Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11418, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11418
EGU General Assembly 2008

The Ent Dynamic Global Terrestrial Ecosystem Model (DGTEM) in the GISS GCM: Algorithms for mixed vegetation communities

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The Ent Dynamic Global Terrestrial Ecosystem Model (DGTEM) captures the dynamics of mixed vegetation communities for coupling with atmospheric general circulation models (GCMs). Representation of mixed vegetation is necessary for simulating vertical light competition and transition zones to predict cover change. We address the challenges of simulating such heterogeneity within computational constraints through flexible data structures, a foliage clumping algorithm for canopy radiative for changing vegetation mixtures, and subgrid patch dynamics driven by disturbance. Ent supports 16 plant functional types (PFTs), and allows users to alter the number and characteristics of PFTs. Here we show the performance of Ent coupled to the NASA Goddard Institute for Space Studies (GISS) GCM: 1) improvement of the GISS GCM climatology through introduction of the Farquhar/Ball-Berry biophysics and the clumping factor in canopy radiative transfer; 2) canopy vertical light profiles and albedo from the clumped canopy radiative transfer scheme; 3) phenology compared to MODIS data, 4) net primary productivity compared to MODIS data, 5) soil carbon pools compared to ISRIC-WISE data. Patch dynamics based on that of the Ecosystem Demography (ED) model is being implemented in the coming year.