Climate Information for the Impacts Community: The Agricultural Model Intercomparison and Improvement Project (AgMIP)

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AgMIP The Agricultural Model Intercomparison and Improvement Project

NASA

UKaid from the Department for International Development

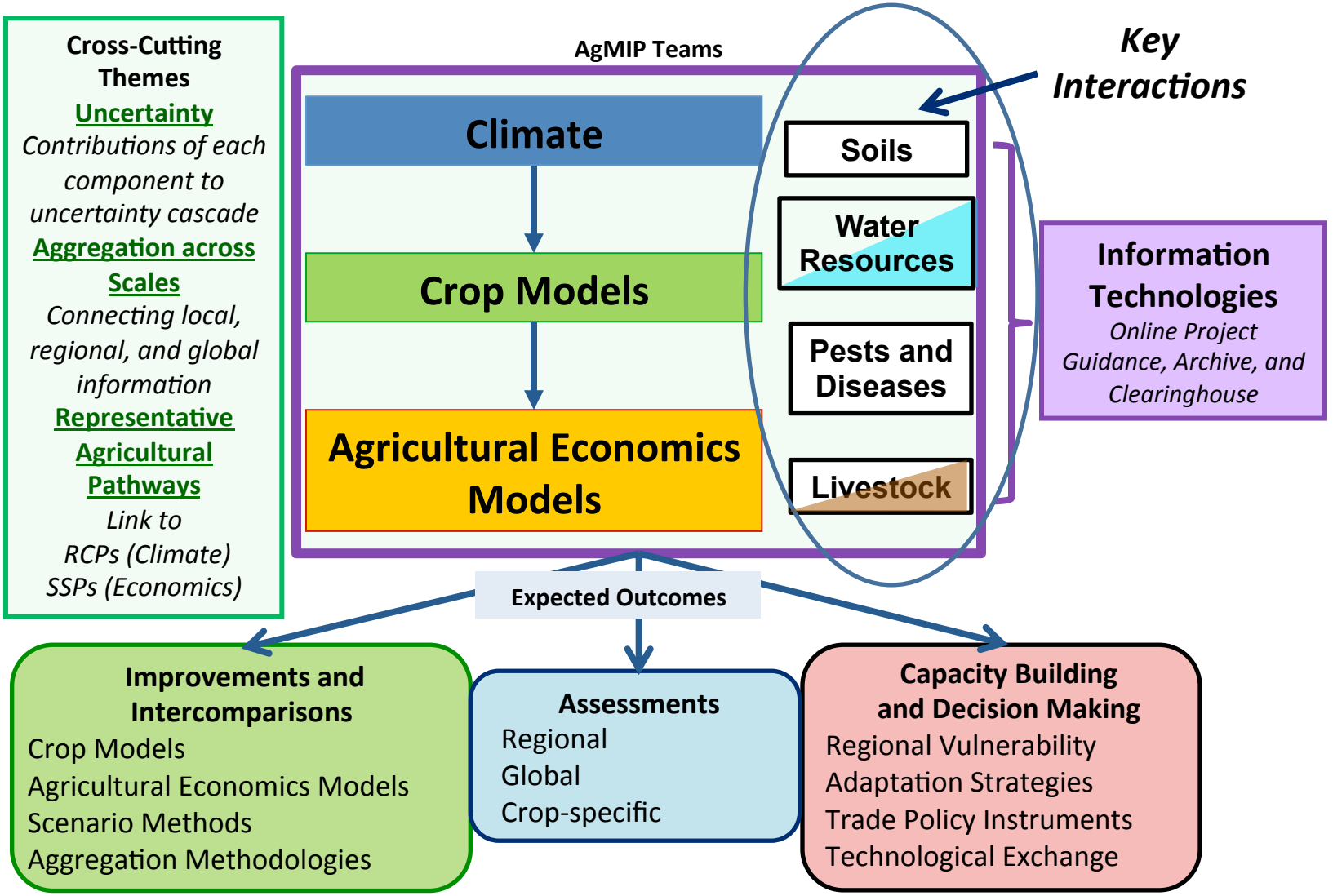
USDA

AgMIP Objectives

- **Incorporate state-of-the-art climate products as well as crop and agricultural trade model improvements into coordinated regional and global assessments of future climate impacts on the agricultural sector**
- **Include multiple models, scenarios, locations, crops, and participants to explore uncertainties and the effects of data and methodological choices**
- **Collaborate with regional experts in agronomy, economics, and climate to build a strong basis for applied simulations addressing key climate-related questions**
- **Improve scientific and adaptive capacity for major agricultural regions in the developing and developed world**
- **Construct framework to identify and prioritize adaptation strategies**
- **Link to key on-going efforts**
  - **CCAFS, Global Futures, MOSAICC, Yield Gap Analysis, SERVIR, MACSUR…**
  - **National Research Programs, National Adaptation Plans, IPCC, ISI-MIP…**

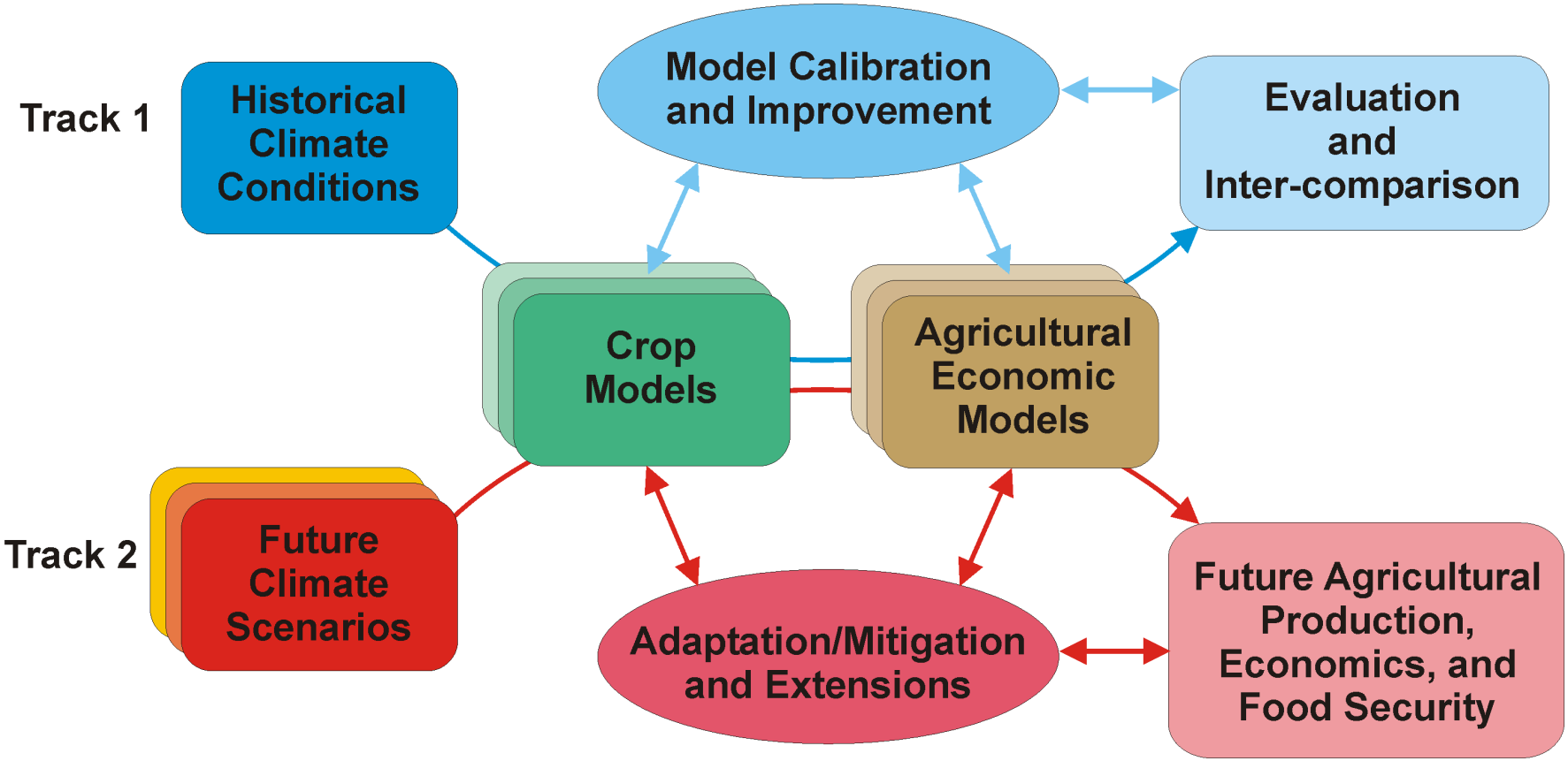



AgMIP Teams, Linkages, and Outcomes



Rosenzweig et al., 2012

AgMIP Two-Track Science Approach



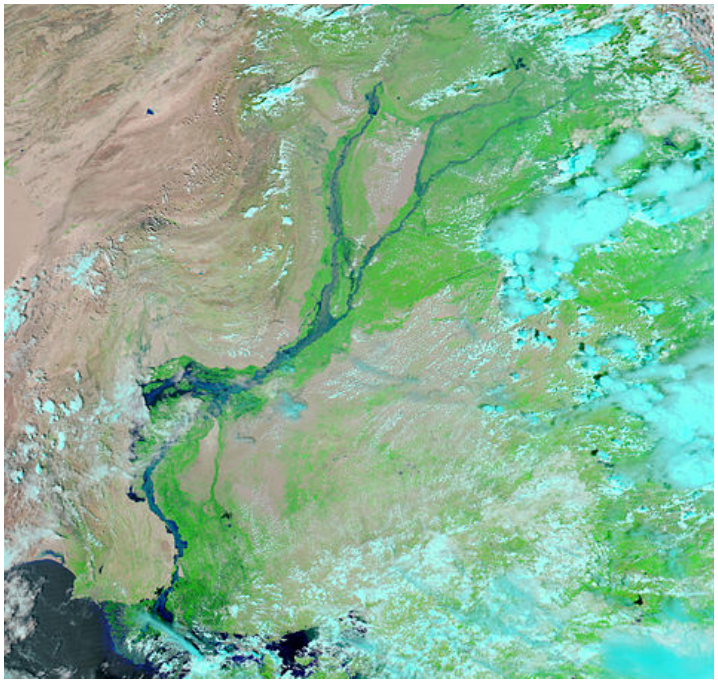
Track 1: Model Improvement and Intercomparison

Track 2: Climate Change Multi-Model Assessment

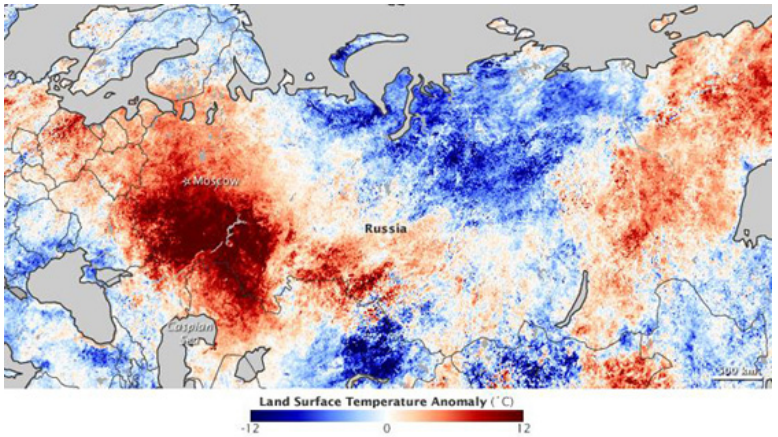
Rosenzweig et al., 2012

Climate Team Goals

- Perform climate analyses for major agricultural regions throughout the world
- Provide historical climate series, sensitivity tests, and future climate scenarios for crop and economic model simulations
- Investigate uncertainties related to observational products, emissions scenarios, GCMs, downscaling methodologies, and weather generators



Pakistan Flood, 2010



Russia Heat Wave, 2010

Climate Team Products and Activities

Baseline Analysis and Intercomparison

Climate Sensitivity Scenarios

Scenarios for Each Future Climate Period

Agroclimatic Analysis

First Phase
- Local station observations
- Geospatial weather generator from local observations

Second Phase
- Alternative weather generators
- Gridded observational products from local obs
- Satellite-based observational products

First Phase
- Mean T, P, [CO_2]
- Impacts response surfaces

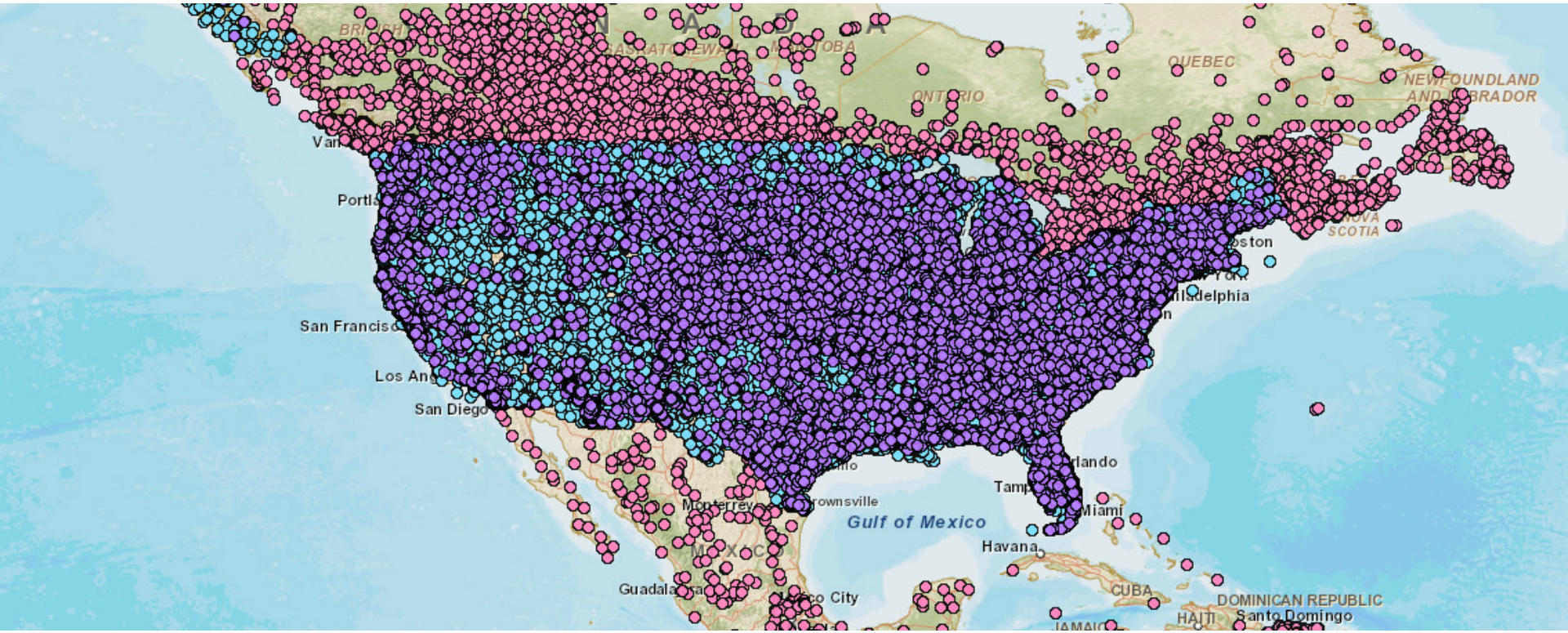
Second Phase
- Temperature variability
- Temperature extremes
- Rainfall variability
- Rainfall extremes

First Phase
- Enhanced GCM delta method
- Geospatial weather generator from GCMs

Second Phase
- Alternative weather generators
- RCM-based mean and variability changes

Baseline Climate Information

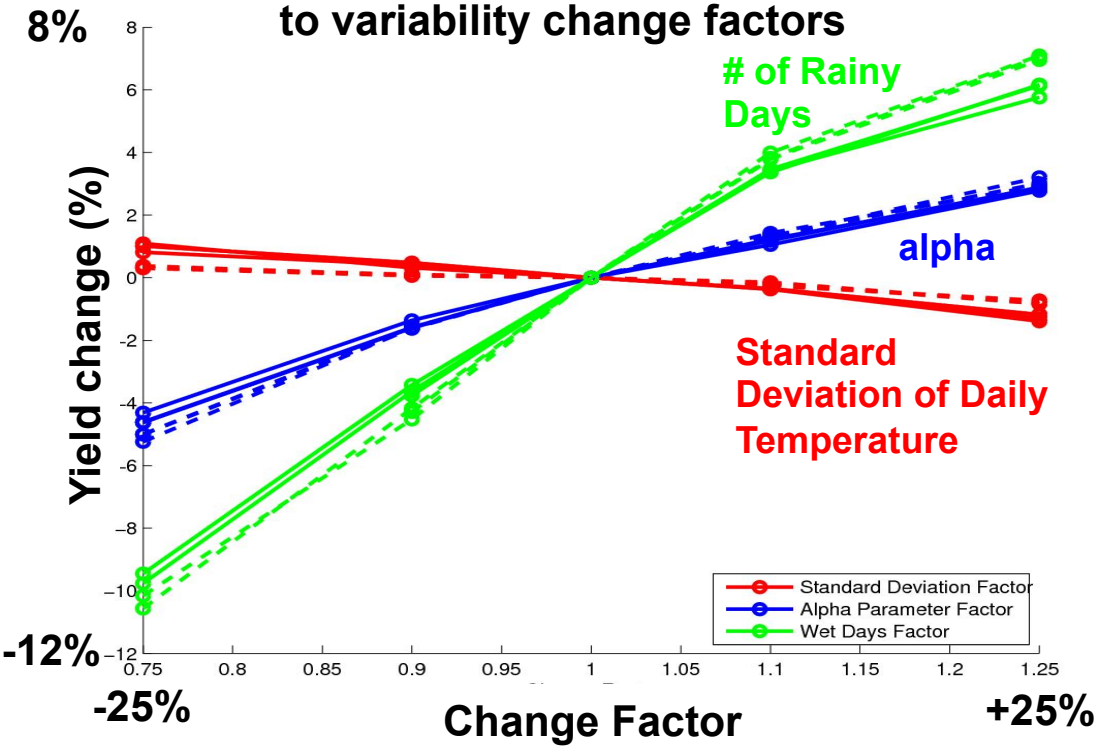
- **Collect and quality control climate series in agricultural regions for field trials and 1980-2009 baseline period**
  - 30-years of daily maximum temperature, minimum temperature, precipitation, and solar radiation (winds and humidity if available)
  - Sample from observational products including station analyses, reanalyses, and satellite products if necessary



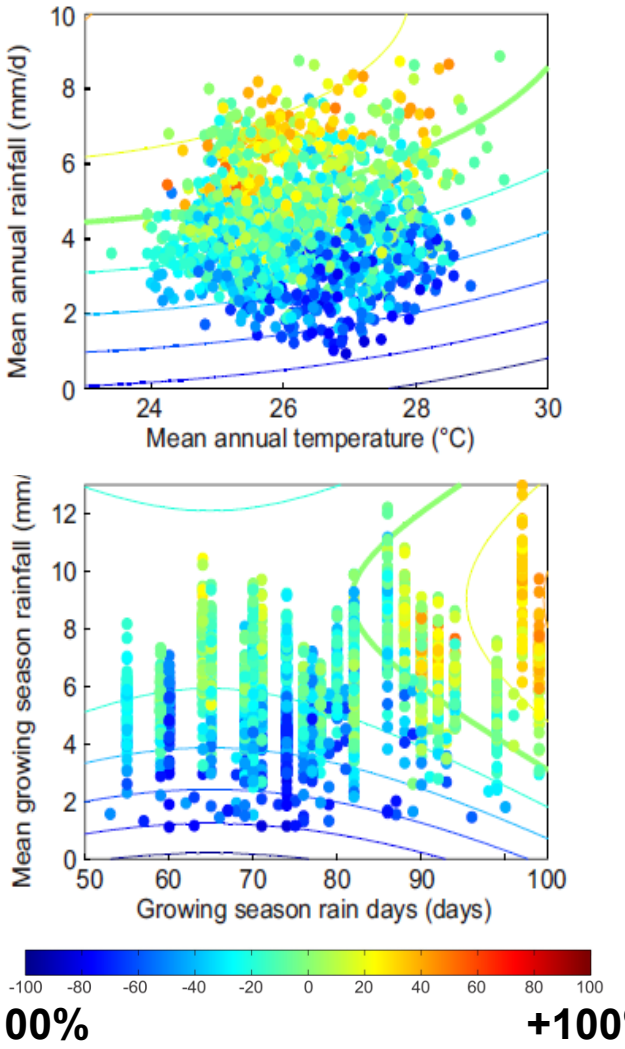
Climate Sensitivity Scenarios

- **Test sensitivity of crop models to:**
  - Mean climate changes (T, P, [CO_2])
  - Changes to climate variability and distribution of extremes

Sensitivity of SE USA Corn yield to variability change factors



CERES-Maize simulations of yield changes (%) in Panama

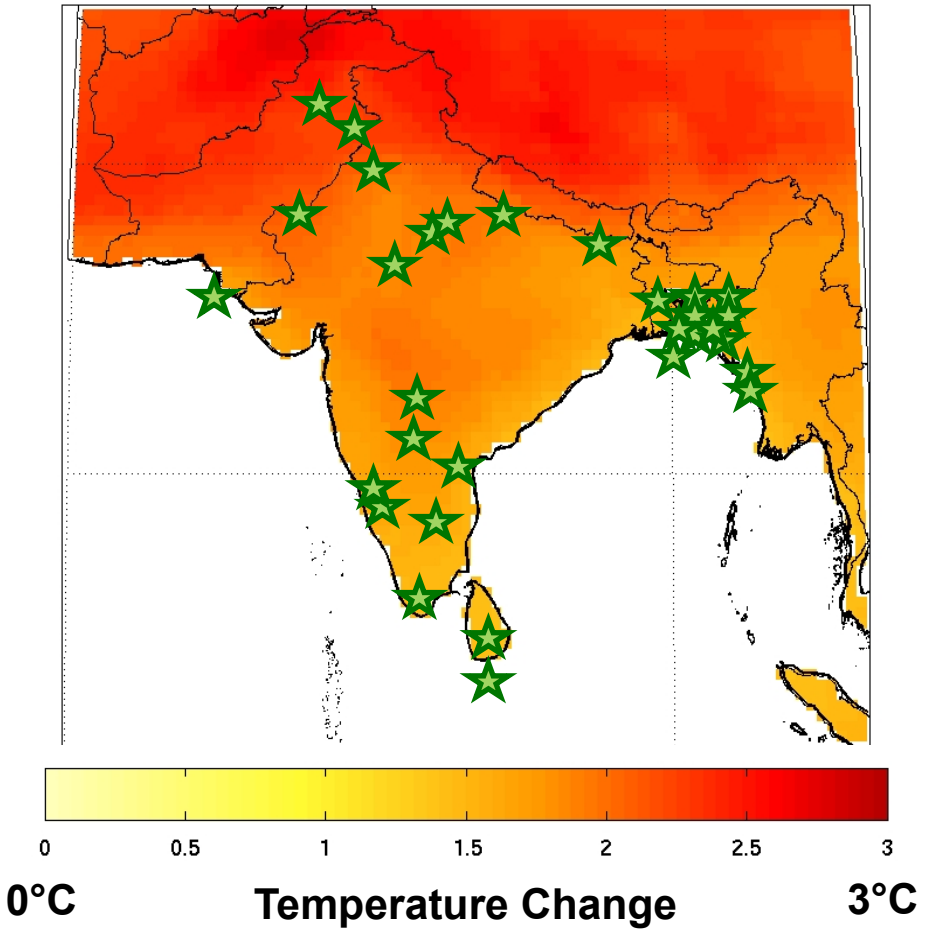


Ruane et al., 2011

Future Climate Scenarios

- **Future Periods**
  - Near-term (2005-2034), Mid-Century (2040-2069), and End-of-Century (2070-2099)
- **Global Climate Model and Emissions Scenario Ensembles**
  - CMIP3/5 climate models and SRES/RCPs

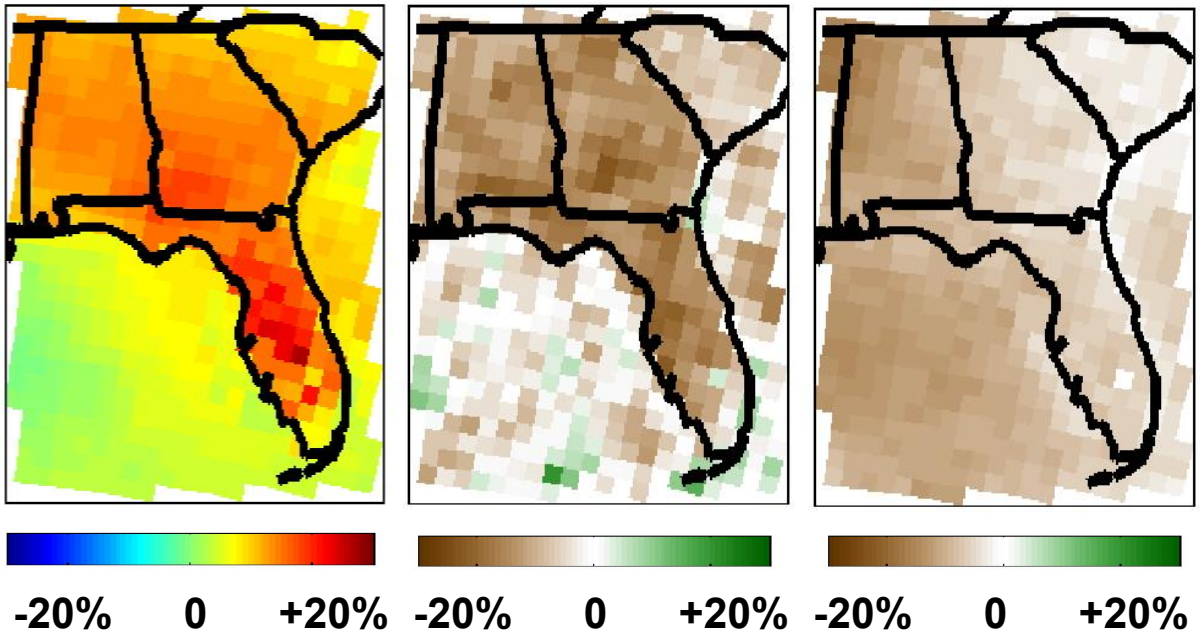
Response of median temperature to climate change (2040-2069 minus 1980-2009) in BCSD GFDL CM2.1 SRES A2 scenario



Future Climate Scenarios

- **Downscaling**
  - Statistical (e.g., BCSD, WorldClim) and dynamical downscaling (e.g., NARCCAP, CORDEX) can provide details on fine-resolution and high-frequency climate changes
- **Weather Generators**
  - Weather generators can provide a high number of seasonal iterations and impose more complex changes in variability and extremes

Growing season changes (GFDL/RegCM3 Mid-Century minus Baseline) in the standard deviation of temperature, the alpha parameter of precipitation (smaller = more extreme), and the number of rainy days



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For protocols, events, and news visit

www.agmip.org

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