Up-scaling gross primary production from site to region with flux measurements and satellite data in northern China

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Carbon cycle of terrestrial ecosystem is a fundamental factor in regional land surface processes and land-atmosphere interactions. Gross primary production (GPP) is an important variable in the global carbon cycle. Remote sensing models based on light use efficiency (LUE) provide promising tools for monitoring GPP at regional scale. However, some key parameters in LUE models such as maximal LUE should be reconsidered due to the heterogeneous nature of terrestrial ecosystem. Here, we take a maximal LUE dynamic modeling method to combine 22 station's flux measurements with remote sensing to generate a regional scale GPP of northern China from 2008 to 2010. In this dynamic method, maximal LUE was generated from satellite derived indices such as enhanced vegetation index (EVI) and visible albedo. The generated maximal LUE was fully considered its spatial heterogeneous nature and reduced the uncertainties in mixed pixels. The flux data mentioned was intensive calibrated before the coordinated enhanced observation period and the same method of quality control such as WPL term was taken to make those site scale data comparable. We found that our up-scaled GPP had a good correlation with field flux data. Additionally, our GPP product performed better than MODIS GPP. The likely reason is our method integrated more field measurements than MODIS in the region and the maximal LUE spatial heterogeneity was fully considered in our method. Other factors that influence the GPP modeling accuracy (such as fPAR, meteorology data) were also discussed in this study.