



Forecast potential of precipitation for drought management in central-northern Chile

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International hydrological programme



Ministry of the Flemish Community
Science and Innovation Administration

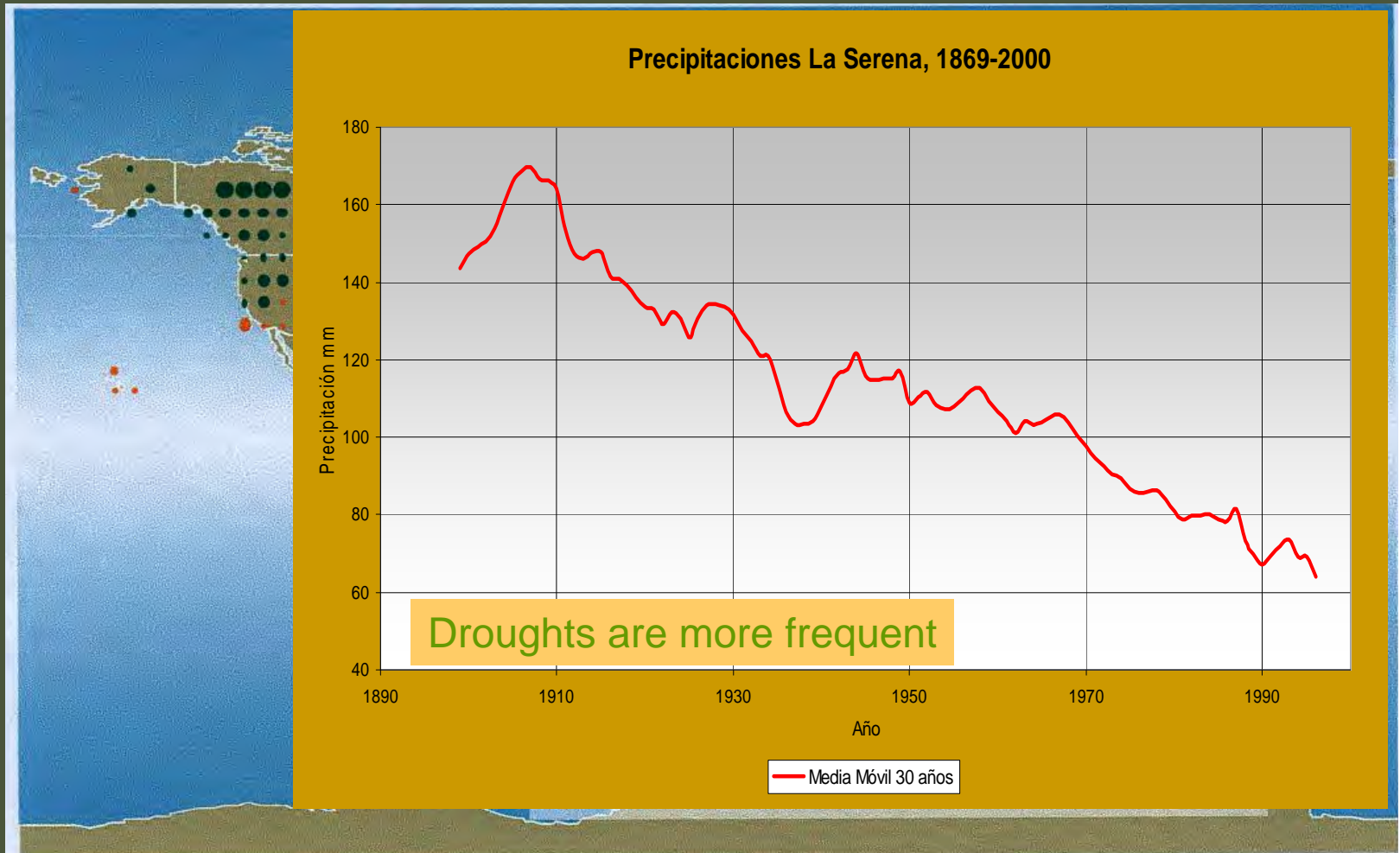


GOBIERNO DE CHILE
DIRECCION GENERAL DE AGUAS

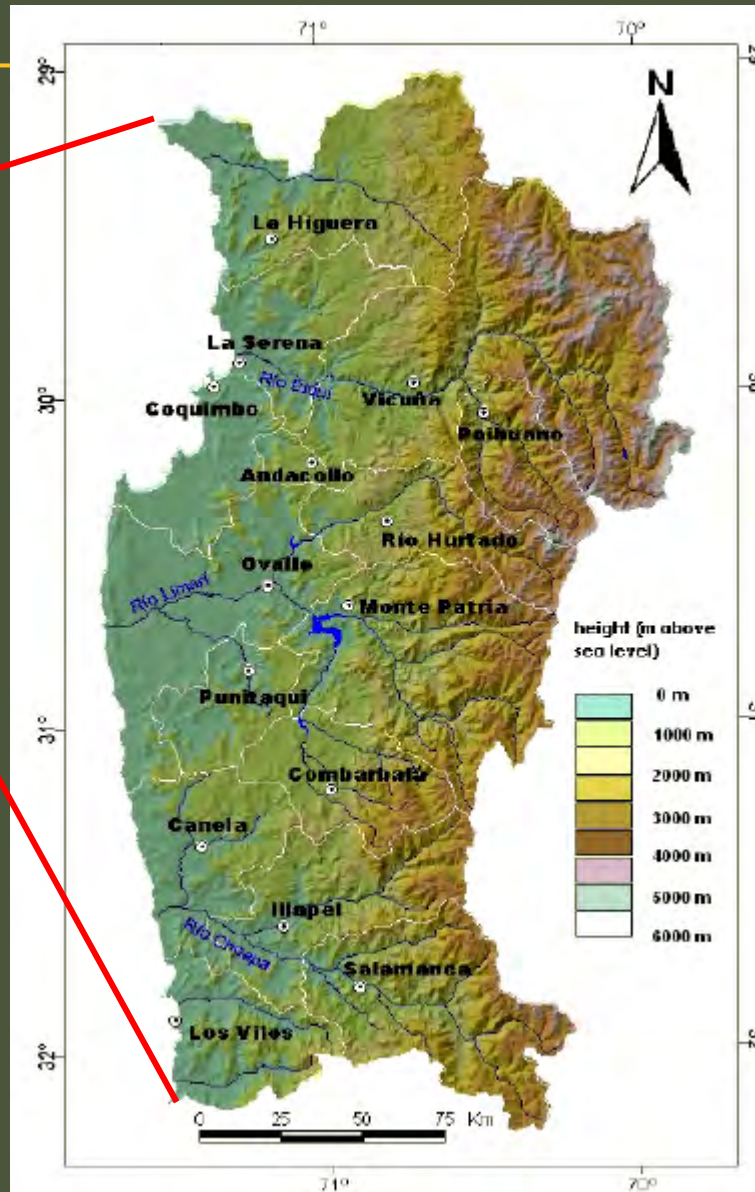
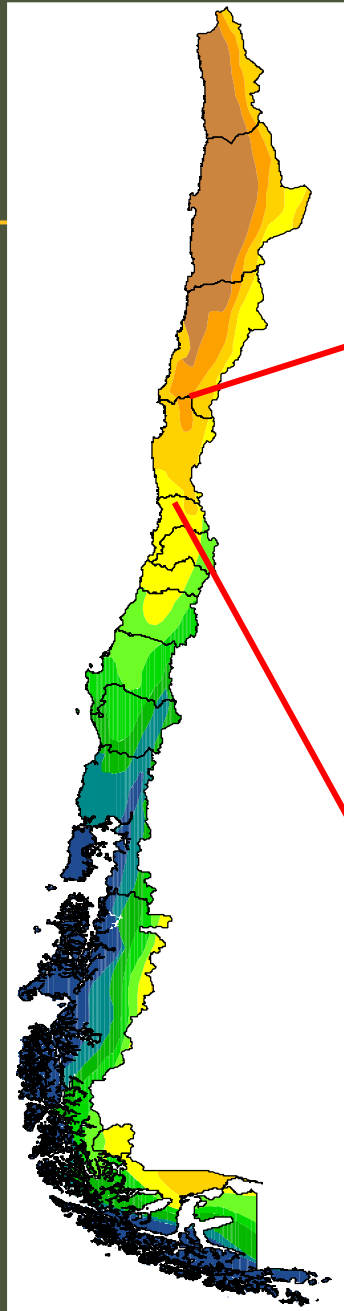


What is the problem?

→ Important decrease in rainfall in Northern Chile in the last 100 years



Study Area – the IVth Region of Chile

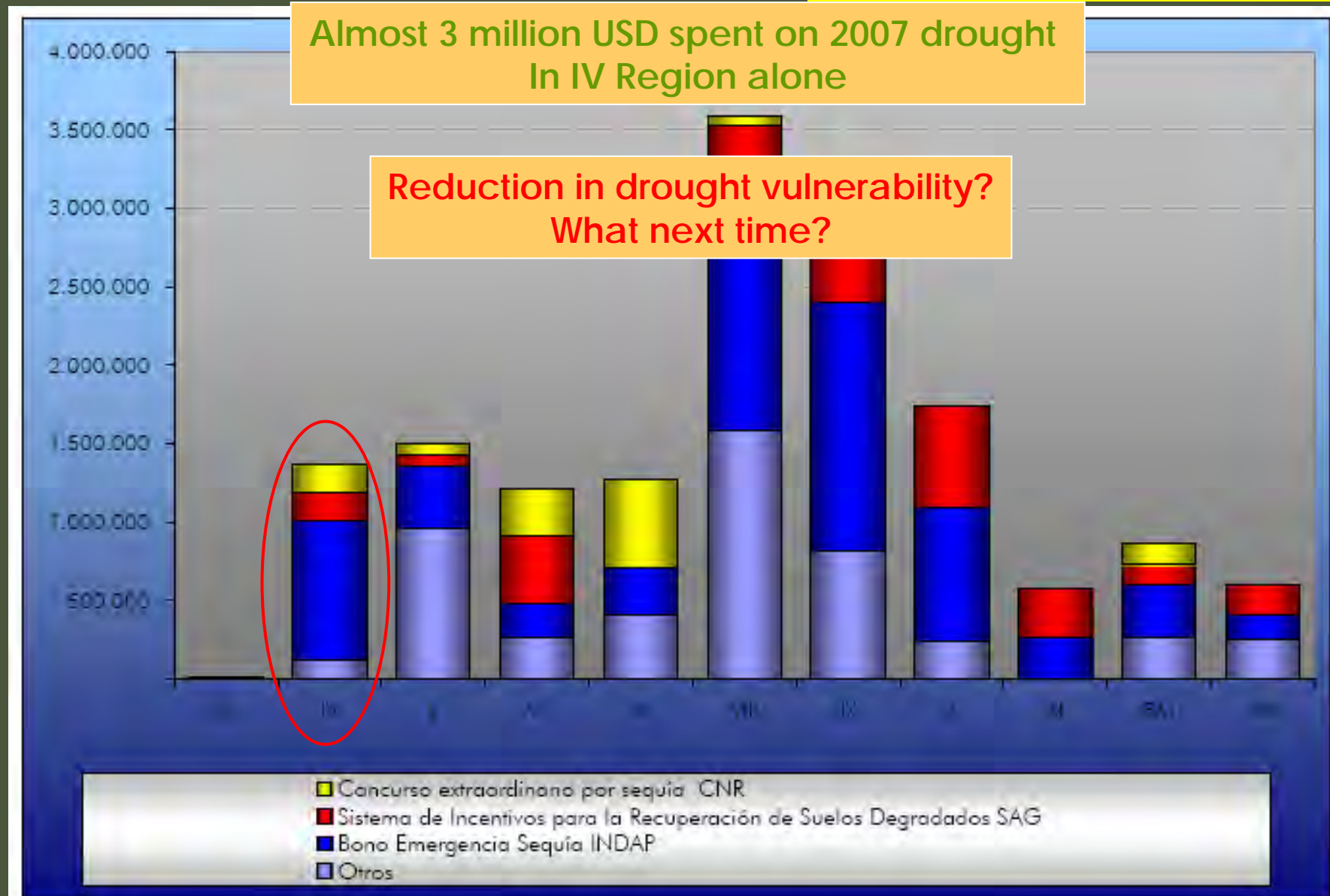


Cuenca Elqui

Cuenca Limarí

Cuenca Choapa

Why predict rainfall and manage climatic risks?



Why predict rainfall and manage climatic risks?

FOSIS 2007: Help needed by 16.307 rural families

Problem reported	% of families
Lack of water for irrigation	86
Lack of water for personal health care	86
Lack of water for cooking and consumption	85
Harvest losses of crops for personal consumption	73
Not able to seed new crops due to water deficit	68
Harvest losses of cash crops	42
Cattle diseases due to water deficit	39
Animals died due to water deficit	24

Need to reduce climatic vulnerability!

Climate Risk Management

1. Identify Vulnerabilities to Climate Variability

2. Reduce Uncertainties

Provide Relevant Information

(ex. Seasonal probability: “good” or “bad” year)

3. Identify Technologies that reduce the Vulnerability

(Diversify, water storage, irrigation, etc.)

4. Political or Institutional Interventions to

Reduce or Transfer the risks

(subsidies, insurances)



Climate Risk Management

2. Reduce Uncertainties

Provide Relevant Information:

Analyses of the **PAST** (Drought Atlas, etc.)

Monitoring the **PRESENT** situation (climate, vegetation, Soil humidity, diseases, etc.)

Release relevant information on **FUTURE** climate (precipitation and discharges)



Why we want to predict precipitation?

Example: What is the average rainfall in the Region?

It can be expected that rainfall will never
behave as the 64-year average

The average has a Probability = 0

**Is there any information
with a Probabilidad > 0 ??**

Probabilistic Climatic Predictions

Drought Prediction

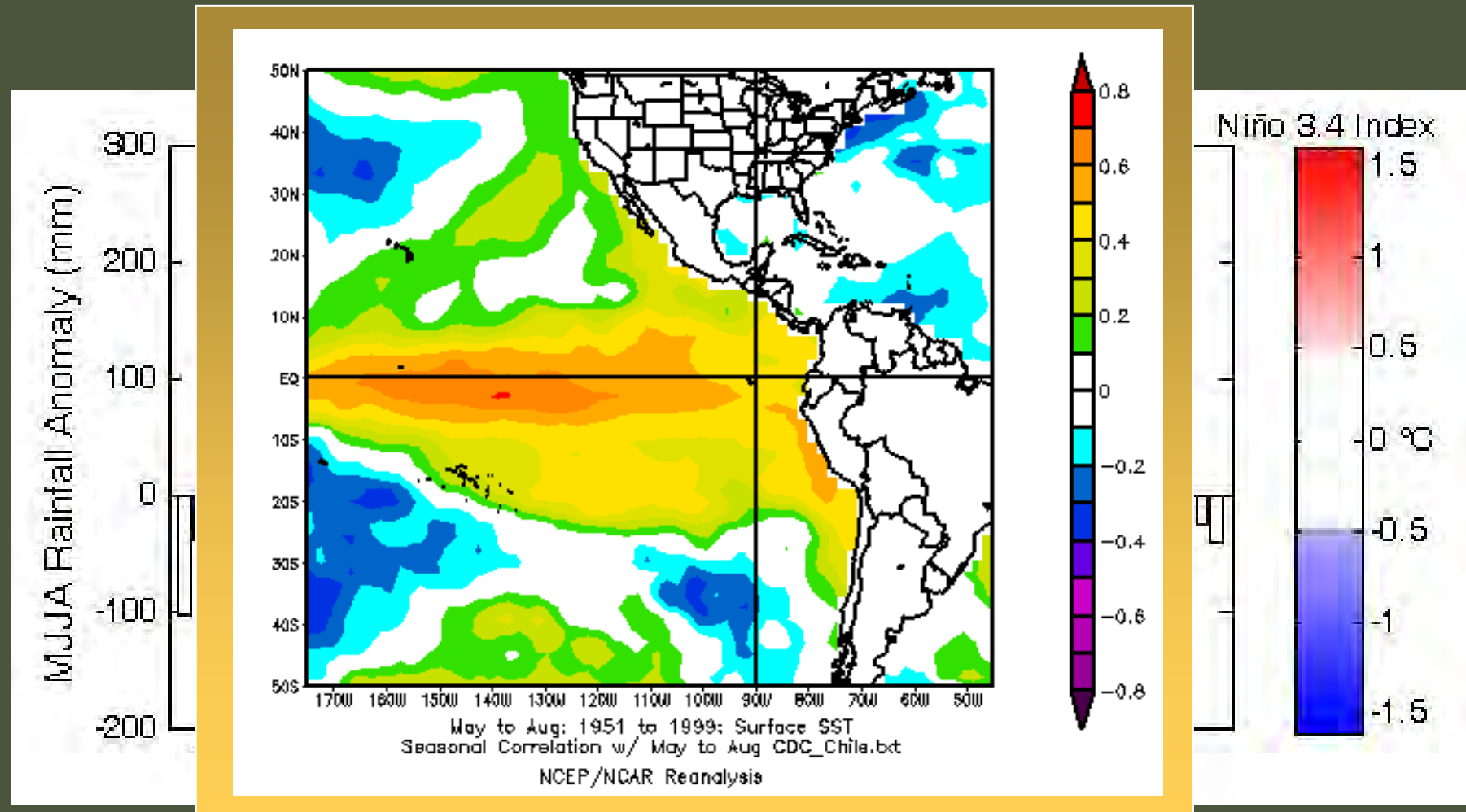


Predicting Rainfall Patterns



Drought Prediction

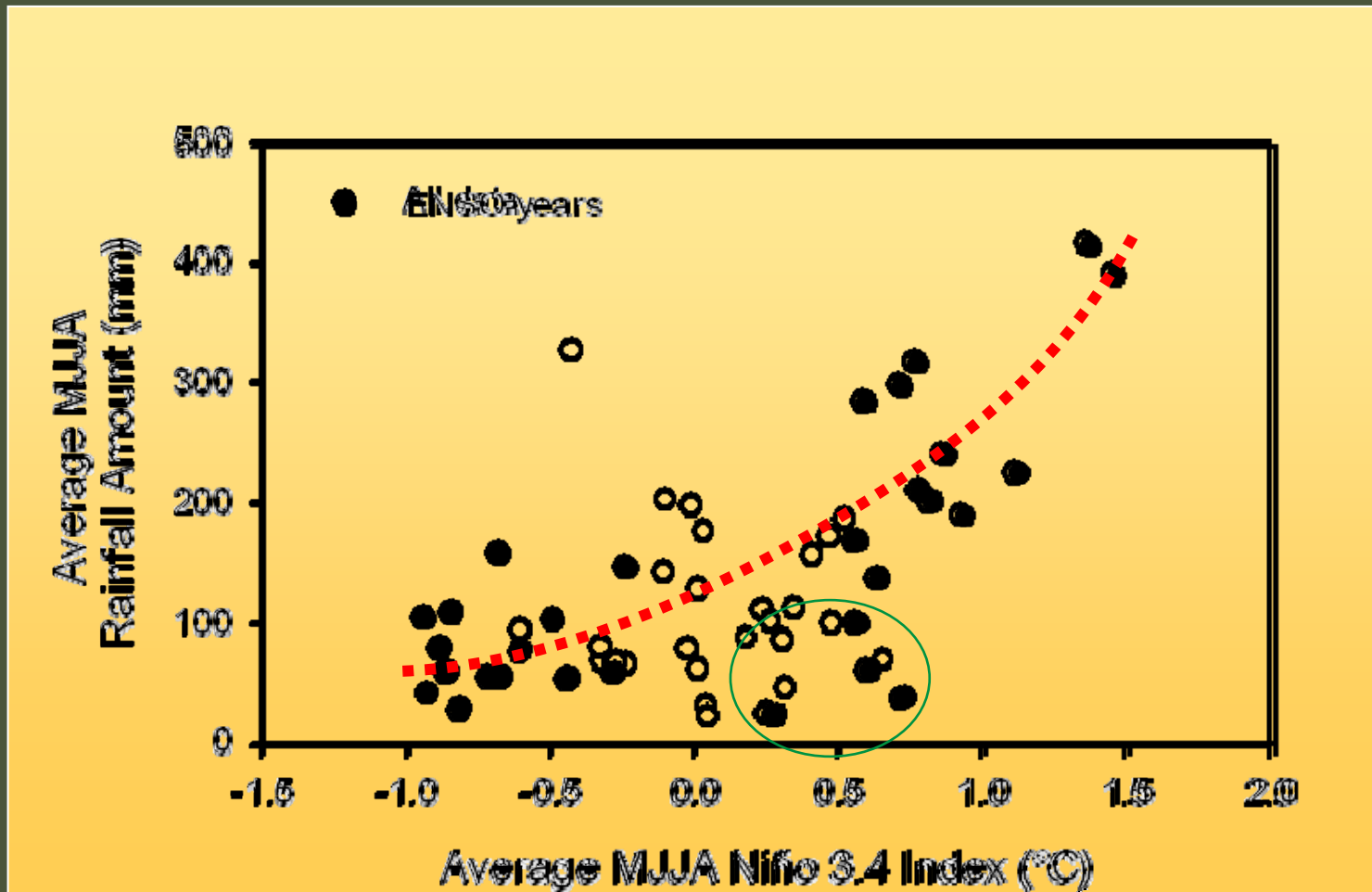
Can we identify a common regional influence on rainfall?



Drought Prediction

1. Using Sea Surface Temperature as a predicant

Seasonal Rainfall

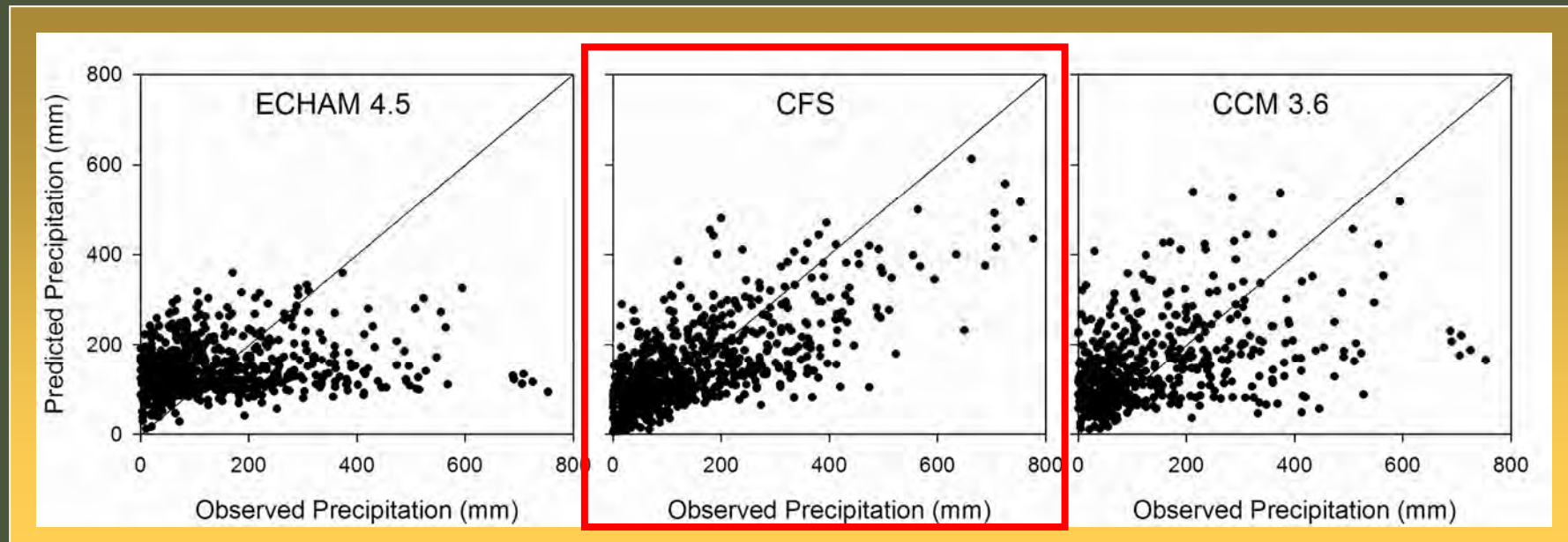


Drought Prediction

2. Using a GCM driven by Sea Surface Temperature

Seasonal Rainfall

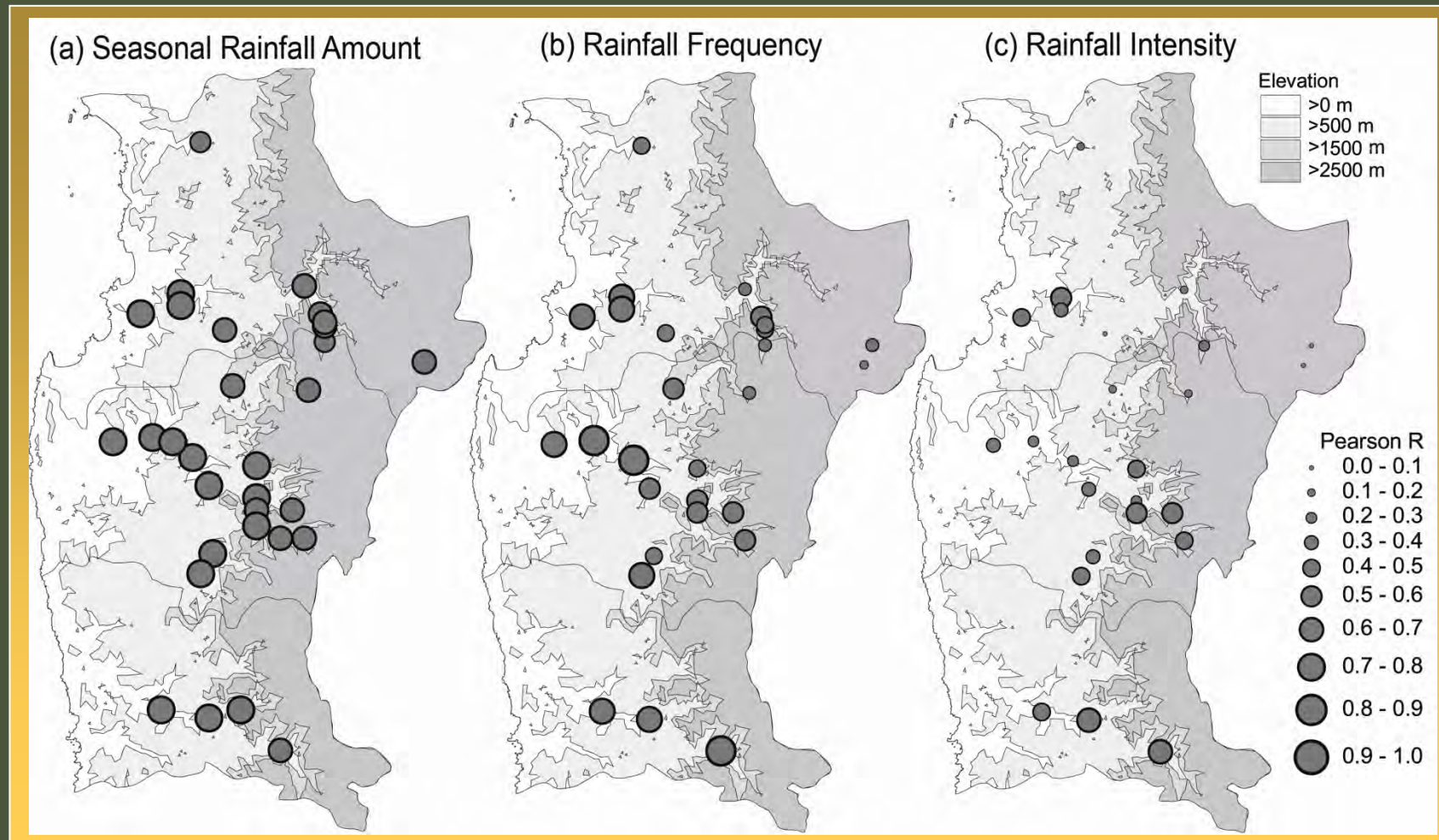
1980-2000



Drought Prediction

2. Using a GCM to predict **seasonal rainfall characteristics**

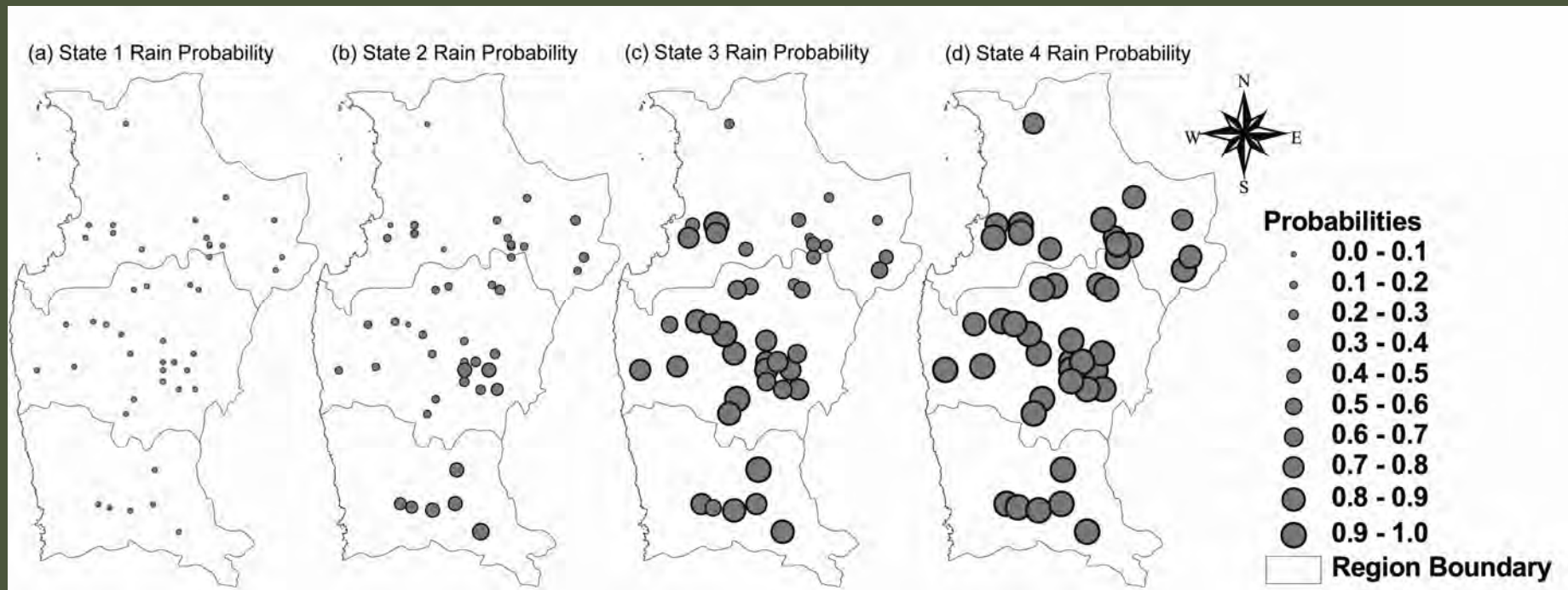
Seasonal Rainfall Prediction (CCA)



Drought Prediction

3. Using a GCM to predict daily rainfall characteristics

Determination of 4 'Rainfall States'



Dry



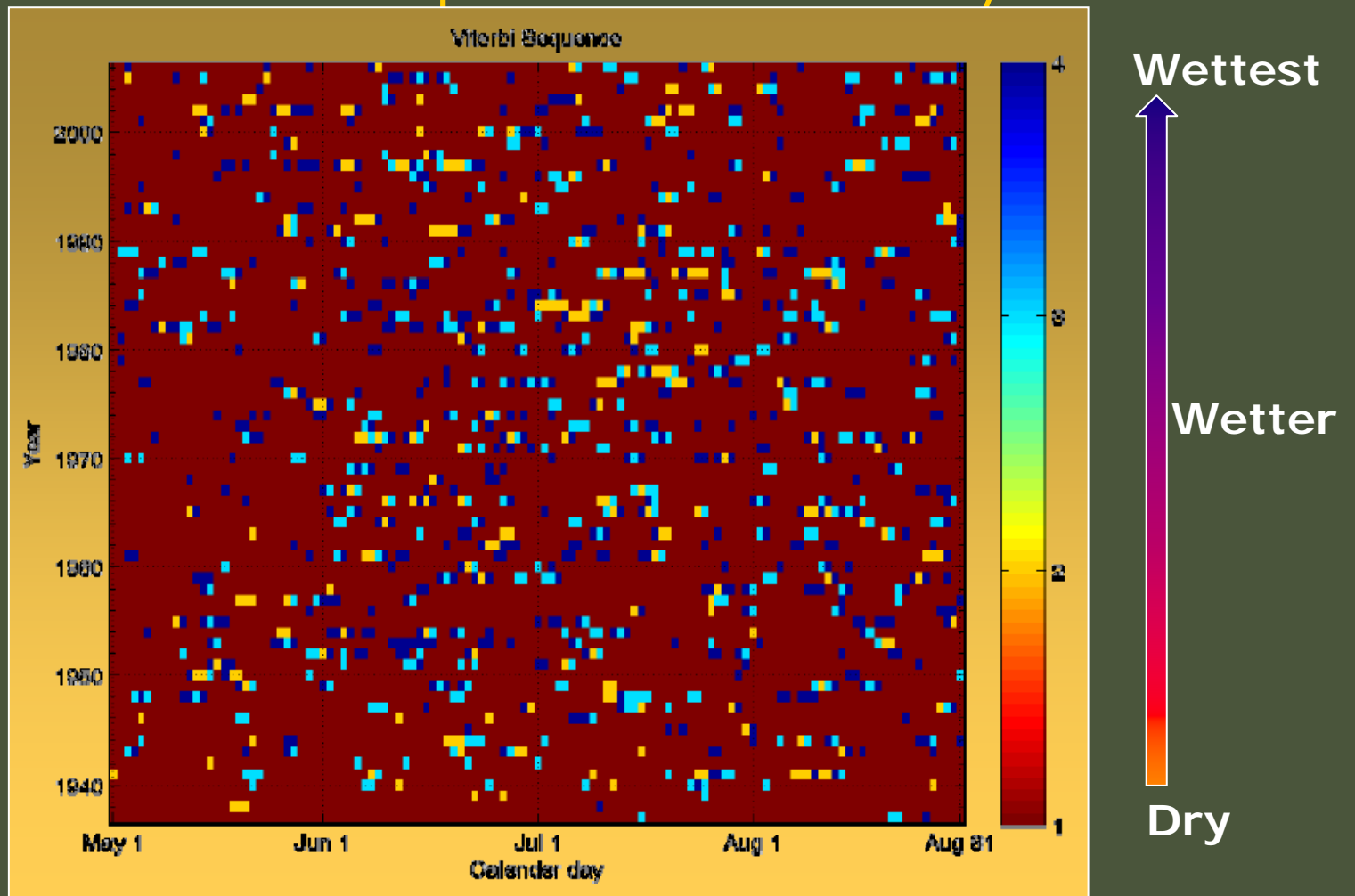
Wetter

Wettest

Drought Prediction

3. Using a GCM to predict daily rainfall characteristics

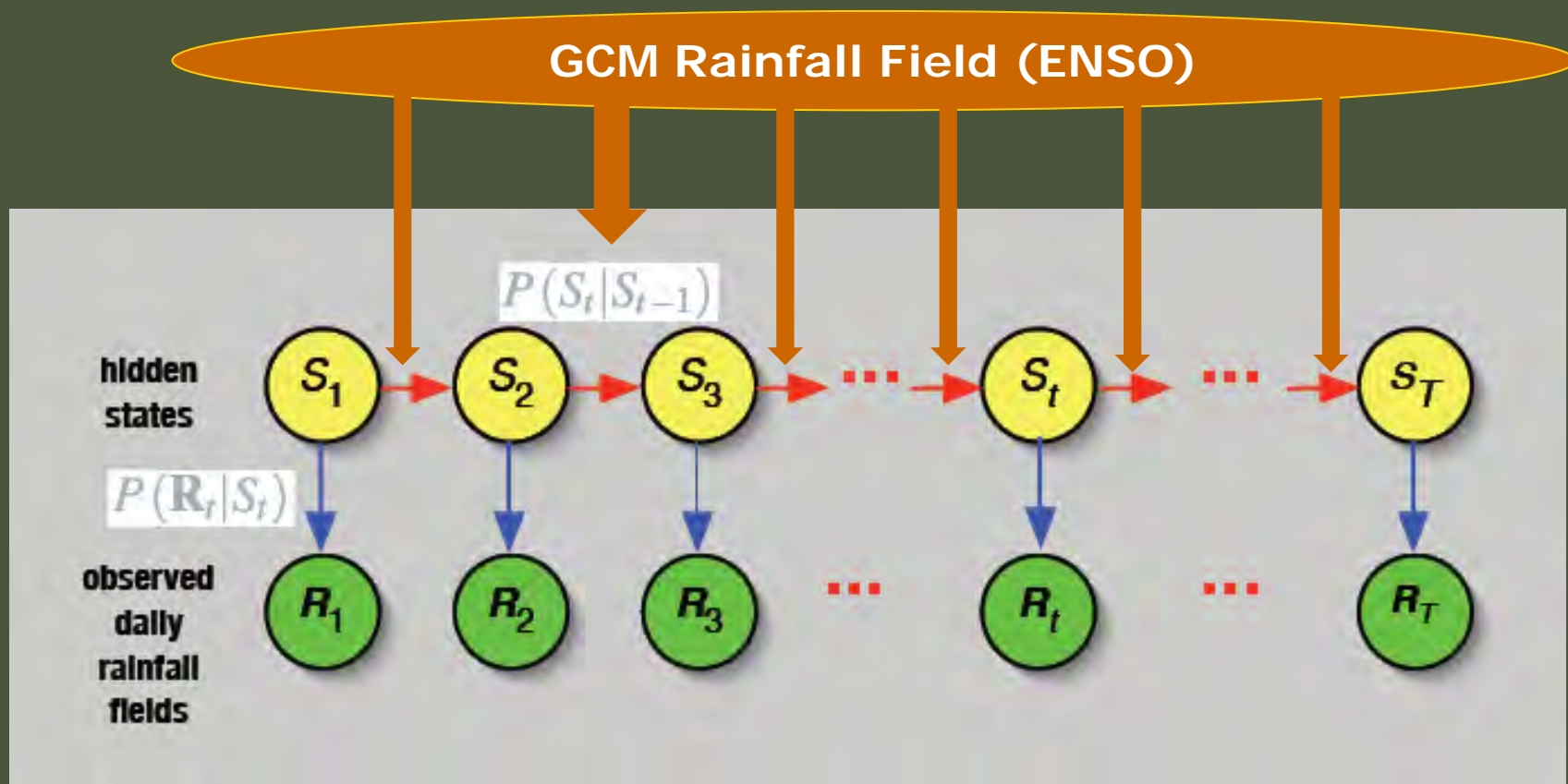
Rainfall state sequence influenced by ENSO



Drought Prediction

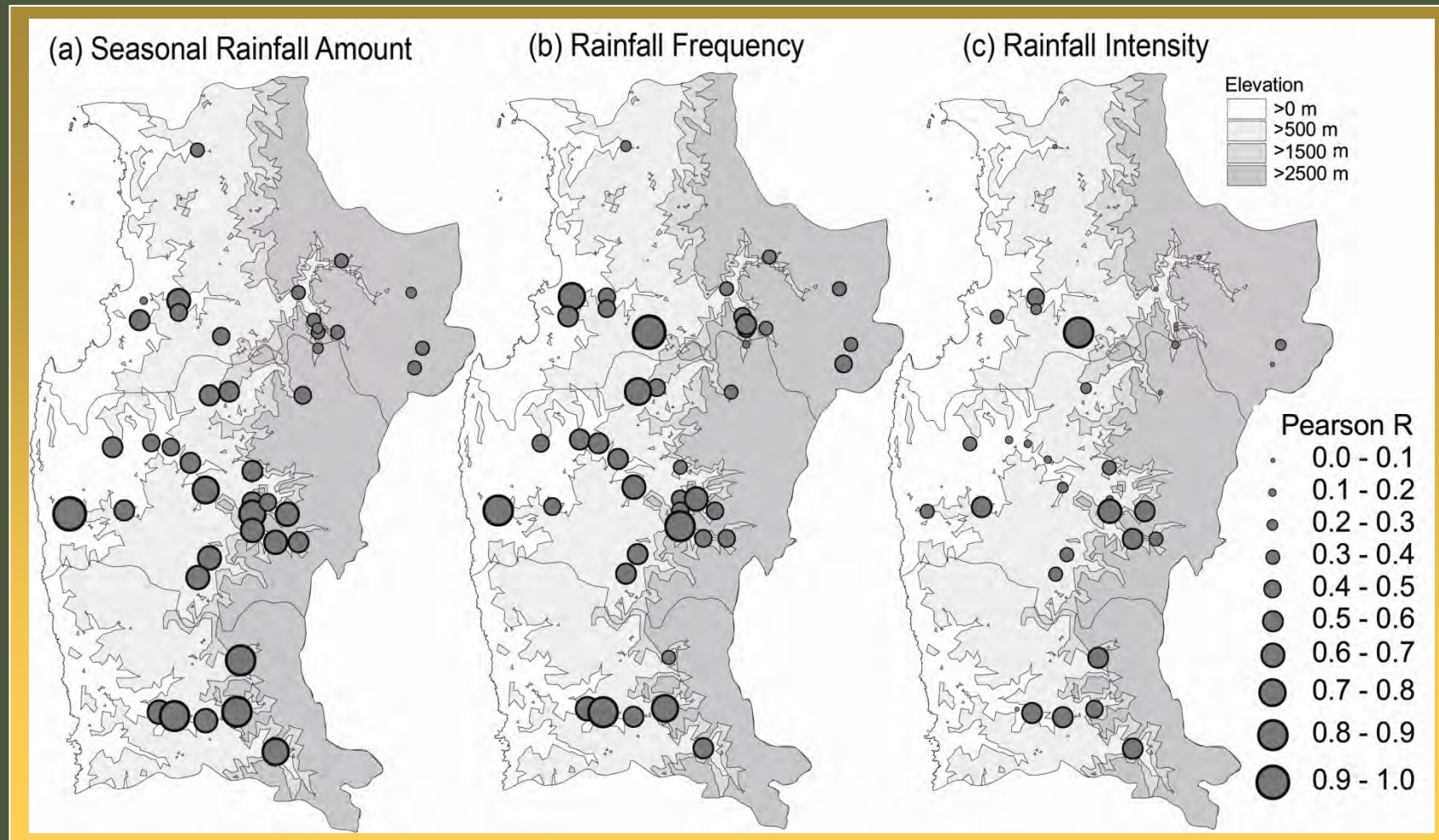
3. Using a GCM to predict daily rainfall characteristics

Building a prediction model:
Non-Homogeneous Markov Model



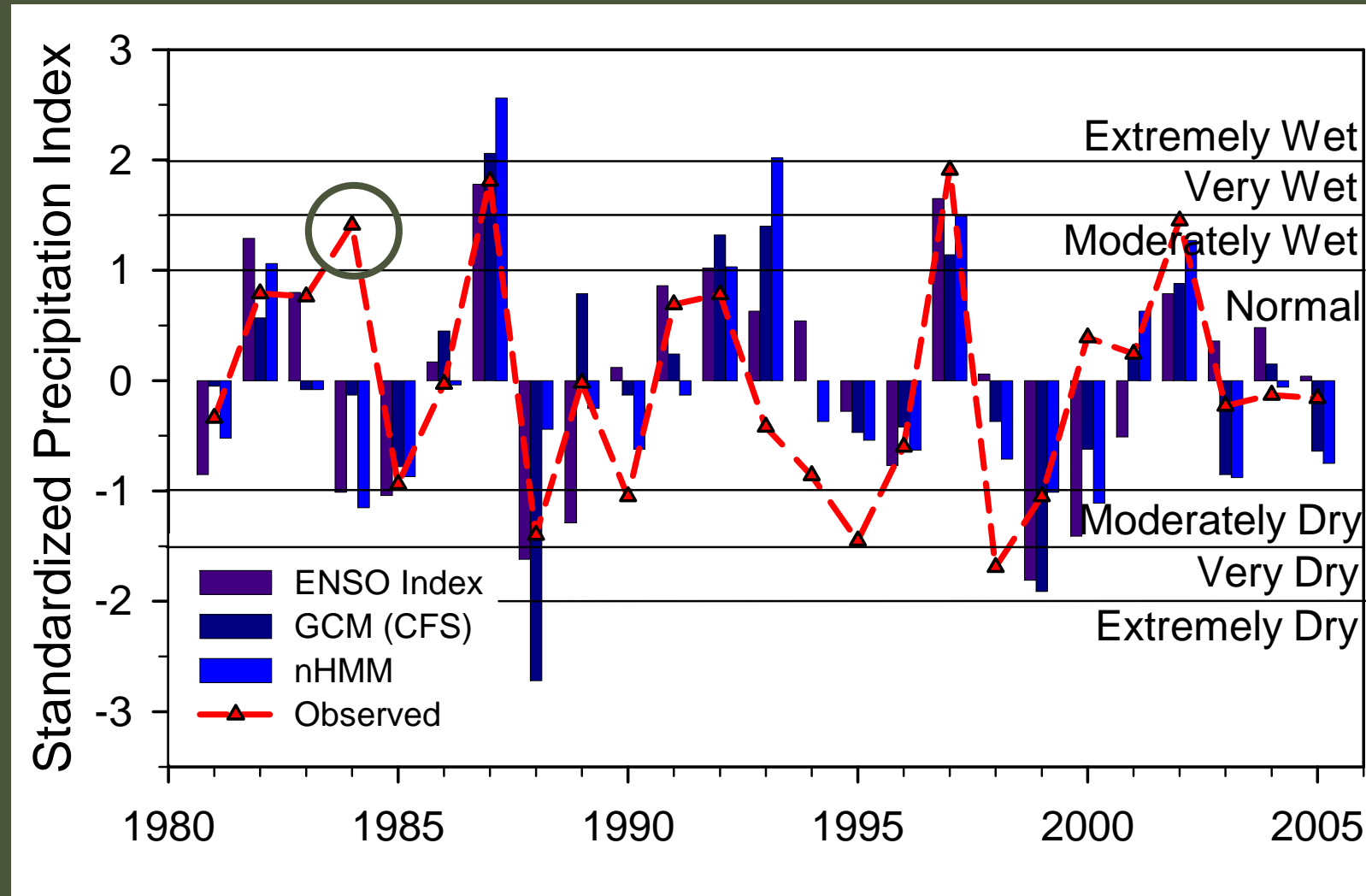
Drought Prediction

Can we use this model to predict **seasonal rainfall**?



Drought Prediction

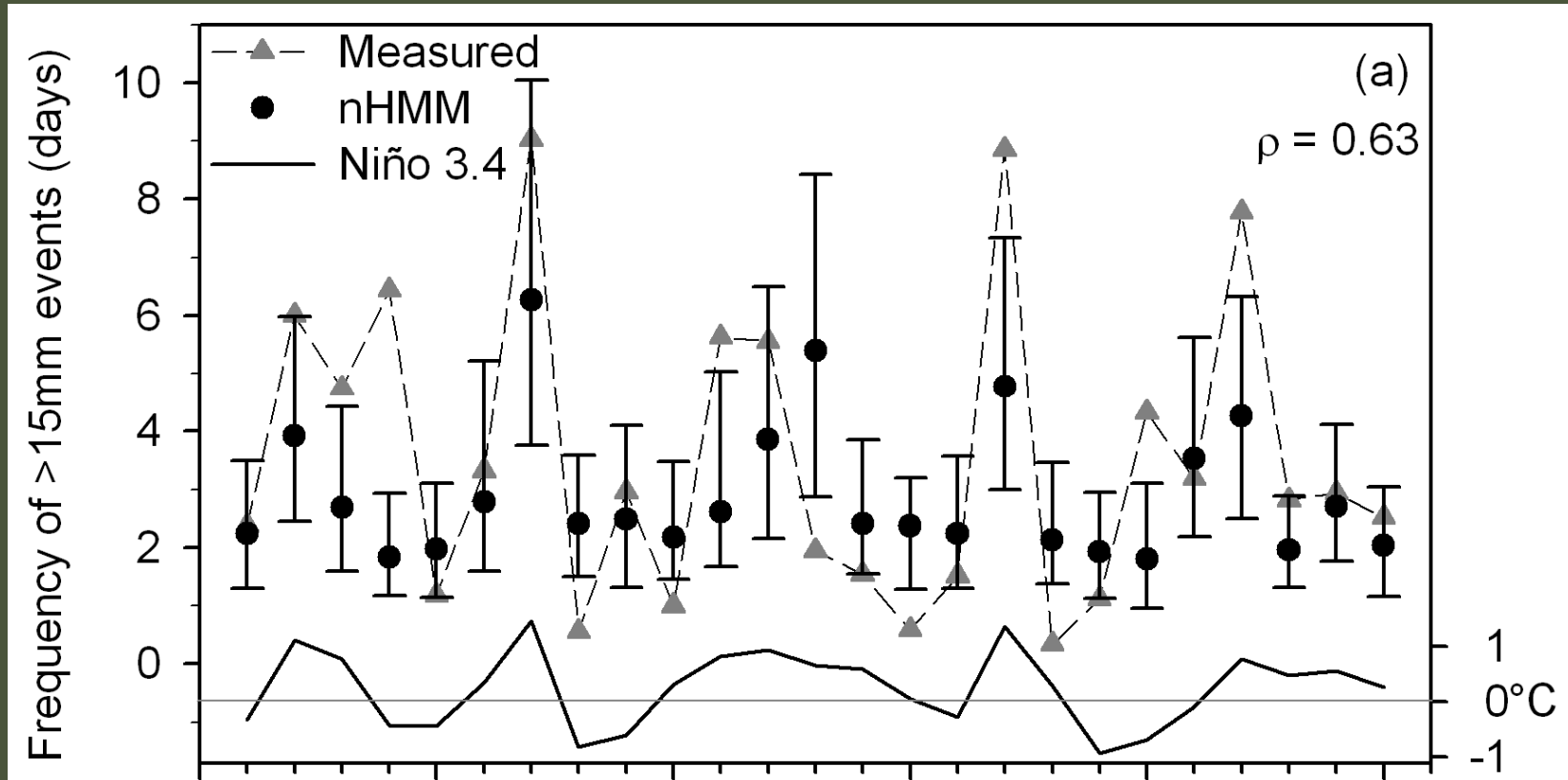
Can we use the 3 approaches to predict **seasonal drought**?



Drought Prediction

...and what with predicting **DAILY drought indices?**

Probabilistic predictions of the number of days with more than 15 mm of rain

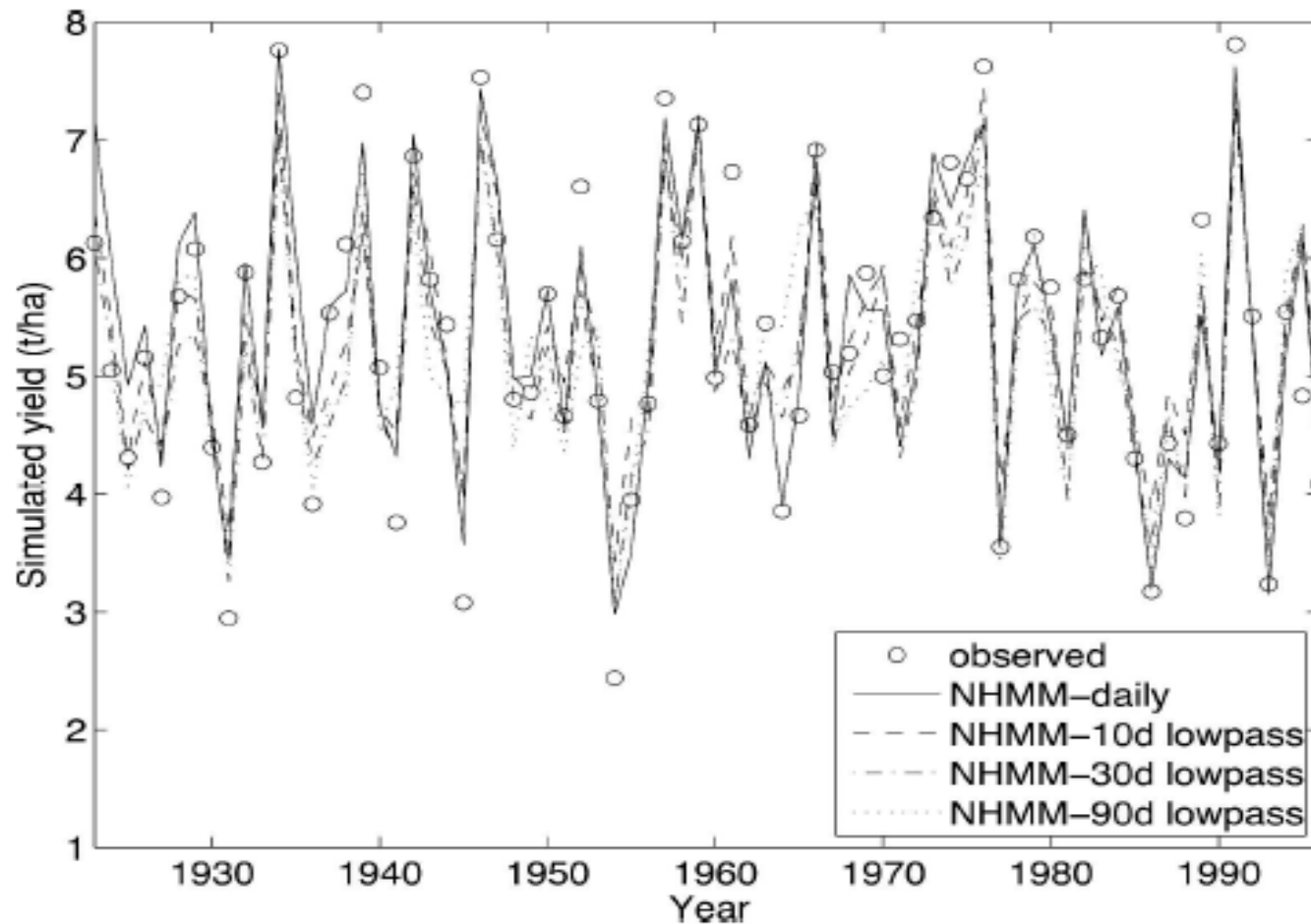


➔ Highly correlated with observed **Agricultural Drought**

Drought Prediction

Can we use these approaches to predict **crop yields**?

Daily data needed to perform these predictions!



Climate Risk Management

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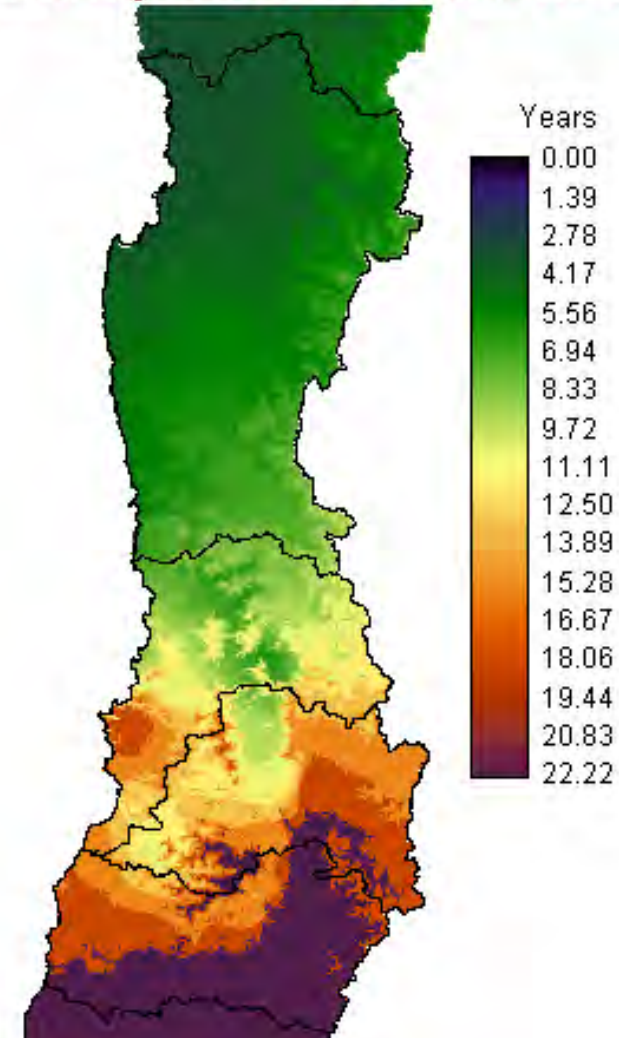
Drought Atlas

Regional Frequency Analysis using L-Moments

Objective:

- Develop a methodology using robust statistics for data-poor environments
- Produce drought probability maps for Latin-America and the Caribbean

Return period for deficit of 60%



Climate Risk Management

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Arid and Semi Arid Development through Water Augmentation



Al Sitio Español

December 5-10 2010, Valparaiso, Chile


It needs no introduction that water scarcity is one of the mayor problems nations are facing in the next decades, especially in (semi)arid locations. It has also been shown that climatic vulnerability is increasing in these areas, due to global change, exacerbating climate risks in already drought prone regions. Given the continuous rise in water demand due to further development of these drylands, and the occurrence of large (mega)cities in some of these regions (Lima, Santiago, Mexico City) the water resources are under enormous pressures that threaten their sustainable use in the long run. Ensuring water availability with acceptable quality therefore remains a key task for policy makers, increasing the need for sound scientific research in these areas. The problem tackled within the conference is the need for sustainable ways to secure water availability in regions where climatic uncertainty highly influences growth potential. Out of the myriad of possible solutions, those need to be documented that effectively address the problem and contribute to the further consolidation of sustainable development in these dryland regions.



We invite submissions for presentations.

The topics to be covered include the development, efficiency assesment, design, implementation, impact, constraints and social, economical and cultural aspects of

- Rainfall-Runoff Water Harvesting
- Fog harvesting



Done

start

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