

Evaluation of MODIS LAI in drylands of Central Kazakhstan using in situ measurements – designing a new LAI data set

Martin Kappas and Pavel Propastin

Department of Geography, Georg-August University Göttingen, Goldschmidtstr. 5, 37077, Göttingen, Germany, E-Mail: ppropas@uni-goettingen.de, mkappas@uni-goettingen.de

Abstract

Leaf area index (LAI) is a key variable in the modelling of vegetation productivity using remote sensing data. The 1-km resolution MOD15A2 is a global LAI product that is being operationally produced from Moderate Resolution Spectroradiometer (MODIS) data at 8-day intervals and released to the public use. MOD15A2 is derived from a global-scale process model involved such biome-specific constants as leaf angle distribution, canopy heterogeneity, and soil and wood optical properties. Validation of MODIS LAI product is an important prerequisite to the use of this biophysical variable as input algorithms for global modelling of net and gross primary production. This study presents results of MODIS LAI validation in a semi-arid region of Central Kazakhstan. For comparison with MODIS LAI data, in situ measurements of LAI were carried out at 25 test sites across a 250-km transect through shrubland, short grassland and steppe grassland biomes. At the peak of the growing season, the spatial pattern of in situ LAI were captured relatively well by MODIS LAI. However, MODIS LAI overestimates the overall level of ground LAI by 10-15%. MODIS LAI is characterized by a moderate offset, which is slightly higher than can be explained by model and input data uncertainty. The study revealed problems with MODIS LAI outside the growing season. The first is that the MODIS LAI tends to shift the spring greening earlier and the autumn withering later. The second problem is that values of 0.1 and more were maintained throughout the year even during periods with air temperature below 0 when no photosynthetic activity of vegetation occurs. It is not clear if this is an issue with screening for effects of winter snow and clouds or possibly problems with soil reflectance. Keeping these constraints in mind, a new revised LAI product for Kazakhstan will be presented.