Project Database of ICP Forests
PROJECT DESCRIPTION

PROJECT INFORMATION

Project title: Global Forest Monitoring

Project ID: 14

Contact person: John Caspersen (john.caspersen@utoronto.ca)

PROJECT DESCRIPTION

Understanding the way in which forests stands grow under different environmental conditions is essential to developing dynamic global vegetation models that accurately capture ecological-scale relationships between climate and terrestrial carbon storage across the world. There is a long and rich history of forest dynamics modelling to help inform such an effort, but nearly all model development and parameterization to date has targeted research and management problems at local and regional scales. Forest ecologists have yet to apply a generic, versatile, and data-constrained model of stand dynamics to predict patterns of terrestrial carbon uptake, storage, and release in forests worldwide – despite a recognized need to properly capture such relationships in models of the Earth's carbon-climate feedback.

The availability of forest inventory data (growth and mortality observations for individual trees within fixed plots) for many of the world's forests provides an outstanding opportunity to parameterize simple but proven models of stand dynamics for forests worldwide. The recent PPA model of Purves et al. (PNAS 105: 17018-22), for example, has been shown to accurately predict basal area and species composition through time using a small set of readily estimated parameters (species-specific size allometry, plus growth and mortality rates for trees in the canopy and understory). The global variation in these key tree-level parameters, and their consequences for stand dynamics, may explain how and why forests differ in their capacity to capture and store carbon. Such a model could enable global forest carbon dynamics to be predicted across space and through time in an ecologically-realistic manner.

Main steps/objectives:

- To parameterize the PPA model (and/or other models to be identified) for many different forest types across the world using forest inventory data
- To estimate and validate potential rates of stand growth and equilibrium biomass for different forest types by scaling up tree-level processes to the stand level in model simulations
- To interpret geographic variation in basic parameters and key model outputs by relating them to underlying environmental variables (e.g., climate, soils)
- To infer the future potential for different forests to act as carbon sinks, based on current biomass, projected growth, and potential equilibrium biomass