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Recalling southern Africa's abnormally hot conditions during January 2023:

Causes, future outlook and farmworker heat stress impacts

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From about 9-23 January 2023, the southern African region as a whole experienced a prolonged period of abnormally hot conditions, with daily average temperatures up to 5 °C higher than normal (Figure 1). Looking back, most of us probably felt very hot and fatigued,

and might have also experienced other heat stress symptoms like dehydration, headaches, nausea, and even heat stroke. By 23 January, at least five farmworker deaths, resulting from heat stroke, were recorded in the Northern Cape town of Kakamas.

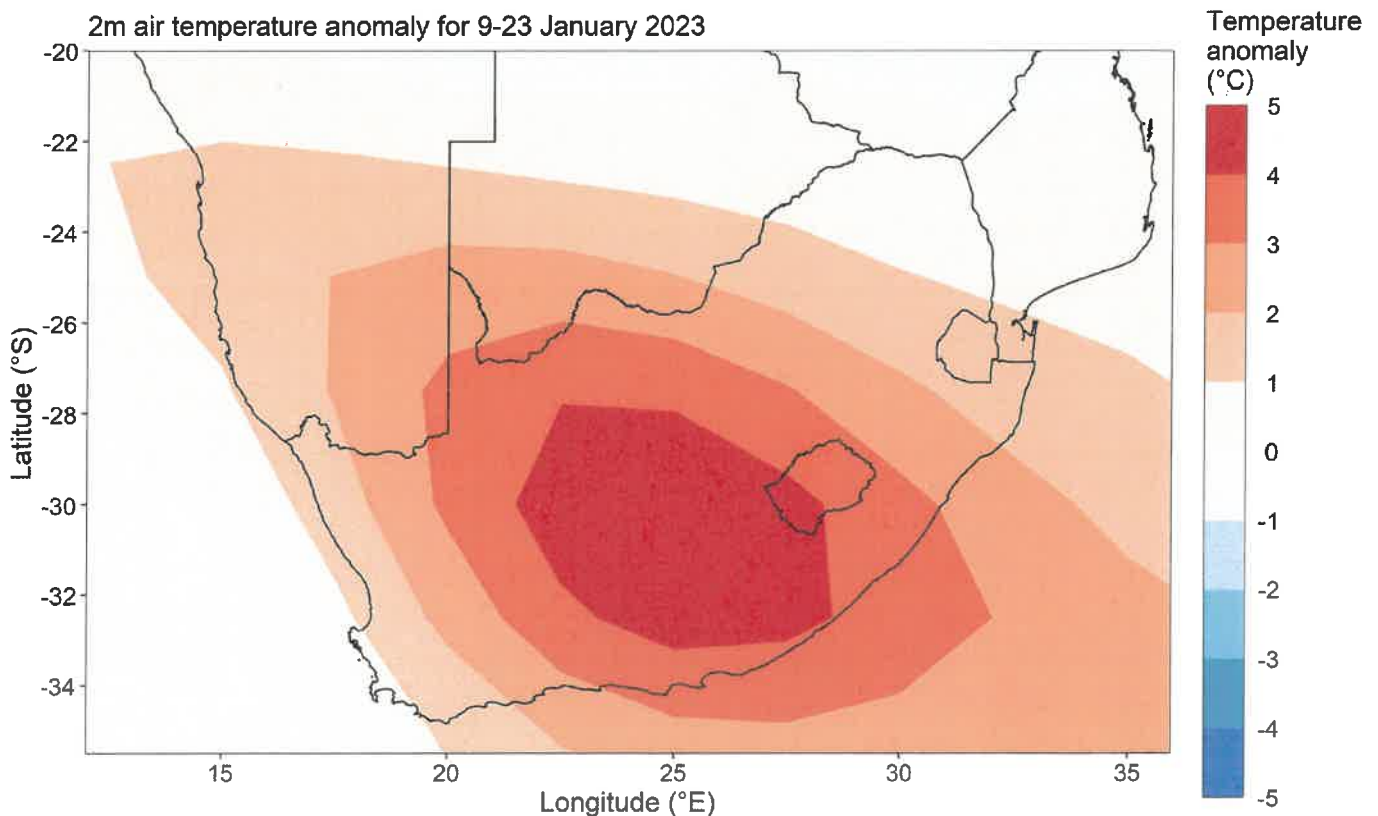


Figure 1: Daily surface air temperature anomalies for 9-23 January derived from the NCEP/NCAR Reanalysis dataset. The anomaly represents the deviation of 9-23 January temperatures from long-term mean temperatures for 1991-2020.

A mid-level high-pressure system, known as the Botswana High, was a driver of the 9-23 January 2023 spell of hot (and dry) conditions. Throughout spring to autumn (i.e., October-April), the Botswana High often dominates the circulation over southern Africa for many days, and it is typically known to cause hot and dry conditions. This is because high-pressure systems are associated with clear skies and sinking air that warms dramatically as it sinks towards the surface. In turn, this causes hot air temperatures as well as dry conditions.

Over southern Africa, research has shown that global warming is driving an increase in the intensity of high-pressure systems, like the Botswana High, and in turn, this is one of the drivers causing increases in the intensity and frequency of very hot days and nights. While we should be hesitant to attribute the 9-23 January hot conditions to human-induced climate change, we must acknowledge this link and that these changes are occurring at alarming rates because much of southern Africa has been (and will continue) warming at above global-average rates. In turn, heat stress occurrences have increased over southern Africa. In the future, the situation is only going to get worse as many more of the southern African population will be exposed to more frequent and intense episodes of heat stress, and according to the 6th Assessment of the Intergovernmental Panel on Climate Change, there is high confidence that thermal-associated morbidity and mortality will increase.

Outlook: 2023/24 extended summer season

At the time of writing, we are moving to the summer season, when concerns of heat stress are prominent. For the upcoming summer season, forecasts suggest a high likelihood of El Niño conditions persisting. Over southern Africa, heat stress occurrences are typically more frequent, widespread, and intense when El Niño conditions coincide with warmer summer months. This is because El Niño events are associated with more common occurrences of high-pressure anomalies (i.e. a stronger than normal Botswana High) that can induce very hot conditions. As such, southern Africa should prepare for hotter conditions, with heat stress occurrences being more frequent, with a wider extent and higher intensities. Conditions might be more unfavourable than what we experienced during 9-23 January 2023 because La Niña conditions dominated global atmospheric circulation patterns at this time, and during

La Niña events heat stress occurrences are typically less frequent, less intense and of smaller extent.

Impacts of heat stress and potential coping strategies: a farmworker perspective

Across southern Africa, farmworkers spend a large proportion of their time working outdoors, often undertaking strenuous work-related tasks, such as land preparation, planting, and harvesting. As a result, farmworkers (and outdoor workers in general) are among those most vulnerable populations to heat stress occurrences. Although we are all at risk to heat stress, their vulnerability is heightened by the fact that there is little that can be done to adapt to and cope with heat stress while working outside during day-time hours. Adjusting outdoor work hours to avoid peak heat hours is, however, one measure that can be adopted to mitigate heat stress. Bearing in mind the farmworker deaths that occurred around 19 January 2023, it is important to document and understand heat stress health impacts and possible measures to alleviate these. Given the health risks, it is also important to acknowledge that those with underlying co-morbidities are more vulnerable. Heat stress occurrences can cause and exacerbate cardiovascular diseases, strokes, severe headaches, asthma, damage to vital organs (like the brain, kidneys, heart and lungs), and decreased metabolic activity – in severe cases heat stress can lead to death.

For an individual exposed to heat stressed situations, it is important to limit exposure to the sun by moving to shade or indoors to a well-ventilated or air-conditioned room, keeping hydrated (with water), avoiding strenuous activities (like excessive manual labour), wearing sun protective clothing, a hat and applying sunblock, and if you feel ill immediately seek medical attention. It is also important to take heed of extreme heat warnings issued by the South African Weather Service. In the context of early warning of heat stress for farmworkers, it is valuable to acknowledge the numerical weather modelling infrastructure that has recently been set up by the Agrometeorology Division at the Agricultural Research Council of South Africa, as this serves as a first step towards early warning.

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