

Warm Spells in Mauritius during December 2023 and January 2024

Under the influence of strong to very strong El Nino, the whole globe is experiencing warmer conditions. Mauritius is no exception and has lately experienced persistent warm spells that could be compared to a heat wave. By definition “*Meteorological heatwaves are the consequence of local cumulative excess heat over a sequence of unusually hot days and nights*”.

Heat waves are amongst the severe weather phenomenon and several countries, oftentimes impacted by heat waves, have categorized the hazard as follows:

- (i) Low-intensity: most heatwaves are low intensity ones whereby normal community capacity and practices to manage heat is sufficient,
- (ii) Severe-intensity: these are less frequent heatwaves but are hazardous for vulnerable people which require warning services,
- (iii) Extreme-intensity: these are rarer heatwaves which require even healthy people to take protective measures.

There is no formal definition of heat wave for Mauritius, though occasionally the island is impacted by “warm spell”, a terminology used locally. Such “warm spells” **may be** considered as equivalent to the low intensity heatwaves.

For the Republic of Mauritius, daily temperature anomalies have been classified as follows:

- (i) Normal temperature: when daily temperature is within ± 1.0 °C of the monthly long term mean,
- (ii) Slightly above (below) normal: when daily temperature is within $+1.1$ °C (-1.1 °C) to $+2.0$ °C (-2.0 °C) of the monthly long term mean,
- (iii) Above (below) normal: when daily temperature is $> +2.0$ °C (< -2.0 °C) of the monthly long term mean,

For indicative purpose, as of now, conditions of warm spell are said to prevail when above normal temperatures have prevailed for at least 3 to 4 consecutive days and nights. Further, high humidity (usually $\geq 80\%$) and light wind conditions are also taken into consideration during these days, as these accentuate the warm sensation.

Two such spells were experienced over Mauritius, one in December (from 20-24) and in January 2024 (03-06)

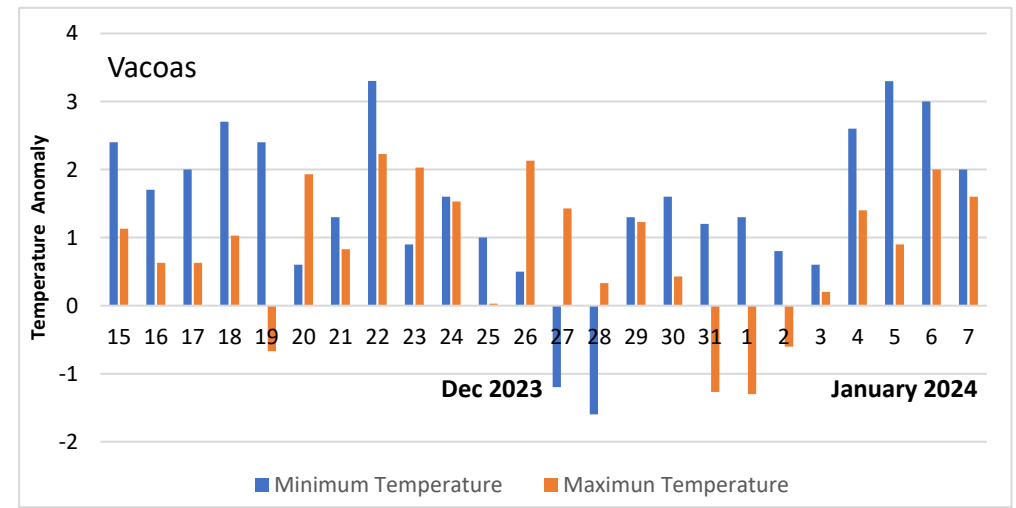
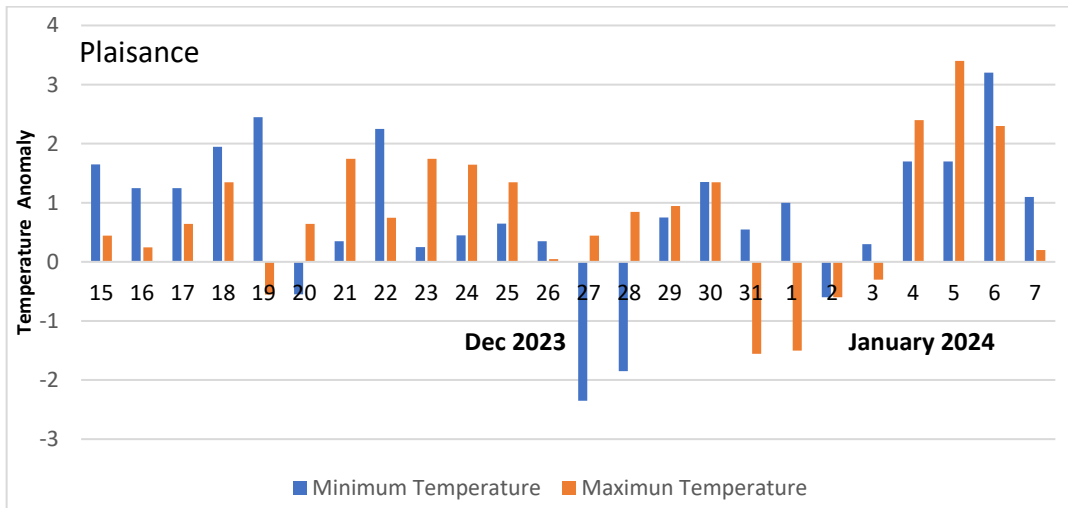


Fig. 1: Daily maximum and minimum temperature anomaly observed at Vacoas and Plaisance from 15 December 2023 to 07 Jan 2024.

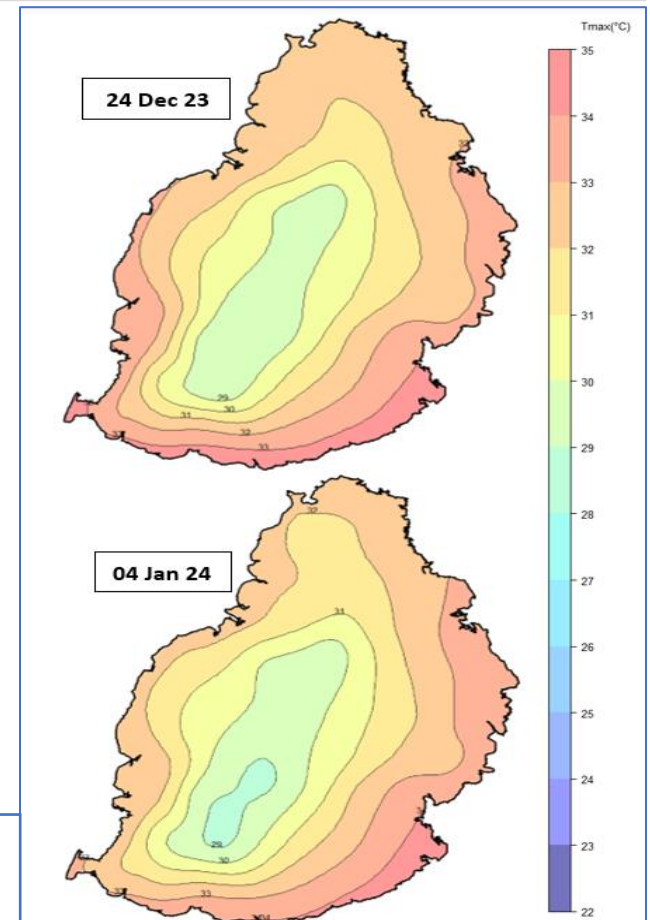
Though not well discernible at Vacoas and Plaisance, analysis of temperatures, notably maximum temperatures, for other stations clearly shows the prevalence of continuous warm days that prevail from 20 to 24 December 2023 and from 04 to 06 January 2024.

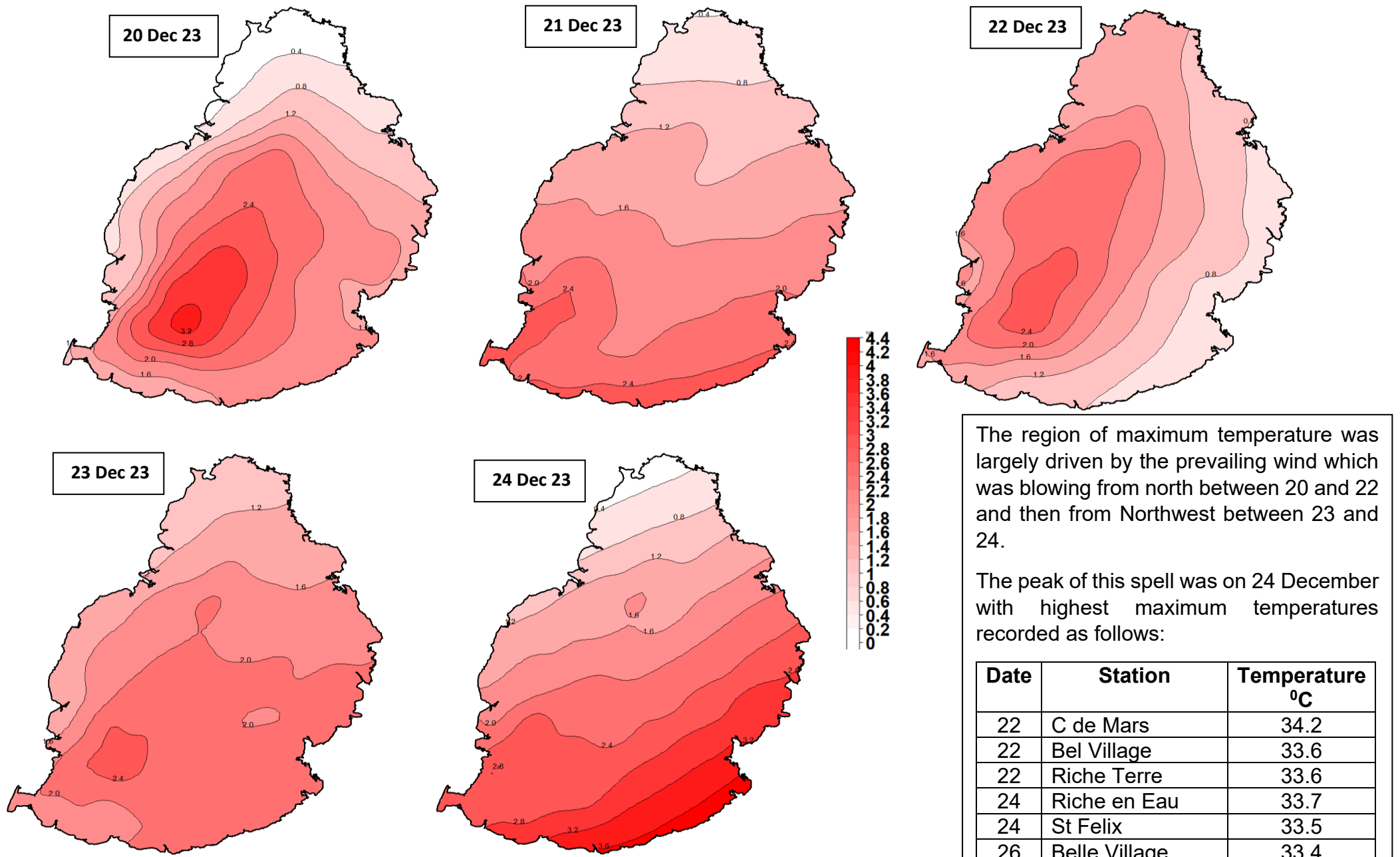
The region with highest maximum temperatures, excluding other effects, are largely determined by the prevailing wind directions. With the light wind blowing predominantly from the north and northwest since 15 December 2024, warm days prevailed mostly to the south and southeast. Occasionally with prevailing westerly light winds, warm spots were also observed to the east.

From 17 December 2023 to 04 January 2024, Mauritius was continuously under the influence of wind from the Northern sector. Such airstream has a high moisture content after travelling over warm seas located in the equatorial regions. North-westerly winds further carries the warm airmasses from large land masses like from Madagascar and even from eastern coast of African continent towards the Mascarene region.

January 04 turned out to be the warmest day for summer 23-24 as at now with several stations reporting above 34 °C, notably to the south and east (Fig. 3)

Fig. 2: Maximum temperature observed over the island on 24 December 2023 and 04 January 2024



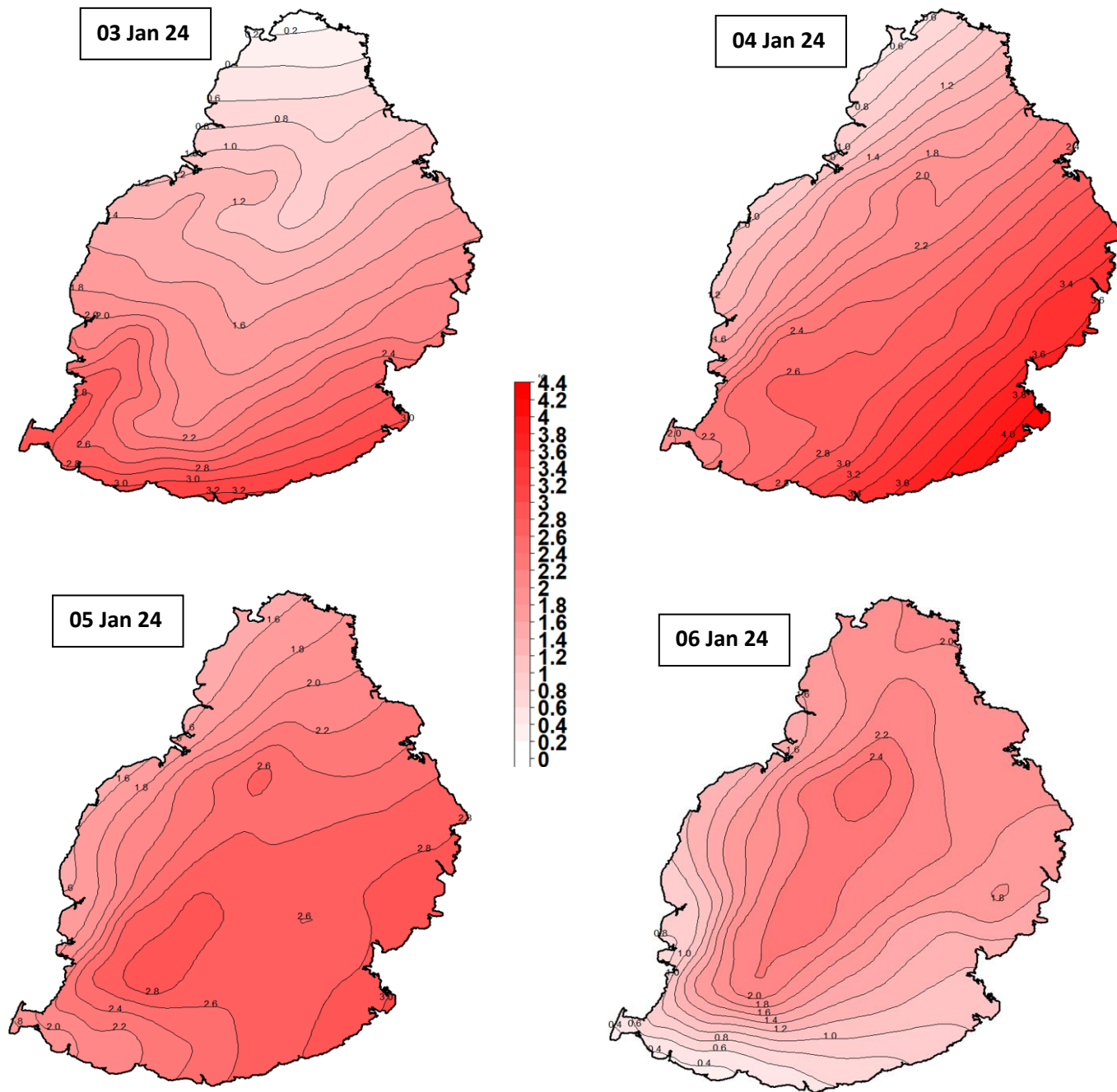


The region of maximum temperature was largely driven by the prevailing wind which was blowing from north between 20 and 22 and then from Northwest between 23 and 24.

The peak of this spell was on 24 December with highest maximum temperatures recorded as follows:

Date	Station	Temperature °C
22	C de Mars	34.2
22	Bel Village	33.6
22	Riche Terre	33.6
24	Riche en Eau	33.7
24	St Felix	33.5
26	Belle Village	33.4

Fig. 3: Maximum temperature anomaly _ warm spell from 20 to 24 December 2023.



The wind blew mostly from Northwest between 03 and 05 causing the southern and eastern region to report the highest anomaly during the day.

With the wind blowing from the south on 06, warm spots shifted over the northern part of the island.

The peak of his spell was 04 January with maximum temperatures above 34 °C being recorded at several places as follows:

Date	Station	Temperature °C
03,04	St Felix	34.4
04	Riv des Anguilles	34.0
04	Riche Terre	34.6
04	Riche en Eau	33.9
05	Mon Loisir SE	33.9
05	Bois Mongues	33.7
06	Riche Terre	34.2

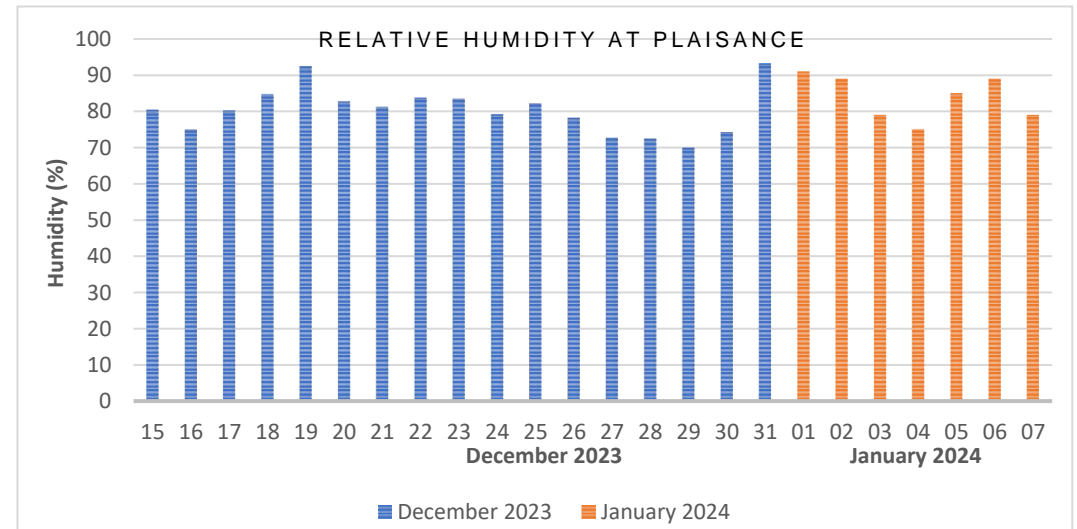
04 January is actually the warmest day of summer 2023-2024 as at now.

Fig. 4: Maximum temperature anomaly _ warm spell from 03 to 06 January 2024 .

Contributions of wind and humidity to heat sensation

Humidity also has a considerable effect on how comfortable we feel. The natural way for our body to keep itself cool, when we feel hot, is through sweating, i.e. evaporation of water droplets from our skin lead to a cooling of the body. When humidity is high, which imply a fully saturated air around us, the air can no longer accommodate any more moisture. So, our sweat cannot evaporate anymore hindering the natural cooling process leading to an accumulation of heat in our body, which could be termed as an overheat of the body. Thus, the higher the humidity level, the harder is the evaporation of sweats and the lesser is the cooling of the body.

During the month of December and persisting during the first week of January, the mean relative humidity at Plaisance was over 80 %. On some days, it even crossed 90%. Such conditions prevailed over the whole of the island. With a relative humidity of 80% and the air temperature of 30 °C, the temperature felt by an individual, also known as the heat index, is 36 °C. This heat index is even higher as the ambient temperature increases. Thus, over the Central Plateau heat index was of the order of 35 °C, whilst over the coastal areas, particularly to the east and southeast, the heat index was of the order of 40 °C, or possibly even higher.



Wind is another factor that determines the sensation of heat. The presence of blowing wind acts as a ventilating system which firstly prevents accumulation of heat at the surface and secondly enhance the evaporation process on the surface of our skin. The stronger the wind, the more the air will be cooled and so will be the surface of our body. The wind over our region was mostly light during December 2023 and first week of January 2024 which resulted in a poor natural ventilation.

The direction from which the wind blows also contributes to the warming or cooling of the air. Winds blowing from the North are warm and moist.

Summer Solstice

Another contributing factor to the “warm spell” was the Summer Solstice. The summer solstice occurs at the moment the earth's tilt toward/from the sun is at a maximum. Therefore, on the day of the summer solstice, the sun appears at its highest elevation with a noontime position that changes very little for several days before and after the summer solstice. The summer solstice for the southern Hemisphere occurs when the sun is directly over the Tropic of Capricorn, which is located at 23.5° latitude South. As such, during this period, there was maximum solar radiation over our region as we experienced the longest days.

Furthermore, it is to be noted that the earth passes at its closest point to the Sun during the first week of January. For Year 2024, the Earth was at its closest distance on 03 January.

Conclusions

Light northerly wind conditions brought very warm and moist air over our region. Combined with above normal ambient temperatures, this resulted in an increase in the discomfort level.

This indicates that Mauritius was indeed under the influence of “warm spell” conditions comparable to a low intensity heatwave, from 20 to 24 December 2023 and from 03 to 06 January 2024.

The long days (Summer Solstice) contributed partly to the “warm spell” in December 2023 . The passing of the Earth at its closest point to the Sun at the start of January 2024 contributed partly to the “warm spell” of January 2024.

It is to be noted that temperatures were above normal during both the days and nights during these two warm spells.

This is a preliminary report based on available data.

Mauritius Meteorological Services, 09 January 2024.