



Sahel greening due to increasing CO₂ in CMIP5 Earth System Models

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The Sahel is a climatic transition region where water and food supply are particularly vulnerable to climatic fluctuations and changes. Poverty, low development and political conflicts tend to enforce this vulnerability. The agricultural yield in the future will depend on the prosperity of vegetation in a changed climate with higher CO₂-levels. As Northern Africa was substantially greener and wetter some thousand years ago the question arises whether the Sahel will become green again due to man-made climate change. In our study we assess the results of three complex climate models and current literature to investigate the crucial sources of uncertainties involved in answering this question.

We find that the three models agree on a substantial Sahel greening in the next decades because atmospheric CO₂ acts like a fertiliser. In two models this trend is reversed under prolonged climate change, especially in the western Sahel, where it becomes too dry. However, this apparent model agreement hides the large uncertainty involved in different processes such as precipitation changes and CO₂-fertilisation, which tend to oppose each other so that the question about future vegetation changes in the Sahel remains unsolved. In particular, two of the three models indicate that the vegetation expansion into the desert has a cooling effect due to the plants' transpiration, but also that the importance of this effect crucially depends on the location.