



CarbonFusion

Progress Report: 1 November 2006

During the CarbonFusion International Meeting in Edinburgh in May 2006, 4 working groups were set up to develop certain themes related to data assimilation in carbon cycle science. Here we report on the progress of these themes and other ongoing activities of CFusion. Please contact us if you would like to be involved the activities of the working groups, or to share news of other activities related to CFusion.

Theme 1: REFLEX (Regional Flux Estimation Experiment)

Summary

REFLEX is a model-data fusion inter-comparison project aimed at assessing the capability of extrapolating observations of CO₂ and related (water, energy) fluxes from intensively studied sites (e.g. flux towers) to other locations (i.e. the surrounding area). This project will address many of the issues faced when predicting carbon fluxes at local-to-regional scales, and will compare and contrast a range of carbon-model parameter estimation/flux forecasting techniques. The outcome of this project will be an improved capability for prediction of carbon fluxes at regional to continental scales, and a quantification of the errors associated with extrapolation.

Progress

Andrew Fox, University of Sheffield and CTCD, is the Reflex Coordinator. Andrew is currently developing a detailed protocol for Reflex, to be completed by the end of this year. The project is overseen by a Steering Committee (SC – members include M Raupach, D Barrett, M Reichstein, and other tbd), chaired by the Science Leader (M Williams). Mat Williams will spend time at CSIRO in early 2007 on Reflex activities.

Theme 2: Preparing for OCO/GOSAT

The Orbiting Carbon Observatory and the Greenhouse Gas Observing Satellite hold considerable promise for monitoring the global C cycle. However, the column CO₂ estimates generated must be assimilated with models of the C cycle and atmospheric transport for maximum utility.

Constructing and testing a suitable data assimilation system to be ready for the satellite products is thus a priority for the community.

CFusion is supporting UK activities in this area, including proposal development. However, we would like to ensure international collaboration and we are planning a meeting to discuss progress, linked to some other activities (see below).

Theme 3: Mathematics of Data Assimilation

This activity is led by DARC and has developed a set of objectives:

1. Translation of data assimilation methodologies to a common mathematical framework.
2. A review paper comparing and contrasting different classes of solution algorithms.
3. Provision of a suite of educational tools, available via WWW.

DARC are also talking with mathematicians to scope their potential involvement, and has invited Cathy Trudinger (CSIRO) to spend time at Reading. Ed Rastetter (MBL) will spend time at Edinburgh in spring 2007 and 2008 to work on developments with the Ensemble Kalman Filter.

Theme 4: Assimilating Stochastic Events

The C cycle is perturbed by stochastic events, such as land clearance or fire. Globally these impacts are significant, but they are largely unrepresented in models, and poorly quantified in general. Earth Observation provides a means of monitoring these disturbance events, but integrating observations with models of the C cycle represents a challenge. The role of this working group was to investigate methods for assimilating stochastic events.

We would like to develop a test-bed for relevant DA approaches using burnt area, active fire and FAPAR/LAI datasets over Southern Africa in 2004, linked to a C model parameterised for the same area. While Martin Wooster and Phil Lewis can provide the relevant EO products, currently there are no personnel available for developing the DA process. CTCD is looking to fill this gap with a new hire early in 2007. Please contact us if you are interested in working on this topic.

Other activities

The Joint UK Land Environment Simulator (JULES, www.jchmr.org/jules) is a community model of land-atmosphere interactions, with a major terrestrial C cycle component. JULES will serve as the land-surface scheme for the UK Met Office and Hadley Centre models.

At the JULES launch meeting in Reading, 2-3rd October 2006, we discussed the role of DA in land surface models, and the need to structure such models appropriately. We identified interested parties as QUEST, CLASSIC, Hadley Centre and CTCD, and agreed to arrange a workshop to discuss DA and land surface schemes (LSS) in more detail. The role of LSS in a OCO/GOSAT assimilation activity was one potential objective identified for discussion.

The meeting will be arranged for late November or early December, probably in Edinburgh. CFusion can fund attendance, so all interested parties should respond to Mat Williams asap. The meeting will likely last a single day or perhaps span 2 days.

As a result of the May CarbonFusion meeting, Marko Scholze is developing a proposal on the development of a network design tool based on CCDAS, which will likely be submitted to NERC in December. The project will be a collaborative activity among University of Bristol, Laboratoire des Sciences du Climat et l'Environnement (LSCE), Paris, and FastOpt, Hamburg

International Links

CFusion supports workshops, meetings and exchanges, but it does not have much funding for staff to ensure that selected activities are carried out. Hence the emphasis on UK leads for activities, as we (CTCD, DARC etc) can supply personnel from internal budgets. However, we are keen on developing proper international involvement. We have this in place for Reflex, but not properly elsewhere yet - we hope to do better.

Money still remains for exchanges and meetings to facilitate and develop the CFusion goals. Please contact us if you have a proposal for a relevant exchange or meeting.

Mathew Williams and Shaun Quegan