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Ecosystem Modelling and Satellite Data Assimilation

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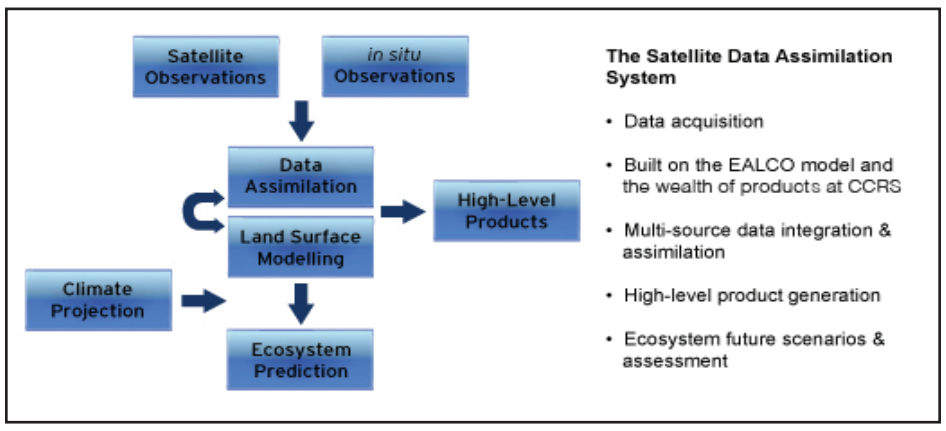
Objectives of the Ecosystem Modelling and Satellite Data Assimilation research are to develop process-based ecosystem models and satellite data assimilation system to:

- Better understand the interactions between ecosystem services and climate;
- Quantify the historical change and current state of Canada's key ecosystems;
- Predict future climate change impacts on ecosystem performance and services;
- Provide end users with useful information for sustainable management of Canada's natural resources.

Why use Models and Satellite Data Assimilation?

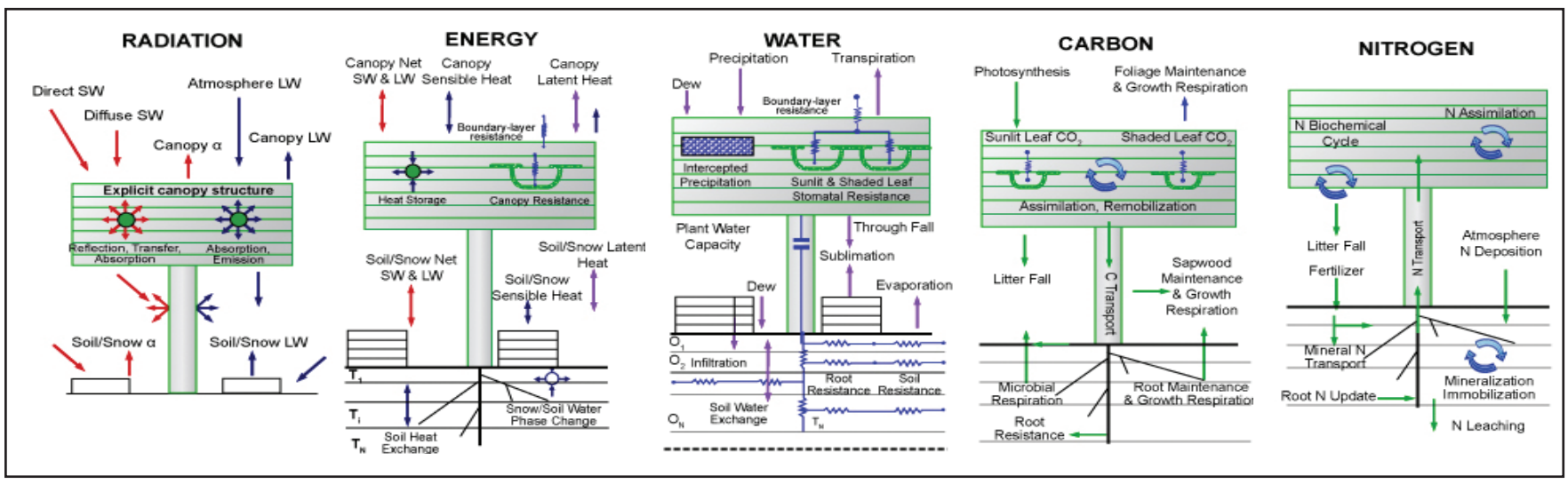
- Ecosystem and climate systems are complex involving a large number of processes, impacts, and feedbacks. Numerical models are effective tools to synthesis the data and information of such systems;
- Numerical models allow predictions;
- Effective ecosystem assessment requires two key elements: (1) consistent and well-distributed observations of ecosystem parameters for which satellite sensors are the largest source, (2) numerical models that embody the physical and biological laws governing the performance of ecosystems. Data assimilation aims to bind these two elements into a robust system for ecosystem assessment and prediction. It enables us to bridge the spatial scales of in situ, regional, and national, the temporal scales of past, current, and future, and the information scales from data to knowledge;
- To achieve maximum benefit from EO, to reduce uncertainties and data gaps from single sensors, and to produce high-level products that serve as important indicators in ecosystem performance and services but are difficult to measure in the field or difficult to retrieve solely from satellite observations.

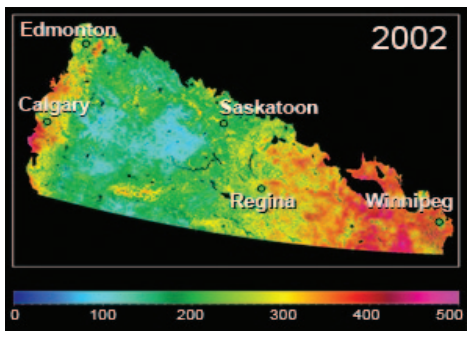


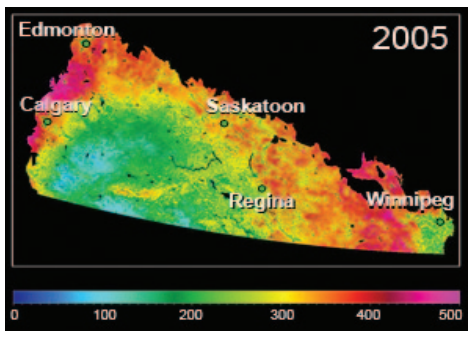
The Satellite Data Assimilation System

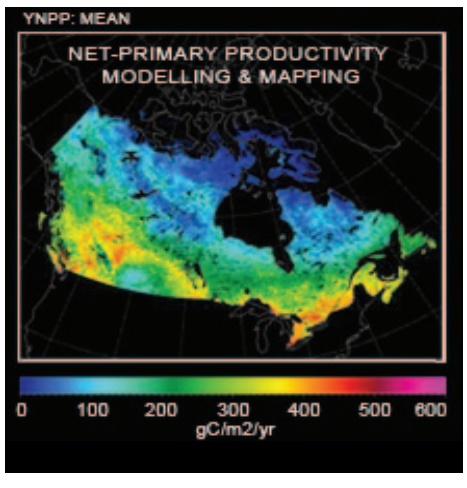
Our Approach to this activity is built on the EALCO model and the wealth of remote sensing products over Canada's landmass held at the Canada Centre for Remote Sensing.

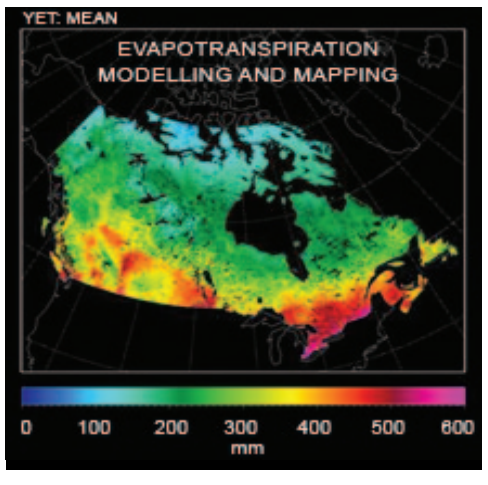
High-level Products from this activity include the key indicators of ecosystem performance and services such as plant and ecosystem productivity, water and carbon cycles (left figures), energy states, and radiation budgets. The activity is targeted to the monitoring, modelling, and mapping of the key ecosystem variables at regional and national scales, and to meet the needs of end-users with useful information and knowledge in addition to data.











Drought impact monitoring, modelling, and mapping

The 2001-2002 drought over the Canadian Prairies was the most severe one in more than a century. Total value of crop production dropped by $3 billion for the two years. Shown here is the plant productivity (gCm^2) simulated by the EALCO model in the dry year of 2002, and in the wet year of 2005 for comparison. Spatial resolution 250mx250m.

Cat. No.: M77-4/9-2010E-PDF (On-line)
ISBN: 978-1-100-15014-7

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