Geophysical Research Abstracts
Vol. 19, EGU2017-11597, 2017
EGU General Assembly 2017

A global cropland GPP dataset (GCMGPP) with 26 crop types

Tiexi Chen

Nanjing University of Information Science & Technology, School of Geography and Remote Sensing, Nanjing, China (txchen@nuist.edu.cn)

Croplands cover about 12% of the ice-free terrestrial land surface. Compared with natural ecosystems, croplands have distinct characteristics due to anthropogenic in?uences. Their global gross primary production (GPP) is not well constrained. A dataset known as GCMGPP (Global cropland monthly gross primary production) was built using a light use e?ciency (LUE) model, employing satellite observations and survey data of crop types and distribution. A novel step in our analysis was to assign a maximum light use e?ciency estimate (ε^*_{GPP}) to each of the 26 di?erent crop types, instead of taking a uniform value as done in the past. These ε^*_{GPP} values were calculated based on ?ux tower CO_2 exchange measurements and a literature survey of ?eld studies, and ranged from 1.20 g C MJ^{-1} to 2.96 g C MJ^{-1}. Global cropland GPP was estimated to be 11.05 Pg C yr^{-1} in the year 2000. Maize contributed most to this (1.55 Pg C yr^{-1}), and the continent of Asia contributed most with 38.9% of global cropland GPP. In the continental United States, annual cropland GPP (1.28 Pg C yr^{-1}) was close to values reported previously (1.24 Pg C yr^{-1}) constrained by harvest records, but our estimates of ε^*_{GPP} values were considerably higher. Our results are sensitive to satellite information and survey data on crop type and extent, but provide a consistent and data-driven approach to generate a look-up table of ε^*_{GPP} for the 26 crop types for potential use in other vegetation models.

The feature of 26 crop types offers a more sophisticated global spatial distribution of GPP than the models using identical crop or C3/C4 crops. Crop GPP based chlorophyll fluorescence and GCMGPP illustrate very consistent spatial patterns and these two datasets are totally independent. GCMGPP also offers an opportunity to quantify the spatial errors of global cropland GPP estimations due to identical value of LUE parameter.