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TITLE: Modeling GPP in Semi-arid Inner Mongolia using MODIS Imagery and Tower-based Fluxes

PRESENTATION TYPE: Poster Requested

CURRENT SECTION/FOCUS GROUP: Global Environmental Change (GC)

CURRENT SESSION: GC16. Regional Climate Impacts 7. Environmental, Socio-economic and Climatic Changes in Northern Eurasia and their Feedbacks to the Global Earth System: The Role of Remote Sensing and Integrative Studies

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Title of Team:

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ABSTRACT BODY: Semi-arid Inner Mongolia is experiencing climate change with associated land cover/use change that includes an increase in irrigated agriculture and population growth. We evaluate temporal scaling up of carbon fluxes from eddy covariance (EC) tower observations in different water-limited land cover/use and biome types. The Vegetation Photosynthesis model (VPM) and modified VPM (MVPM), driven by Enhanced Vegetation Index (EVI) and Land Surface Water Index (LSWI) for 2006-2007 that were derived from MODIS surface reflectance product (MOD09A1) was used to scale up and validate temporal changes in GPP from the EC towers during 2006 & 2007 growing seasons. The VPM model predicted the annual GPP (GPPvpm) reasonably well at the Duolun cropland (R2 = 0.67 & 0.71) and Xilinhaote typical steppe (R2 = 0.80 & 0.73). The predictive power of VPM varied in the desert steppe, at an irrigated poplar stand (R2 = 0.74 & 0.68) and nearby shrubland in Kubuqi (R2 = 0.31 & 0.49). The comparison between GPPtower and GPPmvpm predicted GPP showed good agreement for the Xilinhaote typical steppe (R2 = 0.84 & 0.70) in 2006-2007, Duolun typical steppe (R2 = 0.63), and cropland (R2 = 0.63) in 2007. The predictive power of MVPM decreased slightly in the desert steppe, at the irrigated poplar stand (R2 = 0.55 & .47) and the shrubland (R2 = 0.20 & 0.41). The results of this study demonstrate the feasibility of scaling up GPP from EC towers to the regional scale.
The inter & intra-annual changes in dynamics of GPP in Inner Mongolia are especially relevant given the extreme climate events on the Mongolian Plateau. We seek to study the effects of drought in the Mongolian plateau through the mapping of anomalies in different vegetation indices (EVI, NDVI, SAVI) as well as functional variables (GPP, ET) during the MODIS decade (2001-2010). Our research question is: What is the biome response to the severe dzuds (extreme winters) and summer droughts? We then compared the MODIS data to spatially interpolated climate station data by year & season and found a good correlation. Our ultimate goal is to link these anomalies to socio-economic variables at aimag level in Mongolia and county/prefecture level in Inner Mongolia.

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INDEX TERMS: [1640] GLOBAL CHANGE / Remote sensing, [0480] BIOGEOSCIENCES / Remote sensing, [0428] BIOGEOSCIENCES / Carbon cycling, [1632] GLOBAL CHANGE / Land cover change.