

## VERTICAL ANALYSIS OF ATMOSPHERIC TEMPERATURE ANOMALIES AT DAVIS STATION, ANTARCTICA (68.6°S; 78°E)

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### INTRODUÇÃO

Antarctica plays a crucial role in the global climate system, being particularly sensitive to atmospheric changes. The East Antarctic region exhibits complex interactions between stratospheric and tropospheric dynamics, influenced by stratospheric ozone variations and large-scale atmospheric circulation (Choi et al., 2024).

### OBJECTIVE

The objective of the study was to analyze temperature anomalies and climate trends in the vertical atmospheric profile (30-1013 hPa) at Davis Station, Antarctica (68.6°S; 78.0°E), during the period 1977-2024.

### METHODOLOGY

Monthly temperature data were used to calculate annual means at 10 pressure levels.

The data were obtained from the British Antarctic Survey's READER digital archive.

The anomalies ( $A(t)$ ) were calculated relative to 2024.

$$A(t) = T(t) - T_{ref} \quad (1)$$

The non-parametric Mann-Kendall test ( $S$ ) was used to verify temperature trends (Mann, 1945; Kendall, 1975).

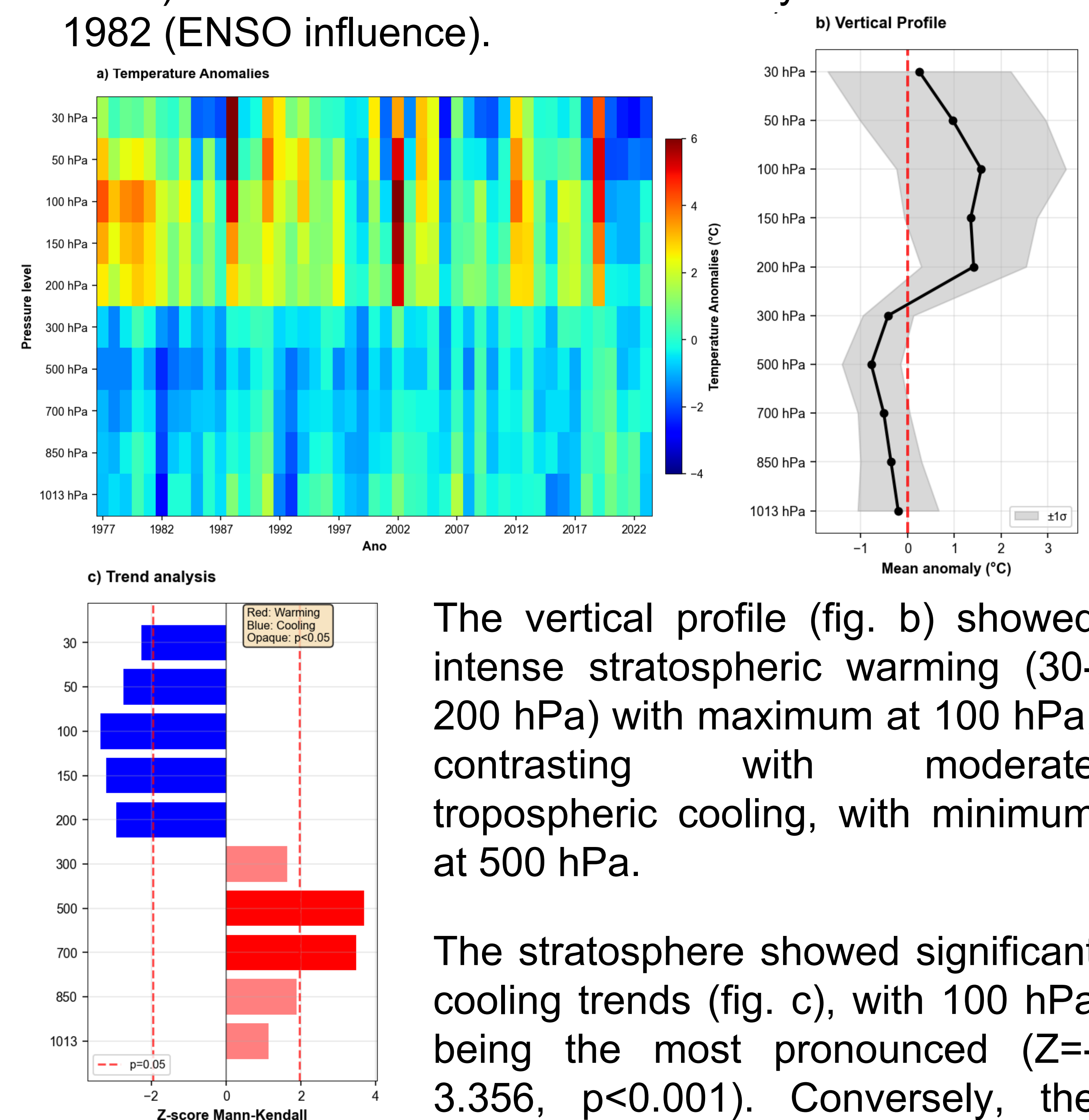
$$S = \sum_{i=n}^{n-1} \sum_{j=i+1}^n \text{sgn}(x_j - x_i) \quad (2)$$

Study area: Davis Station, Antarctica



### RESULTS

Temperature extremes at 100 hPa with anomaly (fig.a) of +6.3°C in 2002 (associated with stratospheric event) and at 1013 hPa with anomaly of -2.6°C in 1982 (ENSO influence).



The vertical profile (fig. b) showed intense stratospheric warming (30-200 hPa) with maximum at 100 hPa, contrasting with moderate tropospheric cooling, with minimum at 500 hPa.

The stratosphere showed significant cooling trends (fig. c), with 100 hPa being the most pronounced ( $Z=-3.356$ ,  $p<0.001$ ). Conversely, the middle troposphere (500-700 hPa) showed significant warming, with significant trends 500 hPa exhibiting the strongest at 70% of the trend ( $Z=+3.687$ ,  $p<0.001$ ).

levels.

### FINAL CONSIDERATIONS

This study demonstrates stratified climate changes in East Antarctica, with stratospheric warming (+1.575°C) and tropospheric cooling (-0.778°C), showing opposite trends at 70% of atmospheric levels ( $p<0.001$ ).

The results advance knowledge of Antarctic vertical atmospheric dynamics, establishing Davis Station as a key indicator for climate policies and polar monitoring.

### REFERENCES

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- Kendall, M. G. (1975). *Rank Correlation Methods* (4th ed.). London: Charles Griffin.