

The 2014 Minas Gerais Drought

PS Baker & R Ruiz Cardenas

CABI & Federal University of Minas Gerais

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Drought in Minas Gerais (MG)



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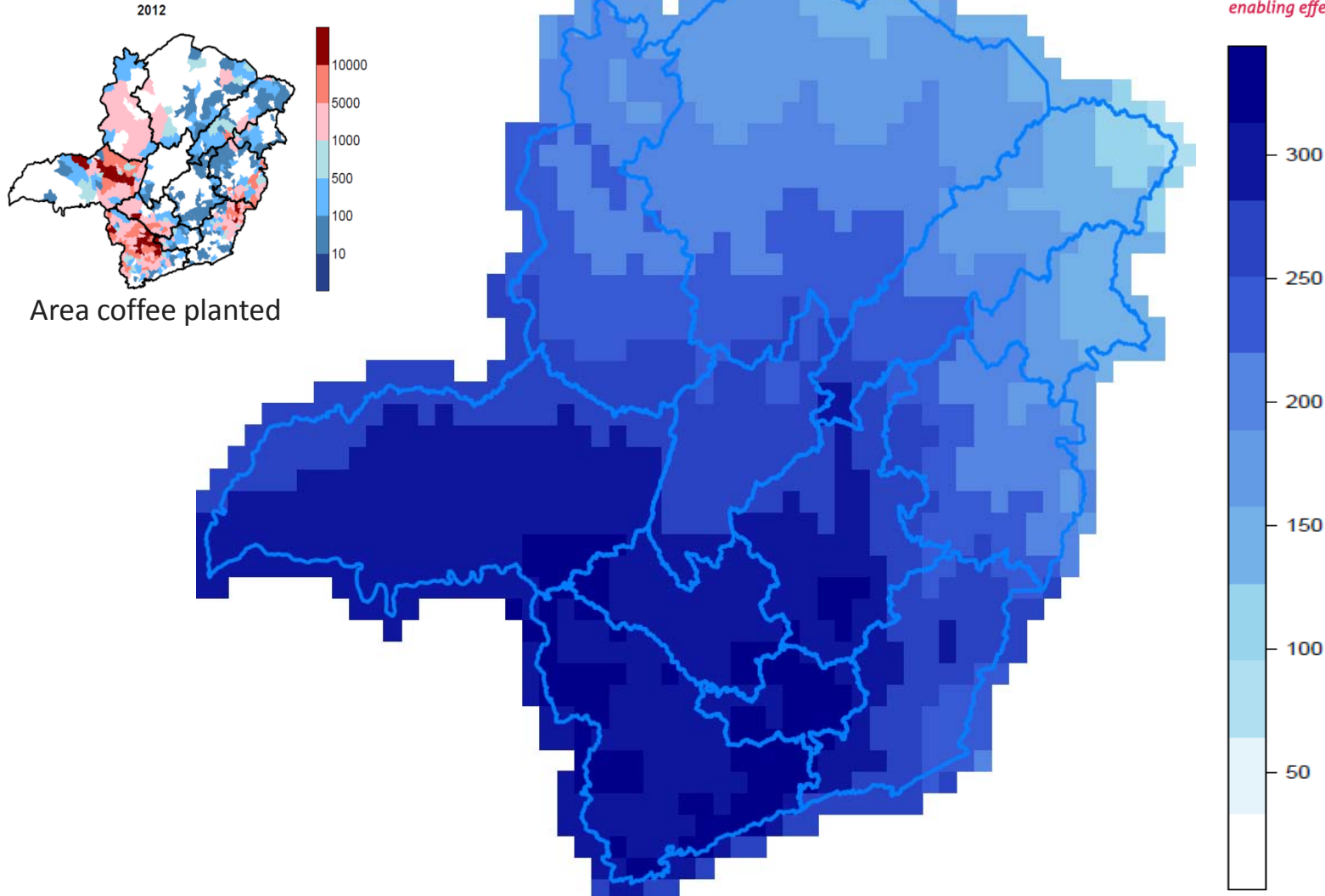
- We present here some facts about the extreme weather in MG over the past two months
- We draw upon a very extensive meteorological database developed with assistance from the Initiative for coffee & climate (www.coffeeandclimate.org)
- Data was analysed at the Federal University of Minas Gerais

Jan 1981-2010 average rainfall

a crucial time to support berry development



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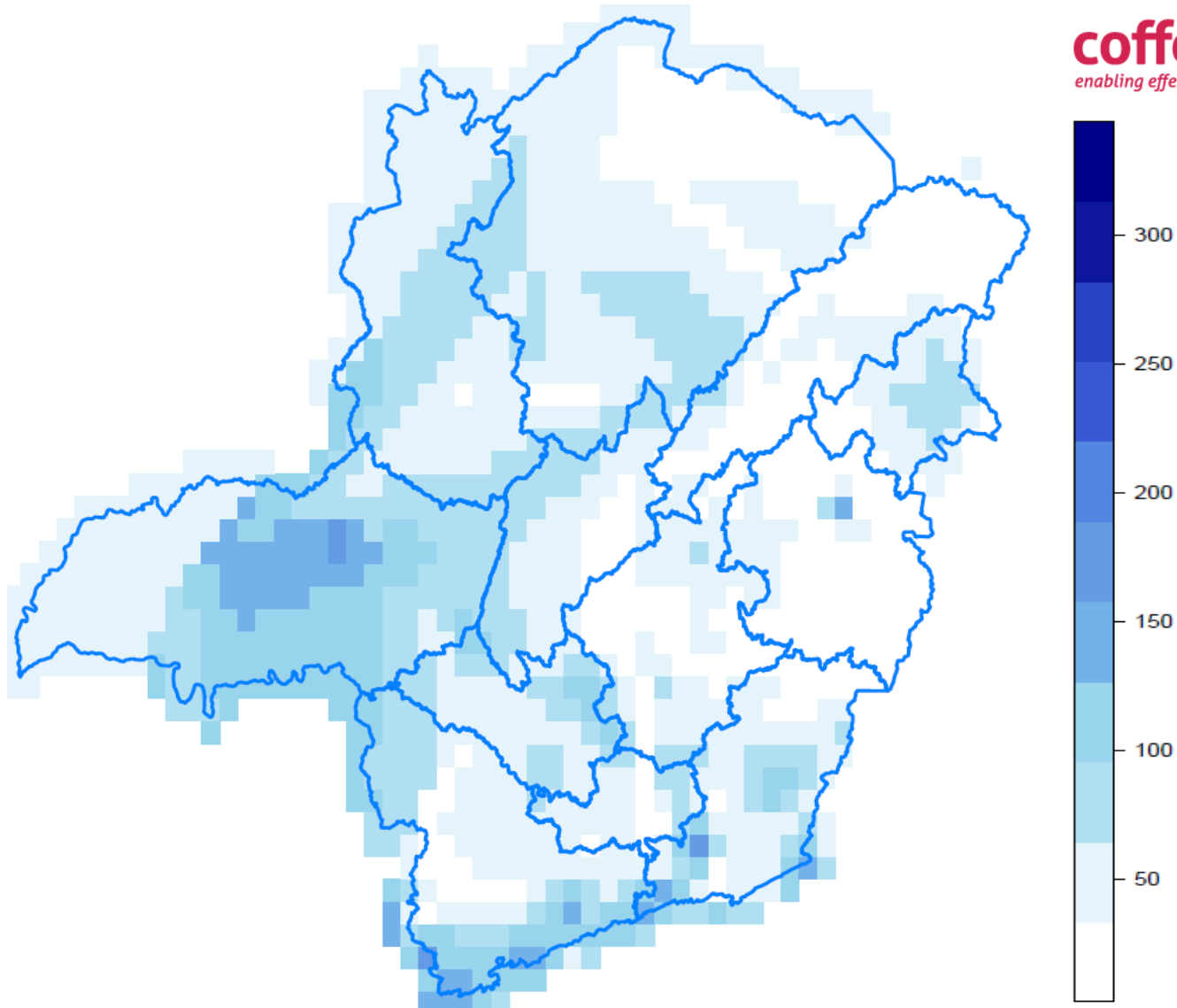


Accumulated rainfall (mm) for January in Minas Gerais (**1981-2010 climate**)

Jan 2014 rainfall



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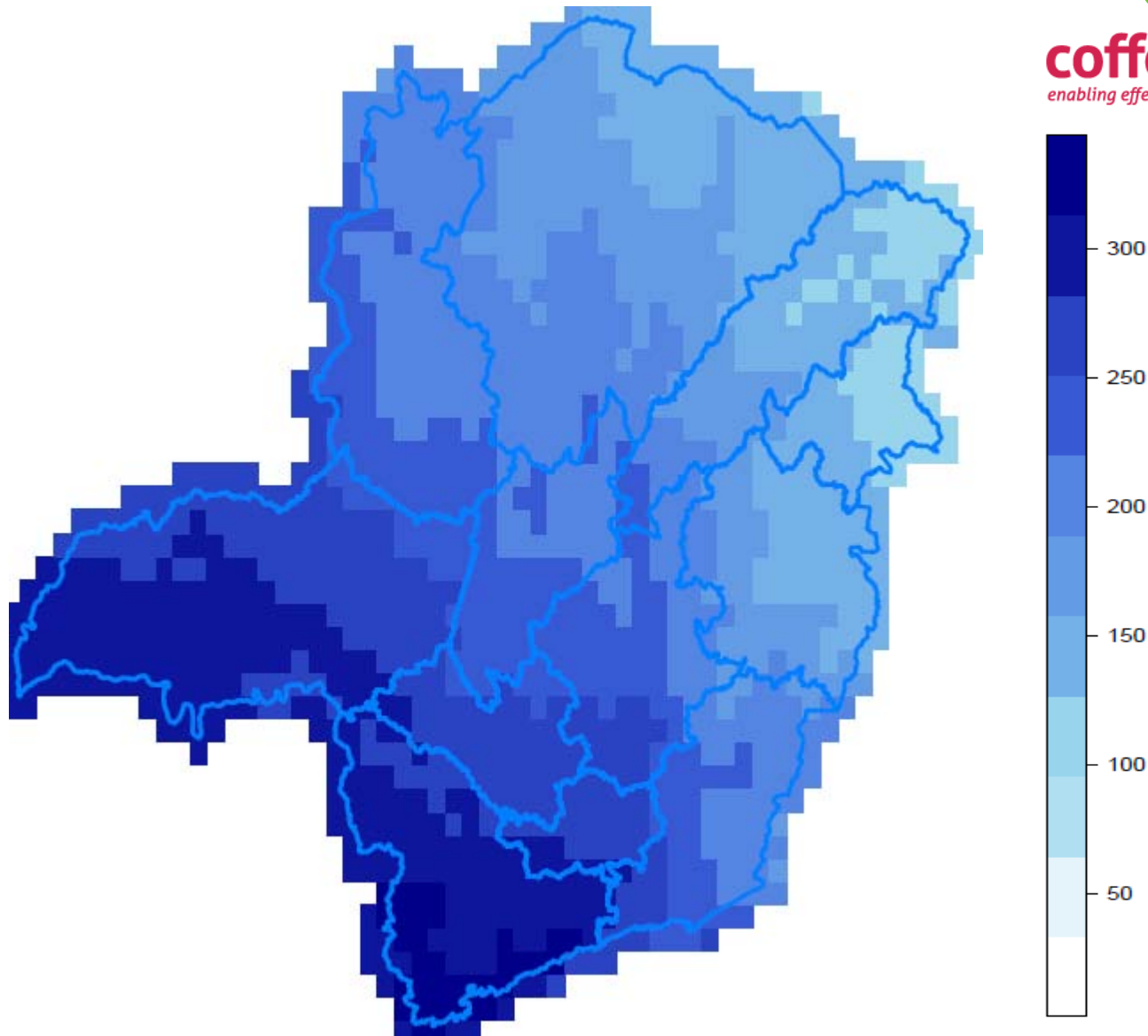


Accumulated rainfall (mm) for January in Minas Gerais (**2014 only**)

Feb 1981-2010 average rainfall



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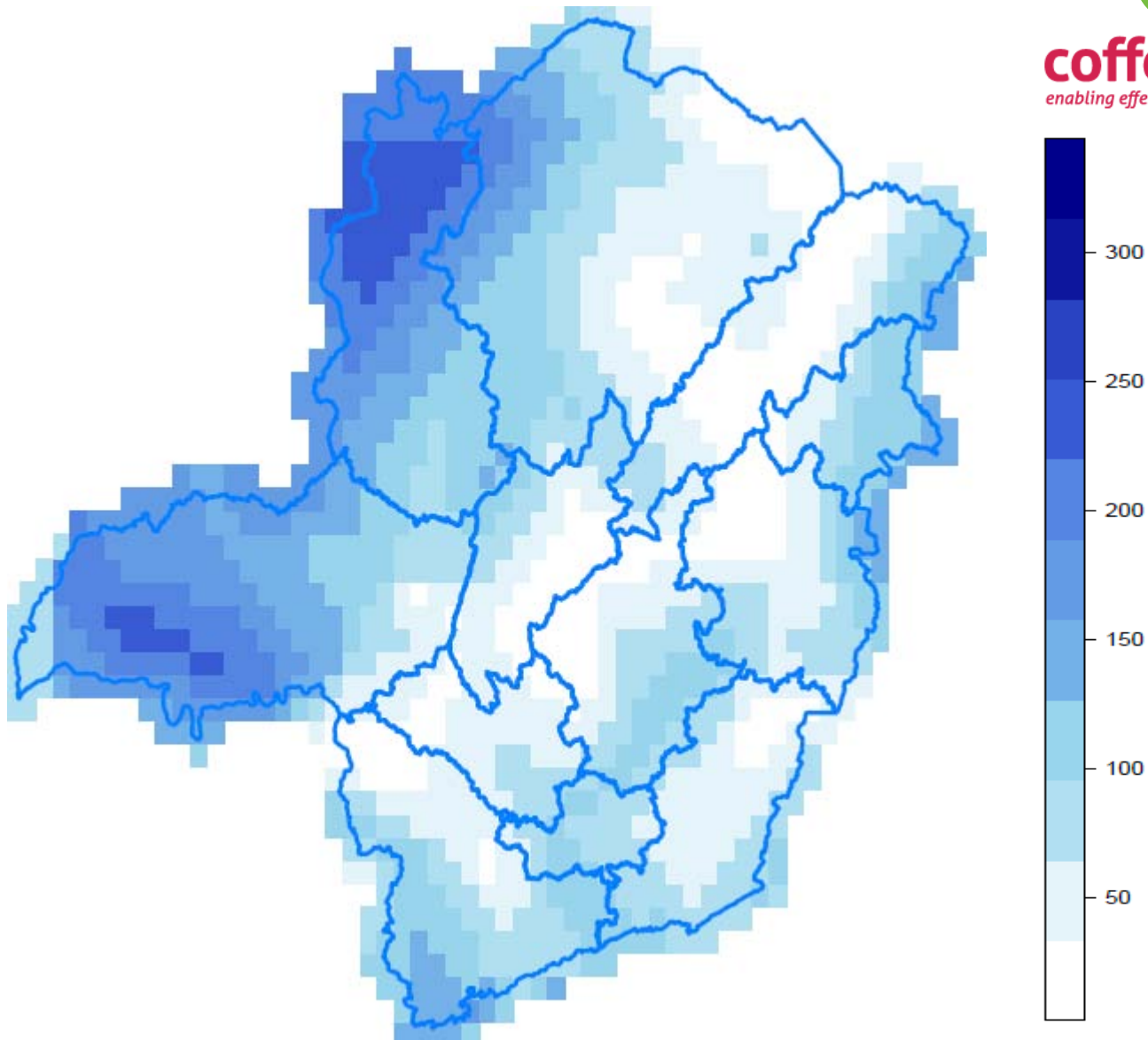


Accumulated rainfall (mm) for February in Minas Gerais (**1981-2010 climate**)

Feb 2014 rainfall



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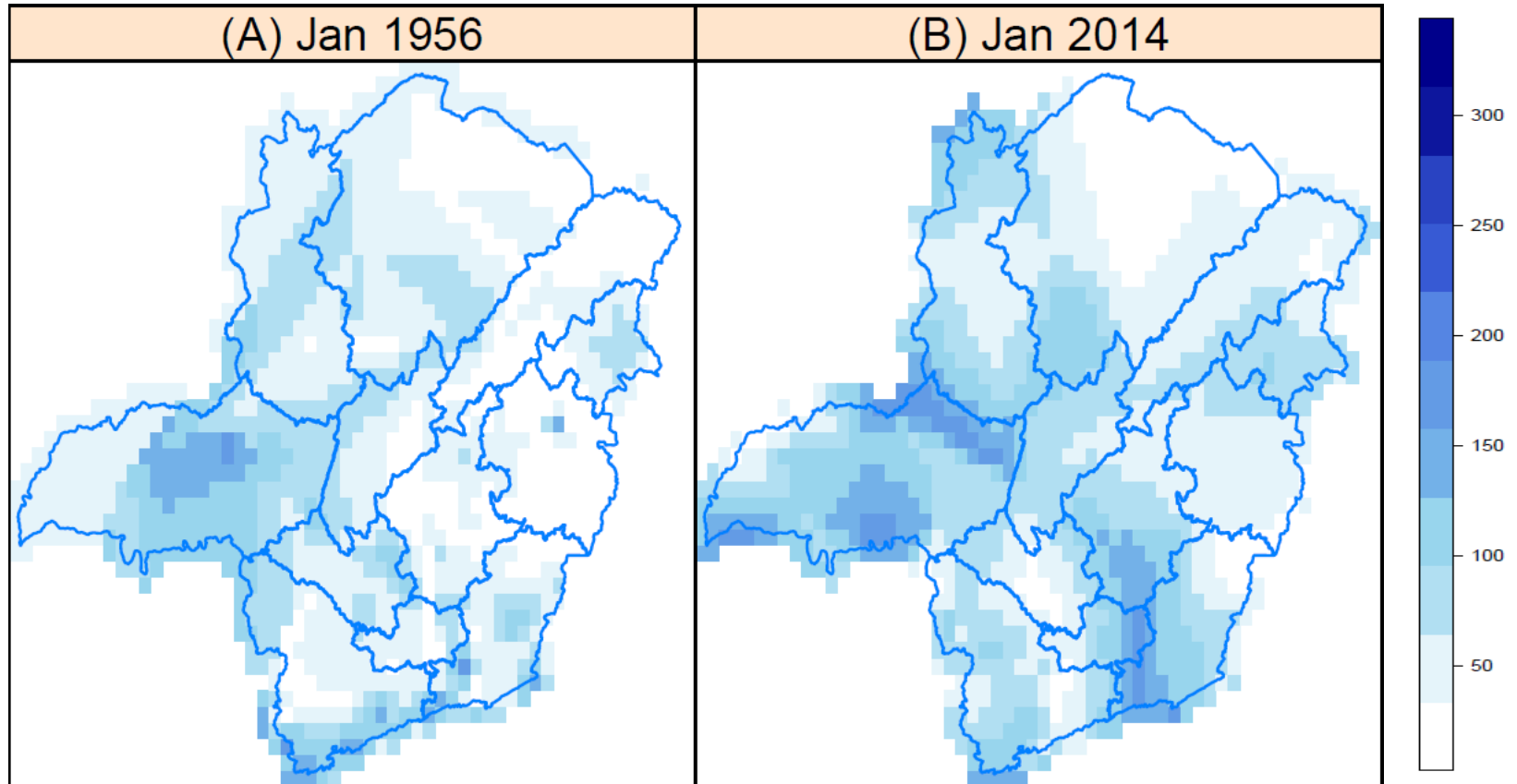


Accumulated rainfall (mm) for February in Minas Gerais (**2014 only**)

Jan 2014 rainfall was very similar to Jan 1956



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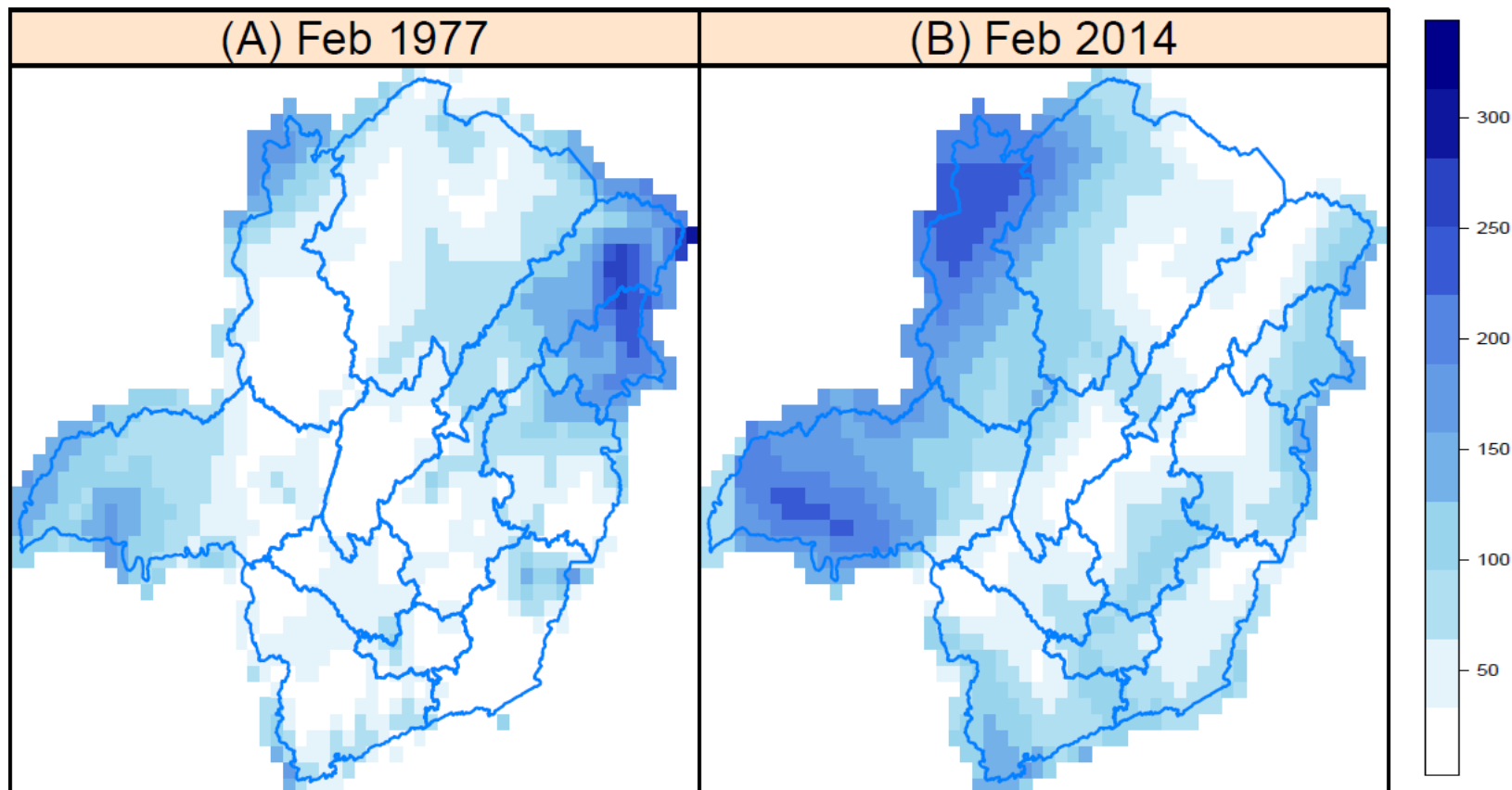
Feb 2014 rainfall was similar to Feb 1977



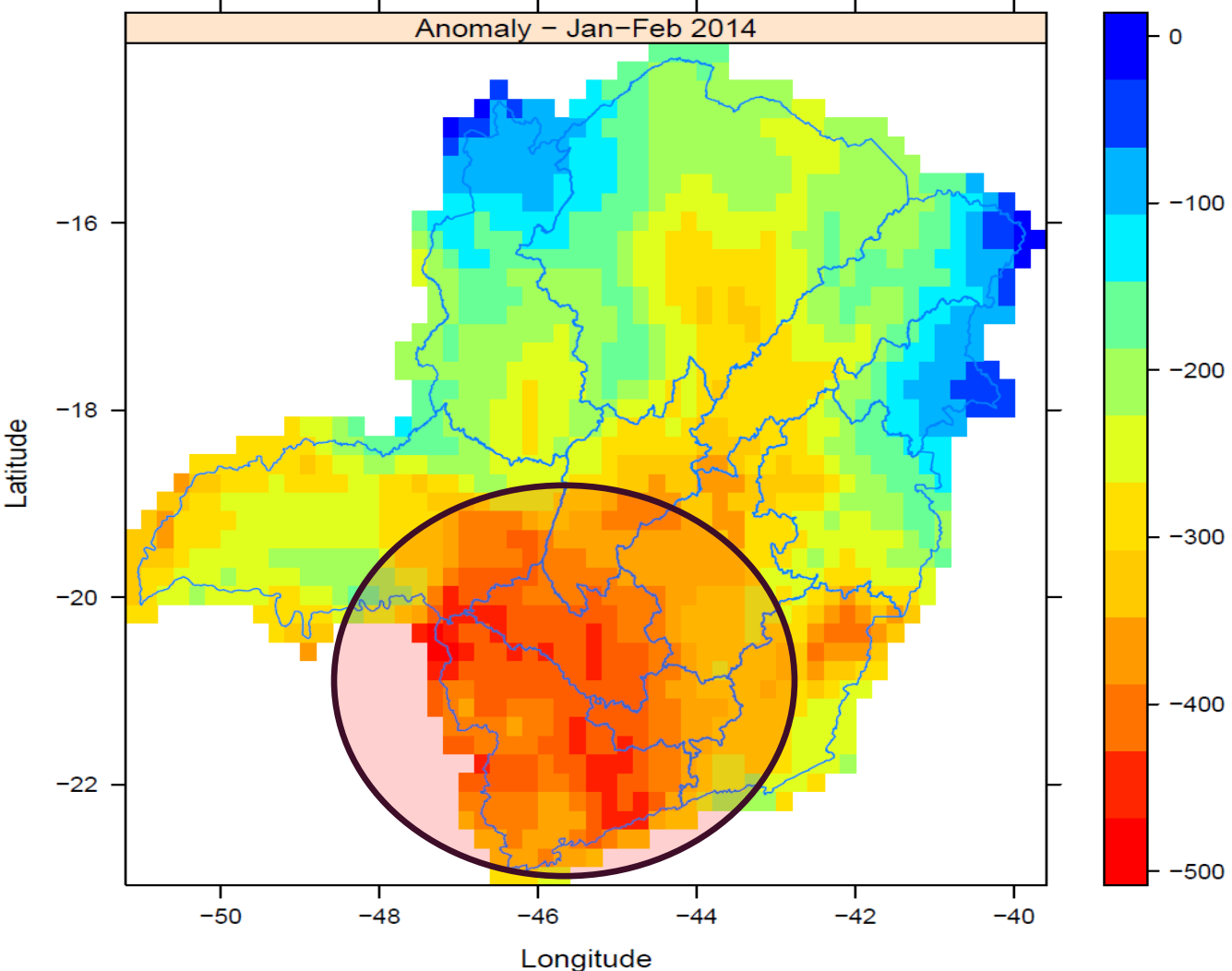
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Combined Jan+Feb rain deficit approaches 500 mm in Sul de Minas

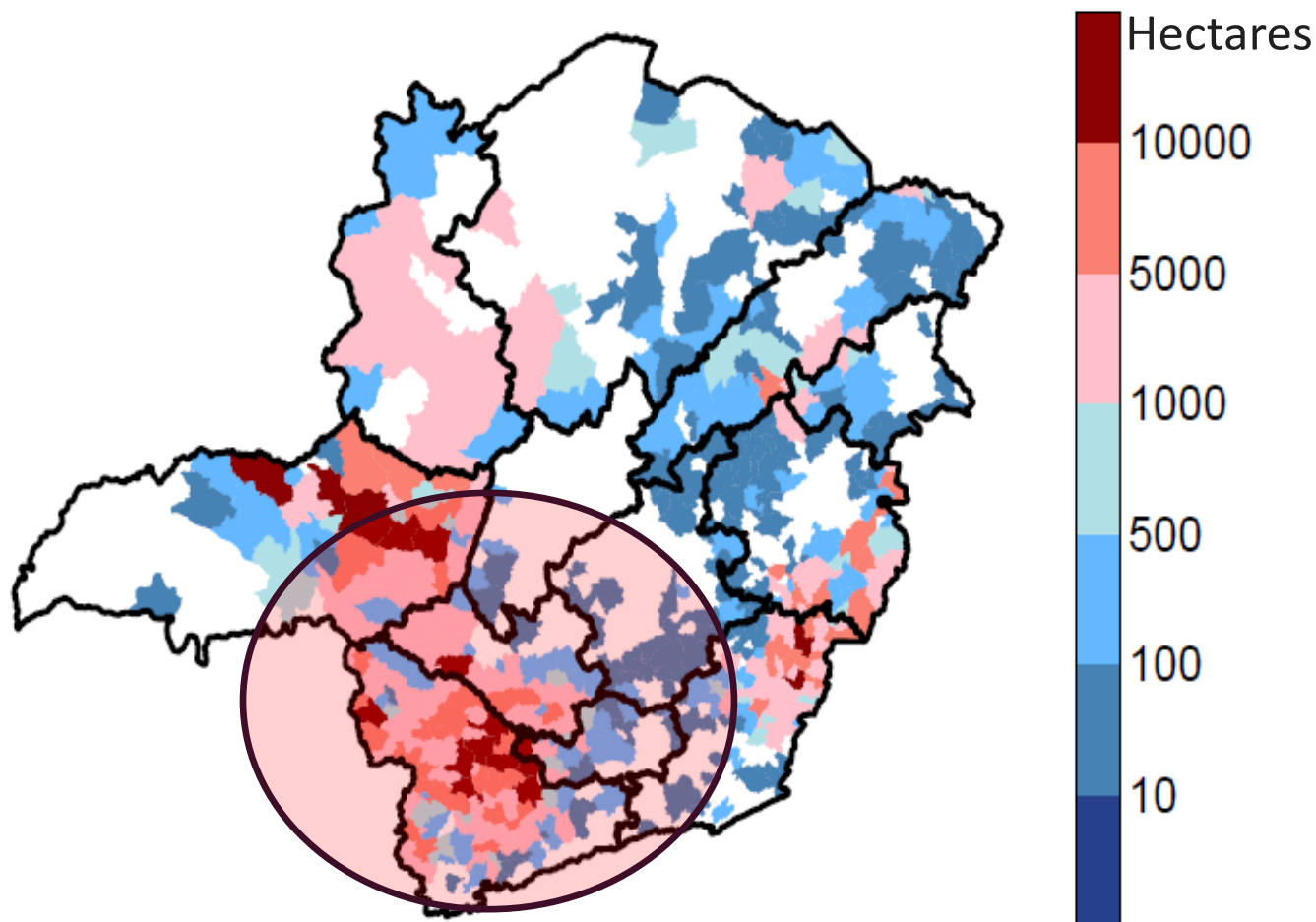


Much of the state's coffee is in the hardest hit zones



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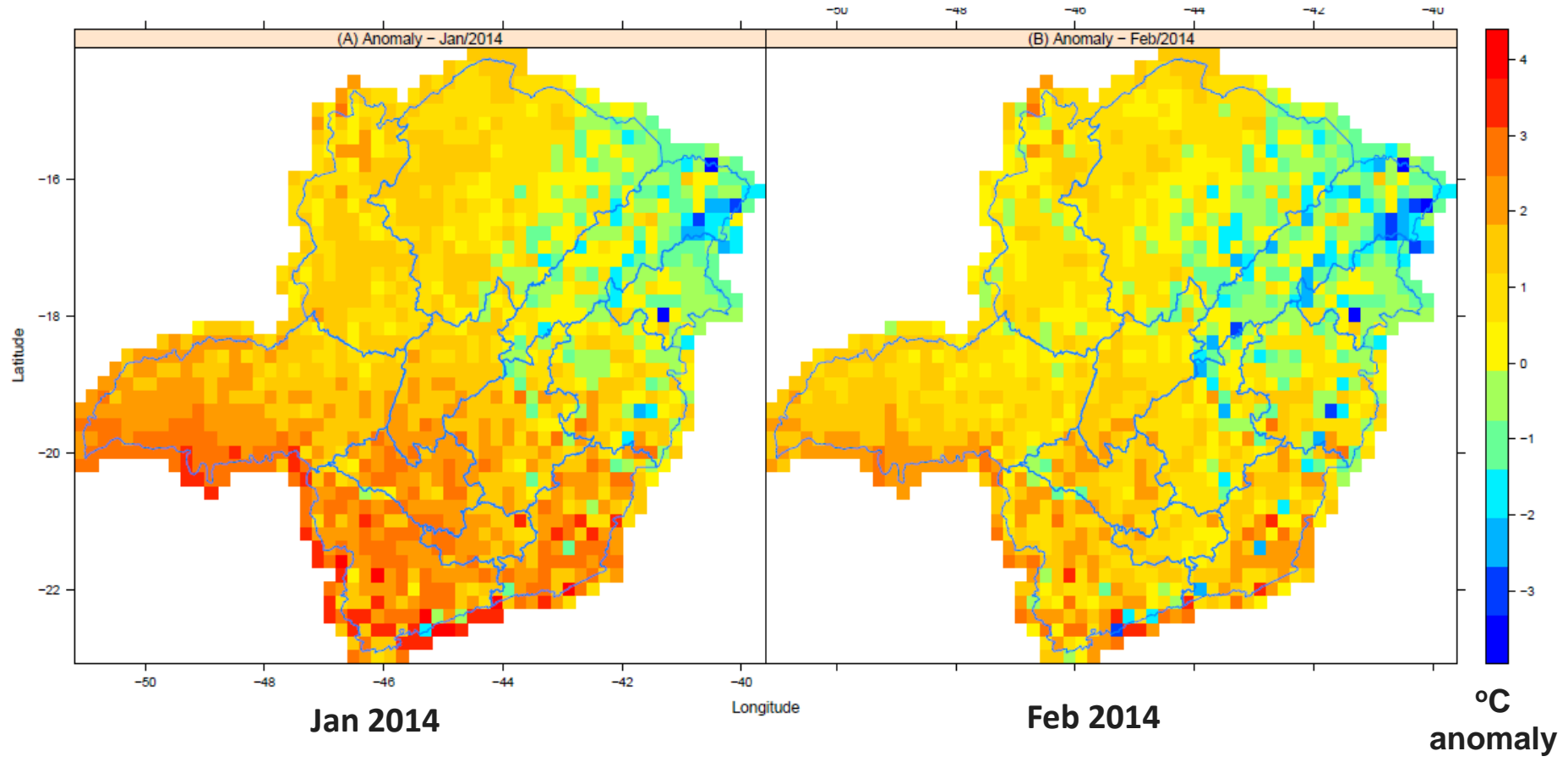
2012



Municipalities of Minas Gerais with more than 10 Ha of coffee planted in 2012 according to IBGE.

Drought is combined with high temps

Mean Jan-Feb Tmax up to 4°C more than normal



Mean daily maximum temperature anomaly (°C) for Jan & Feb 2014 in MG (difference between the mean daily maximum temperature in 2014 and the 1981-2010 climate normal).

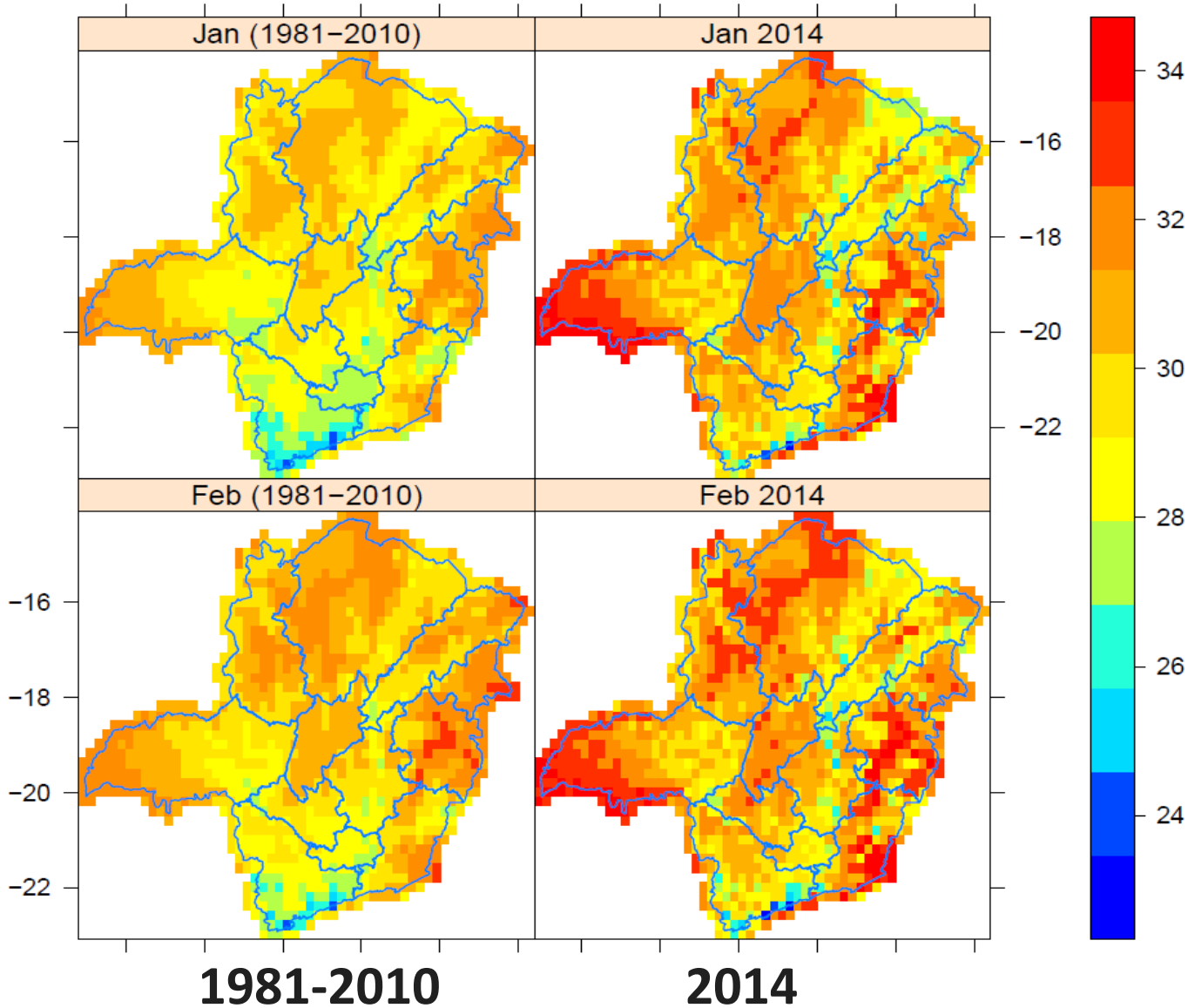
Mean daily Tmax over 30°C in many zones



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An unprecedented drought?



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- We can find no similar two month period of such extreme Jan-Feb drought in the meteorological records
- Records become increasingly scant and unreliable pre-1960
- But it seems quite certain that any similar event as the current MG drought would have to be pre-1950
- So it's a very rare event

Berries not filling... [Courtesy of Cristiano Soares]



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85% floaters!

[Nivaldo M. Tavares Commercial Director of Cocatrel]



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Is it climate change?

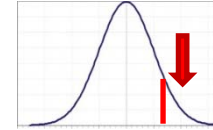


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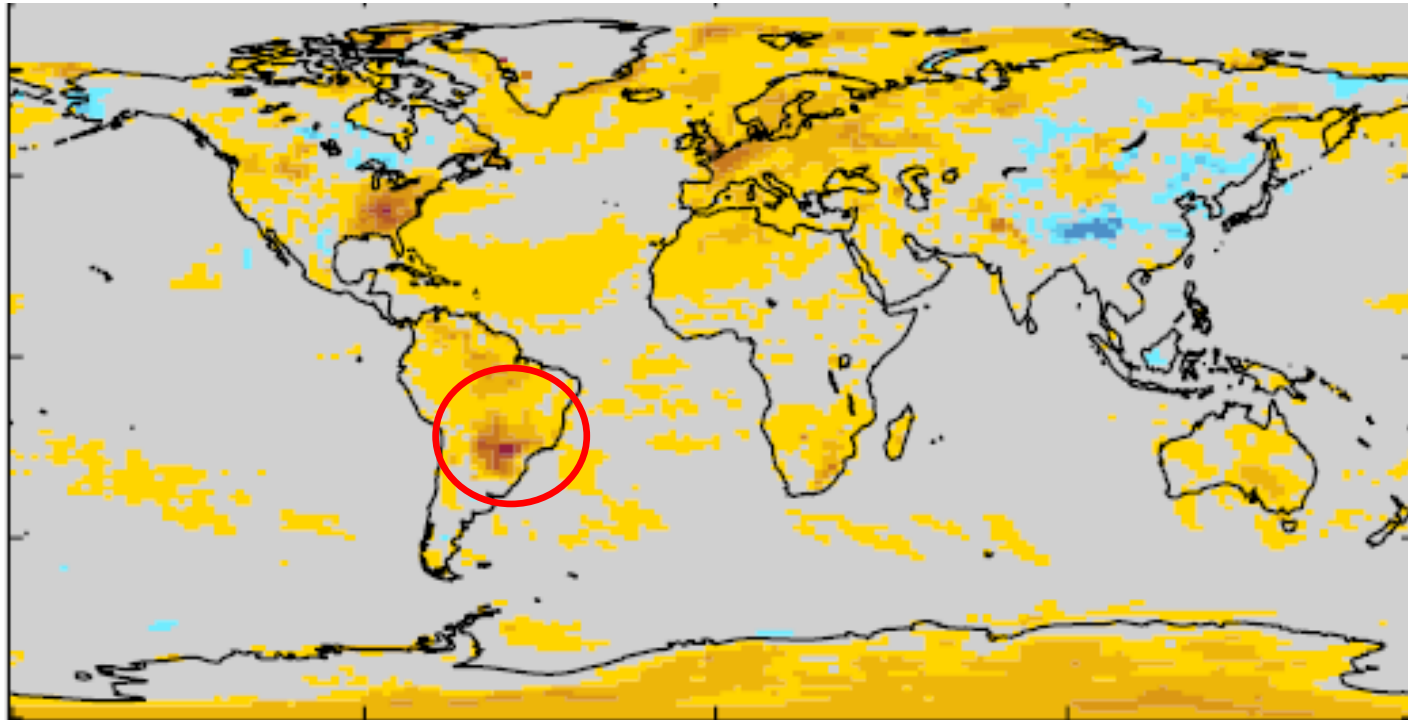
- Droughts happen – we cannot blame a single drought on climate change
- But is it likely that climate change has made it worse?
 - Yes – MG temperatures have been rising for decades
- In fact the whole region has been warming quite substantially:

Trend of warm days increasing strongly in Central S America

(Warm days = those above 90th percentile of daily historical Tmax)



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-0.6 -0.4 -0.2 0 0.2 0.4 0.6

Patterns of the **1951–2003 trend** of the index for warm days (in C/decade) estimated from the observations and the ensemble mean of model experiments with ALL forcings (Christidis et al. 2013)

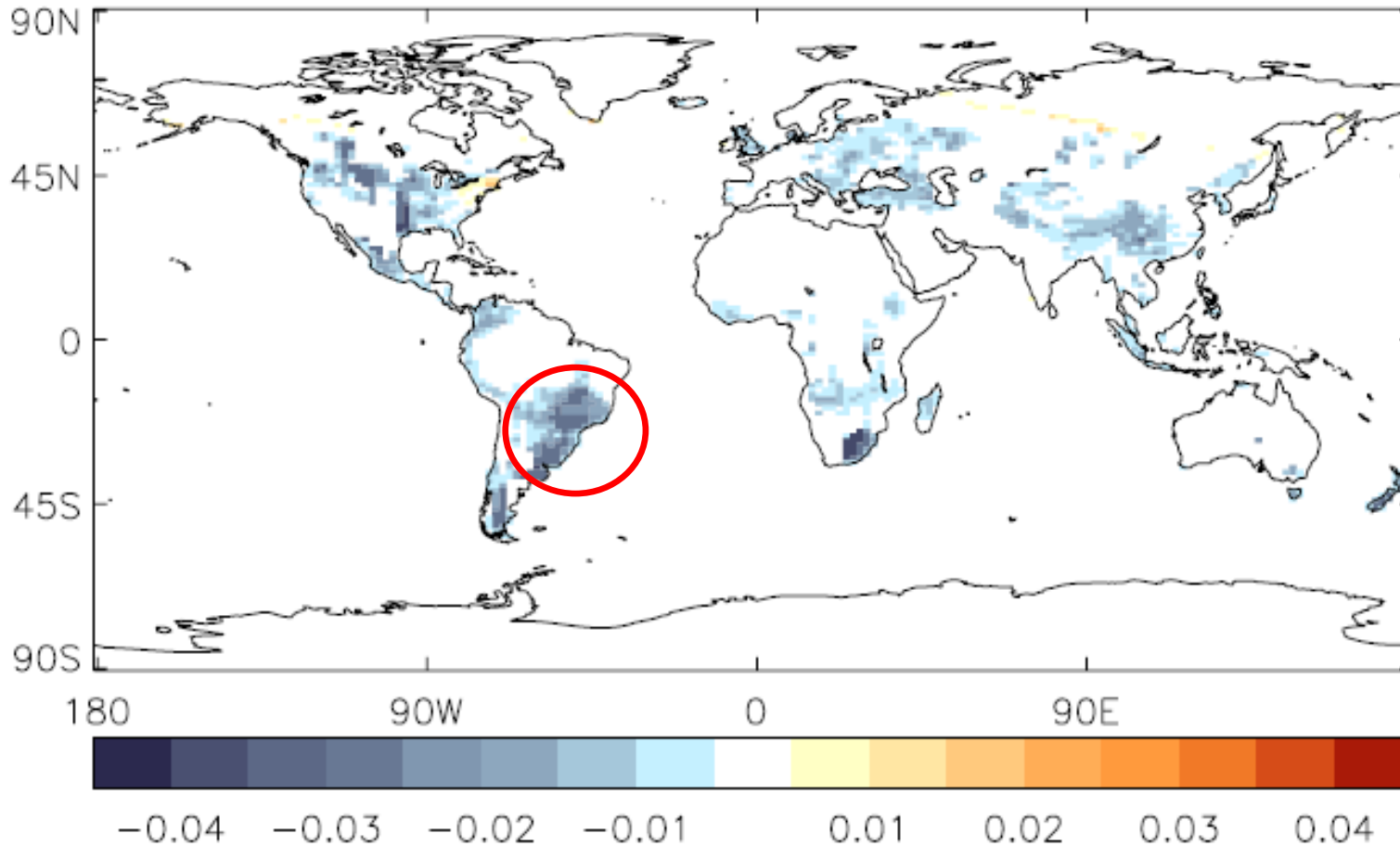
Tree cover loss (1860-2010) Just a coincidence?



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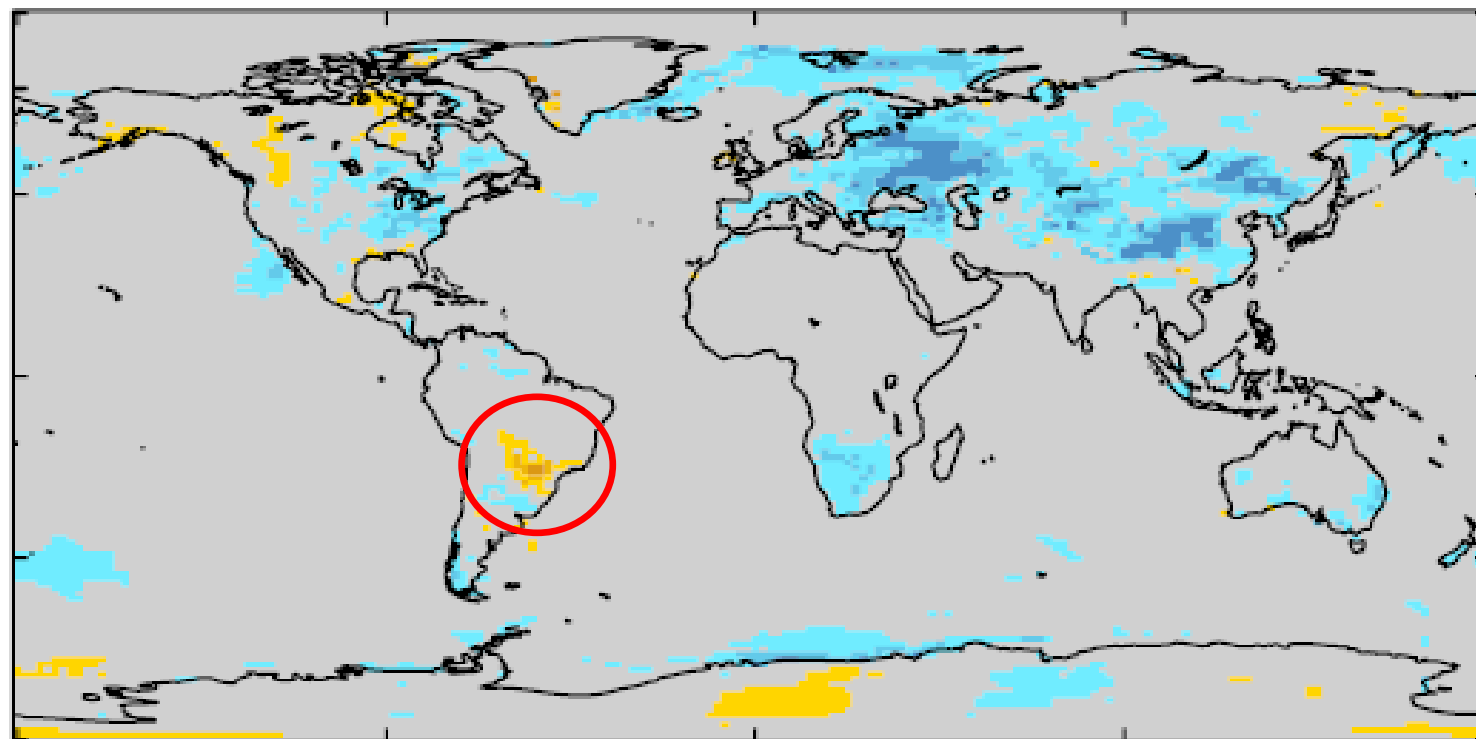


Patterns of the 1860–2010 trend in tree-cover fraction per decade

Estimated warming trend due to land use change only



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-0.6 -0.4 -0.2 0 0.2 0.4 0.6

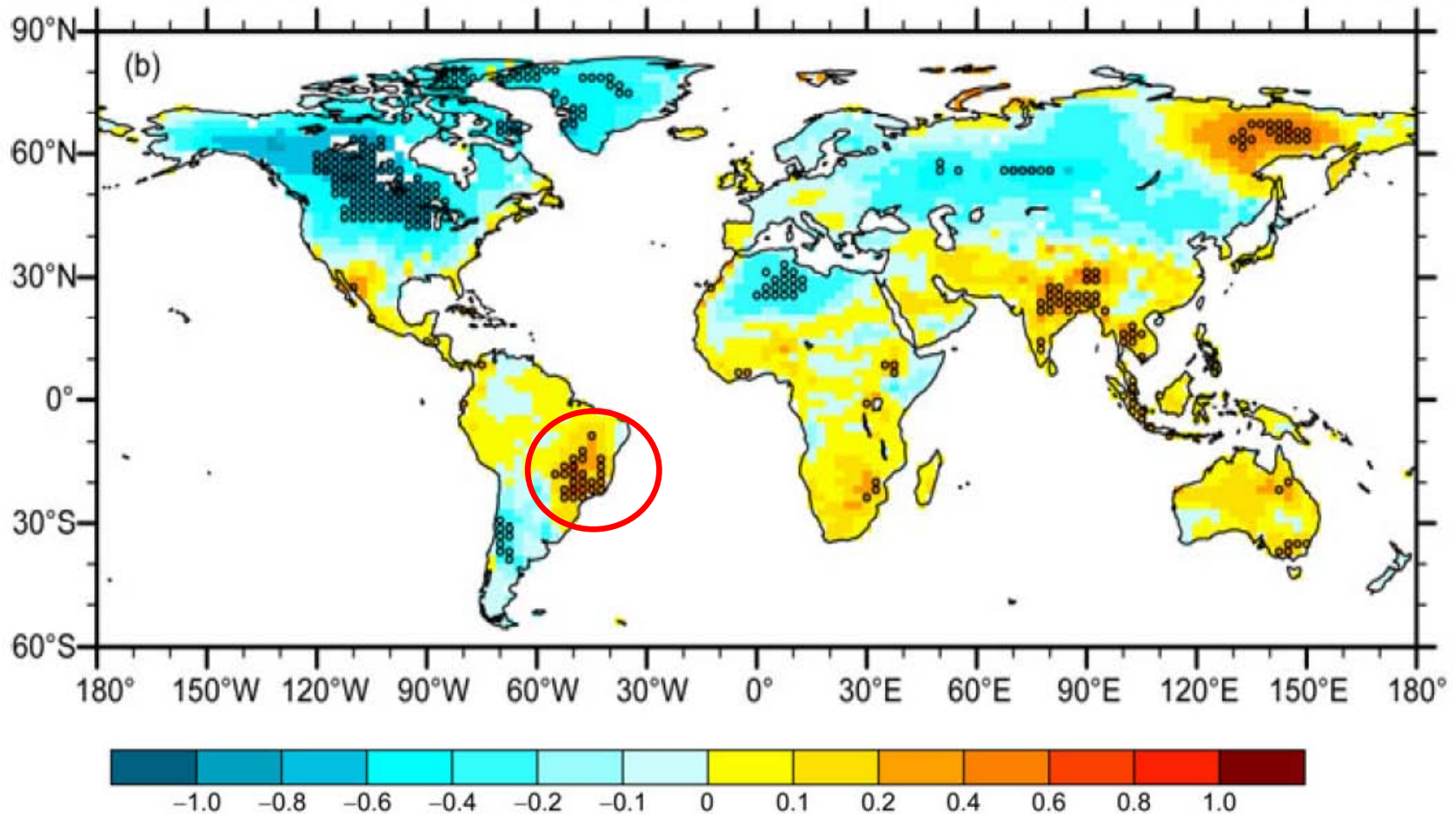
Patterns of the 1951–2003 trend of the index for warm days (in C/decade) estimated due to land use change only (Christidis et al. 2013)

Another study (Hua Wen Jian et al 2013)

Mean temp change due to land use change



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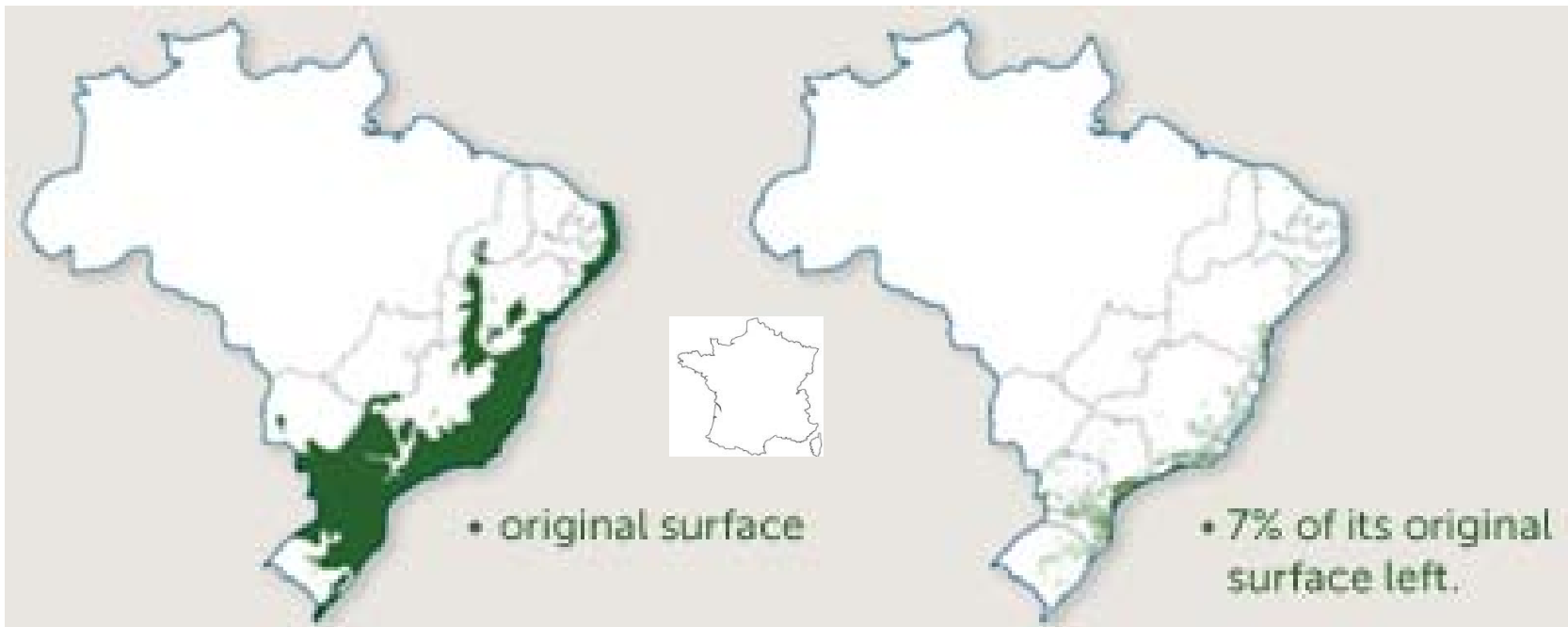


Changes in annual mean surface air temperature due to land use change (hollow circles show the 0.05 significance level). Hua Wen-Jian et al. 2013

Atlantic forest biome Severely degraded



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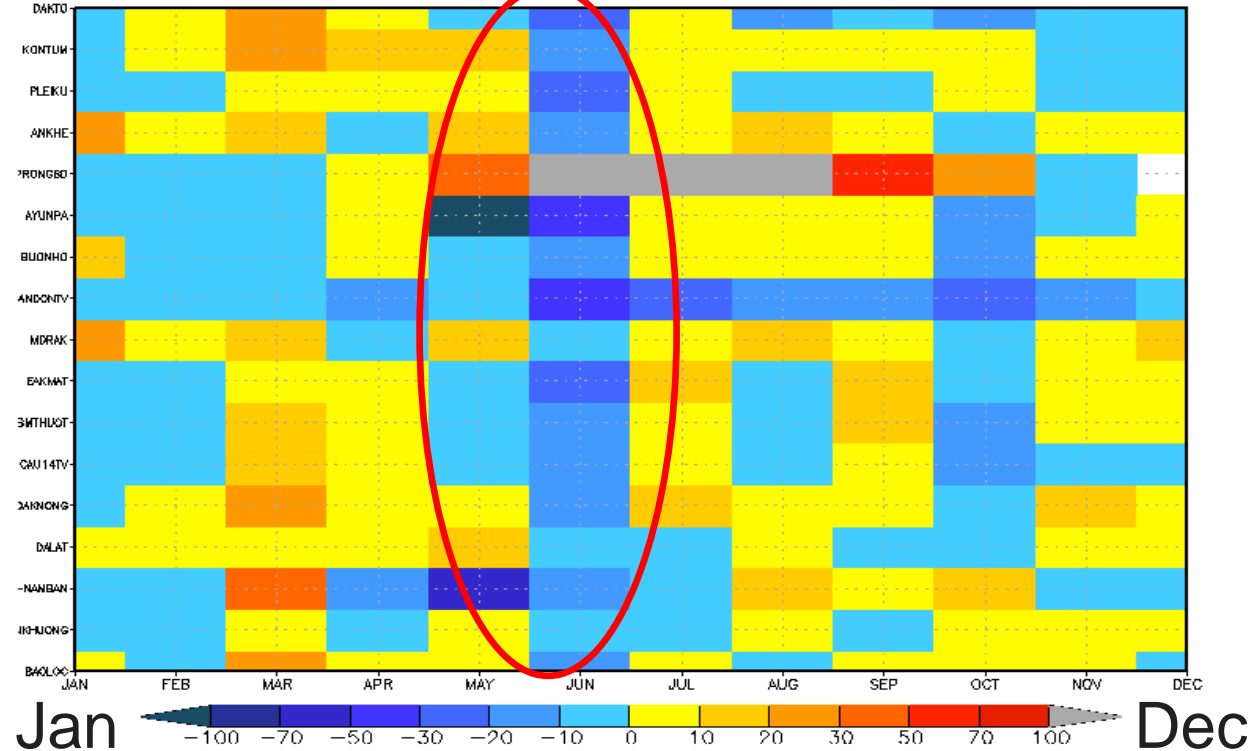
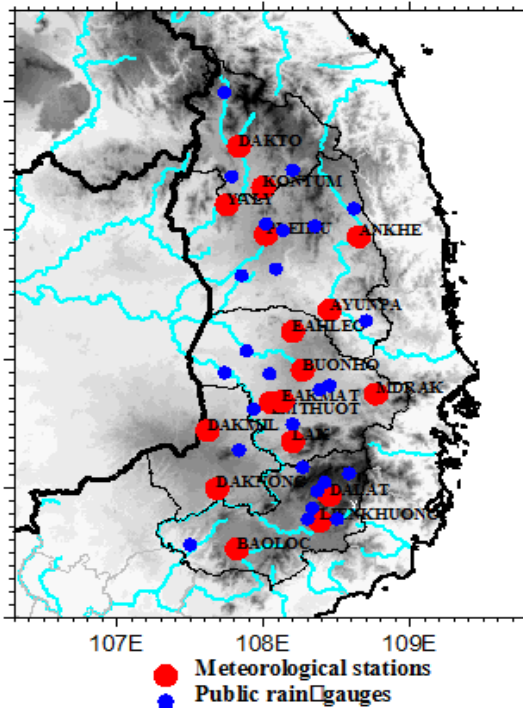
Vietnam: similar story?

Central Highlands Decreasing rain in early-mid wet season



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Trend of Change (Sen slope) in Monthly Rainfall Amount (%/decade)



c&c collaboration with: Phan Van Tan, Ngo Duc Thanh, Nguyen Van Hiep
Vietnam National University in Hanoi,
Vietnam Institute of Meteorology Hydrology and Environment

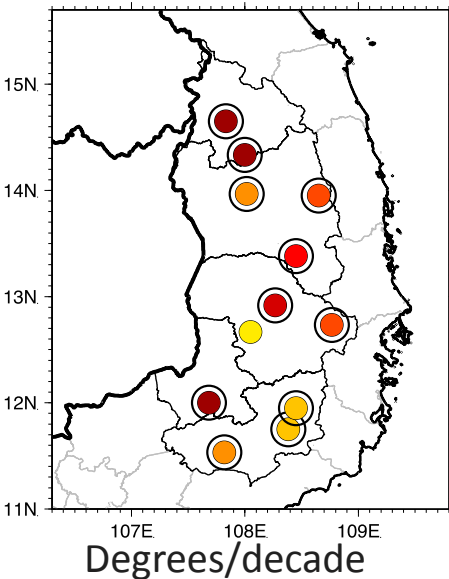
Vietnam: with fast increasing temps 0.7°C+ per decade in some months



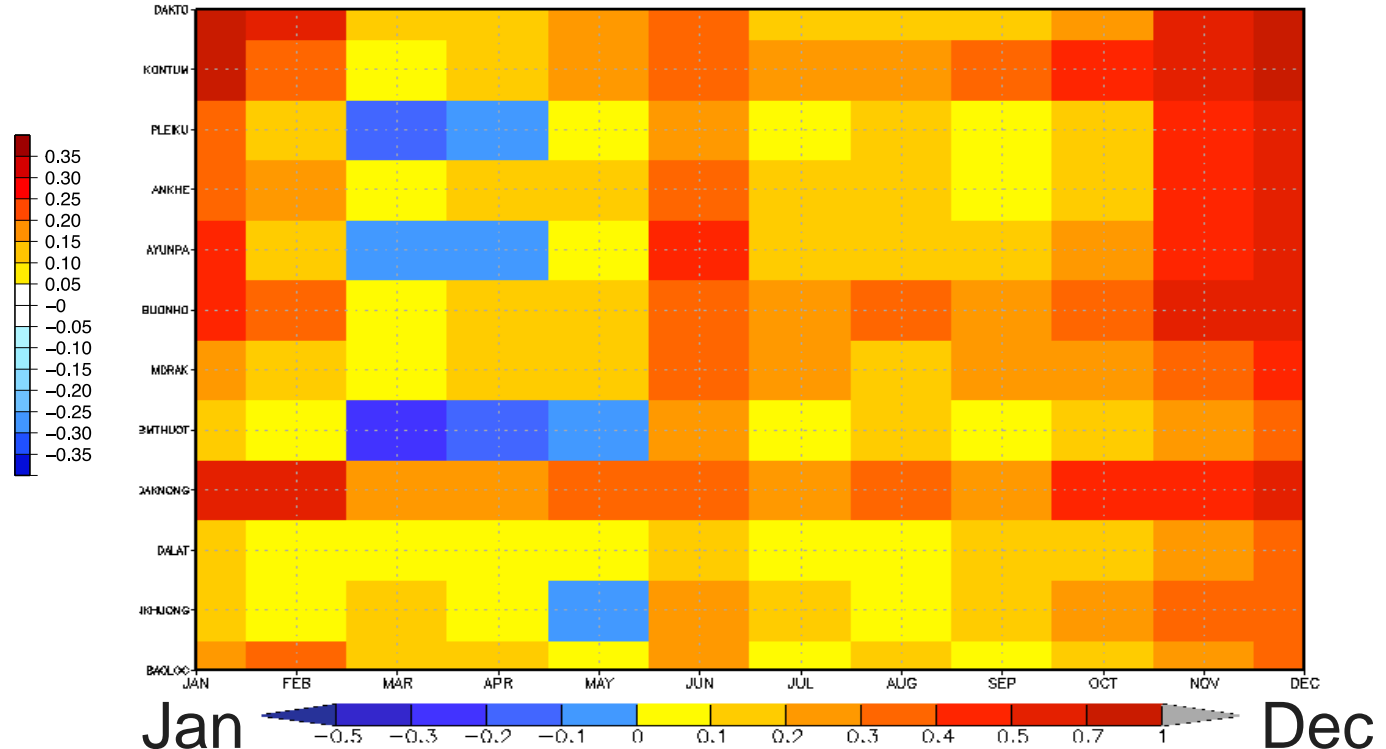
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Trend of Change (Sen slope) in
Monthly 2m Temperature (deg.C/decade)



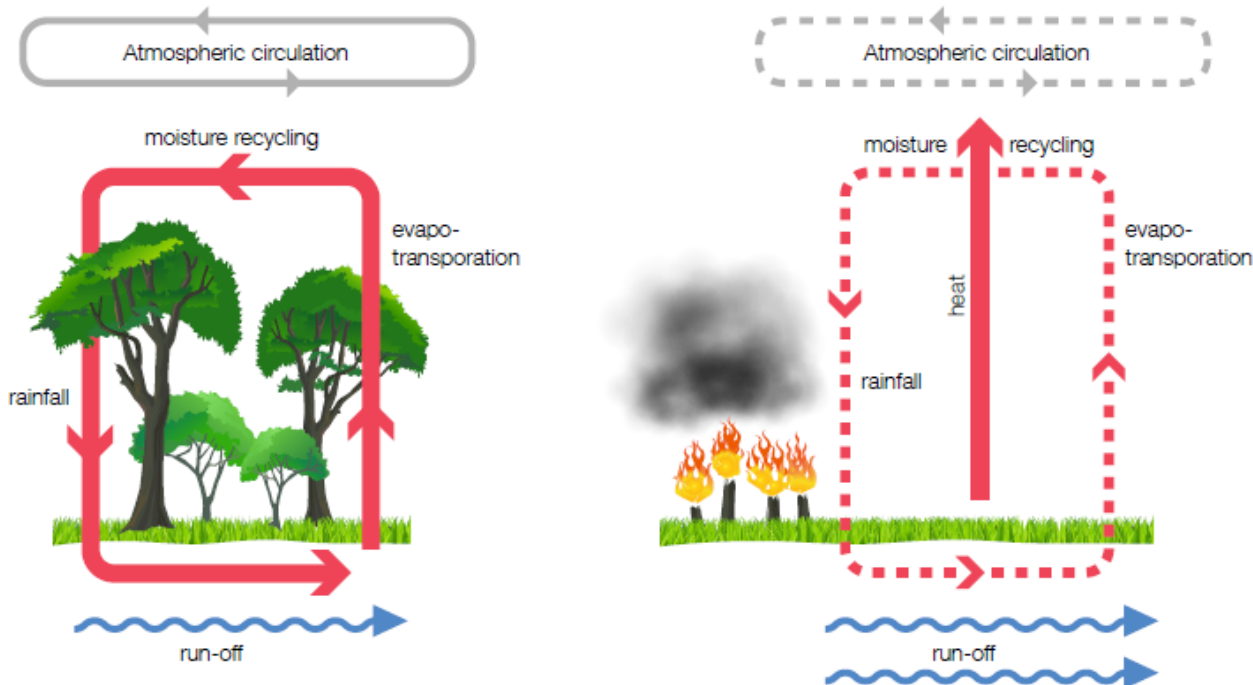
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Increasing extremes



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- It is likely that major deforestation would make any normal drought worse
- Forests buffer extreme climate – canopy evaporation cools the local climate and increases the chance of cloud and rain formation



Conclusions



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- Drought not caused by climate change
- But very likely made more intense by it
- Two types of climate change need to be considered:
 - Global warming – drought has a higher base temperature
 - Regional warming caused by land use change – lack of evaporative cooling and reduced precipitation

Such a drought is a rare event



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- But rare events are becoming common!
- **Colombia (2008 – 10):** unprecedented rains
- **Central America, Peru 2012-13:** major rust outbreaks
- **Brazil 2014:** drought
- **E Africa, India, Indonesia, Vietnam:** droughts and unseasonal rains increasing over past few years

Playing the climate lottery?



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- Do you think the extreme events of the past few years all random occurrences?
- Or is it time to join the dots?
- This problem will not go away
- Expect more severe events in the future
- We must act now and in concerted fashion

Some of c&c's adaptation work in MG

(Lage et al. – mostly drought-related)



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Bigger planting bags



Met. data collection



Gypsum applications



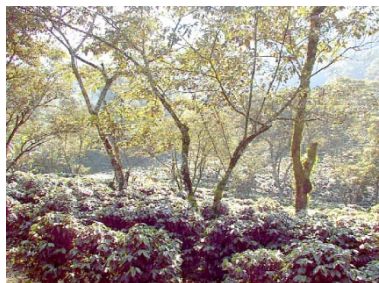
Rainwater harvesting



c&c toolbox



Ground cover & mulch



Shade trials



Hydrogel applications



Wind breaks



Run-off & infiltration

There are a lot of adaptations that can be tried



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- c&c has developed a robust and science-based approach to CC adaptation
- Each coffee country should developing its own adaptation tool-kit to confront to locally derived priorities
- A lot is already available that can be applied over the short to medium term

Christiana Figueres, UN Climate Head [London interview March 2014] Discussing extreme weather events:



"If you take them individually you can say maybe it's a fluke. The problem is it's not a fluke and you can't take them individually. What it's doing is giving us a pattern of abnormality that's becoming the norm.

These very strange extreme weather events are going to continue in their frequency and their severity ... It's not that climate change is going to be here in the future, we are experiencing climate change."



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Thank You

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p.baker@cabi.org

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