A probabilistic assessment for future precipitation according to ENSO predictions

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Introduction

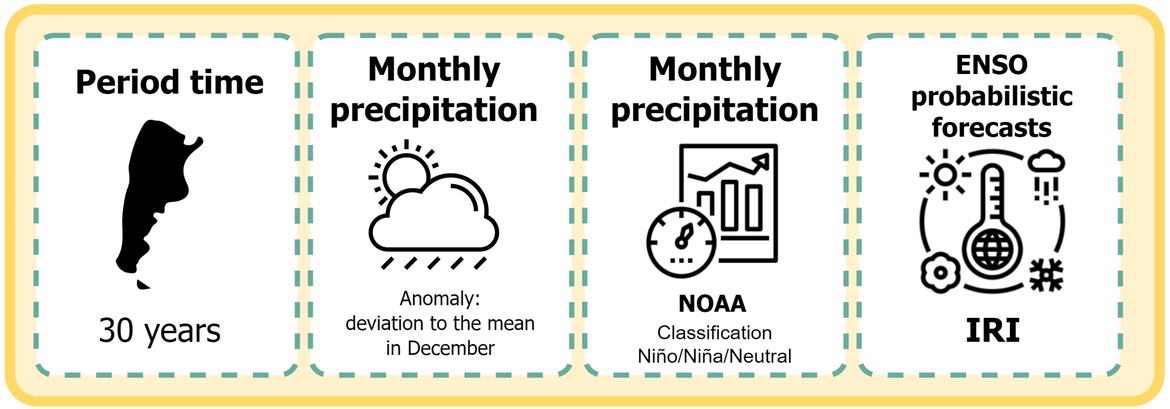
Water availability around flowering is one of the most important factors modulating corn (*Zea mays* L.) **yield** in rainfed cropping systems. Thus, precipitation forecasts during this period are relevant for agronomic management.

Objectives:

- Design a model that integrates weather data with ENSO probabilistic forecasts.
- Develop location-specific assessments of future precipitation.

Methods

1. Data sources



2. Model fitting

Data were fitted to a hierarchical Bayesian model:

$$y_i \sim N(\mu_i, \sigma_i^2)$$

$$\mu_i = \beta_{NEU} \cdot z_{1i} + \beta_{NINO} \cdot z_{2i} + \beta_{NINA} \cdot z_{3i}$$

$$z_{1i} = \begin{cases} 1, & \text{if December is Neutral} \\ 0, & \text{otherwise} \end{cases} \qquad z_{3i} = \begin{cases} 1, & \text{if December is Nino} \\ 0, & \text{otherwise} \end{cases}$$

$$z_{2i} = \begin{cases} 1, & \text{if December is Nina} \\ 0, & \text{otherwise} \end{cases} \qquad \sigma_i^2 \sim \text{half-student-t}(3, 0, 43.8)$$

3. Forecasting

Posterior distributions were merged with IRI probabilistic forecasts.

Results

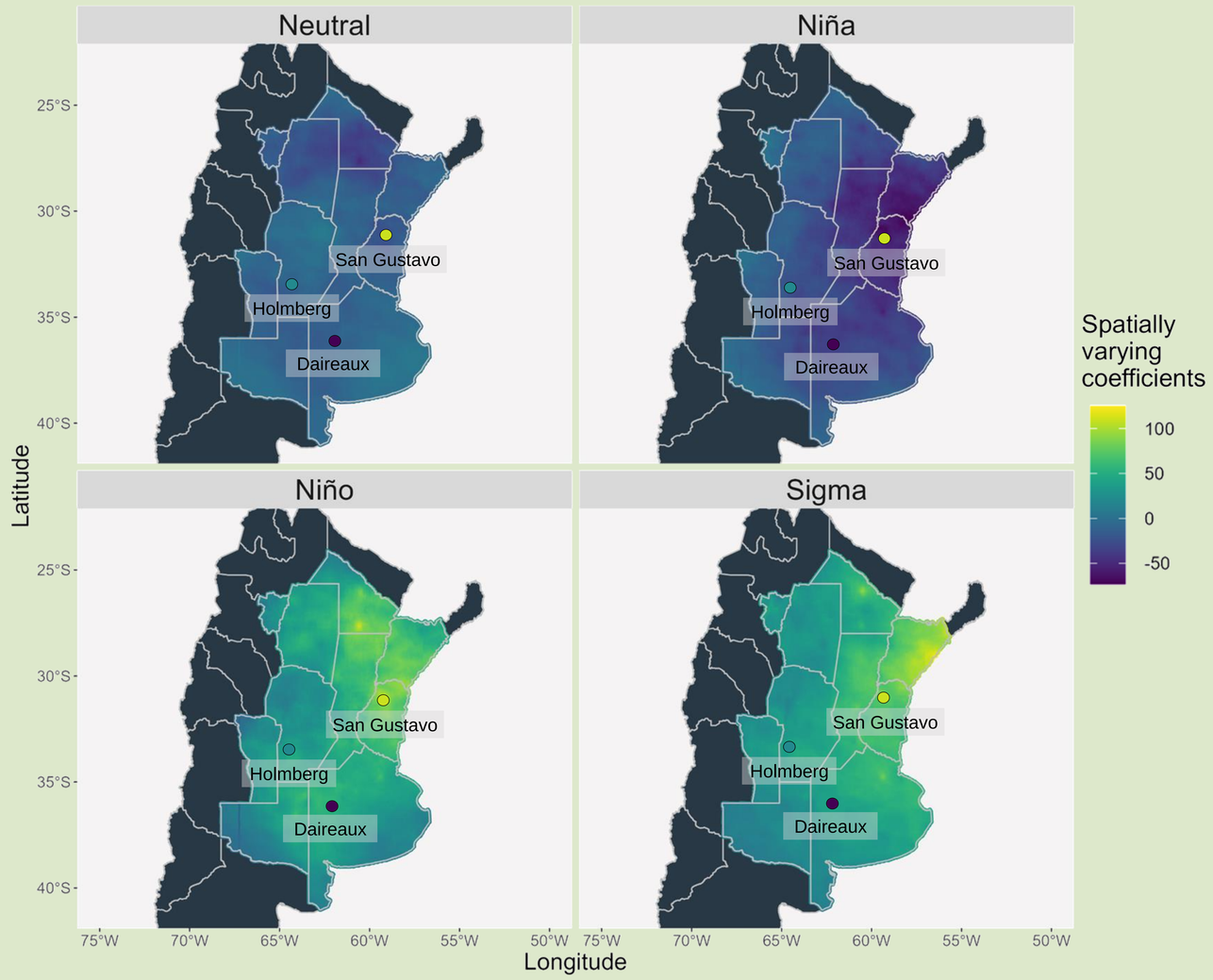


Figure 1. Spatially varying coefficients reflecting spatial differences in precipitation for a Niño, Niña, or Neutral year according to their ENSO classification in the trimester centered in December.

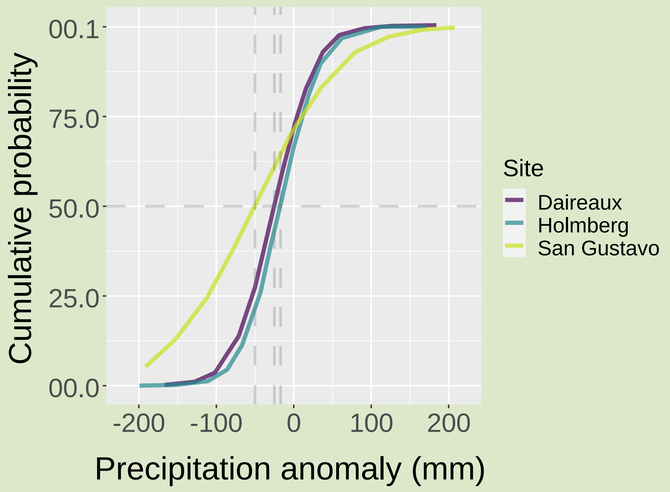


Figure 2. Cumulative probability (30-yr) of precipitation anomaly in three locations under different ENSO conditions.

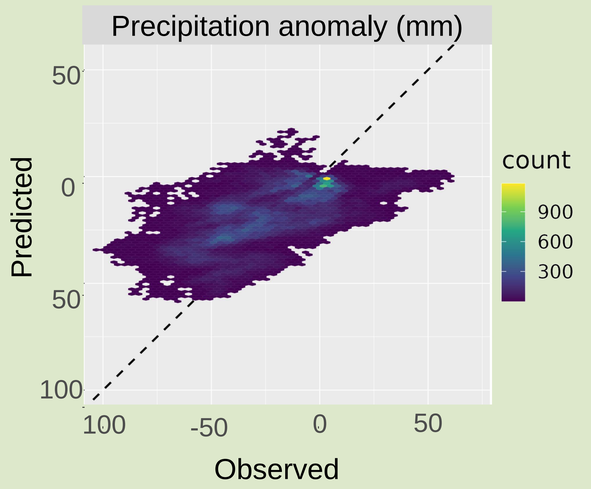


Figure 3. Observed versus predicted differences in precipitation for all locations. Dashed line indicates x=y.`

Conclusions

- **Applications**: water-restricted environments, and to build probabilistic tools to assist management decisions.
- **Future work**: integrate weather and crop data in a single model for management decisions.

Read more at: