

Land Cover Change Modulates River Flow Response to Climate Variability in Central Chile

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Land cover change drives streamflow decline more strongly than *El Niño Southern Oscillation variability in central Chile

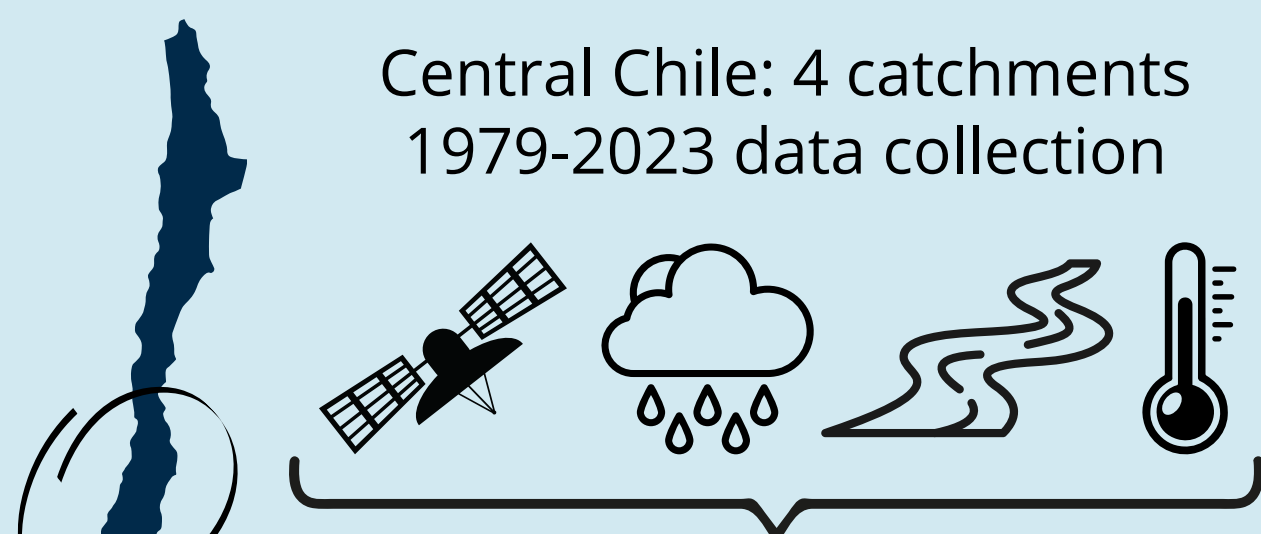
Why does this matter?

- Streamflow declines are increasing in Mediterranean regions
- Climate variability (*ENSO) may mask land cover effects
- The role of native forests vs exotic plantations remains unclear

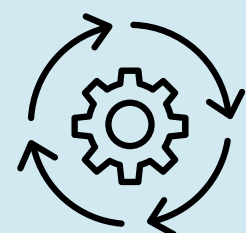
How do land cover change and ENSO variability jointly influence streamflow dynamics?

Methods

Central Chile: 4 catchments
1979-2023 data collection



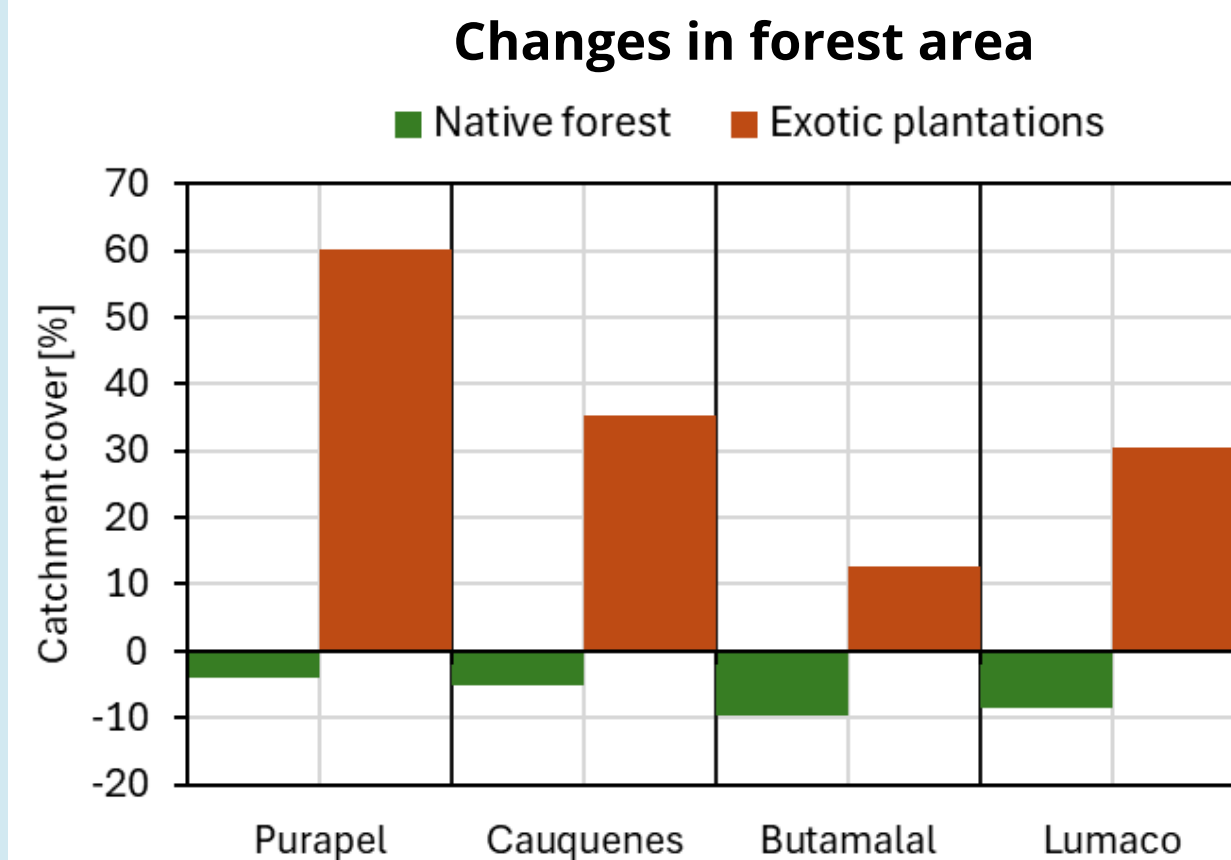
Statistical analysis



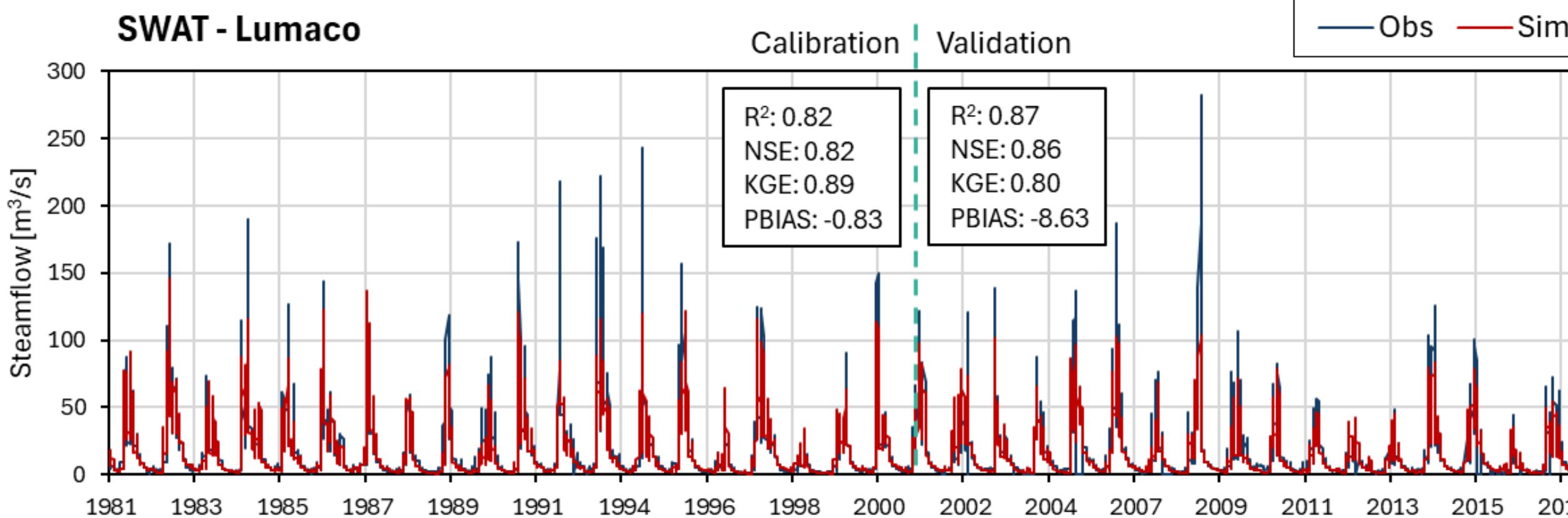
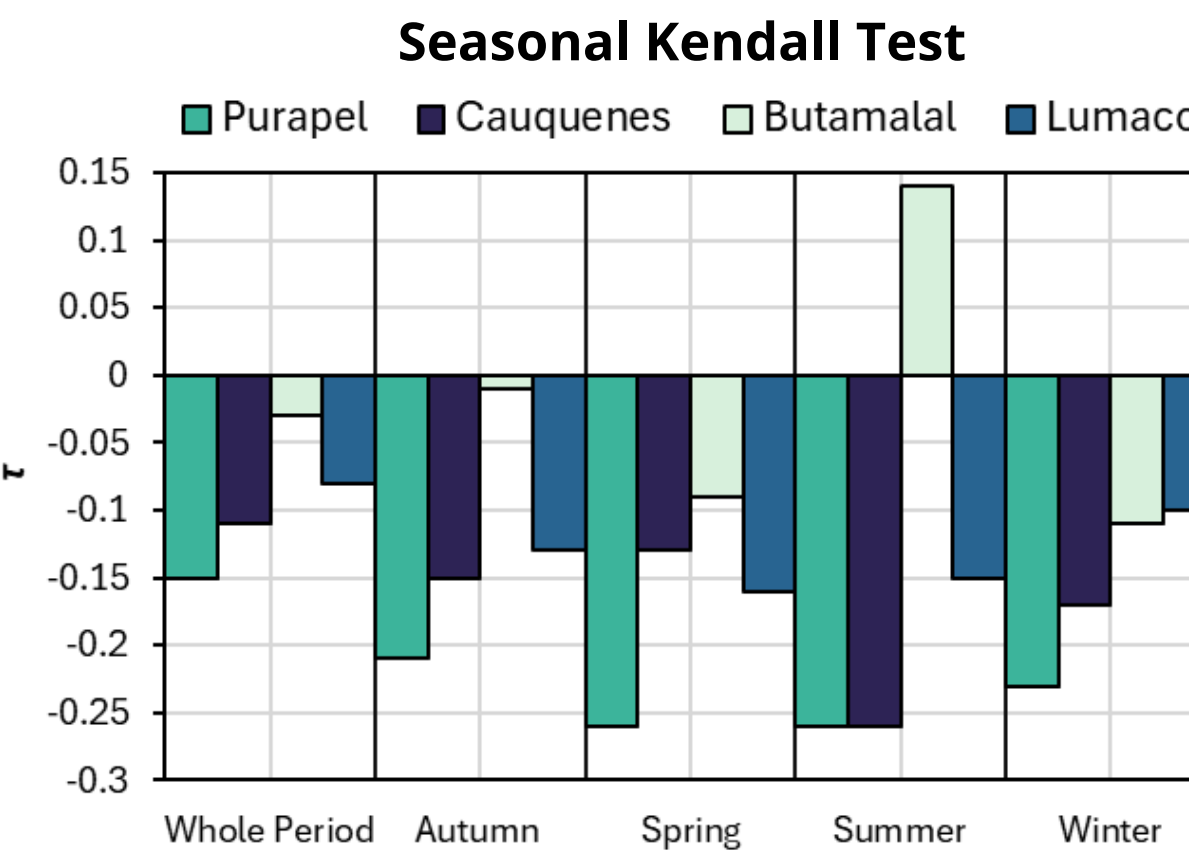
Process-based Hydrological Modelling

SWAT

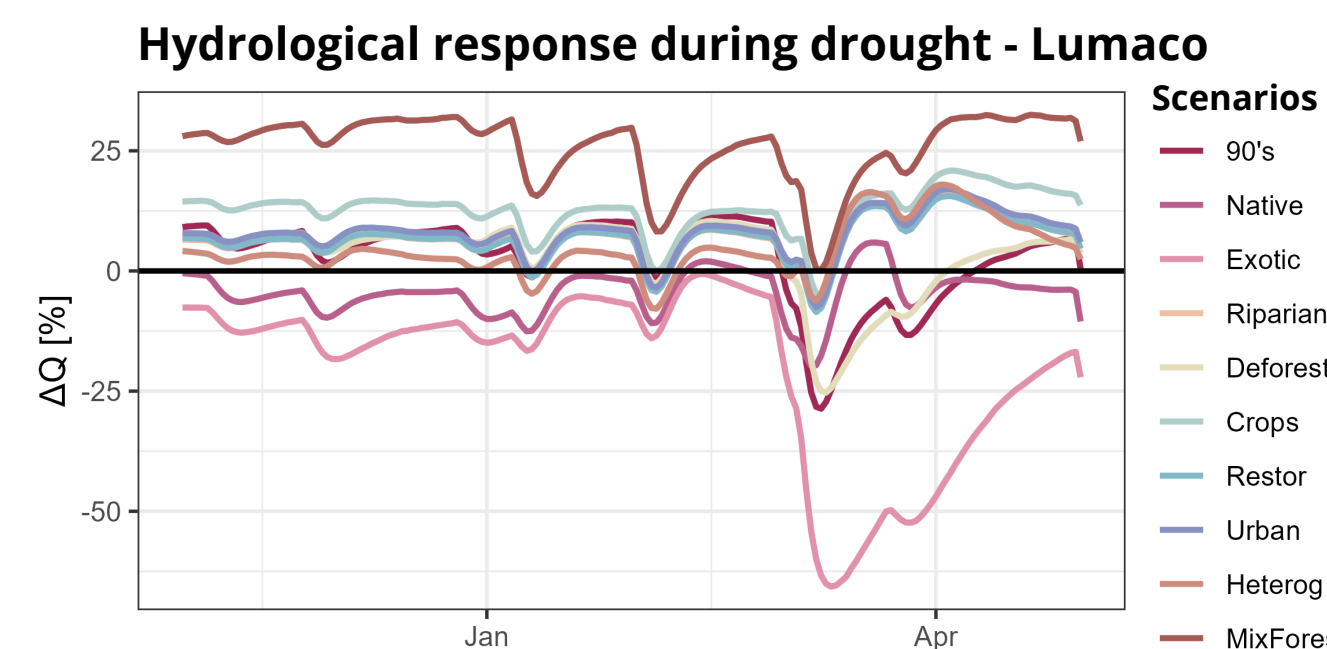
- Seasonal Kendall Test
- Multiple Linear Regression



Land cover-ENSO interactions explained streamflow variability ($R^2 = 0.45-0.61$) far better than ENSO alone (mean $R^2 \approx 0.02$).



SWAT simulations reproduced observed streamflow dynamics with satisfactory performance.



Scenario-based simulations are currently being used to explore the hydrological impacts of contrasting vegetation cover during drought and flood periods during ENSO phases.

Key findings

- Native forest loss reduces baseflow and summer water availability
- Exotic plantations expansion reduce hydrological efficiency (Q/PP)
- ENSO modulates but does not directly drive streamflow changes

Implications

- Land cover change can amplify drought impacts
- Native forests enhance hydrological resilience
- Land management is key for water security

ABSTRACT- OSPP



Read more about this work:



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