Climatic Change and Its Consequences on Gross Primary Production, Evapotranspiration, and Water Use Efficiency on Mongolia Plateau

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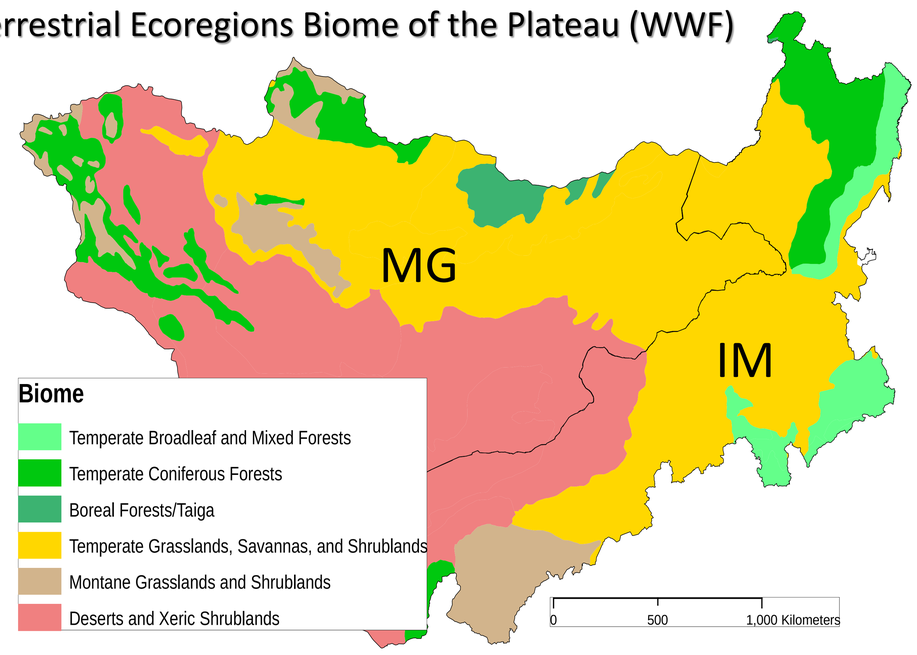
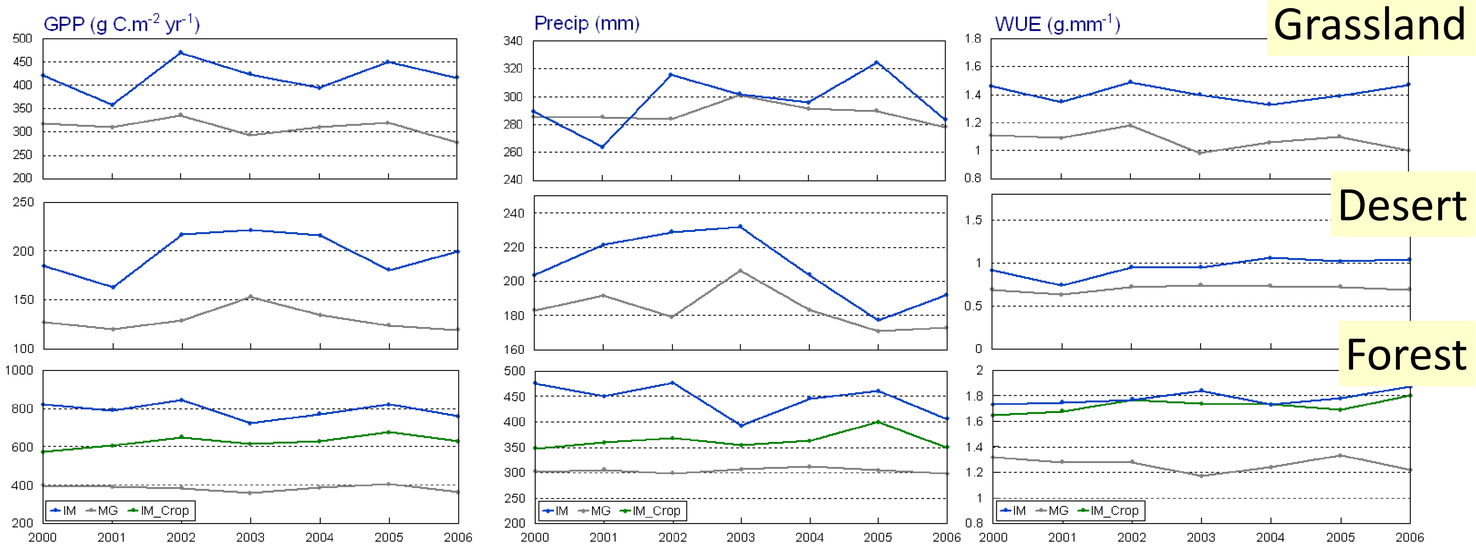
The Mongolia Plateau is among the most sensitive regions to the changing climate while experiencing rapid increases in land uses. Using MODIS products and other available databases, we examined the changes of gross primary production (**GPP**), evapotranspiration (**ET**), and water use efficiency (**WUE**) by biomes (desert, grassland, forest, and agricultural land) and country, i.e., 1.146 and 1.56 million km^2 for Inner Mongolia (**IM**) of China and Mongolia (**MG**), respectively. From 2000 through 2006, the mean (**SD**) GPP of the plateau 841.1 (34.0) Tg C.Yr^{-1}, with 449.3 (26.4) and 391.8 (14.0) Tg C.Yr^{-1} for IM and MG, respectively. IM and MG, respectively, also lost 326.3 (13.4) and 267.8 (8.7) billion m^3 water loss through ET, resulting an average WUE of1.47 (0.07) and 1.01 (0.06) g.mm^{-2}. At biome level, desert showed the most variable over the 7-year study period, while forest had the least. More interestingly, the temporal variation of all three metrics for the same biome in IM was significantly higher than that of MG. The cooler, wetter 2003 seemed to be responsible for the elevated GPP and WUE for the desert and grassland biomes, but not for the forest. In comparison, the cooler and drier 2005 increased GPP, but not WUE of the grassland and forest biomes.

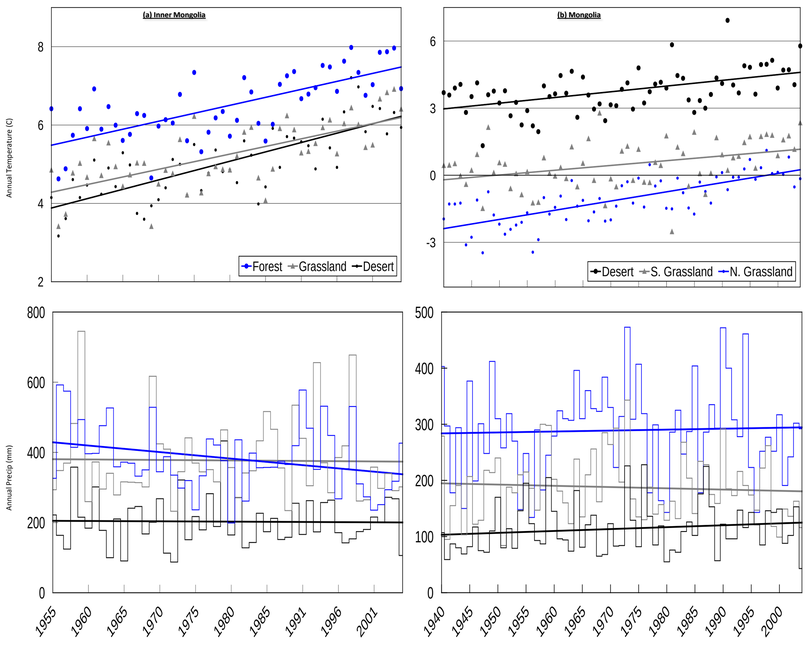
Terrestrial Ecoregions Biome of the Plateau (WWF)



Changes in climate (temperature, precipitation from 12 selected climatic stations in IM and MG in recent decades. Significantly higher rates of climate change than global average were detected based on selected stations, but varied between the two countries. This is consistent with a much greater increasing rate of socioeconomic trends. Sound scientific investigations cannot be completed without inclusion of socioeconomic components, including land use and other human activities (see coupled human and natural system, CHN, in the above figure).

Changes of GPP, precipitation, and WUE for 2000-2006 in three biomes of IM and MG





The mean and standard deviation (SD) of GPP, ET, and WUE on Mongolian Plateau (2000-2006)