

A System Dynamics Approach to Global Warming

TJHSST Computer Systems Lab 2008-2009

(Noah) Junho Kang

Abstract

Predicting the effects of increased amount of CO₂ the atmosphere is the key to understanding the long term effects of global warming. This project intends to do just that utilizing Netlogo's System Dynamics Modeler. First part of the project is devoted to building a convincing model of Earth's Ecosystem, including a built-in carbon cycle, and second part of the project is devoted to making the model relevant to the real world, by calibrating and validating results from the model. With two parts combined together, this project will be able to help people determine what consequences (if any) that increase amount of CO₂ the air can have on us humans.

Introduction

The issue of Global Warming has been one of the most talked about topics in recent years, as well as being one of the most controversial. What is the issue? One of the main problems that most people seem to have with the idea of Global Warming is the fact that recent changes in global climate may not be man-induced: some charge that current increase in global temperature is part of a bigger Earth temperature cycle, while some ignore the recent temperature increases altogether. By building a convincing Global Warming model using System Dynamics, the results of this project will hopefully convince the detractors of how serious the problem is.

Procedures and Methods

Current Software being used to model Global Warming is the System Dynamics Modeler in Netlogo. STELLA is also used in conjunction with the System Dynamics Modeler to validate Netlogo Models.

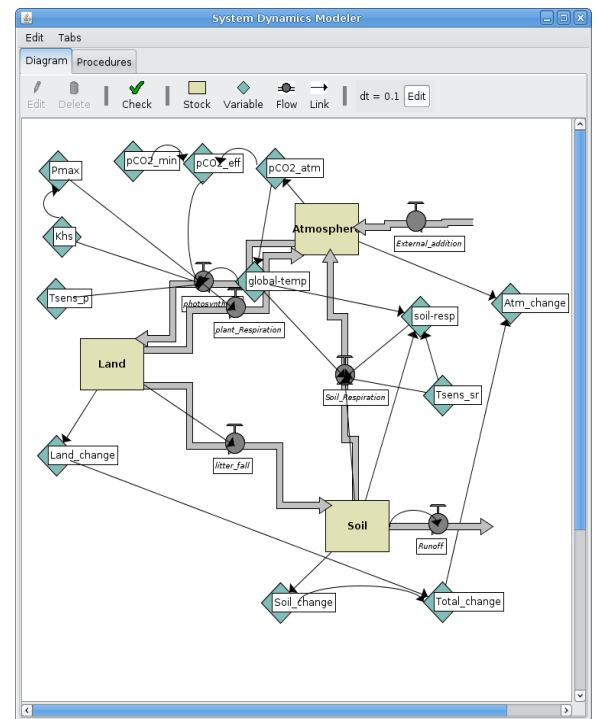


Figure 1. Current System Dynamics Model of the Global Warming Scenario

The model uses set of equations and stocks to determine the results of the simulation. Figure 1 shows the diagram that is being used by Netlogo to calculate results.

Results (as of Second Quarter)

I expect to see, as is supported by the real life environmental data, that Earth's global temperature is directly related to the increase in Atmospheric Carbon Dioxide.

Second quarter results show a sharp acceleration in the rate of warming up after some time. Because Global warming is capable of increasing ocean temperatures and melting ice, which, in turn, is capable of accelerating Global Warming further, it is necessary to act upon Global Warming before its negative impacts become clear.