

The Issue of Spatial Scale of Climate Scenarios for Regional Climate Change Impacts Analysis: Examples from Agriculture

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The climate change impacts community has long expressed concern regarding the coarse (100s of kilometers) resolution of climate change scenarios made available for impacts assessments and integrated assessments based on coarse resolution general circulation model (GCM) results (e.g., Gates, 1985). Higher resolution scenarios (10s of kilometers) have been requested, especially for regions containing complex topography and coastlines. There are now techniques available (regional climate modeling and statistical downscaling) for generating high resolution climate scenarios (Giorgi and Mearns, 1999; Wilby and Wigley, 1997). And over the past five years or so, higher resolution scenarios have been applied for a variety of regional assessments such as temperature extremes (Hennessy et al., 1998; Mearns, 1999); water resources (Hassell et al., 1998; Hay et al., 1999; Wang et al., 1999; Wilby et al., 1999); agriculture (Mearns et al., 1998, 1999, 2000, 2001; Easterling et al., 2001; Brown et al., 1999; Thomson et al., 2001) and forest fires (Wotton et al. 1998). However, there has been little research indicating whether these scenarios result in important differences in the calculations of climate change impacts or in integrated assessments compared to those calculated from coarse resolution. This uncertainty in impacts assessments due to spatial scale of scenarios needs much investigation. In this paper I present four examples of studies concerning high-resolution climate scenarios applied to agricultural impact assessments. Four different regions are considered: the central Great Plains of the U.S., the Southeastern U. S., the Pacific Northwest, and Italy. With each example, I illustrate particular aspects of the uncertainty of spatial scale in agricultural impacts assessment. In all examples there appears to be some value added to having high-resolution information. Minimally, there are significant differences in the agricultural impacts of climate change based on the spatial scale of the climate change information. I also provide recommendations for future research that will help resolve issues concerning when high resolution information on climate change is necessary and when it is not.