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JULES benchmarking and discussion on I/O

Matt Pryor, JULES meeting, CEH Wallingford, 13th January 2011

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Contents

This presentation covers the following areas

- Benchmarking
- Discussion on rethink of JULES I/O

Benchmarking

Benchmarking

- Defines a set of standard model runs and data along with code to produce a HTML report from the model output
- R code, control files for standard model runs and data now available
- Single point FLUXNET tests
- Distributed tests from Blyth et al. GMD paper
  - Atmospheric CO2 not complete yet
- Tests for closure of energy, water and carbon budgets

Discussion on JULES I/O

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Discussion on JULES I/O

This section is intended to stimulate a discussion about the I/O requirements of the JULES community.

- Use of a convention for JULES input and output
- NetCDF as the only (binary) format
- NAMELISTS for other options
- Generic routines for reading time varying data
- Dumps and the restart system

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Convention for JULES input and output

- Currently, each new dataset used with JULES requires new code in JULES
- Following a convention (for input in particular) moves this complexity into external conversion tools
  - If an industry standard convention is used, many data will already be in the correct format
- Input convention could be either a formally defined convention, such as CF convention, or inherited from a commonly used dataset (e.g. gswp2, WATCH)
  - General consensus (and my personal preference) is for CF convention as it is rigorous and seems to be becoming an industry standard

NetCDF as the only (binary) format

- Supporting only one binary format would reduce code complexity
- NetCDF is an open standard
  - Libraries available for most major programming languages and supported by a lot of software, meaning increased portability of data
- Metadata can be attached to files and variables
- NetCDF comes with a range of tools (e.g. ncdump) that make inspecting the data as easy as inspecting ASCII data
- No endian related issues
- Conflicting opinions on whether ASCII should still be available for single point runs – possibly as an external conversion tool
- A possible solution to this problem is to have some kind of community “JULES utilities repository” that members of the JULES community can submit pre and post processing code to that might be useful to others, avoiding people starting from scratch on problems that have already been solved

NAMELISTS for other options

- The JULES control file contains a lot of options
  - Can be intimidating for new users
  - Most are never changed from the default
- With Fortran NAMELISTS, users only need specify items they want to change
  - This would simplify the JULES control file
  - Has the downside that users may not be aware of all the options that they can change (although these would be well documented)

Generic routines for reading time varying data

- It is currently hard to add new time varying ancillaries to JULES that vary on a different timestep to the driving data
- New routines (possibly adapted from the current code) could provide interpolation facilities etc. for any given timestep to users that want to add new ancillaries to JULES
- Perhaps some thought should be given to a fully fledged data assimilation scheme for JULES?

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Dumps and the restart system

- This is currently quite incomplete – for example, runs with TRIFFID on that are restarted from dump lose information about carbon accumulations
- The overwhelming consensus is that the best format for the dump file is named variables in NetCDF
  - Some work has been done in this area for QESM-JULES by Jonathan Gregory and others that could potentially be built upon
- It needs to be obvious how to add a new variable to the restart system
- It has been suggested that all the variables required to restart any configuration of JULES should be included in the dump, regardless of whether they are required in the current configuration – this would allow dump files to be used to start JULES in a different configuration from that which produced the dump. Is this desirable behaviour?

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Discussion