

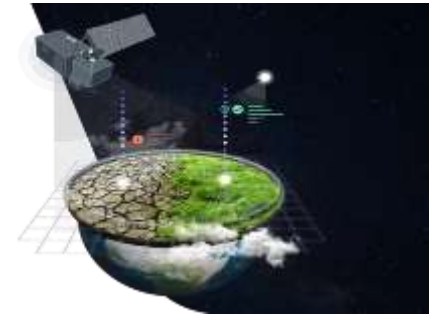
Spatio-temporal monitoring of soil moisture as an indicator of drought patterns in the Tyume catchment using remote sensing techniques

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Introduction

- Droughts are extended periods of low precipitation that result in water scarcity (Mukhawana et al. 2023).
- Drought affects environmental, social and economic factors.
- Soil moisture as an indicator of drought patterns.
- Conventional methods of soil moisture monitoring
- Remote sensing has recently demonstrated the ability to offer real-time soil moisture data (Yuan et al. 2022).



Aim and objectives

This study was aimed at assessing drought severity patterns based on soil moisture assessment.

Objectives:

- To assess the extent to which soil moisture content changed over the period between the year 1999 and the year 2023
- To determine the relationship between soil moisture and precipitation patterns in the Tyume catchment

Study area description

- This study was conducted in the Tyume Catchment located in the Nkonkobe local municipality in the Eastern Cape Province of South Africa (Sibanda et al. 2012).
- The Tyume catchment also feeds the Binfield Park Dam which is used as a source of water in some of the areas.
- The Tyume catchment is situated at $32^{\circ}47'17''\text{S}$ $26^{\circ}50'31''$ and $32^{\circ}55'6.98''\text{S}$ $26^{\circ}85'09.7''\text{E}$

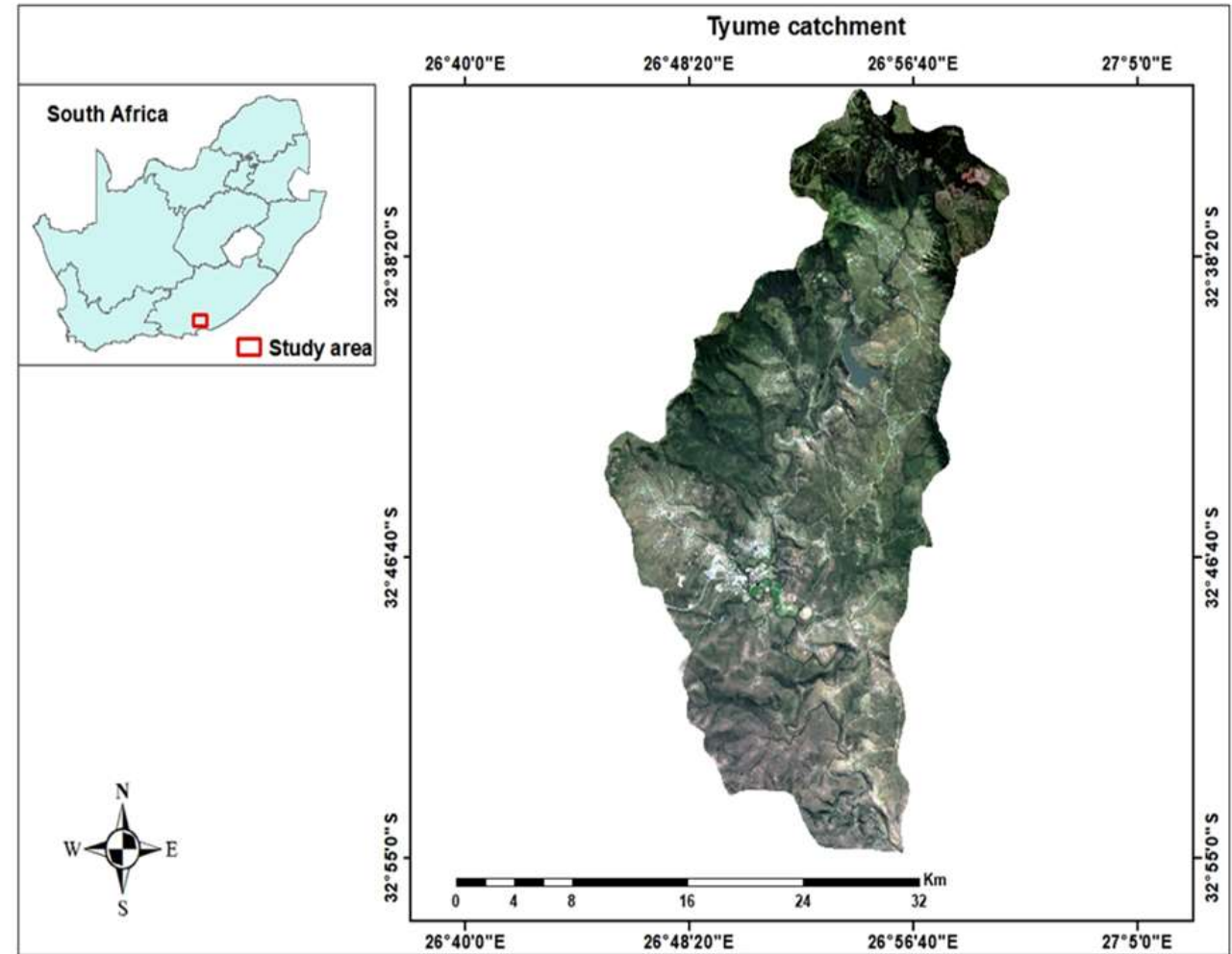


Figure 1: Locality map

Methods and Material

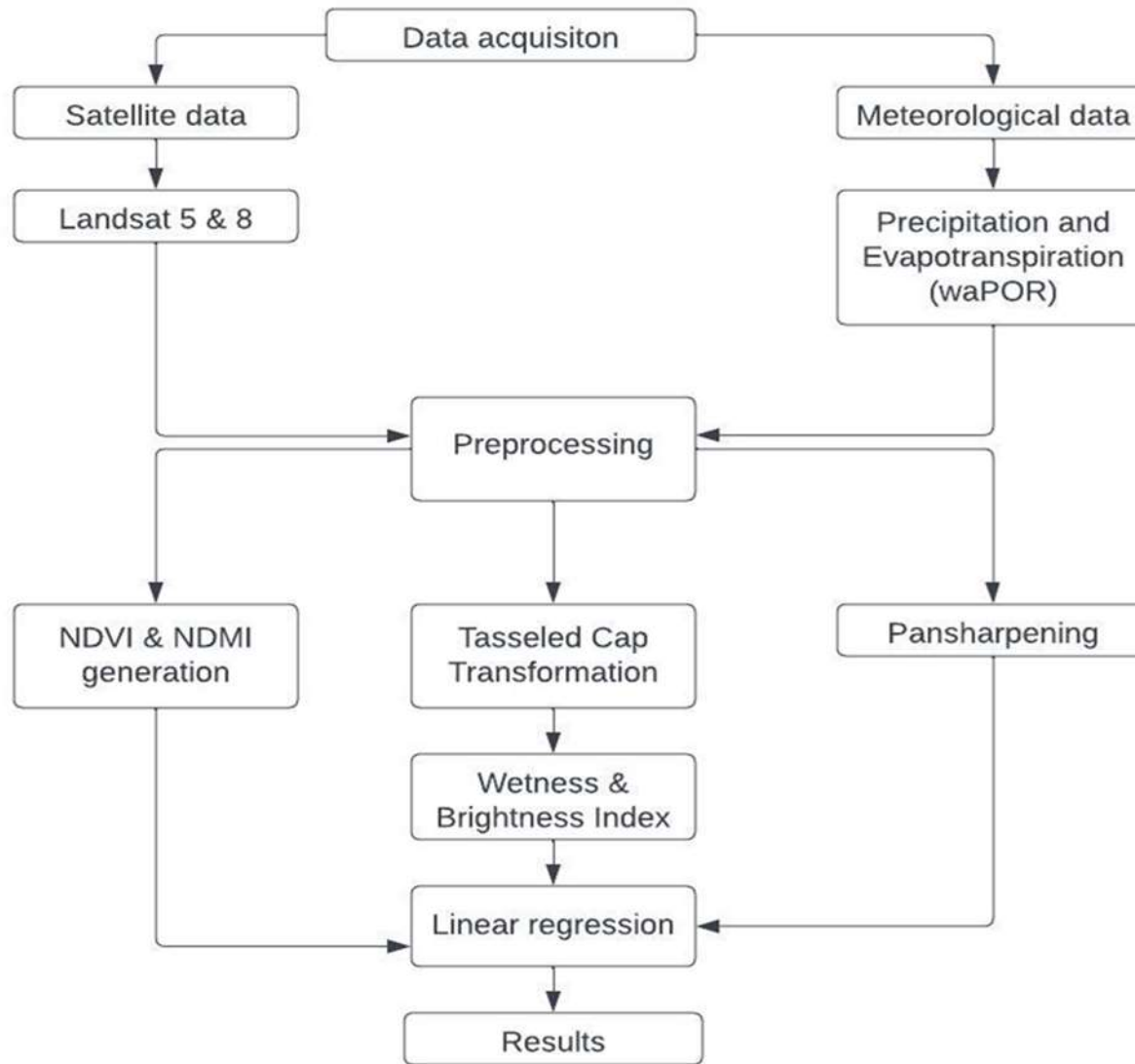


Figure 2: Methodology flow chart

Results

- Tyume catchment had dry conditions in 2015 and moderate in 2023
- The results reported relatively high accuracy in wetness and brightness index ($r^2 > 0.7$)

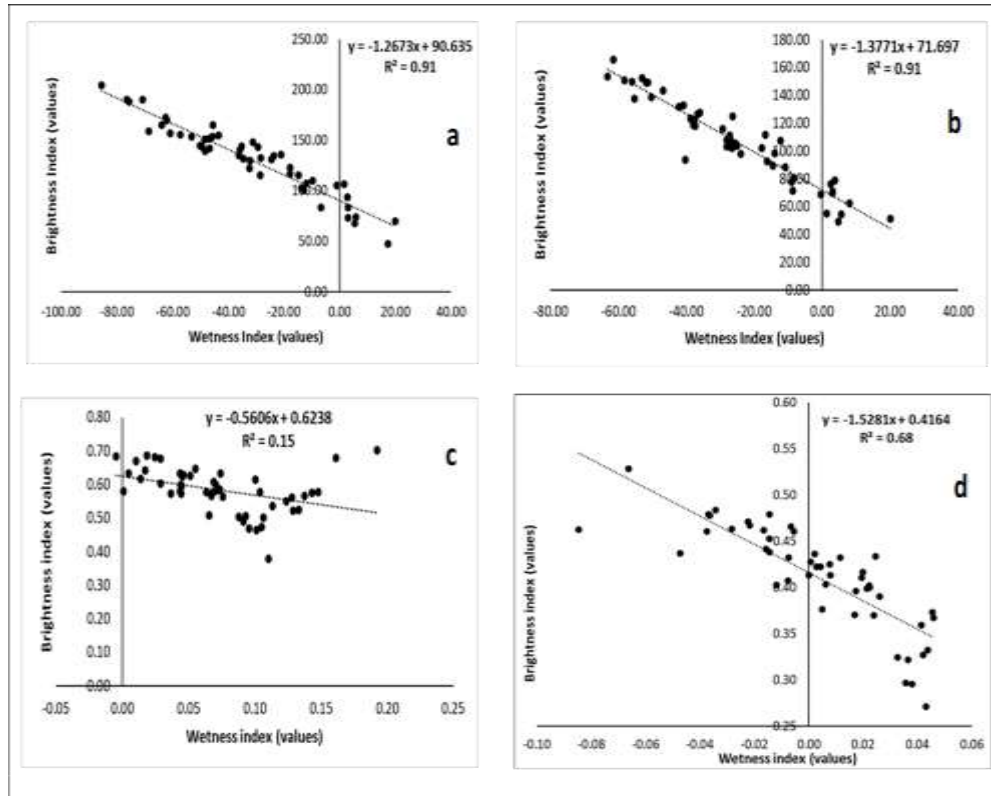


Figure 3: TCT Prediction accuracy

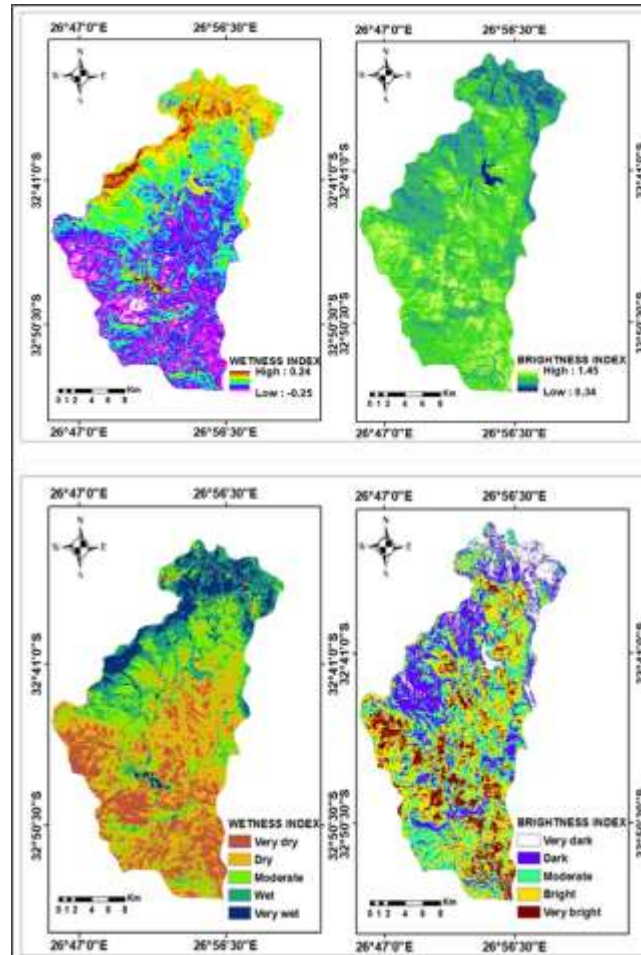


Figure 4: Wetness and Brightness Index 2015

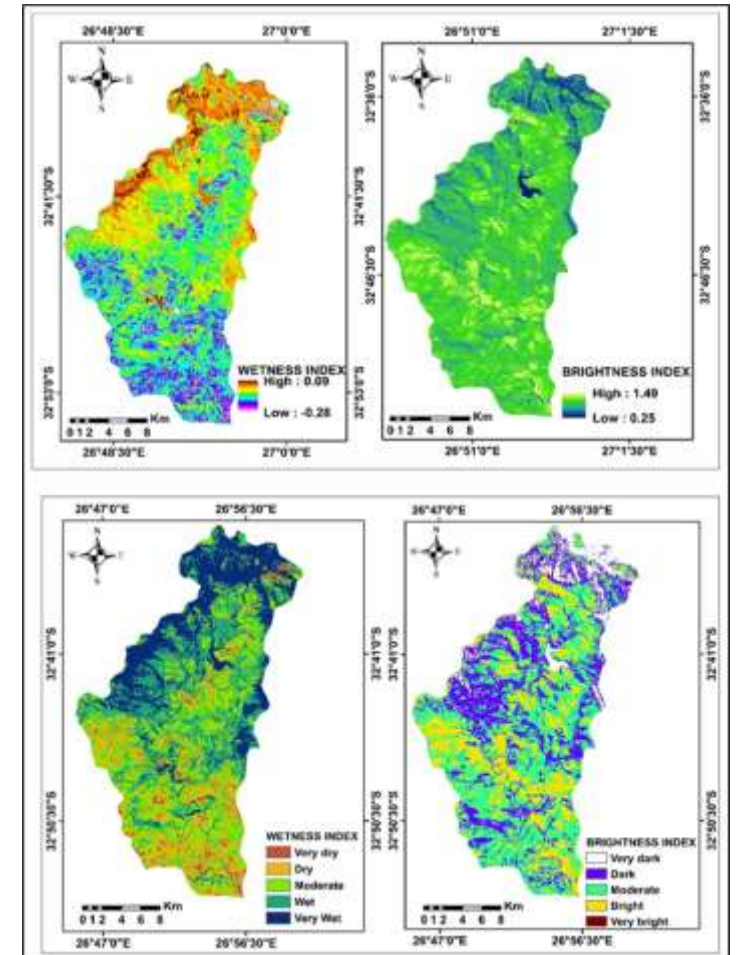


Figure 5: Wetness and Brightness Index 2023

Results cont...

- The years 1999 and 2015 experienced drought patterns

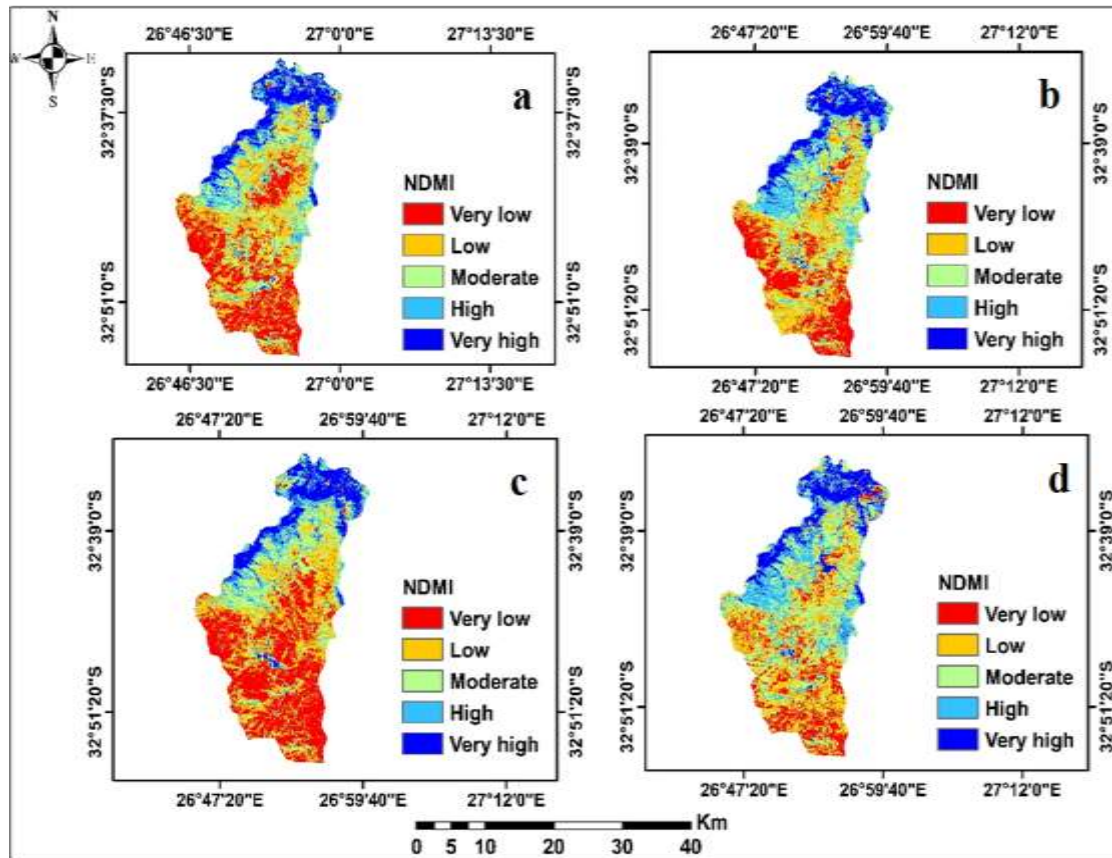


Figure 5: Drought severity maps (a, 1999: b, 2009: c, 2015 and d, 2023)

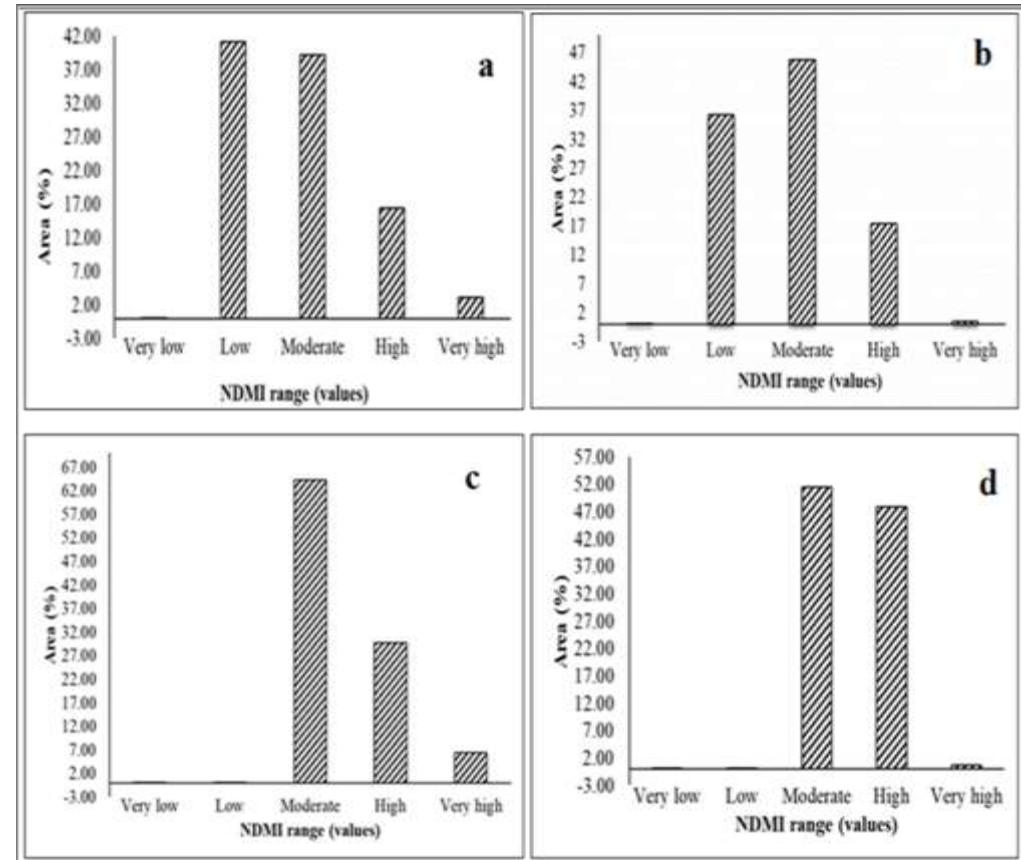


Figure 6: Tyume drought area extent

Discussion and conclusion

- The tasselled cap transformation components results reveal that wet soil appears darker and is less reflective than dry soil with $r^2 > 0.7$
- The vegetation and soil moisture indices demonstrated significant importance in drought patterns.
- There is no significant relationship between precipitation patterns and soil moisture content.
- The findings of this study address gaps in the current literature by introducing concepts for improved soil moisture assessment.

References

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Thank You!



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