

August 20 2023

## August 2023 heat wave – an irregular sequence of high minimum temperatures

On August 12-20 unusual weather conditions prevailed, characterized by higher-than-normal temperatures, high humidity, and extensive nighttime and morning cloud cover. These conditions significantly reduced nighttime radiative cooling in valleys and plains, leading to an unprecedented sequence of warm nights along the coastal plain and northern valleys.

### Synoptic Conditions

In the high and intermediate layers of the atmosphere, a static high-altitude high-pressure system prevailed alongside the seasonal Persian Gulf Trough in the low layers with winds from the western sector (figure 1). The high-altitude ridge caused the air to descend from the high layers (subsidence) and become warmer, so temperatures at the 850-mbar level (approximately 1,500 m) reached approximately 29 to 30 °C, compared to a multi-annual average of approximately 21 to 22 °C. In the lower layers, there was a flow of relatively cool, humid air from the sea so a thick inversion layer was formed, with a base altitude of approximately 900 to 1,000 m (figure 2). Below this stable layer of air extensive cloud-cover was formed at night and in the morning, primarily on the coastal plain, with high humidity. These conditions prevented nightly heat dissipation (greenhouse effect), so warm nights prevailed in this area.

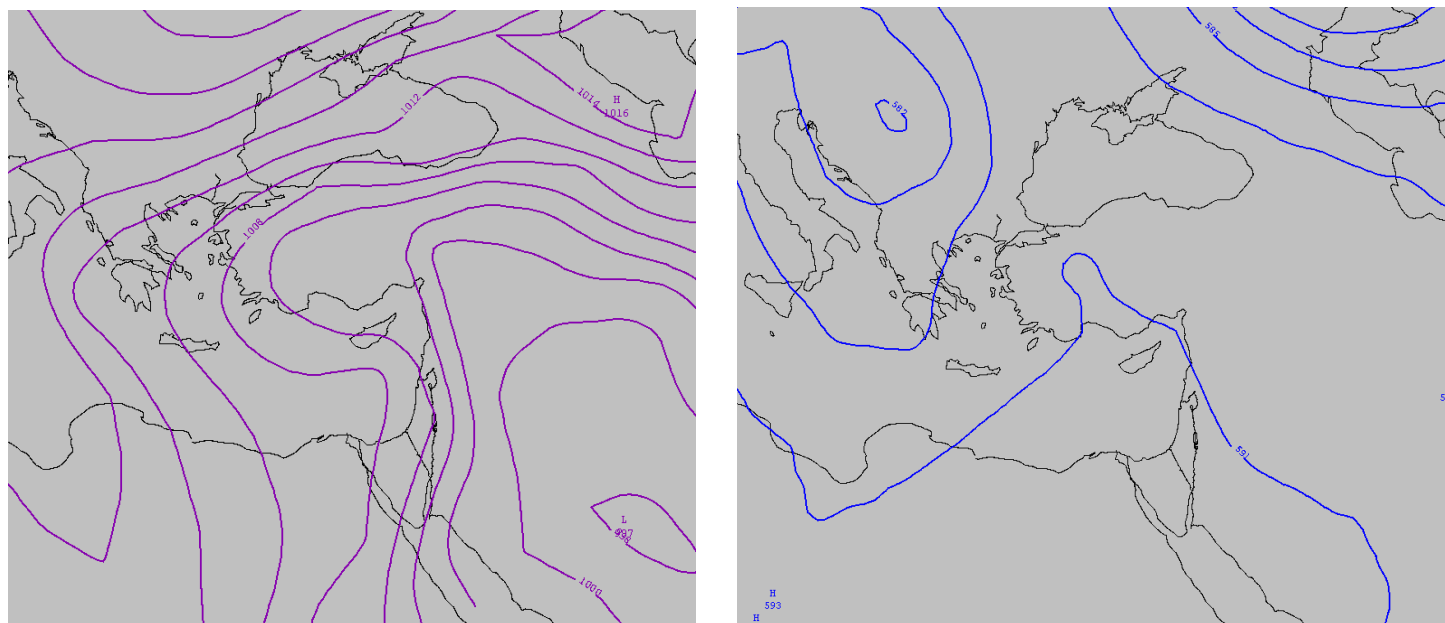


Figure 1: 500 mm map (right) and ground level map (left) 17.08.2023 00Z

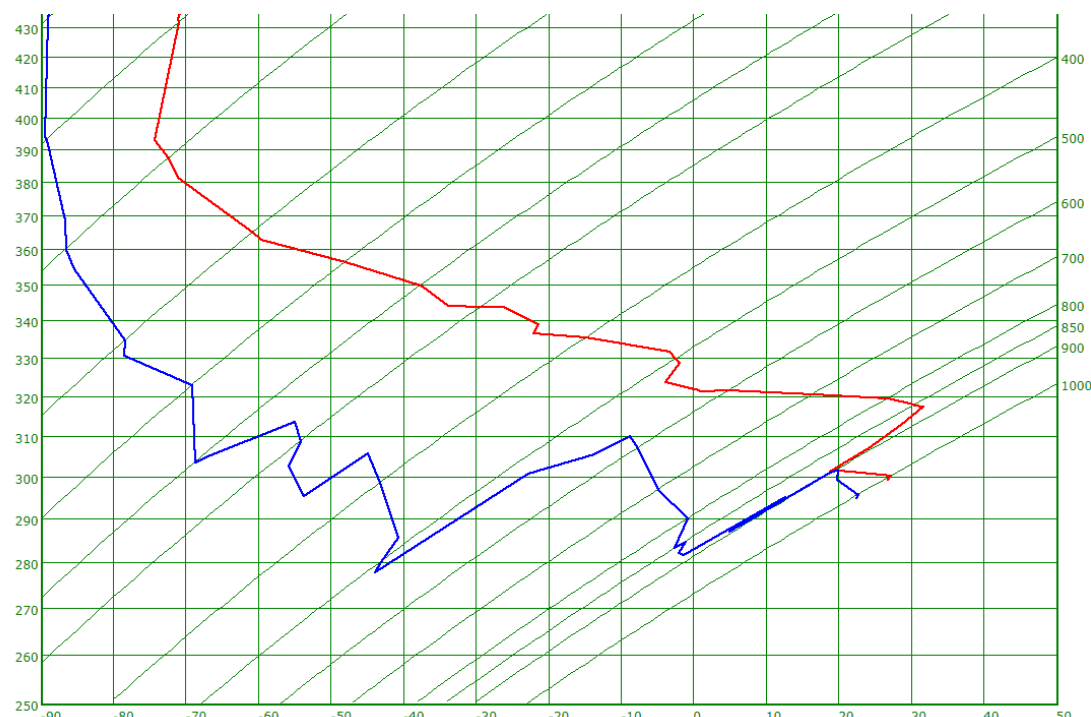


Figure 2: Tephigram at Beit Dagan 17.08.2023 00Z

The point of contact between the blue line (dew point temperature) and the red line (temperature) at the 900-mbar level represents a zone of 100% humidity and condensation around a height of 1,000 meters. Above this level the air becomes significantly warmer and drier.

## Temperatures and Relative Humidity

At the start of the heatwave (August 12–13), the inversion base was lower (approximately 700 m), resulting in high daytime temperatures. These reached 45–46°C in the Hula Valley, 38–42°C in the central mountains, 36–37°C in northern Golan Heights and the Upper Galilee, and 42–45°C in the Arava, where dry conditions prevailed. In the lowlands and northern Negev, temperatures ranged from 34 to 37°C, while in the coastal plain, they were 33 to 34°C. However, higher relative humidity in these areas increased the heat stress.

Subsequently, the inversion layer rose (as mentioned earlier), leading to a decrease in daytime temperatures, but warm nights persisted along the coastal plain and northern valleys. Minimum temperatures in these areas reached 27–29°C (compared to an average of 21–23°C) and 29–31°C around the Sea of Galilee (average approximately 24°C). Relative humidity at night reached 75–80%, meaning the heat stress, which was severe to extreme during the day, eased only slightly at night and remained moderate for most of the night and early morning.

Tables 1 and 2 present the minimum and maximum temperatures recorded from August 11 to 20, 2023.

**Table 1: Minimum Temperatures (°C) on the 12<sup>th</sup> through the 20<sup>th</sup> of August 2023**

	12.8	13.8	14.8	15.8	16.8	17.8	18.8	19.8	20.8
En HaHoresh	23.4	28.3	28.0	25.0	27.4	24.6	27.6	27.1	27.3
Bet Dagan	25.7	29.0	28.8	27.8	27.3	25.5	28.4	28.3	28.2
Ben Gurion Airport	26.3	28.7	28.5	27.7	27.2	26.7	28.3	28.4	28.1
Negba	23.8	27.4	28.2	26.0	24.2	24.6	27.1	27.2	27.2
Afula	22.6	28.0	28.4	26.9	27.6	26.6	27.9	27.2	27.2
Har Kena'an	20.5	25.2	26.6	22.3	22.1	20.9	20.6	21.2	21.1
Beit Jimal	23.5	25.5	25.9	25.2	24.2	23.8	25.1	25.6	25.2
Jerusalem	20.1	22.1	23.8	21.9	21.0	20.5	21.7	21.6	21.6
Be'er Sheva	23.6	26.2	26.6	25.2	24.4	25.2	24.7	25.7	25.7
Sede Boqer	22.7	24.4	24.8	23.5	23.2	24.0	22.6	24.0	23.9
Kefar Blum	21.4	27.7	28.5	27.5	27.3	26.6	26.8	27.5	26.9
Zemah	23.8	29.9	31.5	30.0	29.3	28.8	28.9	27.2	29.4
Sedom	31.9	33.7	34.4	33.9	32.6	33.0	32.8	33.3	32.2
Eilat	28.9	30.4	32.0	29.8	29.2	29.6	30.3	30.5	29.7

**Table 2: Maximum Temperatures (°C) on the 12<sup>th</sup> through the 20<sup>th</sup> of August 2023**

	12.8	13.8	14.8	15.8	16.8	17.8	18.8	19.8	20.8
En HaHoresh	32.5	33.7	32.3	32.6	32.5	32.8	32.6	32.6	31.6
Bet Dagan	32.9	33.9	32.7	33.7	33.7	33.8	34.0	33.5	32.7
Ben Gurion Airport	32.3	33.7	31.8	32.4	32.3	32.9	32.8	32.7	31.5
Negba	32.2	33.5	32.5	32.7	32.4	32.7	32.5	32.4	31.8
Afula	34.9	38.9	37.0	35.6	35.4	36.3	37.1	36.3	34.8
Har Kena'an	37.5	39.4	37.6	32.1	31.6	33.3	33.8	32.6	31.0
Beit Jimal	34.0	35.8	32.8	33.6	33.6	35.0	34.3	34.5	33.4
Jerusalem	38.6	41.7	33.0	32.3	32.1	35.3	34.2	34.0	32.1
Be'er Sheva	35.3	37.4	32.6	35.4	35.4	37.0	35.3	35.6	34.5
Sede Boqer	33.9	36.0	30.0	33.8	33.7	34.7	34.3	33.6	32.7
Kefar Blum	43.3	45.8	41.9	38.4	38.0	39.7	39.9	39.2	37.6
Zemah	41.9	41.2	40.8	39.5	38.8	38.8	39.6	38.9	38.7
Sedom	42.1	42.0	40.9	41.1	39.4	39.7	40.6	40.4	39.7
Eilat	40.8	44.3	41.3	39.8	40.5	41.4	41.5	40.9	39.6

### Uniqueness of the Event

The sequence of warm nights along the coastal plain and the northern valleys was exceptional. As shown in Table 3, the series of high minimum temperatures recorded at various stations in the region was remarkable and, in most cases, unprecedented since measurements began!

For example, in Bet Dagan, there was a sequence of 4 nights during the heatwave with minimum temperatures exceeding 27°C and 9 consecutive nights with minimum temperatures above 25°C. Such sequences have not occurred since the station's measurements began in 1962. In Zemah, in the southern Sea of Galilee region, there was a sequence of 4 nights with minimum temperatures above 29°C and 8 nights above 27°C—unprecedented since the start of measurements in 1945.

It is noteworthy that in terms of the highest minimum temperature recorded during the event, several stations barely surpassed the record previously set, typically in early September 2020 (e.g., Beit Dagan and Negba). In other stations, this was the second or third highest value on record.

It is important to emphasize that the exceptional nature of the minimum temperatures pertains to the areas mentioned (coastal plain and northern valleys). In other parts of the country, while temperatures were above average, there were no anomalies in absolute values or in the high temperature sequence.

**Table 3: Uniqueness of high minimum temperatures and warm night sequences on August 11-20, 2023.**

Station	Absolute value in °C during the current event and its ranking (similar or higher value in the past and its date)	Sequence of days above a minimum temperature threshold value and whether it has occurred in the past	Year of beginning of measurements in the station or area
En HaHoresh	28.3 – 2 (3.9.20, 28.5)	2 above 28 – has not occurred 8 days above 24 – has not occurred	1945
Bet Dagan	29.0 – 1 (4.9.20, 28.9)	4 above 27 - has not occurred 9 above 25 - has not occurred	1962
Ben Gurion Airport	28.7 – 2-3 (4-5.9.20, 28.7, 29.0)	4 above 27 – occurred on August 2010 8 above 26 - has not occurred	1950
Negba	28.2 – 1 (4.9.20, 3.8.15, 28.0)	3 above 27 - has not occurred 8 above 26 – occurred on August 2010	1950
Afula	28.4 – 4 (31.7.00, 29.6)	3 above 27 - has not occurred 7 above 26 - has not occurred	1948
Kefar Blum	28.5 – 2 (8.9.15, 30.8)	4 above 27 - has not occurred 8 above 26 - has not occurred	1948
Zemah	31.5 – 2 (8.9.15, 32.1)	4 above 29 - has not occurred 8 above 27 - has not occurred	1945