

Abstract

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Title: Global modeling, field campaigns, upscaling and Ray Desjardins

In the early 1980's, it became apparent that land surface radiation and energy budgets were unrealistically represented in Global Circulation models (GCM's). Shortly thereafter, it became clear that the land carbon budget was also poorly represented in Earth System Models (ESM's). A number of scientific communities, including GCM/ESM modelers, micrometeorologists, satellite data specialists and plant physiologists, came together to design field experiments that could be used to develop and validate the contemporary prototype land surface models. These experiments were designed to measure land surface fluxes of radiation, heat, water vapor and CO₂ using a network of flux towers and other plot-scale techniques, coincident with satellite measurements of related state variables. The interdisciplinary teams involved in these experiments quickly became aware of the scale gap between plot-scale measurements (~10-100m), satellite measurements (100m-10km), and GCM grid areas (10-200km). At the time, there was no established flux measurement capability to bridge these scale gaps. Then, a Canadian science team led by Ray Desjardins started to actively participate in the design and execution of the experiments, with airborne eddy correlation providing the radically innovative bridge across the scale gaps. In a succession of brilliantly executed field campaigns followed up by convincing scientific analyses, they demonstrated that airborne eddy correlation allied with satellite data was the most powerful upscaling tool available to the community. The rest is history: the realism and credibility of weather and climate models has been enormously improved enormously over the last 25 years with immense benefits to the public and policy-makers.