Workshop hosted by MEXT Project
"Innovative Program of Climate Change Projection for the 21st Century"

"Advanced prediction of biome boundary shifts in regional and global dynamic vegetation models"

Sponsor:
Frontier Research Center for Global Change, Japan Agency for Marine-Earth Science and Technology (FRCGC-JAMSTEC)

Co-sponsors: Global Land Project; DIVERSITAS; Swiss Federal Institute for Forest, Snow and Landscape Research; Science Council of Japan (IGBP National Committee)

Date and venue:
March 4–7, 2008
Frontier Research Center of Global Change, JAMSTEC, Yokohama, Japan

Description:
This workshop aims to contribute to the Fast-Track Activity of Global Land Project, "Decreasing uncertainty in predicting biome boundary shifts". It will provide a forum to summarize the present status of predicting future dynamics of vegetation patterns at large spatial scales as affected by rapid climate change and pressure through land use, in particular at biome boundaries. The long-term goal is to improve existing vegetation models or to develop new models that are reliable and robust and can be included in Earth System models for studying biosphere-atmosphere feedbacks. Participants drawn from leading global change research centers around the world will exchange knowledge and views of ecological processes, model requirements, theoretical issues (e.g., upscaling) and computational methods (e.g., efficient implementations) and simulation protocols required for model development and testing. Participants will also deliberate on plant reproduction and dispersal processes, plant functional type representations, eco-physical effects of boundaries and modeling biome boundary shifts, interactions with land-use change, and inclusion of fine to medium scale heterogeneity in the models. The expected outcomes of the meeting are enhanced collaborations between participants leading to common modeling efforts and a joint synthesis leading to one or several publications.

Background:

"Decreasing uncertainty in predicting biome boundary shifts"
(Biome Boundary Shift)

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The structure of terrestrial ecosystems is generally characterized by sessile plants with life-spans on the order of 100-102 years. The resulting dynamics of these systems is relatively slow compared to pelagic marine ecosystems with relatively short lived and mobile primary producers. The relatively slow dynamics of terrestrial systems, combined with the rapid pace of contemporary climate change, suggests that complex time lags may characterize the response of terrestrial ecosystems to

future climate change.

Because of the nature of terrestrial plant population and community dynamics and dispersal, and the pace of climate change, predicting the future distribution of plant species is challenging. Many coupled GCM's assume simply that the boundaries between major terrestrial biomes are either static, or adjusted non-mechanistically to follow the change of climate without time lags. In some DGVM's, a non-mechanistic treatment of biome boundaries is employed with assumed delays.

Empirical reconstructions of past vegetation patterns, by pollen analysis, suggests that the response to climate change since last glacial maximum is complex, and has not uniform across species. Theoretical studies have identified the importance of characterizing dispersal to estimates of migration rates. Recent model simulations with both explicit seed dispersal and population and community dynamics suggest that range shifts of forest biomes will be both complex and extremely delayed (several millennia delay for centennial warming).

This initiative will address several important issues with the goal of reducing the uncertainty in predicting the migration of terrestrial biomes in response to climate change. Issues that will be addressed include: (a) the effect of plant population processes and dispersal on migration; (b) the effect of spatial heterogeneity (e.g. fragmentation or barriers) on dispersal and migration (c) the effect of climate change on soil conditions and through this on population processes; and (d) methods to incorporate these effects into large scale models like such as DGVM's or CGCM's.

The proposed FTI aims to review the present knowledge and knowledge gaps, and indicate the direction of relevant research, through web-communication and an intensive workshop. The topic will be mainly dealt with in GLP, while is potentially also related to PAGES, AIMES, GCP and DIVERSITAS.

Possible contributors (other than proposers)

Jerome Chave (France), Andrea Lloyd (USA), David Mladenoff (USA), Ron Neilson (USA), Shinya Sugita (USA), Akio Takenaka (Japan), Dean Urban (USA), Jim Clark (USA)

This is invitation-based semi-closed workshop.

Inquiry on this workshop should be mailed to: info(at)glp.hokudai.ac.jp