



Simulation of Forest Cover Dynamics for Eastern Eurasian Boreal Forests

H.H. Shugart (1), Y. Xiaodong (1), Z. Ningning (2), A.S. Iseav (1), and D.M. German (1)

(1) Department of Environmental Sciences, University of Virginia, Charlottesville, VA 22904, USA, (2) START Temperate East Asia Regional Research Center (TEA RRC), Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029 China, (3) Centre for Ecological Problems and Productivity of Forests of the Russian Academy of Sciences (CEPL RAS) 84/32, Profsoyuznaya Str. 119997, Moscow, Russia

We are developing and testing a boreal zone forest dynamics model capable of simulating the forest cover dynamics of the Eurasian boreal forest, a major biospheric ecosystem with potentially large roles in the planetary carbon cycle and in the feedback between terrestrial surface and the atmosphere. In appreciating the role of this region in the coupling between atmosphere and terrestrial surface, one must understand the interactions between CO₂ source/sink relationships (associated with growing or clearing forests) and the albedo effects (from changes in terrestrial surface cover). There is some evidence that in the Eurasian Boreal zone, the Carbon budget effects from forest change may oppose the albedo changes. This creates complex feedbacks between surface and atmosphere and motivates the need for a forest dynamics model that simultaneously represents forest vegetation and carbon storage and release. A forest dynamics model applied to Eastern Eurasia, FAREAST, has been tested using three types of information:

1. Direct species composition comparisons between simulated and observed mature forests at the same locations;
2. Forest type comparisons between simulated and observed forests along altitudinal gradients of several different mountains;
3. Comparison with forest stands in different succession stages of simulated forests.

Model comparisons with independent data indicate the FAREAST model is capable of representing many of the broad features of the forests of Northeastern China. After model validation in the Northeast China region, model applications were developed for the forests of the Russian Far East. Continental-scale forest cover can be simulated to a relatively realistic degree using a forest gap model with standard representations of individual-plant processes. It appears that such a model, validated relatively locally in this case, in Northeastern China, can then be applied over a much larger region and under conditions of climatic change.