Estimation of Maize Yield by Using a Process-Based Model and Remote Sensing Data in the Northeast China Plain

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Abstract : The accurate estimation of crop yield is of great importance for the food security. In this study, a process-based mechanism model was modified to estimate yield of C4 crop by modifying the carbon metabolic pathway in the photosynthesis sub-module of the RS-P-YEC (Remote-Sensing-Photosynthesis-Yield estimation for Crops) model. The yield was calculated by multiplying net primary productivity (NPP) and the harvest index (HI) derived from the ratio of grain to stalk yield. The modified RS-P-YEC model was used to simulate maize yield in the Northeast China Plain during the period 2002-2011. The statistical data of maize yield from study area was used to validate the simulated results at county-level. The results showed that the Pearson correlation coefficient (R) was 0.827 (P < 0.01) between the simulated yield and the statistical data, and the root mean square error (RMSE) was 712 kg/ha with a relative error (RE) of 9.3%. From 2002-2011, the yield of maize planting zone in the Northeast China Plain was increasing with smaller coefficient of variation (CV). The spatial pattern of simulated maize yield was consistent with the actual distribution in the Northeast China Plain, with an increasing trend from the northeast to the southwest. Hence the results demonstrated that the modified process-based model coupled with remote sensing data was suitable for yield prediction of maize in the Northeast China Plain at the spatial scale.

Keywords : process-based model, C4 crop, maize yield, remote sensing, Northeast China Plain
Conference Title : ICB 2015 : International Conference on Biometeorology
Conference Location : Cape Town, South Africa
Conference Dates : November 05-06, 2015