Geophysical Research Abstracts
Vol. 18, EGU2016-15736, 2016
EGU General Assembly 2016

Impact of climate aggregation over different scales on regional NPP modelling

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Model input data aggregation methods and data aggregation across spatial scales affect various model outputs, e.g. Net Primary Productivity (NPP). The scale at which data is collected is of great importance. In ecosystem modelling studies we often see soil and climate data collected at coarse scale being used in models to predict ecosystem responses e.g. NPP in dependency of these parameters at finer scale. Outputs of these models are impacted by the way the data is aggregated or dis-aggregated to the spatial scale. Up to know there are very few studies which quantified the impact of scaling on the simulation results. In this study, we quantify the impact of climate data aggregation using five different resolutions, to simulate NPP by 11 different crop and biogeochemical models for the same study area. The aggregation effect is investigated for wheat and maize cropping systems in the state of North Rhine-Westphalia, Germany. The simulation results are analysed for NPP averaged over growing seasons of a 30 year period at different spatial resolutions as well as for annual NPP during growing season. While there is only a minor impact of input data aggregation on NPP on 30 year averages, the annual data show differences in NPP up to 9.4 % and 13.6 % between the different resolutions for wheat and maize, respectively. The scale effect differ between the models and shows higher impacts for extreme years. This is tested by selecting years with extreme dry conditions based on a drought index, which showed stronger scale effects of up to 12.8 % and 15.5 % for wheat and maize, respectively.