Geophysical Research Abstracts,
Vol. 11, EGU2009-7773, 2009
EGU General Assembly 2009

Contribution of changes in RCM parameterizations to uncertainties in the projections of climate change impacts in cropping systems

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This work seeks to quantify the uncertainty related to impact assessments when crop models are linked to simulations with a Regional Climate Model (RCM) using different parameterizations. Both climate and crop impact modelling processes have several uncertainty sources, and their identification and quantification is a difficult task. For that reason, new methodologies are being generated to build ensembles prediction systems providing a more accurate estimation of uncertainties linked to projections. However, several decisions have to be accomplished to build an ensemble system. For climate, one possibility is to consider a wide set of RCMs (multi-model ensemble). Other possibility is to consider different parameterizations of the same RCM (mixed-physics ensemble). This work compares the uncertainty introduced by both options on agricultural impact projections.
A crop simulation model of maize was applied on several agricultural locations of the Iberian Peninsula, for 10 years of control climate and 10 years of A2 IPCC SRES scenario. The simulations were repeated with several different parameterizations of the RCM PROMES. Two-by-two comparisons of means and ANOVA analyses were applied to simulated time series of crop yield. Uncertainties were measured as the degree of coincidence among impact projections. The results enabled estimation of the relative contribution of RCM parameterizations to uncertainty generated through the modelling chain from climate to impacts. Consequences for the construction of ensembles prediction systems will be discussed.