AN INTERCOMPARISON OF THE DIURNAL AND SYNOPTIC BEHAVIOUR OF GLOBAL TRANSPORT MODELS

R. Law[1], W. Peters[2], C. Rödenbeck[3], L. Bruhwiler[2] and TC modellers

[1] *CSIRO Atmospheric Research, Aspendale, Victoria, Australia; rachel.law@csiro.au*

[2] *NOAA CMDL, Boulder, Colorado, USA;Wouter.Peters@noaa.gov, Lori.Bruhwiler@noaa.gov*

[3] *Max-Planck-Institut für Biogeochemie, Jena, Germany; christian.roedenbeck@bgc-jena.mpg.de*

ABSTRACT

Over the last decade the TransCom group has coordinated a number of intercomparisons. The latest project focuses on the diurnal and synoptic behaviour of transport models. The poster will describe the experiment, introduce the participating models and present a sample of preliminary results.

BACKGROUND

The focus of the recently completed TransCom 3 phase was the inversion of monthly mean CO_2 observations to estimate monthly sources and sinks of CO_2. However, there is presently much interest in incorporating continuous (hourly or daily) CO_2 into inversions, as well as using individual flask measurements at their sampling times. This development assumes that transport models are able to adequately simulate CO_2 concentrations at diurnal and synoptic timescales. To assess this ability, a new intercomparison is currently being run in which forward simulations with prescribed surface fluxes are compared at a range of locations.

EXPERIMENTAL SET-UP

The experiment involves running a tracer transport model or full atmospheric model forward in time with imposed surface fluxes (Table 1). The surface fluxes include representations of fossil, oceanic and biospheric CO_2 fluxes, with the biospheric fluxes being input on a variety of timescales. SF_6 and radon are also being simulated to provide additional diagnostics of transport behaviour. The models are run with atmospheric forcing applicable to 2000-2003 with model output being saved for 2002 and 2003. The major output of the experiment is hourly concentration timeseries at a large number of current and potential observing sites. Multiple model level data and meteorological forcing data are also being output for a subset of sites where continuous observations are available for 2002 or 2003 to allow for more detailed analysis. A detailed experimental protocol is available (http://www.transcom.colostate.edu).

Flux	Time frequency	Data source
CO_2 biosphere – SiB3	Hourly	Denning (pers.comm.)
CO_2 biosphere – SiB3	Daily	
CO_2 biosphere – SiB3	Monthly	
CO_2 biosphere – CASA	3-hourly	http://www.gps.caltech.edu/
CO_2 biosphere – CASA	Monthly	~olsen/DiurnalBio/diurnalCASA.html
Fossil CO_2 (1998)	Constant	Carbon Dioxide Information Analysis Center
Ocean CO_2	Monthly	http://www.ldeo.columbia.edu/res/pi/CO2/ carbondioxide/air_sea_flux/fluxdata.txt
Radon	Constant	
SF_6	Annual	http://www.rivm.nl/EDGAR

Table 1: Temporal frequency of surface fluxes input to the experiment

MODELS

Approximately 12 groups anticipate submitting model output with some groups running models at multiple resolutions. Both offline tracer transport models and nudged online models will be included. The range of models includes those forced with European Centre for Medium-Range Weather Forecasts (ECMWF-ERA), National Centers for Environmental Prediction (NCEP) and Japan Meteorological Agency (JMA) analyses. Preliminary submissions have been received for some models and initial quality control has been undertaken. Final submissions are due in the last quarter of 2005, following an update to the experimental protocol in early August.

ANALYSIS

An overview of the experiment and model results will be prepared and detailed analysis of individual sites will be undertaken. We particularly welcome the involvement of those who collect continuous CO_2 data for collaborative analysis of the results.