Geophysical Research Abstracts
Vol. 20, EGU2018-16933, 2018
EGU General Assembly 2018


# Trends (and no-trends) in crop water footprint

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Agriculture is the major water-consuming sector, with irrigation contributing to 70% of freshwater withdrawals. On average, crop production requires 7500 km3 of water per year and 12% of this volume comes from surface and ground water bodies. Hence, crop production exerts a pressure on the water cycle, which has been measured through the concept of Crop Water Footprint. Crop Water Footprint quantifies the amount of water required to produce a good in a certain location, and it is a function of two parameters: crop yield and evapotranspiration. The study of these parameters is essential in a framework aiming at blunting pressure on water resources.
In this study, we explore water footprint patterns of wheat, maize, rice, and soybean over the period 1961-2016. On a global average, we found a statistically significant decreasing trend in 70, 90, 74, 83% of their harvested areas. Wheat and soybean exhibit the steepest negative trend (around 80m3/ton per year). The decreasing trend of crop water footprint means that the water use efficiency is increasing over time: i.e. higher amount of crops can be produced using the same amount of water. However, these trends are sharply heterogeneous in space even at the sub-national scale. We examined how variations in crop water footprint relate to evapotranspiration patterns and yield variations at the pixel level to capture a comprehensive picture of the water efficiency evolution. Results show that crop water footprint trends are mostly driven by crop yield variations, while the effect of evapotranspiration is marginal. Indeed, the statistical tests show significant positive trends in crop yields while evapotranspiration trends are generally non-significant. In the case of the water footprint, the anthropogenic component linked to the technological advances in agriculture, producing a change in crop yield, therefore dominates over the climate-change component, inducing changes in crop evapotranspiration.