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# Earth observation data for terrestrial Carbon flux modeling over Siberia

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The majority of terrestrial biospheric carbon modeling efforts to date rely upon global vegetation models (process-based) or accounting/inventory methods (empirical-based). Process-based methods operate typically at coarse spatial resolution, rely on climate data as input but have high temporal resolution and prognostic capabilities. Process models however often have a large set of input variables, some of them hardly available or not measurable on a regional basis (Veroustraete, et al., 2000). Accounting methods operate at a finer spatial resolution but are typically static and employ long-term average empirical data. Earth Observation (EO) data has been applied in both these methodologies; however it has played a secondary role. More recently, various forms of Monteith-based Production Efficiency Models (PEMs) have been developed, relying on satellite data as input. The similarity among ecosystems of canopy light use efficiency provides a basis for estimating carbon input to ecosystems globally, using remote sensing (Chapin, et al., 2002). Recent advances in earth observation now provide a vast array of parameters which may be used in the modeling of the terrestrial carbon cycle.

One of the aims of this study is to employ Earth Observation data to test the estimates of regional carbon fluxes produced by vegetation models and empirical studies. This study utilizes earth observation data to model the terrestrial carbon fluxes of Gross Primary Productivity (GPP) and Net Primary Productivity (NPP) over a complete growing season within the Siberia region. GPP represents the gross uptake of carbon by photosynthesis while NPP accounts for autotrophic respiratory losses. The hypothesis is that large amounts of variation are occurring in the carbon cycle at the regional scale, but they are currently being masked by the lack of spatial and tempo-

ral detail being applied to the problem in current modeling efforts (global and even regional models work at levels of 0.5 degree or 1:1 Million scale).

This study utilizes as a basis the C-Fix carbon exchange model (Veroustraete and Sabbe, 2000), adapting it for Siberia. For a given pixel location, the model simulates terrestrial carbon fluxes ($gC/m^2$) with high temporal frequency. Two types of input data are used to force the model. The key biological variable is the fraction of absorbed photosynthetic active radiation (fAPAR) obtained from MODIS satellite data. The key environmental variables, incoming global radiation and mean air temperature, are derived from meteorological stations in the study area, interpolated to cover all grid cells. The methodology used and application of the model to the Siberia region are discussed. Future improvements incorporating more satellite-based parameters including mean air temperature, soil moisture, land cover, etc., are also discussed, along with testing the sensitivity of the various factors driving the model.