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The Latin American Modeling Project (LAMP)

Kate Calvin

CESM SDWG Meeting

19 February 2013

Boulder, Colorado

Long term research support provided by

U.S. DEPARTMENT OF ENERGY | Office of Science

Regional Model Comparisons

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- We, at PNNL, were asked to coordinate a series of regional model comparison efforts for the U.S. Environmental Protection Agency.

- The studies:
  - The Asia Modeling Exercise (AME): 2009-2012
  - The Latin American Modeling Project (LAMP): 2012-?
  - An African Modeling Exercise: TBD

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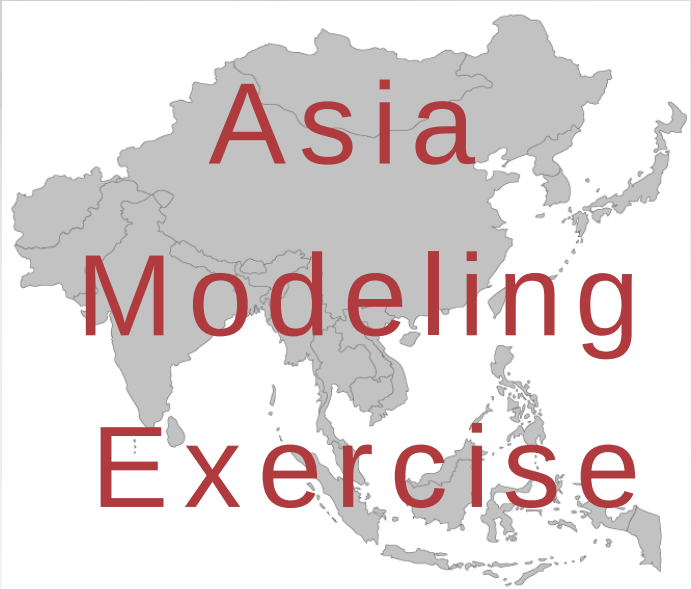

THE ASIA MODELING EXERCISE (AME)

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Goals of AME

Asia Modeling Exercise

- ***Objective:*** **to better articulate the role of Asia in addressing climate change**.

- ***Goal:*** To **bring together global modelers** that commonly participate in efforts to explore international policy architectures **with regional modelers and experts** with Asia-specific knowledge, understanding, data, and analysis.

- ***Method:*** A **coordinated modeling exercise** that attempts to link these communities to provide more effective modeling and analysis of Asia within a global context.

Final Product: the Journal

ELSEVIER

Volume 34, Supplement 3, December 2012 ISSN 0140–9883

Energy Economics

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Available online at www.sciencedirect.com

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- Results from the project were published in a special issue of Energy Economics in December 2012
  - 7 overview articles
  - 20 individual modeling team articles

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THE LATIN AMERICA MODELING PROJECT (LAMP)

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In 2010, Latin America Consumed ~10 EJ of Fossil Fuels (Mostly Oil).

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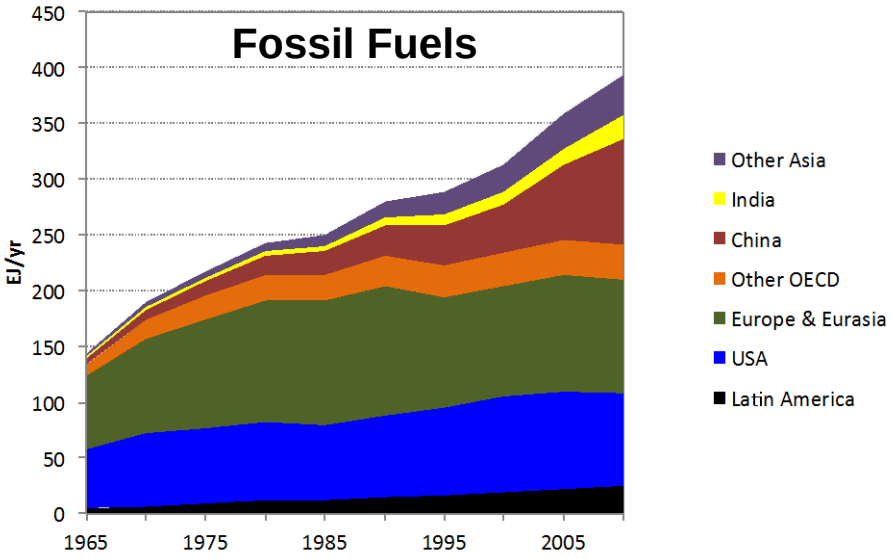

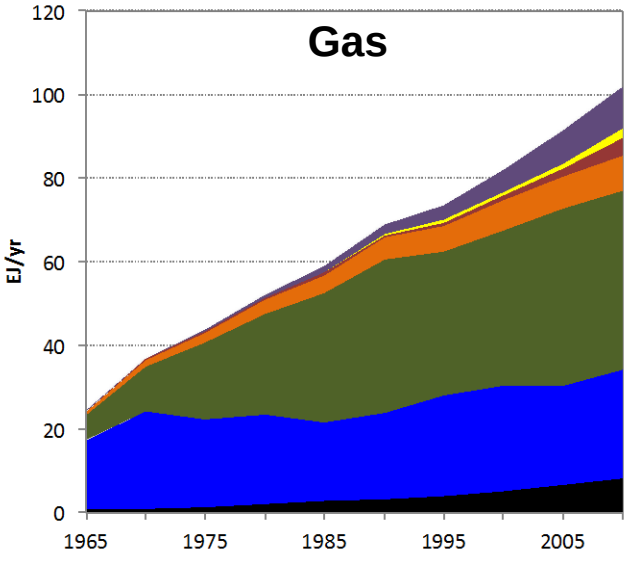

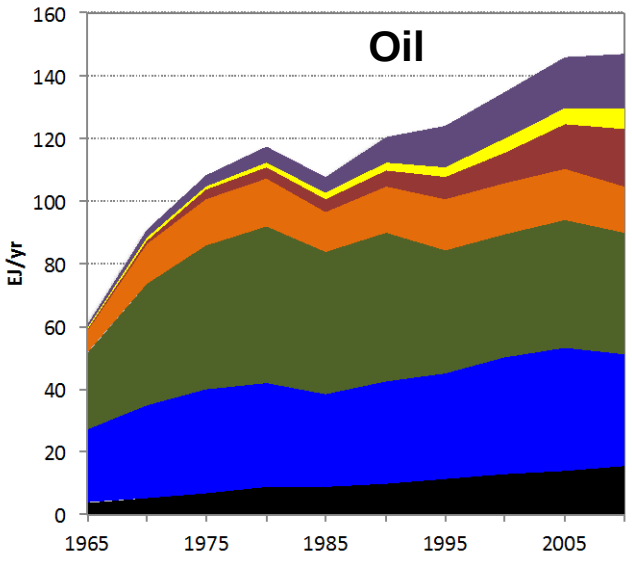

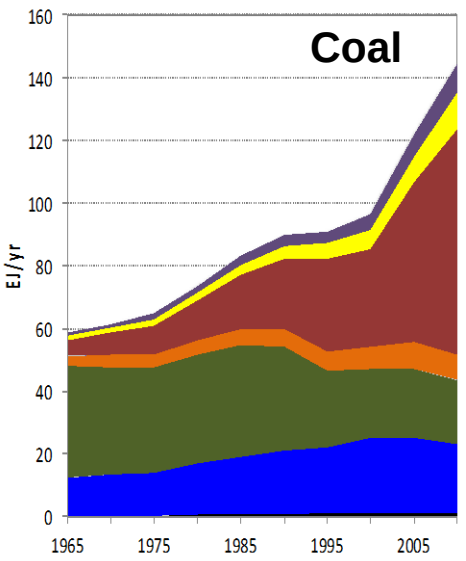

Source: BP (2011). “BP Statistical Review of World Energy June 2011”

In 2005, Latin America Emitted ~0.4 GtC from Energy-Related Activities and ~0.6 GtC from Land Use Change

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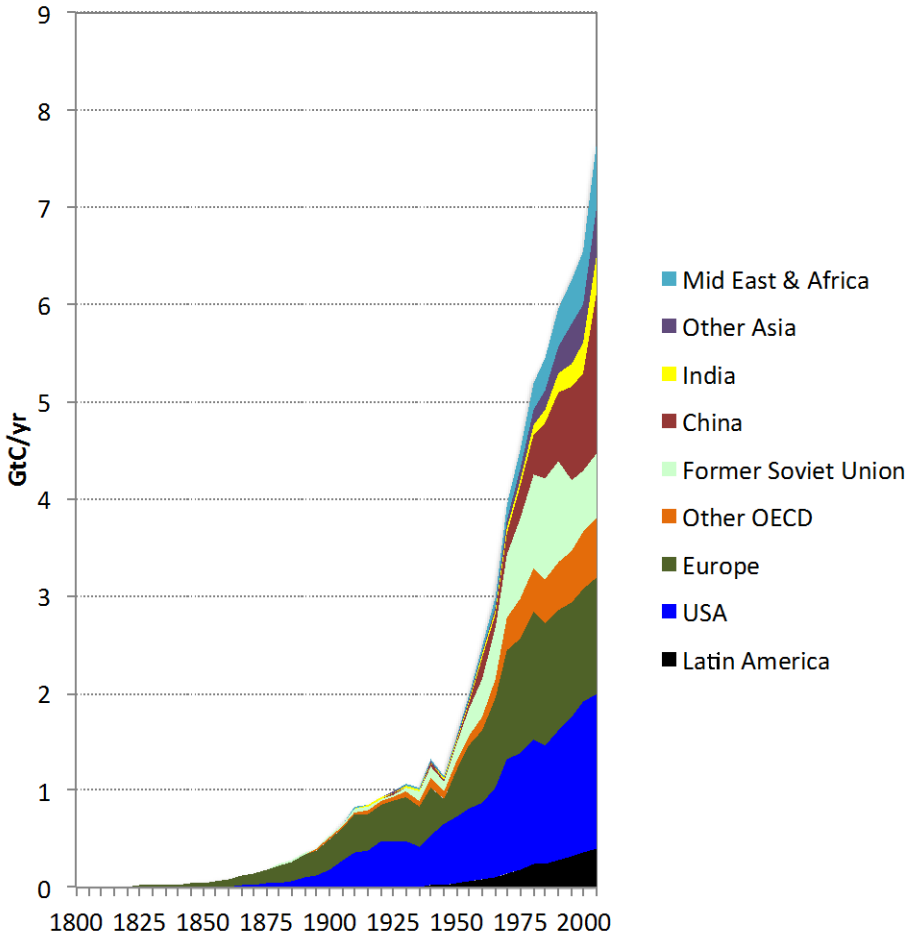
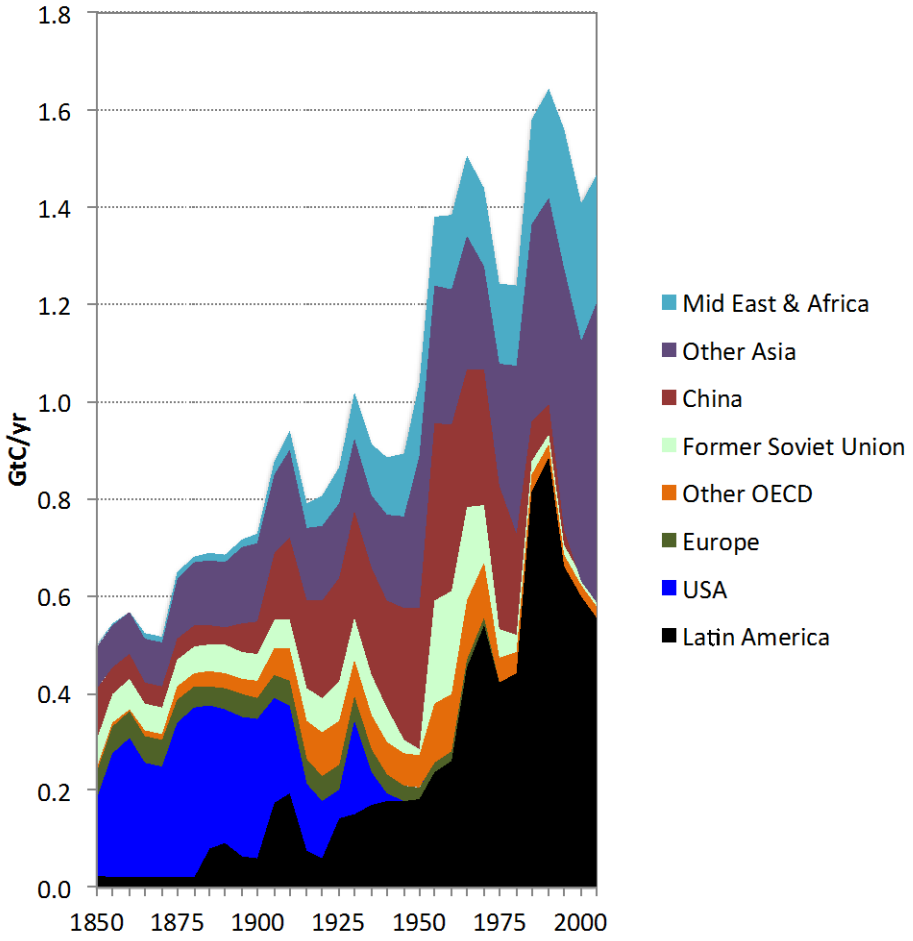
Fossil Fuel & Industrial CO_2



Land-Use Change CO_2



Source: CDIAC. Accessed January 7, 2012.

Participants

- Global Modeling Teams included:
  - EPPA (MIT, USA)
  - GCAM (PNNL, USA)
  - iPETS (NCAR, USA)
  - Phoenix (Penn State, USA)
  - POLES (IPTS, EU)
  - TIAM-ECN (ECN, Netherlands)
  - TIAM-World (Kanlo-KanORS, France)

- Regional Modeling Teams:
  - MEG4C (DNP, Colombia)
  - MESSAGE-Brazil (COPPE, Brazil)
  - TBD (INE, Mexico)
  - CGE Model (RTI, Uruguay)
  - LEAP (FB, Argentina)
  - Land-use model (IPEA, Brazil)

LAMP Modeling Teams

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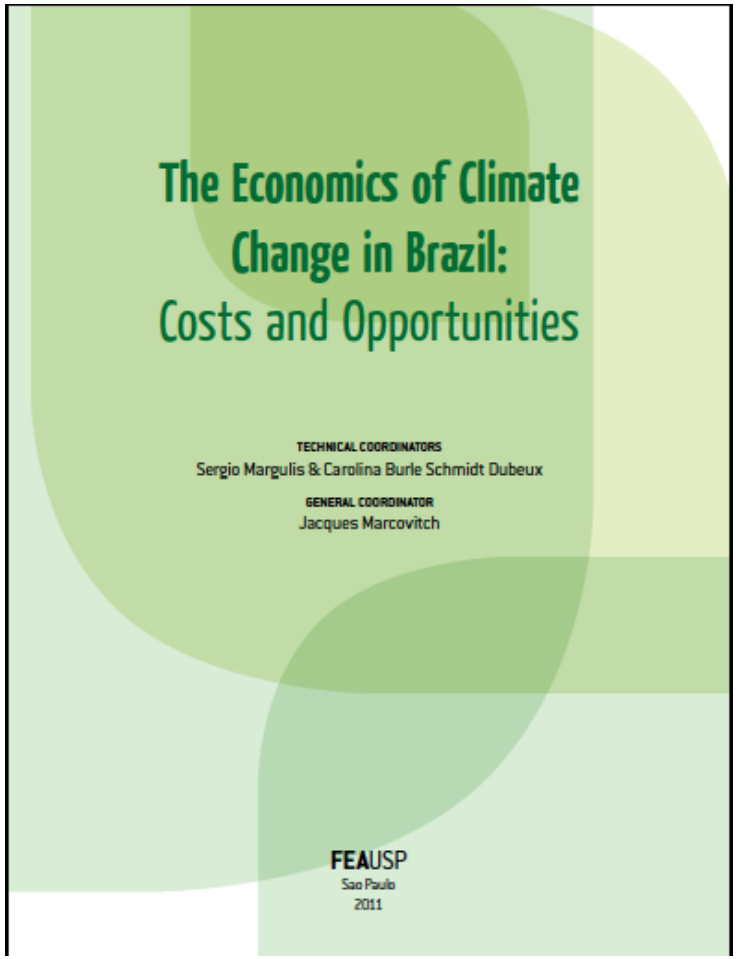
- Participating modeling teams are varied
  - Some are energy system only.
  - Some are agriculture/land-use only.
  - Some have both.
- Some models will just do mitigation.
- Some will do impacts/adaptation.

- LAMP will have to design a set of scenarios that can link across the two fields (e.g., use the RCPs).

LAMP Modeling Teams

- The modeling teams doing impacts assessments are also varied.
  - Some are global and fairly aggregate. These models can use CMIP5 archive data, for scenarios that exist in the archive.
  - Others are regional and require higher resolution data. These models need climate data at a resolution of 50km.

Previous Impacts Studies in Latin America



- Inspired by the Stern Report
- Published in 2011
- Links physical impact models with economic models to calculate the cost of climate change for Brazil
- Looks at water, energy, agriculture, land use, and biodiversity
- Uses A2 and B2 scenarios
- Physical impact models required data at a 50km resolution. Used regional climate model, PRECIS, forced with data from the Hadley Center Model

Previous Impacts Studies in Latin America

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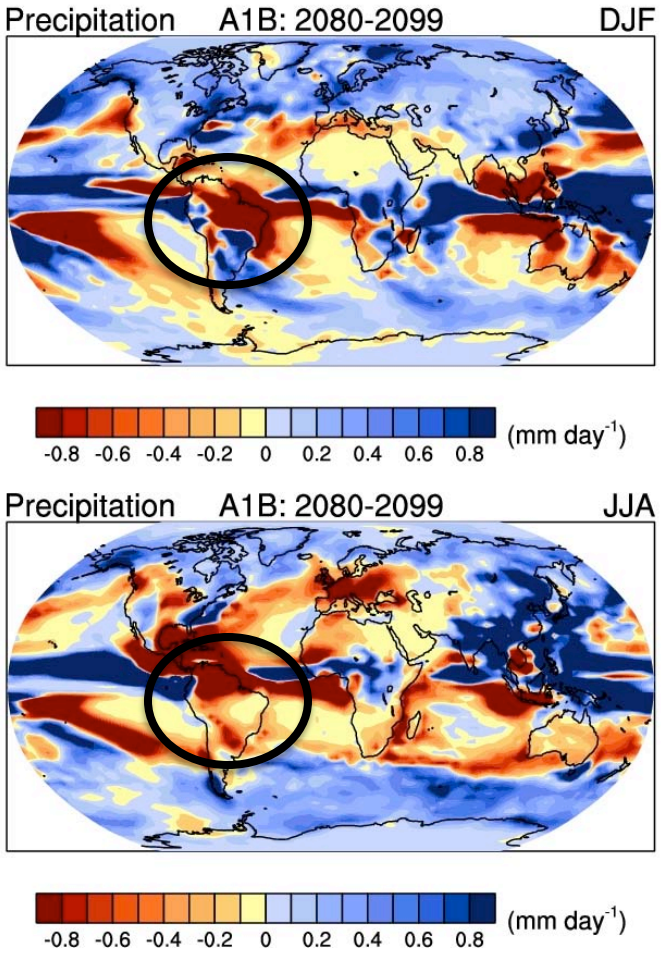
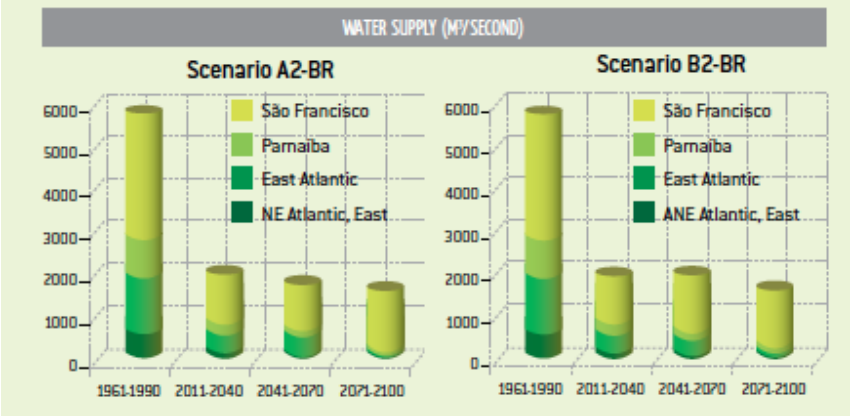
Hadley Center Precipitation



Impacts Assessment Results



- Water supply reduced by 2/3
- Average decline in hydropower production in 2100 of 30% in the A2 (higher in some regions)
- Estimated cost of adapting to reduced hydropower on the order of $50 billion

Meehl et al. (2007). *Global Climate Projections.* In: Climate Change 2007: The Physical Science Basis. Cambridge University Press: Cambridge, UK and New York, NY, USA.

Climate Data Needs for Latin American Impacts Assessment

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- Regional modeling teams would like to assess different scenario/climate model combinations, but need climate data at a 50km resolution.
- They currently rely on INPE to provide the necessary data. INPE has plans to provide more downscaled data, but are resource limited.
  - CLARIS project – data for A1B from HadCM3, ECHAM5
  - CORDEX – uses RCPs, will have LAM data, but current focus is Africa
  - They have plans to downscale: MIROC 4.5, IPSL 4.5, HadGEM-ES 4.5, CSIRO 4.5, CanESM 4.5, HadGEM-ES 8.5. Work just beginning (if it is still on schedule)

GCM Precipitation Comparison

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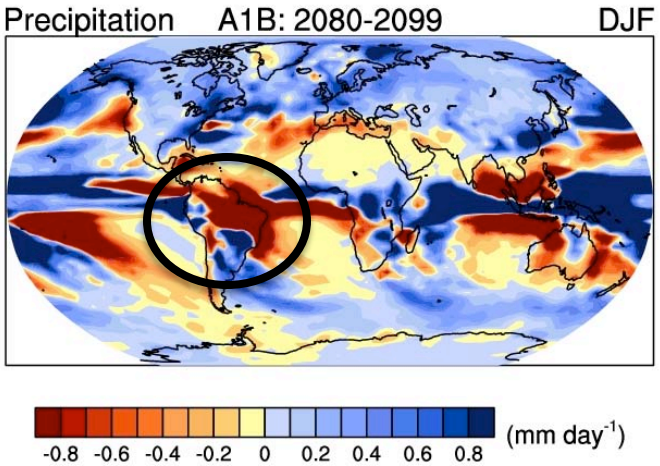
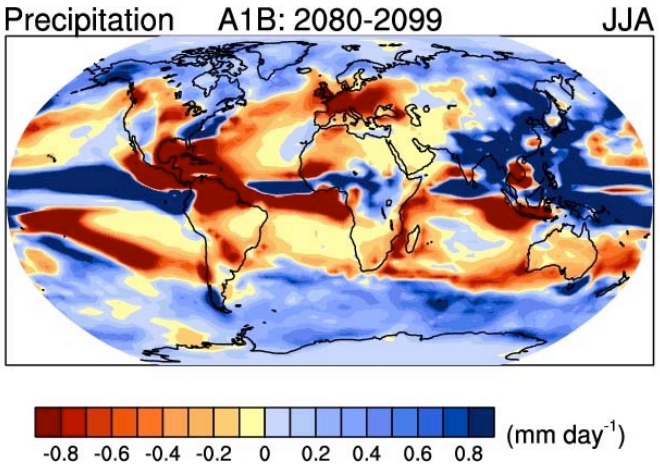
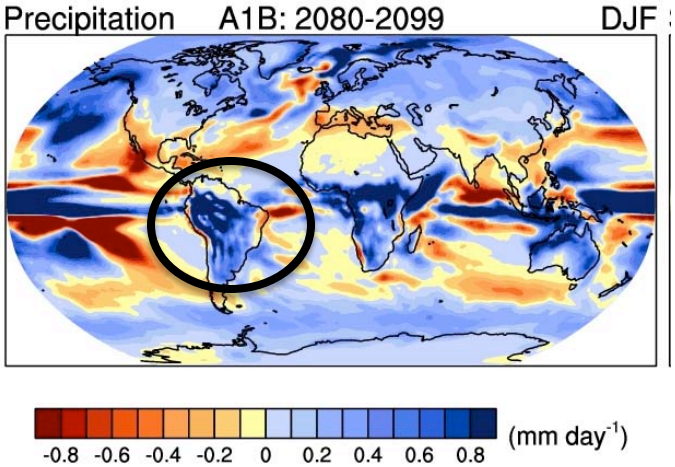
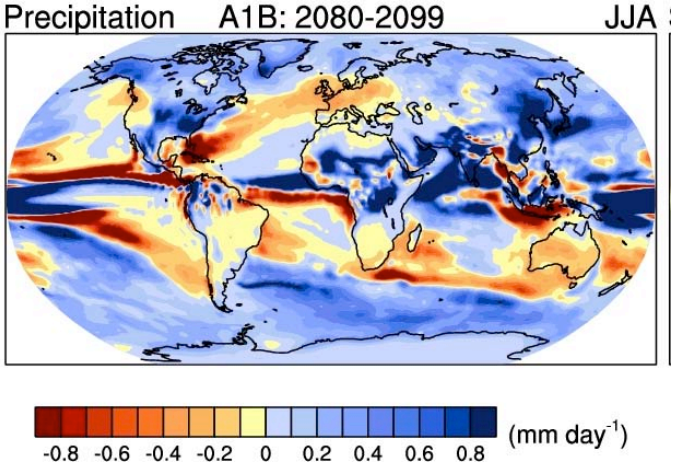
Hadley Center Precipitation





CCSM3 Precipitation





Meehl et al. (2007). *Global Climate Projections.* In: Climate Change 2007: The Physical Science Basis. Cambridge University Press: Cambridge, UK and New York, NY, USA.

Climate Data Needs for Latin American Impacts Assessment

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- All teams could benefit from additional scenarios.
- Examples:
  - **3.7 W/m^2 Stabilization.** This is one of the more frequently assessed scenarios from a mitigation perspective, but we don't have climate data for it.
  - **Additional land cover scenarios.** Agriculture, forestry, land use are incredibly important in Latin America. Different policies will have different effects. Assessing the climate implications of these choices could be useful.
  - **SSPs.** New socioeconomic scenarios *may* have different regional emissions and land cover patterns than the official RCPs. This could be interesting for Latin America.

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DISCUSSION

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