Environmental *Change* Institute

The Interactions and Feedbacks between Climate Change and Amazon Biosphere Change

The Nature Conservancy/
Oxford Martin School Climate Partnership

Theme 1 – Attribution of extreme weather events

Sihan Li, Friederike Otto, David Wallom, Myles Allen

Aug 16th 2018 4th GCPC

GEM Global Ecosystems Monitoring Network

climateprediction.net
the world's largest climate forecasting experiment for the 21st century

The Nature Conservancy

Extreme Event Attribution

Often when a societally impactful extreme weather event occurs the question is asked:

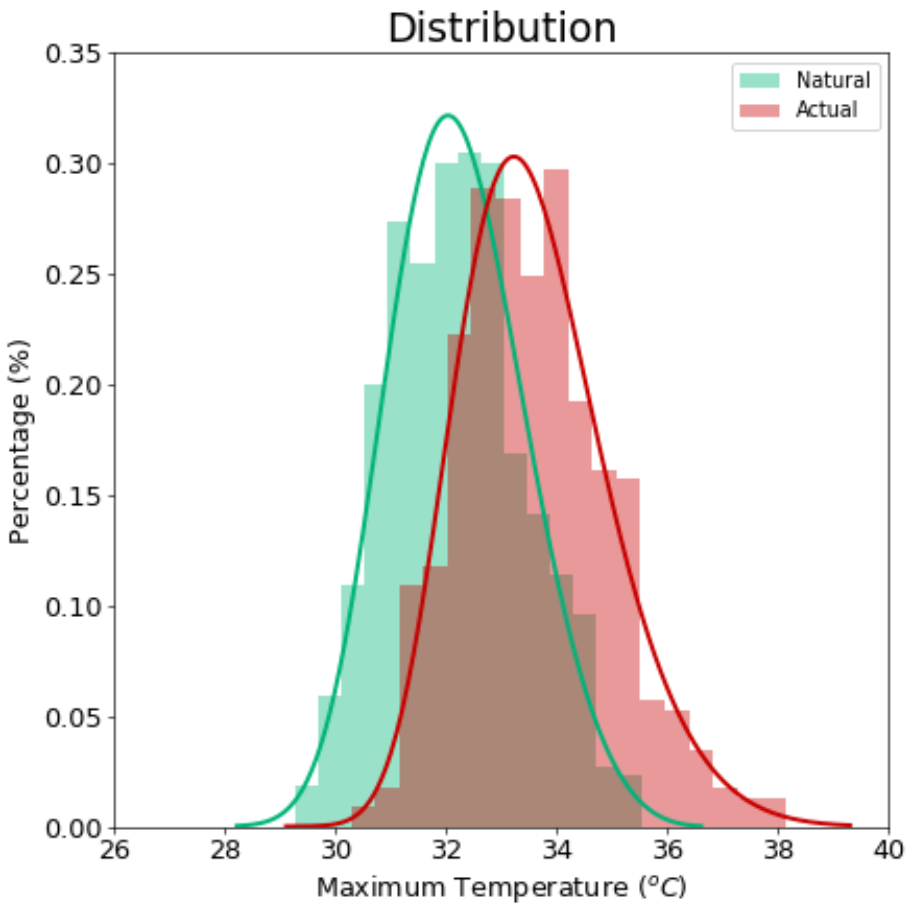
"Has this extreme event been **caused** by climate change?"

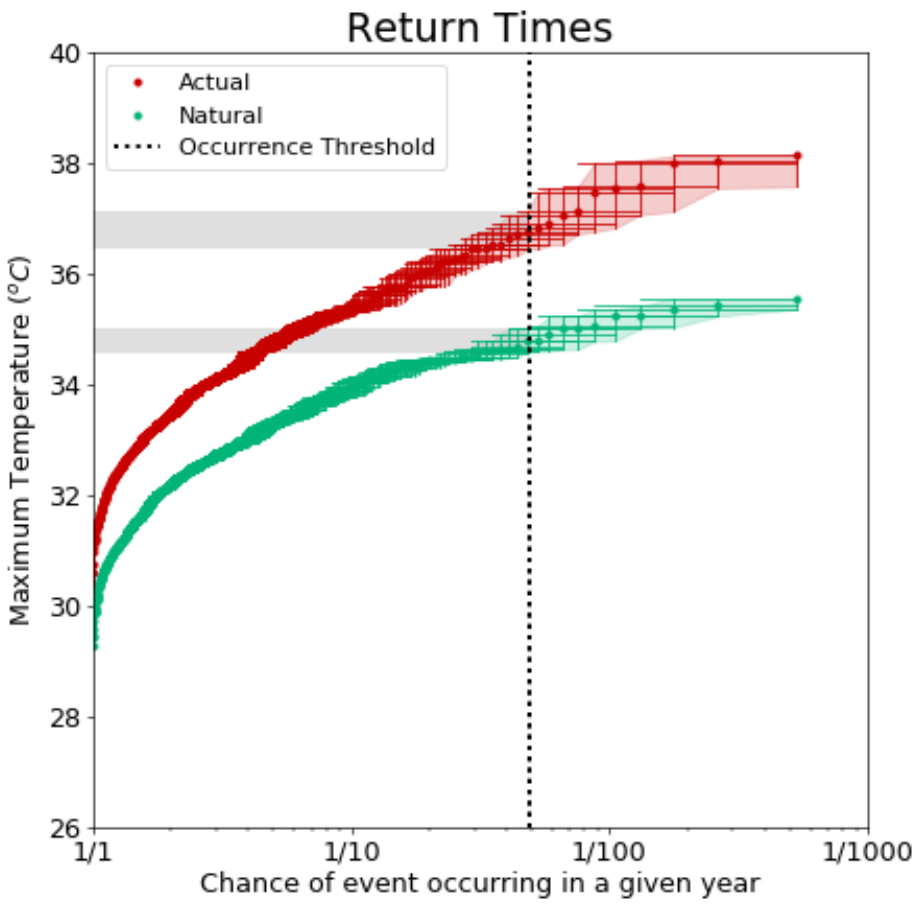
It is not possible to attribute the cause of an extreme weather event solely to climate change, due to the complex nature of the climate system.

However it is possible to look at whether human activity has changed the likelihood of a particular event occurring by comparing large ensembles of climate model simulations with and without the effects of human activity.

Our Approach: Exploring the Change in Probabilities

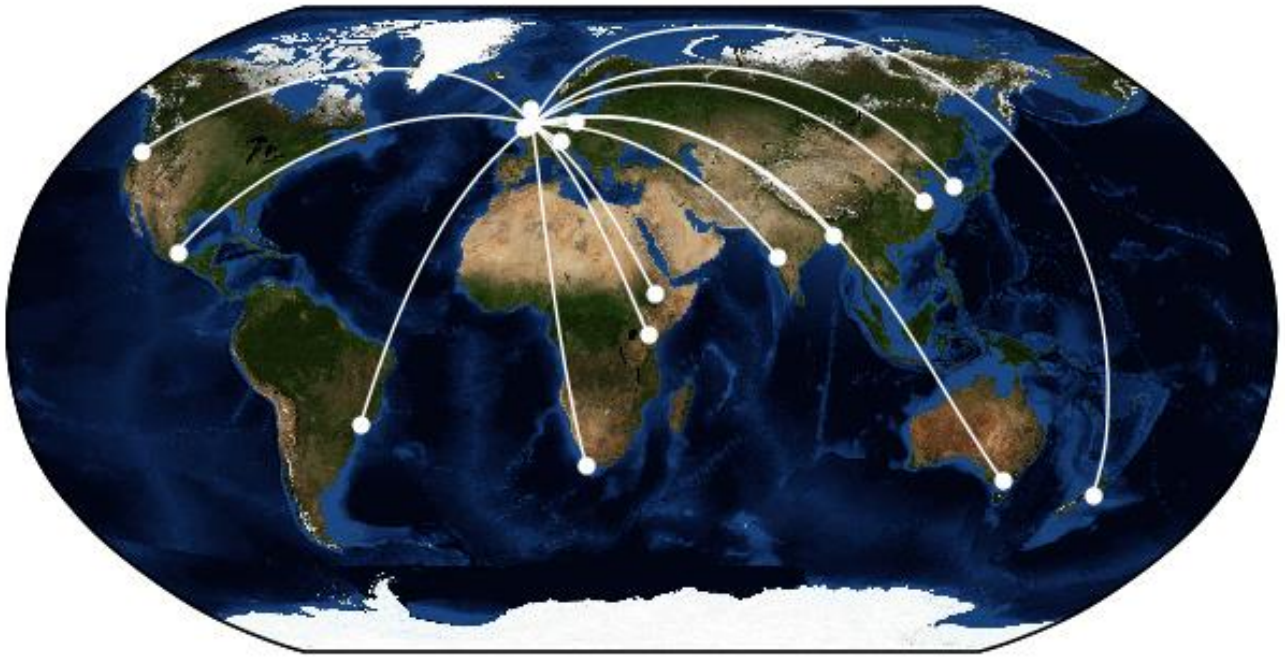
$$\text{Risk Ratio} = \frac{\text{Chance in world as observed}}{\text{Chance in world without humans}}$$



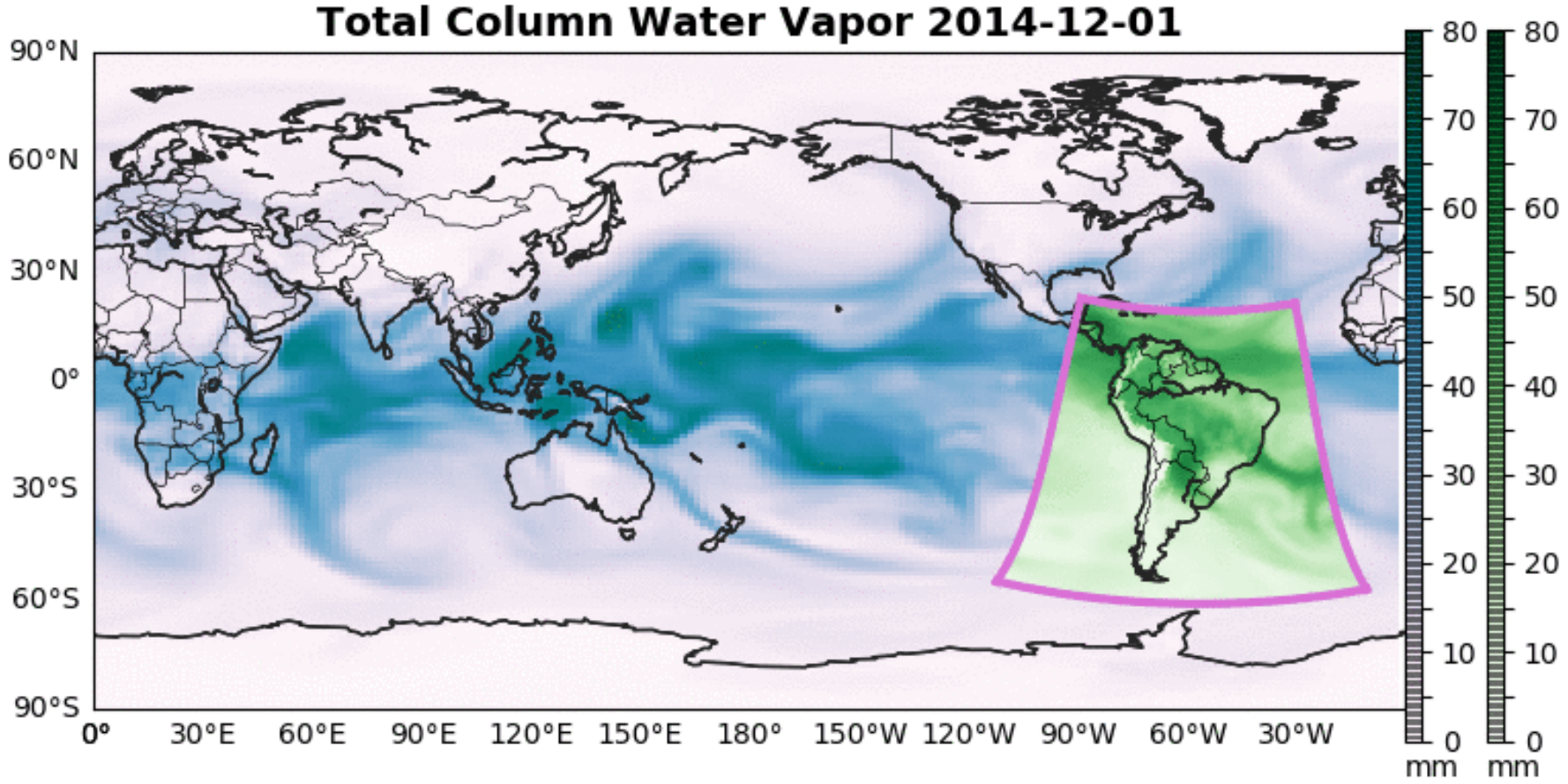


Example Heatwave Event

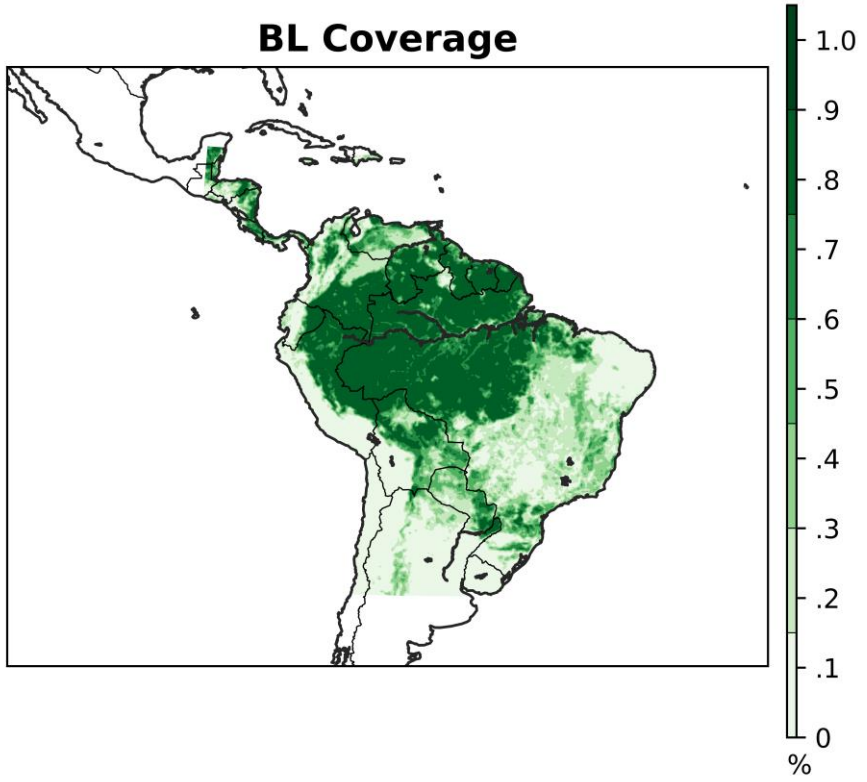
Our modeling networks



weather@home 50-km region over South America

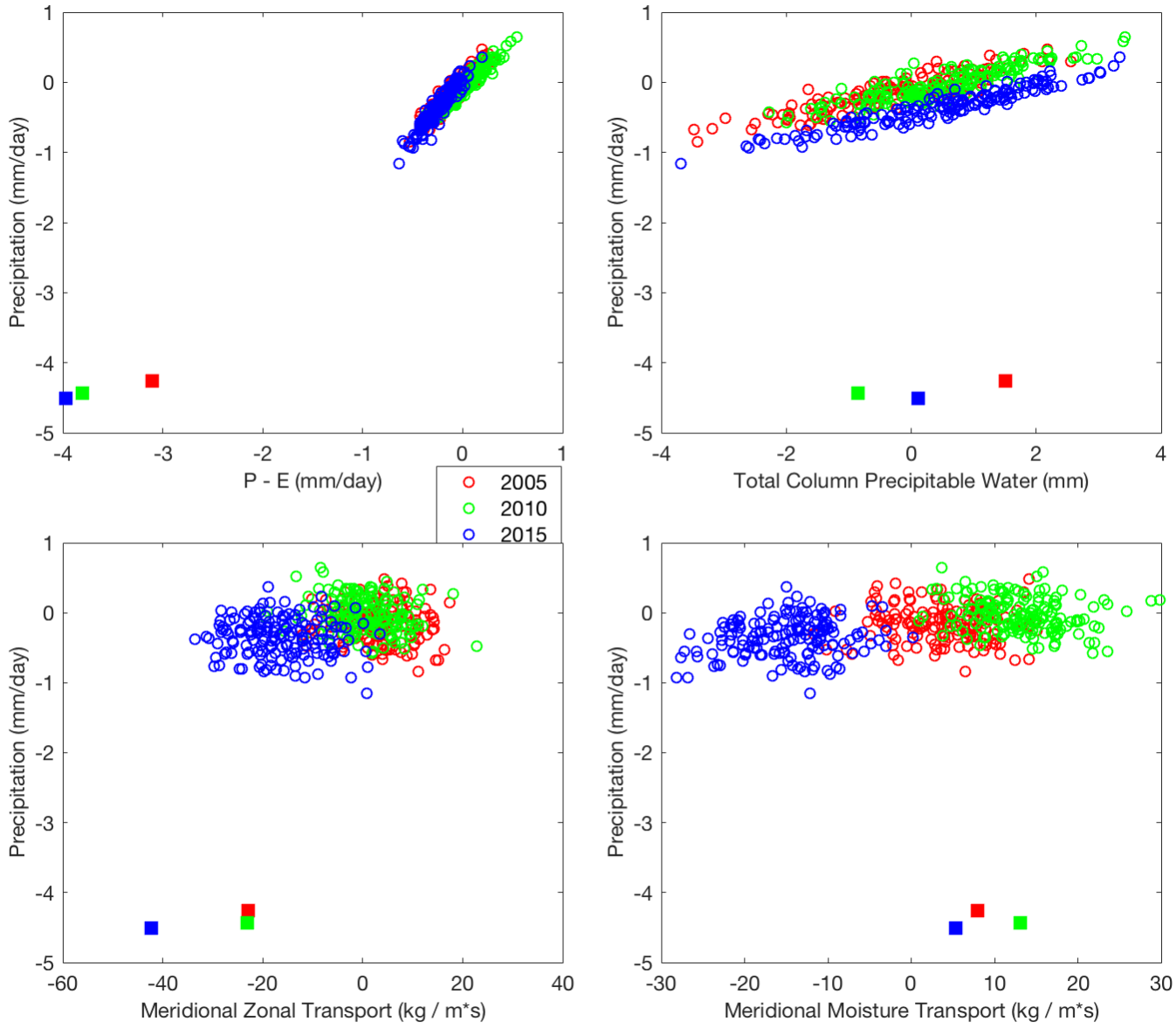


A 25km region coupled with dynamic vegetation model – TRIFFID (5 PFTs)



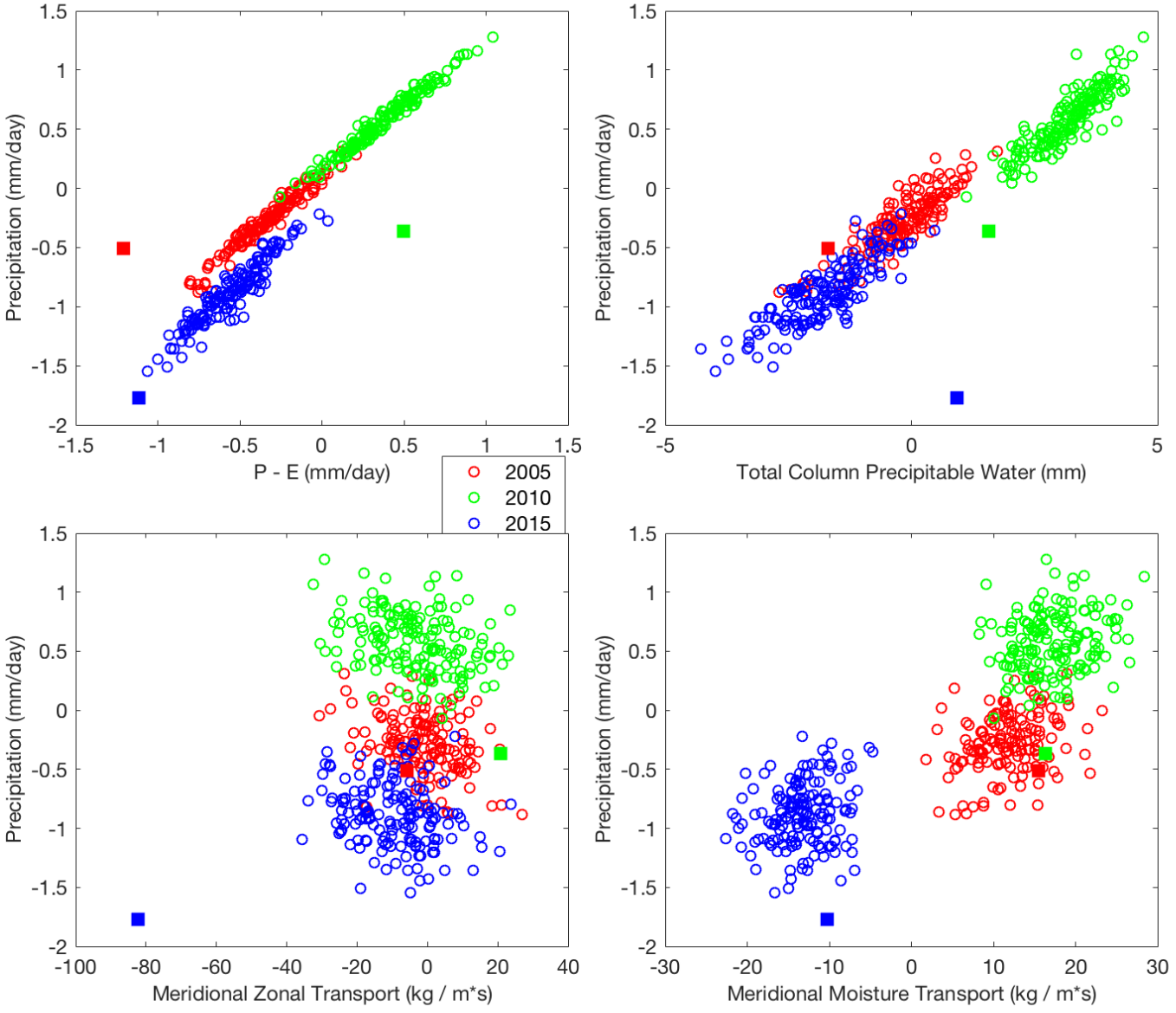
Part 1: Understand the model behaviour

Can the model ‘faithfully’ represent the processes that led to the event?

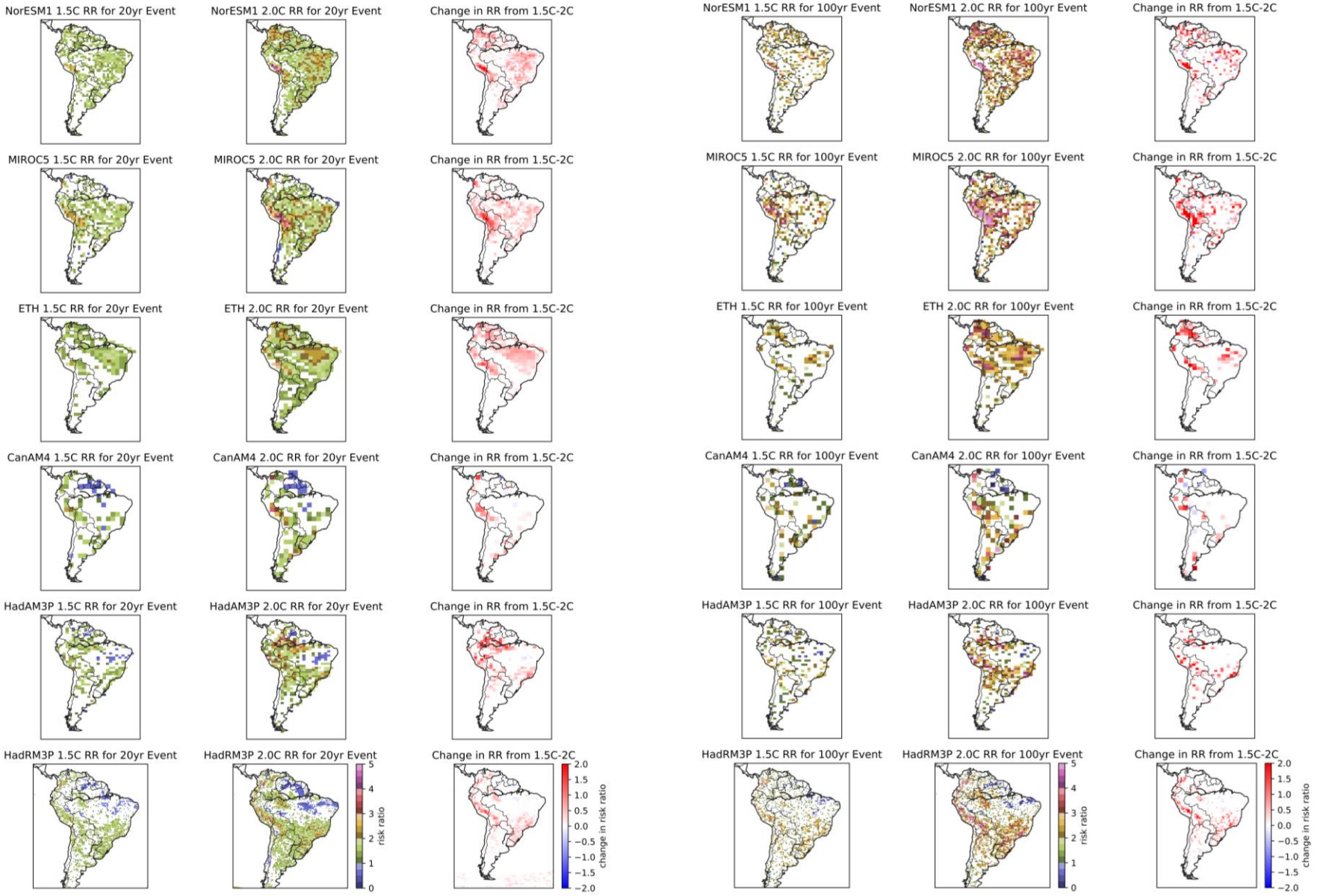


Part 1: Understand the model behaviour

Can the model 'faithfully' represent the processes that led to the event?

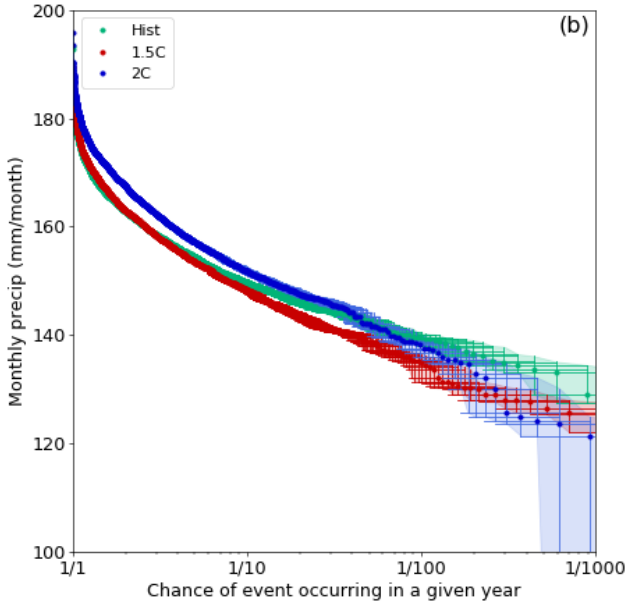


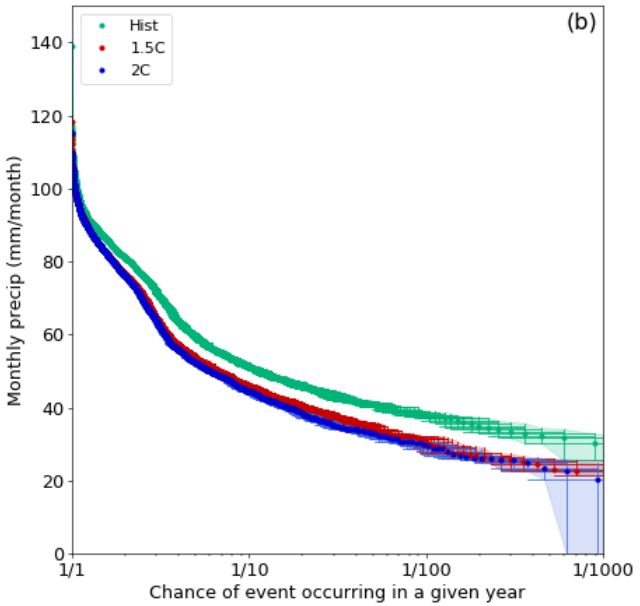
Part 2: Future projections
Heavy precipitation



Part 2: Future projections
Dry end

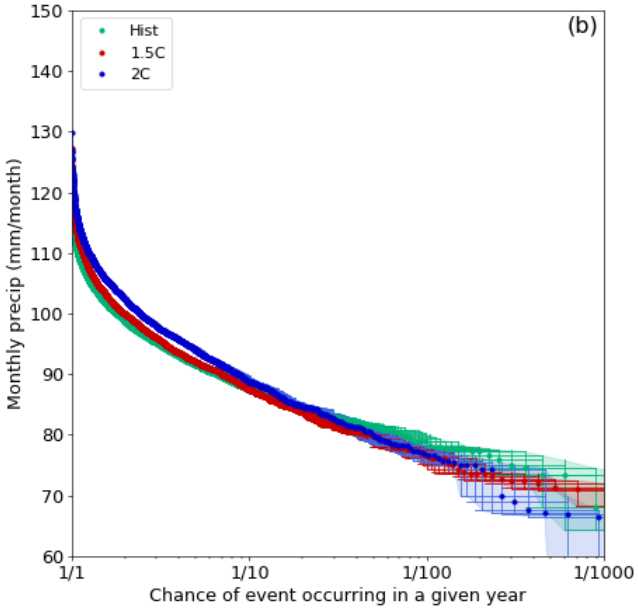
NW Amazon

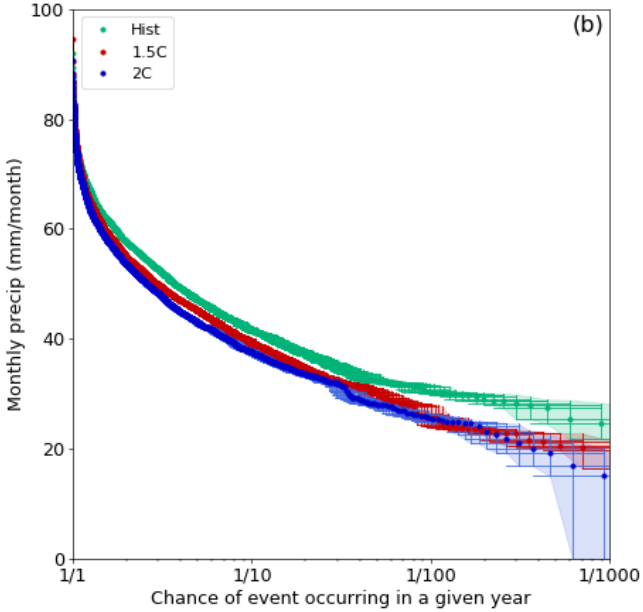




NE Amazon

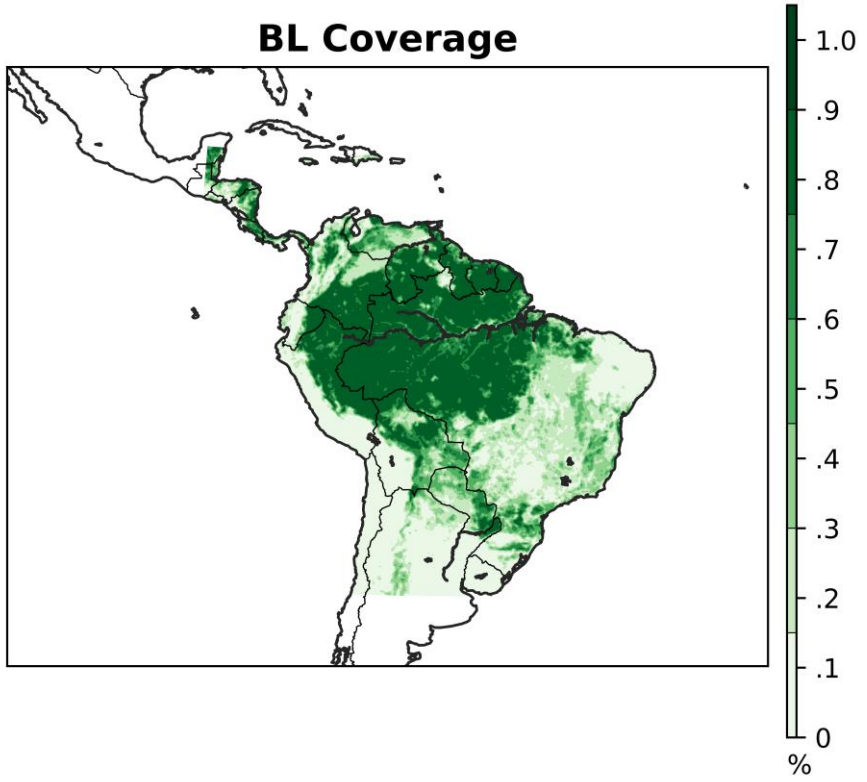
SW Amazon





SE Amazon

Part 3: Couple the 25km region with dynamic vegetation model – TRIFFID (5 PFTs)



THEME 2:
RESILIENT LAND USE PLANNING IN A CHANGING WORLD

Theme leader: E.J. Milner-Gulland

TNC & OMS Climate Partnership

PDRA: Cecilia Larrosa

OXFORD MARTIN SCHOOL

UNIVERSITY OF OXFORD

ICCS
Interdisciplinary Centre for Conservation Science

Aim

Cost-effective reforestation strategy to enhance resilience to climate change, accounting for:

- Regional climate change
- Economic and environmental feedbacks of setting aside agricultural land

Basis for strategy

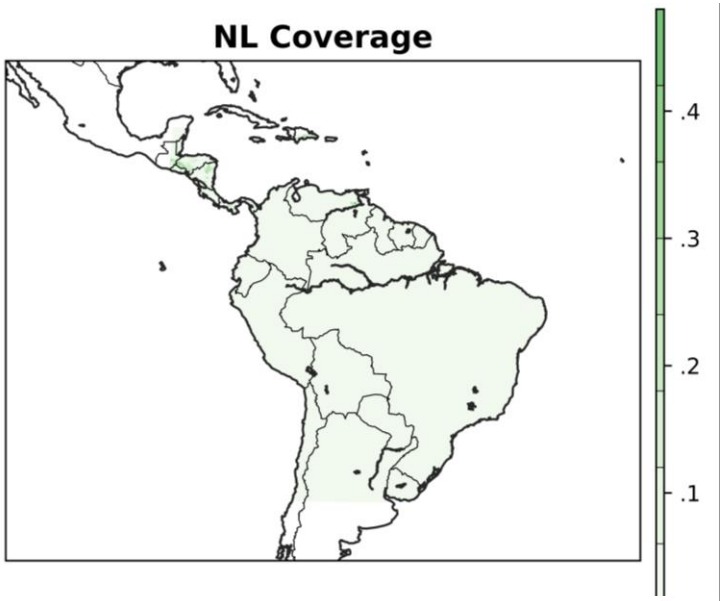
Three restoration activities:

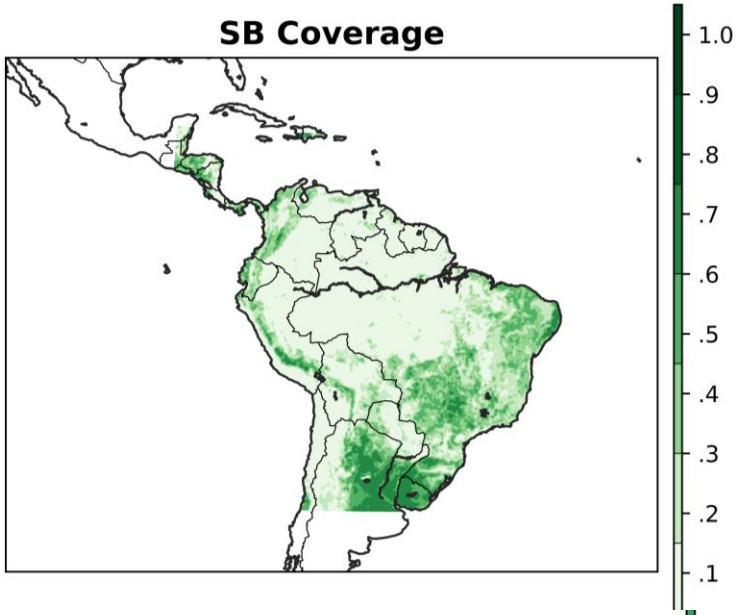
- Passive reforestation (set-aside + fence)
- Active reforestation (set-aside + planting)
- Forest trade (payment for standing forest)

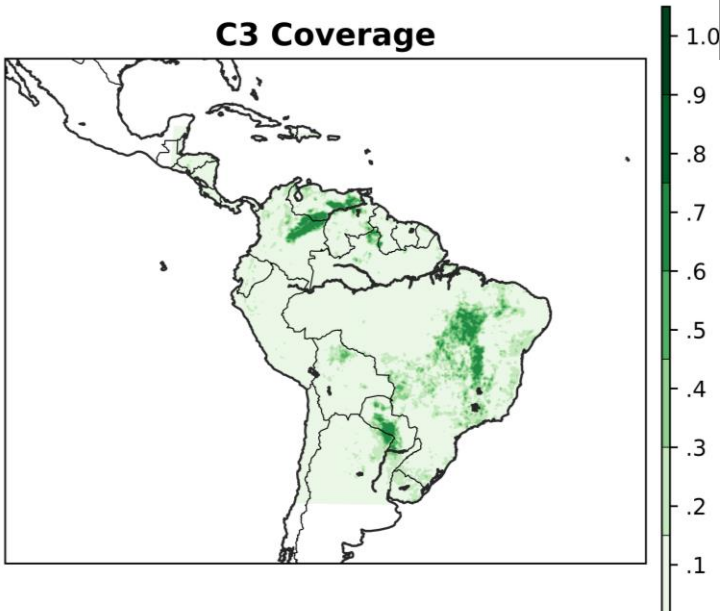
Approach:

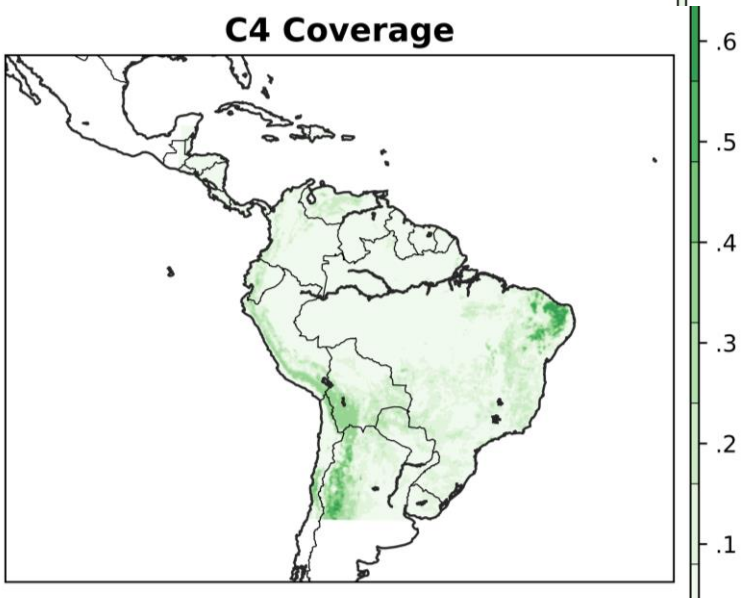
- Assessing the effect of reforestation on local/regional climate

Couple the 25km region with dynamic vegetation model – TRIFFID (5 PFTs)

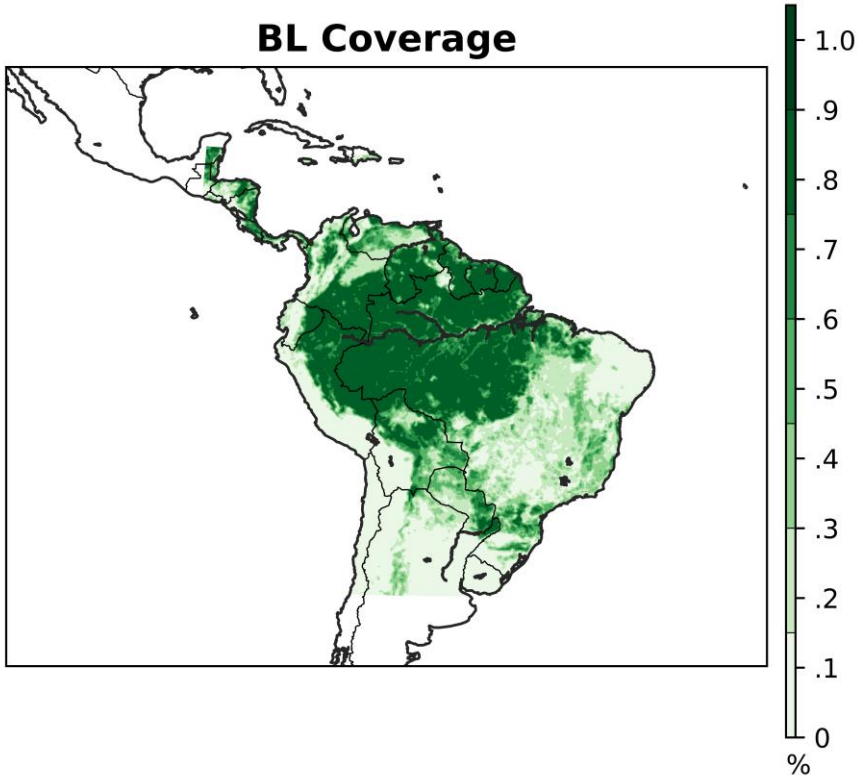


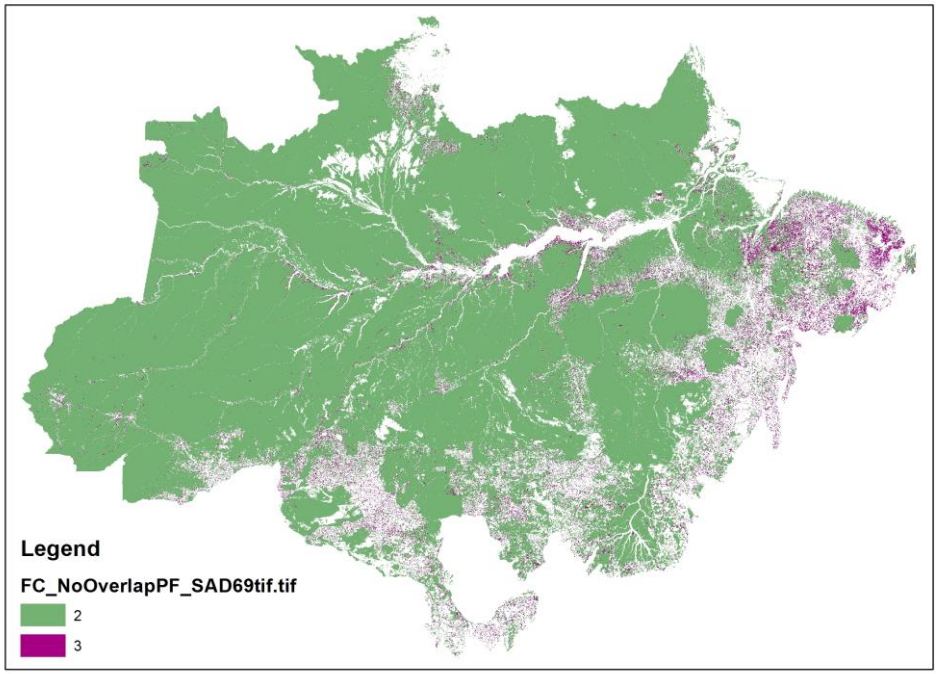






Run TRIFFID with the forest data





Planned Experiments

RCP2.6
or 1.5 degree

RCP4.5
or 2 degree

RCP8.5
or 3 degree

Current
Forest

Reforested
Scenario

Deforestation
Scenario

GEM
Global Ecosystems Monitoring Network

climateprediction.net
the world's largest climate forecasting experiment for t

Environmental *Change* Institute

eci

UNIVERSITY OF OXFORD

Oxford e-Research Centre

Questions to address with our modeling framework

- Attribution of recent events.
- Future projections of changes in risks of extremes.
- The effects of different biosphere (by applying different forest coverage scenarios) on the regional climate in Amazon and globally through teleconnection – the impacts of reforestation on mitigation of climate change.