between Païkon and Kerkini mountains followed by the river Axios, from which it took its name Vardaris [5]. It blows in all seasons of the year, though more frequently during the cold period, as a chill, dry wind and reaches Thessaloniki usually from the north to the north-north-west. Although no special study of the Vardaris wind has been published to date, the conditions under which it is formed can be specified: the main pre-requirements are the prevelence of high atmospheric pressures in the Northern Balkans and relatively lower pressures in the North Aegean. Blowing under a clear sky, this wind removes pre-existing cloud or fog and causes a reduction in air temperature and both relative and absolute humidity, as well as an increase in water evaporation rate. It generally commences abruptly, lasts from two to three days, and drops just as suddenly; its average speed in Thessaloniki is 8-10 m/sec. The conclusion we wish to draw from these considerations is that in Thessaloniki the Etesian winds

usually bring about an increase in temperature, whereas the Vardaris lowers the temperature [2].

The sea breeze. As we said above, the emphasis on the south-western components of the summer wind rose of coastal Thessaloniki is due to the highfrequency sea breeze. As is well known, the formation of a sea breeze presupposes strong heating of the land by the sun's rays, the formation of up-draughts above it, and the incursion onto the land of air masses (breezes) from the sea where the atmospheric pressure remains relatively higher. In Thessaloniki the breeze usually rises between 0900 and 1000; it becomes more lively around 1100, achieves its maximum speed around 1600 and drops at about 2100 hrs. In the morning and early hours of the afternoon in Thessaloniki the direction of this breeze is south westerly, turning subsequently towards the south. Its speed is less than that of the Vardaris, usually not above 5-7 m/sec. When it blows, it produces a drop in termperature and an increase in the relative humidity of the air [2].

The fire[14]. In the city of St. Demetrius, as in all the big cities of the Ottoman Empire the outbreak of fire was by no means a rare occurrence. Zographakis writes as follows:

> «It was not the first time that the city of Cassander became prey to the flames. One of the preceding fires (September 4th, 1890) destroyed part of the city (2000 homes, and the church of Gregory Palamas together with its archive, of enormous value for the history of the city). On this occasion, the Byzantine church of Ayia Sophia also suffered damage.
>
> Leaving aside another great fire prior to that of 1917, on the 24th of March 1896, let us recall the dates of some earlier conflagrations: in 629-634 St. Demetrius' sufferred damage from fire. In addition to the years 1890 and 1896 which we have mentioned above, destruction from the same cause followed in the years 1545, 1587, 1610, 1625, 1734, 1840, 1849 1877, 1898 and 1910» [6].

In the summer of 1917 the war in the Balkans between the Western Allies and the Germans and Bulgarians reached a crucial phase in its development. The battle front between the opposing ranks lay only a few dozen kilometres from Thessaloniki, and the city and its harbour was the main installation and supply base for the embattled allied armed forces.

A little after midday on Saturday 5/18 th. of August 1917, fire broke out in a house in the Ladadika quarter in the northern section of the

city near the Egnatian Way. In spite of desperate efforts by the populace and Greek and French military authorities, the fire spread rapidly during the afternoon and in two days destroyed almost the whole of the main section of the city, an area more than a square kilometre in size. The main district reduced to ashes lay in a rough square between the streets Leontos Sophou - Agiou Dimitriou - Ethnikis Aminis (now Basilissis Sophias) and Leophoros Nikis (now Vasileos Konstantinou) along the sea front (Fig. 1).

The fire destroyed a large proportion of the more important buildings in Thessaloniki «within the walls», including almost all the banks, the leading hotels, commercial premises and ware-houses, as well as various military depots belonging to the Greeks, the French Armée d'Orient and the other allies. Ivestigations conducted by both Greeks and Allies reached the conclusion that this catastrophe was due neither to war activity nor to arson.

The fire's extraordinary extensiveness came about through a lack of modern means of fire extinguishing and of sufficient water inside the area, coupled with the necessities of the military, the inflammable material in the chiefly wooden buildings, the poorly laid out narrow winding lanes, the protracted dry spell the preceded the fire — from all these factors together and, above all else, the wind.

The speed with which the fire spread was truly exceptional. As well as the rapidly advancing main front, a host of secondary outbreaks were continuously being started by burning splinters of wood light enough to be carried behind the burnt out main line by the strong wind. In spite of the vigilance of residents up on their rooves, timely extinguishing of new flare-ups was not always achieved. Finally, the ignition and explosion of a large American liquid fuel dump created an additiona flood of flames.

The blaze subsided on the third day, although isolated centres of fire remained burning for quite some time. But the great catastrophe had already happened by the first night.

In spite of the fact that it is only fifty seven years since this fire struck Macedonia's capital city, great difficulty is encountered in gathering relevant information about it. This is because publication of Thessaloniki's newspapers stopped when their establishments were destroyed, and also because of the relative taciturnity in the newspapers of Athens, due probably to the war that was going on at the time [7,17].

Meteorological Development During The Fire [2,3,4,9,10]

Weather charts of the year 1917 for the relevant region are not to be found; even if they were, they would be imprecise and deficient in comparison with today's charts: imprecise, because of the imperfect means then at the disposal of the meteorological service, as well as contemporary notions about weather changes; defective, because the broadcasting of «open» meteorological information by the meteorological services of those engaged in the war had been banned in view of the war front established at that time in Macedonia, and hence the drawing up of sufficiently well-informed weather charts for regions much north of Tbessaloniki was impossible.

For this reason, in order to ascertain weather conditions during the time in question we are obliged to confine ourselves to the meagre evidence provided by the ground stations of the Macedonian capital.

In August 1917 there were two meteorological stations operating in the district of Thessaloniki. One, belonging to the Athenian Observatory network, had been established from the time of Turkish occupation in what was then the garden of Thessaloniki's historic Greek Gymnasium, whose two-storied building was saved from the fire; it still exists today on the Egnatian Way, by the arch of Galerius, and houses a school of domestic science.

Details from the recordings of this station for August 1917 have been taken from the *Annales de l'Observatoire National d'Athènes*, Volume VIII (see Table), as well as directly from the archives of the Observatory of Athens [4].

The other meteorological station was that of the French Armée d'Orient. This was under the supervision of the French military pharmacist A. Valdiguié, and operated within Thessaloniki but on a site that is today unknown. From the meteorological details for the days of the fire published in summary form, however, we may infer that it must have been located at a position somewhere north of the burning city, probably where the Evosmos quarter is today. Valdiguié published the observations of this station in the second issue of the series *Cahiers d'Orient* [3], produced in Thessaloniki in French, and by now a collector's item.

The following are the conclusions to be drawn from the available meteorological evidence of these two stations and the accompanying rare photograph (Fig. 2).

The summer of 1917 passed exceptionally dry, almost rainless. As

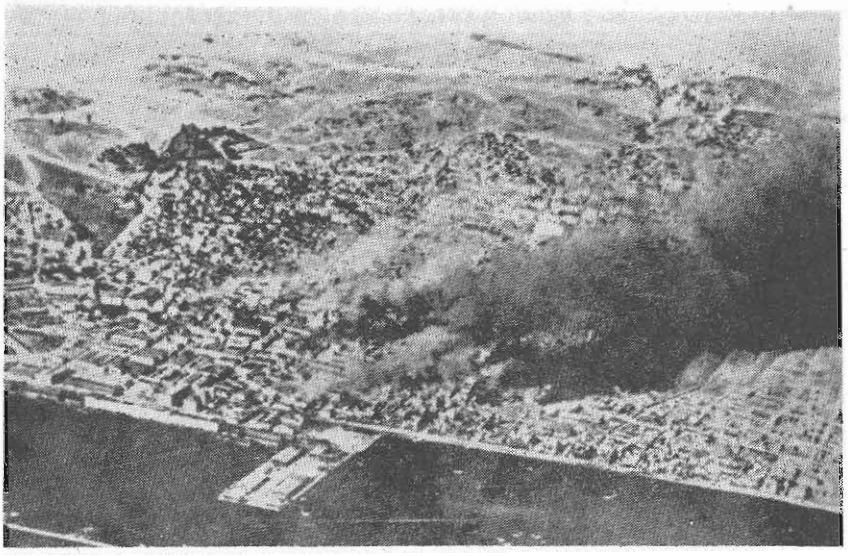

Fig. 2. The above view of Thessaloniki was published by a contemporary French periodical. It is an aerial photograph (Archives of B. Kyriazopoulos), taken from a French aircraft most probably on the afternoon of the first day of the fire (5/18 August). This can be inferred from the relatively limited extent of the fire at the time, and from the shadows that fall eastwards of the buildings. The acute angle of the smoke - almost parallel with the ground —and its approximately southeastern direction indicate the force and direction of the wind blowing— the Vardaris.

we mentioned above, except for a few drops no rainfall was recorded in the city of Thessaloniki for the entire period from June the 29th until October the 11th (New Calendar). The protracted dryness of the air was intensified on the eve of the fire, the 17th of August, when at 1400 hrs an abnormally low relative humidity of 26% was recorded. This meant that extremely favourable conditions for the spread of fire had come about, and in fact newspapers had already reported forest fires [8].

From the 17th of August, the day before the fire, a strong dry north-east to north-west wind with a relative humidity of 26-45% blew in Thessaloniki (see Table) with a speed of 12-18 m/sec, i.e., force 6-8 on the Beanfort scale. Almost without exception, the air temperature at the three daily observations as well as the highest and lowest values for the twenty-four hours fell from the 17th to he 18th of August by between 1°.4 and 4°.8 C. The wind blowing from the northern quarter was gusty, dry and cold. On the morning of the 17th it was a blustery north-easter (15-18 m/sec), becoming north-western later during the

course of the 17th and again north-eastern on the morning of the 18th; it returned to the north west at about the time the fire broke out (1400 hrs), while its speed, slightly reduced, continued during those crucial hours to be high (7-10 m/sec, or Beaufort force 5). As may be concluded from the angle and direction of the smoke rising from the fire in the accompanying photograph (Fig. 2), the wind maintained this north-westerly direction during the afternoon hours of the 18th.

In this region of the Balkans a dry wind blowing under a cloudless sky from the northern quarter in summer is either one of the Etesian winds or the local wind, the Vardaris. The Etesian winds that blow in Thessaloniki from the land are relatively warm and not very strong [9,10], whereas in the present case we have a cold, dry mass of air of the cP type moving at gale-level speed. These identifying characteristics —a dry, cold summer wind in the north quarter, of high speed, blowing under a cloudless sky— correspond to those of the local wind, the Vardaris [2].

On the evening of the 18th, when the fire had already expanded considerably, the wind freshened to 10-12 m/sec and the flow became westerly, which means that it was blowing in from the sea. This variable, gusty current, from the west and subsequently from the south on the 19th, persisted until the 20th of the month. After the fire died down (21st) it became a normal low-speed breeze.

Since during the course of the fire the meteorological station at the Greek Gymnasium of Thessaloniki received wind initially from the north and then from the west, that is from the area on fire[11], the relativ-ely humidity naturally remained at a low level (at 2100 on the 17th and the 18th it was 32%, while at 0800 on the 18th it was 44%). The sky above the city remained completely cloudless.

This gradual shift of the wind from north to west and south, that is to the sea, we attribute to the prevelance of a sea breeze that was further strengthened as the fire spread throughout the city: the extensive fires created a strong up-draught above the burning city, resulting in the reduction of atmospheric pressures close to the ground and hence an inflow of air masses from the relatively cooler coastal sea, where a higher atmospheric pressure was maintained. The view that in this instance an «artificial» air current from the sea was created, which is to say an «artificial» sea breeze brought about by the fire[12], is reinforced by the fact that it seems to have persisted throughout the night as well, when the normal sea breeze falls and changes into a land breeze (a west

The meteorological observatory at the Greek Gymnasium of Thessaloniki, Greece 17-21 August 1917.

DATE	AIR TEMPERATURE °C					RELATIVE HUMIDITY			WIND						CLOUDINESS			RAIN mm		
									SPEED m/sec			DIRECTION								
	0800	1400	2100	MAX.	MIN.	0800 %	1400 %	2100 %	0800	1400	2100	0800	1400	2100	0800	1400	2100	0800	1400	2100
17	27.6	33.0	28.	33.4	23.4	45	26	32	15-18	12-15	12-15	NE	NW	NW	0	0	0	0	0	0
18	22.8	29.6	28.6	32.0	21.5	44	28	32	10-12	7-10	10-12	NE	NW	W	0	0	0	0	0	0
19	29.0	29.8	28.0	30.0	23.0	92	36	51	9-12	12-15	5- 7	W	W	S	0	0	0	0	0	0
20	24.0	30.4	25.4	33.4	21.3	68	46	65	2- 3	5- 7	3- 5	S	SW	S	0	0	0	0	0	0
21	25.4	30.4	28.0	32.0	22.6	58	45	64	3- 5	1- 3	1- 3	NW	SW	S	0	0	0	0	0	0

* This high relative humidity is obviously due to the hosing down of the Greek Gymnasium and the buildings around it by fire hoses.

wind coming off the sea to the west was recorded at 2100 on the 18th and at 0800 on the 19th).

In terms of consequences, it was the shift of the wind further to the south that was important in the case under consideration. This change halted the firs's southward progress but turned it across the Egnatian Way towards the more elevated quarters of the inner city. The result was that some buildings around the quarter of the Hippodrome and the arch of Galerius and the area south of this were saved, but among others the seventh-century Byzantine basilica of the defender of the city, St. Demetrius, a building of immense historical and architectural importance, was lost.

This was the biggest fire ever experienced in a Greek city, and the toll of loss and damage was particularly heavy. Apart from the colossal material destruction, five dead were counted, a large number of injured, and 100,000 people were rendered homeless, of whom 25,000 were refugees from the current war. Just housing the thousands of fire victims created enormous additional problems in the city, cramped as it already was through the upheavals of war. Besides this, the fire also caused general alarm among both Greek and Allied military authorities who at the time were trying to fight a war.

NOTES AND REFFERENCES

1. *Thessaloniki's climate*, particularly her winter climate, has been modified noticeably since the data in question through human intervention. In those days, even in the center of the city the buildings were predominantly three-storey and imperfectly heated during the winter with fire-wood, while the streets were generally dust or mud.

Today's bulky, tall buildings crowded close together perceptibly break the force of winds, in particular the northern wind (the Vardaris); at the same time the huge quantities of liquid fuels consumed within the city, the extensive use of electric current and the density of drainage and sewerage networks all contribute to raising the temperature on a local scale, especially during the cold season. On the other hand, the diversion of the Axios estuary has had an influence on the seafront of Thessaloniki; the surface waters along the shore no longer freeze, as they once did from time to time during extremely bitter winters.

Since the War, however, the unhealthy gasses emitted from buildings and vehicles within the city, as well as those carried by the wind from the industrial zone (badly located north of the city and on the axis of the prevailing winds), pollute the atmosphere of Thessaloniki and to some degree diminish the intensity of the sun's rays that fall upon it.

2. B. KYRIAZOPOULOS, *Τὸ κλῖμα τῆς Ἑλληνικῆς Κεντρικῆς Μακεδονίας* (The Climate of Greek Central Macedonia), Athens 1939.

3. A. VALDIGUIÉ, Contribntion à l'étnde dn climat de Salonique», «*Cahiers d'Orient*» No. 2, (Thessaloniki 1918), pp. 1-102.

4. «*Annales de l'Observatoire National d'Athènes*», Vol. VIII (Athens 1926), and the Archives of the Observatory of Athens.

5. F. KOUKOULES derived the name of this river from the word «*βαρδάρια*» meaning «bundles of wood tied with wicker resting on the mill-stone», adding that the Vardaris was thus named becanse it was noisy, rattling like a «*βαρδάριον*». He also derived it from the exclamation «*βάρδα*», called out by someone moving violently and threatening to knock down everything unable to withstand its progress (*Ἀφιέρωμα εἰς Γ. Χατζιδάκην*, 1921, p. 37). Tafel «De Bardari et de gent. Bardariotarnm», «*Rhein. Museum*» Vol. 5 (1837) p. 185, relates the name of the river to the well-known Byzantine names *Βαρδάριος*, *Βάρδας* and *Βαρδάνης*. According to A. AMANTOS («*Λεξικογραφικὸν Ἀρχεῖον τῆς Μέσης καὶ Νέας Ἑλληνικῆς*». Vol. VI(1923), p. 102), the words *βαρδάριος* and *βεριδάρις* originate from the Latin *veredarius*, meaning postmau, swift horseman, the word *βερεδάριος*, *βεριδάριος* = messenger, despatch rider, is common in Byzantum and also occurs under the form *βερεδάριος* and it is therefore possible that part of the Axios, and later the whole river, had been named after a landowner called Vardarios. Eustathins of Thessaloniki names the river Axios or Vardarios [2].

6. G. ZOGRAPHAKIS, «*Ἡ Μεγάλη Πυρκαϊὰ τῆς Θεσσαλονίκης*» (The great fire of Thessaloniki), «*Μακεδονικὴ Ζωὴ*», No. 40 (Thessaloniki, 1919), pp. 8-9. For a photograph of the fire from the gronnd see also «*Μακεδονικὴ Ζωὴ*» No. 92 (Thessaloniki, 1974), p. 20.

7. Athenian newspapers: «*Ἀκρόπολις*» 8 August 1917(old calendar), where there is an extract of E. Venizelos' address in the House abont the fire; «*Ἀκρόπολις*» 19 August; «*Ἐμπρὸς*» 7 & 8 August(100,000 homeless, of whom 40,000 Jews); «*Ἐμπρὸς*» 9 Augnst (huge explosion of large petrol and oil dump; inadequate equipment for pnmping sea water; among the victims of the fire some 25,000 refngees from Thrace and Asia Minor; start of the fire in a honse on the west side of Kassandrou St.); «*Ἐμπρὸς*» 10, 14 & 17 August; «*Ἀθῆναι*» 8, 9, 11 & 12 August 1917 (old calendar).

8. Throughout the summer of 1917 the newspapers reported forest fires in Greece caused by thc continuously warm, dry weather. Cf. the newspaper «*Ἀθῆναι*» 7 August 1917 (old calendar).

9. S. D. PAPAYIANNAKIS, «*Αἱ Καιρικαὶ Καταστάσεις ἐν Ἑλλάδι*» (Weather conditions in Greece), «*Ἡ Πτῆσις*» (Athens 1955).

10. JOHN KARALIS, *Τύποι Καιροῦ Ἑλλάδος* (Types of weather in Greece, Athens, 1969.

11. Admiration is due to the heroic Greek observer at the Meteorological Station of Thessaloniki who, in spite of the flames and the collapsing buildings around the Greek Gymnasinm, continued without omission to carry out the meteorological observations three times daily.

12. A similar artificial wind, although much stronger than that of the fire in Thessaloniki, was created during the terribly retaliatory bonbardment of Hamburg by the English Air Force in July 1943, using massive quantities of incendiary bombs. During this blaze the Germans mourned 50,000 victims.

13. B. KYRIAZOPOULOS, *Πολεοδομικὸν Πρόγραμμα Πανεπιστημίου Θεσσαλονίκης*

(Planning program for the University of Thessaloniki), Thessaloniki 1950.

14. B. Kyriazopoulos, *Ὁ καιρὸς καὶ οἱ πολεμικοὶ ἐμπρησμοὶ* (The weather and military arson), *«Γενικὴ Στρατιωτικὴ Ἐπιθεώρησις»*, December 1956, pp. 31-36. Partial republication by E. Petropoulos in *«Εἰκόνες»*, Athens, 5 August 1968.

15. *«Observations Météorologiques de Thessaloniki»*, 1951, publiées par Bas. Kyriazopoulos, (Thessaloniki, 1958); this contains a synopsis of meteorological observations in Thessaloniki between, 1930-1950.

16. B. Kyriazopoulos, *«Ἡ Πανεπιστημιούπολις τῆς Θεσσαλονίκης. Ἡ πρώτη εἰκοσαετία τῆς πρώτης ἑλληνικῆς Πανεπιστημιουπόλεως»*,(The University City of Thessaloniki. The first twenty years of the first Greek University City), *«Τεχνικὰ Χρονικὰ»*, (Athens, January 1971).

17. E. Mellou, *Ἡ Θεσσαλονίκη μέσα στὶς φλόγες*, (Thessaloniki in flames), short story in *«Μακεδονικὸν Ἡμερολόγιον»*, (Thessaloniki, 1974), pp. 209-214.

ΠΕΡΙΛΗΨΙΣ

Ο ΚΑΙΡΟΣ ΕΙΣ ΤΗΝ ΘΕΣΣΑΛΟΝΙΚΗΝ ΚΑΤΑ ΤΗΝ ΔΙΑΡΚΕΙΑΝ ΤΗΣ ΠΥΡΚΑΪΑΣ ΤΗΣ 18ης - 20ῆς ΑΥΓΟΥΣΤΟΥ 1917

Ὑπὸ

ΒΑΣ. Δ. ΚΥΡΙΑΖΟΠΟΥΛΟΥ

Τὸ δημοσίευμα αὐτὸ περιλαμβάνει τὸ μετεωρολογικὸν καὶ ἱστορικὸν χρονικὸν τῆς μεγάλης πυρκαϊᾶς τῆς Θεσσαλονίκης (Ἑλλάς), ἡ ὁποία κατέστρεψε τὸ κυριώτερον μέρος τῆς πόλεως τὸν Αὔγουστον τοῦ 1917.

Ἐκ τῶν ὑπαρχόντων στοιχείων συνάγεται ὅτι κύρια αἴτια τῆς μεγάλης καὶ ταχείας ἐπεκτάσεως τοῦ πυρὸς ὑπῆρξαν ὁ σφοδρὸς τοπικὸς ἄνεμος Βαρδάρης καὶ ἡ ἐν συνεχείᾳ προκληθεῖσα ἐκ τῆς μεγάλης πυρκαϊᾶς τεχνητὴ θαλασσία αὔρα, λόγῳ τῆς δημιουργηθείσης ὑψηλῆς θερμοκρασίας εἰς μεγάλην ἔκτασιν τῆς παραθαλασσίου πόλεως.