
Modeling of agroecosystem functioning. An Opportunity to assess conservation agriculture in Mediterranean.

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Abstract

Mediterranean agroecosystems are under strong climatic and anthropogenic pressures. The decrease in rainfall (IPCC forecast), intensive management and artificial land threaten the functional capabilities of these agroecosystems and ultimately the provision of ecosystem services expected. The maintenance and / or improvement of provisioning services (crops), regulation (carbon sequestration) and support (erosion and leaching) through integrated management of agricultural soils. Conservation agriculture is perceived as a viable alternative in the Mediterranean bioclimatic context (FAO, CIHEAM). Initially we analyze quantitatively the various effects of this practice on the Mediterranean agroecosystem review in prep.). Based on this analysis we will implement this practice in the dynamic global vegetation model LPJmL (Lund Potsdam Jena managed Land). This model simulates mechanistically the biophysical and biogeochemical processes that control the productivity of the most important worldwide crops via crop functional types (CFTs). The main processes represented are : coupled carbon and water cycle through photosynthesis, phenology and the decomposition of organic matter cycle. Currently 13 CFTs are represented (11 types of crops and 2 grassland types). Agricultural practices are considered through different parameterizations for irrigation, fertilization, residue treatment, planting dates. Therefore it is possible to assess their effects on productivity, soil organic carbon, water use and carbon emissions under several climatic conditions and managements. The new implementation will allow us to perform spatial and temporal simulations to estimate various ecosystem services directly dependent on a conventional or conservative management of agroecosystems. This type of implementation will also highlight the resilience of the system cope with water stress and soil degradation. A first qualitative analysis of the effects of conservation agriculture will also highlight the synergy between soil conservation and soil biodiversity. This work is done in the framework of LABEX OT-Med (Target Earth: Mediterranean Basin) with the objective of close collaboration between the participating institutes to develop an integrated approach (marine, continental, economic and social).

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