

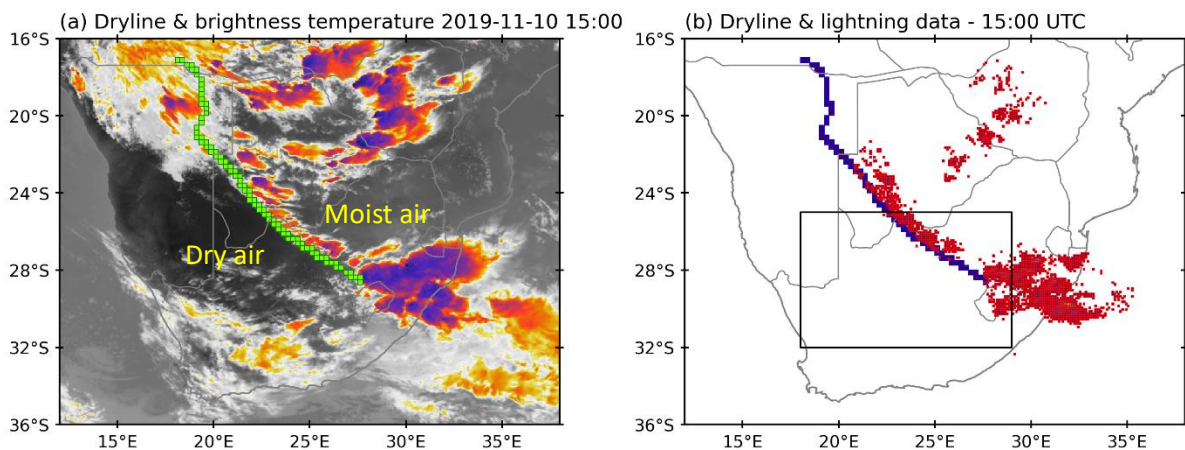
KAPEX 2025 – Chasing drylines across the South African interior



Chris and Lynette with the first installed weather station at Molopo lodge, near the border of Botswana.

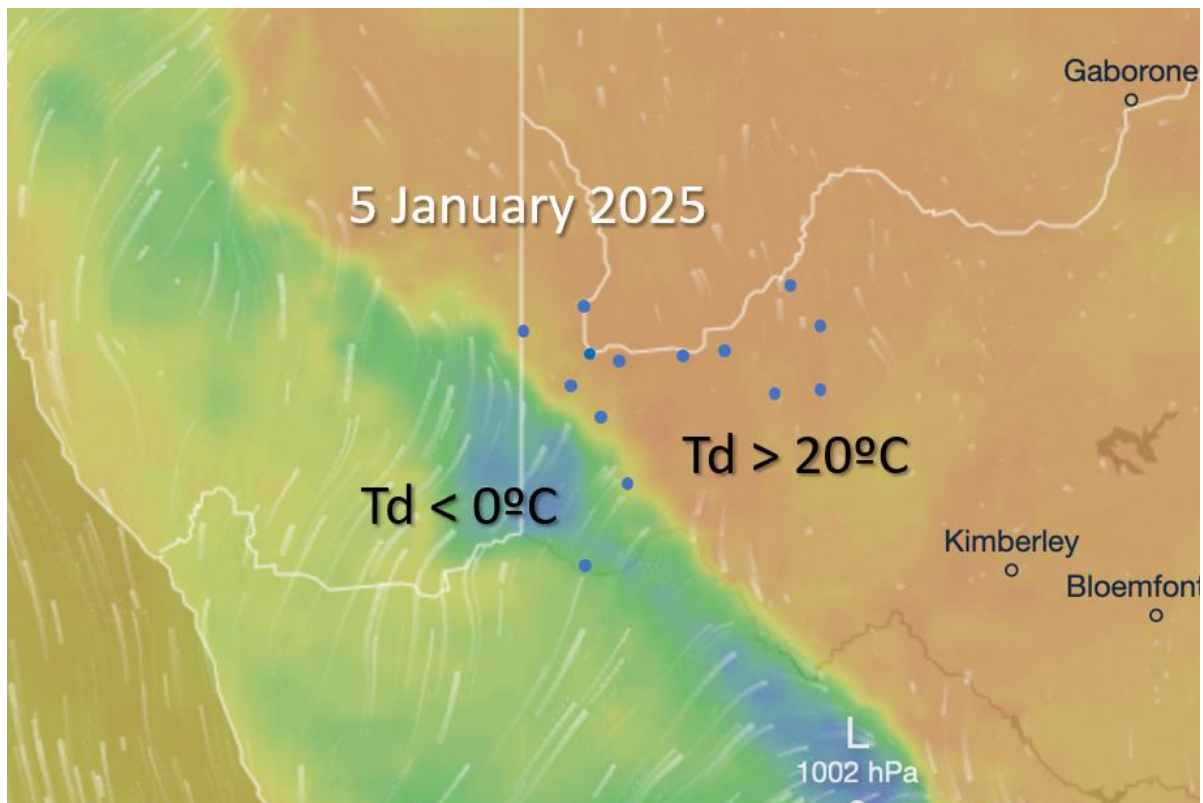
It was an unusual start to the New Year for Prof. Chris Reason and Dr. Lynette van Schalkwyk from the Oceanography Department at the University of Cape Town. Joined by 6 researchers from the Climate Research group of the University of Oxford, they drove thousands of kilometers across the Kalahari, often on dirt roads, in an attempt to make more sense of drylines.

But what are drylines and why are they important? Drylines are found during summer at the interface of a moist airmass, originating from the Indian Ocean, and the ambient dry air over the western southern African plateau.



Left panel - Eumetsat Infrared satellite image showing brightness temperature with the location of the dryline shown in green. Cold temperatures (purple colours) represent strong convection taking place, which can be seen to the east of the dryline (along the moist side). Right panel - the red dots are lightning strikes from the South African Weather Service's lightning detection network, that occurred around the same time the satellite image was taken. It can be seen that a lot of lightning activity occurs right along the dryline on the moist side.

Supervised by Prof. Reason and Dr. Ross Blamey, Dr. Van Schalkwyk has shown in her PhD thesis that drylines play an important part in the development of thunderstorms in central South Africa. Very little is known about drylines in South Africa, which is partly because there are very little observations of these features. This was something the 2025 Kalahari Atmospheric Processes Experiment (KAPEX 2025) aimed to address by establishing a network of weather stations in the data sparse Kalahari region and to collect in situ data on both the dry and moist side of drylines. Fourteen VOX Tornado Twister weather stations were installed between 31 December 2024 and 12 January 2025. During this period altogether 40 weather balloons, with radiosondes attached to them, were released and instrumented vehicle drives permitted transects of 4 drylines at favourable times of day.



Blue dots indicate the location of newly erected weather stations, concentrated in a region where drylines occur regularly in summer. Colours represent dewpoint temperatures of the ICON weather prediction model and shows a sharp boundary between very dry air (blue colours to the west) and very moist air (orange colours to the east) on 5 January at 20:00 SAST.



Lynette and Alice prepare for an ascent: drylines are most intense at night and dryline measurements were either made overnight or in the pre-dawn hours of the day. Here, radiosonde weather balloons are used to measure the vertical conditions of the atmosphere when a dryline occurs.

The weather data collected from the station network will be used to improve our understanding of dryline movement and intensity, but can also be used to study the impact thunderstorms have on localised rainfall and wind speeds in a data sparse region where storm impacts often go unnoticed.

This was illustrated on 2 February when wind damage was reported after a severe thunderstorm passed through Augrabies. One of the recently installed weather stations located nearby, measured wind gusts of 106km/h!



Storm damage in Augrabies on 2 February 2025. Photo from Reëval in SA's Facebook page: <https://www.facebook.com/groups/reenvalsa/permalink/9138803042901031/>

People living in the Kalahari region are faced with many climate-related challenges such as low and extremely variable rainfall, extreme heat and occasional severe thunderstorms. Accurate observation data and improved monitoring and forecasting of drylines and potential associated thunderstorms is a high priority.



The KAPEX 2025 campaign crew in front of a recently installed weather station: From left to right: Chris Reason, Lynette van Schalkwyk, Alice Jardine, Richard Washington, Alex Henry, Callum Munday, Kitty Attwood and Charlie Knight