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TITLE: Long term trends in GPP and ET on the Mongolian Plateau in context of climate and land cover/land use change.

ABSTRACT BODY: Climate extremes such as drought and extreme winters are predicted to increase on the Mongolian plateau over the next century, in addition to consistent warming. Over the past two decades land cover/land use change has accelerated, owing to post liberalization socioeconomic changes in Inner Mongolia, China (IM) and Mongolia (OM), which have different political systems. Since anthropomorphic modifications of ecosystems have the ability to alter the structure and function of landscapes and ecological processes such as the carbon and water cycle, it is important to distinguish them from climate-driven changes. This study identified climate-driven and human-induced vegetation cover change on the Mongolian plateau across the dominant biomes and major political units. We computed long terms trends in MODIS–derived ecosystem function variables including GPP, ET, water use efficiency as well as precipitation and temperature obtained from reanalysis datasets. During the period of 2000 to 2012, we found that ET in the IM grassland biome were reduced at a rate of $-0.546 \text{ mm yr}^{-1}$ while OM grassland ET increased at the rate of 0.623 mm yr^{-1} . The decrease in desert biome ET was higher in OM ($-0.575 \text{ mm yr}^{-1}$) than in IM ($-0.354 \text{ mm yr}^{-1}$). During the same period, GPP in the IM grassland biome ($2.72 \text{ g Cm}^{-2} \text{ yr}^{-1}$) increased at a faster rate than the OM grassland ($2.423 \text{ g Cm}^{-2} \text{ yr}^{-1}$). Similarly, IM desert biome GPP ($0.45 \text{ g Cm}^{-2} \text{ yr}^{-1}$) increased at a faster rate than OM desert ($0.25 \text{ g Cm}^{-2} \text{ yr}^{-1}$). We also evaluated the utility of long term time series such as MODIS VI, Vegetation Index and Phenology (VIP), GIMMS 3g in analyzing residual trends between vegetation index and monthly accumulated rainfall. While some administrative subdivisions in IM and OM showed a decreasing trend in residuals suggesting human induced disturbance (e.g. grazing or urbanization), other subdivisions showed an increasing trend in residuals suggesting increased vegetation cover that could be attributed to grassland restoration efforts in the last decade.

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