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The Sensitivity of Regional Climate Projections to SSP-Based Land Use Changes in the North American CORDEX Domain

Melissa Bukovsky (1), Linda Mearns (1), Jing Gao (2), and Brian O'Neill (3)

(1) National Center for Atmospheric Research, Boulder, CO, USA, (2) University of Delaware, Newark, DE, USA, (3) University of Denver, Denver, CO, USA

In order to assess the combined effects of green-house-gas-induced climate change and land-use land-cover change (LULCC), we are producing regional climate model (RCM) simulations at multiple resolutions that are complementary to the North-American Coordinated Regional Downscaling Experiment (NA-CORDEX) simulations, but with future LULCCs that are consistent with particular Shared Socioeconomic Pathways (SSPs). In standard, existing NA-CORDEX simulations, land surface characteristics are held constant at present day conditions. These new simulations, in conjunction with the NA-CORDEX simulations, will help us assess the magnitude of the changes in regional climate forced by LULCC relative to those produced by increasing greenhouse gas concentrations.

Understanding the magnitude of the regional climate effects of LULCC is important to the SSP-RCP scenarios framework. Currently, an assumption underlying this framework is that the pattern of climate change resulting from any given SSP-RCP pairing is relatively insensitive to the assumed pattern of LULCC, but the degree to which that assumption holds is an open question. Our work will help address this question, and inform thinking about possible needed modifications to the scenarios framework to better account for climate-land use interactions.

Accordingly, in this presentation, we will examine the state of the climate at the end of the 21st century with and without SSP-driven LULCCs in RCM simulations produced using WRF under the RCP8.5 concentration scenario. The included LULCC change effects have been created following the SSP3 narrative using an existing agricultural land model linked with a new long-term spatial urban land model.